SANBORN | HEAD ENGINEERING

Building Trust. Engineering Success.

OPERATIONS AND MAINTENANCE MANUAL
SUBSLAB VAPOR EXTRACTION AND TREATMENT SYSTEM
BUILDING 330D

IBM East Fishkill
Hopewell Junction, New York

IBM
East Fishkill, New York

Prepared for IBM Corporation
File No. 2999.00
May 2014

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

1.0 INTRODUCTION

This Operations and Maintenance (O&M) Manual describes procedures and practices associated with operation, maintenance, and monitoring of the Building 330D (B330D) Subslab Vapor Extraction and Treatment System (the SVE system) at the IBM East Fishkill facility located in Hopewell Junction, New York. The B330D SVE system was put into operation on October 5, 2010. This O&M Manual was prepared by Sanborn, Head Engineering, P.C. (SHPC).

1.1 Background and Performance Objectives

As documented in previous reports[1,2], tetrachloroethene (PCE) residuals from former manufacturing operations are present beneath the 80K clean room manufacturing area at the north end of the building (80K area). The SVE system is intended to remove and intercept PCE vapors from below the floor slab, thereby preventing PCE vapor entry into the building and negative impacts to indoor air quality. The design basis of the system was approved by the New York State Department of Environmental Conservation (NYSDEC) and the New York State Department of Health (NYSDOH) (collectively, the Agencies) in a May 19, 2010 letter to IBM. Following startup and performance monitoring of the SVE system[3], B330D was designated for no further assessment by the Agencies in a March 13, 2013 letter to IBM. Copies of these letters are provided in Appendix F.

1.2 System Overview

The B330D SVE system was designed to extract vapor from beneath approximately 16,500 square feet of floor slab to decrease the potential for PCE-containing vapor migration into the 80K area.

Vapor is withdrawn from beneath the slab through five extraction ports using a regenerative blower installed outside B330D to the south of Service Tower 7. Approximately 90 cubic feet per minute (cfm) of subslab vapor is extracted and treated using granular activated carbon (GAC) held in two 1,000 lb vessels operated in series and under vacuum. The blower discharges treated vapor to the atmosphere through the adjacent TMAH exhaust system stack. A process flow diagram is provided as Figure 1.

Operation of the system is controlled and monitored by a programmable logic controller (PLC) installed in the Control Panel, which is mounted on the blower skid. The PLC is connected to the building's supervisory control and data acquisition (SCADA) system, and can be monitored remotely through that system as necessary. The blower is powered by a variable frequency drive (VFD) that continuously operates at a frequency setpoint of 45 Hz. The operating setpoint can be adjusted if appropriate.

---

[1] IBM Corporation and Sanborn, Head Engineering, P.C., *Report of Findings, Building 330D VOC Source Investigation and Mitigation, IBM East Fishkill Facility, Hopewell Junction, New York*, December 24, 2008.

[2] IBM Corporation and Sanborn, Head Engineering P.C., *Building 330D Exterior Investigation, IBM East Fishkill Facility, Hopewell Junction, New York*, February 8, 2010.

[3] IBM Corporation and Sanborn, Head Engineering P.C., *Performance Monitoring and Confirmatory Sampling Results, Building 330D VOC Source Assessment, IBM East Fishkill Facility, Hopewell Junction, New York*, December 22, 2011.

1.3 Organization of Manual

Section 2.0 of this manual provides detailed descriptions of the components of the SVE system. Operating procedures, including steps for system startup, changeout of filters and GAC vessels, and system shut down are provided in Section 3.0. Section 4.0 describes monitoring and record keeping guidelines. Maintenance guidelines are outlined in Section 5.0.

An As-Built set of drawings is included as Appendix A. Photographs of the system are included as Appendix B. An Inspection and Maintenance Log Sheet prepared to support system performance monitoring is included as Appendix C. Appendix D includes manufacturers' manuals for major system components. Manuals and drawings documenting the system control panel are included as Appendix E.

2.0 B330D SUBSLAB VAPOR EXTRACTION AND TREATMENT SYSTEM DESCRIPTION

This section provides detailed descriptions of the major system components and their intended function.

2.1 Subslab Vapor Extraction Ports

The locations of the 5 subslab vapor extraction ports are shown on Appendix A Sheet G-1, with a photograph of a typical port assembly included in Appendix B, Photo 5. The subslab portion of the extraction ports consists of a 3/4-inch Schedule 40 slotted PVC pipe connected to a 3/4-inch pipe adapter and a 1-inch NPT x BSPP steel coupling. The slotted PVC pipe (0.010-inch slots) extends approximately 2 feet beneath the slab and is plugged at the bottom with a cork and surrounded by silica support sand. The extraction port assembly is secured in place in the slab with granular bentonite and hydraulic cement.

The extraction port risers are constructed of 2-inch Schedule 40 galvanized steel pipe secured to interior building walls. Each riser is equipped with a Swagelok® port for extracted vapor sample collection, a 0 to 80 in. water column (wc) Magnahelic vacuum gauge, and a 2-inch gate valve for manual adjustment of the flow through the ports. The extraction port risers thread into the extraction ports, extend up through the dropped ceiling and are connected to the SVE system via galvanized steel vacuum conveyance tubing attached to the structural ceiling.

2.2 Vapor Transmission Piping

Subslab vapor is transported from the extraction port risers via 4-inch or 6-inch galvanized steel Spencer-brand vacuum conveyance tubing to the dedicated equipment room housing the GAC treatment vessels. Spencer tubing joints under vacuum are constructed using polyolefin shrink sleeves, while joints under pressure (downstream of the blower) are constructed using rubber sleeves and clamps, all manufactured by Spencer. Vessel manifold piping is constructed of 4-inch schedule 40 galvanized steel with 4-inch EPDM rubber hose connecting the vessel inlets and outlets to the galvanized manifold pipe. Four-inch Spencer tube connects the blower discharge to the TMAH manifold. Appendix A, Sheet G-1 shows the piping layout.

2.3 Purge Air Inlet

A purge air inlet with a combination silencer and filter is located upstream of the GAC vessels. The inlet is used to provide dilution air as necessary to control the vacuum applied to the extraction ports. The purge air inlet should be closed during normal operation of the SVE system. The purge air inlet and filter manual is included in Appendix D.

2.4 Granular Activated Carbon Treatment

Two granular activated carbon (GAC) treatment vessels are used to adsorb VOCs from the extracted vapor. The treatment train consists of two Siemens 1,000-pound Vent-Scrub GAC vessels plumbed in series. Swagelok sample ports are located at the inlet, midpoint, and outlet of the treatment train. Samples are collected on a routine basis for laboratory analysis. Results of the sampling are used to calculate VOC mass removal and determine when the GAC vessels need to be changed out.

The SVE system is designed for extracted vapor to flow through both the lead and lag vessels, which are both changed out once VOC breakthrough is observed in the lead vessel. Additional information for GAC vessel changeout is provided in Section 3. Photos of the GAC treatment train are provided in Appendix B.

2.5 Heated Enclosure

A heated enclosure, located adjacent to the blower skid outside the northwest corner of B330D, houses the vapor liquid separator (VLS), a condensate collection vessel, and a transfer pump installed over a secondary containment sump. The condensate collection vessel is no longer in use, or connected to the system, but remains within the enclosure. The enclosure includes a space heater that prevents any liquid within the VLS from freezing during the winter months. The space heater shall be turned On from October 15 to April 15 each year.

The heated enclosure is equipped with two alarm notifications. A low temperature alarm will notify system operators if the temperature within the enclosure drops below an operator adjustable setpoint, while a secondary containment high level alarm will notify system operators of a potential liquid leak within the enclosure.

2.6 Heat Trace

The vapor conveyance pipe leading from the building to the heated enclosure is wrapped with heat trace and jacketed insulation to keep the process air warm and decrease the potential for condensate formation within the pipe. The controller for the heat trace is located in the heated enclosure, and should be turned On from October 15 to April 15 each year. The controller is equipped with a low temperature alarm that will notify system operators of a potential heat trace failure.

2.7 Vapor Liquid Separator

A Steel Fab Model A10045 VLS separates water vapor from the extracted vapor stream. The VLS is an 80-gallon carbon steel tank equipped with a bottom drain, a vacuum gauge, a clear PVC sight tube (removable for cleaning), and three stem-mounted, stainless steel level control switches. A photo of the VLS is included in Appendix B.

2.8 Transfer Pump

Liquid that collects in the VLS is transferred to a drum for disposal via a Moyno positive displacement pump, Model 33352. The pump is constructed of 316 stainless steel and has a ½-horsepower, single-phase motor.

2.9 Dilution Air Inlet

A dilution air inlet with a combination silencer and filter are located between the VLS and the blower. The air inlet can be used to regulate vacuum applied to the extraction ports, although under normal operation, the inlet shall remain closed, and adjustment of applied vacuum shall be done by controlling the blower speed via the VFD. A manual for the purge air inlet, including filter element, is included in Appendix D.

2.10 In-line Particulate Filter

An in-line particulate filter is located immediately upstream of the vacuum blower. A differential pressure gauge measures pressure drop across the filter element, and should be monitored for an increase in pressure, indicating the need to replace the filter element. The filter element should be replaced when the differential pressure reaches 5 in. wc. The filter manual, including the filter element part number, is provided in Appendix D.

2.11 Vacuum Relief Valve

A Tyco Kunkle Model 215V vacuum relief valve is located between the in-line particulate filter and the blower inlet. The relief valve provides protection to the blower by automatically opening if the applied vacuum exceeds the valve’s setpoint. The valve’s setpoint is pre-set to prevent the blower from reaching its maximum amperage, and should not be field adjusted.

2.12 Regenerative Blower

A Rotron DR 909 15 horsepower, 3-phase regenerative blower generates vacuum for the SVE system. The blower speed is controlled by a VFD within the control panel. Blower operational status can be determined by an indicator light on the control panel. A Hand-Off-Auto (HOA) switch for blower control is located on the Control Panel.

When the HOA switch is in the Hand position, the blower is in manual mode and will run continuously and independently of all safety interlocks. It is imperative that the blower switch is not left in the Hand position when an operator is not physically present. When the switch is in the Auto position, safety interlocks will have the ability to stop the blower in the event of an abnormal operating condition. When the switch is in the Off position, the blower will not operate. Photos of the blower and the Control Panel are included in Appendix B. The blower manual is provided in Appendix D.

2.13 Exhaust Connection to TMAH Stack

Extracted vapor from the SVE treatment system travels under positive pressure from the blower outlet through a vapor check valve and an actuated butterfly valve to the TMAH exhaust manifold. The vapor then combines with exhaust vapor from three TMAH process blowers and is exhausted through the TMAH stack above the roofline of B330D. The actuated butterfly valve is connected to the PLC and will automatically open when the blower is put into operation and automatically close when it is shut off.

2.14 Instrumentation

The SVE system is equipped with instrumentation to facilitate continuous monitoring and automated control of system operations. The key instrumentation is described below. An instrument list is provided in Table 1.

2.14.1 Vacuum Gauge

The treatment system is equipped with Winters 0-200 in. wc. vacuum gauges, Model P303, that measure the vacuum generated by the blower at various locations throughout the treatment train. The vacuum gauges do not transmit vacuum data to the PLC; the system vacuums should be manually recorded on a regular basis and when the system is turned off and on for maintenance purposes.

Vacuum gauges are located upstream, between, and downstream of the GAC treatment vessels, and immediately upstream of the inline particulate filter. Vacuum gauge readings from the outlet of each GAC vessel should be recorded regularly.

2.14.2 Inlet Filter Differential Pressure Indicator

A Dwyer 2020 Magnehelic 0-20 in wc differential pressure indicator is located across inlet filter of the SVE treatment system. Once the differential pressure at the gauge reaches 5 in wc, the filter element should be exchanged. The differential pressure gauge does not transmit pressure data to the PLC; the differential pressure across the filter element should be manually recorded on a regular basis.

2.14.3 Temperature Indicators

There are a total of six temperature indicators located throughout the SVE treatment system. One is located at each of the following locations: inlet, mid-point, and outlet of the GAC treatment train; inlet and outlet of the heated enclosure; and outlet of the blower.

The temperature indicators have a field display only, and are not connected to a transmitter, so temperature values are not monitored/logged by the PLC. Temperature readings should be recorded on a regular basis and during maintenance activities. The process and instrumentation diagram (P&ID) shows the locations of each temperature indicator and is provided in Appendix A, Sheet IC-1.

2.14.4 Air Flow Indicator and Sensor

A Dwyer DS-300-3" inline flow sensor and differential pressure guage are located immediately upstream of the blower. The flow sensor is an averaging Pitot tube that is connected to a differential pressure gage. This instrument does not need to be calibrated. The extracted vapor flow rate can be calculated using the differential pressure, pipe diameter, static line pressure and specific gravity. Conversion equations are provided in the instrumentation operation and maintenance manual, included as Appendix D.

2.14.5 Discharge Pressure Switch

A Dwyer Model 1950P-2-2F explosion-proof differential pressure switch ranging from 0.5 to 2.0 pounds per square inch (psi) is located at the blower outlet. If the pressure exceeds the adjustable setpoint, the SVE system will shut down. The setpoint should not be field adjusted.

2.14.6 TMAH Vacuum Switch

A Dwyer Photohelic Model 3000MR-LT-WP low vacuum switch is located at the TMAH influent manifold to monitor the level of vacuum in the TMAH exhaust system. The SVE system exhaust pipe is connected to the TMAH blower discharge stack, so as a safety precaution, the TMAH blowers must be ON, with an operating vacuum of at least 5 in. wc, to prevent potential backflow of treated SVE vapor through the TMAH exhaust system. If the TMAH operating vacuum is below 5 in wc, the SVE system will automatically shut off.

2.14.7 Vapor Liquid Separator Float Switches

There are two Innovative Solutions L500-09 float switches installed within the vapor liquid separator level sight tube. They are designated Level Switch High (LSH-1) and Level High High (LHH-1). When the LSH-1 switch is activated an alarm is sent to the building's SCADA system to notify appropriate personnel of the high level. The current operating configuration requires that the VLS be drained manually, with condensate pumped into a drum for disposal. If the VLS is not manually drained and the liquid level inside the VLS reaches the LHH-1 switch, the system is automatically shut off.

The liquid level settings for the LSH-1 and LHH-1 are fixed and cannot be changed.

A W.E. Anderson Model F6-SS float switch is located in the secondary containment sump within the treatment enclosure and is designated LSH-3. When this float switch is triggered, indicating a possible breach in the VLS tank or associated piping, the system will automatically shut off. The LSH-3 liquid level setting is fixed and cannot be changed.

2.15 Control Panel

The Control Panel is located outdoors on the blower skid and houses a Modicon Momentum microprocessor-based control unit and Altivar VFD manufactured by Schneider Electric. The lockable control panel is rated NEMA 3R for exterior weather protection. A 480 Volt AC main power disconnect switch is located on the interior swing panel. The swing panel is also equipped with Hand/Off/Auto (HOA) switches for the blower and heat exchanger (no longer in use), Open/Close/Auto switch for the actuated valve, an On/Off switch for the transfer pump and control power, a VFD manual keypad for both the blower and heat exchanger (no longer in use), a reset button, and emergency stop button, and alarm lamps. A schematic of the control panel is provided in Appendix D. The alarm lamps are summarized in the following table.

Lamp ID	Activated when…
Heat Trace Low Temperature	Heat trace temp is less than setpoint
Containment Low Temperature	Heated enclosure internal temp is less than setpoint
Air/Water Separator High Level	High water level in the vapor liquid separator
Condensate Trap High Level	High water level in the condensate trap (no longer in use)
Containment High Level	High water level in the secondary containment
TMAH Manifold Low Vacuum	Low vacuum in the TMAH blower inlet manifold
Blower VFD Fault	Fault in the blower VFD
Heat Exchanger VFD Fault	Fault in the heat exchanger VFD (no longer in use)
Heat Exchanger High Temperature	High temp at the HX discharge (no longer in use)
Control Power	Power applied to the control panel

An overview of the function of the Control Panel components is provided below.

2.15.1 Control Power Switch

An On/Off switch labeled "Control Power" is located on the front of the Control Panel. To operate the system, the switch should be turned to the On position. When the switch is in the On position, the PLC, VFD, and ancillary electrical devices will be powered. A white indicator light labeled "Control Power" is located next to the control power switch. When the switch is on the "On" position, the light will be illuminated.

2.15.2 Programmable Logic Controller

The Modicon Momentum PLC, Model 960-20, is a microprocessor-based control/telemonitoring system which continuously monitors and controls the operation of the B330D SVE system. The PLC monitors system operations via input signals from instrumentation (e.g., vacuum switch) and controls the system by issuing commands, or output signals, to equipment (e.g., VFD). The input/output (I/O) signals and commands associated with the PLC are listed in Table 2.

The PLC is accessed via IBM's SCADA system or by local connection to a laptop computer. Pre-wired switches and a VFD control pad located on the internal swing-door of the Control Panel can be used to make limited system changes.

The only PLC adjustable setpoint is the blower speed, which has been set at 45 Hz and should not be adjusted unless system performance data suggest a change is necessary.

The PLC is programmed to monitor and control system operations based on the setpoints and the signals received from instrumentation devices. Under normal, automatic operation, the PLC has been programmed to complete the following key functions:

- Open the actuated valve to the TMAH discharge stack when the blower is turned On;
- Close the actuated valve to the TMAH discharge stack when the blower is turned Off;
- Shut down the blower in the event of a VFD alarm/fault;
- Shut down the blower in the event of a VLS high-high alarm;
- Shut down the blower in the event of a secondary containment high level alarm;
- Shut down the blower in the event of a TMAH influent manifold low vacuum alarm;
- Shut down the blower in the event of a blower discharge high pressure alarm;
- Send a warning notification to the building SCADA system and system operators if the VLS high level switch is activated;
- Send alarm notifications to the building SCADA system and system operators.

A summary of PLC programming functions is provided in Table 2. The PLC program file was prepared by IBM and is kept onsite.

2.15.3 Variable Frequency Drive

The Schneider Electric Altivar 61 VFD adjusts the vacuum blower motor speed based on operator input at the VFD control pad located on the Control Panel or a dedicated operating screen within the IBM SCADA system. The VFD operating parameters were programmed at system startup and should not require further adjustment. For additional information regarding the VFD operations, refer to the Altivar manual provided as Appendix E.

The VFD is programmed for a maximum output of 60 Hz, with the current operating setpoint at 45 Hz. The VFD speed should not be adjusted unless system performance data suggest a change is necessary.

2.15.4 Blower HOA Switch

The blower HOA switch labeled “Blower” is located on the inside swing-door of the Control Panel. For normal SVE system operation, the switch should be toggled to the Auto position. When switched to the Off position, the treatment system will shut down and the automatic startup capabilities will be disabled. When switched to the Hand position, the blower will remain on and all automatic safety interlocks will be disabled. The blower should not be left unsupervised if the switch is toggled to the Hand position.

When the blower switch is toggled to Auto or Hand, the VFD will be used (via the PLC) to control the blower motor speed. The vacuum generated by the blower depends on the motor speed. Currently, the VFD is set to operate continuously at setpoint of 45 Hz. If the Hz setting is changed via the keypad on the Control Panel or the operating screen within the building SCADA system, the blower motor speed will either increase or decrease. As the blower motor speed increases, the vacuum generated increases, and vice versa. The VFD settings should not be changed without prior verification that a change is necessary.

2.15.5 Actuated Valve Switch

An Open/Close/Auto switch for the actuated butterfly valve on the blower discharge where it ties into the TMAH exhaust stack is located on the inside swing-door of the Control Panel. During normal SVE system operation, the switch should be set to "Auto." When the switch is set to Open, the valve will remain opened and automatic open/close capabilities will be disabled. When the switch is set to Close, the valve will remain closed and automatic open/close capabilities will be disabled.

2.15.6 Transfer Pump Switch

An On/Off switch for the positive displacement transfer pump is located on the inside swing-door of the Control Panel. The switch should remain in the Off position unless the VLS is being pumped out (only under manual supervision).

2.15.7 Reset Button

A system reset button labeled "Alarm Reset" is located on the front of the Control Panel. Depressing this button will clear all system alarms and initiate the startup sequence if the condition that initiated the alarm has been corrected. Additionally, this button must be depressed and help while turning the blower HOA switch to Auto to put the system into Auto operation.

3.0 OPERATIONS

This section describes the operating procedures for the SVE system, including startup procedure, changeout procedures for particulate filters and GAC units, and shutdown procedure.

3.1 Normal Operation Overview

The SVE system is designed for continuous, un-manned operation, and under normal conditions, there should be little, if any, day-to-day adjustment or maintenance. During normal operation, the blower HOA switch should be in the Auto position, the actuated valve HOA switch should be in the Auto position, and the transfer pump switch should be in the Off position. During normal operation, all switches, both panel mounted (e.g. toggle) and field mounted (e.g. pressure) are continuously monitored by the PLC for position and potential alarm conditions.

3.2 Procedures

This sub-section provides procedures for operating the SVE system. Startup steps for normal, automatic operation are presented first. Procedures for changing out the particulate filters and granular activated carbon treatment units are also provided.

3.2.1 Startup and Automatic Operation

The steps for starting up the system for automatic operations are as follows:

1. Confirm that the valves on the extraction port risers are open.
2. Confirm that the pipe network isolation valve is open. (See photo 1 in Appendix B)
3. Confirm that the purge air inlet valve is closed. (See photo 1 in Appendix B)
4. Verify that the valve downstream of the GAC vessels is open. (See photo 4 in Appendix B)
5. Verify that the valves to and from the transfer pump are closed.
6. Confirm that all sample taps are closed.
7. Refer to the Modicon Momentum User's Guide for more information.
8. Turn the Control Power switch on.
9. Turn the Actuated Valve HOA switch to Auto.
10. Turn the Blower HOA switch to Auto. The blower will start and run at a frequency of 15Hz for 30 seconds while the actuated valve opens. The blower will increase to the preset operating speed at the end of the time delay.
11. Visually review the treatment system piping for evidence of leaks or defects and review the analog pressure gauges and differential pressure readouts for evidence of abnormal operating conditions.
12. Check the Control Panel to verify that no alarm lights are illuminated.

3.2.2 Particulate Filter Changeout

Particulate filter changeout is required when the differential pressure across the filter reaches 5 in wc. A Solberg CT-235P-300C is used in the SVE system. The filter maintenance manual is included in Appendix D. The steps to changeout the particulate filter(s) are as follows:

1. Open the purge air inlet valve and close the pipe network isolation valve (See photo 1 in Appendix B)
2. Let the blower run for approximately 1 minute with the purge air valve open and the pipe network isolation valve closed.
3. Turn the blower HOA switch to the Off position.
4. Disconnect the canister housing from the filter body by releasing the four wire-form clips.
5. Remove the hex head/wing-nut and washer from the element and then remove the element.

6. Clean the sealing surfaces of the housing, top & base plates, and element end caps.
7. Place the new/cleaned element evenly on the base plate.
8. Place top plate on the element by centering on tap bolt.
9. Secure washer and wing nut to end cap (or top plate) and tap bolt. The element should be tightly secured. Do not over tighten.
10. Wipe down all surfaces. Place the canister housing back on the filter body. Hold the canister housing against the clean o-ring on the filter body. Re-fasten wire form clips.
11. Turn the Blower HOA switch to Auto.
12. Close the purge air inlet valve and open the pipe network isolation valve.

3.2.3 GAC Vessel Change-out

Change-out of both GAC vessels will be completed when process sample analytical results indicate breakthrough of the lead GAC vessel. Arrangements should be made with Siemens to coordinate delivery of new vessels and removal of spent vessels upon receipt of the laboratory results indicating lead vessel breakthrough. The steps to change-out the GAC vessels are as follows:

1. Open the purge air inlet valve and close the pipe network isolation valve (See photo 1 in Appendix B)
2. Let the blower run for approximately 5 minutes with the purge air valve open and the pipe network isolation valve closed.
3. Turn the Blower HOA switch to the Off position.
4. Disconnect the quick-connect fittings at the tops and bottoms of the GAC vessels.
5. Place 4 inch Cam-lock plugs into the female Cam-lock fittings on the vessels to seal the vessels for transport through the building.
6. Remove the spent GAC vessels, loading them directly onto the transport truck for transportation off-site. When the vessels are loaded on the truck, remove the 4 inch Cam-lock plugs for future use.
7. Off-load the new vessels and place them in the appropriate locations in the SVE equipment room.
8. Reconnect the inlet and outlet hoses to the Cam-Lock fittings at the tops and bottoms of the new GAC vessels.
9. Turn the Blower HOA switch to Auto.
10. Open the pipe network isolation valve and close the purge air inlet valve.
11. Review the connections for evidence of leakage by listening and feeling around pipe/hose joints.
12. Review the analog pressure gauges (on the system and at extraction ports) and differential pressure readouts for evidence of abnormal operating conditions.

3.2.4 Shutdown Procedures

To shutdown the system, turn the blower HOA switch to the OFF position.

CAUTION: If shutting down the system for maintenance/repair, implement lockout/tagout procedures in accordance with IBM's site safety protocols.

4.0 MONITORING AND RECORD KEEPING

Monitoring and logging guidelines for the SVE system operation and performance are summarized below. The data generated are used to support periodic evaluation of the effectiveness of the system.

4.1 Operations Monitoring

Effectiveness of the SVE system was evaluated during system startup and again during the second quarter of 2011. Effectiveness of the system was evaluated by measuring differential pressures across the subslab monitoring port network (Figure 2). Additionally, Figure 2 shows the locations of subslab extraction and monitoring ports, as well as the vacuums applied at each port, the resulting vapor flows, and the corresponding pressure response beneath the slab. The SVE system shall be monitored to maintain the operating conditions established during the most recent evaluation (as shown on Figure 2).

4.2 Record Keeping

The SVE system should be inspected on a weekly basis. Inspection and Maintenance Log sheets should be kept in the treatment area (GAC vessel room) and archived on a monthly basis. Logged data should be stored and backed up in accordance with IBM SCADA operations. Weekly system inspections and recordkeeping should include completion of the Inspection and Maintenance Log sheet that is included in Appendix C.

5.0 MAINTENANCE

The SVE system should require limited and infrequent maintenance. The primary maintenance tasks include inspecting the system piping for leakage and changing out the particulate filters and GAC vessels. The maintenance tasks associated with the SVE system operation and their recommended frequency are summarized below:

Item	Action	Frequency	Comments
Vacuum Blower	Inspect	Quarterly	1. Verify tightness of nuts/bolt securing blower in place. 2. Verify that all hose/tube fittings are secure.
System Piping	Inspect	Monthly	1. Review for evidence of leakage.
Transfer Pump	Inspect	Quarterly	1. Verify tightness of nuts/bolts securing pump in place. 2. Verify that all hose/tube fittings are secure.
Extraction Ports	Inspect	Monthly	1. Review pipe/connections for evidence of leakage. Check instrument connections. 2. Confirm the vacuum applied to each port is within the operating range.
Heated Enclosure	Inspect	Monthly during winter months	1. Inspect and clean heating element 2. Inspect secondary containment for evidence of water
Treatment Area (GAC vessel room)	Clean and Inspect	Quarterly, or as needed	1. Wipe clean piping and electrical enclosures. Sweep floor.

TABLES

Table 1
Instrument List
B330D Subslab Vapor Extraction and Treatment System
IBM East Fishkill

ID	Description	Location	Specification
PS-1	Pressures switch	Blower discharge	Dwyer Model 1950P-2-2F
LHH-1	High high level switch	Vapor/liquid separator	Inovative Solutions L500 Series Multiple Stage Switch
LSH-1	High level switch	Vapor/liquid separator	Inovative Solutions L500 Series Multiple Stage Switch
DPI-1	Differential pressure indicator	Across in-line filter	Dwyer Magnahelic gauge, 0 to 20 inches water column
FI-1	Flow indicator		Dwyer Series DS-300 Flow Sensor Dwyer Magnahelic gauge, 0 to 30 inches water column
ZSL-1A	Actuated valve closed	Electric actuator on butterfly valve	Dry contact on Flowserve Centura CE Series Actuator
ZSL-1B	Actuated valve open	Electric actuator on butterfly valve	Dry contact on Flowserve Centura CE Series Actuator
TSL-1	Low temperatuer switch	Heated enclosure (heat trace temp)	Tyco DigiTrace Model JBS-100-ECP-A
TSL-2	Low temperature switch	Heated enclosure (enclosure temp)	Dwyer/Mercoid Model DA-7035-153-3N, range 0 to 100 deg F, set at 50 deg F
LSH-3	High level switch	Secondary containment in heated enclosure	Dwyer Model F6-SS float switch
VSL-1	Low vacuum switch	TMAH suction manifold	Dwyer Photohelic Model 3000MR-LT-WP, low temperature and water proof options, range: 0 to 20 in. wc, set at 5 in wc
VI-1	Vacuum indicator	GAC V-1 inlet (influent)	Winters Model P303, 0-200 inches water column
VI-2	Vacuum indicator	GAC V-1 outlet (mid-point)	"
VI-3	Vacuum indicator	GAC V-2 outlet (effluent)	"
VI-4	Vacuum indicator	Blower inlet	"
TI-1	Temperature indicator	GAC V-1 inlet	Wika Model TI.20, range 1 to 140 degrees Fahrenheit, 6" stem
TI-2	Temperature indicator	GAC V-1 outlet	"
TI-3	Temperature indicator	GAC V-2 outlet	"
TI-4	Temperature indicator	Heated enclosure inlet	"
TI-5	Temperature indicator	Heated enclosure outlet	"
TI-6	Temperature indicator	Blower outlet	Wika Model TI.20, range 1 to 400 degrees Fahrenheit, 6" stem

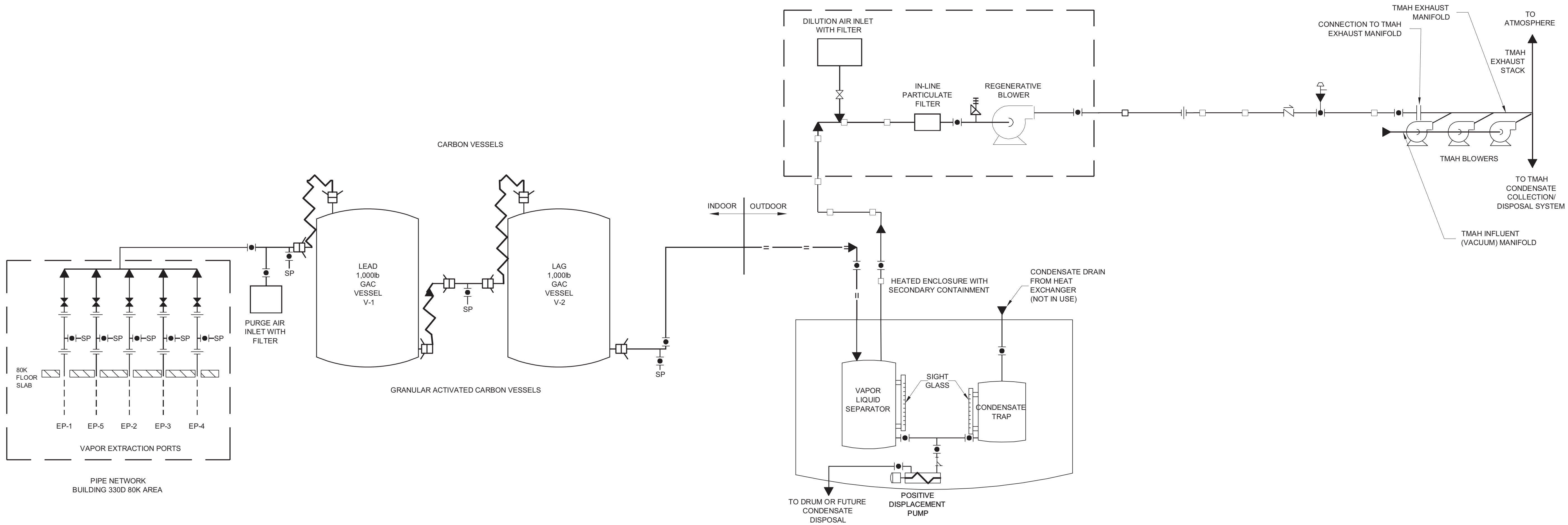
Table 2
Input/Output List
B330D Subslab Vapor Extraction and Treatment System
IBM East Fishkill

Device ID	Location	Description	Function/Programming
Discrete Inputs from:			
PS-1	Vacuum blower discharge	Pressure switch	Pressure switch must indicate blower is On before actuated valve can open
TSL-1	Heat trace	Heat trace low temp switch	Notify building SCADA system; activate alarm lamp on panel
TSL-2	Heated enclosure	Enclosure low temp switch	Notify building SCADA system; activate alarm lamp on panel
LSH-1	Vapor/liquid separator	High liquid level switch	Notify building SCADA system
LSH-3	Enclosure secondary containment	High liquid level switch	Shut down system; notify building SCADA system; activate alarm lamp on panel
LHH-1	Vapor/liquid separator	High-High liquid level switch	Shut down system; notify building SCADA system; activate alarm lamp on panel
VSL-1	TMAH suction manifold	Low vacuum switch	Shut down system; notify building SCADA system; activate alarm lamp on panel
Blower VFD	Blower VFD	General VFD fault	Shut down system; notify building SCADA system; activate alarm lamp on panel
Blower HOA switch	Control panel	HOA not in Auto	
ZSL-1A	Discharge valve to TMAH exhaust	Actuator closed	
ZSL-1B	Discharge valve to TMAH exhaust	Actuator open	Required for vacuum blower run
Manual Reset button	Control panel	Reset and restart system	Clear all alarm outputs; initiate startup sequence
Discrete Outputs to:			
Blower VFD	Blower VFD	Run/stop blower	Refer to control program description
Actuator	Discharge valve to TMAH exhaust	Open/close valve	Refer to control program description
Lamp TSL-1	Control panel	Alarm lamp	Activate lamp when TSL-1 is On
Lamp TSL-2	Control panel	Alarm lamp	Activate lamp when TSL-2 is On
Lamp LSH-1	Control panel	Alarm lamp	Activate lamp when LSH-1 is On
Lamp LSH-3	Control panel	Alarm lamp	Activate lamp when LSH-3 is On
Lamp VSL-1	Control panel	Alarm lamp	Activate lamp when VSL-1 is On
Lamp blower VFD	Control panel	Alarm lamp	Activate lamp when VFD fault is On
Analog Outputs to:			
Blower VFD	Blower VFD		Speed signal to VFD based on operator set point

FIGURES

NOTES:

1. THIS DRAWING IS FOR GENERAL INFORMATION ONLY. REFER TO OTHER DRAWINGS FOR REQUIRED COMPONENTS



PIPE NETWORK
BUILDING 330D 80K AREA

LEGEND:

- Y-STRAINER
- BALL VALVE
- ACTUATED BUTTERFLY VALVE
- GATE VALVE
- GLOBE VALVE
- CHECK VALVE
- VACUUM RELIEF VALVE
- UNION CONNECTION
- FLANGE CONNECTION
- FLEXIBLE CONVEYANCE HOSE
- CAM LOCK QUICK CONNECT
- RIGID CONVEYANCE PIPE
- RIGID CONVEYANCE PIPE WITH INSULATION, INSULATION JACKET & HEAT TRACE
- RIGID CONVEYANCE PIPE WITH INSULATION AND INSULATION JACKET

SANBORN HEAD ENGINEERING

GRAPHICAL SCALE
0 1 2 3 FT

NO.	DATE	DESCRIPTION	BY
1	1/2014	RECORD (AS-BUILT) DRAWING SET	SHPC

DRAWN BY: R.HIRTLE
DESIGNED BY: S.SOOS
REVIEWED BY: D.SHEA
PROJECT MGR: S.SOOS
PIC: D.SHEA
DATE: JANUARY 2014

BUILDING 330D 80K AREA SUBSLAB VAPOR EXTRACTION AND TREATMENT SYSTEM VESSEL RELOCATION
IBM EAST FISHKILL
HOPEWELL JUNCTION, NEW YORK

PROCESS FLOW DIAGRAM

PROJECT NUMBER: 2999.00

SHEET NUMBER: 1

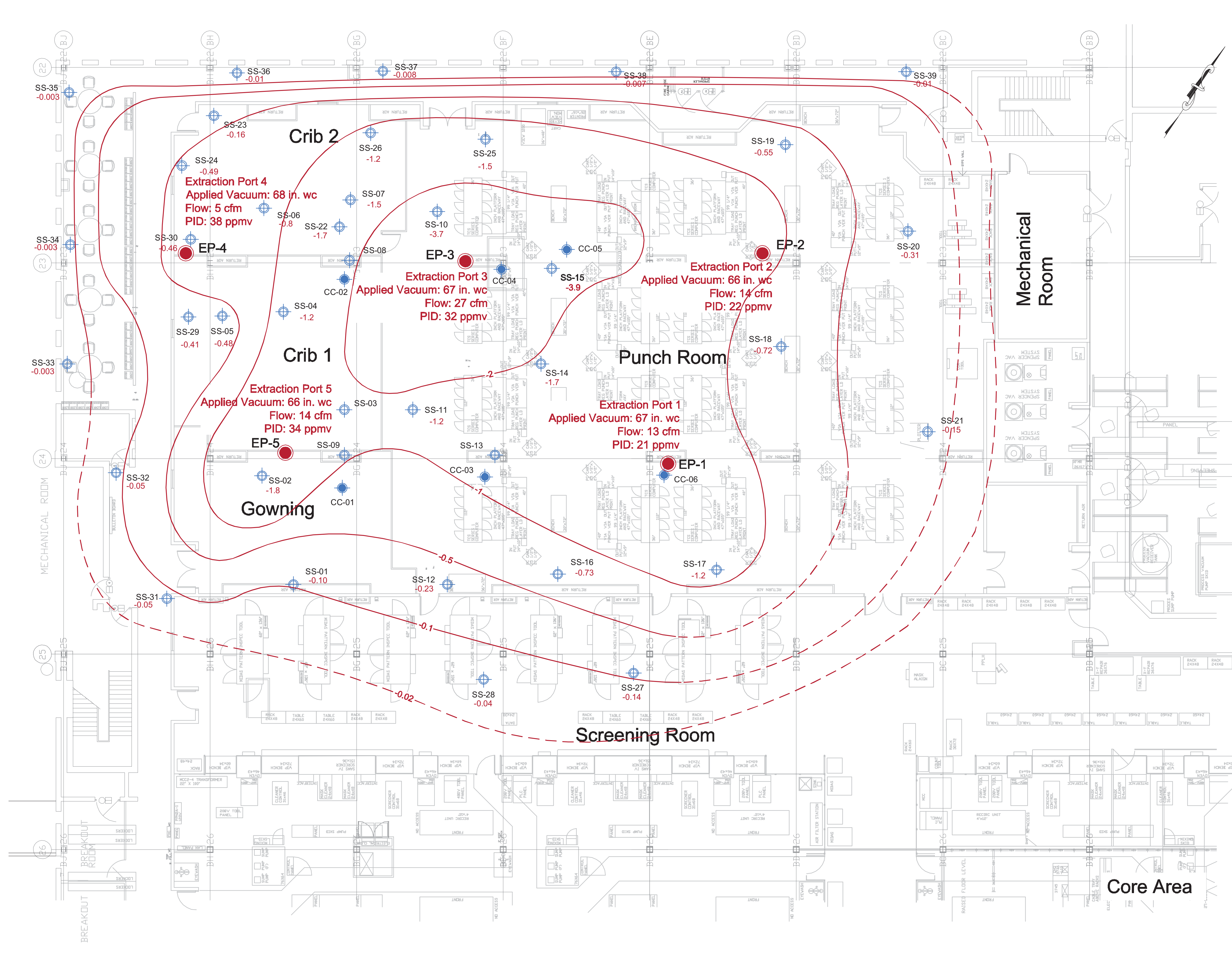


Figure 2

Subslab Pressure Response to Vapor Extraction - April 2011

Performance Monitoring and Confirmatory Sampling Results
Building 330D VOC Source Assessment

IBM East Fishkill Facility
Hopewell Junction, New York

Drawn By: E. Wright
Designed By: S. Soos / L. Atwell
Reviewed By: D. Shea
Project No: 2999.00
Date: December 2011

Figure Narrative

This figure shows the inferred subslab pressure field (measured in inches of water column [in. wc]) in response to vapor extraction conducted on April 26, 2011. Subslab pressure was ... monitoring ports using a Dwyer Series 475 digital manometer referenced to room pressure. Air flow was measured using a TSI 9555 Air Velocity Meter, and screening for the presence of volatile organic compounds (VOCs) was conducted using a MiniRAE 2000 photoionization detector (PID).

Legend

CC-05 — Location and designation of subslab vapor extraction test port

SS-19 — Location and designation of subslab vapor sample port

EP-1 — Location and designation of subslab vapor extraction ports installed September 28-29, 2009

-1 — Subslab pressure contour (dashed where less constrained)

-0.73 — Subslab pressure (in. wc) relative to room pressure

cfm — Cubic foot per minute

ppmv — Gross VOCs (parts per million by volume)

7.5' 3.75' 0 7.5' 15' Feet

SANBORN | HEAD ENGINEERING

File: S:\RANDATA\2900s\2999.00 131\Graphics Files\CAD\Performance Mon & Confirm Results\Pressure_Response_April.dwg Plot Date: 10-6-11

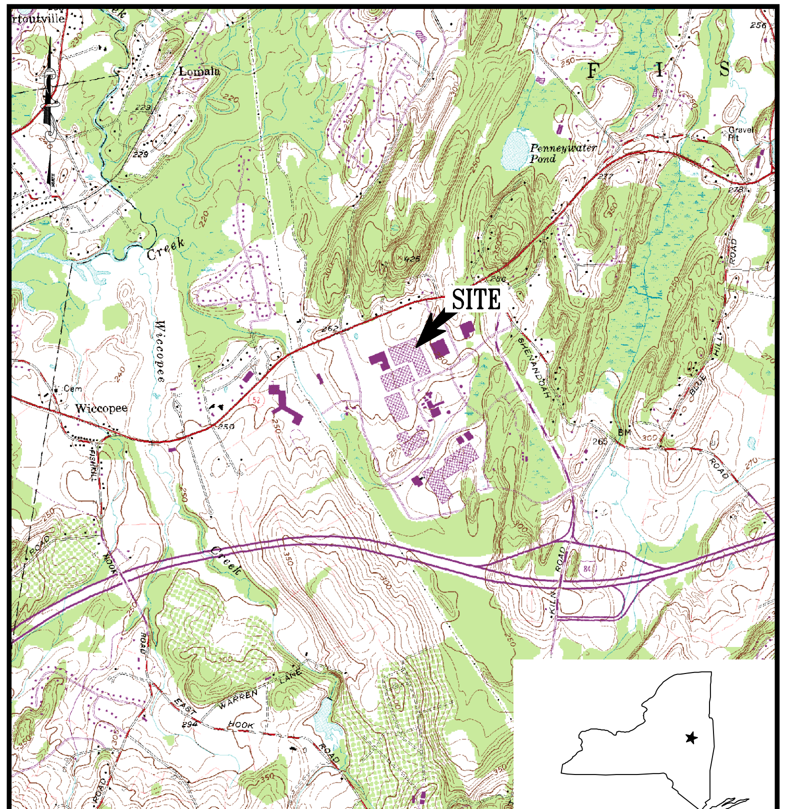
APPENDIX A

AS-BUILT DRAWINGS

RECORD (AS-BUILT) DRAWINGS
BUILDING 330D 80K AREA
SUBSLAB VAPOR EXTRACTION AND TREATMENT SYSTEM

IBM EAST FISHKILL FACILITY - HOPEWELL JUNCTION, NEW YORK

JANUARY 2014



FROM: USGS TOPOGRAPHIC MAP -ADAMS, MASSACHUSETTS, (1988)

LOCUS PLAN

SCALE: 1:25,000

SHEET INDEX

PREPARED FOR:

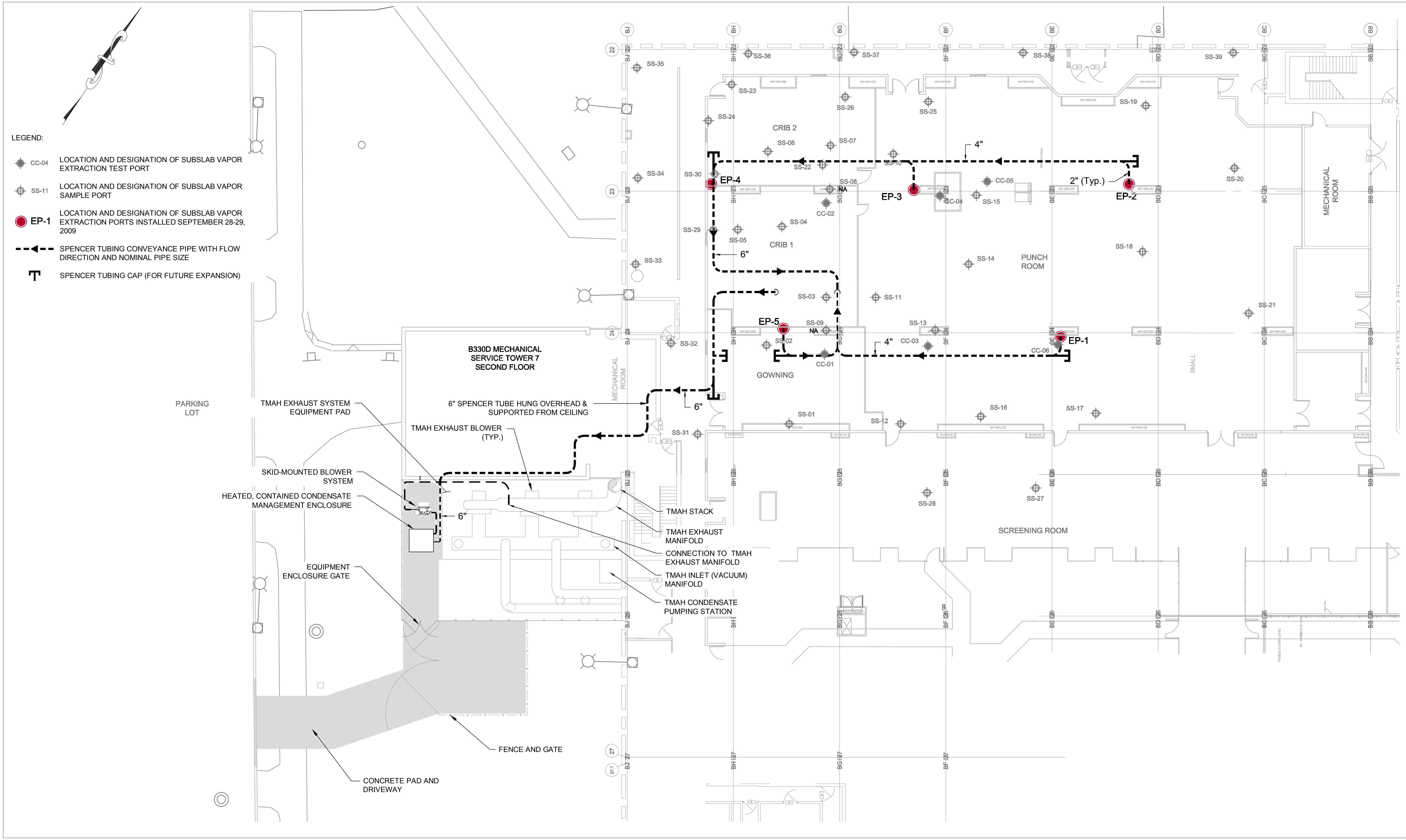
IBM

IBM EAST FISHKILL
HOPEWELL JUNCTION, NEW YORK

PREPARED BY:

SANBORN HEAD ENGINEERING

20 FOUNDRY STREET, CONCORD, NEW HAMPSHIRE 03301
(603) 229-1900



SANBORN | HEAD ENGINEERING

GRAPHICAL SCALE

0 10 20 30 FT

NO.	DATE	DESCRIPTION	BY
1	1/2014	RECORD (AS-BUILT) DRAWING SET	SHPC

DRAWN BY: R.HIRTLE
DESIGNED BY: S.SOOS
REVIEWED BY: D.SHEA
PROJECT MGR: S.SOOS
PIC: D.SHEA
DATE: JANUARY 2014

BUILDING 330D 80K AREA SUBSLAB VAPOR EXTRACTION AND TREATMENT SYSTEM VESSEL RELOCATION

IBM EAST FISHKILL

HOPEWELL JUNCTION, NEW YORK

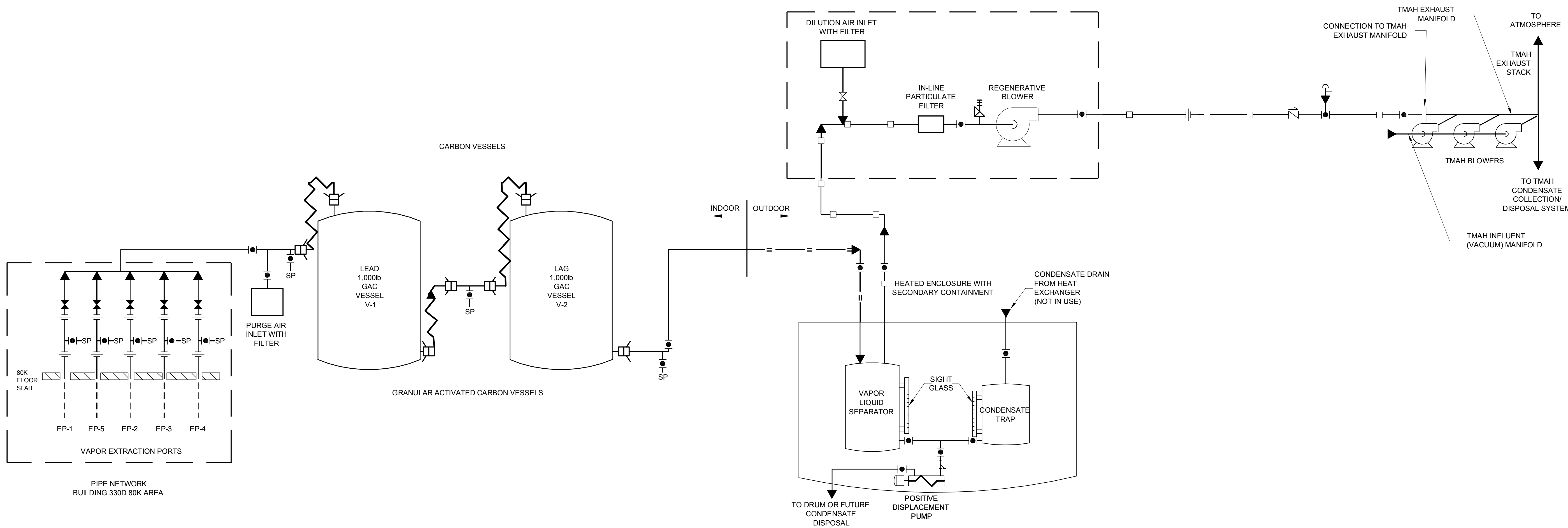
SYSTEM LAYOUT

PROJECT NUMBER: 2999.00

SHEET NUMBER: G-1

NOTES:

1. THIS DRAWING IS FOR GENERAL INFORMATION ONLY. REFER TO OTHER DRAWINGS FOR REQUIRED COMPONENTS



LEGEND:

- Y-STRAINER
- BALL VALVE
- ACTUATED BUTTERFLY VALVE
- GATE VALVE
- GLOBE VALVE
- CHECK VALVE
- VACUUM RELIEF VALVE
- UNION CONNECTION
- FLANGE CONNECTION
- FLEXIBLE CONVEYANCE HOSE
- CAM LOCK QUICK CONNECT
- RIGID CONVEYANCE PIPE
- RIGID CONVEYANCE PIPE WITH INSULATION, INSULATION JACKET & HEAT TRACE
- RIGID CONVEYANCE PIPE WITH INSULATION AND INSULATION JACKET

SANBORN HEAD ENGINEERING

GRAPHICAL SCALE
0 1 2 3 FT

NO.	DATE	DESCRIPTION	BY
1	1/2014	RECORD (AS-BUILT) DRAWING SET	SHPC

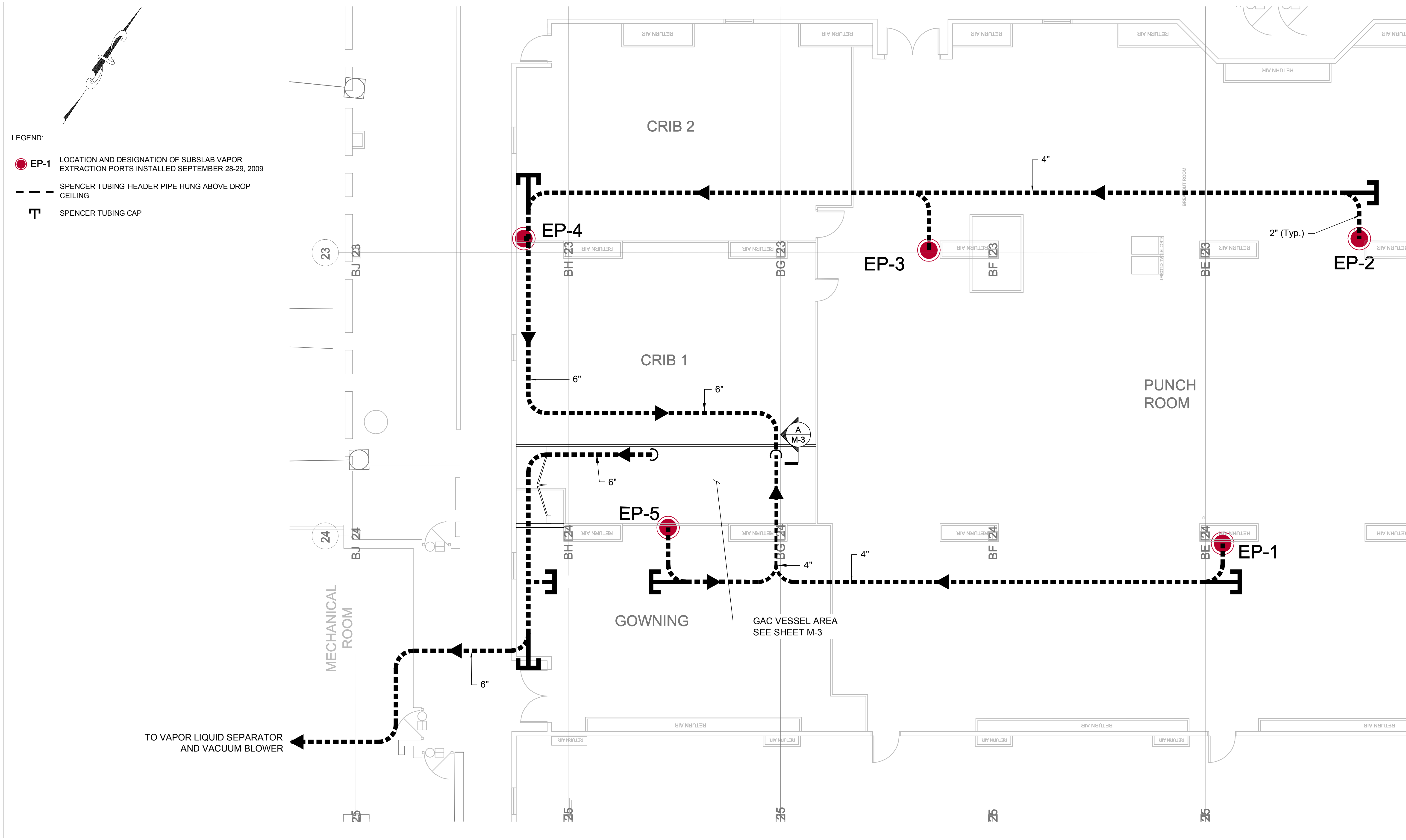
DRAWN BY: R.HIRTLE
DESIGNED BY: S.SOOS
REVIEWED BY: D.SHEA
PROJECT MGR: S.SOOS
PIC: D.SHEA
DATE: JANUARY 2014

BUILDING 330D 80K AREA SUBSLAB VAPOR EXTRACTION AND TREATMENT SYSTEM VESSEL RELOCATION
IBM EAST FISHKILL
HOPEWELL JUNCTION, NEW YORK

PROCESS FLOW DIAGRAM

PROJECT NUMBER: 2999.00

SHEET NUMBER: M-1



SANBORN HEAD ENGINEERING

GRAPHICAL SCALE

0 5 10 15 FT

NO.	DATE	DESCRIPTION	BY
1	1/2014	RECORD (AS-BUILT) DRAWING SET	SHPC

DRAWN BY: R.HIRTLE
DESIGNED BY: S.SOOS
REVIEWED BY: D.SHEA
PROJECT MGR: S.SOOS
PIC: D.SHEA
DATE: JANUARY 2014

BUILDING 330D 80K AREA SUBSLAB VAPOR EXTRACTION AND TREATMENT SYSTEM VESSEL RELOCATION
IBM EAST FISHKILL
HOPEWELL JUNCTION, NEW YORK

INTERIOR CONVEYANCE PIPE PLAN

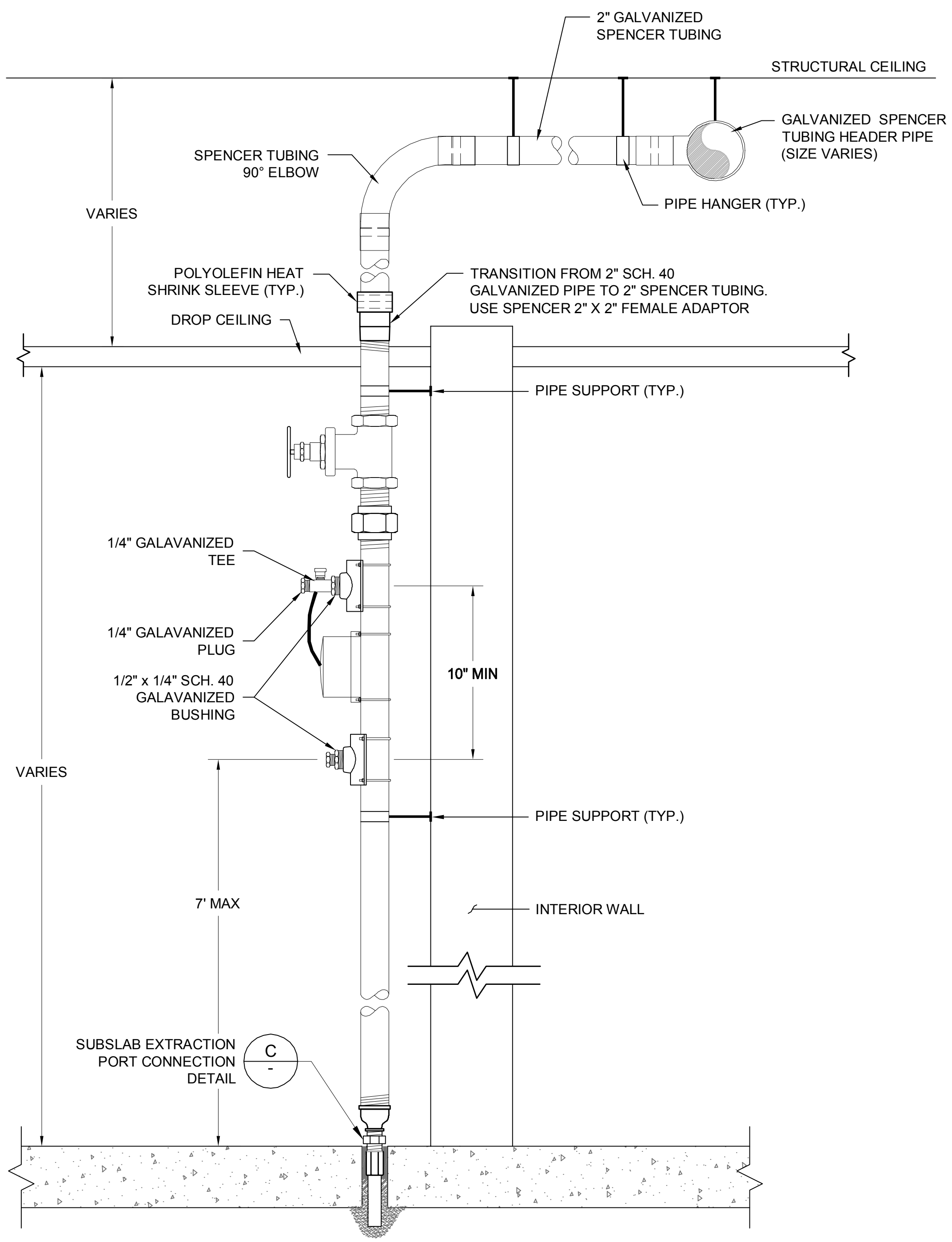
PROJECT NUMBER: 2999.00

SHEET NUMBER: M-2

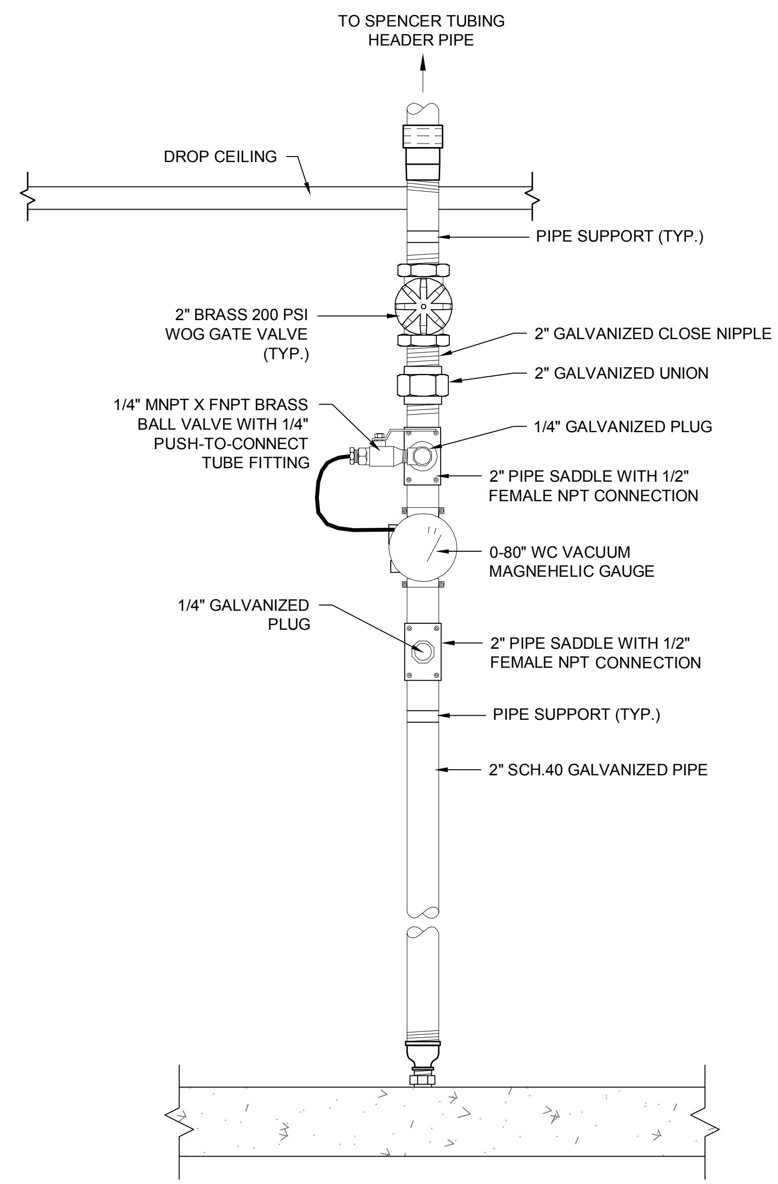
NOTES:

1. MAGNEHELIC GAUGES ARE DWYER INSTRUMENTS MODEL #2080, AND INCLUDE A-610 PIPE MOUNT KIT, A-310A VENT VALVE ON VACUUM SIDE, AND PRESSURE GAUGE SNUBBER WITH 0.5 MICRON FILTERING DISC ON HIGH PRESSURE PORT.

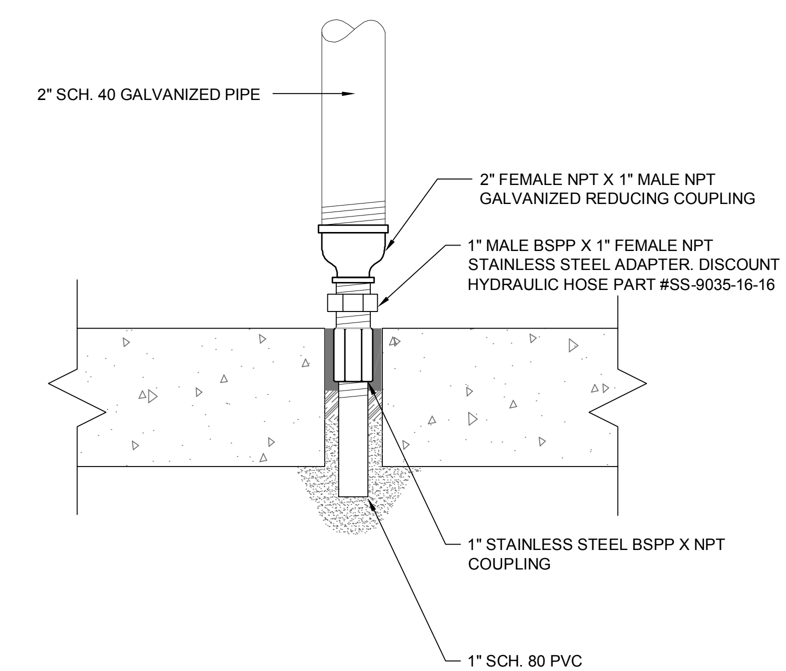
2. THREADED JOINTS ARE MADE WITH TEFLON THREAD SEALANT TAPE AND ARE VACUUM AND/OR PRESSURE TIGHT.



A SUBSLAB EXTRACTION PORT RISER SIDE ELEVATION



B SUBSLAB EXTRACTION PORT RISER FRONT ELEVATION



C SUBSLAB EXTRACTION PORT CONNECTION DETAIL

SANBORN | HEAD ENGINEERING

GRAPHICAL SCALE AS SHOWN

NO.	DATE	DESCRIPTION	BY
1	1/2014	RECORD (AS-BUILT) DRAWING SET	SHPC

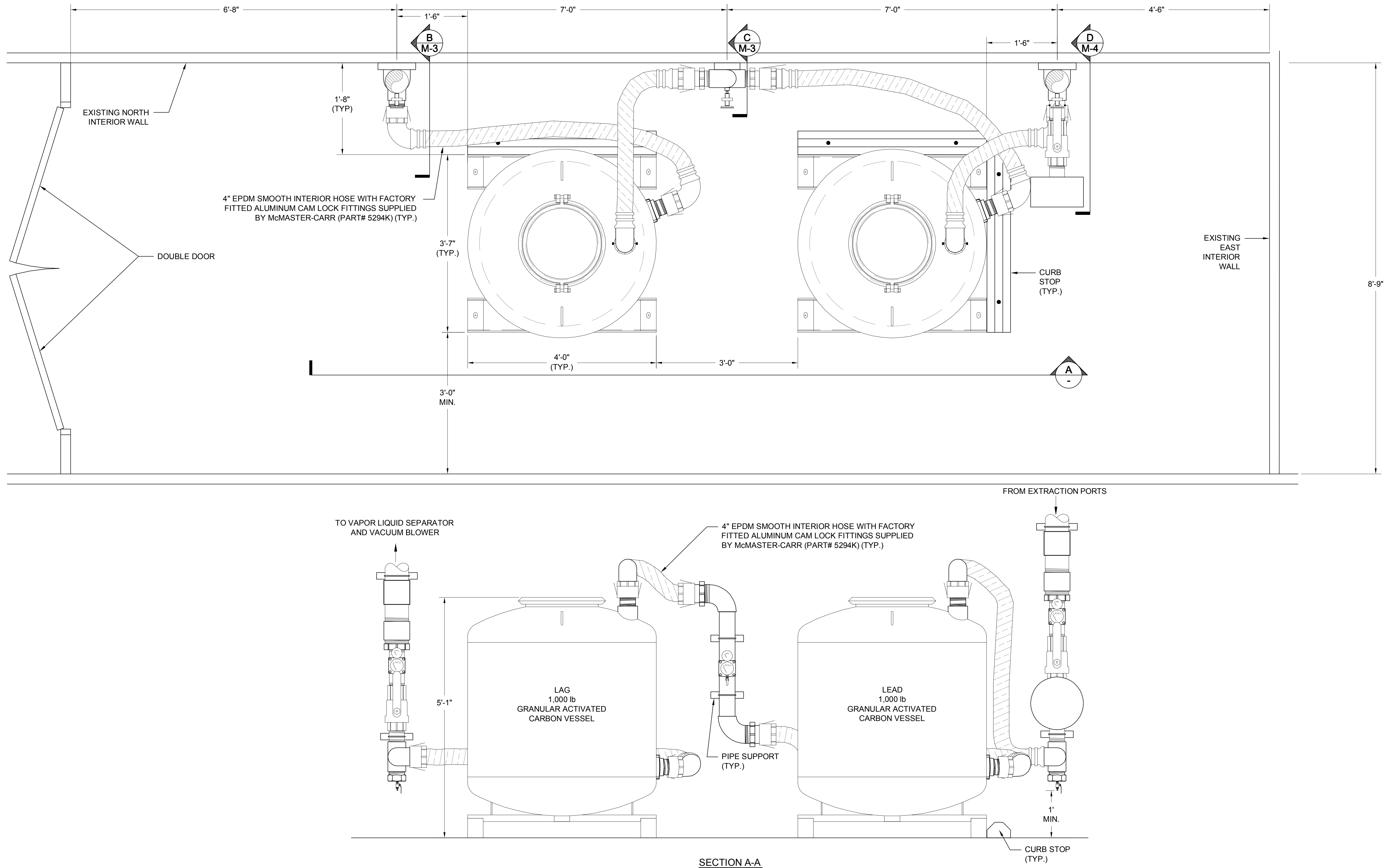
DRAWN BY: R.HIRTLE
DESIGNED BY: S.SOOS
REVIEWED BY: D.SHEA
PROJECT MGR: S.SOOS
PIC: D.SHEA
DATE: JANUARY 2014

BUILDING 330D 80K AREA SUBSLAB VAPOR EXTRACTION AND TREATMENT SYSTEM VESSEL REOCATION
IBM EAST FISHKILL
HOPEWELL JUNCTION, NEW YORK

SUBSLAB EXTRACTION PORTS AND RISERS

PROJECT NUMBER: 2999.00

SHEET NUMBER: M-3



SECTION A-A

SANBORN | HEAD ENGINEERING

GRAPHICAL SCALE
0 1 2 3 FT

NO.	DATE	DESCRIPTION	BY
1	1/2014	RECORD (AS-BUILT) DRAWING SET	SHPC

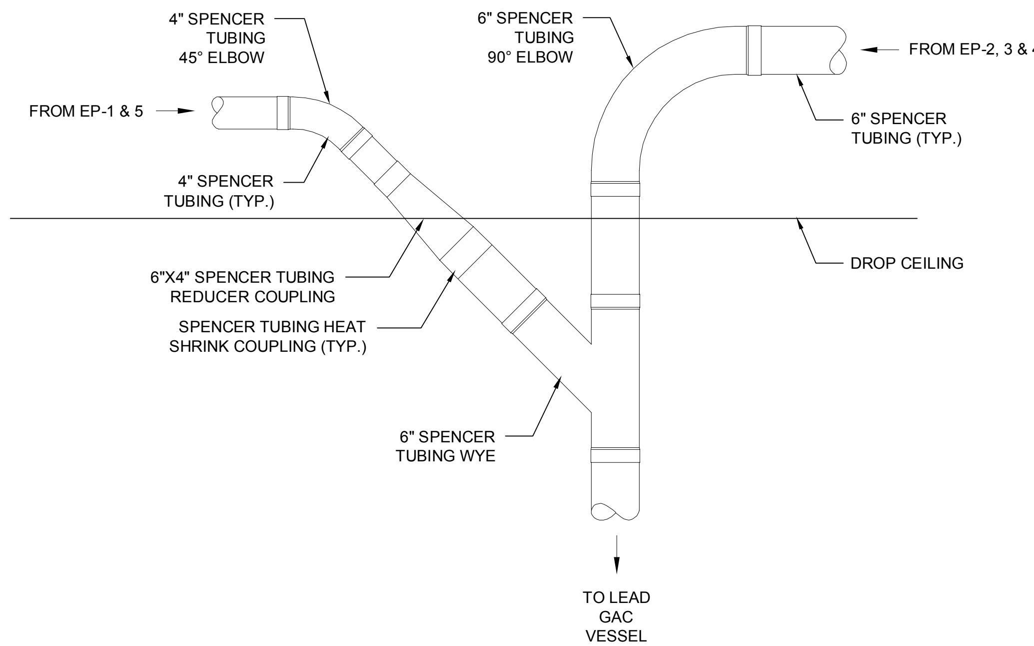
DRAWN BY: R.HIRTLE
DESIGNED BY: S.SOOS
REVIEWED BY: D.SHEA
PROJECT MGR: S.SOOS
PIC: D.SHEA
DATE: JANUARY 2014

BUILDING 330D 80K AREA SUBSLAB VAPOR EXTRACTION
AND TREATMENT SYSTEM VESSEL RELOCATION
IBM EAST FISHKILL
HOPEWELL JUNCTION, NEW YORK

CARBON VESSEL ARRANGEMENT

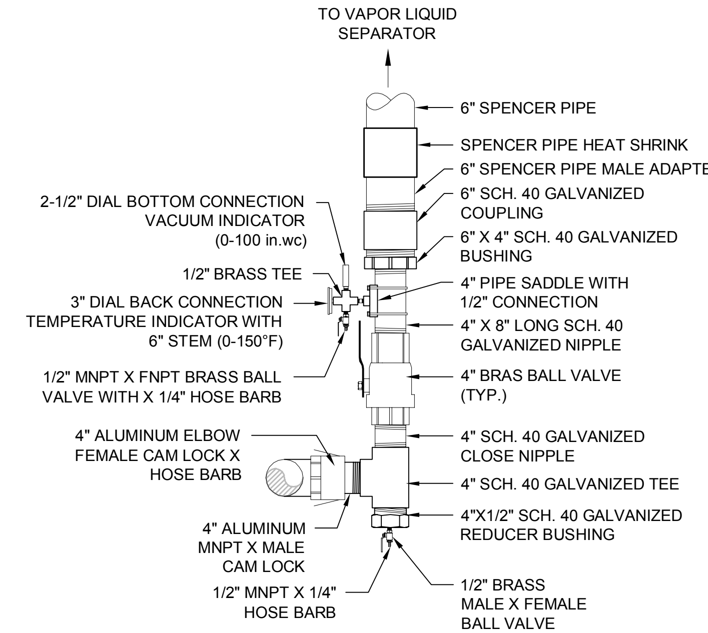
PROJECT NUMBER: 2999.00

SHEET NUMBER: M-4



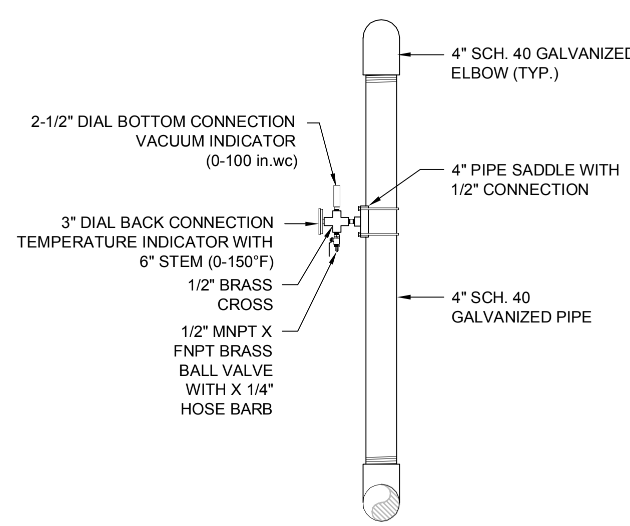
SECTION A-A

NTS



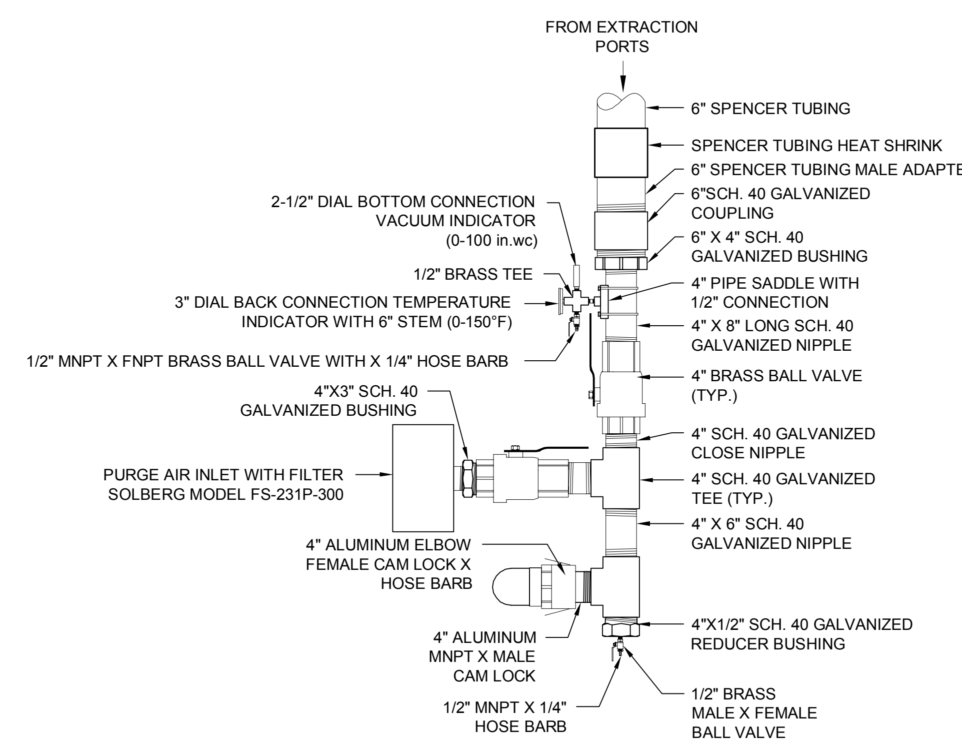
SECTION B-B

NTS



SECTION C-C

NTS



SECTION D-D

NTS

SANBORN HEAD ENGINEERING

GRAPHICAL SCALE AS SHOWN

NO.	DATE	DESCRIPTION	BY
1	1/2014	RECORD (AS-BUILT) DRAWING SET	SHPC

DRAWN BY: R.HIRTLE
DESIGNED BY: S.SOOS
REVIEWED BY: D.SHEA
PROJECT MGR: S.SOOS
PIC: D.SHEA
DATE: JANUARY 2014

BUILDING 330D 80K AREA SUBSLAB VAPOR EXTRACTION AND TREATMENT SYSTEM VESSEL REOCATION

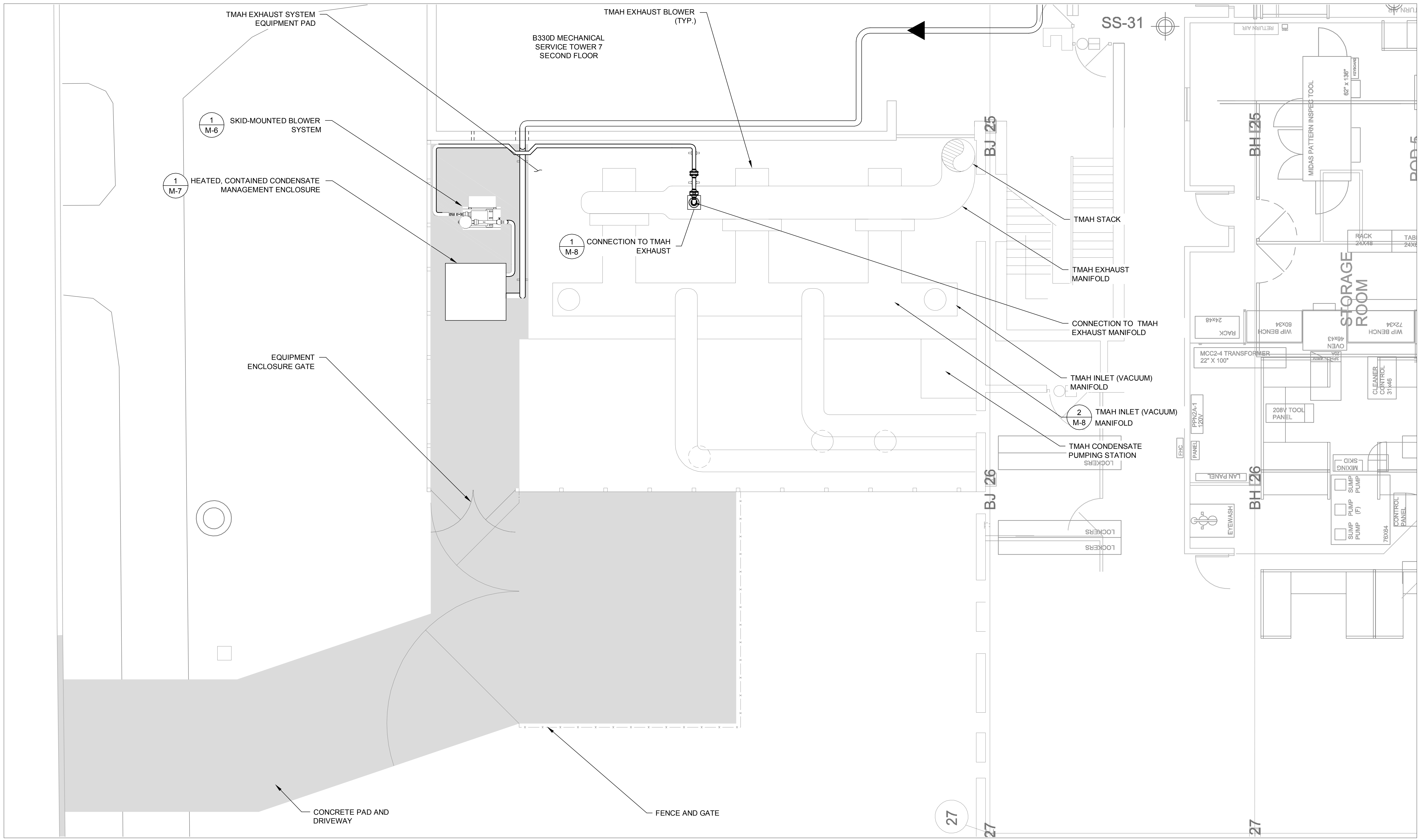
IBM EAST FISHKILL

HOPEWELL JUNCTION, NEW YORK

MECHANICAL DETAILS I

PROJECT NUMBER: 2999.00

SHEET NUMBER: M-5



SANBORN HEAD ENGINEERING

GRAPHICAL SCALE

0 4 8 12 FT

NO.	DATE	DESCRIPTION	BY
1	1/2014	RECORD (AS-BUILT) DRAWING SET	SHPC

DRAWN BY: R.HIRTLE
DESIGNED BY: S.SOOS
REVIEWED BY: D.SHEA
PROJECT MGR: S.SOOS
PIC: D.SHEA
DATE: JANUARY 2014

BUILDING 330D 80K AREA SUBSLAB VAPOR EXTRACTION AND TREATMENT SYSTEM VESSEL RELOCATION

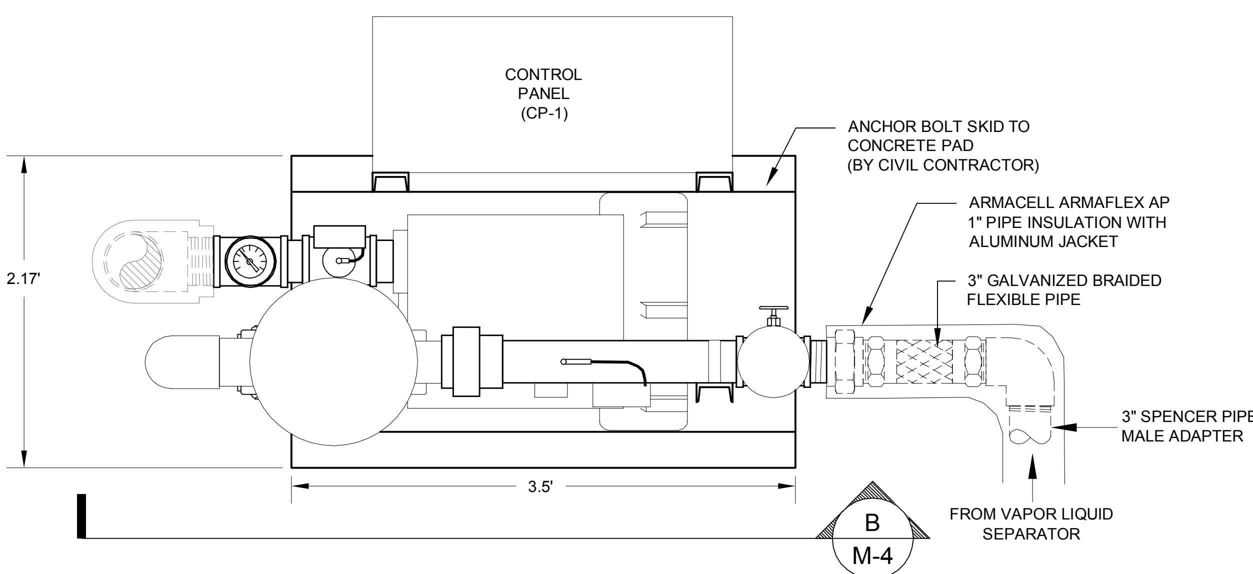
IBM EAST FISHKILL

HOPEWELL JUNCTION, NEW YORK

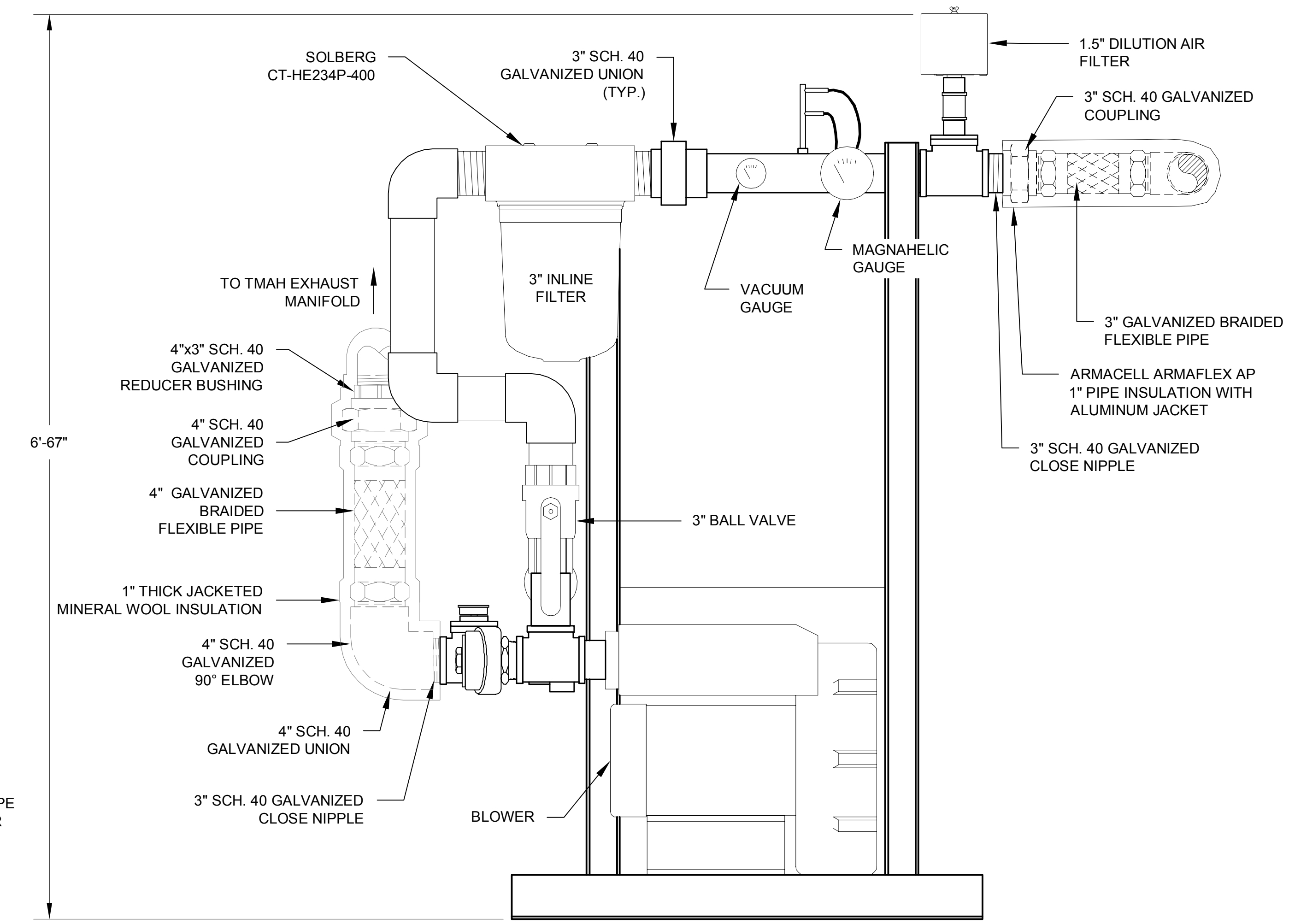
EXTERIOR VAPOR EXTRACTION EQUIPMENT LAYOUT

PROJECT NUMBER: 2999.00

SHEET NUMBER: M-6



1 VACUUM BLOWER SKID AND CONTROL PANEL
NTS



SECTION A - A
NTS

SANBORN | HEAD ENGINEERING

GRAPHICAL SCALE AS SHOWN

NO.	DATE	DESCRIPTION	BY
1	1/2014	RECORD (AS-BUILT) DRAWING SET	SHPC

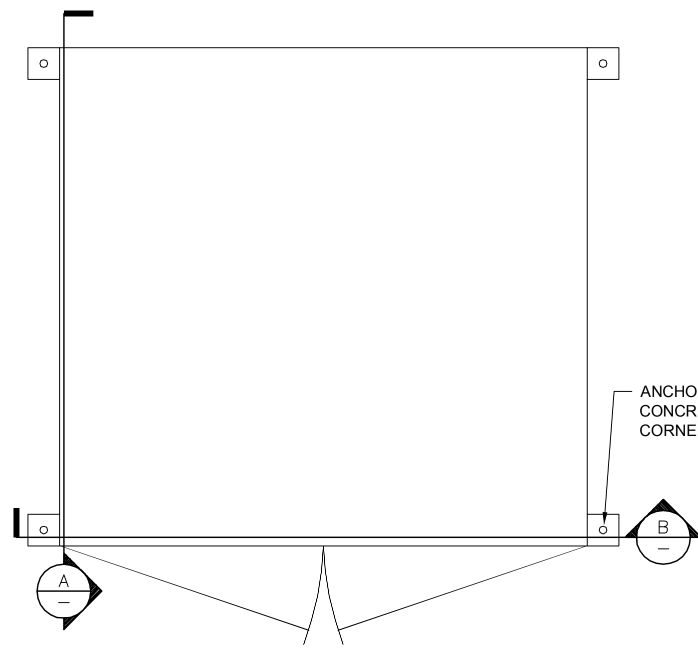
DRAWN BY: R.HIRTLE
DESIGNED BY: S.SOOS
REVIEWED BY: D.SHEA
PROJECT MGR: S.SOOS
PIC: D.SHEA
DATE: JANUARY 2014

BUILDING 330D 80K AREA SUBSLAB VAPOR EXTRACTION AND TREATMENT SYSTEM VESSEL REOCATION
IBM EAST FISHKILL
HOPEWELL JUNCTION, NEW YORK

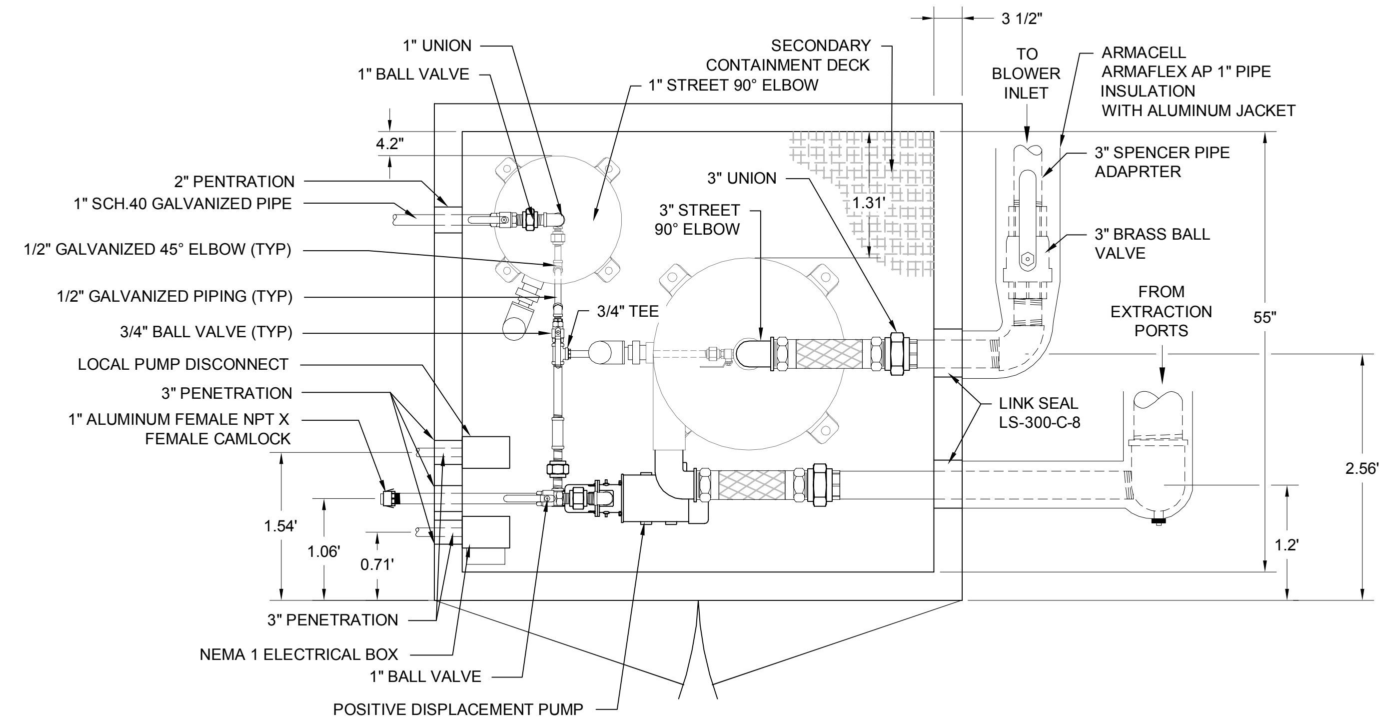
SKID MOUNTED BLOWER

PROJECT NUMBER: 2999.00

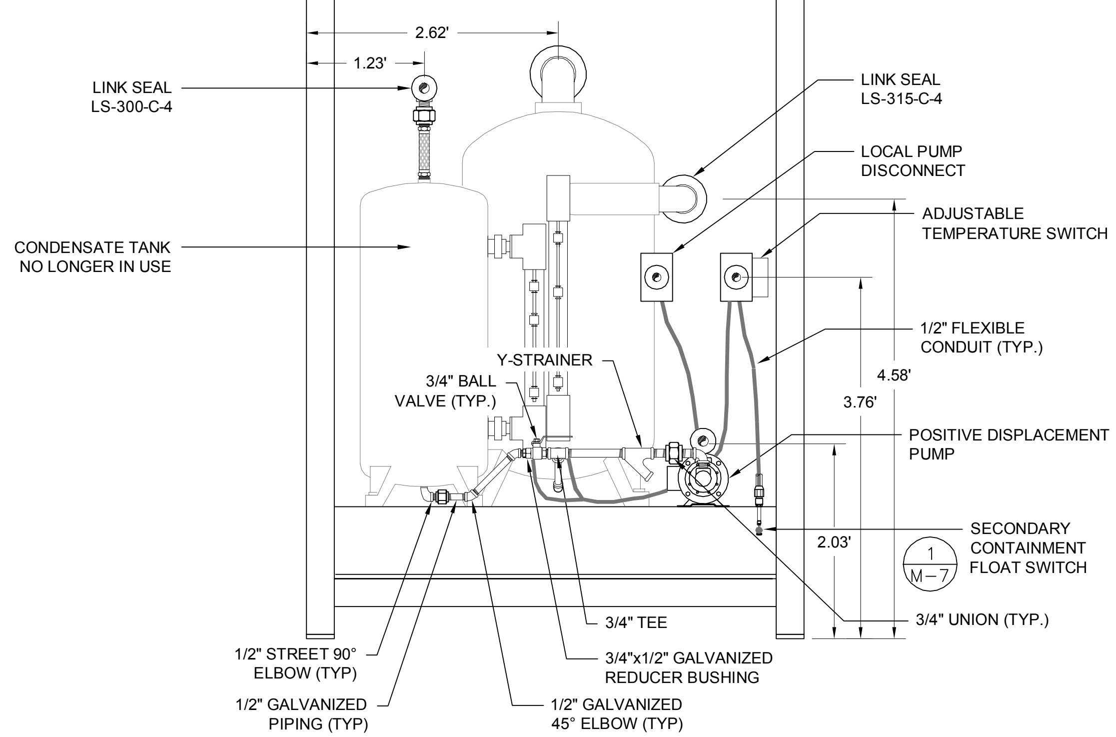
SHEET NUMBER: M-7



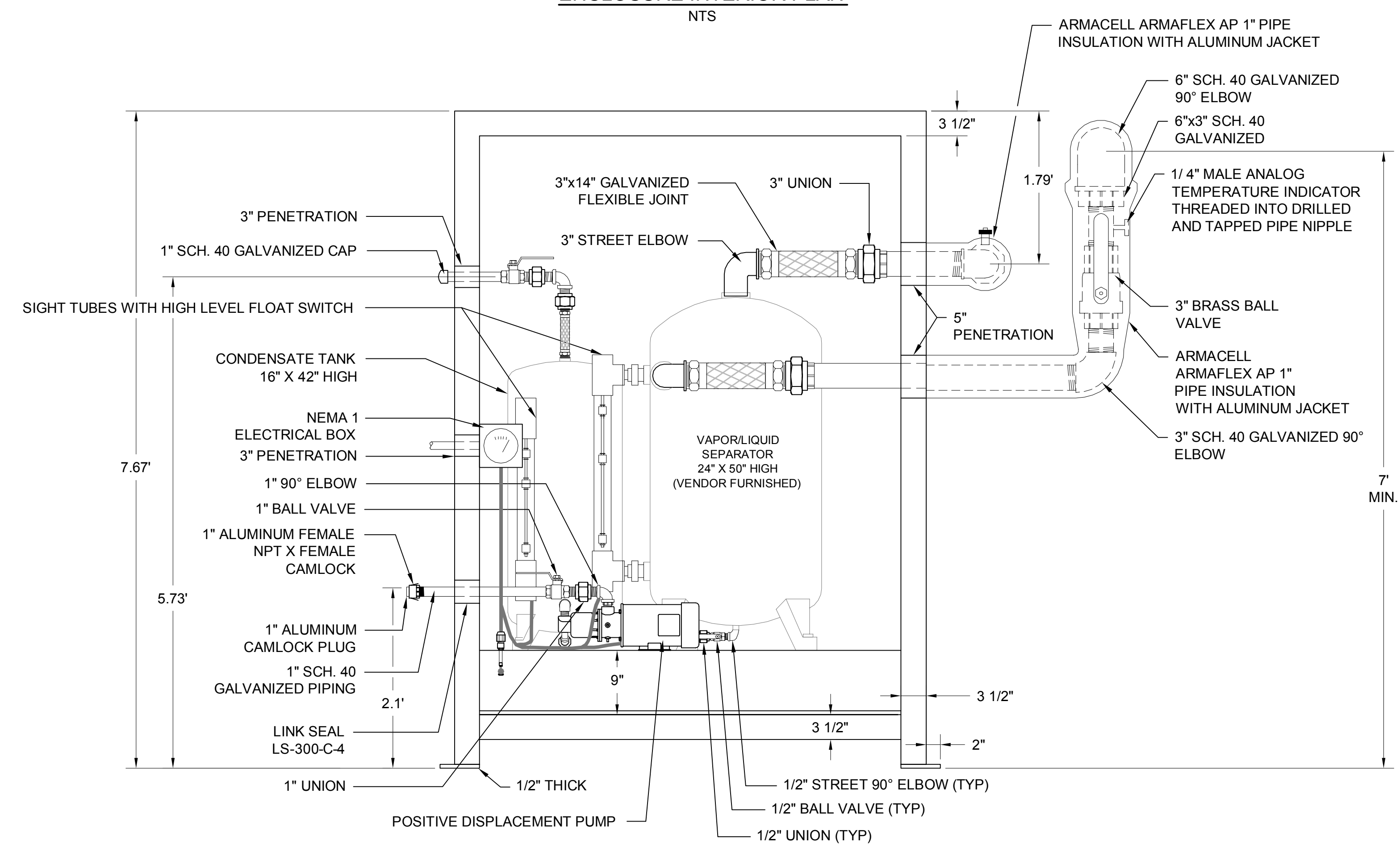
1 HEATED ENCLOSURE
NTS



ENCLOSURE INTERIOR PLAN
NTS



SECTION A - A
NTS



SECTION B - B
NTS

SANBORN | HEAD ENGINEERING

NOT TO SCALE

NO.	DATE	DESCRIPTION	BY
1	1/2014	RECORD (AS-BUILT) DRAWING SET	SHPC

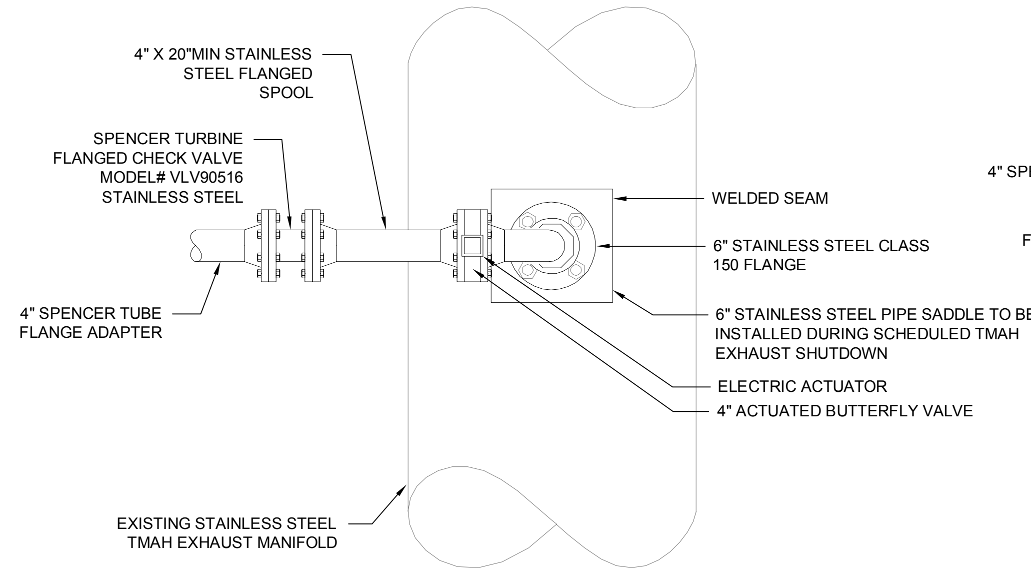
DRAWN BY: R.HIRTLE
DESIGNED BY: S.SOOS
REVIEWED BY: D.SHEA
PROJECT MGR: S.SOOS
PIC: D.SHEA
DATE: JANUARY 2014

BUILDING 330D 80K AREA SUBSLAB VAPOR EXTRACTION AND TREATMENT SYSTEM VESSEL REOCATION
IBM EAST FISHKILL
HOPEWELL JUNCTION, NEW YORK

HEATED CONDENSATE MANAGEMENT ENCLOSURE

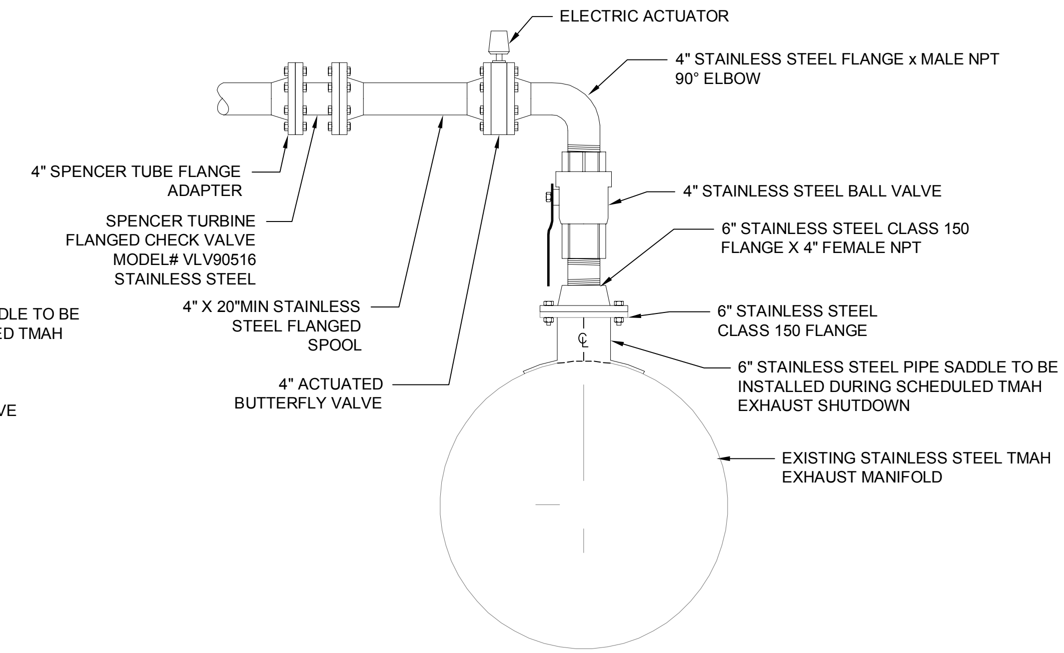
PROJECT NUMBER: 2999.00

SHEET NUMBER: M-8



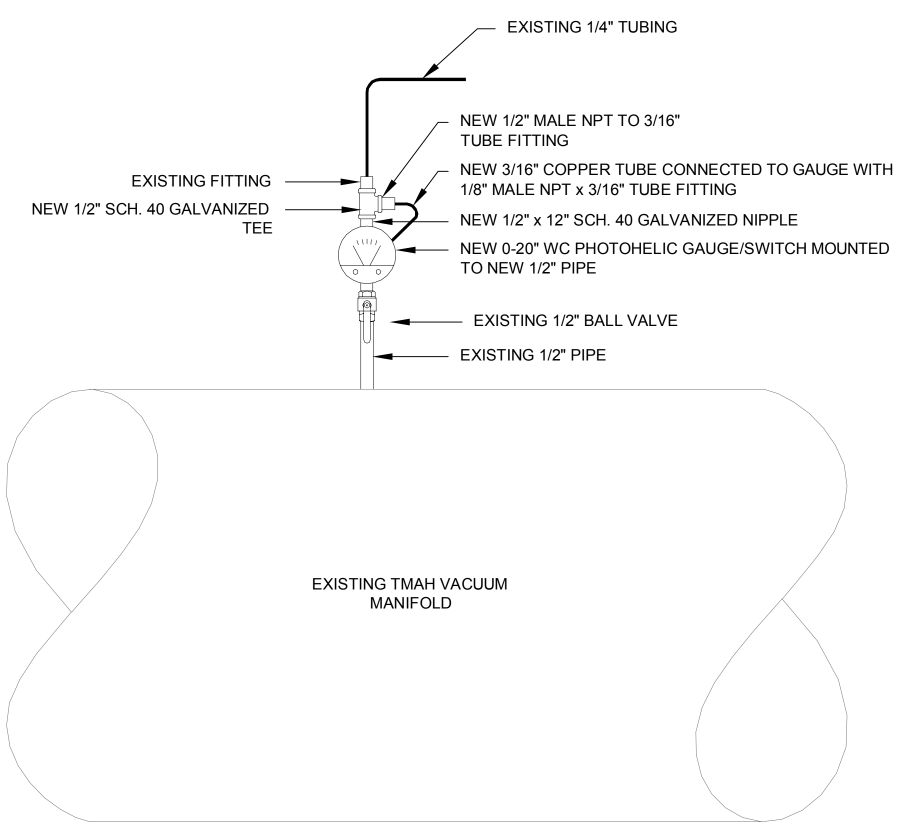
1 CONNECTION TO TMAH EXHAUST

NTS



SECTION A - A

NTS



2 TMAH VACUUM SWITCH

NTS

SANBORN HEAD ENGINEERING

NOT TO SCALE

NO.	DATE	DESCRIPTION	BY
1	1/2014	RECORD (AS-BUILT) DRAWING SET	SHPC

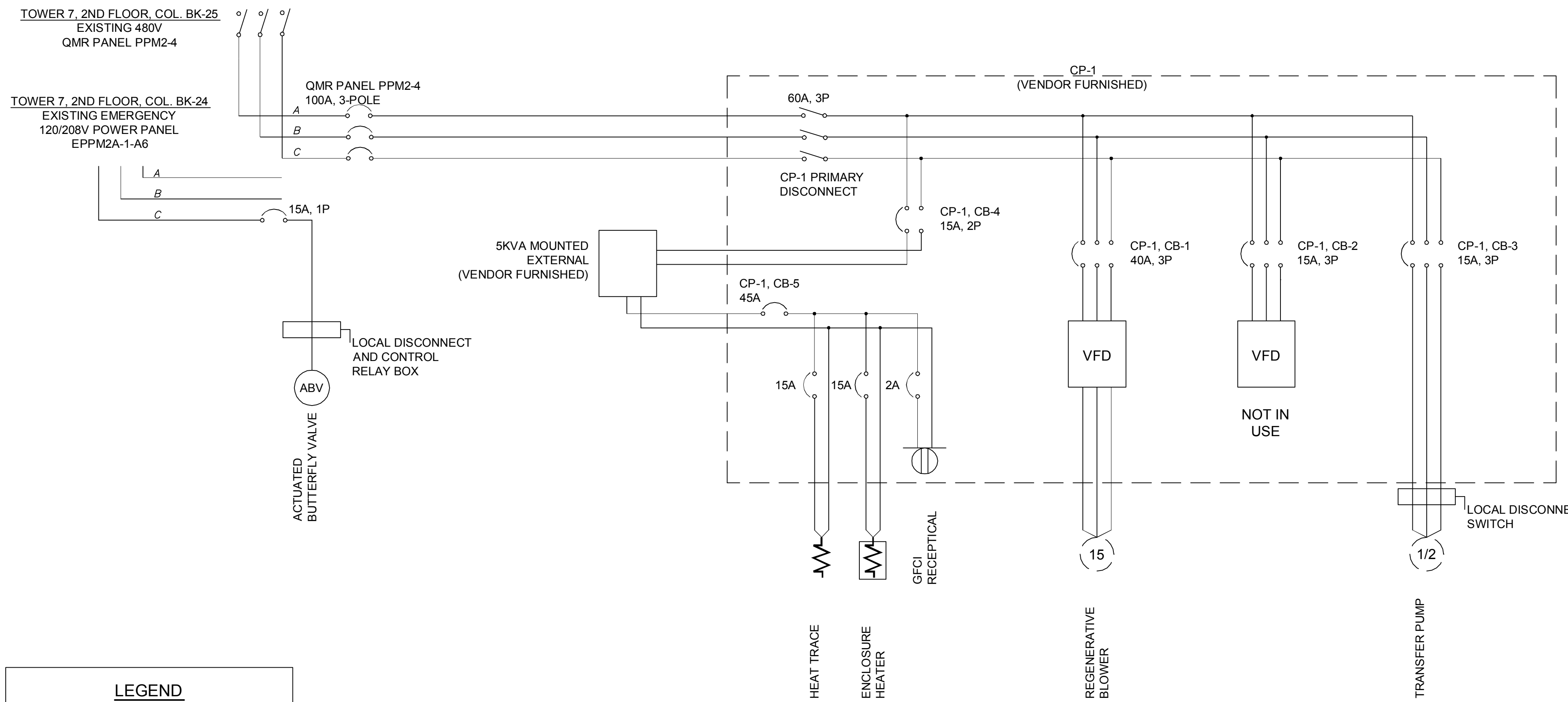
DRAWN BY: R.HIRTLE
DESIGNED BY: S.SOOS
REVIEWED BY: D.SHEA
PROJECT MGR: S.SOOS
PIC: D.SHEA
DATE: JANUARY 2014

BUILDING 330D 80K AREA SUBSLAB VAPOR EXTRACTION AND TREATMENT SYSTEM VESSEL REOCATION
IBM EAST FISHKILL
HOPEWELL JUNCTION, NEW YORK

MECHANICAL DETAILS II

PROJECT NUMBER: 2999.00

SHEET NUMBER: M-9



ELECTRICAL LINE DIAGRAM
NTS

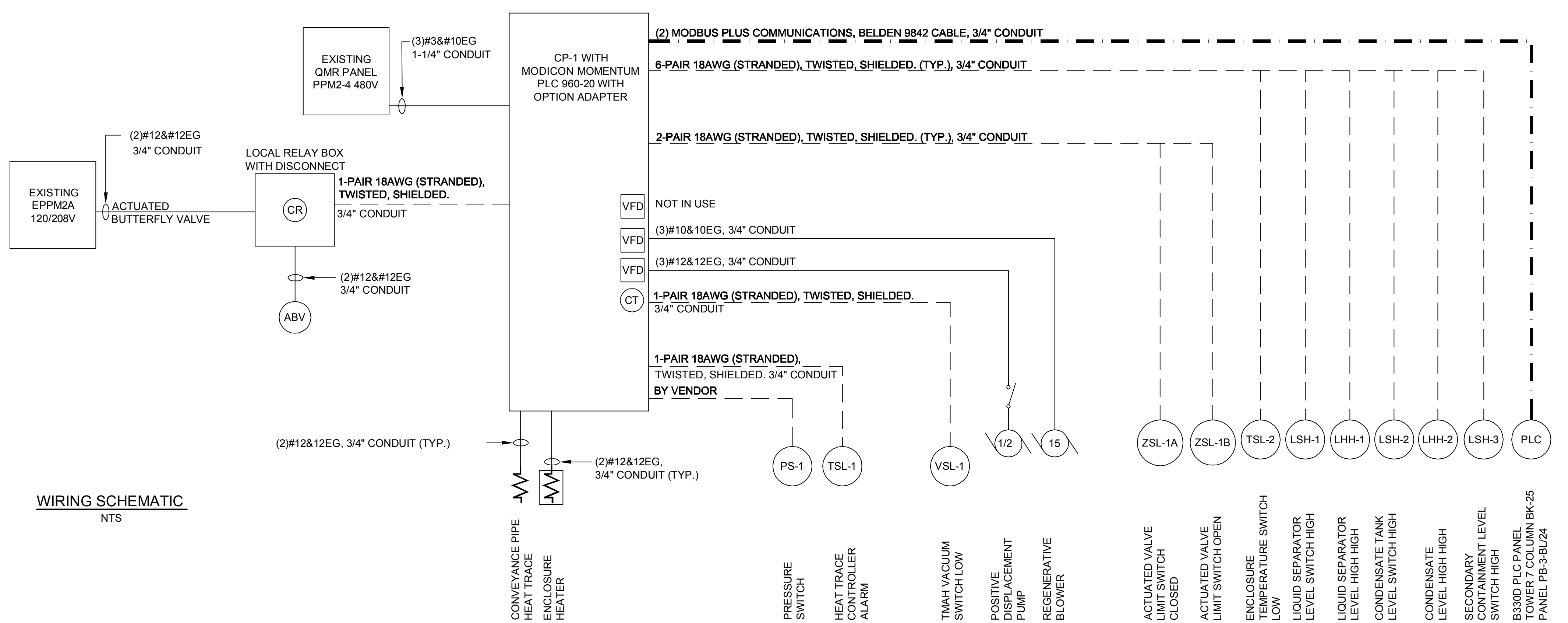
NOTES:

1. 480V, 3-PHASE POWER TO CP-1 HAS BEEN OBTAINED FROM EXISTING 480V PANELBOARD ON SECOND FLOOR OF MECHANICAL SERVICE TOWER 7.

2. 120V, SINGLE PHASE EMERGENCY POWER HAS BEEN DERIVED FROM AN EXISTING 120/208V PANELBOARD ON THE SECOND FLOOR OF MECHANINCAL SERVICE TOWER 7.

LEGEND

CP	CONTROL PANEL
MCC	MOTOR CONTROL CENTER
JB	JUNCTION BOX
DC	DISCONNECT
ABV	ACTUATED BUTTERFLY VALVE
TSL	TEMPERATURE SWITCH LOW
TT	TEMPERATURE TRANSMITTER
ZSL	VALVE LIMIT SWITCH
VSL	VACUUM SWITCH LOW
LSH	LEVEL SWITCH HIGH
LHH	LEVEL HIGH HIGH
CR	CONTROL RELAY
VFD	VARIABLE FREQUENCY DRIVE
CT	CONTACTOR
5	MOTOR (NUMERALS DENOTE HORSEPOWER)
	DC SIGNAL WIRING
	AC LINE VOLTAGE
	ENCLOSURE HEATER
	HEAT TRACE
	MODBUS PLUS COMMUNICATIONS



WIRING SCHEMATIC
NTS

SANBORN HEAD ENGINEERING

GRAPHICAL SCALE AS SHOWN

NO.	DATE	DESCRIPTION	BY
4	1/2014	RECORD (AS-BUILT) DRAWING SET	SHPC
3	06/25/10	INCREASE NUMBER OF MODBUS PLUS COMMUNICATION CABLES	SPS
2	06/24/10	POWER ABV DIRECT FROM EMERGENCY POWER PANEL	DS
1	06/24/10	ADD TRANSFORMER, ELIMINATE CIRCUITS FROM EXISTING 120VAC PANEL	DS

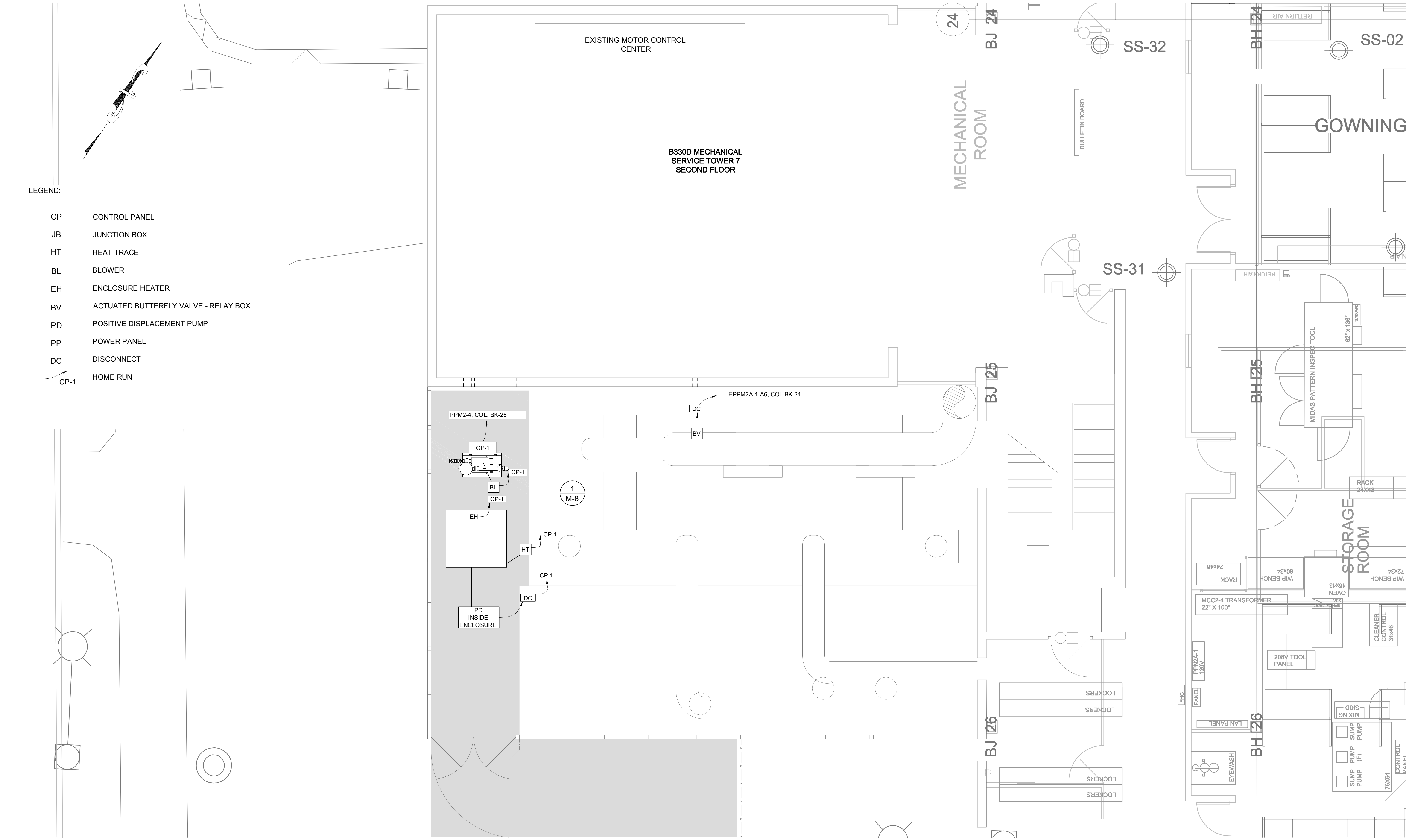
DRAWN BY: R.HIRTLE
DESIGNED BY: S.SOOS
REVIEWED BY: D.SHEA
PROJECT MGR: S.SOOS
PIC: D.SHEA
DATE: JANUARY 2014

BUILDING 330D 80K AREA SUBSLAB VAPOR EXTRACTION AND TREATMENT SYSTEM VESSEL REOCATION
IBM EAST FISHKILL
HOPEWELL JUNCTION, NEW YORK

ELECTRICAL LINE DIAGRAM AND WIRING SCHEMATIC

PROJECT NUMBER: 2999.00

SHEET NUMBER: E-1



LEGEND:

CP	CONTROL PANEL
JB	JUNCTION BOX
HT	HEAT TRACE
BL	BLOWER
EH	ENCLOSURE HEATER
BV	ACTUATED BUTTERFLY VALVE - RELAY BOX
PD	POSITIVE DISPLACEMENT PUMP
PP	POWER PANEL
DC	DISCONNECT
CP-1	HOME RUN

SANBORN HEAD ENGINEERING

GRAPHICAL SCALE AS SHOWN

NO.	DATE	DESCRIPTION	BY
1	1/2014	RECORD (AS-BUILT) DRAWING SET	SHPC

DRAWN BY: R.HIRTLE
DESIGNED BY: S.SOOS
REVIEWED BY: D.SHEA
PROJECT MGR: S.SOOS
PIC: D.SHEA
DATE: JANUARY 2014

BUILDING 330D 80K AREA SUBSLAB VAPOR EXTRACTION AND TREATMENT SYSTEM VESSEL REOCATION

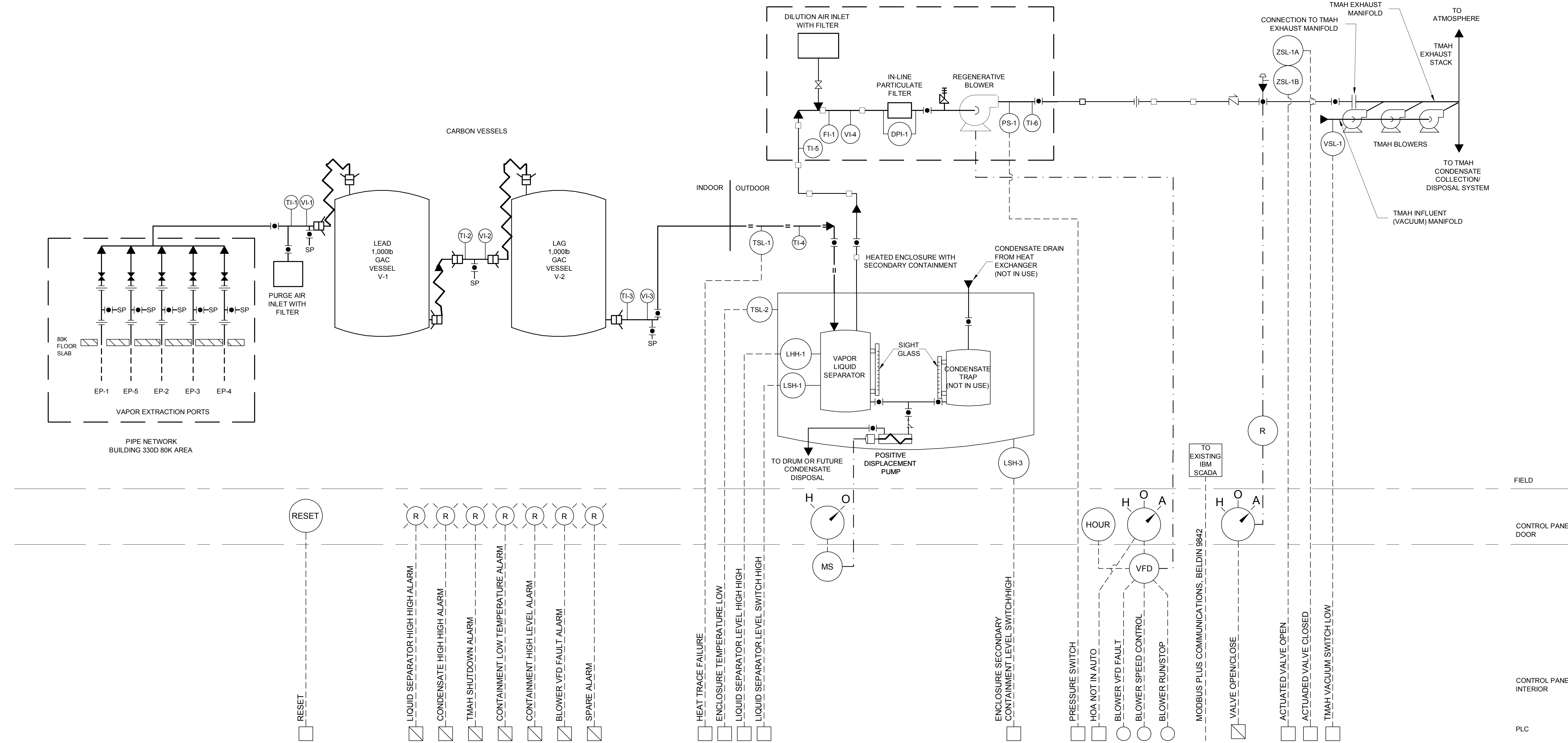
IBM EAST FISHKILL

HOPEWELL JUNCTION, NEW YORK

ELECTRICAL LAYOUT

PROJECT NUMBER: 2999.00

SHEET NUMBER: E-2



LEGEND:

- Y-STRAINER
- BALL VALVE
- ACTUATED BUTTERFLY VALVE
- GATE VALVE
- CHECK VALVE
- VACUUM RELIEF VALVE
- FLEXIBLE CONVEYANCE PIPE
- RIGID CONVEYANCE PIPE
- RIGID CONVEYANCE PIPE WITH INSULATION
- RIGID CONVEYANCE PIPE WITH INSULATION & HEAT TRACE
- EXISTING EQUIPMENT
- PI PRESSURE INDICATOR
- TI TEMPERATURE INDICATOR
- TT TEMPERATURE TRANSMITTER
- VSL VACUUM SWITCH LOW
- LSH HIGH LEVEL SWITCH
- LSH HIGH LEVEL SWITCH
- LHH LEVEL HIGH HIGH
- SP SAMPLE PORT
- DPI DIFFERENTIAL PRESSURE INDICATOR
- VI VACUUM INDICATOR
- FI FLOW INDICATOR
- BINARY SIGNAL INPUT TO PLC
- BINARY SIGNAL (RELAY) OUTPUT FROM PLC
- ANALOG SIGNAL INPUT TO PLC
- ETHERNET COMMUNICATION
- INTERNAL SYSTEM LINK
- ELECTRICAL POWER
- FLOW DIRECTION
- CAM LOCK
- MS MOTOR STARTER
- R RELAY
- H O HAND - OFF SELECTOR SWITCH
- H O A HAND - OFF - AUTO SELECTOR SWITCH
- R STATUS LIGHT/ALARM (RED)
- VFD VARIABLE FREQUENCY DRIVE
- ZSL LIMIT SWITCH
- TSL LOW TEMPERATURE SWITCH
- PS-1 PRESSURE SWITCH
- HOUR HOUR METER

NOTE:THE HAND POSITION OF ALL H-O-A SWITCHES SHALL BE HARD WIRED TO ITS ASSOCIATED EQUIPMENT

SANBORN | HEAD ENGINEERING

GRAPHICAL SCALE AS SHOWN

NO.	DATE	DESCRIPTION	BY
1	1/2014	RECORD (AS-BUILT) DRAWING SET	SHPC

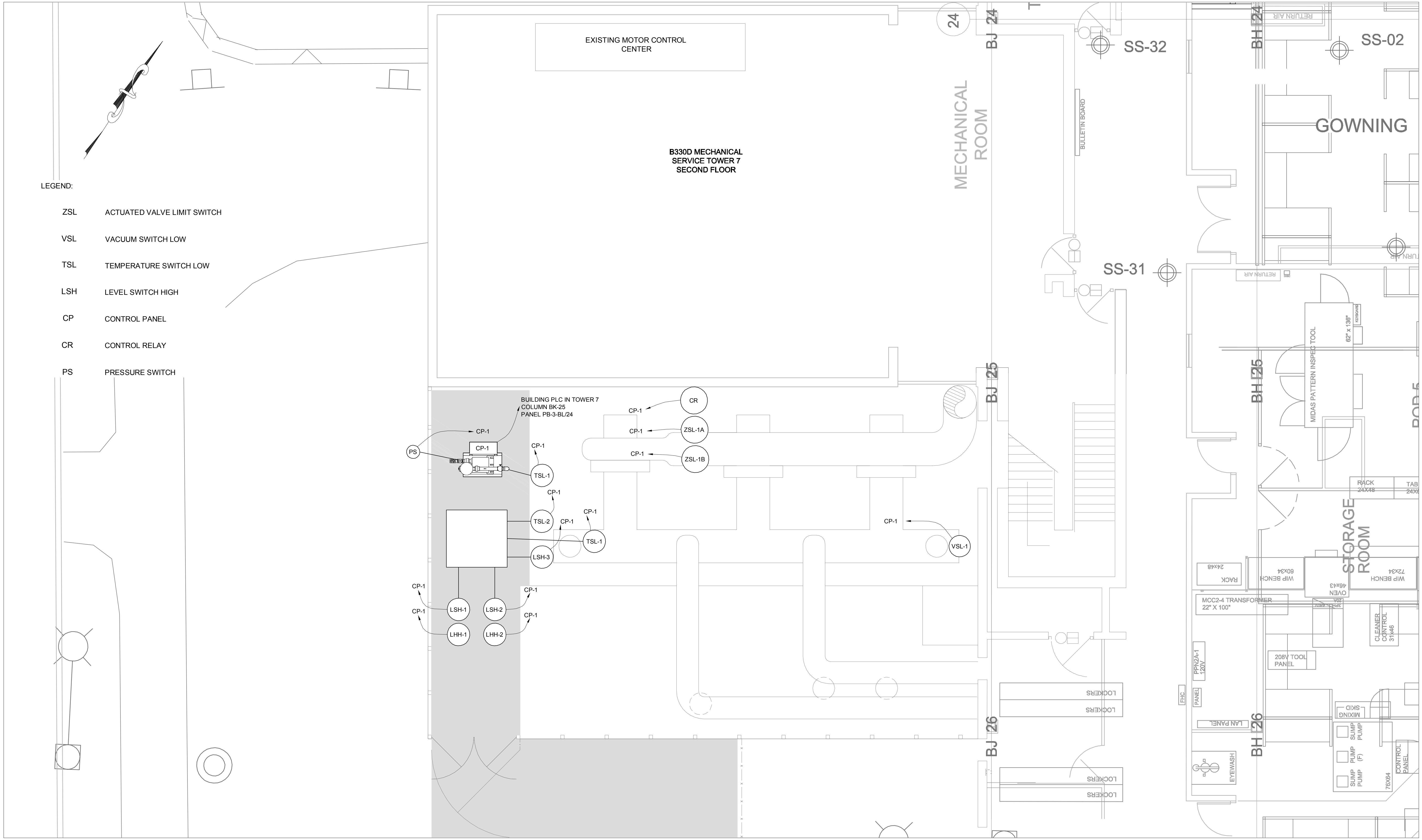
DRAWN BY: R.HIRTLE
DESIGNED BY: S.SOOS
REVIEWED BY: D.SHEA
PROJECT MGR: S.SOOS
PIC: D.SHEA
DATE: JANUARY 2014

BUILDING 330D 80K AREA SUBSLAB VAPOR EXTRACTION AND TREATMENT SYSTEM VESSEL REOCATION
IBM EAST FISHKILL
HOPEWELL JUNCTION, NEW YORK

PIPING AND INSTRUMENTATION DIAGRAM

PROJECT NUMBER: 2999.00

SHEET NUMBER: IC-1



1	1/2014	RECORD (AS-BUILT) DRAWING SET	SHPC
NO.	DATE	DESCRIPTION	BY

SANBORN HEAD ENGINEERING

GRAPHICAL SCALE AS SHOWN

DRAWN BY: R.HIRTLE
DESIGNED BY: S.SOOS
REVIEWED BY: D.SHEA
PROJECT MGR: S.SOOS
PIC: D.SHEA
DATE: JANUARY 2014

BUILDING 330D 80K AREA SUBSLAB VAPOR EXTRACTION AND TREATMENT SYSTEM VESSEL REOCATION
IBM EAST FISHKILL
HOPEWELL JUNCTION, NEW YORK

INSTRUMENTATION LAYOUT

PROJECT NUMBER: 2999.00

SHEET NUMBER: IC-2

APPENDIX B

TREATMENT SYSTEM PHOTOS

APPENDIX B
SVE SYSTEM PHOTOGRAPHS

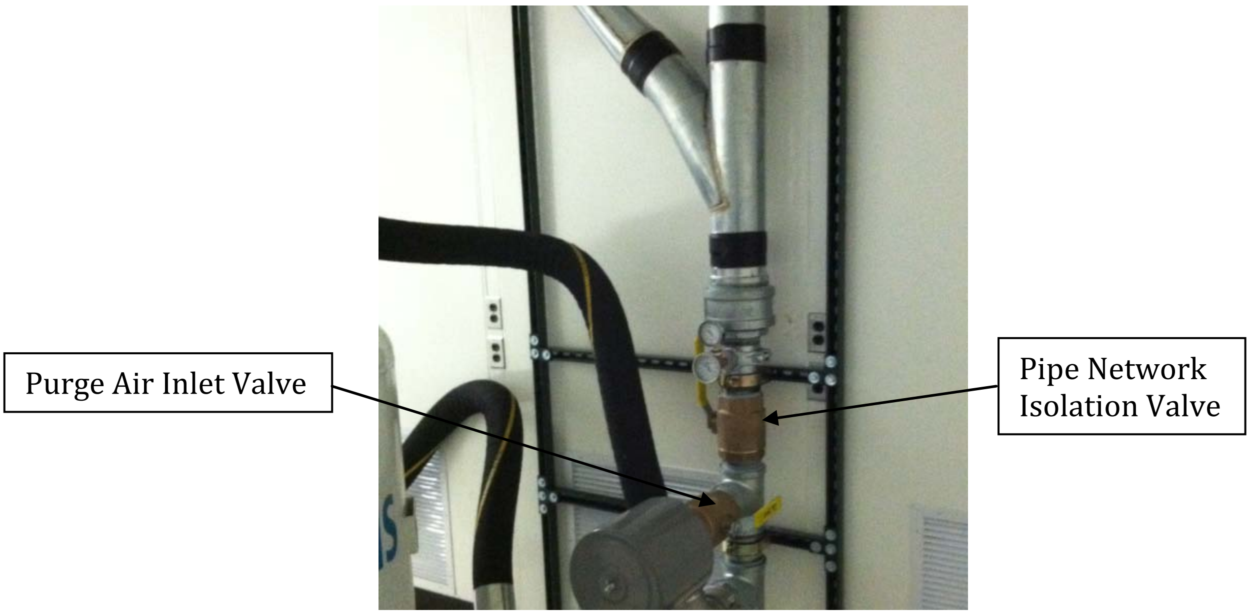


Photo 1: Piping from extraction ports to GAC vessels including pipe network isolation valve (open) and purge air inlet valve (closed).

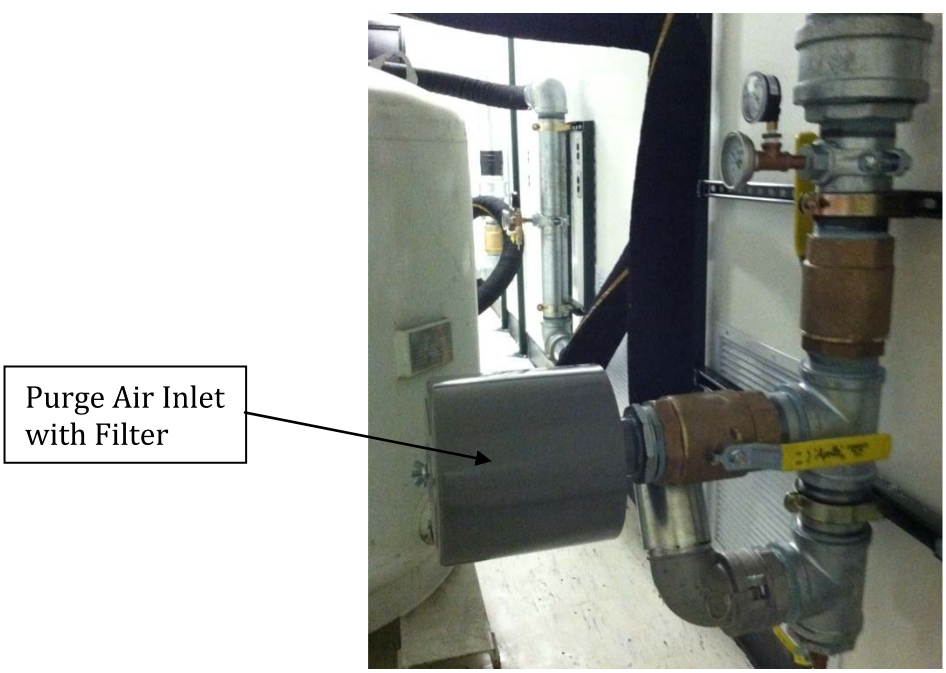


Photo 2: Purge air inlet with filter, purge air inlet and pipe network isolation valves.

Photo 3: Pipe connecting the two GAC vessels contains the mid-point sample port and temperature and vacuum gauges.

Photo 4: Outlet pipe from the lag GAC vessel with sample port and temperature and vacuum gauges.

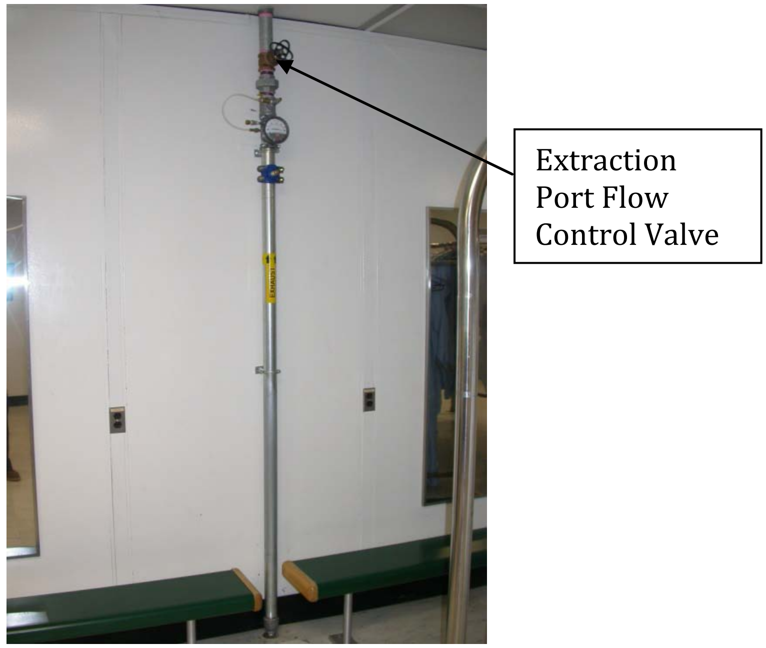


Photo 5: Extraction port inside B330D with flow control valve

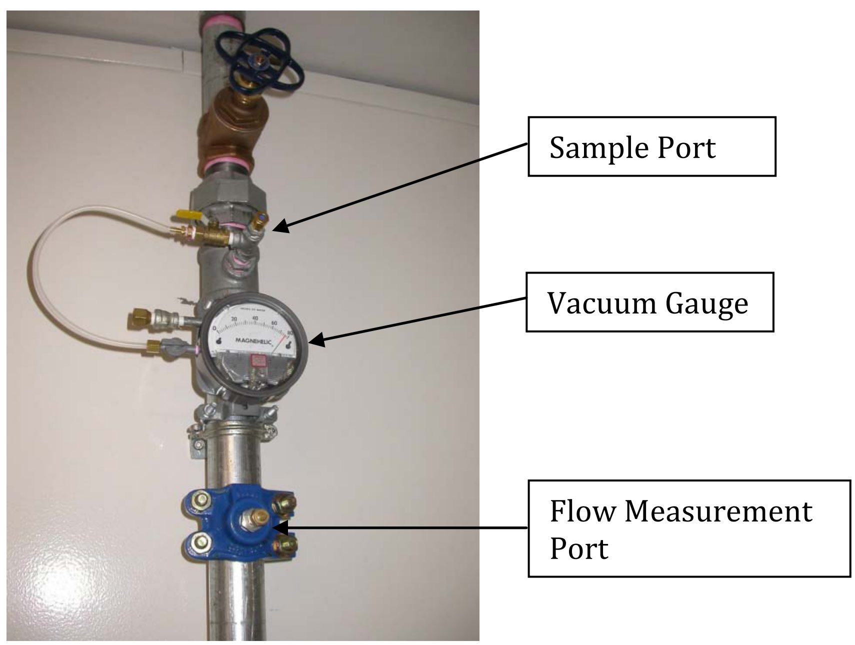


Photo 6: Extraction port instrumentation and ports

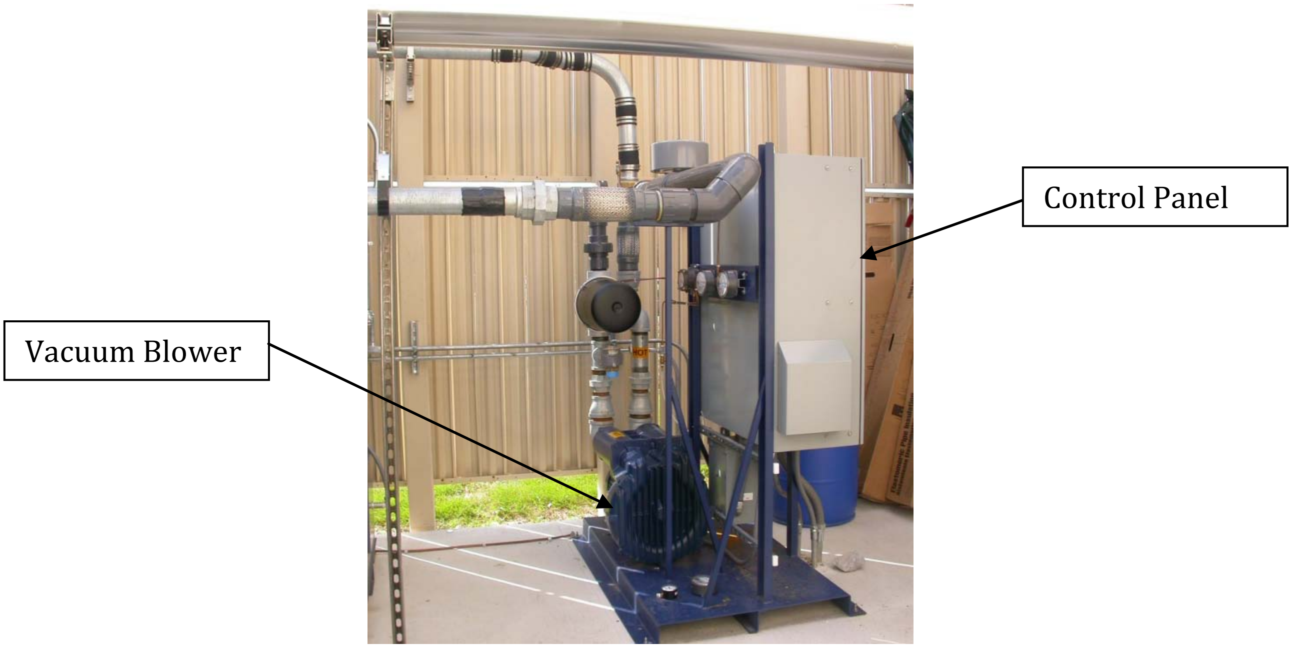


Photo 7: Blower skid

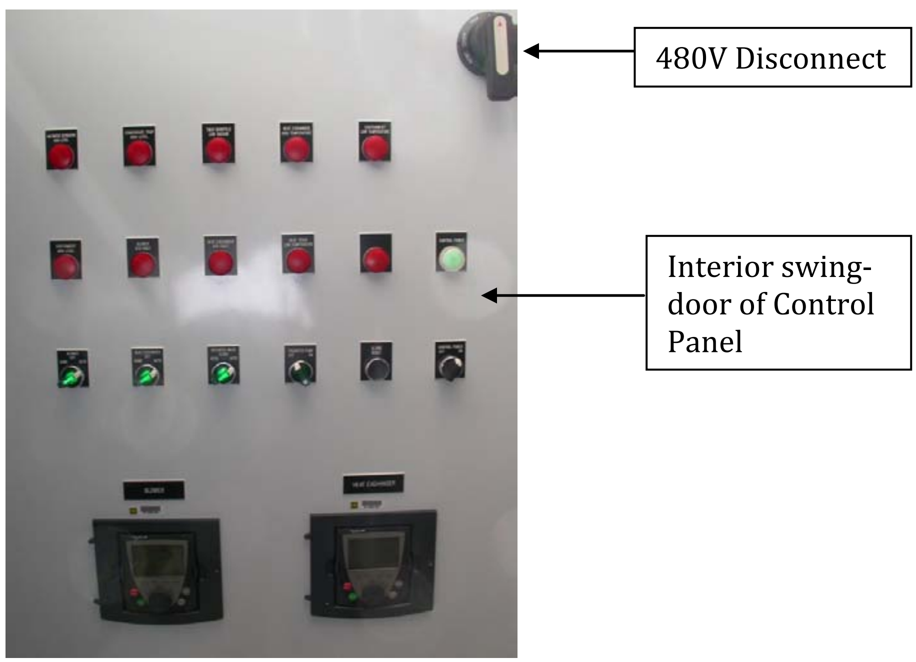


Photo 8: Control Panel

Photo 9: Blower skid and heated enclosure – located outside the 80K area of B330D

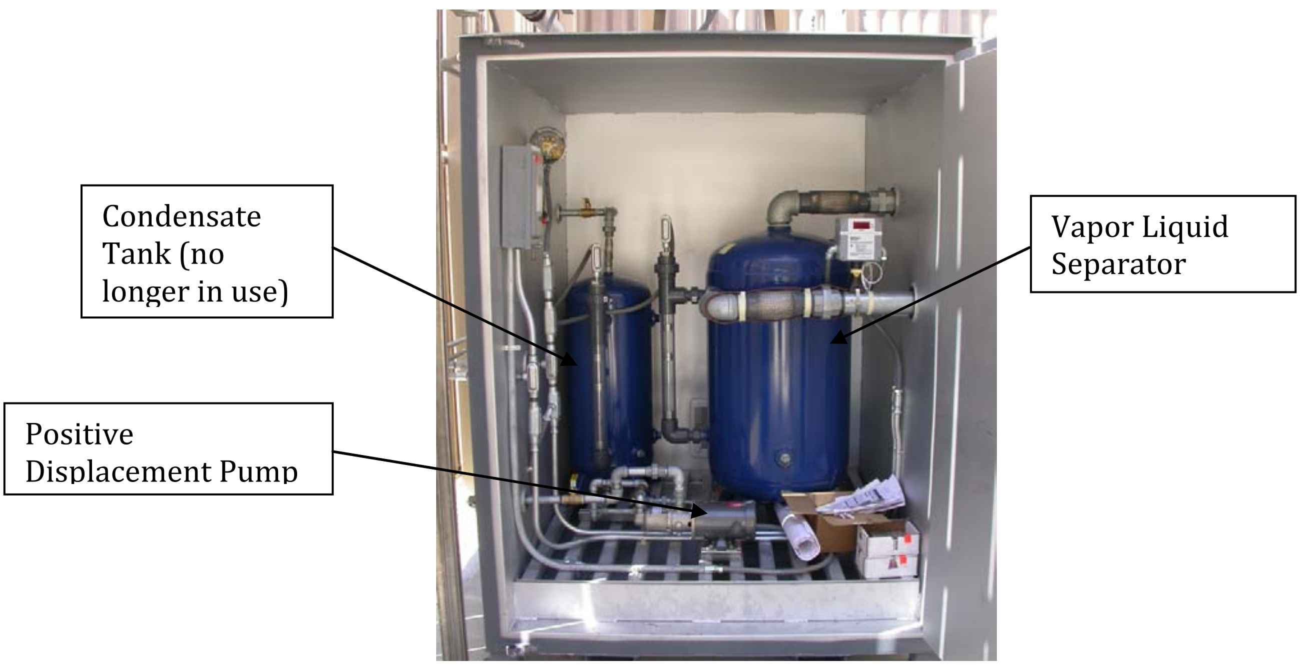


Photo 10: Interior of the heated enclosure wit secondary containment.

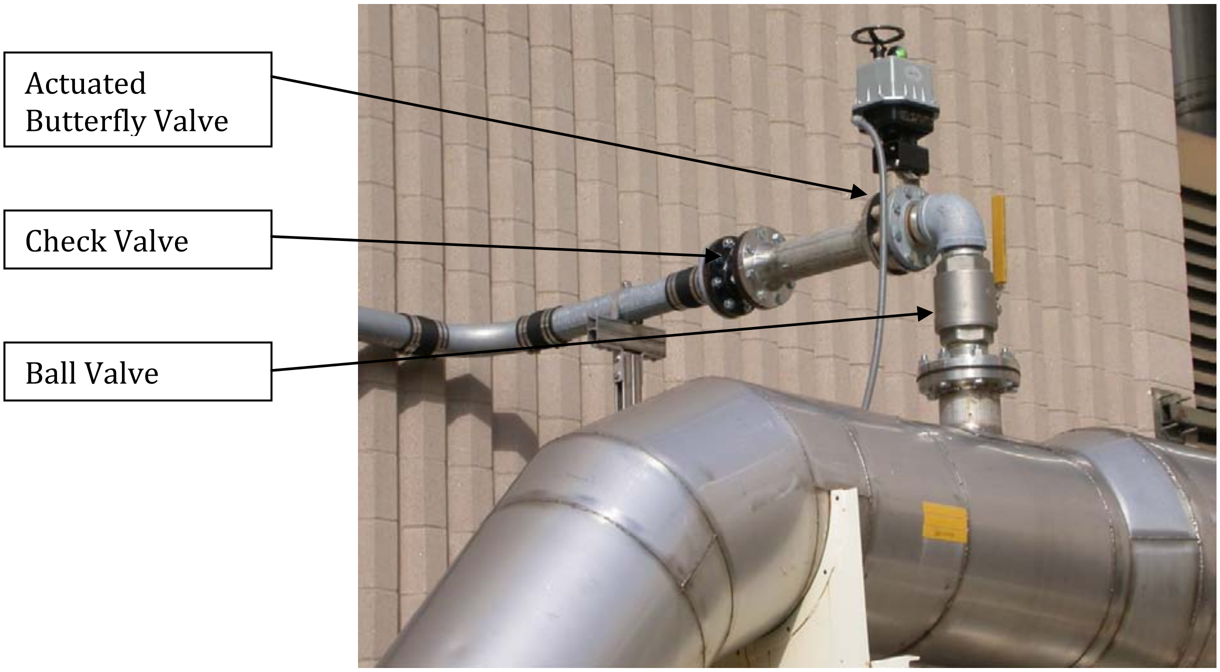


Photo 11: SVE System effluent connection into the TMAH exhaust manifold

Photo 12: SVE exterior enclosure outside of B330D

APPENDIX C

INSPECTION AND MAINTENANCE LOG SHEET

IBM East Fishkill
B330D Subslab Vapor Extraction and Treatment System

Observed By: ______________ On: ______________
Name Date/Time

Extraction System (Extraction Ports, Vapor Liquid Separator, Blower)

General

Blower Running on Arrival (Y/N) ______ Run Time: ______ hours

Alarm Condition(s) ______

Operating Parameters

	Arrival	Departure	Comments
Blower Mode (Hand/Off/Auto)			
Blower Hertz			
Actuated Valve (Hand/Off/Auto)			

Operating Conditions

GAC Vessel Inlet Temp ______ ^{o}F Flow Velocity ______ ft^3/min

Blower Inlet Temp ______ ^{o}F Blower Inlet Vacuum ______ in. wc

Blower Outlet Temp ______ ^{o}F Filter Dif. Pressure ______ in. wc

Liquid Pumped from VLS? (Y/N) ______ Quantity ______ gal

EP-1 ______ in. wc EP-3 ______ in. wc EP-5 ______ in. wc

EP-2 ______ in. wc EP-4 ______ in. wc

Treatment System (Granular Activated Carbon Vessels)

	Lag Vessel Effluent	Lead Vessel Effluent	Influent
Concentration (ppm)			
Pressure (" H_2O)			
Lab Samples Collected (Y/N)			

Date of Last Vessel Change-out ______

Comments

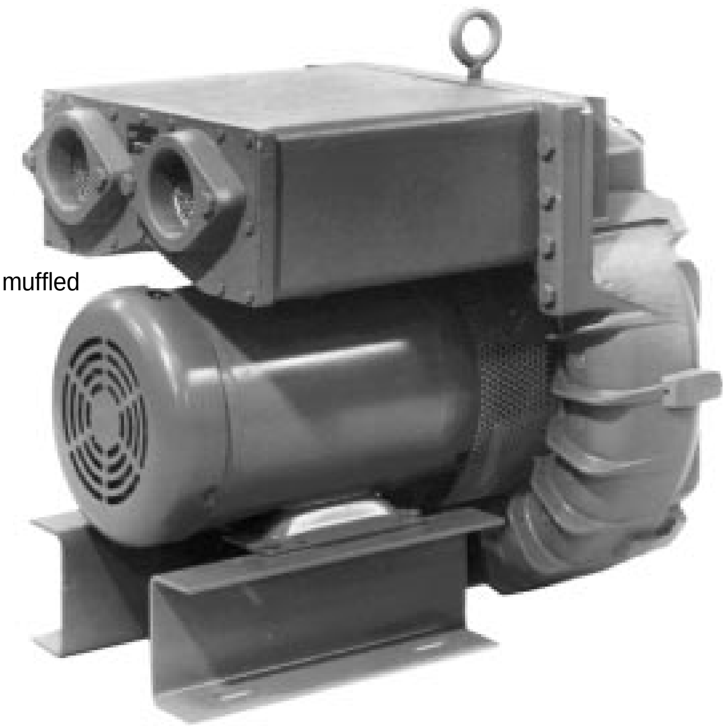
______
______
______
______

APPENDIX D

EQUIPMENT AND INSTRUMENTATION MANUALS

DR 909 ~~& CP 909~~
Regenerative Blower

FEATURES
- Manufactured in the USA – ISO 9001 compliant
- CE compliant – Declaration of Conformity on file
- Maximum flow: 600 SCFM
- Maximum pressure: 125 IWG
- Maximum vacuum: 7.5" Hg (102 IWG)
- Standard motor: 15 HP, TEFC
- Cast aluminum blower housing, impeller & cover; cast iron flanges (threaded)
- UL & CSA approved motor with permanently sealed ball bearings
- Inlet & outlet internal muffling
- Quiet operation within OSHA standards when properly piped or muffled

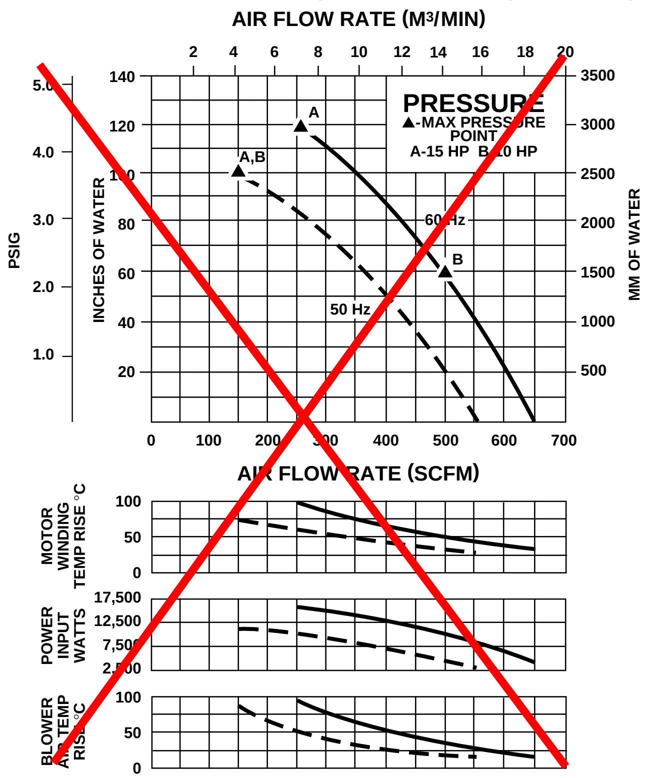


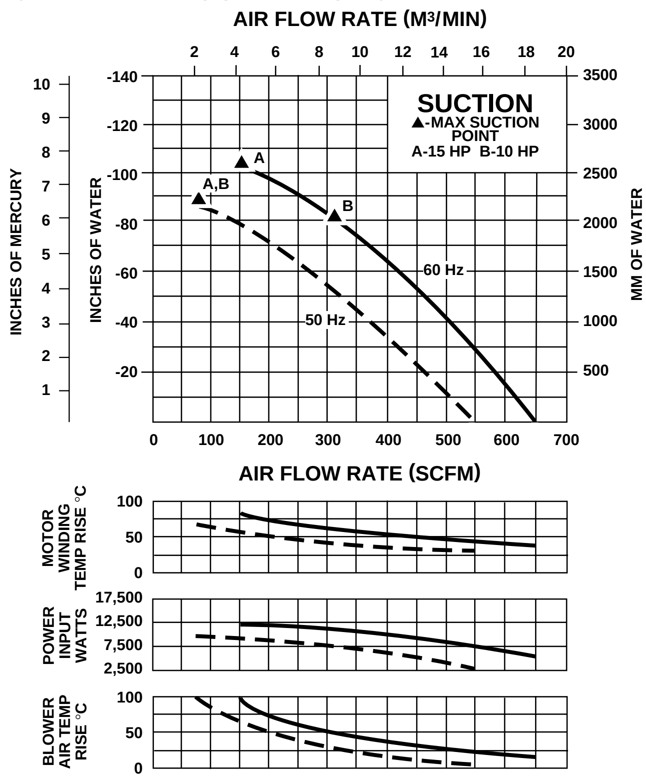
MOTOR OPTIONS
- International voltage & frequency (Hz)
- Chemical duty, high efficiency, inverter duty or industry-specific designs
- Various horsepowers for application-specific needs

BLOWER OPTIONS
- Corrosion resistant surface treatments & sealing options
- Remote drive (motorless) models
- Slip-on or face flanges for application-specific needs

ACCESSORIES (See Catalog Accessory Section)
- Flowmeters reading in SCFM
- Filters & moisture separators
- Pressure gauges, vacuum gauges & relief valves
- Switches – air flow, pressure, vacuum or temperature
- External mufflers for additional silencing
- Air knives (used on blow-off applications)
- Variable frequency drive package

BLOWER PERFORMANCE AT STANDARD CONDITIONS

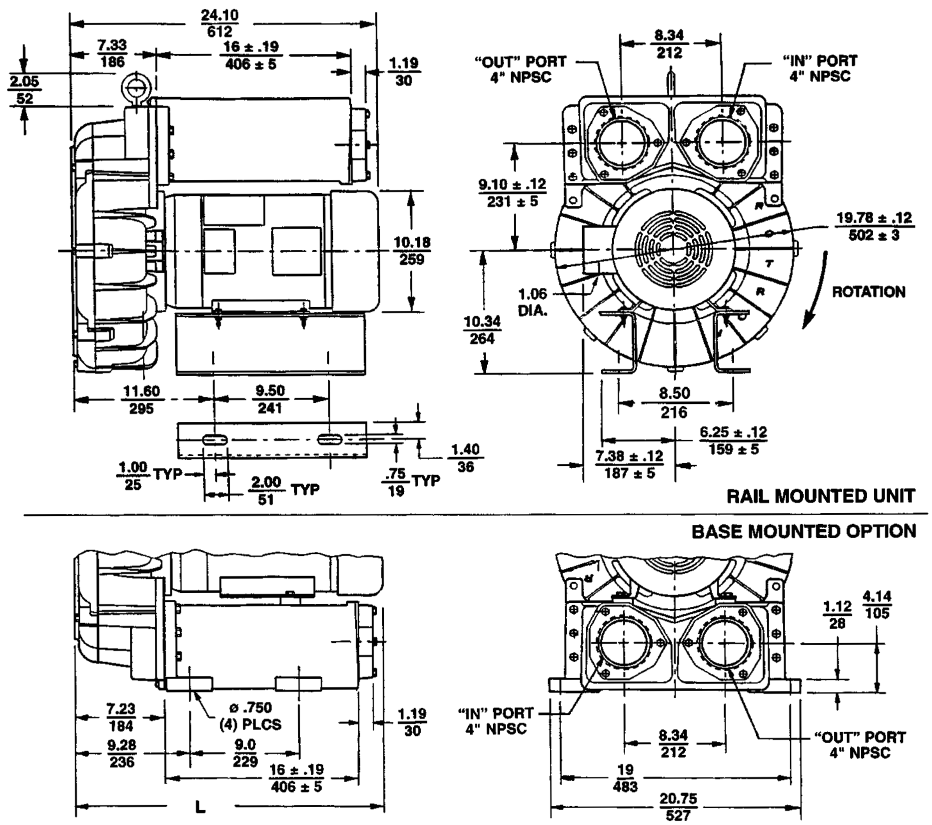




Rev. 2/01

DR 909 ~~& CP 909~~
Regenerative Blower

Scale CAD drawing available upon request.



MODEL	L (IN / MM)
DR909BE72W	23.69 / 602
DR909BE86W	23.15 / 588
DR909BB72W	23.2 / 589
DR909BB86X	23.2 / 589
DR909BE72X	23.69 / 602
DR909BE86X	23.2 / 589
DR909BB72X	23.2 / 589
HiE909BE72W	27.44 / 697

DIMENSIONS: $\frac{IN}{MM}$
TOLERANCES: .XX ± $\frac{.1}{2.5}$
(UNLESS OTHERWISE NOTED)

SPECIFICATIONS

MODEL (RAIL MOUNT)	DR909BE72W	DR909BE86W	DR909BB72W	DR909BB86W	CP909FJ72WLR	HiE909BE72W
Part No. (Rail Mount)	038620	038625	038621	080300	038632	038633
Motor Enclosure – Shaft Material	TEFC – **CS**	TEFC – **CS**	TEFC – **CS**	TEFC – **CS**	ChemTEFC – **SS**	TEFC – **CS**
Horsepower	15	15	10	10	Same as DR909BE72W – 038620 except add Chemical Processing (CP) features from catalog inside front cover	Same as DR909BE72W – 038620 except add High Efficiency motor
Voltage [1]	208-230/460	575	230/460	575		
Phase – Frequency [1]	Three - 60 Hz	Three - 60 Hz	Three - 60 Hz	Three - 60 Hz		
Insulation Class [2]	F	F	F	F		
NEMA Rated Motor Amps	41.5-37.6/18.8	14.6	26/13	10.5		
Service Factor	1.15	1.15	1.15	1.15		
Locked Rotor Amps	318/159	164	162/81	65		
Max. Blower Amps [3]	48.6-44/22	15.8	32.4/16.2	13.0		
Recommended NEMA Starter Size	2/2	2	2/1	1		
Shipping Weight	400 lb (182 kg)	400 lb (182 kg)	400 lb (182 kg)	400 lb (182 kg)		
Model (Base Mount)	DR909BE72X	DR909BE86X	DR909BB72X	DR909BB86X		
Part No. (Base Mount)	038622	038626	038623	080183		

1 Rotron motors are designed to handle a broad range of world voltages and power supply variations. Our dual voltage 3 phase motors are factory tested and certified to operate on both: **208-230/415-460 VAC-3 ph-60 Hz** and **190-208/380-415 VAC-3 ph-50 Hz**. Our dual voltage 1 phase motors are factory tested and certified to operate on both: **104-115/208-230 VAC-1 ph-60 Hz** and **100-110/200-220 VAC-1 ph-50 Hz**. All voltages above can handle a ±10% voltage fluctuation. Special wound motors can be ordered for voltages outside our certified range.

2 Maximum operating temperature: Motor winding temperature (winding rise plus ambient) should not exceed 140°C for Class F rated motors or 120°C for Class B rated motors. Blower outlet air temperature should not exceed 140°C (air temperature rise plus inlet temperature). Performance curve maximum pressure and suction points are based on a 40°C inlet and ambient temperature. Consult factory for inlet or ambient temperatures above 40°C.

3 Maximum blower amps corresponds to the performance point at which the motor or blower temperature rise with a 40°C inlet and/or ambient temperature reaches the maximum operating temperature.

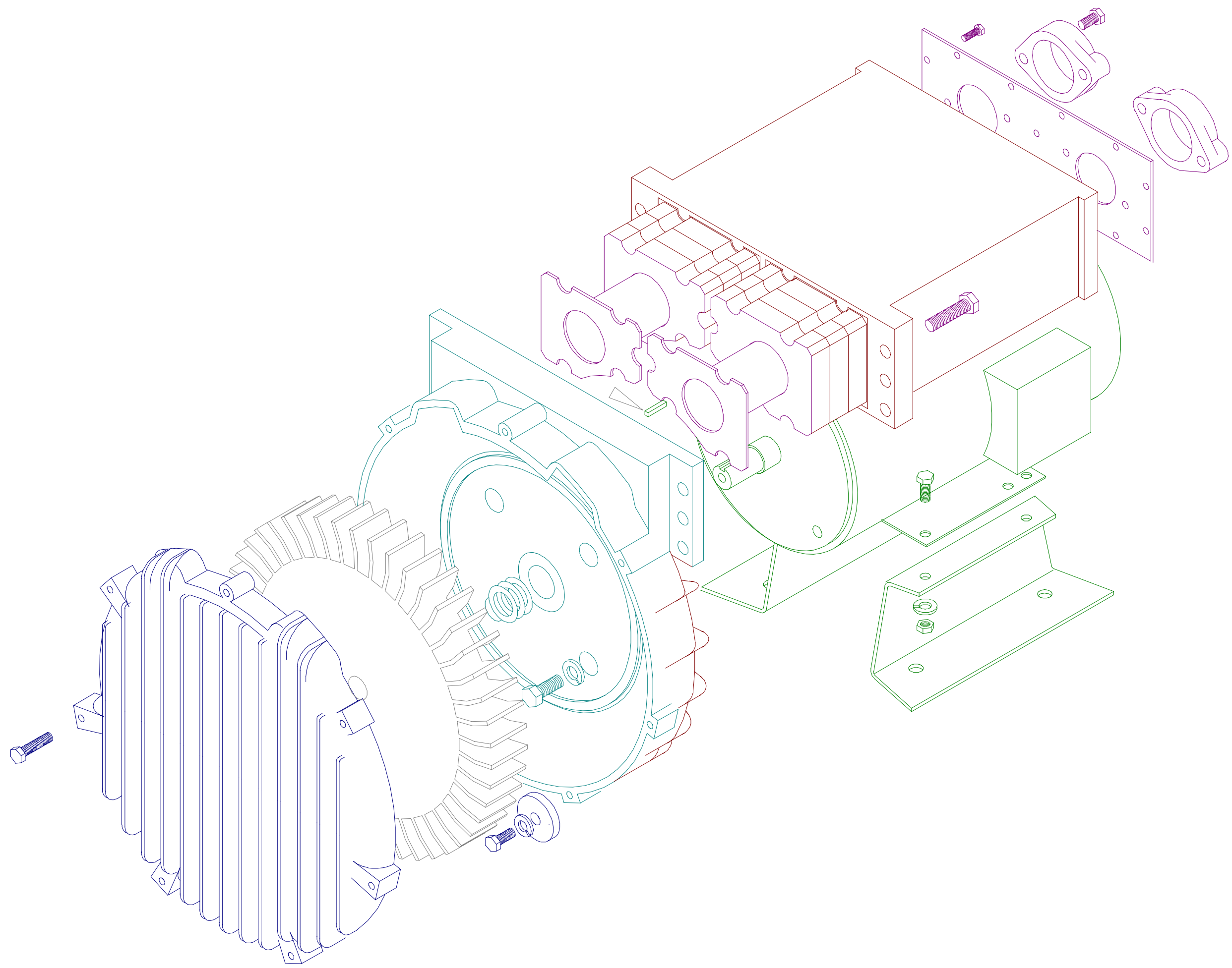
Specifications subject to change without notice. Please consult your Local Field Sales Engineer for specification updates.

Rev. 2/01

SERVICE AND PARTS MANUAL FOR BLOWER MODEL

DR6, 858, 909, 979, 14

DIRECT DRIVE REGENERATIVE BLOWER



AMETEK

Technical & Industrial Products

e-mail:

Your Choice. Our Commitment.™

WARRANTY, INSTALLATION, MAINTENANCE AND TROUBLESHOOTING INSTRUCTIONS

Technical & Industrial Products

e-mail:

1. **No Fault Policy** - AMETEK Rotron DR, EN and HiE regenerative direct drive blowers are guaranteed for one full year from the date of installation (limited to 18 months from the date of shipment.) to the original purchaser only. Should the blower fail, **regardless of the cause of failure**, we will at our option repair or replace the blower.

2. **Standard Policy** - AMETEK Rotron Minispiral, Revaflow, Multiflow, Nautilair, remote drive blowers, moisture separators, packaged units, CP blowers, Nasty Gas™ models and special built (EO) products are guaranteed for one full year from date of shipment for workmanship and material defect to the original purchaser only. Should the blower fail, we will evaluate the failure. If failure is determined to be workmanship or material defect related, we will at our option repair or replace the blower.

3. **Parts Policy** - AMETEK Rotron spare parts and accessories are guaranteed for three months from date of shipment for workmanship and material defect to the original purchaser only. If failure is determined to be workmanship or material defect related we will at our option repair or replace the part.

Corrective Action - A written report will be provided indicating reason(s) for failure, with suggestions for corrective action. Subsequent customer failures due to abuse, misuse, misapplication or repeat offense will not be covered. AMETEK Rotron will then notify you of your options. Any failed unit that is tampered with by attempting repair or diagnosis will void the warranty, unless authorized by the factory.

Terms and Conditions - Our warranty covers repairs or replacement of regenerative blowers only, and will not cover labor for installation, outbound and inbound shipping costs, accessories or other items not considered integral blower parts. Charges may be incurred on products returned for reasons other than failures covered by their appropriate warranty. Out-of -warranty product and in warranty product returned for failures determined to be caused by abuse, misuse, or repeat offense will be subject to an evaluation charge. Maximum liability will in no case exceed the value of the product purchased. Damage resulting from mishandling during shipment is not covered by this warranty. It is the responsibility of the purchaser to file claims with the carrier. Other terms and conditions of sale are stated on the back of the order acknowledgement.

<u>Installation Instructions for SL, DR, EN, CP, and HiE Series Blowers</u>

1. **Bolt It Down** - Any blower must be secured against movement prior to starting or testing to prevent injury or damage. The blower does not vibrate much more than a standard electric motor.

2. **Filtration** - All blowers should be filtered prior to starting. Care must be taken so that no foreign material enters the blower. If foreign material does enter the blower, it could cause internal damage or may exit at extremely high velocity.

Technical & Industrial Products

e-mail:

   Should excessive amounts of material pass through the blower, it is suggested that the cover(s) and impeller(s) be removed periodically and cleaned to avoid impeller imbalance. Impeller imbalance greatly speeds bearing wear, thus reducing blower life. Disassembling the blower will void warranty, so contact the factory for cleaning authorization.

3. **Support the Piping** - The blower flanges and nozzles are designed as connection points only and are not designed to be support members.

   Caution: Plastic piping should not be used on blowers larger than 1 HP that are operating near their maximum pressure or suction point. Blower housing and nearby piping temperatures can exceed 200ºF. Access by personnel to the blower or nearby piping should be limited, guarded, or marked, to prevent danger of burns.

4. **Wiring** - Blowers must be wired and protected/fused in accordance with local and national electrical codes. All blowers must be grounded to prevent electrical shock. Slo-Blo or time delay fuses should be used to bypass the first second of start-up amperage.

5. **Pressure/Suction Maximums** - The maximum pressure and/or suction listed on the model label should not be exceeded. This can be monitored by means of a pressure or suction gage (available from Rotron), installed in the piping at the blower outlet or inlet. Also, if problems do arise, the Rotron Field representative will need to know the operating pressure/suction to properly diagnose the problem.

6. **Excess Air** - Bleed excess air off. DO NOT throttle to reduce flow. When bleeding off excess air, the blower draws less power and runs cooler.

   Note: Remote Drive (Motorless) Blowers - Properly designed and installed guards should be used on all belts, pulleys, couplings, etc. Observe maximum remote drive speed allowable. Due to the range of uses, drive guards are the responsibility of the customer or user. Belts should be tensioned using belt gauge.

Maintenance Procedure

When properly piped, filtered, and applied, little or no routine maintenance is required. Keep the filter clean. Also, all standard models in the DR, EN, CP, and HiE series have sealed bearings that require no maintenance. Bearing should be changed after 15,000 to 20,000 hours, on average. Replacement bearing information is specified on the chart below.

Bearing Part Number	Size	Seal Material	Grease	Heat Stabilized
510217 510218 510219	205 206 207	Polyacrylic	Nye Rheotemp 500 30% +/- 5% Fill	Yes – 325 F
510449 516440 516648	203 202 307	Buna N	Exxon Polyrex Grease	NO
516840 516841 516842 516843 516844 516845 516846 516847	206 207 208 210 309 310 311 313	Buna N	Exxon Polyrex Grease	NO

Troubleshooting

		POSSIBLE CAUSE	OUT OF WARRANTY REMEDY ***
IMPELLER DOES NOT TURN	Humming Sound	1. * One phase of power line not connected	1. Connect
		2. * One phase of stator winding open	2. Rewind or buy new motor
		3. Bearings defective	3. Change bearings
		4. Impeller jammed by foreign material	4. Clean and add filter
		5. Impeller jammed against housing or cover	5. Adjust
		6. ** Capacitor open	6. Change capacitor
	No Soun d	1. * Two phases of power line not connected	1. Connect
		2. * Two phases of stator winding open	2. Rewind or buy new motor
IMPELLER TURNS	Blown Fuse	1. Insufficient fuse capacity	1. Use time delay fuse of proper rating
		2. Short circuit	2. Repair
	Motor Overheated Or Protector Trips	1. High or low voltage	1. Check input voltage
		2. * Operating in single phase condition	2. Check connections
		3. Bearings defective	3. Check bearings
		4. Impeller rubbing against housing or cover	4. Adjust
		5. Impeller or air passage clogged by foreign material	5. Clean and add filter
		6. Unit operating beyond performance range	6. Reduce system pressure/vacuum
		7. Capacitor shorted	7. Change capacitor
		8. * One phase of stator winding short circuited	8. Rewind or buy new motor
	Abnormal Sound	1. Impeller rubbing against housing or cover	1. Adjust
		2. Impeller or air passages clogged by foreign material	2. Clean and add filter
		3. Bearings defective	3. Change bearings
	Performance Below Standard	1. Leak in piping	1. Tighten
		2. Piping and air passages clogged	2. Clean
		3. Impeller rotation reversed	3. Check wiring
		4. Leak in blower	4. Tighten cover, flange
		5. Low voltage	5. Check input voltage

*** 3 phase units**
**** 1 phase units**
***** Disassembly and repair of new blowers or motors will void the Rotron warranty. Factory should be contacted prior to any attempt to field repair an in-warranty unit.**

Blower Disassembly:

WARNING: Attempting to repair or diagnose a blower may void Rotron's warranty. It may also be difficult to successfully disassemble and reassemble the unit.

1) Disconnect the power leads. **CAUTION:** Be sure the power is disconnected before doing any work whatsoever on the unit.

2) Remove or separate piping and/or mufflers and filters from the unit.

3) Remove the cover bolts and then the cover. **NOTE:** Some units are equipped with seals. It is mandatory that these seals be replaced once the unit has been opened.

4) Remove the impeller bolt and washers and then remove the impeller. **NOTE:** Never pry on the edges of the impeller. Use a puller as necessary.

5) Carefully note the number and location of the shims. Remove and set them aside. NOTE: If the disassembly was for inspection and cleaning the unit may now be reassembled by reversing the above steps. If motor servicing or replacement and/or impeller replacement is required the same shims may not be used. It will be necessary to re-shim the impeller according to the procedure explained under assembly.

6) Remove the housing bolts and remove the motor assembly (arbor/.housing on remote drive models).

7) Arbor disassembly (Applicable on remote drive models only):
   a) Slide the bearing retraining sleeve off the shaft at the blower end.
   b) Remove the four (4) screws and the bearing retaining plate from the blower end.
   c) Lift the shaft assembly far enough out of the arbor to allow removal of the blower end snap ring.
   d) Remove the shaft assembly from the arbor.
   e) If necessary, remove the shaft dust seal from the pulley end of the arbor.

Muffler Material Replacement:

1) Remove the manifold cover bolts and them manifold cover.

2) The muffler material can now be removed and replaced if necessary. On blowers with fiberglass acoustical wrap the tubular retaining screens with the fiberglass matting before sliding the muffler pads over the screens.

3) Reassemble by reversing the procedure.

NOTE: On DR068 models with tubular mufflers it is necessary to remove the cover and impeller accessing the muffler material from the housing cavity.

Blower Reassembly:

1) Place the assembled motor (assembled arbor assembly for remote drive models) against the rear of the housing and fasten with the bolts and washer.

2) To ensure the impeller is centered within the housing cavity re-shim the impeller according to the procedure outlined below.

3) If blower had a seal replace the seal with a new one.

4) Place the impeller onto the shaft making sure the shaft key is in place and fasten with the bolt, washer and spacer as applicable. Torque the impeller bolt per the table below. Once fastened carefully rotate the impeller to be sure it turns freely.

5) Replace the cover and fasten with bolts.

6) Reconnect the power leads to the motor per the motor nameplate.

Bolt Size	**Torque**
1/4-20	**6.25 +/- 0.25**
5/16-18	**11.5 +/- 0.25**
3/8-16	**20.0 +/- 0.5**
½-13	**49.0 +/- 1**
5/8 –11	**90.0 +/- 2**

Impeller Shimming Procedure:

WARNING: This unit may be difficult to shim. Extreme care may be exercised.

Tools Needed: Machinist's Parallel Bar
Vernier Caliper with depth measuring capability
Feeler gauges or depth gauge

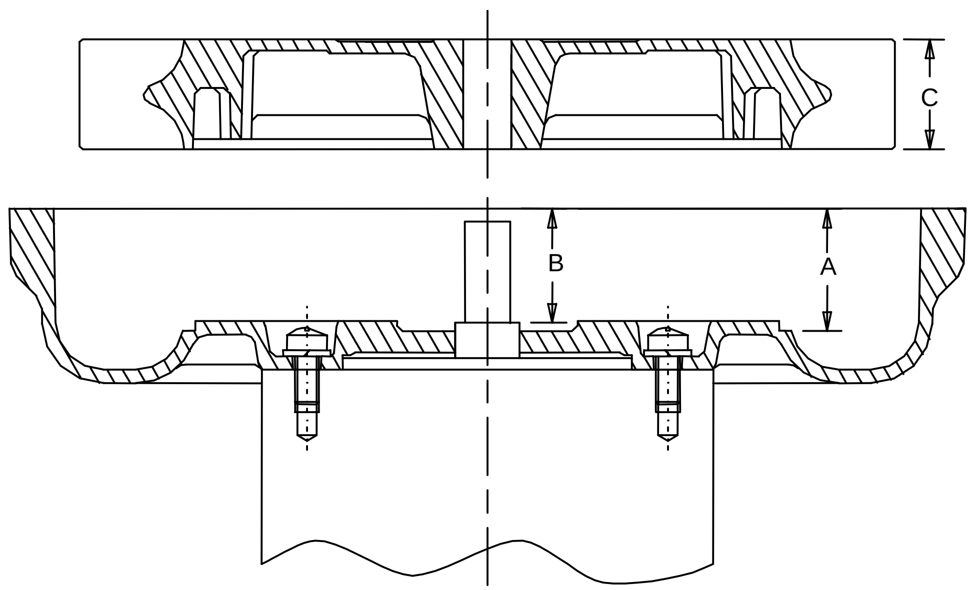
Measure the Following:

Distance from the flange face to the housing (A)
Distance from the flange face to the motor shaft shoulder (B)
Impeller Thickness (C)

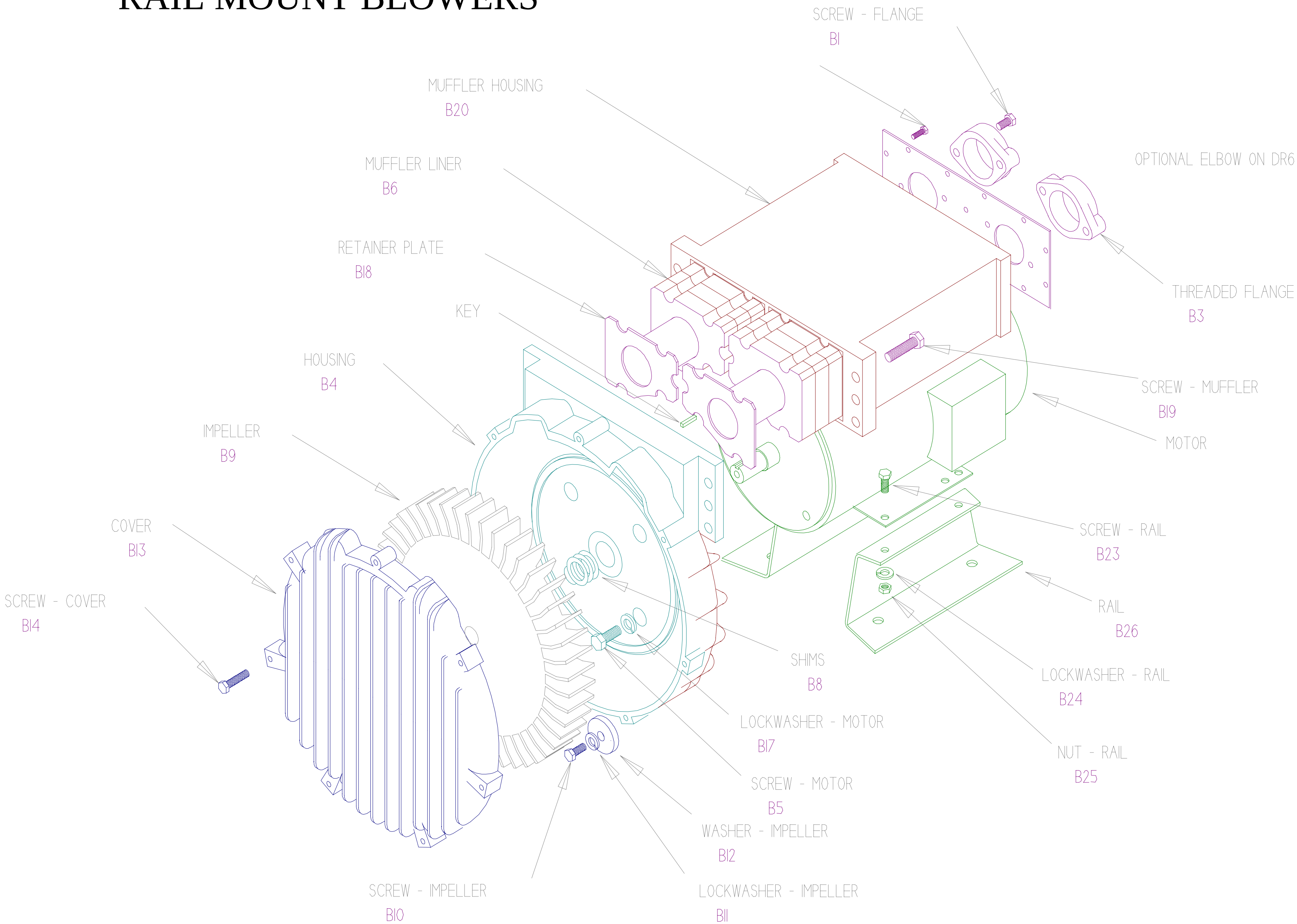
Measurements (A) and (B) are made by laying the parallel bar across the housing flange face and measuring to the proper points. Each measurement should be made at three points, and the average of the readings should be used.

Shim Thickness = B – (A+C)/2

After the impeller installation (step #4 above) the impeller/cover clearance can be checked with feeler gauges, laying the parallel bar across the housing flange face. This clearance should nominally be (A+C)/2.



ASSEMBLY DIAGRAM
DR6 DR858 DR909 DR979 DR14
RAIL MOUNT BLOWERS



Parts Breakdown

Service and Parts Manual

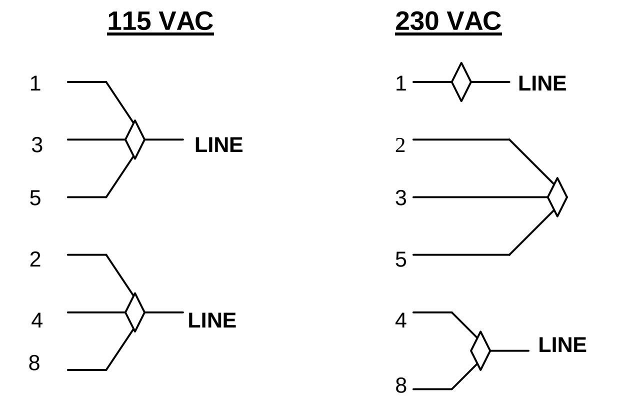
		Model:	**DR6**	**DR858 - Rail**	**DR858 - Base**	**DR909 - Rail**	**DR909 - Base**	**DR979**	**DR14**	**DR14**
		Part No.:	**027578**	**038738**	**038735**	**038620**	**038622**	**080702**	**038750**	**038752**
			027579	**038740**	**038736**	**038621**	**038623**	**080704**	**038751**	**038753**
			027600	**038742**	**038737**	**038625**	**038626**	**080632**	**038759**	
			036212	**038743**		**080300**	**080183**		**080451**	
			038071			**038633**				
Item No.	**Qty. Req'd**	**Description**								
M3	1	Key Motor Shaft	510212	511532	511532	511532	511532	551570	155066	511532
B1	6	Screw, Flange	(4 pcs) 120065	(4 pcs) 155067	(4 pcs) 155067	140016	140016	140016	140016	140016
B3	2	Flange	478341	511614	511614	529912	529912	529912	529912	529912
	2	Screen, Flange Gua	511479	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
		Elbow 90º	See Next Page	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
B4	1	Housing	515497	515410	515410	515356	515356	551383	515975	515983
B5	4	Screw, Hsg /Motor	251792	155034	155034	140014	140014	120205	120205	120205
B6	28	Muffler Material	Not Used	(32 pcs) 550020	(32 pcs) 550020	(40 pcs) 529943	(40 pcs) 529943	(8 pcs) 551571	(54 pcs) 550073	(54 pcs) 550073
	2	Matting, Fiberglass	Not Used	550075	550075	550077	550077	Not Used	550116	550116
B8	*	Shim .002"	272703	511547	511547	511547	511547	511547	515991	511547
	*	Shim .005"	272704	511548	511548	511548	511548	511548	515992	511548
	*	Shim .010"	272705	511549	511549	511549	511549	511549	515993	511549
	*	Shim .020"	272706	511550	511550	511550	511550	511550	515994	511550
	*	Shim .030"	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
B9	1	Impeller	515484	515249	515249	515270	515270	551566	515509	515683
B10	1	Bolt, Impeller	251791	120210	120210	140015	140015	140015	155068	120251
B11	1	Lockwasher, Impelle	251787	251788	251788	251788	251788	251788	251788	251788
B12	1	Washer, Impeller	Not Used	511529	511529	Not Used	Not Used	511529	Not Used	Not Used
B13	1	Cover	515488	515247	515247	515359	515359	551409	515910	515910
B14	8	Screw, Cover	251790	140016	140016	140016	140016	155515	155069	155069
B15	1	Eye Bolt	Not Used	140019	Not Used	140019	Not Used	140019	140019	140019
B16	1	Spacer, Impeller Bol	478336	515555	515555	511529	511529	511529	515990	515990
		Shaft Sleeve	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
B17	4	Lockwasher, Housin	251788	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
B18	1	Screen, Muffler	Not Used	515407	515408	529939	529939	551611	550040	550040
	1	Screen, Muffler	Not Used	515408	515407	529940	529940	551611	550042	550042
B19	6	Bolt, Muffler Hsg/Hs	Not Used	155025	155025	155025	155025	155512	155067	155067
B19A	4	Bolt, Muffler Hsg/Hs	Not Used	120214	Not Used	120214	Not Used	Not Used	120214	120214
B20	1	Muffler Housing	Not Used	550019	550017	529932	529933	551422	550039	550039
	1	Muffler Discrete	522948	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
	2	Bolt, Motor/Muffler	Not Used	Not Used	Not Used	Not Used	120214	Not Used	Not Used	Not Used
	2	Lockwasher, Motor/M	Not Used	Not Used	120203	Not Used	120203	Not Used	Not Used	Not Used
	2	Washer, Motor/Muffl	Not Used	Not Used	155029	Not Used	155029	Not Used	Not Used	Not Used
B23	4	Bolt, Rail	251791	120007	Not Used	See Next Page	Not Used	155095	120256	155025
B24	4	Lockwasher Rail	251787	251787	Not Used	251787	Not Used	251787	251788	251788
	8	Washer Rail/Motor	Not Used	Not Used	Not Used	See Next Page	Not Used	155091	Not Used	Not Used
B25	4	Nut, Rail	251789	251789	Not Used	251789	Not Used	251789	155070	155070
B26	2	Rail Mounting	478338	595301	Not Used	See Next Page	Not Used	595301	516242	516242

*As needed **Viewed looking atinlet/outlet ports

Model	Part #	Motor	Wiring Diagram	Specific Parts	Bearing, Rear (M1)	Bearing, Impeller End (M2)
DR6D89	027578	500291	C	Elbow - not used	510217	510218
DR6D86	027579	500292	G			
DR6K72	027600	500293	C			
DR6D5	036212	510459	A	Elbow - (1 pc) 120153		
HiE6D89	038071	529325	C			
DR858AY72W	038738	511570	C		516840	516844
DR858BB72W	038740	511571	C			
DR858BB86W	038742	515567	G			
HiE858BB72W	038743	529600	C			
DR858BB72X	038735	511571	C			
DR858AY72X	038736	511570	C			
DR858BB86X	038737	515567	G			
DR909BE72W	038620	511572	C	B23 (4 pcs) 155095 (16 pcs) 155091 B26 (2 pcs) 595301		
DR909BB72W	038621	511571	C			
DR909BE86W	038625	511601	G			
DR909BB86W	080300	515567	G			
HiE909BE72W	038633	529601	C	B23 (4 pcs) 120256 (8 pcs) 155091 B26 (2 pcs) 516242		
DR909BE72X	038622	511572	C			
DR909BB72X	038623	511571	C			
DR909BE86X	038626	511601	G			
DR909BB86X	080183	515567	G			
DR979BE86W	080702	551606	G			
DR979BE72W	080704	551605	C			
DR979BE72W	080632	551603	C			
DR14DW72MW	038750	516096	C		516844	516846
DR14DW86MW	038751	516097	G			
DR14BH72MW	038752	510463	C		516842	516844
DR14BH86MW	038753	511511	G			
DR14DT72MW	080451	551037	C		516844	516846
HiE14DW72MW	038759	529603	C			

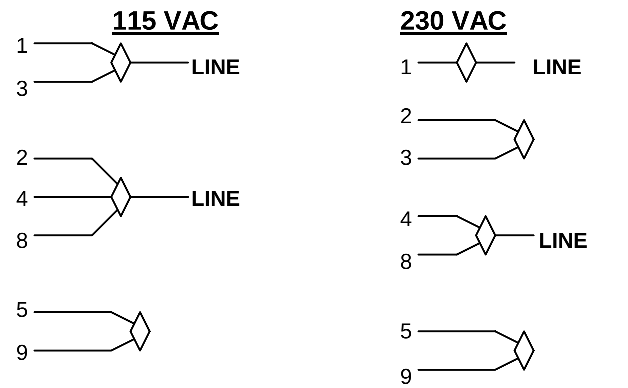
WIRING DIAGRAMS, TEFC and ODP MOTORS

A. 1∅, 6 WIRE



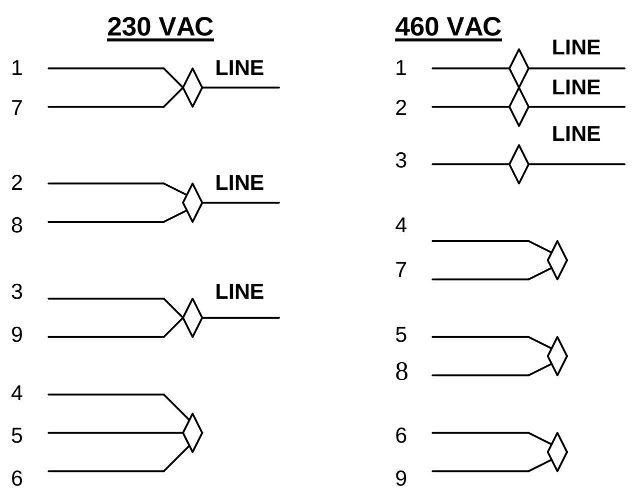
INTERCHANGE LEADWIRES 5 & 8 to REVERSE ROTATION

B. 1∅, 7 WIRE



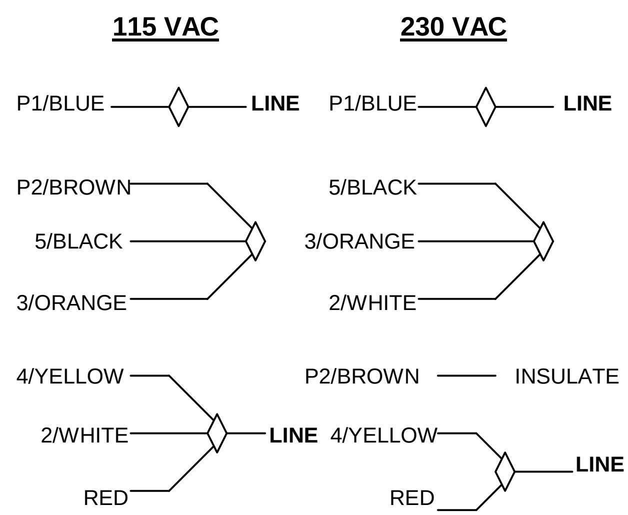
INTERCHANGE LEADWIRES 5 & 8 to REVERSE ROTATION

C. 3∅, 9 WIRE



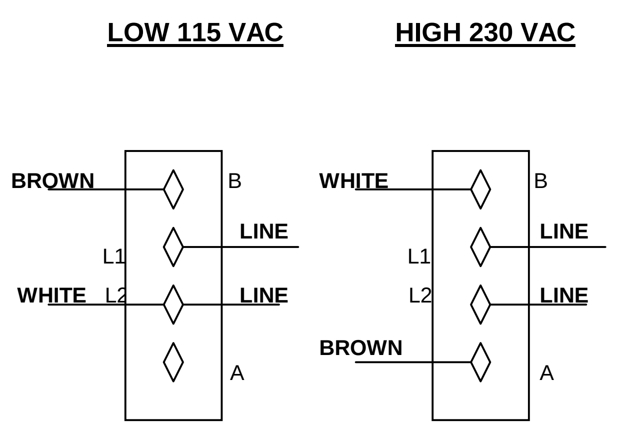
INTERCHANGE ANY TWO LEAD LINES TO REVERSE ROTATION

D. 1∅, EMERSON 1/8 HP MOTOR

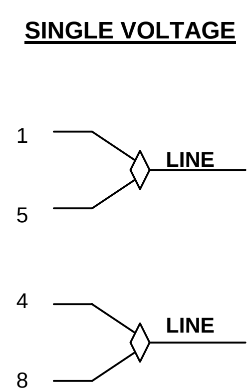


INTERCHANGE RED AND BLACK TO REVERSE ROTATION

E. 1∅, SPA DUTY WITH TERMINAL STRIPS

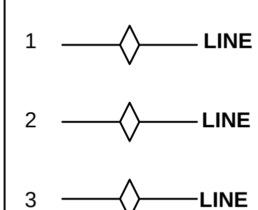


F. 1∅, 230 VAC



INTERCHANGE LEAD WIRES 5 & 8 TO REVERSE ROTATION

G. 3∅, 575 VAC



INTERCHANGE ANY TWO LEAD LINES TO REVERSE ROTATION

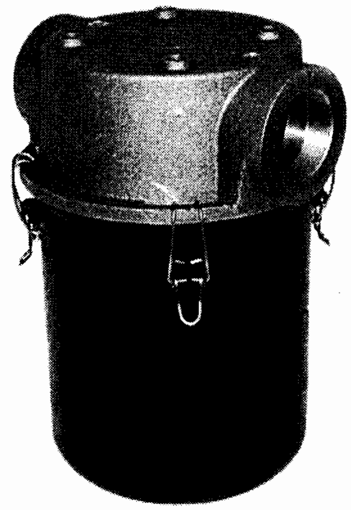
SOLBERG®

Compact T Style Vacuum Filters
"CT Series"
2", 2 1/2" & 5", 6"

New Sizes!

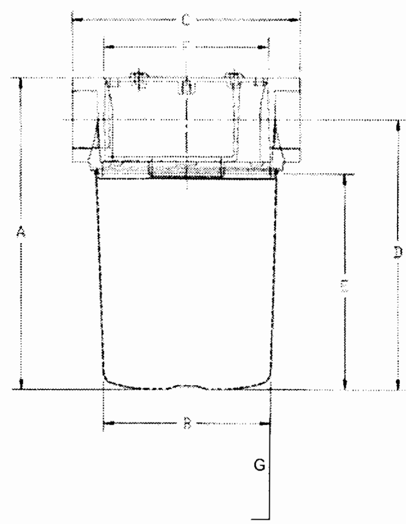
COMING SOON!

- **Compact Design**
- **Multi-Stage Filtration**
- **Quick Change Out**
- **Vacuum Tested**



BENEFITS

- **Compact** design for space restrictions; **Minimal** service area needed
- **Integrated Inlet Baffle**
- Inlet is above the element to **Extend** element life and maintenance intervals
- "T" style design **Minimizes** piping requirements
- "Drop-Down" housing for easy servicing and containment of particles
- Cast aluminum head **Resists** corrosion
- Pressure differential ports standard for monitoring
- Casting has 4 unthreaded tap holes for mounting bracket
- Versatile: Contact SMI for pressure applications
- **Vacuum level**: Typically 1×10^{-3} mmHg (1.3×10^{-3} mbar)
- Swing Bolts on 5" & 6" sizes for additional strength



Dimension tolerance ± 1/8"

OPTIONS (Inquires Encouraged)

- Various media alternatives
- See Through Bottom for Visual Inspection (Now available for 3"& 4" sized CT, contact Solberg for info on other sizes)

		with Polyester Element	with Paper Element	FPT Inlet & Outlet	DIMENSIONS - inches A	B	C	D	E	F	G	Rated Flow SCFM Nominal Rating	Element Rating	Approx. Wt. lbs
New	I	CT-851-200C	CT-850-200C	2"	13	7 5/8	9	10 7/8	9	5 5/8	2	175	290	16
	I	CT-851-250C	CT-850-250C	2 1/2"	13	7 5/8	9	10 7/8	9	5 5/8	2	210	290	15
	I	CT-235P-300C	~~CT-234P-300C~~	3"	18 13/16	9 7/8	13 1/2	16 13/16	13 1/8	10	14	300	570	30
	I	CT-235P-400C	CT-234P-400C	4"	18 13/16	9 7/8	13 1/2	16 13/16	13 1/8	10	14	320	570	20
	S	CT-275P-500C	CT-274P-500C	5"	20 1/2	16	19	15 3/4	10	14 3/4	20	800	1100	50
New	I	CT-275P-600C	CT-274P-600C	6"	20 1/2	16	19	15 3/4	10	14 3/4	20	1100	1100	45

1151 W. Ardmore Ave. • Itasca, IL 60143 USA
Tel: 630/773 1363 • Fax: 630/773 0727
E-mail: sales@solbergmfg.com • Web Site: www.solbergmfg.com

Solberg – Where the Best is in Store for You!

SOLBERG

Inlet Vacuum Filters Maintenance Manual

www.solbergmfg.com

Note: Please read the maintenance instructions given by the OEM for the machinery first. The OEM's manual should be adhered to in order to protect the equipment. Solberg Manufacturing, Inc has made every effort to make sure that these instructions are accurate but is not responsible for any typos, slight variations or for human errors that may occur.

Solberg Manufacturing, Inc., 1151 Ardmore Itasca, IL 60143 USA
Ph: 630.773.1363 Fax: 630.773.0727 Email: sales@solbergmfg.com Web: www.solbergmfg.com
Rev: MMVF-407

Maintenance Manual

SOLBERG Inlet Vacuum Filters

CONTENTS

**For Further Information Please Call: 630-773-1363*

Solberg Manufacturing, Inc., 1151 Ardmore Itasca, IL 60143 USA
Ph: 630.773.1363 Fax: 630.773.0727 Email: sales@solbergmfg.com Web: www.solbergmfg.com

Section A

INTRODUCTION

The purpose of this manual is instruction on the proper assembly and care of Solberg inlet vacuum filters.

WARNING

This manual must be read and thoroughly understood before using and caring for this air filter. Failure to comply could result in explosion, product/system contamination or personal injury.

This manual should be used as a supplement to the user's understanding of the proper care needed to maintain a safe and dependable air filter. It is the responsibility of the user to interpret and explain all instructions to persons who do not read or understand English BEFORE they are allowed to maintain and use this filter.

This manual should be readily available to all operators responsible for operation and maintenance of the vacuum inlet filters.

We thank you for selecting products from Solberg Manufacturing, Inc. We are confident that our superior filter designs will exceed your application requirements.

Section B

GENERAL INFORMATION

1. Identification of Solberg Vacuum Inlet Filters.

All Solberg inlet vacuum air filters should have an identification label/nameplate that gives the following information:

Assembly Model #
Replacement Element #

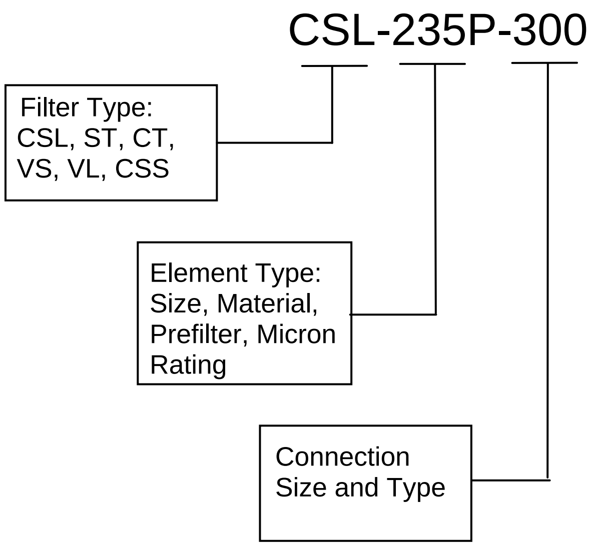
(The exception is OEM supplied units. In this case please enter the OEM part numbers below.)

Fill in the actual nameplate data from your new Solberg inlet filter(s):

No.	Filter Model Number	Replacement Element
1		
2		
3		
4		
5		

Table 1

The model number designates the filter type, the original element configuration and housing connection size. For example, the following part number identifies the filter as being a ‘CSL’ design filter with a 235 element with prefilter and 3” MPT connection size:



2. Filtration Rules of Thumb

General: For peak output performance from a compressor, blower, vacuum pump, engine, or any other machine that consumes air, one must have clean, unrestricted air. Proper filtration can help stabilize the working environment within rotating equipment even when the external conditions may be quite severe. A critical component in creating the right working conditions is filter sizing. With the properly sized filter, equipment will run smoothly over its entire expected operating life.

A major factor in filtration and filter sizing is air velocity through the filter media. Generally, the slower the velocity of air through a media the higher the filter efficiency and, conversely, the lower the pressure drop. Therefore, the primary goal in filter sizing is to optimize the velocity of air through the media (sometimes called face velocity).

Rule of Thumb #1: Always begin with the filter cartridge requirements when sizing a filter. Once the appropriate element has been selected then move on to the housing requirements.

Rule of Thumb #2: Always ask or specify a filter based on a micron rating **with** filtration efficiencies. As an example, stating a requirement for a 1-micron filter is misleading because no efficiency rating has been specified. A 1-micron filter at 95-% efficiency may be less efficient than a 5-micron filter at 99% efficiency. For proper air system performance in light and industrial duty environments, a filter with a minimum of 99% filtration efficiency at 5 microns is required.

Rule of Thumb #3: Size your filter correctly by understanding the impact air velocity through a media has on efficiency and pressure drop. Maintain the suggested Air-to-Media ratios listed below based on the external environment listings and Filtration efficiency needs.

Filtration Efficiency Requirements (99+% efficiency)	**Environmental Conditions**	**Air to Media Ratio**	
Industrial Grade 2-micron **Paper**	Industrial Duty (clean, office/warehouse-like)	30 CFM/ft^2	(51m^3/h)/cm^2
	Severe Duty (workshop, factory-like)	15 CFM/ft^2	(25.5m^3/h)/cm^2
	Extreme Duty (Foundry, Construction-like)	10 CFM/ft^2	(17m^3/h)/cm^2
Industrial Grade 5-micron **Polyester**	Industrial Duty (clean, office/warehouse-like)	50 CFM/ft^2	(85m^3/h)/cm^2
	Severe Duty (workshop, factory-like)	40 CFM/ft^2	(68m^3/h)/cm^2
	Extreme Duty (Foundry, Construction-like)	25 CFM/ft^2	(42.5m^3/h)/cm^2
Industrial Grade 1-micron **Polyester**	Severe Duty (Foundry, Construction-like)	10 CFM/ft^2	(17m^3/h)/cm^2
Industrial Grade 0.3-micron **HEPA** Glass @ 99.97% efficiency	Industrial Duty (clean office/warehouse-like)	10 CFM/ft^2	(17m^3/h)/cm^2
	Severe Duty (workshop, factory-like)	7 CFM/ft^2	(12m^3/h)/cm^2
	Extreme Duty (Foundry, Construction-like)	5 CFM/ft^2	(8.5m^3/h)/cm^2

Table 2

Rule of Thumb #4: Pressure drop is also caused by the dirt holding capacity of the element. As the element fills up with dirt, the pressure drop increases. It is important to document the pressure drop across a given filter when it is new and then clean or replace it when the pressure drop increases by 10” to 15” / 250-380mm H_2O from the original reading.

Rule of Thumb #5: The inlet connection greatly influences the overall pressure drop of the filter system. To minimize the restriction contributed by an inlet filter, a velocity of 6,000 ft/min (10200m^3/h) or less is suggested through the outlet pipe. The table below lists the suggested flows based on pipe size:

Pipe Size (inches)	Max Airflow		Pipe Size (inches)	Max Airflow		Pipe Size (inches)	Airflow	
1/4"	6 CFM	10m^3/h	1 ¼"	60 CFM	102m^3/h	6"	1,100 CFM	1870m^3/h
3/8"	8 CFM	14m^3/h	1 ½"	80 CFM	136m^3/h	8"	1,800 CFM	3060m^3/h
1/2"	10 CFM	17m^3/h	2"	135 CFM	230m^3/h	10"	3,300 CFM	5610m^3/h
3/4"	20 CFM	34m^3/h	2 ½"	195 CFM	332m^3/h	12"	4,700 CFM	7990m^3/h
1"	35 CFM	60m^3/h	3"	300 CFM	510m^3/h	14"	6,000 CFM	10200m^3/h
			4"	520 CFM	884m^3/h			
			5"	800 CFM	1360m^3/h			

Table 3 **Note: This information is for general use only. A qualified engineer must properly design each system.*

3. Element Specifications

Temperature Range: -15° to 220°F / -26° to 105°C
Filter Change-Out Differential: 10” to 15” / 250-380mm H_2O Over Initial Delta P

Media	Micron Rating
Standard Paper	99+% @ 2 micron
Standard Polyester	99+% @ 5 micron
“S” Series Wire Mesh	Epoxy Coated Wire Mesh
“Z” Series Polyester	99+% @ 1 micron
“HE” Series HEPA	99.97% @ 0.3 microns
“U” Series Polyester	99+% @ 25 micron
“W” Series Polyester	99+% @ 100 micron
“S2” Series	Stainless Steel Wire Mesh
“AC” & “ACP” Series	N/A
“Y” Series Polypropylene	99+% @ 5 micron

Table 4

Temperature Range: -15° to 385°F / -26° to 196°C
Filter Change-Out Differential: 10” to 15” / 250-380mm H_2O Over Initial Delta P

Media	Micron Rating
“MX” & “MXD” Series – Nomex Cloth	99+% @ 5 micron

Table 5

4. **Element Cleaning**

Some types of Solberg inlet filter elements can be cleaned and reused. However, damage can occur to an element during cleaning so it is imperative that care is taken during disassembly, cleaning and re-assembly. Damaged elements can allow particulate bypass, which will damage rotating equipment.

A. ***Polyester Element***: The polyester element may be washed in warm soapy water, vacuumed, gently blown out or replaced. The element should be dry before reinstallation.
B. ***Paper Element***: The paper element may be lightly blown with low pressure air. It is disposable and in most cases should be replaced with a new element.
C. ***Polyurethane Prefilter***: The prefilter may be washed as a sponge or replaced to give the element a longer service life.
D. ***Epoxy Coated Wire Mesh and Stainless Steel Wire Mesh Elements***: Cleaning instructions similar to polyester, except mild solvents may be used.
E. ***Activated Carbon Element***: Not cleanable
F. ***Polypropylene Element***: Cleaning instructions similar to polyester
G. ***Nomex Cloth Element***: Cleaning instructions similar to polyester

If you are not confident that the integrity of the element was maintained during cleaning, it is recommended that a new element be installed. Also, spare parts such as gaskets, wingnuts and washers can be supplied upon request.

Section C

PROCEDURES

1. Installation.

A. Maximum inlet gas stream temperature for most Solberg inlet vacuum filter products is 220°F / 105°C. Temperatures in excess of this could cause damage to elements, media and elastomers.

B. Direction of flow is typically from the outside of the element to the inside of the element. Most products have arrows indicating direction of flow on inlet and outlet ports.

C. Ensure that pipe/flange connections are adequately sealed so the potential for leaks is reduced to a minimum.

2. Disconnecting canister top from canister base.

A. ST/CT/Small CSL: Release wire-form clips or loosen wing nut on “claw” bolts.

B. Large CSL: Loosen wing nut or hex head on T-bolts.

C. CSS: Twist upper housing to release.

D. VS/VL: Remove V-clamp by loosening Hex Nut or T-bolt and releasing.

E. Lift off canister top.

3. Removing element for service/maintenance.

A. Remove retaining hex head/wing-nut and washer carefully, and then remove element. Some elements will have a top plate that should also be removed.

B. Clean sealing surfaces of housing, top & base plates, and element endcaps so that they are free of dirt or any other particulate.

WARNING

Failure to comply with these instructions may result in system or pump contamination.

4. **Securing Element.**

   A. Place new or cleaned element evenly on base plate. Be sure element seats properly on base and there is no dirt or particulate present on sealing surfaces.

   B. Place top plate (if necessary) on element by centering on tap bolt.

   C. Secure washer and wing nut to end cap (or top plate) and tap bolt. Element must be tightly secured. Note: DO NOT over tighten!

WARNING

Defective installation may cause system or pump contamination. Use only genuine Solberg replacement parts.

5. **Securing canister top to canister base.**

   A. Make sure all surfaces are free from dust and other particulate.

   B. Hemisphere o-ring must rest evenly along canister/casting base o-ring groove.

   C. ST/CT/Small CSL: Hold canister housing against o-ring or sealing ring on main filter head. Re-fasten wire-form clips or “claw” bolts.

   D. Large CSL: Replace housing top plate. Feed T-bolts into corresponding slots and tighten evenly around perimeter. Note: Do NOT over tighten!

   E. VS/VL: Secure V-clamp by disconnecting hex nut or T-bolt portion and placing V-clamp along the diameter of canister o-ring groove. Fasten T-bolt and secure tightly. V-CLAMP LEGS MUST REST UNIFORMLY ALONG ENTIRE O-RING GROOVE.

   F. CSS: Reassemble top housing to bottom housing by aligning tabs and turning into place.

Section D

MAINTENANCE RECOMMENDATIONS

1. Pressure drop readings are recommended to have an effective air filter. Always document initial pressure drop during start-up when element is clean. Replacement cartridge is needed when system experiences 10” to 15” / 250-380mm H_2O higher pressure drop above the initial reading. Refer to page 4 for instructions.

2. Always check replacement cartridge gaskets to insure they are adhered uniformly along the end caps during handling. If not, contact Solberg Manufacturing, Inc. immediately. Do not modify or change from Solberg specified parts!

3. Always check inlets/outlets, element base and its components when replacing element to insure cleanliness. Wipe clean if necessary.

4. Operate only when a proper seal exists.

5. VS/VL: Never operate without absolute assurance that V-clamp is secured correctly along entire diameter of canisters. Check along V-clamp for wear. Replace if any distortion occurs due to handling and usage.

SPARE PARTS LIST:

CSL/CT/VS/VL Series

		Housing						Element		
Parent Model Model-Element-Connection	Prefilter Model	Top Model No.	O-Ring Model No.	Gasket(s)/ Adapter Model No.	Wingnut(s) Model No.	Washer(s) Model No.	Clips/ Bolts Model No.	Top Plate Model No.	Wingnuts/ Bolt Model No.	Washer(s) Model No.
CSL-825/824-xxx	N/A	T824	OR337	BG224	N/A	N/A	CPWF	N/A	N/A	N/A
CSL-843/842-xxx	PF842	T842	OR550	BG268	N/A	N/A	CPWF	N/A	N/A	N/A
CSL-849/848-xxx	PF848	T848	OR675	BG281	N/A	N/A	CPWF	N/A	N/A	N/A
CSL-851/850-xxx	PF850	T850	OR750	BG412	N/A	N/A	CPWF	N/A	N/A	N/A
CSL-239/238-xxx	PF238	TD238	OR1250	N/A	N/A	N/A	CPWF	N/A	WN38X16	WR38X16
CSL-235/234-xxx	PF234	TC1400	OR1200	N/A	WN38X16	WR38X16	BT38163	T8000437	WN38X16	WR38X16
CSL-335/334-xxx	PF334	TC1400	OR1200	ADEX300	WN38X16	WR38X16	BT38163	T8000437	WN38X16	WR38X16
CSL-245/244-xxx	PF244	TC1850	OR1600	N/A	WN38X16	WR38X16	BT38163	T1000437	WN38X16	WR38X16
CSL-345/344-xxx	PF344	TC1850	OR1600	ADEX300	WN38X16	WR38X16	BT38163	T1000437	WN38X16	WR38X16
CSL-275/274-xxx	PF274	TC1850	OR1600	N/A	WN38X16	WR38X16	BT38163	T12000437	WN38X16	WR38X16
CSL-375/374-xxx	PF374	TC1850	OR1600	ADEX300	WN38X16	WR38X16	BT38163	T12000437	WN38X16	WR38X16
CSL-377/376-xxx	PF376	TC2250	OR2000	N/A	WN38X16	WR38X16	BT38163	T14750625	HN50X13	WR50X13
CSL-384(2)-xxx	PF384(2)	N/A	OR2400	N/A	WN38X16	WR38X16	BT38163	T19750625	HN50X13	WR50X13
CSL-685-xxx	PF684	N/A	OR2400	N/A	WN38X16	WR38X16	BT38163	T19750625	HN50X13	WR50X13
CSL-485(2)/484(2)-xxx	PF484(2)	N/A	OR2400	N/A	WN38X16	WR38X16	BT38163	T19750625	HN50X13	WR50X13
CT-851/850-xxx	PF850	N/A	OR725	BG412	N/A	N/A	CPWF	N/A	N/A	N/A
CT-235/234-xxx	PF234	N/A	GCT1100	ADCT234	N/A	N/A	CPWF	T8000437	BH38X16	WR38X88
CT-275/274-xxx	PF274	N/A	OR386	ADCT234	N/A	N/A	KITCT274	T12000437	BH38450	WR38X16
VS-275/274-xxx	PF274	N/A	OR386	N/A	N/A	N/A	N/A	T12000437	WN38X16	WR38X16
VL-275/274-xxx	PF274	N/A	OR386	N/A	N/A	N/A	N/A	T12000437	WN38X16	WR38X16

*Note: Spare parts are for standard products. See page 4 for replacement element.

Solberg Manufacturing, Inc., 1151 Ardmore Itasca, IL 60143 USA
Ph: 630.773.1363 Fax: 630.773.0727 Email: sales@solbergmfg.com Web: www.solbergmfg.com

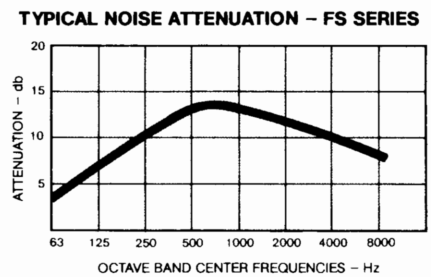
SMALL COMPACT FILTER SILENCERS
WITH STANDARD FILTER DESIGN
"FS" Series 1/2" - 3" MPT

APPLICATIONS

- Industrial & Severe Duty
- Piston Compressors
- Screw Compressors
- Blowers - Side Channel & PD Type
- Hydraulic Breathers – fine filtration
- Engines
- Construction\Contractor Industry
- Workshop
- Medical\Dental Industry
- Pneumatic Conveying
- Waste Water Aeration
- Sparging

FEATURES & SPECIFICATIONS

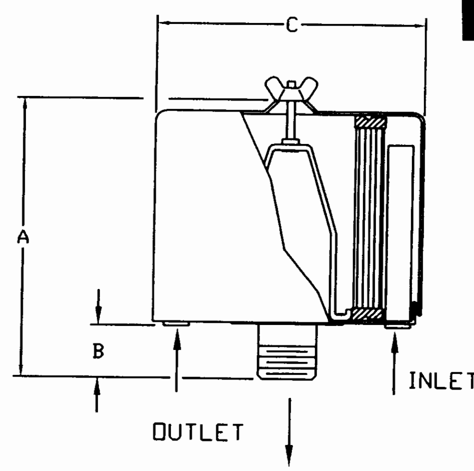
- Polyester: 99%+ removal efficiency standard to 5 micron
- Paper: 99%+ removal efficiency standard to 2 micron
- Fully drawn weatherhood - no welds to rust or vibrate apart
- Tubular silencing design - tube is positioned to maximize attenuation and air flow while minimizing pressure drop
- Durable carbon steel construction with baked enamel finish and powder coated weatherhood
- Interchangeable elements: Polyester, Paper
- Low pressure drop center bracket and outlet pipe design
- Temp (continuous): min -15°F (-26°C) max 220°F (104°C)
- Filter change out differential: 10"-15" H_2O Over Initial Delta P
- Pressure drop graphs available upon request



- Noise attenuation may vary due to the wide range of applications and machines

OPTIONS (Inquiries Encouraged)

- Various media available
- 1/8" & 1/4" tap holes
- Pressure Drop Indicator
- Available in ***Stainless Steel***
- Epoxy coated housings
- Hot dipped galvanized housings
- Special connections, NPT



Dimension tolerance ± 1/8"

I = Industrial Duty S = Severe Duty

	with Polyester Element	with Paper Element	MPT Outlet	DIMENSIONS - inches A	B	C	Rated Flow SCFM Piston	Screw, Blower, Fan	Element Rating	No. of Tubes	Approx. Wt. lbs
I	FS-15-050	FS-14-050	1/2"	4	1 1/2	6	10	10	35	1	2
I	FS-15-075	FS-14-075	3/4"	4	1 1/2	6	20	25	35	2	2
I	FS-15-100	FS-14-100	1"	4	1 1/2	6	25	35	35	3	2
S	FS-19P-100	FS-18P-100	1"	6 5/8	1 5/8	6	35	55	100	3	3
I	FS-19P-125	FS-18P-125	1 1/4"	6 5/8	1 5/8	6	55	70	100	5	3
I	FS-19P-150	FS-18P-150	1 1/2"	6 5/8	1 5/8	6	70	85	100	5	4
I	FS-31P-200	FS-30P-200	2"	7 1/4	2 1/4	10	85	135	135	5	8
S	FS-231P-200	~~FS-230P-200~~	2"	12 1/4	2 1/4	10	135	135	300	7	14
I	FS-31P-250	FS-30P-250	2 1/2"	7 1/4	2 1/2	10	100	195	195	5	8
S	FS-231P-250	FS-230P-250	2 1/2"	12 1/2	2 1/2	10	195	195	300	9	15
I	FS-231P-300	FS-230P-300	3"	13	3	10	200	300	300	9	15

Solberg - Where the Best is in Store for You!

1151 W. Ardmore Ave. • Itasca, IL 60143-1387 • (630) 773-1363 • Fax: (630) 773-0727
E-mail: sales@solbergmfg.com • Web Site: www.solbergmfg.com

SOLBERG

Filter Silencers and Inlet Filters Maintenance Manual

www.solbergmfg.com

Note: Please read the maintenance instructions given by the OEM for the machinery first. The OEM's manual should be adhered to in order to protect the equipment. Solberg Manufacturing, Inc has made every effort to make sure that these instructions are accurate but is not responsible for any typos, slight variations or for human errors that may occur.

Solberg Manufacturing, Inc., 1151 Ardmore Itasca, IL 60143 USA
Ph: 630.773.1363 Fax: 630.773.0727 Email: sales@solbergmfg.com Web: www.solbergmfg.com
Rev: MMIFS-407

Maintenance Manual

Solberg Air Inlet Filters and Filter Silencers

CONTENTS

Section A

Section B

Section C

Section D

**For Further Information Please Call: 630-773-1363*

Solberg Manufacturing, Inc., 1151 Ardmore Itasca, IL 60143 USA
Ph: 630.773.1363 Fax: 630.773.0727 Email: sales@solbergmfg.com Web: www.solbergmfg.com

Section A

INTRODUCTION

The purpose of this manual is instruction on the proper assembly and care of Solberg inlet air filters.

WARNING

This manual must be read and thoroughly understood before using and caring for this air filter. Failure to comply could result in explosion, product/system contamination or personal injury.

This manual should be used as a supplement to the user's understanding of the proper care needed to maintain a safe and dependable air filter. It is the responsibility of the user to interpret and explain all instructions to persons who do not read or understand English BEFORE they are allowed to maintain and use this filter.

This manual should be readily available to all operators responsible for operation and maintenance of the inlet air filters.

We thank you for selecting products from Solberg Manufacturing, Inc. We are confident that our superior filter designs will meet your application requirements.

Section B

GENERAL INFORMATION

1. Identification of Solberg Inlet Air Filters.

All Solberg inlet air filters should have an identification label/nameplate that gives the following information:

Assembly Model #
Replacement Element #

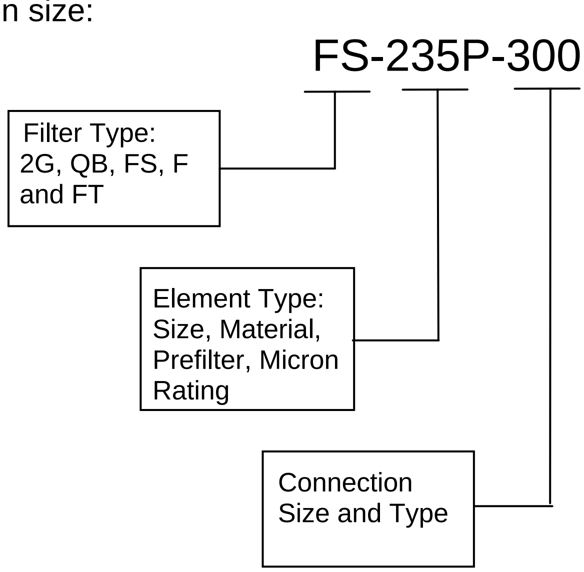
(The exception is OEM supplied units. In this case, please enter the OEM part numbers below.)

Fill in the actual nameplate data from your new Solberg inlet filter(s):

No.	Filter Model Number	Replacement Element	Initial Delta P Readings
1			
2			
3			
4			
5			

Table 1

The model number designates the filter type, the original element configuration and housing connection size. For example, the following part number identifies the filter as being a ‘FS’ design filter with a 235 element with prefilter and 3” MPT connection size:



2. Filtration Rules of Thumb

General: For peak output performance from a compressor, blower, vacuum pump, engine, or any other machine that consumes air, one must have clean, unrestricted air. Proper filtration can help stabilize the working environment within rotating equipment even when the external conditions may be quite severe. A critical component in creating the right working conditions is filter sizing. With the properly sized filter, equipment will run smoothly over its entire expected operating life.

A major factor in filtration and filter sizing is air velocity through the filter media. Generally, the slower the velocity of air through a media the higher the filter efficiency and, conversely, the lower the pressure drop. Therefore, the primary goal in filter sizing is to optimize the velocity of air through the media (sometimes called face velocity).

Rule of Thumb #1: Always begin with the filter cartridge requirements when sizing a filter. Once the appropriate element has been selected then move on to the housing requirements.

Rule of Thumb #2: Always ask or specify a filter based on a micron rating ***with filtration efficiencies***. As an example, stating a requirement for a 1-micron filter is misleading because no efficiency rating has been specified. A 1-micron filter at 95% efficiency may be less efficient than a 5-micron filter at 99% efficiency. For proper air system performance in light and industrial duty environments, a filter with a minimum of 99% filtration efficiency at 5 microns is required.

Rule of Thumb #3: Size your filter correctly by understanding the impact air velocity through a media has on efficiency and pressure drop. Maintain the suggested Air-to-Media ratios listed below based on the external environment listings and Filtration efficiency needs.

Filtration Efficiency Requirements (99%+ efficiency)	**Environmental Conditions**	**Air to Media Ratio**	
Industrial Grade 2-micron **Paper**	Industrial Duty (clean, office/warehouse-like)	30 CFM/ft^2	(51m^3/h)/cm^2
	Severe Duty (workshop, factory-like)	15 CFM/ft^2	(25.5m^3/h)/cm^2
	Extreme Duty (Foundry, Construction-like)	10 CFM/ft^2	(17m^3/h)/cm^2
Industrial Grade 5-micron **Polyester**	Industrial Duty (clean, office/warehouse-like)	50 CFM/ft^2	(85m^3/h)/cm^2
	Severe Duty (workshop, factory-like)	40 CFM/ft^2	(68m^3/h)/cm^2
	Extreme Duty (Foundry, Construction-like)	25 CFM/ft^2	(42.5m^3/h)/cm^2
Industrial Grade 1-micron **Polyester**	Severe Duty (Foundry, Construction-like)	10 CFM/ft^2	(17m^3/h)/cm^2
Industrial Grade 0.3-micron **HEPA** Glass @ 99.97% Efficiency	Industrial Duty (Pre-filtered Applications)	10 CFM/ft^2	(17m^3/h)/cm^2
	Severe Duty (workshop, factory-like)	7 CFM/ft^2	(12m^3/h)/cm^2
	Extreme Duty (Foundry, Construction-like)	5 CFM/ft^2	(8.5m^3/h)/cm^2

Table 2

Rule of Thumb #4: Pressure drop is also caused by the dirt holding capacity of the element. As the element fills up with dirt, the pressure drop increases. It is important to document the pressure drop across a given filter when it is new and then clean or replace it when the pressure drop increases by 10” to 15” / 250-280mm H_2O over the original reading.

Rule of Thumb #5: The inlet connection greatly influences the overall pressure drop of the filter system. To minimize the restriction contributed by an inlet filter, a velocity of 6,000 ft/min (10200m^3/h) or less is suggested through the outlet pipe. The table below lists the suggested flows based on pipe size:

Pipe Size (inches)	Max Airflow		Pipe Size (inches)	Max Airflow		Pipe Size (inches)	Airflow	
1/4"	6 CFM	10m^3/h	1 ¼"	60 CFM	102m^3/h	6"	1,100 CFM	1870m^3/h
3/8"	8 CFM	14m^3/h	1 ½"	80 CFM	136m^3/h	8"	1,800 CFM	3060m^3/h
1/2"	10 CFM	17m^3/h	2"	135 CFM	230m^3/h	10"	3,300 CFM	5610m^3/h
3/4"	20 CFM	34m^3/h	2 ½"	195 CFM	332m^3/h	12"	4,700 CFM	7990m^3/h
1"	35 CFM	60m^3/h	3"	300 CFM	510m^3/h	14"	6,000 CFM	10200m^3/h
			4"	520 CFM	884m^3/h			
			5"	800 CFM	1360m^3/h			

Table 3 **Note: This information is for general use only. A qualified engineer must properly design each system.*

3. Element Specifications

Temperature Range: -15° to 220°F / -26° to 105°C
Filter Change-Out Differential: 10” to 15” / 250-380mm H_2O Over Initial Delta P

Media	Micron Rating
Standard Paper	99+% @ 2 micron
Standard Polyester	99+% @ 5 micron
“S” Series Wire Mesh	Epoxy Coated Wire Mesh
“Z” Series Polyester	99+% @ 1 micron
“HE” Series HEPA	99.97% @ 0.3 microns
“U” Series Polyester	99+% @ 25 micron
“W” Series Polyester	99+% @ 100 micron
“S2” Series	Stainless Steel Wire Mesh
“AC” & “ACP” Series	N/A
“Y” Series Polypropylene	99+% @ 5 micron

Table 4

Temperature Range: -15° to 385°F / -26° to 196°C
Filter Change-Out Differential**:** 10” to 15”/ 250-380mm H_2O Over Initial Delta P

Media	Micron Rating
“MX” & “MXD” Series – Nomex Cloth	99+% @ 5 micron

Table 5

4. Element Cleaning

Some types of Solberg inlet filter elements can be cleaned and reused. However, damage can occur to an element during cleaning so it is imperative that care is taken during disassembly, cleaning and re-assembly. Damaged elements can allow particulate bypass which will damage rotating equipment.

A. ***Polyester Element***: The polyester element may be washed in warm soapy water, vacuumed, gently blown out or replaced. The element should be dry before reinstallation.
B. ***Paper Element***: The paper element may be lightly blown with low pressure air. It is disposable and in most cases should be replaced with a new element.
C. ***Polyurethane Prefilter***: The prefilter may be washed as a sponge or replaced to give the element a longer service life.
D. ***Epoxy Coated Wire Mesh and Stainless Steel Wire Mesh Element***: Cleaning instructions similar to polyester, except mild solvents may be used.
E. ***Activated Carbon Element***: Not cleanable
F. ***Polypropylene Element***: Cleaning instructions similar to polyester
G. ***Nomex Cloth Element***: Cleaning instructions similar to polyester

If you are not confident that the integrity of the element was maintained during cleaning, it is recommended that a new element be installed. Also, spare parts such as gaskets, wingnuts and washers can be supplied upon request.

Section C

PROCEDURES

1. Installation.

A. Maximum operating temperature for most Solberg inlet air filter products is 220°F / 105°C. Temperatures in excess of this could cause damage to elements, media and elastomers. High temperature products are available.

B. Direction of flow is typically from the outside of the element to the inside of the element. Most products have arrows indicating direction of flow on the inlet and outlet ports.

C. Ensure that pipe/flange connections are adequately sealed so the potential for leaks is reduced to a minimum.

2. Disconnecting canister top from canister base.

A. FS-04-06-10 *(or 05-07-11):* Twist top housing to open. Use care to support bottom housing while removing top housing. Fitting damage can occur if fitting is torqued in the wrong direction.

B. Small QB/FS/F/FT*:* Remove weather hood or top plate by loosening hex nut or wing nut and lifting off.

C. Large 2Q/QB/FS/F/FT: Remove cover by loosening hex nut or wing nut and lifting off.

3. Removing element for service/maintenance.

A. Carefully remove retaining hex head/wing-nut and washer over top plate, and then remove element. Note: Model "04-06-10" elements should be free when housing tops are removed.

B. Clean sealing surfaces of housing, top plates and element endcaps so that they are free of dirt or any other particulate.

WARNING

Failure to comply with these instructions may result in system or equipment contamination.

4. Securing Element.

A. Place new or cleaned element evenly on base plate. Be sure element seats properly on base and there is no dirt or particulate present on sealing surfaces. With multiple element stacks place elements in line with base element and ensure elements seat properly.

B. Place top plate (if necessary) on element by centering on tap bolt.

C. Secure washer and wing nut to end cap (or top plate) and tap bolt. Element must be tightly secured. Note: Do NOT over tighten!

WARNING

Defective installation may cause system or pump contamination. Use only genuine Solberg replacement parts.

5. Securing canister top to canister base.

A. Make sure all surfaces are free from dust and other particulate.

B. Small QB/FS/F/FT: Replace top plate and/or weather hood if necessary. Feed threaded rod into corresponding bolthole and tighten. Note: Do NOT over tighten!

C. Large 2G/QB/FS/F/FT: Replace cover. Feed threaded rod into corresponding bolt hole(s) and tighten. Note: Do NOT over tighten!

D. FS-04-06-10 (or 05-07-11): Reassemble top housing to bottom housing by aligning tabs and turning into place.

Section D

MAINTENANCE RECOMMENDATIONS

1. Pressure drop readings are recommended to have an effective air filter. Always document initial pressure drop during start-up when element is clean. Replacement cartridge is needed when system experiences 10" to 15" / 250-380mm H^2O above drop above the initial reading. Refer to page 4 for initial values.

2. Always check replacement cartridge gaskets to insure they are adhered uniformly along the end caps during handling. If not, contact Solberg Manufacturing, Inc. immediately. Do not modify or change!

3. Always check inlets/outlets, element base and its components when replacing element to insure cleanliness. Wipe clean if necessary.

4. Operate only when a proper seal exists.

SPARE PARTS LIST:

2G/QB/FS Series

Parent Model 2G/QB-Element-Connection	Prefilter Model	Housing Weatherhood/Top for FS Series Model No.	Housing Weatherhood/Top for 2G/QB Series Model No.	Element Top Plate Model No.	Wingnut(s)/ Lock Hex Nut(s) Model No.	Washer(s) Model No.
Model-15/14-xxx	PF14	WH6X2	N/A	N/A	WN25X20	WR25X20
Model-19/18-xxx	PF18	WH6X5	QB6X5	N/A	WN25X20	WR25X20
Model-31/30-xxx	PF30	WH10X5	QB10X5	N/A	WN25X20	WR25X20
Model-231/230-xxx	PF230	WH10X10	QB10X10	N/A	WN38X16	WR38X16
Model-235/234-xxx	PF234	WH16X10	QB16X10	N/A	WN38X16	WR38X16
Model-245/244-xxx	PF244	WH16X10	QB16X10	N/A	WN38X16	WR38X16
Model-275/274-xxx	PF274	WH16X10	QB16X10	N/A	WN38X16	WR38X16
Model-375/374-xxx	PF374	T16000625	T16000625	T12000625	LHN50X13	WR50X13
Model-377/376-xxx	PF376	T22000625	T22000625	T14750625	LHN50X13	WR50X13
Model-385/384-xxx	PF384	T28000625	T28000625	T19750625	LHN50X13	WR50X13
Model-384(2)-xxx	PF384(2)	T28000625	T28000625	T19750625	LHN50X13	WR50X13
Model-485/484-xxx	PF484	T28000625	T28000625	T19750625	LHN50X13	WR50X13
Model-485(2)/484(2)-xxx	PF484(2)	T28000625	T28000625	T19750625	LHN50X13	WR50X13
Model-685-xxx	PF684	T28000625	T28000625	T19750625	LHN50X13	WR50X13

F/FT Series

Parent Model F/FT-Element-Connection	Prefilter Model	Weatherhood/Top for F Series Model No.	Element Top for F Series Model No.	Top for FT Series Model No.	Wingnut(s)/ Lock Hex Nut(s) Model No.	Washer(s) Model No.
Model-15/14-xxx	PF14	WH6X2	N/A	T4500312	WN25X20	WR25X20
Model-19/18-xxx	PF18	WH6X5	N/A	T4500312	WN25X20	WR25X20
Model-31/30-xxx	PF30	WH7.625X5	N/A	T6000312	WN25X20	WR25X20
Model-231/230-xxx	PF230	WH10X10	N/A	T6000312	WN38X16	WR38X16
Model-235/234-xxx	PF234	WH10X10	N/A	T8000437	WN38X16	WR38X16
Model-245/244-xxx	PF244	WH16X10	N/A	T1000437	WN38X16	WR38X16
Model-275/274-xxx	PF274	WH16X10	N/A	T12000437	WN38X16	WR38X16
Model-375/374-xxx	PF374	WH16X16	N/A	T12000625	LHN50X13	WR50X13
Model-377/376-xxx	PF376	WH22.5X15	N/A	T14750625	LHN50X13	WR50X13
Model-385/384-xxx	PF384	WH28X15	N/A	T19750625	LHN50X13	WR50X13
Model-384(2)-xxx	PF384(2)	T28000625	T19750625	T19750625	LHN50X13	WR50X13
Model-485/484-xxx	PF484	WH28X24	N/A	T19750625	LHN50X13	WR50X13
Model-485(2)/484(2)-xxx	PF484(2)	T28000625	T19750625	T19750625	LHN50X13	WR50X13
Model-685-xxx	PF684	T28000625	T19750625	T19750625	LHN50X13	WR50X13

*Note: Spare parts are for standard products. See page 4 for replacement element.

Models 215V ~~and 337~~

Model 215V is Non-code Vacuum ~~and Model 337~~ is ASME Section VIII, Air/Gas Vacuum, 'UV' National Board Certified, Safety Valves

tyco

KUNKLE

Features
- **Large nozzle design** provides high capacity.
- **Flat bronze valve seats are lapped** for optimum performance.
- **Warn ring offers easy adjustability** for precise opening with minimum pre-open or simmer and exact blowdown control.
- **Pivot between disc and spring** corrects misalignment and compensates for spring side thrust.

Model Descriptions
- **Model 337 has 'pull-ring' lift device** for easy manual testing.
- **Every valve is 100% tested/inspected** for pressure setting, blowdown and leakage.
- **All adjustments are factory sealed** to prevent tampering or disassembly.

Option
- SS trim. (nozzle and disc) (Variation 03)

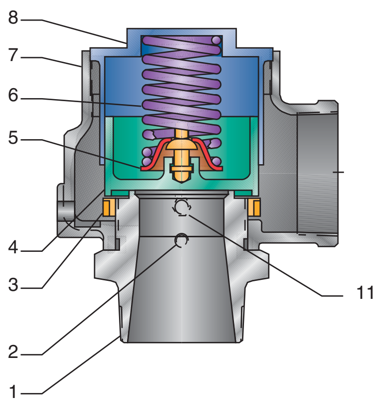
Applications
- Protection of low to medium pressure high volume blowers, compressors and pneumatic conveying systems.
- Bulk hauling trailers/equipment.
- Light gauge tanks.
- Protection of high volume vacuum pumps and conveying systems.

Vacuum Limits
Model 215V:
2-inch HG
to 29-inch HG
[67.7 to 982 mbarg]
-20° to 406°F [-29° to 208°C]

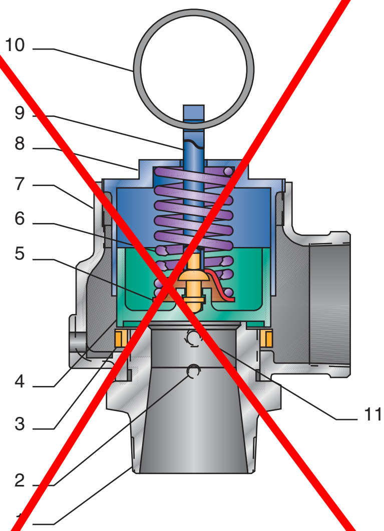
~~Pressure and Temperature Limits~~
~~**Model 337:**~~
~~1 to 60 psig [0.07 to 4.1 barg]~~
~~-20° to 406°F [-29° to 208°C]~~

Models 215V ~~and 337~~

Parts and Materials



Model 215V



~~Model 337~~

Models 215V and 337

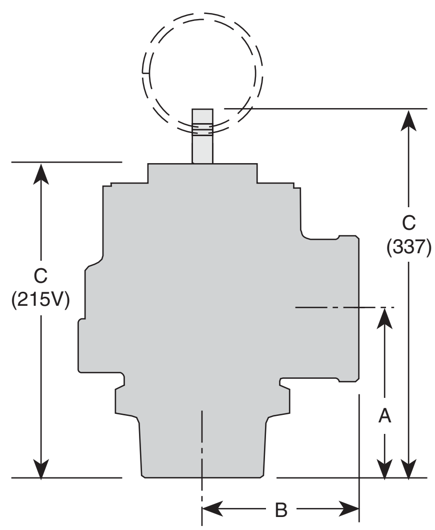
No.	Part Name	215V	337
1	Nozzle[1]	Bronze, SB62	Bronze, SB62
2	Set Screw	Steel A108-1018 Brass Plated	Steel A108-1018 Brass Plated
3	Regulator Ring	Bronze B584 Alloy 84400	Bronze B584-C84400
4	Disc[1]	Bronze B584 Alloy 84400	Bronze B584-C84400
5	Spring Step	Steel A-109 Coated[3]	Steel A109 Coated[3]
6	Spring	SS, A313 TY 302	SS A313-302
7	Body	Cast Iron, Zinc Plated, B633	Iron A-126, CL A or B
8	Compression Screw	Bronze, B-584 Alloy 84400	Bronze, B584-C84400
9	Stem[2]	N/A	Brass B16
10	Lift Ring[2]	N/A	SS A313-302
11	Regulator Ring Set Screw	N/A	Brass B16

Notes

1. Disc and nozzle available in SSA-479 TY 316.
2. Stem and lift ring available on Model 337 only.
3. Corrosion preventative coating.

Specifications

Size Inlet and Outlet	Dimensions, in [mm] A	B	C 215V	~~C 337~~	Weight lb [kg]
2" [50.8 mm]	3¼ [82.5]	3 [76.2]	6½ [165.1]	~~7 [177.8]~~	8 [3.6]
~~2½" [63.5 mm]~~	~~3¾ [95.2]~~	~~3½ [88.9]~~	~~7⅝ [194.0]~~	~~8 [203.2]~~	~~12 [5.4]~~
3" [76.2 mm]	4¼ [107.9]	4 [101.6]	8½ [215.9]	9 [228.6]	20 [4.1]



Model 337

Models 215V ~~and 337~~

Model 215V

Non-code Vacuum Air (SCFM) - Flow Coefficient

Relief Set (in, HG)	Valve Inlet and Outlet Size: 2" Orifice Area, in^2 1.84	2 1/2" Orifice Area, in^2 2.79	3" Orifice Area, in^2 4.04
2	229	347	503
5	338	512	742
10	415	630	912
15	426	646	936
20	426	646	936

Non-code Vacuum Air [Metric, Nm^3/h]

Relief Set [mbarg]	Valve Inlet and Outlet Size: 5.08 cm Orifice Area [11.86 cm^2]	6.35 cm Orifice Area [17.97 cm^2]	7.62 cm Orifice Area [26.05 cm^2]
50	328	498	722
100	450	682	988
150	533	807	1170
200	593	899	1303
250	638	966	1400
300	669	1014	1470
350	690	1046	1516
400	701	1062	1540
450	704	1067	1546
500	704	1067	1546
550	704	1067	1546
600	704	1067	1546
650	704	1067	1546
700	704	1067	1546
750	704	1067	1546

Model 337

Non-code[1] and ASME Section VIII Air (English, SCFM)

Set Pressure (psig)	Valve Inlet and Outlet Size: 2"	2 1/2"	3"
1	240	364	527
5	531	805	1166
10	741	1124	1628
15	948	1436	2081
20	1092	1656	2399
25	1237	1875	2718
30	1382	2095	3036
35	1542	2337	3386
40	1701	2578	3736
45	1860	2820	4086
50	2020	3061	4436
55	2179	3303	4786
60	2338	3544	5136

Note

1. No code stamp or 'NB' on nameplate below 15 psig set.

Non-code[1] and ASME Section VIII Air [Metric, Nm^3/h]

Set Pressure [barg]	Valve Inlet and Outlet Size: 50 mm	63 mm	80 mm
0.5	1049	1589	2303
1.0	1457	2208	3200
1.5	1888	2861	4147
2.0	2235	3387	4910
2.5	2613	3959	5739
3.0	2995	4538	6579
3.5	3377	5117	7418
4.0	3760	5696	8258

Note

1. No code stamp or 'NB' on nameplate below 1.1 barg set.

Models 215V ~~and 337~~

Model Number/Order Guide

Model Number Position	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Example	2	1	5	V	—	H	0	1	A	Q	E	0	0	0	6

Model
215V
~~0337~~

Inlet Size
H - 2-inch [50.8 mm]
~~J - 2½-inch [63.5 mm]~~
~~K - 3-inch [76.2 mm]~~

Variation (01 through 99)
01 - Bronze Disc and Nozzle
~~03 - SS Disc and Nozzle~~
~~06 - BSP Connections~~

Design Revision
Indicates non-interchangeable revision. Current Design is at Revision ‘A’

Valve Service
~~K - Air ASME Section VIII (Model 337 only)~~
Q - Vacuum (Model 215V only)
~~N - Non-code Air/Gas (Model 337 only)~~

Spring Material
E - SS Type 316
~~M - SS (26 psi thru 60 psi set) Type 17-7~~

Set Pressure
~~Model 337, 1 psig [0.7 barg] (0001) through 60 psig [4.1 barg] (0060)~~
Model 215V, 2-inch HG [68 mbarg] (0002) through 29-inch HG [982 mbarg] (0029) vacuum

Facility Phone: 828-669-3700

tyco / Valves & Controls

www.kunklevalve.com

KUNKLE PRESSURE RELIEF VALVES
Installation and Operating Instructions

Pre-Installation Handling

This pressure relief valve is designed to protect equipment from overpressure. The valve should be handled with care, not subjected to heavy shock loads, and protected to prevent contamination from getting inside. It should be installed correctly per A.S.M.E. Boiler & Pressure Vessel Code requirements. Failure to do so could result in property damage or serious injury to personnel. When hoisting the valve into position for installation, care should be exercised so that lifting straps do not contact the valve lift lever.

Installation

Always wear proper safety equipment, including safety glasses and ear protection.

1. Mount the valve in a vertical position so that the valve body is self-draining. If a body drain port is provided, make sure it is open when required by the ASME code. Do not plug any bonnet vent openings. The inlet piping should be as short as possible, with no elbows, and equal to or greater than the size of the pressure relief valve inlet connection. This will help to limit the inlet pressure drop to 3% or less when the valve is relieving.

2. When discharge piping is connected to valve outlet, make sure it is self draining if a body drain port is not used. The valve should not be connected to any discharge pipe that contains pressure before the valve opens or to any pipe where the pressure build-up is greater than 10% of the set pressure when the valve is open and relieving.

   Discharge piping, other than a short tailpipe, must be supported. For steam service, a drip pan elbow or flexible connection between the valve and the pipe should be used to prevent excessive pipe stress, due to thermal expansion, from being imposed on the valve body.

3. For threaded valves, to prevent sealing compound from entering and damaging the valve, apply a small amount of pipe thread sealing compound to external threads only. Do not put any sealing compound on the first thread or on any internal threads. To do so may cause the sealing compound to enter the valve and cause seat leakage.

   Do not use the valve body or bonnet for installing the valve in threaded connections. Use the wrench flats provided to tighten the valve to the connecting pipe, and do not overtighten. To do so may cause valve leakage.

4. For flanged valves, use new gaskets and tighten the mounting studs evenly.

Operation

1. Maintain a system operating pressure at least 5 psig or 10% below the set pressure of the valve, whichever is greater. Operating too close to the valve set pressure will cause seat leakage and will shorten the time between valve maintenance.

2. Do not use the safety valve as a control valve to regulate system operating pressure. Excessive operation will cause the seat to leak and will require more frequent valve maintenance.

3. ASME Section I and VIII valves equipped with lift levers are designed to be operated only when the system pressure is 75% of set pressure or greater. ASME Section IV valves may be operated at any set pressure. When hand operating the valve, hold it open long enough to purge any foreign matter from the seat area. If a cable or wire is attached to the lift lever for remote actuation, make sure the direction of pull is the same as it would be if the lever were pulled directly by hand.

Maintenance

Maintenance should be performed on a regular basis. An initial inspection interval of 12 months is recommended. Depending on the service conditions and the condition of the valve, the inspection interval may be decreased or increased. Use only Kunkle parts for repair. Depending on the local jurisdictional requirements where the valve is installed, repairs may have to be made by a repair facility holding a VR stamp.

WARNING!

Removal of the seal wires or any attempt to adjust, repair or modify this product by non-qualified or non-authorized persons voids the product guarantee and may cause serious damage to equipment, personal injury, and death. Kunkle Valve is not liable for any damage resulting from misuse or misapplication of its products.

Phone: 828-669-5515 953 Old US 70, Black Mountain, NC 28711 Fax: 828-669-4017

SPECIFICATION DATA

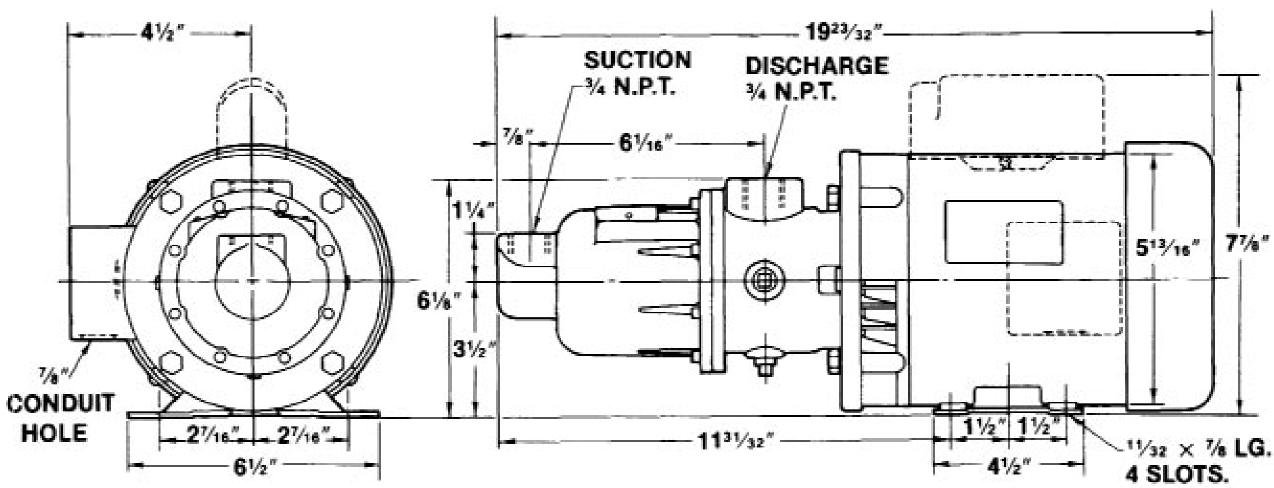
MOYNO® 500 PUMPS

300 SERIES MOTORIZED

331, 332, 333, 344, 356 AND 367 MODELS

331, 332, 333, 344 MODELS

DIMENSIONS

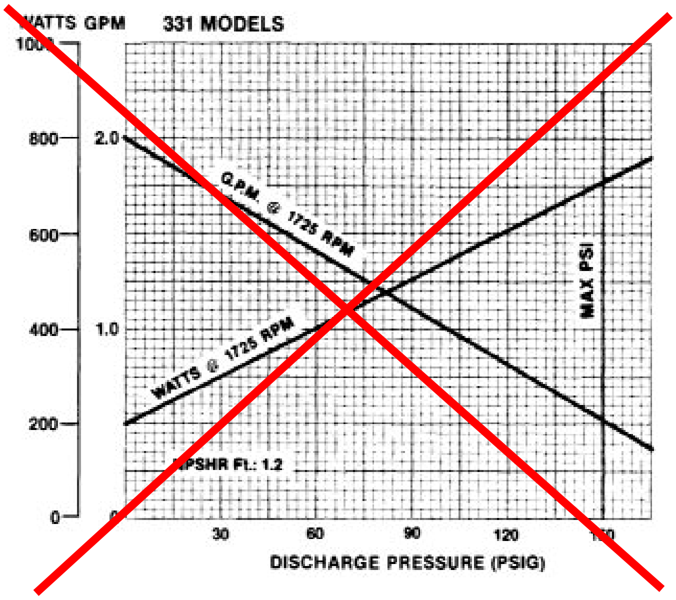


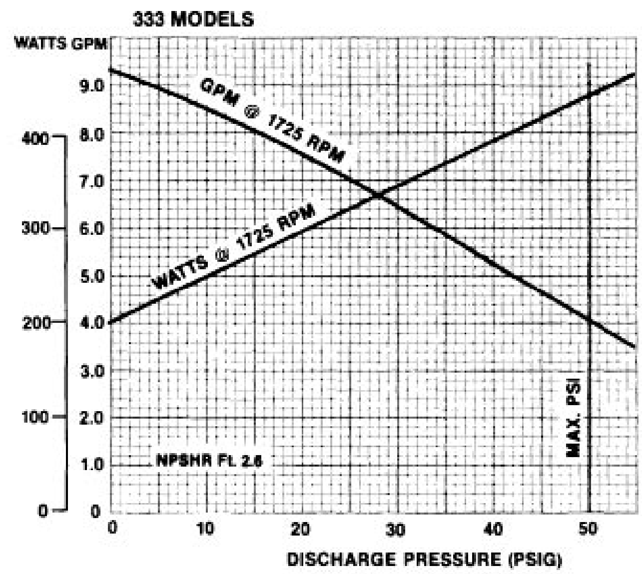
MATERIALS OF CONSTRUCTION

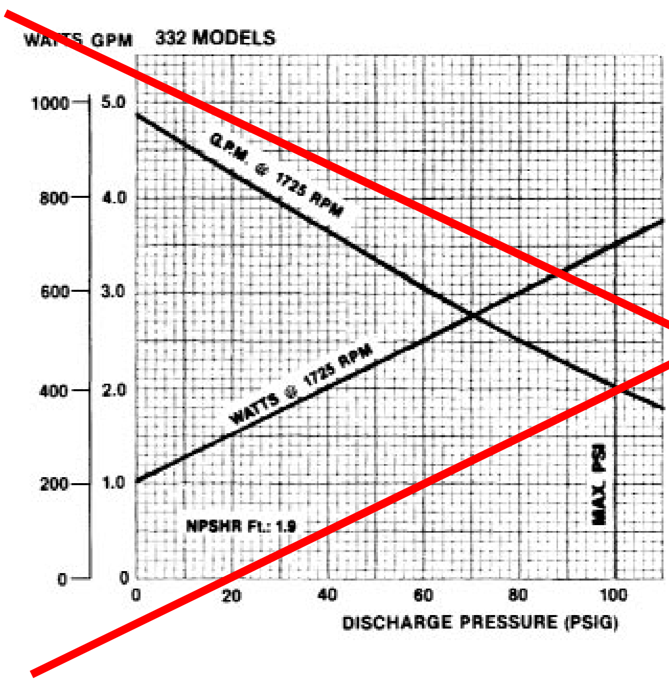
COMPONENT	MODELS			
	33159, 33259 33359, 34459	**33160, 33260 33360, 34460**	**33152, 33252 33352, 34452**	**33150, 33250 33350, 34450**
Housing Rotor Stator	Cast iron 416 SS/CP NBR (Nitrile)	Cast iron 416 SS/CP NBR (Nitrile)	316SS 316 SS/CP NBR (Nitrile)	316SS 316 SS/CP NBR (Nitrile)
Motor Data	1/2 HP,1 PH 115/230 VAC 60 HZ TEFC	1/2 HP, 3 PH 230/440 VAC 60 HZ TEFC	1/2 HP, 1 PH 115/230 VAC 60 HZ TEFC	1/2 HP, 3 PH 230/440 VAC 60 HZ TEFC
Weight (lbs)	41	41	41	41

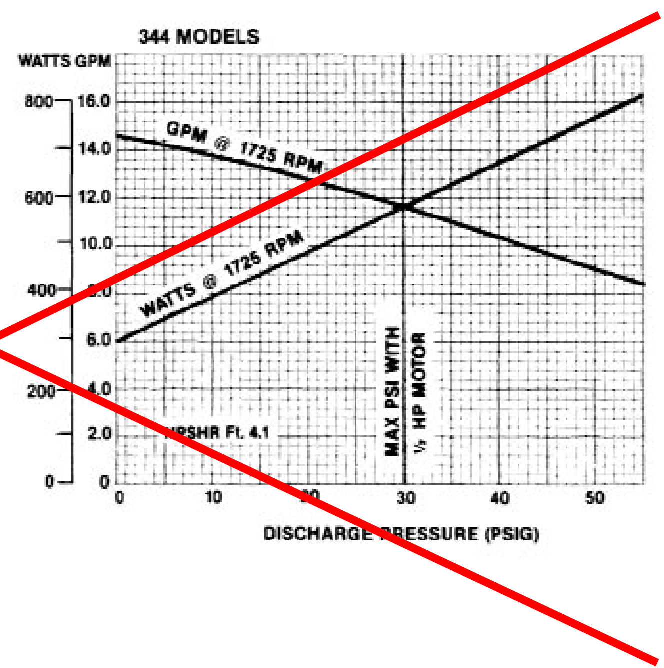
CP = Chrome plated

PERFORMANCE (Water at 70°F)









NOTE: With the standard 1/2 HP motor, maximum fluid viscosity is 100 CP (500 SSU).

SERVICE MANUAL

MOYNO® 500 PUMPS

300 SERIES
331, 332, 333, 344, 356 AND 367 MODELS

Mechanical Seal Models

Packing Gland Models

DESIGN FEATURES	MODELS				
	33101 34401 33201 35601 33301 36701	33104 34404 33204 35604 33304 36704	33108 33308 33208 34408	34411 35611	35613
Housing:	Cast Iron	AISI 316 SS	Nylon	Cast Iron	AISI 316 SS
Pump Rotor:	Chrome plated 416 SS	Chrome plated 316 SS	Chrome plated 416 SS	Chrome plated 416 SS	Chrome plated 316 SS
Pump Stator:	NBR (Nitrile)	NBR (Nitrile)	NBR (Nitrile)	NBR (Nitrile)	NBR (Nitrile)
Shaft:	416 SS	316 SS	416 SS	416 SS	316 SS
Flexible Joint:	Carbon steel/ NBR	316 SS/ NBR	Carbon steel/ NBR	Carbon steel/ NBR	316 SS/ NBR
Bearings:	Ball (sealed)	Ball (sealed)	Ball (sealed)	Ball (sealed)	Ball (sealed)
Mechanical Seal:	Carbon-ceramic	Carbon-ceramic	Carbon-ceramic	---	---
Packing:	---	---	---	Braided PTFE	Braided PTFE

Note: Alternate elastomers available. Refer to Repair/Conversion kit numbers, page 8.

INSTALLATION

Mounting Position. Pump may be mounted in any position. When mounting vertically, it is necessary to keep bearings above seals to prevent possible seal leakage into bearings.

Pre-Wetting. Prior to connecting pump, wet pump elements and mechanical seal or packing by adding fluid to be pumped into suction and discharge ports. Turn shaft over several times in a clockwise direction to work fluid into elements.

Piping. Piping to pump should be self-supporting to avoid excessive strain on pump housings. See Table 1 for suction and discharge port sizes of each pump model. Use pipe “dope” or tape to facilitate disassembly and to provide seal.

Drive. On belt driven units, adjust belt tension to point of non-slip. Do not overtighten.

On direct drive units, coupling components should be aligned and spaced at least 1/16” apart.

Pump rotation must be clockwise when facing shaft to prevent damage to pump. Check direction of rotation before startup.

Water Flush of Packing (356 Models Only). The packing may be either grease lubricated through a grease fitting in the stuffing box or have plumbing connected to the housing to allow a water flush.

Maximum speed is 1750 rpm.

When the material being pumped is abrasive in nature, it may be advantageous to flush the packing to prevent leakage under packing and excessive shaft wear.

Clean water can be injected through a 1/8” NPT tapped hole that normally houses the grease fitting for lubricating the packing. The water can be permitted to leak axially along the shaft in either direction or can be removed from the second tapped hole in the stuffing box. In both cases, the discharge from the stuffing box should be throttled slightly to maintain 10-15 PSI higher pressure in the stuffing box than is present in the discharge housing.

Table 1. Pump Data

Pump Models	331	332	333	344	356	367
Suction Port (NPT)	3/4*	3/4*	3/4*	3/4*	1-1/2	2
Discharge Port (NPT)	3/4	3/4	3/4	3/4	1-1/4	2
Discharge Pressure (psig)	150	100	50	40	50	50

*08 versions = 1” NPT

Table 2. Temperature Limits

Elastomer	Temperature Limits
*NBR	10°-160°F
*EPDM	10°-210°F
*FPM	10°-240°F

*NBR = Nitrile
*EPDM = Ethylene-Propylene-Diene Terpolymer
*FPM = Fluoroelastomer

OPERATION

Self-Priming. With wetted pumping elements, the pump is capable of 25 feet of suction lift when operating at 1750 rpm with pipe size equal to port size.

DO NOT RUN DRY. Unit depends on liquid pumped for lubrication. For proper lubrication, flow rate should be at least 10% of rated capacity.

Pressure and Temperature Limits. See Table 1 for maximum discharge pressure of each model. Unit is suitable for service at temperatures shown in Table 2.

Storage. Always drain pump for extended storage periods by removing suction housing bolts and loosening suction housing.

TROUBLE SHOOTING

WARNING: **Before making adjustments, disconnect power source and thoroughly bleed pressure from system. Failure to do so could result in electric shock or serious bodily harm.**

Failure To Pump.

1. Belt or coupling slip: Adjust belt tension or tighten set screw on coupling.
2. Stator torn; possibly excessive pressure: Replace stator, check pressure at discharge port.
3. Wrong rotation: Rotation must be clockwise when facing shaft.
4. Threads in rotor or on shaft stripped: Replace part. Check for proper rotation.
5. Excessive suction lift or vacuum.

Pump Overloads.

1. Excessive discharge pressure: Check discharge pressure for maximum rating given in Table 1. Check for obstruction in discharge pipe.
2. Fluid viscosity too high: Limit fluid viscosity to 20,000 CP or 100,000 SSU.

Viscosity CP	Limit RPM
1-300	1750
300-1,000	1200
1,000-2,000	700
2,000-5,000	350
5,000-10,000	180
10,000-20,000	100

3. Insufficient motor HP: Check HP requirement.

Noisy Operation.

1. Starved suction: Check fluid supply, length of suction line, and obstructions in pipe.
2. Bearings worn: Replace parts; check alignment, belt tension, pressure at discharge port.
3. Broken flexible joint: Replace part, check pressure at discharge port.
4. Insufficient mounting: Mount to be secure to firm base. Vibration induced noise can be reduced by using mount pads and short sections of hose on suction and discharge ports.

Mechanical Seal Leakage (Mechanical Seal Models Only).

1. Leakage at startup: If leakage is slight, allow pump to run several hours to let faces run in.
2. Persistent seal leakage: Faces may be cracked from freezing or thermal shock. Replace seal.

Packing Leakage (Packing Models Only).

1. Leakage at startup: Adjust packing as outlined in maintenance instructions.

Note: Slight leakage is necessary for lubrication of packing.

2. Persistent leakage: Packing rings and/or shaft may be worn. Replace parts as required.

Pump Will Not Prime.

1. Air leak on suction side: Check pipe connections.

MAINTENANCE

General. These pumps have been designed for a minimum of maintenance, the extent of which is routine lubrication and adjustment of packing. The pump is one of the easiest to work on in that the main elements are very accessible and require few tools to disassemble.

Packing Lubrication (356 Models Only). The zerk fitting on the side of the suction housing leads to the lantern ring halves in the mid-section of the packings. At least once a week, inject a small quantity of good quality grease, such as MPG-2 Multi Purpose Grease (Du Bois Chemical), or equivalent, into the zerk fitting to lubricate the packings.

Note: For Model 34411, lubricate packing by applying a liberal amount of grease during assembly.

Packing Adjustment (Packing Models Only). Packing gland attaching nuts should be evenly adjusted so they are little more than finger tight. Over-tightening of the packing gland may result in premature packing failure and possible damage to the shaft and gland.

When the packing is new, frequent minor adjustments are recommended for the first few hours of operation in order to compress and seat the packing. Be sure to allow slight leakage for lubrication of packing.

When excessive leakage can no longer be regulated by tightening the gland nuts, remove and replace the packings in accordance with the DISASSEMBLY and REASSEMBLY instructions. The entire pump need not be disassembled to replace the packings.

Bearing Lubrication. The prelubricated, fully sealed bearings do not require additional lubrication.

PUMP DISASSEMBLY

WARNING: Before disassembling pump, disconnect power source and thoroughly bleed pressure from system. Failure to do so could result in electric shock or serious bodily harm.

To Disassemble Mechanical Seal Models:

1. Disconnect suction and discharge piping.
2. Remove screws (112) holding suction housing (2) to pump body (1). Remove suction housing and stator (21).
3. Remove rotor (22) from flexible joint (24) by turning counter-clockwise (RH thread). Use 3/16 inch diameter punch to remove rotor pin (45) on Model 36701.
4. Flexible joint (24) can be removed from shaft (26) by using a 3/16 inch allen wrench in end of joint (1/4 inch wrench on 356 Models) and turn counter-clockwise. Use 3/16 inch diameter punch to remove shaft pin (46) on Model 36701.
5. Carefully slide mechanical seal (69) off shaft (26). Carefully pry seal seat out of pump body (1). If any parts of mechanical seal are worn or broken, the complete seal assembly should be replaced. Seal components are matched parts and are not interchangeable.
6. The bearings (29) and shaft (26) assembly can be removed from pump body (1) after snap ring (66) has been removed. To remove the assembly, lightly tap the shaft at threaded end using a block of wood to protect the threads. The bearings may be pressed off the shaft.

To Disassemble Packing Models:

1. Disconnect suction and discharge piping.
2. Remove screws (112) which hold suction housing (2) to pump body (1). Remove suction housing and stator (21).
3. Remove rotor (22) from flexible joint (24) by turning in a counter-clockwise direction (RH thread).
4. Flexible joint (24) can be removed by using a 3/16 inch allen wrench in end of joint (1/4 inch wrench on 356 Models) and turn in a counter-clockwise direction.
5. The packing (42) can be removed without removing the shaft (26) using the following procedure:
   a. Remove gland bolts (47).
   b. Slide gland (41) away from packing (42).
   c. Pull out packing (42) (and lantern ring halves (57) on 356 Models) using a packing removing tool.

   Note: Packing can be removed after shaft has been removed by pushing out from pump side of pump body after gland (41) has been detached.
6. The bearings (29) and shaft (26) assembly can be removed from pump body (1) after snap ring (66) has been removed. To remove the assembly, lightly tap the shaft at threaded end using a block of wood to protect the threads.
7. To disassemble shaft assembly, remove snap ring (66A) from shaft (26) and press bearings (29) and bearing spacer (33) off the shaft.

PUMP ASSEMBLY

To Assemble Mechanical Seal Models:

1. Press bearings (29) on shaft (26), and locate slinger ring (77) near bearing on threaded end of shaft.

Note: When replacing bearings, always press on the inner race when assembling to shaft, and on the outer race when pressing bearings into the housings.

2. Press shaft assembly into pump body (1) securing with snap ring (66).
3. Install mechanical seal (69) using the following procedure:
   a. Clean and oil sealing faces using a clean light oil (not grease).

   Caution: Do not use oil on EPDM parts. Substitute glycerin or soap and water.

   b. Oil the outer surface of the seal seat, and push the assembly into the bore in the pump body (1), seating it firmly and squarely.
   c. After cleaning and oiling the shaft, slide the seal body along the shaft until it meets the seal seat.
   d. Install seal spring and spring retainer on shaft.
4. Thread flexible joint (24) into shaft (26) in a clockwise direction (RH thread). On 356 Models, install seal spacer (69A) and washer (116) before threading flexible joint onto shaft in a clockwise direction. On Model 36701, use shaft pin (46) to pin flexible joint (24) to shaft.
5. Thread rotor (22) onto flexible joint (24) in a clockwise direction (RH thread). On Model 36701, pin rotor (22) to joint using rotor pin (45).
6. Slide stator (21) on rotor (22). On 331 and 332 Models, insert rounded end of stator ring (135) into end of stator prior to installing stator on rotor.
7. Secure stator (21) and suction housing (2), with suction port vertically up, to pump body (1) using screws (112).
8. Proceed as in installation instructions.

To Assemble Packing Models:

1. Press bearings (29), with bearing spacer (33) in between, on shaft (26) and secure in place using snap ring (66A).

Note: When replacing bearings, always press on the inner race when assembling to shaft, and on the outer race when pressing bearings into the housings.

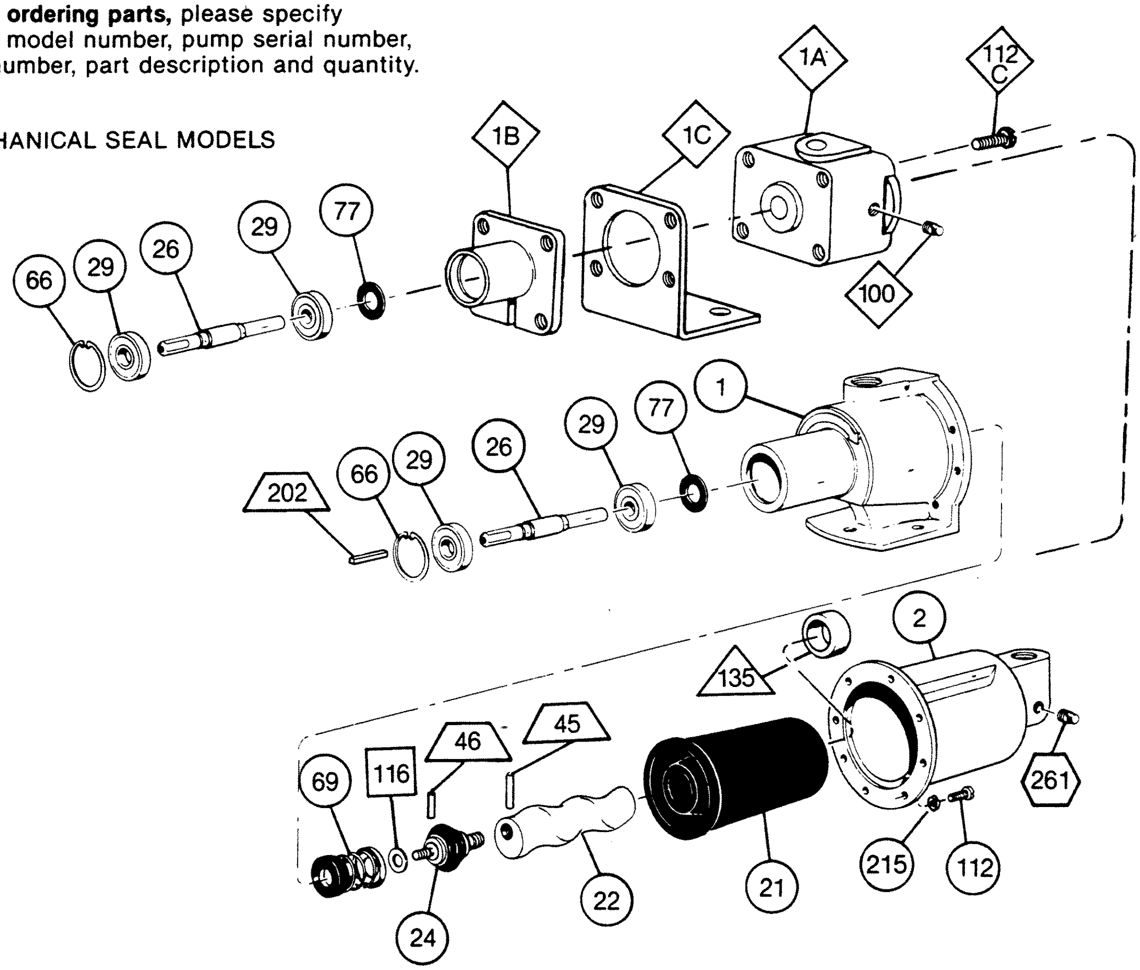
2. Install packing (42) before installing shaft assembly using the following procedure:
   a. Lubricate each individual ring of packing with a grease that is insoluble in the fluid being pumped.
   b. Individually assemble each ring of packing loosely in the packing chamber of the pump body (1). Stagger splits on rings. (Four rings, 3/16 inch square required on Model 34411; four rings, 1/4 inch square and two lantern ring halves (57) assembled between two rings on 356 Models).
   c. Loosely install packing gland (41) on pump body (1) using gland bolts (47).
3. Press shaft assembly into pump body (1) positioning slinger ring (77) between packing gland (41) and bearing end of pump body. Secure the shaft assembly with snap ring (66).
4. Thread flexible joint (24) into shaft (26) in a clockwise direction (RH thread).
5. Thread rotor (22) onto flexible joint (24) in a clockwise direction (RH thread).
6. Slide stator (21) on rotor (22). On 331 and 332 Models, insert rounded end of stator ring (135) into end of stator prior to installing stator on rotor.
7. Secure stator (21) and suction housing (2), with suction port vertically up, to pump body (1) using screws (112).
8. Proceed as in installation instructions.

Note: Adjust newly installed packing as described in maintenance procedure.

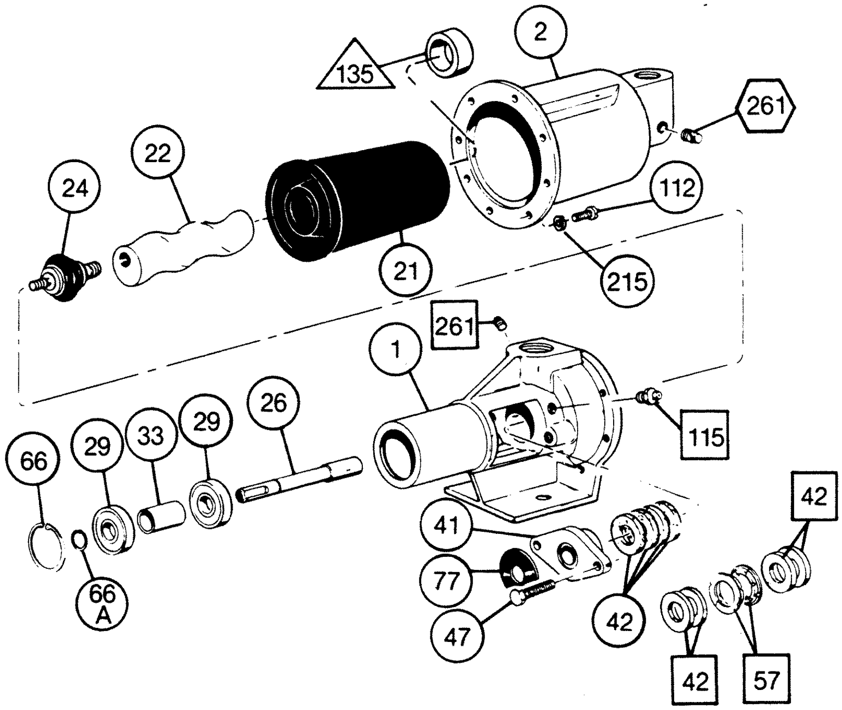
WARNING: Replace belt or coupling guards before reconnecting power.

When ordering parts, please specify pump model number, pump serial number, part number, part description and quantity.

MECHANICAL SEAL MODELS



PACKING MODELS



Used on 332 and 367 only.

Used on 356 only.

Used on 356 and 367 only.

Used on -08 only.

Used on 367 only.

PARTS LIST — 331, 332, 333, AND 344 MODELS

Item No.	Description	Mechanical Seal Models			Packing Gland Models
		33101 33201 33301 34401	**33104 33204 33304 34404**	**33108 33208 33308 34408**	**34411**
1	Pump Body	330-1065-002	330-1910-002		340-1000-001
1A	Discharge Housing			340-2362-000	
1B	Bearing Housing			330-4587-000	
1C	Pump Base			340-2369-000	
2	Suction Housing	330-1064-002	330-1911-002	330-4536-000	330-1064-002
*21	Stator	See Stator section below.			
*22	Rotor	See Rotor section below with circled numbers for each series.			
		1	2	1	1
24	Joint	Carbon Steel/NBR 320-1511-000	316 SS/NBR 320-3759-000	Carbon Steel/NBR 320-1511-000	
26	Drive Shaft	320-1499-000	320-2938-000	320-1499-000	320-2448-000
29	Bearing (2 req.)	630-0502-031			
33	Bearing Spacer				320-1900-000
41	Packing Gland				320-0101-004
42	Packing				340-3396-005
47	Gland Bolt				619-1520-161
66	Snap Ring	320-1506-000			
66A	Snap Ring				320-4182000
69	Mechanical Seal	320-2424-000			
77	Slinger Ring	320-6382-000			320-6384-000
100	Pipe Plug (3 req.)			610-0120-021	
112	Screws (8 req.)	619-1430-103	320-5968-000	619-0860-081	619-1430-103
112C	Screws (4 req.)			61 9-0890-281	
135	Stator Ring (331 -332 only)	320-7812-000			
215	Lock Washer (8 req.)	320-6464-000			

*Recommended spare parts.

STATORS		**Models**			
		331	**332**	**333**	**344**
21	Standard Stator, NBR All Models	340-3501-120	340-3502-120	340-3503-120	340-3504-120
21	EPDM Stator	340-3501-320	340-3502-320	340-3503-320	340-3504-320
21	FPM Stator	340-3501-520	340-3502-520	340-3503-520	340-3504-520
ROTORS					
22	1 416SS - All Models	320-2729-000	330-0906-000	320-1394-000	320-1841-000
22	2 316SS – All Models	320-2933-000	320-2942-000	320-2936-000	320-2934-000

See page 8 for Repair/Conversion Kits

PARTS LIST — 356 AND 367 MODELS

Item No.	Description	Mechanical Seal Models		Packing Gland Models		Mechanical Seal Model	
		35601	**35604**	**35611**	**35613**	**36701**	**36704**
1	Pump Body	Cast Iron 340-0636-000	316SS 340-1550-000	Cast Iron 350-0420-000	316SS 350-0491-000	Cast Iron 350-0423-000	316SS 350-0423-007
2	Suction Housing	350-0280-000	350-0489-000	350-0280-000	350-0489-000	350-0302-000	350-0302-007
*21	Stator	NBR 340-3505-120		NBR 340-3505-120		NBR 340-3506-120	
22	Rotor	416SS 320-2304-000	316SS 320-4431-000	416SS 320-2304-000	316SS 320-4431-000	416SS 330-2042-000	316SS 330-3077-000
24	Flex Joint	Carbon Steel 320-1583-000	316SS 320-4427-000	Carbon Steel 320-1583-000	316SS 320-4427-000	Carbon Steel 320-1749-000	316SS 320-4436-000
26	Drive Shaft	320-1759-000	320-4430-000	320-2765-000	320-4435-000	330-1805-000	330-1805-015
29	Bearing (2 req.)	630-0552-051				630-0552-061	
33	Bearing Spacer			320-2764-000			
41	Packing Gland			320-0003-004	320-0003-007		
*42	Packing			340-3396-008			
45	Rotor Pin					320-4439-002	
46	Shaft Pin					320-4439-001	
47	Gland Bolt			619-1530-241			
57	Lantern Ring Half**			320-6585-000			
66	Snap Ring	320-1758-000				320-2794-000	
66A	Snap Ring			320-3533-000			
*69	Mechanical Seal	320-3945-000				320-1750-000	
69A	Seal Spacer	320-4434-000					
77	Slinger Ring	320-6383-000		320-6385-000		320-6385-000	
112	Screws (6 req.)	619-1530-161				619-1530-161	
115	Zerk Fitting			320-2503-001			
135	Stator Spacer	330-7594-000					
202	Shaft Key					611-0040-240	
215	Lock Washer (6 req.)	623-0010-411					
261	Pipe Plug	610-0120-011	610-0420-010	610-0120-011	610-0420-010	610-0120-011	610-0420-010

*Recommended spare parts.
**2 Required

See page 8 for Repair/Conversion Kits

REPAIR/CONVERSION KIT NUMBERS

ELASTOMER REPAIR/CONVERSION KITS

Item No.	Description	331 Models			332 Models		
		NBR	EPDM	FPM	NBR	EPDM	FPM
—	Kit No.	311-9026-000	311-9025-000	311-9054-000	311-9027-000	311-9038-000	311-9055-000
21	• Stator	340-3501-120	340-3501-320	340-3501-520	340-3502-120	340-3502-320	340-3502-520
24	• Joint	320-1511-000‡	320-6367-000†	320-4670-000†	320-1511-000‡	320-6367-000†	320-4670-000†
69	• Seal	320-2424-000	320-6379-000	320-6501-000	320-2424-000	320-6379-000	320-6501-000
Item No.	**Description**	**333 Models**			**344 Models**		
		NBR	**EPDM**	**FPM**	**NBR**	**EPDM**	**FPM**
—	Kit No.	311-9029-000	311-9028-000	311-9056-000	311-9031-000	311-9030-000	311-9057-000
21	• Stator	340-3503-120	340-3503-320	340-3503-520	340-3504-120	340-3504320	340-3504520
24	• Joint	320-1511-000‡	320-6367-000†	320-4670-000†	320-1511-000‡	320-6367-000†	320-4670-000†
69	• Seal	320-2424-000	320-6379-000	320-6501-000	320-2424-000	320-6379-000	320-6501-000

t316SS/with appropriate elastomer.
‡Carbon steel. NBR kits are available only with carbon steel joints; a 316SS/NBR joint for 331-344 Models is available as 320-3759-000.

Item No.	Description	356 Models			367 Models		
		NBR	EPDM	FPM	NBR	EPDM	FPM
—	Kit No. (Mech. Seal Models)	311-9033-000	311-9032-000	311-9058-000	311-9060-000	311-9036-000	311-9124-000
21	• Stator	340-3505-120	340-3505-320	340-3505-520	340-3506-120	340-3506-320	340-3506-520
24	• Flex Joint	320-1583-000‡	320-6369-000†	320-4671-000†	320-1749-000‡	320-6378-000‡	3206515-000‡
69	• Seal	320-3945-000	320-6380-000	320-6510-000	320-1750-000	320-6390-000	320-6517-000
45	• Rotor Pins				320-4439-002	320-4439-002	320-4439-002
46	• Shaft Pin				320-4439-001	320-4439-001	320-4439-001
—	Kit No (Packing Gland Models)	311-9035-000	311-9034-000	311-9059-000			
21	• Stator	340-3505-120	340-3505-320	340-3505-520			
24	• Joint	320-1583-000‡	320-6369-000†	320-4671-000†			

†316SS/with appropriate elastomer.
‡Carbon steel. NBR kits are available only with carbon steel joints; a 316SS/NBR joint for Model 35604 and 35613 pumps is available as 320-4427-000; a 316SS/NBR joint for model 36704 is available as 320-4436-000.

ABRASION RESISTANT SEALS

Elastomer	Models 331-344	356	36701
NBR	3206460000	3206505000	3206511000
EPDM	3206502000	3206506000	3206512000
FPM	3206503000	3206507000	3206513000

NBR = Nitrile
EPDM = Ethylene-Propylene-Diene Terpolymer
FPM = Fluoroelastomer

Double The Length Of Your Moyno Pump Warranty For FREE!

For your *free* pump warranty extension, choose from one of the three options below:

1. Go to www.moyno.com and fill out the registration form online
2. Mail this form by placing it in an envelope and sending it to:
3. Fax this form to 937-327-3177

Moyno, Inc.
Attn: Tish Wilson
P. O. Box 960
Springfield, OH 45501-0960
U.S.A.

Thank you for choosing a Moyno Pump. Please take the time to complete this warranty registration form. Upon receipt of your form, your standard limited warranty on defective material and workmanship will be extended to twice the standard period of time at no additional cost to you. We appreciate your business and look forward to serving you in the future.

LLOYD'S REGISTER QUALITY COMPANY ISO9001
NATIONAL ACCREDITATION OF CERTIFICATION BODIES
CERTIFICATE No. 101442

MOYNO
Always the Right Solution™

Always Insist on Genuine Moyno Replacement Parts!

Moyno® Pump Warranty Registration

Pump Model # ______________ Pump Serial # ______________

Purchased From ______________ Date Purchased ______________

Your Name ______________ Your Title ______________

Your Company Name ______________

Address ______________

City/State (Province)/Zip Code ______________

Phone Number ______________ Fax Number ______________

E-mail ______________

Application for Which This Pump Was Purchased

Material ________ Flow Rate ________ Process Temperature ________

Operating Speed ________ Viscosity ________ pH Value ________

Hours Operated per Day ________ Continuous ________ Intermittent ________

Discharge Pressure ________ Suction Pressure ________ NPSH Available ________

Percent of Solids ________ Particle Size ________ Abrasion Rating ________

How Did You First Hear of Moyno Pumps?

- ❑ Advertisement
- ❑ Postcard
- ❑ Trade Show
- ❑ Referral
- ❑ Distributor Salesperson
- ❑ Previous Experience With Moyno Pumps
- ❑ Other – Explain Below

Thank You!

AC & DC Motor Installation – Maintenance Instructions

These instructions are intended to complement (not replace) the information in MN400 Installation and Operation manual for "Integral Horsepower AC Induction Motors ODP, TEFC, Explosion Proof" and MN605 Installation and Operation manual for "Integral Horsepower DC Motors".

Handling

The weight of the motor and shipping container will vary. Use correct material handling equipment to avoid injury.

Use caution when removing the motor from its packaging. Sharp corners may exist on motor shaft, motor key, sheet metal and other surfaces.

Receiving

Inspect the motor for damage before accepting it. The Motor shaft should rotate freely with no rubs. Report any damage immediately to the commercial carrier that delivered your motor.

Safety Notice

Only qualified personnel trained in the safe installation and operation of this equipment should install this motor. When improperly installed or used, rotating equipment can cause serious or fatal injury. Equipment must be installed in accordance with the National Electrical Code (NEC), local codes and NEMA MG2 Safety Standards for Construction and Guide for Selection, Installation and Use of Electric Motors and Generators. Observe the following guidelines:

1. When eyebolts are provided, they must be fully tightened and are intended to lift the motor and its included accessories only.
2. Ground the motor according to NEC and local codes.
3. Provide a permanent guard to prevent accidental contact of body parts or clothing with rotating or moving parts or burns if motor is hot.
4. Shaft key must be secured before starting motor.
5. Do not apply power to the motor until the motor is securely mounted by its mounting holes.
6. This motor must only be connected to the proper line voltage, line frequency and load size.
7. Motors are not to be used for load holding or restraining unless a properly sized brake is installed. If a motor mounted brake is installed, provide proper safeguards for personnel in case of brake failure.
8. Disconnect all power services, stop the motor and allow it to cool before servicing.
9. For single phase motors, discharge the start and/or run capacitors before servicing.
10. Do not by-pass or render inoperative any safety device.
11. DC series wound motors must be protected from sudden loss of load causing overspeed damage. DC shunt wound motors must be protected from loss of field voltage which can result in damage.
12. When using AC motors with frequency inverters, be certain that the motors Maximum Speed Rating is not exceeded.
13. Mounting bolts should be high tensile steel. Be sure to use a suitable locking device on each bolt (spring washer or thread lock compound).

Guarding

After motor installation is complete, a guard of suitable dimensions must be constructed and installed around the motor/gearmotor. This guard must prevent personnel from coming in contact with any moving parts of the motor or drive assembly but must allow sufficient cooling air to pass over the motor.

If a motor mounted brake is installed, provide proper safeguards for personnel in case of brake failure.

Brush inspection plates and electrical connection cover plates or lids, must be installed before operating the motor.

When this motor is installed according to these instructions, it complies with the EEC Machinery Directive. Electromagnetic Compatibility (EMC) requirements for CE compliance are met when the incoming power is purely sinusoidal. For other power source types, refer to MN1383 "Recommended Practices for Installation for EC Directive 89/336/EEC Relating to EMC".

BALDOR®
MOTORS • DRIVES • GENERATORS

P.O. Box 2400
Fort Smith, AR 72902–2400 U.S.A.
(479) 646–4711

Motor Enclosure

ODP, **Open drip proof** motors are intended for use in clean, dry locations with adequate supply of cooling air. These motors should not be used in the presence of flammable or combustible materials. Open motors can emit flame and/or molten metal in the event of insulation failure.

TEFC, **totally enclosed** motors are intended for use where moisture, dirt and/or corrosive materials are present in indoor and outdoor locations.

Explosion proof motors, as indicated by the Underwriters Laboratories, Inc. label are intended for use in hazardous areas as specified by the NEC.

Mounting

Foot mounted machines should be mounted to a rigid foundation to prevent excessive vibration. Shims may be used if location is uneven.

Flange mounted machines should be properly seated and aligned. Note: If improper rotation direction is detrimental to the load, check rotation direction prior to coupling the load to the motor shaft.

For **V-belt drive,** mount the sheave pulley close to the motor housing. Allow clearance for end to end movement of the motor shaft. Do not overtighten belts as this may cause premature bearing failure or shaft breakage.

Direct coupled machines should be carefully aligned and the shaft should rotate freely without binding.

Wiring

Connect the motor as shown in the connection diagram. If this motor is installed as part of a motor control drive system, connect and protect the motor according to the control manufacturers diagrams. The wiring, fusing and grounding must comply with the National Electrical Code and local codes. When the motor is connected to the load for proper direction of rotation and started, it should start quickly and run smoothly. If not, stop the motor immediately and determine the cause. Possible causes are: low voltage at the motor, motor connections are not correct or the load is too heavy. Check the motor current after a few minutes of operation and compare the measured current with the nameplate rating.

Adjustment

The neutral is adjustable on some DC motors. AC motors have no adjustable parts.

Noise

For specific sound power or pressure level information, contact your local Baldor representative.

Vibration

This motor is balanced to NEMA MG1, Part 7 standard.

Brushes (DC Motors)

Periodically, the brushes should be inspected and all brush dust blown out of the motor. If a brush is worn $^1/_2$ (from length specified in renewal parts data), replace the brushes. If the commutator is worn or rough, the armature should be removed. The commutator should be turned in a lathe, the mica recut and the commutator polished. Reassemble and seat the new brushes using a brush seating stone. Be sure the rocker arm is set on the neutral mark.

Lubrication

This is a ball or roller bearing motor. The bearings have been lubricated at the factory. Motors that do not have regrease capability are factory lubricated for the normal life of the bearings.

Lubricant

Baldor motors are pregreased, normally with Polyrex EM (Exxon Mobil). If other greases are preferred, check with a local Baldor Service Center for recommendations.

Relubrication Intervals (For motors with regrease capability)

New motors that have been stored for a year or more should be relubricated. Lubrication is also recommended at these intervals:

Table 1 Relubrication Interval

NEMA (IEC) Frame Size	Rated Speed (RPM)			
	3600	1800	1200	900
Up to 210 incl. (132)	5500Hrs.	12000Hrs.	18000Hrs.	22000Hrs.
Over 210 to 280 incl. (180)	3600Hrs.	9500Hrs.	15000Hrs.	18000Hrs.
Over 280 to 360 incl. (225)	*2200Hrs.	7400Hrs.	12000Hrs.	15000Hrs.
Over 360 to 5000 incl.(300)	*2200Hrs.	3500Hrs.	7400Hrs.	10500Hrs.

* Lubrication interval for 6313 or 6314 bearings that are used in 360 through 5000 frame, 2 pole motors. If roller bearings are used, bearings must be lubricated more frequently, divide the relubrication interval by 2.

Table 2 Service Conditions

Severity of Service	Ambient Temperature Maximum	Atmospheric Contamination	Type of Bearing
Standard	40 C	Clean, Little Corrosion	Deep Groove Ball Bearing
Severe	50 C	Moderate dirt, Corrosion	Ball Thrust, Roller
Extreme	>50 C* or Class H Insulation	Severe dirt, Abrasive dust, Corrosion	All Bearings
Low Temperature	<-30 C **		

* Special high temperature grease is recommended.

** Special low temperature grease is recommended.

Table 3 Lubrication Interval Multiplier

Severity of Service	Multiplier
Standard	1.0
Severe	0.5
Extreme	0.1
Low Temperature	1.0

Table 4 Amount of Grease to Add

Frame Size NEMA (IEC)	Bearing Description (Largest bearing in each frame size)					
	Bearing	OD D mm	Width B mm	Weight of grease to add ounce (gram)	Volume of grease to add	
					inches^3	teaspoon
Up to 210 incl. (132)	6307	80	21	0.30 (8.4)	0.6	2.0
Over 210 to 280 incl. (180)	6311	120	29	0.61 (17.4)	1.2	3.9
Over 280 to 360 incl. (225)	6313	140	33	0.81 (23.1)	1.5	5.2
Over 360 to 5000 incl.(300)	NU322	240	50	2.12 (60.0)	4.1	13.4

Weight in grams = 0.005 DB

Procedure

Clean the grease fitting (or area around grease hole, if equipped with slotted grease screws). If motor has a purge plug, remove it. Motors can be regreased while stopped (at less than 80 C) or running.

Apply grease gun to fitting (or grease hole). Too much grease or injecting grease too quickly can cause premature bearing failure. Slowly apply the recommended amount of grease, taking 1 minute or so to apply. Operate motor for 20 minutes, reinstall purge plug if previously removed.

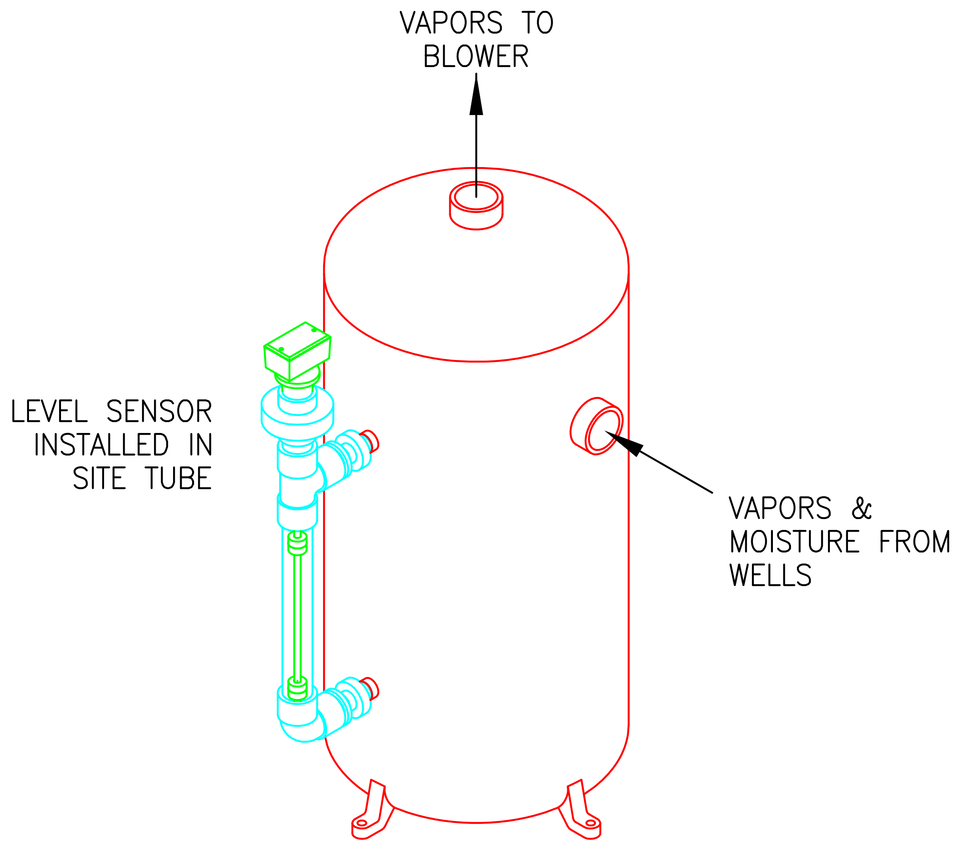
Caution: Keep grease clean. Mixing dissimilar grease is not recommended.

Sample Relubrication Determination

This sample determination is based on a NEMA 286T (IEC 180) motor operating at 1750 RPM driving an exhaust fan in an ambient of 43 C atmosphere that is moderately corrosive.

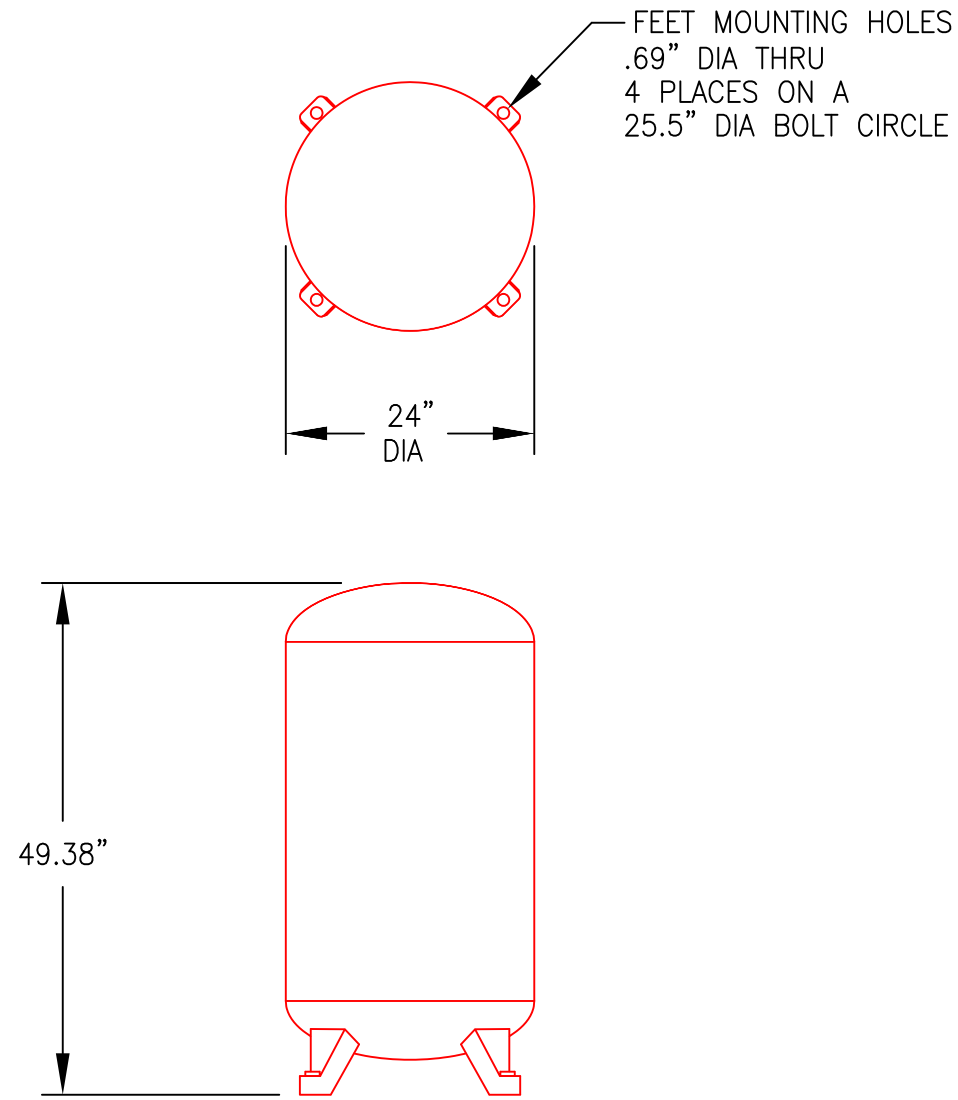
1. Table 1 list 9500 hours for standard conditions.
2. Table 2 classifies severity of service as "Severe".
3. Table 3 lists a multiplier value of 0.5 for Severe conditions.
4. Table 4 shows that 1.2 in^3 or 3.9 teaspoon of grease is to be added.

Note: Smaller bearings in size category may require reduced amounts of grease.

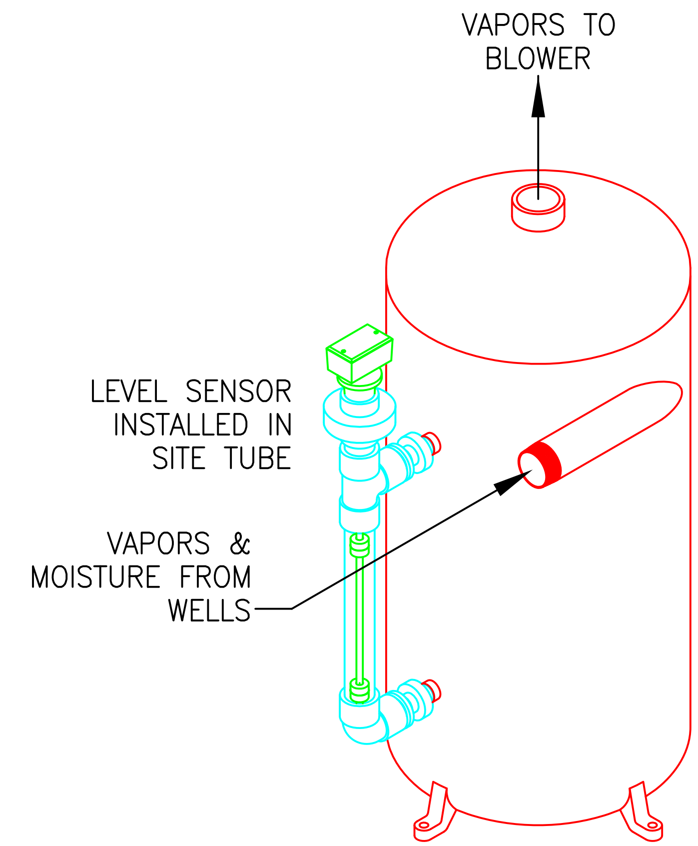


80–GALLON MOISTURE SEPARATOR
SHOWN WITH SIDE ENTRY INLET

PLEASE NOTE THAT ORIENTATION OF FITTINGS
MAY VARY DEPENDING UPON APPLICATION
AND ACTUAL LAYOUT OF EQUIPMENT.



TANK ENVELOPE
DIMENSIONS



80–GALLON MOISTURE SEPARATOR
SHOWN WITH TANGENTIAL INLET

PLEASE NOTE THAT ORIENTATION OF FITTINGS
MAY VARY DEPENDING UPON APPLICATION
AND ACTUAL LAYOUT OF EQUIPMENT.

REV.	DESCRIPTION	DATE	APPR.
	REVISIONS		

CONFIDENTIALITY NOTE:
The information contained in this drawing is intended for use only by BISCO Environmental and the company named herein. The information is confidential and any copying, distribution or dissemination without the consent of BISCO Environmental is STRICTLY PROHIBITED.

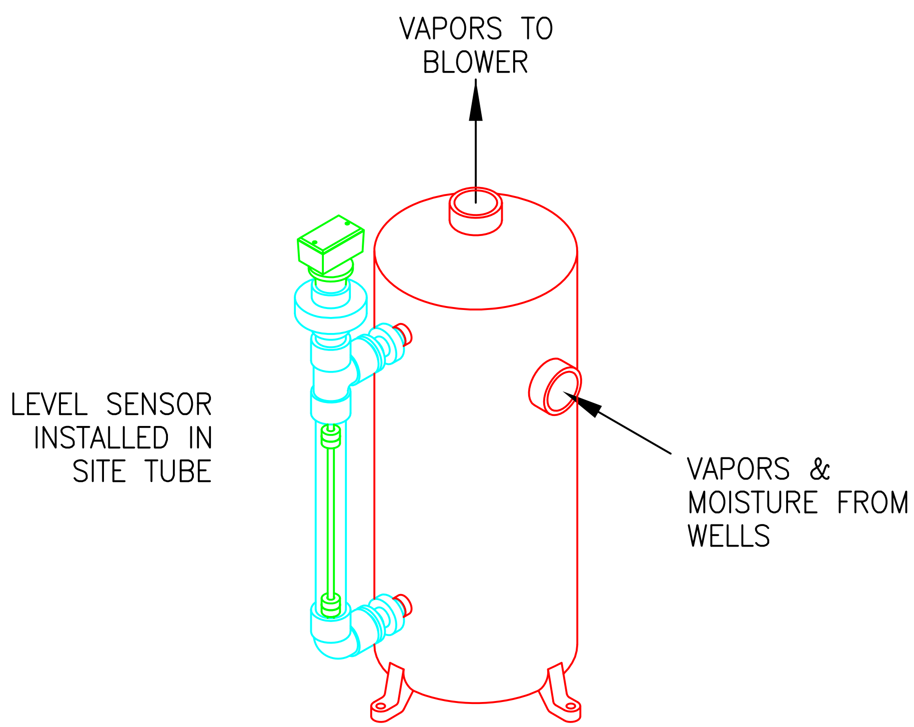
BISCO Environmental
Soil & Groundwater Remediation Equipment
Taunton, Massachusetts 02780

DRWN BY JAD	DATE 10/6/09
CHK BY	DATE
APPR BY	DATE

TITLE
80–GALLON MOISTURE SEPARATOR
STRUCTURAL LAYOUT

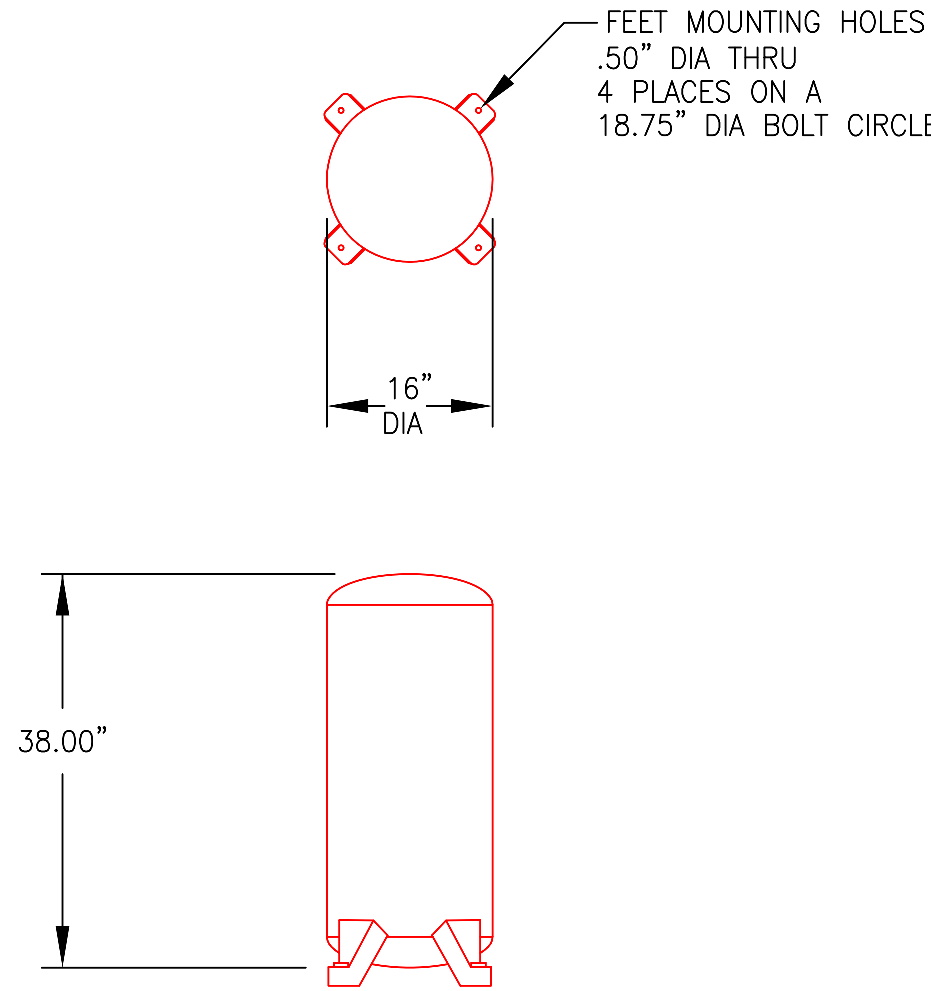
JOB NO.

SCALE	SIZE	DWG NO.	SHEET	REV
1"=20"	B	80G–MS	1 OF 1	

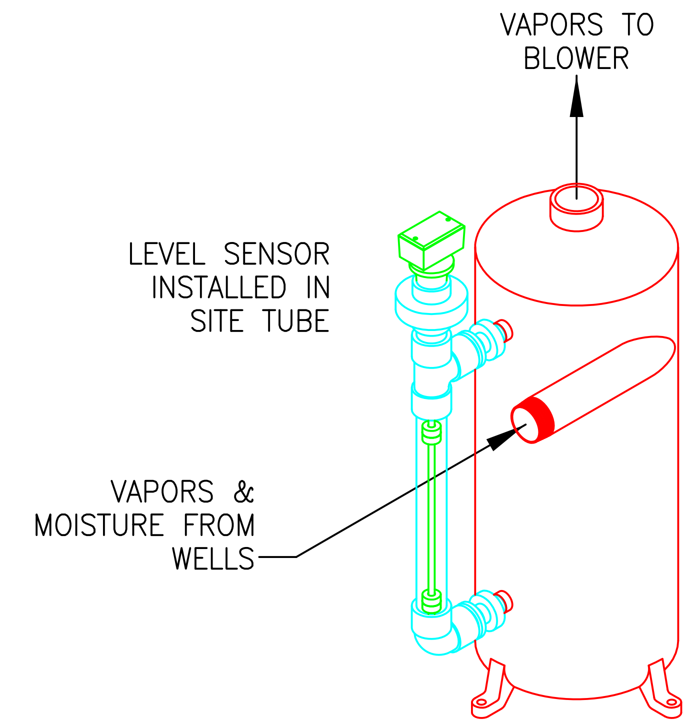


30–GALLON MOISTURE SEPARATOR
SHOWN WITH SIDE ENTRY INLET

PLEASE NOTE THAT ORIENTATION OF FITTINGS
MAY VARY DEPENDING UPON APPLICATION
AND ACTUAL LAYOUT OF EQUIPMENT.



TANK ENVELOPE
DIMENSIONS



30–GALLON MOISTURE SEPARATOR
SHOWN WITH TANGENTIAL INLET

PLEASE NOTE THAT ORIENTATION OF FITTINGS
MAY VARY DEPENDING UPON APPLICATION
AND ACTUAL LAYOUT OF EQUIPMENT.

REV.	DESCRIPTION	DATE	APPR.
	REVISIONS		

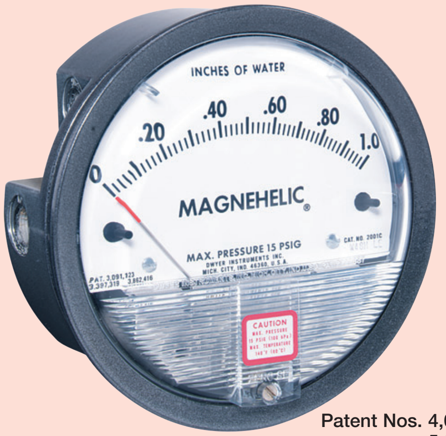
BISCO Environmental
Soil & Groundwater Remediation Equipment
Taunton, Massachusetts 02780

DRWN BY JAD	DATE 5/11/10	TITLE	30–GALLON MOISTURE SEPARATOR, STRUCTURAL LAYOUT
CHK BY	DATE		JOB NO.
APPR BY	DATE	SCALE 1"=20"	SIZE B
DWG NO. 30G–MS	SHEET 1 OF 1	REV	

Dwyer®

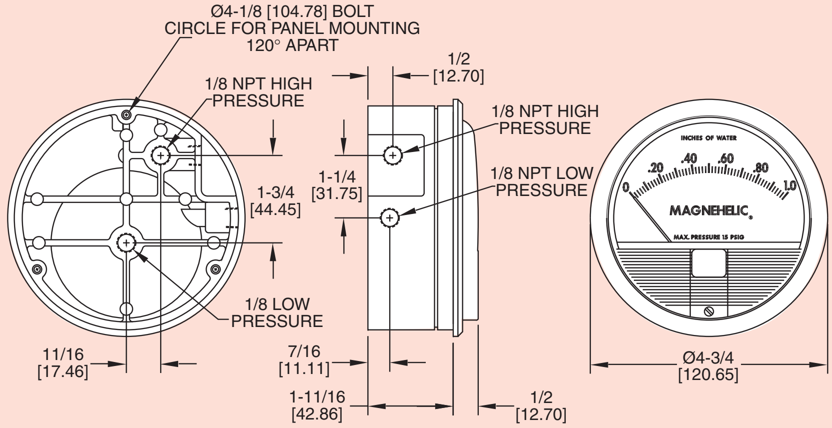
Series 2000 Magnehelic® Differential Pressure Gages

Indicate positive, negative or differential. Accurate within 2%.



Patent Nos. 4,030,365
5,012,678

Standard Magnehelic® Pressure Gage has a large, easy-to-read 4" dial.

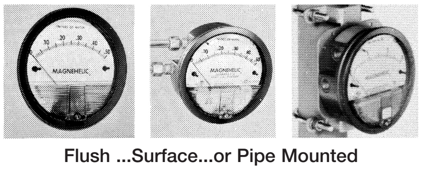


Dimensions, Standard Series 2000 Magnehelic® Pressure Gages. (Slightly different on medium and high pressure models)

Select the Dwyer Magnehelic® gage for high accuracy — guaranteed within 2% of full scale — and for the wide choice of 81 models available to suit your needs precisely. Using Dwyer's simple, frictionless Magnehelic® movement, it quickly indicates low air or non-corrosive gas pressures — either positive, negative (vacuum) or differential. The design resists shock, vibration and over-pressures. No manometer fluid to evaporate, freeze or cause toxic or leveling problems. It's inexpensive, too.

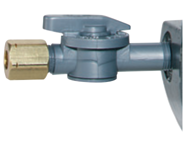
The Magnehelic® is the industry standard to measure fan and blower pressures, filter resistance, air velocity, furnace draft, pressure drop across orifice plates, liquid levels with bubbler systems and pressures in fluid amplifier or fluidic systems. It also checks gas-air ratio controls and automatic valves, and monitors blood and respiratory pressures in medical care equipment.

NOTE: Do Not use with Hydrogen gas. Dangerous reactions will occur.



Flush ...Surface...or Pipe Mounted

MOUNTING. A single case size is used for most models of Magnehelic® gages. They can be flush or surface mounted with standard hardware supplied. With the optional A-610 Pipe Mounting Kit they may be conveniently installed on horizontal or vertical 1¼" - 2" pipe. Although calibrated for vertical position, many ranges above 1" may be used at any angle by simply re-zeroing. However, for maximum accuracy, they must be calibrated in the same position in which they are used. These characteristics make Magnehelic® gages ideal for both stationary and portable applications. A 4⁹⁄₁₆" hole is required for flush panel mounting. Complete mounting and connection fittings plus instructions are furnished with each instrument.



VENT VALVES

In applications where pressure is continuous and the Magnehelic® gage is connected by metal or plastic tubing which cannot be easily removed, we suggest using Dwyer A-310A vent valves to connect gage. Pressure can then be removed to check or re-zero the gage.

HIGH AND MEDIUM PRESSURE MODELS

Installation is similar to standard gages except that a 4¹³⁄₁₆" hole is needed for flush mounting. The medium pressure construction is rated for internal pressures up to 35 psig and the high pressure up to 80 psig. Available for all models. Because of larger case, the medium pressure and high pressure models will not fit in a portable case size. Weight 1 lb., 10 oz. Installation of the A-321 safety relief valve on standard Magnehelic® gages often provides adequate protection against infrequent overpressure.

SPECIFICATIONS

Service: Air and non-combustible, compatible gases. (Natural Gas option available.)
Wetted Materials: Consult Factory.
Housing: Die cast aluminum case and bezel, with acrylic cover, Exterior finish is coated gray to withstand 168 hour salt spray corrosion test.
Accuracy: +/- 2% of full scale (±3% on - 0 and ±4% on - 00 ranges), throughout range at 70°F. (21.1°C)
Pressure Limits: -20˝ Hg. to 15 psig.† (-0.677 bar to 1.034 bar); MP option; 35 psig (2.41 bar), HP option; 80 psig (5.52 bar).
Overpressure: Relief plug opens at approximately 25 psig (1.72 kPa), standard gages only.
Temperature Limits: 20 to 140°F.* (-6.67 to 60°C).
Size: 4˝ (101.6 mm) Diameter dial face.
Mounting Orientation: Diaphragm in vertical position. Consult factory for other position orientations.
Process Connections: 1/8˝ female NPT duplicate high and low pressure taps - one pair side and one pair back.
Weight: 1 lb. 2 oz. (510g), MP & HP 2 Lb. 2 oz. (963g).
Standard Accessories: Two 1/8˝ NPT plugs for duplicate pressure taps, two 1/8˝ pipe thread to rubber tubing adapter and three flush mounting adapters with screws. (Mounting and snap ring retainer substituted for 3 adapters in MP & HP gage accessories.)

*Low temperature models available as special option.
†For applications with high cycle rate within gage total pressure rating, next higher rating is recommended. See Medium and High pressure options at lower left.

OPTIONS AND ACCESSORIES

Transparent overlays
Furnished in red and green to highlight and emphasize critical pressures.

Adjustable signal flag
Integral with plastic gage cover. Available for most models except those with medium or high pressure construction. Can be ordered with gage or separate.

LED Setpoint Indicator
Bright red LED on right of scale shows when setpoint is reached. Field adjustable from gage face, unit operates on 12-24 VDC. Requires MP or HP style cover and bezel.

Portable units
Combine carrying case with any Magnehelic® gage of standard range,except high pressure connection. Includes 9 ft. (2.7 m) of ³⁄₁₆" I.D. rubber tubing, standhang bracket and terminal tube with holder.

Air filter gage accessory package
Adapts any standard Magnehelic® for use as an air filter gage. Includes aluminum surface mounting bracket with screws, two 5 ft. (1.5 m) lengths of ¼" aluminum tubing two static pressure tips and two molded plastic vent valves, integral compression fittings on both tips and valves.

Quality design and construction features

Bezel provides flange for flush mounting in panel.

Clear plastic face is highly resistant to breakage. Provides undistorted viewing of pointer and scale.

Precision litho-printed scale is accurate and easy to read.

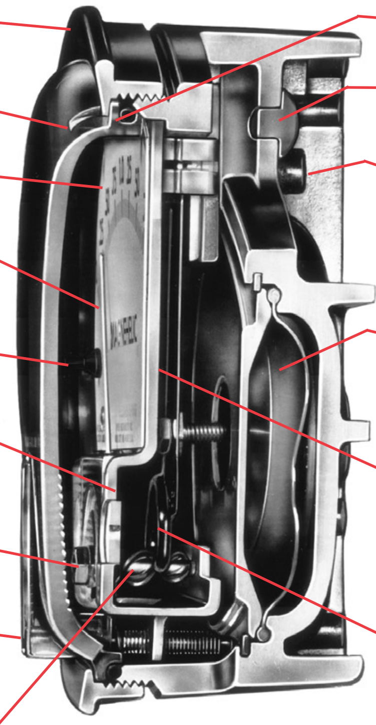
Red tipped pointer of heat treated aluminum tubing is easy to see. It is rigidly mounted on the helix shaft.

Pointer stops of molded rubber prevent pointer over-travel without damage.

"Wishbone" assembly provides mounting for helix, helix bearings and pointer shaft.

Jeweled bearings are shock-resistant mounted; provide virtually friction-free motion for helix. Motion damped with high viscosity silicone fluid.

Zero adjustment screw is conveniently located in the plastic cover, and is accessible without removing cover. 0-ring seal provides pressure tightness.



O-ring seal for cover assures pressure integrity of case.

Blowout plug of silicone rubber protects against overpressure on 15 PSIG rated models. Opens at approximately 25 PSIG.

Die cast aluminum case is precision made and iridite-dipped to withstand 168 hour salt spray corrosion test. Exterior finished in baked dark gray hammerloid. One case size is used for all standard pressure options, and for both surface and flush mounting.

Silicone rubber diaphragm with integrally molded O-ring is supported by front and rear plates. It is locked and sealed in position with a sealing plate and retaining ring. Diaphragm motion is restricted to prevent damage due to overpressures.

Calibrated range spring is flat spring steel. Small amplitude of motion assures consistency and long life. It reacts to pressure on diaphragm. Live length adjustable for calibration.

Samarium Cobalt magnet mounted at one end of range spring rotates helix without mechanical linkages.

Helix is precision made from an alloy of high magnetic permeability. Mounted in jeweled bearings, it turns freely, following the magnetic field to move the pointer across the scale.

Dual Scale English/Metric Models

Model Number	Range, In. W.C.	Range, Pa or kPa
2000-OD	0-0.5	0-125 Pa
2001D	0-1.0	0-250 Pa
2002D	0-2.0	0-500 Pa
2003D	0-3.0	0-700 Pa
2004D	0-4.0	0-1.0 kPa
2006D	0-6.0	0-1.5 kPa
2008D	0-8.0	0-2.0 kPa
2010D	0-10	0-2.5 kPa

SERIES 2000 MAGNEHELIC® — MODELS AND RANGES
STOCKED MODELS in bold

The models below will fulfill most requirements. Page 5 also shows examples of special models built for OEM customers. For special scales furnished in ounces per square inch, inches of mercury, metric units, etc., contact the factory.

Model Number	Range Inches of Water
2000-00†	0-.25
2000-0†	0-.50
2001	0-1.0
2002	0-2.0
2003	0-3.0
2004	0-4.0
2005	0-5.0
2006	0-6.0
2008	0-8.0
2010	0-10
2015	0-15
2020	0-20
2025	0-25
2030	0-30
2040	0-40
2050	0-50
2060	0-60
2080	0-80
2100	0-100
2150	0-150

Model Number	Range Zero Center Inches of Water
2300-0†	.25-0-.25
2301	.5-0-.5
2302	1-0-1
2304	2-0-2
2310	5-0-5
2320	10-0-10
2330	15-0-15

Model Number	Range PSI
2201	0-1
2202	0-2
2203	0-3
2204	0-4
2205	0-5
2210*	0-10
2215*	0-15
2220*	0-20
2230**	0-30

*MP option standard
**HP option standard

Dual Scale Air Velocity Units

Model Number	Range in W.C.I Velocity, F.P.M.
2000-00AV	0-.25/300-2000
2000-0AV	0-.50/500-2800
2001AV	0-1.0/500-4000
2002AV	0-2.0/1000-5600
2010AV	0-10/2000-12500

For use with pitot tube.

Model Number	Range MM of Water
2000-6MM†	0-6
2000-10MM	0-10
2000-25MM	0-25
2000-50MM	0-50
2000-80MM	0-80
2000-100MM	0-100

Zero Center Ranges

2300-20MM†	10-0-10

Model Number	Range, CM of Water
2000-15CM	0-15
2000-20CM	0-20
2000-25CM	0-25
2000-50CM	0-50
2000-80CM	0-80
2000-100CM	0-100
2000-150CM	0-150
2000-200CM	0-200
2000-250CM	0-250
2000-300CM	0-300

Zero Center Ranges

2300-4CM	2-0-2
2300-10CM	5-0-5
2300-30CM	15-0-15

†These ranges calibrated for vertical scale position.

Model Number	Range, Pascals
2000-60 Pa†	0-60
2000-125 Pa†	0-125
2000-250 Pa	0-250
2000-500 Pa	0-500
2000-750 Pa	0-750

Zero Center Ranges

2300-250 Pa	125-0-125
2300-500 Pa	250-0-250

Model Number	Range, Kilopascals
2000-1 kPa	0-1
2000-1.5 kPa	0-1.5
2000-2 kPa	0-2
2000-3 kPa	0-3
2000-4 kPa	0-4
2000-5 kPa	0-5
2000-8 kPa	0-8
2000-10 kPa	0-10
2000-15 kPa	0-15
2000-20 kPa	0-20
2000-25 kPa	0-25
2000-30 kPa	0-30

Zero Center Ranges

2300-1 kPa	.5-0-.5
2300-3 kPa	1.5-0-1.5

Accessories
A-310A, 3-Way Vent Valve..........................
A-321, Safety Relief Valve..........................
A-432, Portable Kit....................................
A-605, Air Filter Kit...................................
A-610, Pipe Mount Kit
Scale Overlays — Red, Green, Mirrored or Combination, Specify Locations

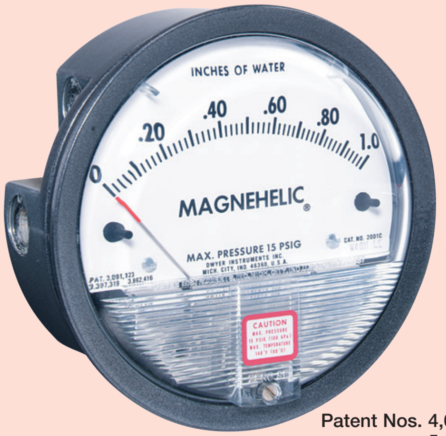
Options — To order, add suffix: I.E. 2001-ASF
ASF (Adjustable Signal Flag)
HP (High Pressure Option)
LT (Low Temperatures to -20°F)
MP (Med. Pressure Option)
SP (Setpoint Indicator

Special Purpose Ranges
Scale No. 2401 Square Root Specify Range
Scale No. 2402 Blank Scale Specify Range
Model 2000-00N. range -.05 to +.20" W.C. For room pressure monitoring

1011R01-0298P

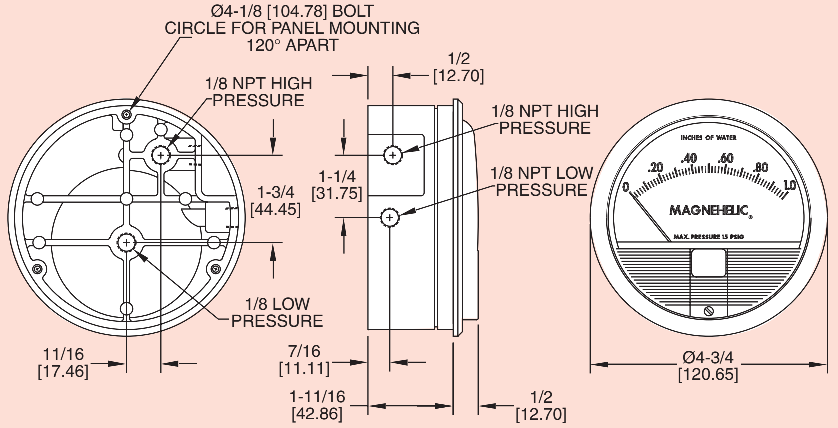
Series 2000 Magnehelic® Differential Pressure Gages

Indicate positive, negative or differential. Accurate within 2%.



Patent Nos. 4,030,365
5,012,678

Standard Magnehelic® Pressure Gage has a large, easy-to-read 4" dial.

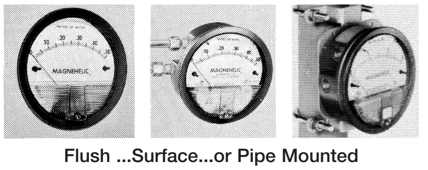


Dimensions, Standard Series 2000 Magnehelic® Pressure Gages. (Slightly different on medium and high pressure models)

Select the Dwyer Magnehelic® gage for high accuracy — guaranteed within 2% of full scale — and for the wide choice of 81 models available to suit your needs precisely. Using Dwyer's simple, frictionless Magnehelic® movement, it quickly indicates low air or non-corrosive gas pressures — either positive, negative (vacuum) or differential. The design resists shock, vibration and over-pressures. No manometer fluid to evaporate, freeze or cause toxic or leveling problems. It's inexpensive, too.

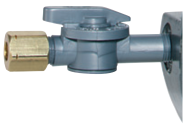
The Magnehelic® is the industry standard to measure fan and blower pressures, filter resistance, air velocity, furnace draft, pressure drop across orifice plates, liquid levels with bubbler systems and pressures in fluid amplifier or fluidic systems. It also checks gas-air ratio controls and automatic valves, and monitors blood and respiratory pressures in medical care equipment.

NOTE: Do Not use with Hydrogen gas. Dangerous reactions will occur.



Flush ...Surface...or Pipe Mounted

MOUNTING. A single case size is used for most models of Magnehelic® gages. They can be flush or surface mounted with standard hardware supplied. With the optional A-610 Pipe Mounting Kit they may be conveniently installed on horizontal or vertical 1¼" - 2" pipe. Although calibrated for vertical position, many ranges above 1" may be used at any angle by simply re-zeroing. However, for maximum accuracy, they must be calibrated in the same position in which they are used. These characteristics make Magnehelic® gages ideal for both stationary and portable applications. A 4⁹⁄₁₆" hole is required for flush panel mounting. Complete mounting and connection fittings plus instructions are furnished with each instrument.



VENT VALVES

In applications where pressure is continuous and the Magnehelic® gage is connected by metal or plastic tubing which cannot be easily removed, we suggest using Dwyer A-310A vent valves to connect gage. Pressure can then be removed to check or re-zero the gage.

HIGH AND MEDIUM PRESSURE MODELS

Installation is similar to standard gages except that a 4¹³⁄₁₆" hole is needed for flush mounting. The medium pressure construction is rated for internal pressures up to 35 psig and the high pressure up to 80 psig. Available for all models. Because of larger case, the medium pressure and high pressure models will not fit in a portable case size. Weight 1 lb., 10 oz. Installation of the A-321 safety relief valve on standard Magnehelic® gages often provides adequate protection against infrequent overpressure.

SPECIFICATIONS

Service: Air and non-combustible, compatible gases. (Natural Gas option available.)
Wetted Materials: Consult Factory.
Housing: Die cast aluminum case and bezel, with acrylic cover, Exterior finish is coated gray to withstand 168 hour salt spray corrosion test.
Accuracy: +/- 2% of full scale (±3% on - 0 and ±4% on - 00 ranges), throughout range at 70°F. (21.1°C)
Pressure Limits: -20˝ Hg. to 15 psig.† (-0.677 bar to 1.034 bar); MP option; 35 psig (2.41 bar), HP option; 80 psig (5.52 bar).
Overpressure: Relief plug opens at approximately 25 psig (1.72 kPa), standard gages only.
Temperature Limits: 20 to 140°F.* (-6.67 to 60°C).
Size: 4˝ (101.6 mm) Diameter dial face.
Mounting Orientation: Diaphragm in vertical position. Consult factory for other position orientations.
Process Connections: 1/8˝ female NPT duplicate high and low pressure taps - one pair side and one pair back.
Weight: 1 lb. 2 oz. (510g), MP & HP 2 Lb. 2 oz. (963g).
Standard Accessories: Two 1/8˝ NPT plugs for duplicate pressure taps, two 1/8˝ pipe thread to rubber tubing adapter and three flush mounting adapters with screws. (Mounting and snap ring retainer substituted for 3 adapters in MP & HP gage accessories.)

*Low temperature models available as special option.
†For applications with high cycle rate within gage total pressure rating, next higher rating is recommended. See Medium and High pressure options at lower left.

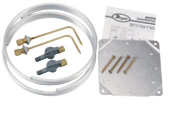
OPTIONS AND ACCESSORIES

Transparent overlays
Furnished in red and green to highlight and emphasize critical pressures.

Adjustable signal flag
Integral with plastic gage cover. Available for most models except those with medium or high pressure construction. Can be ordered with gage or separate.

LED Setpoint Indicator
Bright red LED on right of scale shows when setpoint is reached. Field adjustable from gage face, unit operates on 12-24 VDC. Requires MP or HP style cover and bezel.

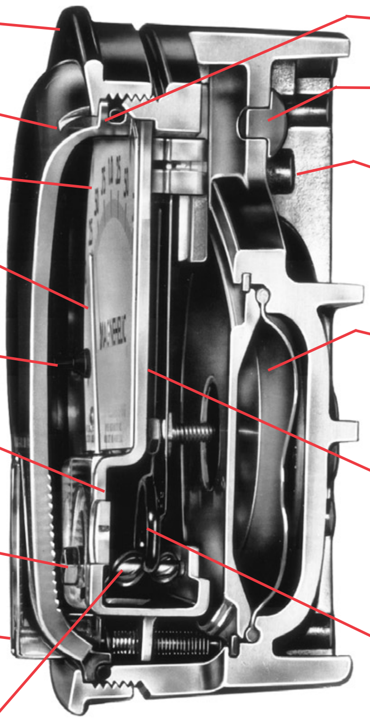
Portable units
Combine carrying case with any Magnehelic® gage of standard range,except high pressure connection. Includes 9 ft. (2.7 m) of ³⁄₁₆" I.D. rubber tubing, standhang bracket and terminal tube with holder.



Air filter gage accessory package
Adapts any standard Magnehelic® for use as an air filter gage. Includes aluminum surface mounting bracket with screws, two 5 ft. (1.5 m) lengths of ¼" aluminum tubing two static pressure tips and two molded plastic vent valves, integral compression fittings on both tips and valves.

Dwyer Instruments, Inc./P.O. Box 373/Michigan City, Indiana 46361/Phone 219 879-8000/Fax 219 872-9057 • U.K. Phone (01494)-461707 • Australia Phone (02) 9756-5355

Quality design and construction features



Bezel provides flange for flush mounting in panel.

Clear plastic face is highly resistant to breakage. Provides undistorted viewing of pointer and scale.

Precision litho-printed scale is accurate and easy to read.

Red tipped pointer of heat treated aluminum tubing is easy to see. It is rigidly mounted on the helix shaft.

Pointer stops of molded rubber prevent pointer over-travel without damage.

"Wishbone" assembly provides mounting for helix, helix bearings and pointer shaft.

Jeweled bearings are shock-resistant mounted; provide virtually friction-free motion for helix. Motion damped with high viscosity silicone fluid.

Zero adjustment screw is conveniently located in the plastic cover, and is accessible without removing cover. 0-ring seal provides pressure tightness.

O-ring seal for cover assures pressure integrity of case.

Blowout plug of silicone rubber protects against overpressure on 15 PSIG rated models. Opens at approximately 25 PSIG.

Die cast aluminum case is precision made and iridite-dipped to withstand 168 hour salt spray corrosion test. Exterior finished in baked dark gray hammerloid. One case size is used for all standard pressure options, and for both surface and flush mounting.

Silicone rubber diaphragm with integrally molded O-ring is supported by front and rear plates. It is locked and sealed in position with a sealing plate and retaining ring. Diaphragm motion is restricted to prevent damage due to overpressures.

Calibrated range spring is flat spring steel. Small amplitude of motion assures consistency and long life. It reacts to pressure on diaphragm. Live length adjustable for calibration.

Samarium Cobalt magnet mounted at one end of range spring rotates helix without mechanical linkages.

Helix is precision made from an alloy of high magnetic permeability. Mounted in jeweled bearings, it turns freely, following the magnetic field to move the pointer across the scale.

Dual Scale English/Metric Models		
Model Number	**Range, In. W.C.**	**Range, Pa or kPa**
2000-0D	0-0.5	0-125 Pa
2001D	0-1.0	0-250 Pa
2002D	0-2.0	0-500 Pa
2003D	0-3.0	0-700 Pa
2004D	0-4.0	0-1.0 kPa
2006D	0-6.0	0-1.5 kPa
2008D	0-8.0	0-2.0 kPa
2010D	0-10	0-2.5 kPa

SERIES 2000 MAGNEHELIC® — MODELS AND RANGES
STOCKED MODELS in bold

The models below will fulfill most requirements. Page 5 also shows examples of special models built for OEM customers. For special scales furnished in ounces per square inch, inches of mercury, metric units, etc., contact the factory.

Model Number	Range Inches of Water
2000-00†	0-.25
2000-0†	0-.50
2001	0-1.0
2002	0-2.0
2003	0-3.0
2004	0-4.0
2005	0-5.0
2006	0-6.0
2008	0-8.0
2010	0-10
2015	0-15
2020	0-20
2025	0-25
2030	0-30
2040	0-40
2050	0-50
2060	0-60
2080	0-80
2100	0-100
2150	0-150

Model Number	Range Zero Center Inches of Water
2300-0†	.25-0-.25
2301	.5-0-.5
2302	1-0-1
2304	2-0-2
2310	5-0-5
2320	10-0-10
2330	15-0-15

Model Number	Range PSI
2201	0-1
2202	0-2
2203	0-3
2204	0-4
2205	0-5
2210*	0-10
2215*	0-15
2220*	0-20
2230**	0-30

*MP option standard
**HP option standard

Dual Scale Air Velocity Units	
Model Number	**Range in W.C.I Velocity, F.P.M.**
2000-00AV	0-.25/300-2000
2000-0AV	0-.50/500-2800
2001AV	0-1.0/500-4000
2002AV	0-2.0/1000-5600
2010AV	0-10/2000-12500

For use with pitot tube.

Model Number	Range MM of Water
2000-6MM†	0-6
2000-10MM	0-10
2000-25MM	0-25
2000-50MM	0-50
2000-80MM	0-80
2000-100MM	0-100
Zero Center Ranges	
2300-20MM†	10-0-10

Model Number	Range, CM of Water
2000-15CM	0-15
2000-20CM	0-20
2000-25CM	0-25
2000-50CM	0-50
2000-80CM	0-80
2000-100CM	0-100
2000-150CM	0-150
2000-200CM	0-200
2000-250CM	0-250
2000-300CM	0-300
Zero Center Ranges	
2300-4CM	2-0-2
2300-10CM	5-0-5
2300-30CM	15-0-15

†These ranges calibrated for vertical scale position.

Model Number	Range, Pascals
2000-60 Pa†	0-60
2000-125 Pa†	0-125
2000-250 Pa	0-250
2000-500 Pa	0-500
2000-750 Pa	0-750
Zero Center Ranges	
2300-250 Pa	125-0-125
2300-500 Pa	250-0-250

Model Number	Range, Kilopascals
2000-1 kPa	0-1
2000-1.5 kPa	0-1.5
2000-2 kPa	0-2
2000-3 kPa	0-3
2000-4 kPa	0-4
2000-5 kPa	0-5
2000-8 kPa	0-8
2000-10 kPa	0-10
2000-15 kPa	0-15
2000-20 kPa	0-20
2000-25 kPa	0-25
2000-30 kPa	0-30
Zero Center Ranges	
2300-1 kPa	.5-0-.5
2300-3 kPa	1.5-0-1.5

Accessories
A-310A, 3-Way Vent Valve ....
A-321, Safety Relief Valve ....
A-432, Portable Kit ....
A-605, Air Filter Kit ....
A-610, Pipe Mount Kit

Options — To order, add suffix: I.E. 2001-ASF
ASF (Adjustable Signal Flag)
HP (High Pressure Option)
LT (Low Temperatures to -20°F)
MP (Med. Pressure Option)
SP (Setpoint Indicator

Scale Overlays — Red, Green, Mirrored or Combination, Specify Locations

Special Purpose Ranges

Scale No. 2401	Scale No. 2402
Square Root	Blank Scale
Specify Range	Specify Range

Model 2000-00N. range -.05 to +.20" W.C. For room pressure monitoring

1011R01-0298P

Magnehelic® Differential Pressure Gage

OPERATING INSTRUCTIONS

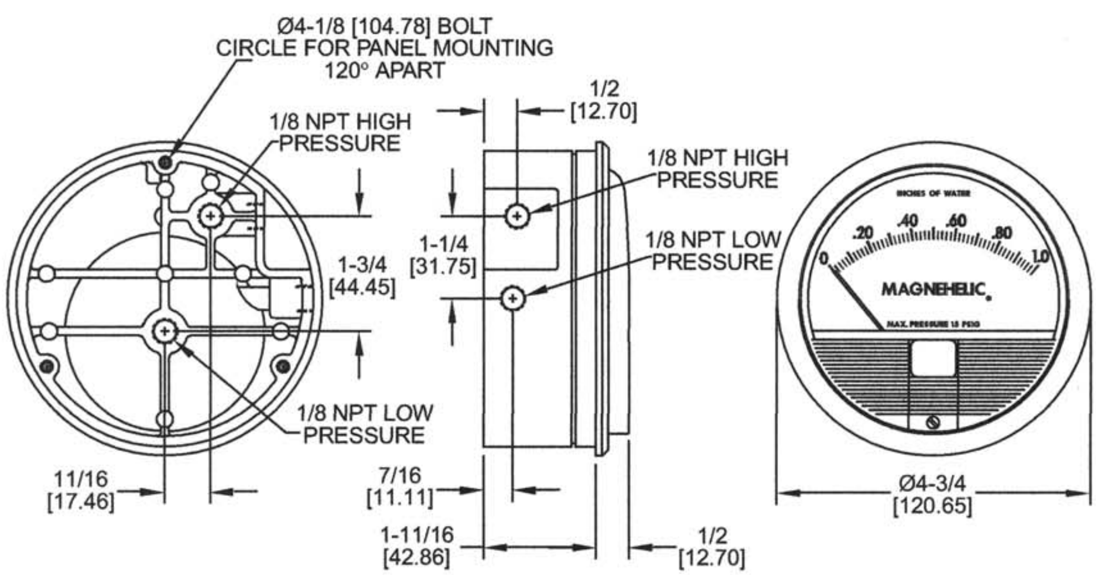
SPECIFICATIONS

Dimensions: 4-3/4″ dia. x 2-3/16″ deep.
Weight: 1 lb. 2 oz.
Finished: Baked dark gray enamel.
Connections: 1/8″ NPT high and low pressure taps, duplicated, one pair side and one pair back.
Accuracy: Plus or minus 2% of full scale, at 70°F. (Model 2000-0, 3%; 2000-00, 4%).
Pressure Rating: 15 PSI (0,35 bar)
Ambient Temperature Range: 20° to 140°F (-7 to 60°C).
Standard gage accessories include two 1/8″ NPT plugs for duplicate pressure taps, two 1/8″ NPT pipe thread to rubber tubing adapters, and three flush mounting adapters with screws.

Caution: For use with air or compatible gases only.

For repeated over-ranging or high cycle rates, contact factory.

Not for use with Hydrogen gas. Dangerous reactions will occur.



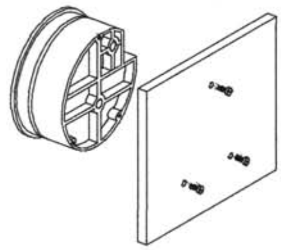
DWYER INSTRUMENTS, INC.
P.O. BOX 373 • MICHIGAN CITY, INDIANA 46361 U.S.A.
Phone: 219/879-8000
Fax: 219/872-9057
Lit-by-Fax: 888/891-4963
www.dwyer-inst.com
e-mail: info@dwyer-inst.com

MAGNEHELIC® INSTALLATION

1. Select a location free from excessive vibration and where the ambient temperature will not exceed 140°F. Also, avoid direct sunlight which accelerates discoloration of the clear plastic cover. Sensing lines my be run any necessary distance. Long tubing lengths will not affect accuracy but will increase response time slightly. Do not restrict lines. If pulsating pressures or vibration cause excessive pointer oscillation, consult the factory for ways to provide additional damping.

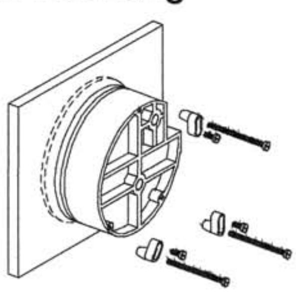
2. All standard Magnehelic gages are calibrated with the diaphragm vertical and should be used in that position for maximum accuracy. If gages are to be used in other than vertical position, this should be specified on the order. Many higher range gages will perform within tolerance in other positions with only rezeroing. Low range Model 2000-00 and metric equivalents must be used in the vertical position only.

3. Surface Mounting



Locate mounting holes, 120° apart on a 4-1/8″ dia. circle. Use No. 6-32 machine screws of appropriate length.

4. Flush Mounting



Provide a 4-9/16″ dia. opening in panel. Insert gage and secure in place with No. 6-32 machine screws of appropriate length, with adapters, firmly secured in place. To mount gage on 1-1/4″-2″ pipe, order optional A-610 pipe mounting kit.

5. To zero the gage after installation

Set the indicating pointer exactly on the zero mark, using the external zero adjust screw on the cover at the bottom. Note that the zero check or adjustment can only be made with the high and low pressure taps both open to atmosphere.

Operation

Positive Pressure: Connect tubing from source of pressure to either of the two high pressure ports. Plug the port not used. Vent one or both low pressure ports to atmosphere.

Negative Pressure: Connect tubing from source of vacuum or negative pressure to either of the two low pressure ports. Plug the port not used. Vent one or both high pressure ports to atmosphere.

Differential Pressure: Connect tubing from the greater of two pressure sources to either high pressure port and the lower to either low pressure port. Plug both unused ports.

When one side of the gage is vented in dirty, dusty atmosphere, we suggest an A-331 Filter Vent Plug be installed in the open port to keep inside of gage clean.

A. For portable use of temporary installation use 1/8″ pipe thread to rubber tubing adapter and connect to source of pressure with rubber or Tygon tubing.

B. For permanent installation, 1/4″ O.D., or larger, copper or aluminum tubing is recommended. See accessory bulletin S-101 for fittings.

Ordering Instructions:

When corresponding with the factory regarding Magnehelic® gage problems, be sure to include model number, pressure range, and any special options. Field repair is not recommended; contact the factory for repair service.

MAINTENANCE

Maintenance: No lubrication or periodic servicing is required. Keep case exterior and cover clean. Occasionally disconnect pressure lines to vent both sides of gage to atmosphere and re-zero. Optional vent valves, (bulletin S-101), should be used in permanent installations.

Calibration Check: Select a second gage or manometer of known accuracy and in an appropriate range. Using short lengths of rubber or vinyl tubing, connect the high pressure side of the Magnehelic gage and the test gage to two legs of a tee. Very slowly apply pressure through the third leg. Allow a few seconds for pressure to equalize, fluid to drain, etc., and compare readings. If accuracy unacceptable, gage may be returned to factory for recalibration. To calibrate in the field, use the following procedure.

Calibration:

1. With gage case, held firmly, loosen bezel, by turning counterclockwise. To avoid damage, a canvas strap wrench or similar tool should be used.
2. Lift out plastic cover and "O" ring.
3. Remove scale screws and scale assembly. Be careful not to damage pointer.
4. The calibration is changed by moving the clamp. Loosen the clamp screw(s) and move slightly toward the helix if gage is reading high, and away if reading low. Tighten clamp screw and install scale assembly.
5. Place cover and O-ring in position. Make sure the hex shaft on inside of cover is properly engaged in zero adjust screw.
6. Secure cover in place by screwing bezel down snug. Note that the area under the cover is pressurized in operation and therefore gage will leak if not properly tightened.
7. Zero gage and compare to test instrument. Make further adjustments as necessary.

Caution: If bezel binds when installing, lubricate threads sparingly with light oil or molybdenum disulphide compound.

Warning: Attempted field repair may void your warrenty. Recalibration or repair by the user is not recommended. For best results, return gage to the factory. Ship prepaid to:

Dwyer Instruments, Inc.

Attn: Repair Dept.

102 Indiana Highway 212

Michigan City, IN 46360

Trouble Shooting Tips:

•*Gage won't indicate or is sluggish.*

1. Duplicate pressure port not plugged.
2. Diaphragm ruptured due to overpressure.
3. Fittings or sensing lines blocked, pinched, or leaking.
4. Cover loose or "O"ring damaged, missing.
5. Pressure sensor, (static tips, Pitot tube, etc.) improperly located.
6. Ambient temperature too low. For operation below 20°F, order gage with low temperature, (LT) option.

•Pointer stuck-gage can't be zeroed.

1. Scale touching pointer.
2. Spring/magnet assembly shifted and touching helix.
3. **Metallic particles clinging to magnet and interfering with helix movement.**
4. Cover zero adjust shaft broken or not properly engaged in adjusting screw.

We generally recommend that gages needing repair be returned to the factory. Parts used in various sub-assemblies vary from one range of gage to another, and use of incorrect components may cause improper operation. After receipt and inspection, we will be happy to quote repair costs before proceeding.

Consult factory for assistance on unusual applications or conditions.

Use with air or compatible gases only.

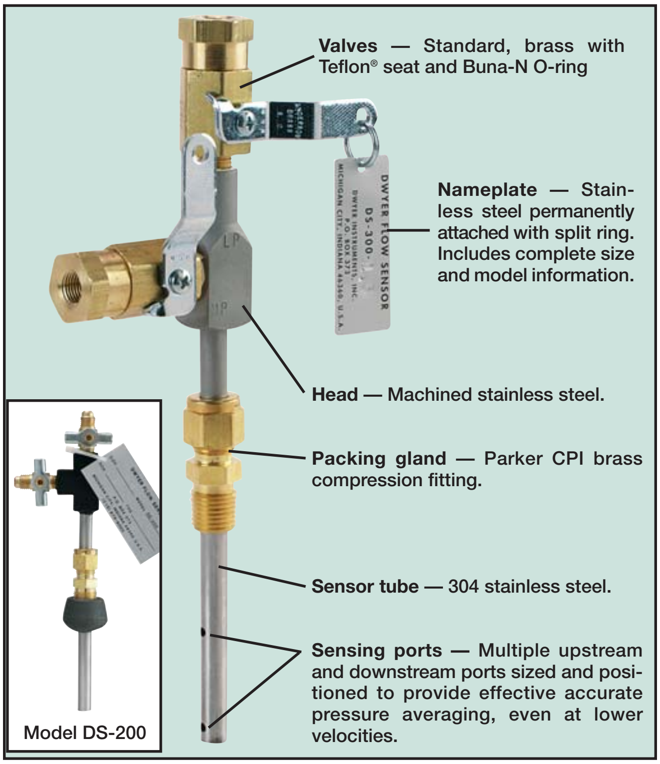
Printed in U.S.A. 4/01 FR# 12-440212-00 Rev. 3

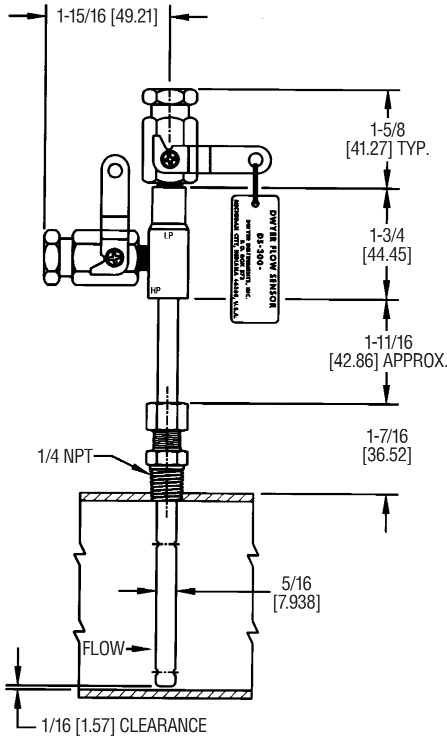
DWYER INSTRUMENTS, INC.
P.O. BOX 373 • MICHIGAN CITY, INDIANA 46361 U.S.A.
Phone: 219/879-8000
Fax: 219/872-9057
Lit-by-Fax: 888/891-4963
www.dwyer-inst.com
e-mail: info@dwyer-inst.com

Series DS

In-Line Flow Sensors

Use with the Dwyer Differential Pressure Gages or Transmitters





Dwyer Flow Sensors are averaging Pitot tubes that provide accurate and convenient flow rate sensing for schedule 40 pipe. When purchased with a Dwyer Capsuhelic® differential pressure gage of appropriate range, the result is a flow indicating system delivered off the shelf at an economical price.

Pitot tubes have been used in flow measurement for years. Conventional pitot tubes sense velocity pressure at only one point in the flowing stream. Therefore, a series of measurements must be taken across the stream to obtain a meaningful average flow rate. The Dwyer flow sensor eliminates the need for "traversing" the flowing stream because of its multiple sensing points and built-in averaging capability.

Series DS-200 models are available in ten insertion lengths from 1" - 10". Operation is similar to DS-300 units. Basic differences are the multi-turn shut-off valves, ⅜" NPT mounting and installed ¼" SAE 45˚ flared pressure connections.

Dwyer Series DS-300 flow sensors are designed to be inserted in the pipeline through a compression fitting. They are furnished with instrument shut-off valves on both pressure connections. Valves are fitted with ⅛" female NPT connections. Accessories include adapters with ¼" SAE 45° flared ends compatible with hoses supplied with the Model A-471 Portable Capsuhelic® kit. Standard valves are rated at 200 psig (13.7 bar) and 200°F (93.3°C). Where valves are not required, they can be omitted at reduced cost. Series DS-300 flow sensors are available for pipe sizes from 1" to 10".

DS-400 Averaging Flow Sensors are quality constructed from extra strong ¾" dia. stainless steel to resist increased forces encountered at higher flow rates with both air and water. This extra strength also allows them to be made in longer insertion lengths up to 24 inches (61 cm). All models include convenient and quick-acting quarter-turn ball valves to isolate the sensor for zeroing. Process connections to the valve assembly are ⅛" female NPT. A pair of ⅛" NPT × ¼" SAE 45° flared adapters are included, compatible with hoses used in the Model A-471 Portable Capsuhelic® Gage Kit. Supplied solid brass mounting adapter has a ¾" dia. compression fitting to lock in required insertion length and a ¾" male NPT thread for mounting in a thred-o-let (not included).

STOCKED MODELS in bold

— Select model with suffix which matches pipe size

DS-200-1"	**DS-300-1"**
DS-200-1¼"	**DS-300-1¼"**
DS-200-1½"	**DS-300-1½"**
DS-200-2"	**DS-300-2"**
DS-200-2½"	**DS-300-2½"**
DS-200-3"	**DS-300-3"**
DS-200-4"	**DS-300-4"**
DS-200-6"	**DS-300-6"**
DS-200-8"	**DS-300-8"**
DS-200-10"	**DS-300-10"**

DS-400-6"
DS-400-8"
DS-400-10"
DS-400-12"
DS-400-14"
DS-400-16"
DS-400-18"
DS-400-20"
DS-400-24"

Options and Accessories

A-160 Thredolet,⅜" NPT, forged steel, 3000 psi
A-161 Brass Bushing, ¼" x ⅜"
DS-200-VK Series DS Flow Sensors Valve Kit
Less Valves (DS-300) To order, add suffix -LV

Dwyer Instruments, Inc./P.O. Box 373/Michigan City, IN 46361/Phone 219 879-8000/Fax 219 872-9057 • U.K. Phone 44 1 494-461707 • Australia Phone 61 2 4272-2055

How To Order

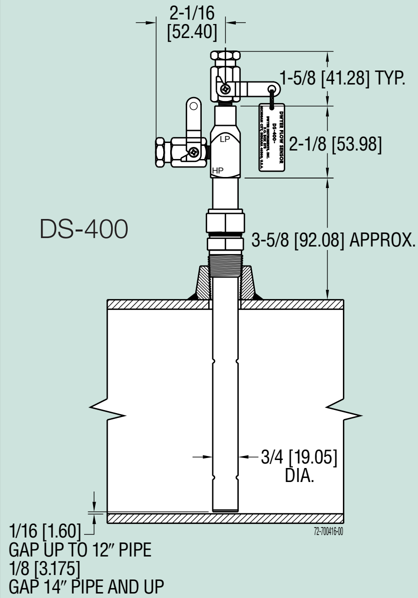
Merely determine the pipe size into which the flow sensor will be mounted and designate the size as a suffix to Model DS-300. For example, a flow sensor to be mounted in a 2" pipe would be a Model No. DS-300-2".

For non-critical water and air flow monitoring applications, the chart below can be utilized for ordering a stock Capsuhelic® differential pressure gage for use with the DS-300 flow sensor. Simply locate the maximum flow rate for the media being measured under the appropriate pipe size and read the Capsuhelic® gage range in inches of water column to the left. The DS-300 sensor is supplied with installation and operating instructions, Bulletin F-50. It also includes complete flow conversion information for the three media conditions shown in the chart below. This information enables the user to create a complete differential pressure to flow rate conversion table for the sensor and differential pressure gage employed. Both the Dwyer Capsuhelic® gage and flow sensor feature excellent repeatability so, once the desired flow rate is determined, deviation from that flow in quantitative measure can be easily determined. You may wish to order the adjustable signal flag option for the Capsuhelic® gage to provide an easily identified reference point for the proper flow.

Capsuhelic® gages with special ranges and/or direct reading scales in appropriate flow units are available on special order for more critical applications. Customer supplied data for the full scale flow (quantity and units) is required along with the differential pressure reading at that full flow figure. Prior to ordering a special Capsuhelic® differential pressure gage for flow read-out, we recommend you request Bulletin F-50 to obtain complete data on converting flow rates of various media to the sensor differential pressure output. With this bulletin and after making a few simple calculations, the exact range gage required can easily be determined.

Large $^{3}/_{4}$ Inch Diameter for Extra Strength in Lengths to 24 Inches

DS-400



GAGE RANGE (IN. W.C.)	MEDIA @ 70°F	FULL RANGE FLOWS BY PIPE SIZE (APPROXIMATE)									
		1"	1¼"	1½"	2"	2½"	3"	4"	6"	8"	10"
2	Water (GPM) Air @ 14.7 PSIA (SCFM) Air @ 100 PSIG (SCFM)	4.8 19.0 50.0	8.3 33.0 90.5	11.5 42.0 120.0	20.5 65.0 210.0	30 113 325	49 183 510	86 330 920	205 760 2050	350 1340 3600	560 2130 6000
5	Water (GPM) Air @ 14.7 PSIA (SCFM) Air @ 100 PSIG (SCFM)	7.7 30.0 83.0	14.0 51.0 142.0	18.0 66.0 190.0	34.0 118.0 340.0	47 173 610	78 289 820	138 510 1500	320 1200 3300	560 2150 5700	890 3400 10000
10	Water (GPM) Air @ 14.7 PSIA (SCFM) Air @ 100 PSIG (SCFM)	11.0 41.0 120.0	19.0 72.0 205.0	25.5 93.0 275.0	45.5 163.0 470.0	67 250 740	110 410 1100	195 725 2000	450 1690 4600	800 3040 8100	1260 4860 15000
25	Water (GPM) Air @ 14.7 PSIA (SCFM) Air @ 100 PSIG (SCFM)	18.0 63.0 185.0	32.0 112.0 325.0	40.5 155.0 430.0	72.0 255.0 760.0	103 390 1200	173 640 1800	310 1130 3300	720 2630 7200	1250 4860 13000	2000 7700 22000
50	Water (GPM) Air @ 14.7 PSIA (SCFM) Air @ 100 PSIG (SCFM)	25.0 90.0 260.0	44.0 161.0 460.0	57.5 205.0 620.0	100.0 360.0 1050.0	152 560 1700	247 900 2600	435 1600 4600	1000 3700 10000	1800 6400 18500	
100	Water (GPM) Air @ 14.7 PSIA (SCFM) Air @ 100 PSIG (SCFM)	36.5 135.0 370.0	62.0 230.0 660.0	82.0 300.0 870.0	142.0 505.0 1500.0	220 800 2300	350 1290 3600	620 2290 6500	1500 5000 15000		

Model A-471 Portable Kit

The Dwyer Series 4000 Capsuhelic® differential pressure gage is ideally suited for use as a read-out device with the DS-300 Flow Sensors. The gage may be used on system pressures of up to 500 PSIG even when the flow sensor differential pressure to be read is less than 0.5" w.c. With accuracy of ±3% of full scale, the Capsuhelic® gage can be used in ambient temperatures from 32 to 200°F (0 to 93.3°C). Zero and range adjustments are made from outside the gage. The standard gage with a die cast aluminum housing can be used with the flow sensor for air or oil applications. For water flow measurements, the optional forged brass housing should be specified. The Capsuhelic® gage may be panel or surface mounted and permanently plumbed to the flow sensor if desired. The optional A-610 pipe mounting bracket allows the gage to be easily attached to any 1¼" - 2" horizontal or vertical pipe.

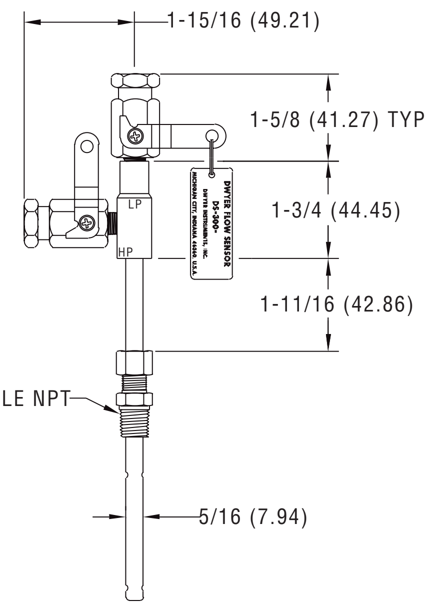
For portable operation, the A-471 Capsuhelic® Portable Gage Kit is available complete with tough polypropylene carrying case, mounting bracket, 3-way manifold valve, two 10' high pressure hoses, and all necessary fittings. See pages 8 and 9 for complete information on the Capsuhelic® gage.

CAPSUHELIC® GAGE SHOWN INSTALLED IN A-471 PORTABLE KIT

Air Velocity

Series DS-300 Flow Sensors

Installation and Operating Instructions Flow Calculations



Series DS-300 Flow Sensors are averaging pitot tubes that provide accurate, convenient flow rate sensing. When purchased with a Dwyer Capsuhelic® for liquid flow or Magnehelic® for air flow, differential pressure gage of appropriate range, the result is a flow-indicating system delivered off the shelf at an economical price. Series DS-300 Flow Sensors are designed to be inserted in the pipeline through a compression fitting and are furnished with instrument shut-off valves on both pressure connections. Valves are fitted with 1/8˝ female NPT connections. Accessories include adapters with 1/4˝ SAE 45° flared ends compatible with hoses supplied with the Model A-471 Portable Capsuhelic® kit. Standard valves are rated at 200°F (93.3°C). Where valves are not required, they can be omitted at reduced cost. Series DS-300 Flow Sensors are available for pipe sizes from 1˝ to 10˝.

INSPECTION

Inspect sensor upon receipt of shipment to be certain it is as ordered and not damaged. If damaged, contact carrier.

INSTALLATION

General - The sensing ports of the flow sensor must be correctly positioned for measurement accuracy. The instrument connections on the sensor indicate correct positioning. The side connection is for total or high pressure and should be pointed upstream. The top connection is for static or low pressure.

Location - The sensor should be installed in the flowing line with as much straight run of pipe upstream as possible. A rule of thumb is to allow 10 - 15 pipe diameters upstream and 5 downstream. The table below lists recommended up and down piping.

PRESSURE AND TEMPERATURE

Maximum: 200 psig (13.78 bar) at 200°F (93.3°C).

Upstream and Downstream Dimensions in Terms of Internal Diameter of Pipe*

Upstream Condition	Minimum Diameter of Straight Pipe		
	Upstream		Downstream
	In-Plane	Out of Plane	
One Elbow or Tee	7	9	5
Two 90° Bends in Same Plane	8	12	5
Two 90° Bends in Different Plane	18	24	5
Reducers or Expanders	8	8	5
All Valves**	24	24	5

* Values shown are recommended spacing, in terms of internal diameter for normal industrial metering requirements. For laboratory or high accuracy work, add 25% to values.

** Includes gate, globe, plug and other throttling valves that are only partially opened. If valve is to be fully open, use values for pipe size change. **CONTROL VALVES SHOULD BE LOCATED AFTER THE FLOW SENSOR.**

DWYER INSTRUMENTS, INC.
P.O. BOX 373 • MICHIGAN CITY, INDIANA 46361, U.S.A.
Phone: 219/879-8000
Fax: 219/872-9057
www.dwyer-inst.com
e-mail: info@dwyer-inst.com

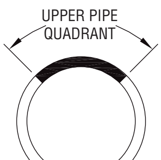
POSITION

Be certain there is sufficient clearance between the mounting position and other pipes, walls, structures, etc, so that the sensor can be inserted through the mounting unit once the mounting unit has been installed onto the pipe.

Flow sensors should be positioned to keep air out of the instrument connecting lines on liquid flows and condensate out of the lines on gas flows. The easiest way to assure this is to install the sensor into the pipe so that air will bleed into, or condensate will drain back to, the pipe.

For Air or Gas Flow

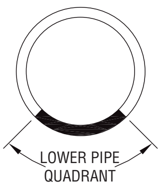
Install in upper quadrant of pipe



Condensate drains back to pipe

For Liquid or Steam Flow

Install in lower quadrant of pipe



Air bleeds back to pipe

INSTALLATION

1. When using an A-160 thred-o-let, weld it to the pipe wall. If replacing a DS-200 unit, an A-161 bushing (1/4˝ x 3/8˝) will be needed.

2. Drill through center of the thred-o-let into the pipe with a drill that is slightly larger than the flow sensor diameter.

3. Install the packing gland using proper pipe sealant. If the packing gland is disassembled, note that the tapered end of the ferrule goes into the fitting body.

4. Insert sensor until it bottoms against opposite wall of the pipe, then withdraw 1/16˝ to allow for thermal expansion.

5. Tighten packing gland nut finger tight. Then tighten nut with a wrench an additional 1-1/4 turns. Be sure to hold the sensor body with a second wrench to prevent the sensor from turning.

INSTRUMENT CONNECTION

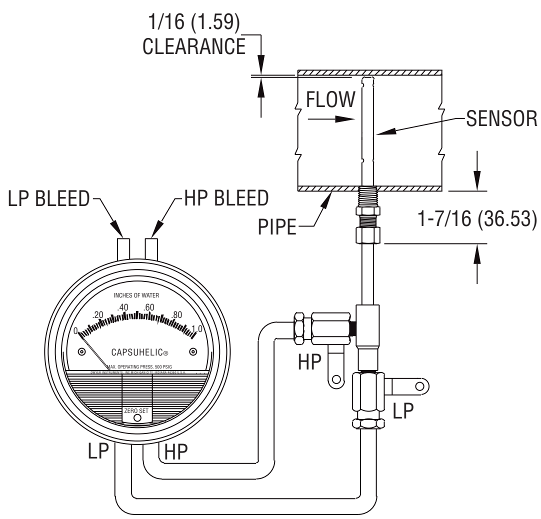
Connect the slide pressure tap to the high pressure port of the Magnehelic® (air only) or Capsuhelic® gage or transmitting instrument and the top connection to the low pressure port.

See the connection schematics below.

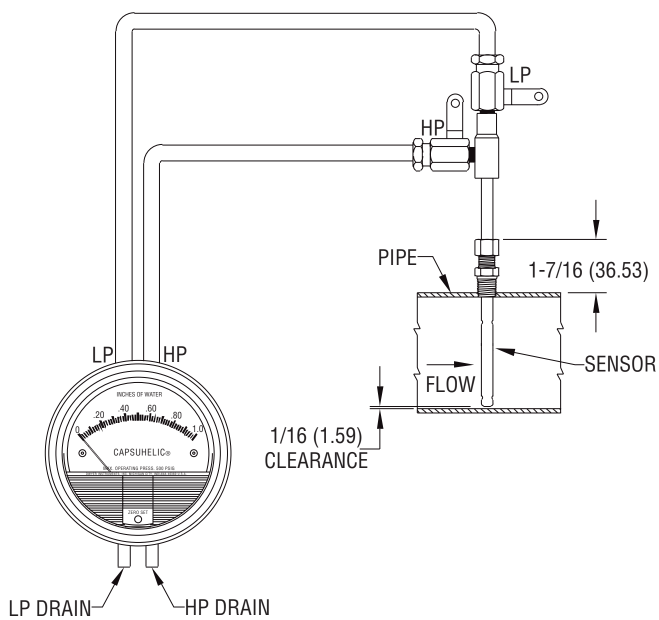
Bleed air from instrument piping on liquid flows. Drain any condensate from the instrument piping on air and gas flows.

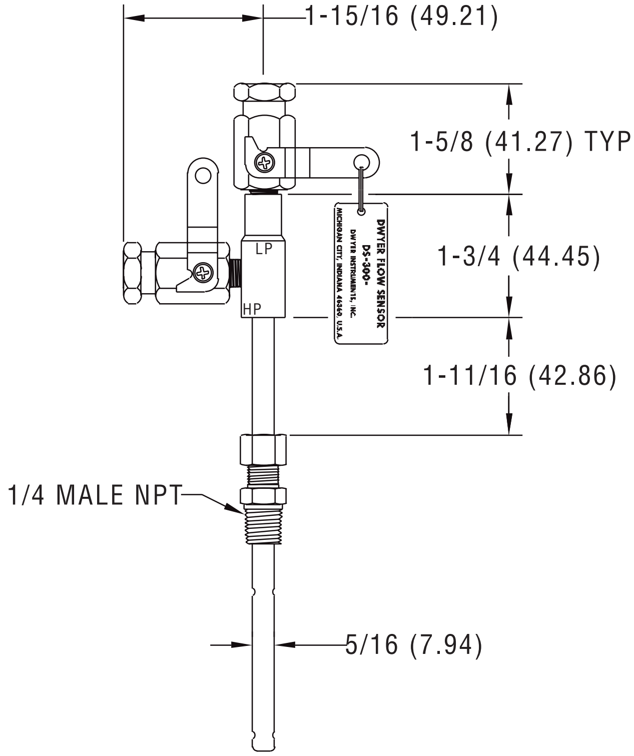
Open valves to instrument to place flow meter into service. For permanent installations, a 3-valve manifold is recommended to allow the gage to be zero checked without interrupting the flow. The Dwyer A-471 Portable Test Kit includes such a device.

Water Flow



Air or Gas Flow





Flow Calculations and Charts

The following information contains tables and equations for determining the differential pressure developed by the DS-300 Flow Sensor for various flow rates of water, steam, air or other gases in different pipe sizes.

This information can be used to prepare conversion charts to translate the differential pressure readings being sensed into the equivalent flow rate. When direct readout of flow is required, use this information to calculate the full flow differential pressure in order to specify the exact range of Dwyer Magnehelic® or Capsuhelic® gage required. Special ranges and calculations are available for these gages at minimal extra cost. See bulletins A-30 and F-41 for additional information on Magnehelic® and Capsuhelic® gages and DS-300 flow sensors.

For additional useful information on making flow calculations, the following service is recommended: Crane Valve Co. Technical Paper No. 410 “Flow of Fluids Through Valves, Fittings and Pipe.” It is available from Crane Valve Company, www.cranevalve.com.

Using the appropriate differential pressure equation from Page 4 of this bulletin,calculate the differential pressure generated by the sensor under normal operating conditions of the system. Check the chart below to determine if this value is within the recommended operating range for the sensor. Note that the data in this chart is limited to standard conditions of air at 60°F (15.6°C) and 14.7 psia static line pressure or water at 70°F (21.1°C). To determine recommended operating ranges of other gases, liquids an/or operating conditions, consult factory.

Note: the column on the right side of the chart which defines velocity ranges to avoid. Continuous operation within these ranges can result in damage to the flow sensor caused by excess vibration.

Pipe Size (Schedule 40)	Flow Coefficient “K”	Operating Ranges Air @ 60°F & 14.7 psia (D/P in. W.C.)	Operating Ranges Water @ 70°F (D/P in. W.C.)	Velocity Ranges Not Recommended (Feet per Second)
1	0.52	1.10 to 186	4.00 to 675	146 to 220
1-1/4	0.58	1.15 to 157	4.18 to 568	113 to 170
1-1/2	0.58	0.38 to 115	1.36 to 417	96 to 144
2	0.64	0.75 to 75	2.72 to 271	71 to 108
2-1/2	0.62	1.72 to 53	6.22 to 193	56 to 85
3	0.67	0.39 to 35	1.43 to 127	42 to 64
4	0.67	0.28 to 34	1.02 to 123	28 to 43
6	0.71	0.64 to 11	2.31 to 40	15 to 23
8	0.67	0.10 to 10	0.37 to 37	9.5 to 15
10	0.70	0.17 to 22	0.60 to 79	6.4 to 10

FLOW EQUATIONS

1. Any Liquid

$$Q\ (GPM) = 5.668 \times K \times D^2 \times \sqrt{\Delta P / S_f}$$

2. Steam or Any Gas

$$Q\ (lb/Hr) = 359.1 \times K \times D^2 \times \sqrt{p \times \Delta P}$$

3. Any Gas

$$Q\ (SCFM) = 128.8 \times K \times D^2 \times \sqrt{\frac{P \times \Delta P}{(T + 460) \times S_s}}$$

DIFFERENTIAL PRESSURE EQUATIONS

1. Any Liquid

$$\Delta P\ (in.\ WC) = \frac{Q^2 \times S_f}{K^2 \times D^4 \times 32.14}$$

2. Steam or Any Gas

$$\Delta P\ (in.\ WC) = \frac{Q^2}{K^2 \times D^4 \times p \times 128{,}900}$$

3. Any Gas

$$\Delta P\ (in.\ WC) = \frac{Q^2 \times S_s \times (T + 460)}{K^2 \times D^4 \times P \times 16{,}590}$$

Technical Notations

The following notations apply:

ΔP = Differential pressure expressed in inches of water column
Q = Flow expressed in GPM, SCFM, or PPH as shown in equation
K = Flow coefficient— See values tabulated on Pg. 3.
D = Inside diameter of line size expressed in inches.

For square or rectangular ducts, use: $D = \sqrt{\frac{4 \times \text{Height} \times \text{Width}}{\pi}}$

P = Static Line pressure (psia)
T = Temperature in degrees Fahrenheit (plus 460 = °Rankine)
p = Density of medium in pounds per square foot
S_f = Sp Gr at flowing conditions
S_s = Sp Gr at 60°F (15.6°C)

SCFM TO ACFM EQUATION

$$\text{SCFM} = \text{ACFM} \times \left(\frac{14.7 + \text{PSIG}}{14.7}\right)\left(\frac{520^*}{460 + {}^\circ F}\right)$$

$$\text{ACFM} = \text{SCFM} \times \left(\frac{14.7}{14.7 + \text{PSIG}}\right)\left(\frac{460 + {}^\circ F}{520}\right)$$

$$\text{POUNDS PER CUBIC FOOT STD.} = \text{POUNDS PER CUBIC FOOT ACT.} \times \left(\frac{14.7}{14.7 + \text{PSIG}}\right)\left(\frac{460 + {}^\circ F}{520^*}\right)$$

$$\text{POUNDS PER CUBIC FOOT ACT.} = \text{POUNDS PER CUBIC FOOT STD.} \times \left(\frac{14.7 + \text{PSIG}}{14.7}\right)\left(\frac{520^*}{460 + {}^\circ F}\right)$$

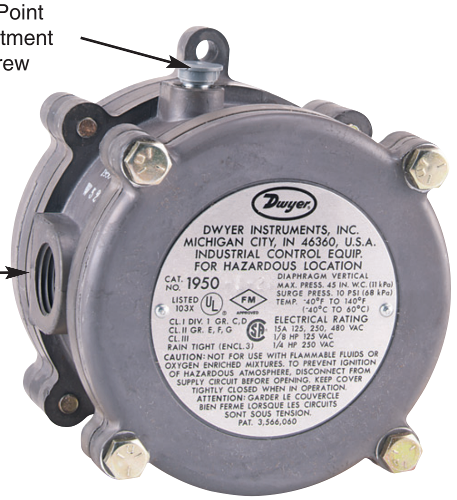
1 Cubic foot of air = 0.076 pounds per cubic foot at 60° F (15.6°C) and 14.7 psia.
* (520°= 460 + 60°) Std. Temp. Rankine

Printed in U.S.A. 7/04 FR# 72-440451-01 Rev. 2

DWYER INSTRUMENTS, INC.
P.O. BOX 373 • MICHIGAN CITY, INDIANA 46361, U.S.A.
Phone: 219/879-8000 **www.dwyer-inst.com**
Fax: 219/872-9057 **e-mail: info@dwyer-inst.com**

Series 1950 Explosion-Proof Differential Pressure Switches

Specifications - Installation and Operating Instructions



Series 1950 Explosion-Proof Differential Pressure Switches combine the best features of the Dwyer Series 1900 Pressure Switch with an integral explosion-proof and weather-proof housing. Each unit is UL & CSA listed; FM approved for use in Class I, Groups C & D; Class II, Groups E, F, & G; and Class III atmospheres (NEMA 7 & 9). They are totally rain-tight for outdoor installations. Twelve models allow set-points from .03 to 20 inches w.c. and from .5 to 50 psi (3.4 to 345 kPa).

Easy access to the SPDT switch for electrical hook-up is provided by removing the top plate of the three-part aluminum housing. Adjustment to the set point of the switch can be made without disassembling the housing. The unit is very compact, about half the weight and bulk of equivalent conventional explosion-proof switches.

CAUTION
For use only with air or compatible gases. Use of the Model 1950 switch with explosive media connected to the Low pressure port (including differential pressure applications in such media) is not recommended. Switch contact arcing can cause an explosion inside the switch housing which, while contained, may render the switch inoperative. If switch is being used to sense a single positive pressure relative to atmosphere, run a line from the low pressure port to a non-hazardous area free of combustible gases. This may increase response time on -0 and -00 models.

NOTE: The last number-letter combination in the model number identifies the switch's electrical rating (number) and diaphragm material (letter). The 2F combination is standard as described in the physical data above. In case of special models, a number 1 rating is the same as 2; a number 3 or 4 rating is 10A 125, 250, 480 VAC; 1/8 H.P. 125 VAC; 1/4 H.P. 250 VAC; a number 5 or 6 rating is 1A 125 VAC. Letter B indicates a Buna-N diaphragm; N = Neoprene; S = Silicone; and V = Viton®.

UL and CSA Listed, FM Approved For
CL. I GR. C, D - CL. II GR. E, F, G - CL. III

Series 1950 Switches
Operating ranges and deadbands

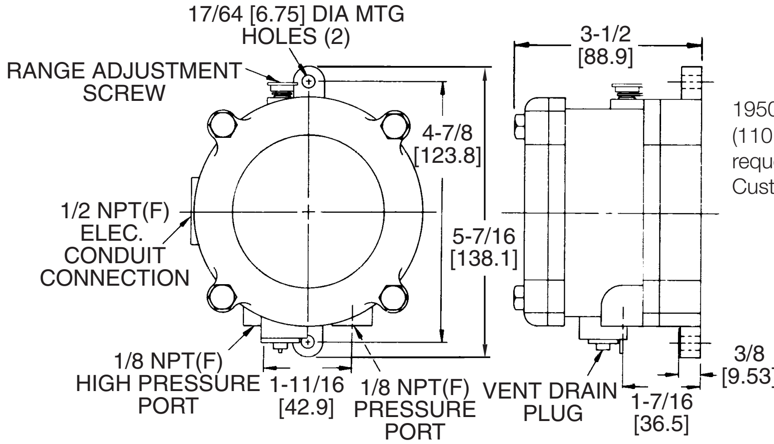
To order specify Model Number	Operating Range: Inches, W.C.	Approximate Dead Band	
		At Min. Set Point	At Max. Set Point
1950-02-2S	0.03 to 0.10	0.025	0.05
1950-00-2F	0.07 to 0.15	0.04	0.05
1950-0-2F	0.15 to 0.5	0.10	0.15
1950-1-2F	0.4 to 1.6	0.15	0.20
1950-5-2F	1.4 to 5.5	0.3	0.4
1950-10-2F	3.0 to 11.0	0.4	0.5
1950-20-2F	4.0 to 20.0	0.4	0.6

Model Number	Operating Range: PSI	Approximate Dead Band	
		Min. Set Point	Max. Set Point
1950P-2-2F	0.5 to 2.0	0.3 psi	0.3 psi
1950P-8-2F	1.5 to 8.0	1.0 psi	1.0 psi
1950P-15-2F	3.0 to 15.0	0.9 psi	0.9 psi
1950P-25-2F	4.0 to 25.0	0.7 psi	0.7 psi
1950P-50-2F	15.0 to 50	1.0 psi	1.5 psi

SPECIFICATIONS
Service: Air and non-combustible, compatible gases.
Wetted Materials: Consult factory.
Temperature Limits: -40 to 140°F (-40 to 60°C); 0 to 140°F (-17.8 to 60°C) for 1950P-8, 15, 25, and 50. -30 to 130°F (-34.4 to 54.4°C) for 1950-02.
Pressure Limits:
Continuous: 1950's - 45˝ w.c. (0.11 bar);
1950P's - 35 psi (2.41 bar); 1950P-50 only - 70 psi (4.83 bar).
Surge: 1950's - 10 psi (0.69 bar), 1950P's - 50 psi (3.45 bar), 1950P-50 only - 90 psi (6.21 bar).
Enclosure Rating: IP64, NEMA 3, 7 and 9.
Switch Type: Single-pole double-throw (SPDT).
Electrical Rating: 15 A @, 125, 250, 480 VAC, 60 Hz. Resistive 1/8 HP @ 125 VAC, 1/4 HP @ 250 VAC, 60 Hz.
Electrical Connections: 3 screw type, common, normally open and normally closed.
Process Connections: 1/8˝ female NPT.
Mounting Orientation: Diaphragm in vertical position. Consult factory for other position orientations.
Set Point Adjustment: Screw type on top of housing.
Weight: 3.25 lb (1.5 kg); 1950-02 model, 4.4 lb (2 kg).
Agency Approvals: CE, UL, CSA, FM.

RESPONSE TIME: Because of restrictive effect of flame arrestors, switch response time may be as much as 10-25 seconds where applied pressures are near set point.

DWYER INSTRUMENTS, INC.
P.O. BOX 373 • MICHIGAN CITY, INDIANA 46361, U.S.A.
Phone: 219/879-8000 www.dwyer-inst.com
Fax: 219/872-9057 e-mail: info@dwyer-inst.com



1950-02: 7-3/4″ (196.9) dia. x 4-11/32″ (110.3) depth. For complete dimensions request drawing 28-700175-00 from our Customer Service Department

1950 Switch Outline Dimensions

INSTALLATION

1. Select a location free from excess vibration and corrosive atmospheres where temperatures will be within the limits noted under Specifications on reverse. Switch may be installed outdoors or in areas where the hazard of explosion exists. See reverse for specific types of hazardous service.

2. Mount standard switches with the diaphragm in a vertical plane and with switch lettering and Dwyer nameplate in an upright position. Some switches are position sensitive and may not reset properly unless they are mounted with the diaphragm vertical.

3. Connect switch to source of pressure, vacuum or differential pressure. Metal tubing with 1/4″ O.D. is recommended, but any tubing which will not restrict the air flow can be used. Connect to the two 1/8″ female NPT pressure ports as noted below:

A. Differential pressures - connect pipes or tubes from source of greater pressure to high pressure port marked HIGH PRESS, and from source of lower pressure to low pressure port marked LOW PRESS.

B. Pressure only (above atmospheric pressure) - connect tube from source of pressure to high pressure port. The low pressure port is left open to atmosphere.

C. Vacuum only (below atmospheric pressure) - connect tube from source of vacuum to low pressure port. The high pressure port is left open to atmosphere.

4. To make electrical connections, remove the three hex head screws from the cover and after loosening the fourth captive screw, swing the cover aside. Electrical connections to the standard single pole, double throw snap switch are provided by means of terminals marked “COM” (common), “NO” (norm open), “NC” (norm closed). The normally open contacts close and the normally closed contacts open when pressure increases beyond the set point. Switch loads for standard models should not exceed the maximum specified current rating of 15 amps resistive. Switch capabilities decrease with an increase in ambient temperature, load inductance, or cycling rate. Whenever an application involves one or more of these factors, the user may find it desirable to limit the switched current to 10 amps or less in the interest of prolonging switch life.

ADJUSTMENT: To Change the Set point

1. Remove the plastic cap and turn the slotted Adjust-ment Screw at the top of the housing clockwise to raise the set point pressure and counter-clockwise to lower the set point. After calibration, replace the plastic cap and re-check the set point.

2. The recommended procedure for calibrating or checking calibration is to use a “T” assembly with three rubber tubing leads, all as short as possible and the entire assembly offering minimum flow restriction. Run one lead to the pressure switch, another to a manometer of known accuracy and appropriate range, and apply pressure through the third tube. Make final approach to the set point very slowly. Note that manometer and pressure switch will have different response times due to different internal volumes, lengths of tubing, fluid drainage, etc. Be certain the switch is checked in the position it will assume in use, i.e. with diaphragm in a vertical plane and switch lettering and Dwyer nameplate in an upright position.

3. For highly critical applications check the set point adjustment and if necessary, reset it as noted in step A.

MAINTENANCE

The moving parts of these switches need no maintenance or lubrication. The only adjustment is that of the set point. Care should be taken to keep the switch reasonably clean. Periodically the vent drain plug should be rotated, then returned to its original position. This will dislodge deposits which could accumulate in applications where there is excessive condensation within the switch. The Series 1950 Explosion-Proof Differential Pressure Switch is not field serviceable and should be returned if repair is needed (field repair should not be attempted and may void warranty). Be sure to include a brief description of the problem plus any relevant application notes. Contact customer service to receive a return goods authorization number before shipping.

 Printed in U.S.A. 3/05 FR# 26-440332-00 Rev. 10

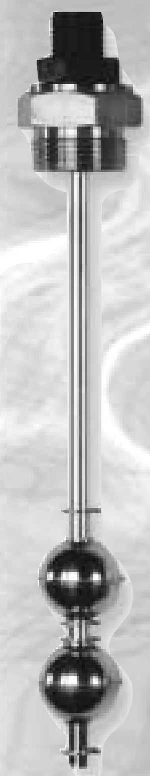
DWYER INSTRUMENTS, INC.
P.O. BOX 373 • MICHIGAN CITY, INDIANA 46361, U.S.A.
Phone: 219/879-8000 **www.dwyer-inst.com**
Fax: 219/872-9057 **e-mail: info@dwyer-inst.com**

Innovative Solutions

L500 Series Custom Switches with a Maximum Length of 11'

The L500 series level switches are individually designed from over 1,400 component parts to create a custom switch available in lengths from six inches (152 mm) to 11 feet (3.3 meters).

To specify, review the choices in mounting types, stem and mounting, float sizes, switching points and electrical specifications that appear on these pages.



L500

Product Configuration Choices:

Mounting & Materials: Select mounting size, mount and stem material, float material, switch type, and optional enclosure from **Table A.**

Float Size: Select float from **Table B.**

Switch Wiring: Select switch wiring from **Table C.**

Actuation Levels: Select switch actuation level(s) from **Table D.**

A. Component Choices L500:

Series	Mounting* Types		Mounting* & Stem Materials		Float Materials		Switch Types		Enclosures	
	04	½" NPT	01	Brass	02	Polypropylene (hollow)	20	20VA SPST	00	No enclosure
	06	1" NPT	02	Polypropylene	05	PVC	03	50VA SPST (standard)	01	Polypropylene NEMA 4
	07	1¼" NPT	05	PVC	08	316 SS	04	100VA SPST	02	Cast aluminum NEMA 4/7/9
	08	1½" NPT	08	316 SS	20	Buna-N	06	3VA SPDT		
L500	09	2" NPT							03	Cast Iron NEMA 4/7/9
	73	2" 150# ANSI Flange								
	75	3" 150# ANSI Flange								
	76	4" 150# ANSI Flange								

Example: **L500-0901-0803-00** = 2" NPT mounting; brass mounting & stem material; 316 SS float; 50VA SPST switches; no enclosure

**Other mountings and materials are available. Consult factory for details.*

Multiple-Stage Switches: **Vertical Mount**

Innovative Solutions

L500 Series Custom Switches with a Maximum Length of 11'

B. Float Sizes and Operating Specifications

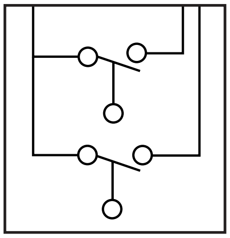
Float Materials	Dimensions	Available Mount Types	Temperature	Pressure	Minimum Specific Gravity
Polypropylene (hollow)	1.810" x 1.875"	04, 06, 09, 73, 75, 76	-40° to +150° F	50 psig	.55
316 stainless steel	1.5" x 1.3"	04, 06, 09, 73, 75, 76	-40° to +300° F	120 psig	.85
316 stainless steel	2" ball	04, 06, 09, 73, 75, 76	-40° to +300° F	750 psig	.75
Teflon (hollow)	2.150" x 1.980"	04, 06, 09, 73, 75, 76	-40° to +500° F	100 psig	.95
Buna-N	1.250" x 1.875"	04, 06, 07, 09, 73, 75, 76	-40° to +180° F	150 psig	.65
Buna-N	1.875" x 1.750"	04, 06, 09, 73, 75, 76	-40° to +180° F	150 psig	.65

C. Switch Wiring and Electrical Specifications

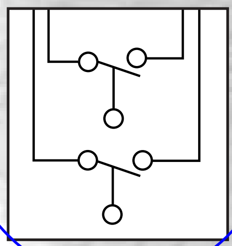
Each switching point requires one float. For special applications, a single float can be used to activate two switch points, though these points must have a minimum separation of ⅛" (3mm). The maximum number of actuation levels depends on the wiring type selected.

Ratings: 20, 50, or 100 VA @ 120 VAC SPST
50 VA @ 240 VAC SPST
100 W @ 240 VAC SPDT
Connection: 24" Free Leads
#22 AWG
Mounting Attitude: Vertical ±30˚

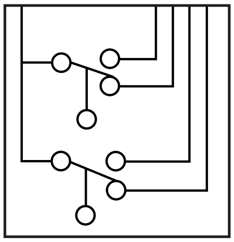
Group 1 SPST
One Common Wire



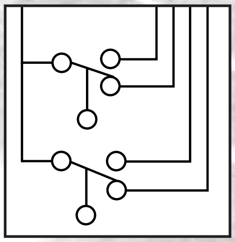
Group 2 SPST
Independent Circuits



Group 3 SPDT
One Common Wire



Group 4 SPDT
Independent Circuits



Switch Wiring Codes

Wiring Options	Group 1 SPST	Group 2 SPST		Group 3 SPDT		Group 4 SPDT		
Common Wire	Black	None		Black		None		
	NO/NC	NO or NC		NO	NC	Common	NO	NC
L1	Red	Red	Red	Red	White-Red	Red	White-Red	White-Black-Red
L2	Yellow	Yellow	Yellow	Yellow	White-Yellow	Yellow	White-Yellow	White-Black-Yellow
L3	Blue	Blue	Blue	Blue	White-Blue			
L4	Brown	Brown	Brown					
L5	Orange							
L6	Gray							

Innovative Solutions

L500 Series Custom Switches with a Maximum Length of 11'

D. Actuation Level Dimensions

A = 1½" (38mm) minimum distance from actuation point to inside surface of tank or mounting pad.

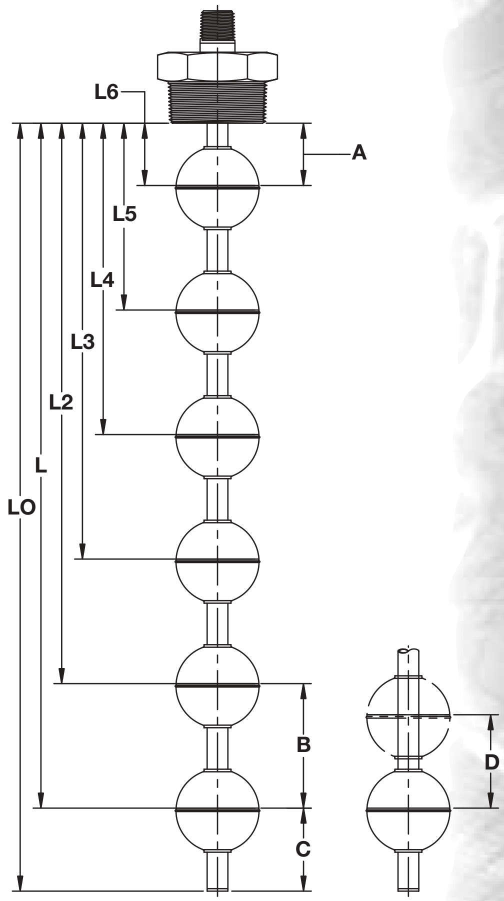
B = 3" (76mm) minimum distance between actuation levels.

C = 2" (51mm) minimum distance from end of unit to lowest actuation level.

D = ¼" (6mm) minimum distance between points when a single float is used to activate two switches. (One float can activate two switches when the lower switch is NC and the upper switch is NO).

Notes:

1. A, B, and C dimensions are based on a specific gravity of 1.0.
2. When using one float for two actuation positions, contact the factory for available switch ratings.
3. Actuation levels are calibrated on descending fluid level, with water as the fluid, unless otherwise specified.
4. Standard tolerance on actuation levels is ±⅛" (3mm).



Integrated Temperature Sensors

All Innovative Solutions L500, multi- level switches can be specially equipped with integrated temperature sensors. Please contact Innovative for more information.

Thermistor:	Variable resistance, continuous output
Thermocouple:	"Type K Junction" continuous readout
Thermostat:	Fixed set point for high/low alarm switching

Innovative Solutions

Multi-Point Liquid Level Switch

(L500 Large Size Vertical Mount)

Installation & Maintenance

General Information:

Switches should be installed securely and clear of obstructions so the float(s) are free to move with liquid level changes.

Switches should be mounted in an area of the tank free of turbulence or direct streams.

Operate only within listed electrical ratings.

Maintenance

Periodically inspect the float to be sure it is not coated or contaminated by any material or substance that would significantly change its weight or volume.

Important Points

- Always operate within specified temperature and pressure ratings. Possible surges in temperature and pressure should also be observed, (see table below).
- Only use with liquids compatible with the material of construction. (Consult factory for information).
- Changes in fluid temperature can affect switch set-points since density/specific gravity may vary with temperature.

General Temperature & Pressure Limits

Float Material	*Temperature*	*Pressure*
Polypropylene	150ºF	50 PSIG
Buna-N	180ºF	150 PSIG
Stainless Steel (1 ½”)	300ºF	120 PSIG
Stainless Steel (2” Ball)	300ºF	750 PSIG

Electrical Ratings and Wiring Diagrams

Reed switches used in *Innovative Solutions* level switches are hermetically sealed and a magnetically actuated SPST or SPDT rated as maximum power limits in Volt-Amps, (VA).

CAUTION: DO NOT EXCEED MAXIMUM LOAD RATINGS
Contact protection such as a diode, (DC), or resistor, (AC), should be used to suppress high transient voltages or in rush currents that may cause burning or welding of the switch contacts.

Switch Ratings—Maximum Loads (Resistive)

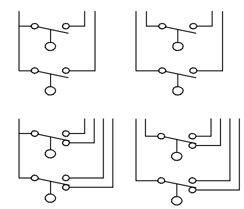
VA	Volts	Amps (AC)	Amps (DC)
50 (SPST)	0-50	0.5	0.5
	120	0.4	0.4
100 (SPST)	120	0.8	0.8
	240	0.2	0.2
3.0 (SPDT)	30 VDC		0.2

Group 1 SPST
One Common Wire

Group 2 SPST
Independent Circuits

Group 3 SPDT
One Common Wire

Group 4 SPDT
Independent Circuits



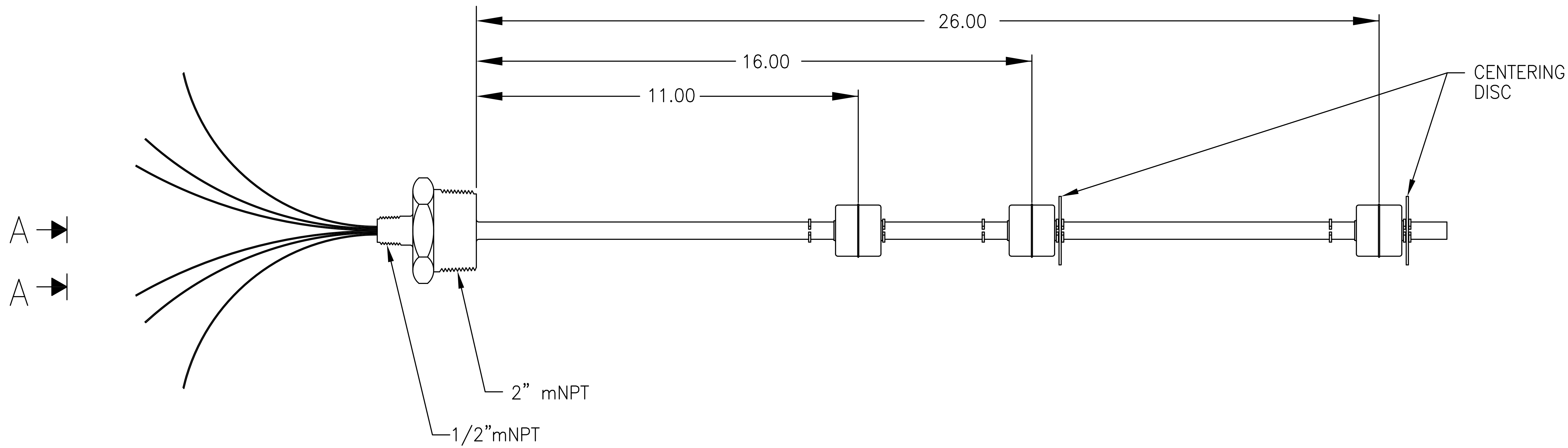
Note: Only two actuation points are shown in the diagrams above

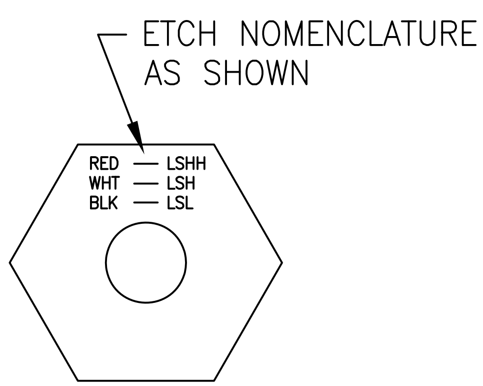
Wire Color Code Table

NOTE: More than one color designation denotes striped or multi-color wire jackets

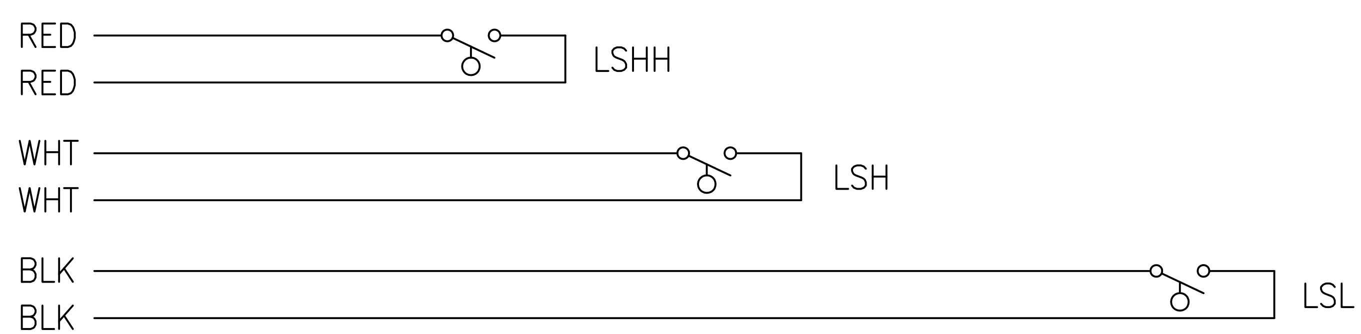
Common Wire	GROUP 1 Black	GROUP 2 None		GROUP 3 Black		GROUP 4 See Below		
	NO/NC	NO or NC		NO	NC	Common	NO	NC
Level 1	Red	Red	Red	Red	White/Red	Red	White/Red	White/Black/Red
Level 2	Yellow	Yellow	Yellow	Yellow	White/Yellow	Yellow	White/Yellow	White/ Black/ Yellow
Level 3	Blue	Blue	Blue	Blue	White/Blue	Blue	White/Blue	White/Black/ Blue
Level 4	Brown	Brown	Brown	Brown	White/Brown	Brown	White/Brown	White/Black/ Brown
Level 5	Orange	Orange	Orange	Orange	White/Orange	Orange	White/Orange	White/Black/ Orange
Level 6	Gray	Gray	Gray	Gray	White/Gray	Gray	White/Gray	White/Black/ Gray

Innovative Solutions, LLC 60 Great Hill Road Naugatuck, CT 06770 Ph: (203) 729-6434 Fax: (203) 729-6696
WWW.INNOVATIVESENSING.COM





VIEW A–A



WIRING SCHEMATIC

NOTE:

1. ALL MATERIAL TO BE 316 ST. ST'L.
2. SPECIFIC GRAVITY 0.6.
3. REED SWITCHES RATED AT 50VA, 125V.
4. SWITCH SHOULD BE IN THE DOWN POSITION FOR MEASUREMENT.
5. ALL WIRE TO BE 18 AWG., PVC JACKETED, 24" MIN. FREE LENGTH.

REV.	DESCRIPTION	DATE	APPR.
1	ADDED SECOND CENTERING DISC	3/21/02	PRS

REVISIONS

BISCO Environmental
Soil & Groundwater Remediation Equipment
Randolph, Massachusetts 02368

DRWN BY PRS DATE 05/29/01
CHK BY DATE
APPR BY DATE

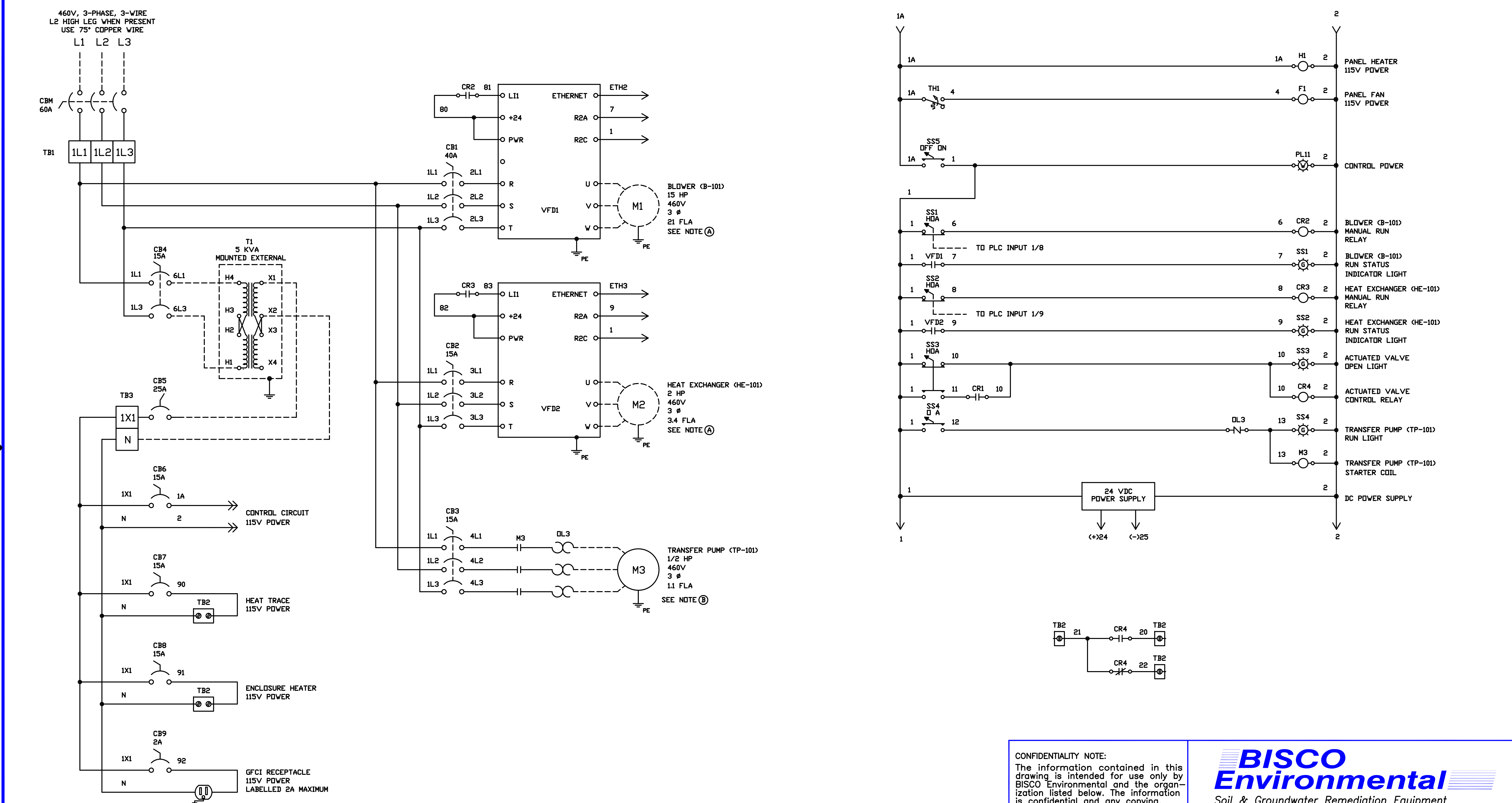
TITLE
PHASE SEPARATOR
3 LEVEL FLOAT SWITCH

JOB NO.

SCALE	SIZE	DWG NO.	SHEET	REV
NONE	B	3FLTSEPLEV	1 OF 1	1

APPENDIX E

CONTROL PANEL MANUALS AND DRAWINGS



NOTE (A): REMOVE JUMPER AND CONNECT MOTOR THERMISTER IF PRESENT

NOTE (B): BASED ON NFPA 70: NEC 2008 SET OVERLOAD RELAYS ACCORDING TO ACTUAL FLA AT INSTALLATION

NOTE (C): CUSTOMER IS RESPONSIBLE FOR PROPER GROUNDING/BONDING OF SYSTEM AT TIME OF INSTALLATION

UL LISTED 508A PANEL

REV.	DESCRIPTION	DATE	APPR.
2	ASBUILT	8/25/10	GWL
1	UPDATED PER CUSTOMER COMMENTS	6/29/10	GWL

REVISIONS

CONFIDENTIALITY NOTE:
The information contained in this drawing is intended for use only by BISCO Environmental and the organization listed below. The information is confidential and any copying, distribution or dissemination without the consent of BISCO Environmental is STRICTLY PROHIBITED.

BISCO Environmental
Soil & Groundwater Remediation Equipment
Taunton, Massachusetts 02780

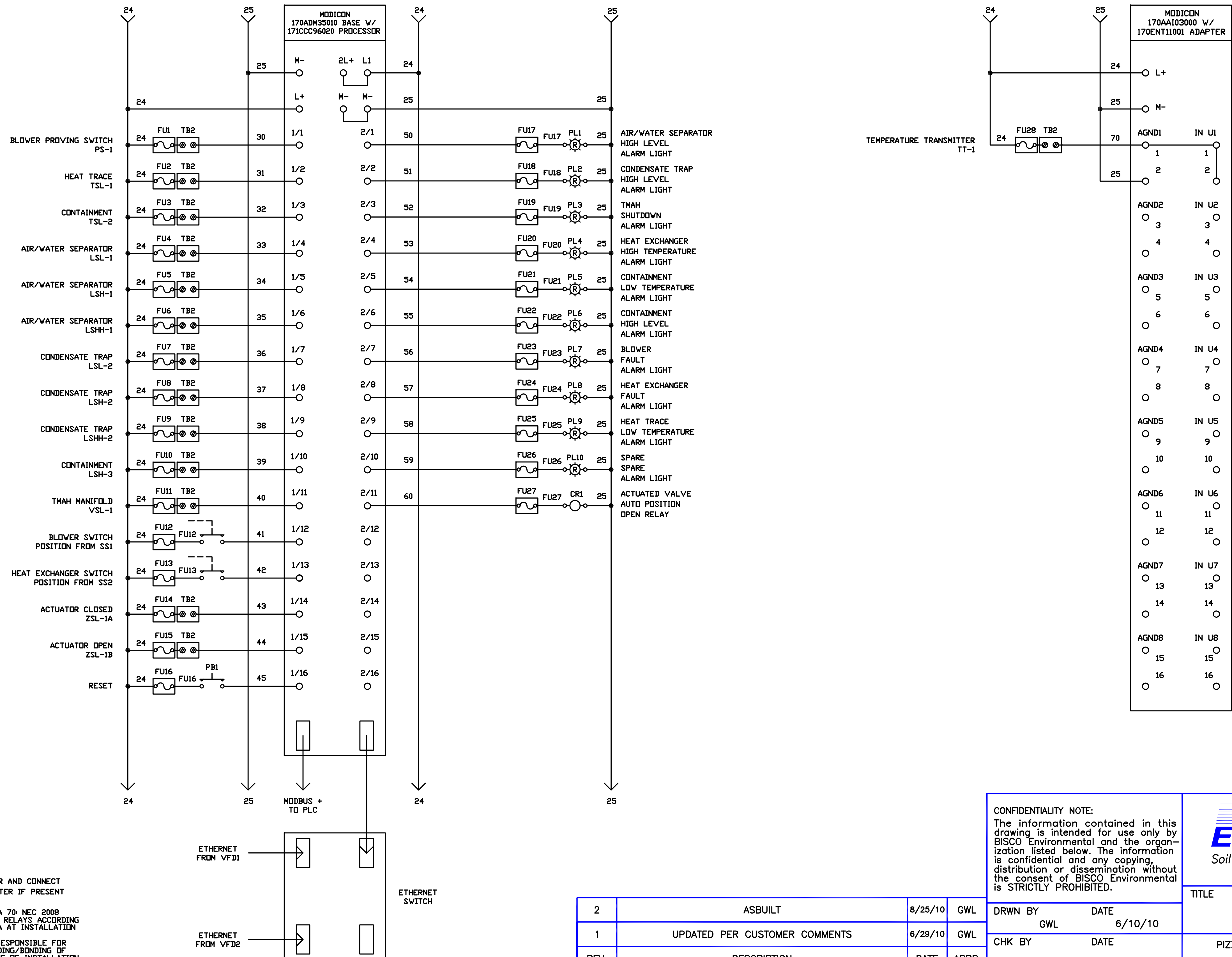
DRWN BY GWL DATE 6/10/10
CHK BY DATE
APPR BY DATE

TITLE: CONTROL PANEL

PIZZAGALLI CONSTRUCTION COMPANY
IBM EAST FISHKILL

JOB NO. 12823

SCALE	SIZE	DWG NO.	SHEET	REV
N/A	B	12823PGS	1 OF 4	2



NOTE Ⓐ: REMOVE JUMPER AND CONNECT MOTOR THERMISTER IF PRESENT

NOTE Ⓑ: BASED ON NFPA 70: NEC 2008 SET OVERLOAD RELAYS ACCORDING TO ACTUAL FLA AT INSTALLATION

NOTE Ⓒ: CUSTOMER IS RESPONSIBLE FOR PROPER GROUNDING/BONDING OF SYSTEM AT TIME OF INSTALLATION

UL LISTED 508A PANEL

REV.	DESCRIPTION	DATE	APPR.
2	ASBUILT	8/25/10	GWL
1	UPDATED PER CUSTOMER COMMENTS	6/29/10	GWL

REVISIONS

BISCO Environmental
Soil & Groundwater Remediation Equipment
Taunton, Massachusetts 02780

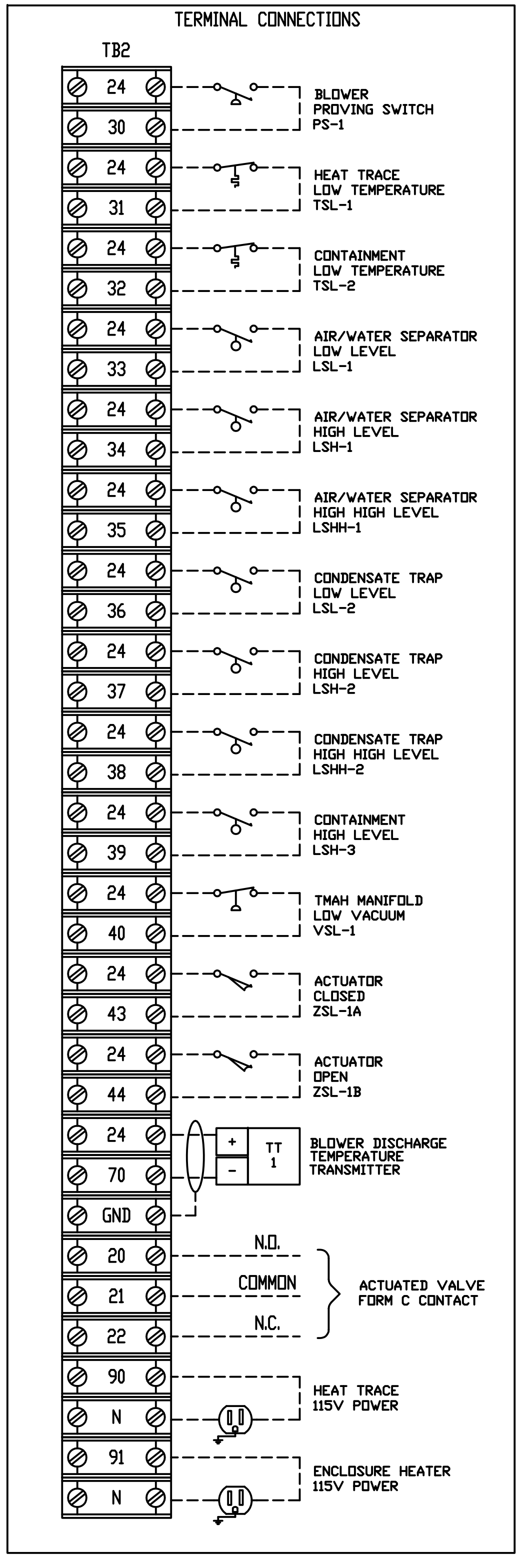
DRWN BY GWL	DATE 6/10/10
CHK BY	DATE
APPR BY	DATE

TITLE CONTROL PANEL

PIZZAGALLI CONSTRUCTION COMPANY
IBM EAST FISHKILL

JOB NO. 12823

SCALE	SIZE	DWG NO.	SHEET	REV
N/A	B	12823PGS	2 OF 4	2



COMPONENT	QTY	TYPE	MODEL #	DESCRIPTION
Control Enclosure (MCP)	1	Hammond	EN4SD483616GY	NEMA 4, Single door, 48"H x 36"W x 16"D
Control Enclosure (MCP)	1	Hammond	EP4836	48"H x 36"W Sub panel
Control Enclosure (MCP)	1	Hammond	2WSP4836	48"H x 36"W Swing Panel
Filter Fan	1	Phannenberg	116 4315 4055	PF 43000 IP55 Filter Fan
Exhaust Filter	1	Phannenberg	117 4000 4055	PFA 40000 IP55 Exhaust Filter
Rain Hood	2	Phannenberg	181 0200 0015	ANSI 61 Gray NEMA 3R size 3 and 4
Thermostat (TH1)	1	Phannenberg	17121000010	FLZ 530 32-140 F Thermostat
Panel Heater	1	Hammond	FLHTF400A115	400W Heater w/Thermostat
Circuit Breaker (CBM)	1	Cutler Hammer	EHD3060L	60A, 480V, 3 Pole
Circuit Breaker (CBM)	1	Cutler Hammer	FHMVD12B	Disconnect Handle for CBM
Terminal Block (TB1)	1	Gould	63133	Distribution Block
Terminal Block (TB3)	1	Gould	63132	Distribution Block
Terminal Block (TB1&3)	5	Gould	08530	Finger Safe Cover
Circuit Breaker (CB1)	1	ABB	T1N040TL	40A, 480V, 3 Pole
Circuit Breaker (CB2-3)	2	ABB	S203P-K15	15A, 480V, 3 Pole
Circuit Breaker (CB4)	1	ABB	S202P-K15	15A, 480V, 2 Pole
Circuit Breaker (CB5)	1	Allen Bradley	1492-MCAA125	25A, 120V, 1 Pole
Circuit Breaker (CB9)	1	Allen Bradley	1489-A1C020	2A, 115V, 1 Pole
Circuit Breaker (CB6-8)	3	Allen Bradley	1492-MCAA115	15A, 15V, 1 Pole
Transformer (T1)	1	Hammond	C1F005LES	5kVA 480 X 120VAC
HOA Switch (SS1-3)	3	Allen Bradley	800FM-LSM33	Selector switch operator, 3-pos., Illum, Green
HOA Switch (SS4)	1	Allen Bradley	800FM-LSM23	Selector switch operator, 2-pos., Illum, Green
HOA Switch (SS5)	1	Allen Bradley	800FM-SM22	Selector switch operator, 2-position, Black
HOA Switch (SS1-4)	4	Allen Bradley	800F-MN5G	Latch w/Pilot light, LED, green
HOA Switch (SS5, PB1)	2	Allen Bradley	800F-ALM	Latch
HOA Switch (SS1-5,PB1)	7	Allen Bradley	800F-X10	Normally open contact
Pilot Light (PL1-10)	1	Allen Bradley	800FP-P4	Pilot light, LED, RED
Pilot Light (PL1-10)	1	Allen Bradley	800F-PN5R	Pilot light, LED, RED
Pilot Light (PL11)	1	Allen Bradley	800FP-P7	Pilot light, LED, white
Pilot Light (PL11)	1	Allen Bradley	800F-PN5W	Pilot light, LED, white
Control Relay (CR1)	1	Idec	RU4S-D24	Control relay, 24VDC, 4-pole
Control Relay (CR2-4)	3	Idec	RU4S-A110	Control relay, 120V, 4-pole
Control Relay (CR1-4)	4	Idec	SY4S-05	Control relay socket
Fused Terminal Block	28	Allen Bradley	1492-WFB424	Fused Terminal Block
Fuse	28	Bussman	BUS GMA2A	22mm Glass Fuse - 250V Max, 2A
Drive (VFD1)	1	SquareD	ATV61HD11N4	Size 4 15HP 460VAC Drive
Drive (VFD2)	1	SquareD	ATV61HU15N4	Size 1 2HP 460VAC Drive
Drive (VFD1-2)	2	SquareD	VW3A3316	VFD Ethernet Card
Drive (VFD1-2)	2	SquareD	VW3A1102	VFD Keypad Remote Mount Kit
Drive (VFD1-2)	2	SquareD	VW3A1104R30	VFD Keypad Cable
Starter (M3)	1	Allen Bradley	100-C09D10	Contactor 5HP 480VAC
Starter (M3)	1	Allen Bradley	193-ED1CB	1-5A Overload
DC Power Supply	1	Phoenix	QUINT-PS-1AC/24DC/5	24VDC Power Supply 5A w/Boost
Programmable Controller	1	SquareD	171CCC96020	MODICON Processor
Programmable Controller	1	SquareD	172PNN21022	MODICON Modbus Adapter
Programmable Controller	1	SquareD	170ADM35010	MODICON Discrete I/O Module
Programmable Controller	1	SquareD	170AAI03000	MODICON Analog Module
Programmable Controller	1	SquareD	170ENT11001	MODICON Ethernet Module
Programmable Controller	6	SquareD	170XTS00100	MODICON Terminal Strip
Programmable Controller	1	SquareD	499NEH10410	MODICON Ethernet Hub

NOTE (A): REMOVE JUMPER AND CONNECT MOTOR THERMISTER IF PRESENT

NOTE (B): BASED ON NFPA 70: NEC 2008 SET OVERLOAD RELAYS ACCORDING TO ACTUAL FLA AT INSTALLATION

NOTE (C): CUSTOMER IS RESPONSIBLE FOR PROPER GROUNDING/BONDING OF SYSTEM AT TIME OF INSTALLATION

UL LISTED 508A PANEL

REV.	DESCRIPTION	DATE	APPR.
2	ASBUILT	8/25/10	GWL
1	UPDATED PER CUSTOMER COMMENTS	6/29/10	GWL

REVISIONS

BISCO Environmental
Soil & Groundwater Remediation Equipment
Taunton, Massachusetts 02780

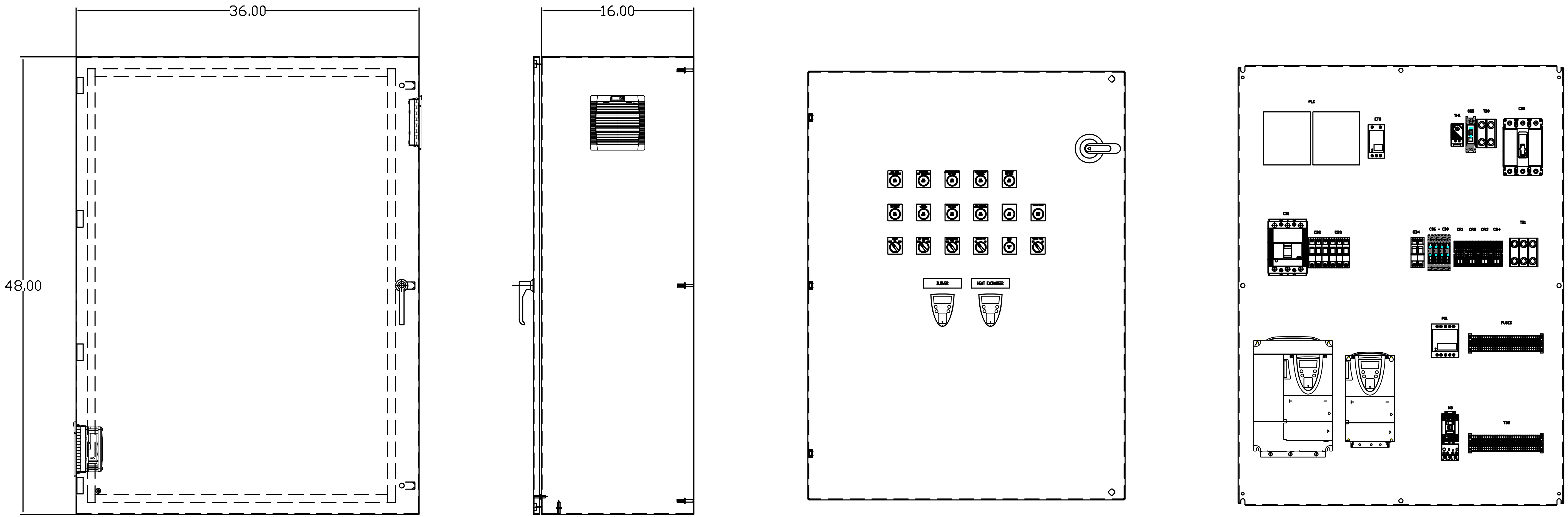
DRWN BY GWL DATE 6/10/10
CHK BY DATE
APPR BY DATE

TITLE
CONTROL PANEL

PIZZAGALLI CONSTRUCTION COMPANY
IBM EAST FISHKILL

JOB NO. 12823

SCALE	SIZE	DWG NO.	SHEET	REV
N/A	B	12823PGS	3 OF 4	2



SWING PANEL

SUBPLATE

NOTE (A): REMOVE JUMPER AND CONNECT MOTOR THERMISTER IF PRESENT

NOTE (B): BASED ON NFPA 70; NEC 2008 SET OVERLOAD RELAYS ACCORDING TO ACTUAL FLA AT INSTALLATION

NOTE (C): CUSTOMER IS RESPONSIBLE FOR PROPER GROUNDING/BONDING OF SYSTEM AT TIME OF INSTALLATION

UL LISTED 508A PANEL

REV.	DESCRIPTION	DATE	APPR.
2	ASBUILT	8/25/10	GWL
1	UPDATED PER CUSTOMER COMMENTS	6/29/10	GWL

REVISIONS

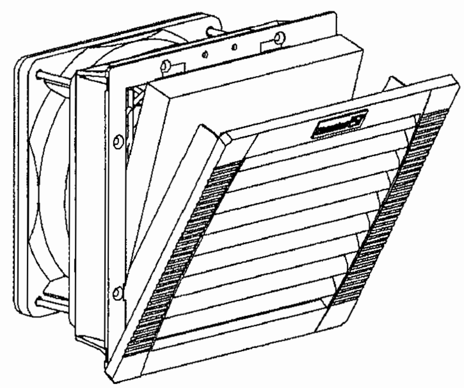
CONFIDENTIALITY NOTE:
The information contained in this drawing is intended for use only by BISCO Environmental and the organization listed below. The information is confidential and any copying, distribution or dissemination without the consent of BISCO Environmental is STRICTLY PROHIBITED.

BISCO Environmental
Soil & Groundwater Remediation Equipment
Taunton, Massachusetts 02780

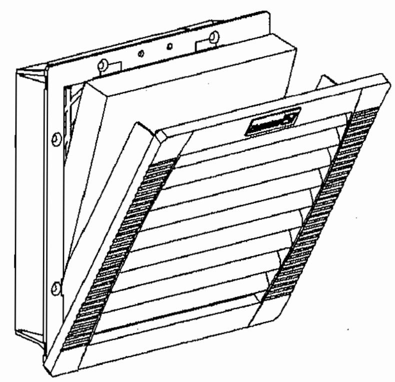
DRWN BY GWL	DATE 6/10/10	TITLE CONTROL PANEL			
CHK BY	DATE	PIZZAGALLI CONSTRUCTION COMPANY IBM EAST FISHKILL		JOB NO. 12823	
APPR BY	DATE	SCALE N/A	SIZE B	DWG NO. 12823PGS	SHEET 4 OF 4 / REV 2

Pfannenberg Filterfan 4th Generation

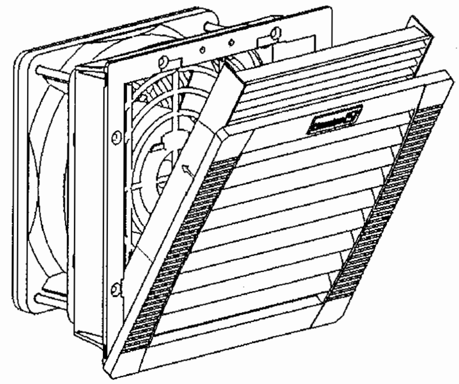
Ⓓ Montage- und Betriebsanleitung
Ⓖⓑ Installation- and operating instructions
Ⓕ Notice de montage et d´utilisation
Ⓝⓛ Montage- en gebruikshandleiding
Ⓢ Installations och bruksanvisning
Ⓘ Istruzioni di montaggio e per l´uso
Ⓔ Instrucciones de montaje y para uso
RUS Инструкция по установке и эксплуатации



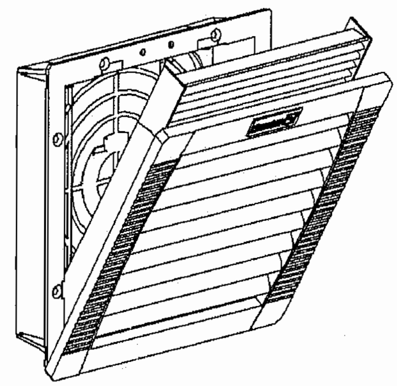
IP54/ TYPE 12 PF/ PF EMC



IP54/ TYPE 12 PFA/ PFA EMC



IP55/ TYPE 12 PF/ PF EMC



IP55/ TYPE 12 PFA/ PFA EMC

Ⓓ Lesen Sie diese Anweisung und bewahren Sie diese auf.
Ⓖⓑ Read and save this instruction.
Ⓕ Lisez et sauvegardez ces instructions.
Ⓝⓛ Deze instructies lezen en opslaan.
Ⓢ Läs och spara dessa anvisningar.
Ⓘ Legga e salvi queste istruzioni.
Ⓔ Lea y salve estas instrucciones.
RUS Прочитайте, пожалуйста, данную инструкцию и сохраните ее

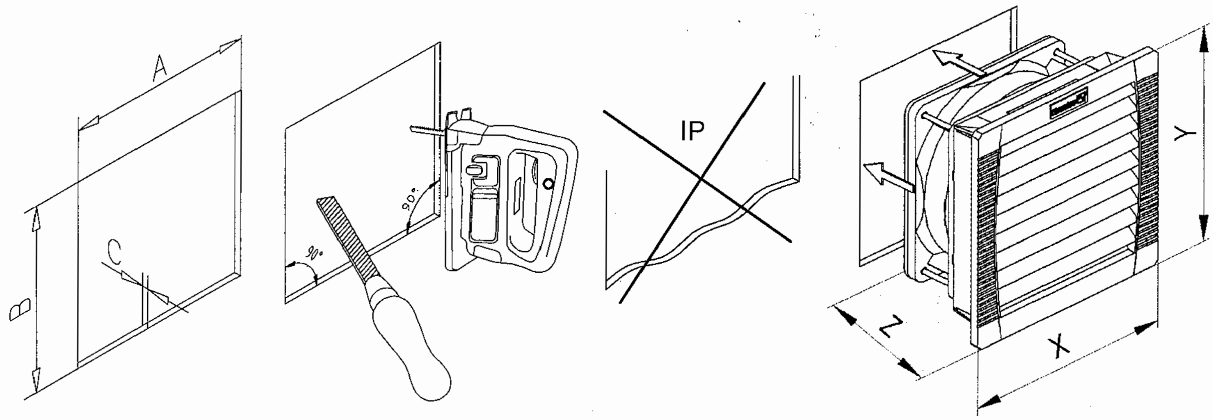
Pfannenberg
ELECTRO-TECHNOLOGY FOR INDUSTRY

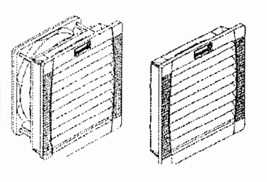
Stand 05.2007
085408082 e

www.filterfan.com

Ⓓ Ausschnitte und Abmessungen
Ⓖⓑ Cut outs and dimensions
Ⓕ Découpes de montage et dimensions
ⓃⓁ Uitsparingen en afmetingen

Ⓢ Urklipp och dimensioner
Ⓘ Dima di foratura e dimensioni
Ⓔ Plantillas y dimensiones
RUS Монтажные вырезы и габаритные размеры



		A = B mm(inch)		X = Y mm(inch)	Z mm(inch)		
		Standard	EMC		PF		PFA
		C ≤ 2(0,08") = A $^{+1(0,04")}_{0}$	±0,5 (0,02")		DC	AC	
		C >2(0,08") ≤ 3(0,12") = A $^{+2(0,08")}_{+1(0,04")}$					
PF 11000	PFA 10000	92($3\frac{5}{8}$")	93($3\frac{21}{32}$")	109($4\frac{19}{64}$")	53($2\frac{3}{32}$")	66($2\frac{19}{32}$")	23($\frac{29}{32}$")
PF 22000	PFA 20000	125($4\frac{59}{64}$")	126,5($4\frac{63}{64}$")	145($5\frac{45}{64}$")	69($2\frac{23}{32}$")	75($2\frac{61}{64}$")	31($1\frac{7}{32}$")
PF 32000	PFA 30000	177($6\frac{31}{32}$")	178 (7")	202($7\frac{61}{64}$")	87($3\frac{27}{64}$")	93($3\frac{43}{64}$")	40($1\frac{37}{64}$")
PF 42500	PFA 40000	223($8\frac{25}{32}$")	224($8\frac{53}{64}$")	252($9\frac{59}{64}$")	103($4\frac{1}{16}$")		44($1\frac{47}{64}$")
PF 43000					103($4\frac{1}{16}$")	119($4\frac{11}{16}$")	
PF 65000	PFA 60000	291($11\frac{29}{64}$")	292($11\frac{1}{2}$")	320($12\frac{19}{32}$")	157($6\frac{3}{16}$")		46($1\frac{13}{16}$")
PF 66000							
PF 67000							

Ⓓ ACHTUNG: Nur in richtiger Einbaulage und bei Nicht-Zerstören der Dichtung ist IP 54 / 55 gewährleistet.
EMC Funktionsgewährleistung nur bei elektrisch leitfähiger Verbindung zwischen EMV- Schirmblech und Montageausschnitt.

Ⓖⓑ CAUTION: The degree of protection IP 54 / 55 cannot be guaranteed unless the correct installation position and a non-destroyed sealing are ensured.
EMC Function cannot be guaranteed unless there is a conductive connection between the EMC-shield and the mounting cut out

Ⓕ ATTENTION: IP 54 ne peut pas être garantie à moins qu'une position d'installation correcte et une étanchéite intacte soient assurées.
CEM La fonction n'est garantie que dans le cas d'un contact électroconducteur entre la tôle de protection CEM et la découpe pour le montage.

ⓃⓁ OPPASSEN: er us slechts sprake van klasse IP 54 / 55, als de mantage ruimtelijk precies op de voorgeschreven manier uitgevoerd is en als de afdichting niet beschadigd is.
EMC De functiegarantie geldt uitsluitend als er tussen de EMC-afscherming en de montage-uitsnijding een elektrisch geleidende verbinding bestaat.

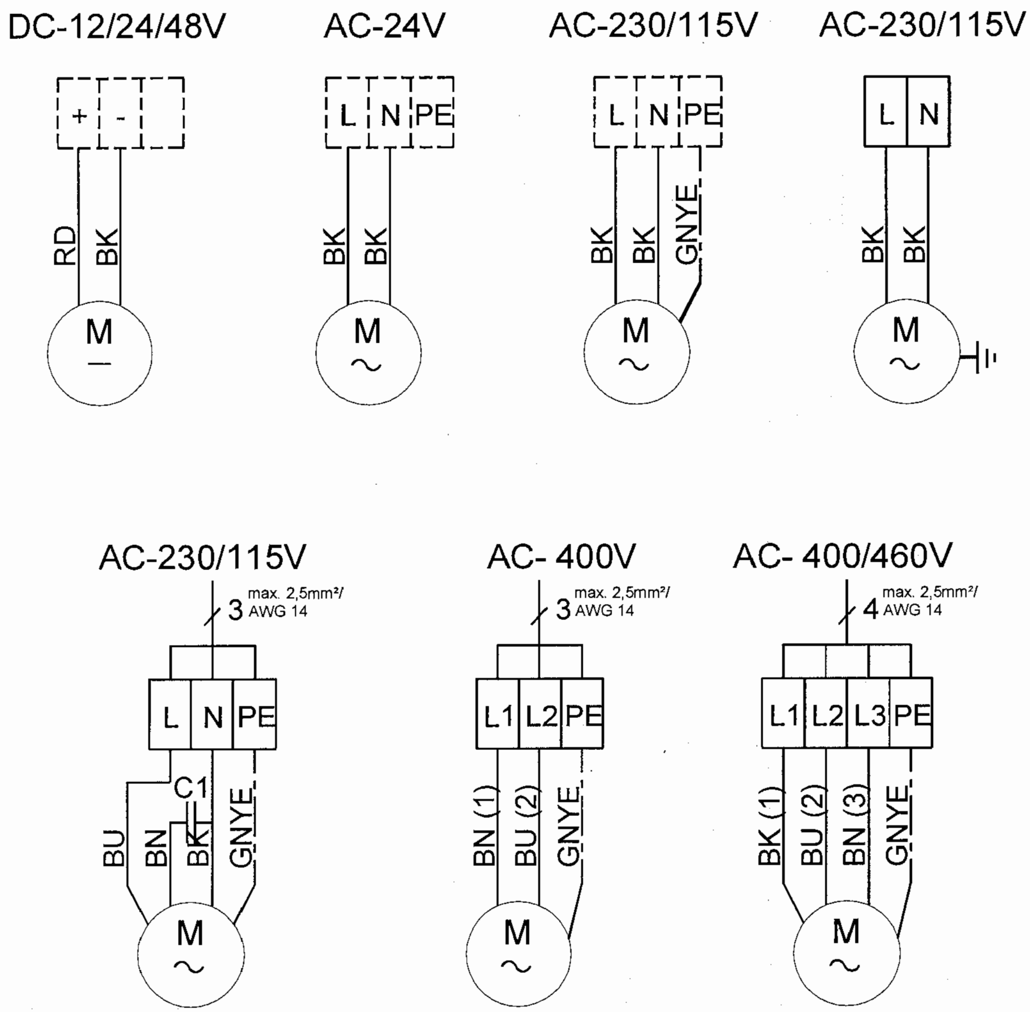
Ⓢ VARNING: IP 54 / 55 gäller endast vid rätt monteringdläge och vid hel packning.
EMC Funktionsgarantin gäller endast under förutsättning att det finns en elektriskt ledande förbindelse mellan EMC-skärmplåten och monteringsutskärningen

Ⓘ ATTENZIONE: Il grado di protezione IP 54 / 55 può essere garantito esclusivamente tramite una posizione di montaggio corretta e non interferendo con la guarnizione die tenuta.
EMC Il funzionamento è garantito solo in caso di possibilità di collegamento elettricamente conducibile fra lo schermo in lamiera EMC e l'apertura di montaggio.

Ⓔ PRECAUCION: La clase de protección IP 54 / 55 puede ser garantizida solamente si la hunta está instalada correctamente y sin destrucción.
EMC Sólo se garantiza el funcionamiento con una conexión eléctrica conductiva entre la chapa de proteccion EMC y el recorte de montaje.

RUS Внимание: Степень защиты IP 54 / 55 может быть гарантирована только при правильной установке и сохранности уплотнения.
EMC Функционирование возможно при наличии токопроводящего соединения между уплотнительной лентой EMC и монтажной стеной.

D Elektrischer Anschluss
GB Power connection
F Branchement électrique
NL Elektrische aansluiting
S Elanslutning
I Allacciamento elettrico
E Conexión de energía
RUS Электрическое подключение



D Mindestabstand zwischen Lichtbogen bildenden Bauteilen und Filter: 30,5cm (12") (UL508A sec. 22)
GB Minimum distance of 30,5cm (12") between arcing parts and filters (acc. UL508A sec. 22)
F Distance minimale entre les pièces formant un arc et les filtres: 30,5 cm (12") (UL508A sec. 22)
NL Minimum afstand tussen lichtbogen vormende componenten en filters: 30,5cm (12") (UL508A sec. 22)
S Minsta avstånd mellan de ljusbågsbildande delar och filtret: 30,5 cm (12") (UL508A sec. 22)
I Distanza minima fra gli elementi che formano l'arco e il filtro: 30,5cm (12") (UL508A sec. 22)
E Distancia mínima entre los componentes del arco eléctrico y los filtros: 30,5 cm (12") (UL508A sec. 22)
RUS Минимальное расстояние между деталями, образующими электродугу, и фильтром: 30,5 см (12") (UL508A sec. 22)

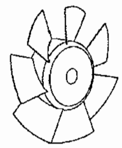
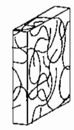
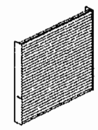
Ⓓ Technische Daten
Ⓖ Technical data
Ⓕ Caractéristiques Techniques
Ⓝ Technische gegevens
Ⓢ Tekniska data
Ⓘ Dati tecnici
Ⓔ Datos técnicos
Ⓡ Технические данные

	U +/- DC	U ~ 50/60 Hz	P	I	°C °F		Kg
	V	V	W	A			standard (EMC)
PF 11.000	12	--	2,4	0,2	-15.. + 55°C + 5.. +131°F	6A	0,16 (0,19)
PF 11.000	24	--	2,4	0,1			
PF 11.000	48	--	2,6	0,05			
PF 11.000	--	24	12/11	0,5/0,5			0,55 (0,58)
PF 11.000	--	115	12/11	0,15/0,15			
PF 11.000	--	230	12/11	0,07/0,06			
PF22.000	12	--	5	0,42	-15.. + 55°C + 5.. +131°F	6A	0,44 (0,49)
PF22.000	24	--	5	0,21			
PF22.000	48	--	5	0,1			
PF22.000	--	24	20/20	1,05/1,02			0,7 (0,76)
PF22.000	--	115	20/20	0,235/0,23			
PF22.000	--	230	19/18	0,12/0,18			
PF 32.000	12	--	5	0,42	-15.. + 55°C + 5.. +131°F	6A	0,61 (0,7)
PF 32.000	24	--	5	0,21			
PF 32.000	48	--	5	0,1			
PF 32.000	--	115	20/20	0,235/0,23			0,87 (0,96)
PF 32.000	--	230	19/18	0,12/0,18			
PF 42.500	12	--	6	0,5	-15.. + 55°C + 5.. +131°F	6A	0,92 (1,08)
PF 42.500	24	--	4,7	0,2			
PF 42.500	48	--	4,6	0,1			
PF 42.500	--	115	18/17	0,25/0,25			1,18 (1,34)
PF 42.500	--	230	18/17	0,12/0,1			
PF 43.000	12	--	12	1	-15.. + 55°C + 5.. +131°F	6A	1,51 (1,77)
PF 43.000	24	--	12	0,5			
PF 43.000	48	--	12	0,25			
PF 43.000	--	115	40/40	0,5/0,5			1,67 (1,83)
PF 43.000	--	230	45/39	0,32/0,26			
PF 43.000	--	400	41/38	0,13/0,13			
PF 65.000	--	115	75/90	0,66/0,8	-15.. + 55°C + 5.. +131°F	6A	3,2 (3,43)
PF 65.000	--	230	65/80	0,3/0,36			
PF 66.000	--	115	110/160	0,96/1,4	-15.. + 55°C + 5.. +131°F	6A	3,2 (3,43)
PF 66.000	--	230	115/150	0,51/0,66			
PF 66.000	--	400/460	120/155	0,26/0,25			
PF 67.000	--	115	140/195	1,23/1,71	-15.. + 55°C + 5.. +131°F	6A	3,7 (3,93)
PF 67.000	--	230	135/215	0,59/1			
PF 67.000	--	400/460	140/170	0,35/0,425			

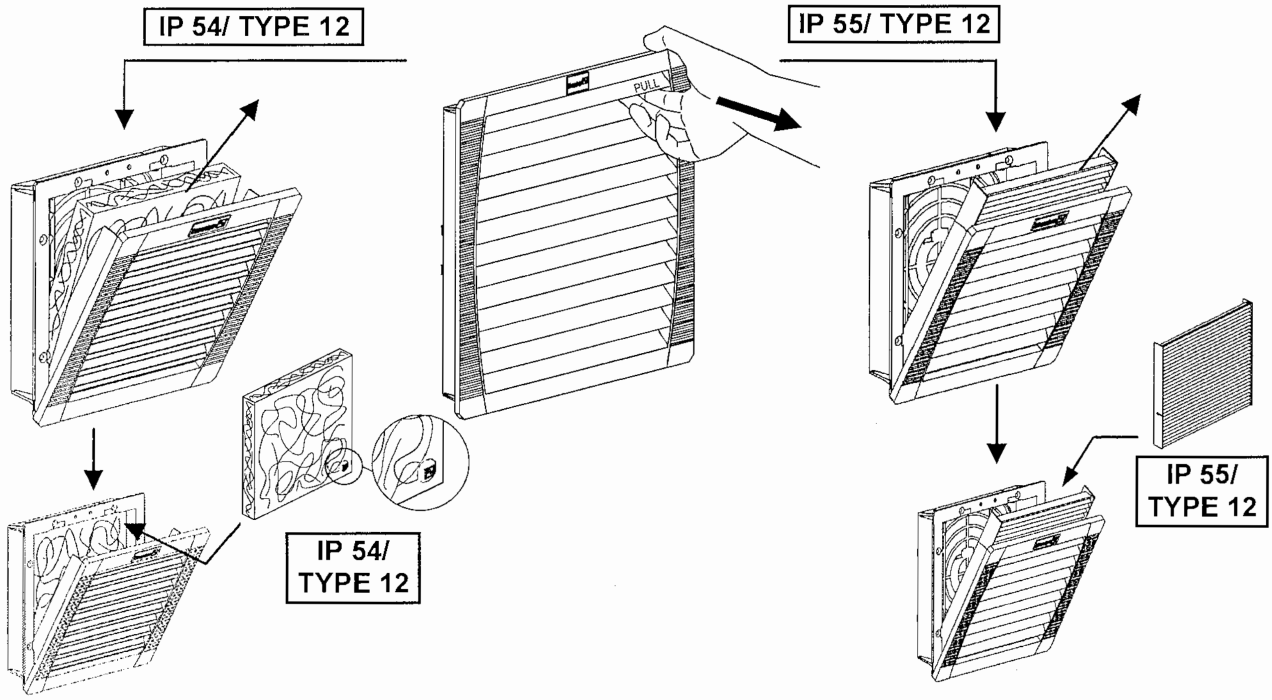
PFA 10.000	--	--	-15.. + 55°C + 5.. +131°F	--	0,06 (0,09)
PFA 20.000					0,12 (0,18)
PFA 30.000					0,26 (0,35)
PFA 40.000					0,46 (0,62)
PFA 60.000					0,7 (0,93)

Ⓓ Ersatzteilbeschaffung
ⒼⒷ Ordering spare parts
Ⓕ Approvisionnement en pièces détachées
ⓃⓁ Bestelling van onderdelen
Ⓢ Beställning av reservdelar
Ⓘ Fornitura delle parti di ricambio
Ⓔ Adquisición de repuestos
(RUS) Приобретение запасных деталей

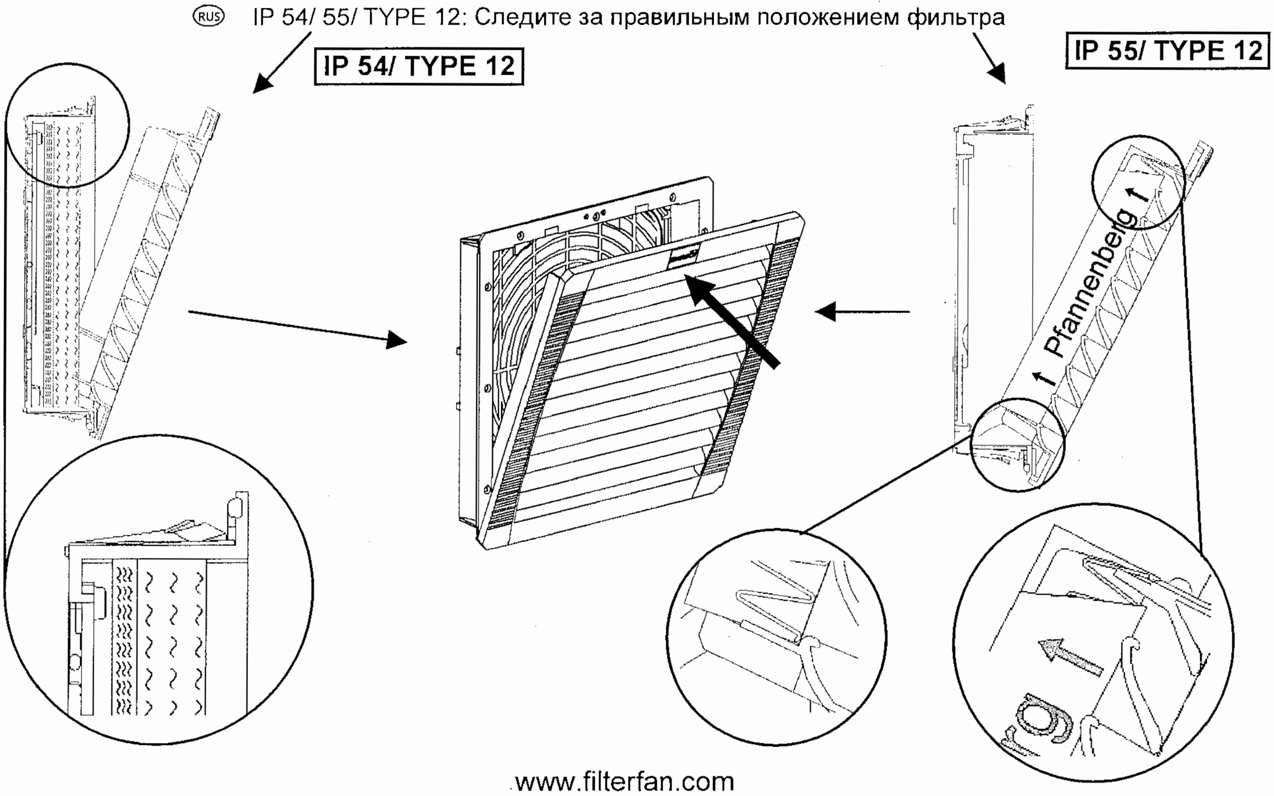
www.filterfan.com · spareparts@pfannenberg.com

	U +/- DC	U ~ 50/60 Hz		IP54/ TYPE 12  5x	IP 55/ TYPE 12  5x
PF 11.000	12V	-	18611000036	18611600029	--
	24V	-	18611000039		
	48V	-	18611000042		
	-	24V	18611000005		
	-	115V	18611000028		
	-	230V	18611000032		
PFA 10.000	--	--	--		
PF 22.000	12V	-	18611000025	18611600030	18611600034
	24V	-	18611000026		
	48V	-	18611000027		
	-	24V	18611000006		
	-	115V	18611000009		
	-	230V	18611000016		
PFA 20.000	--	--	--		
PF 32.000	12V	-	18611000025	18611600031	18611600035
	24V	-	18611000026		
	48V	-	18611000027		
	-	24V	18611000006		
	-	115V	18611000009		
	-	230V	18611000016		
PFA 30.000	--	--	--		
PF 42.500	12V	-	18611000037	18611600032	18611600036
	24V	-	18611000040		
	48V	-	18611000054		
	-	115V	18611000029		
	-	230V	18611000033		
PF 43.000	12V	-	18611000055		
	24V	-	18611000056		
	48V	-	18611000057		
	-	115V	18611000012		
	-	230V	18611000019		
	-	400V	18611000022		
PFA 40.000	--	--	--		
PF 65.000	-	115V	18611000047	18611600033	18611600037
	-	230V	18611000044		
PF 66.000	-	115V	18611000048		
	-	230V	18611000045		
	-	400/460V	18611000050		
PF 67.000	-	115V	18611000049		
	-	230V	18611000046		
	-	400/460V	18611000051		
PFA 60.000	--	--	--		

(D) Filterwechsel / Wartung
(GB) Filter change / Maintenance
(F) Remplacement de la cartouche Filtrante / Entretien
(NL) Filter vervanging / Onderhoud
(S) Fliterbyte / Underhåll
(I) Filtri di ricambio / Manutenzione
(E) Cambio de filtro / Mantenimiento
(RUS) Замена фильтра/ Техническое обслуживание

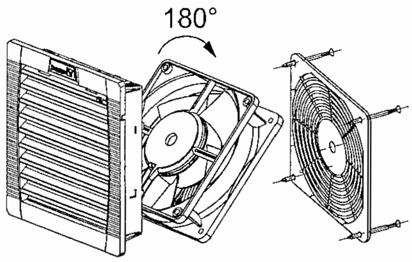


(D) IP 54/ 55/ TYPE 12: Auf korrekte Einbaulage des Filters achten
(GB) IP 54/ 55/ TYPE 12: Make sure that the filter is installed in the proper position.
(F) IP 54/ 55/ TYPE 12: Veillez à insérer correctement le filtre
(NL) IP 54/ 55/ TYPE 12: Op correcte inbouwpositie van het filter letten
(S) IP 54/ 55/ ZYPE 12: Beakta korrekt monteringsläge för filtret
(I) IP 54/ 55 /TYPE 12: Rispettare la corretta posizione di montaggio del filtro.
(E) IP 54/ 55 /TYPE 12: Procure que la posición de montaje del filtro sea la correcta
(RUS) IP 54/ 55/ TYPE 12: Следите за правильным положением фильтра

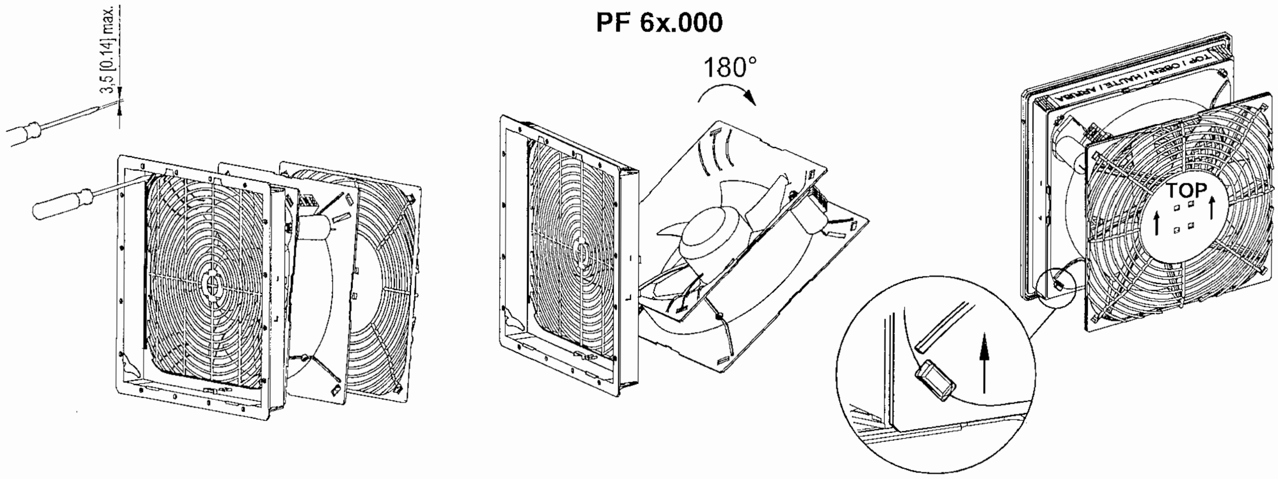


(D) Wechsel der Luftförderrichtung
(GB) Changing the air flow direction
(F) Changement de la direction de l'air
(NL) Omwisselen van de luchttransportrichting
(S) Ändring av riktning för luftmatning
(I) Cambio di direzione del flusso d'aria
(E) Cambio de dirección del flujo de aire
(RUS) Изменение направления движения воздуха

PF 1x.000 – PF 4x.000



PF 6x.000



(D) Verwenden Sie **ausschließlich Original Pfannenberg Ersatzteile**, anderenfalls erlöschen Gewährleistung und Zulassungen. Weiterhin sind bei Nichtverwendung der Original Ersatzteile Schutzarten und Leistungsdaten nicht mehr sichergestellt.

(GB) Warranty and licenses **are limited to original Pfannenberg spare parts** and become void if other spare parts are used. Furthermore, ingress protection and capacity levels are no longer ensured if original Pfannenberg spare parts are not used.

(F) Veuillez utiliser **exclusivement les pièces détachées d'origine de Pfannenberg**, sinon la garantie et les homologations ne sont plus applicables. Il en va de même pour les types de protection et les caractéristiques de performance.

(NL) Gebruik **uitsluitend originele onderdelen van Pfannenberg**, omdat anders garantiewaarborgen en certificeringen vervallen. Tevens zijn bij het niet gebruiken van originele onderdelen beveiligingsgraden en prestatiespecificaties niet langer gewaarborgd.

(S) Använd **uteslutande Pfannenbergs original reservdelar**, annars upphör garantin att gälla. Vidare kan eventuella fel eller reparationer som beror på att inte original Pfannenberg reservdelar används leda till att skyddsklass och effektdata inte längre säkerställas.

(I) Utilizzare **esclusivamente parti di ricambio originali Pfannenberg**, pena l'estinzione della garanzia e delle autorizzazioni. Inoltre, in caso di mancato utilizzo delle parti di ricambio originali, non sono più garantiti i tipi di protezione e le caratteristiche di funzionamento.

(E) Utilice **únicamente repuestos originales de Pfannenberg**; de lo contrario, quedarán sin validez la garantía y las licencias. Además, en caso de no usar dichos repuestos originales, no se podrán garantizar la seguridad ni los datos de rendimiento.

(RUS) Используйте **только оригинальные запасные части от фирмы Pfannenberg**, в противном случае прекращается действие гарантии и допуска к эксплуатации. Кроме того, мы не гарантируем при использовании неоригинальных деталей соблюдение требований по категории защиты и рабочих характеристик.

ELECTRO-TECHNOLOGY FOR INDUSTRY

Konformitätserklärung / Declaration of Conformity

gemäß den EG-Richtlinien / according to EC directives

- **Elektromagnetische Verträglichkeit / Electromagnetic compatibility 89/336/EEC**
- **Niederspannungsrichtlinie / Low-voltage 73/23/EEC**

Die Geräte / The devices:

Hersteller / Manufacturer: **Pfannenberg GmbH**

Produkt / Product: **Filterlüfter / Filter Fan**

Type:	PF 11.000:	12V DC, 24V DC, 48V DC, 24V AC, 115V AC[1]), 230V AC[1])
	PF 22.000:	12V DC, 24V DC, 48V DC, 24V AC, 115V AC[1]), 230V AC[1])
	PF 32.000:	12V DC, 24V DC, 48V DC, 24V AC, 115V AC[1]), 230V AC[1])
	PF 42.500:	12V DC, 24V DC, 48V DC, 115V AC[1]), 230V AC[1])
	PF 43.000:	12V DC, 24V DC, 48V DC, 115V AC[1]), 230V AC[1]), 400 AC[1])
	PF 65.000:	115V AC[1]), 230V AC[1])
	PF 66.000:	115V AC[1]), 230V AC[1]), 400V AC[1])
	PF 67.000:	115V AC[1]), 230V AC[1]), 400V AC[1])

[1]): Niederspannungsrichtlinie / Low voltage directive

wurden entwickelt, konstruiert und gefertigt in Übereinstimmung mit den o.g. EU-Richtlinien, in alleiniger Verantwortung von:
were developed, designed and manufactured to comply with the above-mentioned EC directives, under the sole responsibility of:

Pfannenberg GmbH
Werner-Witt-Str. 1
D-21035 Hamburg

Folgende harmonisierte Normen wurden angewandt / The following harmonised standards were applicable :

- DIN EN ISO 12100-2 (2004) Sicherheit von Maschinen - Grundbegriffe, allgemeine Gestaltungsleitsätze - Teil 2: Technische Leitsätze (ISO 12100-2:2003);
  Safety of machinery, Basic concepts, general principles for design – Part 2: Technical principles
- DIN EN 60335-2-80 (2004) Sicherheit elektrischer Geräte für den Hausgebrauch und ähnliche Zwecke - Teil 2-80: Besondere Anforderungen für Ventilatoren (IEC 60335-2-80:2002);
  Household and similar electrical appliances - Safety - Part 2-80: Particular requirements for fans
- DIN EN 61000-6-2 (2001) Fachgrundnorm, Störfestigkeit für Industriebereich /
  Electromagnetic compatibility (EMC), Generic standards: Immunity for industrial environments
- DIN EN 61000-6-3 (2001) Fachgrundnorm, Störaussendung im Wohnbereich /
  Electromagnetic compatibility (EMC), Generic standards; Emission standard for residential
- DIN EN 60529 (2000) Schutzarten durch Gehäuse (IP-Code) / Degrees of protection provided by enclosures (IP code)
- DIN IEC 60038 (2002) IEC-Normspannungen / IEC standard voltages

Folgende nationale Normen, Richtlinien und Spezifikationen wurden angewandt :
The following standards, guidelines and specifications were applicable at national level:

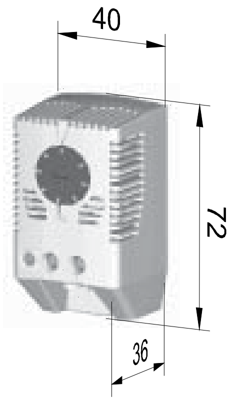
- UVV-BGV A3 Unfallverhütungsvorschrift für Elektrische Anlagen und Betriebsmittel /
  Accident prevention regulation for electrical systems and machinery
- GPSG Geräte- und Produktsicherheitsgesetz / German law - covering equipment and product safety

Eine Technische Dokumentation ist beim Hersteller vorhanden, die Montage-/Betriebsanleitung liegt dem Gerät bei. Die Sicherheitshinweise sind zu beachten. Diese Erklärung bescheinigt die Übereinstimmung mit den genannten Richtlinien.
The manufacturer is in possession of the technical documentation, the installation/operation instruction is attached to the device. The safety references are to be considered. This explanation certifies the agreement with the guidelines mentioned.

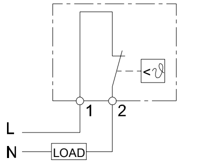
Hamburg, 22.09.2006
Rev.Nr.:01

Nils Halm
Technischer Leiter / Technical Director

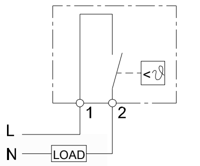
Thermostat FLZ 520 / FLZ 530



FLZ 520 (NC)



FLZ 530 (NO)



Montage
Assembly
Montage
Montage
Montering
Montaggio
Montaje
Монтаж

D Betriebsanleitung Thermostat FLZ 520/530

FLZ 520 – Öffner	(Kontakt öffnet bei steigender Temperatur - Einstellknopf mit roter Bedruckung)		
FLZ 530 – Schließer	(Kontakt schließt bei steigender Temperatur - Einstellknopf mit blauer Bedruckung)		
Einstellbereiche	-20°C .. +40°C / -5°F .. +105°F	0°C .. +60°C / +30°F .. +140°F	+20°C .. +80°C / +70°F .. +180°F
Einsatztemperaturbereich	-20°C..+80°C / -5°F..+180°F		
max. Schaltleistung	240V AC, 10 (2)A / 120V AC, 15 (2)A Wert in Klammern: induktive Last bei cos.φ=0,6 DC: max. 30W		
Schalttemperaturdifferenz	< 7K		
Schaltpunkttoleranz	+/- 4K		
Kontaktart	Öffner - NC / Schließer - NO (Sprungkontakt)		
Anschlussart	2polige Klemme, 2,5mm²		
Farbe	RAL 7035 – grau		
Schutzart	IP 20		
Montage	Schnappbefestigung für - 35mm Profil-Schiene nach EN 60715 - Pfannenberg Austrittsfilter PFA 3000		

Anwendung:
Die Thermostate werden zur Temperaturregelung von Kühlgeräten, Heizgeräten, Filterlüftern u. Wärmetauscher innerhalb von Schaltschränken eingesetzt.
Außerdem können sie als Ansteuerung für Signalgeber zur Meldung von Über- oder Untertemperatur verwendet werden.
Sicherheitshinweise:
Die Thermostate dürfen nur von qualifiziertem Fachpersonal installiert werden.
Die Schutzmaßnahmen und der Berührungsschutz sind durch den Einbau sicherzustellen.
Die Angaben auf dem Typschild (Spannung und Strom) sind zu beachten.
Die Funktionssicherheit des Thermostates ist durch einen Funktionstest sicherzustellen.
Einbauhinweise:
- Der Thermostat sollte im oberen Bereich des Schaltschrankes mit dem größtmöglichen Abstand zu wärmeerzeugenden Bauteilen montiert werden.
- Die Lüftungsschlitze des Thermostates dürfen nicht abgedeckt werden.
- Bei der Temperatureinstellung des Öffners muß die größtmögliche Hysterese zu der geforderten Mindesttemperatur hinzuaddiert werden.

Beispiel: - erforderliche Mindest-Schaltschrankinnentemperatur: 9°C (46°F)
- einzustellende Temperatur: 20°C (66°F)
- resultierend aus:
20°C (66°F)= erforderliche Temperatur 9°C + größtmögliche Hysterese 11K (7K+4K)

GB Thermostat FLZ 520/530 Instructions for Use

FLZ 520 – Opener	(Contact opens with rising temperature – Setting knob with red imprint)		
FLZ 530 – Shutter	(Contact closes with rising temperature – Setting knob with blue imprint)		
Setting ranges	-20°C .. +40°C / -5°F .. +105°F	0°C .. +60°C / +30°F .. +140°F	+20°C .. +80°C / +70°F .. +180°F
Working temperature range	-20°C..+80°C / -5°F..+180°F		
Max. breaking capacity	240V AC, 10 (2)A / 120V AC, 15 (2)A Value in brackets: inductive load at cos.φ=0.6 DC: max. 30W		
Temperature difference	< 7K		
Tolerance for switching point	+/- 4K		
Type of contact	Opener – NC / Shutter – NO (snap-action contact)		
Type of connection	2-pole clamp, 2,5mm²		
Colour	RAL 7035 – grey		
Protection category	IP 20		
Assembly	Snap fastening for - 35mm profile bars in accordance with EN 60715 - Pfannenberg exhaust filter PFA 3000		

Application:
The thermostats are used for the temperature regulation of cooling units, heating appliances, filter ventilators and heat exchangers inside switch cabinets.
Moreover, they can be used as signal transmitters for reporting excess or insufficient temperatures.
Safety instructions
The thermostats may only be installed by qualified staff.
The protective measures and the protection against contact are to be ensured by the installation.
The information on the name plate (voltage and current) is to be heeded.
The operational reliability of the thermostat is to be ensured by an operating test.
Installation instructions:
- The thermostat should be assembled in the upper part of the switch cabinet at the maximum possible distance from heat creating components.
- The ventilation slots of the thermostat should not be covered.
- For the temperature setting of the opener the highest possible hysteresis must be added to the required minimum temperature.

For example: - required minimum temperature inside switch cabinet: 9°C (46°F)
- temperature to be set: 20°C (66°F)
- resulting from: 20°C (66°F) = required temperature 9°C + highest possible hysteresis 11K (7K+4K)

F Mode d'emploi Thermostat FLZ 520/530

FLZ 520 – Contact de repos	(le contact s'ouvre lorsque la température augmente - Bouton de réglage avec inscription rouge)		
FLZ 530 – Contact de travail	(le contact se ferme lorsque la température augmente - Bouton de réglage avec inscription bleue)		
Plages de réglage	-20°C .. +40°C / -5°F .. +105°F	0°C .. +60°C / +30°F .. +140°F	+20°C .. +80°C / +70°F .. +180°F
Plage de température de fonctionnement	de -20°C à +80°C / de -5°F à +180°F		
Puissance de coupure max.	240V CA, 10 (2)A / 120V CA, 15 (2)A valeur entre parenthèses : charge inductive pour cos.φ=0,6 CC : max. 30W		
Différence de température à la commutation	>7K		
Tolérance du point de commutation	+/- 4K		
Type de contact	Contact de repos – NC / contact de travail - NO (contact à ressort)		
Type de connexion	Borne bipolaire, 2,5mm²		
Couleur	RAL 7035 – gris		
Degré de protection	IP 20		
Montage	Clipsage pour - rail profilé de 35mm conformément à EN 60715 - filtre de sortie Pfannenberg PFA 3000		

Application :
Les thermostats sont utilisés pour réguler la température des appareils de refroidissement, de chauffage, des ventilateurs filtrants et des échangeurs de chaleur installés dans des armoires de distribution. Ils peuvent servir également de commande pour les détecteurs de température insuffisante ou excessive.
Conseils de sécurité :
Les thermostats doivent être installés uniquement par un technicien qualifié.
Les mesures de protection générale et contre les contacts accidentels doivent être assurées par le montage.
Les données de la plaque signalétique (tension et courant) doivent être prises en compte.
La sécurité de fonctionnement du thermostat doit être établie par un test de fonctionnement.
Instructions de montage :
- Le thermostat doit être monté dans la partie supérieure de l'armoire de distribution en l'éloignant le plus possible des composants générateurs de chaleur.
- Les fentes d'aération du thermostat ne doivent pas être obstruées.
- Lors du réglage de température du contact de repos, il faut ajouter la plus grande hystérésis possible à la température minimale requise.

Exemple : - Température minimale requise à l'intérieur de l'armoire : 9°C (46°F)
- température à régler : 20°C (66°F)
- ce qui donne :
20°C (66°F)= température nécessaire 9°C + hystérésis la plus grande possible 11K (7K+4K)

NL Gebruikershandleiding thermostaat FLZ 520/530

FLZ 520 – opener	(contact opent bij stijgende temperatuur - Instelknop met rode opdruk)		
FLZ 530 – sluiter	(contact sluit bij stijgende temperatuur - Instelknop met blauwe opdruk)		
instelbereik	-20°C .. +40°C / -5°F .. +105°F	0°C .. +60°C / +30°F .. +140°F	+20°C .. +80°C / +70°F .. +180°F
gebruikstemperatuur	-20°C..+80°C / -5°F..+180°F		
max. afschakelvermogen	240V AC, 10 (2)A / 120V AC, 15 (2)A voorlopige waarde: inductieve belasting bij cos.φ=0,6 DC: max. 30W		
schakeltemperatuurverschil	<7K		
schakelpunttollerantie	+/- 4K		
contacttype	Opener – NC / sluiter – NO (schakelbeveiliging)		
aansluitingstype	2-polige klemmen, 2,5mm²		
kleur	RAL 7035 – grijs		
beveiliging	IP 20		
montage	Klikbevestiging voor - 35mm profielrail conform EN 60715 - Pfannenberg voorzetfilter PFA 3000		

Toepassing:
De thermostaten worden gebruikt voor de temperatuurregeling van koelapparaten, verwarmingstoestellen, filterventilatoren en warmtewisselaars binnen in de schakelkast.
Bovendien kunnen ze als aansturing voor signaleringssystemen voor temperatuurafwijkingen gebruikt worden.
Veiligheidsaanwijzingen:
De thermostaten mogen alleen door gekwalificeerd personeel worden geïnstalleerd.
Bij de installatie dienen alle maatregelen met betrekking tot veiligheid in acht genomen te worden (ook beveiliging tegen direct contact).
De gegevens op het typeplaatje (spanning en stroom) moeten in acht genomen worden.
Het veilige gebruik van de thermostaat dient door middel van een functietest vastgesteld te worden.
Montageaanwijzingen:
- De thermostaat dient gemonteerd te worden in het bovenste gedeelte van de schakelkast op zo groot mogelijke afstand van warmteproducerende onderdelen.
- De ventilatiegleuven van de thermostaat niet afdekken.
- Voor de instelling van de temperatuur van de opener dient de grootst mogelijke hysteresis opgeteld te worden bij de minimale temperatuur.

Voorbeeld: - aanbevolen minimale temperatuur binnen in de schakelkast: 9°C (46°F)
- in te stellen temperatuur: 20°C (66°F)
- resulterend uit:
20°C (66°F)= in te stellen temperatur 9°C + grootst mogelijke hysteresis 11K (7K+4K)

S Bruksanvisning Termostat FLZ 520/530

FLZ 520 – Öppnare	(Kontakten öppnas vid stigande temperatur - Inställningsknapp med röd markering)		
FLZ 530 – Slutare	(Kontakten stängs vid stigande temperatur - Inställningsknapp med blå markering)		
Inställningsområde	-20°C .. +40°C / -5°F .. +105°F	0°C .. +60°C / +30°F .. +140°F	+20°C .. +80°C / +70°F .. +180°F
Användningsområde	-20 °C..+80 °C / -5 °F..+180 °F		
Max utlösningseffekt	240 V AC, 10 (2) A/120 V AC, 15 (2) A Värde i klammer: induktiv belastning vid cos φ=0,6 DC: max. 30W		
Bryttemperaturskillnad	<7 K		
Brytpunktstolerans	+/- 4 K		
Kontakttyp	Öppnare – NC /slutare – NO (vippkontakt)		
Typ av anslutning	2-polig klämma, 2,5 mm²		
Färg	RAL 7035 – grå		
Skyddstyp	IP 20		
Montering	Snäppfäste för - 35 mm profilskena enligt EN 60715 - Pfannenberg försättsfilter PFA 3000		

Användning:
Termostaten används för temperaturstyrning av kylaggregat, värmeapparater, filterfläktar och värmeväxlare i kopplingsskåp.
Dessutom kan de användas som styrning av signalgivare för att meddela över- eller undertemperatur.
Säkerhetsanvisningar:
Termostaterna får endast installeras av kvalificerad fackpersonal.
Skyddsåtgärderna och beröringsskyddet ska säkerställas vid monteringen.
Uppgifterna på märkplåten (spänning och ström) ska beaktas.
Termostatens funktionssäkerhet säkerställs genom en funktionstest.
Monteringsanvisningar:
- Termostaten ska monteras i den övre delen av kopplingsskåpet med största möjliga avstånd till värmealstrande komponenter.
- Termostatens ventilationsöppning får inte övertäckas.
- Vid temperaturinställning av öppnaren måste största möjliga hysteres läggas till den krävda lägsta temperaturen.

Exempel: - krävd lägsta temperatur inuti kopplingsskåpet: 9 °C (46 °F)
- temperatur som ska ställas in: 20 °C (66 °F)
- härlett från:
20 °C (66 °F)= krävd temperatur 9°C + största möjliga hysteres 11 K (7 K+4 K)

INSTALLATION, OPERATION AND MAINTENANCE GUIDE

FOR INDOOR/OUTDOOR SINGLE PHASE ENCAPSULATED TRANSFORMERS

Indoor/Outdoor
Encapsulated Transformers

Single Phase
Up To 50 kVA

Note: This guide is Trilingual (English, French, Spanish)

Literature No.: **IOMGE1PH**
Issue Date: May 2010

Safety Precautions

(1) Do not lift or move a transformer without proper equipment and experienced personnel.

(2) Do not install the transformer until a full inspection has been completed.

(3) Use terminals only for electrical connections, and flexible connectors are recommended.

(4) Connections should only be in accordance with the nameplate diagram or connection drawings.

(5) Make sure all power is disconnected before attempting any work on the transformer.

(6) Make certain all ground connections are complete and tightened before energizing the transformer.

(7) Do not attempt to change any taps - primary or secondary, while the transformer is energized.

(8) Do not change connections when the transformer is energized.

(9) Do not adjust or remove any accessories or cover plates while the transformer is energized.

Class 1, Division 2, Hazardous Location Installation Requirements

If this unit is designed for use in Class 1, Division 2, Groups A, B, C & D hazardous locations then also refer to notes below:

(1) Power, input and output (I/O) wiring must be in accordance with Class 1, Division 2 wiring methods as per Article 501-10 (b) of the National Electrical Code.

(2) WARNING - EXPLOSION HAZARD - DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NON-HAZARDOUS.

CONTENTS

INSTALLATION, OPERATION AND MAINTENANCE OF ENCAPSULATED TRANSFORMERS

GENERAL

Encapsulated transformers are manufactured to provide optimum performance for a lifetime of uninterrupted service. Careful attention to the following instructions is recommended for safe and reliable operation.

Installation, operation and maintenance of transformers should be performed by qualified persons, familiar with electrical apparatus and the potential hazards involved.

Warning: ***Danger! There is the potential of electric shock whenever working in or around electrical equipment such as transformers. Power must be shut off before any work is conducted on a transformer.***

As with any electrical device, transformers must be installed according to the requirements of the national, and local electrical codes. Refer to ANSI/IEEE C57-94 may also be referred to for recommended installation, application, operation and maintenance of dry-type transformers.

HANDLING

Transformers are either shipped in cartons or palletized. The units on pallets can either be lifted via a forklift truck or hoisted by the lifting lugs provided.

Appropriate lifting equipment should be used relative to the size of each transformer. No attempt should be made to lift or move a transformer from any points on the unit other than those indicated.

Please Note: On units bolted to the pallets, please remove the shipping bolts located at the top mounting holes as well as the one(s) located inside the wiring compartment.

RECEIVING INSPECTION

Immediately after receiving the transformer, it should be inspected for any transit damage and for correctness against the shipping documents.

The unit should be examined for any breaks in its packaging, dented or damaged enclosures or missing parts from the packing list.

If any damage is noted, a claim should be filed immediately with the carrier and a second copy of all pertinent information relative to the order and the circumstances should be filed with the local sales office.

STORAGE

Transformers that will not be immediately installed and energized, should be stored in a clean dry environment away from any environmental airborne contaminants.

It is recommended that transformers be stored in a heated building, in the original shipping packaging.

INSTALLATION

All encapsulated transformers are supplied with a NEMA 3R enclosure. NEMA 3R units may be installed indoors, or outdoors where applicable.

For any outdoor location, the appropriate applicable codes must be followed including cable installation and hardware suitable for outdoor service. Water tight couplings must be used at the knockouts.

Encapsulated transformers must be located in an upright position on walls, posts, beams or other locations capable of supporting their weight.

If encapsulated units are to be either stored or installed outdoors, the unit must be oriented vertically with the wiring compartment down to prevent the ingress of moisture.

Mounting Instructions (refer to page 6)

1. Select an installation location that is on a non-combustable surface.
2. The mounting location must allow for air circulation around the transformer for cooling purposes. Please refer to the minimum distances stated in the ventilation section.
3. Using the appropriate mounting template provided, drill the top two mounting holes on the mounting surface.
4. Lift the transformer into position and install the top two mounting bolts.
5. With the transformer hanging on the top two mounting bolts, level the unit, then with the wiring compartment cover open, mark and drill the lower mounting hole(s) into the mounting surface.
6. To provide NEMA 3R protection (protection from falling rain), the transformer must be mounted vertically with the mounting tabs facing up.
7. Install the lower mounting bolt, lock washer, flat washer and rubber washer into the lower mounting hole(s) (refer to Diagram 2).

VENTILATION

Transformers are required to be installed in an area where they can be cooled by means of the free circulation of air where the average ambient temperature is 30°C (86°F) and should not exceed 40°C (104°F) at any time.

Adequate ventilation is essential for transformers to meet their nameplate kVA capability. All encapsulated general purpose transformers should be located at least 2 inches on units up to 10kVA and at least 4 inches on units over 10kVA, away from walls or any other obstructions to allow free, clean circulation of air.

ACCESSIBILTY

NEC standards require that transformers be accessible for inspection and located accordingly. However, transformers should not be located in areas where stored items are likely to interfere with either natural air convection or the capability to have them inspected. Passage ways or other areas where people could be exposed to live parts during inspection should also be avoided.

Adequate protection should be provided under any circumstances.

TRANSFORMER SOUND LEVELS

Transformers are an electrically energized apparatus and by their nature emit sound due to their component materials.

Transformers are required to meet NEMA standards for the maximum sound levels permissible. These sound level standards vary from 40 to 60 DB and hence, can be an annoyance if located in close proximity to where people work or reside.

Care should therefore be exercised in selecting sites for transformers particularly to avoid sensitive areas like hospitals, classrooms, medical or office facilities.

The following guide lines may be helpful;

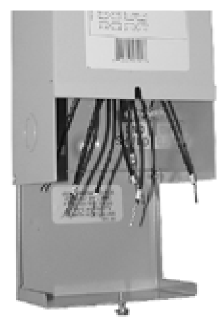
- ➔ Units should be mounted away from corners or reflecting walls or ceilings.
- ➔ Cable or other flexible conduit should be considered to make connections.
- ➔ Acoustically absorbing materials could be considered for walls and ceilings around the unit.
- ➔ The location of the unit should be located as far as practical from areas where sound levels could be considered undesirable.

CABLE CONNECTIONS

1. Open the wiring compartment by loosening the cover screw.
2. Terminals should be cleaned and electrical joint compounds are recommended for use on all electrical connections.
3. Make the appropriate electrical connection to suit the desired voltages as per the connection diagram on the nameplate. This includes the input connections, output connections and the ground(s).

***WARNING**: If this unit is designed for and to be used in Class 1, Division 2, Groups A, B, C and D hazardous locations than the power, input and output (1/0) wiring must be in accordance with Class 1, Division 2 wiring methods as per Articles 501-10 (b) of the National Electrical Code.*

4. Make certain to insulate any unused wire leads with marrette connectors and electrical tape.
5. Close the wiring compartment and ensure that the cover screw is tightly secured.



The connecting cable size is determined from the line current rating of the transformers primary and secondary windings. Convenient pre-punched knockouts are provided on all transformer enclosures, to facilitate cable entry. (NOTE: potted transformers cannot be returned if the knockouts have been removed unless the unit has a manufacturing defect as outlined in the standard warranty policy.)

GROUNDING

All core and coil assemblies are solidly grounded to the enclosure internally to ensure that all conductive metal parts have the same potential.

The transformer enclosure in turn should also be securely and effectively grounded as a safety precaution. This grounding should be in accordance with national electrical code standards.

INSPECTION BEFORE ENERGIZATION

For the safe and proper operation of the transformer, we recommend that the following items be checked for completeness:

a) The insulation resistance, enclosure to primary, enclosure to secondary and primary to secondary, should be greater than 10k ohms.
b) Before energizing and connecting any loads, please measure and verify the output voltage matches nameplate specifications.
c) Ensure correct phase connections. Refer to the nameplate vector diagram.
d) When windings are connected in parallel (as in the case of dual voltage primaries), the primary taps for all coils must be connected to the identical percentage tap positions to avoid the shorting of turns. For tap positions, refer to the nameplate on the transformer.
e) The enclosure should be grounded with the appropriately sized conductor.
f) The clearance and tightness of all electrical connections should be checked.
g) For single phase 3-wire 240/120 volt loads, care must be taken to ensure the neutral current does not exceed 1/2 of the transformers kVA rating.

OPERATION

For all relatively normal and clean installations, encapsulated transformers will operate satisfactorily under normal conditions of energization and load.

For your reference, fully loaded transformers may be very warm to the touch, particularly on the top of the unit.

Standards permit the temperatures of the enclosure to be 65°C over ambient. This represents normal loading and should not be of concern.

Encapsulated transformers are designed to operate continuously at their full nameplate kVA rating.

ANSI C57.96 provides guidance for loading transformers under different conditions including:

➔ Ambient temperatures that are varied from the ambient temperatures required for transformer operation.
➔ Short time overload as it relates to time and temperature and the corresponding loss of life of the transformer.
➔ Overload that results in a reduction of life expectancy of the transformer.

If the transformer is experiencing increased temperatures, the following load characteristics should be considered immediately:

➔ Rigorous motor starting loads or other impact type loading for which a specific transformer for that application is required.
➔ Over-excitation of unit due to excess supply line voltage or current.
➔ Ambient temperatures above standard.
➔ Overload beyond ANSI C57.96 guidelines.
➔ Harmonic distortions of the supply line voltage and currents.

MAINTENANCE

Under normal operating conditions and environments, encapsulated transformers do not require maintenance. However, periodic care and inspection is a good practice, particularly if the unit is exposed to extreme environmental conditions.

Peripheral inspection and external dust and dirt removal may be carried out while the transformer is in operation. However, access covers must not be opened under energized conditions.

The accumulation of ice or snow will not adversly effect the operation of encapsulated transformers. However, the accumulation of dust or dirt will effect the cooling of the transformer and may become a potential fire hazard.

Internal maintenance must be performed with a transformer de-energized, isolated and with the terminals grounded.

The ground connection should be checked to ensure a low impedance connection.

<u>WARNING</u>: If this unit is designed for and to be used in Class 1, Division 2, Groups A, B, C, and D hazardous locations; DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NON-HAZARDOUS

DIAGRAM 1a: NQ0, NQ1, NQ2, NQ3, NQ4 and NQ5 Series Enclosure Mounting for Single Phase Encapsulated Transformers.

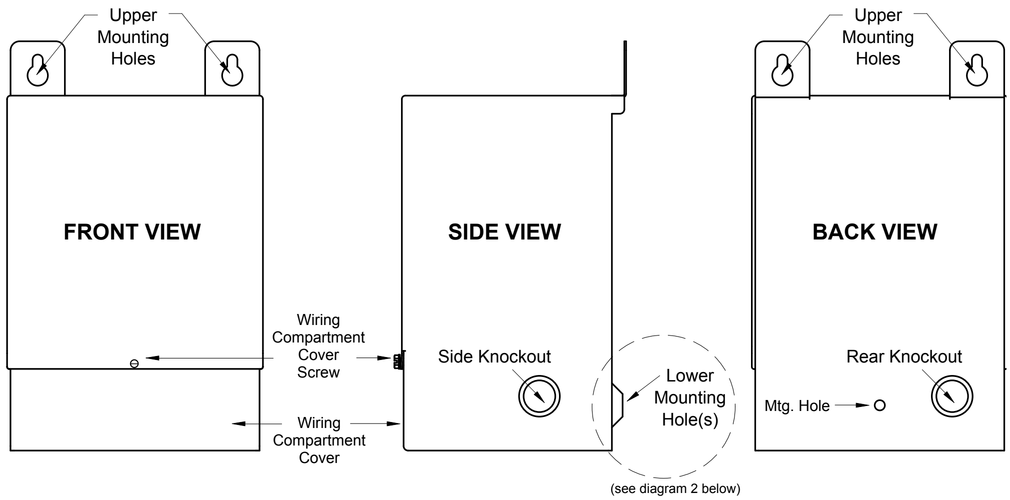


DIAGRAM 1b: NQ6, NQ6A, NQ7 and NQ8 Series Enclosure Mounting for Single Phase Encapsulated Transformers.

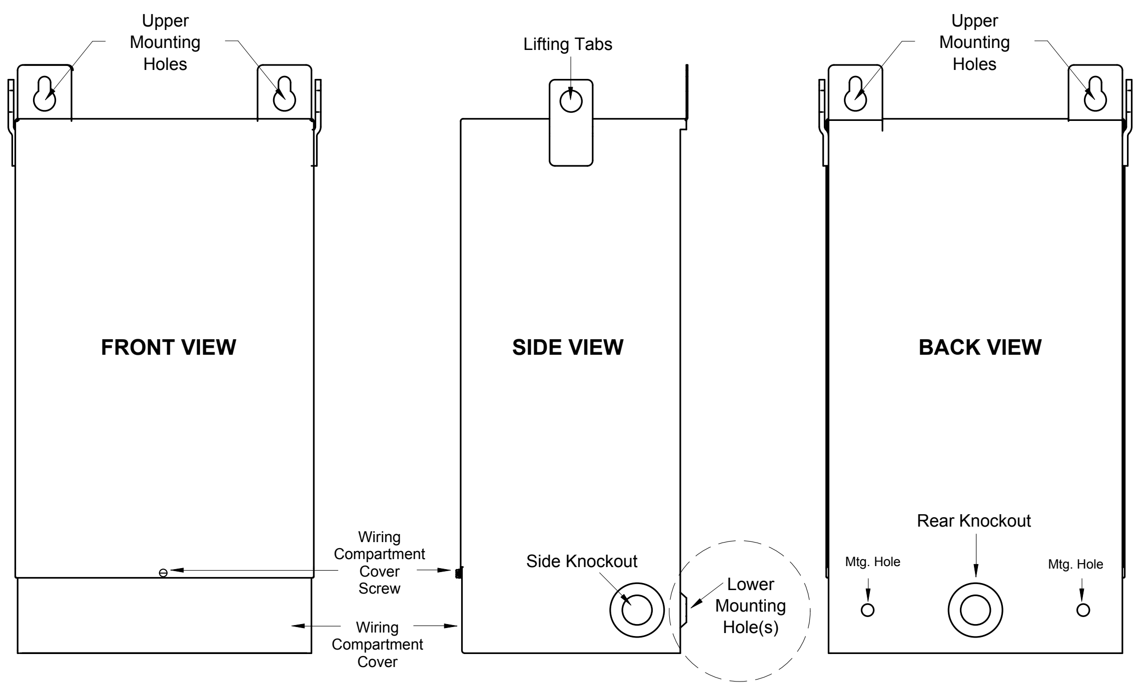
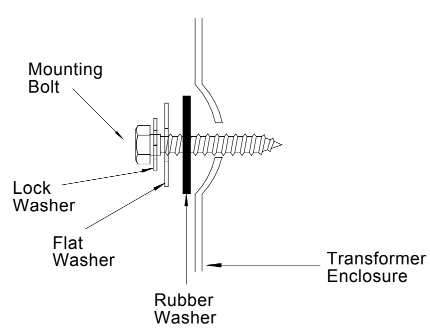


DIAGRAM 2: Lower wiring compartment mounting hole(s), mounting hardware installation assembly diagram.



GUIDE D'INSTALLATION, DE FONCTIONNEMENT ET D'ENTRETIEN

POUR TRANSFORMATEURS ENCAPSULÉS MONOPHASÉS POUR L'INTÉRIEUR ET L'EXTÉRIEUR

Transformateurs encapsulés pour l'intérieur et l'extérieur

Monophasé
Jusqu'à 50 kVA

N° de document : **IOMGE1PH**
Date de publication : Mai 2010

Consignes de sécurité

(1) Ne levez pas et ne déplacez pas un transformateur sans disposer de l'équipement approprié et de personnel expérimenté.

(2) N'installez pas le transformateur tant qu'une inspection complète n'a pas été effectuée.

(3) N'utilisez les bornes que pour les branchements électriques. Il est recom mandé d'utiliser des connecteurs flexibles.

(4) Les branchements doivent respecter le schéma de la plaque signalétique ou les diagrammes de connexion.

(5) Vérifiez que la source d'alimentation est coupée avant de commencer à travailler sur le transformateur.

(6) Vérifiez que toutes les liaisons à la terre sont complètes et sont bien serrées avant de mettre le transformateur sous tension.

(7) Ne tentez pas de changer des prises (primaires ou secondaires) lorsque le transformateur est sous tension.

(8) Ne changez pas les branchements lorsque le transformateur est sous tension.

(9) Ne réglez pas et ne retirez pas les accessoires ou les plaques de recou vrement lorsque le transformateur est sous tension.

Exigences pour l'installation dans des emplacements dangereux de classe 1, division 2

Si cet équipement est conçus pour une utilisation dans des endroits dangereux et non dangereux de classe 1, division 2, groupes A, B, C, D, réferrer aussi aux notes suivants:

(1) L'alimentation ainsi que le câblage d'entrée et de sortie (I/O) doivent être conformes aux méthodes de cablâge des équipements de division 2 décrites dans l'article 501-10(b) du Code national de l'électricité.

(2) AVERTISSEMENT - RISQUE D'EXPLOSION - NE PAS DÉBRANCHER CET ÉQUIPEMENT AVANT D'AVOIR COUPER LE COURANT OU QUE L'ENDROIT EST CONNU POUR ÊTRE NON DANGEREUX.

TABLE DES MATIÈRES

INSTALLATION, FONCTIONNEMENT ET ENTRETIEN DES TRANSFORMATEURS ENCAPSULÉS

INFORMATIONS GÉNÉRALES

Les transformateurs encapsulés sont fabriqués pour fournir un rendement optimal pendant un cycle de vie de service continu. Pour un fonctionnement fiable et sans danger, nous vous recommandons de bien lire les consignes suivantes.

L'installation, le fonctionnement et l'entretien des transformateurs doivent être effectués par du personnel qualifiés, familier avec l'appareillage électrique utilisé et des dangers potentiels qu'il représente.

Avertissement : ***Danger ! Travailler sur un transformateur ou autour d'un équipment électrique similaire présente un risque de choc électrique. Il est indispensable de mettre hors tension la source d'alimentation électrique avant d'entreprendre des travaux sous tension.***

Comme pour tout appareil électrique, les transformateurs doivent être installés en conformité avec les codes nationaux et locaux de l'électricité. Veuillez egalement vous reporter a la norme ANSI/IEEE C57-94 pour les recommandations portant sur l'installation, l'utilisation, le fonctionnement et l'entretien des transformateurs de type sec.

MANUTENTION

Les transformateurs sont envoyés dans des boîtes ou en palettes. Les unités sur palettes peuvent être soulevées à l'aide d'un chariot élévateur à fourche ou levées par les anneaux de levage fournis.

L'équipement de levage doit être adapté à la taille de chaque transformateur. En aucun cas, un transformateur ne doit être soulevé ou déplacé en utilisant d'autres points d'ancrage que ceux indiqués sur l'appareil.

Remarque : Si le transformateur est fixé aux palettes, retirez les boulons de transport situés dans les orifices de fixation supérieurs ainsi le(s) boulon(s) se trouvant dans le compartiment de branchement.

CONTRÔLE DE RÉCEPTION

Immédiatement après avoir reçu le transformateur, une inspection doit être effectuée pour vérifier la présence de dommages éventuels survenus durant le transport ainsi que l'exactitude des documents d'expédition.

L'emballage sera examiné afin d'y détecter des bris, de voir si les boîtiers sont bosselés ou abîmés et si des pièces inscrites sur le bordereau de marchandises sont manquantes.

Si des dommages sont constatés, une réclamation doit immédiatement être effectuée avec le transporteur et une deuxième copie des renseignements concernant la commande et les problèmes survenus devrait étre conservée dans le bureau de vente local.

ENTREPOSAGE

Les transformateurs qui ne sont pas immédiatement installés et mis sous tension doivent être entreposés dans un endroit propre et sec, à l'abri des contaminants atmosphériques environnants.

Nous recommandons d'entreposer les transformateurs dans un immeuble chauffé muni de l'emballage plastiwue d'origine.

INSTALLATION

Tous les transformateurs encapsulés sont fournis avec un boîtier NEMA 3R. Les unités NEMA 3R peuvent être installées à l'intérieur ou à l'extérieur, le cas échéant.

Pour les installations à l'extérieur, les codes en vigueur qui s'appliquent à l'installation doivent être respectés, notamment ceux concernant l'installation des câbles et le matériel convenant à une utilisation extérieure. Des connecteurs de conduits étanches doivent être utilisés aux endroits prévus (diaques défonçables).

Les transformateurs encapsulés peuvent être installés à la verticale sur des murs, des poteaux, des poutres ou dans d'autres endroits pouvant supporter leur poids.

Si les unités encapsulées sont entreposées ou installées à l'extérieur, elles doivent être placées à la verticale, le compartiment de branchement vers le bas, pour éviter que l'humidité n'y pénètre.

Instructions de montage (Référez-vous à la page 12)

1. Choisissez pour l'installation un emplacement dont la surface est non combustible.
2. L'emplacement choisi doit permettre à l'air de circuler librement pour assurer le refroidissement de l'appareil. Reportez-vous aux distances de dégagement minimales indiquées dans la section Ventilation.
3. En vous servant du gabarit de montage appro prié, percez les deux trous de fixation du haut sur la surface de fixation.
4. Soulevez le transformateur jusqu'à sa position de montage définitive et fixez les deux boulons de fixation du haut.
5. Ouvrez le couvercle du compartiment de branchement et marquez le ou les trous de fixation du bas, puis percez la surface de fixation.
6. Pour obtenir une protection NEMA 3R (protection contre la pluie), il faut monter le transformateur verticalement, les pattes de fixation vers le haut.
7. Fixez le boulon de fixation du bas, la rondelle de blocage, la rondelle plate et la rondelle de caoutchouc dans le ou les trous de fixation du bas (voir schéma 2).

VENTILATION

Les transformateurs doivent être installés dans un endroit où ils pourront être refroidis par la circulation de l'air. La température ambiante moyenne doit être de 30 °C (86 °F) et ne jamais excéder 40 °C (104 °F).

Une bonne ventilation est indispensable pour que les transformateurs atteignent la capacité en kVA indiquée sur leur plaque signalétique. Tous les transformateurs encapsulés d'usage général doivent être installés à au moins 5 cm (2 po) des murs et autres obstacles pour des unités de moins de 10 kVA et à au moins 10 cm (4 po) pour des unités de plus de 10 kVA, pour permettre la libre circulation de l'air frais.

ACCESSIBILITÉ

Il est prévu par les normes du Code national de l'électricité que les transformateurs soient accessibles pour l'inspection et que l'emplacement de l'installation soit choisi dans cette optique. Ils ne doivent donc pas être installés dans des locaux renfermant des objets entreposés risquant de faire obstacle à la circulation de l'air et aux inspections. Les passages et les endroits dans lesquels des personnes risquent d'être exposées à des pièces sous tension au cours de l'inspection doivent également être évités.
Une protection adéquate doit être assurée en toutes circonstances.

NIVEAUX DE BRUIT DU TRANSFORMATEUR

Les transformateurs sont des appareils alimentés par l'électricité, et lorsqu'ils sont en fonction, les matériaux qui sont necessaires à leur construction émettent un certain bruit.

Les transformateurs doivent respecter les normes NEMA en matière de niveau sonore. Ces normes varient de 40 à 60 dB, ce qui peut constituer une source de gêne pour les personnes qui travaillent ou résident à proximité.

Il faut donc choisir avec soin leur emplacement d'installation et éviter tout particulièrement les zones sensibles comme les hôpitaux, les écoles, les établissements médicaux et les bureaux.

Les lignes directrices suivantes pourront se révéler utiles pour déterminer le bon emplacement d'installation.

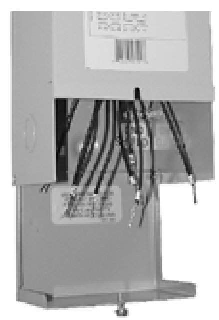
- ➔ Les unités doivent être installées loin des angles et des murs ou plafonds réfléchissants.
- ➔ Pour les branchements, pensez à utiliser des câbles ou autres conduits flexibles.
- ➔ Pensez à installer des matériaux acoustiques absorbants sur les murs et les plafonds se trouvant autour du transformateur.
- ➔ Le transformateur doit se trouver aussi loin que possible des zones pour lesquelles le bruit pourrait constituer une gêne.

BRANCHEMENT DES CÂBLES

1. Ouvrez le compartiment de branchement en desserrant la vis du couvercle.
2. Les bornes devraient être nettoyées. Il est de plus recommandé d'utiliser un produit d'étanchéité pour raccordements électriques pour tous les branchements électriques.
3. Effectuez le branchement électrique qui convient aux tensions désirées en vous conformant au schéma électrique de la plaque signalétique (c.-à-d. les branchements pour l'entrée, la sortie et la mise à la terre).

<u>Avertissement:</u> Si cette unité est conçue pour être utilisé des endroits dangereux de classe 1, division 2, groupes A, B, C, D. alors l'alimentation ainsi que le câblage d'entrée et de sortie (I/O) doivent être conformes aux méthodes de câblage des équipements de division 2 décrites dans l'article 501-10 (b) du Code national de l'électricité.

4. Veillez à bien isoler les fils inutilisés avec des capuchons de connexion et du ruban isolant.
5. Refermez le compartiment de branchement et vérifiez que la vis du couvercle est bien serrée.



La taille du câble de branchement dépend du courant nominal des enroulements primaires et secondaires du transformateur. Des disques defonçables sont fournies avec tous les transformateurs pour faciliter le passage du câble. (REMARQUE : les transformateurs encapsulés dont les disques défonçables ont été retirées ne pourront être retournés sauf si un défaut de fabrication couvert par la garantie a été détecté.)

MISE À LA TERRE

Toutes les piéces métalliques du noyau-bobines, non-porteuses de courant, sont reliées à la terre, via le connecteur de mise à la terre. L'intégrité équipotentielle y est maintenue.

Pour des raisons de sécurité, le boîtier du transformateur doit lui aussi être adéquatement relié à la terre. La mise à la terre doit être effectuée en conformité avec les normes du Code national électrique.

INSPECTION AVANT LA MISE SOUS TENSION

Pour un fonctionnement adéquat et sans danger du transformateur, nous recommandons que les éléments suivants soient également vérifiés :

a) La résistance d'isolation, de la bobine à l'enroulement primaire, de la bobine à l'enroulement secondaire et de l'enroulement primaire au secondaire doit être supérieure à 10 kilohms.
b) Avant de brancher et de mettre la charge sous tension, mesurez la tension de sortie pour vérifier s'il correspond aux spécifications de la plaque signalétique.
c) Assurez-vous de brancher les phases conformément au diagramme vectoriel de la plaque signalétique.
d) Lorsque les enroulements sont branchés en parallèle (comme dans le cas d'enroulements primaires à bitension), les prises primaires de toutes les bobines doivent être branchées au même pourcentage de positions de prises pour éviter que les spires ne soient court-circuitées. Pour connaître les positions des prises, consultez la plaque signalétique du transformateur.
e) Le boîtier doit être mis à la terre à l'aide d'un conducteur d'une taille adaptée.
f) Il faut vérifier que chaque branchement électrique est bien serré et suffisamment dégagé.
g) Dans le cas de charges monophasées à 3 conducteurs de 240/120 volts, il est nécessaire de vérifier que le courant de neutre n'excède pas la moitié du régime nominal en kVA du transformateur.

FONCTIONNEMENT

Dans tous les cas d'installation normale et bien réalisée, les transformateurs encapsulés fonctionnent normalement dans des conditions normales de mise sous tension et de charge.

Pour votre information, un transformateur chargé peut s'avérer très chaud au toucher, particulièrement la partie supérieure de l'appareil.

Les normes permettent que les boîtiers de ce type d'appareil puissent atteindre jusqu'à 65 °C de plus que la température ambiante. Cette chaleur indique une charge normale et ne doit pas vous inquiéter.

Les transformateurs encapsulés sont conçus pour fonctionner en permanence selon la pleine capacité de kVA indiquée sur leur plaque signalétique.

Les normes C57.96 de l'ANSI donnent des directives pour le chargement des transformateurs dans différentes conditions, notamment :

➔ démarrage de moteur brusque ou autre type de charge brusque pour lequel un transformateur spécifique pour ce type d'application est requis.
➔ ur-excitation de l'unité à la suite d'une surtension de l'alimentation ou d'une surcharge.
➔ températures ambiantes supérieures à la normale.
➔ surcharge supérieure aux directives C57.96 de l'ANSI.
➔ distorsions harmoniques de la tension de la ligne d'alimentation et du courant.

ENTRETIEN

Dans des conditions de fonctionnement et des environnements normaux, les transformateurs encapsulés ne nécessitent aucun entretien. Il est cependant recommandé de procéder à un entretien et une inspection de routine, particulièrement si l'unité est exposée à des conditions climatiques extrêmes.

Une inspection des éléments externes et un nettoyage de la poussière et de la saleté accumulées sur le boîtier peuvent être effectués lorsque le transformateur fonctionne. Cependant, les couvercles d'accès ne doivent pas être ouverts lorsque l'appareil est sous tension.

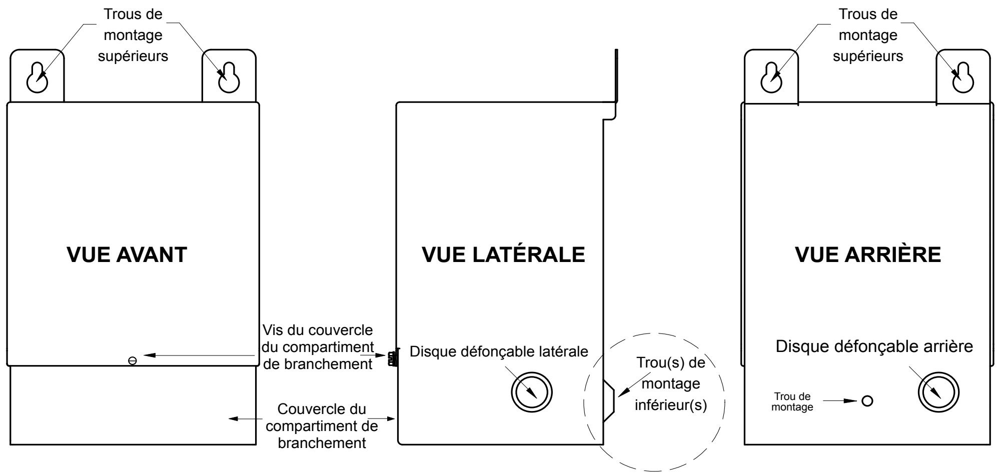
L'accumulation de glace ou de neige ne compromet pas le fonctionnement des transformateurs encapsulés. Par contre, l'accumulation de poussière ou de saleté gène le refroidissement de l'appareil et peut provoquer un risque d'incendie.

L'entretien interne doit être effectué sur un transformateur éteint, isolé, et dont les bornes sont mises à la terre.

Il est nécessaire de vérifier la liaison à la terre pour garantir que le branchement est de faible impédance.

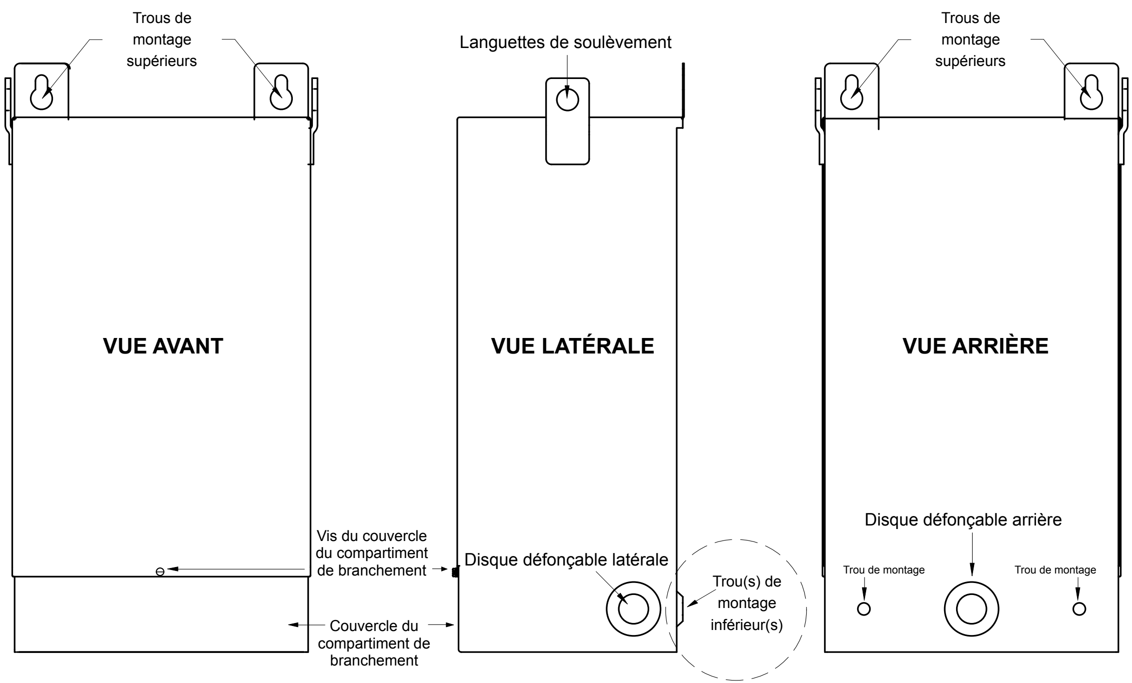
AVERTISSEMENT - Si cette unité est conçue pour être utilise des endroits dangereux de classe 1, division 2, groupes A, B, C, D. – NE PAS DÉBRANCHER CET ÉQUIPEMENT AVANT D'AVOIR COUPER LE COURANT OU QUE L'ENDROIT EST CONNU POUR ÊTRE NON DANGEREUX.

SCHÉMA 1a : Montage du boîtier des séries NQ0, NQ1, NQ2, NQ3, NQ4 et NQ5 pour transformateurs encapsulés monophasés.



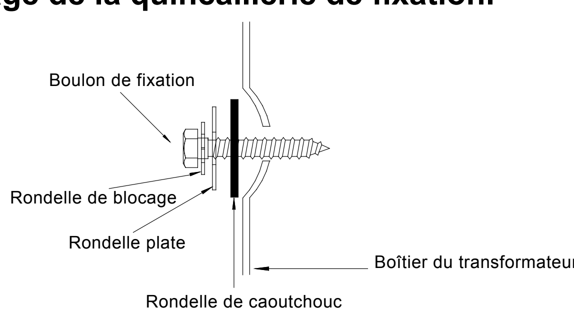
(Reportez-vous au diagramme 2, ci-dessous.)

SCHÉMA 1b : Montage du boîtier des séries NQ6, NQ6A, NQ7 et NQ8 pour transformateurs encapsulés monophasés.



(Reportez-vous au diagramme 2, ci-dessous.)

SCHÉMA 2 : Trou(s) de fixation inférieur(s) du compartiment de branchement, schéma d'assemblage de la quincaillerie de fixation.



GUÍA DE INSTALACIÓN, OPERACIÓN Y MANTENIMIENTO

TRANSFORMADORES MONOFÁSICOS CON GABINETE PARA INTERIORES Y EXTERIORES

Transformadores con gabinete para interiores y exteriores

Monofásico
Hasta 50 kVA

N.º de folleto: **IOMGE1PH**
Fecha de emisión: De mayo de 2010

Precauciones de seguridad

(1) No levante ni traslade un transformador sin equipo apropiado ni personal experimentado.

(2) No instale el transformador hasta que se haya realizado una inspección completa.

(3) Utilice únicamente los terminales para conexiones eléctricas. Se recomiendan conectores flexibles.

(4) Las conexiones solo deben realizarse siguiendo el diagrama de la placa de identificación o los diagramas de conexión.

(5) Asegúrese de que toda la energía esté desconectada antes de iniciar cualquier trabajo en un transformador.

(6) Asegúrese de que todas las conexiones a tierra estén completas y ajustadas antes de dar energía al transformador.

(7) No intente cambiar ninguna derivación, primaria o secundaria, mientras el transformador esté energizado.

(8) No cambie las conexiones cuando el transformador esté bajo excitación.

(9) No ajuste ni retire ningún accesorio ni cubierta protectora mientras el transformador está energizado.

Sitio peligroso de clase 1, división 2
Requisitos para la instalación

Si esta unidad es diseñada para uso en locaciones peligrosas Clase 1, División 2, Grupos A, B, C & D, entonces refiérase también a las notas siguientes:

(1) El cableado de energía, entrada y salida (I/O, por sus siglas en inglés) debe cumplir con los métodos de cableado de clase 1, división 2, de acuerdo con el Artículo 501-10 (b) del Código Eléctrico Nacional.

(2) ADVERTENCIA - PELIGRO DE EXPLOSIÓN - NO DESCONECTE EL EQUIPO A MENOS QUE SE HAYA APAGADO LA ENERGÍA O QUE EL ÁREA NO SEA PELIGROSA.

CONTENIDO

INSTALACIÓN, OPERACIÓN Y MANTENIMIENTO DE LOS TRANSFORMADORES CON GABINETE

GENERAL

Los transformadores con gabinete se fabrican para brindar un rendimiento óptimo con una vida útil de servicio ininterrumpido. Se recomienda seguir al pie de la letra las siguientes instrucciones para lograr una operación segura y confiable.

La instalación, la operación y el mantenimiento de los transformadores deben ser realizados por personas calificado, que tengan conocimiento sobre aparatos eléctricos y los posibles riesgos que conllevan.

Advertencia: ***¡Peligro! Existe el riesgo de descarga eléctrica cuando trabaja con o cerca de equipos eléctricos como los transformadores. Se debe desconectar la energía antes de realizar cualquier trabajo en un transformador.***

Al igual que con cualquier dispositivo eléctrico, los transformadores se deben instalar de acuerdo con los requisitos de los códigos eléctricos nacionales y locales. También puede consultar la norma ANSI/IEEE C57-94 para conocer las pautas recomendadas de instalación, aplicación, operación y mantenimiento de transformadores de tipo seco.

MANIPULACIÓN

Los transformadores se envían en cajas de cartón o en tarimas. Las unidades en las tarimas se pueden elevar con un montacargas o se pueden levantar con las argollas de elevación provistas.

Se debe utilizar equipo de elevación apropiado para el tamaño de cada transformador. No se debe intentar elevar ni trasladar un transformador desde ningún otro punto de la unidad que no sean los puntos indicados.

Tenga en cuenta: En las unidades atornilladas a las tarimas, retire los pernos de envío que se encuentran en los orificios de montaje superiores y los que se encuentran dentro del compartimiento de cableado.

INSPECCIÓN DE RECEPCIÓN

Inmediatamente después de recibir el transformador, se debe inspeccionar para detectar cualquier daño transitorio y para verificar la exactitud de los datos en comparación con los documentos de envío.

Se debe examinar la unidad para detectar cualquier rotura en el embalaje, abolladura o daño en los recintos o piezas faltantes de la lista de empaquetado.

Si se observa algún daño, se debe presentar un reclamo de inmediato ante la empresa de transporte y una segunda copia ante la oficina local de ventas con toda la información pertinente con respecto al pedido y las circunstancias.

ALMACENAMIENTO

Los transformadores que no se instalarán y energizarán de inmediato, se deben guardar en un ambiente seco y limpio, alejados de cualquier contaminante ambiental en suspensión.

Se recomienda guardar los transformadores en un lugar con calefacción, en su embalaje de envío original.

INSTALACIÓN

Todos los transformadores con gabinete vienen provistos de un recinto NEMA 3R. Las unidades NEMA 3R se pueden instalar en interiores, exteriores o donde sea necesario.

Para una ubicación en exteriores, se deben seguir los códigos aplicables adecuados, que incluyen la instalación de los cables y el equipo apropiado para el servicio exterior. Se deben usar acoplamientos herméticos en los troqueles.

Los transformadores con gabinete se deben ubicar en posición vertical apoyados en paredes, postes, vigas u otros lugares que puedan soportar el peso.

Si las unidades encapsuladas se van a guardar o instalar en exteriores, la unidad se debe orientar verticalmente con el compartimiento de cableado hacia abajo para impedir el ingreso de humedad.

<u>**Instrucciones de montaje**</u> (Refierase a la página 18)

1. Seleccione un lugar para la instalación que esté sobre una superficie no inflamable.
2. La ubicación de montaje debe permitir la circulación de aire alrededor del transformador para que pueda enfriarse. Consulte las distancias mínimas especificadas en la sección de ventilación.
3. Con la plantilla de montaje apropiada que viene con el equipo, perfore dos orificios de montaje superior en la superficie de montaje.
4. Levante el transformador hasta colocarlo en su posición e instale los dos pernos de montaje superiores.
5. Con el transformador colgando sobre los dos pernos de montaje superiores, nivele la unidad y luego, con el compartimiento de cableado abierto, marque y perfore los orificios de montaje inferiores en la superficie de montaje.
6. Para brindar protección NEMA 3R (protección contra lluvia), el transformador debe estar montado verticalmente con las lengüetas de montaje orientadas hacia arriba.
7. Instale el perno de montaje inferior, la arandela de presión, la arandela plana y la arandela de goma en el orificio de montaje inferior (ver Diagrama 2).

VENTILACIÓN

Los transformadores se deben instalar en una área donde se puedan enfriar mediante la libre circulación de aire y donde la temperatura ambiente promedio sea de 30°C (86°F) y no supere los 40°C (104°F) en ningún momento.

La ventilación adecuada es esencial para que los transformadores alcancen la capacidad de kVa que figura en la placa de identificación. Todos los transformadores con gabinete para usos generales se deben ubicar por lo menos a 2 pulgadas (5 cm) en las unidades de hasta 10 kVa y a por lo menos 4 pulgadas (10 cm) en las unidades superiores a 10 kVa, alejados de paredes o de otras obstrucciones para permitir la libre y despejada circulación de aire.

ACCESIBILIDAD

Las normas NEC exigen que los transformadores sean accesibles para la inspección y que se ubiquen adecuadamente para tal fin. Sin embargo, los transformadores no se deben ubicar en áreas donde es probable que los elementos almacenados interfieran con la convección natural del aire o con la capacidad de inspeccionarlos. También se deben evitar los pasillos u otras áreas donde la gente pueda estar expuesta a piezas energizadas durante la inspección.

Se debe proporcionar protección adecuada bajo cualquier circunstancia.

NIVELES DE RUIDO DEL TRANSFORMADOR

Los transformadores son aparatos energizados eléctricamente y por su naturaleza emiten ruidos debido a sus materiales componentes.

Los transformadores deben cumplir las normas NEMA para los niveles máximos de ruido permitidos. Estos niveles de ruido varían de 40 a 60 DB, y por lo tanto, pueden ser molestos si se encuentran en las inmediaciones de los lugares donde viven o trabajan personas.

Se debe tener cuidado al elegir los sitios para los transformadores, especialmente para evitar áreas sensibles como hospitales, escuelas, centros médicos u oficinas.

Las siguientes pautas pueden ser útiles.

➔ Las unidades deben montarse alejadas de esquinas o de paredes o cielorrasos que produzcan reflejos.

➔ Los cables u otros conductos flexibles deben tenerse en cuenta para realizar conexiones.

➔ Los materiales absorbentes acústicamente se podrían tener en cuenta para las paredes y los cielorrasos alrededor de la unidad.

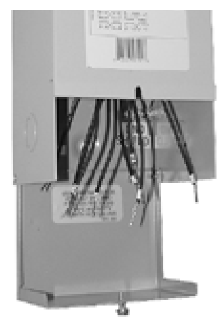
➔ La unidad debe ubicarse lo más alejada posible de las áreas donde los niveles de ruido podrían considerarse indeseables.

CONEXIONES DE CABLES

1. Abra el compartimiento de cableado aflojando el tornillo de la cubierta.
2. Los terminales se deben limpiar, y se recomienda usar compuestos de empalme eléctrico en todas las conexiones eléctricas.
3. Realice las conexiones eléctricas apropiadas para adaptarse a los voltajes deseados de acuerdo con el diagrama de conexión que figura en la placa de identificación. Esto incluye las conexiones de entrada, de salida y la conexión a tierra.

***PELIGRO**: Si esta unidad es diseñada para o va ser usada en, locaciones peligrosas Clase 1, División 2, Grupos A, B, C & D, entonces las conexiones eléctricas de entrada y salida deben estar de acuerdo con los métodos de conexión para Clase 1, División 2, según los Artículos 501-10 (b) del Código Nacional de Electricidad.*

4. Asegúrese de aislar todos los cables conductores no utilizados con conectores Marrette y cinta aisladora.
5. Cierre el compartimiento de cableado y verifique que el tornillo de la cubierta esté firmemente ajustado.



El tamaño del cable de conexión se determina con la potencia de corriente de línea de los bobinados primarios y secundarios de los transformadores. Se suministran prácticos troqueles previamente perforados en todos los recintos de los transformadores para facilitar la entrada de los cables. (NOTA: Los transformadores envasados no se pueden devolver si se han retirado los troqueles, a menos que la unidad tenga un defecto de fabricación, como se describe en la política de garantía estándar).

CONEXIÓN A TIERRA

Todos los conjuntos de núcleo y bobina se conectan sólidamente a tierra al recinto, en forma interna, para garantizar que todas las piezas metálicas conductoras tengan el mismo potencial.

El recinto del transformador también debe tener una conexión a tierra segura y eficaz como precaución de seguridad. Esta conexión a tierra debe cumplir con las normas de los códigos eléctricos nacionales.

INSPECCIÓN ANTES DE LA ENERGIZACIÓN

Para la operación segura y apropiada del transformador, recomendamos verificar que se hayan completado los siguientes pasos:

a) La resistencia del aislamiento, el recinto hasta el primario, el recinto hasta el secundario y del primario al secundario, debe ser superior a 10 k ohmios.
b) Antes de energizar y conectar cualquier carga, mida y verifique que el voltaje de salidacoincida con las especificaciones de la placa de identificación.
c) Verifique que las conexiones de fase sean correctas. Consulte el diagrama vectorial de la placa de identificación.
d) Cuando los bobinados se conectan en paralelo (como en el caso de primarios de doble voltaje), las derivaciones primarias de todas las bobinas se deben conectar en las posiciones de derivación con porcentaje idéntico para evitar el cortocircuito de las marchas. Para conocer las posiciones de derivación, consulte la placa de identificación del transformador.
e) El recinto debe estar conectado a tierra con el conductor del tamaño apropiado.
f) Se debe verificar que todas las conexiones eléctricas respeten la distancia de seguridad y que estén ajustadas.
g) Para las cargas monofásicas, de 3 hilos, de 240/120 voltios, se debe tener cuidado para garantizar que la corriente neutra no supere 1/2 de la potencia de kVA de los transformadores.

OPERACIÓN

Para todas las instalaciones relativamente normales y limpias, los transformadores con gabinete funcionarán satisfactoriamente en condiciones normales de energización y carga.

Para su referencia, los transformadores totalmente cargados pueden estar muy calientes al tacto, especialmente en la parte superior de la unidad.

Las normas permiten que las temperaturas del recinto sean de 65ºC con respecto a la temperatura ambiente. Esto representa una carga normal y no debe ser motivo de preocupación.

Los transformadores con gabinete están diseñados para operar en forma continua a la potencia total de kVA que figura en la placa de identificación.

La norma ANSI C57.96 ofrece pautas para la carga de transformadores en diferentes condiciones, entre ellas:

- ➔ Temperaturas ambiente que varían de las temperaturas ambientes exigidas para la operación de transformadores.
- ➔ Sobrecarga de corta duración que se relaciona con el tiempo y la temperatura y la correspondiente pérdida de la vida útil del transformador.
- ➔ Sobrecarga que provoque la reducción de la expectativa de vida útil del transformador.

Si el transformador presenta aumento de temperatura, se deben considerar de inmediato las siguientes características de carga:

- ➔ Cargas de arranque del motor rigurosas u otra carga de tipo impacto para la cual se requiere un transformador específico para esa aplicación.
- ➔ Excitación excesiva de la unidad debido a un exceso del voltaje o la corriente de la línea de alimentación.
- ➔ Temperaturas ambiente superiores a las estándar.
- ➔ Sobrecarga superior a la indicada en las pautas ANSI C57.96.
- ➔ Distorsiones armónicas del voltaje y las corrientes

MANTENIMIENTO

En condiciones normales de funcionamiento y ambientales, los transformadores con gabinete no requieren mantenimiento. Sin embargo, es una buena práctica realizar el cuidado y la inspección periódica, especialmente si la unidad está expuesta a condiciones ambientales extremas.

La inspección periférica y la remoción del polvo y la suciedad externa se deben realizar mientras el transformador está en funcionamiento. Sin embargo, no se deben abrir las cubiertas de acceso si el transformador está energizado.

La acumulación de hielo o nieve no afectará negativamente el funcionamiento de los transformadores con gabinete. Sin embargo, la acumulación de polvo o suciedad afectará el enfriamiento del transformador y podría representar un riesgo de incendio.

El mantenimiento interno se debe realizar con un transformador desenergizado, aislado y con los terminales con conexión a tierra.

Se debe verificar la conexión a tierra para garantizar que sea una conexión de baja impedancia.

PELIGRO: Si esta unidad es diseñada para o va ser usada en, locaciones peligrosas Clase 1, División 2, Grupos A, B, C & D, NO DESCONECTE EL EQUIPO A NO SER QUE LA ELECTRICIDAD HAYA SIDO DECONECTADA O HASTA ESTAR SEGURO QUE EL AREA ES FUERA DE PELIGRO.

DIAGRAMA 1a: Montaje de recintos de serie NQ0, NQ1, NQ2, NQ3, NQ4 y NQ5 para transformadores con gabinete monofásicos.

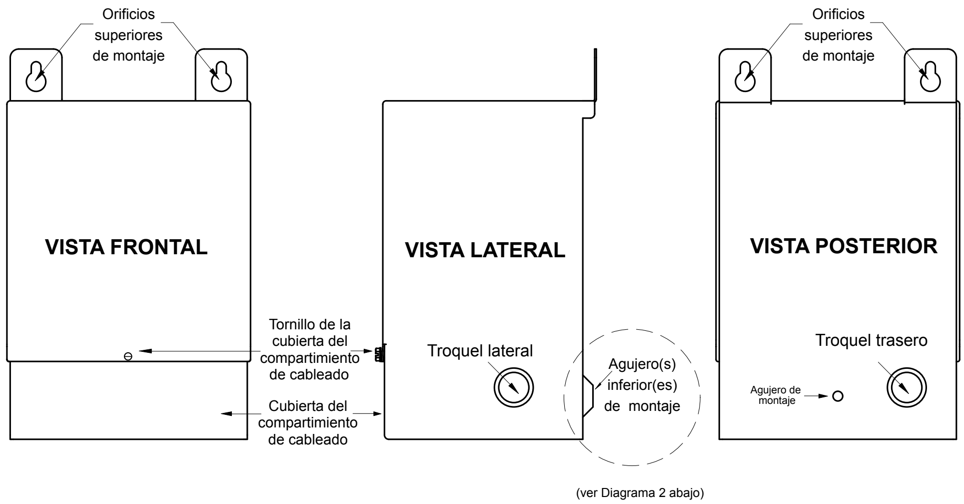


DIAGRAMA 1b: Montaje de recintos de serie NQ6, NQ6A, NQ7 y NQ8 para transformadores con gabinete monofásicos.

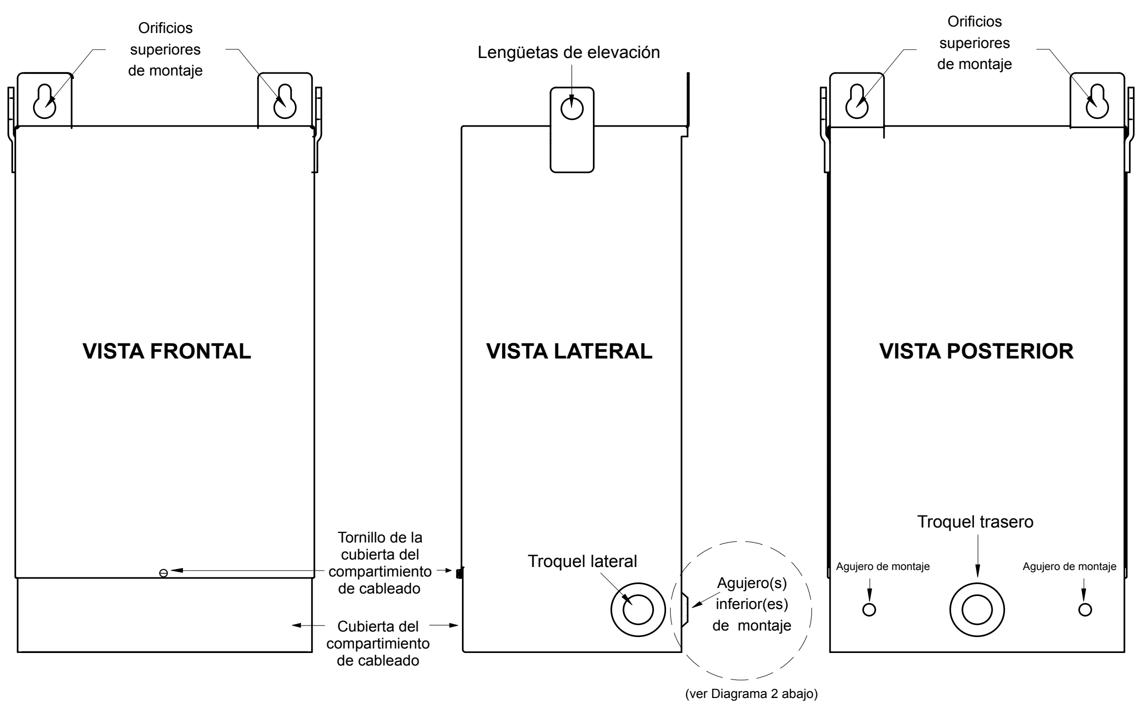
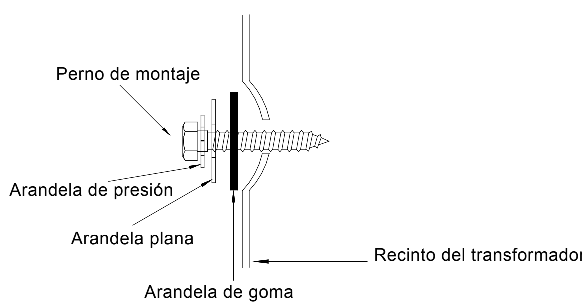


DIAGRAMA 2: Orificios de montaje inferiores del compartimiento de cableado, diagrama del conjunto de instalación del equipo.



Installation Instructions for EHD, EDB, EDS, ED, EDH, EDC, FDB, FD, HFD, FDC Circuit Breakers and Molded Case Switches

WARNING

DO NOT ATTEMPT TO INSTALL OR PERFORM MAINTENANCE ON EQUIPMENT WHILE IT IS ENERGIZED. DEATH, SEVERE PERSONAL INJURY OR SUBSTANTIAL PROPERTY DAMAGE CAN RESULT FROM CONTACT WITH ENERGIZED EQUIPMENT. ALWAYS VERIFY THAT NO VOLTAGE IS PRESENT BEFORE PROCEEDING WITH THE TASK, AND ALWAYS FOLLOW GENERALLY ACCEPTED SAFETY PROCEDURES.

CUTLER-HAMMER IS NOT LIABLE FOR THE MISAPPLICATION OR MISINSTALLATION OF ITS PRODUCTS.

The user is cautioned to observe all recommendations, warnings and cautions relating to the safety of personnel and equipment, as well as all general and local health and safety laws, codes, and procedures.

The recommendations and information contained herein are based on Cutler-Hammer experience and judgment, but should not be considered to be all-inclusive or covering every application or circumstance which may arise. If any questions arise, contact Cutler-Hammer for further information or instructions.

1. INTRODUCTION

Fig. 1-1. Model D Series C Circuit Breaker and Molded Case Switches

The F-Frame Series C circuit breakers (Fig. 10-1) Types FDB, FD, HFD, and FDC are rated from 15A to 225A (150A for 1 pole versions) continuous current and are available as thermal-magnetic circuit breakers and molded case switches. Type EHD circuit breakers and molded case switches are rated 100A maximum. Types EDB, EDS, ED, EDH, and EDC are rated from 100A to 225A continuous current and are available as thermal-magnetic circuit breakers. (Molded case switches are available rated at 100A, 150A, and 225A.) Circuit breakers are listed in accordance with Underwriters Laboratories, Inc. Standard UL489, and Types EHD, EDB, EDS, ED, FDB, EDH, EDC, FD, HFD, and FDC satisfy the (P1) requirements of the International Electrotechnical Commission Recommendation No. IEC 157-1. Molded case switches are listed in accordance with UL1087. For this publication, the term circuit breaker also includes molded case switches. For more information, see Frame Book 29-101.

2. INSTALLATION

The installation procedure consists of inspecting and mounting the circuit breaker, connecting and torquing the line and load terminations, and attaching terminal shields or barriers, when supplied. To install the circuit breaker, perform the following steps:

Note: The EHD, EDB, EDS, ED, EDH, EDC, FDB, FD, HFD, and FDC circuit breakers are factory sealed. UL489 requires that internal accessories be installed at the factory. Where local codes and standards permit and UL listing is not required, internal accessories can be field installed. Accessory installation should be done before the circuit breaker is mounted and connected.

Mounting hardware and unmounted terminations (where required) are supplied in separate packages.

2-1. Make sure that the circuit breaker is suitable for the installation by comparing nameplate data with system requirements. Inspect the circuit breaker for completeness and check for damage before mounting.

WARNING

BEFORE MOUNTING THE CIRCUIT BREAKER IN AN ELECTRICAL SYSTEM, MAKE SURE THERE IS NO VOLTAGE PRESENT WHERE WORK IS TO BE PERFORMED. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

2-2. Depending on the equipment configuration, the circuit breaker can be mounted using different styles of hardware. The following steps describe how to mount the circuit breaker using standard hardware. When special hardware is needed (for example, with the electrical operator), the instruction leaflet describing the accessory also describes the special mounting arrangements.

Note: Before mounting the circuit breaker, check if the termination devices should be installed first. See terminations instructions.

2-3. To mount the circuit breaker, perform the following steps:

a. For individual mounting panels, make sure that mounting panel is predrilled using bolt drilling plan (Fig. 2-1). For panelboard mounting, only load end support mounting holes are required. For deadfront cover applications make sure panel cover is cut out to correct escutcheon dimensions (Fig. 2-2).

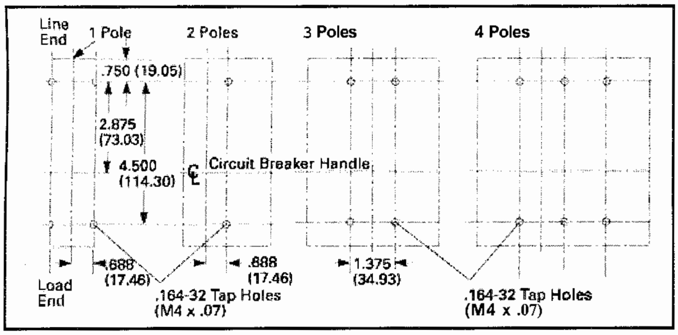
CAUTION

DO NOT EXCEED CONNECTOR/BUS CAPACITY IN CUTLER-HAMMER POWER LINE 3A AND 4 PANELS. USE CONNECTOR KIT KPRL3AFD3 (3 POLE) AND KPRL3AFD2 (2 POLE) IN PANEL TYPE PRL3A AND KPRL4FD (3 POLE) AND KPRL4FD2 (2 POLE) IN PANEL TYPE PRL4.

b. If circuit breaker includes factory installed internal accessories, make sure accessory wiring can be reached when the circuit breaker is mounted.

c. Position circuit breaker on mounting surface.

d. Install mounting screws, washers, and nuts. Tighten screws firmly, but do not exceed 28 pound-inches (3.16 N.m.).



Fig, 2-1. Circuit Breaker Mounting Bolt Drilling Plans

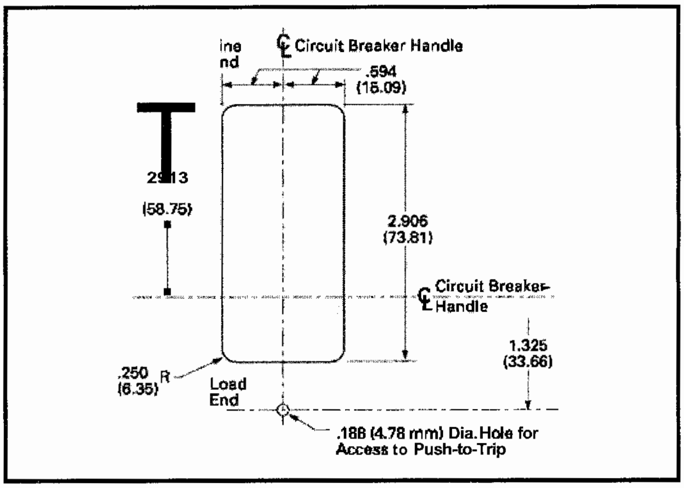


Fig. 2-2. Circuit Breaker Escutcheon Dimensions

2-4. If an optional terminal end cover is to be installed with the circuit breaker (usually line end only), it must be positioned before cable is connected to terminals.

CAUTION

WHEN ALUMINUM CONDUCTORS ARE USED, THE APPLICATION OF A SUITABLE JOINT COMPOUND IS RECOMMENDED TO REDUCE THE POSSIBILITY OF TERMINAL OVERHEATING. TERMINAL OVERHEATING CAN CAUSE NUISANCE TRIPPING AND DAMAGE TO THE CIRCUIT BREAKER.

2-5. After mounting the circuit breaker, line and load terminals and accessory leads should be connected. (See accessory schematic diagram on side of circuit breaker.)

Note: If terminal shield or interphase barriers are to be installed on the circuit breaker, install them after the terminals are connected.

2-6. If required, install terminal shield on circuit breaker cover with mounting screws provided.

2-7. If required, install an interphase barrier by sliding barrier into dovetail grooves between terminals.

2-8. After the circuit breaker is installed, check all mounting hardware and terminal connecting hardware for correct torque loading. Torque values for line/load terminals are given in Tables 2-1 and 2-2 and on the circuit breaker nameplate.

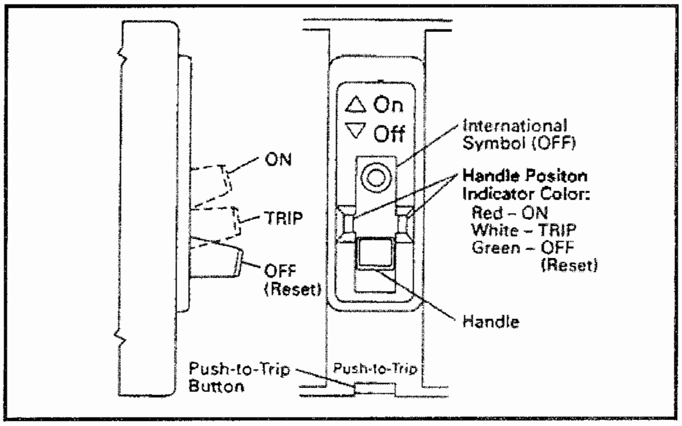


Fig. 3-1. Circuit Breaker Manual Controls

3. MANUAL OPERATION

Manual operation of the circuit breaker is controlled by the circuit breaker handle and the PUSH-TO-TRIP button. The circuit breaker handle has three indicated positions, two of which are shown on the cover with raised lettering to indicate ON and OFF. On the sliding handle barrier, ON, OFF, and trip are also shown by a color-coded strip for each circuit breaker handle position: red for ON, white for tripped, and green for OFF. On the sliding handle barrier, ON/OFF is also shown with the international symbols 1/0 (See Fig. 3-1.)

CIRCUIT BREAKER RESET

After tripping, the circuit breaker is reset by moving the circuit breaker handle to the extreme OFF position.

Note: In the event of a thermal trip, the circuit breaker cannot be reset until the thermal element cools.

PUSH-TO-TRIP BUTTON

The **PUSH-TO-TRIP** button checks the tripping function and is used to periodically exercise the operating mechanism.

4. INSPECTION AND FIELD TESTING

Series C molded case circuit breakers are designed to provide years of almost maintenance-free operation. The following procedure describes how to inspect and test a circuit breaker in service.

INSPECTION

Circuit breakers in service should be Inspected periodically. The inspection should include the following checks 4-1 thru4-7.

WARNING

BEFORE INSPECTING THE CIRCUIT BREAKER IN AN ELECTRICAL SYSTEM, MAKE SURE THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THERE IS NO VOLTAGE PRESENT WHERE WORK IS TO BE PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

CAUTION

MAKE SURE THAT CLEANING AGENTS OR SOLVENTS USED TO CLEAN THE CIRCUIT BREAKER ARE SUITABLE FOR THE JOB. SOME COMMERCIAL CLEANING AGENTS WILL DAMAGE THE NAMEPLATES OR MOLDED PARTS.

4-1. Remove dust, dirt, soot, grease, or moisture from the surface of the circuit breaker using a lint-free dry cloth, brush, or vacuum cleaner. Do not blow debris into circuit breaker. If contamination is found, look for the source and eliminate the problem.

4-2. Switch circuit breaker to ON and OFF several times to be sure that the mechanical linkages are free and do not bind. If mechanical linkages are not free, replace circuit breaker.

4-3. Press the PUSH-TO-TRIP button to mechanically trip the circuit breaker. Trip, reset, and switch circuit breaker ON several times. If mechanism does not reset each time the circuit breaker is tripped, replace the circuit breaker.

4-4. Check base, cover, and operating handle for cracks, chipping, and discoloration. Circuit breakers should be replaced if cracks or severe discoloration is found.

4-5. Check terminals and connectors for looseness or signs of overheating. Overheating will show as discoloration, melting, or blistering of conductor insulation, or as pitting or melting of conductor surfaces due to arcing. If there is no evidence of overheating or looseness, do not disturb or tighten the connections. If there is evidence of overheating, terminations should be cleaned or replaced. Before re-energizing the circuit breaker, all terminations and cable should be refurbished to the condition when originally installed.

4-6. Check circuit breaker mounting hardware. Tighten if necessary.

4-7. Check area where circuit breaker is installed for any safety hazards, including personal safety and fire hazards. Exposure to certain types of chemicals can cause deterioration of electrical connections.

FIELD TESTING

Any field testing should be done in accordance with NEMA Standards Publication AB2 — 1984.

EATON | Cutler-Hammer
170 Industry Drive
Pittsburgh, PA 15275

Style No. 6620C41H08
Effective 11/03
Printed in U.S.A./TQC

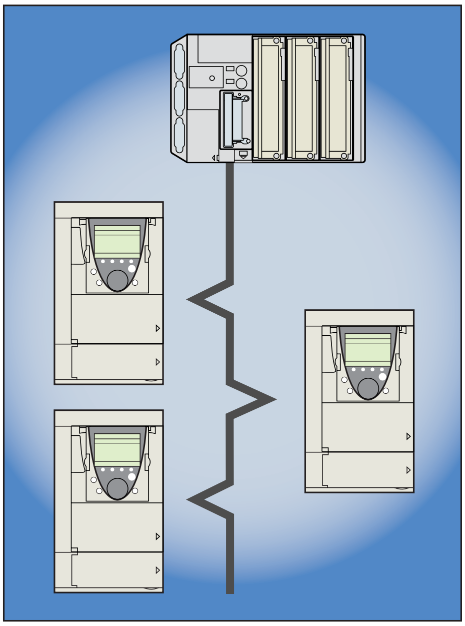
Altivar 61 / 71

User's manual

Retain for future use

EtherNet/IP card

VW3 A3 316



a brand of Schneider Electric

Telemecanique

Table of Contents

1. Important Information

NOTICE

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of this symbol to a Danger or Warning safety label indicates that an electrical hazard exists, which will result in personnal injury if the instruction are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

DANGER

DANGER indicates an imminently hazardous situation, which, if not avoided, **will result** in death, serious injury, or equipment damage.

WARNING

Warning indicates a potentially hazardous situation, which, if not avoided, **can result** in death, serious injury, or equipment damage.

CAUTION

CAUTION indicates a potentially hazardous situation, which, if not avoided, **can result** in injury or equipment damage.

PLEASE NOTE

Electrical equipment should be serviced only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material. This document is not intended as an instruction manual for untrained persons.

Read and understand these instructions before performing any procedure with this drive.

DANGER

HAZARDOUS VOLTAGE

- Read and understand this bulletin in its entirety before installing or operating Altivar 71 drive.
  This equipment must only be installed, adjusted, repaired, and maintained by qualified personnel.
- The user is responsible for compliance with all international and national electrical standards in force concerning protective grounding of all equipment.
- Many parts of this variable speed drive, including the printed circuit boards, operate at the line voltage. DO NOT TOUCH. Use only electrically insulated tools.
- DO NOT touch unshielded components or terminal strip screw connections with voltage present.
- DO NOT short across terminals PA and PC or across the DC bus capacitors.
- Install and close all the covers before applying power or starting and stopping the drive.
- Before servicing the variable speed drive
  - Disconnect all power.
  - Place a “DO NOT TURN ON” label on the variable speed drive disconnect.
  - Lock the disconnect in the open position.
- Disconnect all power including external control power that may be present before servicing the drive.
  WAIT 15 MINUTES to allow the DC bus capacitors to discharge. Then follow the DC bus voltage measurement procedure given in the Installation Manual to verify that the DC voltage is less than 45 VDC. The drive LEDs are not accurate indicators of the absence of DC bus voltage.

Failure to follow these instructions will result in death or serious injury.

WARNING

DAMAGED EQUIPMENT

Do not install or operate any drive or drive accessory that appears damaged.The relays, inputs, or outputs of a damaged drive may not operate in a normal manner, leading to unintended equipment operation.
Failure to follow this instruction can result in death, serious injury, or equipment damage.

WARNING

LOSS OF CONTROL

- The designer of any control scheme must consider the potential failure modes of control paths and, for certain critical control functions, provide a means to achieve a safe state during and after a path failure. Examples of critical control functions are emergency stop and overtravel stop.
- Separate or redundant control paths must be provided for critical control functions.
- System control paths may include communication links. Consideration must be given to the implications of unanticipated transmission delays or failures of the link.*
- € Each implementation of an Altivar 71 Modbus TCP/IP EtherNet/IP card must be individually and thoroughly tested for proper operation before being placed into service.

Failure to follow this instruction can result in death, serious injury, or equipment damage.

* For additional information, refer to NEMA ICS 1.1 (latest edition), "Safety Guidelines for the Application, Installation, and Maintenance of Solid State Control" and to NEMA ICS 7.1 (latest edition), "Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable-Speed Drive Systems".

3. Documentation structure

The following Altivar 71 technical documents are available on the Web site www.telemecanique.com and on the CDROM delivered with each drive.

■ Installation Manual

This manual describes:
- How to assemble the drive.
- How to connect the drive.

■ Programming Manual

This manual describes:
- The functions.
- The parameters.
- How to use the drive display terminal (integrated display terminal and graphic display terminal).

■ Communication Parameters Manual

This manual describes:
- The drive parameters with specific information (addresses, formats, etc.) for use via a bus or communication network.
- The operating modes specific to communication (state chart).
- The interaction between communication and local control.

■ Modbus, CANopen, Ethernet, Profibus, INTERBUS, Uni-Telway, DeviceNet, Modbus Plus, Fipio, etc., manuals.

These manuals describe:
- Connection to the bus or network.
- Configuration of the communication-specific parameters via the integrated display terminal or the graphic display terminal.
- Diagnostics.
- Software setup.
- The communication services specific to the protocol.

■ Altivar 58/58F Migration Manual

This manual describes the differences between the Altivar 71 and the Altivar 58/58F.
It explains how to replace an Altivar 58 or 58F, including how to replace drives communicating on a bus or network.

4. Introduction

4. 1. Presentation

The EtherNet/IP card (catalog number VW3 A3 316) is used to connect an Altivar 71 or an Altivar 61 drive to an Ethernet network using the EtherNet/IP protocol.

IMPORTANT : This communication option card is fully supported with the version V1.5 IE 13 and above of the Altivar 61 firmware.
This communication option card is only supported with the version V1.6 IE 19 and above of the Altivar 71 firmware. Specific versions of the Altivar 71 firmware are not supported.

The VW3 A3 316 card is equipped with two shielded RJ45 EtherNet/IP connectors.

The accessories for connection to the EtherNet/IP network must be ordered separately.

The data exchanges permit full drive functionality:
- Configuration
- Adjustment
- Control
- Monitoring
- Diagnostics

The standard Web server (English only) provides access to the following pages:
- Altivar Viewer
- Data Viewer
- EtherNet/IP
- Security

Etc.

The graphic display terminal or the integrated display terminal can be used to access numerous functions for communication diagnostics.

4. 2. Notation

Drive terminal displays

The graphic display terminal menus are shown in square brackets.
Example: [1.9 COMMUNICATION].

The integrated 7-segment display terminal menus are shown in round brackets.
Example: (COM-).

The parameter names displayed on the graphic display terminal are shown in square brackets.
Example: [Fallback speed].

The parameter codes displayed on the integrated 7-segment display terminal are shown in round brackets.
Example: (LFF).

Formats

Hexadecimal values are written as follows: 16#
Binary values are written as follows: 2#
PowerSuite: Commissioning Software

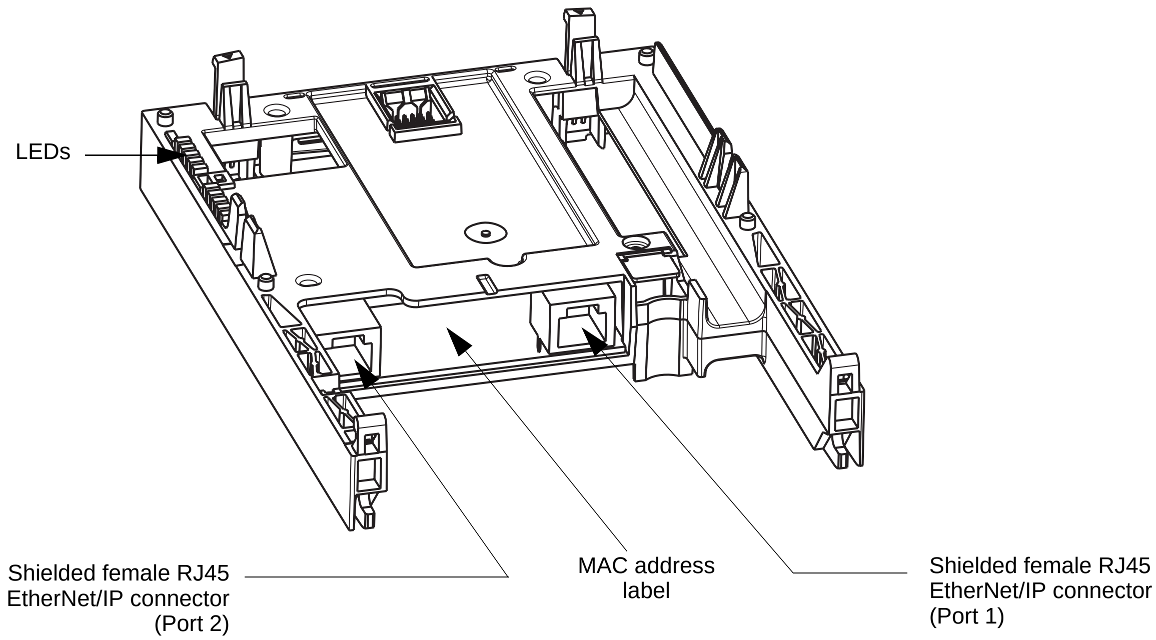
5. Hardware setup

5. 1. Receipt

- Check that the card catalog number marked on the label is the same as that on the delivery note corresponding to the purchase order.
- Remove the option card from its packaging and check that it has not been damaged in transit.

CAUTION
STATIC SENSITIVE COMPONENTS The EtherNet/IP card can be damaged by static electricity. Observe electrostatic precautions when handling and installing the card. **Failure to follow this instruction can result in equipment damage.**

5. 2. Hardware description



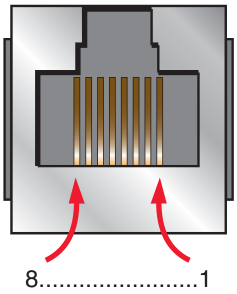
5. 3. Installing the card in the drive

See the Installation Manual.

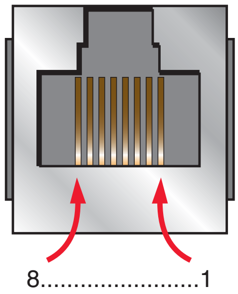
6. Connecting to the EtherNet/IP network

6. 1. Card RJ45 connector pinout

The EtherNet/IP card is equipped with two shielded RJ45 connectors. The shielding is connected to the drive ground.
Use an STP (shielded twisted pair) EtherNet/IP cable.



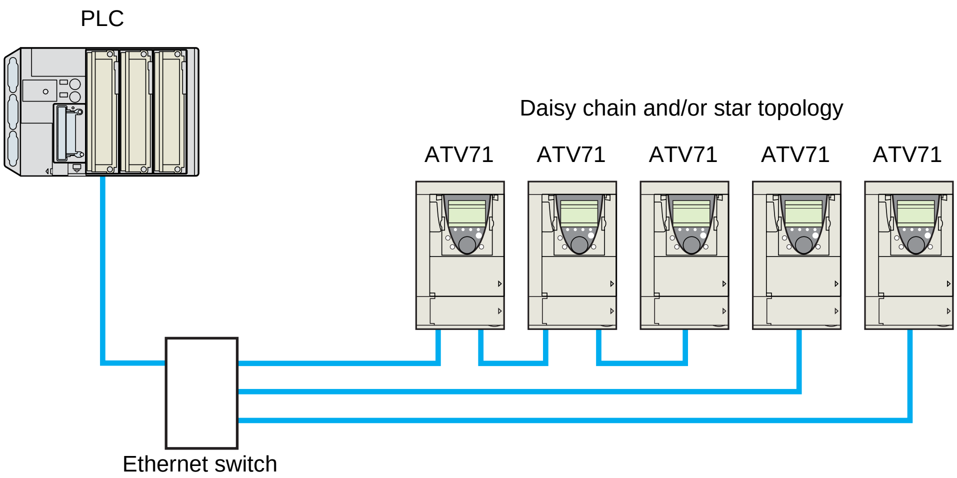
Pin	Signal
1	TD+
2	TD-
3	RD+
4	
5	
6	RD-
7	
8	



The transmission speed is detected automatically by the card (10 Mbps or 100 Mbps).

The card can operate in half duplex or full duplex mode, whether connected to a hub or a switch and regardless of the transmission speed (10 Mbps or 100 Mbps).

6. 2. Example of connection to an EtherNet/IP network

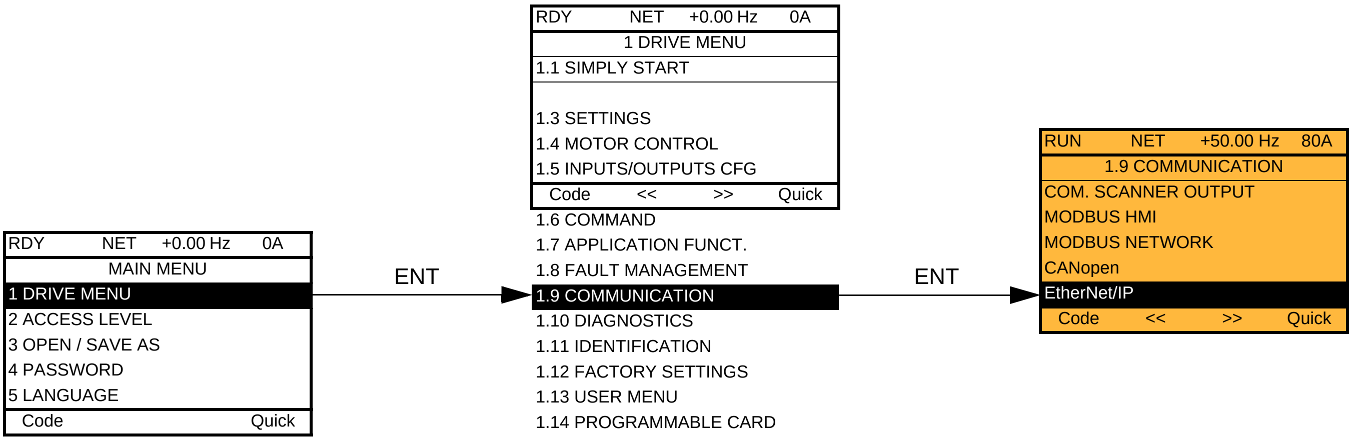


7. Using the HMI with the EtherNet/IP card

7. 1. Access to EtherNet/IP menu via graphic display terminal

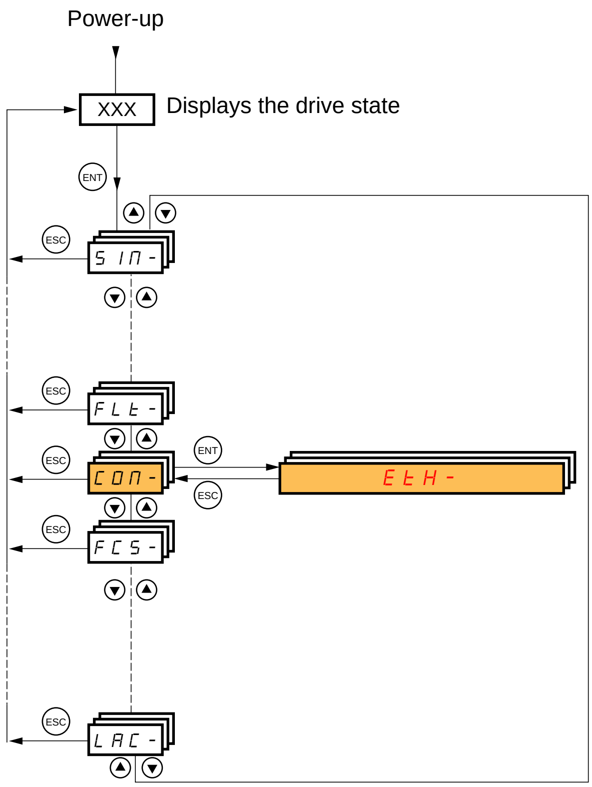
The [EtherNet/IP] submenu is used to configure and display the EtherNet/IP card parameters and can be accessed via the [1.9 - COMMUNICATION] menu.

This menu is only accessible in standard, advanced and expert mode: In the [2 ACCESS LEVEL] (LAC-) menu, set the level to [expert] (EPr).
Can be accessed by the other level.



7. 2. Access to EtherNet/IP menu via the integrated display terminal

The (EtH-) submenu is used to configure and display the EtherNet/IP card parameters. It can be accessed via the (COM-) menu.



7. 3. Ethernet/IP configuration with the HMI

Detail of the Ethernet/IP configuration menu: (All these settings can also be performed from the webserver or PowerSuite). In the table, parameters which are not followed by their parameter code (between parenthesis) are not displayed on the 7 segment display of the drive.
[1.9 - COMMUNICATION] (COM-) → menu [ETHIP] (EtH)

Parameter	Possible value	Terminal display
[DEVICE NAME] The device name is required if the card uses DHCP to obtain its IP Address.	16 chars.	[ABC…]
[Rate Setting] (rdS) This field is used to set the transmission speed and the transmission mode of the card.	0 : Autodetect (default) 1 : 10 Mbps Full 2 : 10 Mbps Half 3 : 100 Mbps Full 4 : 100 Mbps Half (do not use)	[Auto] (AUtO) [10 Mbps full] (10 F) [10 Mbps half] (10H) [100 Mbps full] (100F) [100 Mbps half] (100H)
[Actual Rate] (Ard) This field displays the baud rate and the transmission mode currently used by the communication card. (Display only)	0 : Autodetect 1 : 10 Mbps Full 2 : 10 Mbps Half 3 : 100 Mbps Full 4 : 100 Mbps Half	[Auto] (AUtO) [10 Mbps full] (10 F) [10 Mbps half] (10H) [100 Mbps full] (100F) [100 Mbps half] (100H)
[IP mode] (IPM) Use this parameter to select the IP address assignment method.	0 : Manu 1 : BOOTP 2 : DHCP	[fixed] (MAnU) [BOOTP] (bOOt) [DHCP] (dHCP)
[IP card] (IPC-) (IPC1) (IPC2) (IPC3) (IPC4) IP address of the card	These fields are editable when IP mode is set to Fixed address	[139.160.069.241] (139) (160) (069) (241)
[IP Mask] (IPM-) (IPM1) (IPM2) (IPM3) (IPM4) Subnet mask	These fields are editable when IP mode is set to Fixed address	[255.255.254.0] (255) (255) (254) (0)
[IP Gate] (IPG-) (IPG1) (IPG2) (IPG3) (IPG4) Default gateway IP address	These fields are editable when IP mode is set to Fixed address	[0.0.0.0] (0) (0) (0) (0)
• If the address has been given by a BOOTP or a DHCP server, these fields are read only. • After dynamic addressing by a BOOTP or DHCP server, the new address value is displayed.		
[Services] (E E) Enables web server and e-mail server * This parameter is significant at the bit level. Bit 0 and bit, other bits are reserved	0 : Web Server and Email functions are disabled. 1: Web Server activated. 2: Email function activated 3: Web server and Email functions are activated	0 1 2 3
[MAC @] MAC address display	[00-80-F4-XX-XX-XX]	[00-80-F4-XX-XX-XX]

*: This functionality can only be configured from the WEB server or from PowerSuite commissioning software.

7. 4. Detail of the configured parameters

■ IP address

Assigning IP addresses

The drive needs 3 IP addresses:
- The drive IP address.
- The subnet mask.
- The gateway IP address.

They can be provided by:
- A BOOTP server (correspondence between the MAC address and the IP addresses).
- Or a DHCP server (correspondence between Device Name [DEVICE NAME] and the IP addresses).

The address is assigned according to the IPmode parameter:

IP Mode value	Comments
IP mode = 0	The card uses the address defined in IPC1, IPC2, IPC3, IPC4
IP mode = 1	The card receives its address from a BOOTP server
IP mode = 2 And Device name contains a valid name.	The card receives its address from a DHCP server

IMPORTANT: The IP mode parameter may be modified according to the **configuration control attribute** of the **TCP/IP interface object** (CIP standard). See page 50.

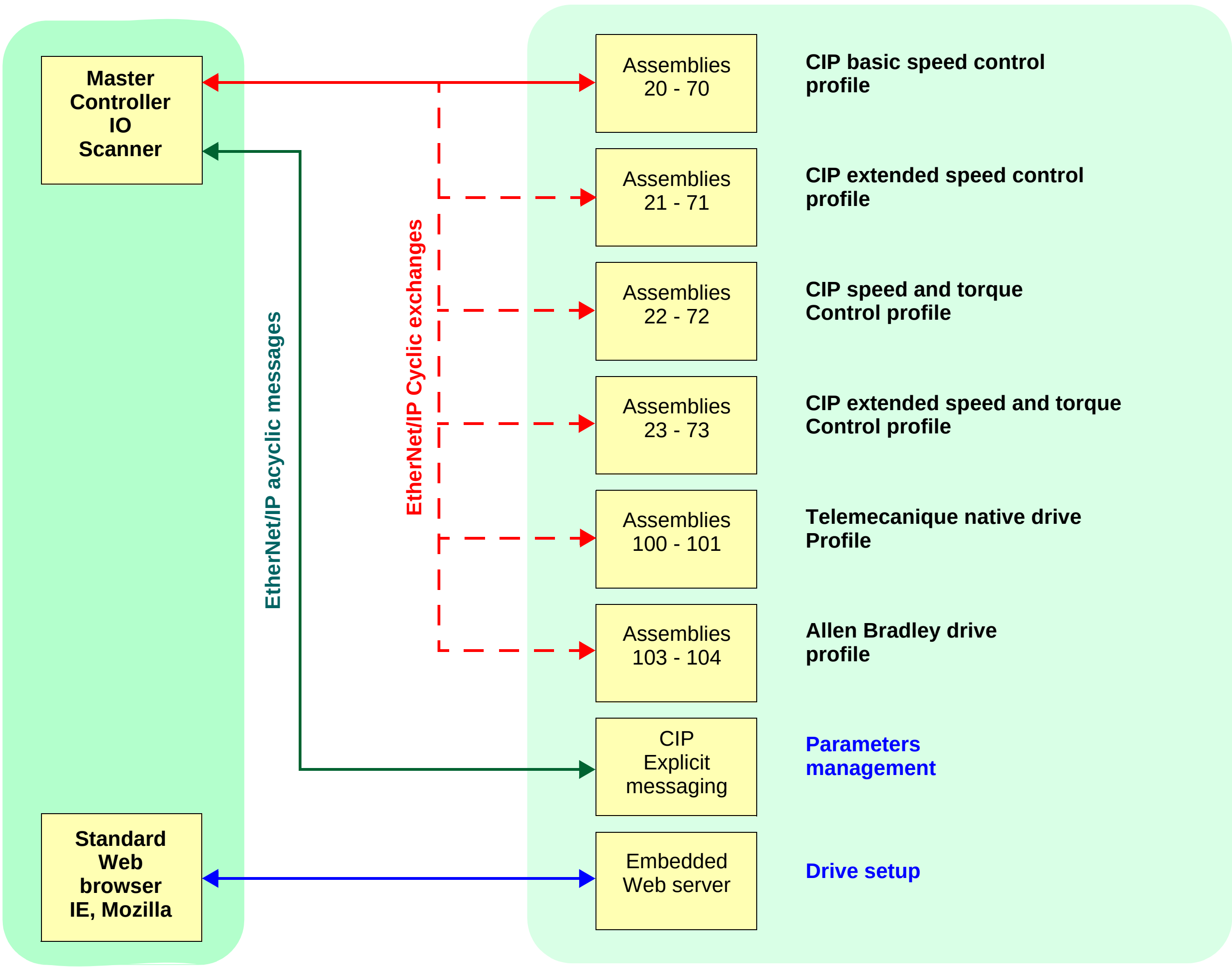
7. 5. Assemblies and scanner configuration

The assemblies are chosen at the master controller level (see for example chapter 16 Integration in RSlogix).
For the 4 ODVA set of assemblies (20,21,22,23,70,71,72,73) there are no more configuration to do at the communication scanner level.
For the Telemecanique assembly (100,101) and Allen Bradley® assembly (103,104) you must:
- configure at the drive level the size of the assembly,
- define the mapping of the additional parameters.

8. Configuration of the assemblies

8. 1. Configuration of the assemblies: overview

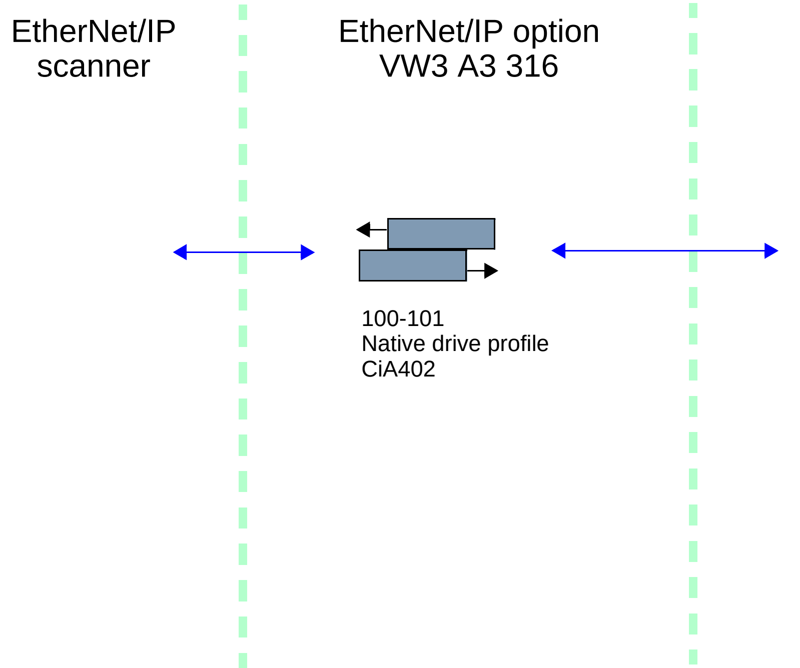
VW3 A3 316 EtherNet/IP communication card
Features overview



8. 2. Configuration of the assembly (100,101) Telemecanique native profile

The size of the assembly is fixed and is equal to 8.
The mapping of the other parameters is made with the communication scanner :
The configuration of the addresses defined with NCAx and NMAx can be made with the graphic keypad:
For assembly 100 : [1.9- COMMUNICATION] (COM-) menu, [COM.SCANNER OUTPUT] (OCS-) submenu.
For assembly 101 : [1.9- COMMUNICATION] (COM-) menu, [COM.SCANNER INPUT] (ICS-) submenu.
See menu [1.2 MONITORING] > COMMUNICATION MAP to monitor the communication scanner.

See also "Configuring the communication scanner" page 16.



Altivar 71/61

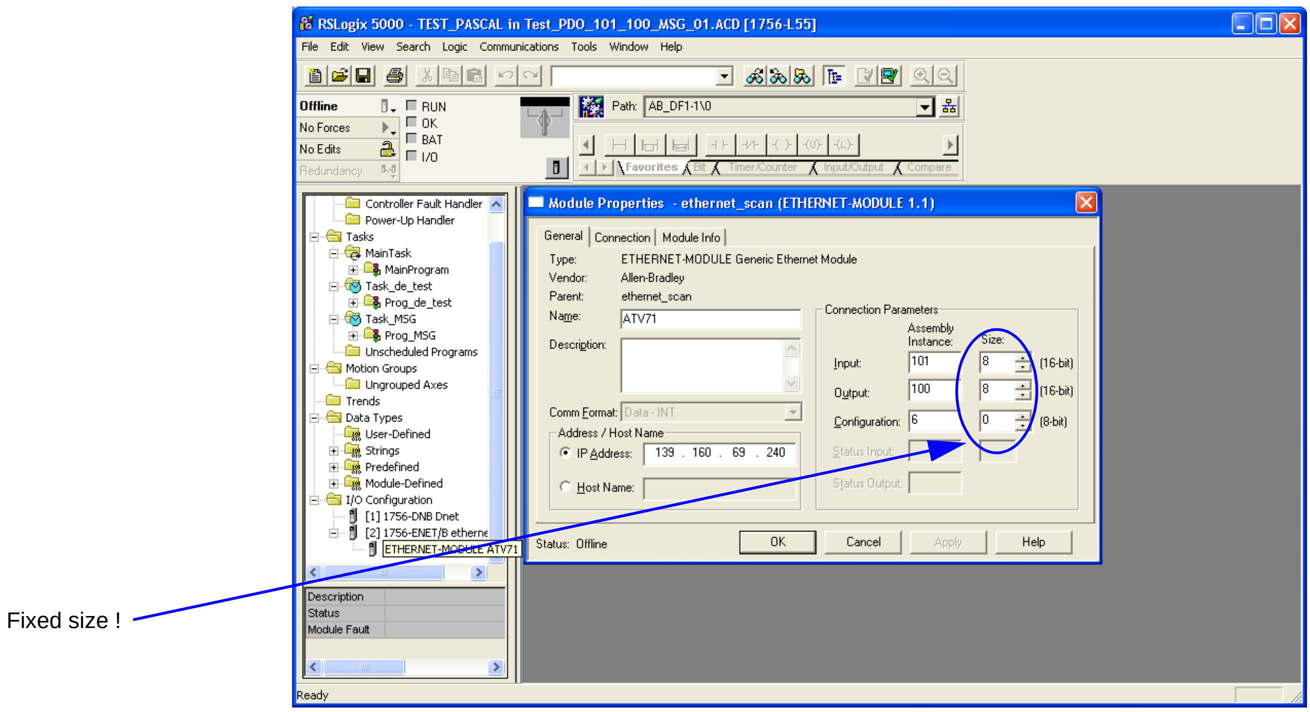
The mapping of the 100-101 Assemblies is made with the ATV71 communication scanner

NCA1	NMA1
NCA2	NMA2
NCA3	NMA3
NCA4	NMA3
NCA5	NMA4
NCA6	NMA5
NCA7	NMA6
NCA8	NMA7
Assembly 100	**Assembly 101**

Up to 8 additional parameters are mapped.

This configuration is made with:
- HMI
- PowerSuite
- Keypad

Here is an example of the configuration of the assemblies 100, 101 from RSLogix software:



8. 3. Configuration of the assembly (103,104) Allen Bradley® profile

The size of the assembly is selectable from 2 to 10 words.
The 2 first words of the input assembly are fixed: Control word, Speed setpoint.
The 4 first words of the output assembly are fixed two pad words: Status word, Actual Speed.

IMPORTANT: NCA1 and NCA2 are already configured (default settings of the drive). It is important when configuring this assembly set to handly remove the default assignment of NCA1 and NCA2: By setting NCA1 and NCA2 to a null address or by configuring this two address to other required parameters of the drive.

This will avoid a conflict between NCA1 and the control word of the profile (located in the first word of the assembly 103).
The configuration of the addresses defined with NCAx and NMAx can be made with the graphic keypad:
For assembly 103 : [1.9- COMMUNICATION] (C O M -) menu, [COM.SCANNER OUTPUT] (O C S -) submenu.
For assembly 104 : [1.9- COMMUNICATION] (C O M -) menu, [COM.SCANNER INPUT] (I C S -) submenu.
See menu [1.2 MONITORING] > COMMUNICATION MAP to monitor the communication scanner.
See also "Configuring the communication scanner" page 16
The mapping of the other parameters is made with the EtherNet/IP scanner:

EtherNet/IP scanner

EtherNet/IP option VW3 A3 316

Altivar 71/61

The mapping of the 103-104 Assemblies is made with the option card EtherNet/IP scanner

103-104
Native drive profile
CiA402

This configuration is made with:
- Webserver
- PowerSuite

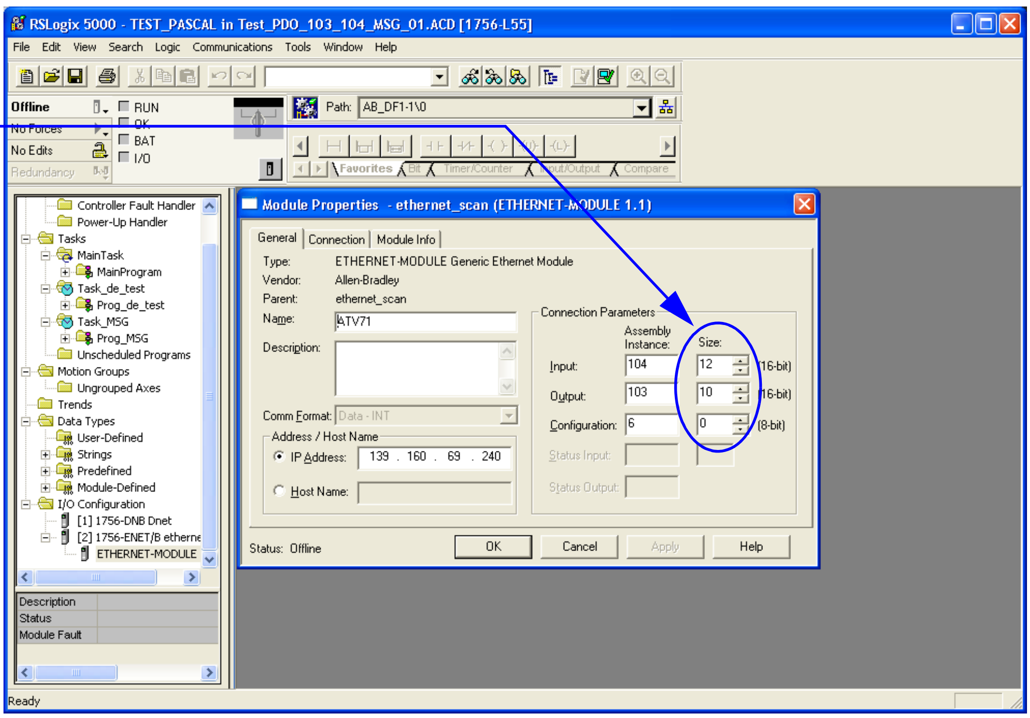
Assembly 103	Assembly 104
	PAD WORD
	PAD WORD
Control Word	Status Word
Set point	Actual speed
NCA1	NMA1
NCA2	NMA2
NCA3	NMA3
NCA4	NMA3
NCA5	NMA4
NCA6	NMA5
NCA7	NMA6
NCA8	NMA7

Up to 8 additional parameters are mapped.

Here is an example of the configuration of the assemblies 103, 104 from RSLogix software

The sizes indicated must be adjusted according to the settings defined with the EtherNet/IP scanner setup (webserver or Power suite).

Note:
- The size of the assembly cannot be modified dynamically; such change requires a power ON.
- Given that assemblies 103 and 104 uses NCAx and NMAx, the configuration edited with the webserver or Power suite software are also applied to the communication scanner of the drive (like assemblies 100 and 101).



8. 4. Configuring the communication scanner

You need to read this chapter only if you use the assemblies 100 or 101 that use the drive communication scanner.

The variables exchanged by the output assembly 100 and input assembly 101 are selected by configuring the communication scanner.

The 8 output variables are assigned by means of the 8 parameters [Scan. Out• address] (nCA•). They are configured using the graphic display terminal via the [1.9 - COMMUNICATION] (COM-) menu, [COM. SCANNER OUTPUT] (OCS-) submenu.

The 8 input variables of the assembly 101 are assigned by means of the 8 parameters [Scan. In• address] (nMA•). They are configured using the graphic display terminal via the [1.9 - COMMUNICATION] (COM-) menu, [COM. SCANNER INPUT] (ICS-) submenu.

Enter the logic address of the parameter (see the Communication parameters manual).
If a parameter [Scan. Out• address] (nCA•) or [Scan. In• address] (nMA•) is equal to zero, the corresponding period variable is not used by the drive.

These 8 assignment parameters are described in the tables below:

Parameter name	Output assembly 100	Default assignment
[Scan. Out1 address] (nCA1)		NCA1 = 8501
[Scan. Out2 address] (nCA2)		NCA2 = 8602
[Scan. Out3 address] (nCA3)		NCA3 = not used
[Scan. Out4 address] (nCA4)		NCA4 = not used
[Scan. Out5 address] (nCA5)		NCA5 = not used
[Scan. Out6 address] (nCA6)		NCA6 = not used
[Scan. Out7 address] (nCA7)		NCA7 = not used
[Scan. Out8 address] (nCA8)		NCA8 = not used

Parameter name	Input assembly 101	Default assignment
[Scan. In1 address] (nMA1)		NMA1=3201
[Scan. In2 address] (nMA2)		NMA2=8604
[Scan. In3 address] (nMA3)		NMA3=not used
[Scan. In4 address] (nMA4)		NMA4=not used
[Scan. In4 address] (nMA5)		NMA5=not used
[Scan. In4 address] (nMA6)		NMA6=not used
[Scan. In4 address] (nMA7)		NMA7=not used
[Scan. In4 address] (nMA8)		NMA8=not used

Example of configuration via the graphic display terminal:

RDY	NET	+0.00Hz	0A
COM. SCANNER INPUT			
Scan. In1 address	:		3204
Scan. In2 address	:		3206
Scan. In3 address	:		0
Scan. In4 address	:		0
Scan. In5 address	:		0
Code		Quick	
Scan. In6 address	:		0
Scan. In7 address	:		0
Scan. In8 address	:		0

RDY	NET	+0.00Hz	0A
COM. SCANNER OUTPUT			
Scan. Out1 address	:		9001
Scan. Out2 address	:		9002
Scan. Out3 address	:		0
Scan. Out4 address	:		0
Scan. Out5 address	:		0
Code		Quick	
Scan. Out6 address	:		0
Scan. Out7 address	:		0
Scan. Out8 address	:		0

Note:
All modifications to parameters [Scan. Out• address] (nCA•) or [Scan. In• address] (nMA•) must be made with the motor stopped. The master PLC program should be updated to take account of this modification.

8. 5. Configuring the control

■ Principle

By the configuration of the control, it is possible to decide from what channel the drive receives its commands and setpoint, either permanently or depending on a switching command.

Numerous configurations are possible. For more information, refer to the Programming manual and Communication parameters manual. The following configurations are some of the possibilities available.

❑ Control with communication scanner

If the default assemblies (100, 101) are selected, all possibilities of Altivar 71 drive are available.

It is possible to use all profiles and modes of the drive:
- I/O profile,
- Drivecom profiles with separate or non separate mode.

By the configuration of the communication scanner, it is possible to assign any relevant parameter of the drive to the 4 input and 4 output variables of the assemblies.
See the input / output interface with the PLC can be fully customised depending on the application.

The use of the communication scanner is also the best way to interface with a "Controller Inside" card.

❑ Control according to ODVA AC drive profile

The ODVA AC drive profile is activated when one of the following assemblies is selected:
- 20: Basic speed control output
- 21: Extended speed control output
- 22: Speed and torque control output
- 23: Extended speed and torque control output
- 70: Basic speed control input
- 71: Extended speed control input
- 72: Speed and torque control input
- 73: Extended speed and torque control input

The advantage of using the ODVA drive profile standard is the interchangeability with other brands.

The drive must be configured in the Drivecom profile with separate mode.
The EtherNet/IP card translates the commands, behaviour and monitoring information from of ODVA profile (on the network) to the Drivecom profile (in the drive).

❑ Control according to Allen-Bradley® drive profile

The Allen-Bradley® Drive profile is activated when one of the following assemblies is selected:
- 103: Allen-Bradley® drive output
- 104: Allen-Bradley® drive input

If you need to replace Allen-Bradley® drives, in an existing application, this profile is a good way to minimise the modifications.

The drive must be configured in the Drivecom profile with separate mode.
The EtherNet/IP card translates the commands, behaviour and monitoring information from of Allen-Bradley® drive profile (on the network) to the Drivecom profile (in the drive).

■ Available configurations

❑ If you use the communication scanner:

- 100: Communication scanner output
- 101: Communication scanner input there is no limitation in the configuration of the control.

The examples below are only possible if you use the communication scanner.

❑ If you use the ODVA AC drive profile or Allen-Bradley® Drive profile, that is, the assemblies:

- 20: Basic speed control output
- 21: Extended speed control output
- 22: Speed and torque control output
- 23: Extended speed and torque control output
- 70: Basic speed control input
- 71: Extended speed control input
- 72: Speed and torque control input
- 73: Extended speed and torque control input
- 103: Allen-Bradley® drive output
- 104: Allen-Bradley® drive input

Parameter	Permitted value	Comment
Profile	Drivecom profile separate	The run commands are in Drivecom profile, the command and the reference can come from different channels.
Setpoint 1 configuration	Network card	Setpoint 1 comes from EtherNet/IP.
Setpoint 1B configuration	Terminals	Setpoint 2 comes from terminals (AI1 or AI2).
Setpoint 2 configuration	Terminals	Setpoint 2 comes from terminals (AI1 or AI2).
Command 1 configuration	Network card	Command 1 comes from EtherNet/IP.
Command 2 configuration	Terminals	Command 2 comes from terminals.
Setpoint switching	Network card bit 12	Bit 12 of the control word switches the setpoint (1 <-> 1B or 1 <-> 2).
Command switching	Network card bit 13	Bit 13 of the control word switches the command.

Configuration via the graphic display terminal or the integrated display terminal:

Case 1: Setpoint 1B is connected to the functions (Summing, PID, etc) which remain active even after switching.

Menu	Parameter	Permitted value
[1.6 - COMMAND] (CtL-)	[Profile] (CHCF)	[Separate] (SEP)
	[Ref.1 channel] (Fr1)	[Com. card] (nEt)
	[Ref.1B channel] (Fr1b)	[Ref. AI1] (AI1) or [Ref. AI2] (AI2)
	[Cmd channel 1] (Cd1)	[Com. card] (nEt)
	[Cmd channel 2] (Cd2)	[Terminals] (tEr)
	[Cmd switching] (CCS)	[C312] (C312)
[1.7 APPLICATION FUNCT.] (FUn-) [REFERENCE SWITCH.]	[Ref 1B switching] (rCb)	[C313] (C313)

Case 2: Setpoint 2 is directly connected to the drive reference limit. If switching is performed, the functions that affect the reference (summing, PID, etc.) are inhibited.

Menu	Parameter	Permitted value
[1.6 - COMMAND] (CtL-) [1.7 APPLICATION FUNCT.] (FUn-) [REFERENCE SWITCH.]	[Profile] (CHCF)	[Separate] (SEP)
	[Ref.1 channel] (Fr1)	[Com. card] (nEt)
	[Ref.2 channel] (Fr2)	[Ref. AI1] (AI1) or [Ref. AI2] (AI2)
	[Cmd channel 1] (Cd1)	[Com. card] (nEt)
	[Cmd channel 2] (Cd2)	[Terminals] (tEr)
	[Cmd switching] (CCS)	[C312] (C312)
	[Ref. 2 switching] (rFC)	[C313] (C313)

Note: It is not possible to configure the display terminal as a channel.
To switch to the display terminal, use the function force local and assign the parameter [Forced local Ref.] to [HMI] (LCC).

8. Configuration of the assemblies

Control via EtherNet/IP in I/O profile

Note: This configuration can only be used if the communication scanner assemblies (100 and 101) are selected.

The command and the setpoint come from EtherNet/IP.
Control is in I/O profile.

Configure the following parameters:

Parameter	Value	Comment
Profile	I/O profile	The run command is simply obtained by bit 0 of the command word.
Setpoint 1 configuration	Network card	The setpoint comes from EtherNet/IP.
Command 1 configuration	Network card	The command comes from EtherNet/IP.

Configuration via the graphic display terminal or the integrated display terminal:

Menu	Parameter	Value
[1.6 - COMMAND] (CtL-)	[Profile] (CHCF)	[I/O profile] (IO)
	[Ref.1 channel] (Fr1)	[Com. card] (nEt)
	[Cmd channel 1] (Cd1)	[Com. opt card] (nEt)

Control via EtherNet/IP or via the terminals in I/O profile

Note: This configuration can only be used if the communication scanner assemblies (100 and 101) are selected.

The command and the setpoint both come from EtherNet/IP or the terminals. Input LI5 at the terminals is used to switch between EtherNet/IP and the terminals.
Control is in I/O profile.

Configure the following parameters:

Parameter	Value	Comment
Profile	I/O profile	The run command is simply obtained by bit 0 of the control word.
Setpoint 1 configuration	Network card	Setpoint 1 comes from EtherNet/IP.
Setpoint 1B configuration	Analog input 1 on the terminals	Setpoint 1B comes from input AI1 on the terminals.
Setpoint switching	Input LI5	Input LI5 switches the setpoint (1 ↔1B).
Command 1 configuration	Network card	Command 1 comes from EtherNet/IP.
Command 2 configuration	Terminals	Command 2 comes from the terminals.
Command switching	Input LI5	Input LI5 switches the command.

Note: Setpoint 1B is connected to the functions (Summing, PID, etc) which remain active even after switching.

Configuration via the graphic display terminal or the integrated display terminal:

Menu	Parameter	Value
[1.6 - COMMAND] (CtL-)	[Profile] (CHCF)	[I/O profile] (IO)
	[Ref.1 chan] (Fr1)	[Com. card] (nEt)
	[Cmd channel 1] (Cd1)	[Com. card] (nEt)
	[Cmd channel 2] (Cd2)	[Terminals] (tEr)
	[Cmd switching] (CCS)	[LI5] (LI5)
[1.7 APPLICATION FUNCT.] (FUn-) [REFERENCE SWITCH.]	[Ref.1B chan] (Fr1b)	[AI1 ref.] (AI1)
	[Ref 1B switching] (rCb)	[LI5] (LI5)

8. Configuration of the assemblies

■ Control via EtherNet/IP in Drivecom profile

Note: This configuration can only be used if the communication scanner assemblies (100 and 101) are selected.

The command and the setpoint come from EtherNet/IP.

Configure the following parameters:

Parameter	Value	Comment
Profile	Separate Drivecom profile	The run commands are in Drivecom profile, the command and the setpoint can come from different channels.
Setpoint 1 configuration	Network card	The setpoint comes from EtherNet/IP.
Command 1 configuration	Network card	Command 1 comes from EtherNet/IP.

Configuration via the graphic display terminal or the integrated display terminal:

Menu	Parameter	Value
[1.6 - COMMAND] (CtL-)	[Profile] (CHCF)	[Separate] (SEP)
	[Ref.1 chan] (Fr1)	[Com. card] (nEt)
	[Cmd channel 1] (Cd1)	[Com. card] (nEt)

■ Control via EtherNet/IP or the terminals in Drivecom profile

Note: This configuration can only be used if the communication scanner assemblies (100 and 101) are selected.

The command and the setpoint both come from EtherNet/IP or the terminals. Input LI5 at the terminals is used to switch between EtherNet/IP and the terminals.

Configure the following parameters:

Parameter	Value	Comment
Profile	Separate Drivecom profile	The run commands are in Drivecom profile, the command and the setpoint can come from different channels.
Setpoint 1 configuration	Network card	Setpoint 1 comes from EtherNet/IP.
Setpoint 2 configuration	Analog input 1 on the terminals	Setpoint 2 comes from input AI1 on the terminals.
Setpoint switching	Input LI5	Input LI5 switches the setpoint (1 ↔ 2) and the command.
Command 1 configuration	Network card	Command 1 comes from EtherNet/IP.
Command 2 configuration	Terminals	Command 2 comes from the terminals.
Command switching	Input LI5	Input LI5 switches the command.

Note: Setpoint 2 is directly connected to the drive reference limit. If switching is performed, the functions that affect the reference (summing, PID, etc) are inhibited.

Configuration via the graphic display terminal or the integrated display terminal:

Menu	Parameter	Value
[1.6 - COMMAND] (CtL-)	[Profile] (CHCF)	[Separate] (SEP)
	[Ref.1 chan] (Fr1)	[Com. card] (nEt)
	[Ref.2 chan] (Fr2)	[AI1 ref.] (AI1)
	[Ref. 2 switching] (rFC)	[LI5] (LI5)
	[Cmd channel 1] (Cd1)	[Com. card] (nEt)
	[Cmd channel 2] (Cd2)	[Terminals] (tEr)
	[Cmd switching] (CCS)	[LI5] (LI5)

■ Control in Drivecom profile via EtherNet/IP and setpoint switching at the terminals

Note: This configuration can only be used if the communication scanner assemblies (100 and 101) are selected.

The command comes from EtherNet/IP.
The setpoint comes either from EtherNet/IP or from the terminals. Input LI5 at the terminals is used to switch the setpoint between EtherNet/IP and the terminals.
Control is in Drivecom profile.

Configure the following parameters:

Parameter	Value	Comment
Profile	Separate Drivecom profile	The run commands are in Drivecom profile, the command and the setpoint can come from different channels.
Setpoint 1 configuration	Network card	Setpoint 1 comes from EtherNet/IP.
Setpoint 1B configuration	Analog input 1 on the terminals	Setpoint 1B comes from input AI1 on the terminals.
Setpoint switching	Input LI5	Input LI5 switches the setpoint (1 ↔1B).
Command 1 configuration	Network card	Command 1 comes from EtherNet/IP.
Command switching	Channel 1	Channel 1 is the command channel.

Note: Setpoint 1B is connected to the functions (summing, PID, etc) that remain active, even after switching.

Configuration via the graphic display terminal or the integrated display terminal:

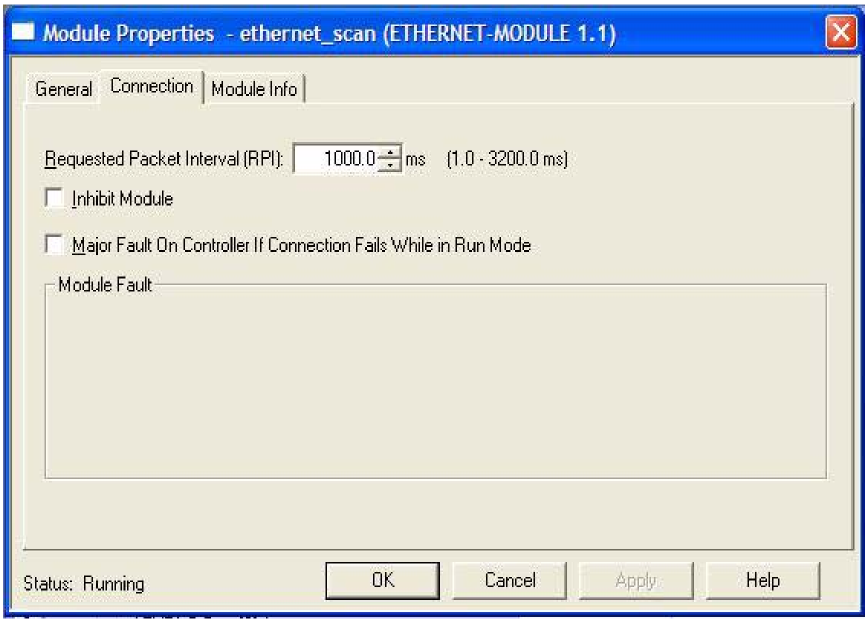
Menu	Parameter	Value
[1.6 - COMMAND] (CtL-)	[Profile] (CHCF)	[Separate] (SEP)
	[Ref.1 chan] (Fr1)	[Com. card] (nEt)
	[Cmd channel 1] (Cd1)	[Com. card] (nEt)
	[Cmd switching] (CCS)	[ch1 active] (Cd1)
[1.7 APPLICATION FUNCT.] (FUn-) [REFERENCE SWITCH.]	[Ref.1B chan] (Fr1b)	[AI1 ref.] (AI1)
	[Ref 1B switching] (rCb)	[LI5] (LI5)

9. Fault management

9. 1. Fault management

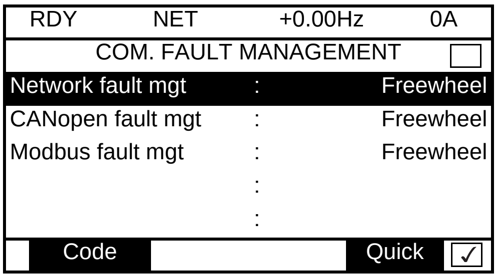
An EtherNet/IP time out is triggered if the card does not receive any cyclic messages (regardless within a predefined time period).
This period is managed by the EtherNet/IP controller (not by the drive) and is configured in its module properties box. The duration of the time out is defined by the RPI (Request packet intervals).

If the card is controlled by explicit messages(without periodic exchanges) There is no control of the communication time-out.



The **response** of the drive in case of such event can be configured.

Configuration can be performed using the graphic display terminal or integrated display terminal using the [Network fault mgt] (CLL) parameter in the [1.8 FAULT MANAGEMENT] (FLt-) menu, [COM. FAULT MANAGEMENT] (CLL-) submenu.



The values of the [Network fault mgt] (CLL) parameter, trigger a [COM. network] (CnF) drive fault, are:

Value	Meaning
[Freewheel] (YES)	Freewheel stop (factory setting)
[Ramp stop] (rMP)	Stop on ramp
[Fast stop] (FSt)	Fast stop
[DC injection] (dCI)	DC injection stop

The values of the [Network fault mgt] (CLL) parameter, which do not trigger a drive fault, are:

Value	Meaning
[Ignore] (nO)	Fault ignored
[Per STT] (Stt)	Stop according to configuration of [Type of stop] (Stt)
[Fallback spd] (LFF)	Switch to fallback speed, maintained as long as the fault is present and the run command is not disabled.
[Spd maint.] (rLS)	The drive maintains the speed at the time the fault occurred, as the fault persists and the run command has not been removed.

The fallback speed can be configured via the [Fallback spd] (LFF) parameter in the [1.8 FAULT MANAGEMENT] (FLt-) menu.

9. 2. Status of the LEDs

The VW3 A3 316 Ethernet/IP card features 5 LEDs, which are visible through the Altivar 61/71 cover.

1.1
1.2
1.3
1.4
1.5

2.1 Port 1 activity
2.2 Port 2 activity
2.3 Link status
2.4 NS "Network status"
2.5 MS "Module status"

The 2 first LEDS are respectively dedicated to each Ethernet port.
The third LED is relative to the IP level.
The 2 last LEDs are specific to EtherNet/IP and CIP communication protocol.

LED	Color/ state	Description
2.1	Off	No link
	Flashing Green/yellow	Power up testing.
	Green ON	Link at 100 Mbps.
	Yellow ON	Link at 10 Mbps.
	Green BLINK	Activity at 100 Mbps.
	Yellow BLINK	Activity at 10 Mbps.
2.2	Off	No link
	Flashing Green/yellow	Power up testing.
	Green ON	Link at 100 Mbps.
	Yellow ON	Link at 10 Mbps.
	Green BLINK	Activity at 100 Mbps.
	Yellow BLINK	Activity at 10 Mbps.
2.3	Off	Physical connections unplugged - No IP address obtained
	Flashing Green/red	Power up testing.
	Green ON	At least one port is connected and an IP address has been obtained.
	Green flashing 3 times	All ports are unplugged, but the card has an IP address.
	Green flashing 4 times	Error: Duplicated IP address (1)
	Green flashing 5 times	The card is performing a BOOTP or DHCP sequence
2.4 "NS"	Off	The device does not have an IP address or powered off.
	Flashing Green/red	Power up testing.
	Green ON	The device has at least one established connection (even to the Message Router).
	Green flashing	The device has not established connections, burt has obtained an IP address.
	Red flashing	One or more of the connections in which this device is the target has timed out. This shall be left only if all time out connections are reestablished or if the device is reset.
	Red ON	The device has detected that its IP address is already in use (1).
2.5 "MS"	Off	No power is supplied to the device
	Flashing Green/red	Power Up testing.
	Green ON	The device is operating correctly.
	Green flashing	The device has not been configured.
	Red flashing	The device has detected a recoverable minor fault.
	Red ON	The device has detected a non-recoverable major fault (1).

(1) In case of duplicate IP Address, the led 2.3 is green flashing 4 times, led 2.4 and 2.5 are solid red.

10. Configuration of monitored parameters

It is possible to select up to 4 parameters to display their values in the [1.2 - MONITORING] menu on the graphic display terminal.

The selection is made via the [6 - MONITORING CONFIG.] menu, [6.3 - COM. MAP CONFIG.] submenu.

Each parameter in the range [Address 1 select.] … [Address 4 select.] is used to select the parameter logic address. Select an address of zero to disable the function.

In the example given here, the monitored words are:

- Parameter 1 = Motor current (LCR): logic address 3204; signed decimal format.
- Parameter 2 = Motor torque (OTR): logic address 3205; signed decimal format.
- Parameter 3 = Last fault occurred (LFT): logic address 7121; hexadecimal format.
- Disabled parameter: address 0; default format: hexadecimal format.

RDY NET	+0.00Hz	0A
6.3 COM. MAP CONFIG.		
Word 1 add. select.	:	3204
Format word 1	:	Signed
Word 2 add. select.	:	3205
Format word 2	:	Signed
Word 3 add. select.	:	7121
Code		Quick
Format word 33	:	Hex
Word 4 add. select.	:	0
Format word 4	:	Hex

One of the three display formats below can be assigned to each monitored word:

Format	Range	Terminal display
Hexadecimal	0000 … FFFF	[Hex]
Signed decimal	-32,767 … 32,767	[Signed]
Unsigned decimal	0 … 65,535	[Unsigned]

11. Webserver

This chapter describes the function of the integrated webserver of the EtherNet/IP card.

11. 1. Opening the Altivar home page

From your web browser, default http password and login are : USER, USER for monitor and setup security level and ADMIN, ADMIN for administrator level.

From the altivar home page, you can access to 4 main menus:
- Drive,
- Network setup,
- Network diagnostic,
- Email

11. 2. Web pages structure

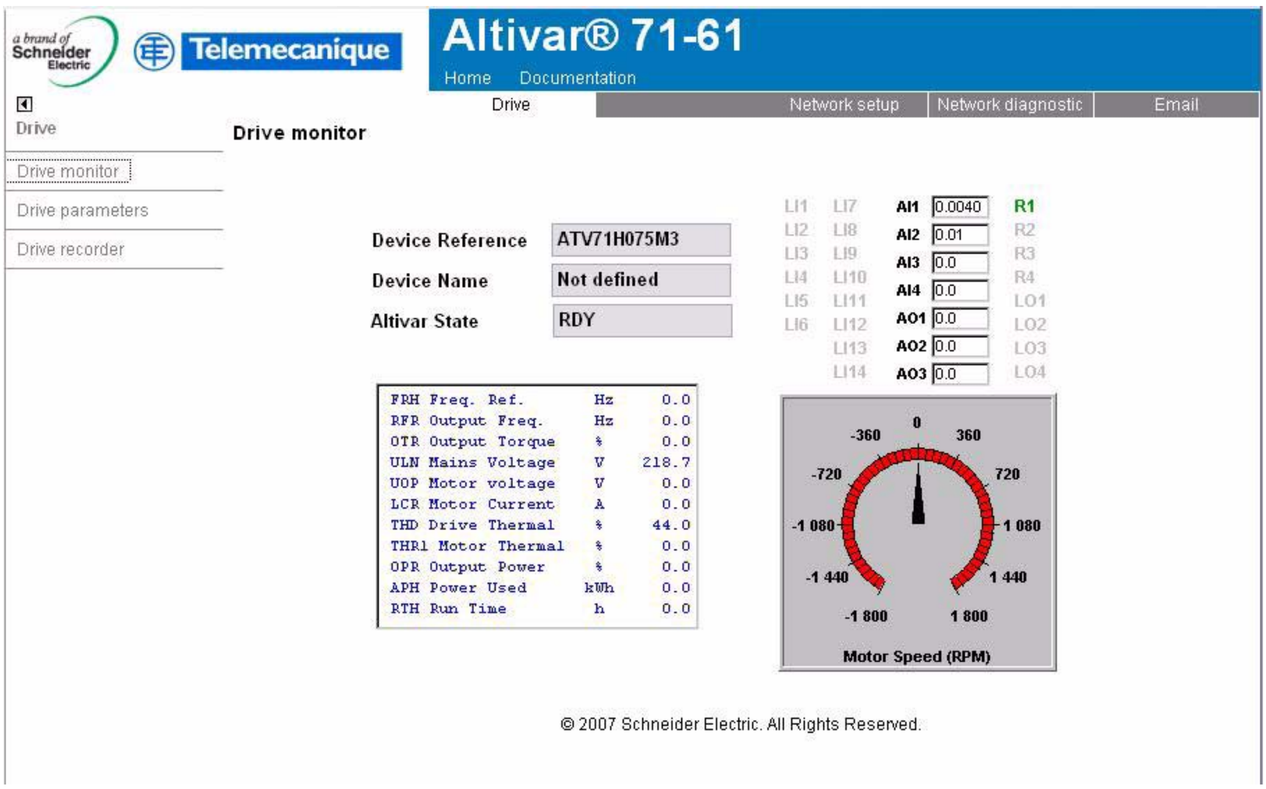
Each web page uses the same structure. Each main menu, "Drive", "Network setup" and "Network Diagnostics" contains each own sub menu. This last one is displayed on the left side of web page.

The toggle button shows or hides the left sided menu.

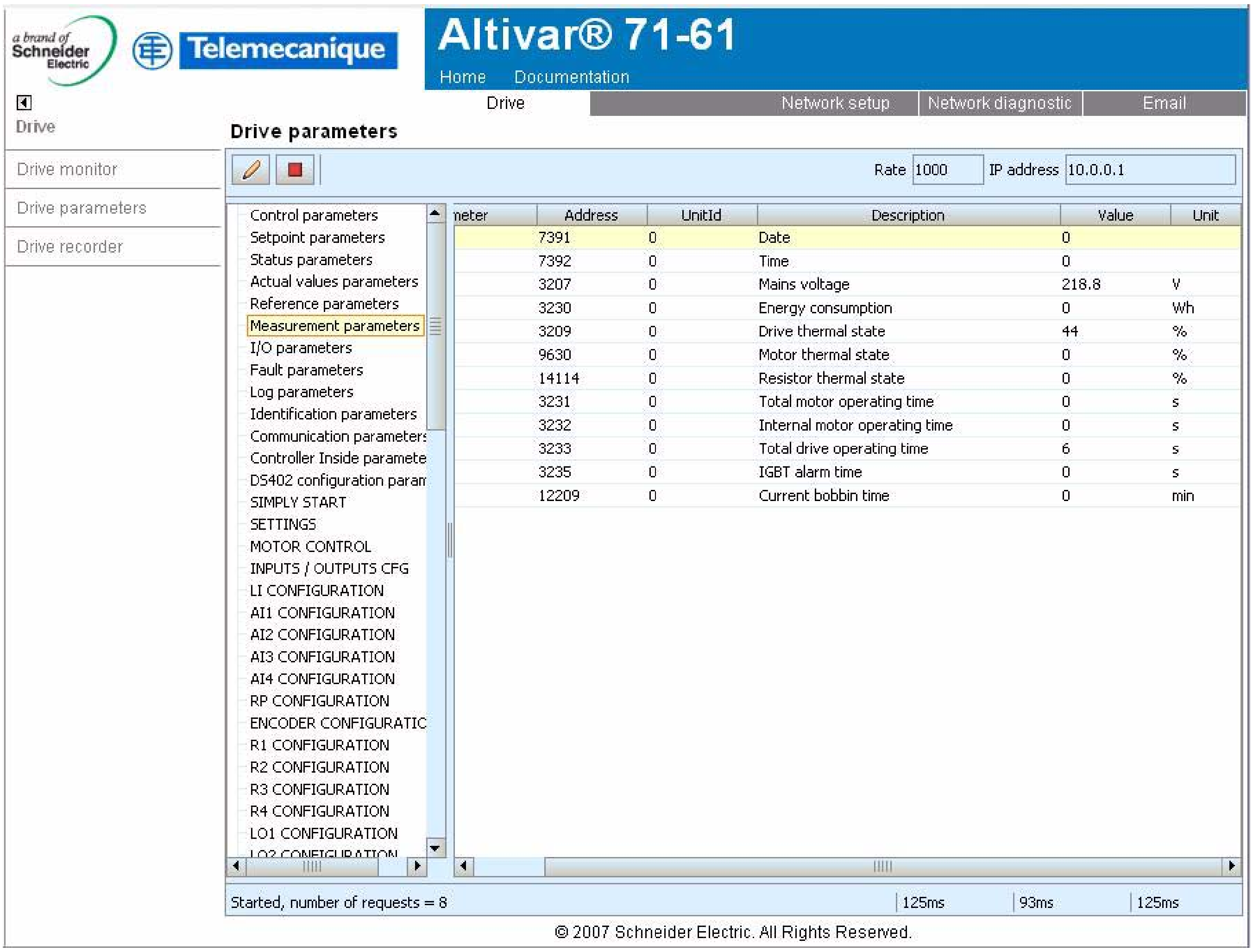
11. Webserver

11. 3. Drive

■ Drive monitor



■ Drive parameters

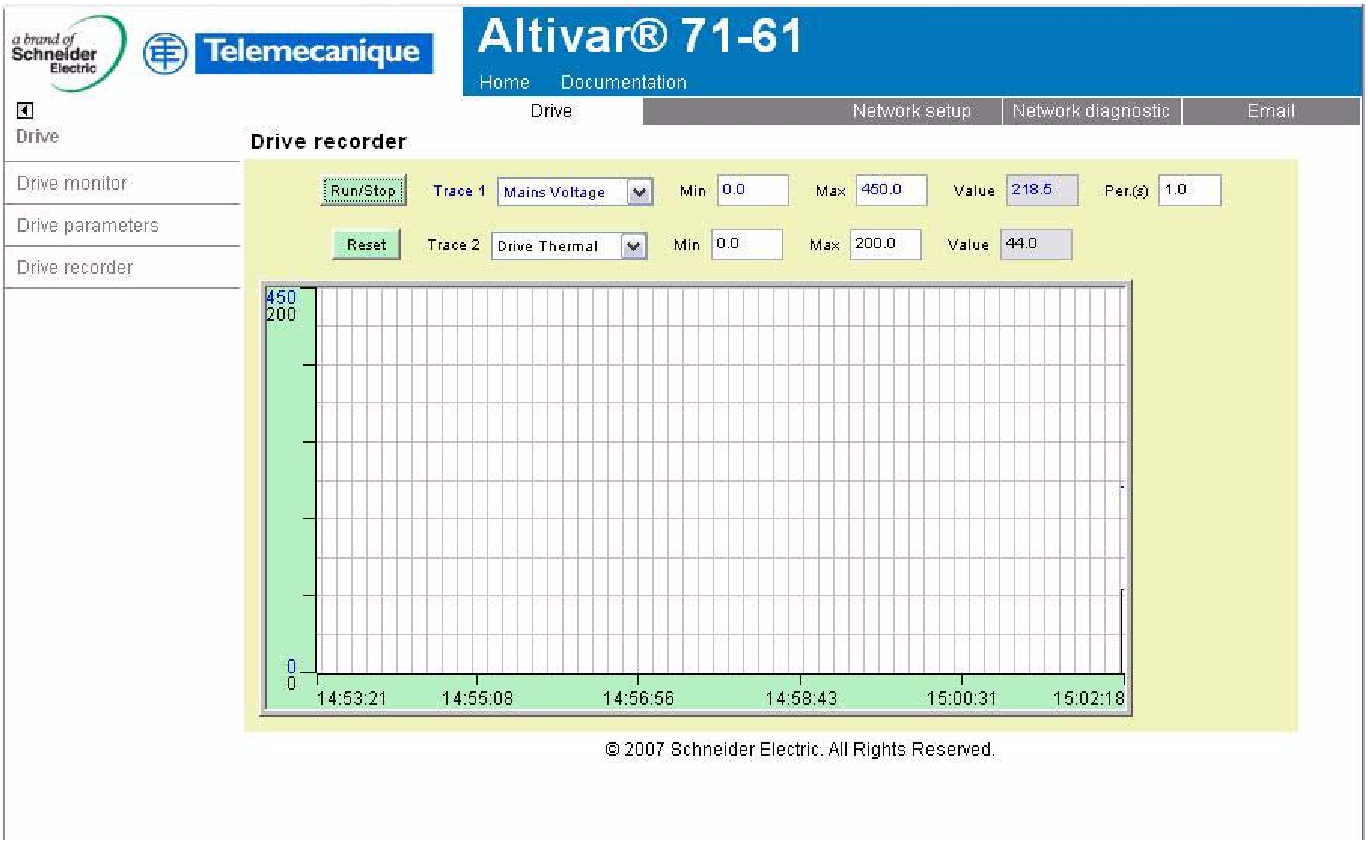


The left column is used to select a mod/imd group (or list) of parameters. The right columns displays the parameters, its Modbus address and its current value.

■SAVING PARAMETERS

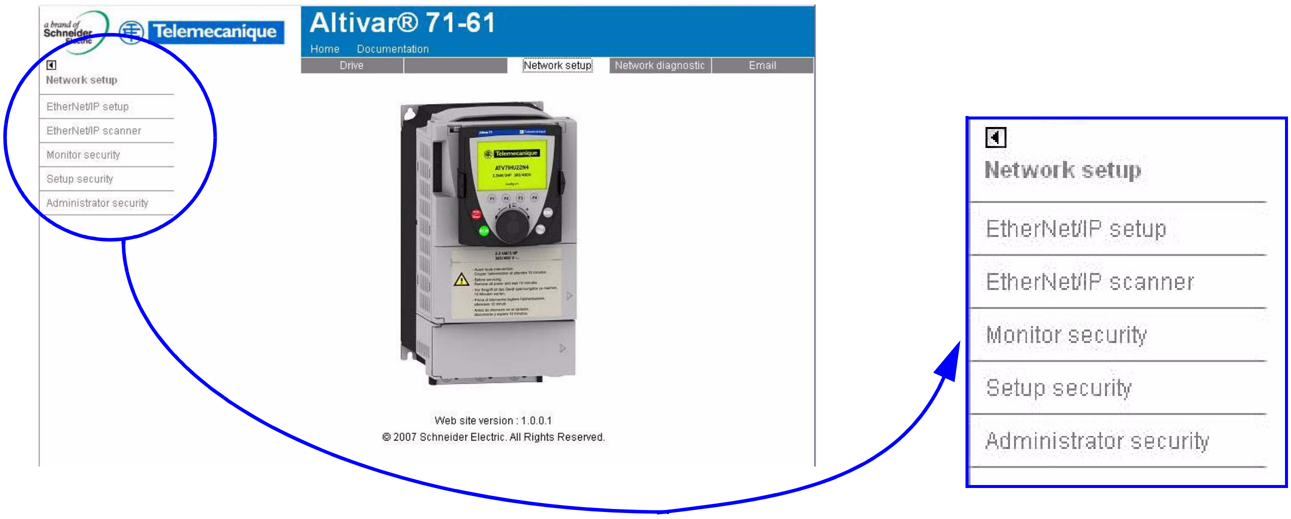
When parameters of the drive are modified from the webserver, they are not saved into drive memory (to avoid numerous write access to the flash memory).
However, it is possible to perform the backup of the parameters from the webserver: This operation can be done by writing 2 to CMI parameter. This operation saves ALL the parameters of the drive to flash memory.

■ Drive recorder

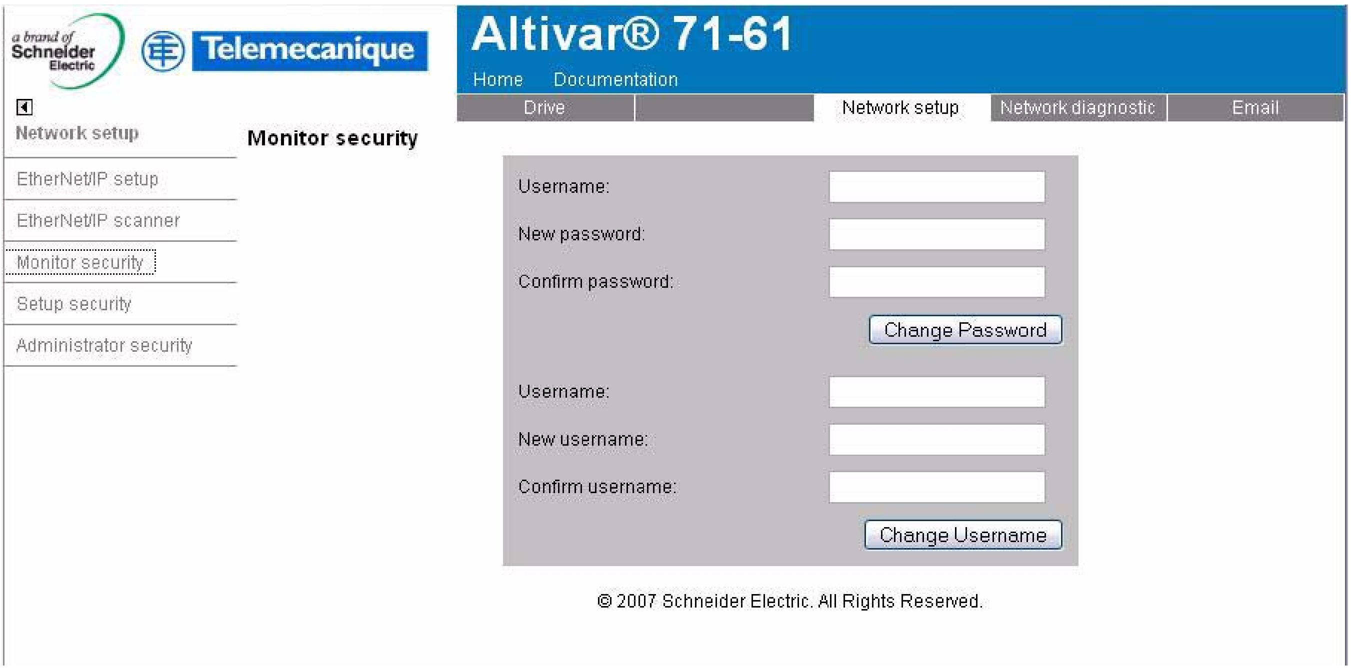


The trend viewer shows traces of two preselected parameters
RUN/STOP: Starts or stoppes the trends recording.
Reset : Erases the recorded trend.
Min/Max : defines the lowest and highest values that are displayed on the trend window.
Per(s) : Periodicity : Minimal value.

11. 4. Network setup

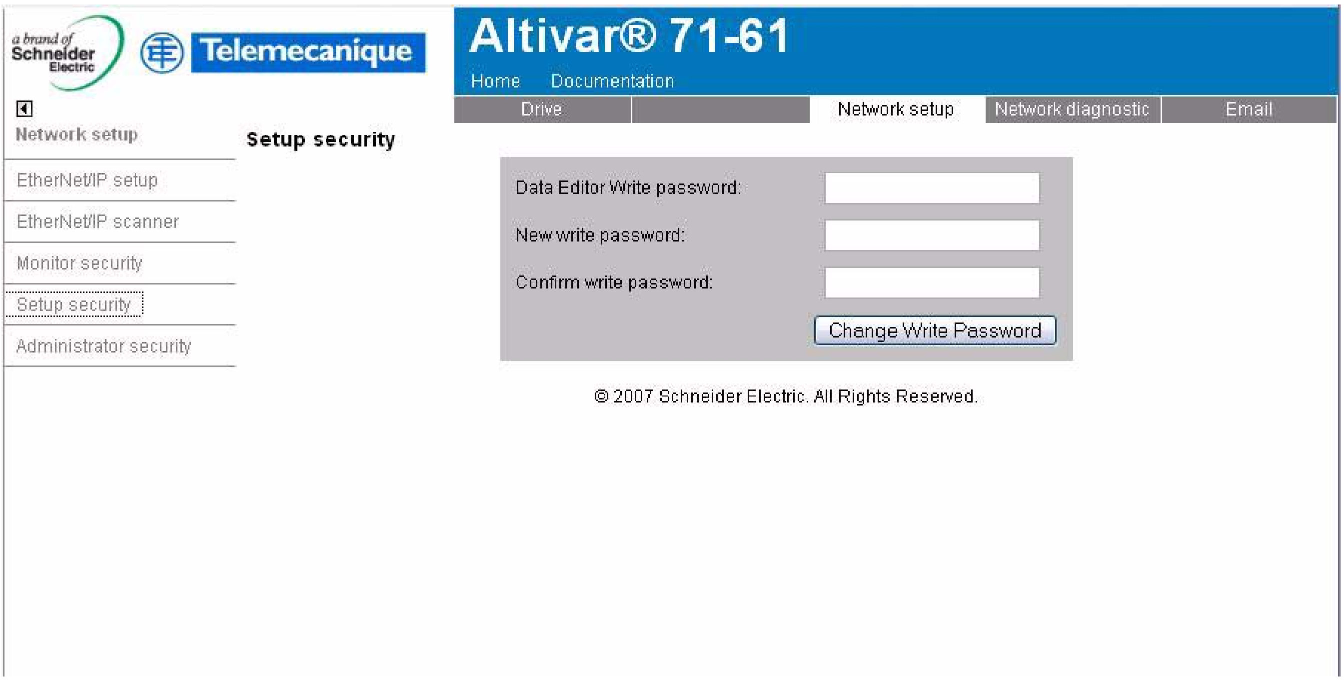


■ Monitor security



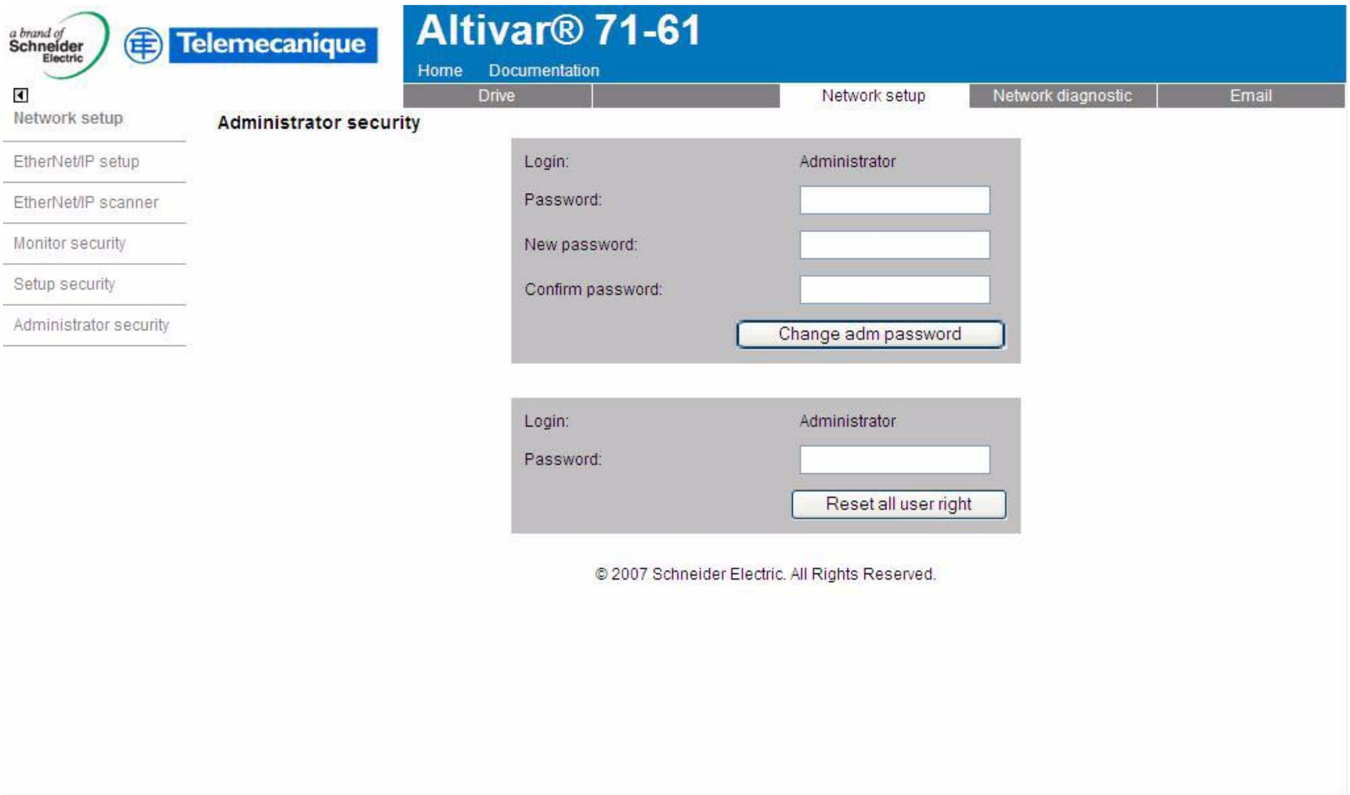
The Monitor security password is the basic level access to the drive through the webserver: it allows the access to the different web pages but don’t authorize write access.
New level username and password can be redefined here.

■ Setup security

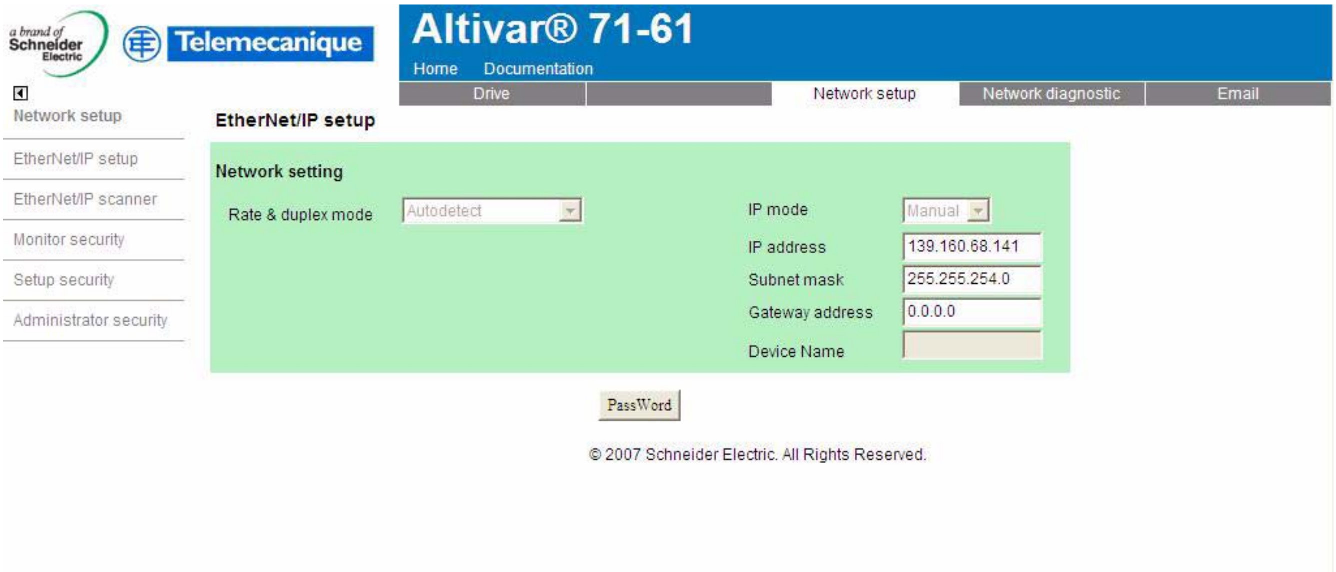


- HTTP : data write.
- Data write level password.

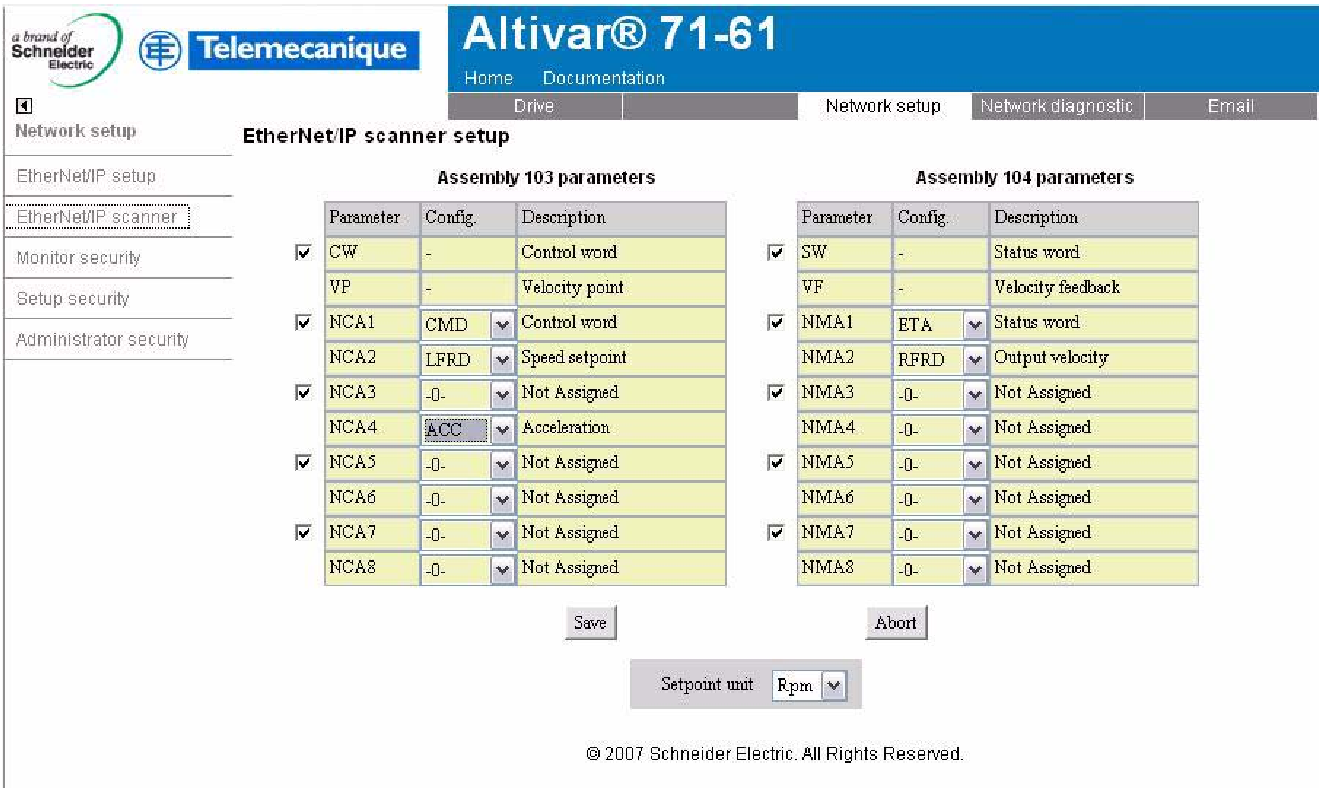
■ Administrator security



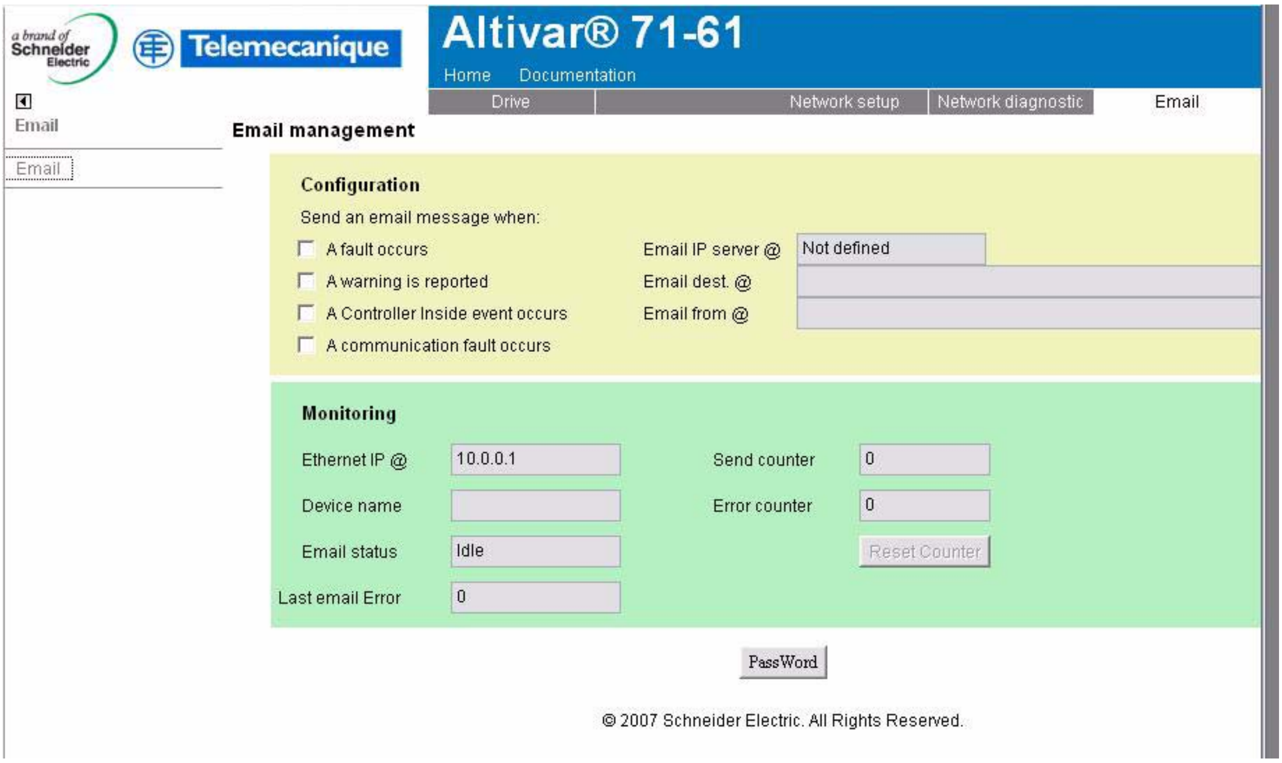
■ EtherNet/IP setup



■ EtherNet/IP scanner setup



■ Email management

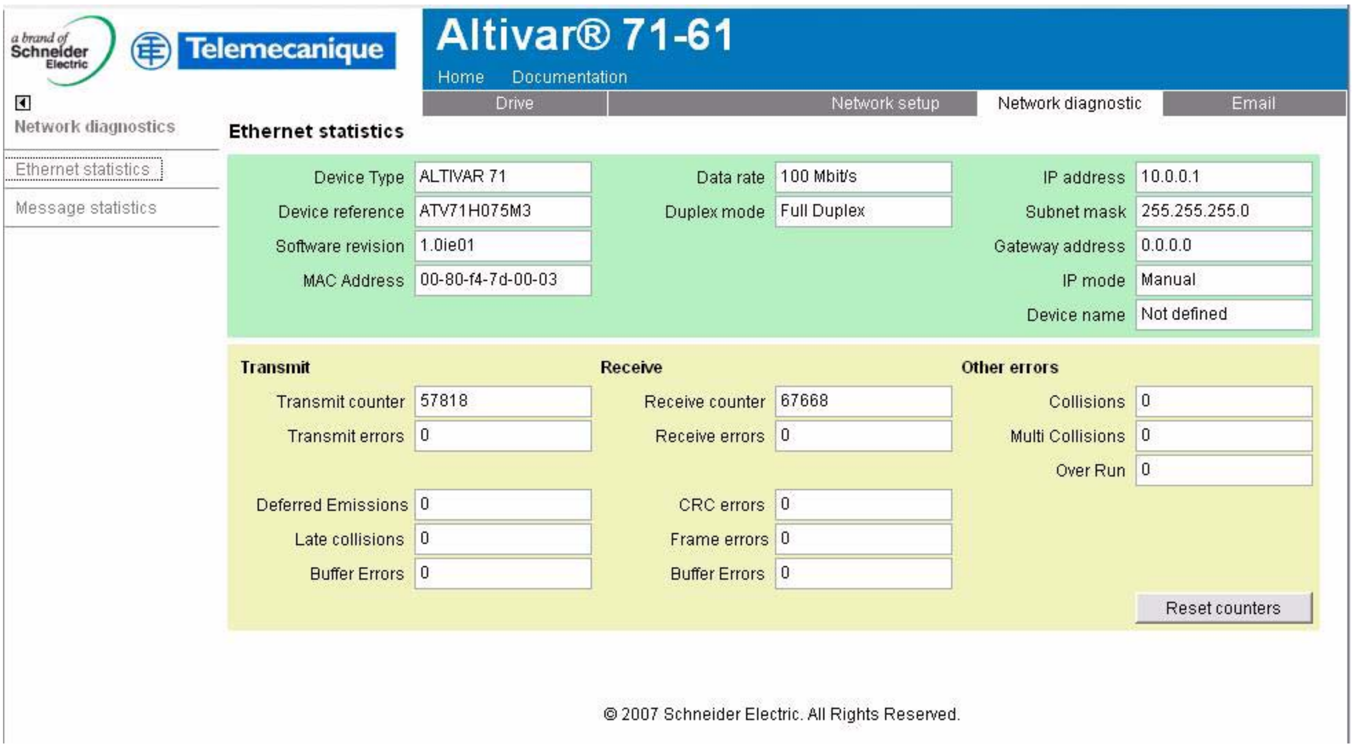


Configuration of the email generator on the left side:
- email IP server Address
- email sender address, recipient address from θ.

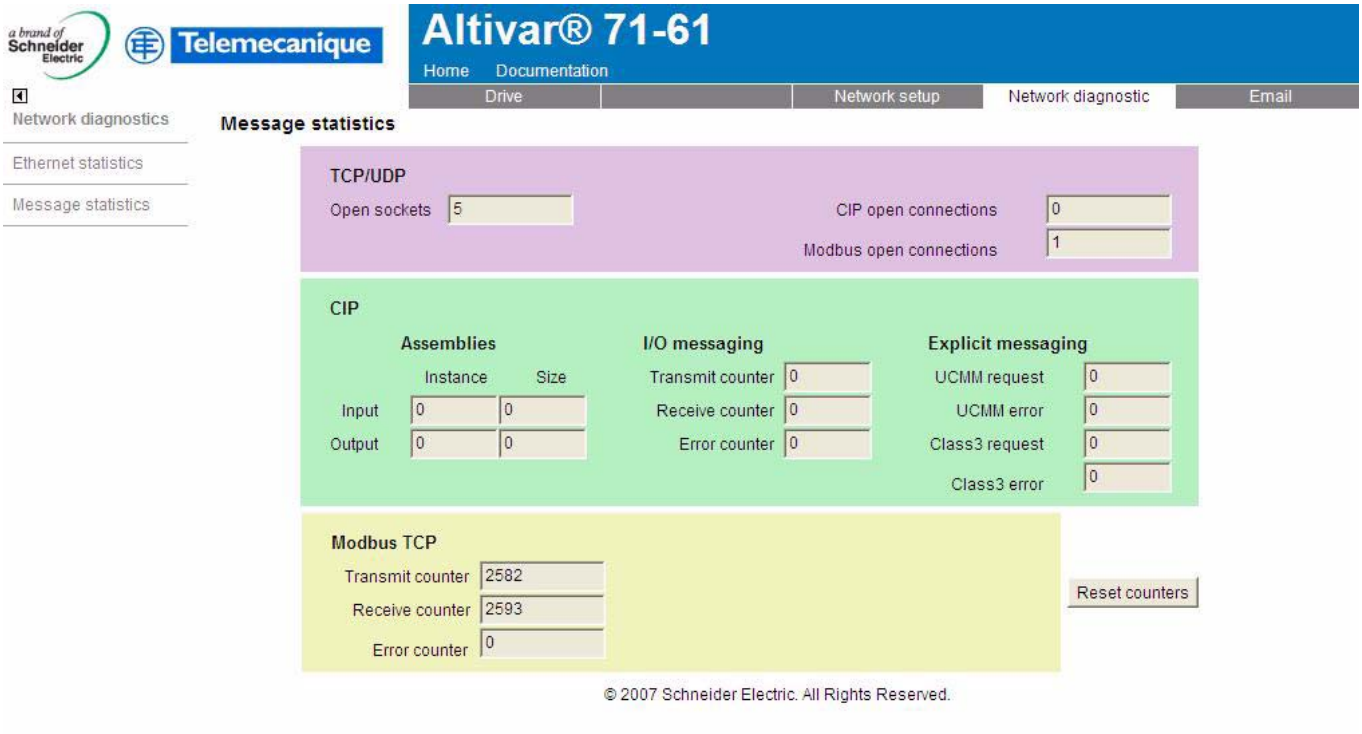
11. 5. Diagnostics

11. Webserver

■ Ethernet statistics



■ Message statistics



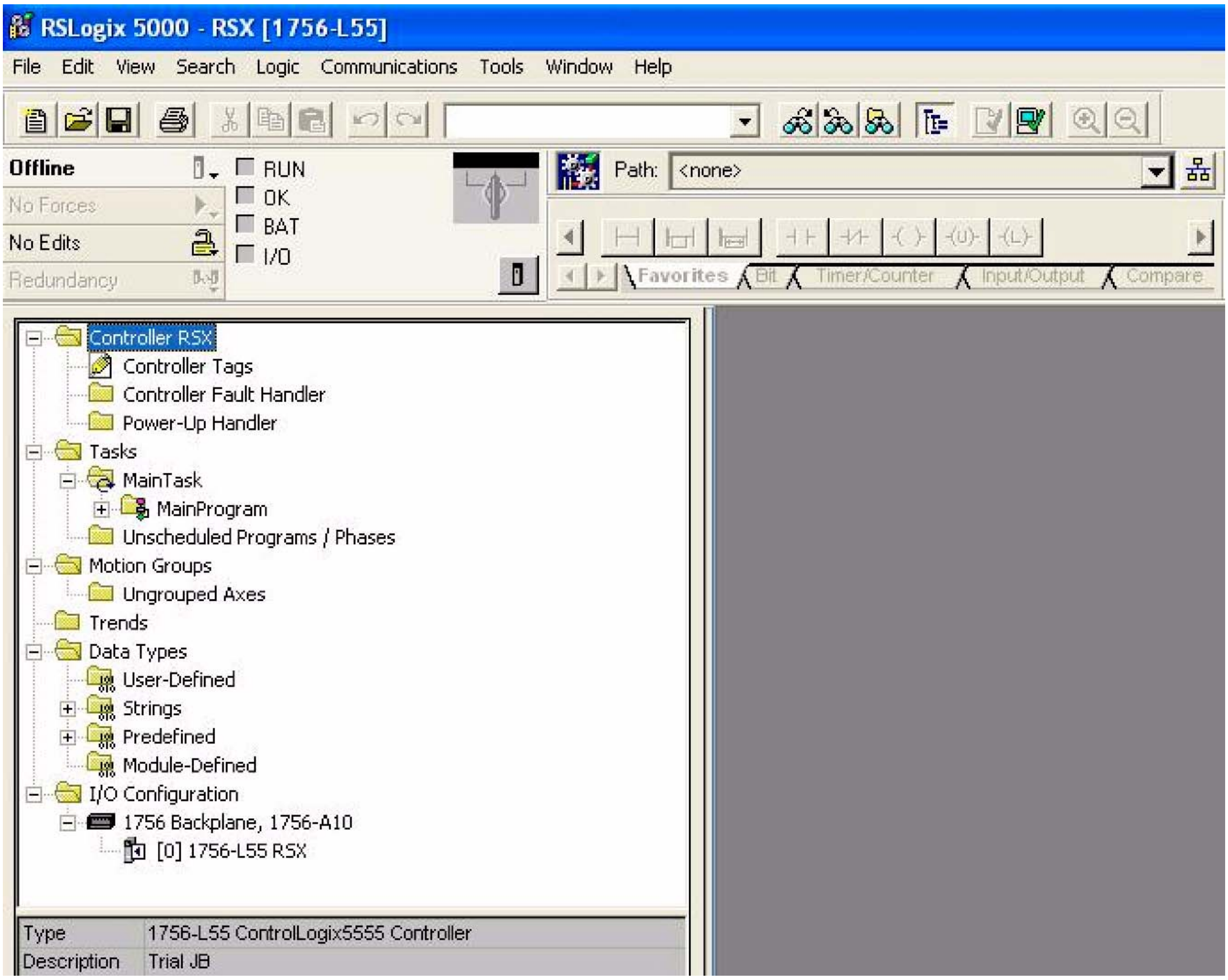
NOTE: As a Schneider product, The EtherNet/IP option card uses internally MODBUS TCP for the web-server. (The MODBUS TCP port is not accessible).

12. 1. Principle

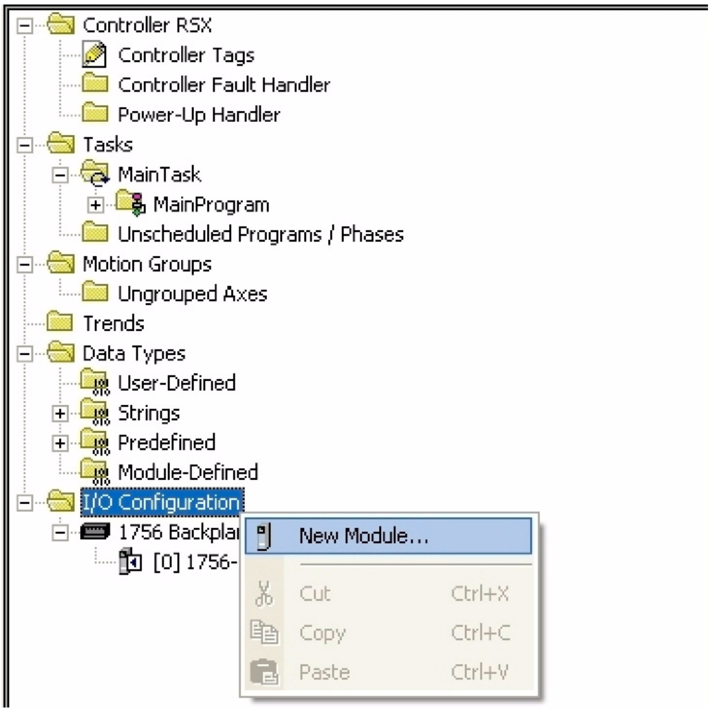
RSX drive equipped with an EtherNet/IP card shall be configured as a "Generic Ethernet Module" in the same way as the EtherNet/IP adapter of PowerFlex 70 drives.

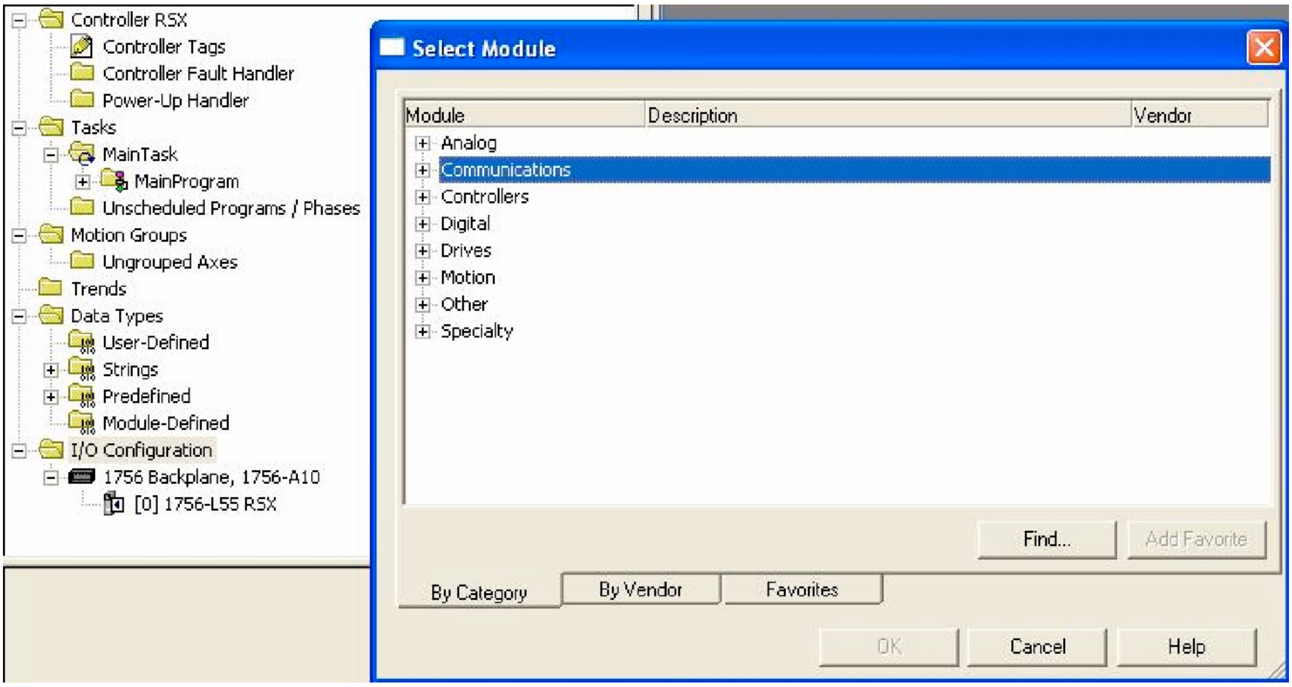
12. 2. Procedure

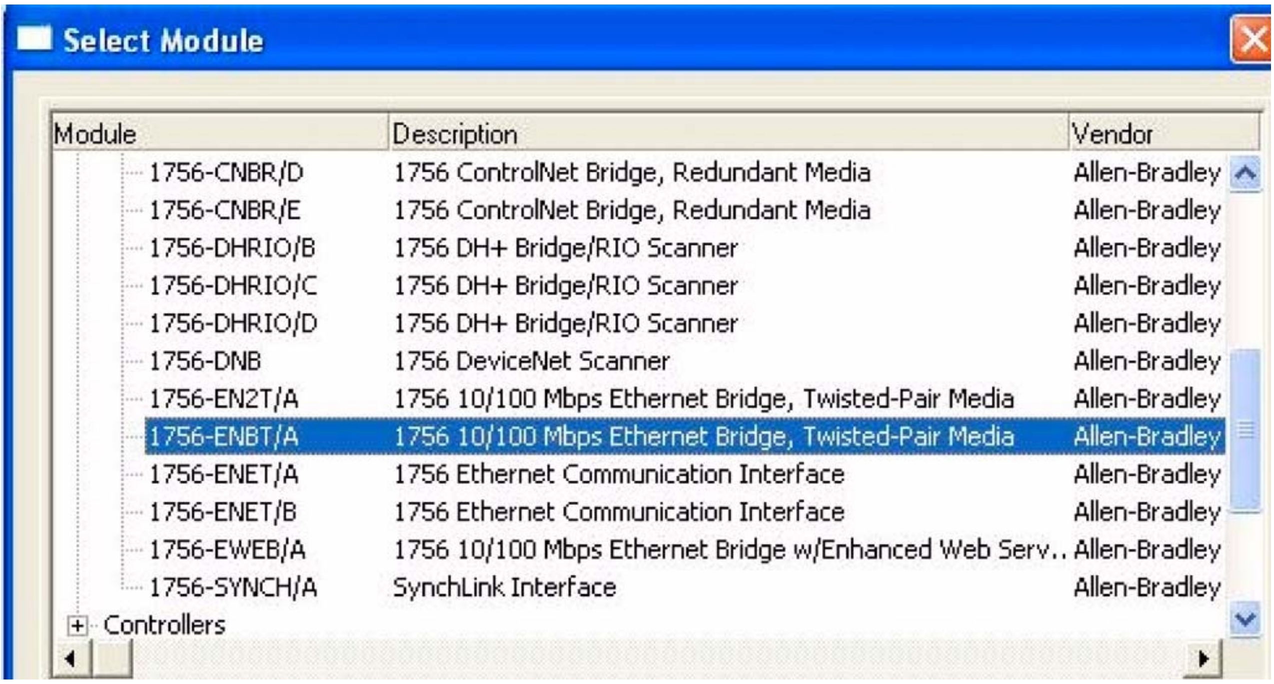
■ Create a new project

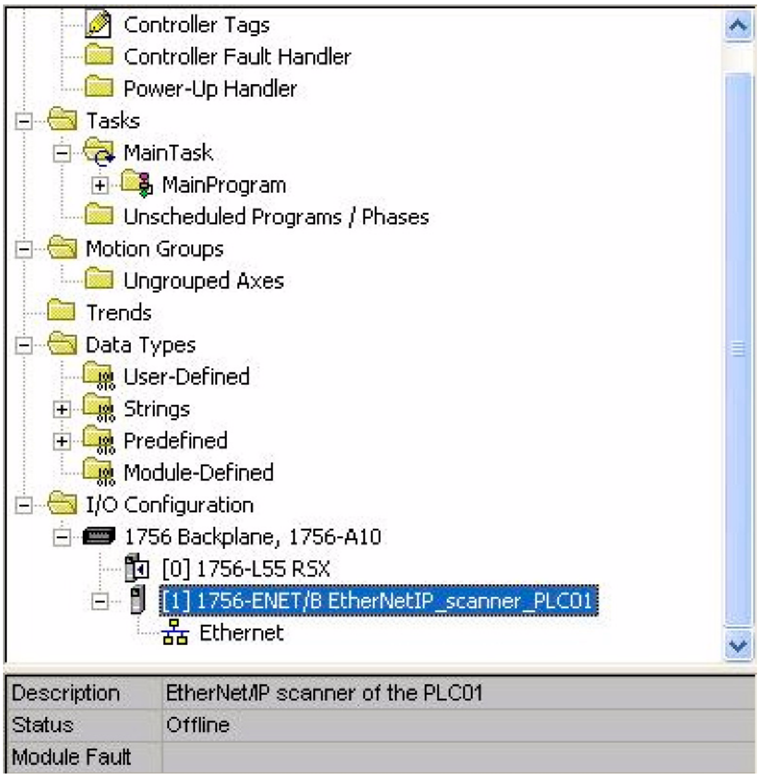


■ Add a EtherNet/IP scanner to the I/O configuration

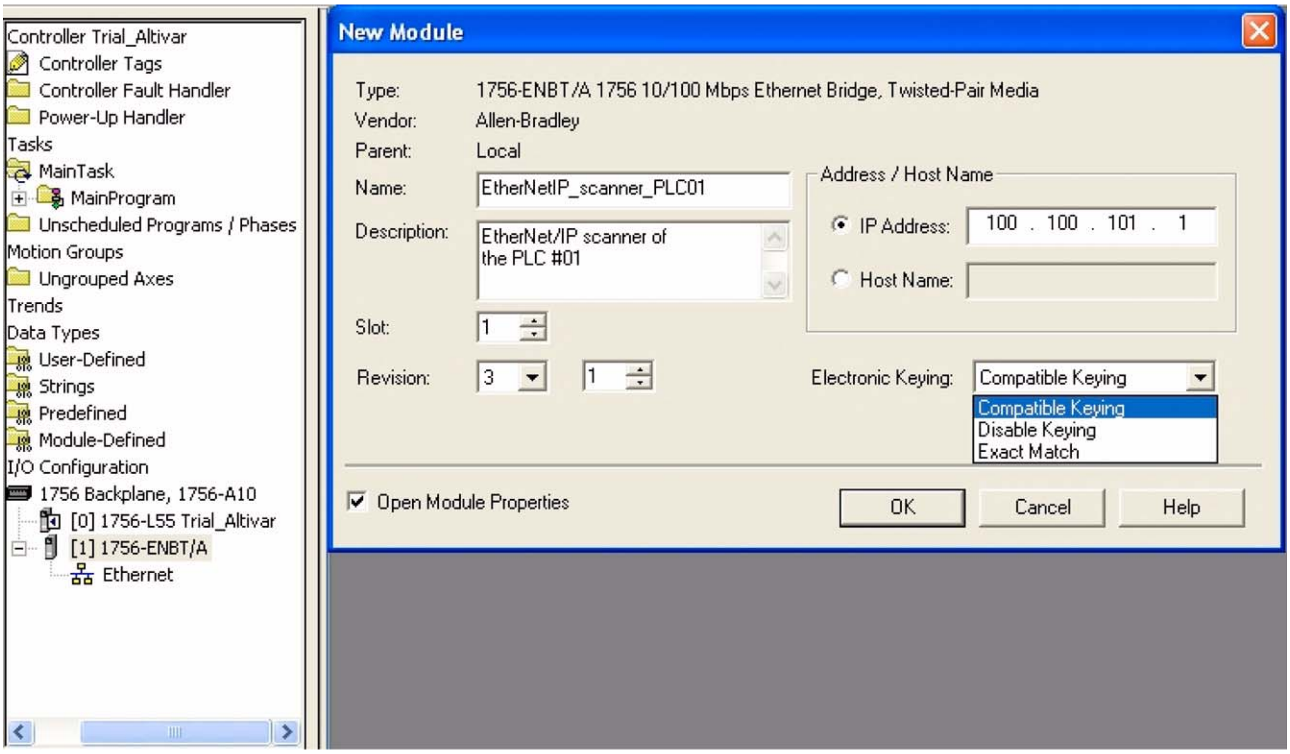




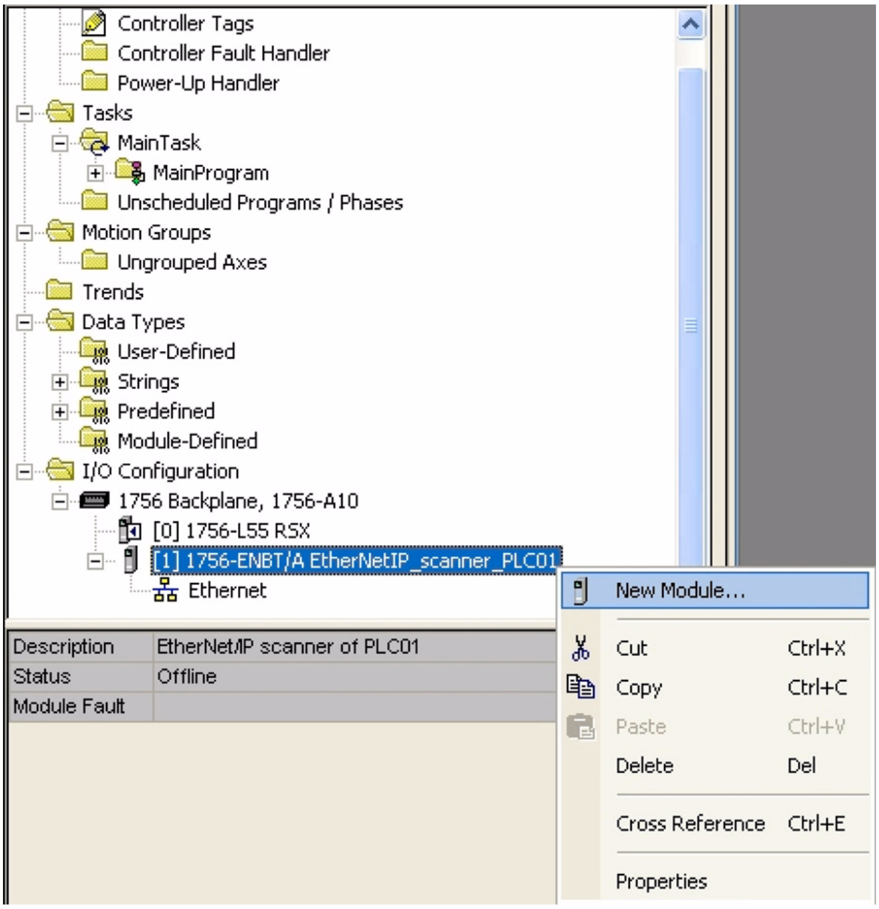

Select Module
Module
Description
Vendor
1756-CNBR/D
1756 ControlNet Bridge, Redundant Media
Allen-Bradley
1756-CNBR/E
1756 ControlNet Bridge, Redundant Media
Allen-Bradley
1756-DHRIO/B
1756 DH+ Bridge/RIO Scanner
Allen-Bradley
1756-DHRIO/C
1756 DH+ Bridge/RIO Scanner
Allen-Bradley
1756-DHRIO/D
1756 DH+ Bridge/RIO Scanner
Allen-Bradley
1756-DNB
1756 DeviceNet Scanner
Allen-Bradley
1756-EN2T/A
1756 10/100 Mbps Ethernet Bridge, Twisted-Pair Media
Allen-Bradley
1756-ENBT/A
1756 10/100 Mbps Ethernet Bridge, Twisted-Pair Media
Allen-Bradley
1756-ENET/A
1756 Ethernet Communication Interface
Allen-Bradley
1756-ENET/B
1756 Ethernet Communication Interface
Allen-Bradley
1756-EWEB/A
1756 10/100 Mbps Ethernet Bridge w/Enhanced Web Serv..
Allen-Bradley
1756-SYNCH/A
SynchLink Interface
Allen-Bradley
Controllers

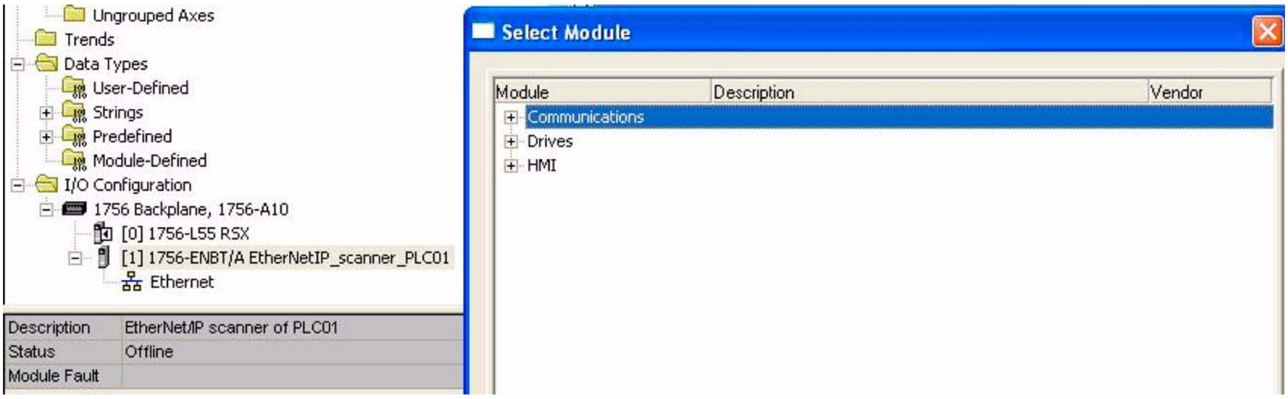

Controller Tags
Controller Fault Handler
Power-Up Handler
Tasks
MainTask
MainProgram
Unscheduled Programs / Phases
Motion Groups
Ungrouped Axes
Trends
Data Types
User-Defined
Strings
Predefined
Module-Defined
I/O Configuration
1756 Backplane, 1756-A10
[0] 1756-L55 RSX
[1] 1756-ENET/B EtherNetIP_scanner_PLC01
Ethernet
Description
EtherNet/IP scanner of the PLC01
Status
Offline
Module Fault

■ Configure the EtherNet/IP scanner

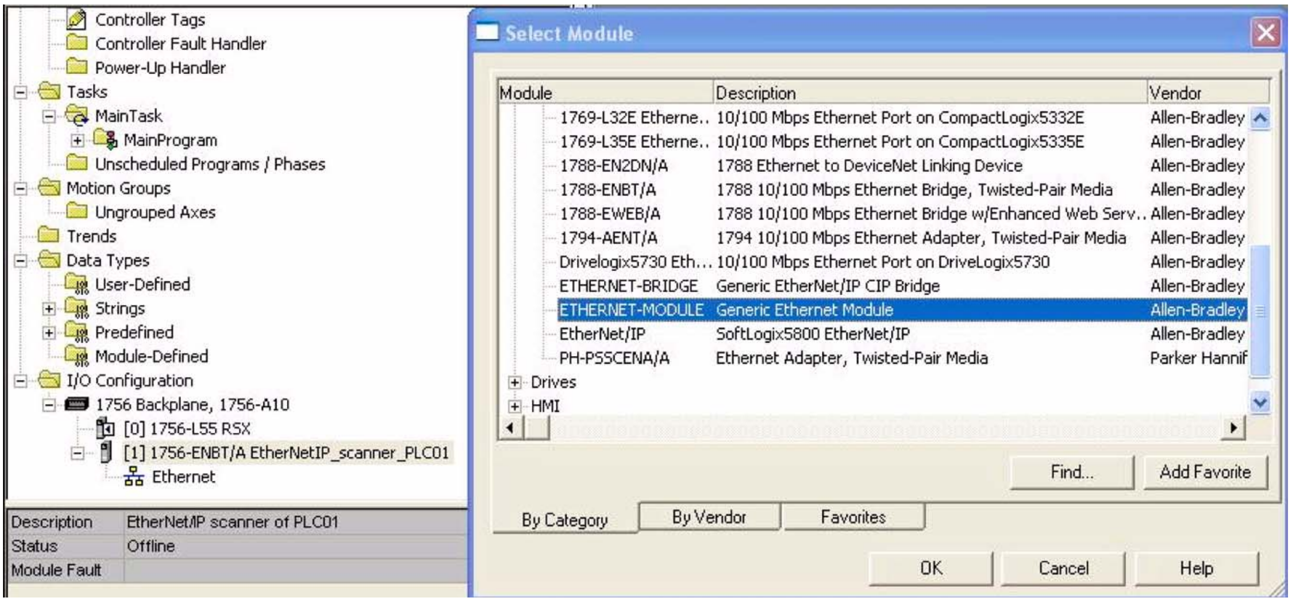


■ Add a EtherNet/IP ATV71/61 drive to the I/O configuration

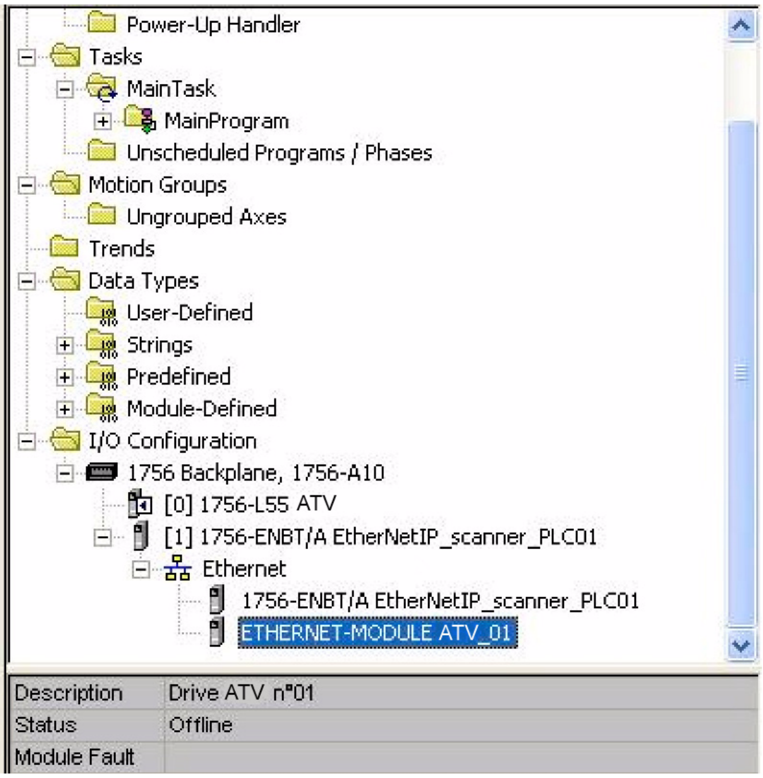




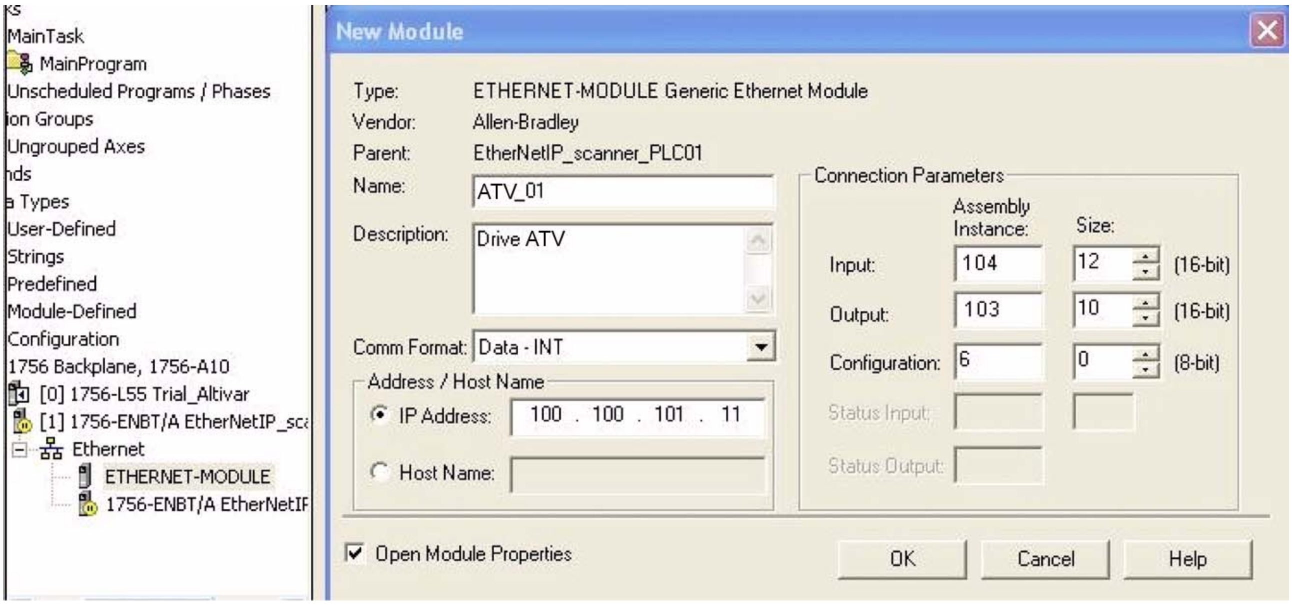
Ungrouped Axes
Trends
Data Types
User-Defined
Strings
Predefined
Module-Defined
I/O Configuration
1756 Backplane, 1756-A10
[0] 1756-L55 RSX
[1] 1756-ENBT/A EtherNetIP_scanner_PLC01
Ethernet
Description EtherNet/IP scanner of PLC01
Status Offline
Module Fault
Select Module
Module
Description
Vendor
Communications
Drives
HMI



Controller Tags
Controller Fault Handler
Power-Up Handler
Tasks
MainTask
MainProgram
Unscheduled Programs / Phases
Motion Groups
Ungrouped Axes
Trends
Data Types
User-Defined
Strings
Predefined
Module-Defined
I/O Configuration
1756 Backplane, 1756-A10
[0] 1756-L55 RSX
[1] 1756-ENBT/A EtherNetIP_scanner_PLC01
Ethernet
Description EtherNet/IP scanner of PLC01
Status Offline
Module Fault
Select Module
Module
Description
Vendor
1769-L32E Etherne.. 10/100 Mbps Ethernet Port on CompactLogix5332E Allen-Bradley
1769-L35E Etherne.. 10/100 Mbps Ethernet Port on CompactLogix5335E Allen-Bradley
1788-EN2DN/A 1788 Ethernet to DeviceNet Linking Device Allen-Bradley
1788-ENBT/A 1788 10/100 Mbps Ethernet Bridge, Twisted-Pair Media Allen-Bradley
1788-EWEB/A 1788 10/100 Mbps Ethernet Bridge w/Enhanced Web Serv.. Allen-Bradley
1794-AENT/A 1794 10/100 Mbps Ethernet Adapter, Twisted-Pair Media Allen-Bradley
Drivelogix5730 Eth... 10/100 Mbps Ethernet Port on DriveLogix5730 Allen-Bradley
ETHERNET-BRIDGE Generic EtherNet/IP CIP Bridge Allen-Bradley
ETHERNET-MODULE Generic Ethernet Module Allen-Bradley
EtherNet/IP SoftLogix5800 EtherNet/IP Allen-Bradley
PH-PSSCENA/A Ethernet Adapter, Twisted-Pair Media Parker Hannif
Drives
HMI
Find...
Add Favorite
By Category
By Vendor
Favorites
OK
Cancel
Help

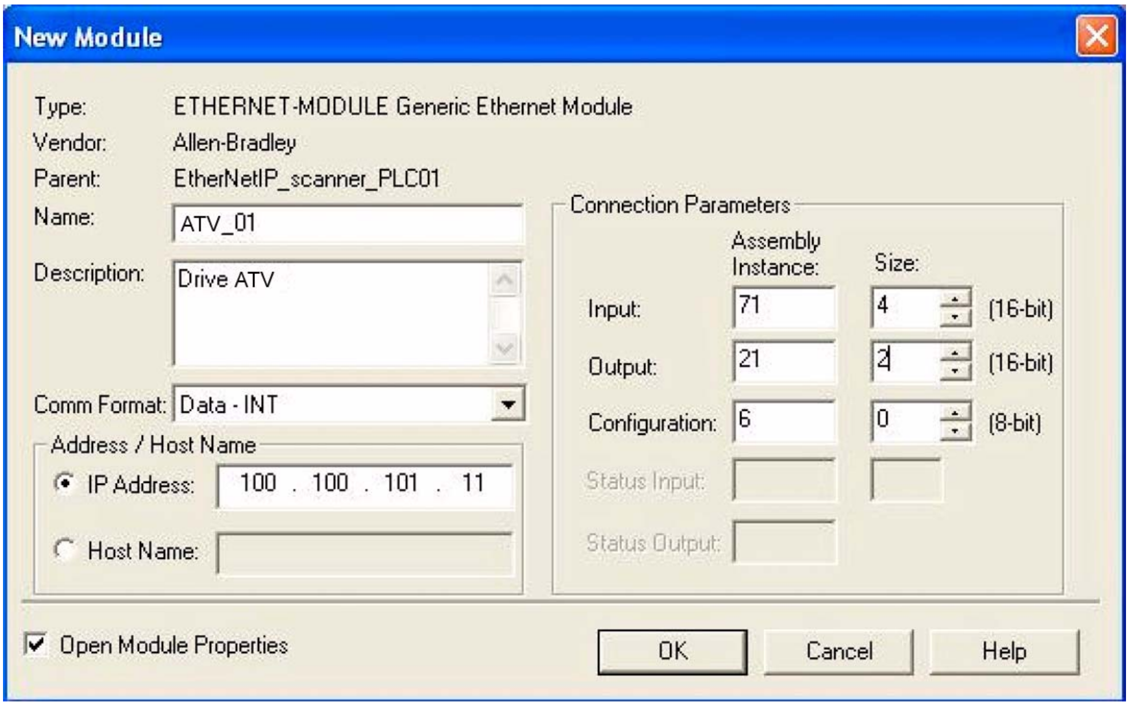


■ Configure the ATV71 EtherNet/IP card

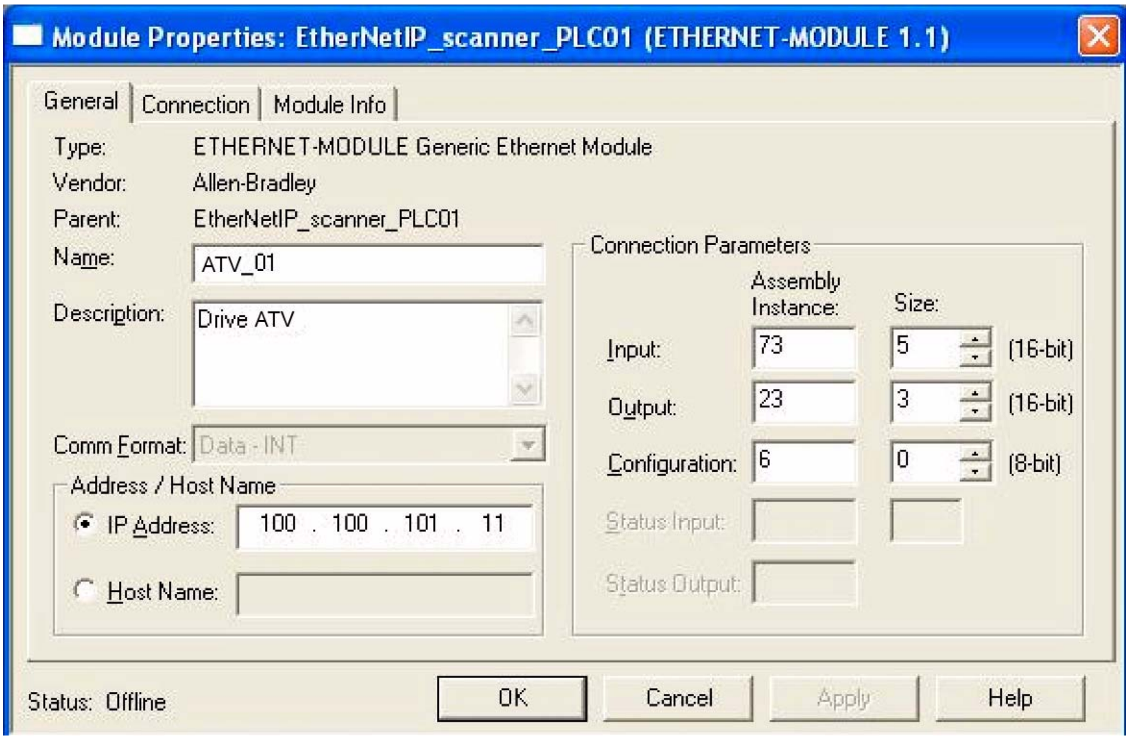


Above the Allen-Bradley drive profile is selected.

Below the CIP extended speed control profile is selected.

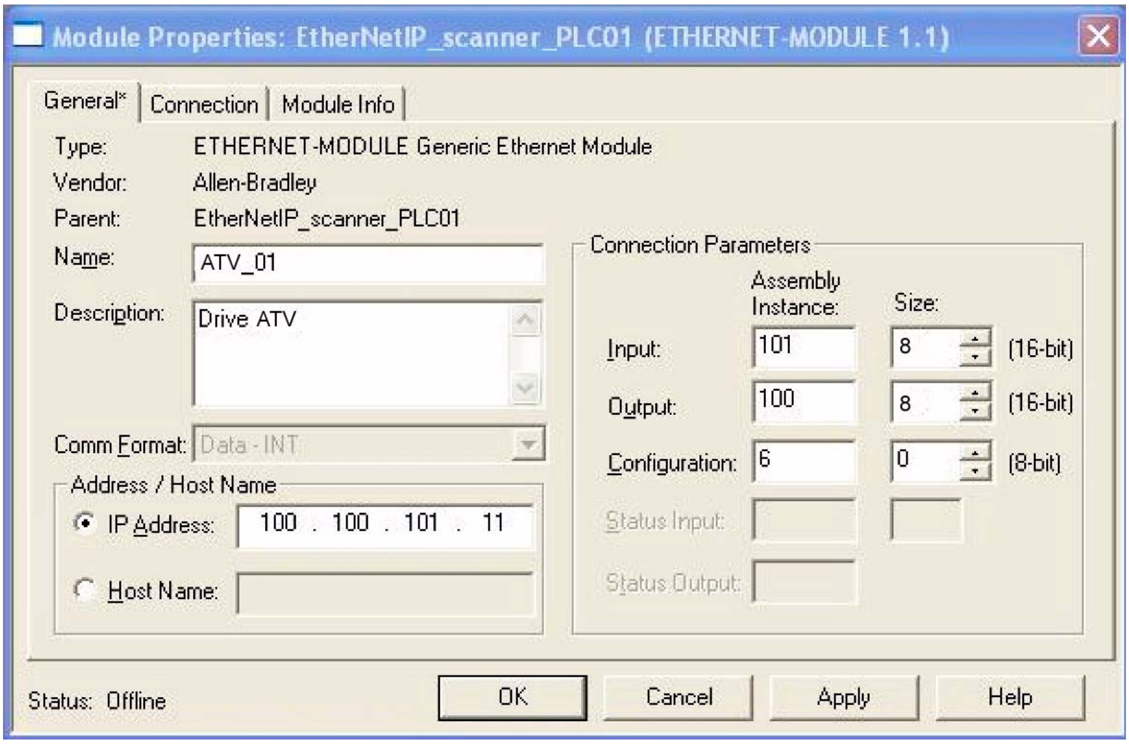


Below the CIP extended speed and torque control profile is selected.



12. Integration in RSLogix

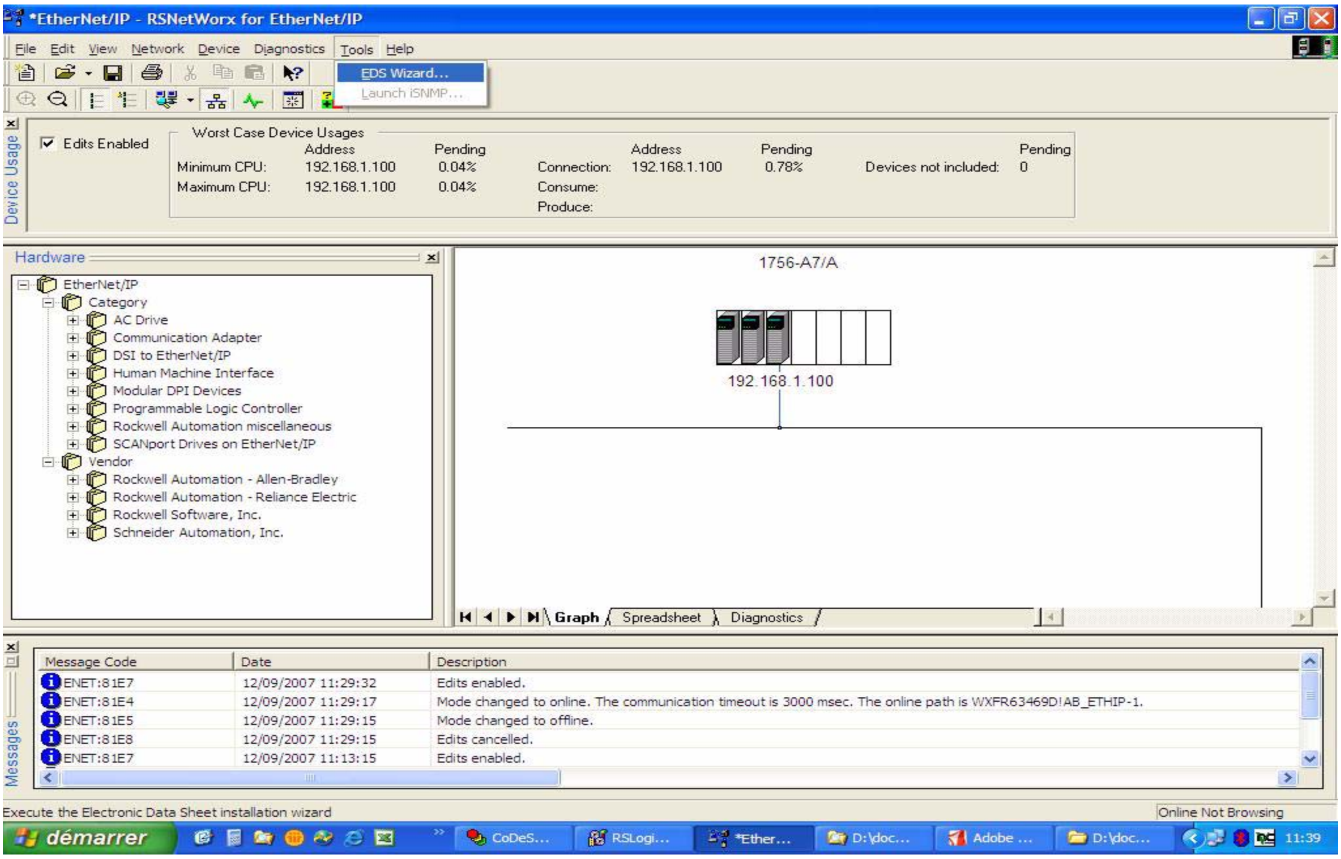
Below native RSX profile is selected.



12. 3. Registering the EDS file in RSlogix

An EDS file is provided with the drive. (This file is available on the CD or on www.telemecanique.com).
It exists 1 EDS file for the ATV71 and 1 EDS file for the ATV61.
The following lines describe how to import these files in your project:

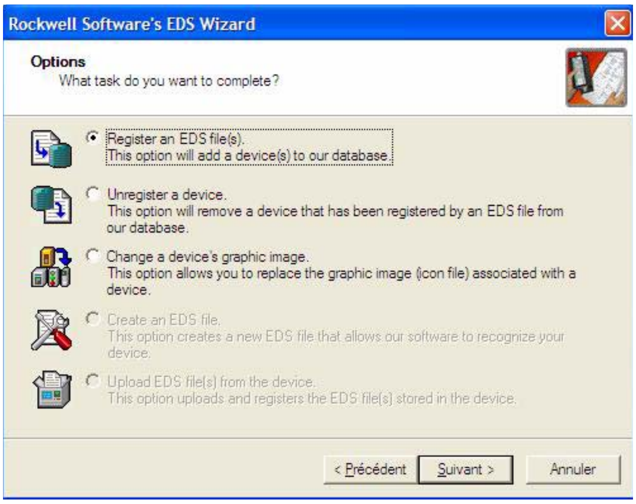
In RSnetWorx , start the EDS wizards



12. Integration in RSLogix

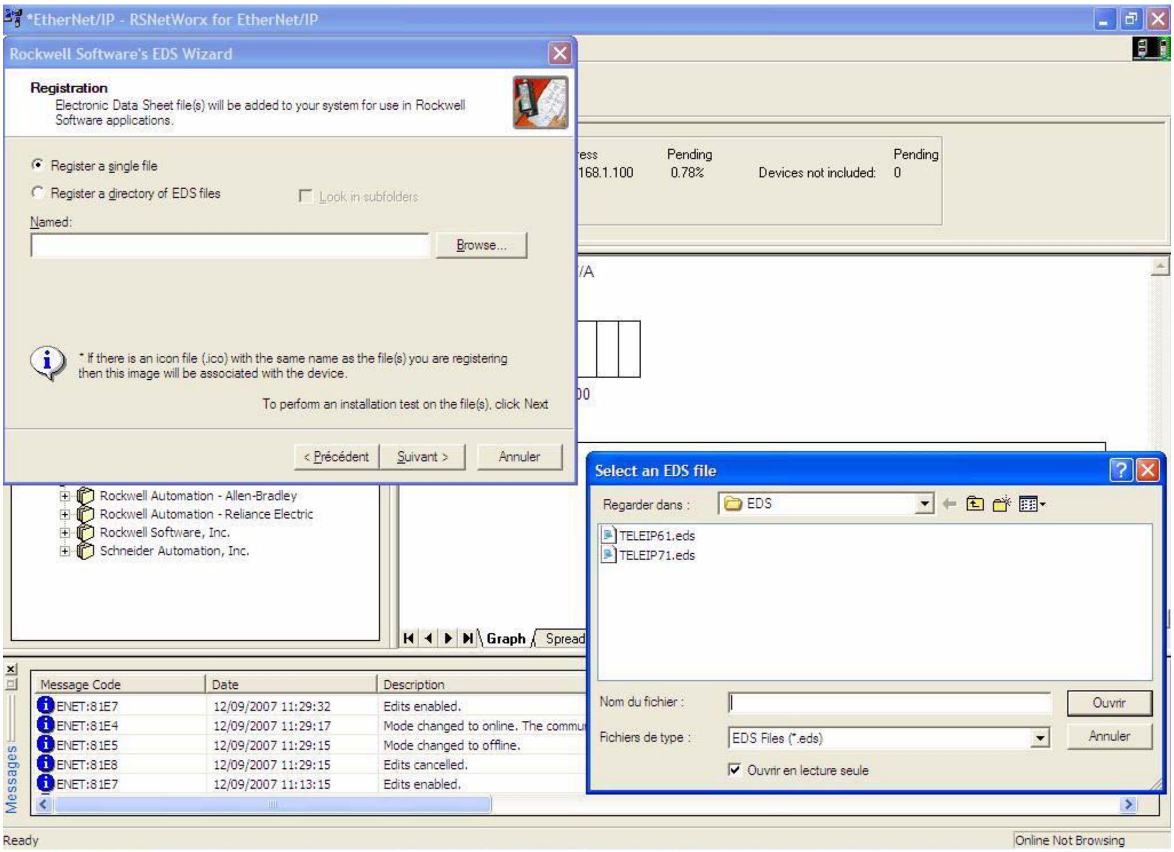
Follow the instructions:

Choose "Register" to import a new EDS file.
If you want to update an EDS file you need to "unregister" this device first.

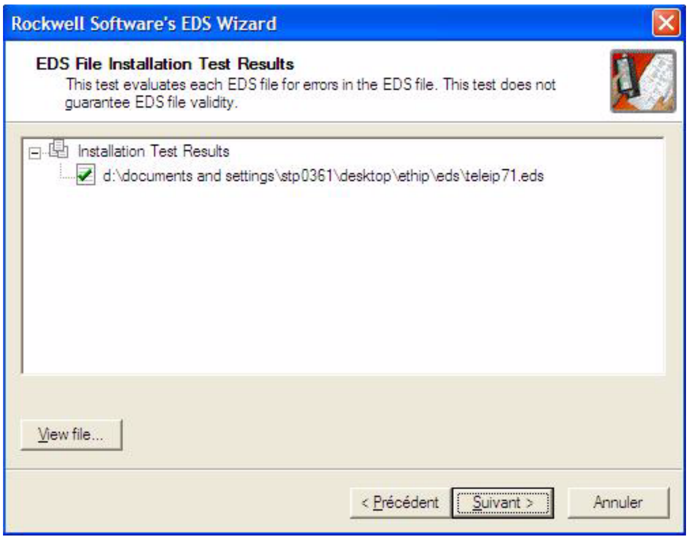


12. Integration in RSLogix

Select the required file:



Then finish, the dialog box displays the result of the import operation.



13. CIP objects

13. 1. Supported object classes

Three categories of object classes can be defined:
- 1: CIP device on EtherNet/IP.
- 2: AC/DC drive.
- 3: VSD specific.

These objects are detailed here:

Object class	Class ID	Cat.	Number of instances	Effect on behavior Interface
Identity object (13. 2.) page 44	16#01	1	1	Supports the reset service
Message router object (13. 3.) page 45	16#02	1	1	Explicit message connection
Ethernet Link object (13. 4.) page 47	16#F6	1	1	Counter and status information
TCP/IP Interface object (13. 5.) page 50	16#F5	1	1	TCP/IP configuration
Connection object manager (13. 6.) page 52	16#05	1	1	
Motor data object (13. 7.) page 53	16#28	2	1	Defines data for the motor connected to the device
Control supervisor object (13. 8.) page 54	16#29	2	1	Manages drive functions, operational states and control
AC/DC Drive Object (13. 9.) page 56	16#2A	2	1	Provides drive configuration
Assembly object (13. 10.) page 57	16#04	2	12	Defines I/O data format
Application objects (13. 11.) page 58		3	1	Vendor specific - drive's parameters

13. 2. Identity object

The Identity object provides identification and status information about the drive.

Class code

Hexadecimal	Decimal
16#01	1

Class attributes

Attribute ID	Access	Name	Need	Data type	Value	Details
1	Get	Revision	Opt.	UINT	1	—
2	Get	Max Instances	Opt.	UINT	1	1 defined instance

Instance attributes

Attribute ID	Access	Name	Need	Data type	Value	Details
1	Get	Vendor ID	Req.	UINT	243	Schneider Automation, Inc [243]
2	Get	Device type	Req.	UINT	16#02	AC/DC drive profile
3	Get	Product code	Req.	UINT	5 or 7	5: ATV71 7: ATV61
4	Get	Revision	Req.	Struct of: USINT USINT	—	Product revision of the drive (1)
5	Get	Status	Req.	WORD	—	See definition in the table below
6	Get	Serial number	Req.	UDINT	—	Serial number of the drive
7	Get	Product name	Req.	Struct of: USINT STRING	—	11 (product name length) “ATV71 Drive”
8	Get	State	Opt.	USINT	—	0: Non existent 1: Device self-testing 2: Standby 3: Operational 4: Major recoverable fault 5: Major unrecoverable fault
10	Get/Set	Heartbeat interval (2)	Opt.	USINT	0–255	Interval in seconds between two heartbeat messages. 0: No message.

(1) Mapped in a word: MSB minor revision (second USINT), LSB major revision (first USINT).
Example: 517 = 16#0205 means revision V5.2.

(2) The heartbeat message broadcasts the current state of the device.

13. 3. Message router object

The Message router object is the element through which all the "Explicit messages" objects pass in order to be directed towards the objects they are truly destined to.

Class code

Hexadecimal	Decimal
16#02	2

Class attributes

Attribute ID	Access	Name	Need	Data type	Value	Details
1	Get	Revision	Opt.	UINT	1	-
2	Get	Max instances	Opt.	UNT	1	1 Defined instance

Instance attributes

Attribute ID	Access	Name	Need	Data type	Value	Details
1	Get	Object list: Number classes	Opt.	Struct of: UINT UINT [ ]	20 (codes)	List of supported objects; the first UINT is the number of supported classes; the remaining UINTs are the codes of these classes.
2	Get	Number available	Opt.	UINT	1	Maximum number of simultaneous connections
3	Get	Number active	Opt.	UINT	1	Number of active connections
4	Get	Active connections	Opt.	UINT [ ]	1	List of active connections (referred to with their respective Connection instance ID)

Class service

Service code	Service name	Need	Description
16#0E	Get_Attribute_Single	Req.	Read an attribute

Instance service

Service code	Service name	Need	Description
16#0E	Get_Attribute_Single	Req.	Read an attribute

13. 4. Ethernet Link object

This object provides the mechanism to configure a device's TCP/IP network interface.

■ Class code

Hexadecimal	decimal
16#F5	245

■ Class attributes

Class attributes for this object are optional.

■ Instance attributes

Attribute ID	Access	Name	need	Data type	Value		Details
1	Get	**Status**	Req.	DWORD	Bit level	0	The interface configuration attribute has not been configured.
						1	The interface configuration contains a valid configuration.
						2-15	Reserved for future use.
2	Get	**Configuration capability**	Req.	DWORD	Bit level	**0**	BOOTP Client.
						1	DNS Client.
						2	DHCP Client.
						3	DHCP-DNS capable.
						4	Interface configuration settable.
						All other bits are reserved and shall be set to 0.	
3	Get Set	**Configuration** **control**	Req.	DWORD	Bit level	**0**	The interface configuration is valid.
						1	The interface configuration must be obtained with BOOTP.
						2	The interface configuration must be obtained with DHCP..
						3	Reserved.
NOTE : This attribute interacts with the Altivar 71 parameter [IPmode]. (see chapter 8.).						**4**	DNS Enable.
						All other bits are reserved and shall be set to 0.	

4	Get	**Physical link**	Req.	STRUCT {
				UINT **path size**
				Padded EPATH **path**
				}
						Path size: number of 16 bit words in the element Path
						Path: Logical segments identifying the physical link object. The path is restricted to one logical class segment and one logical instance segment. The maximum size is 12 bytes.	

Attribute ID	Access	Name	need	Data type	Value	Details

5	Get
	Set
		Interface configuration	Req.	STRUCT {
				
				UDINT **IP Address**
				
				UDINT **Network Mask**
				
				UDINT **Gateway address**
				
				UDINT **Primary Name** server
				
				UDINT **Secondary name** server
				
				STRING **Default Domain name**
				
				}
						IP Address: Value of 0 indicates noIP address has been configured. Otherwise, the IP address shall be set to a valid Class A, B, or C address and shall not be set to the loopback address (127.0.0.1).
						
						Network Mask: Value of 0 indicates no network mask address has been configured.
						
						Gateway Address: Value of 0 indicates no IP address has been configured. Otherwise, the IP address shall be set to a valid Class A, B, or C address and shall not be set to the loopback address (127.0.0.1).
						
						Primary name: Value of 0 indicates no name server address has been configured. Otherwise, the name server address shall be set to a valid Class A, B, or C address.
						
						Secondary Name: Value of 0 indicates no secondary name server address has been configured. Otherwise, the name server address shall be set to a valid Class A, B, or C address.
						
						Default domain name: ASCII characters. Maximum length is 48 characters. Shall be padded to an even number of characters (pad not included in length). A length of 0 shall indicate no Domain Name is configured.

6	Get Set	**Host Name**	Req.	STRING		ASCII characters. Maximum length is 64 characters. Shall be padded to an even number of characters (pad not included in length). A length of 0 shall indicate no Host Name is configured.

■ Class service

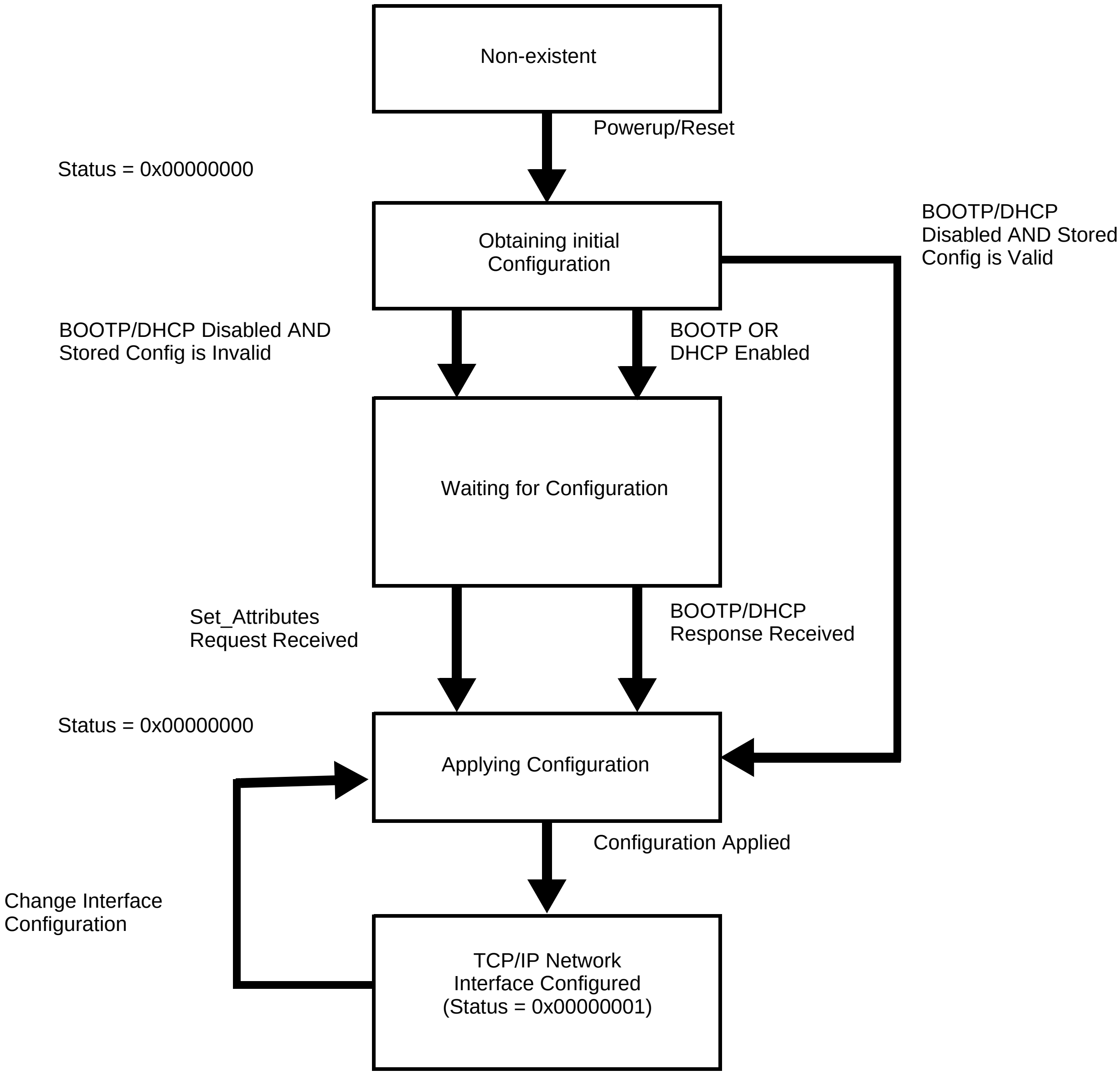
Service Code	Service Name	Need	Description
16#01	Get_Attribute_All	Optional	Returns a predefined listing of this objects attributes.
16#0E	Get_Attribute_Single	Optional	Returns the contents of the specified attribute.

■ Instance service

Service Code	Service Name	Need	Description
16#01	Get_Attribute_All	Optional	Returns a predefined listing of this objects attributes.
16#0E	Get_Attribute_Single	Required	Returns the contents of the specified attribute.
16#02	Set_Attribute_All	optional	Modifies all settable attributes.
16#10	Set_Attribute_Single	Required	Modifies a single attribute.

■ Behaviour

The following state machine is used to configure the TCP/IP network interface.



13. 5. TCP/IP Interface object

This object maintains link specific counters and status information for an Ethernet 802.3 communications interface.

■ Class code

Hexadecimal	Decimal
16#F6	246

■ Class attributes

Attribute ID	Access	Name	Need	Data type	Value
1	Get	Revision	Req.	UINT	2
2 through 7			optional		

■ Instance attributes ../

Attribute ID	Access	Name	Need	Data type	Value	Details
1	Get	**Interface Speed**	Req.	UDINT	0,10,100 1000, etc.	Speed in Mbps.
2	Get	**Interface flags**	Req.	DWORD	Bit level	**0** Link status
						1 Half/full duplex
						2-4 Negotiation status
						5 Manual setting / requires reset
						6 Local Hardware fault
						All other bits are reserved and shall be set to 0.
3	Get	**Physical Address**	Req.	ARRAY OF 6 USINTs		This array contains the MAC address of the card.Format: XX-XX-XX-XX-XX-XX
4 …	*Get*	***Interface counters***	*Cond.*	***STRUCT {***		
				UDINT ***In Octets***		*Octets received on the interface*
				UDINT ***In Ucast Packets***		*Unicast Packets received on the interface.*
				UDINT ***In NUcast Packets***		*Non Unicast Packets received on the interface.*
				UDINT ***In Discards***		*Inbound packets received on the interface but discarded.*
				UDINT ***In Errors***		*Inbound packets that contain errors. (does not include in Discards)*
				UDINT ***In Unknown Protos***		*Inbound packets with unknown protocol.*
				UDINT ***Out Octets***		*Octets sent on the interface.*
				UDINT ***Out Ucast packest***		*Unicast Packets sent on the interface.*
				UDINT ***Out NUcast Packets***		*Non Unicast Packets sent on the interface.*
				UDINT ***Out discards***		*Outbound packets discarded*
				UDINT		*Outbound packets that contain errors*
				}		

Attribute ID	Access	Name	Need	Data type	Value	Details
5	*Get*	***Media Counters***	*Cond.*	***STRUCT {***		
				UDINT ***Alignment errors***		*Frames received that are not an integral number of octets in length*
				UDINT ***FCS Errors***		*Frames received that do not pass the FCS check*
				UDINT ***Single collisions***		*Successfully transmitted frames which experienced exactly one collision*
				UDINT ***Multiple Collisions***		*Successfully transmitted frames which experienced more than one collision*
				UDINT ***SQE Test Errors***		*Number of times SQE test error message is generated*
				UDINT ***Deferred Transmissions***		*Frames for which first transmission attempt is delayed because the medium is busy*
				UDINT ***Late Collisions***		*Number of times a collision is detected later than 512 bittimes into the transmission of a packet*
				UDINT ***Excessive Collisions***		*Frames for which transmission fails due to excessive collision*
				UDINT ***MAC Transmit errors***		*Frames for which transmission fails due to an internal MAC sublayer transmit error*
				UDINT ***Carrier sense Errors***		*Times that the carrier sense condition was lost or never asserted when attempting to transmit a frame*
				UDINT ***Frame too long***		*Frames received that exceed the maximum permitted frame size*
				UDINT ***MAC Receive Errors***		*Frames for which reception on an interface fails due to an internal MAC sublayer receive error*
				}		
6	*Set*	***Interface control***	*Optional*	***STRUCT {***		
				WORD ***Control Bits***		*Interface control bits*
				UINT ***Force interface Speed***		*Speed at which the interface shall be forced to operate.*
				}		

■ Class service

Service Code	Service Name	Need	Description
16#01	Get_Attribute_All	Optional	Returns a predefined listing of this objects attributes.
16#0E	Get_Attribute_Single	Optional	Returns the contents of the specified attribute.
16#10	Get_and_clear	Cond.	Modifies a single attribute

■ Instance service

Service Code	Service Name	Need	Description
16#01	Get_Attribute_All	Optional	Returns a predefined listing of this objects attributes.
16#0E	Get_Attribute_Single	Required	Returns the contents of the specified attribute.
16#10	Set_Attribute_Single	Required	Modifies a single attribute.

13. 6. Connection object manager

Class code

Hexadecimal	Decimal
16#05	5

Class attributes

Attribute ID	Access	Name	Need	Data type	Value	Details
1	Get	Revision	Opt.	UINT	1	—
2	Get	Max instances	Opt.	UINT	4	3 defined instances (1)

(1) Only instances 1 (explicit message), 2 (polled I/O message), and 4 (change of state/cyclic message) are supported. Instance 3 (bit strobe) is not supported.

Attributes of instance 1—Explicit message instance

Attribute ID	Access	Name	Need	Data type	Value	Details
1	Get	State	Req.	USINT	—	0 : Non-existent 3 : Established 5 : Deferred Delete
2	Get	Instance_type	Req.	USINT	0	Explicit Message
3	Get	TransportClass_trigger	Req.	BYTE	16#83	Class 3 server
4	Get	Produced_connection_id	Req.	UINT	10xxxxxx011	xxxxxx = Node address
5	Get	Consumed_connection_id	Req.	UINT	10xxxxxx100	xxxxxx = Node address
6	Get	Initial_comm_characteristics	Req.	BYTE	16#21	Explicit messaging via Group 2
7	Get	Produced_connection_size	Req.	UINT	36	Produced data maximum size (in bytes)
8	Get	Consumed_connection_size	Req.	UINT	36	Consumed data maximum size (in bytes)
9	Get/Set	Expected_packet_rate	Req.	UINT	2500	2.5 sec. (TimeOut)
12	Get/Set	Watchdog_timeout_action	Req.	USINT	1 or 3	1 : Auto-Delete 3 : Deferred Delete (Default)
13	Get	Produced connection path length	Req.	UINT	0	Length of attribute 14 data
14	Get	Produced connection path	Req.	Array of UINT	Null	Empty
15	Get	Consumed connection path length	Req.	UINT	0	Length of attribute 16 data
16	Get	Consumed connection path	Req.	Array of UINT	Null	Empty

Refer to EtherNet/IP specification for more information.

13. 7. Motor data object

The Motor data object acts as a motor parameter database.

Class code

Hexadecimal	Decimal
16#28	40

Object 28hex (Motor Data)

Path	CIP name	CIP configuration parameter name
16#28/01/06 = 40/1/6	RatedCurrent	Motor Rated Cur
16#28/01/07 = 40/1/7	RatedVoltage	Motor Rated Volt
16#28/01/09 = 40/1/9	RatedFreq	Motor Rated Freq
16#28/01/0F = 40/1/15	BaseSpeed	Motor Base Speed

Telemecanique adaptation:

Path	Code	Altivar name	Logic address
16#28/01/06 = 40/1/6	NCR	Rated mot. current	16#2583 = 9603
16#28/01/07 = 40/1/7	UNS	Rated motor volt.	16#2581 = 9601
16#28/01/09 = 40/1/9	FRS	Rated motor freq.	16#2582 = 9602
16#28/01/0F = 40/1/15	NSP	Rated motor speed	16#2584 = 9604

Class attributes

Attribute ID	Access	Name	Need	Data type	Value	Details
1	Get	Revision	Opt.	UINT	2	—
2	Get	Max instance	Opt.	UINT	1	—
6	Get	Max ID number of class attribute	Opt.	UINT	7	—
7	Get	Max ID number of instance attribute	Opt.	UINT	15	—

Instance attributes

Attribute ID	Access	Name	Need	Data type	Value	Details
3	Get/Set	MotorType	Req.	USINT	7	6 = Wound rotor induction motor 7 = Squirrel cage induction motor
6	Get/Set	RatedCurrent	Req.	UINT	Depends on the drive rating	[Rated mot. current] (nCr)
7	Get/Set	RatedVoltage	Req.	UINT	Depends on the drive rating	[Rated mot. volt.] (UnS)
9	Get/Set	RatedFreq	Opt.	UINT	50/60	[Rated motor freq.] (FrS)
15	Get/Set	BaseSpeed	Opt.	UINT	Depends on the drive rating	[Nom motor speed] (nSP)

Class service

Service code	Service name	Need	Description
16#0E	Get_Attribute_Single	Req.	Read an attribute

Instance service

Service code	Service name	Need	Description
16#0E	Get_Attribute_Single	Req.	Read an attribute
16#10	Set_Attribute_Single	Opt.	Write an attribute

13. 8. Control supervisor object

The Control supervisor object models the functions for managing all devices within the hierarchy of motor control devices.

Object 29hex (Control Supervisor)

Path	CIP name	CIP configuration parameter name
16#29/01/0D = 41/1/13	FaultCode	Fault Code

Telemecanique adaptation:

Path	Code	Altivar name	Logic address
16#29/01/0D = 41/1/13	ERRD	CiA402 fault code	16#219E = 8606

Class code

Hexadecimal	Decimal
16#29	41

Class attributes

Attribute ID	Access	Name	Need	Data type	Value	Details
1	Get	Revision	Opt.	UINT	2	—
2	Get	Max instance	Opt.	UINT	1	—
6	Get	Max ID number of class attribute	Opt.	UINT	7	—
7	Get	Max ID number of instance attribute	Opt.	UINT	17	—

Instance attributes

Attribute ID	Access	Name	Need	Data type	Details
3	Get/Set	Run Fwd	Req.	BOOL	On an edge (0 →1)
4	Get/Set	Run Rev	Opt.	BOOL	On an edge (0 →1)
5	Get/Set	NetCtrl	Opt.	BOOL	0: Local Control (Channel 1) 1: Network Control (default)
6	Get	State	Opt.	USINT	0 = Vendor Specific, 1 = Startup, 2 = Not_Ready, 3 = Ready, 4 = Enabled, 5 = Stopping, 6 = Fault_Stop, 7 = Faulted
7	Get	Running Fwd	Req.	BOOL	
8	Get	Running Rev	Opt.	BOOL	
9	Get	Ready	Opt.	BOOL	
10	Get	Faulted	Req.	BOOL	
12	Get/Set	FaultRst	Req.	BOOL	Fault reset (0 →1)
13	Get	FaultCode	Opt.	UINT	Refer to the Communication parameters manual: DSP402 fault code (Errd)
15	Get	CtrlFromNet	Opt.	BOOL	0 = Local Control; 1 = Network Control

13. CIP objects

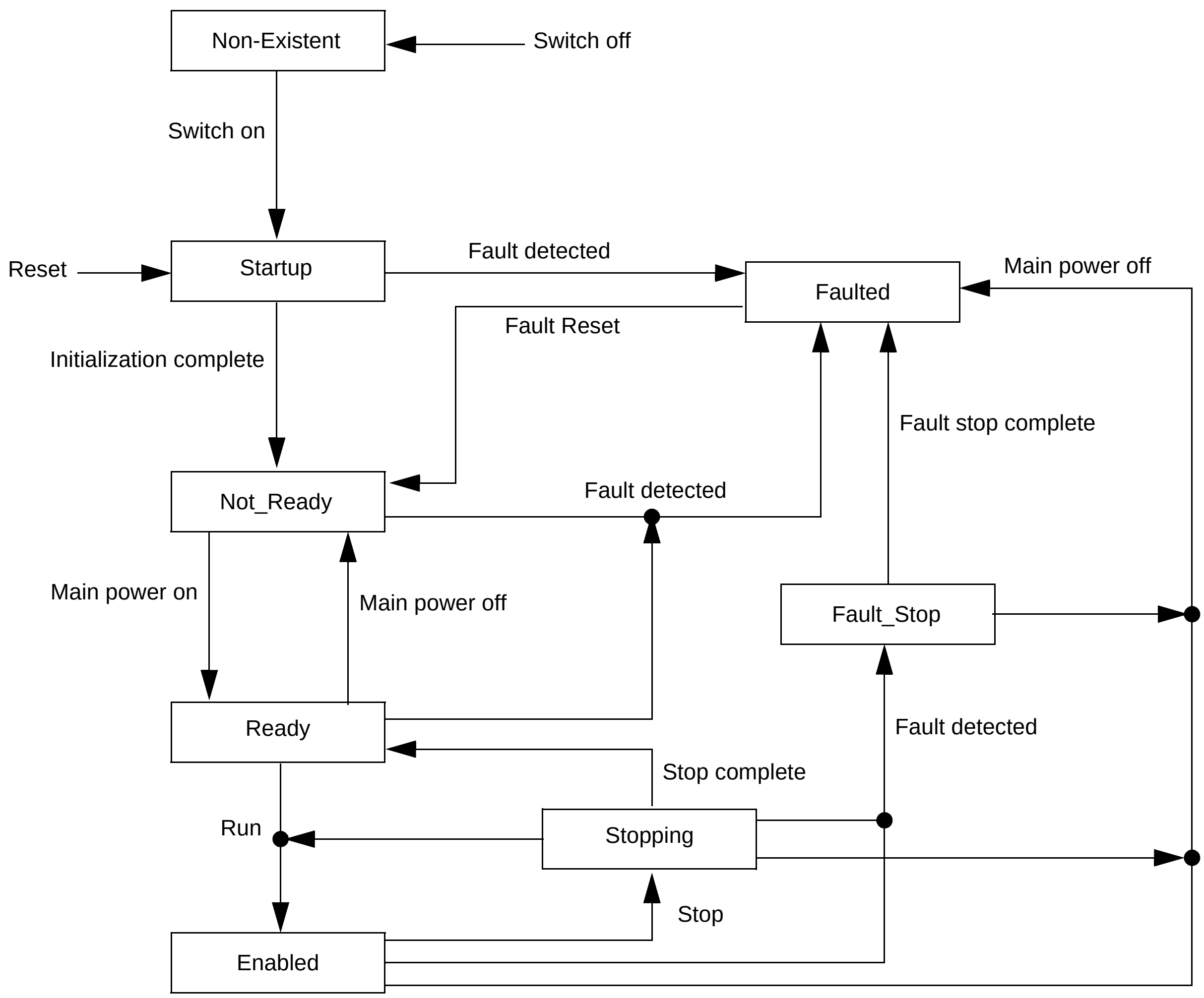
Class service

Service Code	Service name	Need	Description
16#0E	Get_Attribute_Single	Req.	Read an attribute

Instance service

Service Code	Service name	Need	Description
16#0E	Get_Attribute_Single	Req.	Read an attribute
16#10	Set_Attribute_Single	Req.	Write an attribute
16#05	Reset	Req.	Drive reset

Control supervisor state transition diagram



13. CIP objects

13. 9. AC/DC Drive Object

The AC/DC Drive object models the functions (such as torque control and speed ramp) that are specific to drives.

Class code

Hexadecimal	Decimal
16#2A	42

Class attributes

Attribute ID	Access	Name	Need	Data Type	Value	Details
1	Get	Revision	Opt.	UINT	1	—
2	Get	Max instance	Opt.	UINT	1	—
6	Get	Max ID number of class attribute	Opt.	UINT	7	—
7	Get	Max ID number of instance attribute	Opt.	UINT	21	—

Instance attributes

Attribute ID	Access	Name	Need	Data type	Details
3	Get	AtReference	Opt.	BOOL	
4	Get/Set	NetRef (1)	Req.	BOOL	0: Local speed setpoint (AI1 or AI2) 1: Speed setpoint via the network
5	Get/Set	NetProc	Opt.	BOOL	Not handled
6	Get/Set	Drive mode	Req.	USINT	1: Open loop 2: Closed loop (FVC)
7	Get	SpeedActual	Req.	INT	Output speed (rFrd)
8	Get/Set	SpeedRef	Req.	INT	Speed setpoint (LFrd)
9	Get	CurrentActual	Opt.	INT	Motor current (LCr)
10	Get/Set	CurrentLimit	Opt.	INT	[Mot. therm. current] (ItH)
11	Get	TorqueActual	Opt.	INT	Output torque (Otrn)
12	Get/Set	TorqueRef	Opt.	INT	Torque setpoint (LtCr)
18	Get/Set	AccelTime	Opt.	UINT	Acceleration time (ACCd)
19	Get/Set	DecelTime	Opt.	UINT	Deceleration time (dECd)
20	Get/Set	LowSpdLimit	Opt.	UINT	Parameter [Low speed] (LSP) converted in RPM
21	Get/Set	HighSpdLimit	Opt.	UINT	Parameter [High speed] (HSP) converted in RPM

Class service

Service code	Service name	Need	Description
16#0E	Get_Attribute_Single	Req.	Read an attribute

Instance service

Service code	Service name	Need	Description
16#0E	Get_Attribute_Single	Req.	Read an attribute
16#10	Set_Attribute_Single	Opt.	Write an attribute

13. 10. Assembly object

The Assembly object binds together the attributes of multiple objects so that information to or from each object can be communicated over a single connection.

Assembly objects are static.

The assemblies in use can be modified through the parameter access of the network configuration tool (RSNetWorx).

The drive needs a power off to take into account a new assembly assignment.

Class code

Hexadecimal	Decimal
16#04	4

Class attribute

Attribute ID	Access	Name	Need	Data type	Value	Details
1	Get	Revision	Opt.	UINT	2	—
2	Get	Max instance	Opt.	UINT	105	13 defined instances

Instances supported

Instance	Name	Data size
20	ODVA Basic speed control output	4 bytes
21	ODVA Extended speed control output	4 bytes
22	ODVA Speed and torque control output	6 bytes
23	ODVA Extended speed and torque control output	6 bytes
100	Native drive output	16 bytes
103	Allen-Bradley® drive output	20 bytes
70	ODVA Basic speed control input	4 bytes
71	ODVA Extended speed control input	4 bytes
72	ODVA Speed and torque control input	6 bytes
73	ODVA Extended speed and torque control input	6 bytes
101	Native drive input	16 bytes
104	Allen-Bradley® drive input	20 bytes

The description of each instance is detailed in chapter 15. Device profiles

Instance attributes

Attribute ID	Access	Name	Need	Data type	Value	Details
3	Get/Set (1)	Data	Req.			

(1) Set access is restricted to output instances only (instances 20, 21, 22, 23, 100 and 103).

Class service

Service code	Service name	Need	Description
16#0E	Get_Attribute_Single	Req.	Read an attribute

Instance service

Service code	Service name	Need	Description
16#0E	Get_Attribute_Single	Req.	Read an attribute
16#10	Set_Attribute_Single	Opt.	Write an attribute

13. 11. Application objects

Class code

Hexadecimal	Decimal
16#70 to 16#A8	112 to 424

Altivar parameters path

The Altivar parameters are grouped in classes.
Each application class has only 1 instance.
Each instance groups 200 parameters.
Each attribute in an instance relates to a parameter.

The first parameter registered in the first application class (class code: 16#70 = 112) has the logical address 3000.

Examples:

Logical address	Path Hexadecimal	Path decimal
3 000	16# 70 / 01 / 01	112 / 1 / 1
3 100	16# 70 / 01 / 65	112 / 1 / 101
3 200	16# 71 / 01 / 01	113 / 1 / 1
64 318	16# A2 / 1 / 77	418 / 1 / 119

Refer to the Communication parameters manual.

Class attributes

Attribute ID	Access	Name	Need	Data type	Value
1	Get	Revision	Opt.	UINT	1
2	Get	Max instance	Opt.	UINT	1
6	Get	Max ID number of class attribute	Opt.	UINT	7
7	Get	Max ID number of instance attribute	Opt.	UINT	X

Instance attributes

Attribute ID	Access	Name	Data type	Value
1	Get/Set	First parameter of the class	UINT / USINT	Value returned by the drive
...	...	...	...	...
X	Get/Set	Last parameter of the class	UINT / USINT	Value returned by the drive

Note: Depending on the parameter, write access may be prohibited. Refer to the Communication parameters manual for more information.

Class service

Service code	Service name	Need	Description
16#0E	Get_Attribute_Single	Req.	Read an attribute

Instances service

Service code	Service name	Need	Description
16#0E	Get_Attribute_Single	Req.	Read an attribute
116#0	Set_Attribute_Single	Opt.	Write an attribute

■ Object 2Ahex (AC/DC Drive)

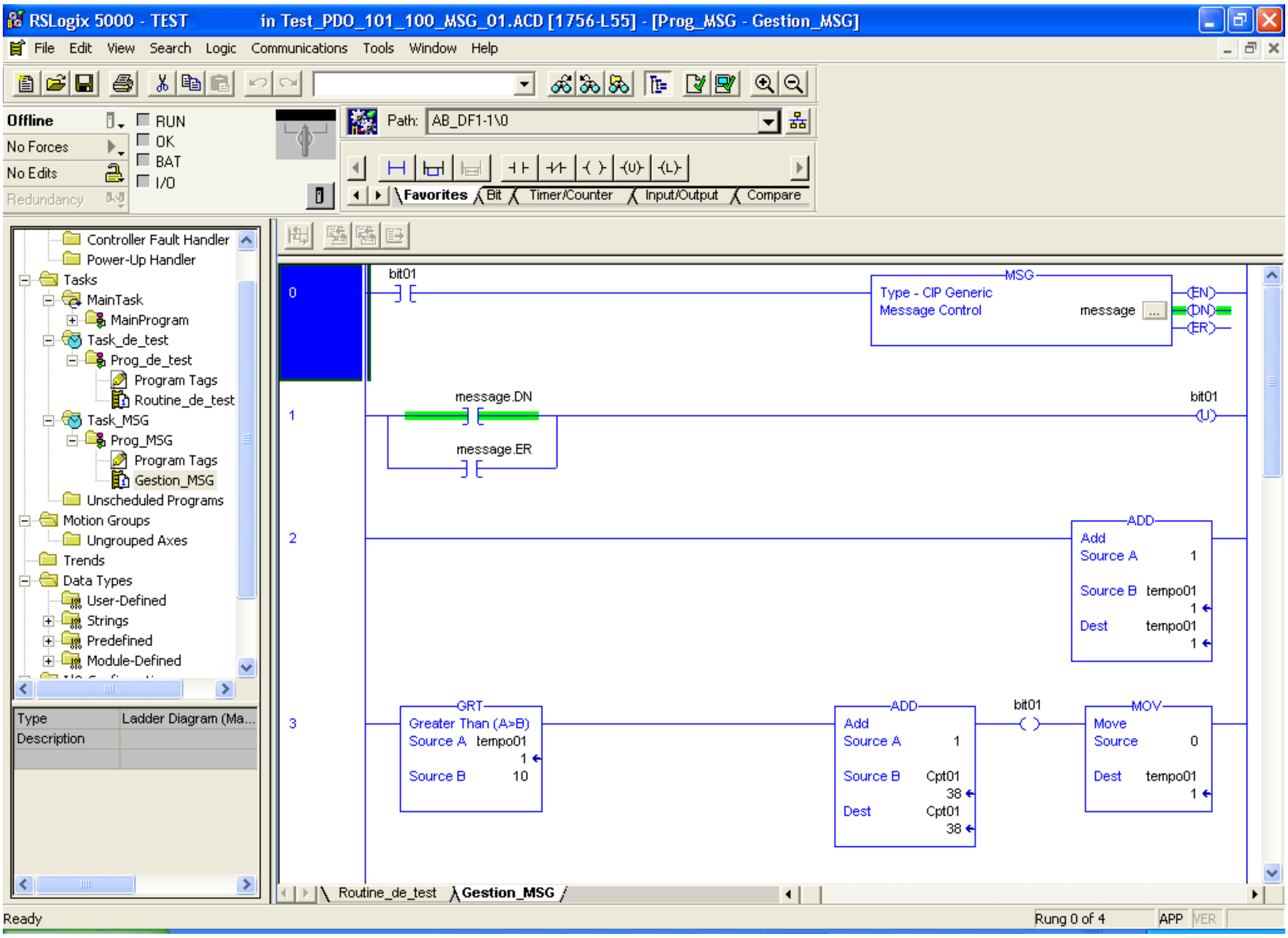
Path	CIP name	CIP configuration parameter name
16#2A/01/07 = 42/1/7	SpeedActual	Speed Actual
16#2A/01/08 = 42/1/8	SpeedRef	Speed Reference
16#2A/01/09 = 42/1/9	CurrentActual	Current Actual
16#2A/01/0A = 42/1/10	CurrentLimit	Current Limit
16#2A/01/0B = 42/1/11	TorqueActual	Torque Actual
16#2A/01/0C = 42/1/12	TorqueRef	Torque Reference
16#2A/01/12 = 42/1/18	AccelTime	Accel Time
16#2A/01/13 = 42/1/19	DecelTime	Decel Time
16#2A/01/14 = 42/1/20	LowSpdLimit	Low Speed Limit
16#2A/01/15 = 42/1/21	HighSpdLimit	High Speed Limit

Telemecanique adaptation:

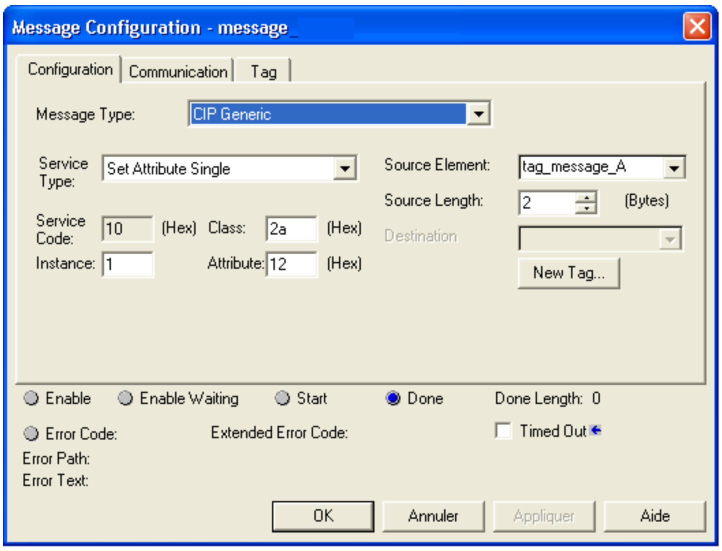
Path	Code	Altivar name	Logic address	Unit Id
16#2A/01/07 = 42/1/7	RFRD	Output velocity	16#219C = 8604	
16#2A/01/08 = 42/1/8	LFRD	Speed setpoint	16#219A = 8602	
16#2A/01/09 = 42/1/9	LCR	Motor current	16#0C84 = 3204	
16#2A/01/0A = 42/1/10	ITH	Mot. therm. current	16#2596 = 9622	
16#2A/01/0B = 42/1/11	Otrn	Output torque (Nm)	16#2A0B = 10763	251
16#2A/01/0C = 42/1/12	n.a.	Torque setpoint (Nm)	16#2A0C = 10764	251
16#2A/01/12 = 42/1/18	ACCD	CIP acceleration time	16#2A12 = 10770	251
16#2A/01/13 = 42/1/19	DECD	CIP deceleration time	16#2A13 = 10771	251
16#2A/01/14 = 42/1/20	LSPD	CIP Low speed limit	16#2A14 = 10772	251
16#2A/01/15 = 42/1/21	HSPD	CIP High speed limit	16#2A15 = 10773	251

14. Explicit Messaging

The following example shows an example of explicit messaging: The value of the ACC parameter (Modbus @ = 9001 / CIP address 16#2A:1:16#12) is modified when the variable "bit01" is toggled ON.



The detailed configuration of the message Box:



15. Device profiles

EtherNet/IP card provides several profiles:
- CIP AC drive profile (0x02) (default setting),
- Allen Bradley drive profile,
- Telemecanique: CiA 402 and I/O.

The profile is chosen by the selection of the right input assembly and output assembly.

In this manual, the chapter "Integration in RSLogix 5000" shows how the user may select the assemblies.

■ List of assemblies

Output assemblies

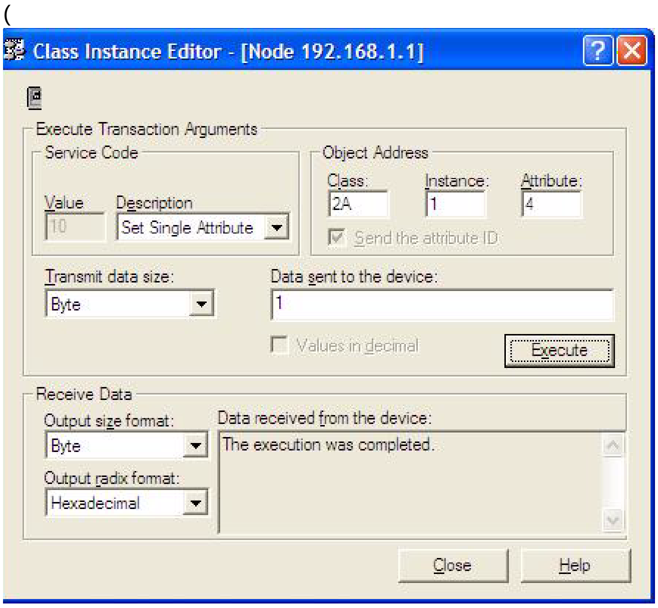
Assembly name	Number	Size
CIP basic speed control output	20	2 words (4 bytes)
CIP extended speed control output	21	2 words (4 bytes)
CIP speed and torque control output	22	3 words (6 bytes)
CIP extended speed and torque control output	23	3 words (6 bytes)
Native drive output	100	2 to 10 words (4 to 20 bytes)
Allen-Bradley® drive output	103	2 to 10 words (4 to 20 bytes)

Input assemblies

Assembly name	Number	Size
CIP basic speed control input	70	2 words (4 bytes)
CIP extended speed control input	71	2 words (4 bytes)
CIP speed and torque control input	72	3 words (6 bytes)
CIP extended speed and torque control input	73	3 words (6 bytes)
Native drive input	101	2 to 10 words (4 to 20 bytes)
Allen-Bradley® drive input	104	2 to 10 words (4 to 20 bytes)

IMPORTANT REMARK:
For the assemblies 20 and 22, the default settings defines that the speed setpoint is originated from the terminals. To fully control the drive from the network the following operation is required:
The object 2A/1/4 (netref) must be changed from 0 to 1 (byte). Such assignment can be done:
- By program, with an MSG() instruction block.
- With the Class instance editor:

(



■ Assembly 20: CIP basic speed control output

Assembly mapping

Word number	Definition
0	CIP basic command word
1	Speed setpoint (rpm)

CIP basic command word

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Not used	Not used	Not used	Not used	Not used	Fault reset (1) 0 = No command 1 = Fault reset	Not used	Run Forward (2) 0 = Stop 1 = Run

(1) Active on rising edge.
(2) Active on level.

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
Not used	Not used	Not used	Not used	Not used	Not used	Not used	Not used

■ Assembly 70: CIP basic speed control input

Assembly mapping

Word number	Definition
0	CIP basic status word
1	Actual speed (rpm)

CIP basic status word

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Not used	Not used	Not used	Not used	Not used	Running 0 = Stopped 1 = Running	Not used	Faulted 0 = No fault 1 = Fault

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
Not used	Not used	Not used	Not used	Not used	Not used	Not used	Not used

■ Assembly 21: CIP extended speed control output

Assembly mapping

Word number	Definition
0	CIP extended command word
1	Speed setpoint (rpm)

CIP extended command word

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1 Bit 0
Not used	Network setpoint 0 = Setpoint by terminals 1 = Setpoint by network	Network command 0 = Command by terminals 1 = Command by network	Not used	Not used	Fault reset (1) 0 = No command 1 = Fault reset	Run forward / reverse 00 = Quick stop 01 = Run forward 10 = Run reverse 11 = Freewheel stop

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
Not used	Not used	Not used	Not used	Not used	Not used	Not used	Not used

(1) Active on rising edge.

■ Assembly 71: CIP extended speed control input

Assembly mapping

Word number	Definition
0	CIP extended status word
1	Actual speed (rpm)

CIP extended status word

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
At reference 0 = Reference not reached 1 = Reference reached	Setpoint from network 0 = Setpoint from terminals 1 = Setpoint from network	Command from network 0 = Command from terminals 1 = Command from network	Ready 0 = Not ready 1 = Ready	Running forward / reverse 00 = Stopped 01 = Running forward 10 = Running reverse 11 = Not used		Warning 0 = No warning 1 = Warning	Not used

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
Not used	Not used	Not used	Not used	Not used	Bit 8 to bit 10 are used for the drive state 000 = Not used 001 = Startup 010 = Not Ready 011 = Ready 100 = Enabled 101 = Stopping 110 = Fault Stop 111 = Faulted		

■ Assembly 22: CIP speed and torque control output

Assembly mapping

Word number	Definition
0	CIP basic command word (1)
1	Speed setpoint (rpm)
2	Torque setpoint (Nm)

(1) Refer to assembly 20.

■ Assembly 72: CIP speed and torque control input

Assembly mapping

Word number	Definition
0	CIP basic status word (1)
1	Actual speed (rpm)
2	Actual torque (Nm)

(1) Refer to assembly 70.

■ Assembly 23: CIP extended speed and torque control output

Assembly mapping

Word number	Definition
0	CIP extended command word (1)
1	Speed setpoint (rpm)
2	Torque setpoint (Nm)

(1) Refer to assembly 21.

■ Assembly 73: CIP extended speed and torque control input

Assembly mapping

Word number	Definition
0	CIP extended status word (1)
1	Actual speed (rpm)
2	Actual torque (Nm)

(1) Refer to assembly 71.

■ Assembly 100: Native drive output

Assembly mapping

Word number	Definition
0	Control word
1	Velocity setpoint
2	Scanner write word 1
3	Scanner write word 2
4	Scanner write word 3
5	Scanner write word 4
6	Scanner write word 5
7	Scanner write word 6

Altivar 71/61 assignment

Word number	Code	Name	Logic address
0	NC1	Communication scanner, value of write word 1 (default value :CMD, Control word)	16#31D9 = 12761
1	NC2	Communication scanner, value of write word 2 (default value: LFRD, velocity setpoint)	16#31DA = 12762
2	NC3	Communication scanner, value of write word 3	16#31DB = 12763
3	NC4	Communication scanner, value of write word 4	16#31DC = 12764
4	NC5	Communication scanner, value of write word 5	16#31DD = 12765
5	NC6	Communication scanner, value of write word 6	16#31DE = 12766
6	NC7	Communication scanner, value of write word 7	16#31DF = 12767
7	NC8	Communication scanner, value of write word 8	16#31E0 = 12768

Note: The default assignment of NC1 and NC2 must be changed to "Not assigned".

■ Assembly 101: Native drive input

Assembly mapping

Word number	Definition
0	Scanner read word 1
1	Scanner read word 2
2	Scanner read word 3
3	Scanner read word 4
4	Scanner read word 5
5	Scanner read word 6
6	Scanner read word 7
7	Scanner read word 8

Altivar 71/61 assignment

Word number	Code	Name	Logic address
0	NM1	Communication scanner, value of read word 1 (default value: Status word, ETA)	16#31C5 = 12741
1	NM2	Communication scanner, value of read word 2 (default value: Velocity actual value, RFRD)	16#31C6 = 12742
2	NM3	Communication scanner, value of read word 3	16#31C7 = 12743
3	NM4	Communication scanner, value of read word 4	16#31C8 = 12744
4	NM5	Communication scanner, value of read word 5	16#31C9 = 12745
5	NM6	Communication scanner, value of read word 6	16#31CA = 12746
6	NM7	Communication scanner, value of read word 7	16#31CB = 12747
7	NM8	Communication scanner, value of read word 8	16#31CC = 12748

■ Assembly 103: Allen-Bradley® drive output

Assembly mapping

Word number	Definition
0	Allen-Bradley® drive logic command
1	Standardized speed setpoint (reference)
2	Scanner write word 1
3	Scanner write word 2
4	Scanner write word 3
5	Scanner write word 4
6	Scanner write word 5
7	Scanner write word 6
8	Scanner write word 7
9	Scanner write word 8

Altivar 71/61 assignment

Word number	Code	Name	Logic address
0	n.a.	Allen-Bradley® drive logic command	n.a.
1	LFR	Frequency setpoint	16#2136 = 8502
2	NC1	Communication scanner, value of write word 1	16#31D9 = 12761
3	NC2	Communication scanner, value of write word 2	16#31DA = 12762
4	NC3	Communication scanner, value of write word 3	16#31DB = 12763
5	NC4	Communication scanner, value of write word 4	16#31DC = 12764
6	NC5	Communication scanner, value of write word 5	16#31DD = 12765
7	NC6	Communication scanner, value of write word 6	16#31DE = 12766
8	NC7	Communication scanner, value of write word 7	16#31DF = 12767
9	NC8	Communication scanner, value of write word 8	16#31E0 = 12768

Note: The default assignment of NC1 and NC2 must be changed to another value or to not assigned..

■ Allen-Bradley® drive logic command

The logic command is a 16-bit word of control produced by the scanner and consumed by the EtherNet/IP card.

If enabled, the Logic command word is always word 0 in the output image.

Bit 7	Bit 6	Bit 5 Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
MOP Increment 0 = Not Increment 1 = Increment	Local control 0 = No local control 1 = Local control	Direction 00 = No command (4) 01 = Forward command 10 = Reverse command 11 = Hold direction control	Clear faults (3) 0 = Not clear faults 1 = Clear faults	Jog 0 = Not jog 1 = Jog	Start (2) 0 = Not start 1 = Start	Stop (1) 0 = Not stop 1 = Stop

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11 Bit 10	Bit 9 Bit 8
MOP Decrement 0 = Not decrement 1 = Decrement	Reference select 000 = No command (7) 001 = Setpoint 1 channel (Fr1) 010 = Setpoint 2 channel (Fr2) 011 = Ref. 3 (Preset 3) 100 = Ref. 4 (Preset 4) 101 = Ref. 5 (Preset 5) 110 = Ref. 6 (Preset 6) 111 = Ref. 7 (Preset 7)			Decel rate 00 = No command (6) 01 = Decel rate 1 command 10 = Decel rate 2 command 11 = Hold decel rate	Accel rate 00 = No command (5) 01 = Accel rate 1 command 10 = Accel rate 2 command 11 = Hold accel rate

(1) Stop: Active at level.
(2) Start: Active on rising edge. A Not stop condition (logic 0 = 0) must first be present before a Start condition (logic 1 = 1) will start the drive.
(3) Clear faults: Active on rising edge. To perform this command, the value must switch from "0" to "1."
(4) Direction \ No command: If a direction is selected acts like Hold direction control.
(5) Accel rate \ No command: If a rate is selected acts like Hold accel rate.
(6) Decel rate \ No command: If a rate is selected acts like Hold decel rate.
(7) Reference select \ No command: If a rate is selected acts like Hold command.

■ Altivar 71/61 assignment

Bit 7	Bit 6	Bit 5 Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Not used	Not used	Direction 00 = No command (4) 01 = Forward command 10 = Reverse command 11 = Hold direction control	Clear faults (3) 0 = Not clear faults 1 = Clear faults	Not used	Start (2) 0 = Not start 1 = Start	Stop (1) 0 = Not stop 1 = Stop

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
Not used	Setpoint select 000 = No command 001 = Terminals 010 = Control by network 011 = Preset 3 100 = Preset 4 101 = Preset 5 110 = Preset 6 111 = Preset 7			Not used	Not used	Not used	Not used

■ Standardised setpoint

The setpoint (16 bits only) is produced by the controller and consumed by the EtherNet/IP card.
If enabled, the setpoint is always word 1 in the output image.
The setpoint value is a standardised (e.g. scaled) value; it is not an engineering value.

Telemecanique adaptation

[Frequency setpoint] (LFr) shall be configured in high resolution: standardised value on 16 signed bits at maximum frequency. The value 32767 corresponds to the parameter [Max frequency] (tFr). The default value of the parameter [Max frequency] (tFr) is 60 Hz, and the resolution is then approximately 0.0018 Hz.

Note:
The commanded maximum speed can never exceed the value of the parameter [High speed] (HSP).
The table below shows example setpoints and their results on an Altivar drive that has its parameter [Max frequency] (tFr) set to 130 Hz and its parameter [High speed] (HSP) set to 60 Hz.

Setpoint value	Scale		Output speed	Feedback value
	Percent	Value		
32767 (1)	100%	130 Hz	60 Hz (2)	15123 (3)
16384	50%	65 Hz	60 Hz (2)	15123 (3)
8192	25%	32.5 Hz	32.5 Hz	8192
0	0%	0 Hz	0 Hz	0

(1) A value of 32767 is equivalent to the parameter [Max frequency] (tFr) frequency value. Values greater than 32767 reverse speed.
(2) The drive runs at 60 Hz instead of 130 Hz or 65 Hz because the parameter [High speed] (HSP) sets 60 Hz as the maximum speed.
(3) The feedback value is also scaled based on the value of the parameter [Max frequency] (tFr), for example, 60/130 = 0.46 so 32767 x 0.46 = 15123.

■ Assembly 104: Allen-Bradley® drive input

Assembly mapping

Word number	Definition
0	Allen-Bradley® drive logic status
1	Speed feedback (actual value)
2	Scanner read word 1
3	Scanner read word 2
4	Scanner read word 3
5	Scanner read word 4
6	Scanner read word 5
7	Scanner read word 6
8	Scanner read word 7
9	Scanner read word 8

Word number	Code	Name	Logic address
0	n.a.	Allen-Bradley® drive logic status	n.a.
1	RFR	Output frequency	16#0C82 = 3202
2	NM1	Communication scanner, value of read word 1	16#31C5 = 12741
3	NM2	Communication scanner, value of read word 2	16#31C6 = 12742
4	NM3	Communication scanner, value of read word 3	16#31C7 = 12743
5	NM4	Communication scanner, value of read word 4	16#31C8 = 12744
6	NM5	Communication scanner, value of read word 5	16#31C9 = 12745
7	NM6	Communication scanner, value of read word 6	16#31CA = 12746
8	NM7	Communication scanner, value of read word 7	16#31CB = 12747
9	NM8	Communication scanner, value of read word 8	16#31CC = 12748

Note: The default assignment of NM1 and NM2 must be changed to "Not assigned".

■ Allen-Bradley® drive logic status

The Logic Status is a 16-bit word of status produced by the EtherNet/IP card and consumed by the scanner.
If enabled, the Logic status word is always word 2 in the input image.

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Fault 0 = No fault 1 = Fault	Alarm 0 = No alarm 1 = Alarm	Decelerating 0 = Not decelerating 1 = Decelerating	Accelerating 0 = Not accelerating 1 = Accelerating	Actual direction 0 = Reverse 1 = Forward	Command direction 0 = Reverse 1 = Forward	Active 0 = Not active 1 = Active	Ready 0 = Not ready 1 = Ready

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
Reference 0000 = Ref A auto 0001 = Ref B auto 0010 = Preset 2 auto 0011 = Preset 3 auto 0100 = Preset 4 auto 0101 = Preset 5 auto 0110 = Preset 6 auto 0111 = Preset 7 auto 1000 = Term blk manual 1001 = DPI 1 manual 1010 = DPI 2 manual 1011 = DPI 3 manual 1100 = DPI 4 manual 1101 = DPI 5 manual 1110 = DPI 6 manual 1111 = Jog reference				Local control 000 = Port 0 (TB) 001 = Port 1 010 = Port 2 011 = Port 3 100 = Port 4 101 = Port 5 110 = Port 6 111 = No local			At speed 0 = Not at reference 1 = At reference

Telemecanique adaptation

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Fault 0 = No fault 1 = Fault	Alarm 0 = No alarm 1 = Alarm	Decelerating 0 = Not decelerating 1 = Decelerating	Accelerating 0 = Not accelerating 1 = Accelerating	Actual direction 0 = Reverse 1 = Forward	Command direction 0 = Reverse 1 = Forward	Running 0 = Not active 1 = Active	Ready 0 = Not ready 1 = Read

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
Setpoint source 0000 = Terminals 0001 = not used 0010 = Preset 2 0011 = Preset 3 0100 = Preset 4 0101 = Preset 5 0110 = Preset 6 0111 = Preset 7 1000 = not used 1001 = Graphic display terminal 1010 = Modbus 1011 = CANopen 1100 = PowerSuite 1101 = EtherNet/IP card 1110 = Controller inside 1111 = not used				Control source 000 = Terminals 001 = Graphic display terminal 010 = Modbus 011 = CANopen 100 = PowerSuite 101 = EtherNet/IP card 110 = Controller inside 111 = not used			At speed 0 = Not at reference 1 = At reference

Note: When the value of Setpoint source (bits 12, 13, 14 and 15) is Preset speed x, it means that the corresponding command is given by the assembly 103 via Setpoint select (bits 12,13 and 14) (not by the terminals).

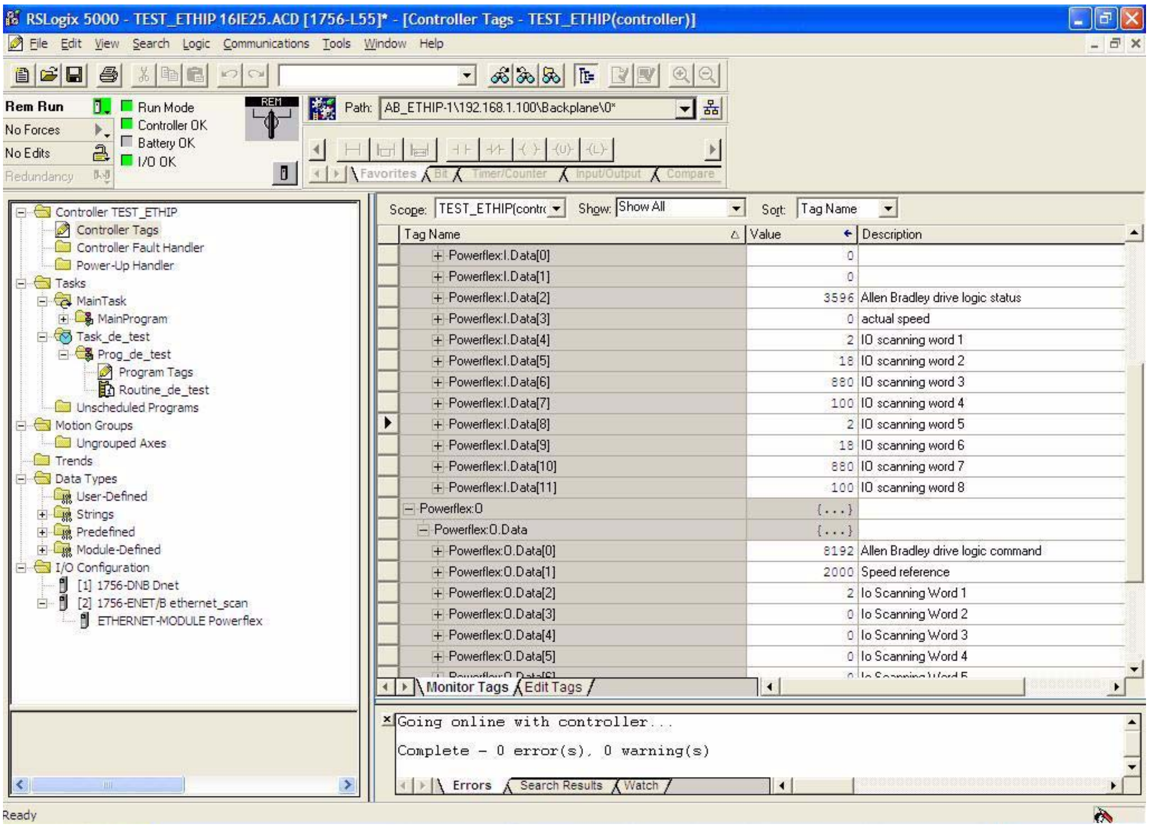
16. Configuring an ATV71/61 in replacement of a Powerflex® drive

This chapter illustrates of to proceed to exchange Powerflex® drive an ATV71. This example has been realized by RSlogix® software.
There are three way to configure the drive equipped with an EtherNet/IP card.

IMPORTANT NOTE:
The ATV71/61 provides several assembly sets. Assembly 103 and 104 emulates the Powerflex drive assemblies. But for compatibility reasons these assemblies can also use number 1 and 2. This means that in the ATV71/61:

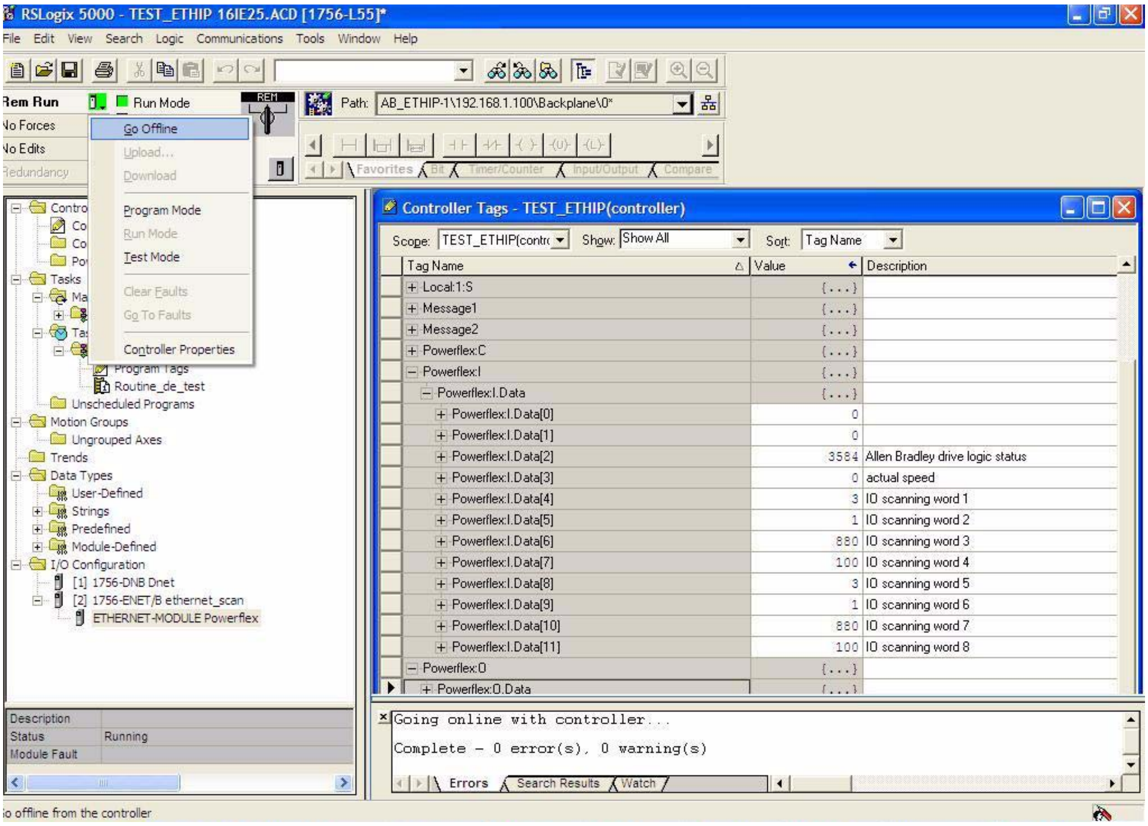
- output assembly 103 and 2 are identical,
- input assembly 104 and 1 are identical.

In the following example, we start with an application based on a network made of a single VSD (a Powerflex drive). The following pages describe how to replace it by an ATV71 .

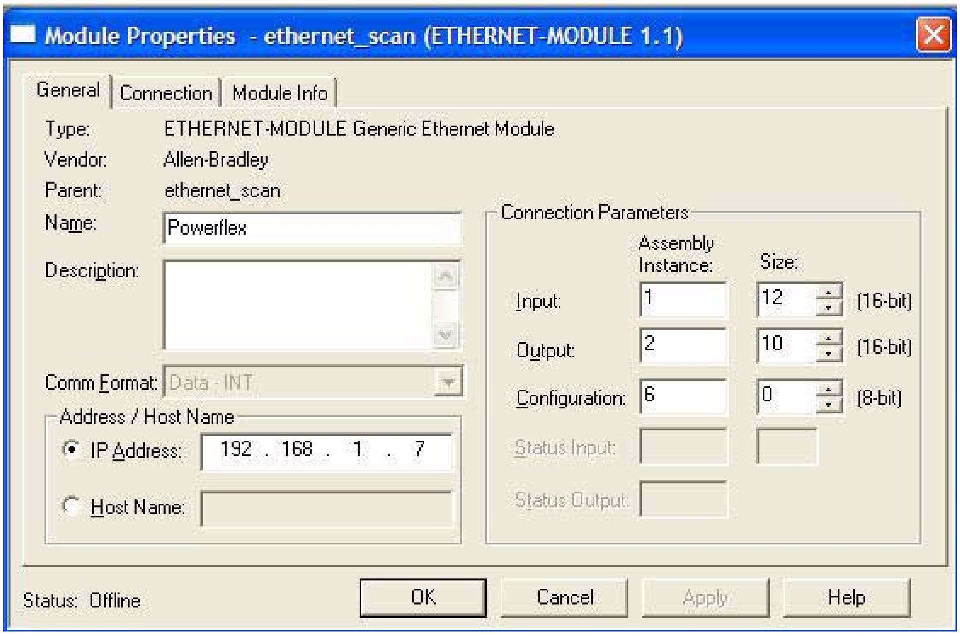


16. Configuring an ATV71/61 in replacement of a Powerflex® drive

Put the RSlogix environment Offline:

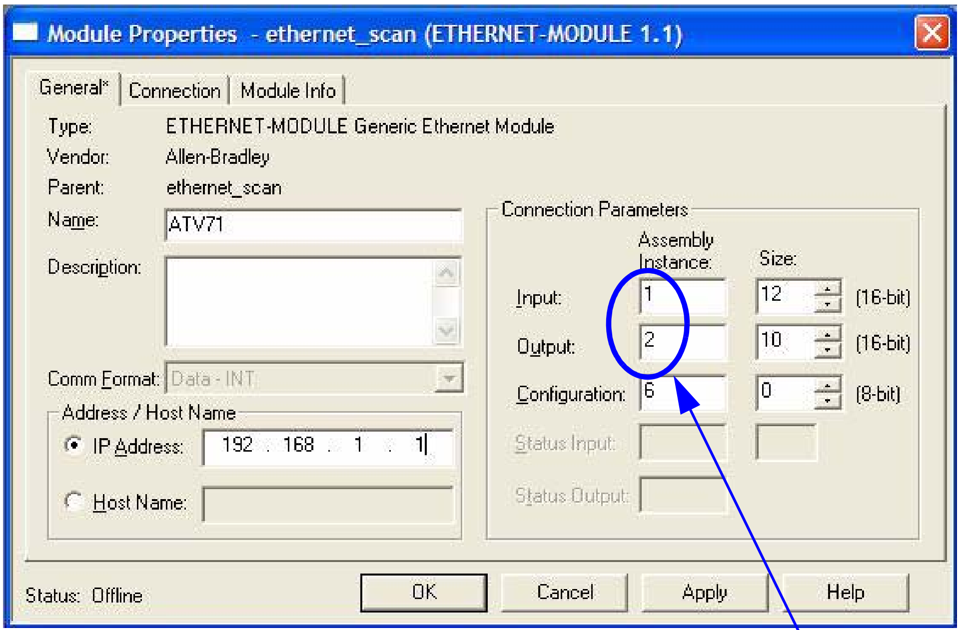


Then edit the module properties of the "ETHERNET MODULE Powerflex" by double-clicking in the navigation tree.



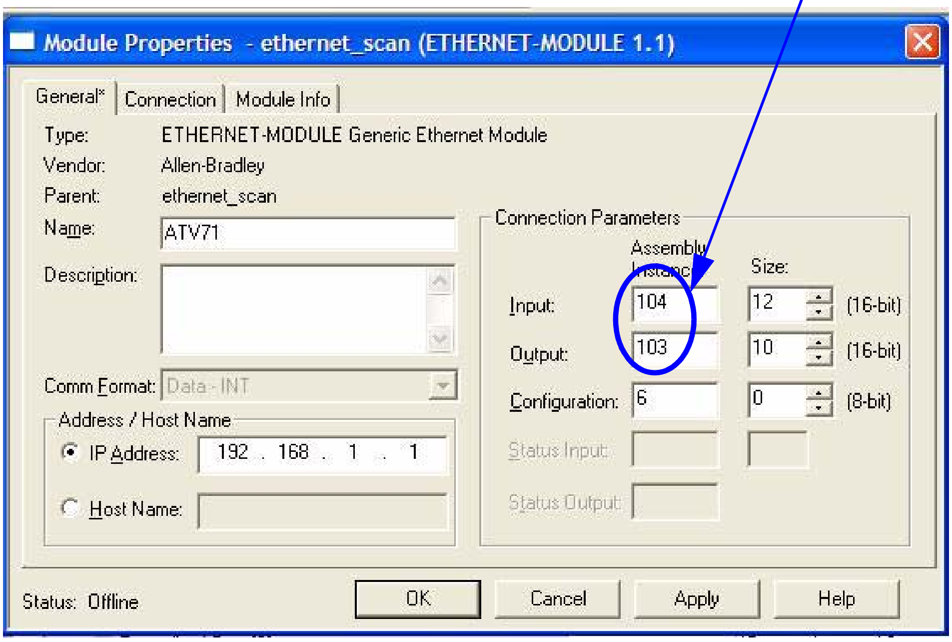
16. Configuring an ATV71/61 in replacement of a Powerflex® drive

Notice that only the Module Name is changed.



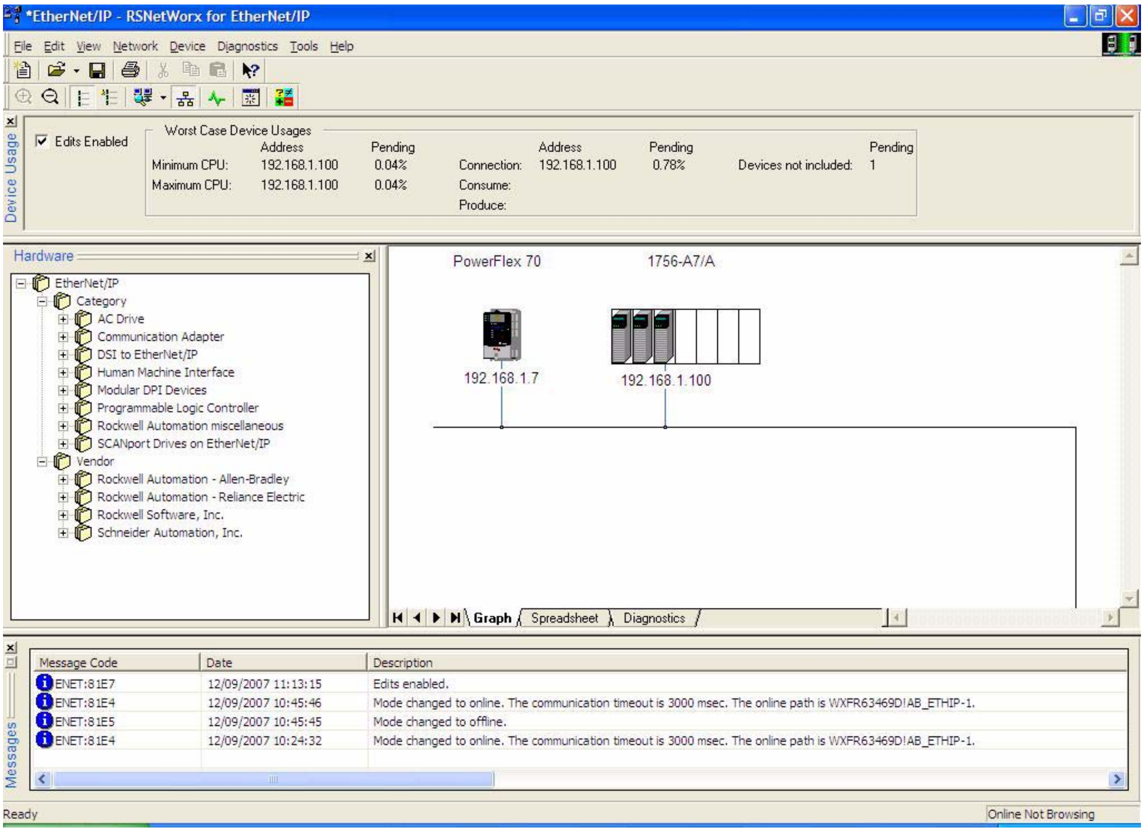
Here, we have used Assemblies 1 and 2 (As Powerflex VSD).

But Assemblies 103 and 104 could also be used, like in the dialog box below.

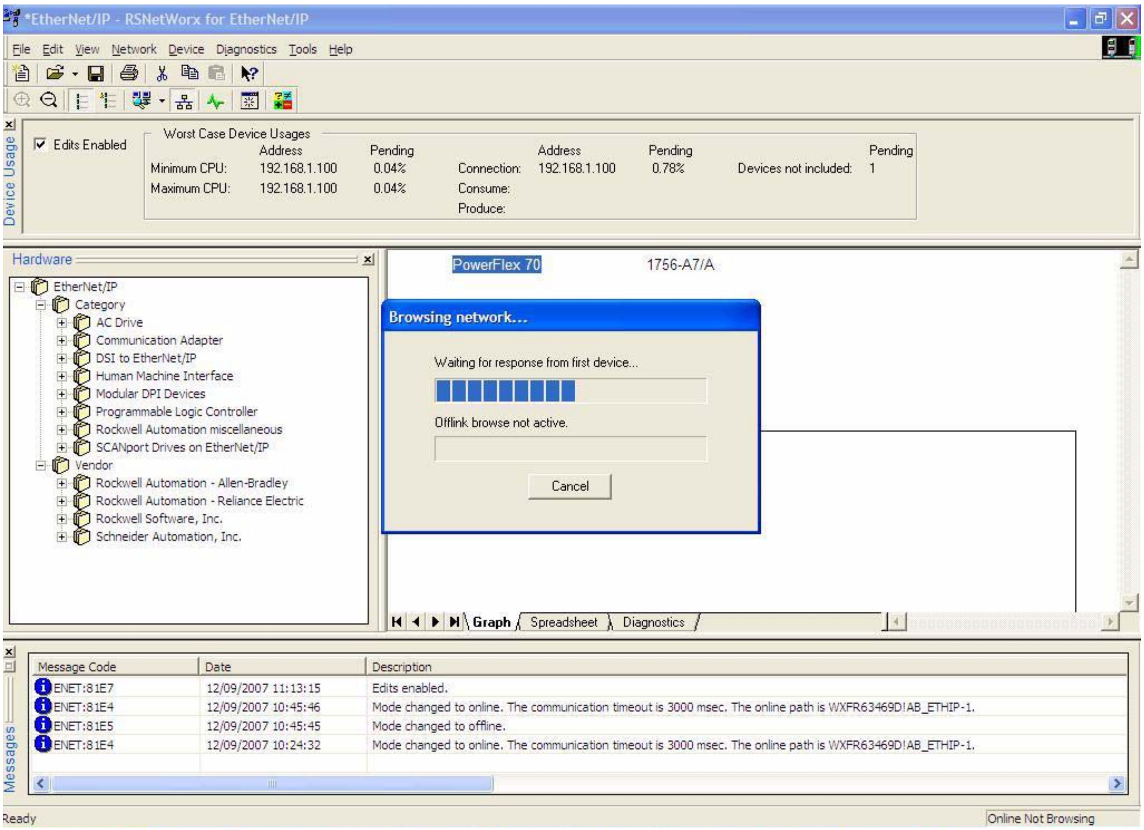


Confirm the modification by OK, save the project and download it to the PLC.

Now, switch to RSnetworx, The old configuration is always displayed:

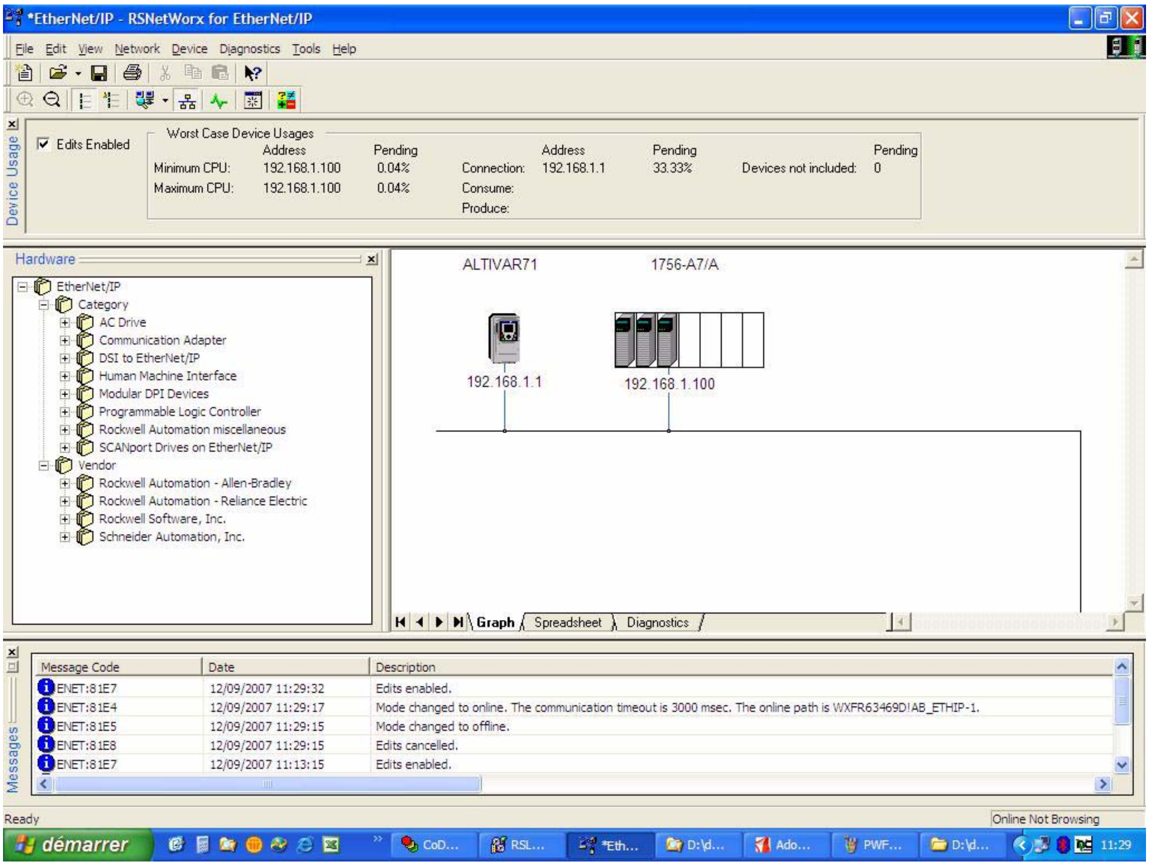


Browse the whole Network:

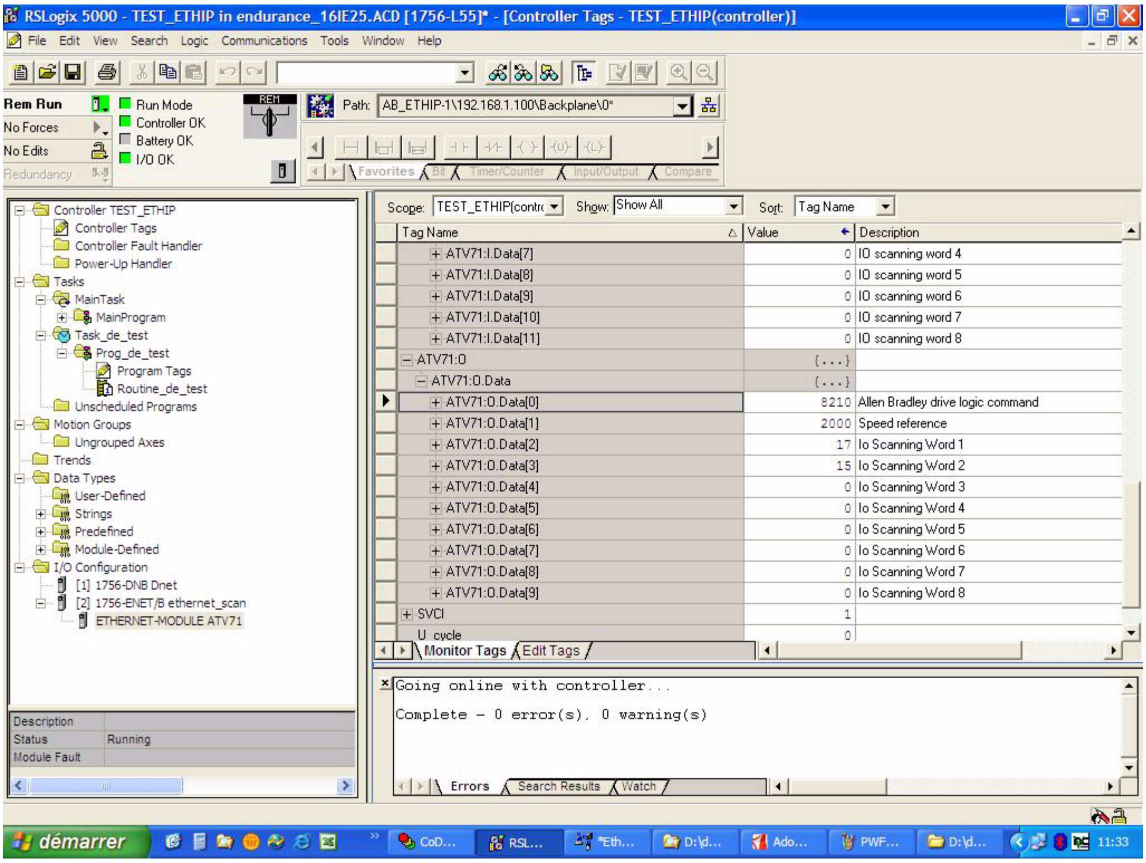


16. Configuring an ATV71/61 in replacement of a Powerflex® drive

Once the network has been scanned, you should obtain this:



This last screen shows the data screen of the ATV71.



Altivar 61

Variable speed drives for synchronous motors and asynchronous motors

Installation Manual

12/2009

0.37 kW (0.5 HP) ... 45 kW (60 HP) / 200 - 240 V
0.75 kW (1 HP) ... 75 kW (100 HP) / 380 - 480 V
2.2 kW (3 HP) ... 7.5 kW (10 HP) / 500 - 600 V
2.2 kW (3 HP) ... 90 kW (100 HP) / 500 - 690 V

1760643

www.schneider-electric.com

Contents

Important information

PLEASE NOTE

Please read these instructions carefully and examine the equipment in order to familiarize yourself with the device before installing, operating or carrying out any maintenance work on it.

The following special messages that you will come across in this document or on the device are designed to warn you about potential risks or draw your attention to information that will clarify or simplify a procedure.

The addition of this symbol to a “Danger” or “Warning” safety label indicates that there is an electrical risk that will result in injury if the instructions are not followed.

This is a safety warning symbol. It warns you of the potential risk of injury. You must comply with all safety messages that follow this symbol in order to avoid the risk of injury or death.

DANGER
DANGER indicates an imminently hazardous situation which, if not avoided, **will result in** death, serious injury or equipment damage.

WARNING
WARNING indicates a potentially hazardous situation which, if not avoided, **can result in** death, serious injury or equipment damage.

CAUTION
CAUTION indicates a potentially hazardous situation which, if not avoided, **can result in** injury or equipment damage.

PLEASE NOTE:

Only qualified personnel are authorized to carry out maintenance work on electrical equipment. Schneider Electric accepts no responsibility for the consequences of using this device. This document does not constitute an instruction manual for inexperienced personnel.

Read and observe these instructions before performing any procedure on this drive.

⚠ DANGER

RISK OF ELECTRIC SHOCK

- Read and understand this manual before installing or operating the Altivar 61 drive. Installation, adjustment, repair, and maintenance must be performed by qualified personnel.
- The user is responsible for compliance with all international and national electrical standards in force concerning protective grounding of all equipment.
- Many parts in this variable speed drive, including printed wiring boards, operate at line voltage. DO NOT TOUCH.
  Use only electrically insulated tools.
- DO NOT touch unshielded components or terminal strip screw connections with voltage present.
- DO NOT short across terminals PA/+ and PC/- or across the DC bus capacitors.
- Install and close all the covers before applying power or starting and stopping the drive.
- Before servicing the variable speed drive
  - Disconnect all power.
  - Place a “DO NOT TURN ON” label on the variable speed drive disconnect.
  - Lock the disconnect in the open position.
- Disconnect all power including external control power that may be present before servicing the drive. WAIT 15 MINUTES to allow the DC bus capacitors to discharge. Then follow the DC bus voltage measurement procedure on page 19 to verify that the DC voltage is less than 45 V. The drive LEDs are not accurate indicators of the absence of DC bus voltage.

Failure to follow these instructions will result in death or serious injury.

⚠ CAUTION

IMPROPER DRIVE OPERATION

- If the drive is not turned on for a long period, the performance of its electrolytic capacitors will be reduced.
- If it is stopped for a prolonged period, turn the drive on at least every two years for at least 5 hours to restore the performance of the capacitors, then check its operation. It is recommended that the drive is not connected directly to the line voltage. The voltage should be increased gradually using an adjustable AC source.

Failure to follow these instructions can result in injury and/or equipment damage.

INSTALLATION

Steps 1 to 4 must be performed with the power off.

■ 1 Receive and inspect the drive controller

- ☐ Check that the catalog number printed on the label is the same as that on the purchase order
- ☐ Remove the Altivar from its packaging and check that it has not been damaged in transit

■ 2 Check the line voltage

- ☐ Check that the line voltage is compatible with the voltage range of the drive (see pages 9 and 10)

■ 3 Mount the drive

- ☐ Mount the drive in accordance with the instructions in this document
- ☐ Install any internal and external options

■ 4 Wire the drive

- ☐ Connect the motor, ensuring that its connections correspond to the voltage
- ☐ Connect the line supply, after making sure that the power is off
- ☐ Connect the control
- ☐ Connect the speed reference

PROGRAMMING

☐ **5 Please refer to the Programming Manual**

Handling/Storage

To protect the drive prior to installation, handle and store the device in its packaging. Ensure that the ambient conditions are acceptable.

WARNING

DAMAGED PACKAGING

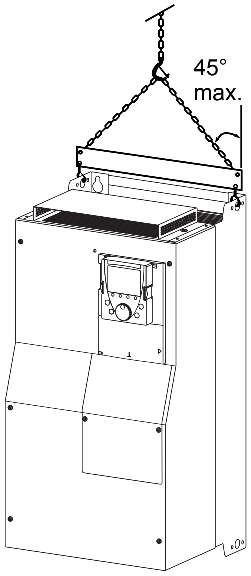
If the packaging appears damaged, it can be dangerous to open it or handle it.
Take precautions against all risks when performing this operation.
Failure to follow this instruction can result in death or serious injury.

WARNING

DAMAGED EQUIPMENT

Do not operate or install any drive that appears damaged.
Failure to follow this instruction can result in death or serious injury.

Handling on installation



ALTIVAR 61 drives up to ratings ATV61HD15M3X, ATV61HD18N4 and ATV61HU75S6X can be removed from their packaging and installed without a handling device.

A hoist must be used for higher ratings and for ATV61H●●●Y drives; for this reason, these drives all have lifting lugs. Follow the recommendations on the next page.

Preliminary recommendations

Precautions

Read and observe the instructions in the Programming Manual.

CAUTION

INCOMPATIBLE LINE VOLTAGE

Before turning on and configuring the drive, ensure that the line voltage is compatible with the supply voltage range shown on the drive nameplate. The drive may be damaged if the line voltage is not compatible.

Failure to follow this instruction can result in injury and/or equipment damage.

DANGER

UNINTENDED EQUIPMENT OPERATION

- Before turning on and configuring the Altivar 61, check that the PWR (POWER REMOVAL) input is deactivated (at state 0) in order to prevent unintended operation.
- Before turning on the drive, or when exiting the configuration menus, check that the inputs assigned to the run command are deactivated (at state 0) since they can cause the motor to start immediately.

Failure to follow these instructions will result in death or serious injury.

☞ If the safety of personnel requires the prohibition of unwanted or unintended operation, electronic locking is performed by the Altivar 61's Power Removal function.
This function requires the use of connection diagrams conforming to category 3 of standard EN 954-1 and safety integrity level 2 according to IEC/EN 61508.
The Power Removal function takes priority over any run command.

Drive ratings

Single-phase supply voltage: 200…240 V 50/60 Hz

Three-phase motor 200...240 V

Motor		Line supply (input)					Drive (output)		Altivar 61
Power indicated on plate (1)		Max. line current (2)		Max. prospective line Isc	Apparent power	Max. inrush current (3)	Max. available nominal current In (1)	Max. transient current (1) for 60 s	Catalog number (4)(5)
		at 200 V	at 240 V						
kW	HP	A	A	kA	kVA	A	A	A	
0.37	0.5	6.9	5.8	5	1.4	9.6	3	3.6	**ATV61H075M3**
0.75	1	12	9.9	5	2.4	9.6	4.8	5.7	**ATV61HU15M3**
1.5	2	18.2	15.7	5	3.7	9.6	8	9.6	**ATV61HU22M3**
2.2	3	25.9	22.1	5	5.3	9.6	11.0	13.2	**ATV61HU30M3**
3	-	25.9	22	5	5.3	9.6	13.7	16.4	**ATV61HU40M3(6)**
4	5	34.9	29.9	22	7	9.6	17.5	21	**ATV61HU55M3(6)**
5.5	7.5	47.3	40.1	22	9.5	23.4	27.5	33	**ATV61HU75M3(6)**

Three-phase supply voltage: 200…240 V 50/60 Hz

Three-phase motor 200...240 V

Motor		Line supply (input)					Drive (output)		Altivar 61
Power indicated on plate (1)		Max. line current (2)		Max. prospective line Isc	Apparent power	Max. inrush current (3)	Max. available nominal current In (1)	Max. transient current (1) for 60 s	Catalog number (4)(5)
		at 200 V	at 240 V						
kW	HP	A	A	kA	kVA	A	A	A	
0.75	1	6.1	5.3	5	2.2	9.6	4.8	5.7	**ATV61H075M3**
1.5	2	11.3	9.6	5	4	9.6	8	9.6	**ATV61HU15M3**
2.2	3	15	12.8	5	5.3	9.6	11	13.2	**ATV61HU22M3**
3	-	19.3	16.4	5	6.8	9.6	13.7	16.4	**ATV61HU30M3**
4	5	25.8	22.9	5	9.2	9.6	17.5	21	**ATV61HU40M3**
5.5	7.5	35	30.8	22	12.4	23.4	27.5	33	**ATV61HU55M3**
7.5	10	45	39.4	22	15.9	23.4	33	39.6	**ATV61HU75M3**
11	15	53.3	45.8	22	18.8	93.6	54	64.8	**ATV61HD11M3X**
15	20	71.7	61.6	22	25.1	93.6	66	79.2	**ATV61HD15M3X**
18.5	25	77	69	22	27.7	100	75	90	**ATV61HD18M3X**
22	30	88	80	22	32	100	88	105.6	**ATV61HD22M3X**
30	40	124	110	22	42.4	250	120	144	**ATV61HD30M3X**
37	50	141	127	22	51	250	144	173	**ATV61HD37M3X**
45	60	167	147	22	65	250	176	211	**ATV61HD45M3X**

(1) These power ratings and currents are given for an ambient temperature of 50°C (122°F) at the factory-set switching frequency, used in continuous operation (factory-set switching frequency of 4 kHz for ATV61H 075M3 to D15M3X and 2.5 kHz for ATV61H D18M3X to D45M3X).
Above this factory setting, the drive will reduce the switching frequency automatically in the event of excessive temperature rise.
For continuous operation above the factory setting, derating must be applied to the nominal drive current in accordance with the curves on page 14.
(2) Current on a line supply with the “Max. prospective line Isc” indicated and for a drive without any external options.
(3) Peak current on power-up for the max. voltage (240 V +10%).
(4) ATV61H 075M3 to D45M3X drives are available with or without a graphic display terminal. Catalog numbers for drives without a graphic display terminal have the letter Z added at the end, e.g.: ATV61H075M3Z. This option is not available for drives which operate in difficult environmental conditions (5).
(5) Drives with the S337 or 337 extension are designed for use in difficult environmental conditions (class 3C2 in accordance with IEC 721-3-3). They are supplied with a graphic display terminal.
(6) A line choke must be used (please refer to the catalog).

☞ Inhibit the input phase loss fault (IPL) so that ATV61H 075M3 to U75M3 drives can operate on a single-phase supply (see the Programming Manual). If this fault is set to its factory configuration, the drive will stay locked in fault mode.

Three-phase supply voltage: 380…480 V 50/60 Hz

Three-phase motor 380...480 V

Motor		**Line supply (input)**					**Drive (output)**			**Altivar 61**
Power indicated on plate (1)		Max. line current (2)		Max. prospective line Isc	Apparent power	Max. inrush current (3)	Max. available nominal current In (1)		Max. transient current (1) for 60 s	Catalog number (4)(5)
		at 380 V	at 480 V				at 380 V	at 460 V		
kW	HP	A	A	kA	kVA	A	A	A	A	
0.75	1	3.7	3	5	2.4	19.2	2.3	2.1	2.7	**ATV61H075N4**
1.5	2	5.8	5.3	5	4.1	19.2	4.1	3.4	4.9	**ATV61HU15N4**
2.2	3	8.2	7.1	5	5.6	19.2	5.8	4.8	6.9	**ATV61HU22N4**
3	-	10.7	9	5	7.2	19.2	7.8	6.2	9.3	**ATV61HU30N4**
4	5	14.1	11.5	5	9.4	19.2	10.5	7.6	12.6	**ATV61HU40N4**
5.5	7.5	20.3	17	22	13.7	46.7	14.3	11	17.1	**ATV61HU55N4**
7.5	10	27	22.2	22	18.1	46.7	17.6	14	21.1	**ATV61HU75N4**
11	15	36.6	30	22	24.5	93.4	27.7	21	33.2	**ATV61HD11N4**
15	20	48	39	22	32	93.4	33	27	39.6	**ATV61HD15N4**
18.5	25	45.5	37.5	22	30.5	93.4	41	34	49.2	**ATV61HD18N4**
22	30	50	42	22	33	75	48	40	57.6	**ATV61HD22N)**
30	40	66	56	22	44.7	90	66	52	79.2	**ATV61HD30N4**
37	50	84	69	22	55.7	90	79	65	94.8	**ATV61HD37N4**
45	60	104	85	22	62.7	200	94	77	112.8	**ATV61HD45N4**
55	75	120	101	22	81.8	200	116	96	139	**ATV61HD55N4**
75	100	167	137	22	110	200	160	124	192	**ATV61HD75N4**

(1) These power ratings and currents are given for an ambient temperature of 50°C (122°F) at the factory-set switching frequency, used in continuous operation (factory-set switching frequency of 4 kHz for ATV61H 075N4 to D30N4 drives, and 2.5 kHz for ATV61H D37N4 to D75N4).
Above this factory setting, the drive will reduce the switching frequency automatically in the event of excessive temperature rise.
For continuous operation above the factory setting, derating must be applied to the nominal drive current in accordance with the curves on page 14.
(2) Current on a line supply with the “Max. prospective line Isc” indicated and for a drive without any external options.
(3) Peak current on power-up for the max. voltage (480 V +10%).
(4) ATV61H 075N4 to D75N4 drives are available with or without a graphic display terminal. Catalog numbers for drives without a graphic display terminal have the letter Z added at the end, e.g.: ATV61H075N4Z. This option is not available for drives which operate in difficult environmental conditions (5).
(5) Drives with the S337 or 337 extension are designed for use in difficult environmental conditions (class 3C2 in accordance with IEC 721-3-3). They are supplied with a graphic display terminal.

Drive ratings

Three-phase supply voltage: 500…600 V 50/60 Hz

Three-phase motor 500...600 V

Motor		Line supply (input)			Drive (output)		Altivar 61
Power indicated on plate (1)		Max. line current (2)		Max. prospective line Isc	Max. available nominal current In (1)		Catalog number
500 V	575 V	at 500 V	at 600 V		500 V	575 V	
kW	HP	A	A	kA	A	A	
2.2	3	7.6	6.7	22	4.5	3.9	**ATV61HU22S6X**
3	-	9.9	10	22	5.8	-	**ATV61HU30S6X**
4	5	12.5	10.9	22	7.5	6.1	**ATV61HU40S6X**
5.5	7.5	16.4	14.2	22	10	9	**ATV61HU55S6X**
7.5	10	21.4	18.4	22	13.5	11	**ATV61HU75S6X**

Three-phase supply voltage: 500…690 V 50/60 Hz

Three-phase motor 500...690 V

Motor			Line supply (input)				Drive (output)			Altivar 61
Power indicated on plate (1)			Max. line current (2)			Max. prospective line Isc	Max. available nominal current In (1)			Catalog number
500 V	575 V	690 V	at 500 V	at 600 V	at 690 V		500 V	575 V	690 V	
kW	HP	kW	A	A	A	kA	A	A	A	
2.2	3	3	5.2	4.4	5.2	22	4.5	3.9	4.5	**ATV61HU30Y**
3	-	4	6.8	-	6.6	22	5.8	-	5.8	**ATV61HU40Y**
4	5	5.5	8.6	7.2	8.6	22	7.5	6.1	7.5	**ATV61HU55Y**
5.5	7.5	7.5	11.2	9.5	11.2	22	10	9	10	**ATV61HU75Y**
7.5	10	11	14.6	12.3	15.5	22	13.5	11	13.5	**ATV61HD11Y**
11	15	15	19.8	16.7	20.2	22	18.5	17	18.5	**ATV61HD15Y**
15	20	18.5	24	21	24	22	24	22	24	**ATV61HD18Y**
18.5	25	22	29	24	27	22	29	27	29	**ATV61HD22Y**
22	30	30	33	28	34	22	35	32	35	**ATV61HD30Y**
30	40	37	48	41	41	22	47	41	43	**ATV61HD37Y**
37	50	45	61	51	55	22	59	52	54	**ATV61HD45Y**
45	60	55	67	57	63	22	68	62	62	**ATV61HD55Y**
55	75	75	84	70.5	82	22	85	77	84	**ATV61HD75Y**
75	100	90	110	92	102	22	104	99	104	**ATV61HD90Y**

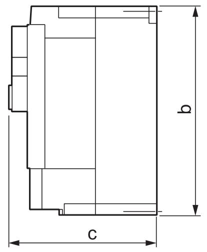
(1) These power ratings and currents are given for an ambient temperature of 50°C (122°F) at the factory-set switching frequency, used in continuous operation (factory-set switching frequency of 4 kHz for ATV61H U22S6X to U75S6X and ATV61H U30Y to D30Y drives, and 2.5 kHz for ATV61H D37Y to D90Y).
Above this factory setting, the drive will reduce the switching frequency automatically in the event of excessive temperature rise.
For continuous operation above the factory setting, derating must be applied to the nominal drive current in accordance with the curves on page 14.
(2) Current on a line supply with the “Max. prospective line Isc” indicated and for a drive without any external options.

Note
The maximum transient current for 60 s corresponds to 120% of the maximum nominal current In.

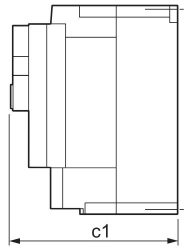
Dimensions and weights

With graphic display terminal

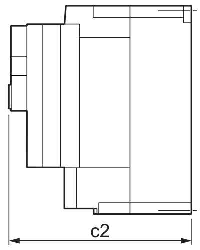
No option card

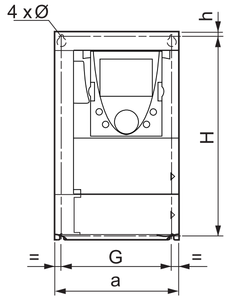


1 option card (1)



2 option cards (1)

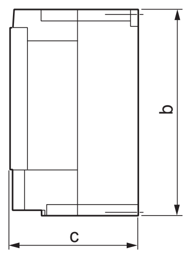




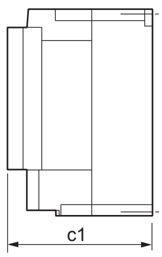
ATV61H	a mm (in.)	b mm (in.)	c mm (in.)	c1 mm (in.)	c2 mm (in.)	G mm (in.)	H mm (in.)	h mm (in.)	Ø mm (in.)	For screws	Weight kg (lb.)
075M3, U15M3, 075N4, U15N4,U22N4	130 (5.12)	230 (9.05)	175 (6.89)	198 (7.80)	221 (8.70)	113.5 (4.47)	220 (8.66)	5 (0.20)	5 (0.20)	M4	3 (6.61)
U22M3, U30M3, U40M3, U30N4, U40N4	155 (6.10)	260 (10.23)	187 (7.36)	210 (8.27)	233 (9.17)	138 (5.43)	249 (9.80)	4 (0.16)	5 (0.20)	M4	4 (8.82)
U55M3, U55N4, U75N4	175 (6.89)	295 (11.61)	187 (7.36)	210 (8.27)	233 (9.17)	158 (6.22)	283 (11.14)	6 (0.24)	5 (0.20)	M4	5.5 (12.13)
U75M3, D11N4 U22S6X ... U75S6X	210 (8.27)	295 (11.61)	213 (8.39)	236 (9.29)	259 (10.20)	190 (7.48)	283 (11.14)	6 (0.24)	6 (0.24)	M5	7 (15.43)
D11M3X, D15M3X, D15N4, D18N4	230 (9.05)	400 (15.75)	213 (8.39)	236 (9.29)	259 (10.20)	210 (8.26)	386 (15.20)	8 (0.31)	6 (0.24)	M5	9 (19.84)
D18M3X, D22M3X, D22N4, U30Y ... D30Y	240 (9.45)	420 (16.54)	236 (9.29)	259 (10.20)	282 (11.10)	206 (8.11)	403 (15.87)	11 (0.45)	6 (0.24)	M5	30 (66.14)
D30N4, D37N4	240 (9.45)	550 (21.65)	266 (10.47)	289 (11.38)	312 (12.28)	206 (8.11)	531.5 (20.93)	11 (0.45)	6 (0.24)	M5	37 (81.57)
D30M3X, D37M3X, D45M3X	320 (12.60)	550 (21.65)	266 (10.47)	289 (11.38)	312 (12.28)	280 (11.02)	524 (20.93)	20 (0.79)	9 (0.35)	M8	37 (81.57)
D45N4, D55N4, D75N4, D37Y ... D90Y	320 (12.60)	630 (24.80)	290 (11.42)	313 (12.32)	334 (13.15)	280 (11.02)	604.5 (23.80)	15 (0.59)	9 (0.35)	M8	45 (99.21)

Without graphic display terminal

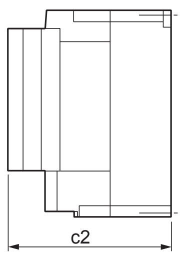
No option card

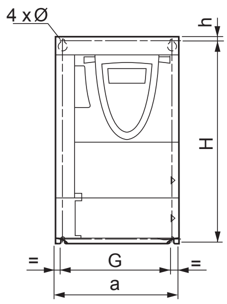


1 option card (1)



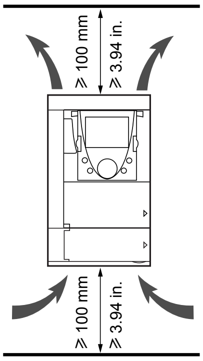
2 option cards (1)





For a drive without a graphic display terminal, dimensions c, c1 and c2 in the table above are reduced by 26 mm (1.01 in.). The other dimensions are unchanged.

(1) For the addition of I/O extension cards, communication cards, or the “Controller Inside” programmable card.



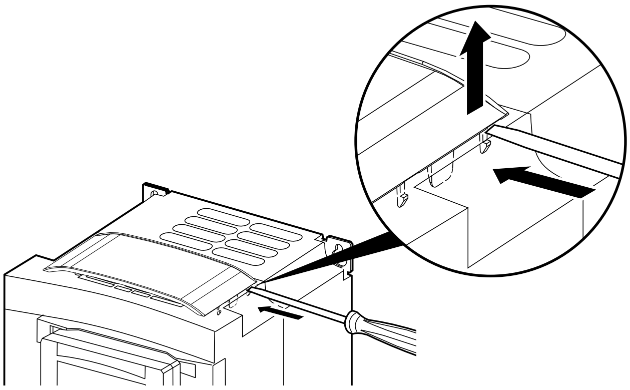
Install the drive vertically to ± 10°.
Do not place it close to heating elements.
Leave sufficient free space to ensure that the air required for cooling purposes can circulate from the bottom to the top of the unit.

Free space in front of the drive: 10 mm (0.39 in.) minimum

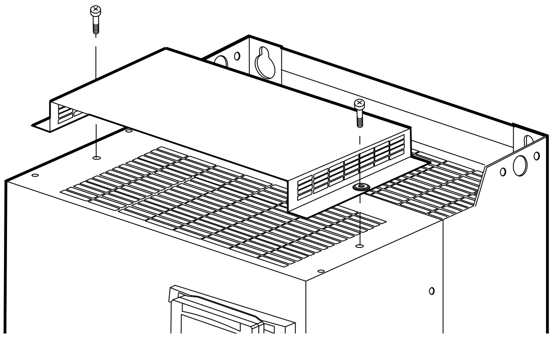
When IP20 protection is adequate, it is recommended that the protective cover on the top of the drive is removed as shown below.

Removing the protective cover

ATV61H 075M3 to D15M3X, ATV61H075N4 to D18N4 and ATV61H U22S6X to U75S6X

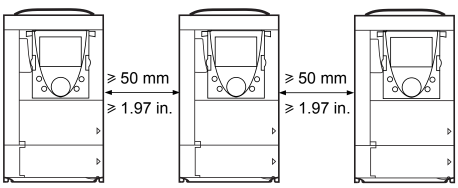


ATV61H D18M3X to D45M3X, ATV61H D22N4 to D75N4 and ATV61H U30Y to D90Y

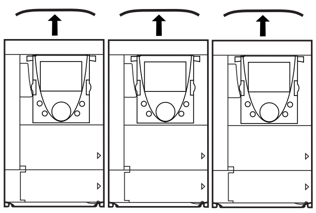


Two types of mounting are possible:

Type A mounting Free space ⩾ 50 mm (⩾ 1.97 in.) on each side, with protective cover fitted



Type B mounting Drives mounted side by side, with the protective cover removed (the degree of protection becomes IP20)

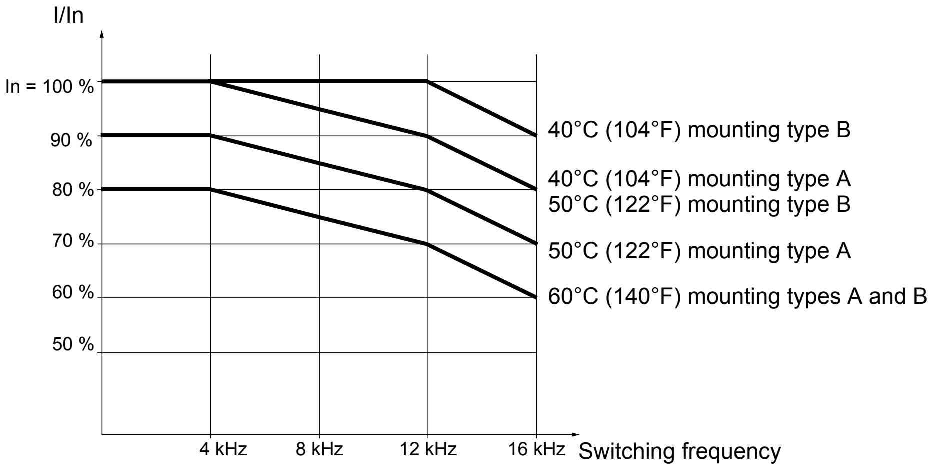


Mounting and temperature conditions

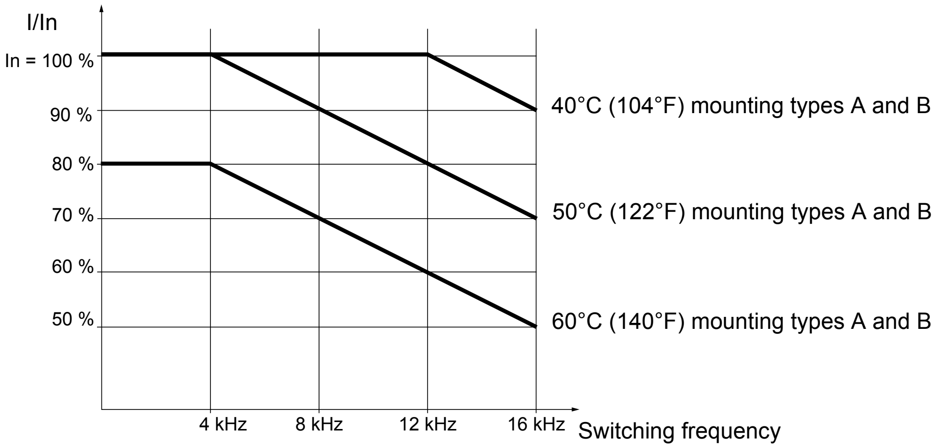
Derating curves

Derating curves for the drive current In as a function of the temperature, switching frequency and type of mounting.

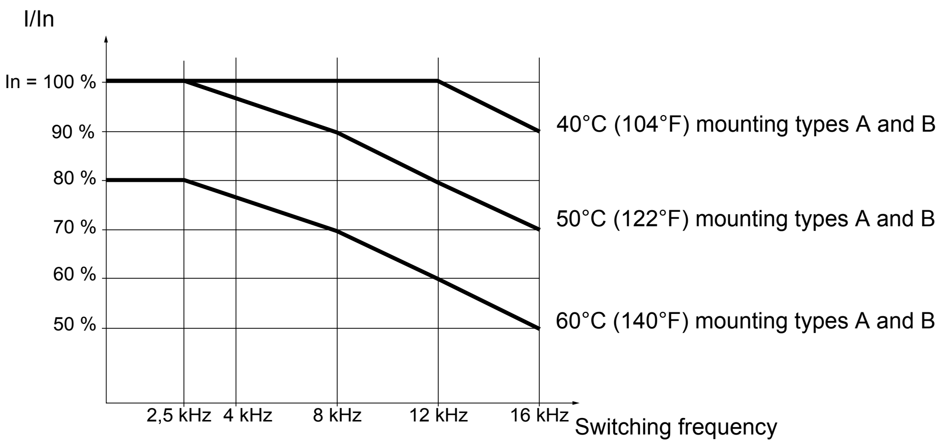
ATV61H 075M3 to D15M3X and ATV61H 075N4 to D18N4



ATV61H D22N4 and ATV61H D30N4 (1)



ATV61H D18M3X to D45M3X and ATV61H D37N4 to D75N4 (1)



For intermediate temperatures (e.g. 55°C (131°F)), interpolate between two curves.

(1) Above 50°C (122°F), these drives must be equipped with a control card fan kit. Please refer to the catalog.

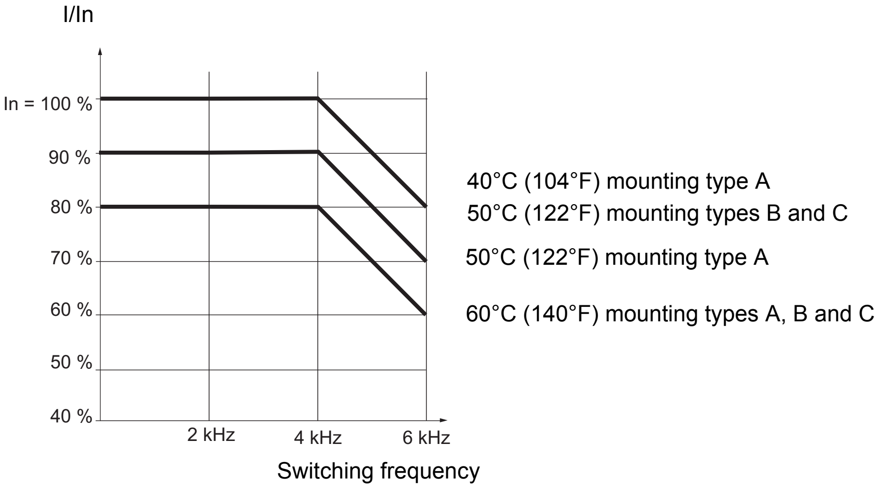
Mounting and temperature conditions

Derating for ATV61H●●●S6X

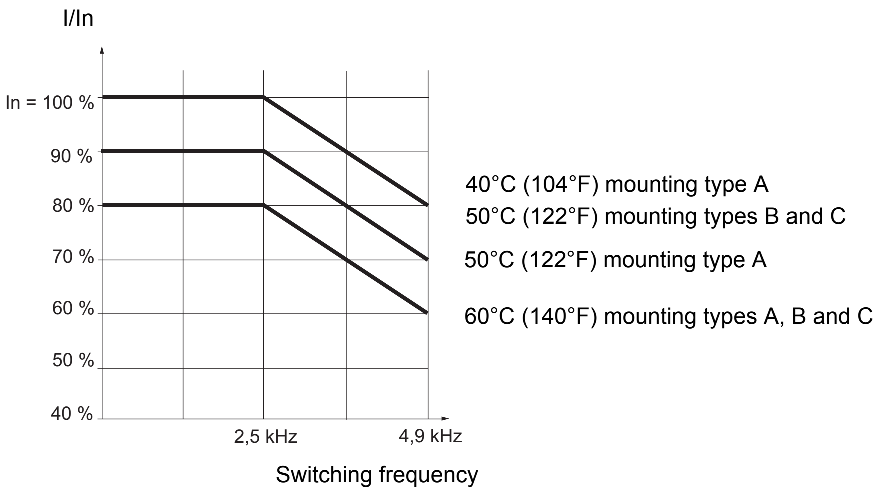
Mounting type A and B:
ATV61H●●●S6X drives can operate with a switching frequency 2,5…6kHz up to 50°C without derating.

Mounting type C:
ATV61H●●●S6X drives can operate with a switching frequency 2,5…6kHz up to 60°C without derating
For operation above 50°C (122°F), power supply voltage must be limited up to 600V+5%.

ATV61H U30Y to D30Y



ATV61H D37Y to D90Y

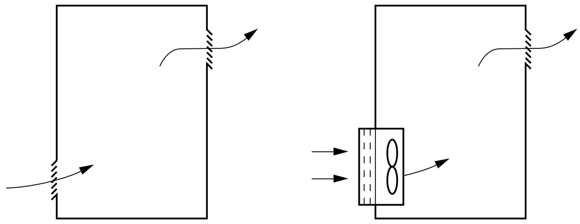


For intermediate temperatures (e.g. 55°C (131°F)), interpolate between two curves.

Mounting in a wall-mounted or floor-standing enclosure

Follow the mounting precautions on the previous pages.
To ensure proper air circulation in the drive:

- Fit ventilation grilles.
- Ensure that the ventilation is adequate: if not, install a forced ventilation unit with a filter.
- Use special IP54 filters.



Dust and damp proof metal wall-mounted or floor-standing enclosure (IP 54 degree of protection)

The drive must be mounted in a dust and damp proof enclosure in certain environmental conditions: dust, corrosive gases, high humidity with risk of condensation and dripping water, splashing liquid, etc.

To avoid hot spots in the drive, add a fan to circulate the air inside the enclosure, catalog number VW3 A9 4●● (see catalog).

Mounting the drive in the enclosure

Dissipated power

These levels of power dissipation are given for operation at nominal load and for the factory-set switching frequency.

ATV61H	Dissipated power (1)
	W
075M3	66
U15M3	101
U22M3	122
U30M3	154
U40M3	191
U55M3	293
U75M3	363
D11M3X	566
D15M3X	620
D18M3X	657
D22M3X	766
D30M3X	980
D37M3X	1154
D45M3X	1366

ATV61H	Dissipated power (1)
	W
075N4	44
U15N4	64
U22N4	87
U30N4	114
U40N4	144
U55N4	178
U75N4	217
D11N4	320
D15N4	392
D18N4	486
D22N4	574
D30N4	799
D37N4	861
D45N4	1060
D55N4	1210
D75N4	1720

ATV61H	Dissipated power (1)
	W
U22S6X	100
U30S6X	118
U40S6X	143
U55S6X	183
U75S6X	244

ATV61H	Dissipated power (1)
	W
U30Y	111
U40Y	119
U55Y	136
U75Y	158
D11Y	182
D15Y	227
D18Y	300
D22Y	386
D30Y	463
D37Y	716
D45Y	716
D55Y	911
D75Y	1087
D90Y	1545

(1) Add 7 W to this value for each option card added

Ensure that the flow of air in the enclosure is at least equal to the value given in the table below for each drive.

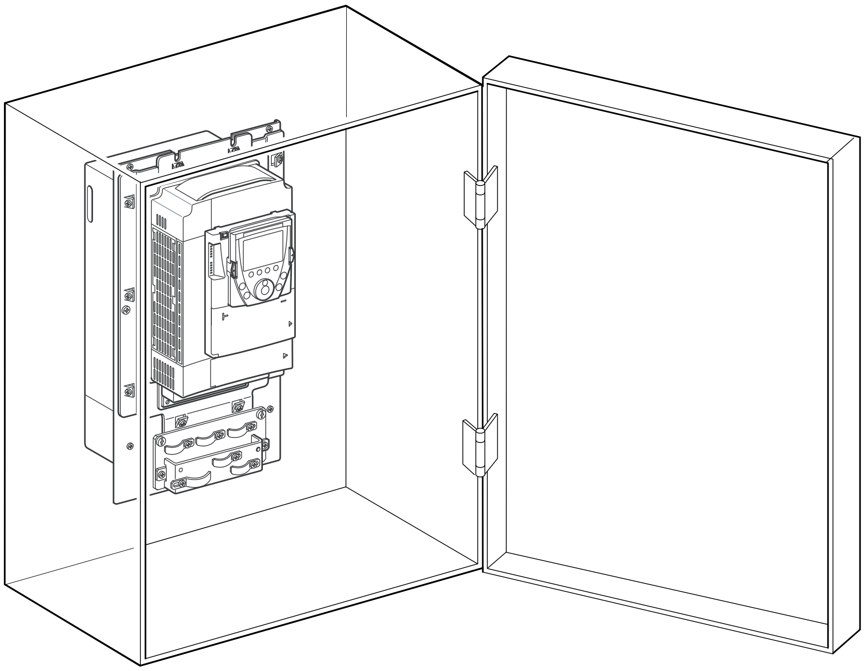
ATV61H	Flow ratex	
	m^3/hour	ft^3/min
075M3, U15M3, 075N4, U15N4, U22N4	17	10
U22M3, U30M3, U40M3, U30N4, U40N4	56	33
U55M3, U55N4, U75N4	112	66
U75M3, D11N4, U22S6X to U75S6X	163	96
D11M3X, D15M3X, D15N4, D18N4	252	148
D18M3X, D22M3X, D22N4, D30N4, D37N4	203	119
D30M3X, D37M3X, D45M3X, D45N4, D55N4, D75N4	406	239

ATV61H	Flow rate	
	m^3/hour	ft^3/min
U30Y to D37Y	330	194
D45Y to D90Y	406	234

Dust and damp proof flange mounting

This mounting is used to reduce the power dissipated in the enclosure by locating the power section outside the enclosure.
This requires the use of a dust and damp proof flange-mounting kit VW3 A9 501...509 (please refer to the catalog).
The degree of protection for the drives mounted in this way becomes IP54.

To install the kit on the drive, please refer to the manual supplied with the kit.



Example: ATV61HU55N4

Power dissipated inside the enclosure for dust and damp proof flange-mounting

These levels of power dissipation are given for operation at nominal load and for the factory-set switching frequency.

ATV61H	Dissipated power (1) W
075M3	27
U15M3	30
U22M3	38
U30M3	38
U40M3	41
U55M3	59
U75M3	67
D11M3X	80
D15M3X	84
D18M3X	114
D22M3X	124
D30M3X	144
D37M3X	161
D45M3X	180

ATV61H	Dissipated power (1) W
075N4	26
U15N4	28
U22N4	30
U30N4	35
U40N4	40
U55N4	50
U75N4	55
D11N4	65
D15N4	85
D18N4	86
D22N4	110
D30N4	135
D37N4	137
D45N4	165
D55N4	178
D75N4	225

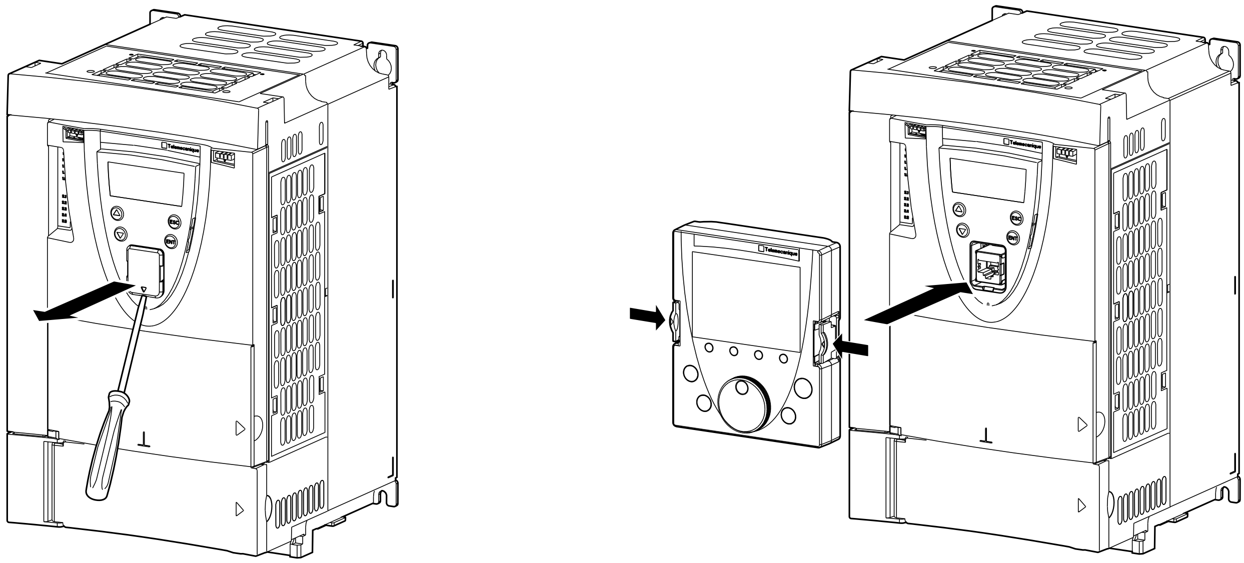
ATV61H	Dissipated power (1) W
U22S6X	60
U30S6X	70
U40S6X	75
U55S6X	80
U75S6X	85

ATV61H	Dissipated power (1) W
U30Y	71
U40Y	71
U55Y	73
U75Y	75
D11Y	77
D15Y	81
D18Y	87
D22Y	94
D30Y	100
D37Y	120
D45Y	120
D55Y	133
D75Y	144
D90Y	158

(1) Add 7 W to this value for each option card added

Installing the graphic display terminal on the drive

Drives with catalog numbers ending in the letter Z are supplied without a graphic display terminal (VW3 A1 101). This can be ordered separately. It is installed on the drive as shown below.



The graphic display terminal can be connected or disconnected with the power on. Before disconnecting it, drive control via the display terminal must be disabled (refer to the Programming Manual).

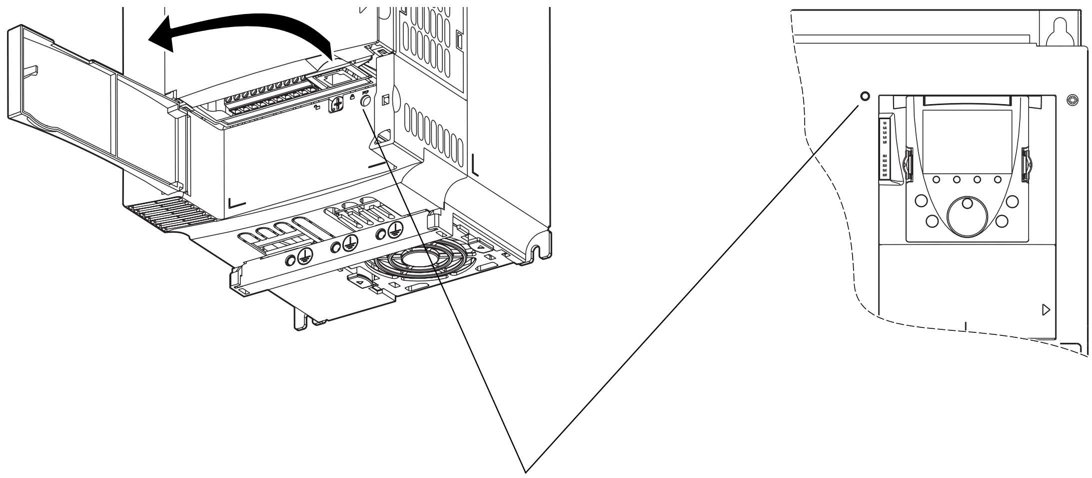
Position of the charging LED

Before working on the drive, turn it off, wait until the red capacitor charging LED has gone out, then measure the DC bus voltage.

Position of the capacitor charging LED

ATV61H 075M3 to D15M3X,
ATV61H 075N4 to D18N4 and
ATV61H U22S6X to U75S6X

ATV61H D18M3 to D45M3X,
ATV61H D22N4 to D75N4 and
ATV61H U30Y to D90Y



Red LED indicating that the DC bus is turned on

Procedure for measuring the DC bus voltage

⚠ DANGER
HAZARDOUS VOLTAGE Read and understand the instructions on page 5 before performing this procedure. **Failure to follow this instruction will result in death or serious injury.**

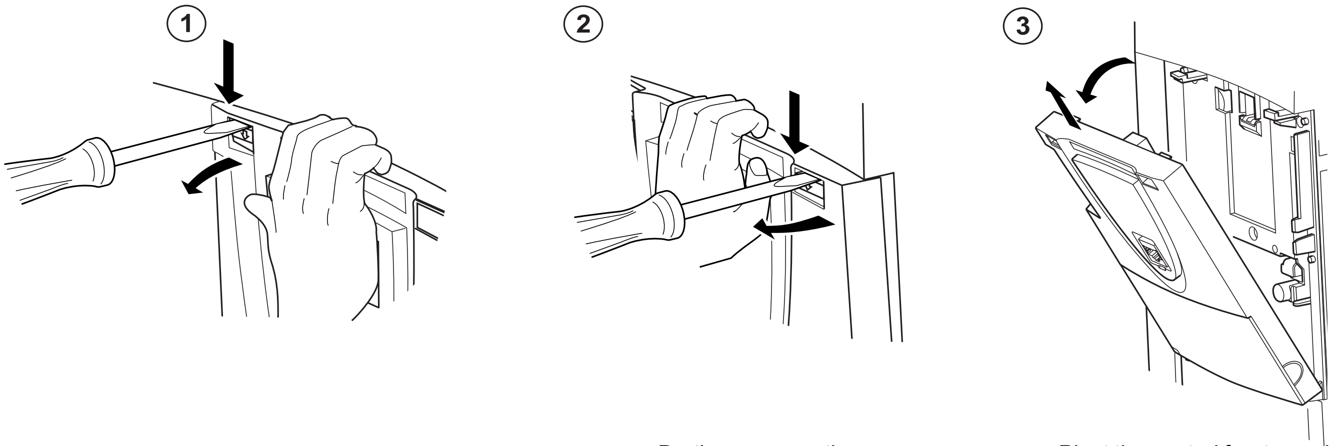
The DC bus voltage can exceed 1,000 V ⎓. Use a properly rated voltage sensing device when performing this procedure. To measure the DC bus voltage:

1 Disconnect the drive power supply.
2 Wait 15 minutes to allow the DC bus capacitors to discharge.
3 Measure the voltage of the DC bus between the PA/+ and PC/- terminals to check whether the voltage is less than 45 V ⎓. See page 26 for the arrangement of the power terminals.
4 If the DC bus capacitors have not discharged completely, contact your local Schneider Electric representative (do not repair or operate the drive).

Installing option cards

These should ideally be installed once the drive is mounted and before wiring it.
Check that the red capacitor charging LED is off. Measure the DC bus voltage in accordance with the procedure indicated on page 19.
The option cards are installed under the drive control front panel. If the drive has a graphic display terminal, remove it, then remove the control front panel as indicated below.

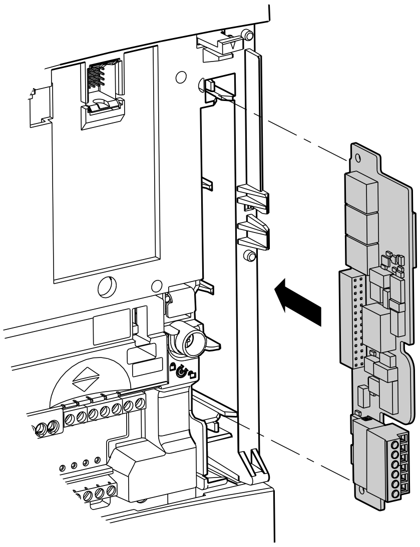
Removing the control front panel



- Using a screwdriver, press down on the catch and pull to release the left-hand part of the control front panel
- Do the same on the right-hand side
- Pivot the control front panel and remove it

Installing an encoder interface card

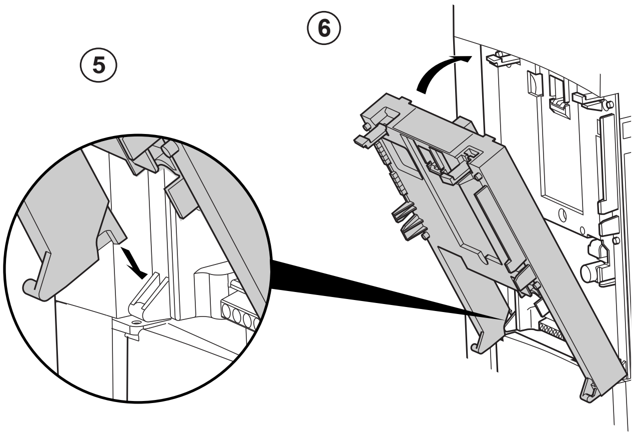
There is a special slot on the drive for adding an encoder interface card.



If an I/O or communication option card or a "Controller Inside" programmable card has already been installed, remove it so you can access the slot for the encoder interface card.

Installing option cards

Installing an I/O extension card, a communication card or a "Controller Inside" programmable card

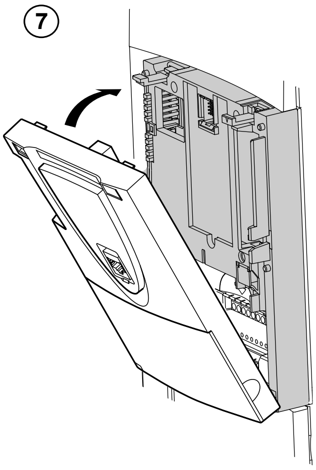


1, 2 and 3 Remove the control front panel (see previous page)

4 Install an encoder interface card (if used) (see previous page)

5 Position the option card on the clasps

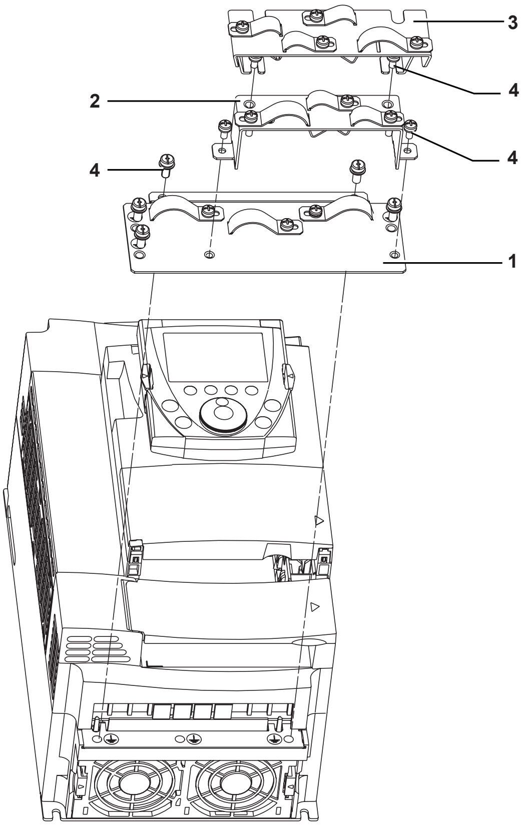
6 Then pivot it until it clicks into place



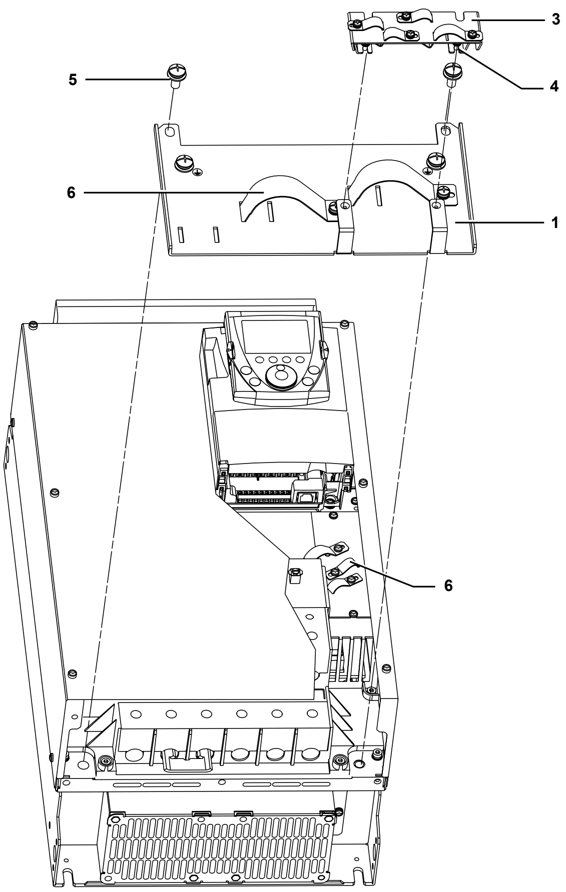
7 Replace the control front panel over the option card (same procedure as for installing the option card, see 5 and 6)

Installing the EMC plates

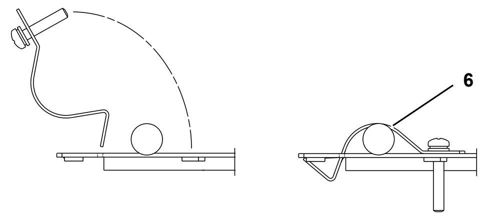
ATV61H 075M3 to D15M3X, ATV61H 075N4 to D18N4 and ATV61H U22S6X to U75S6X



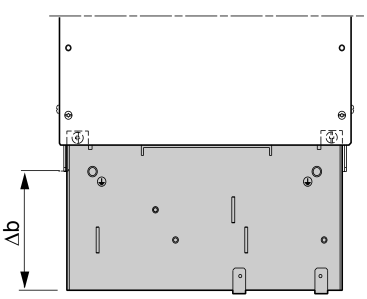
ATV61H D18M3X to D45M3X, ATV61H D22N4 to D75N4 and ATV61H U30Y to D90Y



Installing the EMC clamps



1 - EMC plate for connecting the power cables
2 - EMC plate for connecting the control cables (only for ATV61H 075M3 to D15M3X, ATV61H 075N4 to D18N4 and ATV61H U22S6X to U75S6X
3 - EMC plate for connecting the I/O option card cables (supplied with the option cards)
4 - M4 screws (supplied)
5 - M8 screws (supplied)
6 - EMC clamps with captive screws (supplied)



ATV61H	Δb	
	mm	in.
075M3 to U40M3, 075N4 to U40N4	55	2.17
U55M3 to D15M3X, U55N4 to D18N4, U22S6X to U75S6X	65	2.56
D18M3X to D45M3X, D22N4 to D75N4, U30Y to D90Y	120	4.72

Wiring precautions

Power section

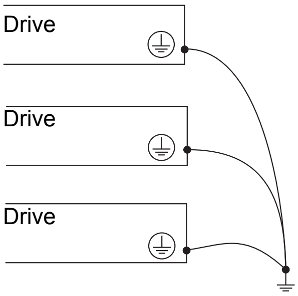
The drive must be connected to the protective ground. To comply with current regulations concerning high leakage currents (above 3.5 mA), use at least a 10 mm² (AWG 6) protective conductor or 2 protective conductors with the same cross-section as the power section AC supply conductors.

⚠ DANGER

HAZARDOUS VOLTAGE

Connect the device to the protective ground using the grounding point provided, as shown in the figure below. The drive panel must be connected to the protective ground before power is applied.

Failure to follow these instructions will result in death or serious injury.



- Check whether the resistance to the protective ground is one ohm or less. Connect a number of drives to the protective ground as shown in the diagram (see left). Do not lay protective grounding cables in a loop or in series.

⚠ WARNING

IMPROPER WIRING PRACTICES

- The ATV61 drive will be damaged if input line voltage is applied to the output terminals (U/T1,V/T2,W/T3).
- Check the power connections before powering up the ATV61 drive.
- If replacing another drive, verify that all wiring connections to the ATV61 drive comply with all wiring instructions in this manual.

Failure to follow these instructions can result in death, serious injury or equipment damage.

When upstream protection by means of a "residual current device" is required by the installation standards, a type A device should be used for single-phase drives and type B for three-phase drives. Choose a suitable model integrating:
- HF current filtering
- A time delay to prevent tripping caused by the load from stray capacitance on power-up. The time delay is not possible for 30 mA devices. In this case, choose devices with immunity against nuisance tripping, for example "residual current devices" with reinforced immunity from the **s.i** range (Merlin Gerin brand).

If the installation includes several drives, provide one residual current device per drive.

⚠ WARNING

INADEQUATE OVERCURRENT PROTECTION

- Overcurrent protective devices must be properly coordinated.
- The Canadian Electricity Code and the National Electrical Code require branch circuit protection. Use the fuses recommended on the drive nameplate to achieve published short-circuit current ratings.
- Do not connect the drive to a power feeder whose short-circuit capacity exceeds the drive short-circuit current rating listed on the drive nameplate.

Failure to follow these instructions can result in death, serious injury or equipment damage.

Wiring recommendations

Keep the power cables separate from circuits in the installation with low-level signals (sensors, PLCs, measuring apparatus, video, telephone).

The motor cables must be at least 0.5 m (20 in.) long.

In certain situations where the motor cables have to be submerged in water, earth leakage currents can cause tripping, requiring the addition of output filters.

Do not use surge arresters or power factor correction capacitors on the variable speed drive output.

⚠ CAUTION

IMPROPER USE OF A BRAKING RESISTOR

- Only use the braking resistors recommended in our catalogs.
- Wire the thermal protection contact on the resistor so that the drive power supply is disconnected immediately in the event of a fault (refer to the manual supplied with the resistor).

Failure to follow these instructions can result in injury and/or equipment damage.

Control section

Keep the control circuits away from the power circuits. For control and speed reference circuits, we recommend using shielded twisted cables with a pitch of between 25 and 50 mm (0.98 and 1.97 in.) and connecting the shielding to ground at each end.

If using conduit, do not lay the motor, power supply and control cables in the same conduit. Keep metal conduit containing power supply cables at least 8 cm (3 in.) away from metal conduit containing control cables. Keep non-metal conduits or cable ducts containing power supply cables at least 31 cm (12 in.) away from metal conduits containing control cables. If it is necessary for control and power cables to cross each other, be sure they cross at right angles.

Length of motor cables

ATV61H		0 m (0 ft)	10 m (32.8 ft)	50 m (164 ft)	100 m (328 ft)	150 m (492 ft)	300 m (984 ft)	1000 m (3280 ft)
075M3 to U75M3 075N4 to D15N4	Shielded cable							
	Unshielded cable							
D11M3X to D45M3X D18N4 to D75N4	Shielded cable							
	Unshielded cable							
U22S6X to U75S6X U30Y to D90Y	Shielded cable		See catalog					

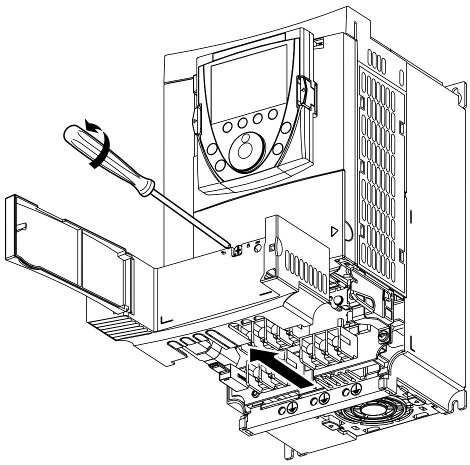
With dv/dt filters

With sinus filters

Choice of associated components:
Please refer to the catalog.

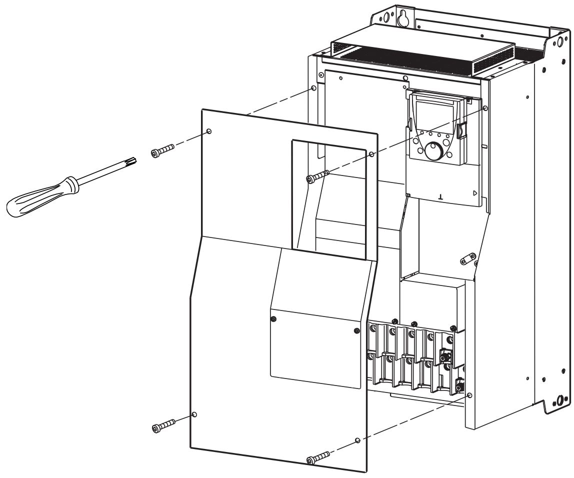
Access to the power terminals

ATV61H 075M3 to D15M3X and ATV61H 075N4 to D18N4 and ATV61H U22S6X to U75S6X
Unlock the power part access flap and remove it as shown below.



Example of ATV61HU22M3

ATV61H D18M3X to D45M3X, ATV61H D22N4 to D75N4 and ATV61H U30Y to D90Y
To access the power terminals, remove the front panel as shown below.



Example of ATV61HD75N4

Characteristics and functions of the power terminals

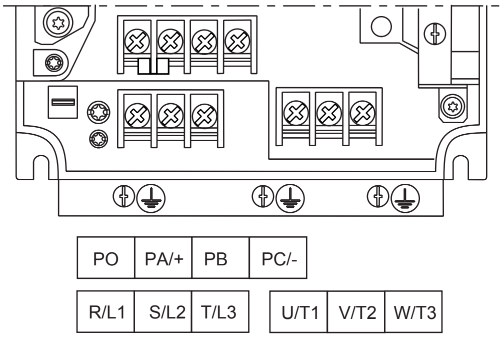
Terminal	Function
⏚	Protective ground connection terminal
R/L1 S/L2 T/L3	Power section AC supply
PO	DC bus + polarity
PA/+	Output to braking resistor (+ polarity)
PB	Output to braking resistor
PC/-	DC bus - polarity
U/T1 V/T2 W/T3	Outputs to the motor

☞ Only remove the link between PO and PA/+ if a DC choke has been added. The screws on the PO and PA/+ terminals must always be fully tightened as there is a high current flowing in the commoning link.

Power terminals

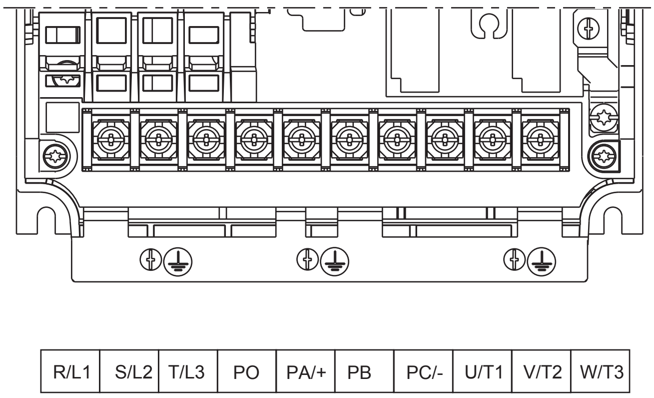
Arrangement of the power terminals

ATV61H 075M3, U15M3, U22M3, U30M3, U40M3, 075N4, U15N4, U22N4, U30N4, U40N4



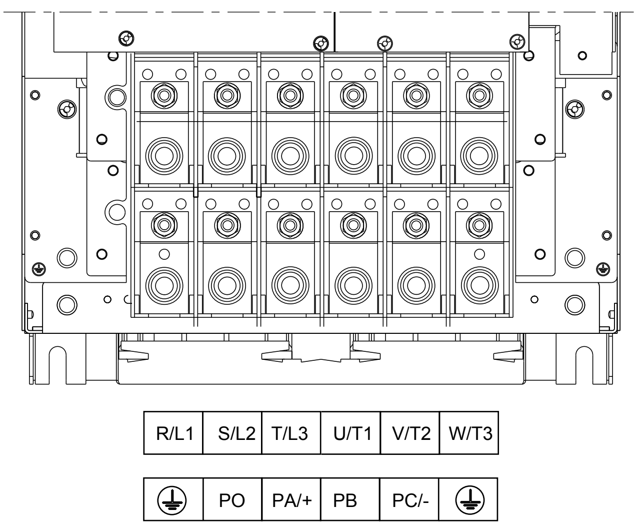
ATV61H	Maximum wire size		Tightening torque
	mm²	AWG	Nm (lb.in)
075M3, U15M3, U22M3, U30M3, U40M3, 075N4, U15N4, U22N4, U30N4, U40N4	4	10	1.4 (12.3)

ATV61H U55M3, U75M3, D11M3X, D15M3X, U55N4, U75N4, D11N4, D15N4, D18N4, U22S6X, U30S6X, U40S6X, U55S6X, U75S6X



ATV61H	Maximum wire size		Tightening torque
	mm²	AWG	Nm (lb.in)
U55M3, U55N4, U75N4	6	8	3 (26.5)
U75M3, D11N4, U22S6X to U75S6X	16	4	3 (26.5)
D11M3X, D15M3X, D15N4, D18N4	35	2	5.4 (47.7)

ATV61H D18M3X, D22M3X, D30M3X, D37M3X, D45M3X, D22N4, D30N4, D37N4, D45N4, D55N4, D75N4

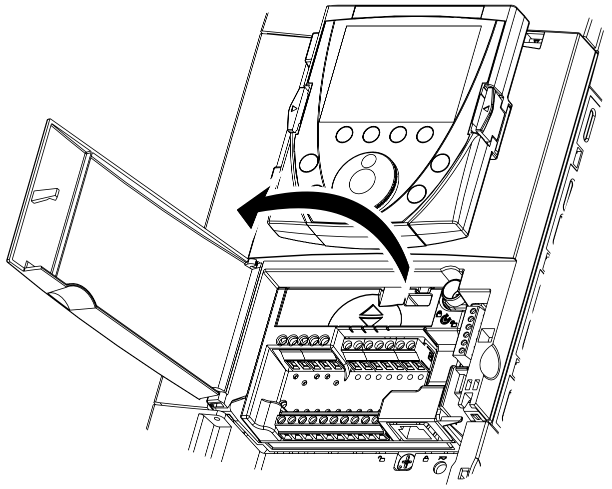


ATV61H	Maximum wire size		Tightening torque
	mm²	AWG	Nm (lb.in)
D18M3X, D22M3X, D22N4, D30N4, D37N4, U30Y to D30Y	50	1/0	12 (102)

ATV61H	Maximum wire size		Tightening torque
	mm²	kcmils	Nm (lb.in)
D30M3X, D37M3X, D45M3X, D45N4, D55N4, D75N4, D37Y to D90Y	150	300	41 (360)

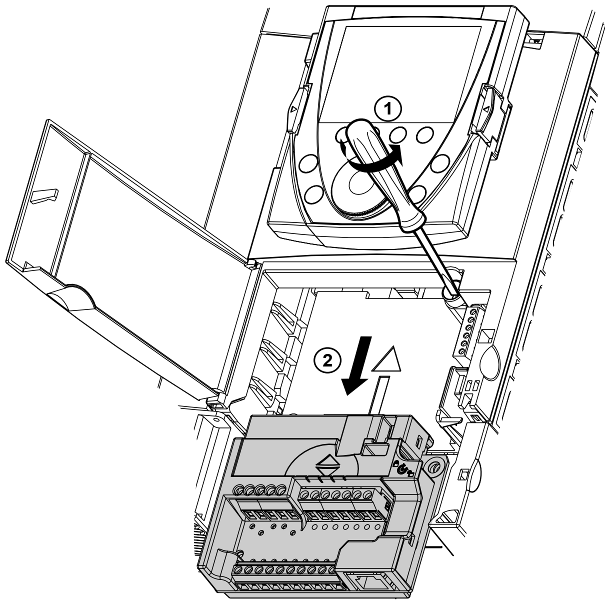
Control terminals

Access to the control terminals



To access the control terminals,
open the cover on the control front panel.

Removing the terminal card



To make it easier to wire the drive control section, the control terminal card can be removed.

- Undo the screw until the spring is fully extended
- Remove the card by sliding it downwards

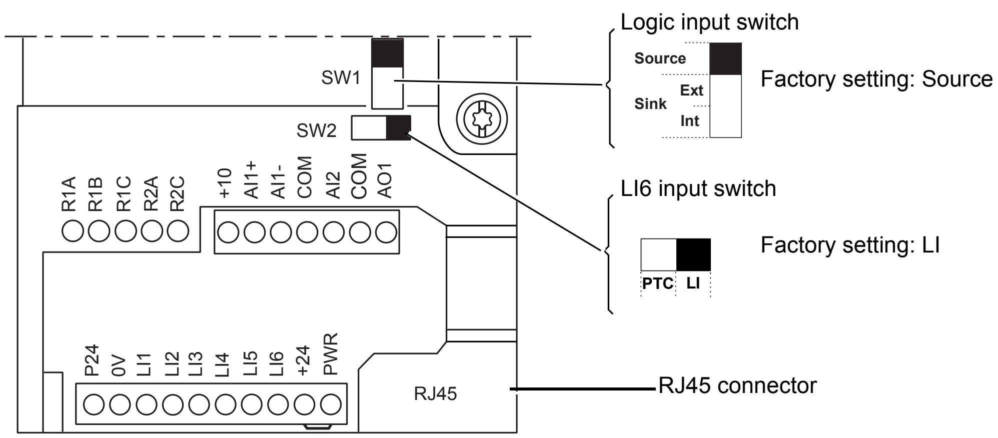
⚠ CAUTION

IMPROPERLY SECURED TERMINAL CARD

When replacing the control terminal card, it is essential to fully tighten the captive screw.

Failure to follow this instruction can result in injury and/or equipment damage.

Arrangement of the control terminals



Maximum wire size:
2.5 mm² - AWG 14

Max. tightening torque:
0.6 Nm - 5.3 lb.in

Note: The ATV61 is supplied with a link between the PWR and +24 terminals.

Characteristics and functions of the control terminals

Terminal	Function	Electrical characteristics
R1A R1B R1C	Common point C/O contact (R1C) of programmable relay R1	• Minimum switching capacity: 3 mA for 24 V ⎓ • Maximum switching capacity on resistive load: 5 A for 250 V ~ or 30 V ⎓ • Maximum switching current on inductive load (cos φ = 0.4 L/R = 7 ms): 2 A for 250 V ~ or 30 V ⎓ • Reaction time: 7 ms ± 0.5 ms • Service life: 100,000 operations at max. switching power
R2A R2C	N/O contact of R2 programmable relay	

+10	+ 10 V ⎓ power supply for 1 to 10 kΩ reference potentiometer	• +10 V ⎓ (10.5 V ± 0.5 V) • 10 mA max.
AI1+ AI1 -	Differential analog input AI1	• -10 to +10 V ⎓ (max. safe voltage 24 V) • Reaction time: 2 ms ± 0.5 ms, 11-bit resolution + 1 sign bit • Accuracy ± 0.6% for Δθ = 60°C (140°F), linearity ± 0.15% of max. value
COM	Analog I/O common	0V
AI2	Depending on software configuration: Analog voltage input or Analog current input	• Analog input 0 to +10 V ⎓ (max. safe voltage 24 V), impedance 30 kΩ or • Analog input X - Y mA, X and Y being programmable from 0 to 20 mA • Impedance 250 Ω • Reaction time: 2 ms ± 0.5 ms • 11-bit resolution, accuracy ± 0.6% for Δθ = 60°C (140°F), linearity ± 0.15% of max. value
COM	Analog I/O common	0V
AO1	Depending on software configuration: Analog voltage output or Analog current output or Logic output	• Analog output 0 to +10 V ⎓, load impedance greater than 50 kΩ or • Analog output X - Y mA, X and Y being programmable from 0 to 20 mA • Max. load impedance 500 Ω • 10-bit resolution, reaction time: 2 ms ± 0.5 ms • Accuracy ± 1% for Δθ = 60°C (140°F), linearity ± 0.2% of max. value or • logic output : 0 to +10V or 0 to 20 mA.

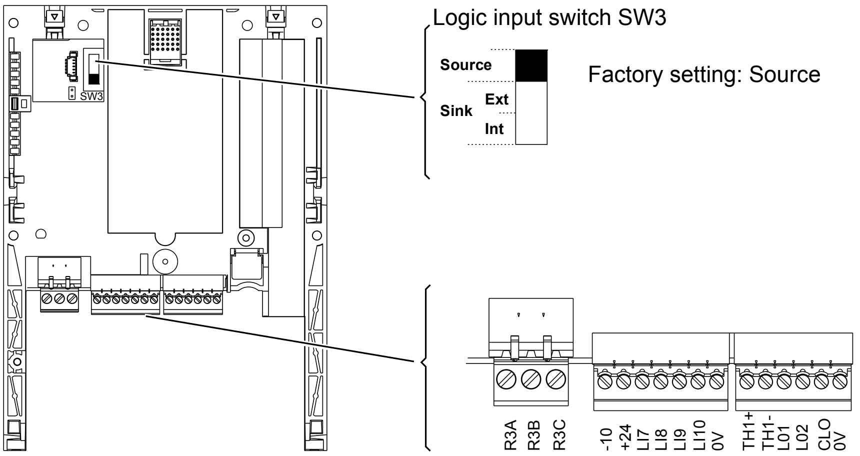
<table>
<tr><td>P24</td><td>Input for external +24 V ⎓ control power supply</td><td>• +24 V ⎓ (min. 19 V, max. 30 V)
• Power 30 Watts</td></tr>
<tr><td>0V</td><td>Logic input common and 0 V
of P24 external power supply</td><td>0V</td></tr>
<tr><td>LI1
LI2
LI3
LI4
LI5</td><td>Programmable logic inputs</td><td>• +24 V ⎓ (max. 30 V)
• Impedance 3.5 kΩ
• Reaction time: 2 ms ± 0.5 ms
<table>
<tr><td>Switch SW1</td><td>State 0</td><td>State 1</td></tr>
<tr><td>Source (factory setting)</td><td>< 5 V ⎓</td><td>> 11 V ⎓</td></tr>
<tr><td>Sink Int or Sink Ext</td><td>> 16 V ⎓</td><td>< 10 V ⎓</td></tr>
</table></td></tr>
<tr><td>LI6</td><td>Depending on the position of switch SW2:
- Programmable logic input

or
- Input for PTC probes</td><td>Switch SW2 on LI (factory setting)
• Same characteristics as logic inputs LI1 to LI5
or
Switch SW2 on PTC
• Trip threshold 3 kΩ, reset threshold 1.8 kΩ
• Short-circuit detection threshold < 50Ω</td></tr>
<tr><td>+24</td><td>Logic input power supply</td><td>Switch SW1 in Source or Sink Int position
• +24 V ⎓ power supply (min. 21 V, max. 27 V), protected against short-circuits and overloads
• Max. current available for customers 200 mA

Switch SW1 in Sink Ext position
• Input for external +24 V ⎓ power supply for the logic inputs</td></tr>
<tr><td>PWR</td><td>Power Removal safety function input
When PWR is not connected to the 24 V, the motor cannot be started (compliance with functional safety standard EN 954-1 and IEC/EN 61508)</td><td>• 24 V ⎓ power supply (max. 30 V)
• Impedance 1.5 kΩ
• State 0 if < 2 V, state 1 if > 17 V
• Reaction time: 10 ms</td></tr>
</table>

Option terminals

Logic I/O option card terminals (VW3 A3 201)



Factory setting: Source

Maximum wire size:
1.5 mm² - AWG 16

Max. tightening torque:
0.25 Nm - 2.21 lb.in

Characteristics and functions of the terminals

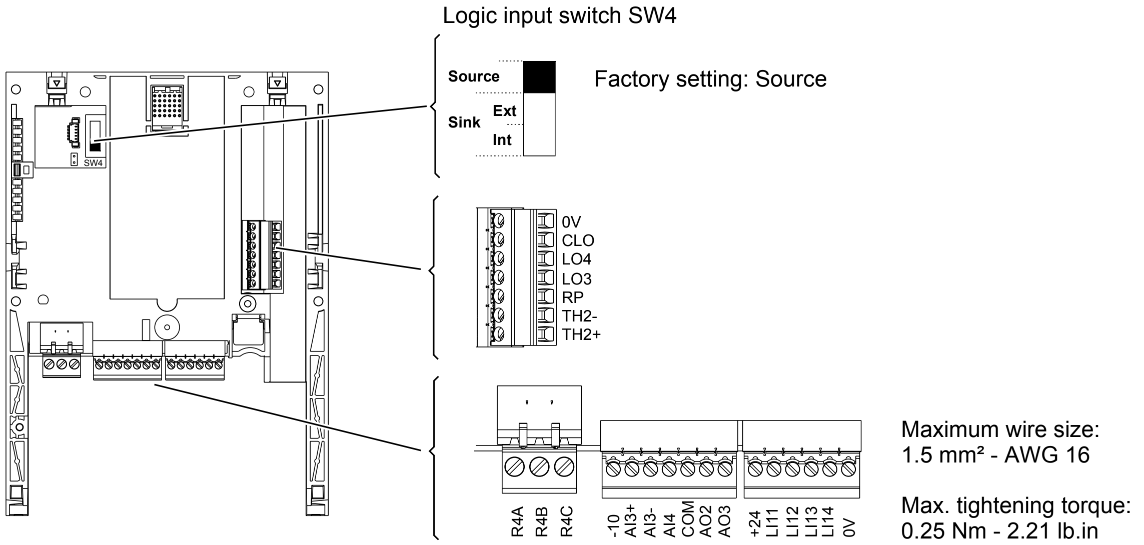
Terminal	Function	Electrical characteristics
R3A R3B R3C	Common point C/O contact R3C of programmable relay R3	• Minimum switching capacity: 3 mA for 24 V ⎓ • Maximum switching capacity on resistive load: 5 A for 250 V ~ or 30 V ⎓ • Maximum switching capacity on inductive load (cos φ = 0.4 L/R = 7 ms): 2 A for 250 V ~ or 30 V ⎓ • Reaction time: 7 ms ± 0.5 ms • Service life: 100,000 operations

<table>
<tr><td>-10</td><td>-10 V ⎓ power supply for 1 to 10 kΩ reference potentiometer</td><td>• - 10 V ⎓ (-10.5 V ± 0.5 V)
• 10 mA max.</td></tr>
<tr><td>+24</td><td>Logic input power supply</td><td>Switch SW3 in Source or Sink Int position
• +24 V ⎓ power supply (min. 21 V, max. 27 V), protected against short-circuits and overloads
• Max. current available for customers 200 mA (This current corresponds to the total consumption on the control card +24 and the option cards +24)

Switch SW3 in Sink Ext position
• Input for external +24 V ⎓ power supply for the logic inputs</td></tr>
<tr><td>LI7
LI8
LI9
LI10</td><td>Programmable logic inputs</td><td>• +24 V ⎓ power supply (max. 30 V)
• Impedance 3.5 kΩ
• Reaction time 2 ms ± 0.5 ms
<table>
<tr><td>Switch SW3</td><td>State 0</td><td>State 1</td></tr>
<tr><td>Source (factory setting)</td><td>< 5 V ⎓</td><td>> 11 V ⎓</td></tr>
<tr><td>Sink Int or Sink Ext</td><td>> 16 V ⎓</td><td>< 10 V ⎓</td></tr>
</table></td></tr>
<tr><td>0 V</td><td>0 V</td><td>0 V</td></tr>
</table>

Terminal	Function	Electrical characteristics
TH1+ TH1-	PTC probe input	• Trip threshold 3 kΩ, reset threshold 1.8 kΩ • Short-circuit detection threshold < 50 Ω
LO1 LO2	Open collector programmable logic outputs	• +24 V ⎓ (max. 30 V) • Max. current 200 mA for internal power supply and 200 mA for external power supply • Reaction time: 2 ms ± 0.5 ms
CLO	Logic output common	
0V	0 V	0 V

Extended I/O option card terminals (VW3 A3 202)



Characteristics and functions of the terminals

Terminal	Function	Electrical characteristics
R4A R4B R4C	Common point C/O contact R4C of programmable relay R4	• Minimum switching capacity: 3 mA for 24 V ⎓ • Maximum switching capacity on resistive load: 5 A for 250 V ∿ or 30 V ⎓ • Maximum switching capacity on inductive load (cos φ = 0.4 L/R = 7 ms): 1.5 A for 250 V ∿ or 30 V ⎓ • Reaction time: 10 ms ± 1 ms • Service life: 100,000 operations

-10	-10 V ⎓ power supply for 1 to 10 kΩ reference potentiometer	• - 10 V ⎓ (-10.5 V ± 0.5 V) • 10 mA max.
AI3 +	+ polarity of the current differential analog input AI3	• Analog input X - Y mA, X and Y being programmable from 0 to 20 mA, impedance 250 Ω • Reaction time: 5 ms ± 1 ms • 11-bit resolution + 1 sign bit, accuracy ± 0.6% for Δθ = 60°C (140°F) • Linearity ± 0.15% of max. value
AI3-	- polarity of the current differential analog input AI3	
AI4	Depending on software configuration: Analog current input or Analog voltage input	• Analog input 0 to +10 V ⎓ (max. safe voltage 24 V), impedance 30 kΩ or • Analog input X - Y mA, X and Y being programmable from 0 to 20 mA, impedance 250 Ω • Reaction time: 5 ms ± 1 ms • 11-bit resolution, accuracy ± 0.6% for Δθ = 60°C (140°F), linearity ± 0.15% of max. value
COM	Analog I/O common	0 V
AO2 AO3	Depending on software configuration: Analog voltage outputs or Analog current outputs	• 0 - 10 V ⎓ or -10/+10 V ⎓ bipolar analog output depending on software configuration, load impedance greater than 50 kΩ or • Analog current output X-Y mA, X and Y being programmable from 0 to 20 mA, max. load impedance 500 Ω • 10-bit resolution • Reaction time 5 ms ± 1 ms, accuracy ± 1% for Δθ = 60°C (140°F), linearity ± 0.2%

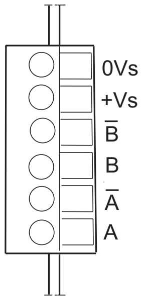
Option terminals

Terminal	Function	Electrical characteristics
+24	Logic input power supply	Switch SW4 in Source or Sink Int position • +24 V ⎓ output (min. 21 V, max. 27 V), protected against short-circuits and overloads • Max. current available for customers 200 mA (This current corresponds to the total consumption on the control card +24 and the option cards +24) Switch SW4 in Sink Ext position • Input for external +24 V ⎓ power supply for the logic inputs
LI11 LI12 LI13 LI14	Programmable logic inputs	• +24 V ⎓ (max. 30 V) • Impedance 3.5 kΩ • Reaction time: 5 ms ± 1 ms Switch SW4 | State 0 | State 1 Source (factory setting) | < 5 V ⎓ | > 11 V ⎓ Sink Int or Sink Ext | > 16 V ⎓ | < 10 V ⎓
0V	Logic input common	0 V

TH2 + TH2 -	PTC probe input	• Trip threshold 3 kΩ, reset threshold 1.8 kΩ • Short-circuit detection threshold < 50Ω
RP	Frequency input	• Frequency range: 0…30 kHz • Cyclic ratio: 50% ± 10% • Maximum sampling time: 5 ms ± 1 ms • Maximum input voltage 30 V, 15 mA • Add a resistor if the input voltage is greater than 5 V (510 Ω for 12 V, 910 Ω for 15 V, 1.3 kΩ for 24 V) • State 0 if < 1.2 V, state 1 if > 3.5 V
LO3 LO4	Open collector programmable logic outputs	• +24 V ⎓ (max. 30 V) • Max. current 20 mA for internal power supply and 200 mA for external power supply • Reaction time 5 ms ± 1 ms
CLO	Logic output common	
0V	0 V	0 V

Encoder interface card terminals

VW3 A3 401...407



Maximum wire size:
1.5 mm² - AWG 16

Max. tightening torque:
0.25 Nm - 2.21 lb.in

Characteristics and functions of the terminals

Encoder interface cards with RS422-compatible differential outputs

Terminal	Function	Electrical characteristics	
		VW3 A3 401	VW3 A3 402
+Vs	Encoder power supply	• 5 V ⎓ (max. 5.5 V) protected against short-circuits and overloads • Max. current 200 mA	• 15 V ⎓ (max. 16 V) protected against short-circuits and overloads • Max. current 175 mA
0Vs			
A, /A B, /B	Incremental logic inputs	• Max. resolution: 5000 points/rev • Max. frequency: 300 kHz	

Encoder interface cards with open collector outputs

Terminal	Function	Electrical characteristics	
		VW3 A3 403	VW3 A3 404
+Vs	Encoder power supply	• 12 V ⎓ (max. 13 V) protected against short-circuits and overloads • Max. current 175 mA	• 15 V ⎓ (max. 16 V) protected against short-circuits and overloads • Max. current 175 mA
0Vs			
A, /A B, /B	Incremental logic inputs	• Max. resolution: 5000 points/rev • Max. frequency: 300 kHz	

Encoder interface cards with push-pull outputs

Terminal	Function	Electrical characteristics		
		VW3 A3 405	VW3 A3 406	VW3 A3 407
+Vs	Encoder power supply	• 12 V ⎓ (max. 13 V) protected against short-circuits and overloads • Max. current 175 mA	• 15 V ⎓ (max. 16 V) protected against short-circuits and overloads • Max. current 175 mA	• 24 V ⎓ (min. 20 V, max. 30 V) protected against short-circuits and overloads • Max. current 100 mA
0Vs				
A, /A B, /B	Incremental logic inputs	• Max. resolution: 5000 points/rev • Max. frequency: 300 kHz		

Selecting the encoder

The 7 encoder interface cards available as options with the ATV61 enable three different encoder technologies to be used:

- Optical incremental encoder with differential outputs compatible with the RS422 standard
- Optical incremental encoder with open collector outputs
- Optical incremental encoder with push-pull outputs

The encoder must comply with the following two limits:
- Maximum encoder frequency 300 kHz
- Maximum resolution 5000 points/revolution

Choose the maximum standard resolution within these limits to obtain optimum accuracy.

Wiring the encoder

Use a shielded cable containing 3 twisted pairs with a pitch of between 25 and 50 mm (0.98 in. and 1.97 in.). Connect the shielding to ground at both ends.
The minimum cross-section of the conductors must comply with the data in the table below, in order to limit line voltage drop:

Max. encoder cable length	VW3 A3 401...402			VW3 A3 403...407		
	Max. consumption current of encoder	Minimum cross-section of conductors		Max. consumption current of encoder	Minimum cross-section of conductors	
10 m 32.8 ft	100 mA	0.2 mm²	AWG 24	100 mA	0.2 mm²	AWG 24
	200 mA	0.2 mm²	AWG 24	200 mA	0.2 mm²	AWG 24
50 m 164 ft	100 mA	0.5 mm²	AWG 20	100 mA	0.5 mm²	AWG 20
	200 mA	0.75 mm²	AWG 18	200 mA	0.75 mm²	AWG 18
100 m 328 ft	100 mA	0.75 mm²	AWG 18	100 mA	0.75 mm²	AWG 18
	200 mA	1.5 mm²	AWG 15	200 mA	1.5 mm²	AWG 15
200 m 656 ft	-	-	-	100 mA	0.5 mm²	AWG 20
	-	-	-	200 mA	1.5 mm²	AWG 15
300 m 984 ft	-	-	-	100 mA	0.75 mm²	AWG 18
	-	-	-	200 mA	1.5 mm²	AWG 15

Connection diagrams conforming to standards EN 954-1 category 1 and IEC/EN 61508 capacity SIL1, stopping category 0 in accordance with standard IEC/EN 60204 1

Single-phase power supply (ATV61H 075M3 to U75M3)

Diagram with line contactor

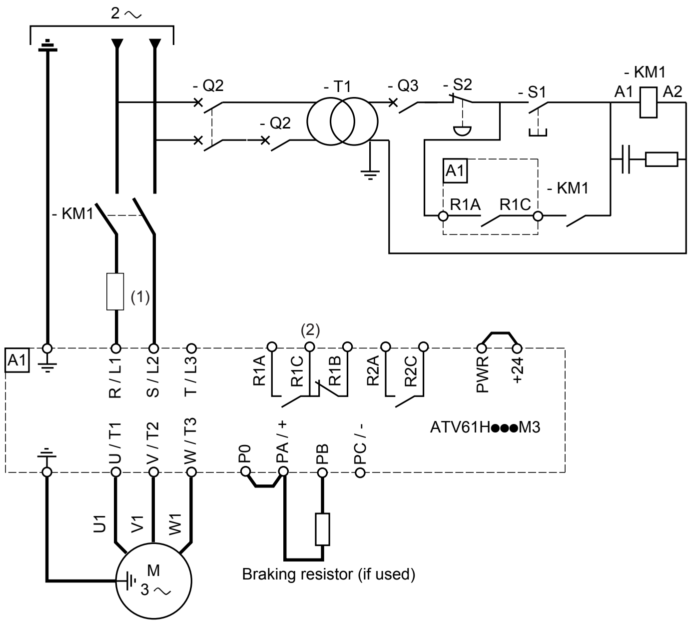
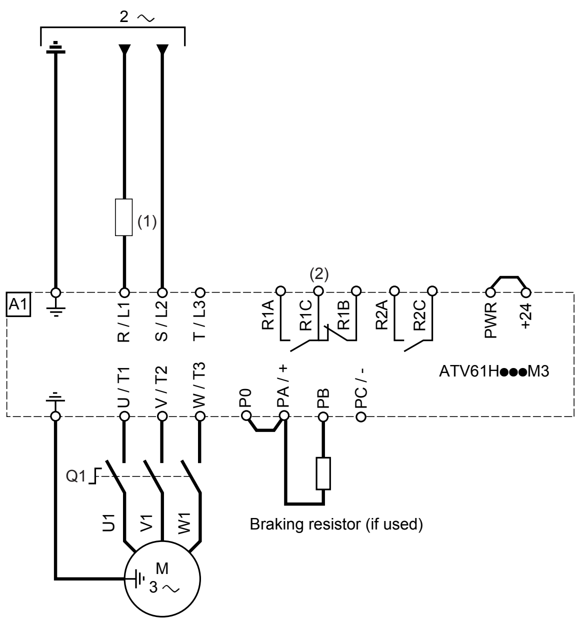


Diagram with switch disconnect



(1) Line choke, if used (compulsory for ATV61H U40M3 to U75M3 drives)
(2) Fault relay contacts for remote signaling of drive status

☞ Inhibit the input phase loss fault (IPL) so that ATV61H 075M3 to U75M3 drives can operate on a single-phase supply (see the Programming Manual). If this fault is set to its factory configuration, the drive will stay locked in fault mode.

Note: Install interference suppressors on all inductive circuits near the drive or connected to the same circuit (relays, contactors, solenoid valves, etc).

Choice of associated components:
Please refer to the catalog.

Connection diagrams conforming to standards EN 954-1 category 1 and IEC/EN 61508 capacity SIL1, stopping category 0 in accordance with standard IEC/EN 60204-1

Three-phase power supply

Diagram with line contactor

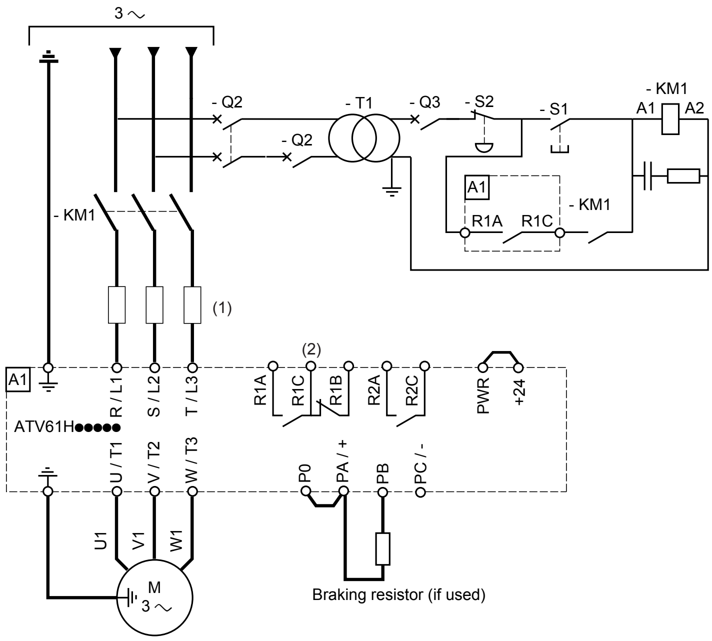
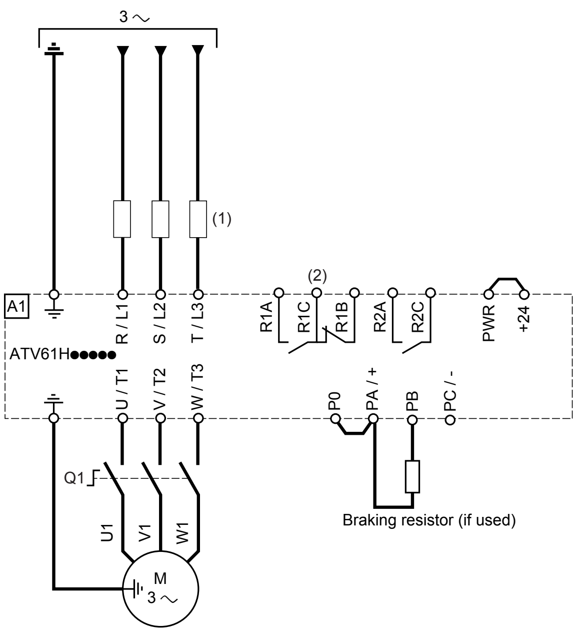


Diagram with switch disconnect



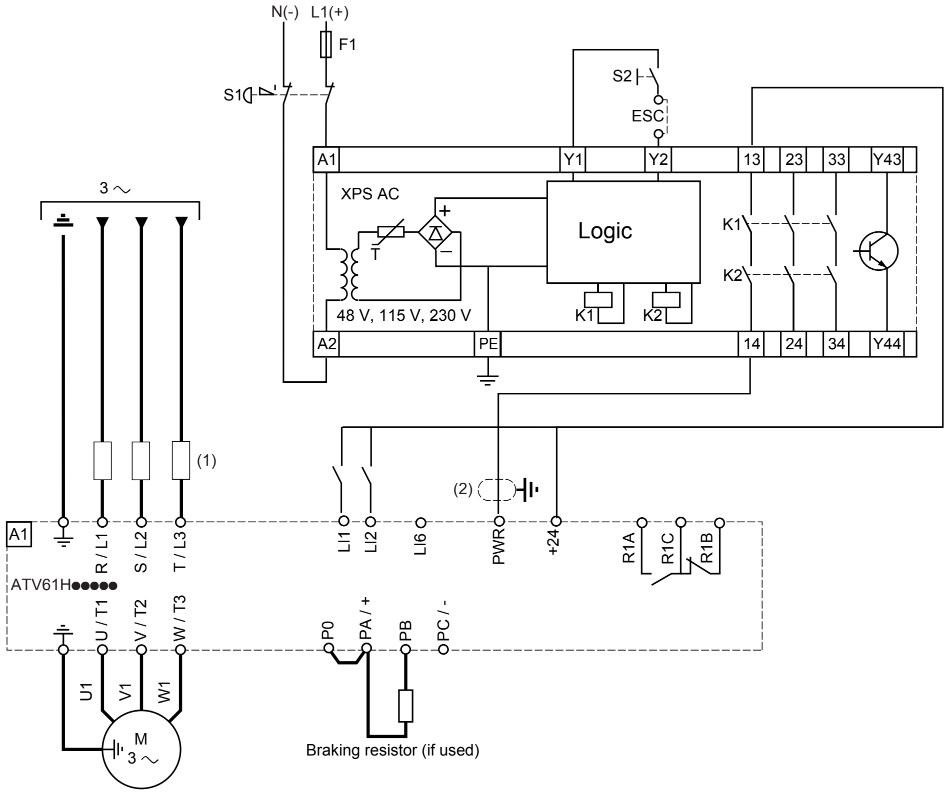
(1) Line choke (if used)
(2) Fault relay contacts for remote signaling of drive status

Note: Install interference suppressors on all inductive circuits near the drive or coupled to the same circuit (relays, contactors, solenoid valves, etc).

Choice of associated components:
Please refer to the catalog.

Connection diagrams conforming to standards EN 954-1 category 3 and IEC/EN 61508 capacity SIL2, stopping category 0 in accordance with standard IEC/EN 60204-1

This connection diagram is suitable for use with machines with a short freewheel stop time (machines with low inertia or high resistive torque).
When the stop request is activated, the motor power supply is cut immediately and it stops in accordance with category 0 of standard IEC/EN 60204-1.



(1) Line choke (if used)
(2) It is essential to ground the shielding on the cable connected to the Power Removal input.

- Standard EN 954-1 category 3 requires the use of a dual-contact stop button (S1).
- S1 is used to activate the Power Removal safety function.
- S2 is used to initialize the Preventa module when powering up or after an emergency stop. ESC enables the use of other initialization conditions for the module.
- One Preventa module can be used for the Power Removal safety function on several ATV61 drives.
- A logic output on the Preventa module can be used to indicate reliably that the drive is operating in safe conditions.

Note:
For preventive maintenance, the Power Removal function must be activated at least once a year.
The drive power supply must be turned off and then on again before carrying out this preventive maintenance.
The drive logic output signals cannot be considered as safety-type signals.
Install interference suppressors on all inductive circuits near the drive or coupled to the same circuit (relays, contactors, solenoid valves, etc).

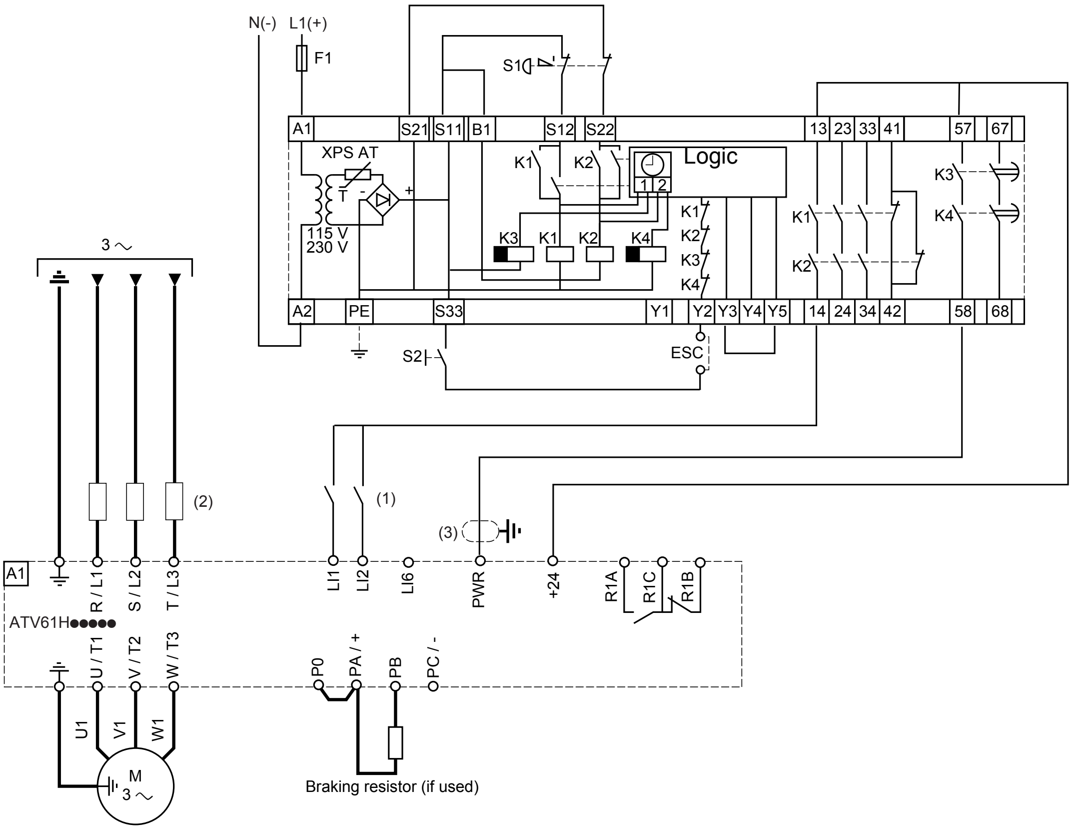
Choice of associated components:
Please refer to the catalog.

Connection diagram conforming to standards EN 954-1 category 3 and IEC/EN 61508 capacity SIL2, stopping category 1 in accordance with standard IEC/EN 60204-1

This connection diagram is suitable for use with machines with a long freewheel stop time (machines with high inertia or low resistive torque).

When the stop request is activated, deceleration of the motor, controlled by the drive, is requested first. Then, after a time delay corresponding to the deceleration time, the Power Removal safety function is activated.

Example:
- 2-wire control
- LI1 assigned to forward
- LI2 assigned to reverse



(1) In this example, the logic inputs LI● are wired as “Source” but can be wired as “Sink Int” or “Sink Ext”.
(2) Line choke (if used)
(3) It is essential to ground the shielding on the cable connected to the Power Removal input.

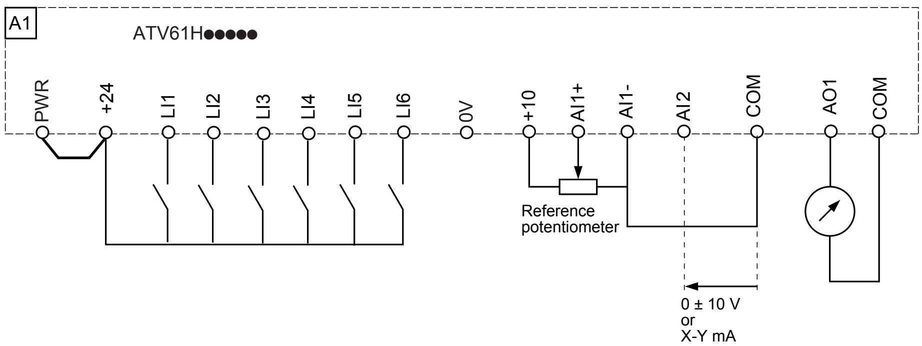
- Standard EN 954-1 category 3 requires the use of a dual-contact stop button (S1).
- S1 is used to activate the Power Removal safety function.
- S2 is used to initialize the Preventa module when powering up or after an emergency stop. ESC enables the use of other initialization conditions for the module.
- One Preventa module can be used for the Power Removal safety function on several ATV61 drives. In this case the time delay must be set to the longest stopping time.
- A logic output on the Preventa module can be used to indicate reliably that the drive is operating in safe conditions.

Note:
For preventive maintenance, the Power Removal function must be activated at least once a year.
The drive power supply must be turned off and then on again before carrying out this preventive maintenance.
The drive logic output signals cannot be considered as safety-type signals.
Install interference suppressors on all inductive circuits near the drive or coupled to the same circuit (relays, contactors, solenoid valves, etc).

Choice of associated components:
Please refer to the catalog.

Control connection diagrams

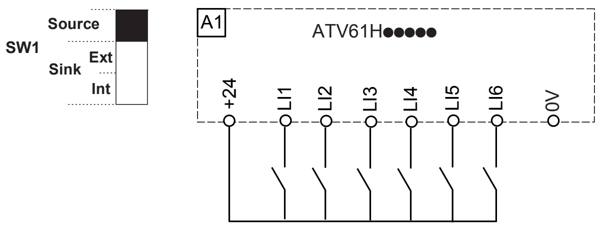
Control card connection diagram



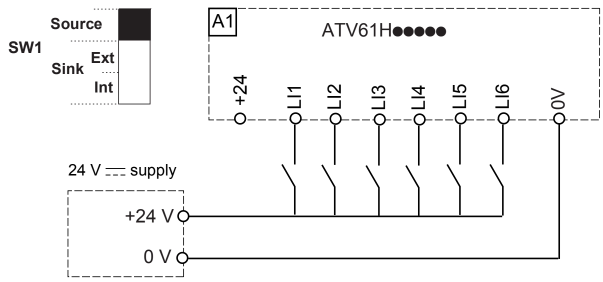
Logic input switch (SW1)

The logic input switch (SW1) is used to adapt the operation of the logic inputs to the technology of the programmable controller outputs.
- Set the switch to Source (factory setting) if using PLC outputs with PNP transistors.
- Set the switch to Sink Int or Sink Ext if using PLC outputs with NPN transistors.

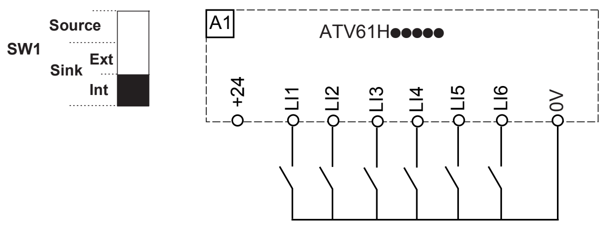
- Switch SW1 set to “Source” position



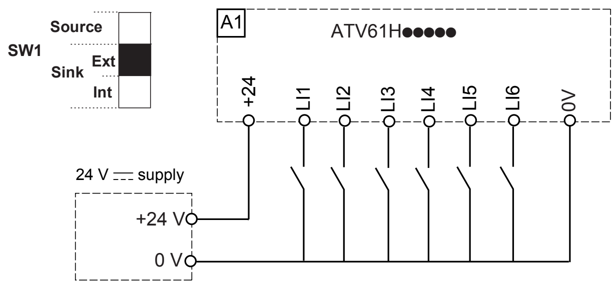
- Switch SW1 set to “Source” position and use of an external power supply for the LIs



- Switch SW1 set to “Sink Int” position



- Switch SW1 set to “Sink Ext” position



⚠ WARNING

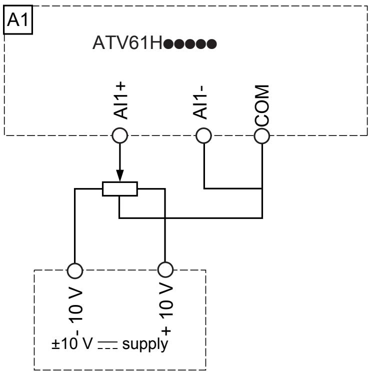
UNINTENDED EQUIPMENT OPERATION

When switch SW1 is set to “Sink Int” or “Sink Ext”, the common must never be connected to ground or the protective ground, as there is then a risk of unintended equipment operation on the first insulation fault.

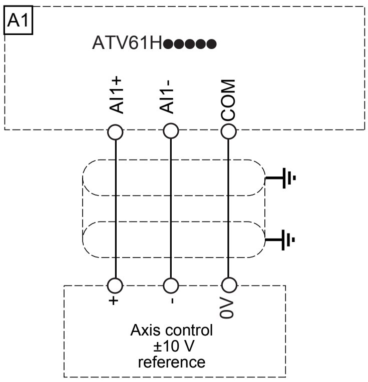
Failure to follow this instruction can result in death, serious injury or equipment damage.

Connection diagrams

Bipolar speed reference



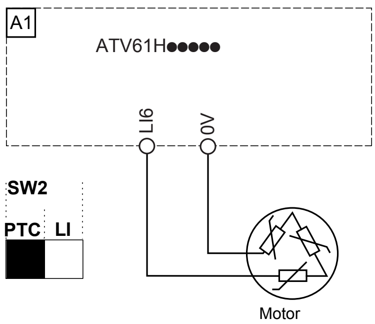
Speed reference using axis control



Switch SW2

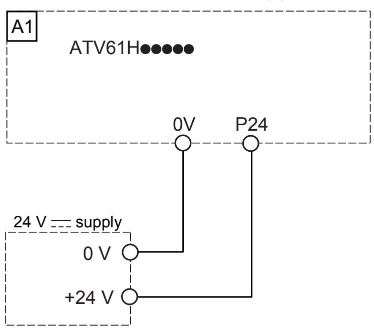
The LI6 logic input switch (SW2) makes it possible to use the LI6 input:

- Either as a logic input by setting the switch to LI (factory setting)
- Or for motor protection via PTC probes by setting the switch to PTC



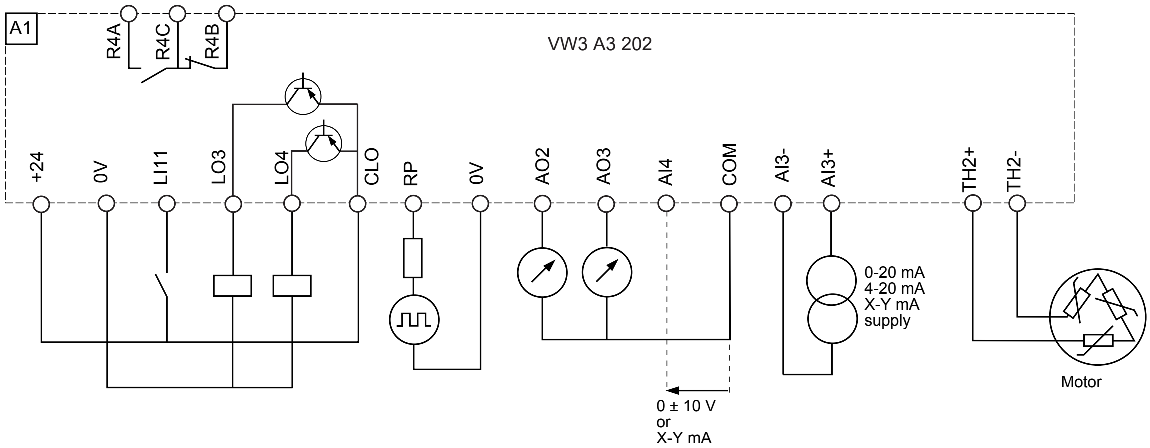
Control power supply via an external source

The control card can be supplied via an external +24 V ⎓ supply source

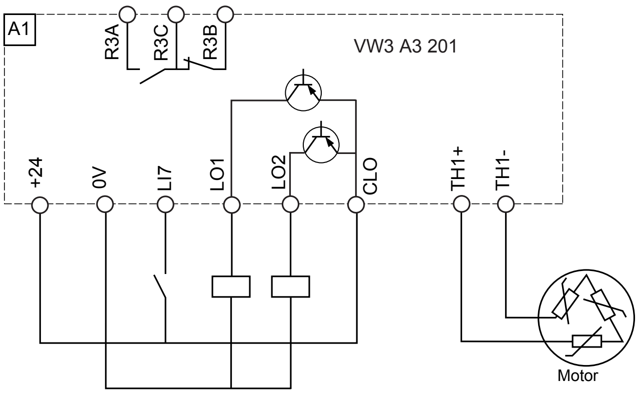


I/O extension card connection diagrams

Connection diagram for extended I/O option card (VW3 A3 202)



Connection diagram for logic I/O option card (VW3 A3 201)

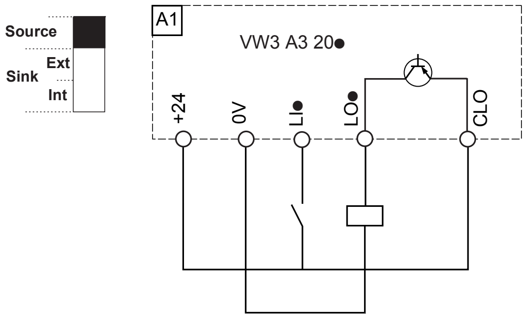


Connection diagrams

SW3/SW4 logic I/O switch

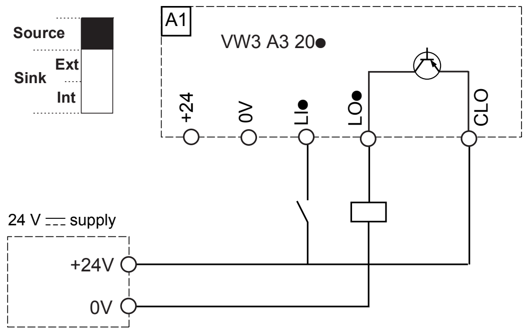
- Switch in “Source” position

SW3 or SW4



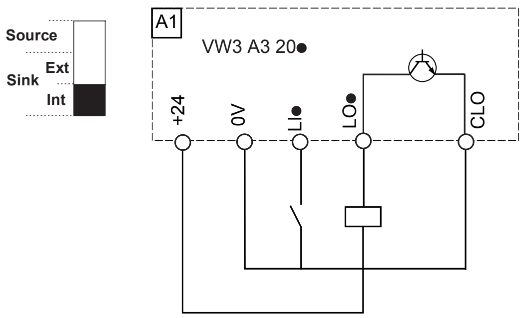
- Switch in “Source” position and use of an external +24 V⎓ supply source

SW3 or SW4



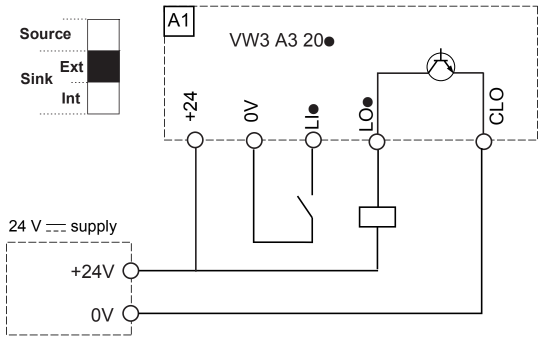
- Switch in “Sink Int” position

SW3 or SW4



- Switch in “Sink Ext” position

SW3 or SW4



⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

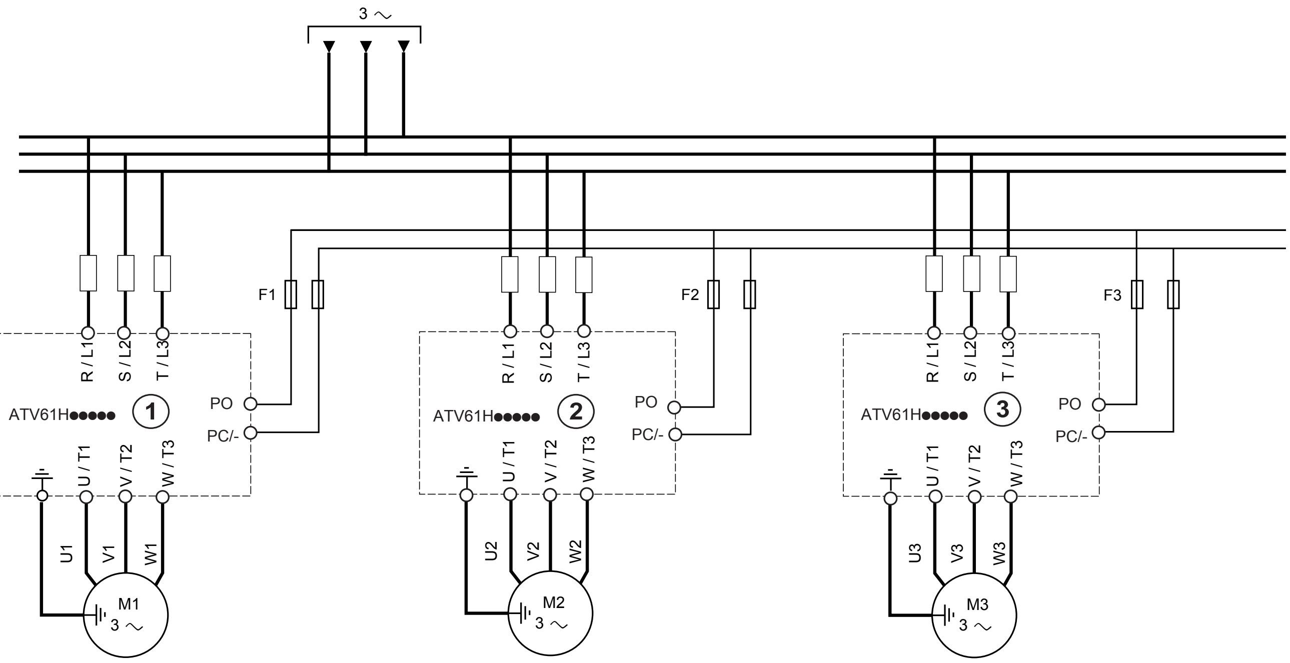
When switches SW3 or SW4 are set to “Sink Int” or “Sink Ext”, the common must never be connected to ground or the protective ground, as there is then a risk of unintended equipment operation on the first insulation fault.

Failure to follow this instruction can result in death, serious injury or equipment damage.

Connection of several drives in parallel on the DC bus

Connection in parallel on the DC bus is recommended in applications for which full motor power must be guaranteed.

Each drive uses its own charging circuit



Drives (1), (2) and (3) must not be more than one size apart when they are connected in this way.

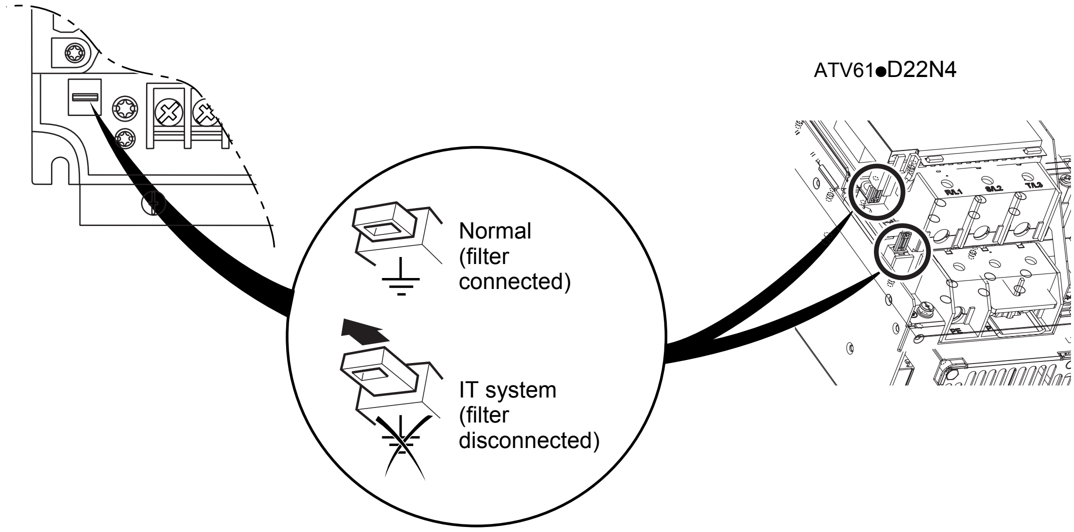
F1, F2, F3: Fast-acting semiconductor fuses for protection on the DC bus side.

Use on IT system and “corner grounded” system

IT system: Isolated or impedance grounded neutral
Use a permanent insulation monitor compatible with non-linear loads, such as a Merlin Gerin type XM200 or equivalent.
“Corner grounded” system: System with one phase connected to ground

Altivar 61 drives feature built-in RFI filters. When using ATV61H U30Y to D90Y drives on an IT system, the link between these filters and ground must be removed as shown in the following two diagrams. For other catalog numbers, removal of this link is possible but not mandatory:

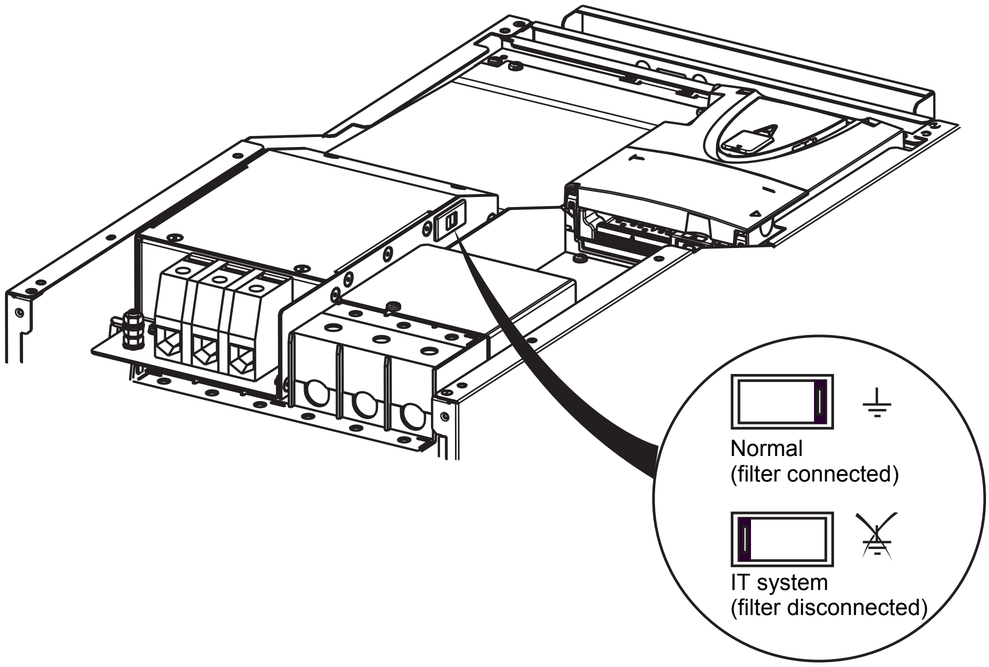
Remove the jumper located to the left of the power terminals (two jumpers for ATV61 ●D22N4).



⚠ CAUTION

RISK OF DAMAGE TO THE DRIVE
On ATV61●075N4 to U40N4 ratings, if the filters are disconnected, the drive's switching frequency must not exceed 4 kHz. Refer to the Programming Manual for the corresponding parameter setting.
Failure to follow these instructions can result in injury and/or equipment damage.

Disconnection of the filter on ATV61H D37Y to D90Y products



WARNING

RISK OF ELECTRIC SHOCK

- ATV61H U30Y to D90Y drives must not be connected to a “corner grounded” system.
- ATV61H●●●S6X must not be used with corner grounded systems in case of altitude is higher than 2000m.

Failure to follow this instruction can result in death, serious injury or equipment damage.

Electromagnetic compatibility

Principle

- Grounds between drive, motor and cable shielding must have “high-frequency” equipotentiality.
- Use of shielded cables with shielding connected to ground at both ends for the motor cables, braking resistor (if used) and control-signal wiring. Metal ducting or conduit can be used for part of the shielding length provided that there is no break in continuity.
- Ensure maximum separation between the power supply cable (line supply) and the motor cable.

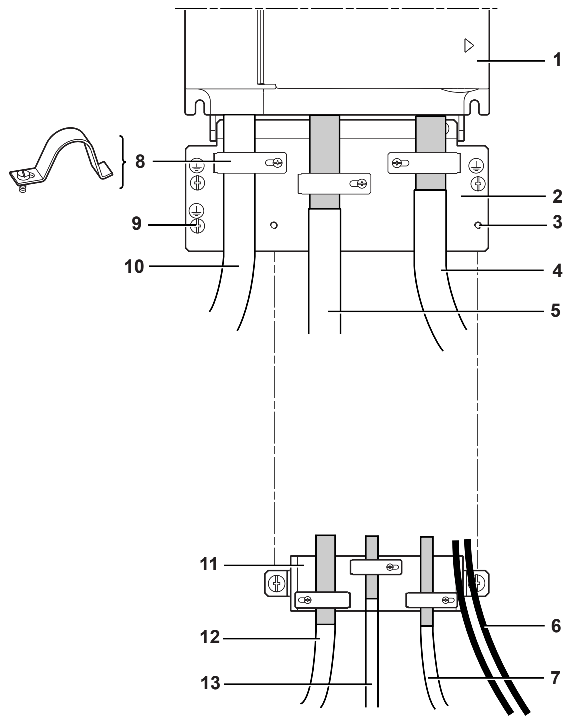
Installation diagram

ATV61H 075M3 to D15M3X, ATV61H 075N4 to D18N4 and ATV61H U22S6X to U75S6X

- Attach and ground the shielding of cables **4** and **5** as close as possible to the drive:
  - Strip the shielding.
  - Use stainless steel metal clamps on the parts from which the shielding has been stripped, to attach them to the metal plate **2**.
  The shielding must be clamped tightly enough to the metal plate to ensure correct contact.

- Install the control EMC plate **11** on the sheet steel grounded plate **2**, as shown in the diagram.

- Attach and ground the shielding of cables **7**, **12** and **13** as close as possible to the drive:
  - Strip the shielding.
  - Use stainless steel metal clamps on the parts from which the shielding has been stripped, to attach them to the control EMC flange **9**.
  The shielding must be clamped tightly enough to the metal plate to ensure correct contact.



1 Altivar 61

2 Sheet steel grounded plate supplied with the drive

3 Tapped holes for installing the control EMC plate

4 Shielded cable for motor connection, with shielding connected to ground at both ends. The shielding must be continuous and intermediate terminals must be in EMC shielded metal boxes.

5 Shielded cable for connecting the braking resistor (if used).
The shielding must be continuous and intermediate terminals must be in EMC shielded metal boxes.

6 Non-shielded wires for relay contact output

7 Shielded cables for connecting the Power Removal safety function input. The shielding must be continuous and intermediate terminals must be in EMC shielded metal boxes.

8 Metal clamps

9 Protective ground connection

10 Unshielded power supply cable or wires

11 Control EMC plate

12 Shielded cables for connecting the control-signal section. For applications requiring several conductors, use cables with a small cross-section ($0.5\ mm^2$ - AWG 20).

13 Shielded cables for connecting the encoder The shielding must be continuous and intermediate terminals must be in EMC shielded metal boxes.

Note:

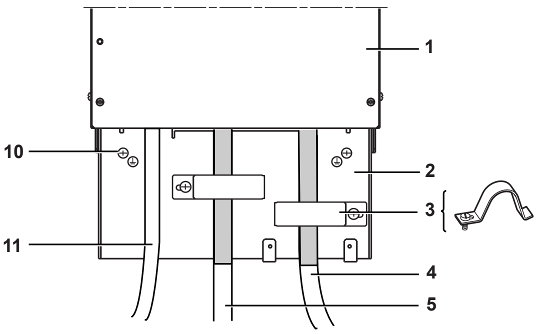
- If using an additional input filter, it should be installed under the drive and connected directly to the line supply via an unshielded cable. Link **10** on the drive is then established via the filter output cable.
- The HF equipotential ground connection between the drive, motor and cable shielding does not remove the need to connect the PE protective conductors (green-yellow) to the appropriate terminals on each unit.

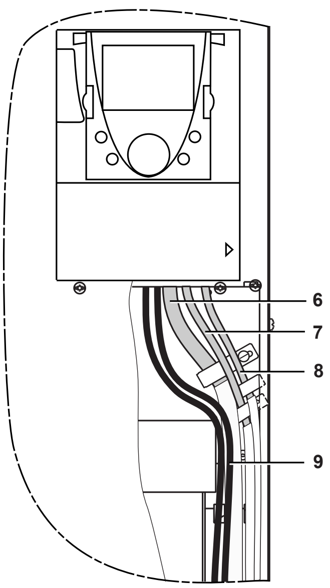
Installation diagram

ATV61H D18M3X to D45M3X, ATV61H D22N4 to D75N4 and ATV61H U30Y to D90Y

Attach and ground the shielding of cables **4** and **5** as close as possible to the drive:
- Strip the shielding.
- Use stainless steel metal clamps on the parts from which the shielding has been stripped, to attach them to the metal plate **2**.
The shielding must be clamped tightly enough to the metal plate to ensure correct contact.

- Attach and ground the shielding of cables **6**, **7** and **8** as close as possible to the drive:
  - Strip the shielding.
  - Use stainless steel metal clamps on the parts from which the shielding has been stripped, to attach them to the drive.
  The shielding must be clamped tightly enough to the metal plate to ensure correct contact.





1 Altivar 61

2 Sheet steel grounded plate supplied with the drive

3 Metal clamps

4 Shielded cable for motor connection, with shielding connected to ground at both ends. The shielding must be continuous and intermediate terminals must be in EMC shielded metal boxes.

5 Shielded cable for connecting the braking resistor (if used). The shielding must be continuous and intermediate terminals must be in EMC shielded metal boxes.

6 Shielded cables for connecting the control-signal section. For applications requiring several conductors, use cables with a small cross-section (0.5 mm^2 - AWG 20).

7 Shielded cables for connecting the Power Removal safety function input. The shielding must be continuous and intermediate terminals must be in EMC shielded metal boxes.

8 Shielded cables for connecting the encoder. The shielding must be continuous and intermediate terminals must be in EMC shielded metal boxes.

9 Non-shielded wires for relay contact output

10 Protective ground connection

11 Unshielded power supply cable or wires

Note:
- If using an additional input filter, it should be installed under the drive and connected directly to the line supply via an unshielded cable. Link **4** on the drive is then established via the filter output cable.
- The HF equipotential ground connection between the drive, motor and cable shielding does not remove the need to connect the PE protective conductors (green-yellow) to the appropriate terminals on each unit.

Altivar 61

Variable speed drives for synchronous and asynchronous motors

Programming Manual

Sofware V2.1

12/2009

1760649

www.schneider-electric.com

Schneider Electric

Contents

Before you begin

Read and understand these instructions before performing any procedure with this drive.

⚠ DANGER

HAZARDOUS VOLTAGE

- Read and understand the Installation Manual in full before installing or operating the ATV61 drive. Installation, adjustment, repair, and maintenance must be performed by qualified personnel.
- The user is responsible for compliance with all international and national electrical standards in force concerning protective grounding of all equipment.
- Many parts in this variable speed drive, including printed wiring boards, operate at line voltage. DO NOT TOUCH. Use only electrically insulated tools.
- DO NOT touch unshielded components or terminal strip screw connections with voltage present.
- DO NOT short across terminals PA and PC or across the DC bus capacitors.
- Install and close all the covers before applying power or starting and stopping the drive.
- Before servicing the variable speed drive
  - Disconnect all power.
  - Place a “DO NOT TURN ON” label on the variable speed drive disconnect.
  - Lock the disconnect in the open position.
- Disconnect all power including external control power that may be present before servicing the drive. WAIT 15 MINUTES for the DC bus capacitors to discharge. Then follow the DC bus voltage measurement procedure given in the Installation Manual to verify that the DC voltage is less than 42 V. The drive LEDs are not accurate indicators of the absence of DC bus voltage.

Failure to follow these instructions can result in death or serious injury

⚠ CAUTION

DAMAGED EQUIPMENT

Do not operate or install any drive that appears damaged.
Failure to follow this instruction can result in equipment damage.

Documentation structure

The following Altivar 61 technical documents are available on the Schneider Electric website (www.schneider-electric.com) as well as on the CD-ROM supplied with the drive.

Installation Manual

This bulletin contains complete mounting and wiring instructions.

Programming Manual

This describes the functions, parameters and use of the drive terminal (integrated display terminal and graphic display terminal).
The communication functions are not described in this manual, but in the manual for the bus or network used.

Communication Parameters Manual

This manual describes:

- The drive parameters with specific information for use via a bus or communication network.
- The operating modes specific to communication (state chart).
- The interaction between communication and local control.

Manuals for Modbus, CANopen, Ethernet, Profibus, INTERBUS, Uni-Telway, FIPIO and Modbus Plus, etc.

These manuals describe the assembly, connection to the bus or network, signaling, diagnostics, and configuration of the communication-specific parameters via the integrated display terminal or the graphic display terminal.
They also describe the communication services of the protocols.

ATV 38/ATV 61 Migration Manual

This manual describes the differences between the Altivar 61 and the Altivar 38 and explains how to replace an Altivar 38, including how to replace drives communicating on a bus or a network.

ATV 78/ATV 61/71 Migration Manual

This manual describes the differences between the Altivar 61/71 and Altivar 78 and explains how to replace an Altivar 78.

Software enhancements

Since the Altivar ATV 61 was first launched, it has benefited from the addition of several new functions. The software version is now V2.1. The old versions can be replaced by this new one without any modifications.
Although this documentation relates to version V2.1, it can still be used with earlier versions, as the updates merely involve the addition of new values and parameters, and none of the parameters of the previous versions have been modified or removed.
The software version is indicated on the nameplate attached to the body of the drive.

Enhancements made to version V1.2 in comparison to V1.1

New parameters and functions

Option of operating with a BACnet communication card

[1.8 FAULT MANAGEMENT] (FLt-) menu

- The external fault [EXTERNAL FAULT] (EtF-) page 197 can now be configured in positive or negative logic via [External fault config.] (LEt).

Enhancements made to version V1.4 in comparison to V1.2

Factory setting

Note: In versions V1.1 and V1.2, analog output AO1 was assigned to the motor frequency. In the new version, this output is not assigned.
With the exception of this parameter, the factory setting of versions V1.1 and V1.2 remain the same in the new version. The new functions are inactive in the factory setting.

New parameters and functions

[1.2 MONITORING] (SUP-) menu

Addition of states and internal values relating to the new functions described below.

[1.3 SETTINGS] (SEt-) menu

- [High torque thd.] (ttH) page 59
- [Low torque thd.] (ttL) page 59
- [Pulse warning thd.] (FqL) page 59
- [Freewheel stop Thd] (FFt) page 60

[1.4 MOTOR CONTROL] (drC-) menu

- Extension of the following configurations to all drive ratings (previously limited *to* 45 kW (60 HP) for ATV61●●●M3X and to 75 kW (100 HP) for ATV61●●●N4): synchronous motor [Sync. mot.] (SYn) page 67, sinus filter [Sinus filter] (OFI) page 75, noise reduction [Noise reduction] (nrd) page 76, braking balance [Braking balance] (bbA) page 78.

[1.5 INPUTS / OUTPUTS CFG] (I-O-) menu

- [AI net. channel] (AIC1) *page* 89
- New options for assigning relays and logic outputs, page 94: torque greater than high threshold, torque less than low threshold, motor in forward rotation, motor in reverse rotation, measured speed threshold attained.
- Analog output AO1 can now be used as a logic output and assigned to relay functions and logic outputs, page 100.
- New option of modifying the scale of analog outputs, page 102, using the parameters [Scaling AOx min] (ASLx) and [Scaling AOx max] (ASHx).
- New options for assigning analog outputs page 103: signed motor torque and measured motor speed.
- New options for assigning alarm groups page 107: torque greater than high threshold, torque less than low threshold, measured speed threshold attained.

[1.7 APPLICATION FUNCT.] (Fun-) menu

- The summing, subtraction and multiplication reference functions can now be assigned to virtual input [Network AI] (AIU1) page 128.
- New parameter [Freewheel stop Thd] (FFt) page 133 used to adjust a threshold for switching to freewheel at the end of a stop on ramp or fast stop.
- The torque limitation [TORQUE LIMITATION] (tOL-) page 164 can now be configured in whole % or in 0.1% increments using [Torque increment] (IntP) and assigned to virtual input [Network AI] (AIU1).
- New Damper control function using the [DAMPER MANAGEMENT] (dAM-) menu, page 172.
- Parameter switching [PARAM. SET SWITCHING] (MLP-) page 174 can now be assigned to attained frequency thresholds [Freq. Th. attain.] (FtA) and [Freq. Th. 2 attain.] (F2A).

[1.8 FAULT MANAGEMENT] (FLt-) menu

- Option to reinitialize the drive without turning it off, via [Product reset] (rP) page 190.
- Option to reinitialize the drive via a logic input without turning it off, using [Product reset assig.] (rPA) page 190.
- The option to configure the "output phase loss" fault [Output Phase Loss] (OPL) page 194 to [Output cut] (OAC) has been extended to all drive ratings (previously limited *to* 45 kW (60 HP) for ATV61●●●M3X and 75 kW (100 HP) for ATV61●●●N4).
- New monitoring function based on speed measurement using "Pulse input" input page 204, via the [FREQUENCY METER] (FqF-) menu.
- The braking unit short-circuit fault can now be configured using [Brake res. fault Mgt] bUb) page 206.
- The [Damper stuck] (Fd1) fault in the Damper control function can be configured via [DAMPER FAULT MGT.] (FdL-) page 211.

[7 DISPLAY CONFIG.] menu

- Addition, in [7.4 KEYPAD PARAMETERS] page 237, of the [Keypad contrast] and [Keypad stand-by] parameters to adjust the contrast and stand-by mode of the graphic display unit.

Enhancements made to version V1.5 in comparison to V1.4

Extension of the range with the addition of **ATV61●●●●Y** drives for 500 to 690 V supplies.
There are no new parameters, but the adjustment ranges and factory settings of some parameters have been adapted to the new voltages.

[1.5 INPUTS / OUTPUTS CFG] (I-O-) menu

Increased adjustment range for the relay and logic output delay parameters: 0 to 60000 ms instead of 0 to 9999 ms.

[1.7 APPLICATION FUNCT.] (Fun-) menu

- New parameter [Conf.sensor flow] (LnS) page 181, used to configure the zero flow sensor for positive or negative logic.

Enhancements made to version V1.6 in comparison to V1.5

The communication option card APOGEE FLN P1 (VW3 A3 314) is fully supported with the version V1.6 and above of the Altivar 61 software.

Enhancements made to version V1.8 in comparison to V1.6

[7 DISPLAY CONFIG.] menu

- Addition in [7.4 KEYPAD PARAMETERS] page 233 of [Power up menu].This parameter allows to choose the menu which displays on the drive on power up.

Enhancements made to version V2.1 in comparison to V1.8

[1.7 APPLICATION FUNCT.] (Fun-) menu

New parameters and functions

- New parameter [REGEN CONNECTION] (AFE) page 185. With this parameter it is possible to retun the braking energy to the mains and reduce the harmonics.

INSTALLATION

☐ **1 Consult the Installation Manual**

PROGRAMMING

Procedure applicable if the factory configuration, page 9, and use of the [SIMPLY START] (SIM-) menu only are sufficient for the application.

■ **2 Power up without run command**

☐ **If you are using a separate power supply for the control section, follow the instructions on page 10.**

■ **3 Select the language, if the drive has a graphic display terminal**

■ **4 Configure the [SIMPLY START] (SIM-) menu**

- ☐ **2-wire or 3-wire control**
- ☐ **Macro configuration**
- ☐ **Motor parameters**
  - ☞ ***Perform an auto-tuning operation***
- ☐ **Motor thermal current**
- ☐ **Acceleration and deceleration ramps**
- ☐ **Speed variation range**

Tips:

- **Before you start programming, complete the user setting tables, page 246.**
- **Perform an auto-tuning operation to optimize performance, page 36.**
- **If you get lost, return to the factory settings, page 222.**

☞ ***Note: Check that the wiring of the drive is compatible with its configuration.***

■ **5 Start**

Factory configuration

Drive factory settings

The Altivar 61 is factory-set for the most common operating conditions:

- Macro-configuration: Pumps/fans
- **Motor** frequency: 50 Hz
- Energy-saving variable torque applications
- Normal stop mode on deceleration ramp
- Stop mode in the event of a fault: freewheel
- Linear, acceleration and deceleration ramps: 3 seconds
- Low speed: 0 Hz
- High speed: 50 Hz
- Motor thermal current = rated drive current
- Standstill injection braking current = 0.7 x rated drive current, for 0.5 seconds
- No automatic starts after a fault
- Switching frequency 2.5 kHz or 12 kHz depending on drive rating
- Logic inputs:
  - LI1: forward (1 operating direction), 2-wire control on transition
  - LI2: inactive (not assigned)
  - LI3: switching of 2nd speed reference
  - LI4: fault reset
  - LI5, LI6: inactive (not assigned)
- Analog inputs:
  - AI1: 1st speed reference 0 +10 V
  - AI2: 2nd speed reference 0-20 mA
- Relay R1: The contact opens in the event of a fault (or drive off)
- Relay R2: The contact closes when the drive is in operation
- Analog output AO1: 0-20 mA, inactive (not assigned)

If the above values are compatible with the application, the drive can be used without changing the settings.

Option card factory settings

The option card inputs/outputs are not factory-set.

Turning on and configuring the drive

DANGER

UNINTENDED EQUIPMENT OPERATION

- Before turning on and configuring the Altivar 61, check that the PWR (POWER REMOVAL) input is deactivated (at state 0) in order to prevent unintended operation.
- Before turning on or on exiting the configuration menus, check that the inputs assigned to the run command are deactivated (at state 0) since they can cause the motor to start immediately.

Failure to follow these instructions will result in death or serious injury.

CAUTION

INCOMPATIBLE LINE VOLTAGE

Before turning on and configuring the drive, ensure that the line voltage is compatible with the supply voltage range shown on the drive nameplate. The drive may be damaged if the line voltage is not compatible.

Failure to follow these instructions can result in equipment damage.

Separate control section power supply

Only supply power to the power section the next time the drive is powered up when:
A) The drive control section is powered independently of the power section (P24 and 0V terminals).
B) Whenever an option card is added or replaced.

Power switching via line contactor

CAUTION

RISK OF EQUIPMENT DAMAGE

- Avoid operating the contactor frequently (premature ageing of the filter capacitors).
- Cycle times < 60 s may result in damage to the pre-charge resistor.

Failure to follow these instructions can result in equipment damage.

User adjustment and extension of functions

- The display unit and buttons can be used to modify the settings and to extend the functions described in the following pages.
- **Return to factory settings** is made easy by the [1.12 FACTORY SETTINGS] (FCS-) menu, see page 220.
- There are three types of parameter:
  - Display: Values displayed by the drive
  - Adjustment: Can be changed during operation or when stopped
  - Configuration: Can only be modified when stopped and no braking is taking place. Can be displayed during operation

DANGER

UNINTENDED EQUIPMENT OPERATION

- Check that changes made to the settings during operation do not present any danger.
- We recommend stopping the drive before making any changes.

Failure to follow these instructions will result in death or serious injury.

Starting

Important:
- In factory settings mode, the motor can only be supplied with power once the “forward”, “reverse” and “DC injection stop” commands have been reset:
  - On power-up or a manual fault reset or after a stop command

  If they have not been reset, the drive will display “nSt” but will not start.
- If the automatic restart function has been configured ([Automatic restart] (Atr) parameter in the [1.8-FAULT MANAGEMENT] (FLt-) menu, see page 191), these commands are taken into account without a reset being necessary.

Test on a low power motor or without a motor

- In factory settings mode, [Output Phase Loss] detection (OPL) page 194 is active (OPL = YES). To check the drive in a test or maintenance environment without having to switch to a motor with the same rating as the drive (particularly useful in the case of high power drives), deactivate [Output Phase Loss] (OPL = no).
- Set [Motor control type] (Ctt) = [V/F 2pts] (UF2) or [V/F 5pts] (UF5) or [U/F Quad.] (UFq) ([1.4-MOTOR CONTROL] (drC-) menu, see page 67)

CAUTION

UNINTENDED EQUIPMENT OPERATION

Motor thermal protection will not be provided by the drive if the motor current is less than 0.2 times the rated drive current. Provide an alternative means of thermal protection.

Failure to follow these instructions can result in equipment damage.

Using motors in parallel

- Set [Motor control type] (Ctt) = [V/F 2pts] (UF2) or [V/F 5pts] (UF5) or [U/F Quad.] (UFq) ([1.4-MOTOR CONTROL] (drC-) menu, see page 67)

CAUTION

UNINTENDED EQUIPMENT OPERATION

Motor thermal protection is no longer provided by the drive. Provide an alternative means of thermal protection on every motor.

Failure to follow these instructions can result in equipment damage.

ATV61●●●Y - Network which presents often under voltage

To assure an optimal running of an ATV61●●●Y used on network which presents often under voltage (network voltage contained between 425 V and 446 V), it is necessary to adjust [Prevention level] (UPL) = 383 V ([1.8-FAULT MANAGEMENT] (FLt-) menu, see page 199).

Using motor with nominal voltage lower than drive supply voltage

- Configure [Vector Control 2pt] (UC2) = [Yes] (YES) ([1.4-MOTOR CONTROL] (drC-) menu, see page 69)

⚠ CAUTION

UNINTENDED EQUIPMENT OPERATION

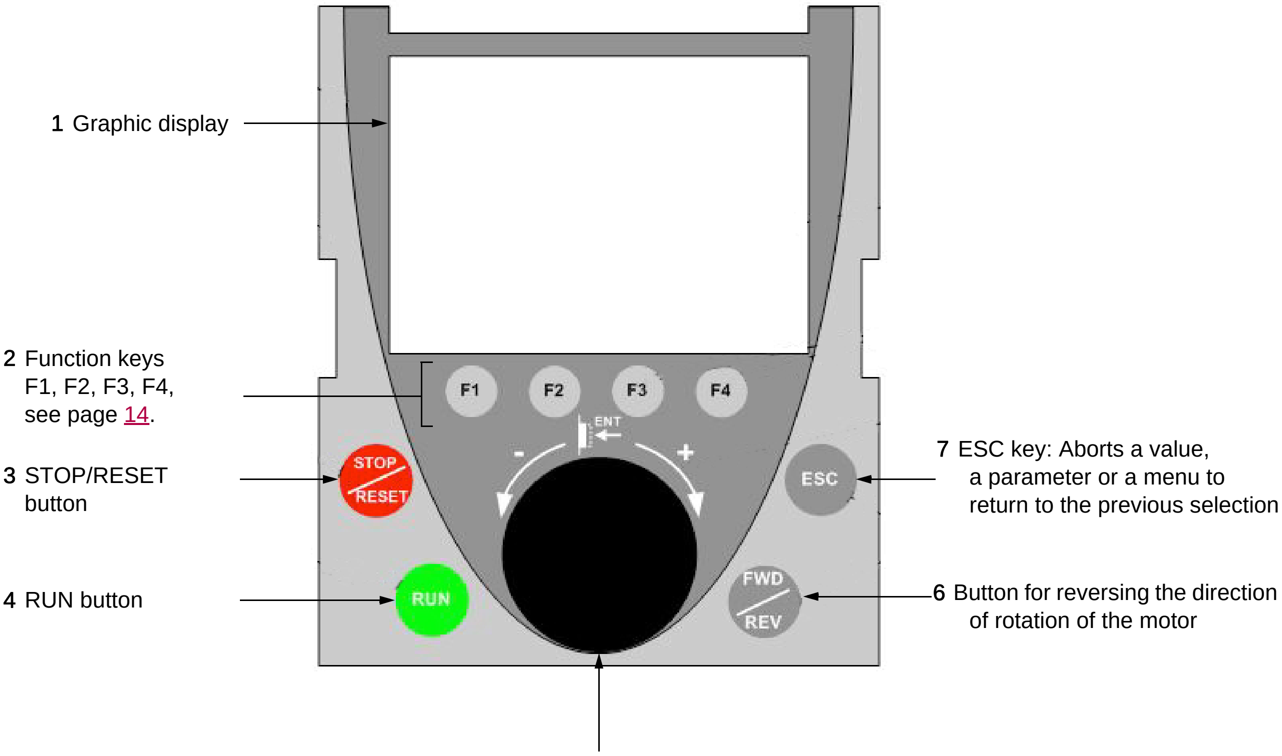
- To protect a motor which has a nominal voltage lower than drive supply voltage, it is mandatory to use [Vector Control 2pt] (UC2) function in order to limit maximal voltage of the motor lower than network voltage.
- Nevertheless, it is necessary to check that instantaneous voltage applied to the motor (link to DC bus voltage) are compatible with characteristics of this one.

Failure to follow these instructions can result in equipment damage.

Graphic display terminal

Although the graphic display terminal is optional for low-power drives, it is a standard component on high-power drives (see catalog). The graphic display terminal can be disconnected and connected remotely (on the door of an enclosure for example) using the cables and accessories available as options (see catalog).

Description of the terminal



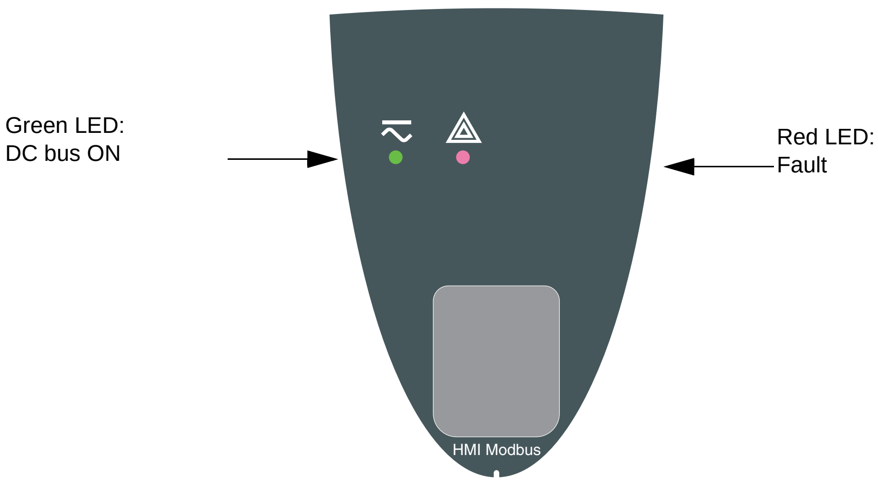
5 Navigation button:

- Press (ENT):
  - To save the current value
  - To enter the selected menu or parameter
- Turn CW/ CCW:
  - To increment or decrement a value
  - To go to the next or previous line
  - To increase or decrease the reference if control via the terminal is activated

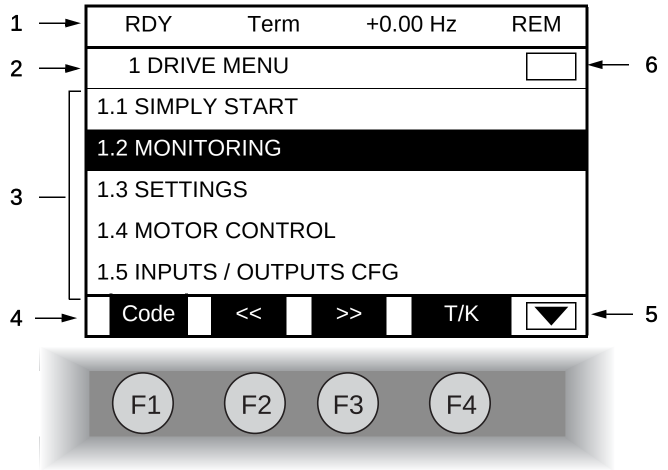
Note: Buttons **3**, **4**, **5** and **6** can be used to control the drive directly, if control via the terminal is activated.

Disconnected terminal

When the terminal is disconnected, two LEDs become visible:



Description of the graphic screen



1. Display line. Its content can be configured; the factory settings show:
   - The drive state (see page 15)
   - The active control channel:
     - Term: Terminals
     - HMI: Graphic display terminal
     - MDB: Integrated Modbus
     - CAN: Integrated CANopen
     - NET: Communication card
     - APP: Controller Inside card
   - Frequency reference
   - LOC/REM: “LOC” appears if the command and reference are set via the graphic display terminal; otherwise, “REM” appears. This corresponds to the state selected by the [T/K] function key.

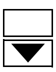
2. Menu line. Indicates the name of the current menu or submenu.

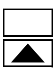
3. Menus, submenus, parameters, values, bar charts, etc., are displayed in drop-down window format on a maximum of 5 lines. The line or value selected by the navigation button is displayed in reverse video.

4. Section displaying the functions assigned to the keys F1 to F4 and aligned with them, for example:

   - Code F1 : Displays the code of the selected parameter, i.e., the code corresponding to the 7-segment display.
   - HELP F1 : Contextual help.
   - << F2 : Navigate horizontally to the left, or go to previous menu/submenu or, for a value, go to the next digit up, displayed in reverse video (see the example on page 16).
   - >> F3 : Navigate horizontally to the right or go to next menu/submenu (going to the [2 ACCESS LEVEL] menu in this example) or, for a value, go to the next digit down, displayed in reverse video (see the example on page 16).
   - T/K F4 : Command and reference via the terminal, see page 120.

The function keys are dynamic and contextual.
Other functions (application functions) can be assigned to these keys via the [1.6 COMMAND] menu.
If a preset speed is assigned to a function key and if the function key is pressed, the motor will run at this preset speed until another preset speed or JOG is pressed, speed reference is changed, or Stop key is pressed.

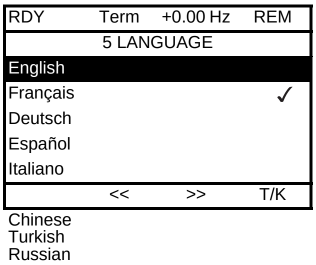
5. 
Indicates that there are no more levels below this display window.
Indicates that there are more levels below this display window.

6. 
Indicates that there are no more levels above this display window.
Indicates that there are more levels above this display window.

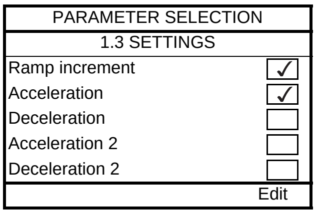
Drive state codes:

- ACC: Acceleration
- CLI: Current limit
- CTL: Controlled stop on input phase loss
- DCB: DC injection braking in progress
- DEC: Deceleration
- FLU: Motor fluxing in progress
- FRF: Drive at fallback speed
- FST: Fast stop
- NLP: No line power (no line supply on L1, L2, L3)
- NST: Freewheel stop
- OBR: Auto-adapted deceleration
- PRA: Power Removal function active (drive locked)
- RDY: Drive ready
- RUN: Drive running
- SOC: Controlled output cut in progress
- TUN: Auto-tuning in progress
- USA: Undervoltage alarm

Example configuration windows:

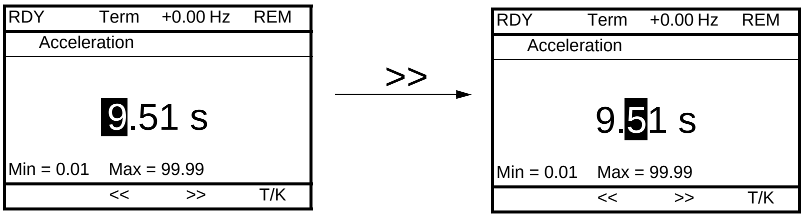


When only one possible selection can be made, the selection made is indicated by ✓
Example: Only one language can be chosen.



When multiple selection is possible, the selections made are indicated by ☑
Example: A number of parameters can be chosen to form the [USER MENU].

Example configuration window for one value:



The << and >> arrows (keys F2 and F3) are used to select the digit to be modified, and the navigation button is rotated to increase or decrease this number.

First power-up – [5. LANGUAGE] menu

The first time the drive is powered up, the user will automatically be guided through the menus as far as [1. DRIVE MENU].
The parameters in the [1.1 SIMPLY START] submenu must be configured and auto-tuning performed before the motor is started up.

Display	
Schneider Electric **ATV61HU22N4** 2.2kW/3HP 380/480V Config. n°1	Display for 3 seconds following power-up
3 seconds ↓	
5 LANGUAGE English Français ✓ Deutsch Español Italiano Chinese Turkish Russian	Switches to [5 LANGUAGE] menu automatically. Select the language and press ENT.
↓	
RDY Term +0.00 Hz REM 2 ACCESS LEVEL Basic Standard ✓ Advanced Expert	Switches to [2 ACCESS LEVEL] menu (see page 26) Select the access level and press ENT.
↓	
RDY Term +0.00 Hz REM 1 DRIVE MENU 1.1 SIMPLY START 1.2. MONITORING 1.3. SETTINGS 1.4. MOTOR CONTROL 1.5. INPUTS / OUTPUTS CFG Code << >> T/K	Switches to [1 DRIVE MENU] (see page 22)
ESC ↓	
RDY Term +0.00 Hz REM MAIN MENU 1 DRIVE MENU 2 ACCESS LEVEL 3 OPEN / SAVE AS 4 PASSWORD 5 LANGUAGE Code T/K	Press ESC to return to [MAIN MENU]

Subsequent power ups

ATV61HU22N4
2.2kW/3HP 380/480V
Config. n°1

3 seconds later, switches to [1. DRIVE MENU] or to [1.14 PROGRAMMABLE CARD].

3 seconds

RDY	Term	+38Hz	REM
1. DRIVE MENU			
1.1 SIMPLY START			
1.2 MONITORING			
1.3 SETTINGS			
1.4 MOTOR CONTROL			
1.5 INPUTS / OUTPUTS CFG			
Code	<<	>>	T/K

or, if the Controller Inside card is present

RDY	Term	+0.00Hz	REM
1.14 PROGRAMMABLE CARD			
Modbus add Prg C.			:17
DATE/TIME SETTINGS			
	<<	>>	T/K

If no operator inputs are made, switches to "Display" automatically 10 seconds later (the display will vary depending on the selected configuration).

10 seconds

RDY	Term	+38Hz	REM
Frequency ref.			
38 Hz			
Min=0		Max=60	
			T/K

ENT

RDY	Term	+0.00 Hz	REM
1.3 SETTINGS			
Ramp increment:			01
Acceleration			9.51 s
Deceleration:			9.67 s
Acceleration 2:			12.58 s
Deceleration 2:			13.45 s
Code	<<	>>	T/K

Menu selected in [Power up menu] page 237

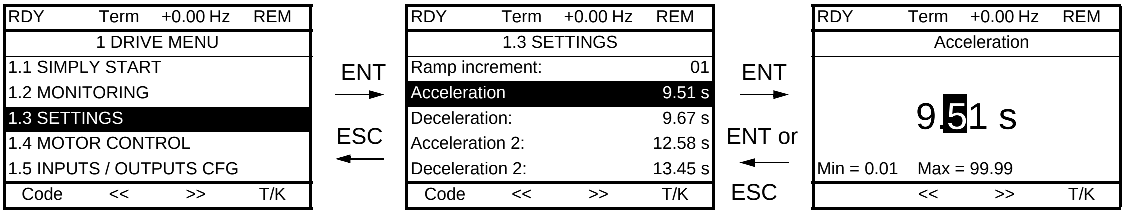
ESC

Users can return to [MAIN MENU] by pressing ENT or ESC.

RDY	Term	+38Hz	REM
MAIN MENU			
1 DRIVE MENU			
2 ACCESS LEVEL			
3 OPEN / SAVE AS			
4 PASSWORD			
5 LANGUAGE			
Code			T/K

Programming: Example of accessing a parameter

Accessing the acceleration ramp



Note:

- To select a parameter:
  - Turn the navigation button to scroll vertically.
- To modify a parameter:
  - Use the << and >> keys (F2 and F3) to scroll horizontally and select the digit to be modified (the selected digit changes to white on a black background).
  - Turn the navigation button to modify the digit.
- To cancel the modification:
  - Press ESC.
- To save the modification:
  - Press the navigation button (ENT).

Quick navigation

In order to access this function you must first reassign the F4 key, which is assigned by default to control via the terminal (T/K) (see page 120).
If the “Quick” function is displayed above the F4 key, you can gain quick access to a parameter from any screen.

Example:

RDY Term +0.00 Hz REM	
1.4 MOTOR CONTROL	
Standard mot. freq:	5 0 Hz IEC
Rated motor power:	0.37 kW (0.5 HP)
Rated motor volt.:	206 V
Rated mot. current:	1.0 A
Rated motor freq.:	50.0 Hz
Code << >> Quick	

Press F4 to access the Quick screen, which contains 4 selection options.

RDY Term +0.00 Hz REM
QUICK NAVIGATION
RETURN TO MAIN MENU
DIRECT ACCESS TO...
10 LAST MODIFICATIONS
GOTO MULTIPOINT SCREEN
Code

ENT

See page 238

- [HOME]: Return to [MAIN MENU].

RDY Term +0.00 Hz REM
MAIN MENU
1 DRIVE MENU
2 ACCESS LEVEL
3 OPEN / SAVE AS
4 PASSWORD
5 LANGUAGE
Code Quick

- [DIRECT ACCESS TO...]: Opens the direct access window, which will contain the text “1”. The function keys << and >> (F2 and F3) can be used to select each of the numbers and the navigation button to increment or decrement the numbers: 1.3 in the example below.

RDY Term +0.00 Hz REM
DIRECT ACCESS TO...
1.3
SETTINGS
<< >>

ENT

RDY Term +0.00 Hz REM	
1.3 SETTINGS	
Ramp increment:	01
Acceleration	9.51 s
Deceleration:	9.67 s
Acceleration 2:	12.58 s
Deceleration 2:	13.45 s
Code << >> Quick	

- [10 LAST MODIFICATIONS]: Opens a window in which the last 10 parameters modified can be accessed directly.

RDY Term +0.00 Hz REM	
10 LAST MODIFICATIONS	
Acceleration:	10 s
Speed prop. gain:	25%
Rated mot. current:	15 A
Preset speed 4:	20 Hz
Preset speed 5:	30 Hz
Code	

ENT
ESC

RDY Term +0.00 Hz REM
Rated mot. current
15.0 A
<< >>

[MAIN MENU] – Menu mapping

RDY Term +0.00 Hz REM
MAIN MENU
1 DRIVE MENU
2 ACCESS LEVEL
3 OPEN / SAVE AS
4 PASSWORD
5 LANGUAGE
Code T/K
6 MONITORING CONFIG.
7 DISPLAY CONFIG.

RDY Term +0.00 Hz REM
1 DRIVE MENU
1.1 SIMPLY START
1.2 MONITORING
1.3 SETTINGS
1.4 MOTOR CONTROL
1.5 INPUTS / OUTPUTS CFG
Code << >> T/K
1.6 COMMAND
1.7 APPLICATION FUNCT.
1.8 FAULT MANAGEMENT
1.9 COMMUNICATION
1.10 DIAGNOSTICS
1.11 IDENTIFICATION
1.12 FACTORY SETTINGS
1.13 USER MENU
1.14 PROGRAMMABLE CARD

Content of [MAIN MENU] menus

[1 DRIVE MENU]	See next page
[2 ACCESS LEVEL]	Defines which menus can be accessed (level of complexity)
[3 OPEN / SAVE AS]	Can be used to save and recover drive configuration files
[4 PASSWORD]	Provides password protection for the configuration
[5 LANGUAGE]	Language selection
[6 MONITORING CONFIG.]	Customization of information displayed on the graphic display terminal during operation
[7 DISPLAY CONFIG.]	• Customization of parameters • Creation of a customized user menu • Customization of the visibility and protection mechanisms for menus and parameters

[1 DRIVE MENU]

RDY	Term	+0.00 Hz	REM
	1 DRIVE MENU		
1.1 SIMPLY START			
1.2 MONITORING			
1.3 SETTINGS			
1.4 MOTOR CONTROL			
1.5 INPUTS / OUTPUTS CFG			
Code	<<	>>	T/K

1.6 COMMAND
1.7 APPLICATION FUNCT.
1.8 FAULT MANAGEMENT
1.9 COMMUNICATION
1.10 DIAGNOSTICS
1.11 IDENTIFICATION
1.12 FACTORY SETTINGS
1.13 USER MENU
1.14 PROGRAMMABLE CARD

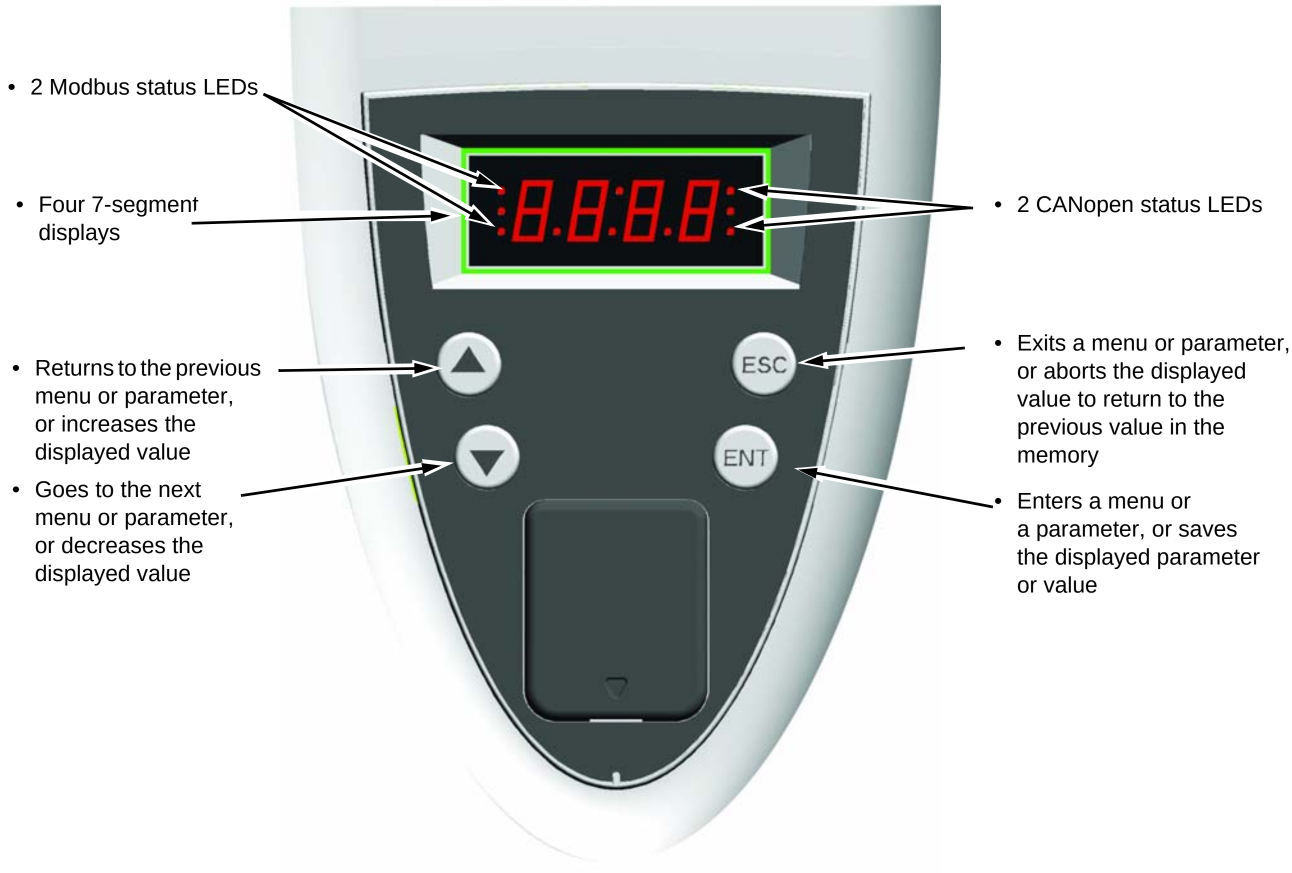
Content of [1. DRIVE MENU] menus:

[1.1 SIMPLY START]:	Simplified menu for fast startup
[1.2 MONITORING]:	Visualization of current, motor and input/output values
[1.3 SETTINGS]:	Accesses the adjustment parameters, which can be modified during operation
[1.4 MOTOR CONTROL]:	Motor parameters (motor nameplate, auto-tuning, switching frequency, control algorithms, etc.)
[1.5 INPUTS / OUTPUTS CFG]:	I/O configuration (scaling, filtering, 2-wire control, 3-wire control, etc.)
[1.6 COMMAND]:	Configuration of command and reference channels (graphic display terminal, terminals, bus, etc.)
[1.7 APPLICATION FUNCT.]:	Configuration of application functions (e.g., preset speeds, PID, etc.)
[1.8 FAULT MANAGEMENT]:	Configuration of fault management
[1.9 COMMUNICATION]:	Communication parameters (fieldbus)
[1.10 DIAGNOSTICS]:	Motor/drive diagnostics
[1.11 IDENTIFICATION]:	Identification of the drive and internal options
[1.12 FACTORY SETTINGS]:	Access to configuration files and return to factory settings
[1.13 USER MENU]:	Specific menu set up by the user in the [7. DISPLAY CONFIG.] menu
[1.14 CONTROL. INSIDE CARD]:	Configuration of optional Controller Inside card

Integrated display terminal

Low-power Altivar 61 drives (see catalog) feature an integrated display terminal with a 7-segment 4-digit display. The graphic display terminal described on the previous pages can also be connected to these drives as an option.

Functions of the display and the keys



Note: **• Pressing ▲ or ▼ does not store the selection.**

• Press and hold down (>2 s) ▲ or ▼ to scroll through the data quickly.

Save and store the selection: ENT

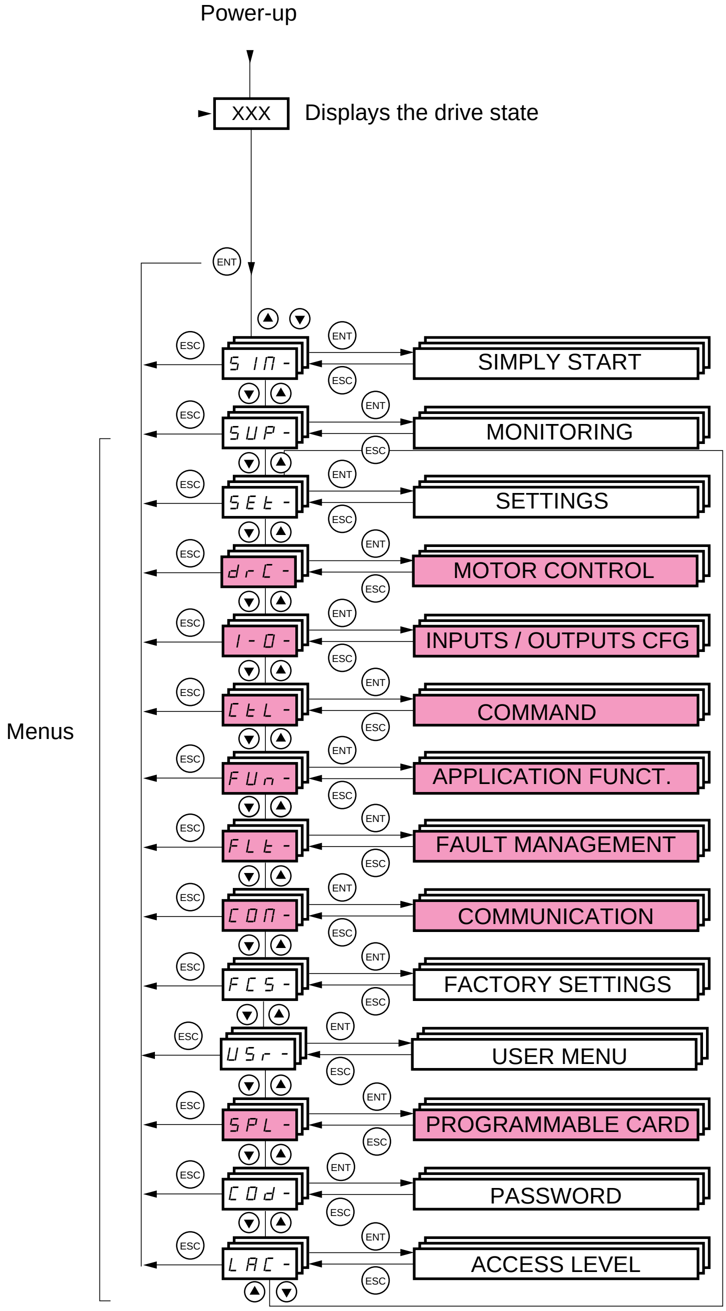
The display flashes when a value is stored.

Normal display, with no fault present and no startup:

- 43.0: Display of the parameter selected in the SUP menu (default selection: motor frequency)
- CLI: Current limit
- CtL: Controlled stop on input phase loss
- dCb: DC injection braking in progress
- FLU: Motor fluxing in progress
- FRF: Drive at fallback speed
- FSt: Fast stop
- nLP: No line power (no line supply on L1, L2, L3)
- nSt: Freewheel stop
- Obr: Auto-adapted deceleration
- PrA: Power Removal function active (drive locked)
- rdY: Drive ready
- SOC: Controlled output cut in progress
- tUn: Auto-tuning in progress
- USA: Undervoltage alarm

The display flashes to indicate the presence of a fault.

Accessing menus



(page 32) Simplified menu for fast startup

(page 38) Visualization of current, motor and input/output values

(page 47) Adjustment parameters, can be modified during operation

(page 66) Motor parameters (motor nameplate, auto-tuning, switching frequency, control algorithms, etc.)

(page 79) I/O configuration (scaling, filtering, 2-wire control, 3-wire control, etc.)

(page 108) Configuration of command and reference channels (graphic display terminal, terminals, bus, etc.)

(page 121) Configuration of application functions (e.g., preset speeds, PID, etc.)

(page 187) Configuration of fault management

(page 213) Communication parameters (fieldbus)

(page 220) Access to configuration files and return to factory settings

(page 223) Specific menu, set up by the user using the graphic display terminal.

(page 224) Menu for the Controller Inside card, if present.

(page 227)

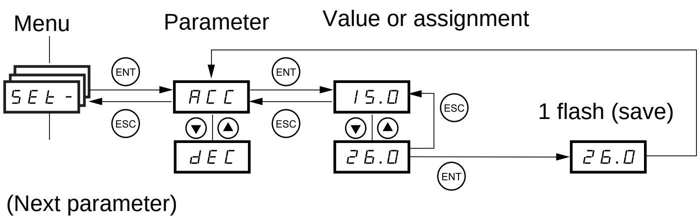
(page 26)

A dash appears after menu and submenu codes to differentiate them from parameter codes.
Examples: FUn- menu, ACC parameter.

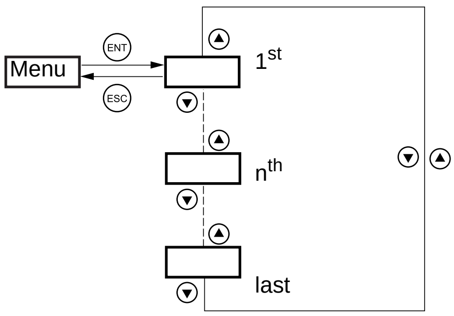
The grayed-out menus may not be accessible depending on the control access (LAC) configuration.

Accessing menu parameters

Save and store the displayed selection: ENT

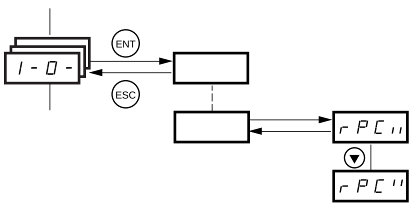


The display flashes when a value is stored.



All the menus are "drop-down scrolling" menus, which means that after the last parameter, if you continue to press ▼, you will return to the first parameter and, conversely, you can switch from the first parameter to the last parameter by pressing ▲.

Selection of multiple assignments for one parameter



Example: List of group 1 alarms in [INPUTS / OUTPUTS CFG] menu (I-O-)
A number of alarms can be selected by "checking" them as follows.

The digit on the right indicates:  selected

 not selected

The same principle is used for all multiple selections.

With graphic display terminal

RDY Term +0.00 Hz REM
2 ACCESS LEVEL
Basic
Standard ✓
Advanced
Expert
<< >> T/K

<u>Basic</u>
Access to 5 menus only, and access to 6 submenus only in the [1. DRIVE MENU] menu.
A single function can be assigned to each input.

RDY Term +0.00 Hz REM
MAIN MENU
1 DRIVE MENU
2 ACCESS LEVEL
3 OPEN / SAVE AS
4 PASSWORD
5 LANGUAGE
Code << >> T/K

RDY Term +0.00 Hz REM
1. DRIVE MENU
1.1 SIMPLY START
1.2. MONITORING
1.3. SETTINGS
1.11. IDENTIFICATION
1.12. FACTORY SETTINGS
Code << >> T/K
1.13 USER MENU

<u>Standard</u>
This is the factory-set level. Access to 6 menus only, and access to all submenus in the [1. DRIVE MENU] menu.
A single function can be assigned to each input.

RDY Term +0.00 Hz REM
MAIN MENU
1 DRIVE MENU
2 ACCESS LEVEL
3 OPEN / SAVE AS
4 PASSWORD
5 LANGUAGE
Code T/K
6 MONITORING CONFIG.

RDY Term +0.00 Hz REM
1 DRIVE MENU
1.1 SIMPLY START
1.2 MONITORING
1.3 SETTINGS
1.4 MOTOR CONTROL
1.5 INPUTS / OUTPUTS CFG
Code << >> T/K
1.6 COMMAND
1.7 APPLICATION FUNCT.
1.8 FAULT MANAGEMENT
1.9 COMMUNICATION
1.10 DIAGNOSTICS
1.11 IDENTIFICATION
1.12 FACTORY SETTINGS
1.13 USER MENU
1.14 PROGRAMMABLE CARD

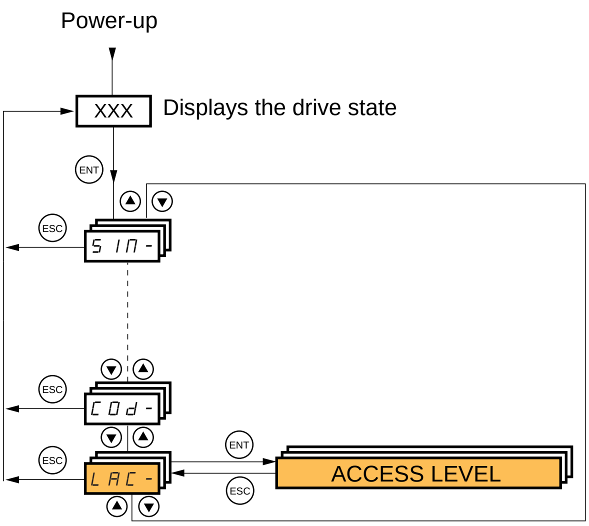
<u>Advanced</u>
Access to all menus and submenus.
Several functions can be assigned to each input.

RDY Term +0.00 Hz REM
MAIN MENU
1 DRIVE MENU
2 ACCESS LEVEL
3 OPEN / SAVE AS
4 PASSWORD
5 LANGUAGE
Code T/K
6 MONITORING CONFIG.
7 DISPLAY CONFIG.

<u>Expert</u>
Access to all menus and submenus as for [Advanced] level, and access to additional parameters.
Several functions can be assigned to each input.

RDY Term +0.00 Hz REM
MAIN MENU
1 DRIVE MENU
2 ACCESS LEVEL
3 OPEN / SAVE AS
4 PASSWORD
5 LANGUAGE
Code T/K
6 MONITORING CONFIG.
7 DISPLAY CONFIG.

With integrated display terminal:



Code	Name/Description	Factory setting
LAC-		Std
bAS	• bAS: Limited access to SIM, SUP, SEt, FCS, USr, COd and LAC menus. A single function can be assigned to each input.	
Std	• Std: Access to all menus on the integrated display terminal. A single function can be assigned to each input.	
AdU	• AdU: Access to all menus on the integrated display terminal. Several functions can be assigned to each input.	
EPr	• EPr: Access to all menus on the integrated display terminal and access to additional parameters. Several functions can be assigned to each input.	

Comparison of the menus that can be accessed on the graphic display terminal/ integrated display terminal

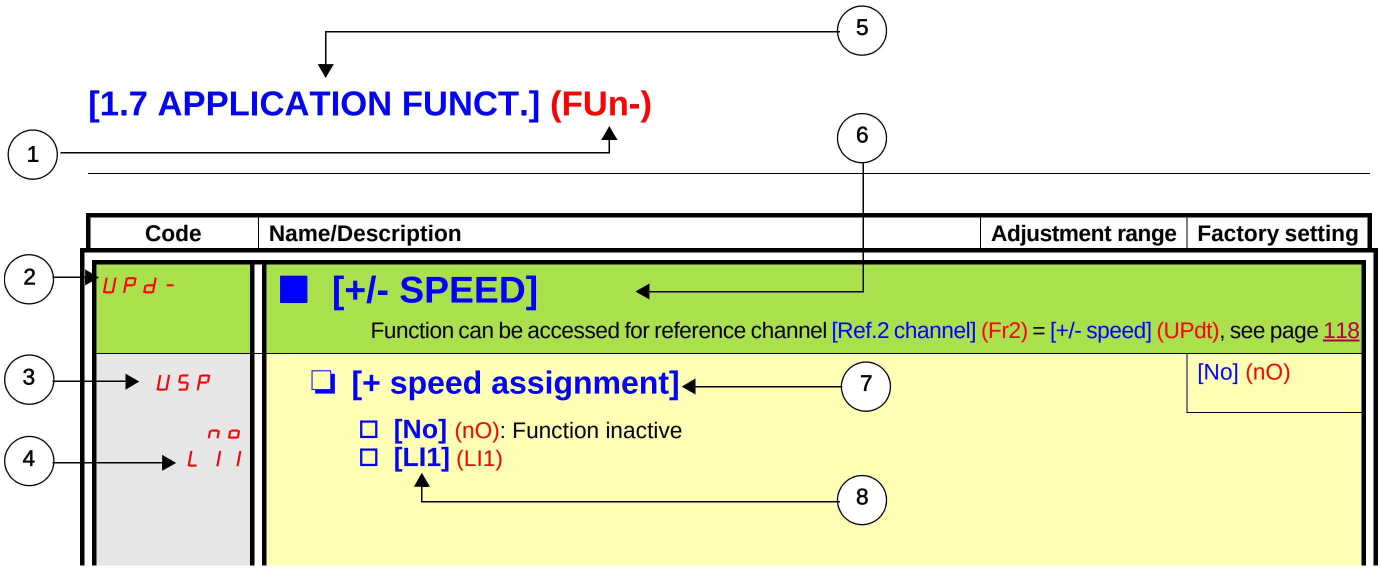
Graphic display terminal		Integrated display terminal	Access level
[2 ACCESS LEVEL]		LAC- (Access level)	Basic bAS
[3. OPEN / SAVE AS]		-	
[4 PASSWORD]		COd- (Password)	
[5 LANGUAGE]		-	
[1 DRIVE MENU]	[1.1 SIMPLY START]	SIM- (Simply start)	
	[1.2 MONITORING]	SUP- (Monitoring)	
	[1.3 SETTINGS]	SEt- (Settings)	
	[1.11 IDENTIFICATION]	-	
	[1.12 FACTORY SETTINGS]	FCS- (Factory settings)	
	[1.13 USER MENU]	USr- (User menu)	
A single function can be assigned to each input.		A single function can be assigned to each input.	
	[1.4 MOTOR CONTROL]	drC- (Motor control)	Standard Std (factory setting)
	[1.5 INPUTS / OUTPUTS CFG]	I-O- (I/O configuration)	
	[1.6 COMMAND]	CtL- (Command)	
	[1.7 APPLICATION FUNCT.]	FUn- (Application functions)	
	[1.8 FAULT MANAGEMENT]	FLt- (Fault management)	
	[1.9 COMMUNICATION]	COM- (Communication)	
	[1.10 DIAGNOSTICS]	-	
	[1.14 PROGRAMMABLE CARD] (1)	PLC- (Controller Inside card) (1)	
[6 MONITORING CONFIG.]		-	
A single function can be assigned to each input.		A single function can be assigned to each input.	
[7 DISPLAY CONFIG.]		-	Advanced AdU
Several functions can be assigned to each input.		Several functions can be assigned to each input.	
Expert parameters		Expert parameters	Expert EPr
Several functions can be assigned to each input.		Several functions can be assigned to each input.	

(1) Can be accessed if the Controller Inside card is present.

Structure of parameter tables

The parameter tables in the descriptions of the various menus can be used with both the graphic display terminal and the integrated display terminal. They, therefore, contain information for these two terminals in accordance with the description below.

Example:



1. Name of menu on 4-digit 7-segment display
2. Submenu code on 4-digit 7-segment display
3. Parameter code on 4-digit 7-segment display
4. Parameter value on 4-digit 7-segment display
5. Name of menu on graphic display terminal
6. Name of submenu on graphic display terminal
7. Name of parameter on graphic display terminal
8. Value of parameter on graphic display terminal

☞ **Note:**

- The text in square brackets [ ] indicates what you will see on the graphic display terminal.
- The factory settings correspond to [Macro configuration] (CFG) = [Pumps.Fans] (PnF). This is the macro configuration set at the factory.

Interdependence of parameter values

The configuration of certain parameters modifies the adjustment range of other parameters, in order to reduce the risk of errors. **This may result in the modification of a factory setting or a value you have already selected.**

Example 1:

1. [Switching freq.] (SFr) page 75 set to 16 kHz.
2. [Sinus filter] (OFI), see page 75, set to [Yes] (YES) (and confirmed with "ENT") limits [Switching freq.] (SFr) to 8 kHz.

If you set [Sinus filter] (OFI) to [No] (nO), [Switching freq.] (SFr) will no longer be limited **but will remain at 8 kHz**. If you require 16 kHz, you must **reset** [Switching freq.] (SFr).

Example 2:

1. The factory setting of [Switching freq.] (SFr) page 75 remains unchanged at 2.5 kHz.
2. Setting [Sinus filter] (OFI) page 75 to [Yes] (YES) (and confirming with "ENT") changes the factory setting of [Switching freq.] (SFr) to 4 kHz.
3. If you set [Sinus filter] (OFI) to [No] (nO), [Switching freq.] (SFr) **will remain at 4 kHz**. If you require 2.5 kHz, you must **reset** [Switching freq.] (SFr).

Finding a parameter in this document

The following assistance with finding explanations on a parameter is provided:

- **With the integrated display terminal:** Direct use of the parameter code index, page 249, to find the page giving details of the displayed parameter.
- **With the graphic display terminal:** Select the required parameter and press F1 : [Code]. The parameter code is displayed instead of its name while the key is held down.

  Example: ACC

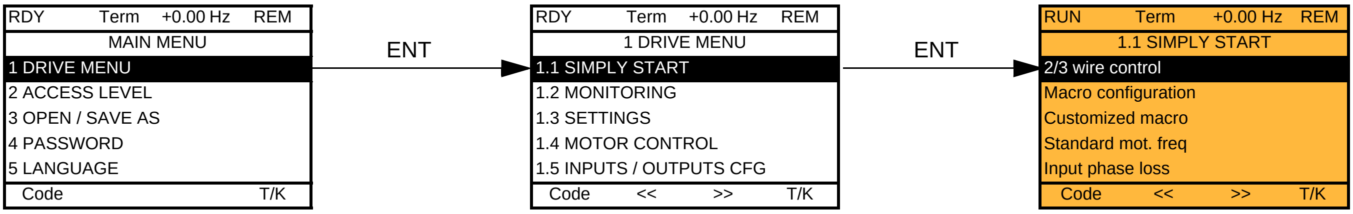
RDY Term +0.00 Hz REM	
1.3 SETTINGS	
Ramp increment:	01
Acceleration	9.51 s
Deceleration:	9.67 s
Acceleration 2:	12.58 s
Deceleration 2:	13.45 s
Code << >> T/K	

Code →

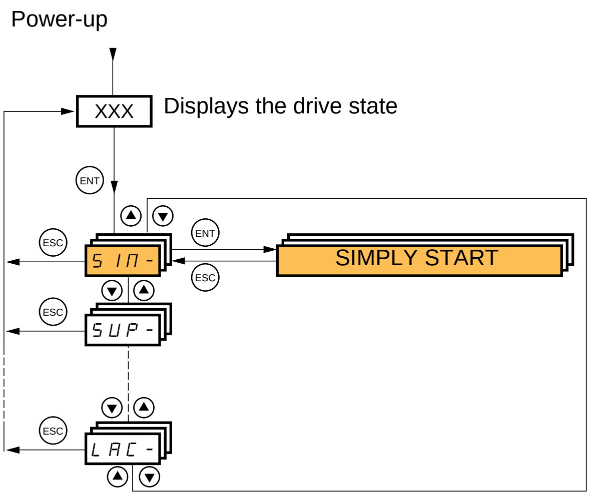
RDY Term +0.00 Hz REM	
1.3 SETTINGS	
Ramp increment:	01
ACC	9.51 s
Deceleration:	9.67 s
Acceleration 2:	12.58 s
Deceleration 2:	13.45 s
Code << >> T/K	

Then use the parameter code index, page 249, to find the page giving details of the displayed parameter.

With graphic display terminal:



With integrated display terminal:



The [1.1-SIMPLY START] (SIM-) menu can be used for fast startup, which is sufficient for the majority of applications.

The parameters in this menu can only be modified when the drive is stopped and no run command is present, with the following exceptions:

- Auto-tuning, which causes the motor to start up
- The adjustment parameters on page 37

Note: The parameters of the [1.1 SIMPLY START] (SIM-) menu must be entered in the order in which they appear, as the later ones are dependent on the first ones.
For example [2/3 wire control] (tCC) must be configured before any other parameters.

The [1.1 SIMPLY START] (SIM-) menu should be configured **on its own or before the other drive configuration menus**. If a modification has previously been made to any of them, in particular in [1.4 MOTOR CONTROL] (drC-), some [1.1 SIMPLY START] (SIM-) parameters may be changed, for example, the motor parameters, if a synchronous motor has been selected. Returning to the [1.1 SIMPLY START] (SIM-) menu after modifying another drive configuration menu **is unnecessary** but does not pose any risk. Changes following modification of another configuration menu **are not described**, to avoid unnecessary complication in this section.

Macro configuration

Macro configuration provides a means of speeding up the configuration of functions for a specific field of application.
5 macro configurations are available:

- Start/stop
- General use
- PID regulator
- Communication bus
- Pumps/fans (factory configuration)

Selecting a macro configuration assigns the parameters in this macro configuration.

Each macro configuration can still be modified in the other menus.

Macro configuration parameters

Assignment of the inputs/outputs

Input/ output	[Start/Stop]	[Gen. Use]	[PID regul.]	[Network C.]	[Pumps.Fans]
AI1	[Ref.1 channel]	[Ref.1 channel]	[Ref.1 channel] (PID reference)	[Ref.2 channel] ([Ref.1 channel] = integrated Modbus) (1)	[Ref.1 channel]
AI2	[No]	[Summing ref. 2]	[PID feedback]	[No]	[Ref.1B channel]
AO1	[No]	[No]	[No]	[No]	[No]
R1	[No drive flt]	[No drive flt]	[No drive flt]	[No drive flt]	[No drive flt]
R2	[No]	[No]	[No]	[No]	[Drv running]
LI1 (2-wire)	[Forward]	[Forward]	[Forward]	[Forward]	[Forward]
LI2 (2-wire)	[Fault reset]	[Reverse]	[Fault reset]	[Fault reset]	[No]
LI3 (2-wire)	[No]	[Jog]	[PID integral reset]	[Ref. 2 switching]	[Ref 1B switching]
LI4 (2-wire)	[No]	[Fault reset]	[2 preset PID ref.]	[Forced local]	[Fault reset]
LI5 (2-wire)	[No]	[Torque limitation]	[4 preset PID ref.]	[No]	[No]
LI6 (2-wire)	[No]	[No]	[No]	[No]	[No]
LI1 (3-wire)	Stop	Stop	Stop	Stop	Stop
LI2 (3-wire)	[Forward]	[Forward]	[Forward]	[Forward]	[Forward]
LI3 (3-wire)	[Fault reset]	[Reverse]	[Fault reset]	[Fault reset]	[No]
LI4 (3-wire)	[No]	[Jog]	[PID integral reset]	[Ref. 2 switching]	[Ref 1B switching]
LI5 (3-wire)	[No]	[Fault reset]	[2 preset PID ref.]	[Forced local]	[Fault reset]
LI6 (3-wire)	[No]	[Torque limitation]	[4 preset PID ref.]	[No]	[No]
Option cards					
LI7 to LI14	[No]	[No]	[No]	[No]	[No]
LO1 to LO4	[No]	[No]	[No]	[No]	[No]
R3/R4	[No]	[No]	[No]	[No]	[No]
AI3, AI4	[No]	[No]	[No]	[No]	[No]
RP	[No]	[No]	[No]	[No]	[No]
AO2	[I motor]	[I motor]	[I motor]	[I motor]	[I motor]
AO3	[No]	[No]	[PID Output]	[No]	[No]
Graphic display terminal keys					
F1 key	[No]	[No]	[No]	[No]	[No]
F2, F3 keys	[No]	[No]	[No]	[No]	[No]
F4 key	[T/K] (Control via graphic display terminal)	[T/K] (Control via graphic display terminal)	[T/K] (Control via graphic display terminal)	[T/K] (Control via graphic display terminal)	[T/K] (Control via graphic display terminal)

In 3-wire control, the assignment of inputs LI1 to LI7 shifts.

(1) To start up with integrated Modbus, [Modbus Address] (Add) must first be configured, page 215.

Note: These assignments are reinitialized every time the macro configuration changes.

Return to factory settings:
Returning to factory settings with [Config. source] (FCSI) = [Macro-Conf] (InI) page 222 will restore the selected macro configuration. The [Macro configuration] (CFG) parameter does not change, although [Customized macro] (CCFG) disappears.

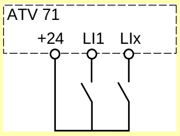
Note:
- The factory settings in the parameter tables correspond to [Macro configuration] (CFG) = [Pumps.Fans] (PnF). This is the macro configuration set at the factory.

Code	Name/Description	Adjustment range	Factory setting
tCC	❑ **[2/3 wire control]**		[2 wire] (2C)

2C — ☐ **[2 wire]** (2C)
3C — ☐ **[3 wire]** (3C)

2-wire control: This is the input state (0 or 1) or edge (0 to 1 or 1 to 0), which controls running or stopping.

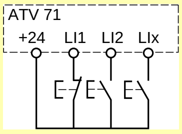
Example of “source” wiring:



LI1: forward
LIx: reverse

3-wire control (pulse control): A “forward” or “reverse” pulse is sufficient to command starting, a “stop” pulse is sufficient to command stopping.

Example of “source” wiring:



LI1: stop
LI2: forward
LIx: reverse

WARNING

UNINTENDED EQUIPMENT OPERATION

To change the assignment of [2/3 wire control] (tCC) press the “ENT” key for 2 s.
The following function will be returned to factory settings: [2 wire type] (tCt) page 80 as will all functions which assign logic inputs.
The macro configuration selected will also be reset if it has been customized (loss of custom settings).
Check that this change is compatible with the wiring diagram used.
Failure to follow these instructions can result in death or serious injury.

Code	Name/Description	Adjustment range	Factory setting
CFG	❑ **[Macro configuration]**		[Pumps.Fans] (PnF)

StS — ☐ **[Start/Stop]** (StS): Start/stop
GEn — ☐ **[Gen. Use]** (GEn): General use
PId — ☐ **[PID regul.]** (PId): PID regulation
nEt — ☐ **[Network C.]** (nEt): Communication bus
PnF — ☐ **[Pumps.Fans]** (PnF): Pumps/fans

WARNING

UNINTENDED EQUIPMENT OPERATION

To change the assignment of [Macro configuration] (CFG) press the “ENT” key for 2 s.
Check that the selected macro configuration is compatible with the wiring diagram used.
Failure to follow these instructions can result in death or serious injury.

Code	Name/Description	Adjustment range	Factory setting
CCFG	❑ **[Customized macro]**		

Read-only parameter, only visible if at least one macro configuration parameter has been modified.
YES — ☐ **[Yes]** (YES)

Code	Name/Description	Adjustment range	Factory setting
bFr 50 60	❑ **[Standard mot. freq]** ☐ **[50Hz IEC]** (50): IEC. ☐ **[60Hz NEMA]** (60): NEMA. This parameter modifies the presets of the following parameters: [Rated motor power] (nPr), [Rated motor volt.] (UnS), [Rated drive current] (nCr), [Rated motor freq.] (FrS), [Rated motor speed] (nSP), and [Max frequency] (tFr) below, [Mot. therm. current] (ItH) page 37, [High speed] (HSP) page 37.		[50Hz IEC] (50)
IPL nO YES	❑ **[Input phase loss]** ☐ **[Ignore]** (nO): Fault ignored, to be used when the drive is supplied via a single-phase supply or by the DC bus. ☐ **[Freewheel]** (YES): Fault, with freewheel stop. If one phase disappears, the drive switches to fault mode [Input phase loss] (IPL) but if 2 or 3 phases disappear, the drive continues to operate until it trips on an undervoltage fault. This parameter is only accessible in this menu on ATV61H037M3 to HU75M3 drives (used with a single phase supply).		According to drive rating
nPr	❑ **[Rated motor power]** Rated motor power given on the nameplate, in kW if [Standard mot. freq] (bFr) = [50 Hz IEC] (50), in HP if [Standard mot. freq] (bFr) = [60 Hz NEMA] (60).	According to drive rating	According to drive rating
UnS	❑ **[Rated motor volt.]** Rated motor voltage given on the nameplate. ATV61●●●M3: 100 to 240 V - ATV61●●●N4: 200 to 480 V - ATV61●●●S6X: 400 to 600 V - ATV61●●●Y: 400 to 690 V.	According to drive rating	According to drive rating and [Standard mot. freq] (bFr)
nCr	❑ **[Rated mot. current]** Rated motor current given on the nameplate.	0.25 to 1.1 or 1.2 Hz according to rating (1)	According to drive rating and [Standard mot. freq] (bFr)
FrS	❑ **[Rated motor freq.]** Rated motor frequency given on the nameplate. The factory setting is 50 Hz, or preset to 60 Hz if [Standard mot. freq] (bFr) is set to 60 Hz.	10 to 500 or 1,000 Hz according to rating	50 Hz
nSP	❑ **[Rated motor speed]** Rated motor speed given on the nameplate. 0 to 9,999 rpm then 10.00 to 60.00 krpm on the integrated display terminal. If, rather than the rated speed, the nameplate indicates the synchronous speed and the slip in Hz or as a %, calculate the rated speed as follows: • Nominal speed = Synchronous speed x $\frac{100 - \text{slip as a \%}}{100}$ or • Nominal speed = Synchronous speed x $\frac{50 - \text{slip in Hz}}{50}$ (50 Hz motors) or • Nominal speed = Synchronous speed x $\frac{60 - \text{slip in Hz}}{60}$ (60 Hz motors)	0 to 60,000 rpm	According to drive rating
tFr	❑ **[Max frequency]** The factory setting is 60 Hz, or preset to 72 Hz if [Standard mot. freq] (bFr) is set to 60 Hz. The maximum value is limited by the following conditions: • It must not exceed 10 times the value of [Rated motor freq.] (FrS) • Values between 500 Hz and 1000 Hz are not possible for ATV61H●●●Y (500 to 690 V) • Values between 500 Hz and 1,000 Hz are only possible in V/F control and for powers limited to 37 kW (50 HP) for ATV61H ●●● and 45 kW (60 HP) for ATV61W●●●. In this case, configure [Motor control type] (Ctt) before [Max frequency] (tFr).	10 to 500 or 1,000 Hz according to rating	60 Hz

(1) In corresponds to the rated drive current indicated in the Installation Manual and on the drive nameplate.

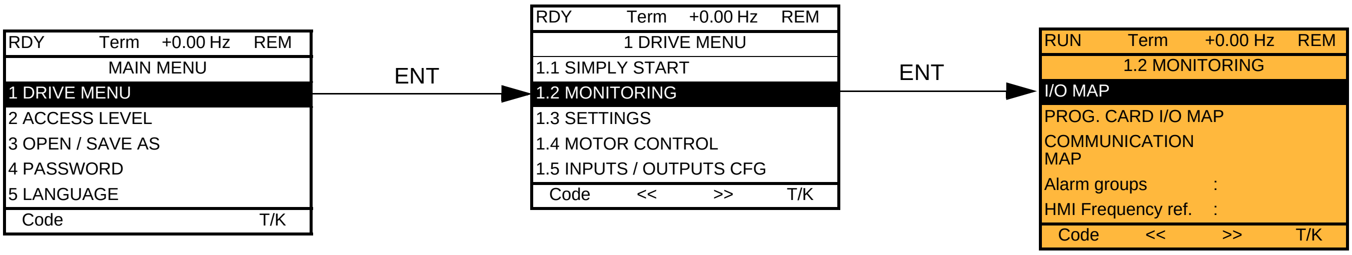
Code	Name/Description	Factory setting
tUn	❑ **[Auto tuning]**	[No] (nO)
nO	☐ **[No]** (nO): Auto-tuning not performed.	
YES	☐ **[Yes]** (YES): Auto-tuning is performed as soon as possible, then the parameter automatically changes to [Done] (dOnE).	
dOnE	☐ **[Done]** (dOnE): Use of the values given the last time auto-tuning was performed. **Caution:** • It is essential that all motor parameters ([Rated motor volt.] (UnS), [Rated motor freq.] (FrS), [Rated mot. current] (nCr), [Rated motor speed] (nSP), [Rated motor power] (nPr)) are configured correctly before starting auto-tuning. If one or more of these parameters is modified after auto-tuning has been performed, [Auto tuning] (tUn) will return to [No] (nO) and the procedure must be repeated. • Auto-tuning is only performed if no stop command has been activated. If a "freewheel stop" or "fast stop" function has been assigned to a logic input, this input must be set to 1 (active at 0). • Auto-tuning takes priority over any run or prefluxing commands, which will be taken into account after the auto-tuning sequence. • If auto-tuning fails, the drive displays [No] (nO) and, depending on the configuration of [Autotune fault mgt] (tnL) page 206, may switch to [Auto-tuning] (tnF) fault mode. • Auto-tuning may last for 1 to 2 seconds. Do not interrupt the process. Wait for the display to change to "[Done] (dOnE)" or "[No] (nO)". **Note:** During auto-tuning the motor operates at rated current.	
tUS	❑ **[Auto tuning status]** (for information only, cannot be modified)	[Not done] (tAb)
tAb	☐ **[Not done]** (tAb): The default stator resistance value is used to control the motor.	
PEnd	☐ **[Pending]** (PEnd): Auto-tuning has been requested but not yet performed.	
PrOG	☐ **[In Progress]** (PrOG): Auto-tuning in progress.	
FAIL	☐ **[Failed]** (FAIL): Auto-tuning has failed.	
dOnE	☐ **[Done]** (dOnE): The stator resistance measured by the auto-tuning function is used to control the motor.	
PHr	❑ **[Output Ph rotation]**	[ABC] (AbC)
AbC	☐ **[ABC]** (AbC): Forward	
ACb	☐ **[ACB]** (ACb): Reverse This parameter can be used to reverse the direction of rotation of the motor without reversing the wiring.	

Parameters that can be changed during operation or when stopped

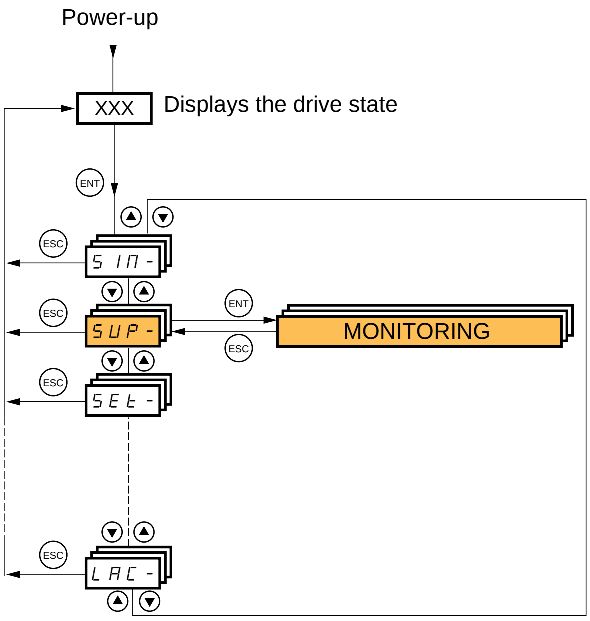
Code	Name/Description	Adjustment range	Factory setting
ItH	❑ **[Mot. therm. current]** Motor thermal protection current, to be set to the rated current indicated on the nameplate.	0 to 1.1 or 1.2 In (1) according to rating	According to drive rating
ACC	❑ **[Acceleration]** Time to accelerate from 0 to the [Rated motor freq.] (FrS) (page 35). Make sure that this value is compatible with the inertia being driven.	0.1 to 999.9 s	3.0 s
dEC	❑ **[Deceleration]** Time to decelerate from the [Rated motor freq.] (FrS) (page 35) to 0. Make sure that this value is compatible with the inertia being driven.	0.1 to 999.9 s	3.0 s
LSP	❑ **[Low speed]** Motor frequency at minimum reference, can be set between 0 and [High speed] (HSP).		0
HSP	❑ **[High speed]** Motor frequency at maximum reference, can be set between [Low speed] (LSP) and [Max frequency] (tFr). The factory setting changes to 60 Hz if [Standard mot. freq] (bFr) = [60Hz NEMA] (60).		50 Hz

(1) In corresponds to the rated drive current indicated in the Installation Manual and on the drive nameplate.

With graphic display terminal:



With integrated display terminal:



With graphic display terminal

This menu can be used to display the inputs/outputs, the drive internal states and values, and the communication data and values.

RUN Term +50.00 Hz REM
1.2 MONITORING
I/O MAP
PROG. CARD I/O MAP
COMMUNICATION MAP
Alarm groups:
HMI Frequency ref.:
Code << >> T/K

I/O
I/O of the Controller Inside card if it is present
Communication data and values
Drive internal drive states and values (see page 44)

I/O

RUN Term +50.00 Hz REM
I/O MAP
LOGIC INPUT MAP
ANALOG INPUTS IMAGE
LOGIC OUTPUT MAP
ANALOG OUTPUTS IMAGE
FREQ. SIGNAL IMAGE
Code T/K

Move from one screen to another
(from LOGIC INPUT MAP
to FREQ. SIGNAL IMAGE)
by turning the navigation button

State 0
State 1

RUN Term-{}- +50.00 Hz REM
LOGIC INPUT MAP
PR LI1 LI2 LI3 LI4 LI5 LI6 LI7
1
0
LI8 LI9 LI10 LI11 LI12 LI13 LI14
1
0
<< >> T/K

Access to the selected input
or output configuration:
Press ENT.

RUN Term +50.00 Hz REM
LI1 assignment
Forward
Pre Fluxing
LI1 On Delay : 0 ms
<< >> T/K

RUN Term +50.00 Hz REM
ANALOG INPUTS IMAGE
AI1 : 9.87 V
AI2 : 2.35 mA
Code << >> T/K

ENT

RUN Term +50.00 Hz REM
AI1 assignment
Ref.1 channel
Forced local
Torque reference
AI1 min value : 0.0 V
AI1 max value : 10.0 V
T/K

State 0
State 1

RUN Term +50.00 Hz REM
LOGIC OUTPUT MAP
R1 R2 LO
LOA: 0000000000000010b
<< >> T/K

ENT

RUN Term +50.00 Hz REM
LO1 assignment
No
LO1 delay time : 0 ms
LO1 active at : 1
LO1 holding time : 0 ms
<< >> T/K

RUN Term +50.00 Hz REM
ANALOG OUTPUTS IMAGE
AO1 : 9.87 V
Code << >> T/K

ENT

RUN Term +50.00 Hz REM
AO1 assignment
Motor freq.
AO1 min output : 4 mA
AO1 max output : 20 mA
AO1 Filter : 10 ms
T/K

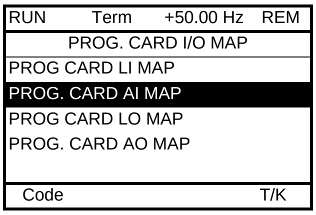
RUN Term +50.00 Hz REM
FREQ. SIGNAL IMAGE
RP input : 25.45 kHz
Encoder : 225 kHz
Code << >> T/K

ENT

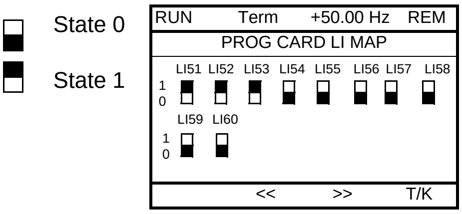
RUN Term +50.00 Hz REM
RP assignment
Frequency ref.
RP min value : 2 kHz
RP max value : 50 kHz
RP filter : 0 ms
T/K

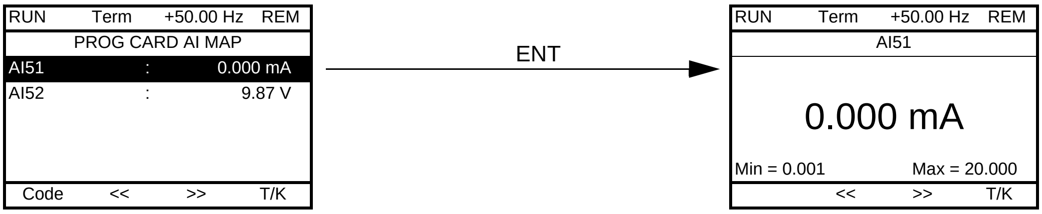
With graphic display terminal

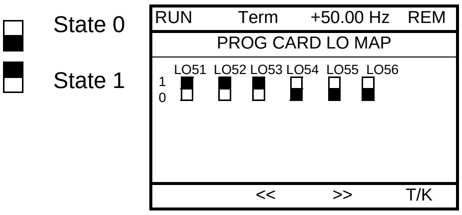
Controller Inside card I/O

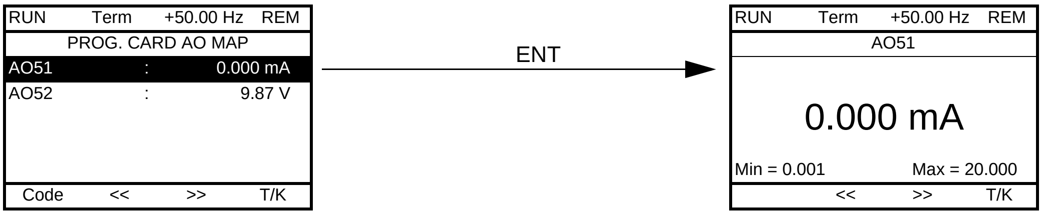


Move from one screen to another
(from PROG CARD LI MAP
to PROG. CARD AO MAP)
by turning the navigation button









With graphic display terminal

Communication

[COMMUNICATION MAP] indicates the types of bus used for control or reference, the corresponding command and reference values, the status word, the words selected in the [DISPLAY CONFIG] menu, etc.
The display format (hexadecimal or decimal) can be configured in the [DISPLAY CONFIG.] menu.

RUN Term +50.00 Hz REM	
COMMUNICATION MAP	
Command Channel:	Modbus
Cmd value:	ABCD Hex
Active ref. channel:	CANopen
Frequency ref.:	- 12.5 Hz
ETA status word:	2153 Hex
Code	T/K

W3141: F230 Hex
W2050: F230 Hex
W4325: F230 Hex
W0894: F230 Hex
COM. SCANNER INPUT MAP
COM SCAN OUTPUT MAP
CMD. WORD IMAGE
FREQ. REF. WORD MAP
MODBUS NETWORK DIAG
MODBUS HMI DIAG
CANopen MAP
PROG. CARD SCANNER

RUN Term +50.00 Hz REM	
COM. SCANNER INPUT MAP	
Com Scan In1 val.:	0
Com Scan In2 val.:	0
Com Scan In3 val.:	0
Com Scan In4 val.:	0
Com Scan In5 val.:	0
Code	T/K
Com Scan In6 val.:	0
Com Scan In7 val.:	0
Com Scan In8 val.:	0

RUN Term +50.00 Hz REM	
COM SCAN OUTPUT MAP	
Com Scan Out1 val.:	0
Com Scan Out2 val.:	0
Com Scan Out3 val.:	0
Com Scan Out4 val.:	0
Com Scan Out5 val.:	0
Code	T/K
Com Scan Out6 val.:	0
Com Scan Out7 val.:	0
Com Scan Out8 val.:	0

RUN Term +50.00 Hz REM	
CMD. WORD IMAGE	
Modbus cmd.:	0000 Hex.
CANopen cmd.:	0000 Hex.
COM. card cmd.:	0000 Hex.
Prog. card cmd:	0000 Hex.
Code	T/K

RUN Term +50.00 Hz REM	
FREQ. REF. WORD MAP	
Modbus ref.:	0.0 Hz
CANopen ref.:	0.0 Hz
Ref. Com. card:	0.0 Hz
Prog. Card ref:	0.0 Hz
Code	T/K

[COM. SCANNER INPUT MAP] and [COM SCAN OUTPUT MAP]:
Visualization of registers exchanged periodically (8 input and 8 output) for integrated Modbus and for fieldbus cards.

With graphic display terminal

Communication (continued)

RUN	Term	+50.00 Hz	REM
COMMUNICATION MAP			
Command Channel:		Modbus	
Cmd value:		ABCD Hex	
Active ref. channel:		CANopen	
Frequency ref.:		- 12.5 Hz	
ETA status word:		2153 Hex	
Code			T/K

W3141 : F230 Hex
W2050 : F230 Hex
W4325 : F230 Hex
W0894 : F230 Hex
COM. SCANNER INPUT MAP
COM SCAN OUTPUT MAP
CMD. WORD IMAGE
FREQ. REF. WORD MAP
MODBUS NETWORK DIAG
MODBUS HMI DIAG
CANopen MAP
PROG. CARD SCANNER

The state of the LEDs, the periodic data, the address, the speed, and the format, etc,. is given for each bus.

⊗ LED off
LED on

Communication via Modbus

RUN	Term	+50.00 Hz	REM
MODBUS NETWORK DIAG			
COM LED :			⊗
Mb NET frames nb.			
Mb NET CRC errors			
Code			T/K

Communication via the graphic display terminal

RUN	Term	+50.00 Hz	REM
MODBUS HMI DIAG			
COM LED :			(LED on)
Mb HMI frames nb.			
Mb HMI CRC errors			
Code			T/K

Communication via CANopen

RUN	Term	+50.00 Hz	REM
CANopen MAP			
RUN LED :			⊗
ERR LED :			⊗
PDO1 IMAGE			
PDO2 IMAGE			
PDO3 IMAGE			
Code			T/K

Canopen NMT state
Number of TX PDO 0
Number of RX PDO 0
Error codes 0
RX Error Counter 0
TX Error Counter 0

PDO images are only visible if CANopen has been enabled (address other than OFF) and if the PDOs are active.

PDO configuration using the network tool.
Some PDOs cannot be used.

RUN	Term	+50.00 Hz	REM
PDO1 IMAGE			
Received PDO1-1		: FDBA Hex	
Received PDO1-2			
Received PDO1-3			
Received PDO1-4			
Transmit PDO1-1		: FDBA Hex	
Code			T/K

Transmit PDO1-2
Transmit PDO1-3
Transmit PDO1-4

RUN	Term	+50.00 Hz	REM
PDO2 IMAGE			
Received PDO2-1		: FDBA Hex	
Received PDO2-2			
Received PDO2-3			
Received PDO2-4			
Transmit PDO2-1		: FDBA Hex	
Code			T/K

Transmit PDO2-2
Transmit PDO2-3
Transmit PDO2-4

RUN	Term	+50.00 Hz	REM
PDO3 IMAGE			
Received PDO3-1		: FDBA Hex	
Received PDO3-2			
Received PDO3-3			
Received PDO3-4			
Transmit PDO3-1		: FDBA Hex	
Code			T/K

Transmit PDO3-2
Transmit PDO3-3
Transmit PDO3-4

With graphic display terminal

Communication (continued)

RUN	Term	+50.00 Hz	REM
COMMUNICATION MAP			
Command Channel:		Modbus	
Cmd value:		ABCD Hex	
Active ref. channel:		CANopen	
Frequency ref.:		- 12.5 Hz	
ETA status word:		2153 Hex	
Code			T/K
W3141	: F230 Hex		
W2050	: F230 Hex		
W4325	: F230 Hex		
W0894	: F230 Hex		
COM. SCANNER INPUT MAP			
COM SCAN OUTPUT MAP			
CMD. WORD IMAGE			
FREQ. REF. WORD MAP			
MODBUS NETWORK DIAG			
MODBUS HMI DIAG			
CANopen MAP			
PROG. CARD SCANNER			

Controller Inside card

RUN	Term	+50.00 Hz	REM
PROG. CARD SCANNER			
Input scanner			
Output scanner			
Code			T/K

RUN	Term	+50.00 Hz	REM
Input scanner			
Prg.card. scan in 1:			0
Prg.card. scan in 2:			0
Prg.card. scan in 3:			0
Prg.card. scan in 4:			0
Prg.card. scan in 5:			0
Code			T/K
Prg.card. scan in 6:			0
Prg.card. scan in 7:			0
Prg.card. scan in 8:			0

RUN	Term	+50.00 Hz	REM
Output scanner			
Prog.card.scan Out1:			0
Prog.card.scan Out2:			0
Prog.card.scan Out3:			0
Prog.card.scan Out4:			0
Prog.card.scan Out5:			0
Code			T/K
Prog.card.scan Out6:			0
Prog.card.scan Out7:			0
Prog.card.scan Out8:			0

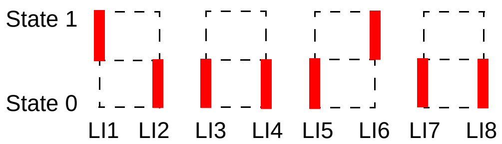
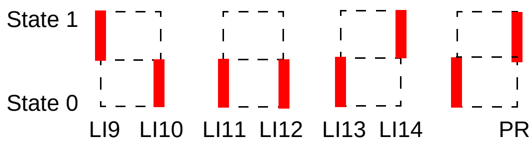
[Input scanner] and [Output scanner]:
Visualization of registers exchanged periodically (8 input and 8 output).

With graphic display terminal: Drive internal states and values

Name/Description	
[Alarm groups] (ALGr)	Current alarm group numbers
[HMI Frequency ref.] (LFr)	in Hz. Frequency reference via the graphic display terminal (can be accessed if the function has been configured)
[Internal PID ref.] (rPI)	as a process value. PID reference via graphic display terminal (can be accessed if the function has been configured)
[Multiplying coeff.] (MFr)	as a % (can be accessed if [Multiplier ref. -] (MA2,MA3) page 128 has been assigned)
[Frequency ref.] (FrH)	in Hz
[Output frequency] (rFr)	in Hz
[Measured output fr.] (MMF)	in Hz: The measured motor speed is displayed if an encoder card has been inserted, otherwise 0 appears.
[Pulse in. work. freq.] (FqS)	in Hz: Frequency of the "Pulse input" input used by the [FREQUENCY METER] (FqF-) function, page 205
[Motor current] (LCr)	in A
[Motor speed] (SPd)	in rpm
[Motor voltage] (UOP)	in V
[Motor power] (OPr)	as a % of the rated power
[Motor torque] (Otr)	as a % of the rated torque
[Mains voltage] (ULn)	in V. Line voltage from the point of view of the DC bus, motor running or stopped
[Motor thermal state] (tHr)	as a %
[Drv. thermal state] (tHd)	as a %
[DBR thermal state] (tHb)	as a % (can only be accessed on high rating drives)
[Input Power] (IPr)	in kW (electrical power consumed by the drive)
[Consumption] (IPHr)	in Wh, kWh or MWh (accumulated electrical consumption of drive)
[Run time] (rtH)	in seconds, minutes or hours (length of time the motor has been switched on)
[Power on time] (PtH)	in seconds, minutes or hours (length of time the drive has been switched on)
[Proc. Operat. Time] (PEt)	in hours (length of time the process has been switched on) This parameter can be initialized by the user if the drive is replaced, in order to maintain a record of previous times.
[IGBT alarm counter] (tAC)	in seconds (length of time the "IGBT temperature" alarm has been active)
[PID reference] (rPC)	as a process value (can be accessed if the PID function has been configured)
[PID feedback] (rPF)	as a process value (can be accessed if the PID function has been configured)
[PID error] (rPE)	as a process value (can be accessed if the PID function has been configured)
[PID Output] (rPO)	in Hz (can be accessed if the PID function has been configured)
[Date/Time] (CLO)	Current date and time generated by the Controller Inside card (can be accessed if the card has been inserted)
[- - - - 2] (o02) to [- - - - 6] (o06)	Words generated by the Controller Inside card (can be accessed if the card has been inserted)
[Config. active] (CnFS)	Active configuration [Config. n°0, 1 or 2]
[Utilised param. set] (CFPS)	[Set n°1, 2 or 3] (can be accessed if parameter switching has been enabled, see page 174)
[ALARMS] (ALr-)	List of current alarms. If an alarm is present, a ✓ appears.
[OTHER STATUS] (SSt-)	List of secondary states: - [In motor fluxing] (FLX): In motor fluxing - [PTC1 alarm] (PtC1): Probe alarm 1 - [PTC2 alarm] (PtC2): Probe alarm 2 - [LI6=PTC alarm] (PtC3): LI6 = PTC probe alarm - [Fast stop in prog.] (FSt): Fast stop in progress - [Current Th. attained] (CtA): Current threshold attained ([Current threshold] (Ctd) page 59) - [Freq. Th. attained] (FtA): Frequency threshold attained ([Freq. threshold] (Ftd) page 59) - [Freq. Th. 2 attained] (F2A): 2nd frequency threshold attained ([Freq. threshold 2] (F2d) page 59) - [Frequency ref. att.] (SrA): Frequency reference attained - [Motor th. state att.] (tSA): Motor 1 thermal state attained - [External fault alarm] (EtF): External fault alarm - [Auto restart] (AUtO): Automatic restart in progress - [Remote] (FtL): Line mode control - [Auto-tuning] (tUn): Performing auto-tuning - [Undervoltage] (USA): Undervoltage alarm - [Cnfg.1 act.] (CnF1): Configuration 1 active - [Cnfg.2 act.] (CnF2): Configuration 2 active - [HSP attained] (FLA): High speed attained - [Set 1 active] (CFP1): Parameter set 1 active - [Set 2 active] (CFP2): Parameter set 2 active - [Set 3 active] (CFP3): Parameter set 3 active - [In braking] (brS): Drive braking - [DC bus loading] (dbL): DC bus loading - [Forward] (MFrd): Motor running forward - [Reverse] (MrrS): Motor running in reverse - [High torque alarm] (ttHA): Motor torque greater than high threshold [High torque thd.] (ttH) page 59. - [Low torque alarm] (ttLA): Motor torque less than low threshold [Low torque thd.] (ttL) page 59. - [Freq. meter Alarm] (FqLA): Measured speed threshold attained: [Pulse warning thd.] (FqL) page 59.

With integrated display terminal

This menu can be used to display the drive inputs, states and internal values.

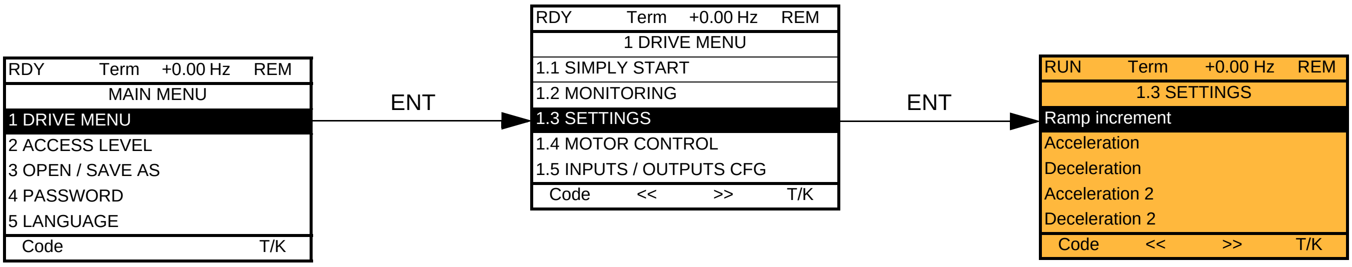
Code	Name/Description	Adjustment range	Factory setting
IOM-	**I/O MAP**		
LIA-	■ **Logic input functions**		
L1A to L14A	Can be used to display the functions assigned to each input. If no functions have been assigned, nO is displayed. Use the ▲ and ▼ arrows to scroll through the functions. If a number of functions have been assigned to the same input, check that they are compatible.		
LIS1	■ **State of logic inputs LI1 to LI8**		
	Can be used to visualize the state of logic inputs LI1 to LI8 (display segment assignment: high = 1, low = 0)  Example above: LI1 and LI6 are at 1; LI2 to LI5, LI7 and LI8 are at 0.		
LIS2	■ **State of logic inputs LI9 to LI14 and Power Removal**		
	Can be used to visualize the state of logic inputs LI19to LI14 and PR (Power Removal) (display segment assignment: high = 1, low = 0)  Example above: LI9 and LI14 are at 1, LI10 to LI13 are at 0 and PR (Power Removal) is at 1.		
AIA-	■ **Analog input functions**		
AI1A AI2A AI3A AI4A	Can be used to display the functions assigned to each input. If no functions have been assigned, nO is displayed. Use the ▲ and ▼ arrows to scroll through the functions. If a number of functions have been assigned to the same input, check that they are compatible.		

With integrated display terminal: Drive internal states and values

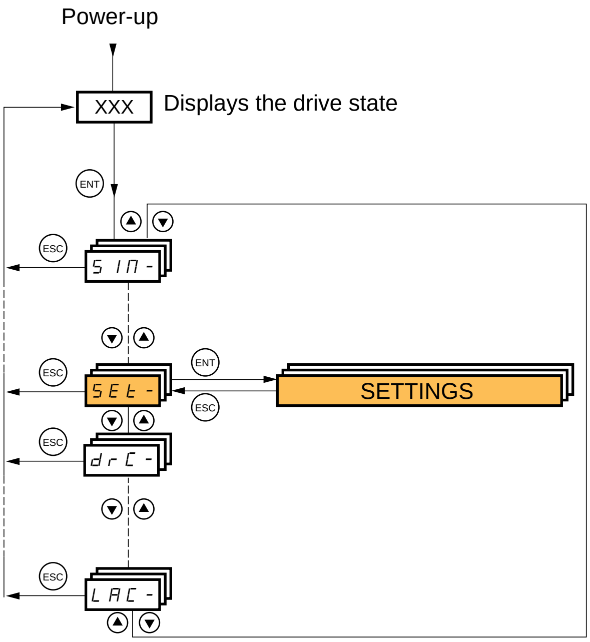
Code	Name/Description	Unit
ALGr	**Alarm groups:** Current alarm group numbers	
rPI	**Internal PID reference:** PID reference via graphic display terminal (can be accessed if the function has been configured).	as a process value
MFr	**Multiplication coefficient** (can be accessed if [Multiplier ref. -] (MA2,MA3) page 128 has been assigned)	%
FrH	**Frequency ref.**	Hz
rFr	**Output frequency**	Hz
MMF	**The measured motor speed is displayed** if an encoder card has been inserted, otherwise 0 appears.	Hz
FqS	**Frequency of the "Pulse input"** used by the **[FREQUENCY METER] (FqF-)** function, page 205	Hz
LCr	**Motor current**	A
SPd	**Motor speed**	rpm
UOP	**Motor voltage**	V
OPr	**Motor power**	%
Otr	**Motor torque**	%
ULn	**Line voltage:** Line voltage from the point of view of the DC bus, motor running or stopped.	V
tHr	**Motor thermal state**	%
tHd	**Drive thermal state**	%
tHb	**DBR thermal state:** Accessible on high rating drives only.	%
IPr	**Electrical power consumed by the drive**	W or kW
IPHr	**Accumulated electrical consumption of drive**	Wh, kWh or MWh
rtH	**Run time:** Length of time the motor has been turned on	seconds, minutes or hours
PtH	**Power on time:** Length of time the drive has been turned on	
PEt	**Length of time the process has been turned on:** in hours. This parameter can be initialized by the user if the drive is replaced, in order to maintain a record of previous times.	hours
tAC	**IGBT alarm counter:** Length of time the “IGBT temperature” alarm has been active	seconds
rPC	**PID reference:** Can be accessed if the PID function has been configured	as a process value
rPF	**PID feedback:** Can be accessed if the PID function has been configured	
rPE	**PID error:** Can be accessed if the PID function has been configured	
rPO	**PID Output:** Can be accessed if the PID function has been configured	Hz
CLO-	**tIME, dAY:** Current date and time generated by the Controller Inside card (can be accessed if the card has been inserted)	
o02	**- - - - 2:** Word generated by the Controller Inside card (can be accessed if the card has been inserted)	
o03	**- - - - 3:** Word generated by the Controller Inside card (can be accessed if the card has been inserted)	
o04	**- - - - 4:** Word generated by the Controller Inside card (can be accessed if the card has been inserted)	
o05	**- - - - 5:** Word generated by the Controller Inside card (can be accessed if the card has been inserted)	
o06	**- - - - 6:** Word generated by the Controller Inside card (can be accessed if the card has been inserted)	
CnFS	**Config. active:** CnF0, 1 or 2 (can be accessed if motor or configuration switching has been enabled, see page 179)	
CFPS	**Utilised param. set:** CFP1, 2 or 3 (can be accessed if parameter switching has been enabled, see page 174)	

[1.3 SETTINGS] (SEt-)

With graphic display terminal:



With integrated display terminal:



The adjustment parameters can be modified with the drive running or stopped.

⚠ DANGER

UNINTENDED EQUIPMENT OPERATION

- Check that changes made to the settings during operation do not present any danger.
- We recommend stopping the drive before making any changes.

Failure to follow these instructions will result in death or serious injury.

Code	Name/Description	Adjustment range	Factory setting
Inr	❑ **[Ramp increment]**	0.01 - 0.1 - 1	0.1
0.01 0.1 1	❑ **[0.01]**: Ramp up to 99.99 seconds ❑ **[0.1]**: Ramp up to 999.9 seconds ❑ **[1]**: Ramp up to 9,000 seconds This parameter is valid for [Acceleration] (ACC), [Deceleration] (dEC), [Acceleration 2] (AC2) and [Deceleration 2] (dE2).		
ACC	❑ **[Acceleration]** Time to accelerate from 0 to the [Rated motor freq.] (FrS) (page 64). Make sure that this value is compatible with the inertia being driven.	0.01 to 9,000 s (1)	3.0 s
dEC	❑ **[Deceleration]** Time to decelerate from the [Rated motor freq.] (FrS) (page 64) to 0. Make sure that this value is compatible with the inertia being driven.	0.01 to 9,000 s (1)	3.0 s
AC2 ★	❑ **[Acceleration 2]** See page 131 Time to accelerate from 0 to the [Rated motor freq.] (FrS). Make sure that this value is compatible with the inertia being driven.	0.01 to 9,000 s (1)	5.0 s
dE2 ★	❑ **[Deceleration 2]** See page 131 Time to decelerate from the [Rated motor freq.] (FrS) to 0. Make sure that this value is compatible with the inertia being driven.	0.01 to 9,000 s (1)	5.0 s
tA1 ★	❑ **[Begin Acc round]** See page 130 Rounding of start of acceleration ramp as a % of the [Acceleration] (ACC) or [Acceleration 2] (AC2) ramp time.	0 to 100%	10%
tA2 ★	❑ **[End Acc round]** See page 130 - Rounding of end of acceleration ramp as a % of the [Acceleration] (ACC) or [Acceleration 2] (AC2) ramp time. - Can be set between 0 and (100% – [Begin Acc round] (tA1))		10%
tA3 ★	❑ **[Begin Dec round]** See page 130 Rounding of start of deceleration ramp as a % of the [Deceleration] (dEC) or [Deceleration 2] (dE2) ramp time.	0 to 100%	10%

(1) Range 0.01 to 99.99 s or 0.1 to 999.9 s or 1 to 9,000 s according to [Ramp increment] (Inr).

★	These parameters only appear if the corresponding function has been selected in another menu. When the parameters can also be accessed and adjusted from within the configuration menu for the corresponding function, their description is detailed in these menus, on the pages indicated, to aid programming.

Code	Name/Description	Adjustment range	Factory setting
tA4 ★	**[End Dec round]** See page 130 - Rounding of end of deceleration ramp as a % of the [Deceleration] (dEC) or [Deceleration 2] (dE2) ramp time. - Can be set between 0 and (100% – [Begin Dec round] (tA3))		10%
LSP	**[Low speed]** Motor frequency at minimum reference, can be set between 0 and [High speed] (HSP).		0 Hz
HSP	**[High speed]** Motor frequency at maximum reference, can be set between [Low speed] (LSP) and [Max frequency] (tFr). The factory setting changes to 60 Hz if [Standard mot. freq] (bFr) = [60 Hz NEMA] (60).		50 Hz
ItH	**[Mot. therm. current]** Motor thermal protection current, to be set to the rated current indicated on the nameplate.	0 to 1.1 or 1.2 In (1) according to rating	According to drive rating
SPG	**[Speed prop. gain]** Speed loop proportional gain	0 to 1,000%	40%
SIt	**[Speed time integral]** Speed loop integral time constant.	1 to 1,000%	100%
SFC	**[K speed loop filter]** Speed loop filter coefficient.	0 to 100	0

(1) In corresponds to the rated drive current indicated in the Installation Manual or on the drive nameplate.

★ These parameters only appear if the corresponding function has been selected in another menu. When the parameters can also be accessed and adjusted from within the configuration menu for the corresponding function, their description is detailed in these menus, on the pages indicated, to aid programming.

Adjusting the [K speed loop filter] (SFC), [Speed prop. gain] (SPG), and [Speed time integral] (SIt) parameters

- The following parameters can only be accessed in vector control profiles: [Motor control type] (Ctt) page 67 = [SVC V] (UUC), [Energy Sav.] (nLd) and [Sync. mot.] (SYn).
- The factory settings are suitable for most applications.

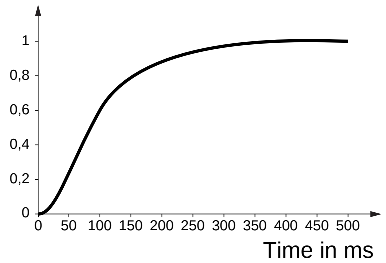
General case: Setting with [K speed loop filter] (SFC) = 0

The regulator is an “IP” type with filtering of the speed reference, for applications requiring flexibility and stability (high inertia, for example).

- [Speed prop. gain] (SPG) affects excessive speed.
- [Speed prop. gain] (SIt) affects the passband and response time.

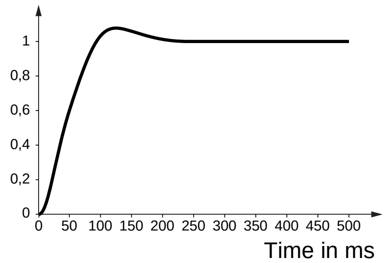
Initial response

Reference division



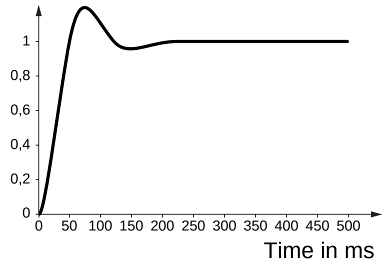
Reduction in SIT ↘

Reference division



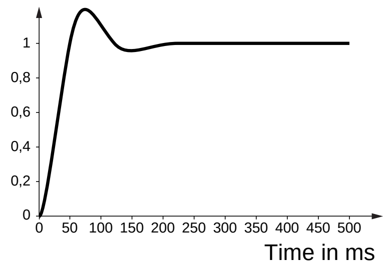
Reduction in SIT ↘↘

Reference division



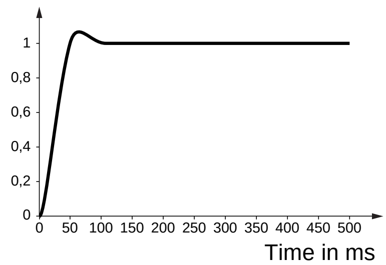
Initial response

Reference division



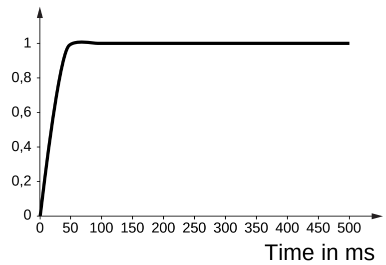
Increase in SPG ↗

Reference division



Increase in SPG ↗↗

Reference division



Special case: Parameter [K speed loop filter] (SFC) not 0

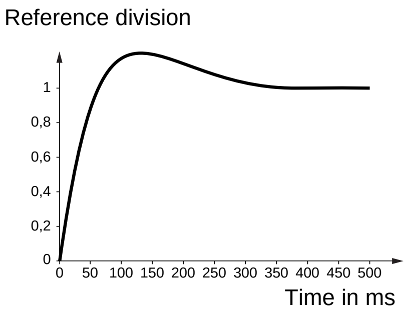
This parameter must be reserved for specific applications that require a short response time (trajectory positioning or servo control).

- When set to 100 as described above the regulator is a “PI” type, without filtering of the speed reference.
- Settings between 0 and 100 will obtain an intermediate function between the settings below and those on the previous page.

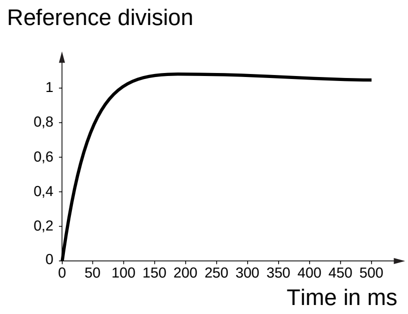
Example: Setting with [K speed loop filter] (SFC) = 100

- [Speed prop. gain] (SPG) affects the passband and response time.
- [Speed time integral] (SIt) affects excessive speed.

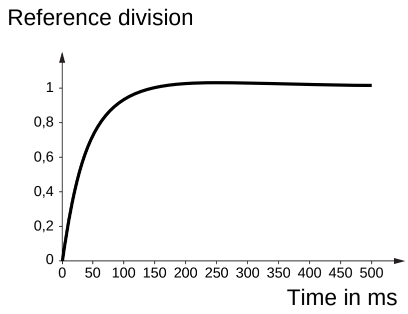
Initial response



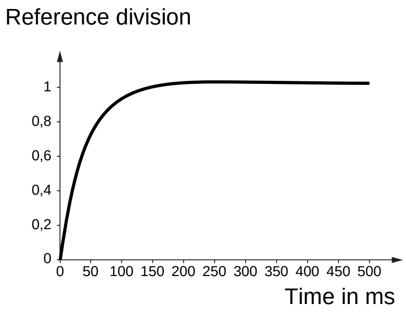
Reduction in SIT ↘



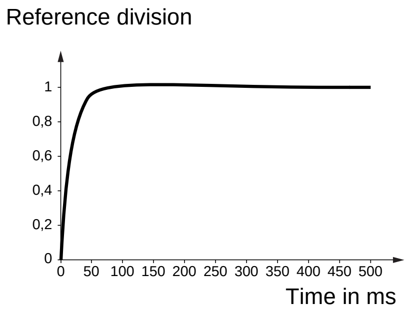
Reduction in SIT ↘↘



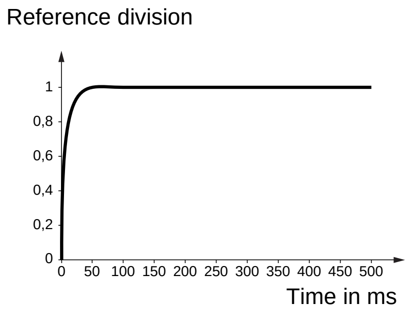
Initial response



Increase in SPG ↗



Increase in SPG ↗↗

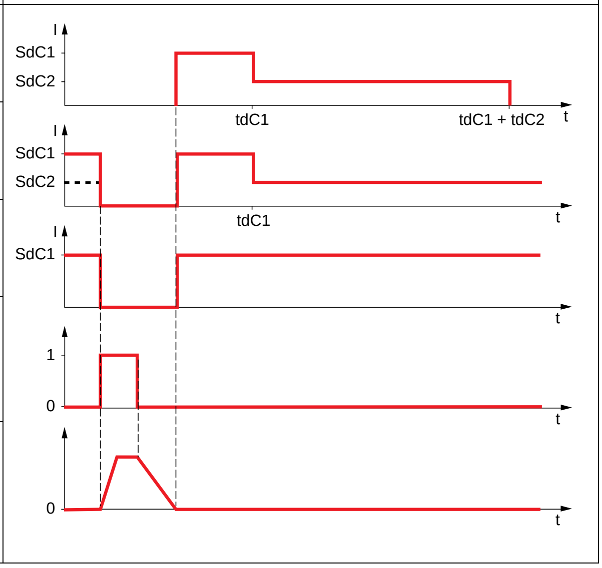


Code	Name/Description	Adjustment range	Factory setting
UFr ★	❑ **[IR compensation]** See page 71	25 to 200%	100%
SLP ★	❑ **[Slip compensation]** See page 71	0 to 300%	100%
dCF ★	❑ **[Ramp divider]** See page 133	0 to 10	4
IdC ★	❑ **[DC inject. level 1]** See page 134 Level of DC injection braking current activated via logic input or selected as stop mode. **CAUTION** Check that the motor will withstand this current without overheating. **Failure to follow these instructions can result in equipment damage.**	0.1 to 1.1 or 1.2 In (1) according to rating	0.64 In (1)
tdI ★	❑ **[DC injection time 1]** See page 134 Maximum current injection time [DC inject. level 1] (IdC). After this time the injection current becomes [DC inject. level 2] (IdC2).	0.1 to 30 s	0.5 s
IdC2 ★	❑ **[DC inject. level 2]** See page 134 Injection current activated by logic input or selected as stop mode, once period of time [DC injection time 1] (tdI) has elapsed. **CAUTION** Check that the motor will withstand this current without overheating. **Failure to follow these instructions can result in equipment damage.**	0.1 In (1) to [DC inject. level 1] (IdC)	0.5 In (1)
tdC ★	❑ **[DC injection time 2]** See page 134 Maximum injection time [DC inject. level 2] (IdC2) for injection selected as stop mode only.	0.1 to 30 s	0.5 s

(1) In corresponds to the rated drive current indicated in the Installation Manual or on the drive nameplate.

★	These parameters only appear if the corresponding function has been selected in another menu. When the parameters can also be accessed and adjusted from within the configuration menu for the corresponding function, their description is detailed in these menus, on the pages indicated, to aid programming.

Code	Name/Description	Adjustment range	Factory setting
SdC1 ★	❑ **[Auto DC inj. level 1]**	0 to 1.1 or 1.2 In (1) according to rating	0.7 In (1)
	Level of standstill DC injection current. This parameter can be accessed if [Auto DC injection] (AdC) page 135 is not [No] (nO). This parameter is forced to 0 if [Motor control type] (Ctt) page 67 = [Sync. mot.] (SYn). **CAUTION** Check that the motor will withstand this current without overheating. **Failure to follow these instructions can result in equipment damage.**		
tdC1 ★	❑ **[Auto DC inj. time 1]**	0.1 to 30 s	0.5 s
	Standstill injection time. This parameter can be accessed if [Auto DC injection] (AdC) page 135 is not [No] (nO) If [Motor control type] (Ctt) page 67 = [Sync. mot.] (SYn) this time corresponds to the zero speed maintenance time.		
SdC2 ★	❑ **[Auto DC inj. level 2]**	0 to 1.1 or 1.2 In (1) according to rating	0.5 In (1)
	2nd level of standstill DC injection current. This parameter can be accessed if [Auto DC injection] (AdC) page 135 is not [No] (nO). This parameter is forced to 0 if [Motor control type] (Ctt) page 67 = [Sync. mot.] (SYn). **CAUTION** Check that the motor will withstand this current without overheating. **Failure to follow these instructions can result in equipment damage.**		
tdC2 ★	❑ **[Auto DC inj. time 2]**	0 to 30 s	0 s
	2nd standstill injection time. This parameter can be accessed if [Auto DC injection] (AdC) page 135 = [Yes] (YES).		

AdC	SdC2	Operation
YES	x	
Ct	≠ 0	
Ct	= 0	
Run command		
Speed		

(1) In corresponds to the rated drive current indicated in the Installation Manual or on the drive nameplate.

★ These parameters only appear if the corresponding function has been selected in another menu. When the parameters can also be accessed and adjusted from within the configuration menu for the corresponding function, their description is detailed in these menus, on the pages indicated, to aid programming.

Code	Name/Description	Adjustment range	Factory setting
SFr	**[Switching freq.]**	According to rating	According to rating
	Switching frequency setting. Adjustment range: It can vary between 1 and 16 kHz, but the minimum and maximum values, as well as the factory setting, can be limited in accordance with the type of drive (ATV61H or W), the rating (power and voltage) and the configuration of the [Sinus filter] (OFI) and [Motor surge limit.] (SUL) parameters, page 75. Adjustment with drive running: - If the initial value is less than 2 kHz, it is not possible to increase it above 1.9 kHz while running. - If the initial value is greater than or equal to 2 kHz, a minimum of 2 kHz must be maintained while running. Adjustment with the drive stopped: No restrictions. **Note:** In the event of excessive temperature rise, the drive will automatically reduce the switching frequency and reset it once the temperature returns to normal. . **CAUTION** On ATV61●075N4 to U40N4 drives, if the RFI filters are disconnected (operation on an IT system), the switching frequency of the drive must not exceed 4 kHz. **Failure to follow this instruction can result in equipment damage.**		
CL1	**[Current Limitation]**	0 to 1.1 or 1.2 In (1) according to rating	1.1 or 1.2 In (1) according to rating
	Used to limit the motor current. **Note:** If the setting is less than 0.25 In, the drive may lock in [Output Phase Loss] (OPF) fault mode if this has been enabled (see page 194). If it is less than the no-load motor current, the limitation no longer has any effect. . **CAUTION** Check that the motor will withstand this current, particularly in the case of permanent magnet synchronous motors, which are susceptible to demagnetization. **Failure to follow this instruction can result in equipment damage.**		
CL2	**[I Limit. 2 value]**	0 to 1.1 or 1.2 In (1) according to rating	1.1 or 1.2 In (1) according to rating
★	See page 166 **Note:** If the setting is less than 0.25 In, the drive may lock in [Output Phase Loss] (OPF) fault mode if this has been enabled (see page 194). If it is less than the no-load motor current, the limitation no longer has any effect. . **CAUTION** Check that the motor will withstand this current, particularly in the case of permanent magnet synchronous motors, which are susceptible to demagnetization. **Failure to follow this instruction can result in equipment damage.**		

(1) In corresponds to the rated drive current indicated in the Installation Manual or on the drive nameplate.

★ These parameters only appear if the corresponding function has been selected in another menu. When the parameters can also be accessed and adjusted from within the configuration menu for the corresponding function, their description is detailed in these menus, on the pages indicated, to aid programming.

Code	Name/Description	Adjustment range	Factory setting
FLU FnC FCt FnO	❑ **[Motor fluxing]** ☐ **[Not cont.]** (FnC): Non-continuous mode ☐ **[Continuous]** (FCt): Continuous mode. This option is not possible if [Auto DC injection] (AdC) page 135 is [Yes] (YES) or if [Type of stop] (Stt) page 133 is [Freewheel] (nSt). ☐ **[No]** (FnO): Function inactive. At and above ATV61HD55M3X, ATV61HD90N4 and ATV61HC11Y, if [Motor control type] (Ctt) page 67 = [SVC V] (UUC) or [Energy Sav.] (nLd), this selection cannot be made and the factory setting is replaced by [Not cont.] (FnC). If [Motor control type] (Ctt) = [Sync. mot.] (SYn) the factory setting is replaced by [Not cont.] (FnC). In order to obtain rapid high torque on startup, magnetic flux needs to already have been established in the motor. • In [Continuous] (FCt) mode, the drive automatically builds up flux when it is powered up. • In [Not cont.] (FnC) mode, fluxing occurs when the motor starts up. The flux current is greater than nCr (configured rated motor current) when the flux is established and is then adjusted to the motor magnetizing current... **CAUTION** Check that the motor will withstand this current without overheating. **Failure to follow these instructions can result in equipment damage.** If [Motor control type] (Ctt) page 67 = [Sync. mot.] (SYn), the [Motor fluxing] (FLU) parameter causes the alignment of the rotor and not the fluxing.		[No] (FnO)
tLS	❑ **[Low speed time out]** Maximum operating time at [Low speed] (LSP) (see page 37) Following operation at LSP + SLE for a defined period, a motor stop is requested automatically. The motor restarts if the reference is greater than LSP + SLE and if a run command is still present. Caution: Value 0 corresponds to an unlimited period. **Note:** If [Low speed time out] (tLS) is not 0, [Type of stop] (Stt) page 133 is forced to [Ramp stop] (rMP) (only if a ramp stop can be configured).	0 to 999.9 s	0 s
SLE	❑ **[Sleep Offset Thres.]** Adjustable restart threshold (offset) following a stop after prolonged operation at [Low speed] (LSP) + [Sleep Offset Thres.] (SLE), in Hz. The motor restarts if the reference rises above (LSP + SLE) and if a run command is still present.	0 to 500 or 1,000 according to rating	1 Hz
JGF ★	❑ **[Jog frequency]** See page 137 Reference in jog operation	0 to 10 Hz	10 Hz
JGt ★	❑ **[Jog delay]** See page 137 Anti-repeat delay between 2 consecutive jog operations.	0 to 2.0 s	0.5 s

★ These parameters only appear if the corresponding function has been selected in another menu. When the parameters can also be accessed and adjusted from within the configuration menu for the corresponding function, their description is detailed in these menus, on the pages indicated, to aid programming.

Code	Name/Description	Adjustment range	Factory setting
SP2 ★	❑ **[Preset speed 2]** See page 140 Preset speed 2	0 to 500 or 1,000 Hz according to rating	10 Hz
SP3 ★	❑ **[Preset speed 3]** See page 140 Preset speed 3	0 to 500 or 1,000 Hz according to rating	15 Hz
SP4 ★	❑ **[Preset speed 4]** See page 140 Preset speed 4	0 to 500 or 1,000 Hz according to rating	20 Hz
SP5 ★	❑ **[Preset speed 5]** See page 140 Preset speed 5	0 to 500 or 1,000 Hz according to rating	25 Hz
SP6 ★	❑ **[Preset speed 6]** See page 140 Preset speed 6	0 to 500 or 1,000 Hz according to rating	30 Hz
SP7 ★	❑ **[Preset speed 7]** See page 140 Preset speed 7	0 to 500 or 1,000 Hz according to rating	35 Hz
SP8 ★	❑ **[Preset speed 8]** See page 140 Preset speed 8 The factory setting changes to 60 Hz if [Standard mot. freq] (bFr) = [60 Hz NEMA] (60).	0 to 500 or 1,000 Hz according to rating	50 Hz

★ These parameters only appear if the corresponding function has been selected in another menu. When the parameters can also be accessed and adjusted from within the configuration menu for the corresponding function, their description is detailed in these menus, on the pages indicated, to aid programming.

Code	Name/Description	Adjustment range	Factory setting
SrP ★	❑ **[+/-Speed limitation]** See page 144 Limitation of +/- speed variation	0 to 50%	10%
rPG ★	❑ **[PID prop. gain]** See page 151 Proportional gain	0.01 to 100	1
rIG ★	❑ **[PID integral gain]** See page 152 Integral gain	0.01 to 100	1
rdG ★	❑ **[PID derivative gain]** See page 152 Derivative gain	0.00 to 100	0
PrP ★	❑ **[PID ramp]** See page 152 PID acceleration/deceleration ramp, defined to go from [Min PID reference] (PIP1) to [Max PID reference] (PIP2) and vice versa.	0 to 99.9 s	3.0 s
POL ★	❑ **[Min PID output]** See page 152 Minimum value of regulator output in Hz	-500 to 500 or -1,000 to 1,000 according to rating	0 Hz
POH ★	❑ **[Max PID output]** See page 152 Maximum value of regulator output in Hz	0 to 500 or 1,000 according to rating	60 Hz
PAL ★	❑ **[Min fbk alarm]** See page 152 Minimum monitoring threshold for regulator feedback	See page 152 (1)	100
PAH ★	❑ **[Max fbk alarm]** See page 152 Maximum monitoring threshold for regulator feedback	See page 152 (1)	1,000

(1) If a graphic display terminal is not in use, values greater than 9,999 will be displayed on the 4-digit display with a period mark after the thousand digit, e.g. 15.65 for 15,650.

★ These parameters only appear if the corresponding function has been selected in another menu. When the parameters can also be accessed and adjusted from within the configuration menu for the corresponding function, their description is detailed in these menus, on the pages indicated, to aid programming.

Code	Name/Description	Adjustment range	Factory setting
PEr ★	❑ **[PID error Alarm]** See page 152 Regulator error monitoring threshold.	0 to 65,535 (1)	100
PSr ★	❑ **[Speed input%]** See page 153 Multiplying coefficient for predictive speed input.	1 to 100%	100%
rP2 ★	❑ **[Preset ref. PID 2]** See page 156 Preset PID reference	See page 156 (1)	300
rP3 ★	❑ **[Preset ref. PID 3]** See page 156 Preset PID reference	See page 156 (1)	600
rP4 ★	❑ **[Preset ref. PID 4]** See page 156 Preset PID reference	See page 156 (1)	900
LPI ★ nO -	❑ **[PID Threshold]** See page 155 PID regulator feedback supervision threshold (alarm can be assigned to a relay or a logic output, page 94). Adjustment range: ☐ **[No]** (nO): Function inactive ☐ between [Min PID feedback] (PIF1) and [Max PID feedback] (PIF2) (2).		100
tPI ★	❑ **[PID Ctrl. time delay]** See page 155 PID regulator feedback supervision time delay	0 to 600 s	0 s

(1) If a graphic display terminal is not in use, values greater than 9,999 will be displayed on the 4-digit display with a period mark after the thousand digit, e.g. 15.65 for 15,650.

★	These parameters only appear if the corresponding function has been selected in another menu. When the parameters can also be accessed and adjusted from within the configuration menu for the corresponding function, their description is detailed in these menus, on the pages indicated, to aid programming.

Code	Name/Description	Adjustment range	Factory setting
tLIM ★	❑ **[Motoring torque lim]** See page 164 Torque limitation in motor mode, as a whole % or in 0.1% increments of the rated torque in accordance with the [Torque increment] (IntP) parameter, page 164.	0 to 300%	100%
tLIG ★	❑ **[Gen. torque lim]** See page 164 Torque limitation in generator mode, as a whole % or in 0.1% increments of the rated torque in accordance with the [Torque increment] (IntP) parameter, page 164.	0 to 300%	100%
Ctd	❑ **[Current threshold]** Upper current threshold for [I attained] (CtA) function assigned to a relay or a logic output (see page 94).	0 to 1.1 or 1.2 In (1) according to rating	In (1)
CtdL	❑ **[Low I Threshold]** Lower current threshold for [Low I Th.At.] (CtAL) function assigned to a relay or a logic output (see page 94).	0 to 1.1 or 1.2 In (1) according to rating	0
ttH	❑ **[High torque thd.]** High current threshold for [High tq. att.] (ttHA) function assigned to a relay or a logic output (see page 94), as a % of the rated motor torque.	-300% to +300%	100%
ttL	❑ **[Low torque thd.]** Low current threshold for [Low tq. att.] (ttLA) function assigned to a relay or a logic output (see page 94), as a % of the rated motor torque.	-300% to +300%	50%
FqL ★	❑ **[Pulse warning thd.]** Speed threshold measured by the [FREQUENCY METER] (FqF-) function, page 205, assigned to a relay or a logic output (see page 95).	0 Hz to 30.00 kHz	0 Hz
Ftd	❑ **[Freq. threshold]** High frequency threshold for the [Freq.Th.att.] (FtA) function assigned to a relay or a logic output (see page 94), or used by the [PARAM. SET SWITCHING] (MLP-) function, page 174.	0 to 500 or 1,000 Hz according to rating	[Standard mot. freq] (bFr)
FtdL	❑ **[Low Freq.Threshold]** Lower frequency threshold for [Low Frq. Th. Attain.] (FtAL) function assigned to a relay or a logic output (see page 94).	0 to 500 or 1,000 Hz according to rating	0
F2d	❑ **[Frequency 2 threshold]** Frequency threshold for [Freq. Th. 2 attain.] (F2A) function assigned to a relay or a logic output (see page 94), or used by the [PARAM. SET SWITCHING] (MLP-) function, page 174.	0 to 500 or 1,000 Hz according to rating	[Standard mot. freq] (bFr)
F2dL	❑ **[2 Freq. Threshold]** Lower frequency threshold for [2Low F.Thld] (F2AL) function assigned to a relay or a logic output (see page 94).	0 to 500 or 1,000 Hz according to rating	0

(1) In corresponds to the rated drive current indicated in the Installation Manual or on the drive nameplate.

★	These parameters only appear if the corresponding function has been selected in another menu. When the parameters can also be accessed and adjusted from within the configuration menu for the corresponding function, their description is detailed in these menus, on the pages indicated, to aid programming.

Code	Name/Description	Adjustment range	Factory setting
FFt	❑ **[Freewheel stop Thd]** See page 133 This parameter supports switching from a ramp stop or a fast stop to a freewheel stop below a low speed threshold. It can be accessed if [Type of stop] (Stt) = [Fast stop] (FSt) or [Ramp stop] (rMP). ❑ 0.0: Does not switch to freewheel stop. ❑ 0.1 to 1000 Hz: Speed threshold below which the motor will switch to freewheel stop.	0.0 to 1000 Hz	0.0
ttd ★	❑ **[Motor therm. level]** See page 194 Trip threshold for motor thermal alarm (logic output or relay)	0 to 118%	100%
rtd	❑ **[High Freq. Ref. Thr.]** Upper frequency reference threshold for [High Ref.] (rtAH) function assigned to a relay or a logic output (see page 94).	0 to 500 or 1,000 Hz according to rating	0
rtdL	❑ **[Low Freq. Ref. Thr.]** Lower frequency reference threshold for [Low Ref.] (rtAL) function assigned to a relay or a logic output (see page 94).	0 to 500 or 1,000 Hz according to rating	0

(1) In corresponds to the rated drive current indicated in the Installation Manual or on the drive nameplate.

★ These parameters only appear if the corresponding function has been selected in another menu. When the parameters can also be accessed and adjusted from within the configuration menu for the corresponding function, their description is detailed in these menus, on the pages indicated, to aid programming.

Code	Name/Description	Adjustment range	Factory setting
JPF	❑ **[Skip Freq.]** Skip frequency. This parameter prevents prolonged operation within an adjustable range around the regulated frequency. This function can be used to prevent a critical speed, which would cause resonance, being reached. Setting the function to 0 renders it inactive.	0 to 500 or 1,000 Hz according to rating	0 Hz
JF2	❑ **[Skip Freq. 2]** 2nd skip frequency. This parameter prevents prolonged operation within an adjustable range around the regulated frequency. This function can be used to prevent a critical speed, which would cause resonance, being reached. Setting the function to 0 renders it inactive.	0 to 500 or 1,000 Hz according to rating	0 Hz
JF3	❑ **[3rd Skip Frequency]** 3rd skip frequency. This parameter prevents prolonged operation within an adjustable range around the regulated frequency. This function can be used to prevent a critical speed, which would cause resonance, being reached. Setting the function to 0 renders it inactive.	0 to 500 or 1,000 Hz according to rating	0 Hz
JFH	❑ **[Skip.Freq.Hysteresis]** Parameter visible if at least one skip frequency [Skip Frequency] (JPF), [Skip Frequency 2] (JF2) or [3rd Skip Frequency] (JF3) is different from 0. Skip frequency range: between (JPF – JFH) and (JPF + JFH), for example. This adjustment is common to all 3 frequencies (JPF, JF2 and JF3).	0.1 to 10 Hz	1 Hz
LUn ★	❑ **[Unld.Thr.Nom.Speed]** See page 209. Underload threshold at rated motor frequency ([Rated motor freq.] (FrS) page 35), as a % of the rated motor torque.	20 to 100%	60%
LUL ★	❑ **[Unld.Thr.0.Speed]** See page 209. Underload threshold at zero frequency, as a % of the rated motor torque.	0 to [Unld.Thr.Nom.Speed] (LUn)	0%
rMUd ★	❑ **[Unld. Freq.Thr. Det.]** See page 209. Underload detection minimum frequency threshold	0 to 500 or 1,000 Hz according to rating	0 Hz
Srb ★	❑ **[Hysteresis Freq.Att.]** See pages 209 and 210. Maximum deviation between the frequency reference and the motor frequency, which defines steady state operation.	0.3 to 500 or 1,000 Hz according to rating	0.3 Hz
FtU ★	❑ **[Underload T.B.Rest.]** See page 209. Minimum time permitted between an underload being detected and any automatic restart. In order for an automatic restart to be possible, the value of [Max. restart time] (tAr) page 191 must exceed that of this parameter by at least one minute.	0 to 6 min	0 min

★	These parameters only appear if the corresponding function has been selected in another menu. When the parameters can also be accessed and adjusted from within the configuration menu for the corresponding function, their description is detailed in these menus, on the pages indicated, to aid programming.

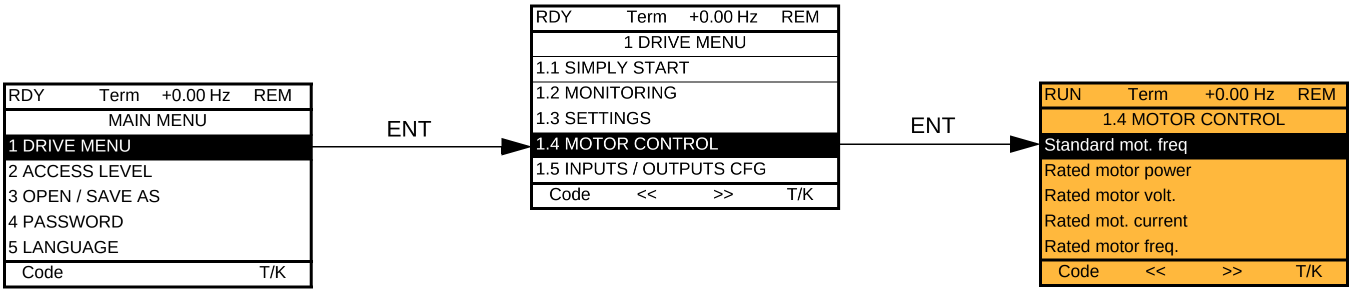
Code	Name/Description	Adjustment range	Factory setting
LOC ★	❏ **[Ovld Detection Thr.]** See page 210. Overload detection threshold, as a % of the rated motor current [Rated mot. current] (nCr). This value must be less than the limit current in order for the function to work.	70 to 150%	110%
FtO ★	❏ **[Overload T.B.Rest.]** See page 210. Minimum time permitted between an overload being detected and any automatic restart. In order for an automatic restart to be possible, the value of [Max. restart time] (tAr) page 191 must exceed that of this parameter by at least one minute.	0 to 6 min	0 min
FFd ★	❏ **[NoFlo.Freq.Thres.Ac.]** See page 181. Zero flow detection activation threshold The parameter can be accessed if [PID feedback ass.] (PIF) is not [No] (nO) and if [No Flow Period Det.] (nFd) is not 0.	0 to 500 or 1,000 Hz according to rating	0 Hz
LFd ★	❏ **[No Flow Offset]** See page 181. Zero flow detection offset The parameter can be accessed if [PID feedback ass.] (PIF) is not [No] (nO) and if [No Flow Period Det.] (nFd) is not 0.	0 to 500 or 1,000 Hz according to rating	0 Hz
nFFt ★	❏ **[Freq.Th.Sensor. Act.]** See page 181. Zero fluid detection activation threshold The parameter can be accessed if [No Flow Sensor] (nFS) is not [No] (nO).	0 to 500 or 1,000 Hz according to rating	0 Hz
nFSt ★	❏ **[Flow Times Ctrl]** See page 181. Zero fluid detection activation time delay The parameter can be accessed if [No Flow Sensor] (nFS) is not [No] (nO).	0 to 999 s	10 s
CHt ★	❏ **[Flow.Lim.Th.Active]** See page 183. Function activation threshold, as a % of the max. signal of the assigned input The parameter can be accessed if [Flow.Sen.Inf] (CHI) is not [No] (nO).	0 to 100%	0%
rCHt ★	❏ **[Flo.Lim.Thres. Inact.]** See page 183. Function deactivation threshold, as a % of the max. signal of the assigned input The parameter can be accessed if [Flow.Sen.Inf] (CHI) is not [No] (nO).	0 to 100%	0%
dFL ★	❏ **[Dec. Flow. limit]** See page 183. The parameter can be accessed if [Flow.Sen.Inf] (CHI) is not [No] (nO). Time to decelerate from [Rated motor freq.] (FrS) to 0. Make sure that this value is compatible with the inertia being driven.	0.01 to 9,000 s (1)	5.0 s

(1) Range 0.01 to 99.99 s or 0.1 to 999.9 s or 1 to 9,000 s according to [Ramp increment] (Inr).

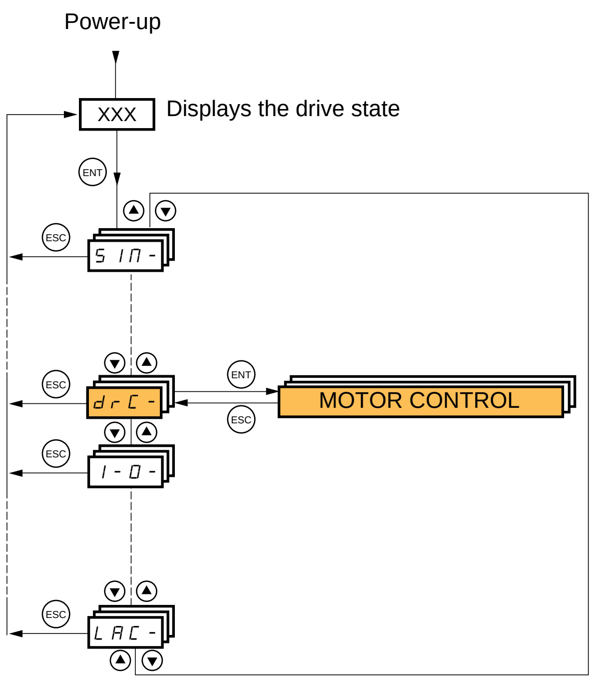
★ These parameters only appear if the corresponding function has been selected in another menu. When the parameters can also be accessed and adjusted from within the configuration menu for the corresponding function, their description is detailed in these menus, on the pages indicated, to aid programming.

[1.4 MOTOR CONTROL] (drC-)

With graphic display terminal:



With integrated display terminal:



[1.4 MOTOR CONTROL] (drC-)

The parameters in the [1.4 MOTOR CONTROL] (drC-) menu can only be modified when the drive is stopped and no run command is present, with the following exceptions:

- [Auto tuning] (tUn) page 66, which causes the motor to start up.
- Parameters containing the sign ◊ in the code column, which can be modified with the drive running or stopped.

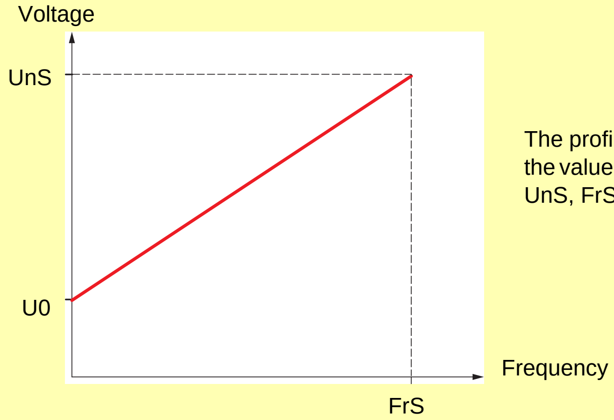
Code	Name/Description	Adjustment range	Factory setting
bFr 50 60	❑ **[Standard mot. freq]** □ **[50Hz IEC]** (50): IEC. □ **[60Hz NEMA]** (60): NEMA. This parameter modifies the presets of parameters [Rated motor power] (nPr), [Rated motor volt.] (UnS), [Rated mot. current] (nCr), [Rated motor freq.] (FrS), [Rated motor speed] (nSP) and [Max frequency] (tFr) below, [Mot. therm. current] (ItH) page 49, [High speed] (HSP) page 49, [Freq. threshold] (Ftd) page 59, [Freq. threshold 2] (F2d) page 59, [V. constant power] (UCP) page 69, [Freq. Const Power] (FCP) page 69, [Nominal freq sync.] (FrSS) page 70, [Preset speed 8] (SP8) page 140, [Forced Run Ref.] (InHr) page 201.		[50Hz IEC] (50)
nPr	❑ **[Rated motor power]** The parameter cannot be accessed if [Motor control type] (Ctt) page 67 = [Sync. mot.] (SYn) Rated motor power given on the nameplate, in kW if [Standard mot. freq] (bFr) = [50 Hz IEC] (50), in HP if [Standard mot. freq] (bFr) = [60 Hz NEMA] (60).	According to drive rating	According to drive rating
UnS	❑ **[Rated motor volt.]** The parameter cannot be accessed if [Motor control type] (Ctt) page 67 = [Sync. mot.] (SYn) Rated motor voltage given on the nameplate. ATV61●●●M3X: 100 to 240 V ATV61●●●N4: 200 to 480 V ATV61●●●Y: 400 to 690 V	According to drive rating	According to drive rating and [Standard mot. freq] (bFr)
nCr	❑ **[Rated mot. current]** The parameter cannot be accessed if [Motor control type] (Ctt) page 67 = [Sync. mot.] (SYn) Rated motor current given on the nameplate.	0.25 to 1.1 or 1.2 In (1) according to rating	According to drive rating and [Standard mot. freq] (bFr)
FrS	❑ **[Rated motor freq.]** The parameter cannot be accessed if [Motor control type] (Ctt) page 67 = [Sync. mot.] (SYn) Rated motor frequency given on the nameplate. The factory setting is 50 Hz, or preset to 60 Hz if [Standard mot. freq] (bFr) is set to 60 Hz. The maximum value is limited to 500 Hz if [Motor control type] (Ctt) (page 67) is not V/F or if the drive rating is higher than ATV61HD37● or ATV61WD45● or if the drive is an ATV61●●●Y (500 to 690 V). Values between 500 Hz and 1000 Hz are only possible in V/F control and for powers limited to 37 kW (50 HP) for the ATV61H ●●● and 45 kW (60 HP) for ATV61W●●●. In this case, configure [Motor control type] (Ctt) before [Rated motor freq.] (FrS).	10 to 500 or 1,000 Hz according to rating	50 Hz

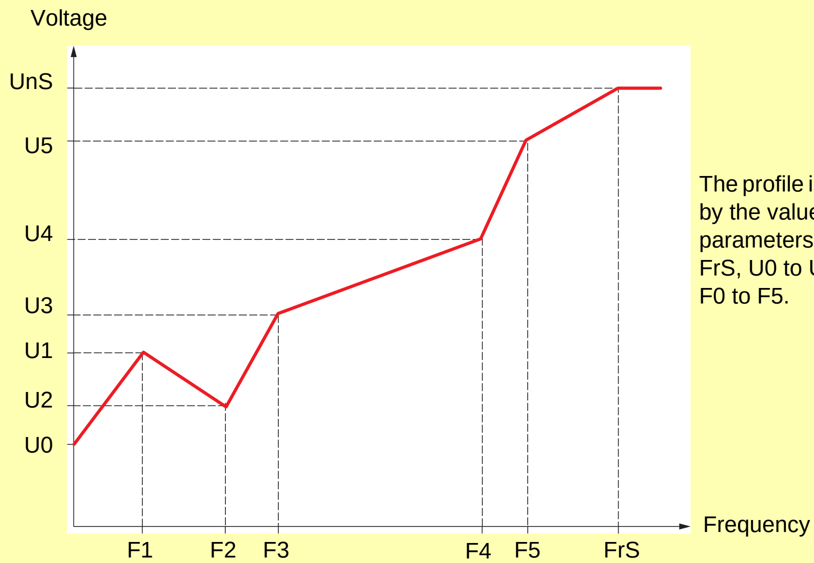
(1) In corresponds to the rated drive current indicated in the Installation Manual and on the drive nameplate.

Code	Name/Description	Adjustment range	Factory setting
nSP	❑ **[Rated motor speed]**	0 to 60,000 rpm	According to drive rating
	The parameter cannot be accessed if [Motor control type] (Ctt) page 67 = [Sync. mot.] (SYn) Rated motor speed given on the nameplate. 0 to 9,999 rpm then 10.00 to 60.00 krpm on the integrated display terminal. If, rather than the rated speed, the nameplate indicates the synchronous speed and the slip in Hz or as a %, calculate the rated speed as follows: • Nominal speed = Synchronous speed x $\frac{100 - \text{slip as a \%}}{100}$ or • Nominal speed = Synchronous speed x $\frac{50 - \text{slip in Hz}}{50}$ (50 Hz motors) or • Nominal speed = Synchronous speed x $\frac{60 - \text{slip in Hz}}{60}$ (60 Hz motors)		
tFr	❑ **[Max frequency]**	10 to 500 or 1,000 Hz according to rating	60 Hz
	The factory setting is 60 Hz, or preset to 72 Hz if [Standard mot. freq] (bFr) is set to 60 Hz. The maximum value is limited by the following conditions: • It must not exceed 10 times the value of de [Rated motor freq.] (FrS) • It cannot exceed 500 Hz if the [Motor control type] (Ctt) (page 67) is not V/F or if the drive rating is higher than ATV61HD37● or ATV61WD45●, or if the drive is an ATV61●●●Y (500 to 690 V). Values between 500 Hz and 1000 Hz are only possible in V/F control and for powers limited to 37 kW (50 HP) for the ATV61H ●●● and 45 kW (60 HP) for ATV61W●●●. In this case, configure [Motor control type] (Ctt) before [Max frequency] (tFr).		

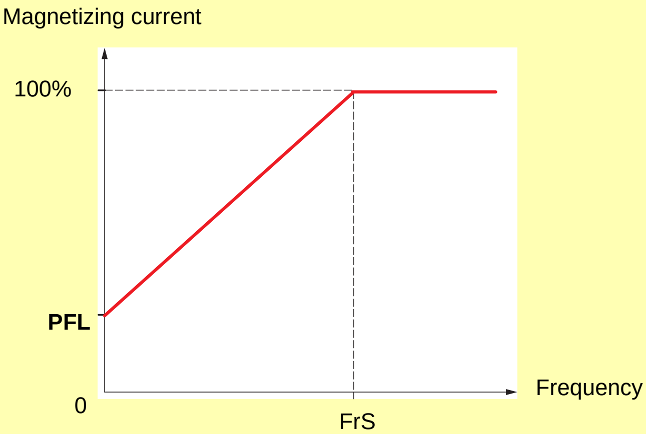
Code	Name/Description	Factory setting
tUn nO YES dOnE	❑ **[Auto tuning]** ☐ **[No]** (nO): Auto-tuning not performed. ☐ **[Yes]** (YES): Auto-tuning is performed as soon as possible, then the parameter automatically changes to [Done] (dOnE). ☐ **[Done]** (dOnE): Use of the values given the last time auto-tuning was performed. **Caution:** • It is essential that all the motor parameters are correctly configured before starting auto-tuning. - Asynchronous motor: [Rated motor volt.] (UnS), [Rated motor freq.] (FrS), [Rated mot. current] (nCr), [Rated motor speed] (nSP), [Rated motor power] (nPr) - Synchronous motor: [Nominal I sync.] (nCrS), [Nom motor spdsync] (nSPS), [Pole pairs] (PPnS), [Syn. EMF constant] (PHS), [Autotune L d-axis] (LdS), [Autotune L q-axis] (LqS) If one or more of these parameters is modified after auto-tuning has been performed, [Auto tuning] (tUn) will return to [No] (nO) and the procedure must be repeated. • Auto-tuning is only performed if no stop command has been activated. If a "freewheel stop" or "fast stop" function has been assigned to a logic input, this input must be set to 1 (active at 0). • Auto-tuning takes priority over any run or prefluxing commands, which will be taken into account after the auto-tuning sequence. • If auto-tuning fails, the drive displays [No] (nO) and, depending on the configuration of [Autotune fault mgt] (tnL) page 206, may switch to [Auto-tuning] (tnF) fault mode. • Auto-tuning may last for 1 to 2 seconds. Do not interrupt the process. Wait for the display to change to "[Done] (dOnE)" or "[No] (nO)". **Note:** During auto-tuning the motor operates at rated current.	[No] (nO)
AUt nO YES	❑ **[Automatic autotune]** ☐ **[No]** (nO): Function inactive ☐ **[Yes]** (YES): Auto-tuning is performed on every power-up. **Caution:** Same comments as for [Auto tuning] (tUn) above. If [Profile] (CHCF) = [8 serie] (SE8), then [Automatic autotune] (AUt) is fixed to [No] (nO).	[No] (nO)
tUS tAb PEnd PrOG FAIL dOnE CUS	❑ **[Auto tuning status]** For information only, cannot be modified. ☐ **[Not done]** (tAb): The default stator resistance value is used to control the motor. ☐ **[Pending]** (PEnd): Auto-tuning has been requested but not yet performed. ☐ **[In Progress]** (PrOG): Auto-tuning in progress ☐ **[Failed]** (FAIL): Auto-tuning has failed. ☐ **[Done]** (dOnE): The stator resistance measured by the auto-tuning function is used to control the motor. ☐ **[Customized]** (CUS): Auto-tuning has been performed, but at least one parameter set by this auto-tuning operation has subsequently been modified. The [Auto tuning] (tUn) parameter then returns to [No] (nO). The following auto-tuning parameters are concerned: [Cust. stator R syn] (rSAS) page 70, [R1w] (rSA), [Idw] (IdA), [LFw] (LFA) and [T2w] (trA) page 72.	[Not done] (tAb)
PHr AbC ACb	❑ **[Output Ph rotation]** ☐ **[ABC]** (AbC): Forward ☐ **[ACB]** (ACb): Reverse This parameter can be used to reverse the direction of rotation of the motor without reversing the wiring.	ABC

(1) The parameter can also be accessed in the [1.3 SETTINGS] (SEt-) menu.

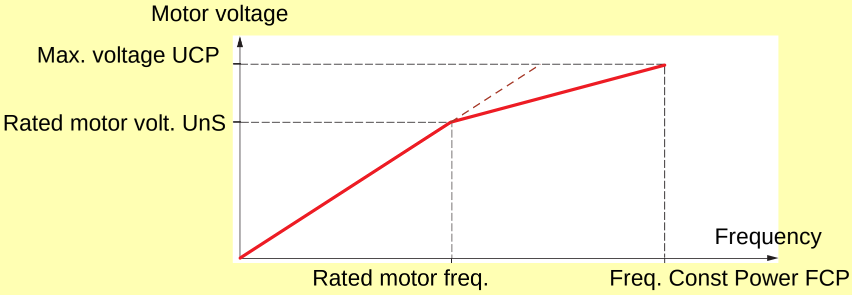
<table>
<tr><th>Code</th><th>Name/Description</th><th>Adjustment range</th><th>Factory setting</th></tr>
<tr><td>CtT</td><td>❑ [Motor control type]</td><td></td><td>[Energy Sav.] (nLd)</td></tr>
<tr><td>UUC</td><td>❑ [SVC V] (UUC): Open-loop voltage flux vector control with automatic slip compensation according to the load. It supports operation with a number of motors connected in parallel on the same drive (if the motors are identical).</td><td></td><td></td></tr>
<tr><td>UF2</td><td>❑ [V/F 2pts] (UF2): Simple V/F profile without slip compensation. It supports operation with:
- Special motors (wound rotor, tapered rotor, etc.)
- A number of motors in parallel on the same drive
- High-speed motors
- Motors with a low power rating in comparison to that of the drive


The profile is defined by the values of parameters UnS, FrS and U0.</td><td></td><td></td></tr>
<tr><td>UF5</td><td>❑ [V/F 5pts] (UF5): 5-segment V/F profile: As V/F 2 pts profile but also supports the avoidance of resonance (saturation).


The profile is defined by the values of parameters UnS, FrS, U0 to U5 and F0 to F5.
FrS > F5 > F4 > F3 > F2 > F1</td><td></td><td></td></tr>
<tr><td>SYn</td><td>❑ [Sync. mot.] (SYn): For synchronous permanent magnet motors with sinusoidal electromotive force (EMF) only. This selection is prohibited with ATV61●●●●Y (500 to 690 V).
This selection makes the asynchronous motor parameters inaccessible, and the synchronous motor parameters accessible.</td><td></td><td></td></tr>
<tr><td>UFq</td><td>❑ [U/F Quad.] (UFq): Variable torque. For pump and fan applications.</td><td></td><td></td></tr>
<tr><td>nLd</td><td>❑ [Energy Sav.] (nLd): Energy saving. For applications that do not require high dynamics. This type of control is recommended when replacing an ATV38.</td><td></td><td></td></tr>
</table>

Code	Name/Description	Adjustment range	Factory setting
PFL ◐	❑ **[U/F Profile]** Adjustment of the [U/F Quad.] (UFq) ratio. The parameter can be accessed if [Motor control type] (Ctt) = [U/F Quad.] (UFq). It defines the magnetizing current at zero frequency, as a % of the rated magnetizing current. 	0 to 100%	20
U0	❑ **[U0]** V/f ratio The parameter can be accessed if [Motor control type] (Ctt) = [V/F 2pts] (UF2) or [V/F 5pts] (UF5) or [U/F Quad.] (UFq).	0 to 600 or 1,000 V according to rating	0
U1	❑ **[U1]** V/F profile setting. The parameter can be accessed if [Motor control type] (Ctt) = [V/F 5pts] (UF5)	0 to 600 or 1,000 V according to rating	0
F1	❑ **[F1]** V/F profile setting. The parameter can be accessed if [Motor control type] (Ctt) = [V/F 5pts] (UF5)	0 to 1,000 Hz	0
U2	❑ **[U2]** V/F profile setting. The parameter can be accessed if [Motor control type] (Ctt) = [V/F 5pts] (UF5)	0 to 600 or 1,000 V according to rating	0
F2	❑ **[F2]** V/F profile setting. The parameter can be accessed if [Motor control type] (Ctt) = [V/F 5pts] (UF5)	0 to 1,000 Hz	0
U3	❑ **[U3]** V/F profile setting. The parameter can be accessed if [Motor control type] (Ctt) = [V/F 5pts] (UF5)	0 to 600 or 1,000 V according to rating	0
F3	❑ **[F3]** V/F profile setting. The parameter can be accessed if [Motor control type] (Ctt) = [V/F 5pts] (UF5)	0 to 1,000 Hz	0

◐ Parameter that can be modified during operation or when stopped.

Code	Name/Description	Adjustment range	Factory setting
U4	❑ **[U4]**	0 to 600 or 1,000 V according to rating	0
	V/F profile setting. The parameter can be accessed if [Motor control type] (Ctt) = [V/F 5pts] (UF5)		
F4	❑ **[F4]**	0 to 1,000 Hz	0
	V/F profile setting. The parameter can be accessed if [Motor control type] (Ctt) = [V/F 5pts] (UF5)		
U5	❑ **[U5]**	0 to 600 or 1,000 V according to rating	0
	V/F profile setting. The parameter can be accessed if [Motor control type] (Ctt) = [V/F 5pts] (UF5)		
F5	❑ **[F5]**	0 to 1,000 Hz	0
	V/F profile setting. The parameter can be accessed if [Motor control type] (Ctt) = [V/F 5pts] (UF5)		
UC2	❑ **[Vector Control 2pt]**		[No] (nO)
	The parameter can be accessed if [Motor control type] (Ctt) is not [Sync. mot.] (SYn).		
nO	❑ **[No]** (nO): Function inactive		
YES	❑ **[Yes]** (YES): Function active. Used in applications in which the motor rated speed and frequency need to be exceeded in order to optimize operation at constant power, or when the maximum voltage of the motor needs to be limited to a value below the line voltage. The voltage/frequency profile must then be adapted in accordance with the motor's capabilities to operate at maximum voltage UCP and maximum frequency FCP.  		
UCP	❑ **[V. constant power]**	According to drive rating	According to drive rating and [Standard mot. freq] (bFr)
	The parameter can be accessed if [Vector Control 2pt] (UC2) = [Yes] (YES)		
FCP	❑ **[Freq. Const Power]**	According to drive rating and [Rated motor freq.] (FrS)	= [Standard mot. freq] (bFr)
	The parameter can be accessed if [Vector Control 2pt] (UC2) = [Yes] (YES)		

Synchronous motor parameters

These parameters can be accessed if [Motor control type] (Ctt) page 67 = [Sync. mot.] (SYn). In this case, the asynchronous motor parameters cannot be accessed.

Code	Name/Description	Adjustment range	Factory setting
nCrS	❑ **[Nominal I sync.]** Rated synchronous motor current given on the nameplate.	0.25 to 1.1 or 1.2 Hz according to rating (1)	According to drive rating
nSPS	❑ **[Nom motor spdsync]** Rated motor speed given on the nameplate. On the integrated display unit: 0 to 9,999 rpm then 10.00 to 60.00 krpm.	0 to 60,000 rpm	According to drive rating
PPnS	❑ **[Pole pairs]** Number of pairs of poles on the synchronous motor.	1 to 50	According to drive rating
PHS	❑ **[Syn. EMF constant]** Synchronous motor EMF constant, in mV per rpm.	0 to 6,553.5	According to drive rating
LdS	❑ **[Autotune L d-axis]** Axis "d" stator inductance in mH. On motors with smooth poles [Autotune L d-axis] (LdS) = [Autotune L q-axis] (LqS) = Stator inductance L.	0 to 655.3	According to drive rating
LqS	❑ **[Autotune L q-axis]** Axis "q" stator inductance in mH. On motors with smooth poles [Autotune L d-axis] (LdS) = [Autotune L q-axis] (LqS) = Stator inductance L.	0 to 655.3	According to drive rating
rSAS	❑ **[Cust. stator R syn]** Cold state stator resistance (per winding) The factory setting is replaced by the result of the auto-tuning operation, if it has been performed. The value can be entered by the user, if he knows it. Value in milliohms (mΩ) up to 75 kW (100 HP), in hundredths of milliohms (mΩ/100) above 75 kW (100 HP). On the integrated display unit: 0 to 9,999 then 10.00 to 65.53 (10,000 to 65,536).	According to drive rating	According to drive rating

(1) In corresponds to the rated drive current indicated in the Installation Manual and on the drive nameplate.

Synchronous motor parameters that can be accessed in [Expert] mode

Code	Name/Description
rSMS	❑ **[R1rS]** Cold state stator resistance (per winding), in read-only mode. This is the drive factory setting or the result of the auto-tuning operation, if it has been performed. Value in milliohms (mΩ) up to 75 kW (100 HP), in hundredths of milliohms (mΩ/100) above 75 kW (100 HP). On the integrated display unit: 0 to 9,999 then 10.00 to 65.53 (10,000 to 65,536).
FrSS	❑ **[Nominal freq sync.]** Motor frequency at rated speed in Hz, calculated by the drive (rated motor frequency), in read-only mode.

Code	Name/Description	Adjustment range	Factory setting
UFr	❑ [IR compensation] (1) The parameter can be accessed if [Motor control type] (Ctt) is not [V/F 2pts] (UF2), [V/F 5pts] (UF5) or [U/F Quad.] (UFq). Used to optimize the torque at very low speed (increase [IR compensation] (UFr) if the torque is insufficient). Check that the [IR compensation] (UFr) value is not too high when the motor is warm (risk of instability).	25 to 200%	100%
SLP	❑ [Slip compensation] (1) The parameter can be accessed if [Motor control type] (Ctt) is not [V/F 2pts] (UF2), [V/F 5pts] (UF5), [U/F Quad.] (UFq) or [Sync. mot.] (SYn). Adjusts the slip compensation around the value set by the rated motor speed. The speeds given on motor nameplates are not necessarily exact. • If slip setting < actual slip: The motor is not rotating at the correct speed in steady state, but at a speed lower than the reference. • If slip setting > actual slip: The motor is overcompensated and the speed is unstable.	0 to 300%	100%

(1) The parameter can also be accessed in the [1.3 SETTINGS] (SEt-) menu.

Parameter that can be modified during operation or when stopped.

Parameter can be accessed in [Expert] mode.

Code	Name/Description
Prt	❑ **[Power Ident]** Parameter reserved for Schneider Electric product support. **Do not modify.** To modify this parameter with the integrated terminal, press and hold down the “ENT” key for 2 s.

Asynchronous motor parameters that can be accessed in [Expert] mode

These parameters can be accessed if [Motor control type] (Ctt) page 67 is not [Sync. mot.] (SYn).
These include:

- Parameters calculated by the drive during auto-tuning, in read-only mode. For example, R1r, calculated cold stator resistance.
- The possibility of replacing some of these calculated parameters by other values, if necessary. For example, R1w, measured cold stator resistance.

When a parameter Xyw is modified by the user, the drive uses it in place of the calculated parameter Xyr.

If auto-tuning is performed or if one of the motor parameters on which auto-tuning depends is modified ([Rated motor volt.] (UnS), [Rated motor freq.] (FrS), [Rated mot. current] (nCr), [Rated motor speed] (nSP), [Rated motor power] (nPr)), parameters Xyw return to their factory settings.

Code	Name/Description
rSM	❑ **[Stator R measured]** Cold stator resistance, calculated by the drive, in read-only mode. Value in milliohms (mΩ) up to 75 kW (100 HP), in hundredths of milliohms (mΩ/100) above 75 kW (100 HP).
IdM	❑ **[Idr]** Magnetizing current in A, calculated by the drive, in read-only mode.
LFM	❑ **[Lfr]** Leakage inductance in mH, calculated by the drive, in read-only mode.
trM	❑ **[T2r]** Rotor time constant in mS, calculated by the drive, in read-only mode.
nSL	❑ **[Nominal motor slip]** Rated slip in Hz, calculated by the drive, in read-only mode. To modify the rated slip, modify the [Rated motor speed] (nSP) (page 65).
PPn	❑ **[Pr]** Number of pairs of poles, calculated by the drive, in read-only mode.
rSA	❑ **[R1w]** Cold state stator resistance (per winding), modifiable value. In milliohms (mΩ) up to 75 kW (100 HP), in hundredths of milliohms (mΩ/100) above 75 kW (100 HP). On the integrated display unit: 0 to 9,999 then 10.00 to 65.53 (10,000 to 65,536).
IdA	❑ **[Idw]** Magnetizing current in A, modifiable value.
LFA	❑ **[Lfw]** Leakage inductance in mH, modifiable value.
trA	❑ **[T2w]** Rotor time constant in mS, modifiable value.

Selecting the encoder

Follow the recommendations in the catalog and the Installation Manual.

Code	Name/Description	Adjustment range	Factory setting
EnS nO AAbb Ab A	**[Encoder type]** To be configured in accordance with the type of card and encoder used (1). ☐ **[----]** (nO): Card missing. ☐ **[AABB]** (AAbb): For signals A, A-, B, B-. ☐ **[AB]** (Ab): For signals A, B. ☐ **[A]** (A): For signal A. Value cannot be accessed if [Encoder usage] (EnU) page 74 = [Spd fdk reg.] (rEG).		[AABB] (AAbb)
PGI	**[Number of pulses]** Number of pulses per encoder revolution. The parameter can be accessed if an encoder card has been inserted (1).	100 to 5,000	1,024

(1) The encoder parameters can only be accessed if the encoder card has been inserted, and the available selections will depend on the type of encoder card used. The encoder configuration can also be accessed in the [1.5- INPUTS / OUTPUTS CFG] (I/O) menu.

Encoder check procedure

1. Set up in open-loop mode, following the recommendations on page 8.
2. Set [Encoder usage] (EnU) = [No] (nO).
3. Set [Encoder type] (EnS) and [Number of pulses] (PGI) accordingly for the encoder used.
4. Set [Encoder check] (EnC) = [Yes] (YES)
5. Check that the rotation of the motor is safe.
6. Set the motor rotating at stabilized speed ≈ 15% of the rated speed for at least 3 seconds, and use the [1.2-MONITORING] (SUP-) menu to monitor its behavior.
7. If it trips on an [Encoder fault] (EnF), [Encoder check] (EnC) returns to [No] (nO).
   - Check [Number of pulses] (PGI) and [Encoder type] (EnS).
   - Check that the mechanical and electrical operation of the encoder, its power supply and connections are all correct.
   - Reverse the direction of rotation of the motor ([Output Ph rotation] (PHr) parameter page 66) or the encoder signals.
8. Repeat the operations from 5 onwards until [Encoder check] (EnC) changes to [Done] (dOnE).

Code	Name/Description	Adjustment range	Factory setting
EnC	❑ **[Encoder check]** Encoder feedback check See the procedure below. The parameter can be accessed if an encoder card has been inserted (1).		[Not done] (nO)
nO	☐ **[Not done]** (nO) Check not performed.		
YES	☐ **[Yes]** (YES): Activates monitoring of the encoder.		
dOnE	☐ **[Done]** (dOnE): Check performed successfully. The check procedure checks: - The direction of rotation of the encoder/motor - The presence of signals (wiring continuity) - The number of pulses/revolution If a fault is detected, the drive locks in [Encoder fault] (EnF) fault mode.		
EnU	❑ **[Encoder usage]** The parameter can be accessed if an encoder card has been inserted (1).		[No] (nO)
nO	☐ **[No]** (nO): Function inactive		
SEC	☐ **[Fdbk monit.]** (SEC): The encoder provides speed feedback for monitoring only.		
rEG	☐ **[Spd fdk reg.]** (rEG): The encoder provides speed feedback for regulation and monitoring. If [Motor control type] (Ctt) = [SVC U] (UUC) the encoder operates in speed feedback mode and enables static correction of the speed to be performed. This configuration is not accessible for other [Motor control type] (Ctt) values.		
PGr	☐ **[Speed ref.]** (PGr): The encoder provides a reference.		

(1) The encoder parameters can only be accessed if the encoder card has been inserted, and the available selections will depend on the type of encoder card used. The encoder configuration can also be accessed in the [1.5- INPUTS / OUTPUTS CFG] (I/O) menu.

Code	Name/Description	Adjustment range	Factory setting
OFI nO YES	❑ **[Sinus filter]** ☐ **[No]** (nO): No sinus filter ☐ **[Yes]** (YES): Use of a sinus filter, to limit overvoltages on the motor and reduce the ground fault leakage current. [Sinus filter] (OFI) is forced to [No] (nO) for ATV61●075●● ratings and all ATV61●●●●Y. . **CAUTION** If [Sinus filter] (OFI) = [Yes] (YES), [Max frequency] (tFr) **must not exceed 100 Hz and** [Motor control type] (Ctt) page 67 **must not be:** • [Sync. mot.] (SYn), irrespective of the drive rating • [SVC V] (UUC) or [Energy Sav.] (nLd) at and above 55 kW (75 HP) for ATV61H●●●M3X and at and above 90 kW (120 HP) for ATV61H●●●N4 **Failure to follow this instruction can result in equipment damage.**		[No] (nO)
SFr	❑ **[Switching freq.]** (1) Switching frequency setting. **Note:** In the event of excessive temperature rise, the drive will automatically reduce the switching frequency and reset it once the temperature returns to normal. **Adjustment range:** It can vary between 1 and 16 kHz, but the minimum and maximum values, as well as the factory setting, can be limited in accordance with the type of drive (ATV61H or W), the rating (power and voltage) and the configuration of the [Sinus filter] (OFI) parameter above and [Motor surge limit.] (SUL) parameter page 76. **Adjustment with drive running:** - If the initial value is less than 2 kHz, it is not possible to increase it above 1.9 kHz while running. - If the initial value is greater than or equal to 2 kHz, a minimum of 2 kHz must be maintained while running. **Adjustment with the drive stopped:** No restrictions. **CAUTION** On ATV61●075N4 to U40N4 drives, if the RFI filters are disconnected (operation on an IT system), the switching frequency of the drive must not exceed 4 kHz. **Failure to follow this instruction can result in equipment damage.**	According to rating	According to rating
CLI	❑ **[Current Limitation]** (1) Used to limit the motor current. **Note:** If the setting is less than 0.25 In, the drive may lock in [Output Phase Loss] (OPF) fault mode if this has been enabled (see page 194). If it is less than the no-load motor current, the limitation no longer has any effect. **CAUTION** Check that the motor will withstand this current, particularly in the case of permanent magnet synchronous motors, which are susceptible to demagnetization. **Failure to follow this instruction can result in equipment damage.**	0 to 1.1 or 1.2 In (2) according to rating	1.1 or 1.2 In (2) according to rating

(1) The parameter can also be accessed in the [1.3 SETTINGS] (SEt-) menu.
(2) In corresponds to the rated drive current indicated in the Installation Manual and on the drive nameplate.

Parameter that can be modified during operation or when stopped.

Code	Name/Description	Adjustment range	Factory setting
nrd	❑ **[Noise reduction]**		According to rating
nO YES	☐ **[No]** (nO): Fixed frequency. Factory setting at and above ATV61HD55M3X, ATV61HD90N4 and ATV61HC11Y. ☐ **[Yes]** (YES): Frequency with random modulation. Factory setting up to ATV61HD45M3X, ATV61HD75N4 and ATV61HD90Y. Random frequency modulation prevents any resonance, which may occur at a fixed frequency.		
SUL	❑ **[Motor surge limit.]**		[No] (nO)
nO YES	This function limits motor overvoltages and is useful in the following applications: - NEMA motors - Japanese motors - Spindle motors - Rewound motors ☐ **[No]** (nO): Function inactive ☐ **[Yes]** (YES): Function active This parameter is forced to [No] (nO) if a sinus filter is used. This parameter can remain = [No] (nO) for 230/400 V motors used at 230 V, or if the length of cable between the drive and the motor does not exceed: - 4 m with unshielded cables - 10 m with shielded cables		
SOP	❑ **[Volt surge limit. opt]**		10 (µs)
	Optimization parameter for transient overvoltages at the motor terminals. Accessible if [Motor surge limit.] (SUL) = [Yes] (YES). Set to 6, 8, or 10 (µs), according to the following table.		

The value of the “SOP” parameter corresponds to the attenuation time of the cable used. It is defined to prevent the superimposition of voltage wave reflections resulting from long cable lengths. It limits overvoltages to twice the DC bus rated voltage.
The tables on the following page give examples of correspondence between the “SOP” parameter and the length of the cable between the drive and the motor. For longer cable lengths, a sinus filter or a dV/dt protection filter must be used.

- For motors in parallel, the sum of all the cable lengths must be taken into consideration. Compare the length given in the line corresponding to the power for one motor with that corresponding to the total power, and select the shorter length. Example: Two 7.5 kW (10 HP) motors – take the lengths on the 15 kW (20 HP) line, which are shorter than those on the 7.5 kW (10 HP) line, and divide by the number of motors to obtain the length per motor (with unshielded “GORSE” cable and SOP = 6, the result is 40/2 = 20 m maximum for each 7.5 kW (10 HP) motor).

In special cases (for example, different types of cable, different motor powers in parallel, different cable lengths in parallel, etc.), we recommend using an oscilloscope to check the overvoltage values obtained at the motor terminals.

To retain the overall drive performance, do not increase the SOP value unnecessarily.

Tables giving the correspondence between the SOP parameter and the cable length, for 400 V line supply

Altivar 61	Motor		Cable cross-section		Maximum cable length in meters					
reference	Power				Unshielded “GORSE” cable Type H07 RN-F 4Gxx			Shielded “GORSE” cable Type GVCSTV-LS/LH		
	kW	HP	in mm^2	AWG	SOP = 10	SOP = 8	SOP = 6	SOP = 10	SOP = 8	SOP = 6
ATV61H075N4	0.75	1	1.5	14	100 m	70 m	45 m	105 m	85 m	65 m
ATV61HU15N4	1.5	2	1.5	14	100 m	70 m	45 m	105 m	85 m	65 m
ATV61HU22N4	2.2	3	1.5	14	110 m	65 m	45 m	105 m	85 m	65 m
ATV61HU30N4	3	-	1.5	14	110 m	65 m	45 m	105 m	85 m	65 m
ATV61HU40N4	4	5	1.5	14	110 m	65 m	45 m	105 m	85 m	65 m
ATV61HU55N4	5.5	7.5	2.5	14	120 m	65 m	45 m	105 m	85 m	65 m
ATV61HU75N4	7.5	10	2.5	14	120 m	65 m	45 m	105 m	85 m	65 m
ATV61HD11N4	11	15	6	10	115 m	60 m	45 m	100 m	75 m	55 m
ATV61HD15N4	15	20	10	8	105 m	60 m	40 m	100 m	70 m	50 m
ATV61HD18N4	18.5	25	10	8	115 m	60 m	35 m	150 m	75 m	50 m
ATV61HD22N4	22	30	16	6	150 m	60 m	40 m	150 m	70 m	50 m
ATV61HD30N4	30	40	25	4	150 m	55 m	35 m	150 m	70 m	50 m
ATV61HD37N4	37	50	35	5	200 m	65 m	50 m	150 m	70 m	50 m
ATV61HD45N4	45	60	50	0	200 m	55 m	30 m	150 m	60 m	40 m
ATV61HD55N4	55	75	70	2/0	200 m	50 m	25 m	150 m	55 m	30 m
ATV61HD75N4	75	100	95	4/0	200 m	45 m	25 m	150 m	55 m	30 m

Altivar 61	Motor		Cable cross-section		Maximum cable length in meters					
reference	Power				Shielded “BELDEN” cable Type 2950x			Shielded “PROTOFLEX” cable Type EMV 2YSLCY-J		
	kW	HP	in mm^2	AWG	SOP = 10	SOP = 8	SOP = 6	SOP = 10	SOP = 8	SOP = 6
ATV61H075N4	0.75	1	1.5	14	50 m	40 m	30 m			
ATV61HU15N4	1.5	2	1.5	14	50 m	40 m	30 m			
ATV61HU22N4	2.2	3	1.5	14	50 m	40 m	30 m			
ATV61HU30N4	3	-	1.5	14	50 m	40 m	30 m			
ATV61HU40N4	4	5	1.5	14	50 m	40 m	30 m			
ATV61HU55N4	5.5	7.5	2.5	14	50 m	40 m	30 m			
ATV61HU75N4	7.5	10	2.5	14	50 m	40 m	30 m			
ATV61HD11N4	11	15	6	10	50 m	40 m	30 m			
ATV61HD15N4	15	20	10	8	50 m	40 m	30 m			
ATV61HD18N4	18.5	25	10	8	50 m	40 m	30 m			
ATV61HD22N4	22	30	16	6				75 m	40 m	25 m
ATV61HD30N4	30	40	25	4				75 m	40 m	25 m
ATV61HD37N4	37	50	35	5				75 m	40 m	25 m
ATV61HD45N4	45	60	50	0				75 m	40 m	25 m
ATV61HD55N4	55	75	70	2/0				75 m	30 m	15 m
ATV61HD75N4	75	100	95	4/0				75 m	30 m	15 m

Note: For 230/400 V used at 230 V, the [Motor surge limit.] (SUL) parameter can remain = [No] (nO).

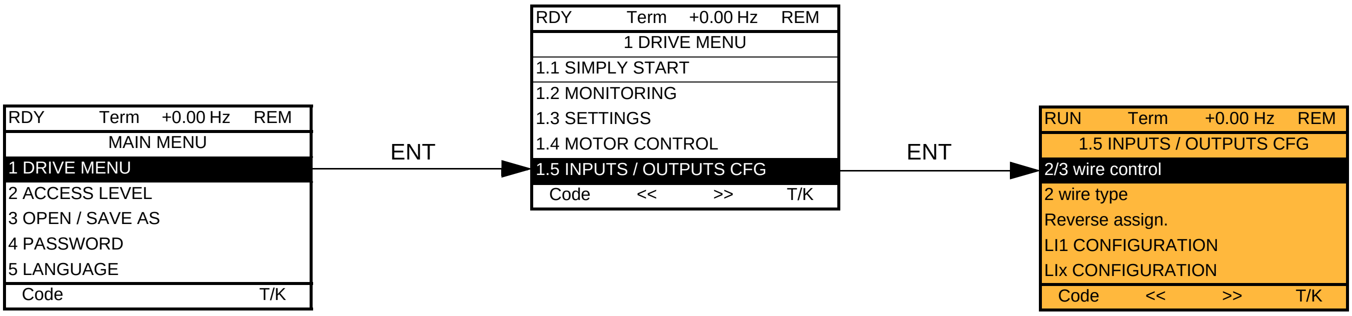
Code	Name/Description	Adjustment range	Factory setting
UbR	**[Braking level]** DC bus voltage threshold above which the braking transistor cuts in to limit this voltage. ATV61●●●●M3●: factory setting 395 V. ATV61●●●●N4: factory setting 785 V. ATV61●●●●S6Y: factory setting 980 V. ATV61●●●●Y: factory setting 1127 V or 1080 V according to rating. The adjustment range depends on the voltage rating of the drive and the [Mains voltage] (UrES) parameter, page 198.		According to drive voltage rating
bbA nO YES	**[Braking balance]** ☐ **[No]** (nO): Function inactive ☐ **[Yes]** (YES): Function active, to be used on drives connected in parallel via their DC bus. Used to balance the braking power between the drives. The [Braking level] (Ubr) parameter, page 78, must be set to the same value on the various drives. The value [Yes] (YES) is only possible if [Dec ramp adapt.] (brA) = [No] (nO) (see page 132).		[No] (nO)

(1) The parameter can also be accessed in the [1.3 SETTINGS] (SEt-) menu.

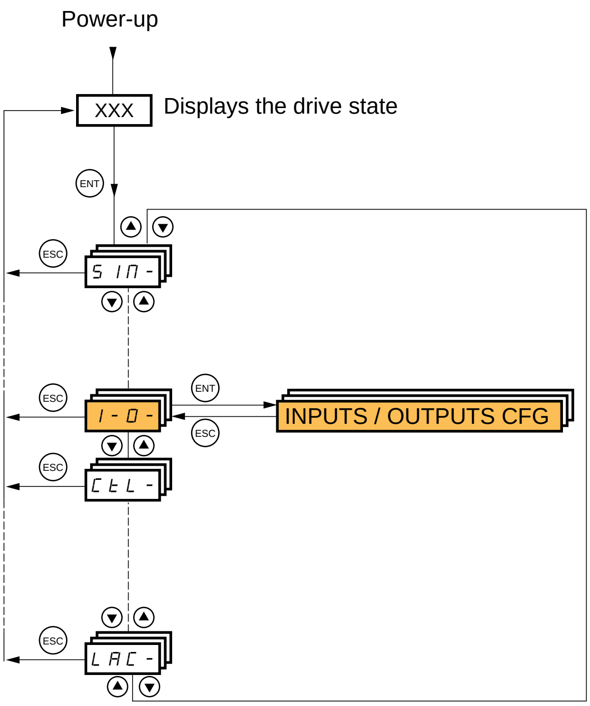
Parameter that can be modified during operation or when stopped.

[1.5 INPUTS / OUTPUTS CFG] (I-O-)

With graphic display terminal:



With integrated display terminal:



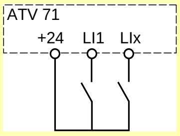
The parameters in the [1.5 INPUTS / OUTPUTS CFG] (I-O-) menu can only be modified when the drive is stopped and no run command is present.

Code	Name/Description	Adjustment range	Factory setting
tCC	**[2/3 wire control]**		[2 wire] (2C)

- 2C — **[2 wire]** (2C)
- 3C — **[3 wire]** (3C)

2-wire control: This is the input state (0 or 1) or edge (0 to 1 or 1 to 0), which controls running or stopping.

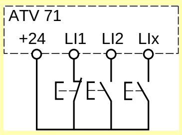
Example of “source” wiring:



LI1: forward
LIx: reverse

3-wire control (pulse control): A “forward” or “reverse” pulse is sufficient to command starting, a “stop” pulse is sufficient to command stopping.

Example of “source” wiring:



LI1: stop
LI2: forward
LIx: reverse

WARNING

UNINTENDED EQUIPMENT OPERATION

To change the assignment of [2/3 wire control] (tCC) press the “ENT” key for 2 s.
It causes the following functions to return to factory setting: [2 wire type] (tCt) and [Reverse assign.] (rrS) below, and all functions which assign logic inputs and analog inputs.
The macro configuration selected will also be reset if it has been customized (loss of custom settings).
It is advisable to configure this parameter before configuring the [1.6 COMMAND] (CtL-) and [1.7 APPLICATION FUNCT.] (FUn-) menus.
Check that this change is compatible with the wiring diagram used.
Failure to follow these instructions can result in death or serious injury.

Code	Name/Description	Adjustment range	Factory setting
tCt	**[2 wire type]**		[Transition] (trn)

- LEL — **[Level]** (LEL): State 0 or 1 is taken into account for run (1) or stop (0).
- trn — **[Transition]** (trn): A change of state (transition or edge) is necessary to initiate operation, in order to prevent accidental restarts after a break in the power supply.
- PFO — **[Fwd priority]** (PFO): State 0 or 1 is taken into account for run or stop, but the “forward” input always takes priority over the “reverse” input.

Code	Name/Description	Adjustment range	Factory setting
rrS	**[Reverse assign.]**		[No] (nO)

- nO — **[No]** (nO): Not assigned
- LI1 — **[LI1]** (LI1) to **[LI6]** (LI6)
- \- — **[LI7]** (LI7) to **[LI10]** (LI10): If VW3A3201 logic I/O card has been inserted
- \- — **[LI11]** (LI11) to **[LI14]** (LI14): If VW3A3202 extended I/O card has been inserted
- C101 — **[C101]** (C101) to **[C115]** (C115): With integrated Modbus in [I/O profile] (IO)
- \- — **[C201]** (C201) to **[C215]** (C215): With integrated CANopen in [I/O profile] (IO)
- \- — **[C301]** (C301) to **[C315]** (C315): With a communication card in [I/O profile] (IO)
- \- — **[C401]** (C401) to **[C415]** (C415): With a Controller Inside card in [I/O profile] (IO)
- Cd00 — **[CD00]** (Cd00) to **[CD13]** (Cd13): In [I/O profile] (IO) can be switched with possible logic inputs
- \- — **[CD14]** (Cd14) to **[CD15]** (Cd15): In [I/O profile] (IO) can be switched without logic inputs

Assignment of the reverse direction command.

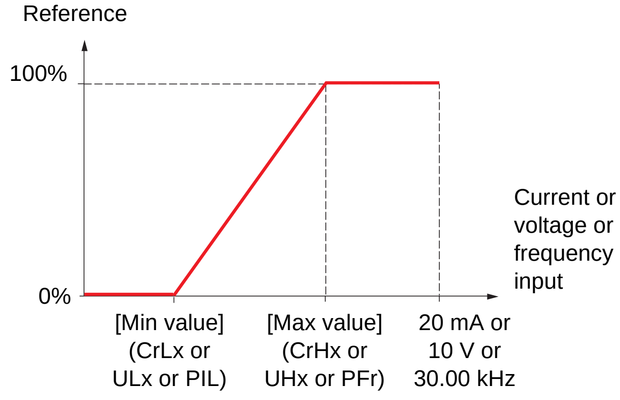
Code	Name/Description	Adjustment range	Factory setting
L1-	■ **[LI1 CONFIGURATION]**		
L1A	❑ **[LI1 assignment]** Read-only parameter, cannot be configured. It displays all the functions that are assigned to input LI1 in order to check multiple assignments.		
L1d	❑ **[LI1 On Delay]** This parameter is used to take account of the change of the logic input to state 1 with a delay that can be adjusted between 0 and 200 milliseconds, in order to filter out possible interference. The change to state 0 is taken into account without delay. **WARNING** **UNINTENDED EQUIPMENT OPERATION** Check that the delay set does not pose a risk or lead to undesired operation. The relative order in which these inputs are taken into account may be modified according to the delay values of the various logic inputs, and thus lead to unintended operation. **Failure to follow these instructions can result in death or serious injury.**	0 to 200 ms	0
L--	■ **[LIx CONFIGURATION]** All the logic inputs available on the drive are processed as in the example for LI1 above, up to LI6, LI10 or LI14, depending on whether or not option cards have been inserted.		

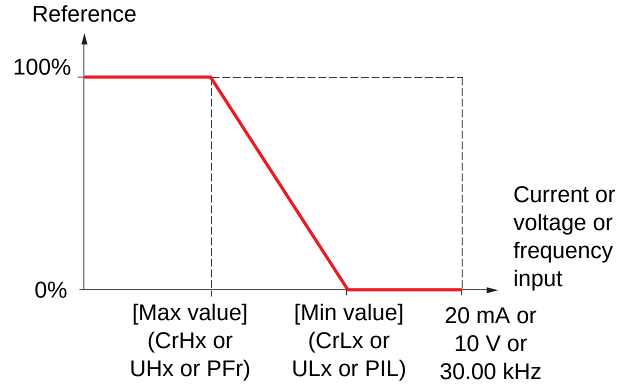
Configuration of analog inputs and Pulse input

The minimum and maximum input values (in volts, mA, etc.) are converted to% in order to adapt the references to the application.

Minimum and maximum input values:

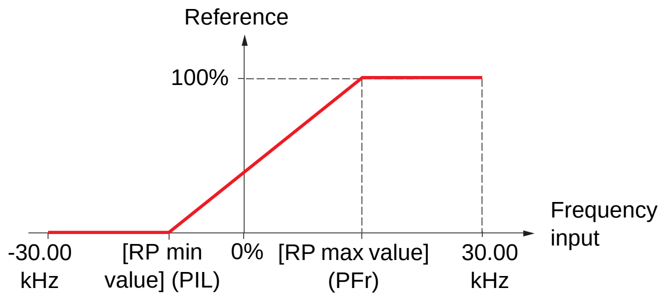
The minimum value corresponds to a reference of 0% and the maximum value to a reference of 100%. The minimum value may be greater than the maximum value:





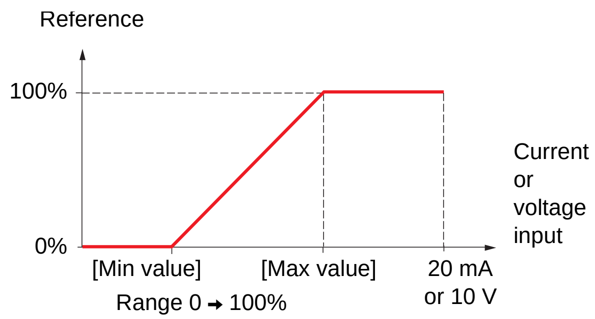
For +/- bidirectional inputs, the min. and max. are relative to the absolute value, for example, +/- 2 to 8 V.

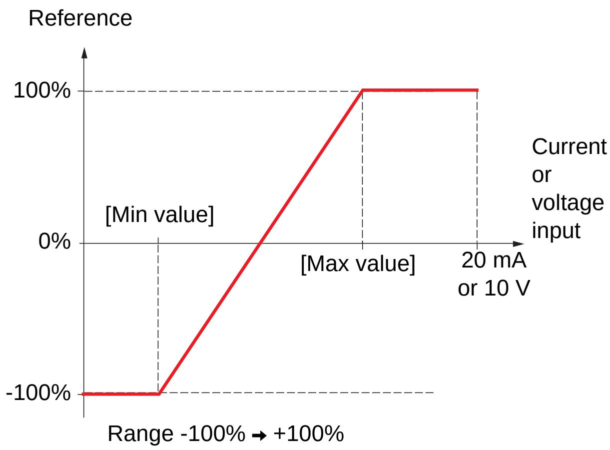
Negative min. value of Pulse input:



Range (output values): For analog inputs only

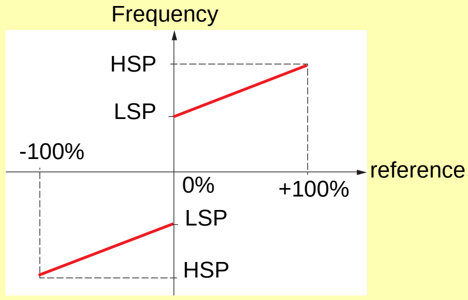
This parameter is used to configure the reference range to [0% → 100%] or [-100% → +100%] in order to obtain a bidirectional output from a unidirectional input.





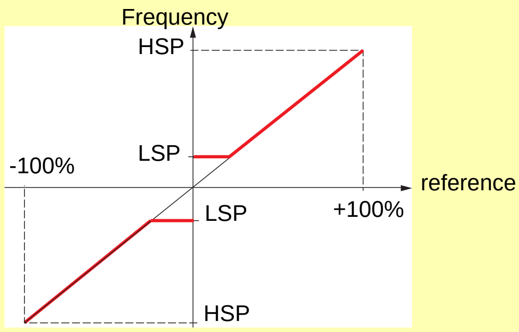
Code	Name/Description	Adjustment range	Factory setting
bSP	❑ **[Reference template]**		[Standard] (bSd)

bSd ☐ **[Standard]** (bSd)



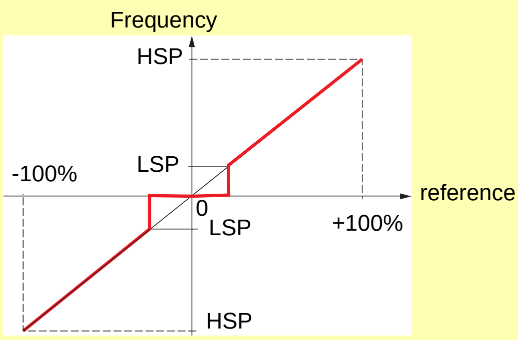
At zero reference the frequency = LSP

bLS ☐ **[Pedestal]** (bLS)



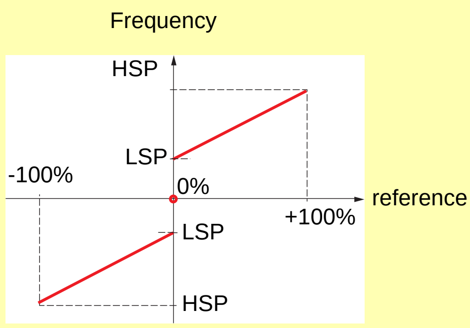
At reference = 0 to LSP the frequency = LSP

bnS ☐ **[Deadband]** (bnS)



At reference = 0 to LSP the frequency = 0

bnS0 ☐ **[Deadband 0]** (bnS0)



This operation is the same as [Standard] (bSd), except that in the following cases at zero reference, the frequency = 0:
• The signal is less than [Min value], which is greater than 0 (example 1 V on a 2 - 10 V input)
• The signal is greater than [Min value], which is greater than [Max value] (example 11 V on a 10 - 0 V input).

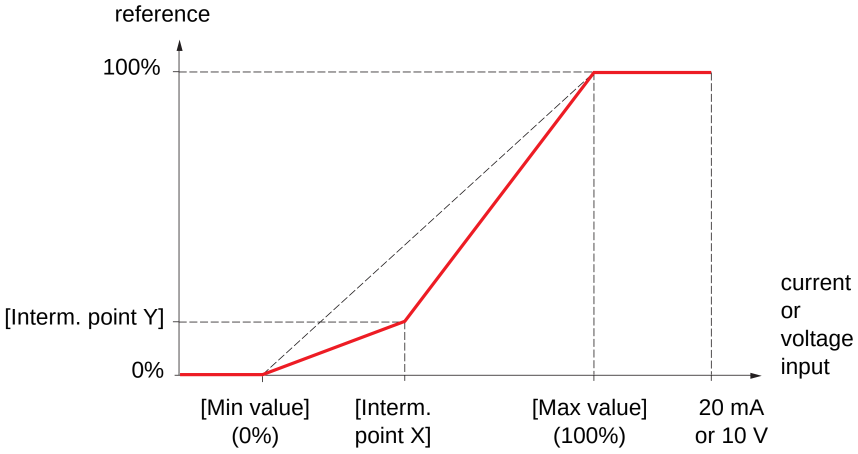
If the input range is configured as “bidirectional”, operation remains identical to [Standard] (bSd).

This parameter defines how the speed reference is taken into account, for analog inputs and Pulse input only. In the case of the PID regulator, this is the PID output reference.
The limits are set by the [Low speed] (LSP) and [High speed] (HSP) parameters, page 37

Delinearization: For analog inputs only

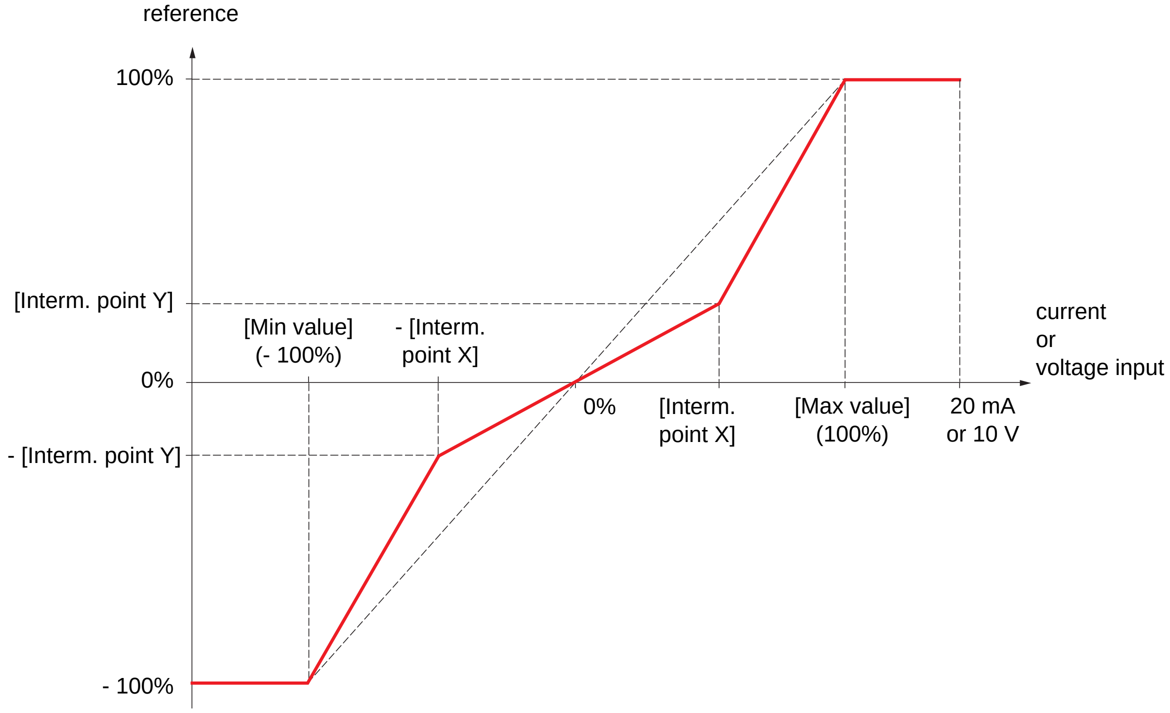
The input can be delinearized by configuring an intermediate point on the input/output curve of this input:

For range 0 → 100%



Note: For [Interm. point X], 0% corresponds to [Min value] and 100% to [Max value]

For range -100% → 100%



Code	Name/Description	Adjustment range	Factory setting
AI1-	■ **[AI1 CONFIGURATION]**		
AI1A	❑ **[AI1 assignment]** Read-only parameter, cannot be configured. It displays all the functions associated with input AI1 in order to check, for example, for compatibility problems.		
AI1t	❑ **[AI1 Type]**		[Voltage] (10U)
10U	☐ **[Voltage]** (10U): Positive voltage input (negative values are considered as zero: the input is unidirectional).		
n10U	☐ **[Voltage +/-]** (n10U): Positive and negative voltage input (the input is bidirectional).		
UIL1	❑ **[AI1 min value]**	0 to 10.0 V	0 V
UIH1	❑ **[AI1 max value]**	0 to 10.0 V	10.0 V
AI1F	❑ **[AI1 filter]** Interference filtering.	0 to 10.00 s	0 s
AI1E	❑ **[AI1 Interm. point X]** Input delinearization point coordinate. • 0% corresponds to [AI1 min value] (UIL1). • 100% corresponds to [AI1 max value] (UIH1).	0 to 100%	0%
AI1S	❑ **[AI1 Interm. point Y]** Output delinearization point coordinate (frequency reference).	0 to 100%	0%

Code	Name/Description	Adjustment range	Factory setting
AI2-	**[AI2 CONFIGURATION]**		
AI2A	❑ **[AI2 assignment]** Read-only parameter, cannot be configured. It displays all the functions associated with input AI2 in order to check, for example, for compatibility problems.		
AI2t 10U 0A	❑ **[AI2 Type]** ☐ **[Voltage]** (10U): Voltage input ☐ **[Current]** (0 A): Current input		[Current] (0 A)
CrL2	❑ **[AI2 min. value]** The parameter can be accessed if [AI2 Type] (AI2t) = [Current] (0 A)	0 to 20.0 mA	0 mA
UIL2	❑ **[AI2 min. value]** The parameter can be accessed if [AI2 Type] (AI2t) = [Voltage] (10U)	0 to 10.0 V	0 V
CrH2	❑ **[AI2 max. value]** The parameter can be accessed if [AI2 Type] (AI2t) = [Current] (0 A)	0 to 20.0 mA	20.0 mA
UIH2	❑ **[AI2 max. value]** The parameter can be accessed if [AI2 Type] (AI2t) = [Voltage] (10U)	0 to 10.0 V	10.0 V
AI2F	❑ **[AI2 filter]** Interference filtering.	0 to 10.00 s	0 s
AI2L POS nEG	❑ **[AI2 range]** ☐ **[0 – 100%]** (POS): Unidirectional input ☐ **[+/- 100%]** (nEG): Bidirectional input Example: On a 0/10 V input - 0 V corresponds to reference -100% - 5 V corresponds to reference 0% - 10 V corresponds to reference +100%		[0 – 100%] (POS)
AI2E	❑ **[AI2 Interm. point X]** Input delinearization point coordinate. • 0% corresponds to [Min value] if the range is 0 → 100%. • 0% corresponds to $\frac{\text{[Max value] + [Min value]}}{2}$ if the range is -100% → +100%. • 100% corresponds to [Max value].	0 to 100%	0%
AI2S	❑ **[AI2 Interm. point Y]** Output delinearization point coordinate (frequency reference).	0 to 100%	0%

Code	Name/Description	Adjustment range	Factory setting
AI3-	**[AI3 CONFIGURATION]** Can be accessed if a VW3A3202 option card has been inserted		
AI3A	**[AI3 assignment]** Read-only parameter, cannot be configured. It displays all the functions associated with input AI3 in order to check, for example, for compatibility problems.		
AI3t 0A	**[AI3 Type]** Read-only parameter, cannot be configured. **[Current]** (0 A): Current input		[Current] (0 A)
CrL3	**[AI3 min. value]**	0 to 20.0 mA	0 mA
CrH3	**[AI3 max. value]**	0 to 20.0 mA	20.0 mA
AI3F	**[AI3 filter]** Interference filtering.	0 to 10.00 s	0 s
AI3L POS nEG	**[AI3 range]** **[0 – 100%]** (POS): Unidirectional input **[+/- 100%]** (nEG): Bidirectional input Example: On a 4 – 20 mA input - 4 mA corresponds to reference -100% - 12 mA corresponds to reference 0% - 20 mA corresponds to reference +100% Since AI3 is, in physical terms, a bidirectional input, the [+/- 100%] (nEG) configuration must only be used if the signal applied is unidirectional. A bidirectional signal is not compatible with a bidirectional configuration.		[0 – 100%] (POS)
AI3E	**[AI3 Interm. point X]** Input delinearization point coordinate. • 0% corresponds to [Min value] (CrL3) if the range is 0 → 100%. • 0% corresponds to $\frac{\text{[AI3 max. value] (CrH3) - [AI3 min. value] (CrL3)}}{2}$ if the range is -100% → +100%. • 100% corresponds to [AI3 max. value] (CrH3).	0 to 100%	0%
AI3S	**[AI3 Interm. point Y]** Output delinearization point coordinate (frequency reference).	0 to 100%	0%

Code	Name/Description	Adjustment range	Factory setting
A14-	■ **[AI4 CONFIGURATION]** Can be accessed if a VW3A3202 option card has been inserted		
A14A	❑ **[AI4 assignment]** Read-only parameter, cannot be configured. It displays all the functions associated with input AI4 in order to check, for example, for compatibility problems.		
A14t	❑ **[AI4 Type]**		[Voltage] (10U)
10U	☐ **[Voltage]** (10U): Voltage input		
0A	☐ **[Current]** (0 A): Current input		
CrL4	❑ **[AI4 min value]** The parameter can be accessed if [AI4 Type] (AI4t) = [Current] (0 A)	0 to 20.0 mA	0 mA
UIL4	❑ **[AI4 min value]** The parameter can be accessed if [AI4 Type] (AI4t) = [Voltage] (10U)	0 to 10.0 V	0 V
CrH4	❑ **[AI4 max value]** The parameter can be accessed if [AI4 Type] (AI4t) = [Current] (0 A)	0 to 20.0 mA	20.0 mA
UIH4	❑ **[AI4 max value]** The parameter can be accessed if [AI4 Type] (AI4t) = [Voltage] (10U)	0 to 10.0 V	10.0 V
A14F	❑ **[AI4 filter]** Interference filtering.	0 to 10.00 s	0 s
A14L	❑ **[AI4 range]**		[0 – 100%] (POS)
POS	☐ **[0 – 100%]** (POS): Unidirectional input		
nEG	☐ **[+/- 100%]** (nEG): Bidirectional input Example: On a 0/10 V input - 0 V corresponds to reference -100% - 5 V corresponds to reference 0% - 10 V corresponds to reference +100%		
A14E	❑ **[AI4 Interm.point X]** Input delinearization point coordinate. • 0% corresponds to [Min value] if the range is 0 → 100%. • 0% corresponds to $\frac{\text{[Max value] + [Min value]}}{2}$ if the range is -100% → + 100%. • 100% corresponds to [Max value].	0 to 100%	0%
A14S	❑ **[AI4 Interm.point Y]** Output delinearization point coordinate (frequency reference).	0 to 100%	0%

Code	Name/Description	Adjustment range	Factory setting
AU1-	■ [VIRTUAL AI1]		
AIC1	❑ [AI net. channel] Virtual input. This parameter can also be accessed in the [PID REGULATOR] (PId-) submenu, page 151.		[No] (nO)
nO	[Non] (nO): Not assigned (in this case, the virtual input does not appear in the analog input assignment parameters for the functions)		
Mdb	❑ [Modbus] (Mdb): Integrated Modbus		
CAn	❑ [CANopen] (CAn): Integrated CANopen		
nEt	❑ [Com. card] (nEt): Communication card (if inserted)		
APP	❑ [C.Insid. card] (APP): Controller Inside card (if inserted) Scale: The value 8192 transmitted by this input is equivalent to 10 V on a 10 V input.		

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

If the equipment switches to forced local mode (see page 216), the virtual input remains frozen at the last value transmitted.
Do not use the virtual input and forced local mode in the same configuration.
Failure to follow this instruction can result in death or serious injury.

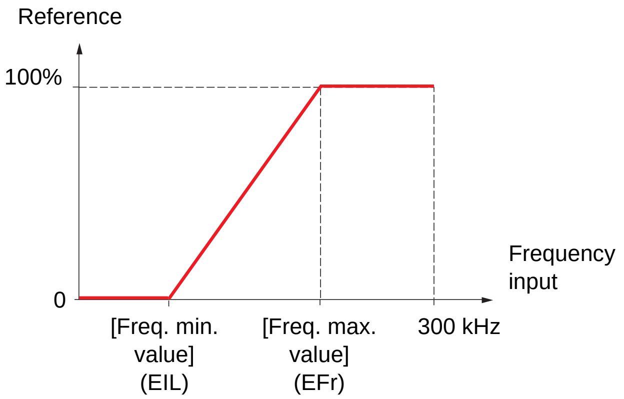
Code	Name/Description	Adjustment range	Factory setting
PL1-	**[RP CONFIGURATION]** Can be accessed if a VW3A3202 option card has been inserted		
P1A	**[RP assignment]** Read-only parameter, cannot be configured. It displays all the functions associated with the Pulse In input in order to check, for example, for compatibility problems.		
P1L	**[RP min value]** Frequency corresponding to the minimum speed	- 30.00 to 30.00 kHz	0
PFr	**[RP max value]** Frequency corresponding to the maximum speed	0 to 30.00 kHz	30.00 kHz
PF1	**[RP filter]** Interference filtering.	0 to 1,000 ms	0

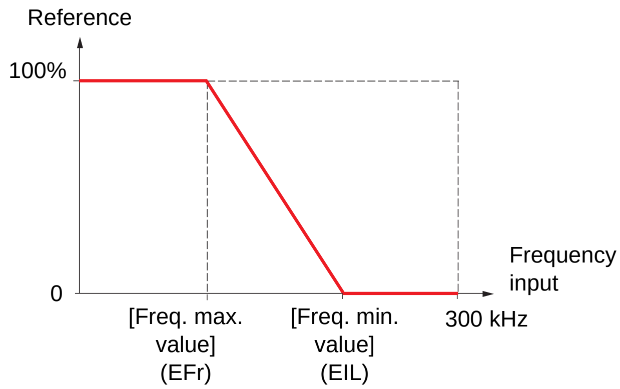
Configuration of the encoder input serving as a reference, with a frequency generator

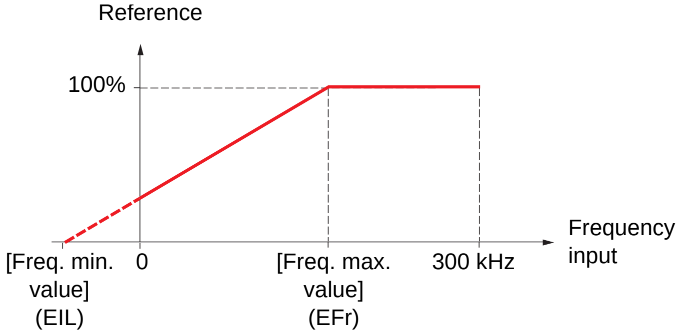
This reference is not signed, therefore the directions of operation must be given via the control channel (logic inputs, for example).

Minimum and maximum values (input values):

The minimum value corresponds to a minimum reference of 0% and the maximum value to a maximum reference of 100%. The minimum value may be greater than the maximum value. It may also be negative.







A reference can be obtained at zero frequency by assigning a negative value to the minimum value.

The encoder configuration can also be accessed in the [1.4 MOTOR CONTROL] (drC-) menu.

Code	Name/Description	Adjustment range	Factory setting
IEn-	■ **[ENCODER CONFIGURATION]** The encoder parameters can only be accessed if the encoder card has been inserted, and the available selections will depend on the type of encoder card used.		
EnS AAbb Ab A	❑ **[Encoder type]** The parameter can be accessed if an encoder card has been inserted. To be configured in accordance with the type of encoder used. ☐ **[AABB]** (AAbb): For signals A, A-, B, B-. ☐ **[AB]** (Ab): For signals A, B. ☐ **[A]** (A): For signal A. Value cannot be accessed if [Encoder usage] (EnU) page 93 = [Spd fdk reg.] (rEG).		[AABB] (AAbb)
EnC nO YES dOnE	❑ **[Encoder check]** Encoder feedback check See procedure page 74. The parameter can be accessed if an encoder card has been inserted and if [Encoder usage] (EnU) page 93 is not [Speed ref.] (PGr). ☐ **[Not done]** (nO) Check not performed. ☐ **[Yes]** (YES): Activates monitoring of the encoder. ☐ **[Done]** (dOnE): Check performed successfully. The check procedure checks: - The direction of rotation of the encoder/motor - The presence of signals (wiring continuity) - The number of pulses/revolution If a fault is detected, the drive locks in [Encoder fault] (EnF) fault mode.		[Not done] (nO)

Code	Name/Description	Adjustment range	Factory setting
	[ENCODER CONFIGURATION] (continued)		
EnU	**[Encoder usage]** The parameter can be accessed if an encoder card has been inserted.		[No] (nO)
nO	**[No]** (nO): Function inactive, In this case, the other parameters cannot be accessed.		
SEC	**[Fdbk monit.]** (SEC): The encoder provides speed feedback for monitoring only.		
rEG	**[Spd fdk reg.]** (rEG): The encoder provides speed feedback for regulation and monitoring. If [Motor control type] (Ctt) = [SVC U] (UUC) the encoder operates in speed feedback mode and enables static correction of the speed to be performed. This configuration is not accessible for other [Motor control type] (Ctt) values.		
PGr	**[Speed ref.]** (PGr): The encoder provides a reference.		
PG1	**[Number of pulses]** Number of pulses per encoder revolution. The parameter can be accessed if an encoder card has been inserted.	100 to 5,000	1,024
PGA	**[Reference type]** The parameter can be accessed if [Encoder usage] (EnU) = [Speed ref.] (PGr).		[Encoder] (EnC)
EnC	**[Encoder]** (EnC): Use of an encoder.		
PtG	**[Freq. gen.]** (PtG): Use of a frequency generator (unsigned reference).		
EIL	**[Freq. min. value]** The parameter can be accessed if [Encoder usage] (EnU) = [Speed ref.] (PGr) and if [Reference type] (PGA) = [Freq. gen.] (PtG). Frequency corresponding to the minimum speed	- 300 to 300 kHz	0
EFr	**[Freq. max value]** The parameter can be accessed if [Encoder usage] (EnU) = [Speed ref.] (PGr) and if [Reference type] (PGA) = [Freq. gen.] (PtG). Frequency corresponding to the maximum speed	0.00 to 300 kHz	300 kHz
EFI	**[Freq. signal filter]** The parameter can be accessed if [Encoder usage] (EnU) = [Speed ref.] (PGr). Interference filtering.	0 to 1,000 ms	0

Code	Name/Description	Adjustment range	Factory setting
r1-	■ [R1 CONFIGURATION]		
r1	❑ [R1 Assignment]		[No drive flt] (FLt)
nO	❑ [No] (nO): Not assigned		
FLt	❑ [No drive flt] (FLt): Drive not faulty (relay normally energized, and de-energized if there is a fault)		
rUn	❑ [Drv running] (rUn): Drive running		
FtA	❑ [Freq. Th. attain.] (FtA): The relay is closed if the frequency is greater than [Freq. threshold] (Ftd) page 59.		
FLA	❑ [HSP attain.] (FLA): High speed reached		
CtA	❑ [Current Th. attained] (CtA): The relay is closed if the current is greater than [Current threshold] (Ctd) page 59.		
SrA	❑ [Freq.ref.att] (SrA): Frequency reference reached		
tSA	❑ [Th.mot. att.] (tSA): Motor 1 thermal state reached		
PEE	❑ [PID error al] (PEE): PID error alarm		
PFA	❑ [PID fdbk al.] (PFA): PID feedback alarm (greater than [Max fbk alarm] (PAH) page 152 or less than [Min fbk alarm] (PAL) page 152)		
AP2	❑ [AI2 Al. 4-20] (AP2): Alarm indicating absence of 4-20 mA signal on input AI2		
F2A	❑ [Freq. Th. 2 attain.] (F2A): The relay is closed if the frequency is greater than [Freq. threshold 2] (F2d) page 59.		
tAd	❑ [Th.drv.att.] (tAd): Drive thermal state reached		
ttHA	❑ [High tq. att.] (ttHA): Motor torque greater than high threshold [High torque thd.] (ttH) page 59		
ttLA	❑ [Low tq. att.] (ttLA): Motor torque less than low threshold [Low torque thd.] (ttL) page 59		
MFrd	❑ [Forward] (MFrd): Motor running forward		
MrrS	❑ [Reverse] (MrrS): Motor running in reverse		
rtAH	❑ [High Reference Att.] (rtAH): The relay is closed if the frequency reference is greater than [High Freq. Ref. Thr.] (rtd) page 60.		
rtAL	❑ [Low Reference Att.] (rtAL): The relay is closed if the frequency reference is less than [Low Freq. Ref. Thr.] (rtdL) page 60.		
FtAL	❑ [Low Frq. Th. Attain.] (FtAL): The relay is closed if the frequency is less than [Low Freq.Threshold] (FtdL) page 59.		
F2AL	❑ [2Low F.Thld] (F2AL): The relay is closed if the frequency is less than [2 Freq. Threshold] (F2dL) page 59.		
CtAL	❑ [Low I Th.At.] (CtAL): The relay is closed if the current is less than [Low I Threshold] (CtdL) page 59.		
ULA	❑ [Pro.Undload] (ULA): Process underload (see page 208)		
OLA	❑ [Ovld.P.Alrm] (OLA): Process overload (see page 210)		
PFAH	❑ [PID high Al.] (PFAH): PID feedback alarm (greater than [Max fbk alarm] (PAH) page 152).		
PFAL	❑ [PID low Alarm] (PFAL): PID feedback alarm (less than [Min fbk alarm] (PAL) page 152).		
PISH	❑ [Regul.Alarm] (PISH): PID regulator feedback supervision fault page 155.		
Ern	❑ [Emerg. Run] (Ern): The relay is closed if the drive is in emergency run. See [Forced Run] (InHS) page 201.		
tS2	❑ [Th.mot2 att.] (tS2): Motor 2 thermal state reached		
tS3	❑ [Th.mot3 att] (tS3): Motor 3 thermal state reached		
bMP	❑ [Rem.Cmd] (bMP): Control via the graphic display terminal is activated via a function key on the terminal.		

Code	Name/Description	Adjustment range	Factory setting
r1-	■ **[R1 CONFIGURATION]** (continued)		
r1	❑ **[R1 Assignment]** (continued)		
AtS	□ **[Neg Torque]** (AtS): Negative torque (braking)		
CnF0	□ **[Cnfg.0 act.]** (CnF0): Configuration 0 active		
CnF1	□ **[Cnfg.1 act.]** (CnF1): Configuration 1 active		
CnF2	□ **[Cnfg.2 act.]** (CnF2): Configuration 2 active		
CFP1	□ **[Set 1 active]** (CFP1): Parameter set 1 active		
CFP2	□ **[Set 2 active]** (CFP2): Parameter set 2 active		
CFP3	□ **[Set 3 active]** (CFP3): Parameter set 3 active		
dbL	□ **[DC charged]** (dbL): DC bus loading		
brS	□ **[In braking]** (brS): Drive braking		
PrM	□ **[P. removed]** (PRM): Drive locked by "Power removal" input		
FqLA	□ **[Fr.met. alar.]** (FqLA): Measured speed threshold attained: [Pulse warning thd.] (FqL) page 59		
MCP	□ **[I present]** (MCP): Motor current present		
AG1	□ **[Alarm Grp 1]** (AGI): Alarm group 1		
AG2	□ **[Alarm Grp 2]** (AG2): Alarm group 2		
AG3	□ **[Alarm Grp 3]** (AG3): Alarm group 3		
P1A	□ **[PTC1 alarm]** (P1A): Probe alarm 1		
P2A	□ **[PTC2 alarm]** (P2A): Probe alarm 2		
PLA	□ **[LI6=PTC al.]** (PLA): LI6 = PTC probe alarms		
EFA	□ **[Ext. fault al]** (EFA): External fault alarm		
USA	□ **[Under V. al.]** (USA): Undervoltage alarm		
UPA	□ **[Uvolt warn]** (UPA): Undervoltage warning		
tHA	□ **[Al. °C drv]** (tHA): Drive overheating		
SSA	□ **[Lim T/I att.]** (SSA): Torque limit alarm		
tJA	□ **[IGBT al.]** (tJA): IGBT alarm		
bOA	□ **[Brake R. al.]** (bOA): Braking resistor temperature alarm		
APA	□ **[Option al.]** (APA): Alarm generated by the Controller Inside card		
AP3	□ **[AI3 Al. 4-20]** (AP3): Alarm indicating absence of 4-20 mA signal on input AI3		
AP4	□ **[AI4 Al. 4-20]** (AP4): Alarm indicating absence of 4-20 mA signal on input AI4		
FSA	□ **[Flow Limit.]** (FSA): Flow rate limiting active (see page 182)		
rdY	□ **[Ready]** (rdY): Drive ready		

Code	Name/Description	Adjustment range	Factory setting
	■ **[R1 CONFIGURATION]** (continued)		
r1d	❑ **[R1 Delay time]** The change in state only takes effect once the configured time has elapsed, when the information becomes true. The delay cannot be set for the [No drive flt] (FLt) assignment, and remains at 0.	0 to 60000 ms (1)	0
r1S POS nEG	❑ **[R1 Active at]** Configuration of the operating logic: □ **[1]**: State 1 when the information is true □ **[0]**: State 0 when the information is true Configuration [1] (POS) cannot be modified for the [No drive flt] (FLt), assignment.		[1] (POS)
r1H	❑ **[R1 Holding time]** The change in state only takes effect once the configured time has elapsed, when the information becomes false. The holding time cannot be set for the [No drive flt] (FLt) assignment, and remains at 0.	0 to 9,999 ms	0
r2-	■ **[R2 CONFIGURATION]**		
r2 LLC OCC dCO dAM	❑ **[R2 Assignment]** Identical to R1 (see page 94) with the addition of (shown for information only as these selections can only be configured in the [APPLICATION FUNCT.] (Fun-)) menu: □ **[Input cont.]** (LLC): Line contactor control □ **[Output cont]** (OCC): Output contactor control □ **[DC charging]** (dCO): DC bus precharging contactor control □ **[Damper]** (dAM): Damper control		[Drv running] (rUn)
r2d	❑ **[R2 Delay time]** The delay cannot be set for the [No drive flt] (FLt), [Output cont] (OCC), [DC charging] (dCO), and [Input cont.] (LLC) assignments, and remains at 0. The change in state only takes effect once the configured time has elapsed, when the information becomes true.	0 to 60000 ms (1)	0
r2S POS nEG	❑ **[R2 Active at]** Configuration of the operating logic: □ **[1]**: State 1 when the information is true □ **[0]**: State 0 when the information is true The [1] (POS) configuration cannot be modified for the[No drive flt] (FLt), [DC charging] (dCO) and [Input cont.] (LLC), assignments.		[1] (POS)
r2H	❑ **[R2 Holding time]** The holding time cannot be set for the [No drive flt] (FLt), [DC charging] (dCO) and [Input cont.] (LLC) assignments, and remains at 0. The change in state only takes effect once the configured time has elapsed, when the information becomes false.	0 to 9,999 ms	0

(1) 0 to 9999 ms then 10.00 to 60.00 s on the integrated display terminal.

Code	Name/Description	Adjustment range	Factory setting
r3-	**[R3 CONFIGURATION]** Can be accessed if a VW3A3201 option card has been inserted		
r3	**[R3 Assignment]** Identical to R2		[No] (nO)
r3d	**[R3 Delay time]** The delay cannot be set for the [No drive flt] (FLt), [Output cont] (OCC), [DC charging] (dCO), and [Input cont.] (LLC) assignments, and remains at 0. The change in state only takes effect once the configured time has elapsed, when the information becomes true.	0 to 60000 ms (1)	0
r3S POS nEG	**[R3 Active at]** Configuration of the operating logic: ☐ [1]: State 1 when the information is true ☐ [0]: State 0 when the information is true The [1] (POS) configuration cannot be modified for the[No drive flt] (FLt), [DC charging] (dCO) and [Input cont.] (LLC), assignments.		[1] (POS)
r3H	**[R3 Holding time]** The holding time cannot be set for the [No drive flt] (FLt), [DC charging] (dCO) and [Input cont.] (LLC) assignments, and remains at 0. The change in state only takes effect once the configured time has elapsed, when the information becomes false.	0 to 9,999 ms	0
r4-	**[R4 CONFIGURATION]** Can be accessed if a VW3A3202 option card has been inserted		
r4	**[R4 Assignment]** Identical to R2 (see page 96).		[No] (nO)
r4d	**[R4 Delay time]** The delay cannot be set for the [No drive flt] (FLt), [Output cont] (OCC), [DC charging] (dCO), and [Input cont.] (LLC) assignments, and remains at 0. The change in state only takes effect once the configured time has elapsed, when the information becomes true.	0 to 60000 ms (1)	0
r4S POS nEG	**[R4 Active at]** Configuration of the operating logic: ☐ [1]: State 1 when the information is true ☐ [0]: State 0 when the information is true The [1] (POS) configuration cannot be modified for the[No drive flt] (FLt), [DC charging] (dCO) and [Input cont.] (LLC), assignments.		[1] (POS)
r4H	**[R4 Holding time]** The holding time cannot be set for the [No drive flt] (FLt), [DC charging] (dCO) and [Input cont.] (LLC) assignments, and remains at 0. The change in state only takes effect once the configured time has elapsed, when the information becomes false.	0 to 9,999 ms	0

(1) 0 to 9999 ms then 10.00 to 60.00 s on the integrated display terminal.

Code	Name/Description	Adjustment range	Factory setting
LO1-	■ **[LO1 CONFIGURATION]** Can be accessed if a VW3A3201 option card has been inserted		
LO1	❑ **[LO1 assignment]**		[No] (nO)
	Identical to R1 (see page 94) with the addition of (shown for information only as these selections can only be configured in the [APPLICATION FUNCT.] (Fun-)) menu:		
LLC	❑ **[Input cont.]** (LLC): Line contactor control		
OCC	❑ **[Output cont]** (OCC): Output contactor control		
dCO	❑ **[[DC charging]** (dCO): DC bus precharging contactor control		
dAM	❑ **[Damper]** (dAM): Damper control		
LO1d	❑ **[LO1 delay time]**	0 to 60000 ms (1)	0
	The delay cannot be set for the [No drive flt] (FLt), [Output cont] (OCC), [DC charging] (dCO), and [Input cont.] (LLC) assignments, and remains at 0. The change in state only takes effect once the configured time has elapsed, when the information becomes true.		
LO1S	❑ **[LO1 active at]**		[1] (POS)
	Configuration of the operating logic:		
POS	❑ **[1]**: State 1 when the information is true		
nEG	❑ **[0]**: State 0 when the information is true		
	The [1] (POS) configuration cannot be modified for the[No drive flt] (FLt), [DC charging] (dCO) and [Input cont.] (LLC), assignments.		
LO1H	❑ **[LO1 holding time]**	0 to 9,999 ms	0
	The holding time cannot be set for the [No drive flt] (FLt), [DC charging] (dCO) and [Input cont.] (LLC) assignments, and remains at 0. The change in state only takes effect once the configured time has elapsed, when the information becomes false.		
LO2-	■ **[LO2 CONFIGURATION]** Can be accessed if a VW3A3201 option card has been inserted		
LO2	❑ **[LO2 assignment]**		[No] (nO)
	Identical to LO1.		
LO2d	❑ **[LO2 delay time]**	0 to 60000 ms (1)	0
	The delay cannot be set for the [No drive flt] (FLt), [Output cont] (OCC), [DC charging] (dCO), and [Input cont.] (LLC) assignments, and remains at 0. The change in state only takes effect once the configured time has elapsed, when the information becomes true.		
LO2S	❑ **[LO2 active at]**		[1] (POS)
	Configuration of the operating logic:		
POS	❑ **[1]**: State 1 when the information is true		
nEG	❑ **[0]**: State 0 when the information is true		
	The [1] (POS) configuration cannot be modified for the[No drive flt] (FLt), [DC charging] (dCO) and [Input cont.] (LLC), assignments.		
LO2H	❑ **[LO2 holding time]**	0 to 9,999 ms	0
	The holding time cannot be set for the [No drive flt] (FLt), [DC charging] (dCO) and [Input cont.] (LLC) assignments, and remains at 0. The change in state only takes effect once the configured time has elapsed, when the information becomes false.		

(1) 0 to 9999 ms then 10.00 to 60.00 s on the integrated display terminal.

Code	Name/Description	Adjustment range	Factory setting
LO3-	**[LO3 CONFIGURATION]** Can be accessed if a VW3A3202 option card has been inserted		
LO3	**[LO3 assignment]** Identical to LO1 (see page 98).		[No] (nO)
LO3d	**[LO3 delay time]** The delay cannot be set for the [No drive flt] (FLt), [Output cont] (OCC), [DC charging] (dCO), and [Input cont.] (LLC) assignments, and remains at 0. The change in state only takes effect once the configured time has elapsed, when the information becomes true.	0 to 60000 ms (1)	0
LO3S	**[LO3 active at]** Configuration of the operating logic:		[1] (POS)
POS	[1]: State 1 when the information is true		
nEG	[0]: State 0 when the information is true The [1] (POS) configuration cannot be modified for the[No drive flt] (FLt), [DC charging] (dCO) and [Input cont.] (LLC), assignments.		
LO3H	**[LO3 holding time]** The holding time cannot be set for the [No drive flt] (FLt), [DC charging] (dCO) and [Input cont.] (LLC) assignments, and remains at 0. The change in state only takes effect once the configured time has elapsed, when the information becomes false.	0 to 9,999 ms	0
LO4-	**[LO4 CONFIGURATION]** Can be accessed if a VW3A3202 option card has been inserted		
LO4	**[LO4 assignment]** Identical to LO1 (see page 98).		[No] (nO)
LO4d	**[LO4 delay time]** The delay cannot be set for the [No drive flt] (FLt), [Output cont] (OCC), [DC charging] (dCO), and [Input cont.] (LLC) assignments, and remains at 0. The change in state only takes effect once the configured time has elapsed, when the information becomes true.	0 to 60000 ms (1)	0
LO4S	**[LO4 active at]** Configuration of the operating logic:		[1] (POS)
POS	[1]: State 1 when the information is true		
nEG	[0]: State 0 when the information is true The [1] (POS) configuration cannot be modified for the[No drive flt] (FLt), [DC charging] (dCO) and [Input cont.] (LLC), assignments.		
LO4H	**[LO4 holding time]** The holding time cannot be set for the [No drive flt] (FLt), [DC charging] (dCO) and [Input cont.] (LLC) assignments, and remains at 0. The change in state only takes effect once the configured time has elapsed, when the information becomes false.	0 to 9,999 ms	0

(1) 0 to 9999 ms then 10.00 to 60.00 s on the integrated display terminal.

Use of analog output AO1 as a logic output

Analog output AO1 can be used as a logic output, by assigning DO1. In this case, state 0 of this output corresponds to the minimum value of AO1 (0 V or 0 mA, for example), and state 1 corresponds to the maxium value of AO1 (10 V or 20 mA, for example).
The electrical characteristics of this analog output remain unchanged. As they differ from logic output characteristics, it is important to ensure that they are compatible with the intended application.

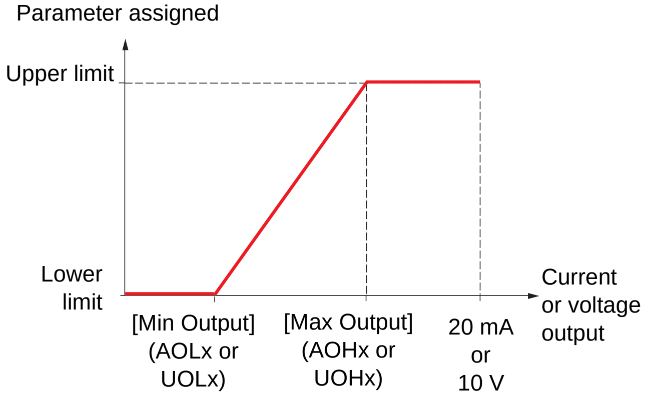
Code	Name/Description	Adjustment range	Factory setting
dO1-	■ **[DO1 CONFIGURATION]**		
dO1	❑ **[DO1 assignment]**		[No] (nO)
	Identical to R1 (see page 94) with the addition of (shown for information only as these selections can only be configured in the [1.7 APPLICATION FUNCT.] (Fun-) menu):		
LLC	☐ **[Input cont.]** (LLC): Line contactor control		
OCC	☐ **[Output cont]** (OCC): Output contactor control		
dCO	☐ **[DC charging]** (dCO): DC bus precharging contactor control		
dAM	☐ **[Damper]** (dAM): Damper control		
dO1d	❑ **[DO1 delay time]**	0 to 60000 ms (1)	0
	The delay cannot be set for the [No drive flt] (FLt), [Output cont] (OCC), [DC charging] (dCO), and [Input cont.] (LLC) assignments, and remains at 0. The change in state only takes effect once the configured time has elapsed, when the information becomes true.		
dO1S	❑ **[DO1 active at]**		[1] (POS)
	Configuration of the operating logic:		
POS	☐ **[1]** (POS): State 1 when the information is true		
nEG	☐ **[0]** (nEG): State 0 when the information is true The [1] (POS) configuration cannot be modified for the [No drive flt] (FLt), [DC charging] (dCO) and [Input cont.] (LLC) assignments.		
dO1H	❑ **[DO1 holding time]**	0 to 9999 ms	0
	The holding time cannot be set for the [No drive flt] (FLt), [DC charging] (dCO) and [Input cont.] (LLC) assignments, and remains at 0. The change in state only takes effect once the configured time has elapsed, when the information becomes false.		

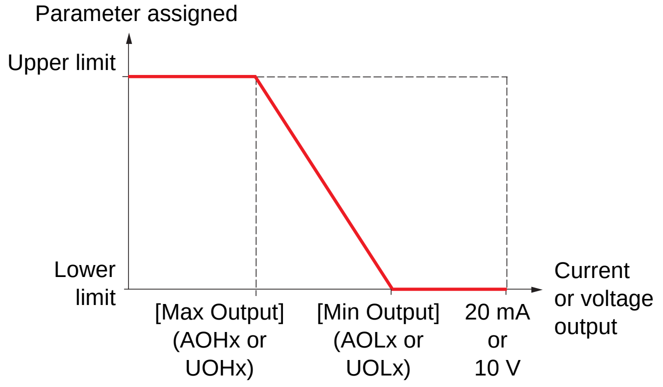
(1) 0 to 9999 ms then 10.00 to 60.00 s on the integrated display terminal.

Configuration of analog outputs

Minimum and maximum values (output values):

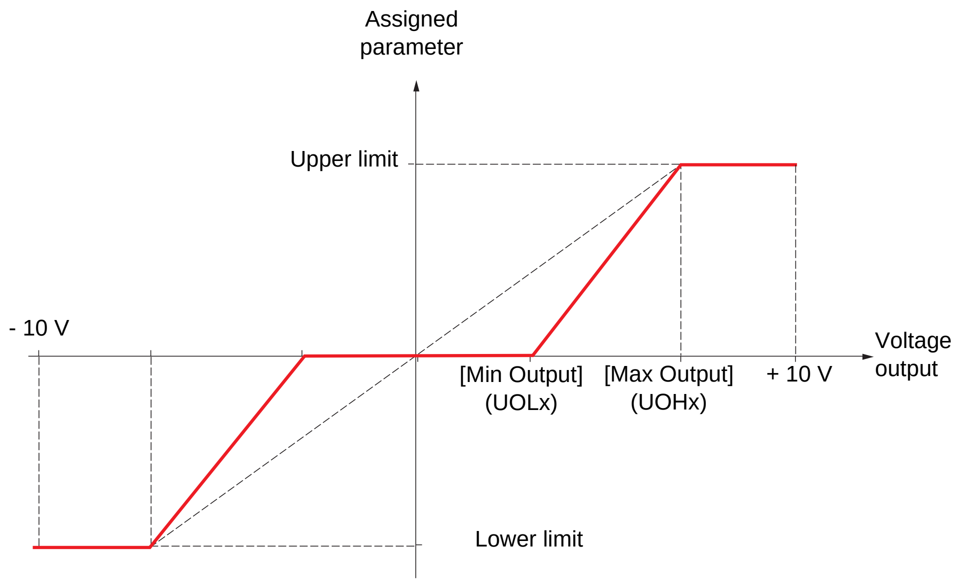
The minimum output value, in volts or mA, corresponds to the lower limit of the assigned parameter and the maximum value corresponds to its upper limit. The minimum value may be greater than the maximum value:





Outputs AO2 and AO3 configured as bipolar outputs (strongly recommended for signed parameters):

The [min Output] (UOLx) and [max Output] (UOHx) parameters are absolute values, although they function symmetrically. In the case of bipolar outputs, always set the maximum value higher than the minimum value.
The [max Output] (UOHx) corresponds to the upper limit of the assigned parameter, and the [min Output] (UOLx) corresponds to an average value between the upper and lower limits (0 for a signed and symmetrical parameter such as in the example below).

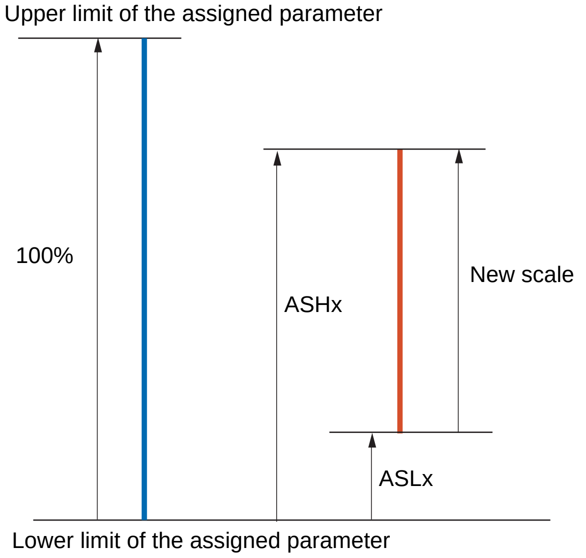


Scaling of the assigned parameter

The scale of the assigned parameter can be adapted in accordance with requirements by modifying the values of the lower and upper limits by means of two parameters for each analog output.
These parameters are given as a %; 100% corresponds to the total variation range of the configured parameter, so:

- 100% = upper limit - lower limit. For example, for [Sign. torque] (Stq), which varies between -3 and +3 times the rated torque, 100% corresponds to 6 times the rated torque.

- The parameter [Scaling AOx min] (ASLx) modifies the lower limit: new value = lower limit + (range x ASLx). The value 0% (factory setting) does not modify the lower limit.
- The [Scaling AOx max] (ASHx) parameter modifies the upper limit: new value = lower limit + (range x ASHx). The value 100% (factory setting) does not modify the upper limit.
- [Scaling AOx min] (ASLx) must always be lower than [Scaling AOx max] (ASHx).



Application example 1

The value of the signed motor torque at the AO2 output is to be transferred with +/- 10 V, with a range of -2 Tr to +2 Tr

The parameter [Sign. torque.] (Stq) varies between -3 and +3 times the rated torque, or a range of 6 times the rated torque.

[Scaling AO2 min] (ASL2) must modify the lower limit by 1x the rated torque, or 100/6 = 16.7% (new value = lower limit + (range x ASL2).

[Scaling AO2 max] (ASH2) must modify the upper limit by 1x the rated torque, or 100 - 100/6 = 83.3% (new value = lower limit + (range x ASH2).

Application example 2

The value of the motor current at the AO2 output is to be transferred with 0 - 20 mA, with a range of 2 In motor, In motor being the equivalent of a 0.8 In drive.

The parameter [I motor] (OCr) varies between 0 and 2 times the rated drive current, or a range of 2.5 times the rated drive current.

[Scaling AO2 min] (ASL2) must not modify the lower limit, which therefore remains at its factory setting of 0%.

[Scaling AO2 max] (ASH2) must modify the upper limit by 0.5x the rated motor torque, or 100 - 100/5 = 80% (new value = lower limit + (range x ASH2).

Code	Name/Description	Adjustment range	Factory setting
AO1-	■ **[AO1 CONFIGURATION]**		
AO1	❑ **[AO1 assignment]**		[No] (nO)
nO	☐ **[No]** (nO): Not assigned		
OCr	☐ **[I motor]** (OCr): Current in the motor, between 0 and 2 In (In = rated drive current indicated in the Installation Manual and on the drive nameplate).		
OFr	☐ **[Motor freq.]** (OFr): Output frequency, between 0 and [Max frequency] (tFr)		
OrP	☐ **[Ramp out.]** (OrP): Between 0 and [Max frequency] (tFr)		
trq	☐ **[Motor torq.]** (trq): Motor torque, between 0 and 3 times the rated motor torque		
Stq	☐ **[Sign. torque]** (Stq): Signed motor torque, between -3 and +3 times the rated motor torque. The + sign corresponds to motor mode and the - sign to generator mode (braking).		
OrS	☐ **[sign ramp]** (OrS): Signed ramp output, between – [Max frequency] (tFr) and + [Max frequency] (tFr)		
OPS	☐ **[PID ref.]** (OPS): PID regulator reference between [Min PID reference] (PIP1) and [Max PID reference] (PIP2)		
OPF	☐ **[PID feedback]** (OPF): PID regulator feedback between [Min PID feedback] (PIF1) and [Max PID feedback] (PIF2)		
OPE	☐ **[PID error]** (OPE): PID regulator error between -5% and +5% of ([Max PID feedback] (PIF2) – [Min PID feedback] (PIF1))		
OPI	☐ **[PID output]** (OPI): PID regulator output between [Low speed] (LSP) and [High speed] (HSP)		
OPr	☐ **[Mot. power]** (OPr): Motor power, between 0 and 2.5 times [Rated motor power] (nPr)		
tHr	☐ **[Mot thermal]** (tHr): Motor thermal state, between 0 and 200% of the rated thermal state		
tHd	☐ **[Drv thermal]** (tHd): Drive thermal state, between 0 and 200% of the rated thermal state		
tqMS	☐ **[Torque 4Q]** (tqMS): Signed motor torque, between -3 and +3 times the rated motor torque. The + sign and the - sign correspond to the physical direction of the torque, regardless of mode (motor or generator).		
OFrr	☐ **[Meas.mot.fr]** (OFrr): Measured motor speed if an encoder card has been inserted, otherwise 0 appears.		
OFS	☐ **[Sig. o/p frq.]** (OFS): Signed output frequency, between – [Max frequency] (tFr) and + [Max frequency] (tFr)		
tHr2	☐ **[Mot therm2]** (tHr2): Thermal state of motor 2, between 0 and 200% of the rated thermal state		
tHr3	☐ **[Mot therm3]** (tHr3): Thermal state of motor 3, between 0 and 200% of the rated thermal state		
Utr	☐ **[Uns.TrqRef]** (Utr): Torque reference, between 0 and 3 times the rated motor torque		
Str	☐ **[Sign trq ref.]** (Str): Signed torque reference, between -3 and +3 times the rated motor torque		
tqL	☐ **[Torque lim.]** (tqL): Torque limit, between 0 and 3 times the rated motor torque		
UOP	☐ **[Motor volt.]** (UOP): Voltage applied to the motor, between 0 and [Rated motor volt.] (UnS)		
dO1	☐ **dO1]** (dO1): Assigned as logic output. This assignment can only appear if [DO1 assignment] (dO1) page 100 has been assigned. This is the only possible choice in this case, and is displayed for information purposes only.		
AO1t	❑ **[AO1 Type]**		[Current] (0 A)
10U	☐ **[Voltage]** (10U): **Voltage output**		
0A	☐ **[Current]** (0 A): Current output		
AOL1	❑ **[AO1 min Output]** The parameter can be accessed if [AO1 Type] (AO1t) = [Current] (0 A)	0 to 20.0 mA	0 mA
AOH1	❑ **[AO1 max Output]** The parameter can be accessed if [AO1 Type] (AO1t) = [Current] (0 A)	0 to 20.0 mA	20.0 mA
UOL1	❑ **[AO1 min Output]** The parameter can be accessed if [AO1 Type] (AO1t) = [Voltage] (10U)	0 to 10.0 V	0 V
UOH1	❑ **[AO1 max Output]** The parameter can be accessed if [AO1 Type] (AO1t) = [Voltage] (10U)	0 to 10.0 V	10.0 V

Code	Name/Description	Adjustment range	Factory setting
AO1-	■ **[AO1 CONFIGURATION]** (continued)		
ASL1	❑ **[Scaling AO1 min]**	0 to 100.0%	0%
	Scaling of the lower limit of the assigned parameter, as a % of the maximum possible variation.		
ASH1	❑ **[Scaling AO1 max]**	0 to 100.0%	100.0%
	Scaling of the upper limit of the assigned parameter, as a % of the maximum possible variation.		
AO1F	❑ **[AO1 Filter]**	0 to 10.00 s	0 s
	Interference filtering. This parameter is forced to 0 if [AO1 assignment] (AO1) = [dO1] (dO1).		

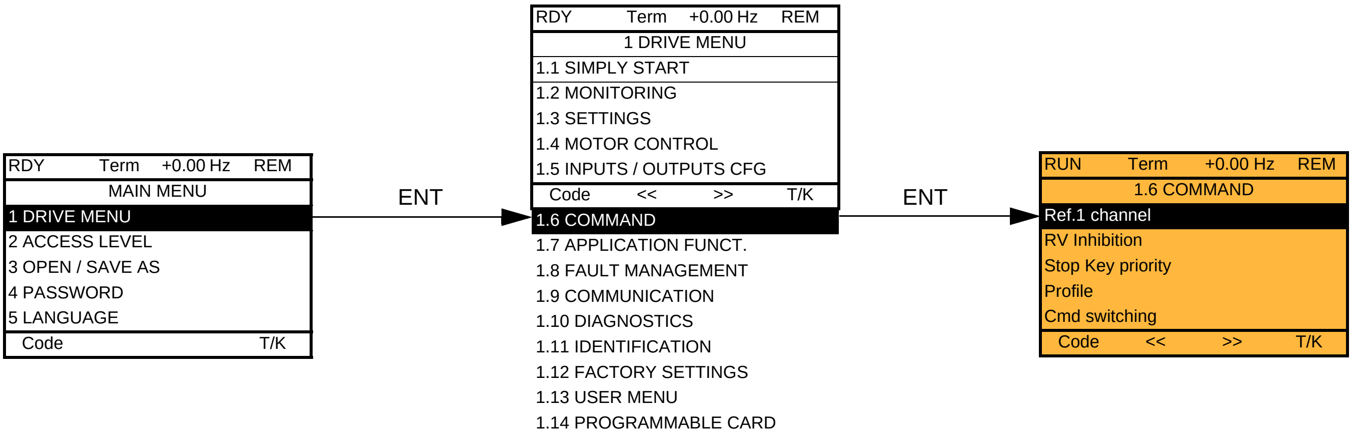
Code	Name/Description	Adjustment range	Factory setting
AO2-	■ **[AO2 CONFIGURATION]** Can be accessed if a VW3A3202 option card has been inserted		
AO2	❑ **[AO2 assignment]** Same assignments as AO1, without [dO1] (dO1)		[No] (nO)
AO2t 10U 0A n10U	❑ **[AO2 Type]** ☐ **[Voltage]** (10U): Voltage output ☐ **[Current]** (0 A): Current output ☐ **[Voltage +/-]** (n10U): Bipolar voltage output		[Current] (0 A)
AOL2	❑ **[AO2 min Output]** The parameter can be accessed if [AO2 Type] (AO2t) = [Current] (0 A)	0 to 20.0 mA	0 mA
AOH2	❑ **[AO2 max Output]** The parameter can be accessed if [AO2 Type] (AO2t) = [Current] (0 A)	0 to 20.0 mA	20.0 mA
UOL2	❑ **[AO2 min Output]** The parameter can be accessed if [AO2 Type] (AO2t) = [Voltage] (10U) or [Voltage +/-] (n10U)	0 to 10.0 V	0 V
UOH2	❑ **[AO2 max Output]** The parameter can be accessed if [AO2 Type] (AO2t) = [Voltage] (10U) or [Voltage +/-] (n10U)	0 to 10.0 V	10.0 V
ASL2	❑ **[Scaling AO2 min]** Scaling of the lower limit of the assigned parameter, as a % of the maximum possible variation.	0 to 100.0%	0%
ASH2	❑ **[Scaling AO2 max]** Scaling of the upper limit of the assigned parameter, as a % of the maximum possible variation.	0 to 100.0%	100.0%
AO2F	❑ **[AO2 Filter]** Interference filtering.	0 to 10.00 s	0 s

Code	Name/Description	Adjustment range	Factory setting
AO3-	■ **[AO3 CONFIGURATION]** Can be accessed if a VW3A3202 option card has been inserted		
AO3	❑ **[AO3 assignment]** Same assignments as AO1, without [dO1] (dO1)		[No] (nO)
AO3t 10U 0A n10U	❑ **[AO3 Type]** ☐ **[Voltage]** (10U): Voltage output ☐ **[Current]** (0 A): Current output ☐ **[Voltage +/-]** (n10U): Bipolar voltage output		[Current] (0 A)
AOL3	❑ **[AO3 min Output]** The parameter can be accessed if [AO3 Type] (AO3t) = [Current] (0 A)	0 to 20.0 mA	0 mA
AOH3	❑ **[AO3 max Output]** The parameter can be accessed if [AO3 Type] (AO3t) = [Current] (0 A)	0 to 20.0 mA	20.0 mA
UOL3	❑ **[AO3 min Output]** The parameter can be accessed if [AO3 Type] (AO3t) = [Voltage] (10U) or [Voltage +/-] (n10U)	0 to 10.0 V	0 V
UOH3	❑ **[AO3 max Output]** The parameter can be accessed if [AO3 Type] (AO3t) = [Voltage] (10U) or [Voltage +/-] (n10U)	0 to 10.0 V	10.0 V
ASL3	❑ **[Scaling AO3 min]** Scaling of the lower limit of the assigned parameter, as a % of the maximum possible variation.	0 to 100.0%	0%
ASH3	❑ **[Scaling AO3 max]** Scaling of the upper limit of the assigned parameter, as a % of the maximum possible variation.	0 to 100.0%	100.0%
AO3F	❑ **[AO3 Filter]** Interference filtering.	0 to 10.00 s	0 s

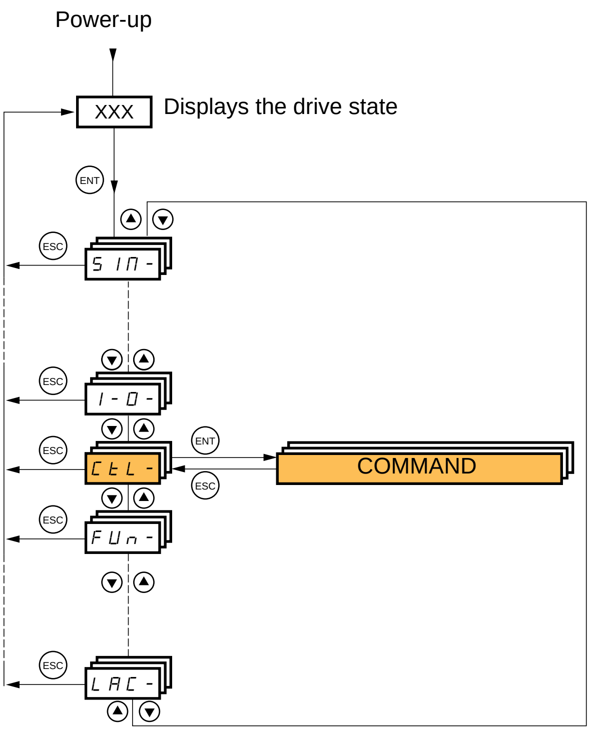
The following submenus group the alarms into 1 to 3 groups, each of which can be assigned to a relay or a logic output for remote signaling. These groups can also be displayed on the graphic display terminal (see [6 MONITORING CONFIG.] menu) and viewed via the [1.2 MONITORING] (SUP) menu.
When one or a number of alarms selected in a group occurs, this alarm group is activated.

Code	Name/Description	Adjustment range	Factory setting
A1C-	■ **[ALARM GRP1 DEFINITION]**		
	Selection to be made from the following list:		
PLA	☐ **[LI6=PTC al.]** (PLA): LI6 = PTC probe alarms		
P1A	☐ **[PTC1 alarm]** (P1A): Probe alarm 1		
P2A	☐ **[PTC2 alarm]** (P2A): Probe alarm 2		
EFA	☐ **[Ext. fault al]** (EFA): External fault alarm		
USA	☐ **[Under V. al.]** (USA): Undervoltage alarm		
CtA	☐ **[I attained]** (CtA): The current is greater than [Current threshold] (Ctd) page 59.		
CtAL	☐ **[Low I Thres. Attain.]** (CtAL): The current is less than [Low I Threshold] (CtdL) page 59.		
FtA	☐ **[Freq. Th. attain.]** (FtA): The frequency is greater than [Freq. threshold] (Ftd) page 59.		
FtAL	☐ **[Low Frq. Th. Attain.]** (FtAL): The frequency is less than [Low Freq.Threshold] (FtdL) page 59.		
F2A	☐ **[Freq. Th. 2 attain.]** (F2A): The frequency is greater than [Freq. threshold 2] (F2d) page 59.		
F2AL	☐ **[Fq. Low Th. 2 attain]** (F2AL): The frequency is less than [2 Freq. Threshold] (F2dL) page 59.		
SrA	☐ **[Freq.ref.att]** (SrA): Frequency reference reached		
tSA	☐ **[Th.mot. att.]** (tSA): Motor 1 thermal state reached		
tS2	☐ **[Th.mot2 att.]** (tS2): Motor 2 thermal state reached		
tS3	☐ **[Th.mot3 att]** (tS3): Motor 3 thermal state reached		
UPA	☐ **[Uvolt warn]** (UPA): Undervoltage warning		
FLA	☐ **[HSP attain.]** (FLA): High speed reached		
tHA	☐ **[Al. °C drv]** (tHA): Drive overheating		
PEE	☐ **[PID error al]** (PEE): PID error alarm		
PFA	☐ **[PID fdbk al.]** (PFA): PID feedback alarm (greater than [Max fbk alarm] (PAH) page 152 or less than [Min fbk alarm] (PAL) page 152)		
PFAH	☐ **[PID high Alarm]** (PFAH): PID feedback alarm (greater than [Max fbk alarm] (PAH) page 152).		
PFAL	☐ **[PID low Alarm]** (PFAL): PID feedback alarm (less than [Min fbk alarm] (PAL) page 152).		
PISH	☐ **[Regulation Alarm]** (PISH): PID regulator feedback supervision fault page 155.		
AP2	☐ **[AI2 Al. 4-20]** (AP2): Alarm indicating absence of 4-20 mA signal on input AI2		
AP3	☐ **[AI3 Al. 4-20]** (AP3): Alarm indicating absence of 4-20 mA signal on input AI3		
AP4	☐ **[AI4 Al. 4-20]** (AP4): Alarm indicating absence of 4-20 mA signal on input AI4		
SSA	☐ **[Lim T/I att.]** (SSA): Torque limit alarm		
tAd	☐ **[Th.drv.att.]** (tAd): Drive thermal state reached		
tJA	☐ **[IGBT alarm]** (tJA): IGBT alarm		
bOA	☐ **[Brake R. al.]** (bOA): Braking resistor temperature alarm		
APA	☐ **[Option alarm]** (APA): Alarm generated by an option card.		
UrA	☐ **[Regen. underV. al.]** (UrA): Reserved.		
rtAH	☐ **[High Reference Att.]** (rtAH): The frequency reference is greater than [High Freq. Ref. Thr.] (rtd) page 60.		
rtAL	☐ **[Low Reference Att.]** (rtAL): The frequency reference is less than [Low Freq. Ref. Thr.] (rtdL) page 60.		
ULA	☐ **[Underload. Proc. Al.]** (ULA): Process underload (see page 208)		
OLA	☐ **[Overload. Proc. Al.]** (OLA): Process overload (see page 210)		
FSA	☐ **[Flow Limit. active]** (FSA): Flow rate limiting active (see page 182)		
Ern	☐ **[Emerg. Run]** (Ern): Emergency run in progress (see page 201)		
ttHA	☐ **[High torque alarm]** (ttHA): Motor torque greater than high threshold [High torque thd.] (ttH) page 59		
ttLA	☐ **[Low torque alarm]** (ttLA): Motor torque less than low threshold [Low torque thd.] (ttL) page 59		
FqLA	☐ **[Freq. meter Alarm]** (FqLA): Measured speed threshold attained: [Pulse warning thd.] (FqL) page 59		
	See the multiple selection procedure on page 25 for the integrated display terminal, and page 16 for the graphic display terminal.		
A2C-	■ **[ALARM GRP2 DEFINITION]**		
	Identical to [ALARM GRP1 DEFINITION] (A1C-)		
A3C-	■ **[ALARM GRP3 DEFINITION]**		
	Identical to [ALARM GRP1 DEFINITION] (A1C-)		

With graphic display terminal:



With integrated display terminal:



[1.6 COMMAND] (CtL-)

The parameters in the [1.6 COMMAND] (CtL) menu can only be modified when the drive is stopped and no run command is present.

Command and reference channels

Run commands (forward, reverse, stop, etc.) and references can be sent using the following channels:

Command	Reference
• Terminals: Logic inputs LI • Graphic display terminal • Integrated Modbus • Integrated CANopen • Communication card • Controller Inside card	• Terminals: Analog inputs AI, frequency input, encoder • Graphic display terminal • Integrated Modbus • Integrated CANopen • Communication card • Controller Inside card • +/- speed via the terminals • +/- speed via the graphic display terminal

The behavior of the Altivar 61 can be adapted according to requirements:

- [8 serie] (SE8): To replace an Altivar 58. See the Migration Manual.
- [Not separ.] (SIM): Command and reference are sent via the same channel.
- [Separate] (SEP): Command and reference may be sent via different channels.

In these configurations, control via the communication bus is performed in accordance with the DRIVECOM standard with only 5 freely-assignable bits (see Communication Parameters Manual). The application functions cannot be accessed via the communication interface.

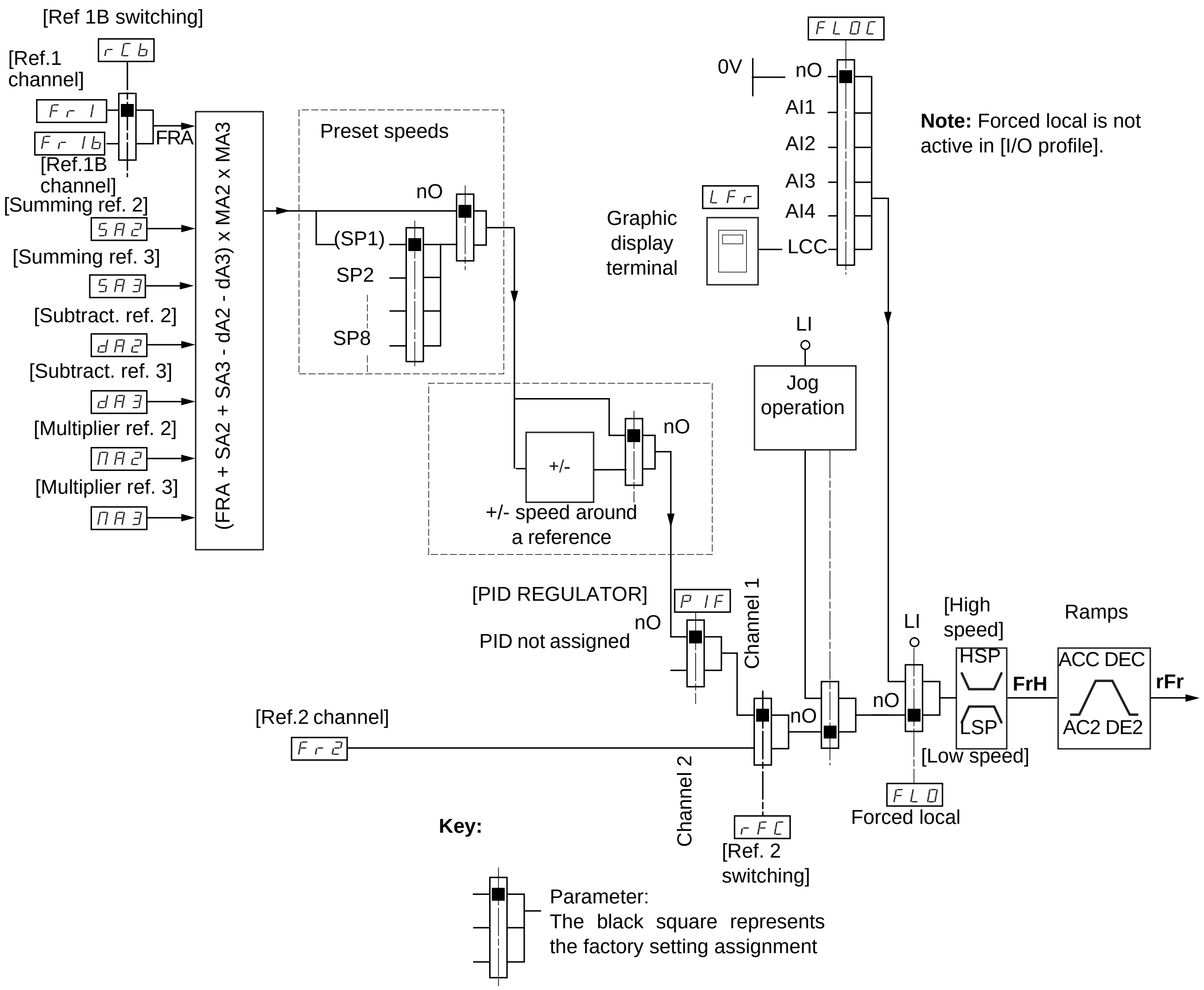
- [I/O profile] (IO): Command and reference may be sent via different channels. This configuration both simplifies and extends use via the communication interface.
  Commands may be sent via the logic inputs on the terminals or via the communication bus.
  When commands are sent via a bus, they are available on a word, which acts as virtual terminals containing only logic inputs.
  Application functions can be assigned to the bits in this word. More than one function can be assigned to the same bit.

Note: Stop commands from the terminals remain active even if the terminals are not the active command channel.

Note: The integrated Modbus channel has 2 physical communication ports:
- The Modbus network port
- The Modbus HMI port

The drive does not differentiate between these two ports, but recognizes the graphic display terminal irrespective of the port to which it is connected.

Reference channel for [Not separ.] (SIM), [Separate] (SEP) and [I/O profile] (IO) configurations, PID not configured



References

Fr1, SA2, SA3, dA2, dA3, MA2, MA3:

- Terminals, graphic display terminal, integrated Modbus, integrated CANopen, communication card, Controller Inside card

Fr1b, for SEP and IO:

- Terminals, graphic display terminal, integrated Modbus, integrated CANopen, communication card, Controller Inside card

Fr1b, for SIM:

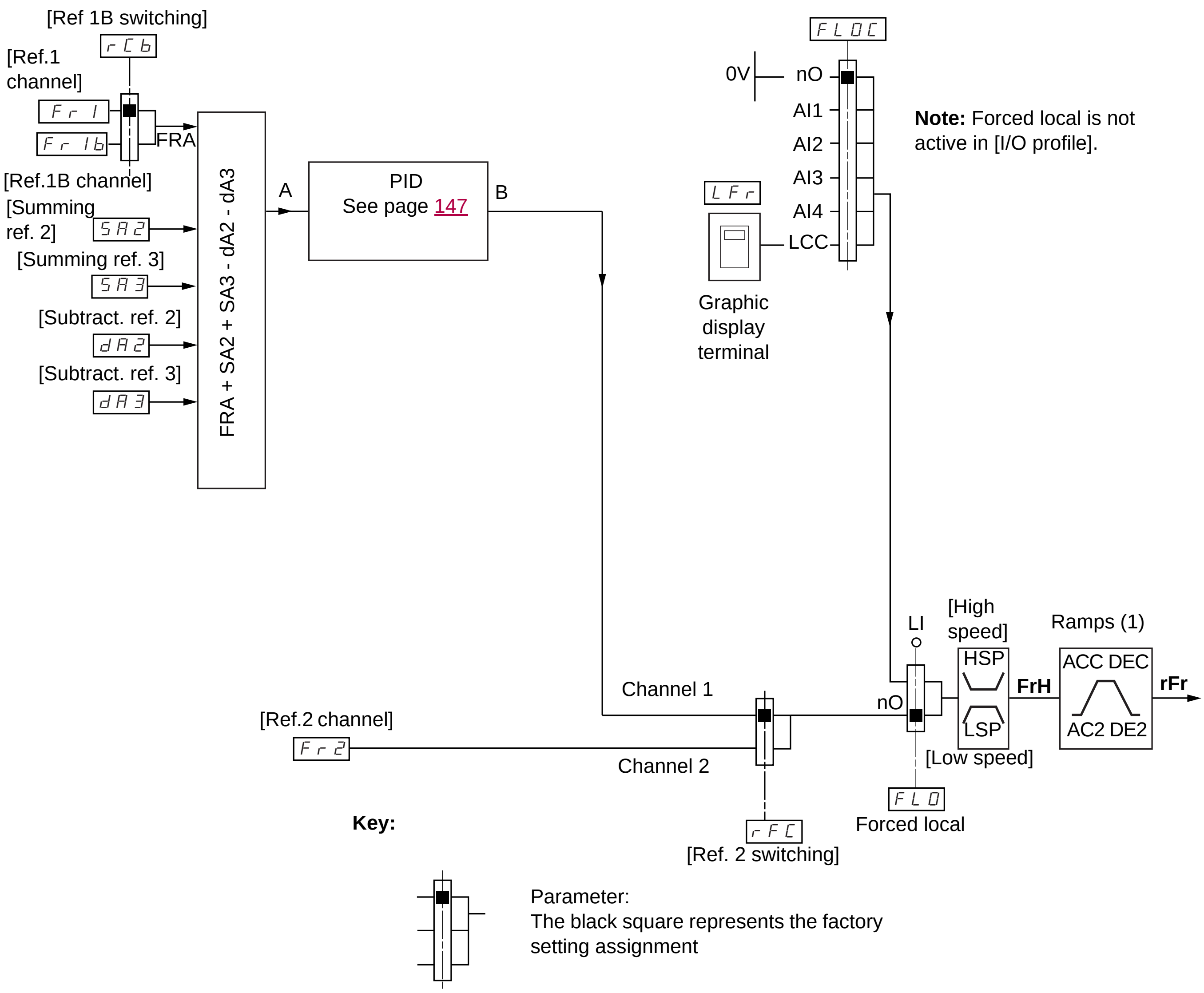
- Terminals, only accessible if Fr1 = terminals

Fr2:

- Terminals, graphic display terminal, integrated Modbus, integrated CANopen, communication card, Controller Inside card, **and +/-speed**

Note: [Ref.1B channel] (Fr1b) and [Ref 1B switching] (rCb) must be configured in the [APPLICATION FUNCT.] (Fun-) menu.

Reference channel for [Not separ.] (SIM), [Separate] (SEP) and [I/O profile] (IO) configurations, PID configured with PID references at the terminals



References

Fr1:

- Terminals, graphic display terminal, integrated Modbus, integrated CANopen, communication card, Controller Inside card

Fr1b, for SEP and IO:

- Terminals, graphic display terminal, integrated Modbus, integrated CANopen, communication card, Controller Inside card

Fr1b, for SIM:

- Terminals, only accessible if Fr1 = terminals

SA2, SA3, dA2, dA3:

- Terminals only

Fr2:

- Terminals, graphic display terminal, integrated Modbus, integrated CANopen, communication card, Controller Inside card, **and +/- speed**

(1) Ramps not active if the PID function is active in automatic mode.

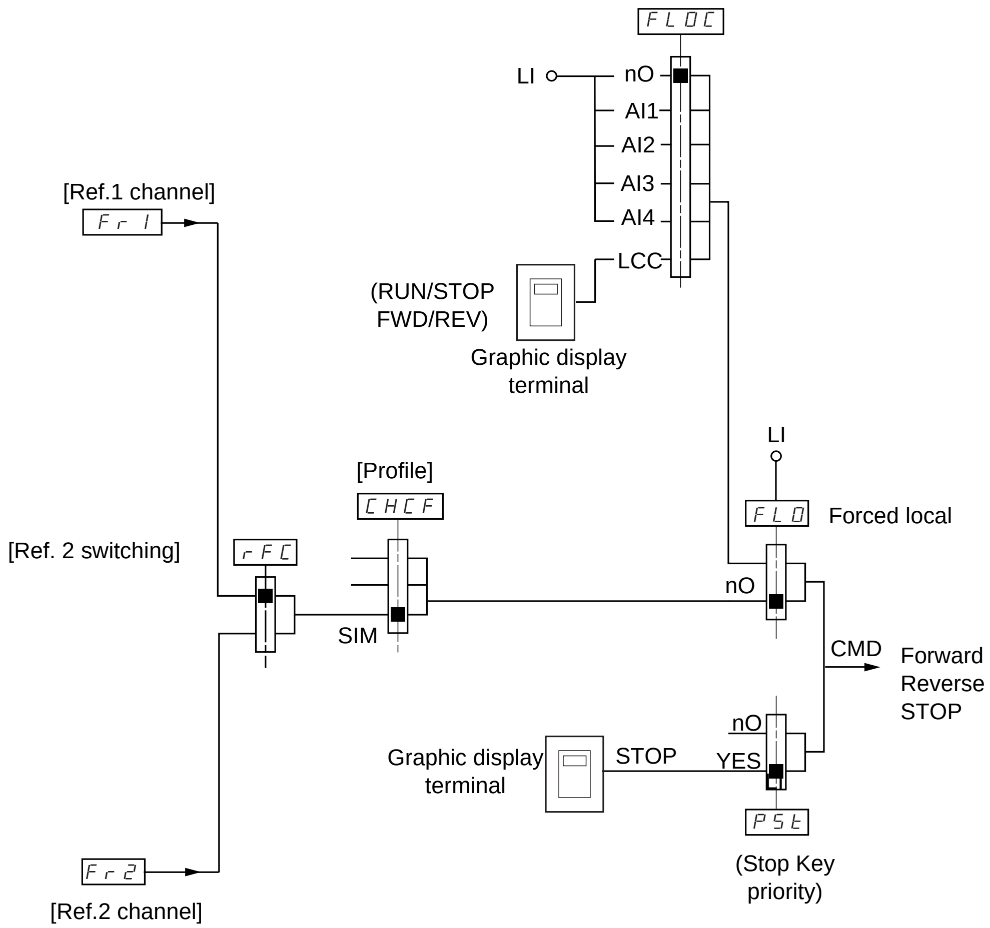
Note: [Ref.1B channel] (Fr1b) and [Ref 1B switching] (rCb) must be configured in the [APPLICATION FUNCT.] (Fun-) menu.

Command channel for [Not separ.] (SIM) configuration

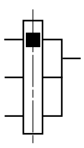
Reference and command, not separate

The command channel is determined by the reference channel. Parameters Fr1, Fr2, rFC, FLO and FLOC are common to reference and command.

Example: If the reference is Fr1 = AI1 (analog input at the terminals), control is via LI (logic input at the terminals).



Key:



Parameter:
The black square represents
the factory setting assignment.

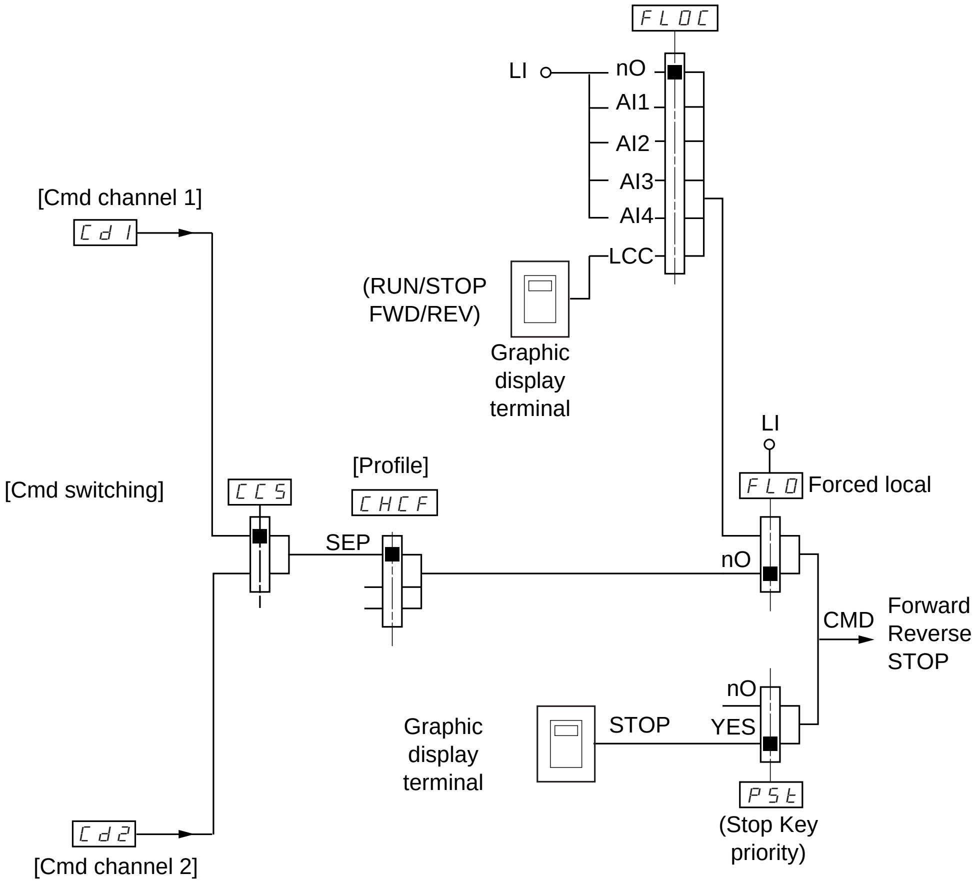
Command channel for [Separate] (SEP) configuration

Separate reference and command

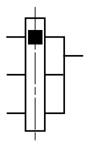
Parameters FLO and FLOC are common to reference and command.

Example: If the reference is in forced local mode via AI1 (analog input at the terminals), command in forced local mode is via LI (logic input at the terminals).

The command channels Cd1 and Cd2 are independent of the reference channels Fr1, Fr1b and Fr2.



Key:



Parameter:
The black rectangle represents the factory setting assignment, except for [Profile].

Commands

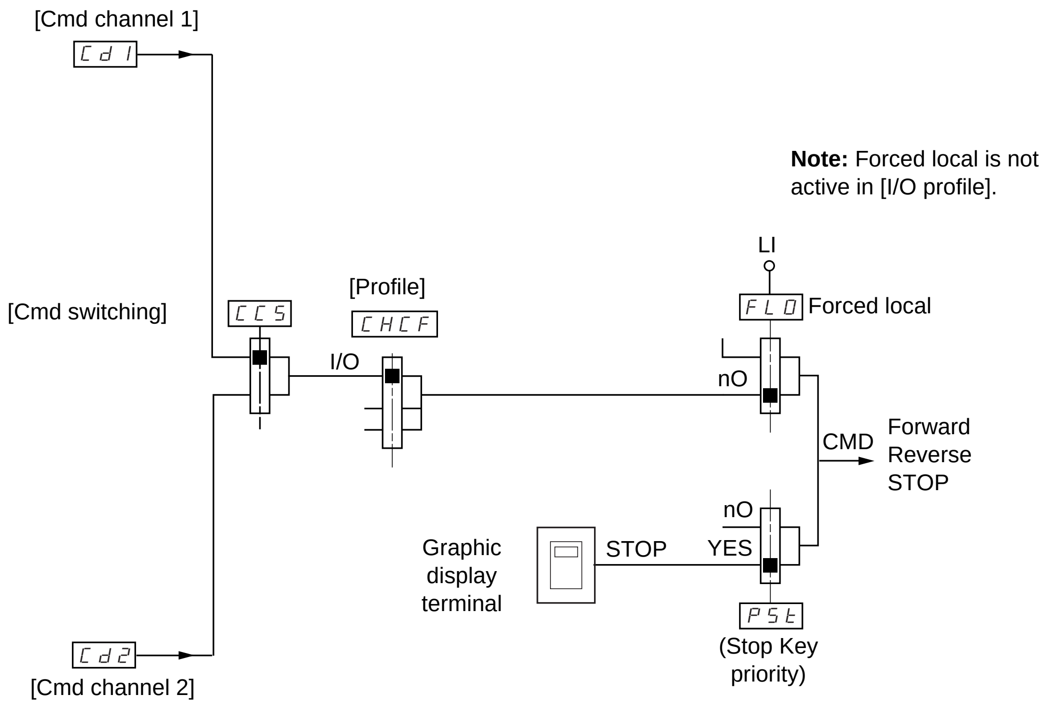
Cd1, Cd2:

- Terminals, graphic display terminal, integrated Modbus, integrated CANopen, communication card, Controller Inside card

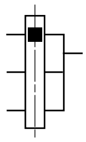
Command channel for [I/O profile] (IO) configuration

Separate reference and command, as in [Separate] (SEP) configuration

The command channels Cd1 and Cd2 are independent of the reference channels Fr1, Fr1b and Fr2.



Key:



Parameter:
The black rectangle represents the factory setting assignment, except for [Profile].

Commands

Cd1, Cd2:

- Terminals, graphic display terminal, integrated Modbus, integrated CANopen, communication card, Controller Inside card

Command channel for [I/O profile] (IO) configuration

Selection of a command channel:

A command or an action can be assigned:
- To a fixed channel by selecting an LI input or a Cxxx bit:
  - By selecting e.g., LI3, this action will always be triggered by LI3 regardless of which command channel is switched.
  - By selecting e.g., C214, this action will always be triggered by integrated CANopen with bit 14 regardless of which command channel is switched.

- To a switchable channel by selecting a CDxx bit:
  - By selecting, e.g., CD11, this action will be triggered by
    LI12 if the terminals channel is active
    C111 if the integrated Modbus channel is active
    C211 if the integrated CANopen channel is active
    C311 if the communication card channel is active
    C411 if the Controller Inside card channel is active

If the active channel is the graphic display terminal, the functions and commands assigned to CDxx switchable internal bits are inactive.

Note:
- CD14 and CD15 can only be used for switching between 2 networks. They do not have equivalent logic inputs.

Terminals	Integrated Modbus	Integrated CANopen	Communication card	Controller Inside card	Internal bit, can be switched
					CD00
LI2 (1)	C101 (1)	C201 (1)	C301 (1)	C401 (1)	CD01
LI3	C102	C202	C302	C402	CD02
LI4	C103	C203	C303	C403	CD03
LI5	C104	C204	C304	C404	CD04
LI6	C105	C205	C305	C405	CD05
LI7	C106	C206	C306	C406	CD06
LI8	C107	C207	C307	C407	CD07
LI9	C108	C208	C308	C408	CD08
LI10	C109	C209	C309	C409	CD09
LI11	C110	C210	C310	C410	CD10
LI12	C111	C211	C311	C411	CD11
LI13	C112	C212	C312	C412	CD12
LI14	C113	C213	C313	C413	CD13
-	C114	C214	C314	C414	CD14
-	C115	C215	C315	C415	CD15

(1) If [2/3 wire control] (tCC) page 80 = [3 wire] (3C), LI2, C101, C201, C301, and C401 cannot be accessed.

Assignment conditions for logic inputs and control bits

The following elements are available for every command or function that can be assigned to a logic input or a control bit:

[LI1] (LI1) to [LI6] (LI6)	Drive with or without option
[LI7] (LI7) to [LI10] (LI10)	With VW3A3201 logic I/O card
[LI11] (LI11) to [LI14] (LI14)	With VW3A3202 extended I/O card
[C101] (C101) to [C110] (C110)	With integrated Modbus in [I/O profile] (IO) configuration
[C111] (C111) to [C115] (C115)	With integrated Modbus regardless of configuration
[C201] (C201) to [C210] (C210)	With integrated CANopen in [I/O profile] (IO) configuration
[C211] (C211) to [C215] (C215)	With integrated CANopen regardless of configuration
[C301] (C301) to [C310] (C310)	With a communication card in [I/O profile] (IO) configuration
[C311] (C311) to [C315] (C315)	With a communication card regardless of configuration
[C401] (C401) to [C410] (C410)	With Controller Inside card in [I/O profile] (IO) configuration
[C411] (C411) to [C415] (C415)	With Controller Inside card regardless of configuration
[CD00] (Cd00) to [CD10] (Cd10)	In [I/O profile] (IO) configuration
[CD11] (Cd11) to [CD15] (Cd15)	Regardless of configuration

Note: In [I/O profile] (IO) configuration, LI1 cannot be accessed and if [2/3 wire control] (tCC) page 80 = [3 wire] (3C), LI2, C101, C201, C301, and C401 cannot be accessed either.

WARNING

UNINTENDED EQUIPMENT OPERATION

Inactive communication channels are not monitored (no lock following malfunction in the event of a communication bus failure). Make sure that the commands and functions assigned to bits C101 to C415 will not pose a risk in the event of the failure of the associated communication bus.

Failure to follow these instructions can result in death or serious injury.

Code	Name/Description	Adjustment range	Factory setting
Fr1	❑ **[Ref.1 channel]**		[AI1] (AI1)
AI1	☐ **[AI1]** (AI1): Analog input		
AI2	☐ **[AI2]** (AI2): Analog input		
AI3	☐ **[AI3]** (AI3): Analog input, if VW3A3202 extension card has been inserted		
AI4	☐ **[AI4]** (AI4): Analog input, if VW3A3202 extension card has been inserted		
LCC	☐ **[HMI]** (LCC): Graphic display terminal		
Mdb	☐ **[Modbus]** (Mdb): Integrated Modbus		
CAn	☐ **[CANopen]** (CAn): Integrated CANopen		
nEt	☐ **[Com. card]** (nEt): Communication card (if inserted)		
APP	☐ **[Prog. card]** (APP): Controller Inside card (if inserted)		
PI	☐ **[RP]** (PI): Frequency input, if VW3A3202 extension card has been inserted		
PG	☐ **[Encoder]** (PG): Encoder input, if encoder card has been inserted		
rIn	❑ **[RV Inhibition]**		[No] (nO)
nO	☐ **[No]** (nO)		
YES	☐ **[Yes]** (YES) Inhibition of movement in reverse direction, does not apply to direction requests sent by logic inputs. - Reverse direction requests sent by logic inputs are taken into account. - Reverse direction requests sent by the graphic display terminal are not taken into account. - Reverse direction requests sent by the line are not taken into account. - Any reverse speed reference originating from the PID, summing input, etc., is interpreted as a zero reference (0 Hz).		
PSt	❑ **[Stop Key priority]**		[Yes] (YES)
nO	☐ **[No]** (nO)		
YES	☐ **[Yes]** (YES): Gives priority to the STOP key on the graphic display terminal when the graphic display terminal is not enabled as the command channel. Press and hold down ENT for 2 seconds in order for any change in the assignment of [Stop Key priority] (PSt) to be taken into account. This will be a freewheel stop. If the active command channel is the graphic display terminal, the stop will be performed according to the [Type of stop] (Stt) page 133 irrespective of the configuration of [Stop Key priority] (PSt).		
CHCF	❑ **[Profile]**		[Not separ.] (SIM)
SE8	☐ **[8 serie]** (SE8): ATV38 interchangeability (see Migration Manual). The [8 serie] (SE8) configuration is used to load, via PowerSuite, for example, an ATV38 drive configuration in an ATV61 that has already been set to this configuration. This assignment cannot be accessed if a Controller Inside card has been inserted. **Note:** Modifications to the configuration of the ATV61 must only be made using PowerSuite when it is in this configuration, otherwise operation cannot be guaranteed.		
SIM	☐ **[Not separ.]** (SIM): Reference and command, not separate		
SEP	☐ **[Separate]** (SEP): Separate reference and command This assignment cannot be accessed in [I/O profile] (IO).		
IO	☐ **[I/O profile]** (IO): I/O profile When [8 serie] (SE8) is selected and [I/O profile] (IO) is deselected, the drive automatically returns to the factory setting (this is mandatory). This factory setting only affects the [1 DRIVE MENU] menu. It does not affect either [1.9 COMMUNICATION] or [1.14 PROGRAMMABLE CARD]. - With the graphic display terminal, a screen appears to perform this operation. Follow the instructions on the screen. - With the integrated display terminal, press ENT and hold it down (for 2 s). This will save the selection and return to the factory setting.		

Code	Name/Description	Adjustment range	Factory setting
CCS Cd1 Cd2 LI1 - - -	❑ **[Cmd switching]** The parameter can be accessed if [Profile] (CHCF) = [Separate] (SEP) or [I/O profile] (IO) ☐ **[ch1 active]** (Cd1): [Cmd channel 1] (Cd1) active (no switching) ☐ **[ch2 active]** (Cd2): [Cmd channel 2] (Cd2) active (no switching) ☐ **[LI1]** (LI1) : : ☐ **[...]** (...): See the assignment conditions on page 116 (not CDOO to CD14). If the assigned input or bit is at 0, channel [Cmd channel 1] (Cd1) is active. If the assigned input or bit is at 1, channel [Cmd channel 2] (Cd2) is active.		[ch1 active] (Cd1)
Cd1 tEr LCC Mdb CAn nEt APP	❑ **[Cmd channel 1]** ☐ **[Terminals]** (tEr): Terminals ☐ **[HMI]** (LCC): Graphic display terminal ☐ **[Modbus]** (Mdb): Integrated Modbus ☐ **[CANopen]** (CAn): Integrated CANopen ☐ **[Com. card]** (nEt): Communication card (if inserted) ☐ **[Prog. card]** (APP): Controller Inside card (if inserted) The parameter is available if [Profile] (CHCF) = [Separate] (SEP) or [I/O profile] (IO).		[Terminals] (tEr)
Cd2 tEr LCC Mdb CAn nEt APP	❑ **[Cmd channel 2]** ☐ **[Terminals]** (tEr): Terminals ☐ **[HMI]** (LCC): Graphic display terminal ☐ **[Modbus]** (Mdb): Integrated Modbus ☐ **[CANopen]** (CAn): Integrated CANopen ☐ **[Com. card]** (nEt): Communication card (if inserted) ☐ **[Prog. card]** (APP): Controller Inside card (if inserted) The parameter is available if [Profile] (CHCF) = [Separate] (SEP) or [I/O profile] (IO).		[Modbus] (Mdb)
rFC Fr1 Fr2 LI1 - - -	❑ **[Ref. 2 switching]** ☐ **[ch1 active]** (Fr1): No switching, [Ref.1 channel] (Fr1) active ☐ **[ch2 active]** (Fr2): No switching, [Ref.2 channel] (Fr2) active ☐ **[LI1]** (LI1) : : ☐ **[...]** (...): See the assignment conditions on page 116 (not CDOO to CD14). If the assigned input or bit is at 0, channel [Ref.1 channel] (Fr1) is active. If the assigned bit or input is at 1, channel [Ref.2 channel] (Fr2) is active.		[ch1 active] (Fr1)
Fr2 nO AI1 AI2 AI3 AI4 UPdt LCC Mdb CAn nEt APP PI PG	❑ **[Ref.2 channel]** ☐ **[No]** (nO): Not assigned If [Profile] (CHCF) = [Not separ.] (SIM), command is at the terminals with a zero reference. If [Profile] (CHCF) = [Separate] (SEP) or [I/O profile] (IO), the reference is zero. ☐ **[AI1]** (AI1): Analog input ☐ **[AI2]** (AI2): Analog input ☐ **[AI3]** (AI3): Analog input, if VW3A3202 extension card has been inserted ☐ **[AI4]** (AI4): Analog input, if VW3A3202 extension card has been inserted ☐ **[+/- Speed]** (UPdt): +/-Speed command ☐ **[HMI]** (LCC): Graphic display terminal ☐ **[Modbus]** (Mdb): Integrated Modbus ☐ **[CANopen]** (CAn): Integrated CANopen ☐ **[Com. card]** (nEt): Communication card (if inserted) ☐ **[Prog. card]** (APP): Controller Inside card (if inserted) ☐ **[RP]** (PI): Frequency input, if VW3A3202 extension card has been inserted ☐ **[Encoder]** (PG): Encoder input, if encoder card has been inserted		[No] (nO)

Code	Name/Description	Adjustment range	Factory setting
COP	❑ **[Copy channel 1 <> 2]**		[No] (nO)
	Can be used to copy the current reference and/or the command by means of switching, in order to avoid speed surges, for example. If [Profile] (CHCF) page 117 = [Not separ.] (SIM) or [Separate] (SEP), copying will only be possible from channel 1 to channel 2. If [Profile] (CHCF) = [I/O profile] (IO), copying will be possible in both directions.		
nO	☐ **[No]** (nO): No copy		
SP	☐ **[Reference]** (SP): Copy reference		
Cd	☐ **[Command]** (Cd): Copy command		
ALL	☐ **[Cmd + ref.]** (ALL): Copy command and reference - A reference or a command cannot be copied to a channel on the terminals. - The reference copied is FrH (before ramp) unless the destination channel reference is set via +/- speed. In this case, the reference copied is rFr (after ramp).		

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

Copying the command and/or reference can change the direction of rotation.
Check that this is safe.

Failure to follow these instructions can result in death or serious injury.

[1.6 COMMAND] (CtL-)

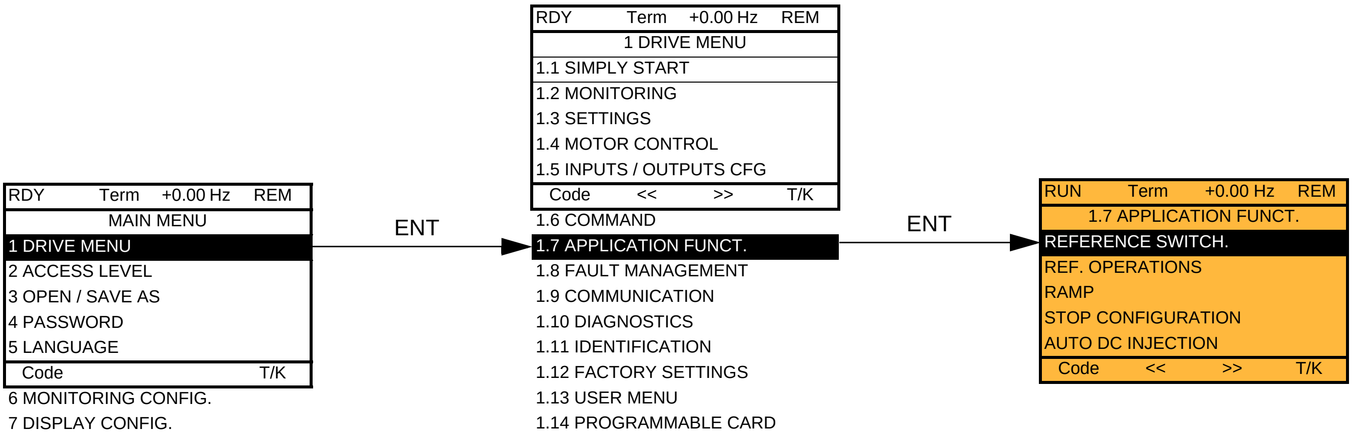
As the graphic display terminal may be selected as the command and/or reference channel, its action modes can be configured.
The parameters on this page can only be accessed on the graphic display terminal, and not on the integrated display terminal.

Notes:

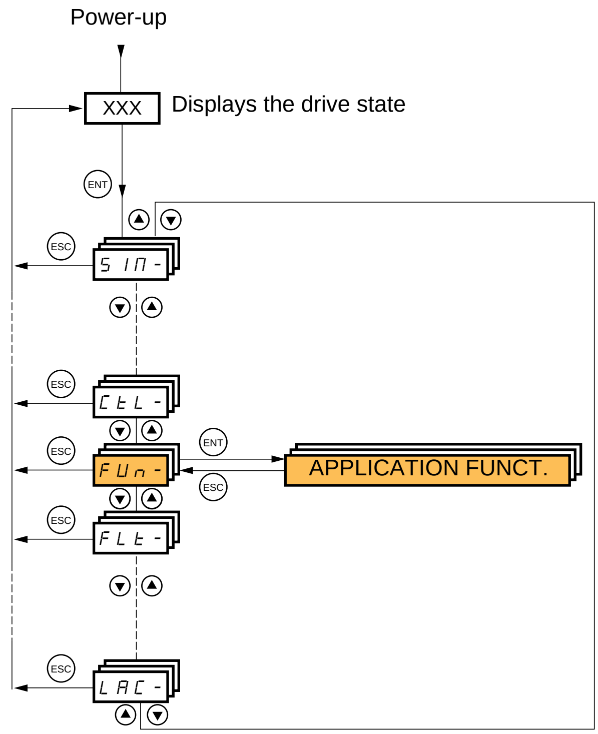
- The display terminal command/reference is only active if the command and/or reference channels from the terminal are active, with the exception of [T/K] (command and reference via the display terminal), which takes priority over these channels. Press [T/K] again or turn off the drive to revert control to the selected channel.
  - •**Note:** The channel selected by pressing [T/K] remains active after a return to factory settings, until [T/K] is pressed again or the drive is turned off.
- Command and reference via the display terminal are impossible if the latter is connected to more than one drive.
- The JOG, preset speed and +/- speed functions can only be accessed if [Profile] (CHCF) = [Not separ.] (SIM).
- The preset PID reference functions can only be accessed if [Profile] (CHCF) = [Not separ.] (SIM) or [Separate] (SEP).
- The [T/K] function (command and reference via the display terminal) can be accessed regardless of the [Profile] (CHCF).

Name/Description	Adjustment range	Factory setting
❑ [F1 key assignment]		[No]
☐ **[No]**: Not assigned ☐ **[Jog]**: JOG operation ☐ **[Preset spd2]**: Press the key to run the drive at the 2nd preset speed [Preset speed 2] (SP2) page 140. Press STOP to stop the drive. ☐ **[Preset spd3]**: Press the key to run the drive at the 3rd preset speed [Preset speed 3] (SP3) page 140. Press STOP to stop the drive. ☐ **[PID ref. 2]**: Sets a PID reference equal to the 2nd preset PID reference [Preset ref. PID 2] (rP2) page 156 without sending a run command. Only operates if [Ref.1 channel] (Fr1) = [HMI] (LCC). Does not operate with the [T/K] function. ☐ **[PID ref. 3]**: Sets a PID reference equal to the 3rd preset PID reference [Preset ref. PID 3] (rP3) page 156 without sending a run command. Only operates if [Ref.1 channel] (Fr1) = [HMI] (LCC). Does not operate with the [T/K] function. ☐ **[+Speed]**: Faster, only operates if [Ref.2 channel] (Fr2) = [HMI] (LCC). Press the key to run the drive and increase the speed. Press STOP to stop the drive. ☐ **[-Speed]**: Slower, only operates if [Ref.2 channel] (Fr2) = [HMI] (LCC) and if a different key is assigned to [+Speed]. Press the key to run the drive and decrease the speed. Press STOP to stop the drive. ☐ **[T/K]**: Command and reference via the display terminal: Takes priority over [Cmd switching] (CCS) and over [Ref. 2 switching] (rFC).		
❑ [F2 key assignment]		[No]
Identical to [F1 key assignment].		
❑ [F3 key assignment]		[No]
Identical to [F1 key assignment].		
❑ [F4 key assignment]		[T/K]
Identical to [F1 key assignment].		
❑ [HMI cmd.]		[Bumpless]
When the [T/K] function is assigned to a key and that function is active, this parameter defines the behavior at the moment when control returns to the graphic display terminal. ☐ **[Stop]**: Stops the drive (although the controlled direction of operation and reference of the previous channel are copied (to be taken into account on the next RUN command)). ☐ **[Bumpless]**: Does not stop the drive (the controlled direction of operation and the reference of the previous channel are copied).		

With graphic display terminal:



With integrated display terminal:



Summary of functions:

Code	Name	Page
rEF-	[REFERENCE SWITCH.]	127
OAI-	[REF. OPERATIONS]	128
rPt-	[RAMP]	129
Stt-	[STOP CONFIGURATION]	133
AdC-	[AUTO DC INJECTION]	135
JOG-	[JOG]	137
PSS-	[PRESET SPEEDS]	139
UPd-	[+/-Speed]	142
SrE-	[+/-SPEED AROUND REF.]	144
SPM-	[MEMO REFERENCE]	145
FLI-	[FLUXING BY LI]	146
PId-	[PID REGULATOR]	151
PrI-	[PID PRESET REFERENCES]	156
SrM-	[SLEEPING / WAKE UP]	158
tOL-	[TORQUE LIMITATION]	164
CLI-	[2nd CURRENT LIMIT.]	166
LLC-	[LINE CONTACTOR COMMAND]	168
OCC-	[OUTPUT CONTACTOR CMD]	170
dAM-	[DAMPER MANAGEMENT]	172
MLP-	[PARAM. SET SWITCHING]	174
MMC-	[MULTIMOTORS/CONFIG.]	179
tnL-	[AUTO TUNING BY LI]	179
nFS-	[NO FLOW DETECTION]	181
FLL-	[FLOW LIMITATION]	183
dCO-	[DC BUS SUPPLY]	184
OIr-	[REGEN CONNECTION]	185

[1.7 APPLICATION FUNCT.] (FUn-)

The parameters in the [1.7 APPLICATION FUNCT.] (FUn-) menu can only be modified when the drive is stopped and there is no run command, except for parameters with a ◌ symbol in the code column, which can be modified with the drive running or stopped.

Note: Compatibility of functions
The choice of application functions may be limited by the number of I/O and by the fact that some functions are incompatible with one another. Functions that are not listed in the table below are fully compatible.
If there is an incompatibility between functions, the first function configured will prevent the others being configured.

Each of the functions on the following pages can be assigned to one of the inputs or outputs.
A single input can activate several functions at the same time (reverse and 2nd ramp, for example). **The user must therefore ensure that these functions can be used at the same time**. It is only possible to assign one input to several functions at [Advanced] (AdU) and [Expert] (EPr) level.

Before assigning a command, reference or function to an input or output, the user must make sure that this input or output has not already been assigned and that another input or output has not been assigned to an incompatible or undesirable function.
The drive factory setting or macro configurations automatically configure functions, **which may prevent other functions being assigned. It may be necessary to unconfigure one or more functions in order to be able to enable another.** Check the compatibility table below.

Compatibility table

	Ref. operations (page 128)	+/- speed (2) (page 142)	Preset speeds (page 139)	PID regulator (page 151)	JOG operation (page 137)	DC injection stop (page 133)	Fast stop (page 133)	Freewheel stop (page 133)	+/- speed around a reference (page 144)	Synchronous motor (page 67)
Ref. operations (page 128)			↑	●(3)	↑					
+/- speed (2) (page 142)					●					
Preset speeds (page 139)	←				↑					
PID regulator (page 151)	●(3)				●				●	
JOG operation (page 137)	←	●	←	●					●	
DC injection stop (page 133)							●(1)	↑		●
Fast stop (page 133)						●(1)		↑		
Freewheel stop (page 133)						←	←			
+/- speed around a reference (page 144)				●	●					
Synchronous motor (page 67)						●				

(1) Priority is given to the first of these two stop modes to be activated.
(2) Excluding special application with reference channel Fr2 (see diagrams on pages 110 and 111).
(3) Only the multiplier reference is incompatible with the PID regulator.

● Incompatible functions | Compatible functions (empty cell) | N/A (grey cell)

Priority functions (functions, which cannot be active at the same time):

← ↑ The function marked with the arrow takes priority over the other.

Stop functions have priority over run commands.
Speed references via logic command have priority over analog references.

Note: This compatibility table does not affect commands that can be assigned to the keys of the graphic display terminal (see page 120).

Incompatible functions

The following functions will be inaccessible or deactivated in the cases described below:

Automatic restart

This is only possible for control type [2/3 wire control] (tCC) = [2 wire] (2C) and [2 wire type] (tCt) = [Level] (LEL) or [Fwd priority] (PFO). See page 80.

Catch on the fly

This is only possible for control type [2/3 wire control] (tCC) = [2 wire] (2C) and [2 wire type] (tCt) = [Level] (LEL) or [Fwd priority] (PFO). See page 80.
This function is locked if automatic injection on stop [Auto DC injection] (AdC) = [Continuous] (Ct). See page 135.

The SUP- monitoring menu (page 38) can be used to display the functions assigned to each input in order to check their compatibility.

When a function is assigned, a ✓ appears on the graphic display terminal, as illustrated in the example below:

RDY	Term	+0.00 Hz	REM
1.7 APPLICATION FUNCT.			
REFERENCE SWITCH.			
REF. OPERATIONS			
RAMP			✓
STOP CONFIGURATION			
AUTO DC INJECTION			
Code	<<	>>	T/K

JOG

If you attempt to assign a function that is incompatible with another function that has already been assigned, an alarm message will appear:

With the graphic display terminal

RDY	Term	+0.00 Hz	REM
INCOMPATIBILITY			
The function can't be assigned because an incompatible function is already selected. See programming book.			
ENT or ESC to continue			

With the integrated display terminal:
COMP flashes until ENT or ESC is pressed.

When you assign a logic input, an analog input, a reference channel or a bit to a function, pressing the HELP button will display the functions that may already have been activated by this input, bit or channel.

When a logic input, an analog input, a reference channel or a bit that has already been assigned is assigned to another function, the following screens appear:

With the graphic display terminal

RUN +50.00 Hz 1250A +50.00 Hz
WARNING - ASSIGNED TO
Reference switch. 2
ENT->Continue ESC->Cancel

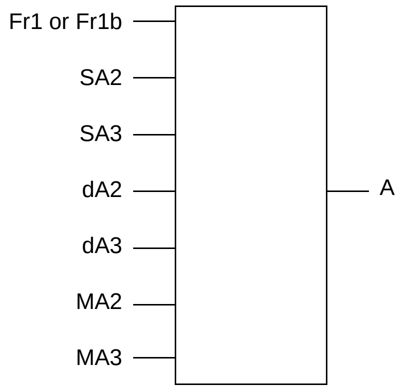
If the access level permits this new assignment, pressing ENT confirms the assignment.
If the access level does not permit this new assignment, pressing ENT results in the following display.

RUN +50.00 Hz 1250A +50.00 Hz
ASSIGNMENT FORBIDDEN
Un-assign the present functions, or select Advanced access level

With the integrated display terminal:

The code for the first function, which is already assigned, is displayed flashing.
If the access level permits this new assignment, pressing ENT confirms the assignment.
If the access level does not permit this new assignment, pressing ENT has no effect, and the message continues to flash. It is only possible to exit by pressing ESC.

Summing input/Subtracting input/Multiplier

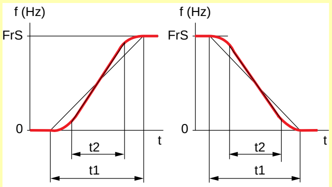
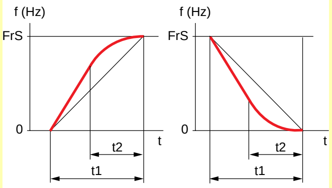
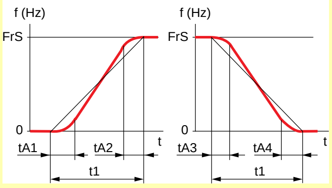


A = (Fr1 or Fr1b + SA2 + SA3 - dA2 - dA3) x MA2 x MA3

- If SA2, SA3, dA2, dA3 are not assigned, they are set to 0.
- If MA2, MA3 are not assigned, they are set to 1.
- A is limited by the minimum LSP and maximum HSP parameters.
- For multiplication, the signal on MA2 or MA3 is interpreted as a %; 100% corresponds to the maximum value of the corresponding input. If MA2 or MA3 is sent via the communication bus or graphic display terminal, an MFr multiplication variable (see page 44) must be sent via the bus or graphic display terminal.
- Reversal of the direction of operation in the event of a negative result can be inhibited (see page 117).

Code	Name/Description	Adjustment range	Factory setting
rEF-	■ **[REFERENCE SWITCH.]**		
rCb	❑ **[Ref 1B switching]** See the diagrams on pages 110 and 111.		[LI3] (LI3)
Fr1	☐ **[ch1 active]** (Fr1): No switching, [Ref.1 channel] (Fr1) active		
Fr1b	☐ **[ch1B active]** (Fr1b): No switching, [Ref.1B channel] (Fr1b) active		
LI1	☐ **[LI1]** (LI1)		
-	:		
-	:		
-	☐ **[...]** (...): See the assignment conditions on page 116 (not CDOO to CD14). • If the assigned input or bit is at 0, [Ref.1 channel] (Fr1) is active (see page 117). • If the assigned input or bit is at 1, [Ref.1B channel] (Fr1b) is active. [Ref 1B switching] (rCb) is forced to [ch1 active] (Fr1) if [Profile] (CHCF) = [Not separ.] (SIM) with [Ref.1 channel] (Fr1) assigned via the terminals (analog inputs, encoder, pulse input); see page 117.		
Fr1b	❑ **[Ref.1B channel]**		[AI2] (AI2)
nO	☐ **[No]** (nO): Not assigned		
AI1	☐ **[AI1]** (AI1): Analog input		
AI2	☐ **[AI2]** (AI2): Analog input		
AI3	☐ **[AI3]** (AI3): Analog input, if VW3A3202 extension card has been inserted		
AI4	☐ **[AI4]** (AI4): Analog input, if VW3A3202 extension card has been inserted		
LCC	☐ **[HMI]** (LCC): Graphic display terminal		
Mdb	☐ **[Modbus]** (Mdb): Integrated Modbus		
CAn	☐ **[CANopen]** (CAn): Integrated CANopen		
nEt	☐ **[Com. card]** (nEt): Communication card (if inserted)		
APP	☐ **[Prog. card]** (APP): Controller Inside card (if inserted)		
PI	☐ **[RP]** (PI): Frequency input, if VW3A3202 extension card has been inserted		
PG	☐ **[Encoder]** (PG): Encoder input, if encoder card has been inserted **Note**: In the following instances, only assignments via the terminals are possible: - [Profile] (CHCF) = [Not separ.] (SIM) with [Ref.1 channel] (Fr1) assigned via the terminals (analog inputs, encoder, pulse input); see page 117. - PID configured with PID references via the terminals		

Code	Name/Description	Adjustment range	Factory setting
OA1-	**■ [REF. OPERATIONS]** Reference = (Fr1 or Fr1b + SA2 + SA3 - dA2 - dA3) x MA2 x MA3. See the diagrams on pages 110 and 111. **Note:** This function cannot be used with certain other functions. Follow the instructions on page 122.		
SA2	**❑ [Summing ref. 2]** Selection of a reference to be added to [Ref.1 channel] (Fr1) or [Ref.1B channel] (Fr1b).		[No] (nO)
nO	❑ **[No]** (nO): No source assigned		
AI1	❑ **[AI1]** (AI1): Analog input		
AI2	❑ **[AI2]** (AI2): Analog input		
AI3	❑ **[AI3]** (AI3): Analog input, if VW3A3202 extension card has been inserted		
AI4	❑ **[AI4]** (AI4): Analog input, if VW3A3202 extension card has been inserted		
LCC	❑ **[HMI]** (LCC): Graphic display terminal		
Mdb	❑ **[Modbus]** (Mdb): Integrated Modbus		
CAn	❑ **[CANopen]** (CAn): Integrated CANopen		
nEt	❑ **[Com. card]** (nEt): Communication card (if inserted)		
APP	❑ **[Prog. card]** (APP): Controller Inside card (if inserted)		
PI	❑ **[RP]** (PI): Frequency input, if VW3A3202 extension card has been inserted		
PG	❑ **[Encoder]** (PG): Encoder input, if encoder card has been inserted		
AIU1	❑ **[Network AI]** (AIU1): Virtual input via communication bus, to be configured via [AI net. channel] (AIC1) page 89 **WARNING** **UNINTENDED EQUIPMENT OPERATION** If the equipment switches to forced local mode (see page 216), the virtual input remains frozen at the last value transmitted. Do not use the virtual input and forced local mode in the same configuration. **Failure to follow this instruction can result in death or serious injury.**		
SA3	**❑ [Summing ref. 3]** Selection of a reference to be added to [Ref.1 channel] (Fr1) or [Ref.1B channel] (Fr1b). • Possible assignments are identical to [Summing ref. 2] (SA2) above.		[No] (nO)
dA2	**❑ [Subtract. ref. 2]** Selection of a reference to be subtracted from [Ref.1 channel] (Fr1) or [Ref.1B channel] (Fr1b). • Possible assignments are identical to [Summing ref. 2] (SA2) above.		[No] (nO)
dA3	**❑ [Subtract. ref. 3]** Selection of a reference to be subtracted from [Ref.1 channel] (Fr1) or [Ref.1B channel] (Fr1b). • Possible assignments are identical to [Summing ref. 2] (SA2) above.		[No] (nO)
MA2	**❑ [Multiplier ref. 2]** Selection of a multiplier reference [Ref.1 channel] (Fr1) or [Ref.1B channel] (Fr1b). • Possible assignments are identical to [Summing ref. 2] (SA2) above.		[No] (nO)
MA3	**❑ [Multiplier ref. 3]** Selection of a multiplier reference [Ref.1 channel] (Fr1) or [Ref.1B channel] (Fr1b). • Possible assignments are identical to [Summing ref. 2] (SA2) above.		[No] (nO)

Code	Name/Description	Adjustment range	Factory setting
rPt-	■ **[RAMP]**		
rPt LIn S U CUS	❑ **[Ramp type]** ☐ **[Linear]** (LIn) ☐ **[S ramp]** (S) ☐ **[U ramp]** (U) ☐ **[Customized]** (CUS) S ramps  The rounding coefficient is fixed, where t2 = 0.6 x t1 and t1 = set ramp time. U ramps  The rounding coefficient is fixed, where t2 = 0.5 x t1 and t1 = set ramp time. Customized ramps  tA1: adjustable from 0 to 100% tA2: adjustable from 0 to (100% – tA1) tA3: adjustable from 0 to 100% tA4: adjustable from 0 to (100% – tA3) As a % of t1, where t1 = set ramp time		[Linear] (LIn)
Inr () 0.01 0.1 1	❑ **[Ramp increment]** (1) ☐ **[0.01]**: Ramp up to 99.99 seconds ☐ **[0.1]**: Ramp up to 999.9 seconds ☐ **[1]**: Ramp up to 9,000 seconds This parameter is valid for [Acceleration] (ACC), [Deceleration] (dEC), [Acceleration 2] (AC2) and [Deceleration 2] (dE2).		[0.1] (0.1)
ACC ()	❑ **[Acceleration]** (1) Time to accelerate from 0 to the [Rated motor freq.] (FrS) (page 64). Make sure that this value is compatible with the inertia being driven.	0.01 to 9,000 s (2)	3.0 s
dEC ()	❑ **[Deceleration]** (1) Time to decelerate from the [Rated motor freq.] (FrS) (page 64) to 0. Make sure that this value is compatible with the inertia being driven.	0.01 to 9,000 s (2)	3.0 s

(1) The parameter can also be accessed in the [1.3 SETTINGS] (SEt-) menu.
(2) Range 0.01 to 99.99 s or 0.1 to 999.9 s or 1 to 9,000 s according to [Ramp increment] (Inr).

()	Parameter that can be modified during operation or when stopped.

Code	Name/Description	Adjustment range	Factory setting
	■ **[RAMP]** (continued)		
tA1	❑ **[Begin Acc round]** (1) - Rounding of start of acceleration ramp as a % of the [Acceleration] (ACC) or [Acceleration 2] (AC2) ramp time. - Can be set between 0 and 100% - The parameter can be accessed if the [Ramp type] (rPt) is [Customized] (CUS).	0 to 100%	10%
tA2	❑ **[End Acc round]** (1) - Rounding of end of acceleration ramp as a % of the [Acceleration] (ACC) or [Acceleration 2] (AC2) ramp time. - Can be set between 0 and (100% – [Begin Acc round] (tA1)) - The parameter can be accessed if the [Ramp type] (rPt) is [Customized] (CUS).		10%
tA3	❑ **[Begin Dec round]** (1) - Rounding of start of deceleration ramp as a % of the [Deceleration] (dEC) or [Deceleration 2] (dE2) ramp time. - Can be set between 0 and 100% - The parameter can be accessed if the [Ramp type] (rPt) is [Customized] (CUS).	0 to 100%	10%
tA4	❑ **[End Dec round]** (1) - Rounding of end of deceleration ramp as a % of the [Deceleration] (dEC) or [Deceleration 2] (dE2) ramp time. - Can be set between 0 and (100% – [Begin Dec round] (tA3)) - The parameter can be accessed if the [Ramp type] (rPt) is [Customized] (CUS).		10%

(1) The parameter can also be accessed in the [1.3 SETTINGS] (SEt-) menu.

Parameter that can be modified during operation or when stopped.

Code	Name/Description	Adjustment range	Factory setting
	[RAMP] (continued)		
FrE	**[Ramp 2 threshold]**	0 to 500 or 1,000 Hz according to rating	0 Hz

Ramp switching threshold
The 2nd ramp is switched if the value of Frt is not 0 (0 deactivates the function) and the output frequency is greater than Frt.
Threshold ramp switching can be combined with [Ramp switch ass.] (rPS) switching as follows:

LI or bit	Frequency	Ramp
0	<Frt	ACC, dEC
0	>Frt	AC2, dE2
1	<Frt	AC2, dE2
1	>Frt	AC2, dE2

Code	Name/Description	Adjustment range	Factory setting
rPS	**[Ramp switch ass.]**		[No] (nO)
nO	**[No]** (nO): Not assigned.		
LI1	**[LI1]** (LI1) : :		
-	**[...]** (...): See the assignment conditions on page 116. - ACC and dEC are enabled when the assigned input or bit is at 0. - AC2 and dE2 are enabled when the assigned input or bit is at 1.		
AC2	**[Acceleration 2]** (1) Time to accelerate from 0 to the [Rated motor freq.] (FrS). Make sure that this value is compatible with the inertia being driven. The parameter can be accessed if [Ramp 2 threshold] (Frt) > 0 or if [Ramp switch ass.] (rPS) is assigned.	0.01 to 9,000 s (2)	5.0 s
dE2	**[Deceleration 2]** (1) Time to decelerate from [Rated motor freq.] (FrS) to 0. Make sure that this value is compatible with the inertia being driven. The parameter can be accessed if [Ramp 2 threshold] (Frt) > 0 or if [Ramp switch ass.] (rPS) is assigned.	0.01 to 9,000 s (2)	5.0 s

(1) The parameter can also be accessed in the [1.3 SETTINGS] (SEt-) menu.
(2) Range 0.01 to 99.99 s or 0.1 to 999.9 s or 1 to 9,000 s according to [Ramp increment] (Inr) page 129.

Parameter that can be modified during operation or when stopped.

Code	Name/Description	Adjustment range	Factory setting
brA	❑ **[Dec ramp adapt.]** Activating this function automatically adapts the deceleration ramp, if this has been set at too low a value for the inertia of the load, which can cause an overvoltage fault.		[Yes] (YES)
nO	☐ **[No]** (nO): Function inactive		
YES	☐ **[Yes]** (YES): Function active, for applications that do not require strong deceleration. The following selections appear depending on the rating of the drive and [Motor control type] (Ctt) page 67. They enable stronger deceleration to be obtained than with [Yes] (YES). Use comparative testing to determine your selection. When [Dec ramp adapt.] (brA) is configured on [High torq. x] (dYnx), the dynamic performances for braking are improved by the addition of a current flow component. The aim is to increase the iron loss and magnetic energy stored in the motor.		
dYnA	☐ **[High torq. A]** (dYnA): Addition of a constant current flow component.		
dYnb	☐ **[High torq. B]** (dYnb): Addition of a current flow component oscillating at 100 Hz.		
dYnC	☐ **[High torq. C]** (dYnC): Addition of a current flow component oscillating at 200 Hz but with a greater amplitude. [Dec ramp adapt.] (brA) is forced to [No] (nO) if [Braking balance] (bbA) page 78 = [Yes] (YES). The function is incompatible with applications requiring: - Positioning on a ramp - The use of a braking resistor (the resistor would not operate correctly). **CAUTION** Do not use [High torq. A] (dYnA), [High torq. B] (dYnB) or [High torq. C] (dYnC) configurations if the motor is a permanent magnet synchronous motor, as it will be demagnetized. **Failure to follow this instruction can result in equipment damage.**		

Code	Name/Description	Adjustment range	Factory setting
StT-	**[STOP CONFIGURATION]** **Note:** Some types of stop cannot be used with all other functions. Follow the instructions on page 122.		
Stt rMP FSt nSt dCI	**[Type of stop]** Stop mode on disappearance of the run command or appearance of a stop command. ☐ **[Ramp stop]** (rMP): On ramp ☐ **[Fast stop]** (FSt): Fast stop ☐ **[Freewheel]** (nSt): Freewheel stop This selection will not appear if [Motor fluxing] (FLU) page 146 = [Continuous] (FCt). ☐ **[DC injection]** (dCI): DC injection stop If the [Low speed time out] (tLS) parameter page 55 or 158 is not 0, [Type of stop] (Stt) is forced to [Ramp stop] (rMP).		[Ramp stop] (rMP)
FFt	**[Freewheel stop Thd]** (1) This parameter supports switching from a ramp stop or a fast stop to a freewheel stop below a low speed threshold. It can be accessed if [Type of stop] (Stt) = [Fast stop] (FSt) or [Ramp stop] (rMP). ☐ 0.0: Does not switch to freewheel stop ☐ 0.1 to 1000 Hz: Speed threshold below which the motor will switch to freewheel stop	0.0 to 1000 Hz	0.0
nSt nO LI1 - - C101 - - - Cd00 -	**[Freewheel stop ass.]** ☐ **[No]** (nO): Not assigned ☐ **[LI1]** (LI1) to **[LI6]** (LI6) ☐ **[LI7]** (LI7) to **[LI10]** (LI10): If VW3A3201 logic I/O card has been inserted ☐ **[LI11]** (LI11) to **[LI14]** (LI14s): If VW3A3202 extended I/O card has been inserted ☐ **[C101]** (C101) to **[C115]** (C115): With integrated Modbus in [I/O profile] (IO) ☐ **[C201]** (C201) to **[C215]** (C215): With integrated CANopen in [I/O profile] (IO) ☐ **[C301]** (C301) to **[C315]** (C315): With a communication card in [I/O profile] (IO) ☐ **[C401]** (C401) to **[C415]** (C415): With a Controller Inside card in [I/O profile] (IO) ☐ **[CD00]** (Cd00) to **[CD13]** (Cd13): In [I/O profile] (IO) can be switched with possible logic inputs ☐ **[CD14]** (Cd14) to **[CD15]** (Cd15): In [I/O profile] (IO) can be switched without logic inputs The stop is activated when the input or bit is at 0. If the input returns to state 1 and the run command is still active, the motor will only restart if [2/3 wire control] (tCC) page 80 = [2 wire] (2C) and [2 wire type] (tCt) = [Level] (LEL) or [Fwd priority] (PFO). If not, a new run command must be sent.		[No] (nO)
FSt nO LI1 - - -	**[Fast stop assign.]** **Note:** This function cannot be used with certain other functions. Follow the instructions on page 122. ☐ **[No]** (nO): Not assigned ☐ **[LI1]** (LI1) : : ☐ **[...]** (...): See the assignment conditions on page 116. The stop is activated when the input changes to 0 or the bit changes to 1(bit in [I/O profile] (IO) at 0). If the input returns to state 1 and the run command is still active, the motor will only restart if [2/3 wire control] (tCC) page 80 = [2 wire] (2C) and [2 wire type] (tCt) = [Level] (LEL) or [Fwd priority] (PFO). If not, a new run command must be sent.		[No] (nO)
dCF	**[Ramp divider]** (1) The parameter can be accessed if [Type of stop] (Stt) = [Fast stop] (FSt) and if [Fast stop assign.] (FSt) is not [No] (nO). The ramp that is enabled (dEC or dE2) is then divided by this coefficient when stop requests are sent. Value 0 corresponds to a minimum ramp time.	0 to 10	4

(1) The parameter can also be accessed in the [1.3 SETTINGS] (SEt-) menu.

Parameter that can be modified during operation or when stopped.

Code	Name/Description	Adjustment range	Factory setting
	■ **[STOP CONFIGURATION]** (continued)		
dC1 nO LI1 - - -	❑ **[DC injection assign.]** **Note:** This function cannot be used with certain other functions. Follow the instructions on page 122. □ **[No]** (nO): Not assigned □ **[LI1]** (LI1) : : □ **[...]** (...): See the assignment conditions on page 116. DC injection braking is initiated when the assigned input or bit changes to state 1. If the input returns to state 1 and the run command is still active, the motor will only restart if [2/3 wire control] (tCC) page 80 = [2 wire] (2C) and [2 wire type] (tCt) = [Level] (LEL) or [Fwd priority] (PFO). If not, a new run command must be sent.		[No] (nO)
IdC	❑ **[DC inject. level 1]** (1) (3) Level of DC injection braking current activated via logic input or selected as stop mode. The parameter can be accessed if [Type of stop] (Stt) = [DC injection] (dCI) or if [DC injection assign.] (dCI) is not [No] (nO). **CAUTION** Check that the motor will withstand this current without overheating. **Failure to follow these instructions can result in equipment damage.**	0.1 to 1.1 or 1.2 In (2) according to rating	0.64 In (2)
tdI	❑ **[DC injection time 1]** (1) (3) Maximum current injection time [DC inject. level 1] (IdC). After this time the injection current becomes [DC inject. level 2] (IdC2). The parameter can be accessed if [Type of stop] (Stt) = [DC injection] (dCI) or if [DC injection assign.] (dCI) is not [No] (nO).	0.1 to 30 s	0.5 s
IdC2	❑ **[DC inject. level 2]** (1) (3) Injection current activated by logic input or selected as stop mode, once period of time [DC injection time 1] (tdI) has elapsed. The parameter can be accessed if [Type of stop] (Stt) = [DC injection] (dCI) or if [DC injection assign.] (dCI) is not [No] (nO). **CAUTION** Check that the motor will withstand this current without overheating. **Failure to follow these instructions can result in equipment damage.**	0.1 In (2) to [DC inject. level 1] (IdC)	0.5 In (2)
tdC	❑ **[DC injection time 2]** (1) (3) Maximum injection time [DC inject. level 2] (IdC2) for injection, selected as stop mode only. The parameter can be accessed if [Type of stop] (Stt) = [DC injection] (dCI).	0.1 to 30 s	0.5 s

(1) The parameter can also be accessed in the [1.3 SETTINGS] (SEt-) menu.
(2) In corresponds to the rated drive current indicated in the Installation Manual and on the drive nameplate.
(3) Warning: These settings are independent of the [AUTO DC INJECTION] (AdC-) function.

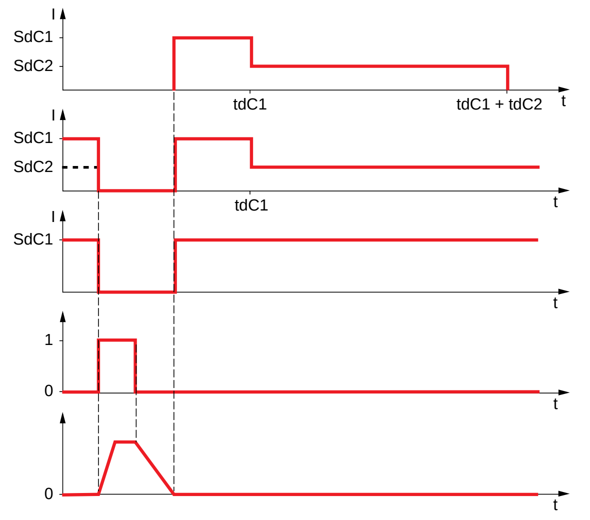
Parameter that can be modified during operation or when stopped.

Code	Name/Description	Adjustment range	Factory setting
AdC-	■ **[AUTO DC INJECTION]**		
AdC nO YES Ct	❑ **[Auto DC injection]** Automatic current injection on stopping (at the end of the ramp) ☐ **[No]** (nO): No injection ☐ **[Yes]** (YES): Adjustable injection time ☐ **[Continuous]** (Ct): Continuous standstill injection **Warning**: There is an interlock between this function and [Motor fluxing] (FLU) page 146. If [Motor fluxing] (FLU) = [Continuous] (FCt), [Auto DC injection] (Adc) must be [No] (nO). **Note:** This parameter gives rise to the injection of current even if a run command has not been sent. It can be accessed with the drive running.		[Yes] (YES)
SdC1	❑ **[Auto DC inj. level 1]** (1) Level of standstill DC injection current. The parameter can be accessed if [Auto DC injection] (AdC) is not [No] (nO). This parameter is forced to 0 if [Motor control type] (Ctt) page 67 = [Sync. mot.] (SYn). **CAUTION** Check that the motor will withstand this current without overheating. **Failure to follow these instructions can result in equipment damage.**	0 to 1.1 or 1.2 In (2) according to rating	0.7 In (2)
tdC1	❑ **[Auto DC inj. time 1]** (1) Standstill injection time. The parameter can be accessed if [Auto DC injection] (AdC) is not [No] (nO). If [Motor control type] (Ctt) page 67 = [Sync. mot.] (SYn) this time corresponds to the zero speed maintenance time.	0.1 to 30 s	0.5 s
SdC2	❑ **[Auto DC inj. level 2]** (1) 2nd level of standstill DC injection current. The parameter can be accessed if [Auto DC injection] (AdC) is not [No] (nO). This parameter is forced to 0 if [Motor control type] (Ctt) page 67 = [Sync. mot.] (SYn). **CAUTION** Check that the motor will withstand this current without overheating. **Failure to follow these instructions can result in equipment damage.**	0 to 1.1 or 1.2 In (2) according to rating	0.5 In (2)

(1) The parameter can also be accessed in the [1.3 SETTINGS] (SEt-) menu.
(2) In corresponds to the rated drive current indicated in the Installation Manual and on the drive nameplate.

Parameter that can be modified during operation or when stopped.

Code	Name/Description		Adjustment range	Factory setting
	■ [AUTO DC INJECTION] (continued)			
tdC2	❑ [Auto DC inj. time 2]	(1)	0 to 30 s	0 s
	2nd standstill injection time. The parameter can be accessed if [Auto DC injection] (AdC) = [Yes] (YES.)			

AdC	SdC2	Operation
YES	x	
Ct	≠ 0	
Ct	= 0	
Run command		
Speed		

(1) The parameter can also be accessed in the [1.3 SETTINGS] (SEt-) menu.

Parameter that can be modified during operation or when stopped.

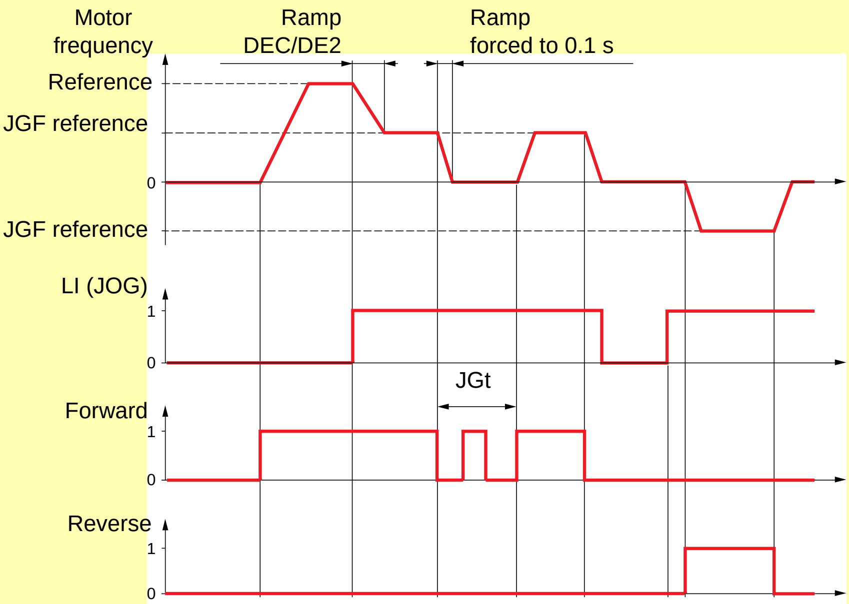
Code	Name/Description	Adjustment range	Factory setting
JOG-	**[JOG]** **Note:** This function cannot be used with certain other functions. Follow the instructions on page 122.		
JOG	**[JOG]**		[No] (nO)

Pulse operation.
The JOG function is only active if the command channel and the reference channels are on the terminals.
Selecting the assigned logic input or bit activates the function.

Code	
nO	☐ **[No]** (nO): Not assigned
LI1	☐ **[LI1]** (LI1) to **[LI6]** (LI6)
-	☐ **[LI7]** (LI7) to **[LI10]** (LI10): If VW3A3201 logic I/O card has been inserted
-	☐ **[LI11]** (LI11) to **[LI14]** (LI14): If VW3A3202 extended I/O card has been inserted
C101	☐ **[C101]** (C101) to **[C115]** (C115): With integrated Modbus in [I/O profile] (IO) configuration
-	☐ **[C201]** (C201) to **[C215]** (C215): With integrated CANopen in [I/O profile] (IO) configuration
-	☐ **[C301]** (C301) to **[C315]** (C315): With a communication card in [I/O profile] (IO) configuration
-	☐ **[C401]** (C401) to **[C415]** (C415): With a Controller Inside card in [I/O profile] (IO) configuration
Cd00	☐ **[CD00]** (Cd00) to **[CD13]** (Cd13): In [I/O profile] (IO) configuration can be switched with possible logic inputs
-	☐ **[CD14]** (Cd14) to **[CD15]** (Cd15): In [I/O profile] (IO) configuration can be switched without logic inputs

The function is active when the assigned input or bit is at 1.

Example: 2-wire control operation (tCC = 2C)



Code	Name/Description		Adjustment range	Factory setting
JGF	**[Jog frequency]** The parameter can be accessed if [JOG] (JOG) is not [No] (nO) or if a function key has been assigned to JOG (see page 120). Reference in jog operation	(1)	0 to 10 Hz	10 Hz
JGt	**[Jog delay]** The parameter can be accessed if [JOG] (JOG) is not [No] (nO) or if a function key has been assigned to JOG (see page 120). Anti-repeat delay between 2 consecutive jog operations.	(1)	0 to 2.0 s	0.5 s

(1) The parameter can also be accessed in the [1.3 SETTINGS] (SEt-) menu.

Parameter that can be modified during operation or when stopped.

Preset speeds

2, 4 or 8 speeds can be preset, requiring 1, 2 or 3 logic inputs respectively.

Note: **You must configure 2 and 4 speeds in order to obtain 4 speeds.**
You must configure 2, 4 and 8 speeds in order to obtain 8 speeds.

Combination table for preset speed inputs

8 speeds LI (PS8)	4 speeds LI (PS4)	2 speeds LI (PS2)	Speed reference
0	0	0	Reference (1)
0	0	1	SP2
0	1	0	SP3
0	1	1	SP4
1	0	0	SP5
1	0	1	SP6
1	1	0	SP7
1	1	1	SP8

(1) See the diagram on page 110: Reference 1 = (SP1).

Code	Name/Description	Adjustment range	Factory setting
PSS-	■ **[PRESET SPEEDS]** **Note:** This function cannot be used with certain other functions. Follow the instructions on page 122.		
PS2	❑ **[2 preset speeds]**		[No] (nO)
nO	☐ **[No]** (nO): Function inactive		
LI1 - - -	☐ **[LI1]** (LI1) : : ☐ **[...]** (...): See the assignment conditions on page 116.		
PS4	❑ **[4 preset speeds]**		[No] (nO)
nO	☐ **[No]** (nO): Function inactive		
LI1 - - -	☐ **[LI1]** (LI1) : : ☐ **[...]** (...): See the assignment conditions on page 116. To obtain 4 speeds you must also configure 2 speeds.		
PS8	❑ **[8 preset speeds]**		[No] (nO)
nO	☐ **[No]** (nO): Function inactive		
LI1 - - -	☐ **[LI1]** (LI1) : : ☐ **[...]** (...): See the assignment conditions on page 116. To obtain 8 speeds you must also configure 2 and 4 speeds.		

Code	Name/Description	Adjustment range	Factory setting
	[PRESET SPEEDS] (continued) The appearance of these [Preset speed x] (SPx) parameters is determined by the number of speeds configured.		
SP2	**[Preset speed 2]** (1)	0 to 500 or 1,000 Hz according to rating	10 Hz
SP3	**[Preset speed 3]** (1)		15 Hz
SP4	**[Preset speed 4]** (1)		20 Hz
SP5	**[Preset speed 5]** (1)		25 Hz
SP6	**[Preset speed 6]** (1)		30 Hz
SP7	**[Preset speed 7]** (1)		35 Hz
SP8	**[Preset speed 8]** (1) The factory setting changes to 60 Hz if [Standard mot. freq] (bFr) = [60Hz NEMA] (60).		50 Hz

(1) The parameter can also be accessed in the [1.3 SETTINGS] (SEt-) menu.

Parameter that can be modified during operation or when stopped.

+/- speed

Two types of operation are available.

1. **Use of single-press buttons:** Two logic inputs are required in addition to the operating direction(s).
   The input assigned to the "+ speed" command increases the speed, the input assigned to the "- speed" command decreases the speed.

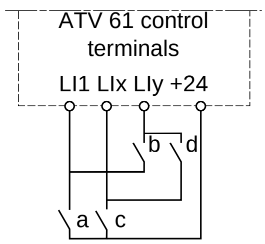
2. **Use of double-press buttons:** Only one logic input assigned to "+ speed" is required.

+/- speed with double-press buttons:

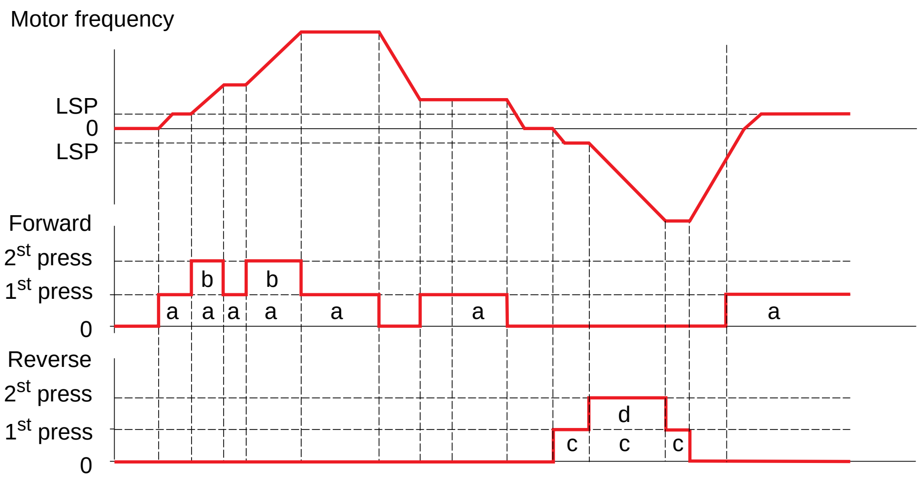
Description: 1 button pressed twice (2 steps) for each direction of rotation. A contact closes each time the button is pressed.

	Released (- speed)	1st press (speed maintained)	2nd press (faster)
Forward button	–	a	a and b
Reverse button	–	c	c and d

Example of wiring:



LI1: forward
LIx: reverse
LIy: + speed



Do not use this +/-speed type with 3-wire control.

Whichever type of operation is selected, the max. speed is set by [High speed] (HSP) (see page 37).

Note:
If the reference is switched via rFC (see page 118) from any one reference channel to another reference channel with "+/- speed", the value of reference rFr (after ramp) may be copied at the same time in accordance with the [Copy channel 1 --> 2] (COP) parameter, see page 119.
If the reference is switched via rFC (see page 118) from one reference channel to any other reference channel with "+/- speed", the value of reference rFr (after ramp) is always copied at the same time.

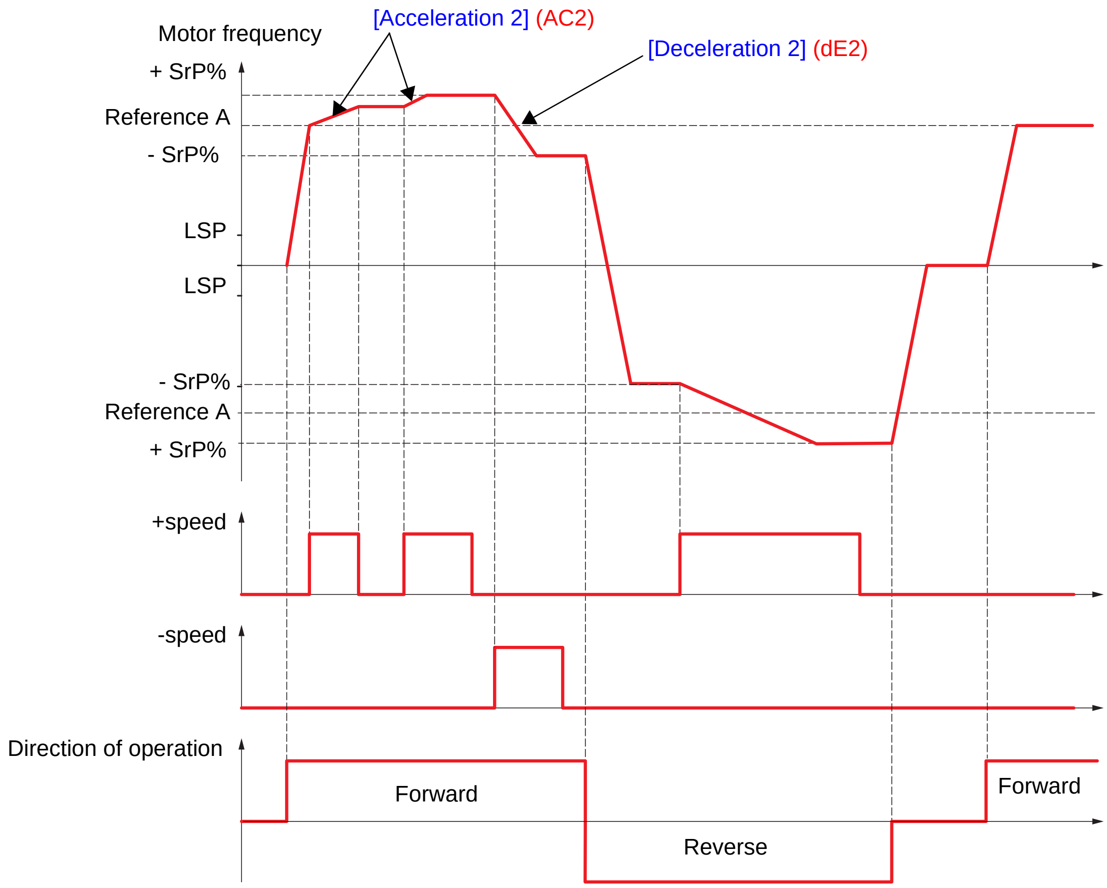
This prevents the speed being incorrectly reset to zero when switching takes place.

Code	Name/Description	Adjustment range	Factory setting
UPd-	■ **[+/-Speed]** Function can be accessed if reference channel [Ref.2 channel] (Fr2) = [+/-Speed] (UPdt) see page 118. **Note:** This function cannot be used with certain other functions. Follow the instructions on page 122.		
USP nO LI1 - - C101 - - - Cd00 -	❑ **[+ speed assignment]** ☐ **[No]** (nO): Function inactive ☐ **[LI1]** (LI1) to **[LI6]** (LI6) ☐ **[LI7]** (LI7) to **[LI10]** (LI10): If VW3A3201 logic I/O card has been inserted ☐ **[LI11]** (LI11) to **[LI14]** (LI14): If VW3A3202 extended I/O card has been inserted ☐ **[C101]** (C101) to **[C115]** (C115): With integrated Modbus in [I/O profile] (IO) ☐ **[C201]** (C201) to **[C215]** (C215): With integrated CANopen in [I/O profile] (IO) ☐ **[C301]** (C301) to **[C315]** (C315): With a communication card in [I/O profile] (IO) ☐ **[C401]** (C401) to **[C415]** (C415): With a Controller Inside card in [I/O profile] (IO) ☐ **[CD00]** (Cd00) to **[CD13]** (Cd13): In [I/O profile] (IO) can be switched with possible logic inputs ☐ **[CD14]** (Cd14) to **[CD15]** (Cd15): In [I/O profile] (IO) can be switched without logic inputs Function active if the assigned input or bit is at 1.		[No] (nO)
dSP nO LI1 - - C101 - - - Cd00 -	❑ **[-Speed assignment]** ☐ **[No]** (nO): Function inactive ☐ **[LI1]** (LI1) to **[LI6]** (LI6) ☐ **[LI7]** (LI7) to **[LI10]** (LI10): If VW3A3201 logic I/O card has been inserted ☐ **[LI11]** (LI11) to **[LI14]** (LI14): If VW3A3202 extended I/O card has been inserted ☐ **[C101]** (C101) to **[C115]** (C115): With integrated Modbus in [I/O profile] (IO) ☐ **[C201]** (C201) to **[C215]** (C215): With integrated CANopen in [I/O profile] (IO) ☐ **[C301]** (C301) to **[C315]** (C315): With a communication card in [I/O profile] (IO) ☐ **[C401]** (C401) to **[C415]** (C415): With a Controller Inside card in [I/O profile] (IO) ☐ **[CD00]** (Cd00) to **[CD13]** (Cd13): In [I/O profile] (IO) can be switched with possible logic inputs ☐ **[CD14]** (Cd14) to **[CD15]** (Cd15): In [I/O profile] (IO) can be switched without logic inputs Function active if the assigned input or bit is at 1.		[No] (nO)
Str nO rAM EEP	❑ **[Reference saved]** Associated with the "+/- speed" function, this parameter can be used to save the reference: • When the run commands disappear (saved to RAM) • When the line supply or the run commands disappear (saved to EEPROM) Therefore, the next time the drive starts up, the speed reference is the last reference saved. ☐ **[No]** (nO): No save (the next time the drive starts up, the speed reference is [Low speed] (LSP), see page 37) ☐ **[RAM]** (rAM): Save to RAM ☐ **[EEprom]** (EEP): Save to EEPROM		[No] (nO)

+/- speed around a reference

The reference is given by Fr1 or Fr1b with summing/subtraction/multiplication functions and preset speeds if relevant (see the diagram on page 110). For improved clarity, we will call this reference A. The action of the +speed and -speed buttons can be set as a % of this reference A. On stopping, the reference (A +/- speed) is not saved, so the drive restarts with reference A only.
The maximum total reference is always limited by [High speed] (HSP) and the minimum reference by [Low speed] (LSP), see page 37.

Example of 2-wire control:



Code	Name/Description	Adjustment range	Factory setting
SrE-	**[+/-SPEED AROUND REF.]** The function can be accessed for reference channel [Ref.1 channel] (Fr1). **Note:** This function cannot be used with certain other functions. Follow the instructions on page 122.		
USI	**[+ speed assignment]**		[No] (nO)
nO	[No] (nO): Function inactive		
LI1	[LI1] (LI1)		
- - -	: : [...] (...): See the assignment conditions on page 116. Function active if the assigned input or bit is at 1.		
dSI	**[-Speed assignment]**		[No] (nO)
nO	[No] (nO): Function inactive		
LI1	[LI1] (LI1)		
- - -	: : [...] (...): See the assignment conditions on page 116. Function active if the assigned input or bit is at 1.		
SrP	**[+/-Speed limitation]** This parameter limits the variation range with +/- speed as a % of the reference. The ramps used in this function are [Acceleration 2] (AC2) and [Deceleration 2] (dE2). The parameter can be accessed if +/- speed is assigned.	0 to 50%	10%
AC2	**[Acceleration 2]** (1) Time to accelerate from 0 to the [Rated motor freq.] (FrS). Make sure that this value is compatible with the inertia being driven. The parameter can be accessed if +/- speed is assigned.	0.01 to 9,000 s (2)	5.0 s
dE2	**[Deceleration 2]** (1) Time to decelerate from the [Rated motor freq.] (FrS) to 0. Make sure that this value is compatible with the inertia being driven. The parameter can be accessed if +/- speed is assigned.	0.01 to 9,000 s (2)	5.0 s

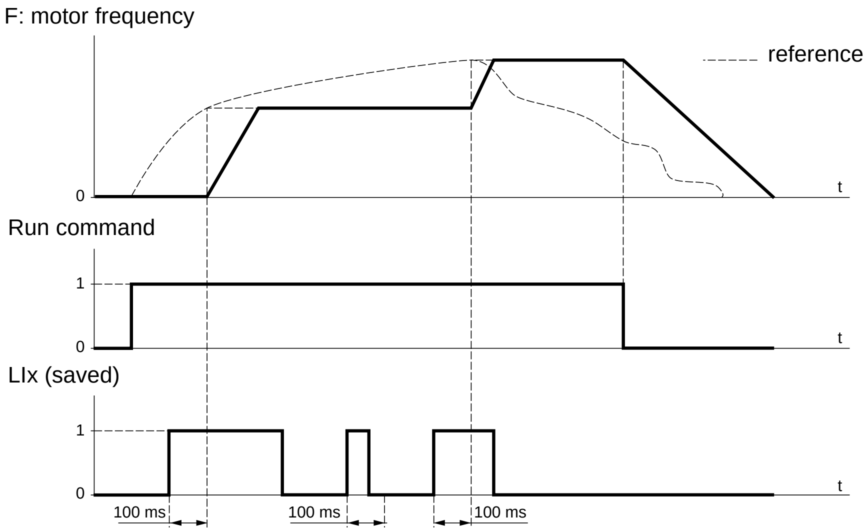
(1) The parameter can also be accessed in the [1.3 SETTINGS] (SEt-) menu.
(2) Range 0.01 to 99.99 s or 0.1 to 999.9 s or 1 to 9,000 s according to [Ramp increment] (Inr) page 129.

Parameter that can be modified during operation or when stopped.

Reference saving:

Saving a speed reference value using a logic input command lasting longer than 0.1 s.

- This function is used to control the speed of several drives alternately via a single analog reference and one logic input for each drive.
- It is also used to confirm a line reference (communication bus or network) on several drives via a logic input. This allows movements to be synchronized by getting rid of variations when the reference is sent.
- The reference is acquired 100 ms after the rising edge of the request. A new reference is not then acquired until a new request is made.



Code	Name/Description	Adjustment range	Factory setting
SPM-	■ **[MEMO REFERENCE]**		
SPM nO LI1 - LI14	❑ **[Ref. memo ass.]** ☐ **[No]** (nO): Function inactive ☐ **[LI1]** (LI1) to **[LI6]** (LI6) ☐ **[LI7]** (LI7) to **[LI10]** (LI10): If VW3A3201 logic I/O card has been inserted ☐ **[LI11]** (LI11) to **[LI14]** (LI14): If VW3A3202 extended I/O card has been inserted Assignment to a logic input. Function active if the assigned input is at 1.		[No] (nO)

Code	Name/Description	Adjustment range	Factory setting
FLI-	**[FLUXING BY LI]**		
FLU	**[Motor fluxing]**	(1)	[No] (FnO)
FnC	**[Not cont.]** (FnC): Non-continuous mode		
FCt	**[Continuous]** (FCt): Continuous mode. This option is not possible if [Auto DC injection] (AdC) page 135 is [Yes] (YES) or if [Type of stop] (Stt) page 133 is [Freewheel] (nSt).		
FnO	**[No]** (FnO): Function inactive At and above ATV61HD55M3X, ATV61HD90N4 and ATV61HC11Y, if [Motor control type] (Ctt) page 67 = [SVC V] (UUC) or [Energy Sav.] (nLd), this selection cannot be made and the factory setting is replaced by [Not cont.] (FnC). If [Motor control type] (Ctt) = [Sync. mot.] (SYn) the factory setting is replaced by [Not cont.] (FnC). In order to obtain rapid high torque on startup, magnetic flux needs to already have been established in the motor. • In [Continuous] (FCt) mode, the drive automatically builds up flux when it is powered up. • In [Not cont.] (FnC) mode, fluxing occurs when the motor starts up. The flux current is greater than nCr (configured rated motor current) when the flux is established and is then adjusted to the motor magnetizing current... **CAUTION** Check that the motor will withstand this current without overheating. **Failure to follow these instructions can result in equipment damage.** If [Motor control type] (Ctt) page 67 = [Sync. mot.] (SYn), the [Motor fluxing] (FLU) parameter causes the alignment of the motor and not the fluxing.		
FLI	**[Fluxing assignment]**		[No] (nO)
nO	**[No]** (nO): Function inactive		
LI1 - - -	**[LI1]** (LI1) : : **[...]** (...): See the assignment conditions on page 116. Assignment is only possible if [Motor fluxing] (FLU) is not [Continuous] (FCt). • In [Not cont.] (FnC) mode: - If an LI or a bit is assigned to the motor fluxing command, flux is built up when the assigned input or bit is at 1. - If an LI or a bit has not been assigned, or if the LI or bit assigned is at 0 when a run command is sent, fluxing occurs when the motor starts. • In [No] (FnO) mode: - If an LI or a bit is assigned to the motor fluxing command, flux is built up when the assigned input or bit is at 1 and is suppressed when the assigned input or bit is at 0.		

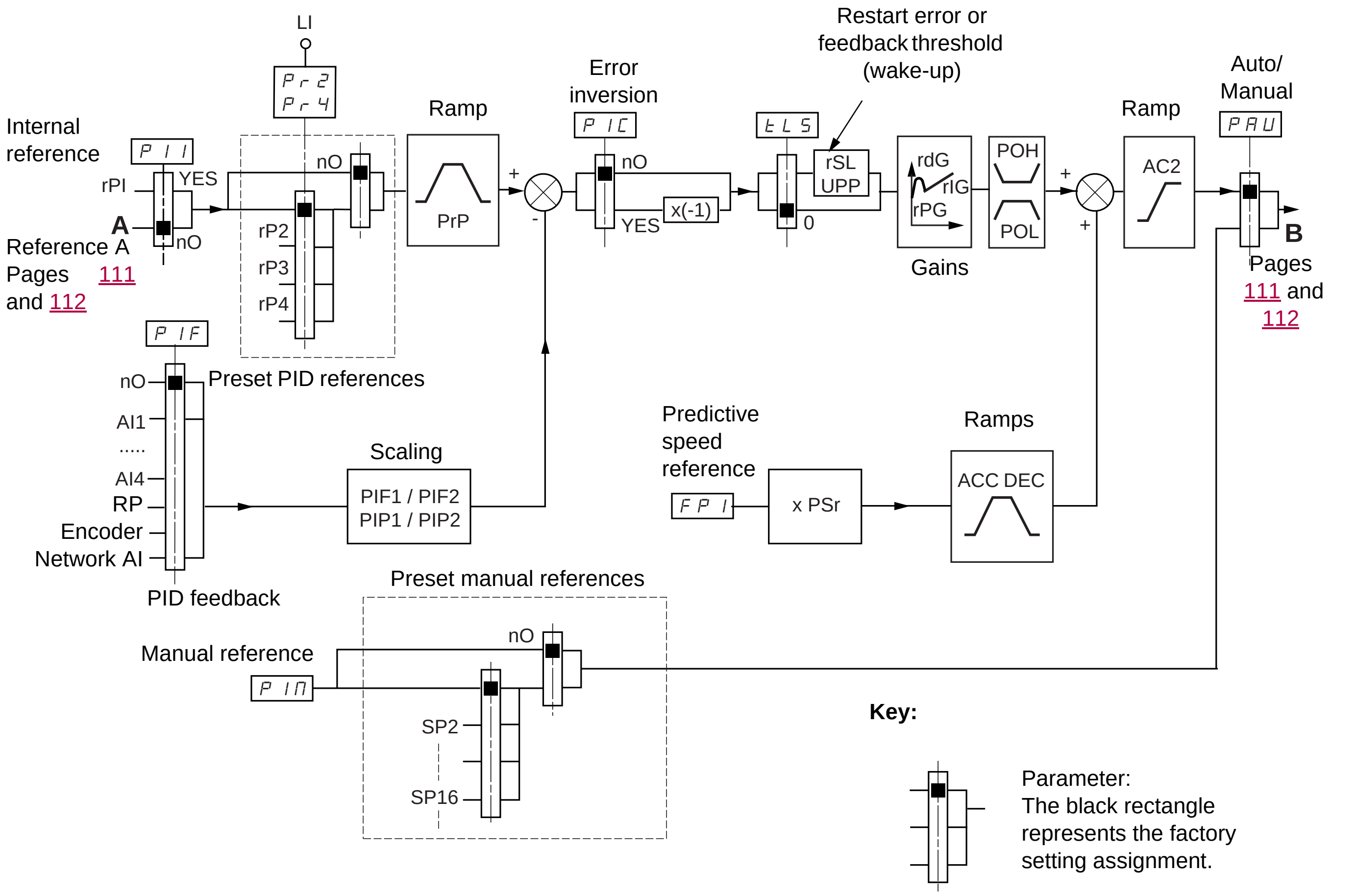
(1) The parameter can also be accessed in the [1.3 SETTINGS] (SEt-) menu.

Parameter that can be modified during operation or when stopped.

PID regulator

Block diagram

The function is activated by assigning an analog input to the PID feedback (measurement).



PID feedback:
The PID feedback must be assigned to one of the analog inputs AI1 to AI4, to the frequency input or the encoder, according to whether any extension cards have been inserted.

PID reference:
The PID reference must be assigned to the following parameters:
- Preset references via logic inputs (rP2, rP3, rP4)
- In accordance with the configuration of [Act. internal PID ref.] (PII) pages 151:
  - Internal reference (rPI) or
  - Reference A (Fr1 or Fr1b, see page 111)

Combination table for preset PID references

LI (Pr4)	LI (Pr2)	Pr2 = nO	reference
			rPI or A
0	0		rPI or A
0	1		rP2
1	0		rP3
1	1		rP4

A predictive speed reference can be used to initialize the speed on restarting the process.

How the various ramps work:
- ACC and dEC are only active in the event of changes in the predictive reference and not on starting PID regulation.
- AC2 affects the PID output on starting PID regulation and on PID "wake-ups" only.
- PrP is only active in the event of changes in the PID reference.

Scaling of feedback and references:

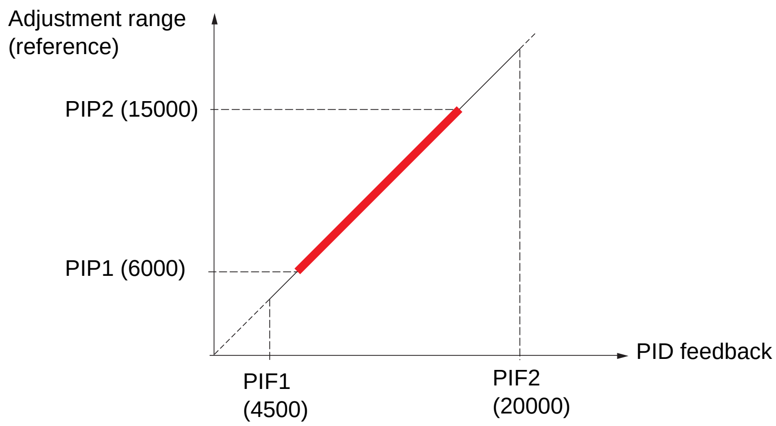
- PIF1, PIF2 parameters
  Can be used to scale the PID feedback (sensor range).
  This scale MUST be maintained for all other parameters.

- PIP1, PIP2 parameters
  Can be used to scale the adjustment range, i.e., the reference. **The adjustment range MUST be within the sensor range.**

  The scaling parameters must not exceed a value of 32767. To simplify setup, we recommend that you use values as close as possible to this maximum limit but remain within powers of 10 in respect of the actual values.

  Example (see the graph below): Adjustment of the volume in a tank, between 6 m^3 and 15 m^3.
  - Sensor used 4-20 mA, 4.5 m^3 for 4 mA, 20 m^3 for 20 mA, with the result that PIF1 = 4500 and PIF2 = 20000.
  - Adjustment range 6 to 15 m^3, with the result that PIP1 = 6000 (min. reference) and PIP2 = 15000 (max. reference).
  - Example references:
    - rP1 (internal reference) = 9,500
    - rp2 (preset reference) = 6,500
    - rP3 (preset reference) = 8,000
    - rP4 (preset reference) = 11,200

The [DISPLAY CONFIG.] menu can be used to customize the name of the unit displayed and its format.



Other parameters:

- rSL parameter:
  Can be used to set the PID error threshold, above which the PID regulator will be reactivated (wake-up) after a stop due to the max. time threshold being exceeded at low speed (tLS).

- Reversal of the direction of correction (PIC): If PIC = nO, the speed of the motor will increase when the error is positive, for example: pressure control with a compressor. If PIC = YES, the speed of the motor will decrease when the error is positive, for example: temperature control using a cooling fan.

- UPP parameter:
  If PIC = nO, can be used to set the PID feedback threshold, above which the PID regulator will be reactivated (wake-up) after a stop due to the max. time threshold being exceeded at low speed (tLS).
  If PIC = YES, can be used to set the PID feedback threshold, below which the PID regulator will be reactivated (wake-up) after a stop due to the max. time threshold being exceeded at low speed (tLS).

- The integral gain may be short-circuited by a logic input.

- An alarm on the PID feedback may be configured and indicated by a logic output.

- An alarm on the PID error may be configured and indicated by a logic output.

"Manual – Automatic" operation with PID

This function combines the PID regulator, the preset speeds and a manual reference. Depending on the state of the logic input, the speed reference is given by the preset speeds or by a manual reference input via the PID function.

Manual reference (PIM)

- Analog inputs AI1 to AI4
- Frequency input
- Encoder

Predictive speed reference (FPI)

- [AI1] (AI1): Analog input
- [AI2] (AI2): Analog input
- [AI3] (AI3): Analog input, if VW3A3202 extension card has been inserted
- [AI4] (AI4): Analog input, if VW3A3202 extension card has been inserted
- [RP] (PI): Frequency input, if VW3A3202 extension card has been inserted
- [Encoder] (PG): Encoder input, if encoder card has been inserted
- [HMI] (LCC): Graphic display terminal
- [Modbus] (Mdb): Integrated Modbus
- [CANopen] (CAn): Integrated CANopen
- [Com. card] (nEt): Communication card (if inserted)
- [Prog. card] (APP): Controller Inside card (if inserted)

Setting up the PID regulator

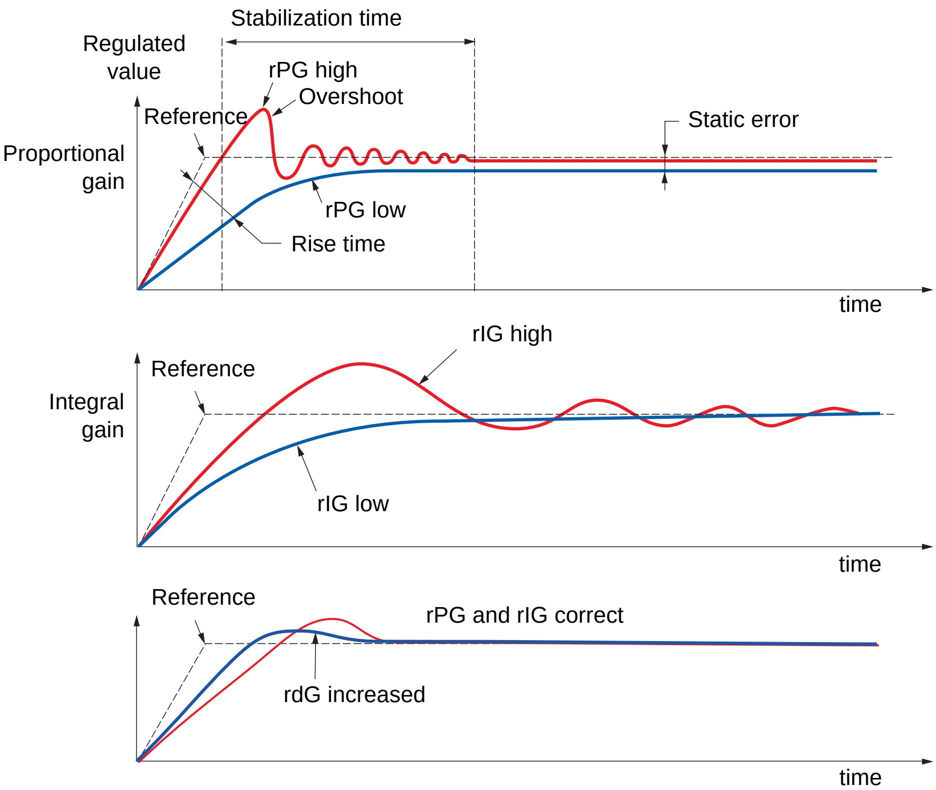
1. **Configuration in PID mode**
   See the diagram on page 147.

2. **Perform a test in factory settings mode (in most cases, this will be sufficient).**
   To optimize the drive, adjust rPG or rIG gradually and independently and observe the effect on the PID feedback in relation to the reference.

3. **If the factory settings are unstable or the reference is incorrect**

   - Perform a test with a speed reference in Manual mode (without PID regulator) and with the drive on load for the speed range of the system:
     - In steady state, the speed must be stable and comply with the reference and the PID feedback signal must be stable.
     - In transient state, the speed must follow the ramp and stabilize quickly, and the PID feedback must follow the speed.
     If this is not the case, see the settings for the drive and/or sensor signal and wiring.

   - Switch to PID mode.
   - Set brA to no (no auto-adaptation of the ramp).
   - Set the PID ramp (PrP) to the minimum permitted by the mechanism without triggering an ObF fault.
   - Set the integral gain (rIG) to minimum.
   - Leave the derivative gain (rdG) at 0.
   - Observe the PID feedback and the reference.
   - Switch the drive ON/OFF a number of times or vary the load or reference rapidly a number of times.
   - Set the proportional gain (rPG) in order to ascertain the best compromise between response time and stability in transient phases (slight overshoot and 1 to 2 oscillations before stabilizing).
   - If the reference varies from the preset value in steady state, gradually increase the integral gain (rIG), reduce the proportional gain (rPG) in the event of instability (pump applications), find a compromise between response time and static precision (see diagram).
   - Lastly, the derivative gain may permit the overshoot to be reduced and the response time to be improved, although this will make it more difficult to obtain a compromise in terms of stability, as it depends on 3 gains.
   - Perform in-production tests over the whole reference range.



The oscillation frequency depends on the system kinematics.

Parameter	Rise time	Overshoot	Stabilization time	Static error
rPG ↗	↘↘	↗	=	↘
rIG ↗	↘	↗↗	↗	↘↘
rdG ↗	=	↘	↘	=

Code	Name/Description	Adjustment range	Factory setting
PId-	**[PID REGULATOR]** **Note:** This function cannot be used with certain other functions. Follow the instructions on page 122.		
PIF	**[PID feedback ass.]**		[No] (nO)
nO AI1 AI2 AI3 AI4 PI PG AIU1	[No] (nO): Not assigned (function inactive) In this case, none of the function parameters can be accessed. [AI1] (AI1): Analog input [AI2] (AI2): Analog input [AI3] (AI3): Analog input, if VW3A3202 extension card has been inserted [AI4] (AI4): Analog input, if VW3A3202 extension card has been inserted [RP] (PI): Frequency input, if VW3A3202 extension card has been inserted [Encoder] (PG): Encoder input, if encoder card has been inserted [Network AI] (AIU1): Virtual input via communication bus. **Note :** If the equipment switches to forced local mode (see page 216), the virtual input remains frozen at the last value transmitted.		
AIC1	**[AI net. channel]** The parameter can be accessed if [PID feedback ass.] (PIF) = [Network AI] (AIU1). This parameter can also be accessed in the [1.5 INPUTS / OUTPUTS CFG] (I-O-) menu.		[No] (nO)
nO Mdb CAn nEt APP	[No] (nO): Not assigned [Modbus] (Mdb): Integrated Modbus [CANopen] (CAn): Integrated CANopen [Com. card] (nEt): Communication card (if inserted) [Prog. card] (APP): Controller Inside card (if inserted)		
PIF1	**[Min PID feedback]** (1) Value for minimum feedback. Adjustment range from 0 to [Max PID feedback] (PIF2) - 1 (2).		100
PIF2	**[Max PID feedback]** (1) Value for maximum feedback Adjustment range from [Min PID feedback] (PIF1) + 1 to 32,767 (2).		1,000
PIP1	**[Min PID reference]** (1) Minimum process value. Adjustment range between [Min PID feedback] (PIF1) and [Max PID feedback] (PIP2) - 1 (2).		150
PIP2	**[Max PID reference]** (1) Maximum process value Adjustment range between [Min PID reference] (PIP1) + 1 to [Max PID reference] (PIF2) (2).		900
PII	**[Act. internal PID ref.]** Internal PID regulator reference		[No] (nO)
nO YES	[No] (nO): The PID regulator reference is given by Fr1 or Fr1b with summing/subtraction/multiplication functions (see the diagram on page 110). [Yes] (YES): The PID regulator reference is internal via parameter rPI.		
rPI	**[Internal PID ref.]** Internal PID regulator reference This parameter can also be accessed in the [1.2 MONITORING] (SUP-) menu. Adjustment range between [Min PID reference] (PIP1) and [Max PID reference] (PIP2) (2).		150
rPG	**[PID prop. gain]** Proportional gain	0.01 to 100	1

(1) The parameter can also be accessed in the [1.3 SETTINGS] (SEt-) menu.
(2) If a graphic display terminal is not in use, values greater than 9,999 will be displayed on the 4-digit display with a period mark after the thousand digit, e.g., 15.65 for 15,650.

Parameter that can be modified during operation or when stopped.

Code	Name/Description	Adjustment range	Factory setting
	[PID REGULATOR] (continued)		
rIG	**[PID integral gain]** Integral gain	0.01 to 100	1
rdG	**[PID derivative gain]** Derivative gain	0.00 to 100	0
PrP	**[PID ramp]** (1) PID acceleration/deceleration ramp, defined to go from [Min PID reference] (PIP1) to [Max PID reference] (PIP2) and vice versa.	0 to 99.9 s	0 s
PIC nO YES	**[PID correct. reverse]** **[No]** (nO) **[Yes]** (YES) Reversal of the direction of correction (PIC): If PIC = nO, the speed of the motor will increase when the error is positive. Example: pressure control with a compressor. If PIC = YES, the speed of the motor will decrease when the error is positive. Example: temperature control using a cooling fan.		[No] (nO)
POL	**[Min PID output]** (1) Minimum value of regulator output in Hz	- 500 to 500 or -1,000 to 1,000 Hz according to rating	0 Hz
POH	**[Max PID output]** (1) Maximum value of regulator output in Hz	0 to 500 or 1,000 Hz according to rating	60 Hz
PAL	**[Min fbk alarm]** (1) Minimum regulator feedback monitoring threshold (alarm can be assigned to a relay or a logic output, page 94). Adjustment range from [Min PID feedback] (PIF1) to [Max PID feedback] (PIF2) (2).		100
PAH	**[Max fbk alarm]** (1) Maximum regulator feedback monitoring threshold (alarm can be assigned to a relay or a logic output, page 94). Adjustment range from [Min PID feedback] (PIF1) to [Max PID feedback] (PIF2) (2).		1,000
PEr	**[PID error Alarm]** (1) Regulator error monitoring threshold.	0 to 65,535 (2)	100
PIS nO LI1 - - -	**[PID integral reset]** **[No]** (nO): Function inactive **[LI1]** (LI1) : : **[...]** (...): See the assignment conditions on page 116. If the assigned input or bit is at 0, the function is inactive (the PID integral is enabled). If the assigned input or bit is at 1, the function is active (the PID integral is disabled).		[No] (nO)

(1) The parameter can also be accessed in the [1.3 SETTINGS] (SEt-) menu.
(2) If a graphic display terminal is not in use, values greater than 9,999 will be displayed on the 4-digit display with a period mark after the thousand digit, e.g., 15.65 for 15,650.

Parameter that can be modified during operation or when stopped.

Code	Name/Description	Adjustment range	Factory setting
	[PID REGULATOR] (continued)		
FPI	**[Speed ref. assign.]** PID regulator predictive speed input		[No] (nO)
nO	**[No]** (nO): Not assigned (function inactive)		
AI1	**[AI1]** (AI1): Analog input		
AI2	**[AI2]** (AI2): Analog input		
AI3	**[AI3]** (AI3): Analog input, if VW3A3202 extension card has been inserted		
AI4	**[AI4]** (AI4): Analog input, if VW3A3202 extension card has been inserted		
LCC	**[HMI]** (LCC): Graphic display terminal		
Mdb	**[Modbus]** (Mdb): Integrated Modbus		
CAn	**[CANopen]** (CAn): Integrated CANopen		
nEt	**[Com. card]** (nEt): Communication card (if inserted)		
APP	**[Prog. card]** (APP): Controller Inside card (if inserted)		
PI	**[RP]** (PI): Frequency input, if VW3A3202 extension card has been inserted		
PG	**[Encoder]** (PG): Encoder input, if encoder card has been inserted		
PSr ( )	**[Speed input%]** (1) Multiplying coefficient for predictive speed input. The parameter cannot be accessed if [Speed ref. assign.] (FPI) = [No] (nO).	1 to 100%	100%
PAU	**[Auto/Manual assign.]**		[No] (nO)
nO	**[No]** (nO): The PID is always active.		
LI1	**[LI1]** (LI1)		
-	:		
-	:		
-	**[...]** (...): See the assignment conditions on page 116. If the assigned input or bit is at 0, the PID is active. If the assigned input or bit is at 1, manual operation is active.		
AC2 ( )	**[Acceleration 2]** (1) Time to accelerate from 0 to the [Rated motor freq.] (FrS). Make sure that this value is compatible with the inertia being driven. Ramp AC2 is only active when the PID function is starting up and in the event of PID "wake-ups".	0.01 to 9000 s (2)	5.0 s
PIM	**[Manual reference]** Manual speed input. The parameter can be accessed if [Auto/Manual assign.] (PAU) is not [No] (nO).		[No] (nO)
nO	**[No]** (nO): Not assigned (function inactive)		
AI1	**[AI1]** (AI1): Analog input		
AI2	**[AI2]** (AI2): Analog input		
AI3	**[AI3]** (AI3): Analog input, if VW3A3202 extension card has been inserted		
AI4	**[AI4]** (AI4): Analog input, if VW3A3202 extension card has been inserted		
PI	**[RP]** (PI): Frequency input, if VW3A3202 extension card has been inserted		
PG	**[Encoder]** (PG): Encoder input, if encoder card has been inserted The preset speeds are active on the manual reference if they have been configured.		

(1) The parameter can also be accessed in the [1.3 SETTINGS] (SEt-) menu.
(2) Range 0.01 to 99.99 s or 0.1 to 999.9 s or 1 to 9000 s according to [Ramp increment] (Inr) page 129.

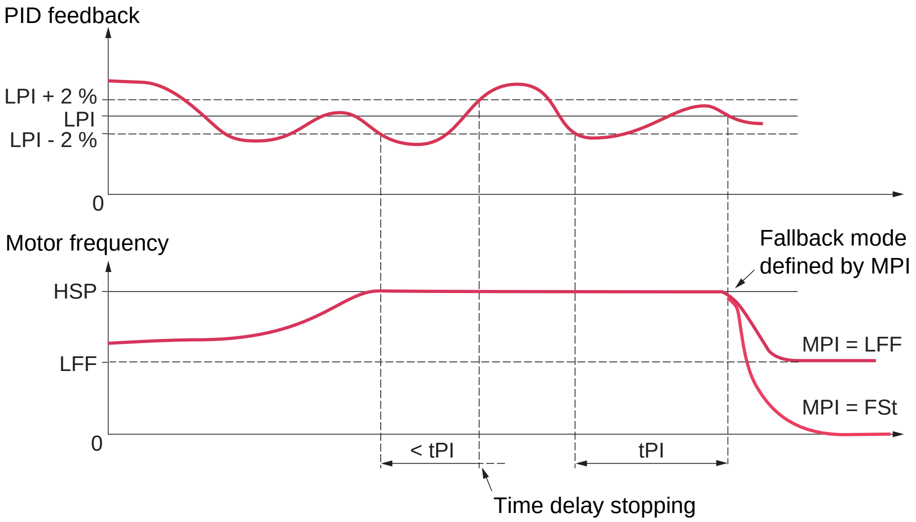
( ) Parameter that can be modified during operation or when stopped.

PID feedback supervision

Used to define the operating mode in the event of detection of a PI feedback:

- Lower than the limit set if [PID correct. reverse] (PIC) = [No] (nO)
- Higher than the limit set if [PID correct. reverse] (PIC) = [Yes] (YES)

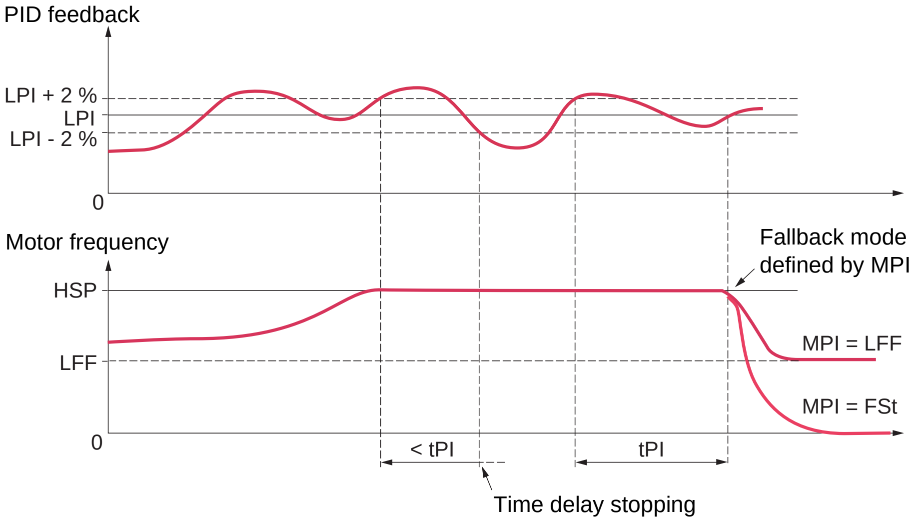
Where [PID correct. reverse] (PIC) = [No] (nO)



If, once maximum speed has been reached ([High speed] (HSP)), the PID feedback is lower than the supervision threshold [PID Threshold] (LPI) -2%, a time delay tPI is launched. If at the end of this time delay the value of the PID feedback is still lower than the supervision threshold [PID Threshold] (LPI) + 2%, the drive switches to fallback mode as defined by parameter MPI.

In all cases the drive reverts to PID regulation mode as soon as the PID feedback exceeds the supervision threshold [PID Threshold] (LPI) +2%.

Where [PID correct. reverse] (PIC) = [Yes] (YES)



If, once maximum speed has been reached ([High speed] (HSP)), the PID feedback is higher than the supervision threshold [PID Threshold] (LPI) +2%, a time delay tPI is launched. If at the end of this time delay the value of the PID feedback is still higher than the supervision threshold [PID Threshold] (LPI) -2%, the drive switches to fallback mode as defined by parameter MPI.

In all cases the drive reverts to PID regulation mode as soon as the PID feedback undershoots the supervision threshold [PID Threshold] (LPI) -2%.

Code	Name/Description	Adjustment range	Factory setting
	[PID REGULATOR] (continued)		
LPI	**[PID Threshold]** (1) PID regulator feedback supervision threshold (alarm can be assigned to a relay or a logic output, page 94). Adjustment range:		100
nO	□ **[No]** (nO): Function inactive (it will not be possible to access the other function parameters)		
-	□ between [Min PID feedback] (PIF1) and [Max PID feedback] (PIF2) (2).		
tPI	**[PID Ctrl. time delay]** (1) PID regulator feedback supervision time delay	0 to 600 s	0 s
MPI	**[PID Control Mngmt]** Type of stop for PID regulator feedback supervision fault.		[Ignore] (nO)
nO	□ **[Ignore]** (nO): Fault ignored		
YES	□ **[Freewheel]** (YES): Freewheel stop.		
LFF	□ **[fallback spd]** (LFF): Switch to fallback speed, maintained as long as the fault is present and the run command is not disabled (3).		
rMP	□ **[Ramp stop]** (rMP): Stop on ramp		
FSt	□ **[Fast stop]** (FSt): Fast stop		
LFF	**[Fallback speed]** Fallback speed for PID regulator feedback supervision fault.	0 to 500 or 1,000 Hz according to rating	0 Hz

(1) The parameter can also be accessed in the [1.3 SETTINGS] (SEt-) menu.
(2) If a graphic display terminal is not in use, values greater than 9,999 will be displayed on the 4-digit display with a period mark after the thousand digit, e.g., 15.65 for 15,650.
(3) Because, in this case, the fault does not trigger a stop, it is essential to assign a relay or logic output to its indication.

Parameter that can be modified during operation or when stopped.

Code	Name/Description	Adjustment range	Factory setting
Pr1-	■ **[PID PRESET REFERENCES]** Function can be accessed if [PID feedback ass.] (PIF) is assigned.		
Pr2 nO LI1 - - -	❑ **[2 preset PID ref.]** ☐ **[No]** (nO): Function inactive ☐ **[LI1]** (LI1) : : ☐ **[...]** (...): See the assignment conditions on page 116. If the assigned input or bit is at 0, the function is inactive. If the assigned input or bit is at 1, the function is active.		[No] (nO)
Pr4 nO LI1 - - -	❑ **[4 preset PID ref.]** Make sure that [2 preset PID ref.] (Pr2) has been assigned before assigning this function. ☐ **[No]** (nO): Function inactive ☐ **[LI1]** (LI1) : : ☐ **[...]** (...): See the assignment conditions on page 116. If the assigned input or bit is at 0, the function is inactive. If the assigned input or bit is at 1, the function is active.		[No] (nO)
rP2	❑ **[Preset ref. PID 2]** (1) The parameter can be accessed if [2 preset PID ref.] (Pr2) has been assigned. Adjustment range between [Min PID reference] (PIP1) and [Max PID reference] (PIP2) (2).		300
rP3	❑ **[Preset ref. PID 3]** (1) The parameter can be accessed if [2 preset PID ref.] (Pr2) and [4 preset PID ref.] (Pr4) have been assigned. Adjustment range between [Min PID reference] (PIP1) and [Max PID reference] (PIP2) (2).		600
rP4	❑ **[Preset ref. PID 4]** (1) The parameter can be accessed if [2 preset PID ref.] (Pr2) and [4 preset PID ref.] (Pr4) have been assigned. Adjustment range between [Min PID reference] (PIP1) and [Max PID reference] (PIP2) (2).		900

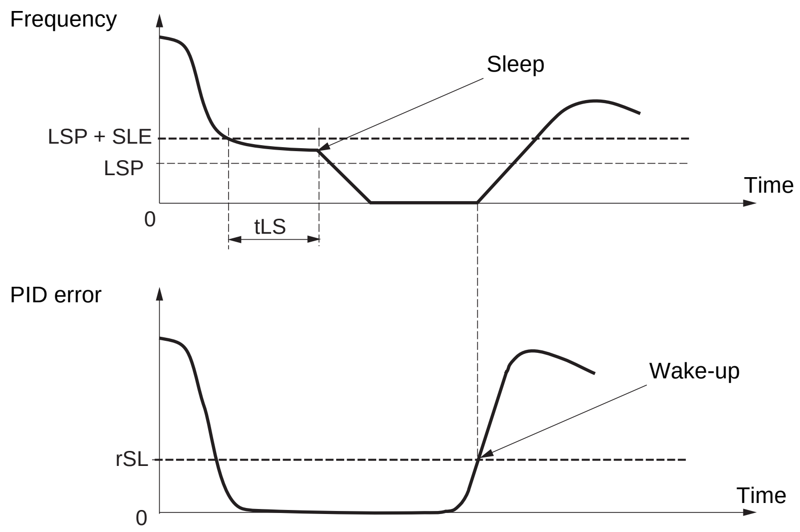
(1) The parameter can also be accessed in the [1.3 SETTINGS] (SEt-) menu.
(2) If a graphic display terminal is not in use, values greater than 9,999 will be displayed on the 4-digit display with a period mark after the thousand digit, e.g., 15.65 for 15,650.

Parameter that can be modified during operation or when stopped.

Sleep/Wake-up

This function supplements the PID regulator, in order to avoid prolonged operation at excessively low speeds when neither useful nor desirable.

- It stops the motor after a period of operation at reduced speed. This time and speed can be adjusted.
- It restarts the motor if the PID error or feedback exceeds an adjustable threshold.



Sleep:

Following operation at a speed less than [Low speed] (LSP) + [Sleep Offset Thres.] (SLE) for a period of time greater than or equal to [Low speed time out] (tLS), the motor is stopped on a ramp.

Wake-up:

If the PID error exceeds [PID wake up thresh.] (rSL) (see the example opposite) or if the PID feedback exceeds [PID Wakeup Thres.] (UPP), the PID regulator is reactivated.

Code	Name/Description		Adjustment range	Factory setting
SrM-	**[SLEEPING / WAKE UP]**			
tLS	**[Low speed time out]**	(1)	0 to 999.9 s	0 s
	Maximum operating time at [Low speed] (LSP). Following operation at LSP + SLE for a defined period, a motor stop is requested automatically. The motor restarts if the reference exceeds (LSP + SLE) and if a run command is still present. Caution: Value 0 corresponds to an unlimited period. **Note:** If [Low speed time out] (tLS) is not 0, [Type of stop] (Stt) page 133 is forced to [Ramp stop] (rMP) (only if a ramp stop can be configured).			
LSP	**[Low speed]**	(1)		0 Hz
	Motor frequency at minimum reference, can be set between 0 and [High speed] (HSP) (see page 49).			
SLE	**[Sleep Offset Thres.]**	(1)	0 to 500 or 1,000 Hz according to rating	1 Hz
	Adjustable restart threshold (offset) following a stop after prolonged operation at [Low speed] (LSP) + [Sleep Offset Thres.] (SLE), in Hz. The motor restarts if the reference rises above (LSP + SLE) and if a run command is still present.			
rSL	**[PID wake up thresh.]**			0
	If the "PID" and "Low speed operating time" tLS functions are configured at the same time, the PID regulator may attempt to set a speed lower than LSP. This results in unsatisfactory operation, which consists of starting, operating at low speed then stopping, and so on… Parameter rSL (restart error threshold) can be used to set a minimum PID error threshold for restarting after a stop at prolonged LSP. The function is inactive if the PID function has not been configured or if tLS = 0 or if rSL = 0. **WARNING** **UNINTENDED EQUIPMENT OPERATION** Check that unintended restarts will not present any danger. **Failure to follow these instructions can result in death or serious injury.** Adjustment range from 0.0 to [Max PID feedback] (PIF2) (2).			

(1) The parameter can also be accessed in the [1.3 SETTINGS] (SEt-) menu.
(2) If a graphic display terminal is not in use, values greater than 9,999 will be displayed on the 4-digit display with a period mark after the thousand digit, e.g., 15.65 for 15,650.

Parameter that can be modified during operation or when stopped.

Code	Name/Description	Adjustment range	Factory setting
UPP	❑ **[PID Wakeup Thres.]** If the "PID" and "Low speed operating time" tLS functions are configured at the same time, the PID regulator may attempt to set a speed lower than LSP. This results in unsatisfactory operation, which consists of starting, operating at low speed then stopping, and so on… Parameter UPP (restart feedback threshold) can be used to set a PID feedback threshold for restarting after a stop due to prolonged LSP. This threshold is minimum if [PID correct. reverse] (PIC) = [No] (nO) and maximum if [PID correct. reverse] (PIC) = [Yes] (YES) The function is inactive if the PID function has not been configured or if tLS = 0 or if UPP = [No] (nO) or if rSL is active (not 0). **WARNING** **UNINTENDED EQUIPMENT OPERATION** Check that unintended restarts will not present any danger. **Failure to follow these instructions can result in death or serious injury.** Adjustment range: [No] (nO) or between [Min PID feedback] (PIF1) and [Max PID feedback] (PIF2) (2).		[No] (nO)

(1) If a graphic display terminal is not in use, values greater than 9,999 will be displayed on the 4-digit display with a period mark after the thousand digit, e.g., 15.65 for 15,650.

Sleeping on the basis of flow detection

Parameters can be accessed in [Expert] mode.

This function is only active when the motor frequency is less than [NoFlo.Freq.Thres.Ac.] (FFd).
This function is used in applications where zero flow cannot be detected by the sleep function alone. At periodic intervals (based on time [No Flow Period Det.] (nFd)), it forces the drive's frequency reference to [Low speed] (LSP) + [No Flow Offset] (LFd) in order to test for zero flow.

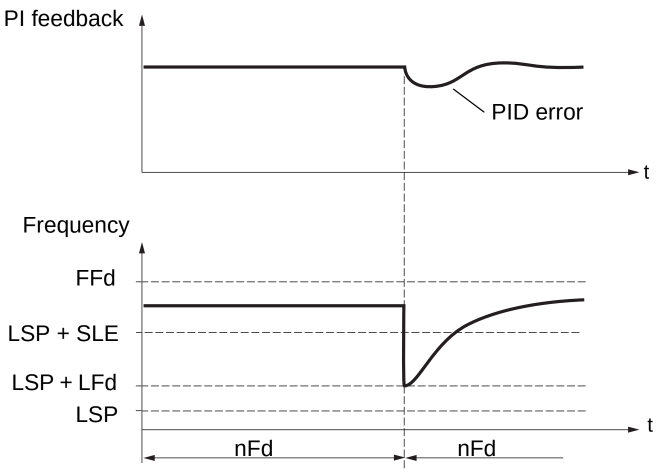
Set the sleep function so that the drive switches to sleep mode when zero flow is detected ([No Flow Offset] (LFd) ⩽ [Sleep Offset Thres.] (SLE) page 158).

The test can be carried out at underpressure or overpressure as appropriate for the type of installation.

Test at underpressure: (LSP + LFd) < FFd

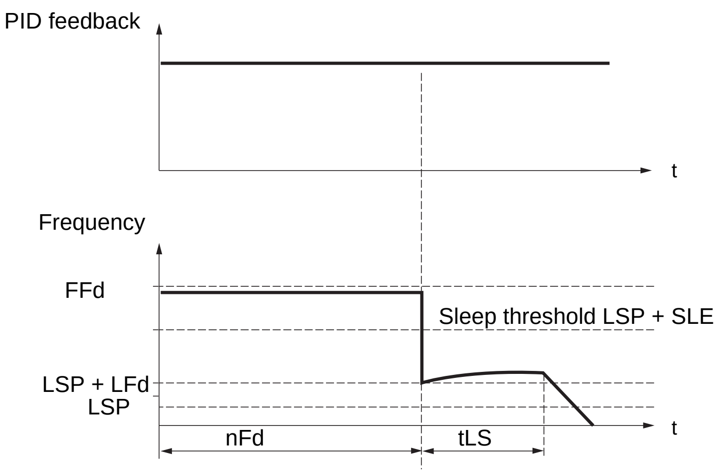
- If the request is still present, the PID regulator error increases (at underpressure), causing the drive to restart at its previous speed above the sleep threshold.

.



- If the request is no longer present (zero flow), the PID regulator error will not increase, and the speed will remain below the sleep threshold, thereby inducing a stop.

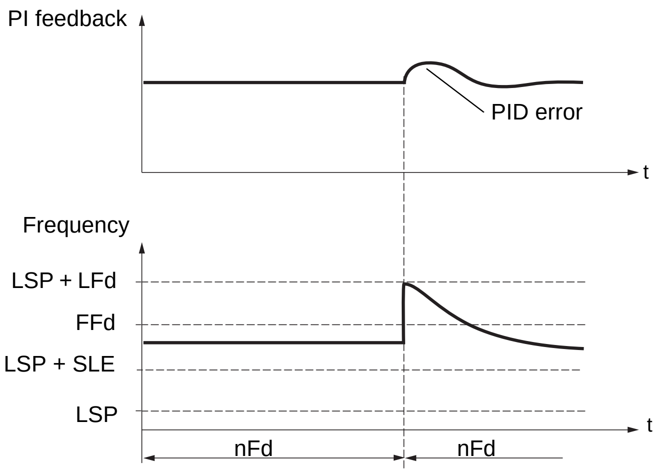
.



Test at overpressure: (LSP + LFd) > FFd

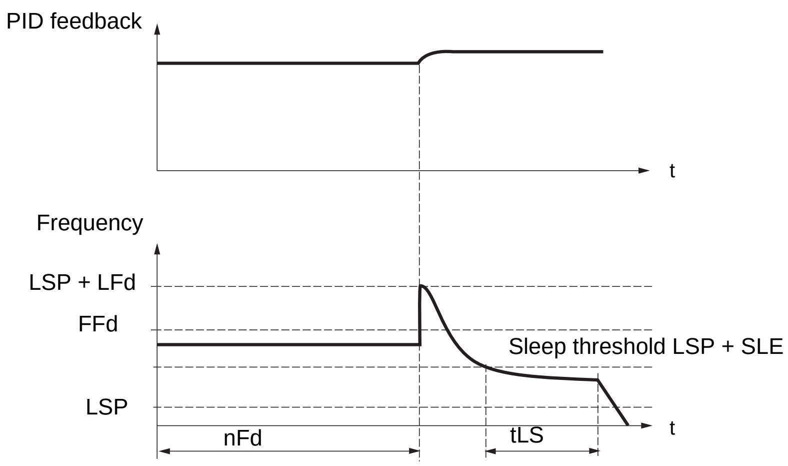
- If the request is still present, the PID regulator error increases (at overpressure), causing the drive to decelerate. If flow is detected, the speed will stabilize at its previous level, above the sleep threshold.

.



- If the request is no longer present (zero flow), the PID regulator error increases (at overpressure), causing the drive to decelerate. The absence of flow maintains the overpressure and the speed falls below the sleep threshold, causing the drive to stop.

.



Parameters can be accessed in [Expert] mode.

Code	Name/Description	Adjustment range	Factory setting
	■ **[SLEEPING / WAKE UP]** (continued)		
nFd	❑ **[No Flow Period Det.]** Zero flow detection interval, in minutes. The parameter can be accessed if [PID feedback ass.] (PIF) is not [No] (nO).	0 to 20 min	0 min
FFd	❑ **[NoFlo.Freq.Thres.Ac.]** (1) Zero flow detection activation threshold The parameter can be accessed if [PID feedback ass.] (PIF) is not [No] (nO) and if [No Flow Period Det.] (nFd) is not 0.	0 to 500 or 1,000 Hz according to rating	0 Hz
LFd	❑ **[No Flow Offset]** (1) Zero flow detection offset The parameter can be accessed if [PID feedback ass.] (PIF) is not [No] (nO) and if [No Flow Period Det.] (nFd) is not 0.	0 to 500 or 1,000 Hz according to rating	0 Hz

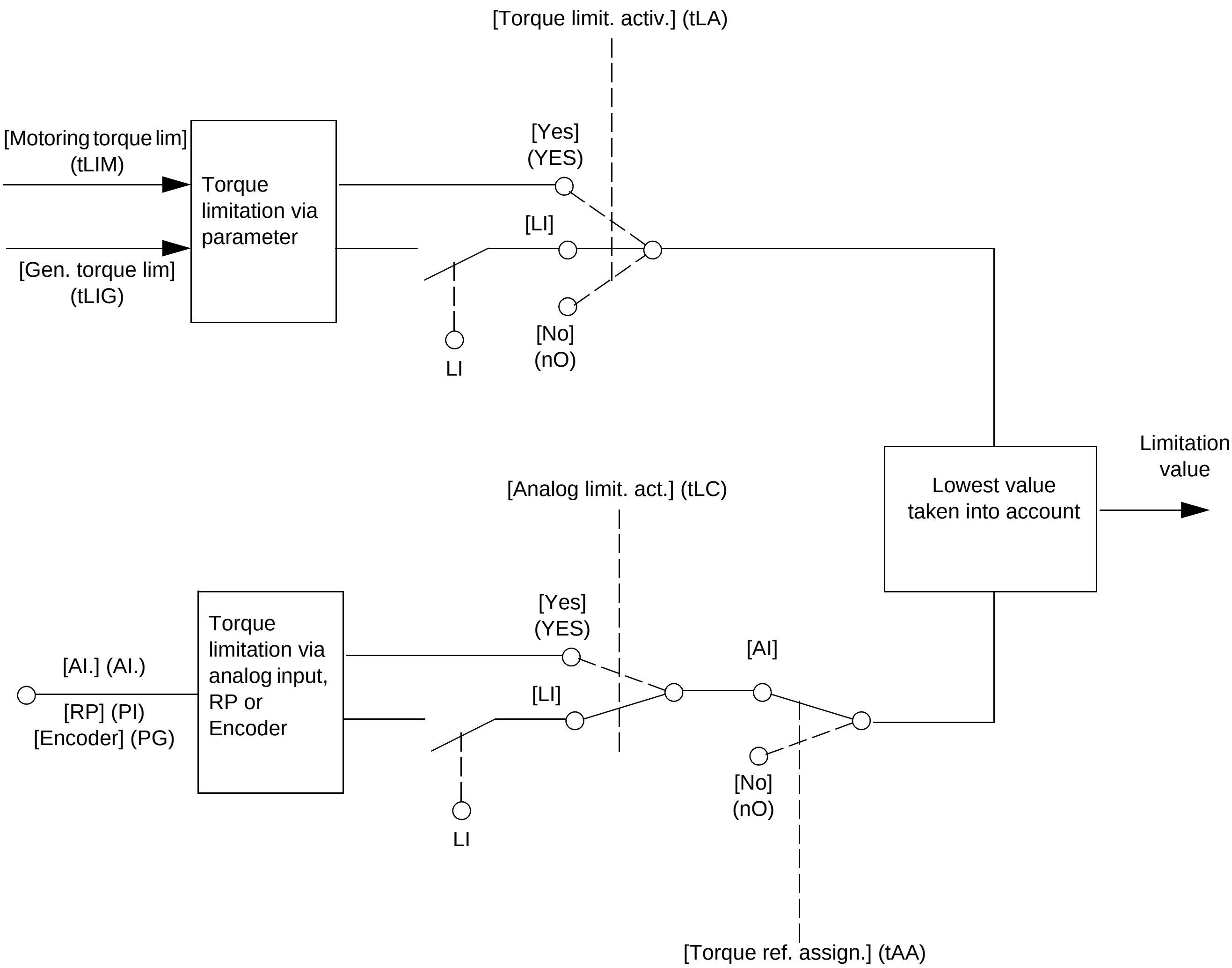
(1) The parameter can also be accessed in the [1.3 SETTINGS] (SEt-) menu.

Parameter that can be modified during operation or when stopped.

Torque limitation

There are two types of torque limitation:
- With a value that is fixed by a parameter
- With a value that is set by an analog input (AI, pulse or encoder)

If both types are enabled, the lowest value is taken into account. The two types of limitation can be configured or switched remotely using a logic input or via the communication bus.



Code	Name/Description	Adjustment range	Factory setting
tOL-	**■ [TORQUE LIMITATION]** This function cannot be accessed in V/F profile mode.		
tLA nO YES LI1 - - -	**❑ [Torque limit. activ.]** ☐ **[No]** (nO): Function inactive ☐ **[Yes]** (YES): Function always active ☐ **[LI1]** (LI1) : : ☐ **[...]** (...): See the assignment conditions on page 116. If the assigned input or bit is at 0, the function is inactive. If the assigned input or bit is at 1, the function is active.		[No] (nO)
IntP 0.1 1	**❑ [Torque increment]** The parameter cannot be accessed if [Torque limit. activ.] (tLA) = [No] (nO). Selection of units for the [Motoring torque lim] (tLIM) and [Gen. torque lim] (tLIG) parameters ☐ **[0.1%]** (0.1): 0.1% unit ☐ **[1%]** (1): 1% unit		[1%] (1)
tLIM	**❑ [Motoring torque lim]** (1) The parameter cannot be accessed if [Torque limit. activ.] (tLA) = [No] (nO) Torque limitation in motor mode, as a whole % or in 0.1% increments of the rated torque in accordance with the [Torque increment] (IntP) parameter.	0 to 300%	100%
tLIG	**❑ [Gen. torque lim]** (1) The parameter cannot be accessed if [Torque limit. activ.] (tLA) = [No] (nO) Torque limitation in generator mode, as a whole % or in 0.1% increments of the rated torque in accordance with the [Torque increment] (IntP) parameter.	0 to 300%	100%
tAA nO AI1 - AI4 PI PG AIU1	**❑ [Torque ref. assign.]** If the function is assigned, the limitation varies between 0% and 300% of the rated torque on the basis of the 0% to 100% signal applied to the assigned input. Examples: - 12 mA on a 4-20 mA input results in limitation to 150% of the rated torque. - 2.5 V on a 10 V input results in 75% of the rated torque. ☐ **[No]** (nO): Not assigned (function inactive) ☐ **[AI1]** (AI1) to **[AI4]** (AI4): Analog input, if VW3A3202 I/O card has been inserted ☐ **[RP]** (PI): Frequency input, if VW3A3202 I/O card has been inserted ☐ **[Encoder]** (PG): Encoder input, if encoder card has been inserted ☐ **[Network AI]** (AIU1): Virtual input via communication bus, to be configured via [AI net. channel] (AIC1) page 89 **⚠ WARNING** **UNINTENDED EQUIPMENT OPERATION** If the equipment switches to forced local mode (see page 216), the virtual input remains frozen at the last value transmitted. Do not use the virtual input and forced local mode in the same configuration. **Failure to follow this instruction can result in death or serious injury.**		[No] (nO)

(1) The parameter can also be accessed in the [1.3 SETTINGS] (SEt-) menu.

Parameter that can be modified during operation or when stopped.

Code	Name/Description	Adjustment range	Factory setting
tLC	❑ **[Analog limit. act.]**		[Yes] (YES)
	The parameter can be accessed if [Torque ref. assign.] (tAA) is not [No] (nO).		
YES	❑ **[Yes]** (YES): The limitation depends on the input assigned by [Torque ref. assign.] (tAA).		
LI1	❑ **[LI1]** (LI1)		
-	:		
-	:		
-	❑ **[...]** (...): See the assignment conditions on page 116. If the assigned input or bit is at 0: • The limit is specified by the [Motoring torque lim] (tLIM) and [Gen. torque lim] (tLIG) parameters if [Torque limit. activ.] (tLA) is not [No] (nO). • No limitation if [Torque limit. activ.] (tLA) = [No] (nO). If the assigned input or bit is at 1: • The limitation depends on the input assigned by [Torque ref. assign.] (tAA). **Note:** If [Torque limitation] (tLA) and [Torque ref. assign.] (tAA) are enabled at the same time, the lowest value will be taken into account.		

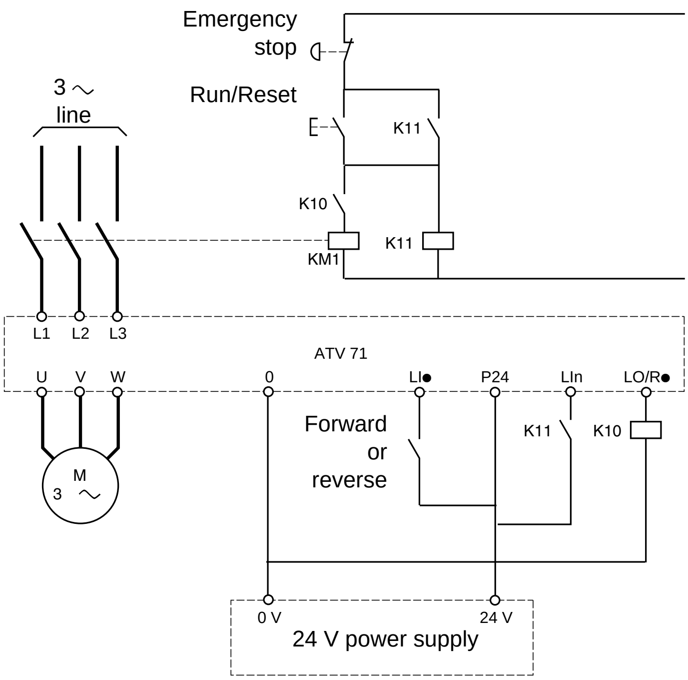
Code	Name/Description	Adjustment range	Factory setting
CLI-	■ **[2nd CURRENT LIMIT.]**		
LC2 nO LI1 - - -	❑ **[Current limit 2]** ☐ **[No]** (nO): Function inactive. ☐ **[LI1]** (LI1) : : ☐ **[...]** (...): See the assignment conditions on page 116. If the assigned input or bit is at 0, the first current limitation is active. If the assigned input or bit is at 1, the second current limitation is active.		[No] (nO)
CL2 ()	❑ **[I Limit. 2 value]** (1) Second current limitation The parameter can be accessed if [Current limit 2] (LC2) is not [No] (nO). **Note:** If the setting is less than 0.25 In, the drive may lock in [Output Phase Loss] (OPF) fault mode if this has been enabled (see page 194). If it is less than the no-load motor current, the limitation no longer has any effect. **CAUTION** Check that the motor will withstand this current, particularly in the case of permanent magnet synchronous motors, which are susceptible to demagnetization. **Failure to follow this instruction can result in equipment damage.**	0 to 1.1 or 1.2 In (2) according to rating	1.1 or 1.2 In (2) according to rating
CLI ()	❑ **[Current Limitation]** (1) First current limitation **Note:** If the setting is less than 0.25 In, the drive may lock in [Output Phase Loss] (OPF) fault mode if this has been enabled (see page 194). If it is less than the no-load motor current, the limitation no longer has any effect. **CAUTION** Check that the motor will withstand this current, particularly in the case of permanent magnet synchronous motors, which are susceptible to demagnetization. **Failure to follow this instruction can result in equipment damage.**	0 to 1.1 or 1.2 In (2) according to rating	1.1 or 1.2 In (2) according to rating

(1) The parameter can also be accessed in the [1.3 SETTINGS] (SEt-) menu.
(2) In corresponds to the rated drive current indicated in the Installation Manual and on the drive nameplate.

() Parameter that can be modified during operation or when stopped.

Line contactor command

Example circuit:



Note: The "Run/Reset" button must be pressed once the "Emergency stop" button has been released.

The drive control power supply must be provided via an external 24 V source.

CAUTION
This function can only be used for a small number of consecutive operations with a cycle time longer than 60 s (in order to avoid premature aging of the filter capacitor charging circuit). **Failure to follow these instructions can result in equipment damage.**

Note: The line contactor closes every time a run command (forward or reverse) is sent and opens after every stop.

Code	Name/Description	Adjustment range	Factory setting
LLC-	■ **[LINE CONTACTOR COMMAND]**		
LLC	❑ **[Line contactor ass.]**		[No] (nO)
	Logic output or control relay		
nO	☐ **[No]** (nO): Function not assigned (in this case, none of the function parameters can be accessed).		
LO1	☐ **[LO1]** (LO1)		
-	to		
LO4	**[LO4]** (LO4): Logic output (if one or two I/O cards have been inserted, LO1 to LO2 or LO4 can be selected).		
r2	☐ **[R2]** (r2)		
-	to		
r4	**[R4]** (r4): Relay (selection of R2 extended to R3 or R4 if one or two I/O cards have been inserted).		
dO1	☐ **[dO1]** (dO1): Analog output AO1 functioning as a logic output. Selection can be made if [AO1 assignment] (AO1) page 103 = [No] (nO).		
LES	❑ **[Drive lock]**		[No] (nO)
nO	☐ **[No]** (nO): Function inactive.		
LI1	☐ **[LI1]** (LI1)		
-	:		
-	:		
-	☐ **[...]** (...): See the assignment conditions on page 116. The drive locks when the assigned input or bit changes to 0.		
LCt	❑ **[Mains V. time out]**	5 to 999 s	5 s
	Monitoring time for closing of line contactor. If, once this time has elapsed, there is no voltage on the drive power circuit, the drive will lock with an [input contactor] (LCF) fault.		

Output contactor command

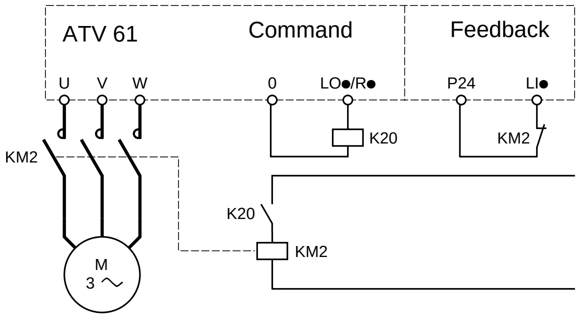
This allows the drive to control a contactor located between the drive and the motor. The request for the contactor to close is made when a run command is sent. The request for the contactor to open is made when there is no longer any current in the motor.

CAUTION
If a DC injection braking function has been configured it should not be left operating too long in stop mode, as the contactor only opens at the end of braking. **Failure to follow these instructions can result in equipment damage.**

Output contactor feedback

The corresponding logic input should be at 1 when there is no run command and at 0 during operation.
In the event of an inconsistency, the drive trips on an FCF2 fault if the output contactor fails to close (LIx at 1) and on an FCF1 fault if it is stuck (LIx at 0).
The parameter [Time to motor run] (dbS) can be used to delay tripping in fault mode when a run command is sent and the parameter [Time to open cont.] (dAS) delays the fault when a stop command is set.

Note:
Fault FCF2 (contactor failing to close) can be reset by the run command changing state from 1 to 0 (0 --> 1 --> 0 in 3-wire control).



The [Out. contactor ass.] (OCC) and [Output contact. fdbk] (rCA) functions can be used individually or together.

Code	Name/Description	Adjustment range	Factory setting
OCC-	■ **[OUTPUT CONTACTOR CMD]**		
OCC	❑ **[Out. contactor ass.]**		[No] (nO)
	Logic output or control relay		
nO	❑ **[No]** (nO): Function not assigned (in this case, none of the function parameters can be accessed).		
LO1 - LO4	❑ **[LO1]** (LO1) to **[LO4]** (LO4): Logic output (if one or two I/O cards have been inserted, LO1 to LO2 or LO4 can be selected).		
r2 - r4	❑ **[R2]** (r2) to **[R4]** (r4): Relay (selection of R2 extended to R3 or R4 if one or two I/O cards have been inserted)		
dO1	❑ **[dO1]** (dO1): Analog output AO1 functioning as a logic output. Selection can be made if [AO1 assignment] (AO1) page 103 = [No] (nO).		
rCA	❑ **[Output contact. fdbk]**		[No] (nO)
nO	❑ **[No]** (nO): Function inactive		
LI1 - - -	❑ **[LI1]** (LI1) : : ❑ **[...]** (...): See the assignment conditions on page 116. The motor starts up when the assigned input or bit changes to 0.		
dbS ()	❑ **[Time to motor run]**	0.05 to 60 s	0.15
	Time delay for: • Motor control following the sending of a run command • Output contactor fault monitoring, if the feedback is assigned. If the contactor fails to close at the end of the set time, the drive will lock in FCF2 fault mode. This parameter can be accessed if [Output cont.] (OCC) is assigned or if [Output contact. fdbk] (rCA) is assigned. The time delay must be greater than the closing time of the output contactor.		
dAS ()	❑ **[Time to open cont.]**	0 to 5.00 s	0.10
	Time delay for output contactor opening command following motor stop. This parameter can be accessed if [Output contact. fdbk] (rCA) is assigned. The time delay must be greater than the opening time of the output contactor. If it is set to 0, the fault will not be monitored. If the contactor fails to open at the end of the set time, the drive will lock in FCF1 fault mode.		

()	Parameter that can be modified during operation or when stopped.

Damper control

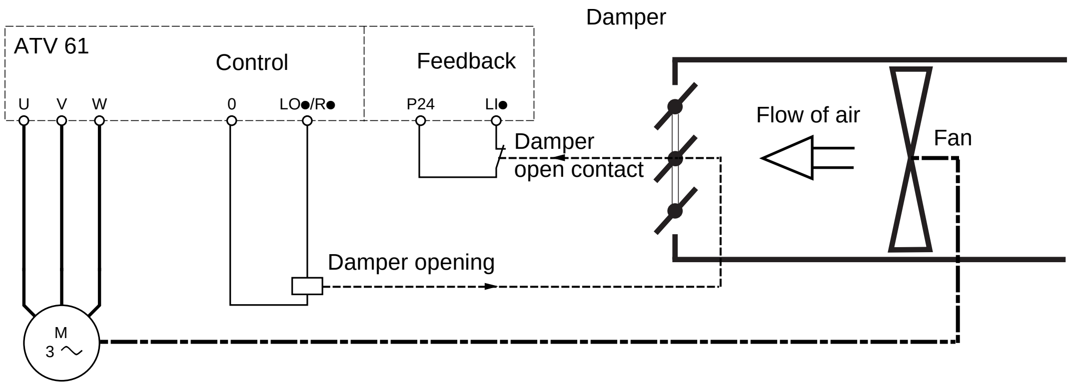
This function applies to the ventilation ducts. The aim is to control the opening of the duct (shutter device called a "damper") when the fan starts up.

Damper opening command

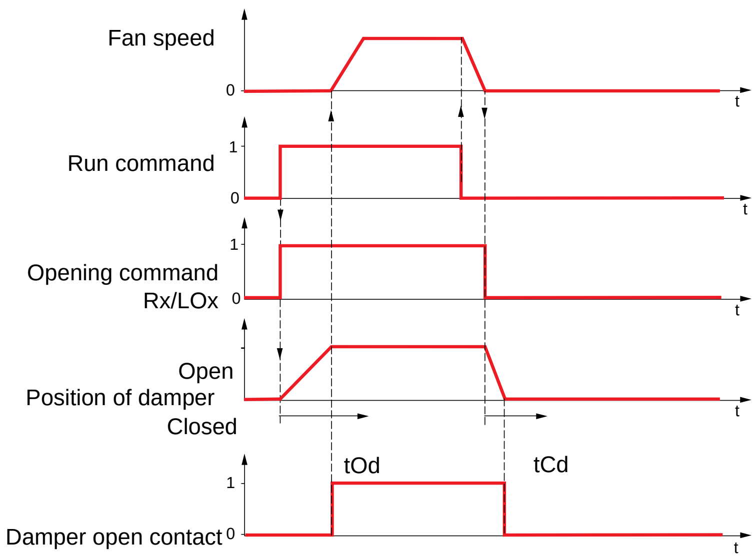
The opening command can be assigned to a logic output or a relay via the [Damper assignment] (dAM)parameter. The damper is closed automatically when there is no longer an opening command.

Damper opening feedback

Opening is controlled by a bit or a logic input that can be assigned via the [Damper feedback] (dFb) parameter. The corresponding logic input or bit can be configured (state 0 or 1 for damper open) via the parameter [F.back dam. contact](Fbtd).
When there is an inconsistency, the drive trips on a [Damper stuck] (Fd1) fault if the damper does not open and on a [Damper open] (Fd2) fault if it does not close.
The parameter [Time to open damp.] (tOd) can be used to delay tripping on an opening fault when a run command is sent and the parameter [Time to close damp.] (tCd) delays the closing fault when a stop command is sent.



Example of operation with feedback at state 1 for damper open



Code	Name/Description	Adjustment range	Factory setting
dAM-	**[DAMPER MANAGEMENT]**		
dAM nO LO1 - LO4 r2 - r4 dO1	**[Damper assignment]** Logic output or opening control relay ☐ **[No]** (nO): Function not assigned (in this case, none of the function's parameters can be accessed) ☐ **[LO1]** (LO1) to **[LO4]** (LO4): Logic output (if one or two I/O cards have been inserted, LO1 to LO2 or LO4 can be selected) **[R2]** (r2) to **[R4]** (r4): Relay (selection of R2 extended to R3 or R4 if one or two I/O cards have been inserted) ☐ **[dO1]** (dO1): Analog output AO1 functioning as a logic output. Selection can be made if [AO1 assignment] (AO1) page 103 = [No] (nO).		[No] (nO)
dFb nO LI1 - - -	**[Damper feedback]** Feedback of the "damper open" information ☐ **[No]** (nO): Function inactive ☐ **[LI1]** (LI1) : : ☐ **[...]** (...) : See the assignment conditions on page 116. **Note:** Before assigning damper feedback, check that the input wiring or the state of the assigned bit corresponds to the configuration of parameter [F.back dam. contact] (Fbtd) below. If it does not, the drive may immediately switch to fault mode.		[No] (nO)
tOd ()	**[Time to open damp.]** Opening fault monitoring time delay. If the damper does not open at the end of the set time, the drive will lock in [Damper stuck] (Fd1) fault mode. The time delay must be greater than the normal opening time of the damper.	0.05 to 300 s	60
tCd ()	**[Time to close damp.]** Closing fault monitoring time delay. If the damper does not close at the end of the set time, the drive will lock in [Damper open.] (Fd1) fault mode. If this parameter is at 0.00, the [Damper open.] (Fd2) fault is monitored only at the run command before activation of the relay or the control logic output. The time delay must be greater than the normal closing time of the damper.	0.00 to 300 s	60
Fbtd SHUt OPEn	**[F.back dam. contact]** This parameter defines the positive or negative logic of the input or bit assigned by [Damper feedback] (dFb). ☐ **[Active at 0]** (SHUt): The motor starts up when the assigned input or bit changes to 0. ☐ **[Active at 1]** (OPEn): The motor starts up when the assigned input or bit changes to 1.		[Active at 0] (SHUt)

() Parameter that can be modified during operation or when stopped

Parameter set switching [PARAM. SET SWITCHING]

A set of 1 to 15 parameters from the [1.3 SETTINGS] (SEt-) menu on page 47 can be selected and 2 or 3 different values assigned. These 2 or 3 sets of values can then be switched using 1 or 2 logic inputs or control word bits. This switching can be performed during operation (motor running).
It can also be controlled on the basis of one or two frequency thresholds, whereby each threshold acts as a logic input (0 = threshold not attained, 1 = threshold attained).

	Values 1	Values 2	Values 3
Parameter 1 Parameter 2 Parameter 3 Parameter 4 Parameter 5 Parameter 6 Parameter 7 Parameter 8 Parameter 9 Parameter 10 Parameter 11 Parameter 12 Parameter 13 Parameter 14 Parameter 15	Parameter 1 Parameter 2 Parameter 3 Parameter 4 Parameter 5 Parameter 6 Parameter 7 Parameter 8 Parameter 9 Parameter 10 Parameter 11 Parameter 12 Parameter 13 Parameter 14 Parameter 15	Parameter 1 Parameter 2 Parameter 3 Parameter 4 Parameter 5 Parameter 6 Parameter 7 Parameter 8 Parameter 9 Parameter 10 Parameter 11 Parameter 12 Parameter 13 Parameter 14 Parameter 15	Parameter 1 Parameter 2 Parameter 3 Parameter 4 Parameter 5 Parameter 6 Parameter 7 Parameter 8 Parameter 9 Parameter 10 Parameter 11 Parameter 12 Parameter 13 Parameter 14 Parameter 15
Input LI or bit or frequency threshold 2 values	0	1	0 or 1
Input LI or bit or frequency threshold 3 values	0	0	1

Note: Do not modify the parameters in the [1.3 SETTINGS] (SEt-) menu, because any modifications made in this menu will be lost on the next power-up. The parameters can be adjusted during operation in the [PARAM. SET SWITCHING] (MLP-) menu, on the active configuration.

Note: Parameter set switching cannot be configured from the integrated display terminal.
Parameters can only be adjusted on the integrated display terminal if the function has been configured previously via the graphic display terminal, by PowerSuite or via the bus or communication network. If the function has not been configured, the **MLP-** menu and the **PS1-**, **PS2-**, **PS3-** submenus do not appear.

Code	Name/Description	Adjustment range	Factory setting

MLP- ■ [PARAM. SET SWITCHING]

CHA1 ❑ [2 Parameter sets]

Factory setting: [No] (nO)

- nO ☐ **[No]** (nO): Function inactive.
- FtA ☐ **[Freq.Th.att.]** (FtA): Switching via [Freq. threshold] (Ftd) page 59
- F2A ☐ **[Freq. Th. 2 attain.]** (F2A): Switching via [Freq. threshold 2] (Ftd) page 59
- LI1 ☐ **[LI1]** (LI1)
- \- :
- \- :
- \- ☐ **[...]** (...): See the assignment conditions on page 116.

Switching 2 parameter sets

CHA2 ❑ [3 Parameter sets]

Factory setting: [No] (nO)

- nO ☐ **[No]** (nO): Function inactive.
- FtA ☐ **[Freq.Th.att.]** (FtA): Switching via [Freq. threshold] (Ftd) page 59
- F2A ☐ **[Freq. Th. 2 attain.]** (F2A): Switching via [Freq. threshold 2] (Ftd) page 59
- LI1 ☐ **[LI1]** (LI1)
- \- :
- \- :
- \- ☐ **[...]** (...): See the assignment conditions on page 116.

Switching 3 parameter sets

Note: In order to obtain 3 parameter sets, [2 Parameter sets] must also be configured.

❑ [PARAMETER SELECTION]

The parameter can only be accessed on the graphic display terminal if [2 Parameter sets] is not [No].

Making an entry in this parameter opens a window containing all the adjustment parameters that can be accessed.

Select 1 to 15 parameters using ENT (a tick then appears next to the parameter). Parameter(s) can also be deselected using ENT.

Example:

PARAMETER SELECTION	
1.3 SETTINGS	
Ramp increment	✓
- - - - - - - - -	☐
- - - - - - - - -	☐
- - - - - - - - -	✓

PS1- ❑ [SET 1]

The parameter can be accessed if one or more parameters have been selected in [PARAMETER SELECTION].

Making an entry in this parameter opens a settings window containing the selected parameters **in the order in which they were selected**.

With the graphic display terminal:

RDY Term +0.00 Hz REM		
SET1		
Acceleration	:	9.51 s
Deceleration	:	9.67 s
Acceleration 2	:	12.58 s
Deceleration 2	:	13.45 s
Begin Acc round	:	2.3 s
Code		T/K

ENT →

RDY Term +0.00 Hz REM	
Acceleration	
9.51 s	
Min = 0.1	Max = 999.9
<< >>	T/K

With the integrated display terminal:

Proceed as in the Settings menu using the parameters that appear.

Code	Name/Description	Adjustment range	Factory setting
	■ **[PARAM. SET SWITCHING]** (continued)		
PS2-	❑ **[SET 2]** The parameter can be accessed if one or more parameters have been selected in [PARAMETER SELECTION]. Procedure identical to [SET 1] (PS1-).		
PS3-	❑ **[SET 3]** The parameter can be accessed if [3 parameter sets] is not [No] and if one or more parameters have been selected in [PARAMETER SELECTION]. Procedure identical to [SET 1] (PS1-).		

Note: We recommend that a parameter set switching test is carried out on stopping and a check is made to ensure that it has been performed correctly.
Some parameters are interdependent and in this case may be restricted at the time of switching.

Interdependencies between parameters must be respected, <u>even between different sets</u>.

Example: The highest [Low speed] (LSP) must be below the lowest [High speed] (HSP).

Motor or configuration switching [MULTIMOTORS/CONFIG.]

The drive may contain up to 3 configurations, which can be saved using the [1.12 FACTORY SETTINGS] (FCS-) menu, page 220.
Each of these configurations can be activated remotely, enabling adaptation to:

- 2 or 3 different motors or mechanisms (multimotor mode)
- 2 or 3 different configurations for a single motor (multiconfiguration mode)

The two switching modes cannot be combined.

Note: The following conditions MUST be observed:

- Switching may only take place when stopped (drive locked). If a switching request is sent during operation, it will not be executed until the next stop.
- In the event of motor switching, the following additional conditions apply:
  - When the motors are switched, the power and control terminals concerned must also be switched as appropriate.
  - The maximum power of the drive must not be exceeded by any of the motors.
- All the configurations to be switched must be set and saved in advance in the same hardware configuration, this being the definitive configuration (option and communication cards). Failure to follow this instruction can cause the drive to lock on an [Incorrect config.] (CFF) fault.

Menu and parameters switched in multimotor mode

- [1.3 SETTINGS] (SEt-)
- [1.4 MOTOR CONTROL] (drC-)
- [1.5 INPUTS / OUTPUTS CFG] (I-O-)
- [1.6 COMMAND] (CtL-)
- [1.7 APPLICATION FUNCT.] (FUn-) with the exception of the [MULTIMOTORS/CONFIG.] function (to be configured once only)
- [1.8 FAULT MANAGEMENT] (FLt)
- [1.13 USER MENU]
- [USER CONFIG.]: The name of the configuration specified by the user in the [1.12 FACTORY SETTINGS] (FCS-) menu

Menu and parameters switched in multiconfiguration mode

As in multimotor mode, except for the motor parameters that are common to the three configurations:

- Rated current
- Thermal current
- Rated voltage
- Rated frequency
- Rated speed
- Rated power
- Magnetizing current at zero frequency
- IR compensation
- Slip compensation
- Synchronous motor parameters
- Type of thermal protection
- Thermal state
- The auto-tuning parameters and motor parameters that can be accessed in expert mode
- Type of motor control

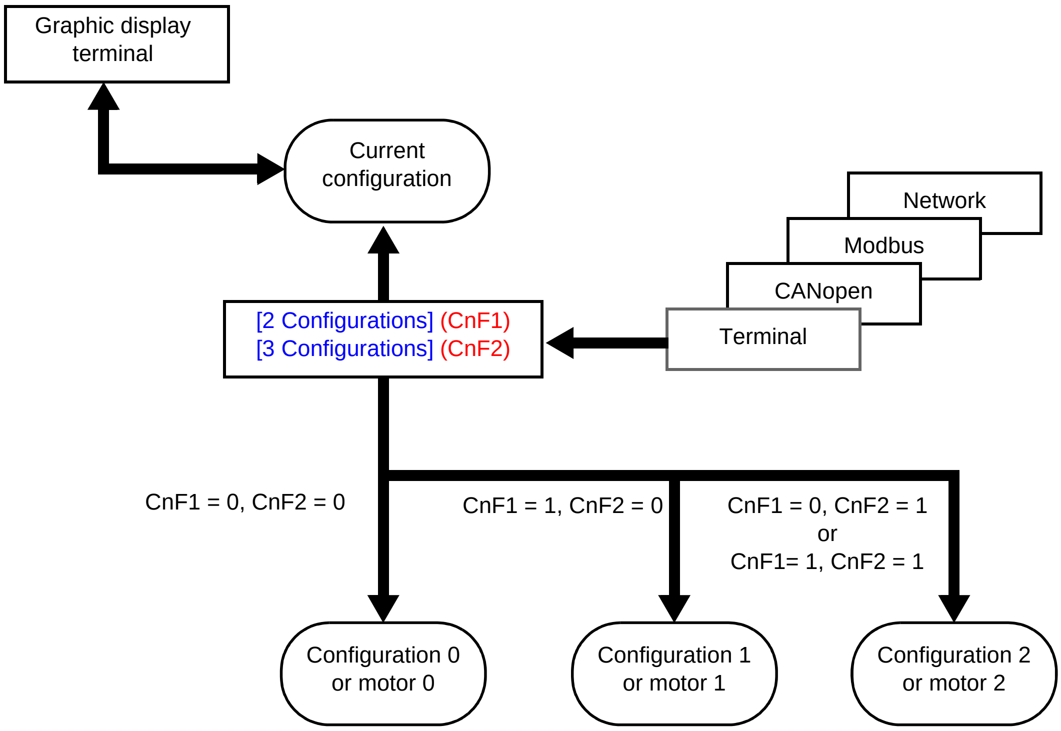
Note: No other menus or parameters can be switched.

Transfer of a drive configuration to another one, with graphic display terminal, when the drive uses [MULTIMOTORS/CONFIG.] function

Let A be the source drive and B the drive addressed. In this example, switching are controled by logic input.

1. Connect graphic display terminal to the drive A.
2. Put logic input LI ([2 Configurations] (CnF1)) and LI ([3 Configurations] (CnF2)) to 0.
3. Download configuration 0 in a file of graphic display terminal (example : file 1 of the graphic display terminal).
4. Put logic input LI ([2 Configurations] (CnF1)) to 1 and leave logic input LI ([3 Configurations] (CnF2)) to 0.
5. Download configuration 1 in a file of graphic display terminal (example : file 2 of the graphic display terminal).
6. Put logic input LI ([3 Configurations] (CnF2)) to 1 and leave logic input LI ([2 Configurations] (CnF1)) to 1.
7. Download configuration 2 in a file of graphic display terminal (example : file 3 of the graphic display terminal).
8. Connect graphic display terminal to the drive B.
9. Put logic input LI ([2 Configurations] (CnF1)) and LI ([3 Configurations] (CnF2)) to 0.
10. Make a factory setting of the drive B.
11. Download the configuration file 0 in the drive (file 1 of graphic display terminal in this example).
12. Put logic input LI ([2 Configurations] (CnF1)) to 1 and leave logic input LI ([3 Configurations] (CnF2)) to 0.
13. Download the configuration file 1 in the drive (file 2 of graphic display terminal in this example).
14. Put logic input LI ([3 Configurations] (CnF2)) to 1 and leave logic input LI ([2 Configurations] (CnF1)) to 1.
15. Download the configuration file 2 in the drive (file 3 of graphic display terminal in this example).

Nota: Steps 6, 7, 14 et 15 are necessary only if [MULTIMOTORS/CONFIG.] function is used with 3 configurations or 3 motors.

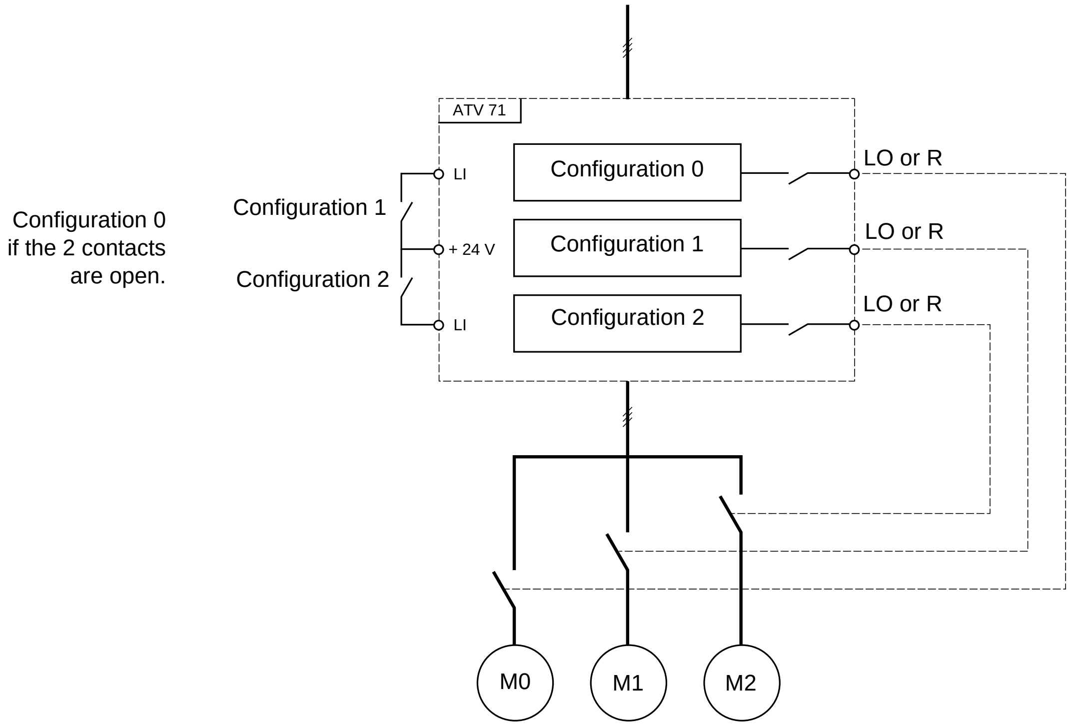


Switching command

Depending on the number of motors or selected configuration (2 or 3), the switching command is sent using one or two logic inputs. The table below lists the possible combinations.

LI 2 motors or configurations	LI 3 motors or configurations	Number of configuration or active motor
0	0	0
1	0	1
0	1	2
1	1	2

Schematic diagram for multimotor mode



Auto-tuning in multimotor mode

This auto-tuning can be performed:
- Manually using a logic input when the motor changes
- Automatically each time the motor is activated for the 1st time after switching on the drive, if the [Automatic autotune] (AUt) parameter on page 66 = [Yes] (YES).

Motor thermal states in multimotor mode:

The drive protects the three motors individually. Each thermal state takes into account all stop times, including drive shutdowns.
It is therefore not necessary to perform auto-tuning every time the power is switched on. It is sufficient to auto-tune each motor at least once.

Configuration information output

In the [1.5 INPUTS / OUTPUTS CFG] (I-O-) menu, a logic output can be assigned to each configuration or motor (2 or 3) for remote information transmission.

☞ **Note:** As the [1.5 INPUTS / OUTPUTS CFG] (I-O-) menu is switched, these outputs must be assigned in all configurations in which information is required.

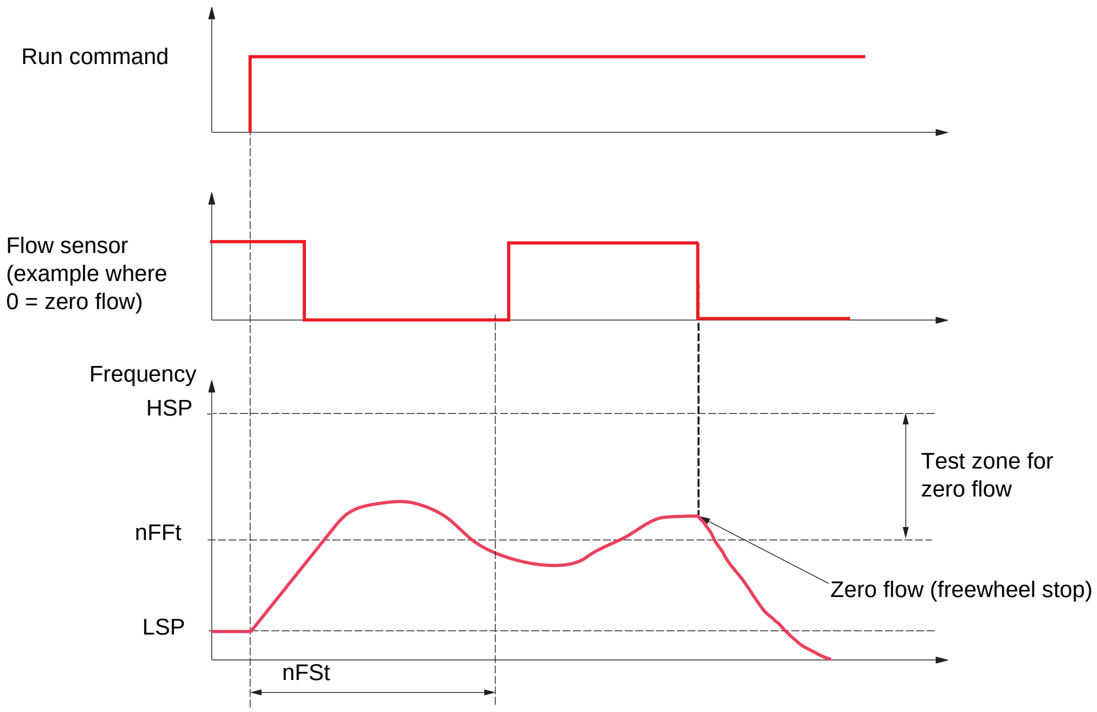
Code	Name/Description	Adjustment range	Factory setting
MMC-	■ **[MULTIMOTORS/CONFIG.]**		
CHM nO YES	❑ **[Multimotors]** ☐ **[No]** (nO): Multiconfiguration possible ☐ **[Yes]** (YES): Multimotor possible		[No] (nO)
CnF1 nO LI1 - - C111 - - -	❑ **[2 Configurations]** ☐ **[No]** (nO): No switching. ☐ **[LI1]** (LI1) to **[LI6]** (LI6) ☐ **[LI7]** (LI7) to **[LI10]** (LI10): If VW3A3201 logic I/O card has been inserted ☐ **[LI11]** (LI11) to **[LI14]** (LI14): If VW3A3202 extended I/O card has been inserted ☐ **[C111]** (C111) to **[C115]** (C115): With integrated Modbus ☐ **[C211]** (C211) to **[C215]** (C215): With integrated CANopen ☐ **[C311]** (C311) to **[C315]** (C315): With a communication card ☐ **[C411]** (C411) to **[C415]** (C415): With a Controller Inside card Switching of 2 motors or 2 configurations		[No] (nO)
CnF2 nO LI1 - - C111 - - -	❑ **[3 Configurations]** ☐ **[No]** (nO): No switching ☐ **[LI1]** (LI1) to **[LI6]** (LI6) ☐ **[LI7]** (LI7) to **[LI10]** (LI10): If VW3A3201 logic I/O card has been inserted ☐ **[LI11]** (LI11) to **[LI14]** (LI14): If VW3A3202 extended I/O card has been inserted ☐ **[C111]** (C111) to **[C115]** (C115): With integrated Modbus ☐ **[C211]** (C211) to **[C215]** (C215): With integrated CANopen ☐ **[C311]** (C311) to **[C315]** (C315): With a communication card ☐ **[C411]** (C411) to **[C415]** (C415): With a Controller Inside card Switching of 3 motors or 3 configurations **Note:** In order to obtain 3 motors or 3 configurations, [2 Configurations] (CnF1) must also be configured.		[No] (nO)
tnL-	■ **[AUTO TUNING BY LI]**		
tUL nO LI1 - - -	❑ **[Auto-tune assign.]** ☐ **[No]** (nO): Not assigned ☐ **[LI1]** (LI1) : : ☐ **[...]** (...): See the assignment conditions on page 116. Auto-tuning is performed when the assigned input or bit changes to 1. **Note:** Auto-tuning causes the motor to start up.		[No] (nO)

Zero fluid or zero flow detection via sensor

In the case of a pump, for example, this function can be used to avoid operation when there is no fluid or if the conduits are blocked. Although this function is independent of the "[1.7 APPLICATION FUNCT.] (FUn-)" function on page 160, the two can be used in tandem.

The function uses a fluid sensor assigned to a logic input or a bit, which can be configured for positive or negative logic by [Conf.sensor flow] (LnS).
The fault is triggered if the frequency exceeds an adjustable threshold [Freq.Th.Sensor. Act.] (nFFt) and the input or bit assigned to the sensor changes to 0 or 1 depending on its configuration.
The fault is ignored on startup for an adjustably time delay [Flow Times Ctrl] (nFSt) in order to avoid untimely triggering due to a transient state.

This fault triggers a freewheel stop.



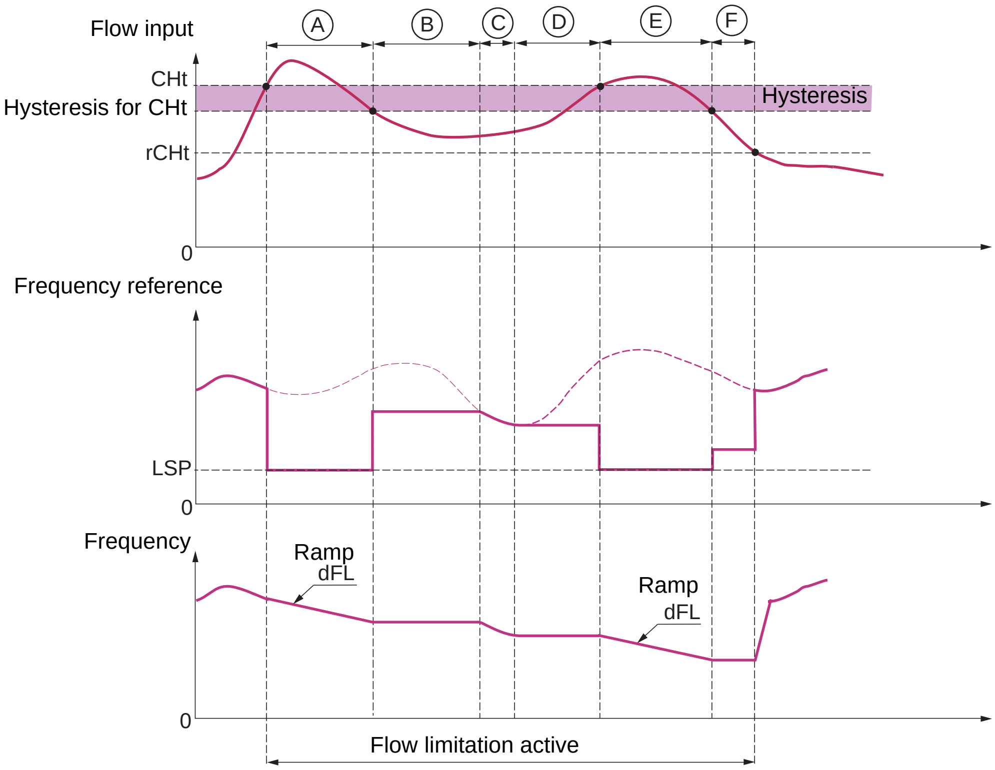
Code	Name/Description	Adjustment range	Factory setting
nFS-	■ **[NO FLOW DETECTION]**		
nFS nO LI1 - - C101 - - - Cd00 -	❑ **[No Flow Sensor]** Assignment of the zero fluid sensor. ☐ **[No]** (nO): Function inactive ☐ **[LI1]** (LI1) to **[LI6]** (LI6) ☐ **[LI7]** (LI7) to **[LI10]** (LI10): If VW3A3201 logic I/O card has been inserted ☐ **[LI11]** (LI11) to **[LI14]** (LI14): If VW3A3202 extended I/O card has been inserted ☐ **[C101]** (C101) to **[C115]** (C115): With integrated Modbus in [I/O profile] (IO) ☐ **[C201]** (C201) to **[C215]** (C215): With integrated CANopen in [I/O profile] (IO) ☐ **[C301]** (C301) to **[C315]** (C315): With a communication card in [I/O profile] (IO) ☐ **[C401]** (C401) to **[C415]** (C415): With a Controller Inside card in [I/O profile] (IO) ☐ **[CD00]** (Cd00) to **[CD13]** (Cd13): In [I/O profile] (IO) can be switched with possible logic inputs ☐ **[CD14]** (Cd14) to **[CD15]** (Cd15): In [I/O profile] (IO) can be switched without logic inputs		[No] (nO)
LnS LO HIG	❑ **[Conf.sensor flow]** This parameter can be accessed if zero flow detection has been assigned to a logic input or a bit. It defines the positive or negative logic of the input or bit assigned to this detection. ☐ **[Active low]** (LO): Detection on falling edge (change from 1 to 0) of the assigned input or bit. ☐ **[Active high]** (HIG): Detection on rising edge (change from 0 to 1) of the assigned input or bit.		[Active low] (LO)
nFFt	❑ **[Freq.Th.Sensor. Act.]** (1) Zero fluid detection activation threshold The parameter can be accessed if [No Flow Sensor] (nFS) is not [No] (nO).	0 to 500 or 1,000 Hz according to rating	0 Hz
nFSt	❑ **[Flow Times Ctrl]** (1) Zero fluid detection activation time delay The parameter can be accessed if [No Flow Sensor] (nFS) is not [No] (nO).	0 to 999 s	10 s

(1) The parameter can also be accessed in the [1.3 SETTINGS] (SEt-) menu.

Parameter that can be modified during operation or when stopped.

Flow limitation

This function can be used to limit the flow of a fluid, in the case of a pump, for example.
The function uses a flow sensor assigned to an analog input, the "pulse in" input or the encoder input. It limits the frequency reference. In the case of regulation with PID, it affects the PID regulator output reference.



- **Before A** – The signal on the input assigned to the flow measurement has not reached the activation threshold [Flow.Lim.Th.Active] (CHt): Flow limitation is not activated and the input reference is applied.
- **A –** The signal on the input assigned to the flow measurement has reached the threshold [Flow.Lim.Th.Active] (CHt): Flow limitation is activated, the reference is limited to [Low speed] (LSP) and the frequency decelerates along the ramp [Dec. Flow. limit] (dFL).
- **B** – The signal on the input assigned to the flow measurement has fallen below the hysteresis of the threshold [Flow.Lim.Th.Active] (CHt): The current frequency is copied and applied as the reference.
- **C** – The input reference has fallen below the reference **B** and is continuing to fall: It is applied.
- **D** – The input reference starts to rise again: The current frequency is copied and applied as the reference.
- **E** – The signal on the input assigned to the flow measurement has reached the threshold [Flow.Lim.Th.Active] (CHt): The reference is limited to [Low speed] (LSP) and the frequency decelerates along the ramp [Dec. Flow. limit] (dFL).
- **F** – The signal on the input assigned to the flow measurement has fallen below the hysteresis of the threshold [Flow.Lim.Th.Active] (CHt): The current frequency is copied and applied as the reference.
- **After F** – The signal on the input assigned to the flow measurement has fallen below the deactivation threshold [Flo.Lim.Thres. Inact.] (rCHt): Flow limitation is no longer active and the input reference is applied.

Code	Name/Description	Adjustment range	Factory setting
FLL-	**[FLOW LIMITATION]**		
CHI	**[Flow.Sen.Inf]**		[No] (nO)
nO	[No] (nO): Not assigned (function inactive)		
AI1	[AI1] (AI1)		
-	to		
AI4	[AI4] (AI4): Analog input, if VW3A3202 I/O card has been inserted		
PI	[RP] (PI): Frequency input, if VW3A3202 I/O card has been inserted		
PG	[Encoder] (PG): Encoder input, if encoder card has been inserted		
CHt	**[Flow.Lim.Th.Active]** (1)	0 to 100%	0%
	The parameter can be accessed if [Flow.Sen.Inf] (CHI) is not [No] (nO). Function activation threshold, as a % of the max. signal of the assigned input		
rCHt	**[Flo.Lim.Thres. Inact.]** (1)	0 to 100%	0%
	The parameter can be accessed if [Flow.Sen.Inf] (CHI) is not [No] (nO). Function deactivation threshold, as a % of the max. signal of the assigned input		
dFL	**[Dec. Flow. limit]** (1)	0.01 to 9,000 s (2)	5.0 s
	The parameter can be accessed if [Flow.Sen.Inf] (CHI) is not [No] (nO). Time to decelerate from the [Rated motor freq.] (FrS) to 0. Make sure that this value is compatible with the inertia being driven.		

(1) The parameter can also be accessed in the [1.3 SETTINGS] (SEt-) menu.
(2) Range 0.01 to 99.99 s or 0.1 to 999.9 s or 1 to 9,000 s according to [Ramp increment] (Inr) page 129.

Parameter that can be modified during operation or when stopped.

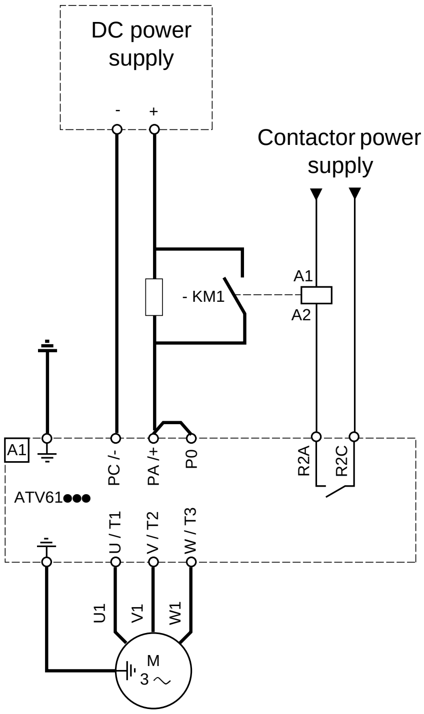
Direct power supply via DC bus

This function is only accessible for ATV61H●●●M3 ⩾ 18.5 kW, ATV61H●●●N4 ⩾ 18.5 kW, ATV61W●●●N4 ⩾ 22 kW drives and all ratings of ATV61H●●●Y drives.

Direct power supply via the DC bus requires a protected direct current source with adequate power and voltage as well as a suitably dimensioned resistor and capacitor precharging contactor. Consult Schneider Electric for information about dimensioning these components.

The "direct power supply via DC bus" function can be used to control the precharging contactor via a relay or a logic input on the drive.

Example circuit using R2 relay:



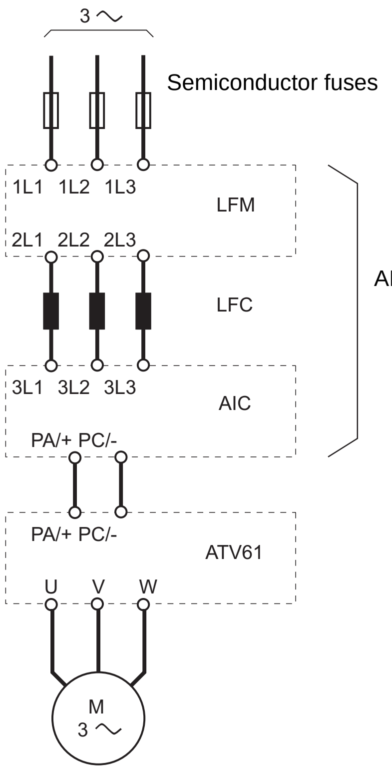
Code	Name/Description	Adjustment range	Factory setting
dCO-	■ **[DC BUS SUPPLY]** This function is only accessible for ATV61H●●●M3 ⩾ 18.5 kW, ATV61H●●●N4 ⩾ 18.5 kW, ATV61W●●●N4 ⩾ 22 kW drives and all ratings of ATV61H●●●Y drives.		
dCO	❑ **[Precharge cont. ass.]** Logic output or control relay		[No] (nO)
nO	☐ **[No]** (nO): Function not assigned.		
LO1 - LO4	☐ **[LO1]** (LO1) to **[LO4]** (LO4): Logic output (if one or two I/O cards have been inserted, LO1 to LO2 or LO4 can be selected).		
r2 - r4	☐ **[R2]** (r2) to **[R4]** (r4): Relay (selection of R2 extended to R3 or R4 if one or two I/O cards have been inserted).		
dO1	☐ **[dO1]** (dO1): Analog output AO1 functioning as a logic output. Selection can be made if [AO1 assignment] (AO1) page 103 = [No] (nO).		

Active Front End connection

This function is not accessible for ATV61H●●●S6X ⩾ and for ATV61H●●●Y ⩾ 110 kW (150 HP). (HHP range)

Direct power supply via Active Front End (AFE) reduces the mains current harmonics to less than 4% and gives enables the drive to feedback the generative energy to the mains supply.

Example circuit using one AFE for one ATV61



AFE (Active Front End)

- LFM (Line Filter Module)
- LFC (Line Filter Choke)
- AIC (Active Infeed Converter)

Code	Name/Description	Adjustment range	Factory setting
O1r-	■ **[REGEN CONNECTION]**		
AFE	❑ **[Regen. Connection]**		[No] (nO)
nO	☐ **[No]** (nO): Not assigned		
YES	☐ **[Yes]** (YES): Function always active		
LI1	☐ **[LI1]** (LI1) to **[LI6]** (LI6)		
-	☐ **[LI7]** (LI7) to **[LI10]** (LI10): If VW3A3201 logic I/O card has been inserted		
-	☐ **[LI11]** (LI11) to **[LI14]** (LI14): If VW3A3202 extended I/O card has been inserted		
C101	☐ **[C101]** (C101) to **[C115]** (C115): With integrated Modbus in [I/O profile] (IO)		
-	☐ **[C201]** (C201) to **[C215]** (C215): With integrated CANopen in [I/O profile] (IO)		
-	☐ **[C301]** (C301) to **[C315]** (C315): With a communication card in [I/O profile] (IO)		
-	☐ **[C401]** (C401) to **[C415]** (C415): With a Controller Inside card in [I/O profile] (IO)		
Cd00	☐ **[CD00]** (Cd00) to **[CD13]** (Cd15): In [I/O profile] (IO) it can be switched with possible logic inputs		
-	☐ **[CD14]** (Cd14) to **[CD15]** (Cd15): In [I/O profile] (IO) it can be switched without logic inputs		
	If [Profile] (CHCF) = [8 serie] (SE8), then only [Yes] (YES) and [LIx] (LIx) are available		

⚠ CAUTION

DAMAGED EQUIPMENT

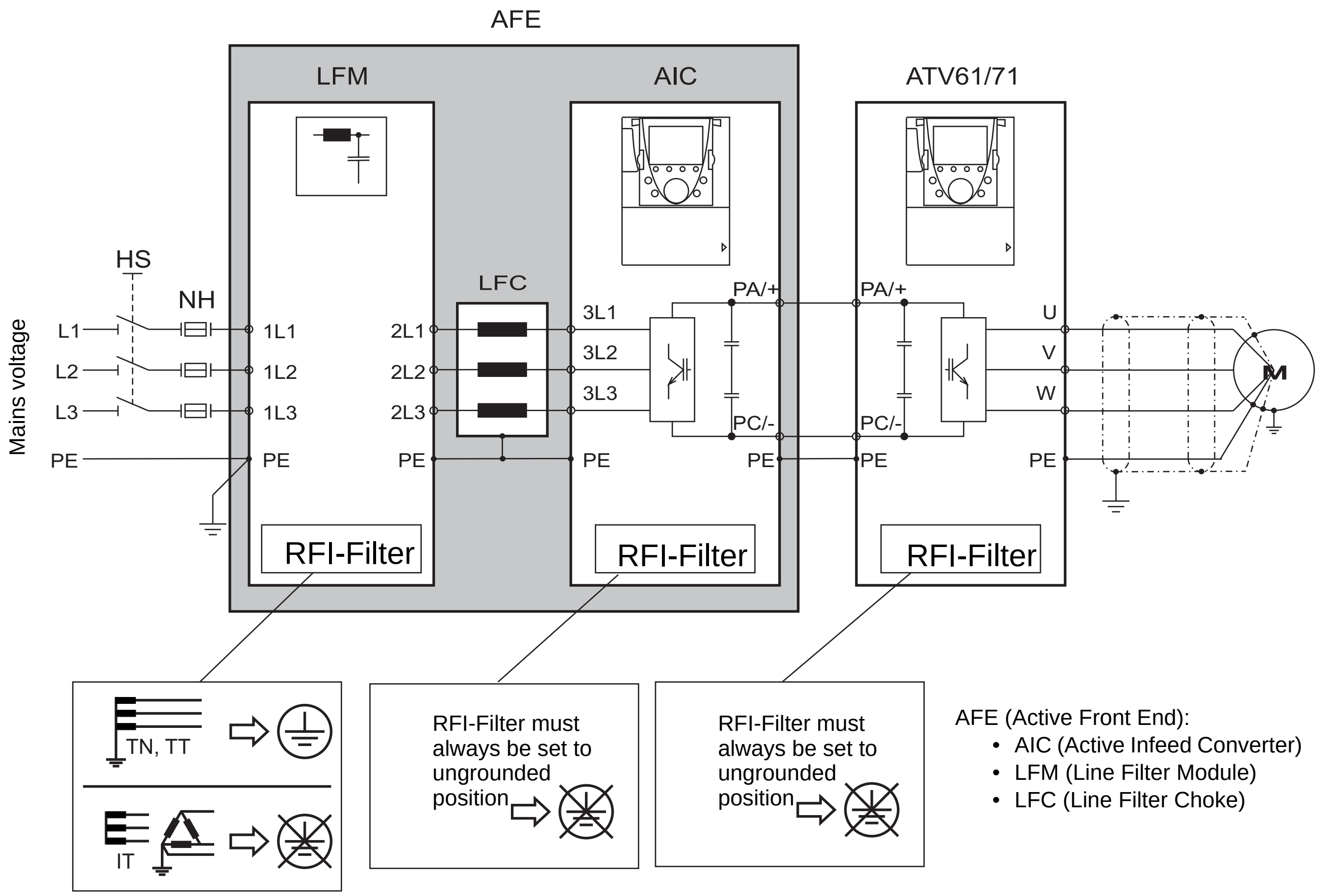
It is absolutely necessary to carry out further parameter setting on all ATV61 drive connnected to Active Front End (AFE). Check the list of parameter on next page.

Failure to follow this instruction can result in equipment damage.

Active Front End connection

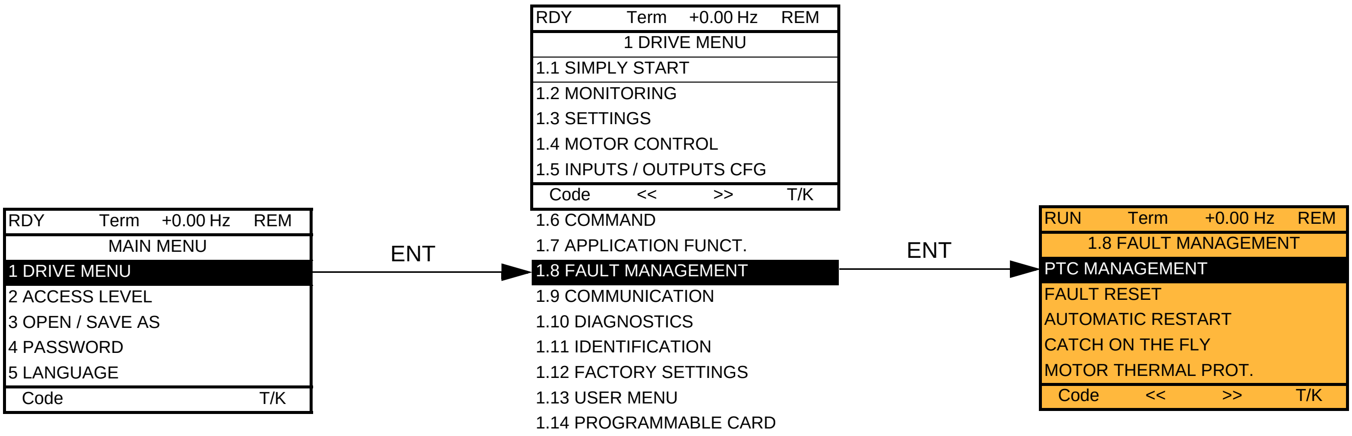
It is necessary to carry out the following settings for all frequency inverters connected to an active front end:

- Parameter [Mains voltage] (UrES) : Same setting as the active front end (Thereby the internal voltage levels of the frequency inverter are adapted).
- Parameter [Input phase loss] (IPL) has to be set to [Ignore] (nO).
- Parameter for operation with active front end [Regen. Connection] (AFE) has to be set to [Yes] (YES) (Thereby the undervoltage level of the frequency inverter is adapted to the operation with the active front end).
- Parameter [Dec ramp adapt.] (brA) is set to [nO] to inactivate this function.
- Parameter [Brake res. fault Mgt] (bUb) has to be set to [ignore] (nO) (for HHP range only).
- Parameter [Deceleration] (dEC) has to be increased for applications with high inertia to avoid overload of Active Front End. This can be prevented also by rounding the deceleration ramp with parameter [Begin Dec round] (tA3).
- Parameter [2 wire type] (tCt) has to be set on [Level] (LEL) to ensure an automatic restart after undervoltage detection of the Active Front End. An automatic restart is only possible on 2 wire control.
- The integrated RFI filter has to be always deactivated (position IT, non-grounded mains) for all ATV 61 inverter and also for the Active Infeed Converter (AIC) because there exists no direct mains connection.

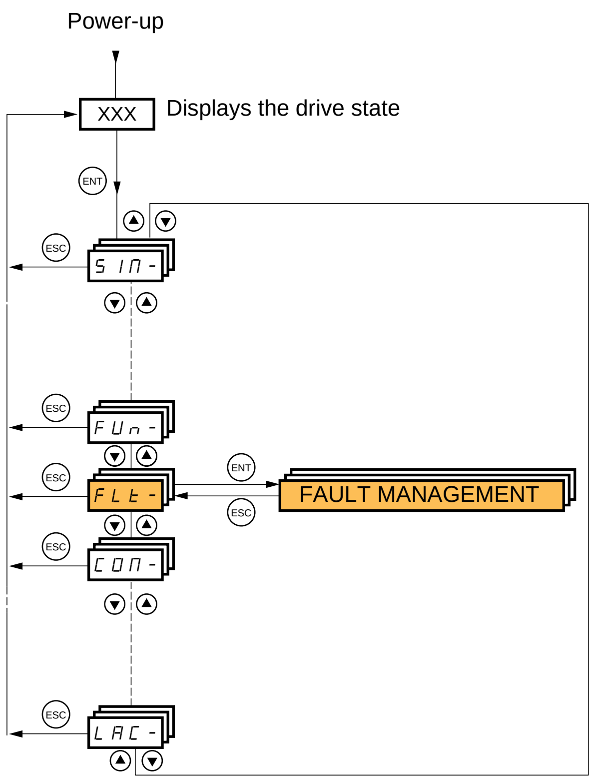


AFE (Active Front End):
- AIC (Active Infeed Converter)
- LFM (Line Filter Module)
- LFC (Line Filter Choke)

With graphic display terminal:



With integrated display terminal:



Summary of functions:

Code	Name	Page
PtC-	[PTC MANAGEMENT]	189
rSt-	[FAULT RESET]	190
Atr-	[AUTOMATIC RESTART]	191
FLr-	[CATCH ON THE FLY]	192
tHt-	[MOTOR THERMAL PROT.]	194
OPL-	[OUTPUT PHASE LOSS]	194
IPL-	[INPUT PHASE LOSS]	195
OHL-	[DRIVE OVERHEAT]	195
SAt-	[THERMAL ALARM STOP]	196
EtF-	[EXTERNAL FAULT]	197
USb-	[UNDERVOLTAGE MGT]	198
tIt-	[IGBT TESTS]	199
LFL-	[4-20mA LOSS]	200
InH-	[FAULT INHIBITION]	201
CLL-	[COM. FAULT MANAGEMENT]	202
tId-	[TORQUE OR I LIM. DETECT.]	203
FqF-	[FREQUENCY METER]	205
brP-	[DB RES. PROTECTION]	206
bUF-	[BU PROTECTION]	206
tnF-	[AUTO TUNING FAULT]	206
PPI-	[CARDS PAIRING]	207
ULd-	[PROCESS UNDERLOAD]	209
OLd-	[PROCESS OVERLOAD]	210
FdL-	[DAMPER FAULT MGT.]	211
LFF-	[FALLBACK SPEED]	212
FSt-	[RAMP DIVIDER]	212
dCI-	[DC INJECTION]	212

The parameters in the [1.8 FAULT MANAGEMENT] (FLt-) menu can only be modified when the drive is stopped and there is no run command, except for parameters with a symbol in the code column, which can be modified with the drive running or stopped.

PTC probes

3 sets of PTC probes can be managed by the drive in order to protect the motors:

- 1 on logic input LI6 converted for this use by switch "**SW2**" on the control card.
- 1 on each of the 2 option cards VW3A3201 and VW3A3202.

Each of these sets of PTC probes is monitored for the following faults:

- Motor overheating
- Sensor break fault
- Sensor short-circuit fault

Protection via PTC probes does not disable protection via I^2t calculation performed by the drive (the two types of protection can be combined).

Code	Name/Description	Adjustment range	Factory setting
PtC-	**[PTC MANAGEMENT]**		
PtCL	**[LI6 = PTC probe]**		[No] (nO)
	Can be accessed if switch **SW2** on the control card is set to PTC.		
nO	[No] (nO): Not used		
AS	[Always] (AS): "PTC probe" faults are monitored permanently, even if the power supply is not connected (as long as the control remains connected to the power supply).		
rdS	[Power ON] (rdS): "PTC probe" faults are monitored while the drive power supply is connected.		
rS	[Motor ON] (rS): "PTC probe" faults are monitored while the motor power supply is connected.		
PtC1	**[PTC1 probe]**		[No] (nO)
	Can be accessed if a VW3A3201 option card has been inserted.		
nO	[No] (nO): Not used		
AS	[Always] (AS): "PTC probe" faults are monitored permanently, even if the power supply is not connected (as long as the control remains connected to the power supply).		
rdS	[Power ON] (rdS): "PTC probe" faults are monitored while the drive power supply is connected.		
rS	[Motor ON] (rS): "PTC probe" faults are monitored while the motor power supply is connected.		
PtC2	**[PTC2 probe]**		[No] (nO)
	Can be accessed if a VW3A3202 option card has been inserted.		
nO	[No] (nO): Not used		
AS	[Always] (AS): "PTC probe" faults are monitored permanently, even if the power supply is not connected (as long as the control remains connected to the power supply).		
rdS	[Power ON] (rdS): "PTC probe" faults are monitored while the drive power supply is connected.		
rS	[Motor ON] (rS): "PTC probe" faults are monitored while the motor power supply is connected.		

Code	Name/Description	Adjustment range	Factory setting
rSt-	**[FAULT RESET]**		
rSF	**[Fault reset]**		[LI4] (LI4)
	Manual fault reset		
nO	**[No]** (nO): Function inactive		
LI1 - -	**[LI1]** (LI1) to **[LI6]** (LI6)		
	[LI7] (LI7) to **[LI10]** (LI10): If VW3A3201 logic I/O card has been inserted		
	[LI11] (LI11) to **[LI14]** (LI14): If VW3A3202 extended I/O card has been inserted		
C101 - - -	**[C101]** (C101) to **[C115]** (C115): With integrated Modbus in [I/O profile] (IO)		
	[C201] (C201) to **[C215]** (C215): With integrated CANopen in [I/O profile] (IO)		
	[C301] (C301) to **[C315]** (C315): With a communication card in [I/O profile] (IO)		
	[C401] (C401) to **[C415]** (C415): With a Controller Inside card in [I/O profile] (IO)		
Cd00 -	**[CD00]** (Cd00) to **[CD13]** (Cd13): In [I/O profile] (IO) can be switched with possible logic inputs		
	[CD14] (Cd14) to **[CD15]** (Cd15): In [I/O profile] (IO) can be switched without logic inputs		
	Faults are reset when the assigned input or bit changes to 1, if the cause of the fault has disappeared. The STOP/RESET button on the graphic display terminal performs the same function. See pages 240 to 244 for the list of faults that can be reset manually.		
rP	**[Product reset]**		[No] (nO)
	Parameter can only be accessed in [ACCESS LEVEL] = [Expert] mode. Drive reinitialization. Can be used to reset all faults without having to disconnect the drive from the power supply.		
nO	**[No]** (nO): Function inactive		
YES	**[Yes]** (YES): Reinitialization. Press and hold down the "ENT" key for 2 s. The parameter changes back to [No] (nO) automatically as soon as the operation is complete. The drive can only be reinitialized when locked.		
	CAUTION Make sure that the cause of the fault that led to the drive locking has been removed before reinitializing. **Failure to follow this instruction can result in equipment damage.**		
rPA	**[Product reset assig.]**		[No] (nO)
	Parameter can only be modified in [ACCESS LEVEL] = [Expert] mode. Drive reinitialization via logic input. Can be used to reset all faults without having to disconnect the drive from the power supply. The drive is reinitialized on a rising edge (change from 0 to 1) of the assigned input. The drive can only be reinitialized when locked.		
nO	**[No]** (nO): Function inactive		
LI1 -	**[LI1]** (LI1) to **[LI6]** (LI6)		
	[LI7] (LI7) to **[LI10]** (LI10): If VW3A3201 logic I/O card has been inserted		
LI14	**[LI11]** (LI11) to **[LI14]** (LI14): If VW3A3202 extended I/O card has been inserted		
	To assign reinitialization, press and hold down the "ENT" key for 2 s.		
	CAUTION Make sure that the cause of the fault that led to the drive locking has been removed before reinitializing. **Failure to follow this instruction can result in equipment damage.**		

Code	Name/Description	Adjustment range	Factory setting
AtR-	■ **[AUTOMATIC RESTART]**		
Atr	❑ **[Automatic restart]**		[No] (nO)
nO YES	☐ **[No]** (nO): Function inactive ☐ **[Yes]** (YES): Automatic restart, after locking on a fault, if the fault has disappeared and the other operating conditions permit the restart. The restart is performed by a series of automatic attempts separated by increasingly longer waiting periods: 1 s, 5 s, 10 s, then 1 mn for the following attempts. The drive fault relay remains activated if this function is active. The speed reference and the operating direction must be maintained. Use 2-wire control ([2/3 wire control] (tCC) = [2 wire] (2C) and [2 wire type] (tCt) = [Level] (LEL) see page 80). **WARNING** **UNINTENDED EQUIPMENT OPERATION** **Check that an automatic restart will not endanger personnel or equipment in any way.** **Failure to follow these instructions can result in death or serious injury.** If the restart has not taken place once the configurable time tAr has elapsed, the procedure is aborted and the drive remains locked until it is turned off and then on again. The faults which permit this function are listed on page 243:		
tAr	❑ **[Max. restart time]**		[5 minutes] (5)
5 10 30 1h 2h 3h Ct	☐ **[5 minutes]** (5): 5 minutes ☐ **[10 minutes]** (10): 10 minutes ☐ **[30 minutes]** (30): 30 minutes ☐ **[1 hour]** (1h): 1 hour ☐ **[2 hours]** (2h): 2 hours ☐ **[3 hours]** (3h): 3 hours ☐ **[Unlimited]** (Ct): Unlimited Max. duration of restart attempts. This parameter appears if [Automatic restart] (Atr) = [Yes] (YES). It can be used to limit the number of consecutive restarts on a recurrent fault.		

Code	Name/Description	Adjustment range	Factory setting
FLr-	**[CATCH ON THE FLY]**		
FLr	**[Catch on the fly]** Used to enable a smooth restart if the run command is maintained after the following events: • Loss of line supply or disconnection • Reset of current fault or automatic restart • Freewheel stop The speed given by the drive resumes from the estimated speed of the motor at the time of the restart, then follows the ramp to the reference speed. This function requires 2-wire level control.		[Yes] (YES)
nO	**[No]** (nO): Function inactive		
YES	**[Yes]** (YES): Function active When the function is operational, it activates at each run command, resulting in a slight delay of the current (0.5 s max.). [Catch on the fly] (FLr) is forced to [No] (nO) if [Auto DC injection] (AdC) page 135 = [Continuous] (Ct)		
UCb ()	**[Sensitivity]** Parameter accessible at and above ATV61HD55M3X, ATV61HD90N4 and ATV61HC11Y. Adjusts the catch-on-the-fly sensitivity around the zero speed. Decrease the value if the drive is not able to perform the catch on the fly, and increase it if the drive locks on a fault as it performs the catch on the fly.	0.4 to 15%	0.6%

() Parameter that can be modified during operation or when stopped.

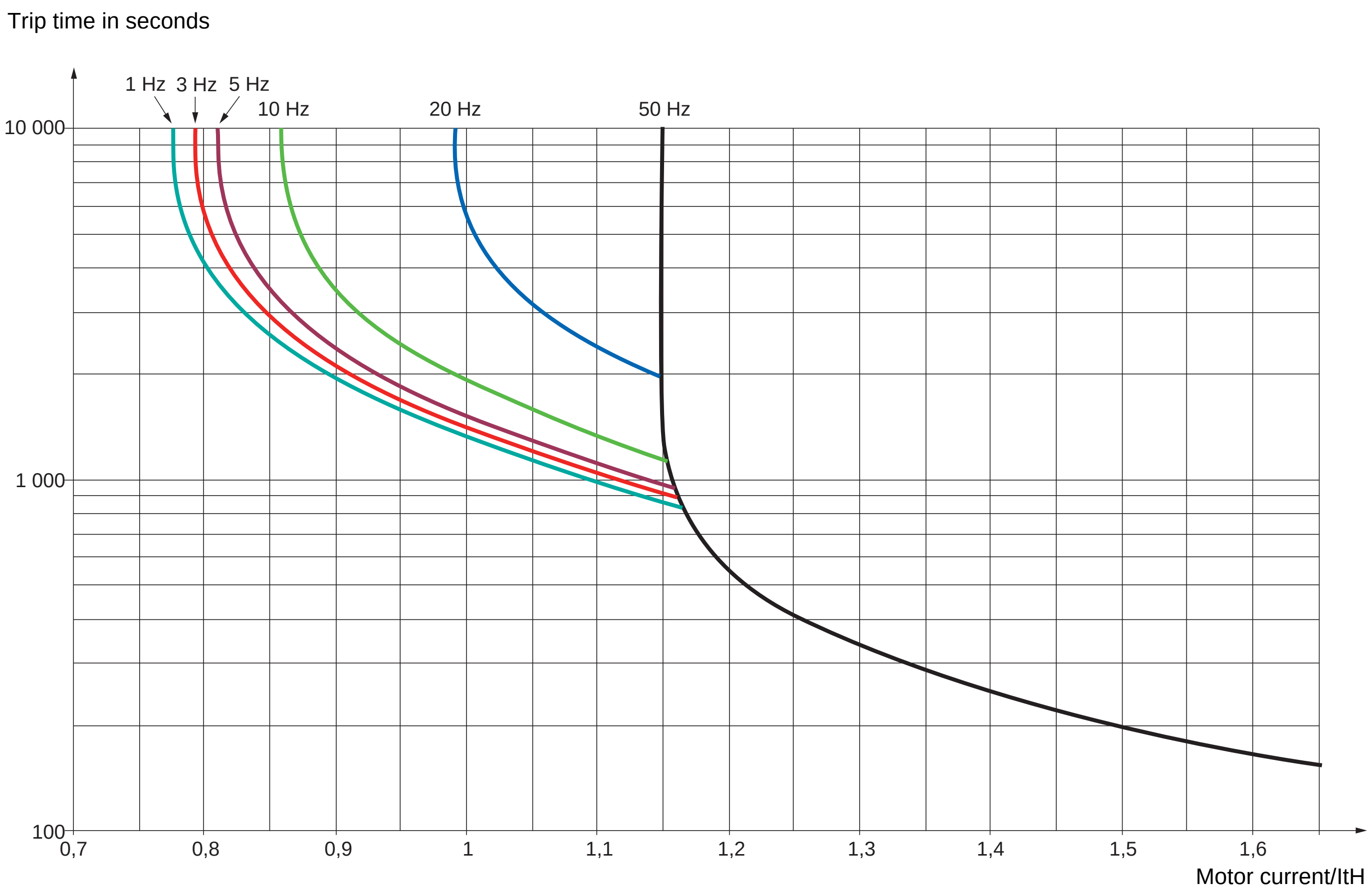
Motor thermal protection

Function:

Thermal protection by calculating the I^2t.

☞ **Note:** The memory of the motor thermal state is saved when the drive is switched off. The power-off time is used to recalculate the thermal state the next time the drive is switched on.

- Naturally-cooled motors:
  The tripping curves depend on the motor frequency.
- Force-cooled motors:
  Only the 50 Hz tripping curve needs to be considered, regardless of the motor frequency.



Code	Name/Description	Adjustment range	Factory setting
tHt-	■ **[MOTOR THERMAL PROT.]**		
tHt nO ACL FCL	❑ **[Motor protect. type]** ☐ **[No]** (nO): No protection. ☐ **[Self cooled]** (ACL): For self-cooled motors ☐ **[Force-cool]** (FCL): For force-cooled motors **Note:** A fault trip will occur when the thermal state reaches 118% of the rated state and reactivation will occur when the state falls back below 100%.		[Self cooled] (ACL)
ttd	❑ **[Motor therm. level]** (1) Trip threshold for motor thermal alarm (logic output or relay)	0 to 118%	100%
ttd2	❑ **[Motor2 therm. level]** Trip threshold for motor 2 thermal alarm (logic output or relay)	0 to 118%	100%
ttd3	❑ **[Motor3 therm. level]** Trip threshold for motor 3 thermal alarm (logic output or relay)	0 to 118%	100%
OLL nO YES Stt LFF rLS rMP FSt dCI	❑ **[Overload fault mgt]** Type of stop in the event of a motor thermal fault ☐ **[Ignore]** (nO): Fault ignored ☐ **[Freewheel]** (YES): Freewheel stop. ☐ **[Per STT]** (Stt): Stop according to configuration of [Type of stop] (Stt) page 133, without fault tripping. In this case the fault relay does not open and the drive is ready to restart as soon as the fault disappears, according to the restart conditions of the active command channel (e.g., according to [2/3 wire control] (tCC) and [2 wire type] (tCt) page 80 if control is via the terminals). Configuring an alarm for this fault is recommended (assigned to a logic output, for example) in order to indicate the cause of the stop. ☐ **[fallback spd]** (LFF): Switch to fallback speed, maintained as long as the fault is present and the run command is not disabled (2). ☐ **[Spd maint.]** (rLS): The drive maintains the speed being applied when the fault occurred, as long as the fault is present and the run command is not disabled (2). ☐ **[Ramp stop]** (rMP): Stop on ramp ☐ **[Fast stop]** (FSt): Fast stop ☐ **[DC injection]** (dCI): DC injection stop. This type of stop cannot be used with certain other functions. See table on page 122.		[Freewheel] (YES)
OPL-	■ **[OUTPUT PHASE LOSS]**		
OPL nO YES OAC	❑ **[Output Phase Loss]** ☐ **[No]** (nO): Function inactive ☐ **[Yes]** (YES): Tripping on OPF fault with freewheel stop. ☐ **[Output cut]** (OAC): No fault triggered, but management of the output voltage in order to avoid an overcurrent when the link with the motor is re-established and catch on the fly performed (even if this function has not been configured). This selection cannot be made at and above 55 kW (75 HP) for the ATV61●●●M3X and at and above 90 kW (120 HP) for the ATV61●●●N4.		[Yes] (YES)
Odt	❑ **[OutPh time detect]** Time delay for taking the [Output Phase Loss] (OPL) fault into account, or for taking management of the output voltage into account if [Output Phase Loss] (OPL) = [Ouptut cut] (OAC).	0.5 to 10 s	0.5 s

(1) The parameter can also be accessed in the [1.3 SETTINGS] (SEt-) menu.
(2) Because, in this case, the fault does not trigger a stop, it is essential to assign a relay or logic output to its indication.

Parameter that can be modified during operation or when stopped.

IPL-	**[INPUT PHASE LOSS]**
IPL	**[Input phase loss]** — According to drive rating
nO	[Ignore] (nO): Fault ignored, to be used when the drive is supplied via a single-phase supply or by the DC bus.
YES	[Freewheel] (YES): Fault, with freewheel stop. If one phase disappears, the drive switches to fault mode [Input phase loss] (IPL), but if 2 or 3 phases disappear, the drive continues to operate until it trips on an undervoltage fault.
OHL-	**[DRIVE OVERHEAT]**
OHL	**[Overtemp fault mgt]** — [Freewheel] (YES)
	CAUTION **RISK OF EQUIPMENT DAMAGE** Inhibiting faults results in the drive not being protected. This invalidates the warranty. Check that the possible consequences do not present any risk. **Failure to follow these instructions can result in equipment damage.**
	Behavior in the event of the drive overheating
nO	[Ignore] (nO): Fault ignored
YES	[Freewheel] (YES): Freewheel stop.
Stt	[Per STT] (Stt): Stop according to configuration of [Type of stop] (Stt) page 133, without fault tripping. In this case the fault relay does not open and the drive is ready to restart as soon as the fault disappears, according to the restart conditions of the active command channel (e.g., according to [2/3 wire control] (tCC) and [2 wire type] (tCt) page 80 if control is via the terminals). Configuring an alarm for this fault is recommended (assigned to a logic output, for example) in order to indicate the cause of the stop.
LFF	[fallback spd] (LFF): Switch to fallback speed, maintained as long as the fault is present and the run command is not disabled (1).
rLS	[Spd maint.] (rLS): The drive maintains the speed being applied when the fault occurred, as long as the fault is present and the run command is not disabled (1).
rMP	[Ramp stop] (rMP): Stop on ramp
FSt	[Fast stop] (FSt): Fast stop
dCI	[DC injection] (dCI): DC injection stop. This type of stop cannot be used with certain other functions. See table on page 122. **Note:** A fault trip will occur when the thermal state reaches 118% of the rated state and reactivation will occur when the state falls back below 90%.
tHA ⟳	**[Drv therm. state al]** — 0 to 118% — 100% Trip threshold for drive thermal alarm (logic output or relay).

(1) Because, in this case, the fault does not trigger a stop, it is essential to assign a relay or logic output to its indication.

⟳ Parameter that can be modified during operation or when stopped.

Deferred stop on thermal alarm

This function can be used in intermittent applications, where it is desirable to avoid any stops for which no command has been given.
It prevents untimely stopping if the drive or motor overheats, by authorizing operation until the next stop for which a command is given.
At the next stop, the drive is locked until the thermal state falls back to a value which undershoots the set threshold by 20%. Example: A trip threshold set at 80% enables reactivation at 60%.
One thermal state threshold must be defined for the drive, and one thermal state threshold for the motor(s), which will trip the deferred stop.

Code	Name/Description	Adjustment range	Factory setting
SAt-	■ [THERMAL ALARM STOP]		
SAt	❑ [Thermal alarm stop]		[No] (nO)
nO YES	☐ [No] (nO): Function inactive (in this case, the following parameters cannot be accessed) ☐ [Yes] (YES): Freewheel stop on drive or motor thermal alarm **CAUTION** **The drive and motor are no longer protected in the event of thermal alarm stops. This invalidates the warranty.** **Check that the possible consequences do not present any risk.** **Failure to follow these instructions can result in equipment damage.**		
tHA ( )	❑ [Drv therm. state al] Thermal state threshold of the drive tripping the deferred stop.	0 to 118%	100%
ttd ( )	❑ [Motor therm. level] Thermal state threshold of the motor tripping the deferred stop.	0 to 118%	100%
ttd2 ( )	❑ [Motor2 therm. level] Thermal state threshold of the motor 2 tripping the deferred stop.	0 to 118%	100%
ttd3 ( )	❑ [Motor3 therm. level] Thermal state threshold of the motor 3 tripping the deferred stop.	0 to 118%	100%

( ) Parameter that can be modified during operation or when stopped.

Code	Name/Description	Adjustment range	Factory setting
EtF-	**[EXTERNAL FAULT]**		
EtF	**[External fault ass.]**		[No] (nO)
nO LI1 - - -	☐ **[No]** (nO): Function inactive ☐ **[LI1]** (LI1) : : ☐ **[...]** (...): See the assignment conditions on page 116. If the assigned bit is at 0, there is no external fault. If the assigned bit is at 1, there is an external fault. Logic can be configured via [External fault config] (LEt) if a logic input has been assigned.		
LEt	**[External fault config]**		[Active high] (HIG)
LO HIG	Parameter can be accessed if the external fault has been assigned to a logic input. It defines the positive or negative logic of the input assigned to the fault. ☐ **[Active low]** (LO): Fault on falling edge (change from 1 to 0) of the assigned input ☐ **[Active high]** (HIG): Fault on rising edge (change from 0 to 1) of the assigned input		
EPL	**[External fault mgt]**		[Freewheel] (YES)
nO YES Stt LFF rLS rMP FSt dCI	Type of stop in the event of an external fault ☐ **[Ignore]** (nO): Fault ignored ☐ **[Freewheel]** (YES): Freewheel stop. ☐ **[Per STT]** (Stt): Stop according to configuration of [Type of stop] (Stt) page 133, without fault tripping. In this case the fault relay does not open and the drive is ready to restart as soon as the fault disappears, according to the restart conditions of the active command channel (e.g., according to [2/3 wire control] (tCC) and [2 wire type] (tCt) page 80 if control is via the terminals). Configuring an alarm for this fault is recommended (assigned to a logic output, for example) in order to indicate the cause of the stop. ☐ **[fallback spd]** (LFF): Switch to fallback speed, maintained as long as the fault is present and the run command is not disabled (1). ☐ **[Spd maint.]** (rLS): The drive maintains the speed being applied when the fault occurred, as long as the fault is present and the run command is not disabled (1). ☐ **[Ramp stop]** (rMP): Stop on ramp ☐ **[Fast stop]** (FSt): Fast stop ☐ **[DC injection]** (dCI): DC injection stop. This type of stop cannot be used with certain other functions. See table on page 122.		

(1) Because, in this case, the fault does not trigger a stop, it is essential to assign a relay or logic output to its indication.

Code	Name/Description	Adjustment range	Factory setting
USb-	■ [UNDERVOLTAGE MGT]		
USb	❑ [UnderV. fault mgt] Behavior of the drive in the event of an undervoltage		[Flt&R1open] (0)
0	☐ [Flt&R1open] (0): Fault and fault relay open.		
1	☐ [Flt&R1close] (1): Fault and fault relay closed.		
2	☐ [Alarm] (2): Alarm and fault relay remains closed. The alarm may be assigned to a logic output or a relay.		
UrES	❑ [Mains voltage] Rated voltage of the line supply in V. For ATV61●●●M3:	According to drive voltage rating	According to drive voltage rating
200	☐ [200Vac] (200): 200 Volts AC		
220	☐ [220Vac] (220): 220 Volts AC		
240	☐ [240Vac] (240): 240 Volts AC		
260	☐ [260Vac] (260): 260 Volts AC (factory setting) For ATV61●●●N4:		
380	☐ [380Vac] (380): 380 Volts AC		
400	☐ [400Vac] (400): 400 Volts AC		
440	☐ [440Vac] (440): 440 Volts AC		
460	☐ [460Vac] (460): 460 Volts AC		
480	☐ [480Vac] (480): 480 Volts AC (factory setting) For ATV61●●●S6X:		
500	☐ [500 Vac] (500): 500 Volts AC		
600	☐ [600 Vac] (600): 600 Volts AC (factory setting) For ATV61●●●Y:		
500	☐ [500 Vac] (500): 500 Volts AC		
600	☐ [600 Vac] (600): 600 Volts AC		
690	☐ [690 Vac] (690): 690 Volts AC (factory setting)		
USL	❑ [Undervoltage level] Undervoltage fault trip level setting in V. The adjustment range and factory setting are determined by the drive voltage rating and the [Mains voltage] (UrES) value.		
USt	❑ [Undervolt. time out] Time delay for taking undervoltage fault into account	0.2 s to 999.9 s	0.2 s
StP	❑ [UnderV. prevention] Behavior in the event of the undervoltage fault prevention level being reached		[No] (nO)
nO	☐ [No] (nO): No action		
MMS	☐ [DC Maintain] (MMS): This stop mode uses the inertia to maintain the DC bus voltage as long as possible.		
rMP	☐ [Ramp stop] (rMP): Stop following an adjustable ramp [Max stop time] (StM).		
LnF	☐ [Lock-out] (LnF): Lock (freewheel stop) without fault		

Parameter that can be modified during operation or when stopped.

Code	Name/Description	Adjustment range	Factory setting
USb-	■ **[UNDERVOLTAGE MGT]**		
tSM	❑ **[UnderV. restart tm]** Time delay before authorizing the restart after a complete stop for [UnderV. prevention] (StP) = [Ramp stop] (rMP), if the voltage has returned to normal.	1.0 s to 999.9 s	1.0 s
UPL	❑ **[Prevention level]** Undervoltage fault prevention level setting in V, which can be accessed if [UnderV. prevention] (StP) is not [No] (nO). The adjustment range and factory setting are determined by the drive voltage rating and the [Mains voltage] (UrES) value.		
StM	❑ **[Max stop time]** Ramp time if [UnderV. prevention] (StP) = [Ramp stop] (rMP).	0.01 to 60.00 s	1.00 s
tbS	❑ **[DC bus maintain tm]** DC bus maintain time if [UnderV. prevention] (StP) = [DC Maintain] (MMS).	1 to 9,999 s	9,999 s
tIt-	■ **[IGBT TESTS]**		
Strt nO YES	❑ **[IGBT test]** ☐ **[No]** (nO): No test ☐ **[Yes]** (YES): The IGBTs are tested on power up and every time a run command is sent. These tests cause a slight delay (a few ms). In the event of a fault, the drive will lock. The following faults can be detected: - Drive output short-circuit (terminals U-V-W): SCF display - IGBT faulty: xtF, where x indicates the number of the IGBT concerned - IGBT short-circuited: x2F, where x indicates the number of the IGBT concerned		[No] (nO)

Parameter that can be modified during operation or when stopped.

Code	Name/Description	Adjustment range	Factory setting
LFL-	■ **[4-20mA LOSS]**		
LFL2	❑ **[AI2 4-20mA loss]**		[Ignore] (nO)
nO	☐ **[Ignore]** (nO): Fault ignored. This configuration is the only one possible if [AI2 min. value] (CrL2) page 86 is not greater than 3 mA or if [AI2 Type] (AI2t) page 86 = [Voltage] (10U).		
YES	☐ **[Freewheel]** (YES): Freewheel stop.		
Stt	☐ **[Per STT]** (Stt): Stop according to configuration of [Type of stop] (Stt) page 133, without fault tripping. In this case the fault relay does not open and the drive is ready to restart as soon as the fault disappears, according to the restart conditions of the active command channel (e.g., according to [2/3 wire control] (tCC) and [2 wire type] (tCt) page 80 if control is via the terminals). Configuring an alarm for this fault is recommended (assigned to a logic output, for example) in order to indicate the cause of the stop.		
LFF	☐ **[fallback spd]** (LFF): Switch to fallback speed, maintained as long as the fault is present and the run command is not disabled (1).		
rLS	☐ **[Spd maint.]** (rLS): The drive maintains the speed being applied when the fault occurred, as long as the fault is present and the run command is not disabled (1).		
rMP	☐ **[Ramp stop]** (rMP): Stop on ramp		
FSt	☐ **[Fast stop]** (FSt): Fast stop		
dCI	☐ **[DC injection]** (dCI): DC injection stop. This type of stop cannot be used with certain other functions. See table on page 122.		
LFL3	❑ **[AI3 4-20mA loss]** Can be accessed if a VW3A3202 option card has been inserted.		[Ignore] (nO)
nO	☐ **[Ignore]** (nO): Fault ignored. This configuration is the only one possible if [AI3 min. value] (CrL3) page 87 is not greater than 3 mA.		
YES	☐ **[Freewheel]** (YES): Freewheel stop.		
Stt	☐ **[Per STT]** (Stt): Stop according to configuration of [Type of stop] (Stt) page 133, without fault tripping. In this case the fault relay does not open and the drive is ready to restart as soon as the fault disappears, according to the restart conditions of the active command channel (e.g., according to [2/3 wire control] (tCC) and [2 wire type] (tCt) page 80 if control is via the terminals). Configuring an alarm for this fault is recommended (assigned to a logic output, for example) in order to indicate the cause of the stop.		
LFF	☐ **[fallback spd]** (LFF): Switch to fallback speed, maintained as long as the fault is present and the run command is not disabled (1).		
rLS	☐ **[Spd maint.]** (rLS): The drive maintains the speed being applied when the fault occurred, as long as the fault is present and the run command is not disabled (1).		
rMP	☐ **[Ramp stop]** (rMP): Stop on ramp		
FSt	☐ **[Fast stop]** (FSt): Fast stop		
dCI	☐ **[DC injection]** (dCI): DC injection stop. This type of stop cannot be used with certain other functions. See table on page 122.		
LFL4	❑ **[AI4 4-20mA loss]** Can be accessed if a VW3A3202 option card has been inserted.		[Ignore] (nO)
nO	☐ **[Ignore]** (nO): Fault ignored. This configuration is the only one possible if [AI4 min. value] (CrL4) page 88 is not greater than 3 mA or if [AI4 Type] (AI4t) page 88 = [Voltage] (10U).		
YES	☐ **[Freewheel]** (YES): Freewheel stop.		
Stt	☐ **[Per STT]** (Stt): Stop according to configuration of [Type of stop] (Stt) page 133, without fault tripping. In this case the fault relay does not open and the drive is ready to restart as soon as the fault disappears, according to the restart conditions of the active command channel (e.g., according to [2/3 wire control] (tCC) and [2 wire type] (tCt) page 80 if control is via the terminals). Configuring an alarm for this fault is recommended (assigned to a logic output, for example) in order to indicate the cause of the stop.		
LFF	☐ **[fallback spd]** (LFF): Switch to fallback speed, maintained as long as the fault is present and the run command is not disabled (1).		
rLS	☐ **[Spd maint.]** (rLS): The drive maintains the speed being applied when the fault occurred, as long as the fault is present and the run command is not disabled (1).		
rMP	☐ **[Ramp stop]** (rMP): Stop on ramp		
FSt	☐ **[Fast stop]** (FSt): Fast stop		
dCI	☐ **[DC injection]** (dCI): DC injection stop. This type of stop cannot be used with certain other functions. See table on page 122.		

(1) Because, in this case, the fault does not trigger a stop, it is essential to assign a relay or logic output to its indication.

Parameter can be accessed in [Expert] mode.

<table>
<tr><th>Code</th><th>Name/Description</th><th>Adjustment range</th><th>Factory setting</th></tr>
<tr><td>InH-</td><td colspan="3">■ [FAULT INHIBITION]</td></tr>
<tr><td>InH

nO
LI1
-
-
-</td><td colspan="2">❑ [Fault inhibit assign.]
To assign fault inhibit, press the "ENT" key for 2 s.

CAUTION
Inhibiting faults results in the drive not being protected. This invalidates the warranty.
Check that the possible consequences do not present any risk.
Failure to follow these instructions can result in equipment damage.

☐ [No] (nO): Function inactive, thereby preventing access to other function parameters.
☐ [LI1] (LI1)
:
:
☐ [...] (...): See the assignment conditions on page 116.
If the assigned input or bit is at 0, fault monitoring is active. If the assigned input or bit is at 1, fault monitoring is inactive. Active faults are reset on a rising edge (change from 0 to 1) of the assigned input or bit.

Note: The "Power Removal" function and any faults that prevent any form of operation are not affected by this function.
A list of faults affected by this function appears on pages 240 to 245.</td><td>[No] (nO)</td></tr>
<tr><td>InHS

nO
Frd
rrS</td><td colspan="2">❑ [Forced Run]
This parameter causes the run command to be forced in a specific direction when the input or bit for fault inhibition is at 1, with priority over all other commands with the exception of "Power Removal".
To assign forced run, press and hold down the "ENT" key for 2 s.
☐ [No] (nO): Function inactive
☐ [Fw.For.Run] (Frd): Forced forward run.
☐ [Rev.For.Run] (rrS): Forced reverse run.

DANGER
UNINTENDED EQUIPMENT OPERATION
• Check that it is safe to force the run command.

Failure to follow these instructions will result in death or serious injury.</td><td>[No] (nO)</td></tr>
<tr><td>InHr</td><td>❑ [Forced Run Ref.]
The parameter can be accessed if [Forced Run] (InHS) is not [No] (nO)
This parameter causes the reference to be forced to the configured value when the input or bit for fault inhibition is at 1, with priority over all other references. Value 0 = function inactive.
The factory setting changes to 60 Hz if [Standard mot. freq] (bFr) = [60 Hz NEMA] (60).</td><td>0 to 500 or 1,000 Hz according to rating</td><td>50 Hz</td></tr>
</table>

Code	Name/Description	Adjustment range	Factory setting
CLL-	■ **[COM. FAULT MANAGEMENT]**		
CLL	❑ **[Network fault mgt]**		[Freewheel] (YES)
	Behavior of the drive in the event of a communication fault with a communication card		
nO	☐ **[Ignore]** (nO): Fault ignored		
YES	☐ **[Freewheel]** (YES): Freewheel stop.		
Stt	☐ **[Per STT]** (Stt): Stop according to configuration of [Type of stop] (Stt) page 133, without fault tripping. In this case the fault relay does not open and the drive is ready to restart as soon as the fault disappears, according to the restart conditions of the active command channel (e.g., according to [2/3 wire control] (tCC) and [2 wire type] (tCt) page 80 if control is via the terminals). Configuring an alarm for this fault is recommended (assigned to a logic output, for example) in order to indicate the cause of the stop.		
LFF	☐ **[fallback spd]** (LFF): Switch to fallback speed, maintained as long as the fault is present and the run command is not disabled (1).		
rLS	☐ **[Spd maint.]** (rLS): The drive maintains the speed being applied when the fault occurred, as long as the fault is present and the run command is not disabled (1).		
rMP	☐ **[Ramp stop]** (rMP): Stop on ramp		
FSt	☐ **[Fast stop]** (FSt): Fast stop		
dCI	☐ **[DC injection]** (dCI): DC injection stop. This type of stop cannot be used with certain other functions. See table on page 122.		
COL	❑ **[CANopen fault mgt]**		[Freewheel] (YES)
	Behavior of the drive in the event of a communication fault with integrated CANopen		
nO	☐ **[Ignore]** (nO): Fault ignored		
YES	☐ **[Freewheel]** (YES): Freewheel stop.		
Stt	☐ **[Per STT]** (Stt): Stop according to configuration of [Type of stop] (Stt) page 133, without fault tripping. In this case the fault relay does not open and the drive is ready to restart as soon as the fault disappears, according to the restart conditions of the active command channel (e.g., according to [2/3 wire control] (tCC) and [2 wire type] (tCt) page 80 if control is via the terminals). Configuring an alarm for this fault is recommended (assigned to a logic output, for example) in order to indicate the cause of the stop.		
LFF	☐ **[fallback spd]** (LFF): Switch to fallback speed, maintained as long as the fault is present and the run command is not disabled (1).		
rLS	☐ **[Spd maint.]** (rLS): The drive maintains the speed being applied when the fault occurred, as long as the fault is present and the run command is not disabled (1).		
rMP	☐ **[Ramp stop]** (rMP): Stop on ramp		
FSt	☐ **[Fast stop]** (FSt): Fast stop		
dCI	☐ **[DC injection]** (dCI): DC injection stop. This type of stop cannot be used with certain other functions. See table on page 122.		
SLL	❑ **[Modbus fault mgt]**		[Freewheel] (YES)
	Behavior of the drive in the event of a communication fault with integrated Modbus		
nO	☐ **[Ignore]** (nO): Fault ignored		
YES	☐ **[Freewheel]** (YES): Freewheel stop.		
Stt	☐ **[Per STT]** (Stt): Stop according to configuration of [Type of stop] (Stt) page 133, without fault tripping. In this case the fault relay does not open and the drive is ready to restart as soon as the fault disappears, according to the restart conditions of the active command channel (e.g., according to [2/3 wire control] (tCC) and [2 wire type] (tCt) page 80 if control is via the terminals). Configuring an alarm for this fault is recommended (assigned to a logic output, for example) in order to indicate the cause of the stop.		
LFF	☐ **[fallback spd]** (LFF): Switch to fallback speed, maintained as long as the fault is present and the run command is not disabled (1).		
rLS	☐ **[Spd maint.]** (rLS): The drive maintains the speed being applied when the fault occurred, as long as the fault is present and the run command is not disabled (1).		
rMP	☐ **[Ramp stop]** (rMP): Stop on ramp		
FSt	☐ **[Fast stop]** (FSt): Fast stop		
dCI	☐ **[DC injection]** (dCI): DC injection stop. This type of stop cannot be used with certain other functions. See table on page 122.		

(1) Because, in this case, the fault does not trigger a stop, it is essential to assign a relay or logic output to its indication.

Code	Name/Description		Adjustment range	Factory setting
tId-	■ **[TORQUE OR I LIM. DETECT.]**			
SSb	❑ **[Trq/I limit. Stop]**			[Ignore] (nO)
		Behavior in the event of switching to torque or current limitation		
nO		□ **[Ignore]** (nO): Fault ignored		
YES		□ **[Freewheel]** (YES): Freewheel stop.		
Stt		□ **[Per STT]** (Stt): Stop according to configuration of [Type of stop] (Stt) page 133, without fault tripping. In this case the fault relay does not open and the drive is ready to restart as soon as the fault disappears, according to the restart conditions of the active command channel (e.g., according to [2/3 wire control] (tCC) and [2 wire type] (tCt) page 80 if control is via the terminals). Configuring an alarm for this fault is recommended (assigned to a logic output, for example) in order to indicate the cause of the stop.		
LFF		□ **[fallback spd]** (LFF): Switch to fallback speed, maintained as long as the fault is present and the run command is not disabled (1).		
rLS		□ **[Spd maint.]** (rLS): The drive maintains the speed being applied when the fault occurred, as long as the fault is present and the run command is not disabled (1).		
rMP		□ **[Ramp stop]** (rMP): Stop on ramp		
FSt		□ **[Fast stop]** (FSt): Fast stop		
dCI		□ **[DC injection]** (dCI): DC injection stop. This type of stop cannot be used with certain other functions. See table on page 122.		
StO ⟲	❑ **[Trq/I limit. time out]**		0 to 9,999 ms	1,000 ms
		(If fault has been configured) Time delay for taking SSF "Limitation" fault into account		

(1) Because, in this case, the fault does not trigger a stop, it is essential to assign a relay or logic output to its indication.

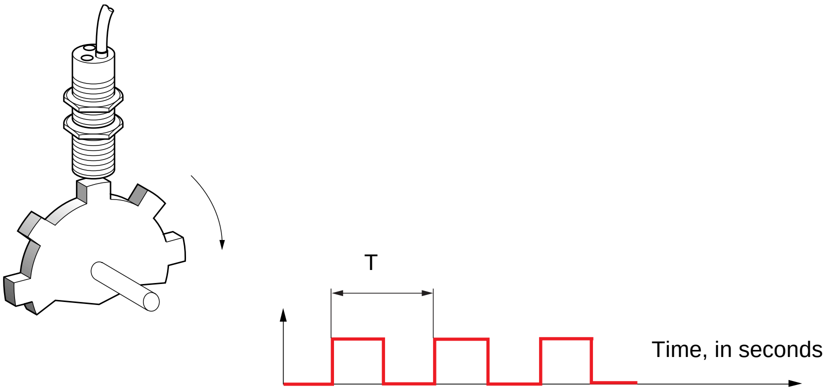
⟲	Parameter that can be modified during operation or when stopped.

Use of the "Pulse input" to measure the speed of rotation of the motor

This function uses the "Pulse input" from the VW3A3202 extension card and can, therefore, only be used if this card has been inserted and if the "Pulse input" is not being used for another function.

Example of use

A notched disc driven by the motor and connected to a proximity sensor can be used to generate a frequency signal that is proportional to the speed of rotation of the motor.



When applied to the "Pulse input", this signal supports:

- Measurement and display of the motor speed: signal frequency = 1/T. This frequency is displayed by means of the [Pulse in. work. freq.] (FqS) parameter, page 44 or 46.
- Overspeed detection (if the measured speed exceeds a preset threshold, the drive will trip on a fault).
- Detection of a speed threshold that can be adjusted using [Pulse warning thd.] (FqL) page 59 and is assignable to a relay or logic output, see page 94.

Code	Name/Description	Adjustment range	Factory setting
FqF-	■ **[FREQUENCY METER]** Can be accessed if a VW3A3202 option card has been inserted		
FqF	❑ **[Frequency meter]** Activation of the speed measurement function.		[No] (nO)
nO	☐ **[No]** (nO): Function inactive		
YES	☐ **[Yes]** (YES): Function active, assignment only possible if no other functions have been assigned to the "Pulse input".		
FqC	❑ **[Pulse scal. divisor]** Scaling factor for the "Pulse input" (divisor). The frequency measured is displayed by means of the [Pulse in. work. freq.] (FqS) parameter, page 44 or 46.	1.0 to 100.0	1.0
FqA	❑ **[Overspd. pulse thd.]** Activation and adjustment of overspeed monitoring: [Overspeed] (SOF) fault.		[No] (nO)
nO	☐ **[No]** (nO): No overspeed monitoring		
-	☐ **1 Hz to 30.00 Hz**: Adjustment of the frequency tripping threshold on the "Pulse input" divided by [Pulse scal. divisor] (FqC)		
tdS	❑ **[Pulse overspd delay]** Time delay for taking overspeed fault into account	0.0 s to 10.0 s	0.0 s
Fdt	❑ **[Level fr. pulse ctrl]** Activation and adjustment of monitoring for the Pulse input (speed feedback): [Speed fdback loss] (SPF) fault		[No] (nO)
nO	☐ **[No]** (nO): No monitoring of speed feedback		
-	☐ **0.1 Hz to 500.0 Hz**: Adjustment of the motor frequency threshold for tripping a speed feedback fault (difference between the estimated frequency and the measured speed)		

Code	Name/Description	Adjustment range	Factory setting
brP-	**[DB RES. PROTECTION]**		
brO	**[DB res. protection]**		[No] (nO)
nO	[No] (nO): No braking resistor protection (thereby preventing access to the other function parameters).		
YES	[Alarm] (YES): Alarm. The alarm may be assigned to a logic output or a relay (see page 94).		
FLt	[Fault] (FLt) : Switch to fault (bOF) with locking of drive (freewheel stop).		
	Note: The thermal state of the resistor can be displayed on the graphic display terminal. It is calculated for as long as the drive control remains connected to the power supply.		
brP ()	**[DB Resistor Power]** The parameter can be accessed if [DB res. protection] (brO) is not [No] (nO). Rated power of the resistor used.	0.1 kW (0.13 HP) to 1,000 kW (1,333 HP)	0.1 kW (0.13 HP)
brU ()	**[DB Resistor value]** The parameter can be accessed if [DB res. protection] (brO) is not [No] (nO). Rated value of the braking resistor in Ohms.	0.1 to 200 Ohms	0.1 Ohm
bUF-	**[BU PROTECTION]** Parameter accessible at and above ATV61HD55M3X, ATV61HD90N4 and ATV61HC11Y.		
bUb	**[Brake res. fault Mgt]** Management of short-circuit [DB unit sh. circuit] (bUF) and overheating [Internal- th. sensor] (InFb) faults in the braking unit.		[Freewheel] (YES)
nO	[Ignore] (nO): Fault ignored. **Configuration to be used if there is no braking unit or resistor connected to the drive.**		
YES	[Freewheel] (YES): Freewheel stop		
tnF-	**[AUTO TUNING FAULT]**		
tnL	**[Autotune fault mgt]**		[Freewheel] (YES)
nO	[Ignore] (nO): Fault ignored.		
YES	[Freewheel] (YES): Freewheel stop.		

() Parameter that can be modified during operation or when stopped.

Card pairing

Function can only be accessed in [Expert] mode.

This function is used to detect whenever a card has been replaced or the software has been modified in any way.
When a pairing password is entered, the parameters of the cards currently inserted are stored. On every subsequent power-up these parameters are verified and in the event of a discrepancy the drive locks in HCF fault mode. Before the drive can be restarted you must revert to the original situation or re-enter the pairing password.

The following parameters are verified:
- The type of card for: all cards
- The software version for: the two control cards, the VW3A3202 extension card, the Controller Inside card and the communication cards
- The serial number for: both control cards

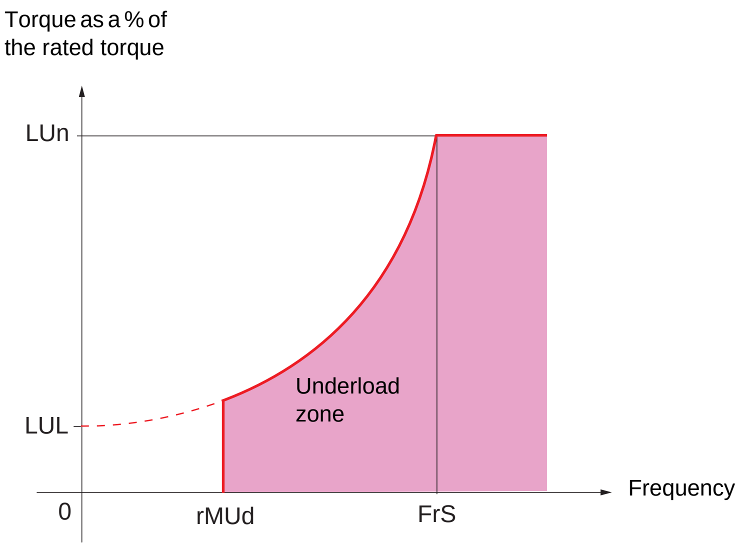
Code	Name/Description	Adjustment range	Factory setting
PPI-	■ [CARDS PAIRING]		
PPI	❑ [Pairing password]	OFF to 9,999	[OFF] (OFF)
	The [OFF] (OFF) value signifies that the card pairing function is inactive. The [ON] (On) value signifies that card pairing is active and that an access code must be entered in order to start the drive in the event of a card pairing fault. As soon as the code has been entered the drive is unlocked and the code changes to [ON] (On). - The PPI code is an unlock code known only to Schneider Electric Product Support.		

Process underload fault

A process underload is detected when the next event occurs and remains pending for a minimum time (ULt), which is configurable:

- The motor is in steady state and the torque is below the set underload limit (LUL, LUn, rMUd parameters).

The motor is in steady state when the offset between the frequency reference and motor frequency falls below the configurable threshold (Srb).



.

Between zero frequency and the rated frequency, the curve reflects the following equation:

$$\text{torque} = \text{LUL} + \frac{(\text{LUn} - \text{LUL}) \times (\text{frequency})^2}{(\text{rated frequency})^2}$$

The underload function is not active for frequencies below rMUd.

A relay or a logic output can be assigned to the signaling of this fault in the [1.5 INPUTS / OUTPUTS CFG] (I-O-) menu.

Code	Name/Description	Adjustment range	Factory setting
ULd-	■ [PROCESS UNDERLOAD]		
ULt	❑ [Unld T. Del. Detect] Underload detection time delay. A value of 0 deactivates the function and renders the other parameters inaccessible.	0 to 100 s	0 s
LUn ⟲	❑ [Unld.Thr.Nom.Speed] (1) Underload threshold at rated motor frequency ([Rated motor freq.] (FrS) page 35), as a % of the rated motor torque.	20 to 100%	60%
LUL ⟲	❑ [Unld.Thr.0.Speed] (1) Underload threshold at zero frequency, as a % of the rated motor torque.	0 to [Unld.Thr.Nom.Speed] (LUn)	0%
rMUd ⟲	❑ [Unld. Freq.Thr. Det.] (1) Minimum frequency underload detection threshold	0 to 500 or 1,000 Hz according to rating	0 Hz
Srb ⟲	❑ [Hysteresis Freq.Att.] (1) Maximum deviation between the frequency reference and the motor frequency, which defines steady state operation.	0.3 to 500 or 1,000 Hz according to rating	0.3 Hz
UdL nO YES rMP FSt	❑ [Underload Mangmt.] Behavior on switching to underload detection. ☐ **[Ignore]** (nO): Fault ignored ☐ **[Freewheel]** (YES): Freewheel stop ☐ **[Ramp stop]** (rMP): Stop on ramp ☐ **[Fast stop]** (FSt): Fast stop		[Freewheel] (YES)
FtU ⟲	❑ [Underload T.B.Rest.] (1) This parameter cannot be accessed if [Underload Mangmt.] (UdL) = [Ignore] (nO). Minimum time permitted between an underload being detected and any automatic restart. In order for an automatic restart to be possible, the value of [Max. restart time] (tAr) page 191 must exceed that of this parameter by at least one minute.	0 to 6 min	0 min

(1) The parameter can also be accessed in the [1.3 SETTINGS] (SEt-) menu.

⟲ Parameter that can be modified during operation or when stopped.

Process overload fault

A process overload is detected when the next event occurs and remains pending for a minimum time (tOL), which is configurable:
- The drive is in current limitation mode.
- The motor is in steady state and the current is above the set overload threshold (LOC).

The motor is in steady state when the offset between the frequency reference and motor frequency falls below the configurable threshold (Srb).
A relay or a logic output can be assigned to the signaling of this fault in the [1.5 INPUTS / OUTPUTS CFG] (I-O-) menu.

Code	Name/Description	Adjustment range	Factory setting
OLd-	■ [PROCESS OVERLOAD]		
tOL	❑ [Unld Time Detect.] Overload detection time delay. A value of 0 deactivates the function and renders the other parameters inaccessible.	0 to 100 s	0 s
LOC ()	❑ [Ovld Detection Thr.] (1) Overload detection threshold, as a % of the rated motor current [Rated mot. current] (nCr). This value must be less than the limit current in order for the function to work.	70 to 150%	110%
Srb ()	❑ [Hysteresis Freq.Att.] (1) Maximum deviation between the frequency reference and the motor frequency, which defines steady state operation.	0.3 to 500 or 1,000 Hz according to rating	0.3 Hz
OdL	❑ [Ovld.Proces.Mngmt] Behavior on switching to overload detection.		[Freewheel] (YES)
nO	☐ [Ignore] (nO): Fault ignored		
YES	☐ [Freewheel] (YES): Freewheel stop		
rMP	☐ [Ramp stop] (rMP): Stop on ramp		
FSt	☐ [Fast stop] (FSt): Fast stop		
FtO ()	❑ [Overload T.B.Rest.] (1) This parameter cannot be accessed if [Ovld.Proces.Mngmt] (OdL) = [Ignore] (nO). Minimum time permitted between an overload being detected and any automatic restart. In order for an automatic restart to be possible, the value of [Max. restart time] (tAr) page 191 must exceed that of this parameter by at least one minute.	0 to 6 min	0 min

(1) The parameter can also be accessed in the [1.3 SETTINGS] (SEt-) menu.

() Parameter that can be modified during operation or when stopped.

Code	Name/Description	Adjustment range	Factory setting
FdL-	**[DAMPER FAULT MGT.]**		
FdL	**[Damper fault mgt.]**		[Freewheel] (YES)
	Type of stop in the event of a damper fault: [Damper stuck] (Fd1)		
nO	**[Ignore]** (nO): Fault ignored		
YES	**[Freewheel]** (YES): Freewheel stop		
Stt	**[Per STT]** (Stt): Stop according to configuration of [Type of stop] (Stt) page 133, without fault tripping. In this case the fault relay does not open and the drive is ready to restart as soon as the fault disappears, according to the restart conditions of the active command channel (e.g. according to [2/3 wire control] (tCC) and [2 wire type] (tCt) page 80 if control is via the terminals). It is advisable to configure an alarm for this fault (assigned to a logic output, for example) in order to indicate the cause of the stop.		
LFF	**[fallback spd]** (LFF): Change to fallback speed, maintained as long as the fault persists and the run command has not been removed (1).		
rLS	**[Spd maint.]** (rLS): The drive maintains the speed being applied when the fault occurred, as long as the fault is present and the run command has not been removed (1).		
rMP	**[Ramp stop]** (rMP): Stop on ramp		
FSt	**[Fast stop]** (FSt): Fast stop		
dCI	**[DC injection]** (dCI): DC injection stop. This type of stop cannot be used with certain other functions. See table on page 122.		

(1) Because, in this case, the fault does not trigger a stop, it is essential to assign a relay or logic output to its indication.

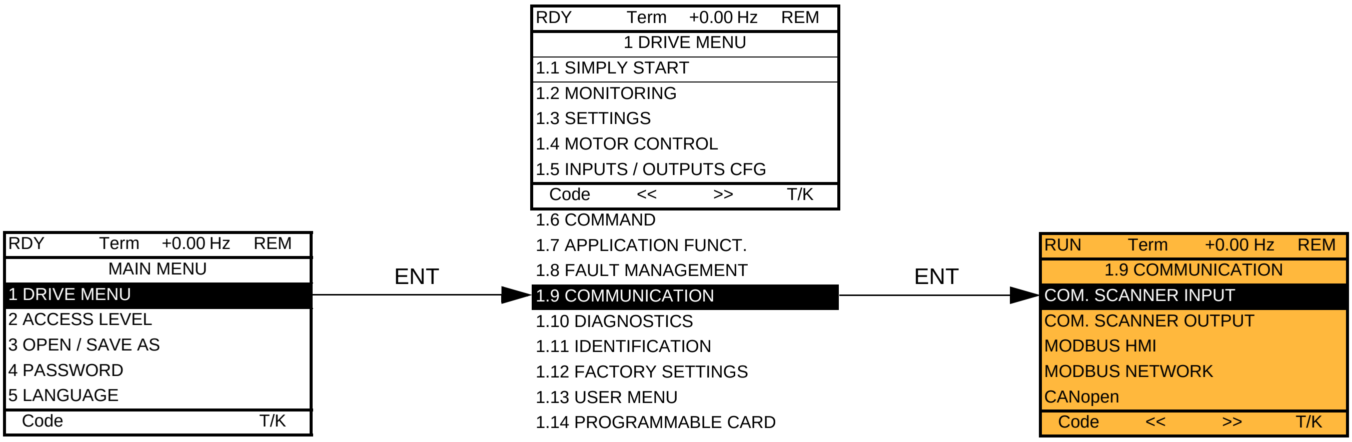
Code	Name/Description	Adjustment range	Factory setting
LFF-	**[FALLBACK SPEED]**		
LFF	**[Fallback speed]** Selection of the fallback speed	0 to 500 or 1,000 Hz according to rating	0 Hz
FSt-	**[RAMP DIVIDER]**		
dCF	**[Ramp divider]** (1) The ramp that is enabled (dEC or dE2) is then divided by this coefficient when stop requests are sent. Value 0 corresponds to a minimum ramp time.	0 to 10	4
dCI-	**[DC INJECTION]**		
IdC	**[DC inject. level 1]** (1) (3) Level of DC injection braking current activated via logic input or selected as stop mode. **CAUTION** Check that the motor will withstand this current without overheating. **Failure to follow these instructions can result in equipment damage.**	0.1 to 1.1 or 1.2 In (2) according to rating	0.64 In (2)
tdI	**[DC injection time 1]** (1) (3) Maximum current injection time [DC inject. level 1] (IdC). After this time the injection current becomes [DC inject. level 2] (IdC2).	0.1 to 30 s	0.5 s
IdC2	**[DC inject. level 2]** (1) (3) Injection current activated by logic input or selected as stop mode, once period of time [DC injection time 1] (tdI) has elapsed. **CAUTION** Check that the motor will withstand this current without overheating. **Failure to follow these instructions can result in equipment damage.**	0.1 In (2) to [DC inject. level 1] (IdC)	0.5 In (2)
tdC	**[DC injection time 2]** (1) (3) Maximum injection time [DC inject. level 2] (IdC2) for injection, selected as stop mode only. (Can be accessed if [Type of stop] (Stt) = [DC injection] (dCI)).	0.1 to 30 s	0.5 s

(1) The parameter can also be accessed in the [1.3 SETTINGS] (SEt-) and [1.7 APPLICATION FUNCT.] (FUn-) menus.
(2) In corresponds to the rated drive current indicated in the Installation Manual and on the drive nameplate.
(3) Warning: These settings are independent of the [AUTO DC INJECTION] (AdC-) function.

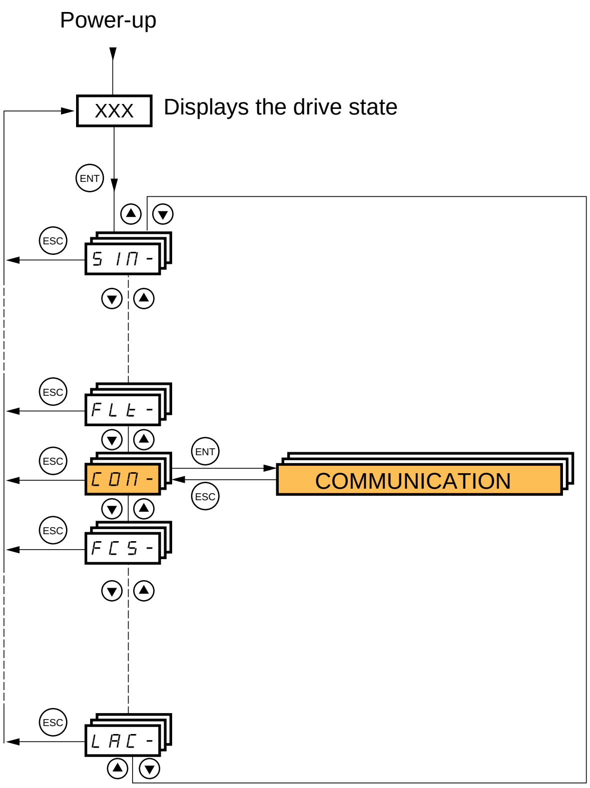
Parameter that can be modified during operation or when stopped.

[1.9 COMMUNICATION] (COM-)

With graphic display terminal:



With integrated display terminal:



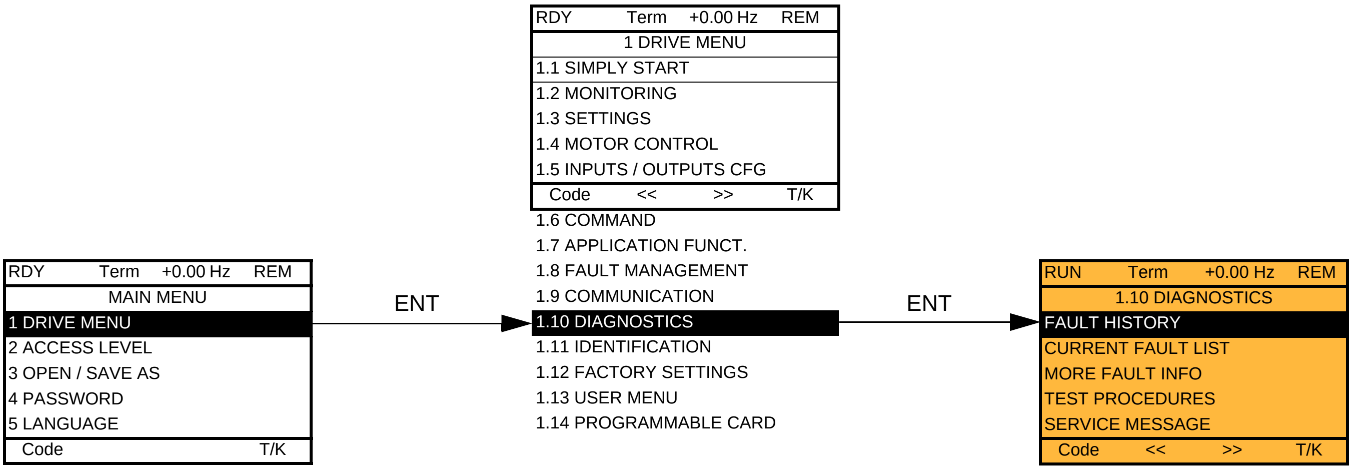
Code	Name/Description	Adjustment range	Factory setting
	■ **[COM. SCANNER INPUT]** **Only accessible via graphic display terminal**		
nMA1	❑ **[Scan. IN1 address]** Address of the 1st input word		3201
nMA2	❑ **[Scan. IN2 address]** Address of the 2nd input word		8604
nMA3	❑ **[Scan. IN3 address]** Address of the 3rd input word		0
nMA4	❑ **[Scan. IN4 address]** Address of the 4th input word		0
nMA5	❑ **[Scan. IN5 address]** Address of the 5th input word		0
nMA6	❑ **[Scan. IN6 address]** Address of the 6th input word		0
nMA7	❑ **[Scan. IN7 address]** Address of the 7th input word		0
nMA8	❑ **[Scan. IN8 address]** Address of the 8th input word		0
	■ **[COM. SCANNER OUTPUT]** **Only accessible via graphic display terminal**		
nCA1	❑ **[Scan.Out1 address]** Address of the 1st output word		8501
nCA2	❑ **[Scan.Out2 address]** Address of the 2nd output word		8602
nCA3	❑ **[Scan.Out3 address]** Address of the 3rd output word		0
nCA4	❑ **[Scan.Out4 address]** Address of the 4th output word		0
nCA5	❑ **[Scan.Out5 address]** Address of the 5th output word		0
nCA6	❑ **[Scan.Out6 address]** Address of the 6th output word		0
nCA7	❑ **[Scan.Out7 address]** Address of the 7th output word		0
nCA8	❑ **[Scan.Out8 address]** Address of the 8th output word		0

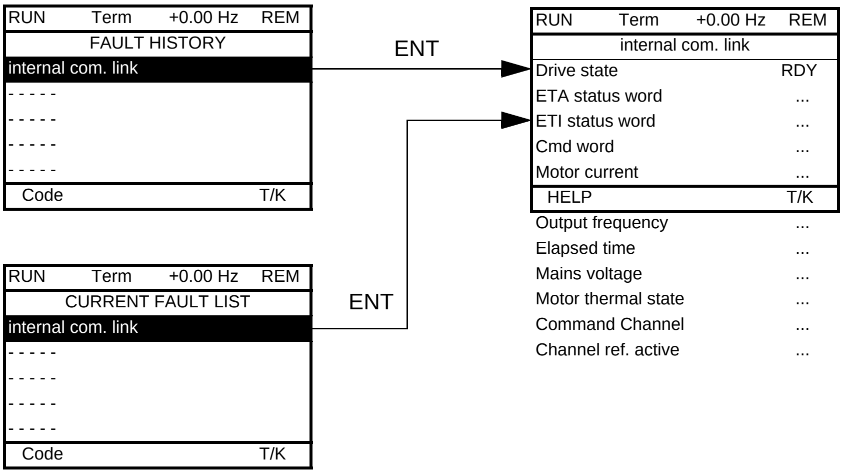
Code	Name/Description	Adjustment range	Factory setting
Md2-	**[MODBUS HMI]** Communication with the graphic display terminal		
tbr2	**[HMI baud rate]** 9.6 or 19.2 kbps via the integrated display terminal. 9,600 or 19,200 bauds via the graphic display terminal. The graphic display terminal only operates if [HMI baud rate] (tbr2) = 19,200 bauds (19.2 kbps). In order for any change in the assignment of [HMI baud rate] (tbr2) to be taken into account you must: - Provide confirmation in a confirmation window if using the graphic display terminal - Press the ENT key for 2 s if using the integrated display terminal		19.2 kbps
tFO2	**[HMI format]** Read-only parameter, cannot be modified.		8E1
Md1-	**[MODBUS NETWORK]**		
Add	**[Modbus Address]** OFF to 247		OFF
AMOA	**[Modbus add Prg C.]** Modbus address of the Controller Inside card OFF at 247 The parameter can be accessed if the Controller Inside card has been inserted and depending on its configuration (please consult the specific documentation).		OFF
AMOC	**[Modbus add Com.C.]** Modbus address of the communication card OFF to 247 The parameter can be accessed if a communication card has been inserted and depending on its configuration (please consult the specific documentation).		OFF
tbr	**[Modbus baud rate]** 4.8 – 9.6 – 19.2 – 38.4 kbps on the integrated display terminal. 4,800, 9,600, 19,200 or 38,400 bauds on the graphic display terminal.		19.2 kbps
tFO	**[Modbus format]** 8O1 – 8E1 – 8n1, 8n2		8E1
ttO	**[Modbus time out]** 0.1 to 30 s		10.0 s
CnO-	**[CANopen]**		
AdCO	**[CANopen address]** OFF to 127		OFF
bdCO	**[CANopen bit rate]** 50 – 125 – 250 – 500 kbps – 1 Mbps		125 kbps
ErCO	**[Error code]** Read-only parameter, cannot be modified.		

Code	Name / Description	Factory setting
-	**[COMMUNICATION CARD]**	
	See the specific documentation for the card used.	
LCF-	**[FORCED LOCAL]**	
FLO	**[Forced local assign.]**	[No] (nO)
nO	[No] (nO): Function inactive	
LI1 - LI14	[LI1] (LI1) to [LI6] (LI6) [LI7] (LI7) to [LI10] (LI10): If VW3A3201 logic I/O card has been inserted [LI11] (LI11) to [LI14] (LI14): If VW3A3202 extended I/O card has been inserted Forcing to local is active when the input is at state 1. [Forced local assign.] (FLO) is forced to [No] (nO) if [Profile] (CHCF) page 117 = [I/O profile] (IO).	
FLOC	**[Forced local Ref.]**	[No] (nO)
nO	[No] (nO): Not assigned (control via the terminals with zero reference).	
AI1	[AI1] (AI1): Analog input	
AI2	[AI2] (AI2): Analog input	
AI3	[AI3] (AI3): Analog input, if VW3A3202 extension card has been inserted	
AI4	[AI4] (AI4): Analog input, if VW3A3202 extension card has been inserted	
LCC	[HMI] (LCC): Assignment of the reference and command to the graphic display terminal. Reference: [HMI Frequency ref.] (LFr), page 44, control: RUN/STOP/FWD/REV buttons.	
PI	[RP] (PI): Frequency input, if VW3A3202 card has been inserted If the reference is assigned to an analog input, or [RP] (PI), the command is automatically assigned to the terminals as well (logic inputs).	
FLOt	**[Time-out forc. local]** 0.1 to 30 s The parameter can be accessed if [Forced local assign.] (FLO) is not [No] (nO). Time delay before communication monitoring is resumed on leaving forced local mode.	10.0 s

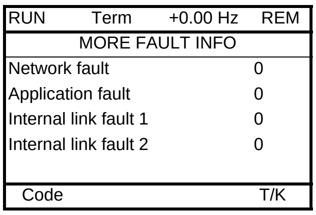
[1.10 DIAGNOSTICS]

This menu can only be accessed with the graphic display terminal:



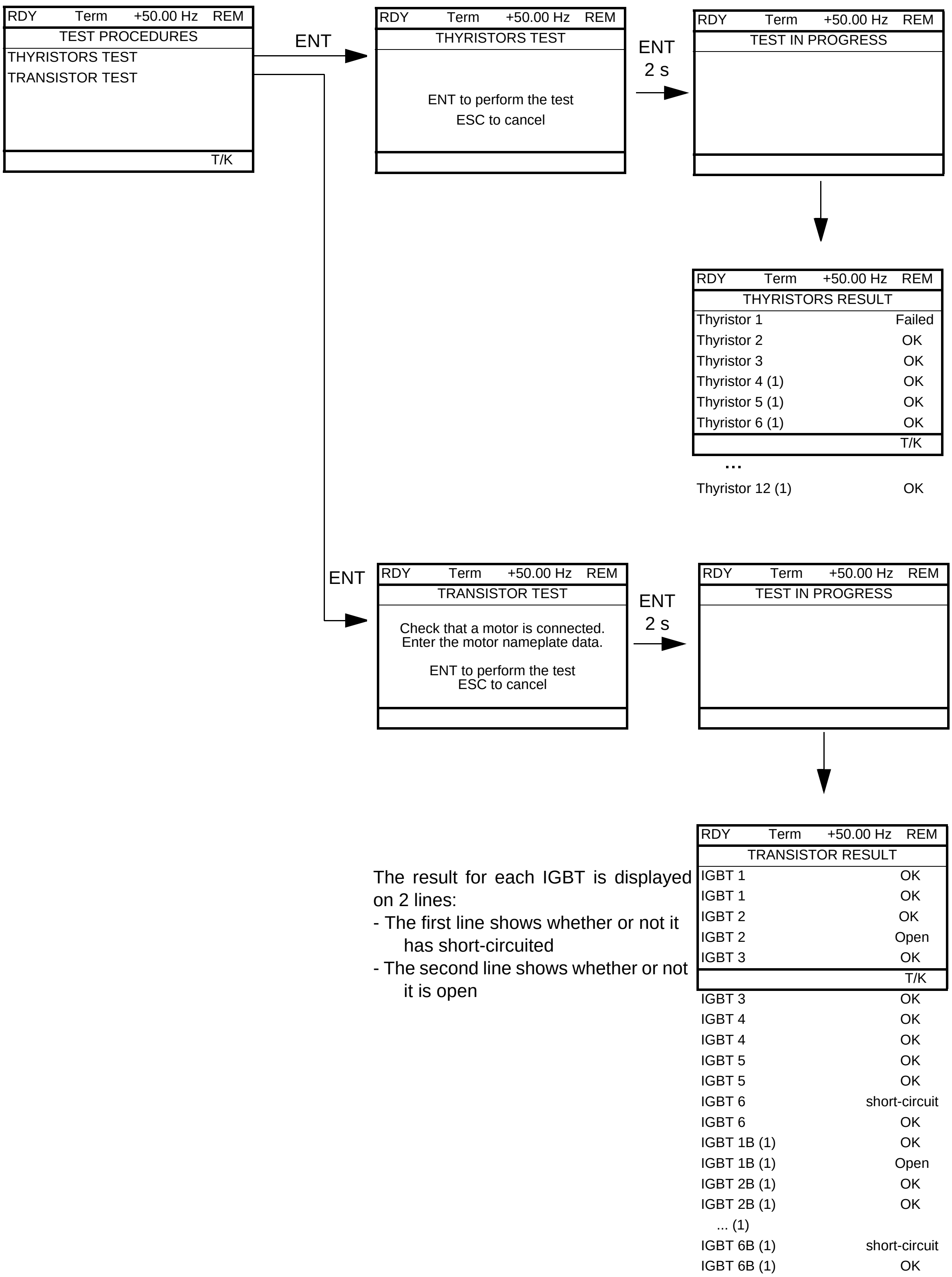


This screen indicates the state of the drive at the moment the selected fault occurred.



This screen indicates the number of communication faults, for example, with the option cards.
Number: 0 to 65,535

[TEST THYRISTORS] is only accessible for ATV61●●●M3 ⩾ 18.5 kW, ATV61●●●N4 drives > 18.5 kW, and all ratings of ATV61●●●Y drives.

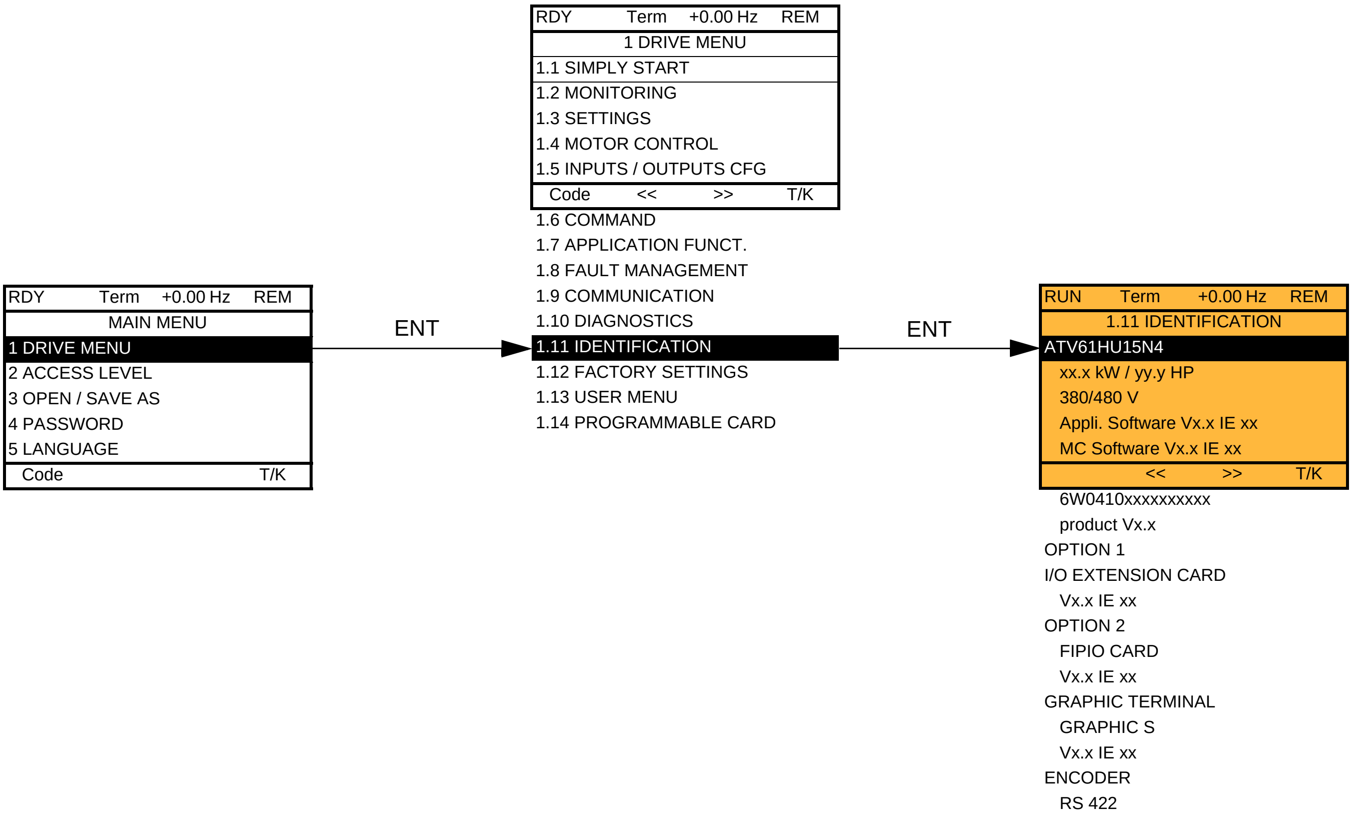


The result for each IGBT is displayed on 2 lines:
- The first line shows whether or not it has short-circuited
- The second line shows whether or not it is open

Note: To start the tests, press and hold down (2 s) the ENT key.

(1) Test results for Thyristor 4...12 and IGBT 1B ... 6B are only accessible for ATV61EC90N4 to M14N4 and ATV61EM15Y to M24Y

[1.11 IDENTIFICATION]

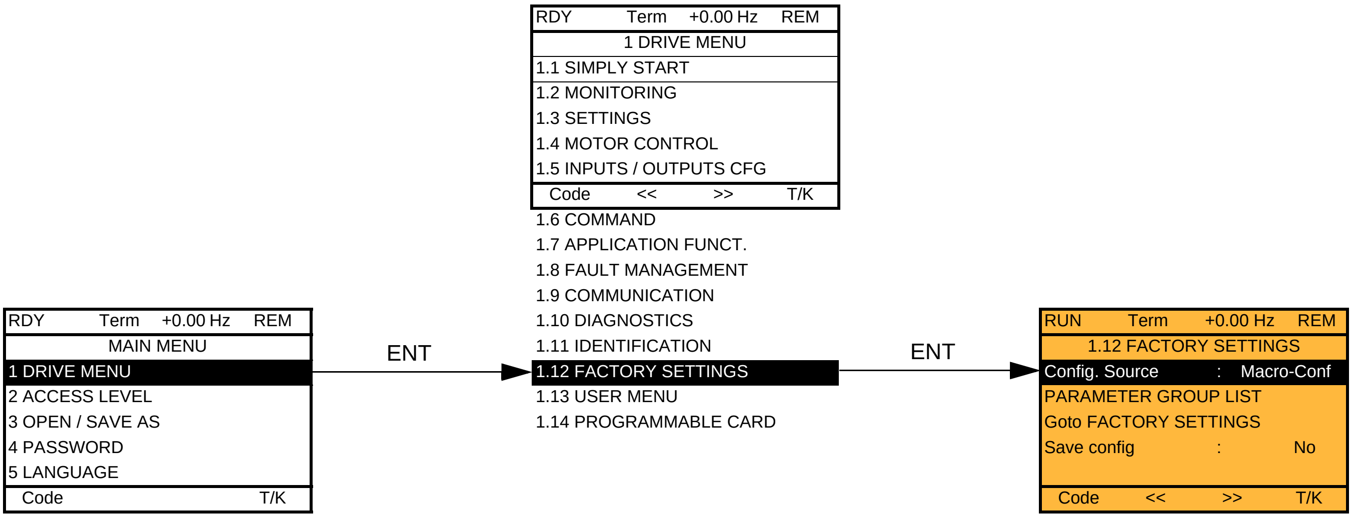


The [1.11 IDENTIFICATION] menu can only be accessed on the graphic display terminal.
This is a read-only menu that cannot be configured. It enables the following information to be displayed:

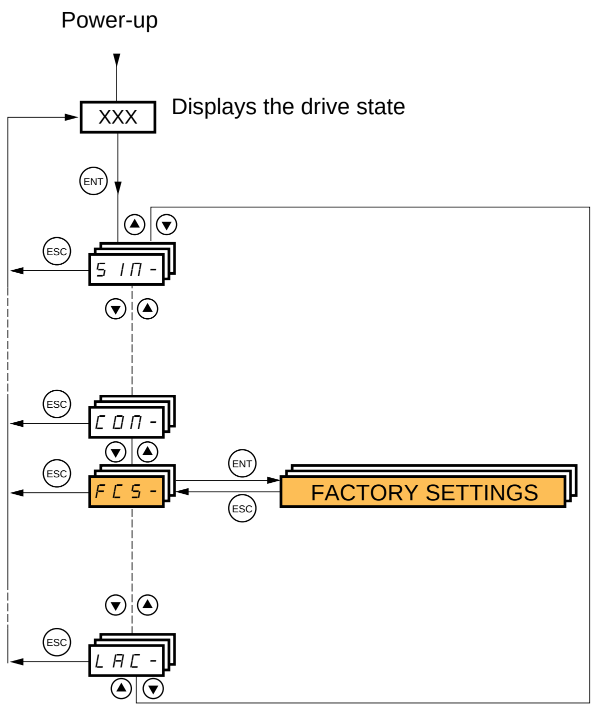
- Drive reference, power rating and voltage
- Drive software version
- Drive serial number
- Type of options present, with their software version

[1.12 FACTORY SETTINGS] (FCS-)

With graphic display terminal:



With integrated display terminal:

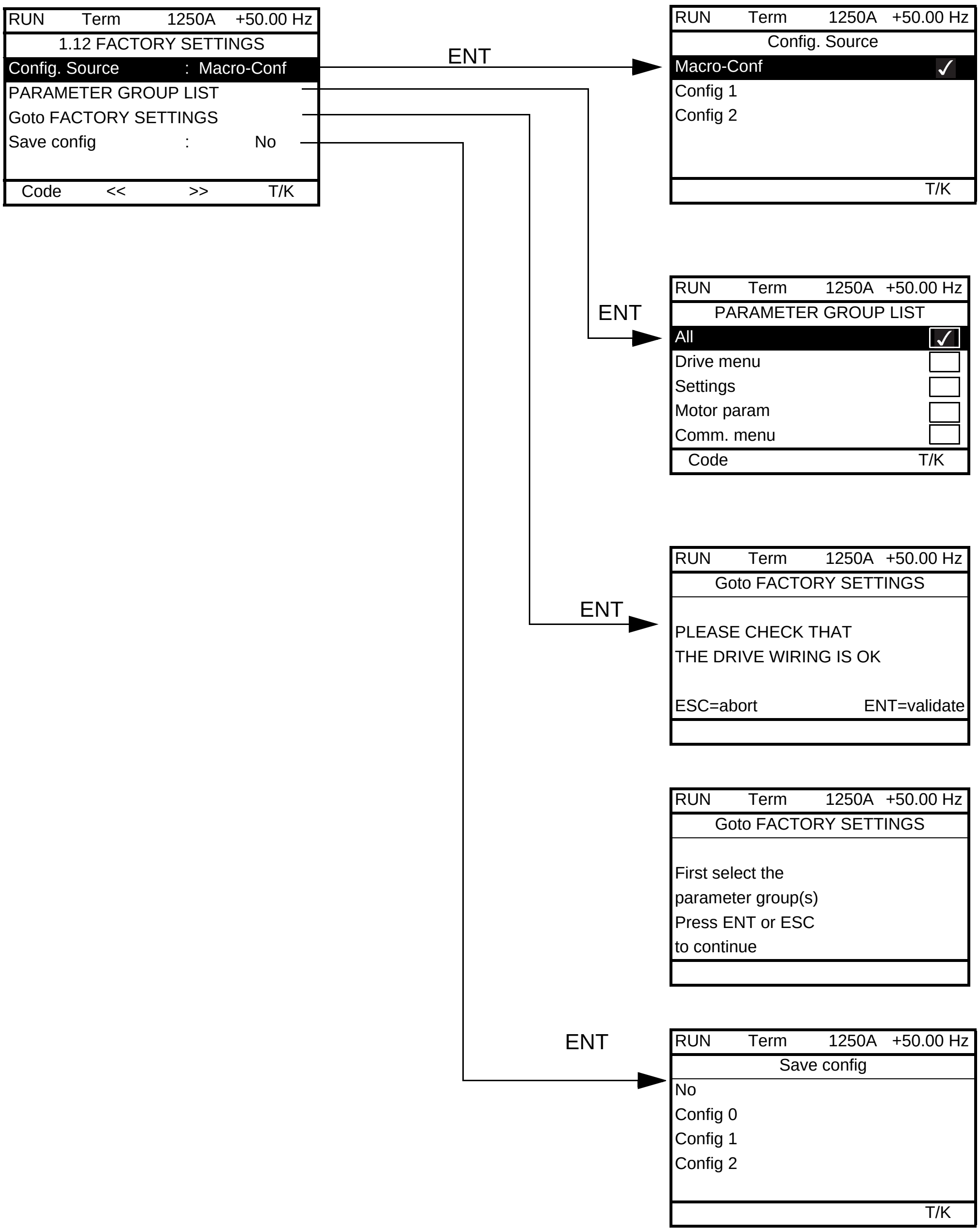


The [1.12 FACTORY SETTINGS] (FCS-) menu is used to:

- Replace the current configuration with the factory configuration or a configuration saved previously.
  All or part of the current configuration can be replaced: Select a group of parameters in order to select the menus you wish to load with the selected source configuration.

- Save the current configuration to a file.

[1.12 FACTORY SETTINGS] (FCS-)



Selection of source configuration

Selection of the menus to be replaced

Note: In factory configuration and after a return to “factory settings”, [PARAMETER GROUP LIST] will be empty.

Command to return to “factory settings”

This window appears if no group of parameters is selected.

Code	Name/Description
FCSI	**[Config. Source]**
	Choice of source configuration. The parameter cannot be accessed if the drive has locked on an [Incorrect config.] (CFF) fault.
InI	**[Macro-Conf]** (InI) Factory configuration, return to selected macro configuration.
CFG1	**[Config 1]** (CFG1)
CFG2	**[Config 2]** (CFG2)
	If the configuration switching function is configured, it will not be possible to access [Config 1] (CFG1) and [Config 2] (CFG2).
FrY-	**[PARAMETER GROUP LIST]**
	Selection of menus to be loaded
ALL	**[All]** (ALL) : All parameters.
drM	**[Drive menu]** (drM): The [1 DRIVE MENU] menu without [1.9 COMMUNICATION] and [1.14 PROGRAMMABLE CARD]. In the [7 DISPLAY CONFIG.] menu, [Return std name] page 234 returns to [No].
SEt	**[Settings]** (SEt): The [1.3 SETTINGS] menu without the [IR compensation] (UFr), [Slip compensation] (SLP) and [Mot. therm. current] (ItH) parameters.
MOt	**[Motor param]** (MOt): Motor parameters, see list below.
	The following selections can only be accessed if [Config. Source] (FCSI) = [Macro-Conf.] (InI):
COM	**[Comm. menu]** (COM): The [1.9 COMMUNICATION] menu without either [Scan. IN1 address] (nMA1) to [Scan. IN8 address] (nMA8) or [Scan.Out1 address] (nCA1) to [Scan.Out8 address] (nCA8).
PLC	**[Prog. card menu]** (PLC): the [1.14 PROGRAMMABLE CARD] menu.
MOn	**[Monitor config.]** (MOn): The [6 MONITORING CONFIG.] menu.
dIS	**[Display config.]** (dIS): the [7 DISPLAY CONFIG.] menu.
	See the multiple selection procedure on page 25 for the integrated display terminal and page 16 for the graphic display terminal.
	Note: In factory configuration and after a return to “factory settings”, [PARAMETER GROUP LIST] will be empty.
GFS	**[Goto FACTORY SETTINGS]**
	It is only possible to revert to the factory settings if at least one group of parameters has previously been selected. With the integrated display terminal:
nO	- No
YES	- Yes: The parameter changes back to nO automatically as soon as the operation is complete.
	With the graphic display terminal: See the previous page.
SCSI	**[Save config]**
nO	**[No]** (nO):
Str0	**[Config 0]** (Str0): Press the “ENT” key for 2 s.
Str1	**[Config 1]** (Str1): Press the “ENT” key for 2 s.
Str2	**[Config 2]** (Str2): Press the “ENT” key for 2 s.
	The active configuration to be saved does not appear for selection. For example, if the active configuration is [Config 0] (Str0), only [Config 1] (Str1) and [Config 2] (Str2) appear. The parameter changes back to [No] (nO) automatically as soon as the operation is complete.

List of motor parameters

[1.4 MOTOR CONTROL] (drC-) menu:

[Rated motor power] (nPr) – [Rated motor volt.] (UnS) – [Rated mot. current] (nCr) – [Rated motor freq.] (FrS) – [Rated motor speed] (nSP) – [Auto tuning] (tUn) – [Auto tuning status] (tUS) – [U/F Profile] (PFL) – [U0] (U0) to [U5] (U5) – [F1] (F1) to [F5] (F5) – [V. constant power] (UCP) - [Freq. Const Power] (FCP) – [Nominal I sync.] (nCrS) – [Nom motor spdsync] (nSPS) – [Pole pairs] (PPnS) – [Syn. EMF constant] (PHS) – [Autotune L d-axis] (LdS) – [Autotune L q-axis] (LqS) – [Cust. stator R syn] (rSAS) – [IR compensation] (UFr) – [Slip compensation] (SLP) – motor parameters that can be accessed in [Expert] mode, page 72.

[1.3 SETTINGS] (SEt-) menu:

[Mot. therm. current] (ItH)

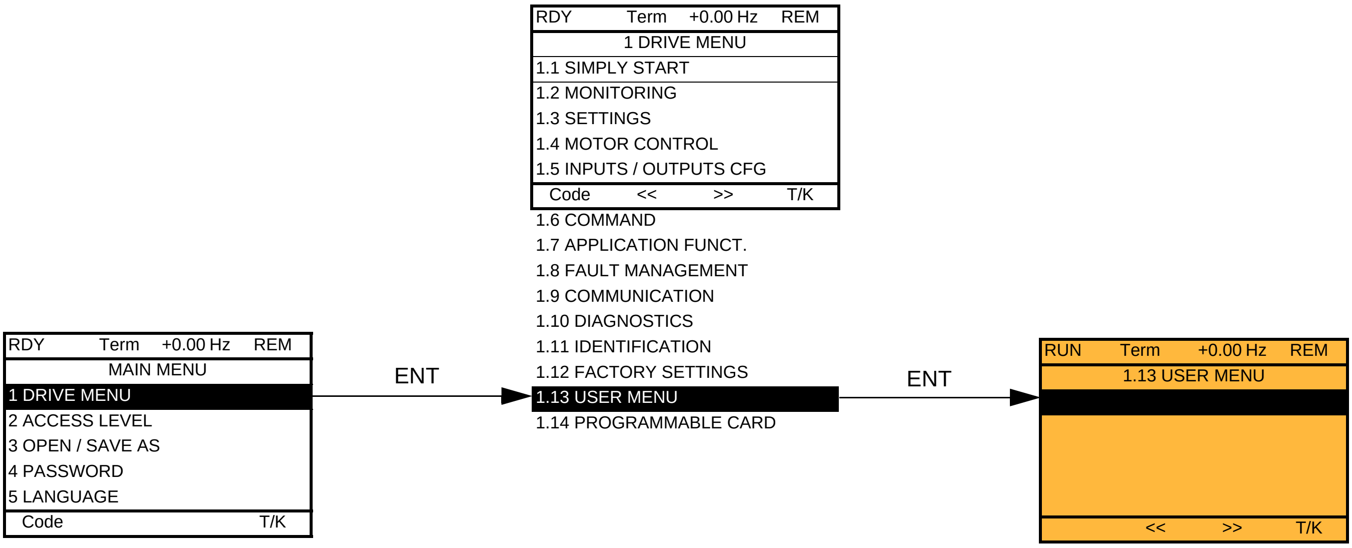
Example of total return to factory settings

1. [Config. Source] (FCSI) = [Macro-Conf] (InI)
2. [PARAMETER GROUP LIST] (FrY-) = [All] (ALL)
3. [Goto FACTORY SETTINGS] (GFS = YES)

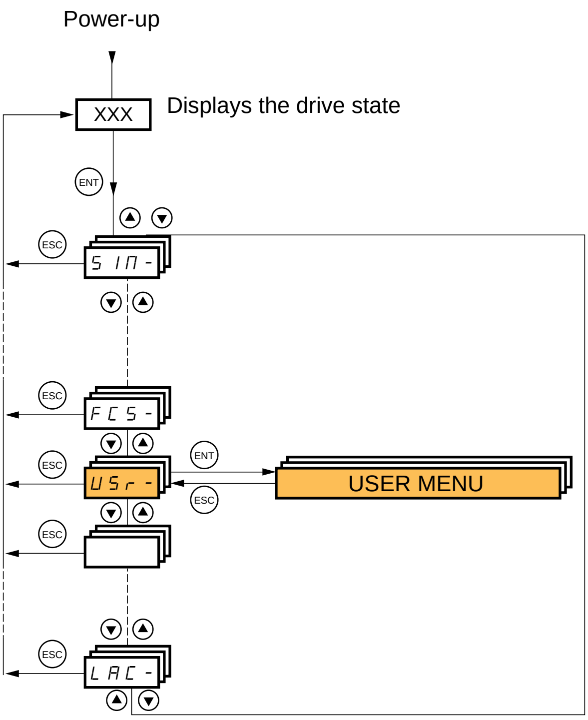
[1.13 USER MENU] (USr-)

This menu contains the parameters selected in the [7 DISPLAY CONFIG.] menu on page 233.

With graphic display terminal:

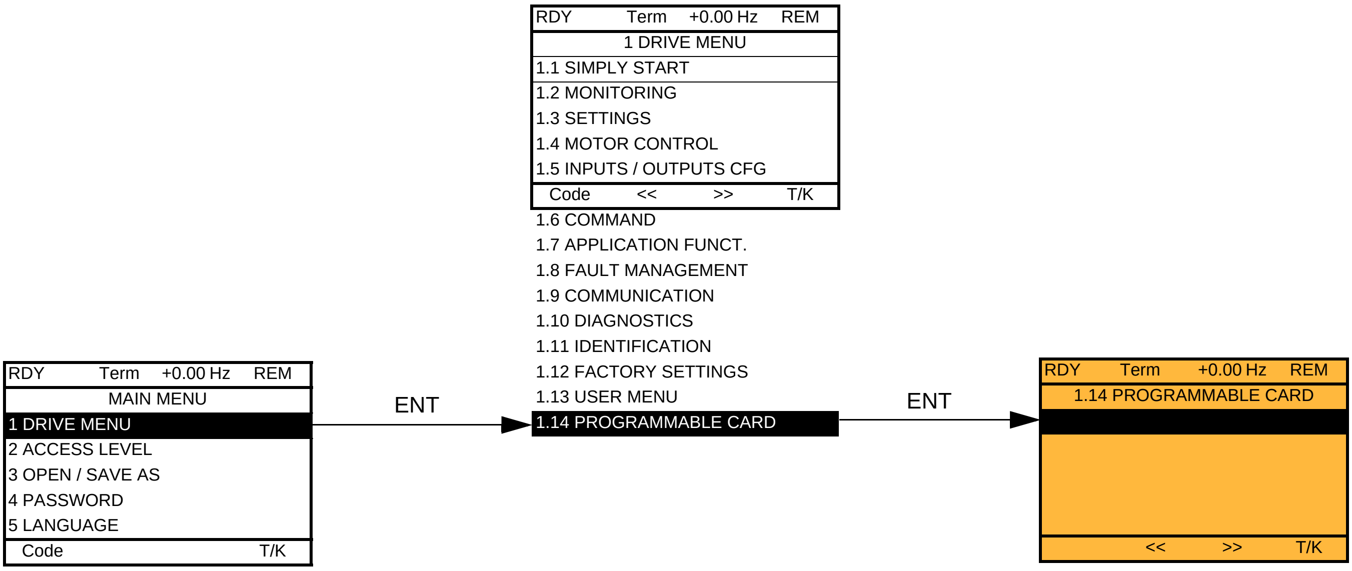


With integrated display terminal:

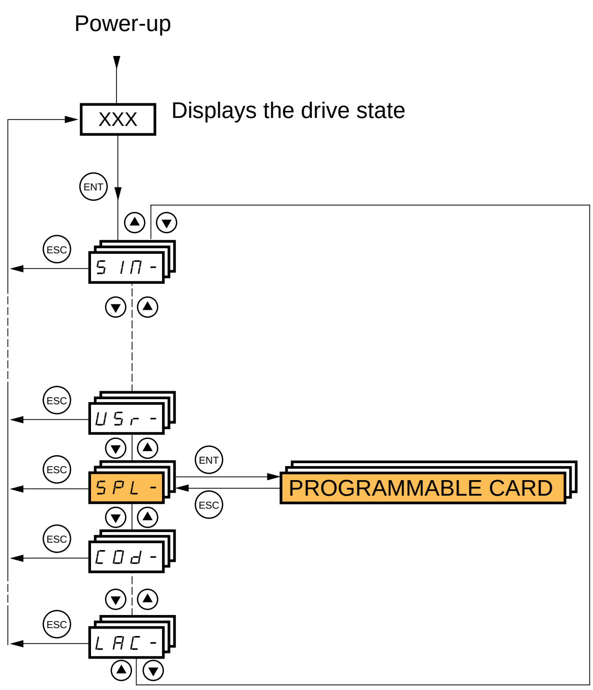


This menu can only be accessed if a Controller Inside card has been inserted. Please refer to the documentation specific to this card.

With graphic display terminal:

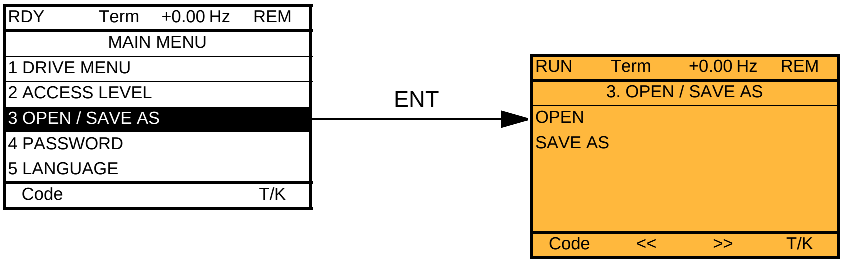


With integrated display terminal:

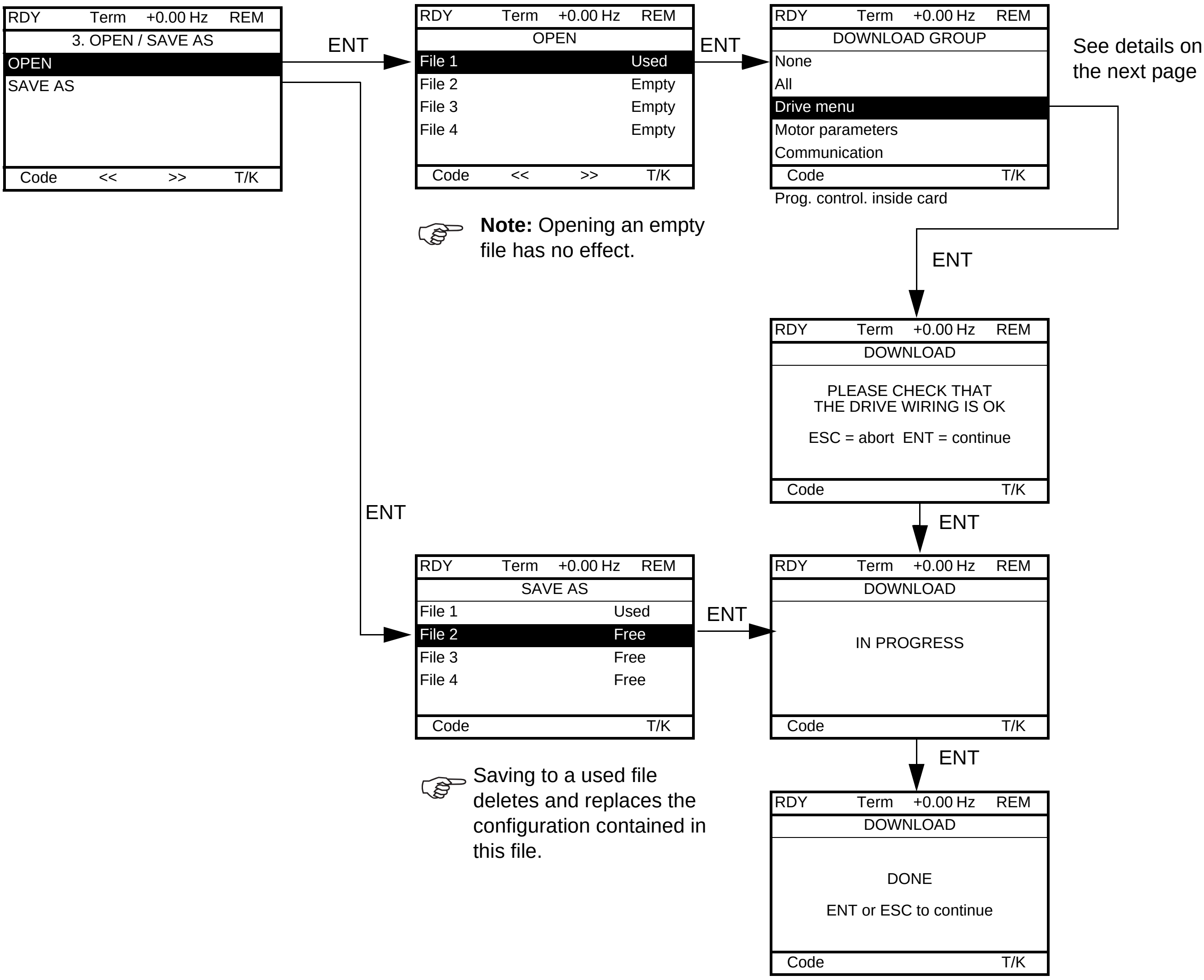


[3. OPEN / SAVE AS]

This menu can only be accessed with the graphic display terminal.



[OPEN]: To download one of the 4 files from the graphic display terminal to the drive.
[SAVE AS]: To download the current configuration from the drive to the graphic display terminal.



Various messages may appear when the download is requested:

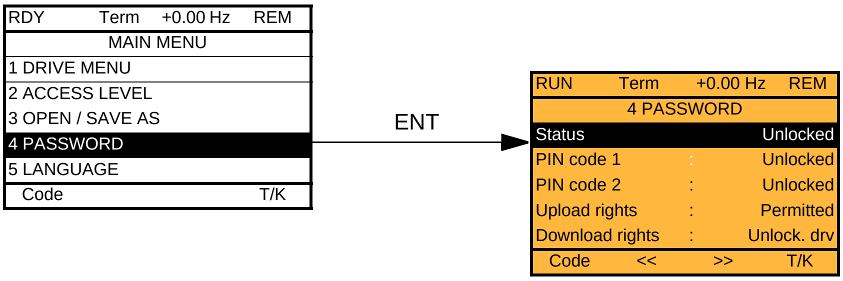
- [IN PROGRESS]
- [DONE]
- Error messages if download not possible
- [Motor parameters are NOT COMPATIBLE. Do you want to continue?]: In this case the download is possible, but the parameters will be restricted.

[DOWNLOAD GROUP]

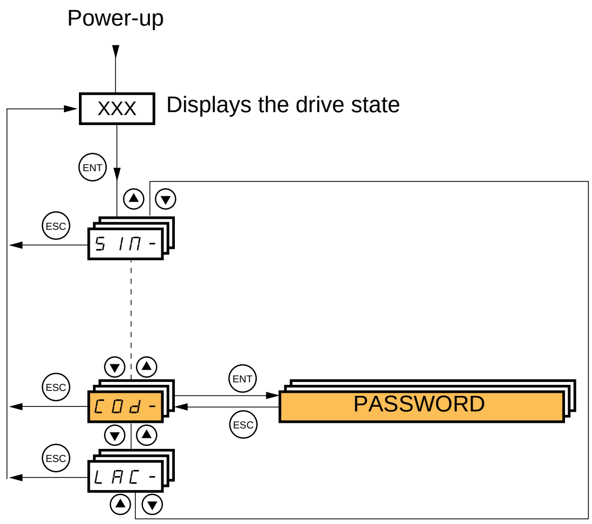
[None]:		No parameters
[All]:		All parameters in all menus
[Drive menu]:		The entire [1 DRIVE MENU] without [1.9 COMMUNICATION] and [1.14 PROGRAMMABLE CARD].
[Motor parameters]:	[Rated motor power] (nPr)	in the [1.4 MOTOR CONTROL] (drC-) menu
	[Rated motor volt.] (UnS)	
	[Rated mot. current] (nCr)	
	[Rated motor freq.] (FrS)	
	[Rated motor speed] (nSP)	
	[Auto tuning] (tUn)	
	[Auto tuning status] (tUS)	
	[U/F Profile] (PFL)	
	[U0] (U0) to [U5] (U5)	
	[F1] (F1) to [F5] (F5)	
	[V. constant power] (UCP)	
	[Freq. Const Power] (FCP)	
	[Nominal I sync.] (nCrS)	
	[Nom motor spdsync] (nSPS)	
	[Pole pairs] (PPnS)	
	[Syn. EMF constant] (PHS)	
	[Autotune L d-axis] (LdS)	
	[Autotune L q-axis] (LqS)	
	[Cust. stator R syn] (rSAS)	
	[IR compensation] (UFr)	
	[Slip compensation] (SLP)	
	The motor parameters that can be accessed in [Expert] mode, page 72	
	[Mot. therm. current] (ItH)	in the [1.3 SETTINGS] (SEt-) menu
[Communication]:		All the parameters in the [1.9 COMMUNICATION] menu
[Prog. control. inside card]:		All the parameters in the [1.14 PROGRAMMABLE CARD] menu

[4. PASSWORD] (COd-)

With graphic display terminal:

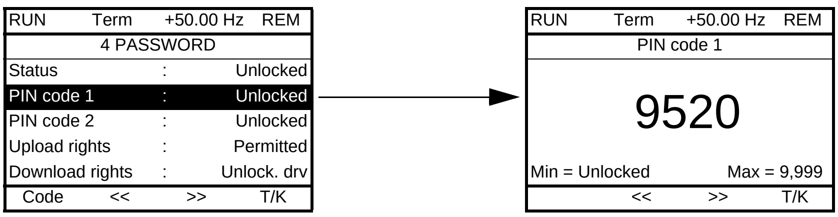


With integrated display terminal:



Enables the configuration to be protected with an access code or a password to be entered in order to access a protected configuration.

Example with graphic display terminal:



- The drive is unlocked when the PIN codes are set to [Unlocked] (OFF) (no password) or when the correct code has been entered. All menus are visible.
- Before protecting the configuration with an access code, you must:
  - Define the [Upload rights] (ULr) and [Download rights] (dLr).
  - Make a careful note of the code and keep it in a safe place where you will always be able to find it.
- The drive has 2 access codes, enabling 2 access levels to be set up.
  - PIN code 1 is a public unlock code: 6969.
  - PIN code 2 is an unlock code known only to Schneider Electric Product Support. It can only be accessed in [Expert] mode.
  - Only one PIN1 or PIN2 code can be used – the other must remain set to [OFF] (OFF).

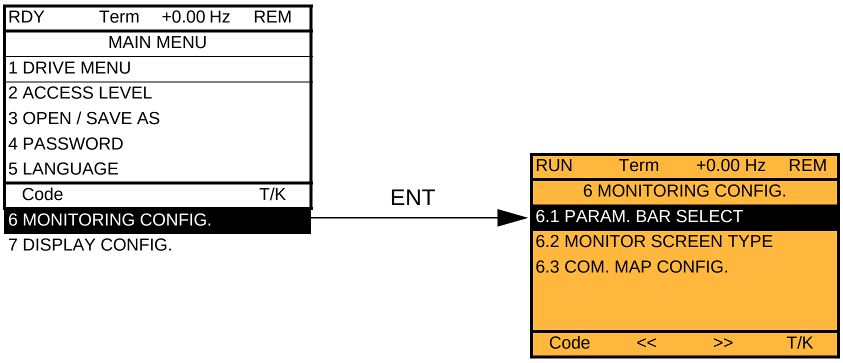
Note: When the unlock code is entered, the user access code appears.

The following items are access-protected:
- Return to factory settings ([1.12 FACTORY SETTINGS] (FCS-) menu.
- The channels and parameters protected by the [1.13 USER MENU] as well as the menu itself.
- The custom display settings ([7 DISPLAY CONFIG.] menu).

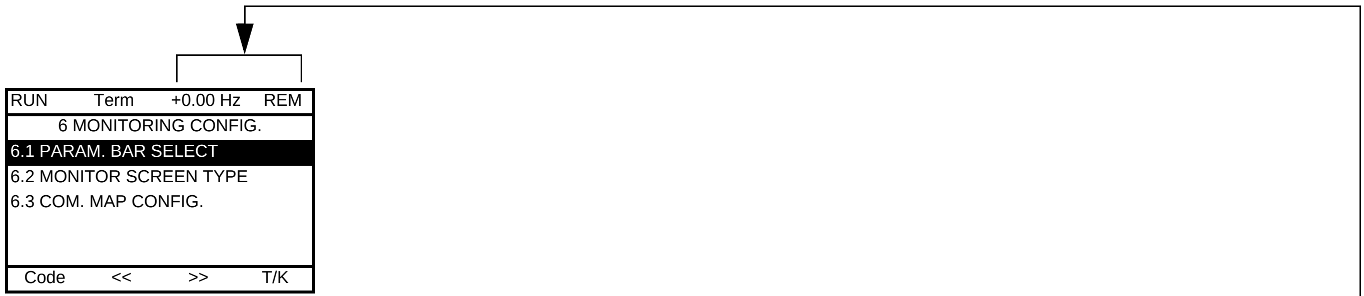
Code	Name/Description	Adjustment range	Factory setting
CSt	❑ **[Status]** Information parameter, cannot be modified.		[Unlocked] (ULC)
LC	☐ **[Locked]** (LC): The drive is locked by a password.		
ULC	☐ **[Unlocked]** (ULC): The drive is not locked by a password.		
COd	❑ **[PIN code 1]** 1st access code. The value [OFF] (OFF) indicates that no password has been set [Unlocked]. The value [ON] (On) indicates that the drive is protected and an access code must be entered in order to unlock it. Once the correct code has been entered, it remains on the display and the drive is unlocked until the next time the power supply is disconnected. - PIN code 1 is a public unlock code: 6969.	OFF to 9,999	[OFF] (OFF)
COd2	❑ **[PIN code 2]** Parameter can only be accessed in [Expert] mode. 2nd access code. The value [OFF] (OFF) indicates that no password has been set [Unlocked]. The value [ON] (On) indicates that the drive is protected and an access code must be entered in order to unlock it. Once the correct code has been entered, it remains on the display and the drive is unlocked until the next time the power supply is disconnected. - PIN code 2 is an unlock code known only to Schneider Electric Product Support. When [PIN code 2] (COd2) is not set to OFF, the [1.2 MONITORING] (SUP-) menu is the only one visible. Then if [PIN code 2] (COd2) is set to OFF (drive unlocked), all menus are visible. If the display settings are modified in [7 DISPLAY CONFIG.] menu, and if [PIN code 2] (COd2) is not set to OFF, the visibility configured is kept. Then if [PIN code 2] (COd2) is set to OFF (drive unlocked), the visibility configured in [7 DISPLAY CONFIG.] menu is kept.	OFF to 9,999	[OFF] (OFF)
ULr	❑ **[Upload rights]** Read or copy the current configuration to the drive		[Permitted] (ULr0)
ULr0	☐ **[Permitted]** (ULr0): The current drive configuration can always be uploaded to the graphic display terminal or PowerSuite.		
ULr1	☐ **[Not allowed]** (ULr1): The current drive configuration can only be uploaded to the graphic display terminal or PowerSuite if the drive is not protected by an access code or if the correct code has been entered.		
dLr	❑ **[Download rights]** Writes the current configuration to the drive or downloads a configuration to the drive		[Unlock. drv] (dLr1)
dLr0	☐ **[Locked drv]** (dLr0): A configuration file can only be downloaded to the drive if the drive is protected by an access code, which is the same as the access code for the configuration to be downloaded.		
dLr1	☐ **[Unlock. drv]** (dLr1): A configuration file can be downloaded to the drive or a configuration in the drive can be modified if the drive is unlocked (access code entered) or is not protected by an access code.		
dLr2	☐ **[not allowed]** (dLr2): Download not authorized.		
dLr3	☐ **[Lock/unlock]** (dLr3): Combination of [Locked drv] (dLr0) and [Unlock. drv] (dLr1).		

[6 MONITORING CONFIG.]

This menu can only be accessed with the graphic display terminal.



This can be used to configure the information displayed on the graphic display screen during operation.



[6.1 PARAM. BAR SELECT]: Selection of 1 to 2 parameters displayed on the top line (the first 2 cannot be modified).

[6.2. MONITOR SCREEN TYPE]: Selection of parameters displayed in the centre of the screen and the display mode (values in digita or bar graph format).

[6.3. COM. MAP CONFIG.]: Selection of the words displayed and their format.

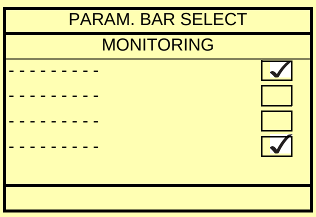
Name/Description

[6.1 PARAM. BAR SELECT]

☐ **[Alarm groups]**	
☐ **[Frequency ref.]**	in Hz: parameter displayed in factory configuration
☐ **[Output frequency]**	in Hz
☐ **[Motor current]**	in A
☐ **[Motor speed]**	in rpm
☐ **[Motor voltage]**	in V
☐ **[Motor power]**	in W
☐ **[Motor torque]**	as a %
☐ **[Mains voltage]**	in V
☐ **[Motor thermal state]**	as a %
☐ **[Drv. thermal state]**	as a %
☐ **[DBR thermal state]**	as a %
☐ **[Input Power]**	in W or kW depending on drive rating
☐ **[Consumption]**	in Wh or kWh depending on drive rating
☐ **[Run time]**	in hours (length of time the motor has been switched on)
☐ **[Power on time]**	in hours (length of time the drive has been switched on)
☐ **[IGBT alarm counter]**	in seconds (total time of IGBT overheating alarms)
☐ **[PID reference]**	as a %
☐ **[PID feedback]**	as a %
☐ **[PID error]**	as a %
☐ **[PID Output]**	in Hz
☐ **[- - - - 2]**	Word generated by the Controller Inside card (can be accessed if the card has been inserted)
to	
☐ **[- - - - 6]**	Word generated by the Controller Inside card (can be accessed if the card has been inserted)
☐ **[Config. active]**	CNFO, 1 or 2 (see page 176)
☐ **[Utilised param. set]**	SET1, 2 or 3 (see page 174)
☐ **[Local / Remote]**	Display factory configuration. “LOC” appears if the command and reference are set via the graphic display terminal; otherwise, “REM” appears. This corresponds to the state selected by the [T/K] function key, page 120.

Select the parameter using ENT (a ☑ then appears next to the parameter). Parameter(s) can also be deselected using ENT.
1 or 2 parameters can be selected.

Example:



Name/Description

[6.2. MONITOR SCREEN TYPE]

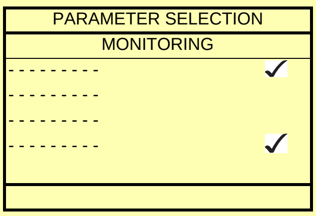
[Display value type]

- **[Digital]**: Display of one or two digital values on the screen (factory configuration).
- **[Bar graph]**: Display of one or two bar graphs on the screen.
- **[List]**: Display a list of between one and five values on the screen.

[PARAMETER SELECTION]

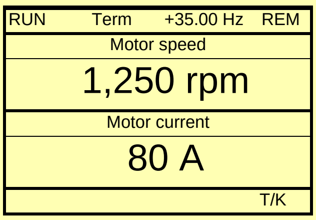
[Alarm groups]	can only be accessed if [Display value type] = [List]
[Frequency ref.]	in Hz: parameter displayed in factory configuration
[Output frequency]	in Hz
[Motor current]	in A
[Motor speed]	in rpm
[Motor voltage]	in V
[Motor power]	in W
[Motor torque]	as a %
[Mains voltage]	in V
[Motor thermal state]	as a %
[Drv. thermal state]	as a %
[DBR thermal state]	as a %
[Input Power]	in W or kW depending on drive rating
[Consumption]	in Wh or kWh depending on drive rating
[Run time]	in hours (length of time the motor has been switched on)
[Power on time]	in hours (length of time the drive has been switched on)
[IGBT alarm counter]	in seconds (total time of IGBT overheating alarms)
[PID reference]	as a %
[PID feedback]	as a %
[PID error]	as a %
[PID Output]	in Hz
[- - - - 2]	Word generated by the Controller Inside card (can be accessed if the card has been inserted)
to	
[- - - - 6]	Word generated by the Controller Inside card (can be accessed if the card has been inserted)
[Config. active]	CNFO, 1 or 2 (see page 176), can only be accessed if [Display value type] = [List]
[Utilised param. set]	SET1, 2 or 3 (see page 174), can only be accessed if [Display value type] = [List]

Select the parameter(s) using ENT (a ✓ then appears next to the parameter). Parameter(s) can also be deselected using ENT.

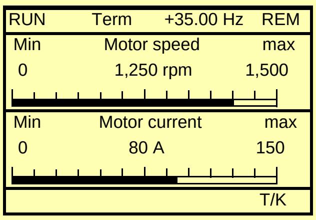


Examples:

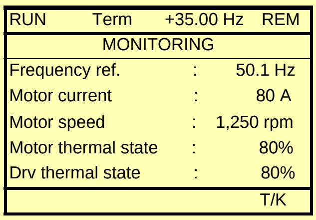
Display of 2 digital values



Display of 2 bar graphs



Display of a list of 5 values



Name/Description

[6.3. COM. MAP CONFIG.]

[Word 1 add. select.]

Select the address of the word to be displayed by pressing the <<, >> (F2 and F3) keys and rotating the navigation button.

[Format word 1]

Format of word 1.

- **[Hex]**: Hexadecimal
- **[Signed]**: Decimal with sign
- **[Unsigned]**: Decimal without sign

[Word 2 add. select.]

Select the address of the word to be displayed by pressing the <<, >> (F2 and F3) keys and rotating the navigation button.

[Format word 2]

Format of word 2.

- **[Hex]**: Hexadecimal
- **[Signed]**: Decimal with sign
- **[Unsigned]**: Decimal without sign

[Word 3 add. select.]

Select the address of the word to be displayed by pressing the <<, >> (F2 and F3) keys and rotating the navigation button.

[Format word 3]

Format of word 3.

- **[Hex]**: Hexadecimal
- **[Signed]**: Decimal with sign
- **[Unsigned]**: Decimal without sign

[Word 4 add. select.]

Select the address of the word to be displayed by pressing the <<, >> (F2 and F3) keys and rotating the navigation button.

[Format word 4]

Format of word 4.

- **[Hex]**: Hexadecimal
- **[Signed]**: Decimal with sign
- **[Unsigned]**: Decimal without sign

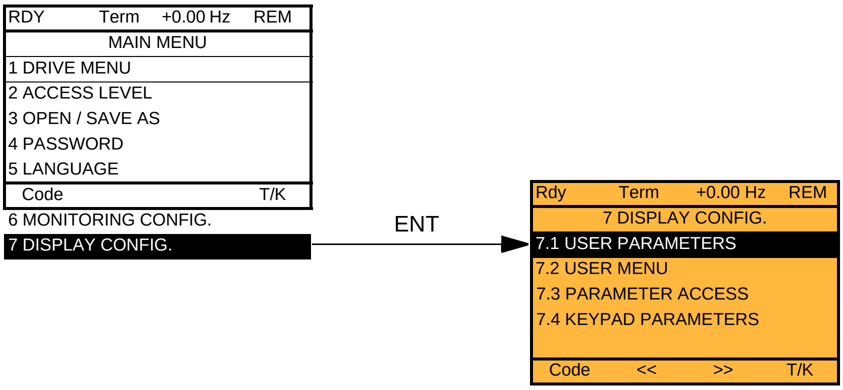
It will then be possible to view the selected words in the [COMMUNICATION MAP] submenu of the [1.2 MONITORING] menu.
Example:

```
RUN       Term    +35.00 Hz   REM
      COMMUNICATION MAP
- - - - - - - -- -
- - - - -- - - - -
W3141        :  F230 Hex

           <<       >>       T/K
```

[7 DISPLAY CONFIG.]

This menu can only be accessed with the graphic display terminal. It can be used to customize parameters or a menu and to access parameters.



7.1 USER PARAMETERS: Customization of 1 to 15 parameters.

7.2 USER MENU: Creation of a customized menu.

7.3 PARAMETER ACCESS: Customization of the visibility and protection mechanisms of menus and parameters.

7.4 KEYPAD PARAMETERS: Adjustment of the contrast and stand-by mode of the graphic display terminal (parameters stored in the terminal rather than in the drive). Choice of the menu displayed on power up.

If [Return std name] = [Yes] the display reverts to standard but the custom settings remain stored.

RDY Term +0.00 Hz REM
7.1 USER PARAMETERS
Return std name : No
PARAMETER SELECTION
CUSTOMIZED SELECTION
USER MENU NAME
DEVICE NAME
Code << >> T/K
SERVICE MESSAGE
CONFIGURATION 0
CONFIGURATION 1
CONFIGURATION 2
ATV SERIAL NUMBER

ENT

PARAMETER SELECTION
1 DRIVE MENU
1.1 SIMPLY START
1.2 MONITORING
1.3 SETTINGS
1.4 MOTOR CONTROL
1.5 INPUTS / OUTPUTS CFG
Code << >> T/K

ENT

PARAMETER SELECTION
1.3 SETTINGS
Ramp increment ✓
Acceleration
Deceleration
Acceleration 2
Deceleration 2
List

Selection of 1 to 15 parameters to be customized

List

Note: The 1st line is [PARAMETER SELECTION] or [RDY Term +0.00 Hz REM] depending on the path (ENT or List).

ENT

RDY Term +0.00 Hz REM
CUSTOMIZED SELECTION
Ramp increment
Acceleration
Speed prop. gain
Delete

List of customized parameters

ENT

RDY Term +0.00 Hz REM
Ramp increment
User name
Unit
Multiplier
Divisor
Offset

ENT

RDY Term +0.00 Hz REM
User name
FLOW REFERENCE
Nb characters max. 13
ABC << >>

If no custom settings have been made, the standard value appears (names, units, etc.).

Display on 1 or 2 lines of characters

Offsets and coefficients are numerical values. Do not use too high a multiplier (99,999 – max display).

Use F1 to change to ABC, abc, 123, *[-.
Use the navigation selector button to increment the character (alphabetical order) and << and >> (F2 and F3) to switch to the next or previous character respectively.

ENT

- Standard: use of the factory set unit
- Customized: customization of the unit
-%, mA, etc.: select from drop-down list

RDY Term +0.00 Hz REM
Unit
Standard ✓
Customized
%
mA
T/K

RDY Term +0.00 Hz REM
Customized
LBS
Nb characters max. 3
ABC << >>

Once you have entered the unit, if you press ENT, the Ramp increment screen will re-appear in order to display the name. Press ESC to return to Unit.

RDY Term +0.00 Hz REM
SERVICE MESSAGE
LINE 1
LINE 2
LINE 3
LINE 4
LINE 5
View T/K

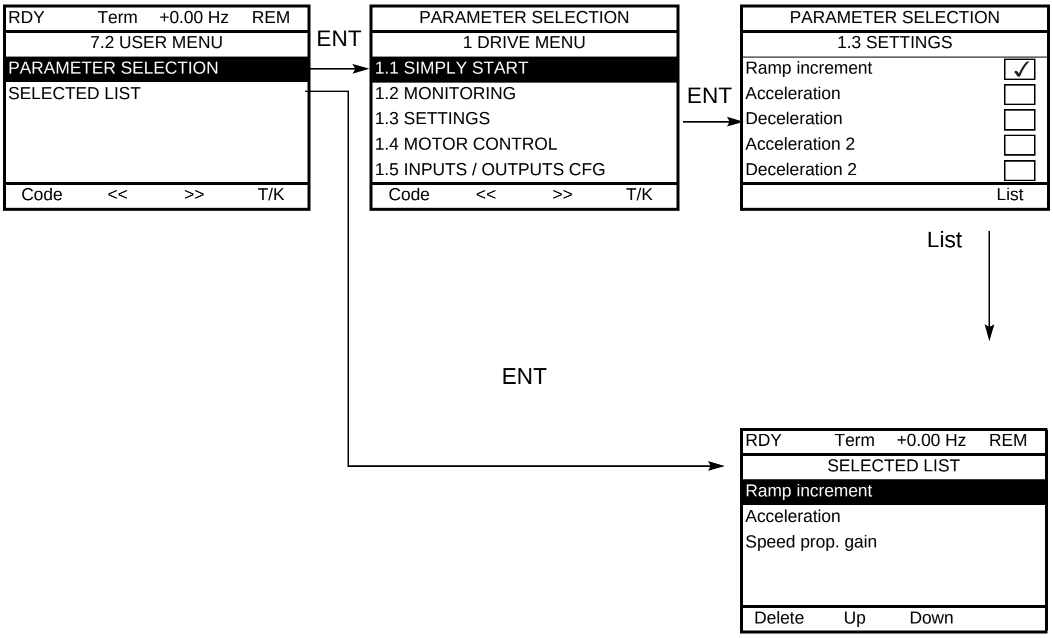
The message entered appears while the "View" button is pressed.

ENT

RDY Term +0.00 Hz REM
LINE 2
For any service, dial:
Nb characters max. 23
ABC << >> T/K

RDY Term +0.00 Hz REM
USER MENU NAME
FLOW REFERENCE
Nb characters max. 18
ABC << >> T/K

Names (USER MENU NAME, DRIVE NAME, configuration, serial no., lines of messages, names of units, etc.) are customized as in the example of the parameter name shown opposite.
If no custom settings have been made, the standard value appears (names, units, etc.).
Display on 1 or 2 lines of characters.
Use F1 to change to ABC, abc, 123, *[-.
Use the navigation selector button to increment the character (alphabetical order) and << and >> (F2 and F3) to switch to the next or previous character respectively.

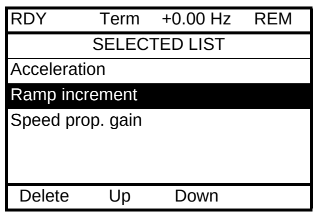


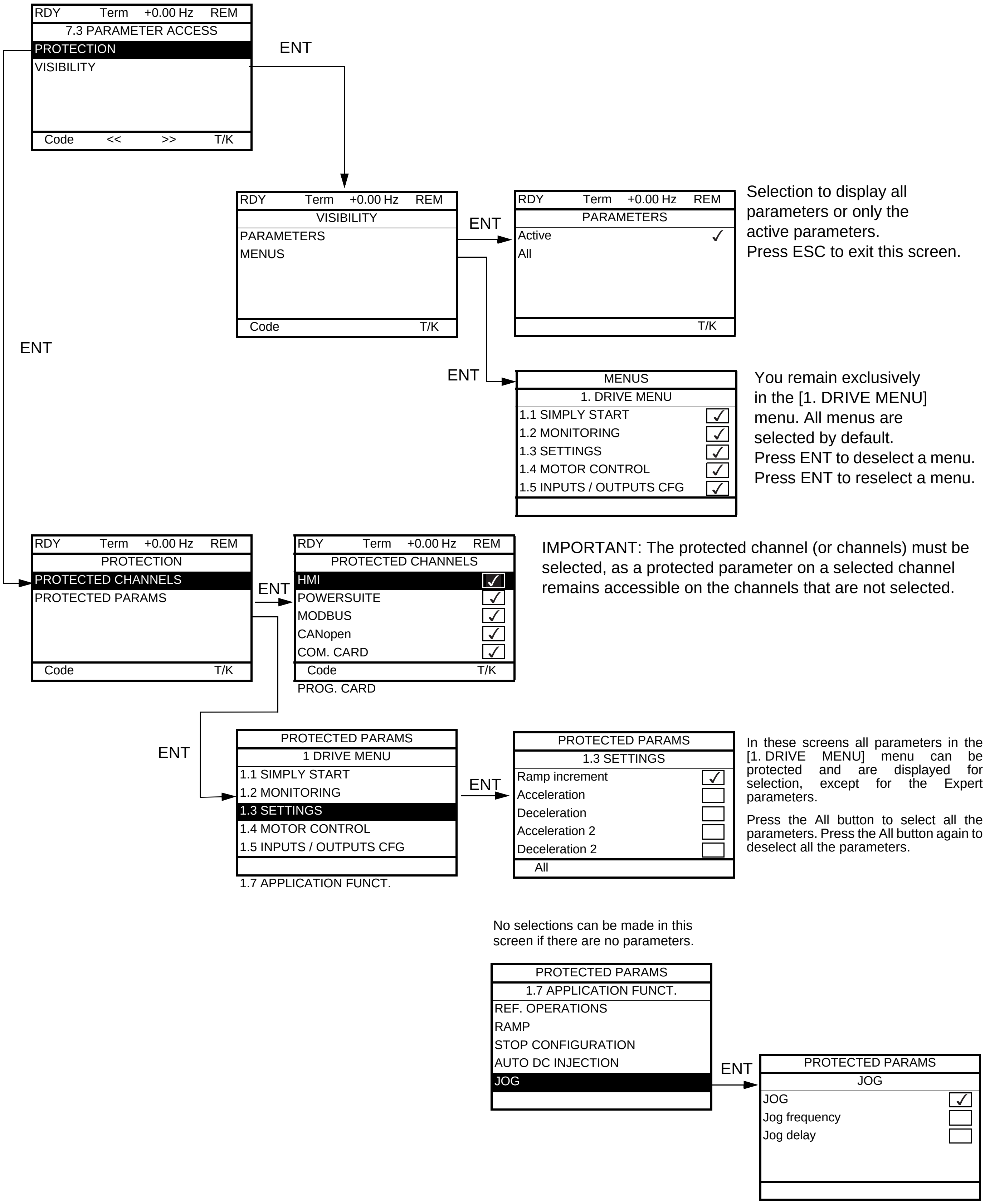
Selection of parameters included in the user menu

Note: The 1st line is [PARAMETER SELECTION] or [RDY Term +0.00 Hz REM] depending on the path (ENT or List).

Parameter list making up the user menu.

Use the F2 and F3 keys to arrange the parameters in the list (example below using F3).





Selection to display all parameters or only the active parameters.
Press ESC to exit this screen.

You remain exclusively in the [1. DRIVE MENU] menu. All menus are selected by default.
Press ENT to deselect a menu.
Press ENT to reselect a menu.

IMPORTANT: The protected channel (or channels) must be selected, as a protected parameter on a selected channel remains accessible on the channels that are not selected.

In these screens all parameters in the [1. DRIVE MENU] menu can be protected and are displayed for selection, except for the Expert parameters.

Press the All button to select all the parameters. Press the All button again to deselect all the parameters.

No selections can be made in this screen if there are no parameters.

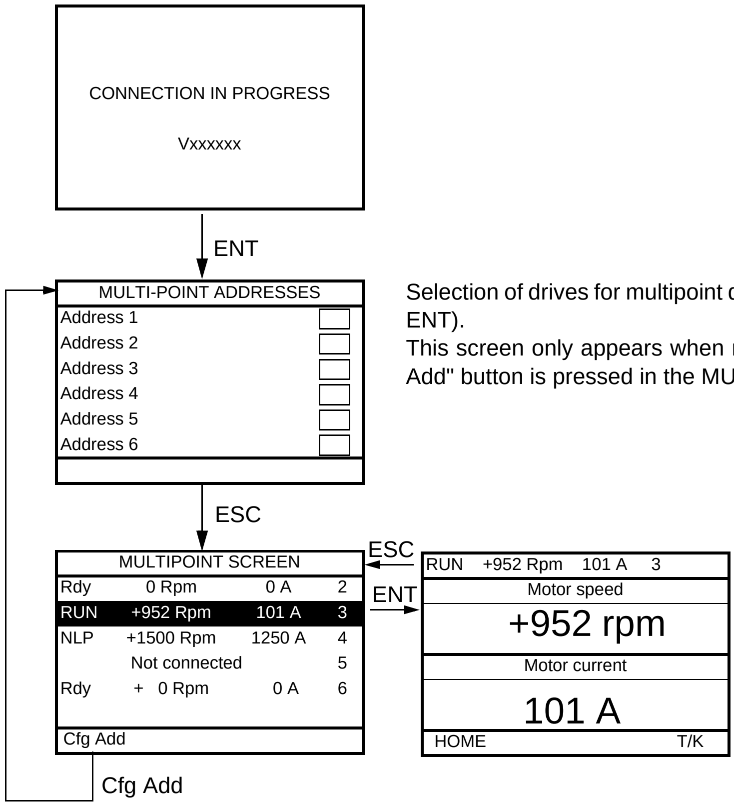
Note: The protected parameters are no longer accessible and are not, therefore, displayed for the selected channels.

RDY	Term	+0.00Hz	REM
7.4 KEYPAD PARAMETERS			
Keypad contrast			
Keypad stand-by			
Power up menu			
Code	<<	>>	T/K

Name/Description	Adjustment range	Factory setting
❑ **[Keypad contrast]**	0 to 100%	50%
Adjustment of contrast on the graphic display unit		
❑ **[Keypad stand-by]**		[5]
Configures and adjusts the stand-by mode of the graphic display unit. ☐ **[No]**: No stand-by mode. ☐ **[1]** to **[10]**: Adjusts the time during which the terminal is to remain idle before stand-by mode is triggered, in minutes. After this idle time, the display backlight turns off and the contrast is reduced. The screen returns to normal operation when a key or the navigation button is pressed. It also returns to normal operation if the terminal exits the normal display mode, for example, if a fault occurs.		
❑ **[Power up menu]**		[Main menu]
Choice of menu which appears on the product on power-up ☐ **[Drive menu]**: Displays the drive menu. ☐ **[Sim. start]**: Displays the simply start menu. ☐ **[Monitoring]**: Displays the monitoring menu. ☐ **[Settings]**: Displays the settings menu. ☐ **[Mot. Ctrl]**: Displays the control motor menu. ☐ **[I/O Conf.]**: Displays the inputs / outputs configuration menu. ☐ **[Command]**: Displays the command menu. ☐ **[Appli. fun.]**: Displays the application function menu. ☐ **[Fault mgt]**: Displays the fault management menu. ☐ **[Com.]**: Displays the communication menu. ☐ **[Diagnostics]**: Displays the diagnostics menu. ☐ **[Ident.]**: Displays the identification menu. ☐ **[Factory Set.]**: Displays the factory settings menu. ☐ **[User menu]**: Displays the user menu. ☐ **[CI menu]**: Displays the card CI menu. ☐ **[Main menu]**: Displays the main menu.		

Communication is possible between a graphic display terminal and a number of drives connected on the same bus. The addresses of the drives must be configured in advance in the [1.9 COMMUNICATION] menu using the [Modbus Address] (Add) parameter, page 215.

When a number of drives are connected to the same display terminal, the terminal automatically displays the following screens:



Selection of drives for multipoint dialog (select each address and check it by pressing ENT).
This screen only appears when making a connection for the first time or if the "Cfg Add" button is pressed in the MULTIPOINT SCREEN below.

Selection of a drive for multipoint dialog.

In multipoint mode, the command channel is not displayed. The state, then the 2 selected parameters and the drive address appear from left to right.

All menus can be accessed in multipoint mode. Only drive control via the graphic display terminal is not authorized, apart from the Stop key, which locks all the drives.
If there is a fault on a drive, this drive is displayed.

Servicing

The Altivar 61 does not require any preventive maintenance. It is nevertheless advisable to perform the following regularly:

- Check the condition and tightness of the connections.
- Ensure that the temperature around the unit remains at an acceptable level and that ventilation is effective (average service life of fans: 3 to 5 years depending on the operating conditions).
- Remove any dust from the drive.

Assistance with maintenance, fault display

If a problem arises during setup or operation, first check that the recommendations relating to the environment, mounting and connections have been observed.

The first fault detected is saved and displayed, and the drive locks.
The drive switching to fault mode can be indicated remotely via a logic output or a relay, which can be configured in the [1.5 INPUTS / OUTPUTS CFG] (I-O-) menu, see, for example, [R1 CONFIGURATION] (r1-) page 94.

[1.10 DIAGNOSTICS] menu

This menu can only be accessed with the graphic display terminal. It displays faults and their cause in plain text and can be used to carry out tests, see page 217.

Clearing the fault

Disconnect the drive power supply in the event of a non-resettable fault.
Wait for the display to disappear completely.
Find the cause of the fault in order to correct it.

The drive is unlocked after a fault:

- By switching off the drive until the display disappears completely, then switching on again
- Automatically in the scenarios described for the [AUTOMATIC RESTART] (Atr-) function, page 191
- By means of a logic input or control bit assigned to the [FAULT RESET] (rSt-) function, page 190
- By pressing the STOP/RESET button on the graphic display terminal

[1.2 MONITORING] (SUP-) menu:

This is used to prevent and find the causes of faults by displaying the drive state and its current values.
It can be accessed with the integrated display terminal.

Spares and repairs:

Consult Schneider Electric product support.

Starter does not start, no fault displayed

- If the display does not light up, check the power supply to the drive.
- The assignment of the "Fast stop" or "Freewheel" functions will prevent the drive starting if the corresponding logic inputs are not powered up. The ATV61 then displays [Freewheel] (nSt) in freewheel stop and [Fast stop] (FSt) in fast stop. This is normal since these functions are active at zero so that the drive will be stopped safely if there is a wire break.
- Make sure that the run command input or inputs are activated in accordance with the selected control mode ([2/3 wire control] (tCC) and [2 wire type] (tCt) parameters, page 80).
- If the reference channel or command channel is assigned to a communication bus, when the power supply is connected, the drive will display [Freewheel] (nSt) and remain in stop mode until the communication bus sends a command.

Faults, which cannot be reset automatically

The cause of the fault must be removed before resetting by turning off and then back on.
AI2F, EnF, SOF, SPF, and tnF faults can also be reset remotely by means of a logic input or control bit ([Fault reset] (rSF) parameter, page 190).
EnF, InFA, InFb, SOF, SPF, and tnF faults can be inhibited and cleared remotely by means of a logic input or control bit ([Fault inhibit assign.] (InH) parameter, page 201).

Fault	Name	Probable cause	Remedy
AI2F	[AI2 input]	• Non-conforming signal on analog input AI2	• Check the wiring of analog input AI2 and the value of the signal • If necessary, modify the fault configuration via [AI2 4-20mA loss] (LFL2), page 200
bOF	[DBR overload]	• The braking resistor is under excessive stress	• Check the size of the resistor and wait for it to cool down • Check the [DB Resistor Power] (brP) and [DB Resistor value] (brU) parameters, page 206.
bUF	[DB unit sh. Circuit]	• Short-circuit output from braking unit • Braking unit not connected	• Check the wiring of the braking unit and the resistor • Check the braking resistor • The monitoring of this fault must be disabled by the [Brake res. fault Mgt] (bUb) parameter, page 206 if there is no braking unit or resistor connected to the drive, at and above 55 kW (75 HP) for ATV61H●●●M3X and at and above 90 kW (120 HP) for ATV61H●●●N4.
CrF1	[Precharge]	• Load relay control fault or charging resistor damaged	• Switch the drive off and then back on again • Check the internal connections • Inspect/repair the drive
CrF2	[Thyr. soft charge]	• DC bus charging fault (thyristors)	
dCF	[Differential curent Fault]	• Current difference between power block A and B (ATV61EC60 ... M14N4 or ATVEM15...M24Y only)	• Check thyristor with [TEST THYRISTORS] • Check IGBT with [TRANSISTOR TEST] • Check current transformer
EEF1	[Control Eeprom]	• Internal memory fault, control card	• Check the environment (electromagnetic compatibility) • Turn off, reset, return to factory settings • Inspect/repair the drive
EEF2	[Power Eeprom]	• Internal memory fault, power card	
EnF	[Encoder]	• Encoder feedback fault	• Check [Number of pulses] (PGI) and [Encoder type] (EnS) page 73 • Check that the encoder's mechanical and electrical operation, its power supply and connections are all correct • If necessary, reverse the direction of rotation of the motor ([Output Ph rotation] (PHr) parameter, page 66) or the encoder signals
FCF1	[Out. contact. stuck]	• The output contactor remains closed although the opening conditions have been met	• Check the contactor and its wiring • Check the feedback circuit
Fd2	[Damper open]	• The damper remains open although the closing conditions have been met	• Check the damper and its wiring • Check the feedback circuit • Check the time delay for the function, page 172
HdF	[IGBT desaturation]	• Short-circuit or grounding at the drive output	• Check the cables connecting the drive to the motor, and the insulation of the motor • Perform the diagnostic tests via the [1.10 DIAGNOSTICS] menu.

Faults, which cannot be reset automatically (continued)

Fault	Name	Probable cause	Remedy
ILF	[internal com. link]	• Communication fault between option card and drive	• Check the environment (electromagnetic compatibility) • Check the connections • Check that no more than 2 option cards (max. permitted) have been installed on the drive • Replace the option card • Inspect/repair the drive
InF1	[Rating error]	• The power card is different from the card stored	• Check the reference of the power card
InF2	[Incompatible PB]	• The power card is incompatible with the control card	• Check the reference of the power card and its compatibility
InF3	[Internal serial link]	• Communication fault between the internal cards	• Check the internal connections • Inspect/repair the drive
InF4	[Internal MFG area]	• Internal data inconsistent	• Recalibrate the drive (performed by Schneider Electric Product Support)
InF6	[Internal-option]	• The option installed in the drive is not recognized	• Check the reference and compatibility of the option
InF7	[Internal-hard init.]	• Initialization of the drive is incomplete	• Turn off and reset
InF8	[Internal-ctrl supply]	• The control power supply is incorrect	• Check the control section power supply
InF9	[Internal- I measure]	• The current measurements are incorrect	• Replace the current sensors or the power card • Inspect/repair the drive
InFA	[Internal-mains circuit]	• The input stage is not operating correctly	• Perform the diagnostic tests via the [1.10 DIAGNOSTICS] menu. • Inspect/repair the drive
InFb	[Internal- th. sensor]	• The drive temperature sensor is not operating correctly • The braking unit's temperature sensor is not operating correctly	• Replace the temperature sensor • Inspect/repair the drive • Replace the braking unit's temperature sensor • Inspect/repair the braking unit • The monitoring of this fault must be disabled by the [Brake res. fault Mgt] (bUb) parameter, page 206 if there is no braking unit connected to the drive
InFC	[Internal-time meas.]	• Fault on the electronic time measurement component	• Inspect/repair the drive
InFE	[internal- CPU]	• Internal microprocessor fault	• Turn off and reset. Inspect/repair the drive
OCF	[Overcurrent]	• Parameters in the [SETTINGS] (SEt-) and [1.4 MOTOR CONTROL] (drC-) menus are not correct • Inertia or load too high • Mechanical locking	• Check the parameters • Check the size of the motor/drive/load • Check the state of the mechanism
PrF	[Power removal]	• Fault with the drive's "Power removal" safety function	• Inspect/repair the drive
SCF1	[Motor short circuit]	• Short-circuit or grounding at the drive output	• Check the cables connecting the drive to the motor, and the insulation of the motor • Perform the diagnostic tests via the [1.10 DIAGNOSTICS] menu. • Reduce the switching frequency • Connect chokes in series with the motor • Check the adjustment of speed loop and brake
SCF2	[Impedant sh. circuit]		
SCF3	[Ground short circuit]	• Significant earth leakage current at the drive output if several motors are connected in parallel	
SOF	[Overspeed]	• Instability or driving load too high	• Check the motor, gain and stability parameters • Add a braking resistor • Check the size of the motor/drive/load • Check the parameter settings for the [FREQUENCY METER] (FqF-) function, page 205, if it is configured

Faults, which cannot be reset automatically (continued)

Fault	Name	Probable cause	Remedy
SPF	[Speed fdback loss]	• Encoder feedback signal missing • No signal on "Pulse input", if the input is used for speed measurement	• Check the wiring between the encoder and the drive • Check the encoder • Check the wiring of the input and the detector used
tnF	[Auto-tuning]	• Special motor or motor whose power is not suitable for the drive • Motor not connected to the drive	• Check that the motor/drive are compatible • • Check that the motor is present during auto-tuning • If an output contactor is being used, close it during auto-tuning

Faults that can be reset with the automatic restart function, after the cause has disappeared

These faults can also be reset by turning on and off or by means of a logic input or control bit ([Fault reset] (rSF) parameter, page 190). APF, CnF, COF, EPF1, EPF2, FCF2, Fd1, LFF2, LFF3, LFF4, nFF, ObF, OHF, OLC, OLF, OPF1, OPF2, OSF, OtF1, OtF2, OtFL, PHF, PtF1, PtF2, PtFL, SLF1, SLF2, SLF3, SPIF, SSF, tJF, and ULF faults can be inhibited and cleared remotely by means of a logic input or control bit ([Fault inhibit assign.] (InH) parameter, page 201).

Fault	Name	Probable cause	Remedy
APF	[Application fault]	• Controller Inside card fault	• Please refer to the card documentation
CnF	[Com. network]	• Communication fault on communication card	• Check the environment (electromagnetic compatibility) • Check the wiring • Check the time-out • Replace the option card • Inspect/repair the drive
COF	[CAN com.]	• Interruption in communication on the CANopen bus	• Check the communication bus • Check the time-out • Refer to the CANopen User's Manual
EPF1	[External flt-LI/Bit]	• Fault triggered by an external device, depending on user	• Check the device, which caused the fault, and reset
EPF2	[External fault com.]	• Fault triggered by a communication network	• Check for the cause of the fault and reset
FCF2	[Out. contact. open.]	• The output contactor remains open although the closing conditions have been met.	• Check the contactor and its wiring • Check the feedback circuit
Fd1	[Damper stuck]	• The damper remains closed although the opening conditions have been met	• Check the damper and its wiring • Check the feedback circuit • Check the time delay for the function, page 172
LCF	[input contactor]	• The drive is not turned on even though [Mains V. time out] (LCt) has elapsed.	• Check the contactor and its wiring • Check the time-out • Check the line/contactor/drive connection
LFF2 LFF3 LFF4	[AI2 4-20mA loss] [AI3 4-20mA loss] [AI4 4-20mA loss]	• Loss of the 4-20 mA reference on analog input AI2, AI3 or AI4	• Check the connection on the analog inputs • If necessary, modify the fault configuration via [AIx 4-20mA loss] (LFLx), page 200
nFF	[No Flow Fault]	• Zero fluid	• Check and rectify the cause of the fault. • Check the zero fluid detection parameters page 181.
ObF	[Overbraking]	• Braking too sudden or driving load	• Increase the deceleration time • Install a braking resistor if necessary • Activate the [Dec ramp adapt.] (brA) function, page 132, if it is compatible with the application.
OHF	[Drive overheat]	• Power board -PCB over temperature • Braking unit over temperature • Phase module over temperature • Rectifier over temperature	• Check the motor load, the drive ventilation and the ambient temperature. Wait for the drive to cool down before restarting
OLC	[Proc. Overload Flt]	• Process overload	• Check and remove the cause of the overload. • Check the parameters of the [PROCESS UNDERLOAD] (OLd-) function, page 210.
OLF	[Motor overload]	• Triggered by excessive motor current	• Check the setting of the motor thermal protection, check the motor load. Wait for the drive to cool down before restarting
OPF1	[1 motor phase loss]	• Loss of one phase at drive output	• Check the connections from the drive to the motor

Faults that can be reset with the automatic restart function, after the cause has disappeared (continued)

Fault	Name	Probable cause	Remedy
OPF2	[3 motor phase loss]	• Motor not connected or motor power too low • Output contactor open • Instantaneous instability in the motor current	• Check the connections from the drive to the motor • If an output contactor is being used, parameterize [Output Phase Loss] (OPL) = [Output cut] (OAC), page 194 • Test on a low power motor or without a motor: In factory settings mode, motor phase loss detection is active [Output Phase Loss] (OPL) = [Yes] (YES). To check the drive in a test or maintenance environment, without having to use a motor with the same rating as the drive (in particular for high power drives), deactivate motor phase loss detection [Output Phase Loss] (OPL) = [No] (nO) • Check and optimize the [IR compensation] (UFr) page 71, [Rated motor volt.] (UnS) and [Rated mot. current] (nCr) parameters, page 64, and perform [Auto tuning] (tUn), page 66.
OSF	[Mains overvoltage]	• Line voltage too high • Disturbed line supply	• Check the line voltage
OtF1	[PTC1 overheat]	• Overheating of the PTC1 probes detected	• Check the motor load and motor size • Check the motor ventilation • Wait for the motor to cool before restarting • Check the type and state of the PTC probes
OtF2	[PTC2 overheat]	• Overheating of the PTC2 probes detected	
OtFL	[LI6=PTC overheat]	• Overheating of PTC probes detected on input LI6	
PtF1	[PTC1 probe]	• PTC1 probes open or short-circuited	• Check the PTC probes and the wiring between them and the motor/drive
PtF2	[PTC2 probe]	• PTC2 probes open or short-circuited	
PtFL	[LI6=PTC probe]	• PTC probes on input LI6 open or short-circuited	
SCF4	[IGBT short circuit]	• Power component fault	• Perform a test via the [1.10 DIAGNOSTICS] menu. • Inspect/repair the drive
SCF5	[Motor short circuit]	• Short-circuit at drive output	• Check the cables connecting the drive to the motor, and the motor's insulation • Perform tests via the [1.10 DIAGNOSTICS] menu. • Inspect/repair the drive
SLF1	[Modbus com.]	• Interruption in communication on the Modbus bus	• Check the communication bus • Check the time-out • Refer to the Modbus User's Manual
SLF2	[PowerSuite com.]	• Fault communicating with PowerSuite	• Check the PowerSuite connecting cable • Check the time-out
SLF3	[HMI com.]	• Fault communicating with the graphic display terminal	• Check the terminal connection • Check the time-out
SPIF	[PI Feedback]	• PID feedback below lower limit	• Check the PID function feedback. • Check the PID feedback supervision threshold and time delay, page 155.
SSF	[Torque/current lim]	• Switch to torque limitation	• Check if there are any mechanical problems • Check the parameters of [TORQUE LIMITATION] (tLA-) page 164 and the parameters of the [TORQUE OR I LIM. DETECT.] (tId-) fault, page 203).
tJF	[IGBT overheat]	• Drive overheated	• Check the size of the load/motor/drive • Reduce the switching frequency • Wait for the motor to cool before restarting
ULF	[Proc. Underload Flt]	• Process underload	• Check and remove the cause of the underload. • Check the parameters of the [PROCESS OVERLOAD] (ULd-) function, page 209.

Faults that can be reset as soon as their causes disappear

The USF fault can be inhibited and cleared remotely by means of a logic input or control bit ([Fault inhibit assign.] (InH) parameter, page 201).

Fault	Name	Probable cause	Remedy
CFF	[Incorrect config.]	• changed or removed • The current configuration is inconsistent	• Check that there are no card errors. • In the event of the option card being changed/removed deliberately, see the remarks below • Return to factory settings or retrieve the backup configuration, if it is valid (see page 222)
CFI	[Invalid config.]	• Invalid configuration The configuration loaded in the drive via the bus or communication network is inconsistent.	• Check the configuration loaded previously • Load a compatible configuration
HCF	[Cards pairing]	• The [CARDS PAIRING] (PPI-) function, page 207, has been configured and a drive card has been changed	• In the event of a card error, reinsert the original card • Confirm the configuration by entering the [Pairing password] (PPI) if the card was changed deliberately
PHF	[Input phase loss]	• Drive incorrectly supplied or a fuse blown • Failure of one phase • 3-phase ATV61 used on a single-phase line supply • Unbalanced load This protection only operates with the drive on load	• Check the power connection and the fuses. • Use a 3-phase line. • Disable the fault by [Input phase loss] (IPL) = [No] (nO). (page 195)
PrtF	[Power Ident]	• The [Power Identification] (Prt) parameter, page 72, is incorrect. • Control card replaced by a control card configured on a drive with a different rating	• Enter the correct parameter (reserved for Schneider Electric product support). • Check that there are no card errors. • In the event of the control card being changed deliberately, see the remarks below
USF	[Undervoltage]	• Line supply too low • Transient voltage dip • Damaged pre-charge resistor	• Check the voltage and the parameters of [UNDERVOLTAGE MGT] (USb-), page 198 • Replace the pre-charge resistor • Inspect/repair the drive

Option card changed or removed

When an option card is removed or replaced by another, the drive locks in [Incorrect config.] (CFF) fault mode on power-up. If the card has been deliberately changed or removed, the fault can be cleared by pressing the ENT key twice, which **causes the factory settings to be restored** (see page 222) for the parameter groups affected by the card. These are as follows:

Card replaced by a card of the same type

- I/O cards: [Drive menu] (drM)
- Encoder cards: [Drive menu] (drM)
- Communication cards: Only the parameters that are specific to communication cards
- Controller Inside cards: [Prog. card menu] (PLC)

Card removed (or replaced by a different type of card)

- I/O card: [Drive menu] (drM)
- Encoder card: [Drive menu] (drM)
- Communication card: [Drive menu] (drM) and parameters specific to communication cards
- Controller Inside card: [Drive menu] (drM) and [Prog. card menu] (PLC)

Control card changed

When a control card is replaced by a control card configured on a drive with a different rating, the drive locks in [Power Ident] (PrtF) fault mode on power-up. If the card has been deliberately changed, the fault can be cleared by modifying the [Power Identification] (Prt) parameter, page 72, which **causes all the factory settings to be restored.**

[1.1 SIMPLY START] (SIM-) menu

Code	Name	Factory setting	Customer setting
tCC	[2/3 wire control]	[2 wire] (2C)	
CFG	[Macro configuration]	[Start/Stop] (StS)	
bFr	[Standard mot. freq]	[50 Hz] (50)	
IPL	[Input phase loss]	According to drive rating	
nPr	[Rated motor power]	According to drive rating	
UnS	[Rated motor volt.]	According to drive rating	
nCr	[Rated mot. current]	According to drive rating	
FrS	[Rated motor freq.]	50 Hz	
nSP	[Rated motor speed]	According to drive rating	
tFr	[Max frequency]	60 Hz	
PHr	[Output Ph rotation]	ABC	
ItH	[Mot. therm. current]	According to drive rating	
ACC	[Acceleration]	3.0 s	
dEC	[Deceleration]	3.0 s	
LSP	[Low speed]	0	
HSP	[High speed]	50 Hz	

Functions assigned to I/O

Inputs Outputs	Functions assigned
LI1	
LI2	
LI3	
LI4	
LI5	
LI6	
LI7	
LI8	
LI9	
LI10	
LI11	
LI12	
LI13	
LI14	

Inputs Outputs	Functions assigned
LO1	
LO2	
LO3	
LO4	
AI1	
AI2	
AI3	
AI4	
R1	
R2	
R3	
R4	
RP	
Encoder	

Other parameters (table to be created by the user)

Code	Name	Customer setting

Code	Name	Customer setting

Index of functions

Index of parameter codes

Code	Page										
	[1.1 SIMPLY START] (SIM-)	[1.2 MONITORING] (SUP-)	[1.3 SETTINGS] (SEt-)	[1.4 MOTOR CONTROL] (drC-)	[1.5 INPUTS / OUTPUTS CFG] (I-O-)	[1.6 COMMAND] (CtL-)	[1.7 APPLICATION FUNCT.] (FUn-)	[1.8 FAULT MANAGEMENT] (FLt-)	[1.9 COMMUNICATION] (COM-)	[1.12 FACTORY SETTINGS] (FCS-)	[4 PASSWORD] (COd-)
A1C-					107						
A2C-					107						
A3C-					107						
AC2			48				131 144 153				
ACC	37		48				129				
AdC							135				
AdCO									215		
Add									215		
AI1A		45			85						
AI1E					85						
AI1F					85						
AI1S					85						
AI1t					85						
AI2A		45			86						
AI2E					86						
AI2F					86						
AI2L					86						
AI2S					86						
AI2t					86						
AI3A		45			87						
AI3E					87						
AI3F					87						
AI3L					87						
AI3S					87						
AI3t					87						
AI4A		45			88						
AI4E					88						
AI4F					88						
AI4L					88						
AI4S					88						
AI4t					88						
AIC1					89		151				
AFE							185				
ALGr		46									
AMOA									215		

Index of parameter codes

Code	Page										
	[1.1 SIMPLY START] (SIM-)	[1.2 MONITORING] (SUP-)	[1.3 SETTINGS] (SEt-)	[1.4 MOTOR CONTROL] (drC-)	[1.5 INPUTS / OUTPUTS CFG] (I-O-)	[1.6 COMMAND] (CtL-)	[1.7 APPLICATION FUNCT.] (FUn-)	[1.8 FAULT MANAGEMENT] (FLt-)	[1.9 COMMUNICATION] (COM-)	[1.12 FACTORY SETTINGS] (FCS-)	[4 PASSWORD] (COd-)
AMOC									215		
AO1					103						
AO1F					104						
AO1t					103						
AO2					105						
AO2F					105						
AO2t					105						
AO3					106						
AO3F					106						
AO3t					106						
AOH1					103						
AOH2					105						
AOH3					106						
AOL1					103						
AOL2					105						
AOL3					106						
ASH1					104						
ASH2					105						
ASH3					106						
ASL1					104						
ASL2					105						
ASL3					106						
Atr								191			
AUt				66							
bbA				78							
bdCO									215		
bFr	35		64								
brA							132				
brO								206			
brP								206			
brU								206			
bSP					83						
bUb								206			
CCFG	34										
CCS						118					
Cd1						118					

Index of parameter codes

Code	Page										
	[1.1 SIMPLY START] (SIM-)	[1.2 MONITORING] (SUP-)	[1.3 SETTINGS] (SEt-)	[1.4 MOTOR CONTROL] (drC-)	[1.5 INPUTS / OUTPUTS CFG] (I-O-)	[1.6 COMMAND] (CtL-)	[1.7 APPLICATION FUNCT.] (FUn-)	[1.8 FAULT MANAGEMENT] (FLt-)	[1.9 COMMUNICATION] (COM-)	[1.12 FACTORY SETTINGS] (FCS-)	[4 PASSWORD] (COd-)
Cd2						118					
CFG	34										
CFPS		46									
CHA1							174				
CHA2							174				
CHCF						117					
CH1							183				
CHM							179				
CHt			62				183				
CL2			54				166				
CL1			54	75			166				
CLL								202			
CLO-		46									
CnF1							179				
CnF2							179				
CnFS		46									
COd											228
COd2											228
COL								202			
COP						119					
CrH2					86						
CrH3					87						
CrH4					88						
CrL2					86						
CrL3					87						
CrL4					88						
CSt											228
Ctd			59								
CtdL			59								
Ctt				67							
dA2							128				
dA3							128				
dAM							172				
dAS							170				
dbS							170				
dCF			52				133	212			

Index of parameter codes

Code	Page										
	[1.1 SIMPLY START] (SIM-)	[1.2 MONITORING] (SUP-)	[1.3 SETTINGS] (SEt-)	[1.4 MOTOR CONTROL] (drC-)	[1.5 INPUTS / OUTPUTS CFG] (I-O-)	[1.6 COMMAND] (CtL-)	[1.7 APPLICATION FUNCT.] (FUn-)	[1.8 FAULT MANAGEMENT] (FLt-)	[1.9 COMMUNICATION] (COM-)	[1.12 FACTORY SETTINGS] (FCS-)	[4 PASSWORD] (COd-)
dC1							134				
dCO							184				
dE2			48				131, 144				
dEC	37		48				129				
dFb							172				
dFL			62				183				
dLr											228
dO1					100						
dO1d					100						
dO1H					100						
dO1S					100						
dS1							144				
dSP							142				
EF1					93						
EFr					93						
E1L					93						
EnC				74	92						
EnS				73	92						
EnU				74	93						
EPL								197			
ErCO									215		
EtF								197			
F1				68							
F2				68							
F2d			59								
F2dL			59								
F3				68							
F4				69							
F5				69							
Fbtd							172				
FCP				69							
FCS1										222	
FdL								211			
Fdt								205			
FFd			62				162				

Index of parameter codes

Code	Page										
	[1.1 SIMPLY START] (SIM-)	[1.2 MONITORING] (SUP-)	[1.3 SETTINGS] (SEt-)	[1.4 MOTOR CONTROL] (drC-)	[1.5 INPUTS / OUTPUTS CFG] (I-O-)	[1.6 COMMAND] (CtL-)	[1.7 APPLICATION FUNCT.] (FUn-)	[1.8 FAULT MANAGEMENT] (FLt-)	[1.9 COMMUNICATION] (COM-)	[1.12 FACTORY SETTINGS] (FCS-)	[4 PASSWORD] (COd-)
FFt			60				133				
FLI							146				
FLO									216		
FLOC									216		
FLOt									216		
FLr								192			
FLU			55				146				
FPI							153				
FqA								205			
FqC								205			
FqF								205			
FqL			59								
FqS		44, 46									
Fr1						117					
Fr1b							127				
Fr2						118					
FrH		46									
FrS	35		64								
FrSS				70							
Frt							131				
FrY-										222	
FSt							133				
Ftd			59								
FtdL			59								
FtO			62					210			
FtU			61					209			
GFS										222	
HSP	37		49								
IdA				72							
IdC			52				134	212			
IdC2			52				134	212			
IdM				72							
InH								201			
InHr								201			
InHS								201			
Inr			48				129				

Index of parameter codes

Code	Page										
	[1.1 SIMPLY START] (SIM-)	[1.2 MONITORING] (SUP-)	[1.3 SETTINGS] (SEt-)	[1.4 MOTOR CONTROL] (drC-)	[1.5 INPUTS / OUTPUTS CFG] (I-O-)	[1.6 COMMAND] (CtL-)	[1.7 APPLICATION FUNCT.] (FUn-)	[1.8 FAULT MANAGEMENT] (FLt-)	[1.9 COMMUNICATION] (COM-)	[1.12 FACTORY SETTINGS] (FCS-)	[4 PASSWORD] (COd-)
IntP							164				
IPHr		46									
IPL	35							195			
IPr		46									
ItH	37		49								
JF2			61								
JF3			61								
JFH			61								
JGF			55				137				
JGt			55				137				
JOG							137				
JPF			61								
L1A to L14A		45			81						
L1d to L14d					81						
LC2							166				
LCr		46									
LCt							168				
LdS				70							
LES							168				
LEt								197			
LFA				72							
LFd			62				162				
LFF							155	212			
LFL2 LFL3 LFL4								200			
LFM				72							
LIS1		45									
LIS2		45									
LLC							168				
LnS							181				
LO1					98						
LO1d					98						
LO1H					98						
LO1S					98						
LO2					98						

Index of parameter codes

Index of parameter codes

Code	Page										
	[1.1 SIMPLY START] (SIM-)	[1.2 MONITORING] (SUP-)	[1.3 SETTINGS] (SEt-)	[1.4 MOTOR CONTROL] (drC-)	[1.5 INPUTS / OUTPUTS CFG] (I-O-)	[1.6 COMMAND] (CtL-)	[1.7 APPLICATION FUNCT.] (FUn-)	[1.8 FAULT MANAGEMENT] (FLt-)	[1.9 COMMUNICATION] (COM-)	[1.12 FACTORY SETTINGS] (FCS-)	[4 PASSWORD] (COd-)
nMA1									214		
nMA2									214		
nMA3									214		
nMA4									214		
nMA5									214		
nMA6									214		
nMA7									214		
nMA8									214		
nPr	35		64								
nrd				76							
nSL				72							
nSP	35		65								
nSPS				70							
nSt							133				
o06		46									
o02		46									
o03		46									
o04		46									
o05		46									
OCC							170				
OdL								210			
Odt								194			
OF1				75							
OHL								195			
OLL								194			
OPL								194			
OPr		46									
Otr		46									
PAH			57				152				
PAL			57				152				
PAU							153				
PEr			58				152				
PEt		46									
PF1					90						
PFL				68							
PFr					90						

Code	Page										
	[1.1 SIMPLY START] (SIM-)	[1.2 MONITORING] (SUP-)	[1.3 SETTINGS] (SEt-)	[1.4 MOTOR CONTROL] (drC-)	[1.5 INPUTS / OUTPUTS CFG] (I-O-)	[1.6 COMMAND] (CtL-)	[1.7 APPLICATION FUNCT.] (FUn-)	[1.8 FAULT MANAGEMENT] (FLt-)	[1.9 COMMUNICATION] (COM-)	[1.12 FACTORY SETTINGS] (FCS-)	[4 PASSWORD] (COd-)
PGA					93						
PG1				73	93						
PHS				70							
PHr	36			66							
PIA					90						
PIC							152				
PIF							151				
PIF1							151				
PIF2							151				
PII							151				
PIL					90						
PIM							153				
PIP1							151				
PIP2							151				
PIS							152				
POH			57				152				
POL			57				152				
PP1								207			
PPn				72							
PPnS				70							
Pr2							156				
Pr4							156				
PrP			57				152				
Prt				72							
PS1-							174				
PS2-							175				
PS3-							175				
PS2							139				
PS4							139				
PS8							139				
PSr			58				153				
PSt						117					
PtC1								189			
PtC2								189			
PtCL								189			
PtH		46									

Code	Page										
	[1.1 SIMPLY START] (SIM-)	[1.2 MONITORING] (SUP-)	[1.3 SETTINGS] (SEt-)	[1.4 MOTOR CONTROL] (drC-)	[1.5 INPUTS / OUTPUTS CFG] (I-O-)	[1.6 COMMAND] (CtL-)	[1.7 APPLICATION FUNCT.] (FUn-)	[1.8 FAULT MANAGEMENT] (FLt-)	[1.9 COMMUNICATION] (COM-)	[1.12 FACTORY SETTINGS] (FCS-)	[4 PASSWORD] (COd-)
r1					94						
r1d					96						
r1H					96						
r1S					96						
r2					96						
r2d					96						
r2H					96						
r2S					96						
r3					97						
r3d					97						
r3H					97						
r3S					97						
r4					97						
r4d					97						
r4H					97						
r4S					97						
rCA							170				
rCb							127				
rCHt			62				183				
rdG			57				152				
rFC						118					
rFr		46									
rIG			57				152				
rIn						117					
rMUd			61					209			
rP								190			
rP2			58				156				
rP3			58				156				
rP4			58				156				
rPA								190			
rPC		46									
rPE		46									
rPF		46									
rPG			57				151				
rPI							151				
rPO		46									

Index of parameter codes

Code	Page										
	[1.1 SIMPLY START] (SIM-)	[1.2 MONITORING] (SUP-)	[1.3 SETTINGS] (SEt-)	[1.4 MOTOR CONTROL] (drC-)	[1.5 INPUTS / OUTPUTS CFG] (I-O-)	[1.6 COMMAND] (CtL-)	[1.7 APPLICATION FUNCT.] (FUn-)	[1.8 FAULT MANAGEMENT] (FLt-)	[1.9 COMMUNICATION] (COM-)	[1.12 FACTORY SETTINGS] (FCS-)	[4 PASSWORD] (COd-)
rPS							131				
rPt							129				
rrS					80						
rSA				72							
rSAS				70							
rSF								190			
rSL							158				
rSM				72							
rSMS				70							
rtd			60								
rtdL			60								
rtH		46									
SA2							128				
SA3							128				
SAt								196			
SCS1										222	
SdC1			53				135				
SdC2			53				135				
SFC			49								
SFr			54	75							
SIt			49								
SLE			55				158				
SLL								202			
SLP			52	71							
SOP				76							
SP2			56				140				
SP3			56				140				
SP4			56				140				
SP5			56				140				
SP6			56				140				
SP7			56				140				
SP8			56				140				
SPd		46									
SPG			49								
SPM							145				

Index of parameter codes

Code	Page										
	[1.1 SIMPLY START] (SIM-)	[1.2 MONITORING] (SUP-)	[1.3 SETTINGS] (SEt-)	[1.4 MOTOR CONTROL] (drC-)	[1.5 INPUTS / OUTPUTS CFG] (I-O-)	[1.6 COMMAND] (CtL-)	[1.7 APPLICATION FUNCT.] (FUn-)	[1.8 FAULT MANAGEMENT] (FLt-)	[1.9 COMMUNICATION] (COM-)	[1.12 FACTORY SETTINGS] (FCS-)	[4 PASSWORD] (COd-)
SrB			61					209, 210			
SrP			57				144				
SSB								203			
StM								199			
StO								203			
StP								198			
Str							142				
Strt								199			
Stt							133				
SUL				76							
tA1			48				130				
tA2			48				130				
tA3			48				130				
tA4			49				130				
tAA							164				
tAC		46									
tAr								191			
tbr									215		
tbr2									215		
tbS								199			
tCC	34				80						
tCd							172				
tCt					80						
td1			52				134	212			
tdC			52				134	212			
tdC1			53				135				
tdC2			53				136				
tdS								205			
tFO									215		
tFO2									215		
tFr	35		65								
tHA								195, 196			
tHb		46									
tHd		46									

Index of parameter codes

Code	Page										
	[1.1 SIMPLY START] (SIM-)	[1.2 MONITORING] (SUP-)	[1.3 SETTINGS] (SEt-)	[1.4 MOTOR CONTROL] (drC-)	[1.5 INPUTS / OUTPUTS CFG] (I-O-)	[1.6 COMMAND] (CtL-)	[1.7 APPLICATION FUNCT.] (FUn-)	[1.8 FAULT MANAGEMENT] (FLt-)	[1.9 COMMUNICATION] (COM-)	[1.12 FACTORY SETTINGS] (FCS-)	[4 PASSWORD] (COd-)
tHr		46									
tHt								194			
tLA							164				
tLC							165				
tL1G			59				164				
tL1M			59				164				
tLS			55				158				
tOd							172				
tOL								210			
tP1			58				155				
trA				72							
trM				72							
tSM								199			
ttd			60					194, 196			
ttd2								194, 196			
ttd3								194, 196			
ttH			59								
ttL			59								
ttO								215			
tUL							179				
tUn	36			66							
tUS	36			66							
U0				68							
U1				68							
U2				68							
U3				68							
U4				69							
U5				69							
Ubr				78							
UC2				69							
UCb								192			
UdL								209			
UCP				69							
UFr			52	71							

Index of parameter codes

Code	Page										
	[1.1 SIMPLY START] (SIM-)	[1.2 MONITORING] (SUP-)	[1.3 SETTINGS] (SEt-)	[1.4 MOTOR CONTROL] (drC-)	[1.5 INPUTS / OUTPUTS CFG] (I-O-)	[1.6 COMMAND] (CtL-)	[1.7 APPLICATION FUNCT.] (FUn-)	[1.8 FAULT MANAGEMENT] (FLt-)	[1.9 COMMUNICATION] (COM-)	[1.12 FACTORY SETTINGS] (FCS-)	[4 PASSWORD] (COd-)
UIH1					85						
UIH2					86						
UIH4					88						
UIL1					85						
UIL2					86						
UIL4					88						
ULn		46									
ULr											228
ULt								209			
UnS	35		64								
UOH1					103						
UOH2					105						
UOH3					106						
UOL1					103						
UOL2					105						
UOL3					106						
UOP		46									
UPL								199			
UPP							159				
UrES								198			
USb								198			
US1							144				
USL								198			
USP							142				
USt								198			

ATV61_programming_manual_EN_1760649_07

1760649   12/2009

AAV8144501

Altivar

VW3 A9 702

ATTENTION

RISQUE DE DESTRUCTION DU MATERIEL

- Le kit de flashage (VW3 A9 702) peut être utilisé uniquement sur des PC équipés de **Windows XP** ou **Windows 2000**.
- La mise à jour des pilotes contenus dans le CD ROM QUATECH est obligatoire pour obtenir un fonctionnement correct du kit de flashage.

Si ces précautions ne sont pas respectées, cela peut entraîner des lésions corporelles et/ou des dommages matériels.

CAUTION

RISK OF MATERIAL DESTRUCTION

- The flash keypad kit (VW3 A9 702) can be used only with PC fited with **Windows XP** or **Windows 2000**.
- The update of drivers located in QUATECH CD ROM is mandatory to keep the flash keypad kit in good working order.

Failure to follow these instructions can result in injury or equipment damage.

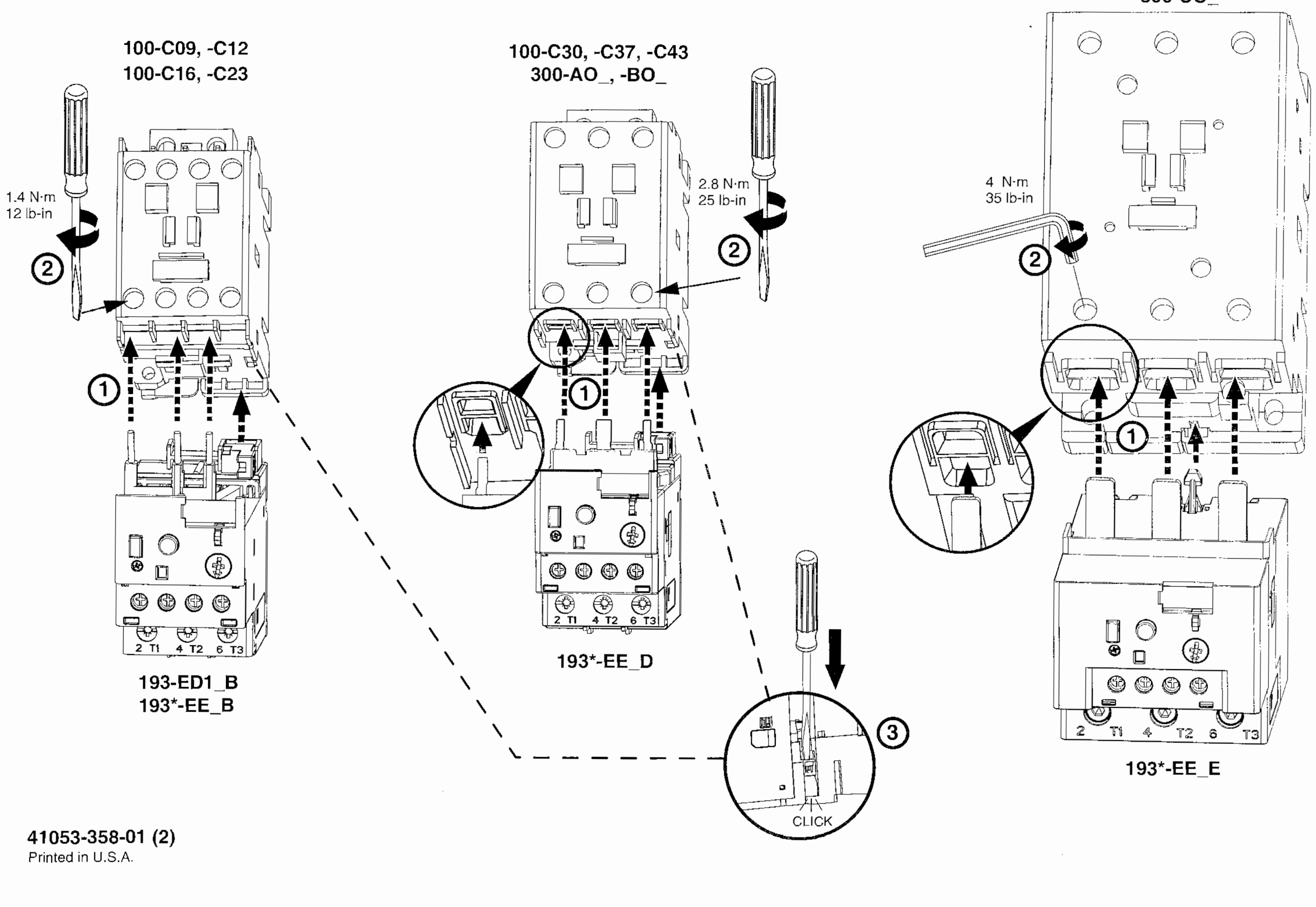
Bulletin 193 E1 PLUS Overload Relay Application and Installation

(Cat 193-ED1_ _ , 193*-EE_ _)

Installation

ATTENTION: To prevent electrical shock, disconnect from power source before installing or servicing. Install in suitable enclosure. Keep free from contaminants.

193-E___ = 3 Ø
193S-E___ = 1 Ø

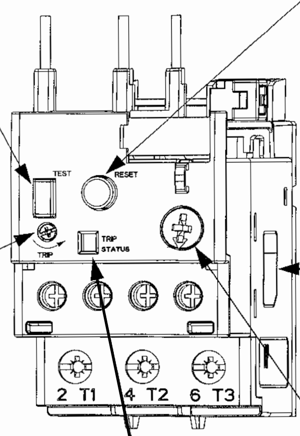


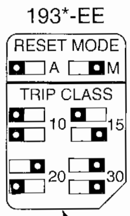
41053-358-01 (2)
Printed in U.S.A.

E1 PLUS Features

Push To Test

Push to Reset





A = Automatic/Manual Reset Mode

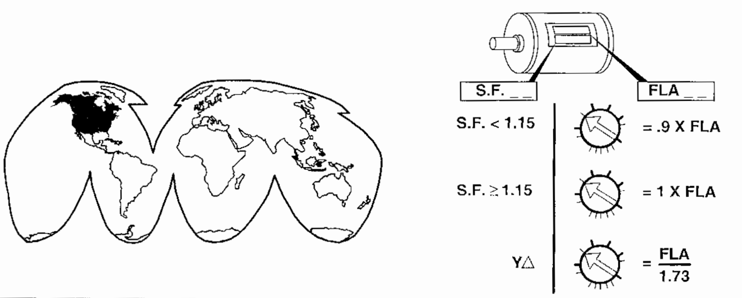
Rotate to Manually Trip

M = Manual Reset Mode

Selectable Trip Class

- Trip Indicator Window — ~~Visor de disparo~~
  Yellow indicator not visible: Not Tripped.
  Yellow indicator visible: Tripped.

- To adjust trip current, turn dial until the desired current is aligned with the ▲ pointer. Trip rating is 120% of dial setting.

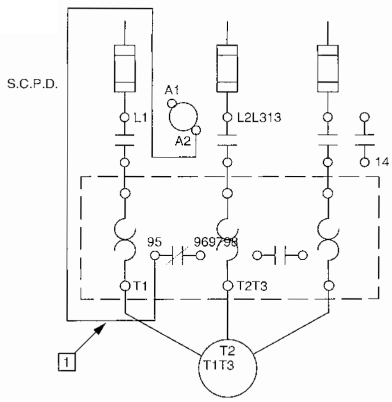


ATTENTION: Do not use automatic reset mode in applications where unexpected automatic restart of the motor can cause injury to persons or damage to equipment.

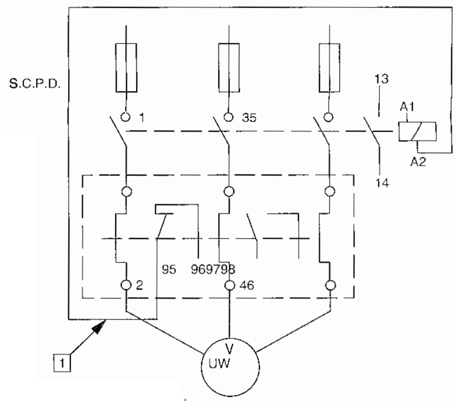
Contact Status

Normal		Test	Tripped
95 — 96	Closed	Open	Open
97 98	Open	Open	Closed
9795 9896		9795 9896	9795 9896

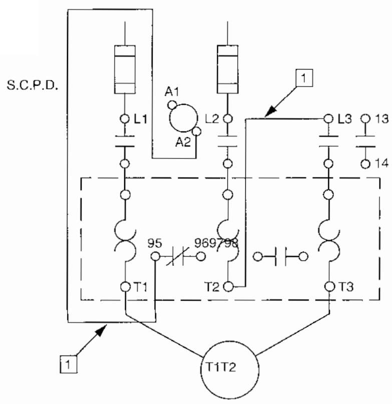
Wiring Diagram - 3 Phase Full Voltage DOL Starter



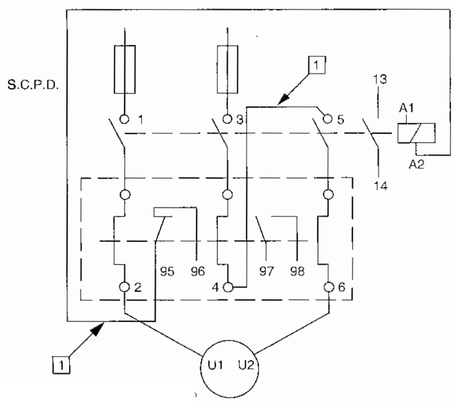
1 Connection must be fitted by user



Wiring Diagram - 1 Phase Full Voltage DOL Starter (193S-____)



1 Connection must be fitted by user



Main Connections

	193-ED1_B * 193-EE_B	193-EE_D *	193-EE_E
Terminal Screw	M5	M5	M8
	1x 2.5 … 16 mm^2 2.5 Nm	1x 2.5 … 16 mm^2 2.5 Nm	1x 4 … 35 mm^2 4 Nm
	2x 2.5 … 10 mm^2 3.4 Nm	2x 2.5 … 10 mm^2 3.4 Nm	2x 4 … 25 mm^2 4 Nm
	1x 2.5 … 25 mm^2 2.5 Nm	1x 2.5 … 25 mm^2 2.5 Nm	1x 4 … 50 mm^2 4 Nm
	2x 6 …16 mm^2 3.4 Nm	2x 6 …16 mm^2 3.4 Nm	2x 4 … 35 mm^2 4 Nm
	1x 14… 6 AWG 22 lb-in	1x 14… 6 AWG 22 lb-in	1x 12 … 1 AWG 35 lb-in
	2x 14...6 AWG 30 lb-in	2x 14...6 AWG 30 lb-in	2x 6 … 2 AWG 35 lb-in
	#2	#2	--
	1 x 6 mm	1 x 6 mm	--
	--	--	4 mm

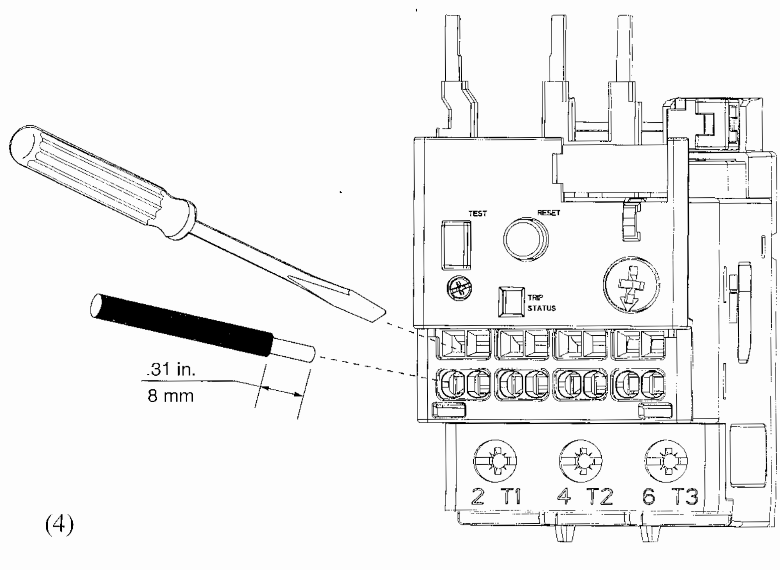
* FOR MULTIPLE CONDUCTOR APPLICATIONS THE SAME SIZE AND STYLE WIRE MUST BE USED.

Control Connections

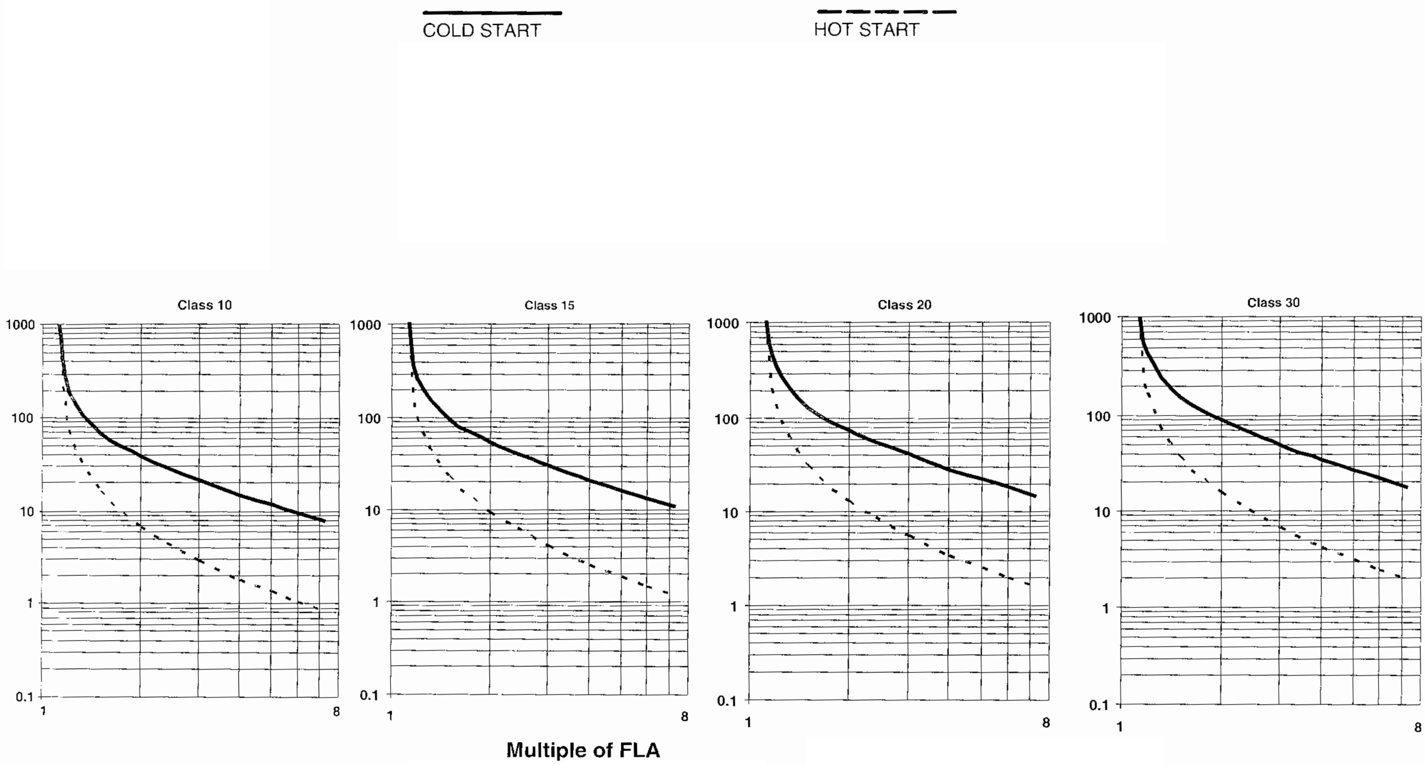
Terminal Screw		M3
	1x	0.5 … 2.5 mm^2 0.55 Nm
	2x	0.25 … 1.5 mm^2 0.55 Nm
	1x	0.5 … 4 mm^2 0.55 Nm
	2x	0.2 … 2.5 mm^2 0.55 Nm
	1x	24 … 10 AWG 5 lb-in
	2x	24 … 10 AWG 5 lb-in
		#1
		0.6 x 3.5 mm

Cage Clamp Operation (193R-EE)

	0.25 … 1 mm^2
	0.2 … 1.5 mm^2
	24 … 14 AWG



Trip Curve



Short Circuit Ratings

Table 1 Standard Fault Short Circuit Ratings per UL508 and CSA 22.2 No. 14

E1 Plus Cat. No.		Max. available fault current (kA)	Max. voltage (V)	S.C.P.D.
193,193R, 193S	ED1AB, ED1BB, EEAB, EEBB	1	600	Suitable for use with fuses only
	ED1CB, ED1DB, ED1EB, EECB, EEDB, EEEB, EEED, EEFD, EEPB, EERB, EESB, EETD	5		Not resticted to fusing only
	EEEE, EEFE, EEGE, EEUE	10		

Table 2 High Fault Short Circuit Ratings per UL508 and CSA 22.2 No. 14

E1 Plus Cat. No.		Contactor Cat. No.	Max. starter FLC (A)	Max.available fault current (kA)	Max. voltage (V)	Max. UL Class J or CC fuse, CSA HRCI-J (A)
193, 193R	ED1AB, EEAB	100-C09	0.5	100	600	3
	ED1BB, EEBB		1			6
	ED1CB, ED1DB, ED1EB, EECB, EEDB, EEEB	100-C09	9			20
		100-C12	12			20
		100-C16	16			30
		100-C23	23			40
	EEED, EEFD	100-C30	30			50
		100-C37	37			50
		100-C43	43			70
	EEEE, EEFE, EEGE	100-C60	60			80
		100-C72	72			100
		100-C85	85			150

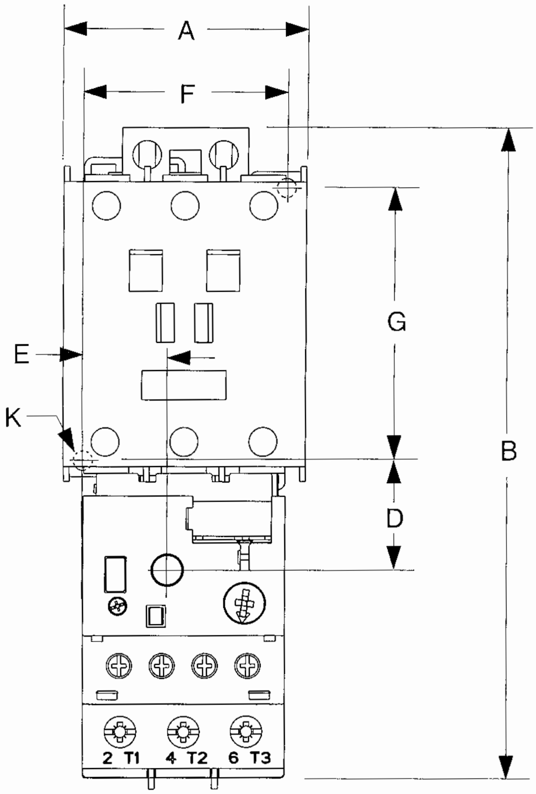
Table 3 Short Circuit Ratings per EN 60947-4-1

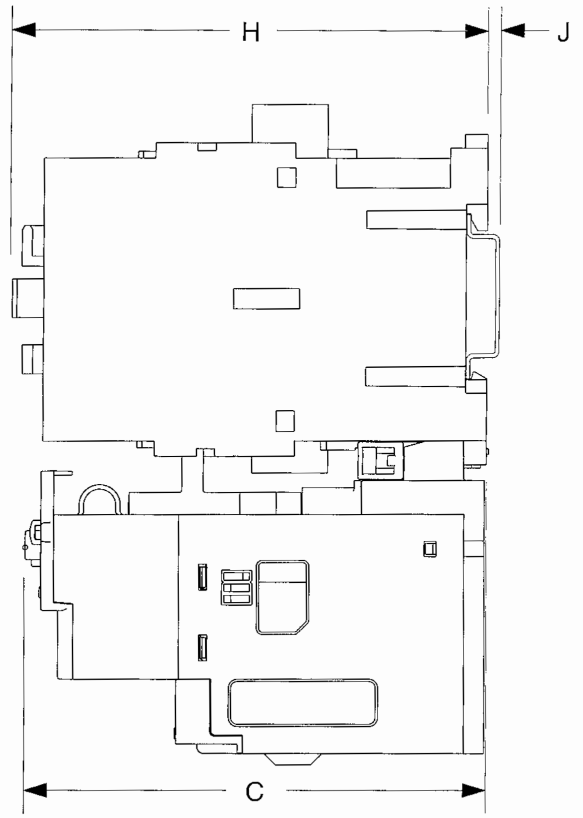
E1 Plus Cat. No.		Prospective S.C. current, Ir (kA)	Conditional S.C. current, Iq (kA)	Max. voltage (V)	S.C.P.D.
193,193R, 193S	ED1AB, ED1BB, EEAB, EEBB	1	100	690	Suitable for use with fuses only
	ED1CB, ED1DB, EECB, EEDB, EEPB, EERB	1			Not resticted to fusing only
	ED1EB, EEEB, EEED, EEFD, EEEE, EEFE, EESB, EETD	3			
	EEGE, EEGF, EEUE	5			

Fuse Coordination

Table 1 Type I and Type II Fuse Coordination with Bul. 100-C contactors per EN 60947-4-1

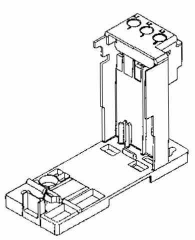
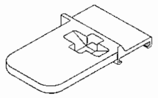
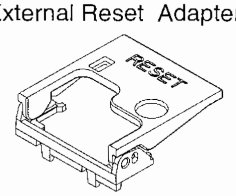
E1 Plus Cat. No.		Contactor Cat. No.	Max. starter FLC (A)	Prospective S.C. current, Ir (kA)	Conditional S.C. current, Iq (kA)	Max. voltage (V)	Type I Max. Class J or CC fuse (A)	Type II Max. Class J or CC fuse (A)
193,193R	ED1AB, EEAB	100-C09	0.5	1	100	600	3	3
	ED1BB, EEBB		1				6	6
	ED1CB, ED1DB, EECB, EEDB	100-C09	9	1			20	15
		100-C12	12				20	20
		100-C16	16				30	30
		100-C23	23				40	40
	ED1EB, EEEB	100-C09	9	3			20	15
		100-C12	12				20	20
		100-C16	16				30	30
		100-C23	23				40	40
	EEED, EEFD	100-C30	30	3			50	50
		100-C37	37				50	50
		100-C43	43				70	70
	EEEE, EEFE	100-C60	60	3			80	80
		100-C72	72				100	100
		100-C85	85				150	150
	EEGE	100-C60	60	5			80	80
		100-C72	72				100	100
		100-C85	85				150	150





CONTACTOR CAT. NO.	E1 PLUS CAT. NO.		A	B	C	D	E	F	G	H	J	K
100-C09, -C12, -C16, -C23	193-ED1_B, 193*-EE_B	mm (in)	45 (1.76)	146.6 (5.77)	85.2 (3.35)	24.5 (.96)	13.9 (.55)	35 (1.38)	60 (2.36)	86.5 (3.40)	2 (.08)	4.5 (.17)
100-C30, -C37	193*-EE_D	mm (in)	45 (1.76)	146.6 (5.77)	101.2 (3.98)	24.5 (.96)	13.9 (.55)	35 (1.38)	60 (2.36)	104 (4.09)	2 (.08)	4.5 (.17)
100-C43		mm (in)	54 (2.12)	146.6 (5.77)	101.2 (3.98)	24.5 (.96)	18.4 (.74)	45 (1.77)	60 (2.36)	104 (4.09)	2 (.08)	4.5 (.17)
100-C60, -C72, -C85	193*-EE_E	mm (in)	72 (2.83)	192 (7.57)	120.4 (4.74)	29 (1.14)	23.8 (.94)	55 (2.16)	100 (3.94)	126 (4.94)	2 (.08)	5.4 (.21)
300-AO_, -BO_	193*-EE_D	mm (in)	45 (1.76)	146.6 (5.77)	101.2 (3.98)	24.5 (.96)	13.9 (.55)	35 (1.38)	60 (2.36)	104 (4.09)	2 (.08)	4.5 (.17)
300-CO_	193*-EE_E	mm (in)	72 (2.83)	192 (7.57)	120.4 (4.74)	29 (1.14)	23.8 (.94)	55 (2.16)	100 (3.94)	126 (4.94)	2 (.08)	5.4 (.21)

Accessories

	For Use With	Cat. No.
DIN Rail/Panel Adapter 	193-ED1_B, 193*-EE_B	193-EPB
	193*-EE_D	193-EPD
	193*-EE_E	193-EPE
Current Adjustment Shield 	193-ED1 (all) 193*-EE (all)	193-BC8
External Reset Adapter 	193-ED1 (all) 193*-EE (all)	193-ERA

QUINT-PS/ 1AC/24DC/ 5

Primary-switched power supply with SFB technology, 1 AC, output current 5 A

INTERFACE

Data sheet
103127_en_04

1 Description

QUINT POWER power supply units – Maximum system availability with SFB technology
Compact power supply units of the new QUINT POWER generation maximize the availability of your system. With the SFB technology (Selective Fuse Breaking Technology), six times the nominal current for 12 ms, even the standard power circuit-breakers can now also be triggered reliably and quickly. Faulty current paths are switched off selectively, the fault is located and important system parts continue to operate. Comprehensive diagnostics are provided through constant monitoring of output voltage and current. This preventive function monitoring visualizes critical operating modes and reports them to the control unit before an error can occur.

Features

– Quick tripping of the standard power circuit-breakers using dynamic power reserve SFB technology
– Reliable starting of difficult loads with static POWER BOOST power reserve
– Preventive function monitoring
– Can be used worldwide
– High degree of operational safety due to high MTBF > 500 000 h, long mains buffering times > 20 ms, high dielectric strength up to 300 V AC

DANGER OF EXPLOSION!
Only remove equipment when it is disconnected and not in the potentially explosive area.

DANGER
Components with dangerously high voltage and high stored energy are located in the device!
Never carry out work on live parts!
Depending on the ambient temperature and the load, the housing can become very hot!

Make sure you always use the latest documentation.
It can be downloaded at www.phoenixcontact.net/download

2 Table of contents

3 Ordering data

Description	Type	Order No.	Pcs. / Pkt.
Primary-switched power supply with SFB technology, 1 AC, output current 5 A	QUINT-PS/ 1AC/24DC/ 5	2866750	1

Accessories	Type	Order No.	Pcs. / Pkt.
Universal wall adapter	UWA 182/52	2938235	1
Assembly adapter for QUINT-PS... power supply on S7-300 rail	QUINT-PS-ADAPTERS7/1	2938196	1
Fan for QUINT-PS ... power supply. The fan eliminates the position-dependent derating of the power supply.	QUINT-PS/FAN/4	2320076	1

4 Technical data

Input data	
Input nominal voltage range	100 V AC ... 240 V AC
AC input voltage range	85 V AC ... 264 V AC
Short-term input voltage	300 V AC
DC input voltage range	90 V DC ... 350 V DC
AC frequency range	45 Hz ... 65 Hz
DC frequency range	0 Hz
Current consumption	Approx. 1.2 A (120 V AC) Approx. 0.6 A (230 V AC)
Inrush current limitation	< 15 A (typical)
I^2t	< 1 A^2s
Power failure bypass	> 30 ms (120 V AC) > 30 ms (230 V AC)
Typical response time	< 0.5 s
Protective circuitry	Transient surge protection Varistor
Input fuse, integrated	5 A (slow-blow, internal)
Recommended backup fuse for mains protection	6 A (characteristic B) 10 A (characteristic B) 16 A (characteristic B)
Discharge current to PE	< 3.5 mA

Output data	
Nominal output voltage	24 V DC ±1%
Setting range of the output voltage	18 V DC ... 29.5 V DC (> 24 V constant capacity)
Output current	5 A (-25°C ... 70°C, U_{OUT} = 24 V DC) 7.5 A (with POWER BOOST, -25°C ... 40°C permanently, U_{OUT} = 24 V DC) 30 A (with SFB technology, 12 ms)
Magnetic fuse tripping	max 2 A (Characteristic C)
Derating	From +60°C 2.5% per Kelvin
Control deviation	< 1 % (change in load, static 10% ... 90%) < 2 % (change in load, dynamic 10% ... 90%) < 0.1 % (change in input voltage ±10%)
Power loss nominal load max.	15 W
Maximum power dissipation idling	3 W
Efficiency	> 90 % (for 230 V AC and nominal values)
Ascent time	< 0.5 ms
Residual ripple	< 40 mV_{PP} (with nominal values)
Connection in parallel	Yes, for redundancy and increased capacity

Output data (Continued)	
Connection in series	Yes
Surge protection against internal surge voltages	Yes, limited to approx. 35 V DC
Resistance to reverse feed	max. 35 V DC

DC OK active	
Output description	U_{OUT} > 0.9 x U_N: High signal
Voltage	+ 18 V DC ... 24 V DC
Current	≤ 20 mA (short circuit resistant)
Status display	U_{OUT} > 0.9 x U_N: "DC OK" LED green / U_{OUT} < 0.9 x U_N: Flashing "DC OK" LED

DC OK floating	
Output description	Relay contact, U_{OUT} > 0.9 x U_N: Contact closed
Voltage	≤ 30 V AC/DC
Current	≤ 1 A
Status display	U_{OUT} > 0.9 x U_N: "DC OK" LED green / U_{OUT} < 0.9 x U_N: Flashing "DC OK" LED

POWER BOOST, active	
Output description	I_{OUT} < I_N: High signal
Voltage	+ 18 V DC ... 24 V DC
Current	≤ 20 mA (short circuit resistant)
Status display	I_{OUT} > I_N: LED "BOOST" yellow /

General data	
Insulation voltage input/output	4 kV AC (type test) 2 kV AC (routine test)
Insulation voltage input / PE	3.5 kV AC (type test) 2 kV AC (routine test)
Insulation voltage output / PE	500 V DC (routine test)
Degree of protection	IP20
Class of protection	I, with PE connection
MTBF	> 500 000 h in acc. with IEC 61709 (SN 29500)
Type of housing	Steel sheet, zinc-plated
Housing material	Steel sheet, zinc-plated
Dimensions W / H / D (state of delivery)	40 mm / 130 mm / 125 mm
Dimensions W / H / D (90° turned)	122 mm / 130 mm / 43 mm
Weight	0.7 kg

Ambient conditions	
Ambient temperature (operation)	-25 °C ... 70 °C (> 60 °C derating)
Ambient temperature (storage/transport)	-40 °C ... 85 °C
Max. permissible relative humidity (operation)	95 % (at 25 °C, no condensation)
Vibration (operation)	< 15 Hz, amplitude ±2.5 mm in acc. with IEC 60068-2-6 15 Hz ... 150 Hz, 2.3g, 90 min.
Shock	30g in all directions in acc. with IEC 60068-2-27
Pollution degree in acc. with EN 50178	2
Climatic class	3K3 (in acc. with EN 60721)

Standards

Electrical Equipment for Machinery	EN 60204
Safety transformers for power supply units	IEC 61558-2-17
Electrical safety (of information technology equipment)	IEC 60950/VDE 0805 (SELV)
Electronic equipment for use in electrical power installations	EN 50178/VDE 0160 (PELV)
SELV	IEC 60950 (SELV) and EN 60204 (PELV)
Safe isolation	DIN VDE 0100-410 DIN VDE 0106-1010
Protection against electric shock	DIN 57100-410
Protection against electric shock, basic requirements for safe isolation in electrical equipment	DIN VDE 0106-101
Limitation of mains harmonic currents	EN 61000-3-2
Device safety	GS (tested safety)
Network variants (undervoltage)	Semi F47-0706
Certificate	CB Scheme

Approvals

UL approvals	UL Listed UL 508 UL/C-UL Recognized UL 60950 UL/C-UL Listed UL 1604 Class I, Division 2, Groups A, B, C, D

Conformance with EMC guideline 2004/108/EC and for low-voltage guideline 2006/95/EC

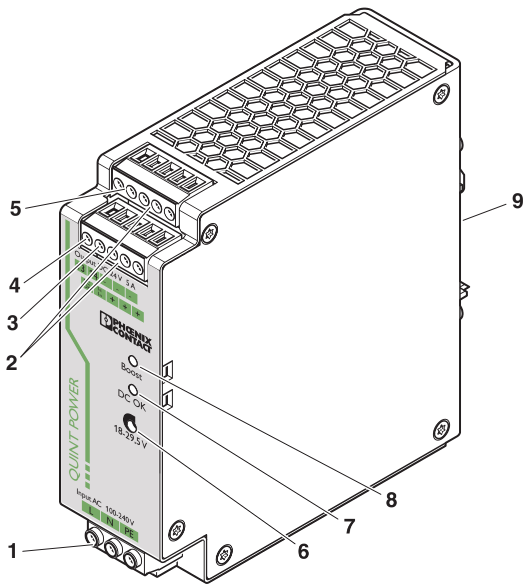
Noise immunity according to EN 61000-6-2

Electrostatic discharge	EN 61000-4-2	
	Housing	Level 4
	Contact discharge	8 kV
	Discharge in air	15 kV
	Comments	Criterion B
Electromagnetic HF field	EN 61000-4-3	
	Housing	Level 4
	Frequency range	80 MHz ... 1000 MHz (20 V/m) 1 GHz ... 3 GHz (10 V/m)
	Field intensity	
	Comments	Criterion A
Fast transients (burst)	EN 61000-4-4	
	Input	4 kV (level 4 - asymmetrical)
	Output	2 kV (level 1 - asymmetrical)
	Signal	1 kV (level 1 - asymmetrical)
	Comments	Criterion B
Surge current loads (surge)	EN 61000-4-5	
	Input	4 kV (inst. class 4 - asymmetrical: conductor to ground) 2 kV (inst. class 4 -symmetrical: conductor to conductor)
	Output	2 kV (level 3 - asymmetrical: conductor to ground) 1 kV (level 1 - symmetrical: conductor to conductor)
	Signal	1 kV (level 3 - asymmetrical: conductor to ground)
	Comments	Criterion B

Conformance with EMC guideline 2004/108/EC and for low-voltage guideline 2006/95/EC (Continued)		
Noise immunity according to EN 61000-6-2		
Conducted interference	EN 61000-4-6	
	Input/Output/Signal	Level 3 - asymmetrical
	Frequency range	0.15 MHz ... 80 MHz
	Voltage	10 V
	Comments	Criterion A
Voltage dips	EN 61000-4-11	
	Input	(Mains buffering > 20 ms (Semi F47))
	Comments	Criterion B

Emitted interference in acc. with EN 61000-6-3	
Radio interference voltage in acc. with EN 55011	EN 55011 (EN 55022) Class B, area of application: Industry and residential
Emitted radio interference in acc. with EN 55011	EN 55011 (EN 55022) Class B, area of application: Industry and residential

5 Structure



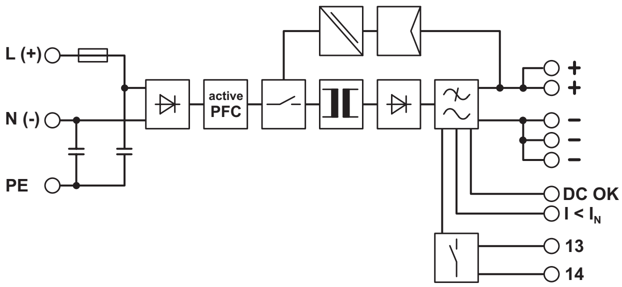
1 AC input
2 DC output
3 POWER BOOST switching output, active
4 DC OK switching output active
5 DC OK output, floating
6 Potentiometer 18 V DC ... 29.5 V DC
7 "DC OK" LED
8 "BOOST" LED
9 Universal DIN rail adapter UTA 107/30

	[mm²]		AWG	[Nm]
	solid	stranded		Torque
Input	0.2 - 2.5	0.2 - 2.5	20 - 12	0.5 - 0.6
Output	0.2 - 2.5	0.2 - 2.5	20 - 12	0.5 - 0.6
Signal	0.2 - 2.5	0.2 - 2.5	20 - 12	0.5 - 0.6

Input data	
Input nominal voltage range	100 V AC ... 240 V AC
AC input voltage range	85 V AC ... 264 V AC
Short-term input voltage	300 V AC
DC input voltage range	90 V DC ... 350 V DC
AC frequency range	45 Hz ... 65 Hz
DC frequency range	0 Hz
Input fuse, integrated	5 A (slow-blow, internal)
Recommended backup fuse for mains protection	6 A (characteristic B) 10 A (characteristic B) 16 A (characteristic B)
Type of connection	Pluggable screw connection
Stripping length	7 mm

Output data	
Nominal output voltage	24 V DC ±1%
Setting range of the output voltage	18 V DC ... 29.5 V DC (> 24 V constant capacity)
Output current	5 A (-25°C ... 70°C, U_{OUT} = 24 V DC) 7.5 A (with POWER BOOST, -25°C ... 40°C permanently, U_{OUT} = 24 V DC) 30 A (with SFB technology, 12 ms)
Type of connection	Pluggable screw connection
Stripping length	7 mm

6 Block diagram



7 Safety and warning notes

DANGER OF EXPLOSION!

Only remove equipment when it is disconnected and not in the potentially explosive area.

DANGER

The device contains dangerous live elements and high levels of stored energy.
Never carry out work when the power is turned on.

WARNING

Before startup please ensure:

The mains connection has been carried out by a competent person and protection against electric shock is guaranteed!

The device can be disconnected outside the power supply unit in accordance with the regulations as in EN 60950 (e.g. through primary side line protection)!

The ground conductor is connected!

All feed lines are sufficiently protected and dimensioned!

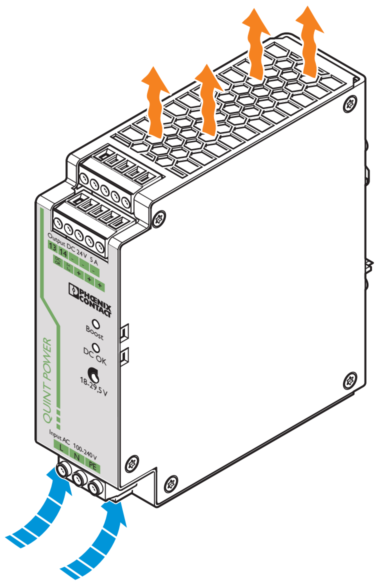
All output lines are dimensioned according to the maximum output current of the device or separately protected!

Sufficient convection is guaranteed!

CAUTION

The power supply units are built-in devices. The device may only be installed and put into operation by qualified personnel. The corresponding national regulations must be observed.

8 Installation

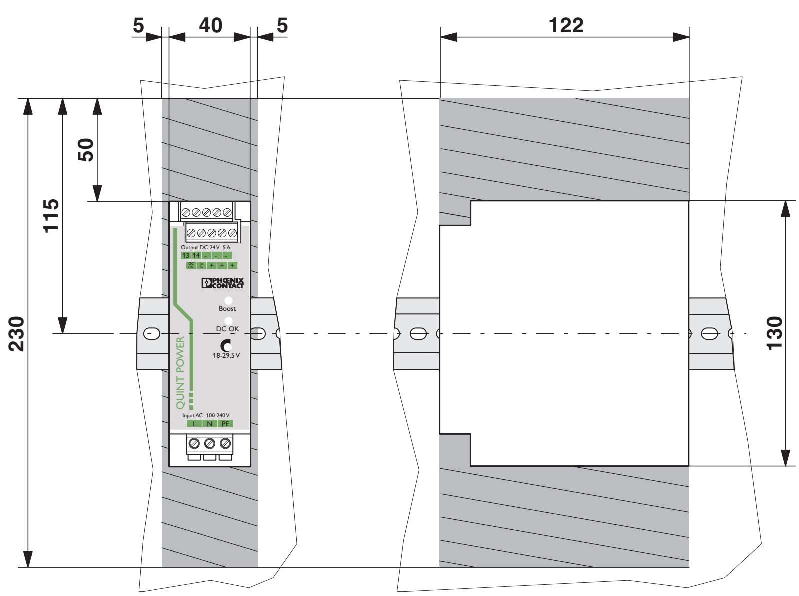


ATTENTION

In order to ensure sufficient convection, we recommend a minimum vertical distance of 5 cm to the other modules.
A lateral distance of 5 mm, and in the case of active components, that of 15 mm is necessary for proper functioning of the module.
Depending on the ambient temperature and the load of the module, the housing can become very hot!

The power supply unit can be snapped onto all DIN rails in acc. with EN 60715. They must be mounted horizontally (connecting terminal blocks top and bottom).

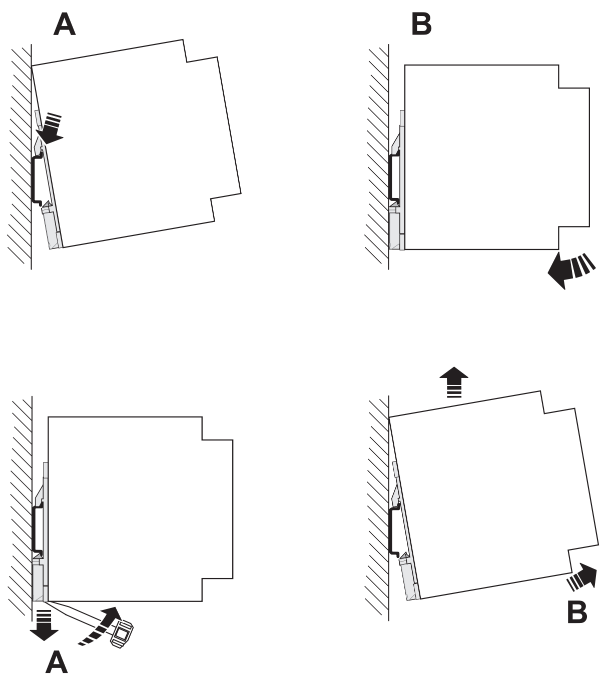
9 Installation position



Slim-style installation: Installation depth 125 mm (+ DIN rail) (state at delivery)

Low-profile installation: Installation depth 43 mm (+ DIN rail)

10 Mounting on DIN rails



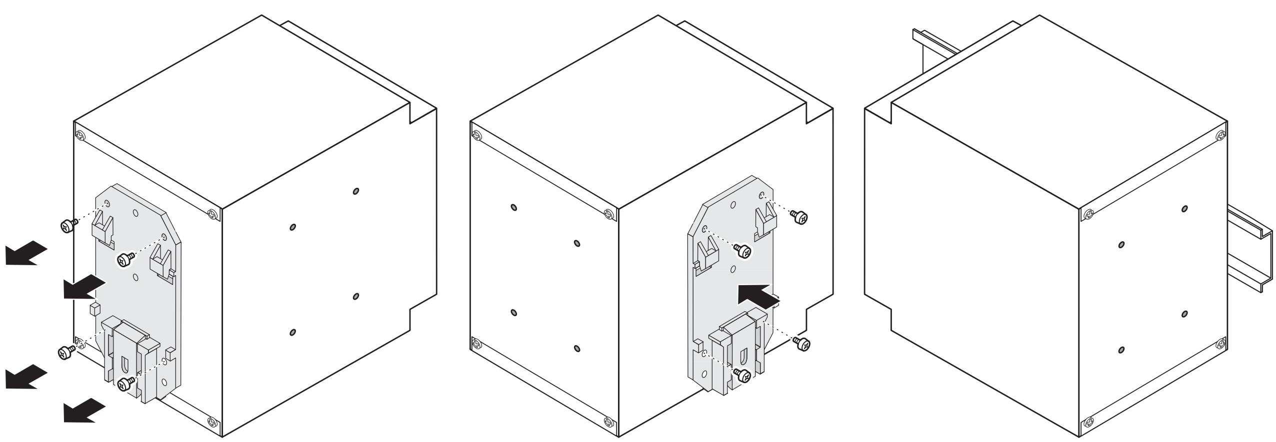
Slim-style installation

Assembly:

Position the module with the DIN rail guide on the upper edge of the DIN rail, and snap it in with a downward motion.

Removing:

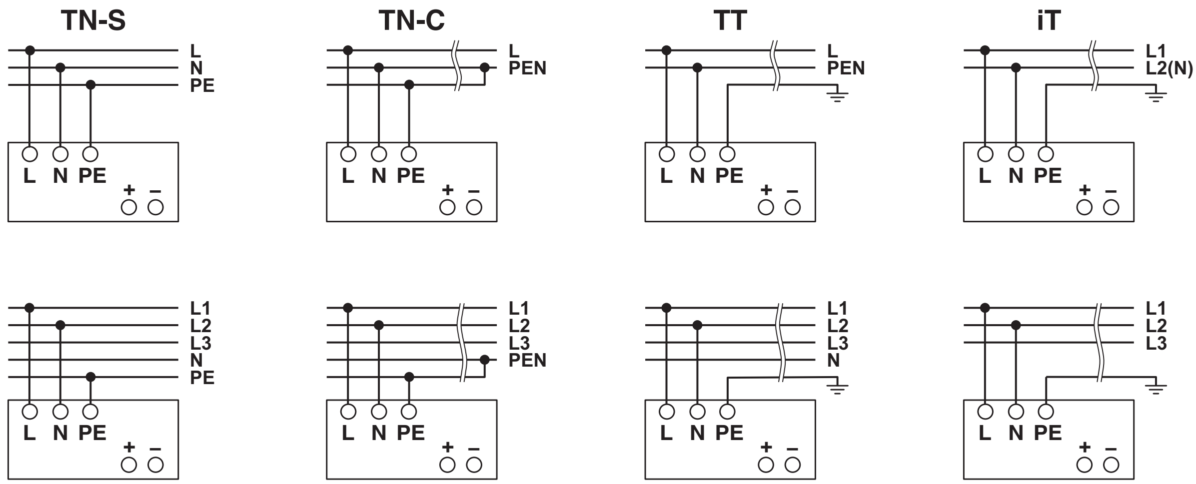
Pull the snap lever open with the aid of a screwdriver and slide the module out at the lower edge of the DIN rail.



Low-profile installation

Low-profile installation can be achieved by mounting the device at right-angles to the DIN rail. Mount the DIN rail adapter (UTA 107/30) as described in the figure. No additional mounting material is required. Fixing screws: Torx T10 (torque 0.8 Nm ... 0.9 Nm).

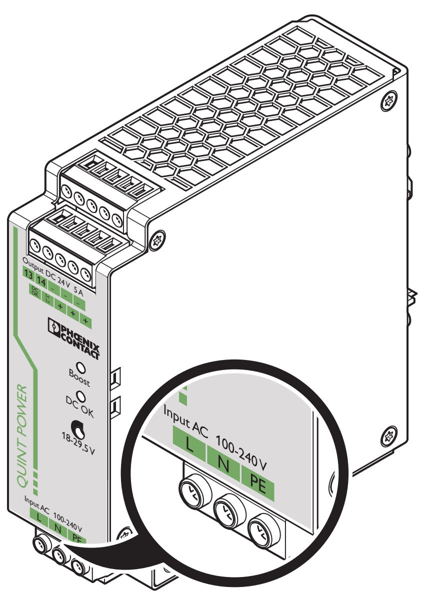
11 Connection to various systems



The connection for 100 V AC ... 240 V AC is established using the L, N, and P screw connections.
The device can be connected to 1-phase AC networks or to two of the phase conductors of three-phase systems (TN, TT or IT systems in accordance with VDE 0100-300/IEC 60364-3) with nominal voltages of 100 V AC ... 240 V AC.
The device also continues to work on short-term input voltages > 300 V AC.

For operation on two of the phase conductors of a three-phase system, an isolating facility for all poles must be provided.

12 Input



CAUTION

If an internal fuse is triggered, there is most probably a malfunction in the device. In this case, the device must be inspected in the factory!

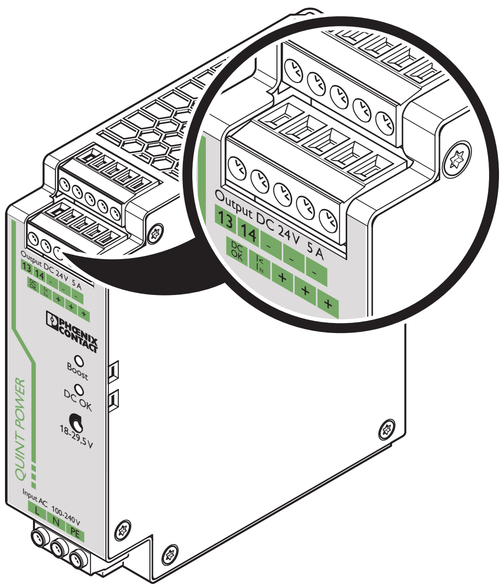
Protection of the primary side

The device must be installed in acc. with the regulations as in EN 60950. It must be possible to disconnect the device using a suitable isolating facility outside the power supply.
The primary side line protection, for example, is suitable. For device protection, there is an internal fuse. Additional device protection is not necessary.

Recommended backup fuse for mains protection

Power circuit-breaker 6 A, 10 A or 16 A, characteristic B (or identical function). Connect a suitable fuse upstream for DC applications!

13 Output



CAUTION

Make sure that all output lines are dimensioned according to the maximum output current or are separately protected. The cables on the secondary side must have sufficiently large cross sections in order to keep the voltage drops on the lines as low as possible.

The connection is established using screw connections on the screw connection of the DC output:
24 V DC: "+" and "–"; DC OK switching output active: "DC OK" and "–"; DC OK output floating: "13" and "14"; POWER BOOST switching output active: "$I < I_N$" and "–".
At the time of delivery, the output voltage is 24 V DC. The output voltage can be set on the potentiometer.

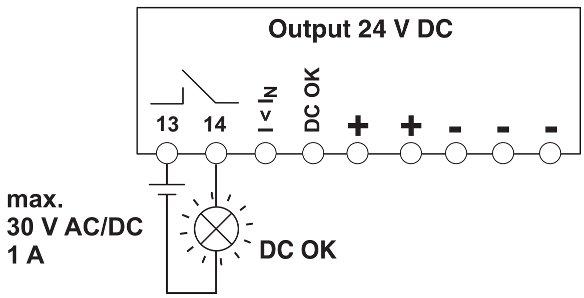
Protection of the secondary side

The device is electronically protected against short circuit and idling. In the event of a malfunction, the output voltage is limited to 35 V DC.

14 Signaling

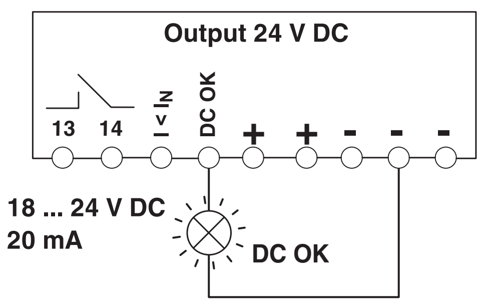
An active signal output DC OK, a floating signal contact DC OK and an active signal output POWER BOOST are available for function monitoring. In addition, the DC OK LED and the BOOST LED can be used to evaluate the function of the power supply directly at the installation location (see output characteristic curve).

	$I < I_N$	$I > I_N$	$U_{OUT} < 0.9 \times U_N$
"DC OK" LED	ON	ON	Flashing
"BOOST" LED	OFF	ON	ON
Active DC OK switching output	ON	ON	OFF
Floating DC OK output	Closed	Closed	Open
Active POWER BOOST switching output	ON	OFF	OFF
Meaning	Normal operation of the power supply ($U_{OUT} > 21.5$ V)	POWER BOOST operation, e.g. to start loads	Overload mode, e.g. consumer short circuit or overload



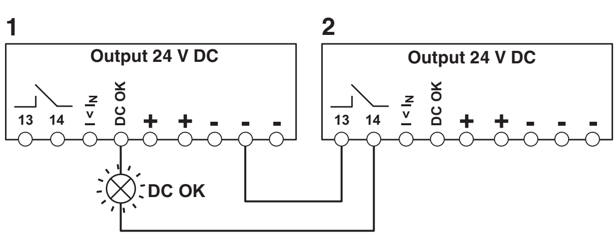
Floating contact

The floating signal contact opens and indicates that the set output voltage has undershot by more than 10%. Signals and ohmic loads of up to maximum 30 V and currents of maximum 1 A (or maximum 60 V with maximum 0.5 A) can be switched. For heavily inductive loads such as a relay, a suitable protection circuit (e.g. damping diode) is necessary.



Active signal outputs

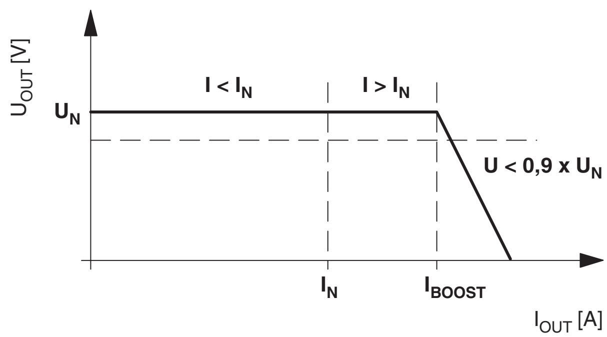
The 18 ... 24 V DC signal is applied between the "DC OK" and the "–" connection terminal blocks or between "I < I_N" and "–" and can carry up to 20 mA. By switching from "active high" to "low", the DC OK signal output signalizes when the output voltage is fallen short of by more than 10 %.
The DC OK signal is decoupled from the power output. This ensures that an external supply does not enter from devices connected in parallel.
The POWER BOOST signal output I < I_N signalizes that the nominal current is exceeded. The power supply unit is then in the POWER BOOST mode. Using this preventive function monitoring, critical operating statuses can be governed at an early stage before it results in a voltage dip.
The 18 ... 24 V DC signal can be directly connected to a logic input for evaluation.



Signal loop

Monitoring two devices: Use the active signal output of device 1 and loop in the floating signal output of device 2. In the event of malfunctioning, a common alarm is output. Any number of devices can be looped in. This signal combination saves wiring costs and logic inputs.

15 Function



Output characteristic curve

The power supply unit works with the static power reserve POWER BOOST as shown in the U/I characteristic curve in the figure. At ambient temperatures T_{amb} < +40 °C, I_{BOOST} is available continuously. At higher temperatures, it's available for a few minutes. In the event of a secondary-side short circuit or overload, the output current is limited to I_{BOOST}. Thereby, the module does not switch off, but rather supplies a continuous output current. The secondary voltage is reduced here until the short circuit is eliminated. The U/I characteristic curve with the power reserve POWER BOOST ensures that both high inrush currents of capacitive loads as well as consumers with DC/DC converters in the primary circuit can be supplied.
In order to trip standard power circuit breakers magnetically and very quickly, power supply units must supply a multiple of their nominal current for a short period.
As can be seen from the characteristic curve, when $I < I_N$, $I > I_N$ and $U < 0.9 \times U_N$. The relevant signaling can be found in the table "Signaling".

U_N = 24 V

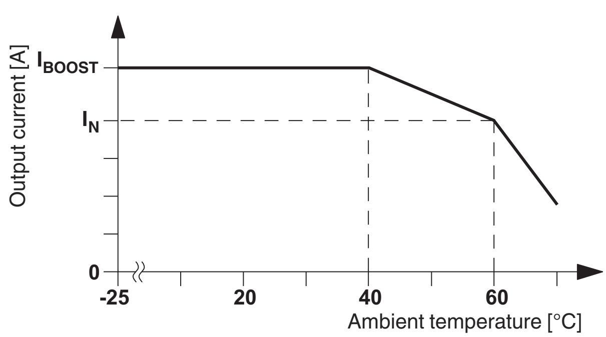
I_N = 5 A

I_{BOOST} = 7.5 A

SFB technology = 30 A

P_N = 120 W

P_{BOOST} = 180 W

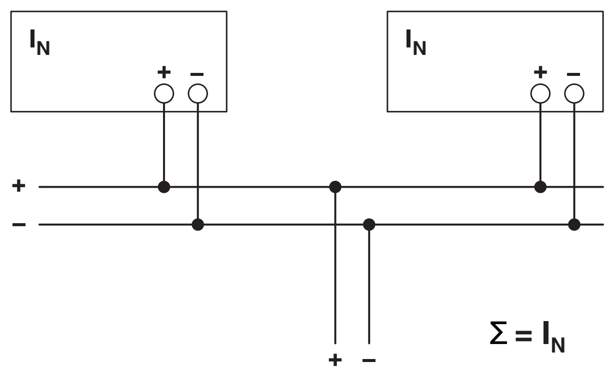


Thermal behavior

With an ambient temperature of up to +40°C, the device supplies the continuous output current of I_{BOOST}. The device can supply a nominal output current of I_N with ambient temperatures of up to +60°C. In the case of ambient temperatures above +60°C, the output current must be reduced by 2.5% per Kelvin increase in temperature. The device does not switch off at ambient temperatures of +70°C or thermal overload. The output capacity is reduced as far as necessary to provide device protection. After it has cooled down, the output capacity is increased again.

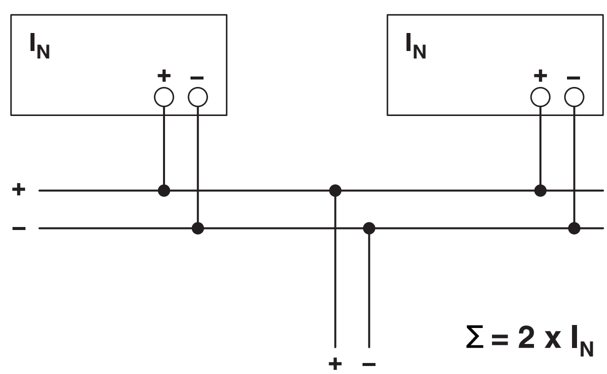
Parallel operation

Devices of the same type can be connected in parallel to enable both redundancy and an increase in efficiency. On default upon delivery, a further adjustment is not needed.
If the output voltage is adjusted, a uniform distribution of power is guaranteed by setting all parallel operated power supply units to exactly the same output voltage.
To ensure symmetrical current distribution we recommend that all cable connections from the power supply unit to the busbar are the same length and have the same cross-section!
Depending on the system, for parallel connection of more than two power supply units a protective circuit should be installed at each individual device output (e.g. decoupling diode, DC fuse or power circuit breaker). This prevents high return currents in the event of a secondary device fault.



Redundant operation

Redundant circuits are suitable for the supply of systems which make especially high requirements on the operational safety. If a fault occurs in the primary circuit of the first power supply unit, the second device automatically takes over the entire power supply, without interruption, and vice versa. For this reason, the power supply units to be connected in parallel are dimensioned in such a way that the total current requirement of all consumers can be completely covered by one power supply unit. 100% redundancy makes external decoupling diodes necessary (QUINT-DIODE/40, Order No. 2938963)!



Increased performance

For n parallel connected devices, the output current can be increased to n x I_N. Parallel connection to increase efficiency is used for the expansion of existing systems. It is advisable to use parallel connection if the power supply unit does not cover the current requirement of the most powerful consumer. Otherwise the consumers should be spread among individual devices independent of one another. A maximum of five devices can be connected in parallel!

Modicon Momentum I/O Base

User Guide

05/2010

31001697.13

www.schneider-electric.com

Schneider Electric

Table of Contents

Safety Information

Important Information

NOTICE

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of this symbol to a Danger or Warning safety label indicates that an electrical hazard exists, which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

DANGER
DANGER indicates an imminently hazardous situation which, if not avoided, **will result in** death or serious injury.

WARNING
WARNING indicates a potentially hazardous situation which, if not avoided, **can result in** death or serious injury.

⚠ CAUTION
CAUTION indicates a potentially hazardous situation which, if not avoided, **can result in** minor or moderate injury.

CAUTION
CAUTION, used without the safety alert symbol, indicates a potentially hazardous situation which, if not avoided, **can result in** equipment damage.

PLEASE NOTE

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction and operation of electrical equipment and the installation, and has received safety training to recognize and avoid the hazards involved.

About the Book

At a Glance

Document Scope

This manual contains complete information about the Momentum I/O bases. It contains only passing references to other Momentum components, including processor adapters, option adapters, and communication adapters.

Validity Note

This document is valid for Unity Pro 2.0 or later.

The technical characteristics of the device(s) described in this manual also appear online. To access this information online:

Step	Action
1	Go to *www.schneider-electric.com*
2	In the **Search** box on the home page, type a model number. Do not type any blank spaces in the model number. To get information on a grouping similar modules, you can use the characters ****; do not use dots or *xx*'s.
3	Under **All**, click **Products** →**Product Datasheets** and select the model number that interests you.
4	To save or print a data sheet as a .pdf file, click **Export to PDF**.

The characteristics presented in this manual should be the same as those that appear online. In line with our policy of constant improvement we may revise content over time to improve clarity and accuracy. In the event that you see a difference between the manual and online information, use the online information as your reference.

Related Documents

Title of Documentation	Reference Number
Momentum Processor Adapter and Option Adapter User Guide	870 USE 101
Momentum InterBus Communication Adapter User Manual	870 USE 009
Momentum Profibus-DP Communication Adapter User Manual	870 USE 004
Momentum FIPI/O Communication Adapter User Manual	870 USE 005
Momentum ControlNet Communication Adapter User Manual	870 USE 007
Momentum 170 AEC 920 00 I/O Base with 2 High-Speed Counters User Manual	870 USE 008
Momentum Modbus Plus PNT Series Communication Adapter User Manual	870 USE 103
Momentum DeviceNet Communication Adapter User Manual	870 USE 104
Momentum Modbus Plus NEF Series Communication Adapter User Manual	870 USE 111
Momentum 170ENT11001/170ENT11002 Ethernet Communications Adapter User Guide	870 USE 114

You can download these technical publications and other technical information from our website at www.schneider-electric.com.

User Comments

We welcome your comments about this document. You can reach us by e-mail at techcomm@schneider-electric.com.

Using Momentum I/O Bases

I

Overview

This part describes how to assemble TSX Momentum I/O bases with other Momentum components, how to mount assembled modules, and how to ground them.

What's in this Part?

This part contains the following chapters:

Introducing the TSX Momentum I/O Bases

1

Overview

This chapter introduces the basic features and types of TSX Momentum I/O bases.

What's in this Chapter?

This chapter contains the following topics:

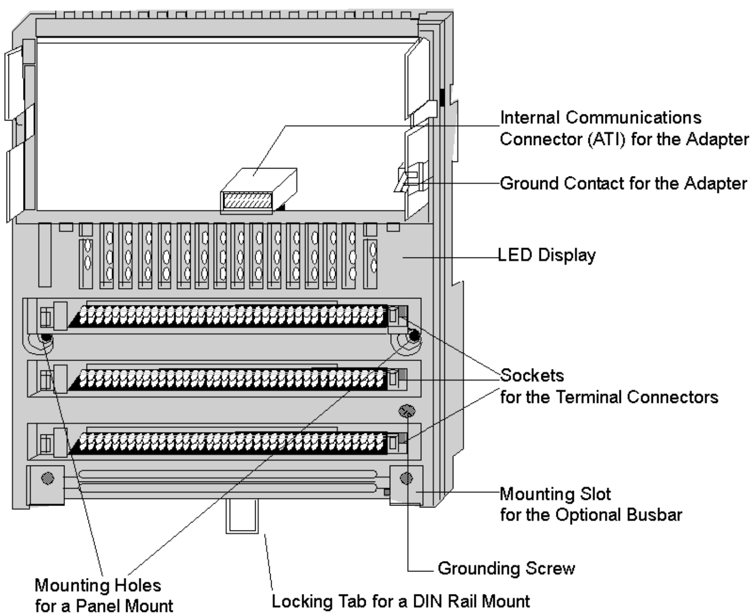
Basic Features of I/O Bases

Overview

This section provides a drawing of a typical I/O base and describes basic features of I/O bases.

Front View

The front panel components of a typical I/O base are shown in the illustration below



Internal Communications Connector

The internal communications connector on an I/O base provides automatic communication to any adapter mounted on the base.

LED Display

Each I/O base has a custom LED display, providing information about the status of input and output devices. Refer to the LED illustration and description for your I/O base for details.

Ground Contact

This contact provides an earth ground connection to any adapter mounted on the base.

Terminal Connector Sockets

Each I/O base has sockets for as many as three terminal connectors. Terminal connectors are required for connecting I/O devices and must be ordered separately. For ordering information, see *Terminal Connectors, page 26*.

Busbar Slot

A slot at the bottom of the I/O base allows a busbar to be attached to support 3- and 4-wire field devices. Busbars are optional. They must be ordered separately. For ordering information, see *Busbar Numbers, page 50*.

Mounting

Each I/O base has mounting holes for a panel mount and a locking tab for a DIN rail mount. For mounting instructions, see *Mounting TSX Momentum Devices, page 59*.

CE Compliant

TSX Momentum I/O bases are designed to meet CE mark requirements for open equipment. Other agency approvals can be found in the specifications for each I/O base module.

Types of I/O Bases

Overview

This section provides part numbers and descriptions for the TSX Momentum I/O bases.

Analog

The following analog I/O bases are available.

Part Number	Channels	Type	Details
170 AAI 030 00	8	Input	Broken wire detection
170 AAI 140 00	16	Input	Single-ended
170 AAI 520 40	4	Input	RTD/Thermocouple/mV
170 AAO 120 00	4	Output	0...20 mA
170 AAO 921 00	4	Output	4...20 mA

Combination

The following I/O bases support a combination of analog and discrete I/O.

Part Number	Channels	Type	Details
170 AMM 090 00	4 analog in 2 analog out 4 discrete in 2 discrete out	Input/Output	24 VDC
170 ANR 120 90 Unipolar	6 analog in 4 analog out 8 discrete in 8 discrete out	Input/Output	24 VDC
170 ANR 120 91 Bipolar	6 analog in 4 analog out 8 discrete in 8 discrete out	Input/Output	24 VDC

Discrete

The following discrete I/O bases are available.

Part Number	Points	Type	Details
170 ADI 340 00	16	Input	24 VDC
170 ADI 350 00	32	Input	24 VDC
170 ADI 540 50	16	Input	120 VAC
170 ADI 740 50	16	Input	230 VAC
170 ADM 350 10	16 in 16 out	Input Output	24 VDC, True High
170 ADM 350 11	16 in 16 out	Input Output	24 VDC, True High Fast Inputs
170 ADM 350 15	16 in 16 out	Input Output	24 VDC, True Low
170 ADM 370 10	16 in 8 out	Input Output	24 VDC @ 2 A
170 ADM 390 10	16 in 12 out	Input Output	24 VDC
170 ADM 390 30	10 in 8 relay out	Input Output	24 VDC
170 ADM 690 51	10 in 8 out	Input Output	120 VAC
170 ADO 340 00	16	Output	24 VDC
170 ADO 350 00	32	Output	24 VDC
170 ADO 530 50	8	Output	115 VAC @ 2A
170 ADO 540 50	16	Output	120 VAC
170 ADO 730 50	8	Output	230 VAC @ 2A
170 ADO 740 50	16	Output	230 VAC
170 ARM 370 30	10 in 8 out	Input Output	120 VAC Powered 24 VDC in

NOTE: The 170 ADM 690 50 has been replaced by the 170 ADM 690 51.

Specials

The following specialty I/O bases are available.

Part Number	Points	Type	Details
170 AEC 920 00	2	Counter	24 VDC
170 ANM 050 10		Seriplex	
170 ADM 540 80	6 in/3 out	Modbus	120 VAC

Selecting Other TSX Momentum Components

2

Overview

A TSX Momentum I/O base must be assembled with a communication adapter or processor adapter in order to function. If you choose a processor adapter, you may also use an option adapter.

This chapter describes:
- TSX Momentum adapters
- terminal connectors
- busbars

What's in this Chapter?

This chapter contains the following topics:

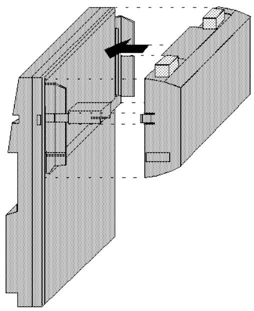
Which Components Should I Use?

Overview

This topic explains the choices you have in assembling a Momentum I/O device.

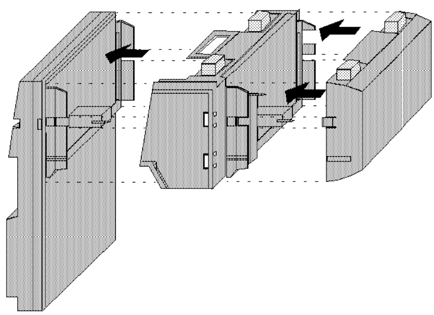
Primary Adapter

Each TSX Momentum I/O base must be assembled with a communication adapter or a processor adapter. Without one of these adapters, the I/O base will not function.



Option Adapter

If you use a processor adapter, you may add an option adapter. Option adapters cannot be used with communication adapters.



Terminal Connectors

Terminal connectors must be used to connect I/O devices to the I/O base.

Busbars

Busbars may be used to support 3- and 4-wire field devices. They are optional.

Communication Adapters

Overview

This topic describes the function of communication adapters, the types available, and where to get more information.

Function

A communication adapter provides an interface between an I/O base and a number of industry standard open-communication networks.

Types

The following communication adapters are available.

For this Network...	Order this Adapter...	and this Manual...
ControlNet	170 LNT 810 00	870 USE 007
DeviceNet	170 LNT 710 00	870 USE 104
Ethernet	170 ENT 110 01	870 USE 114
FIPI/O	170 FNT 110 00	870 USE 005
InterBus	170 INT 110 00 170 INT 110 01 170 INT 120 00	870 USE 009
Modbus Plus (IEC data format)	170 PNT 110 20 (Single Port) 170 PNT 160 20 (Dual Port)	870 USE 103
Modbus Plus (984 data format)	170 NEF 110 21 (Single Port) 170 NEF 160 21 (Dual Port)	870 USE 111
Profibus-DP	170 DNT 110 00	870 USE 004

Processor Adapters

Overview

This topic describes the function of processor adapters, the types available, and where to get more information.

Function

A processor adapter is a programmable logic controller (PLC). It stores and executes a logic program, and controls I/O points over a common communication bus. It is designed to mount on any Momentum I/O base and control its points as local I/O.

The following Momentum processor adapters are available.

Model	Internal Memory	Flash RAM	Clock Speed	Comm Ports
171 CCS 700 00	64K bytes	256K bytes	20 MHz	One Modbus RS-232 port
171 CCS 700 10	64K bytes	256K bytes	32 MHz	One Modbus RS-232 port
171 CCS 760 00	256K bytes	256K bytes	32 MHz	One Modbus RS-232 port
				One I/O bus port
171 CCC 760 10	512K bytes	512K bytes	32 MHz	One Modbus RS-232 port
				One I/O Bus port
171 CCS 780 00	64K bytes	256K bytes	20 MHz	One Modbus RS-232 port
				One Modbus RS-485 port
171 CCC 780 10	512K bytes	512K bytes	32 MHz	One Modbus RS-232 port
				One Modbus RS-485 port
171 CCC 960 20	512K bytes	512K bytes	50 MHz	One Ethernet port
				One I/O Bus port
171 CCC 960 30	512K bytes	512K bytes	50 MHz	One Ethernet port
				One I/O bus port
171 CCC 980 20	512K bytes	1 M bytes	50 MHz	One Ethernet port
				One Modbus RS-485 port
171 CCC 980 30	512K bytes	1 M bytes	50 MHz	One Ethernet port
				One Modbus RS-485 port

Model	Internal Memory	Flash RAM	Clock Speed	Comm Ports
171 CCC 960 91	512K bytes	512K bytes	50 MHz	One Ethernet port
				One I/O bus port
171 CCC 980 91	512K bytes	1 M bytes	50 MHz	One Ethernet port
				One Modbus RS-485 port
171 CBB 970 30	512K bytes	1 M bytes	50 MHz	Four Ethernet ports
				One Modbus RS-232/485 port

For More Information

For detailed descriptions of all the processor adapters, refer to the *TSX Momentum Processor Adapter and Option Adapter User Guide* (870 USE 101).

Option Adapters

Overview

This section describes the function of option adapters, the types available, and where to get more information.

Function

An option adapter is used in conjunction with a processor adapter and an I/O base to provide:
- a time-of-day clock
- a battery backup
- one or more additional communication ports

Types

The following option adapters are available

For these Communication Ports...	Order Adapter Part Number...
One user-selectable RS-232/RS-485 port	172 JNN 210 32
One Modbus Plus port	172 PNN 210 22
Two (redundant) Modbus Plus ports	172 PNN 260 22

For More Information

For detailed descriptions of all option adapters, refer to the *TSX Momentum Processor Adapter and Option Adapter User Guide* (870 USE 101).

Terminal Connectors

Overview

This section describes:
- the function of terminal connectors
- the coding key feature
- types of terminal connectors available
- how many are needed
- how to order them

Function

Terminal connectors are used to connect I/O field devices and the power supply to the I/O base. While busbars may also be used, terminal connectors are electrically connected to the module, busbars are not.

Coding Key Feature

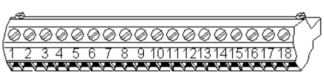
Some I/O bases can be operated over dangerous voltage ranges (above 42.4 VAC and above 60 VDC). Coding keys shipped with the I/O base and coding tabs shipped with the terminal connector can be used to prevent the accidental insertion into an I/O base of a terminal connector wired for the wrong voltage range.

For information on using coding keys, see Using Terminal Connector Coding Keys *(see page 47)*.

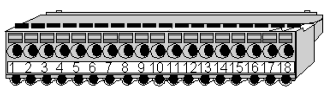
NOTE: For maximum protection, key coding is required during installation.

Types

Terminal connectors are available in screw-in and spring-clip versions.



Screw-type terminal block



Spring-clip terminal block

How Many Do I Need?

One terminal connector is required for each row of terminals that you will connect to the module's operating voltages and field devices.

Ordering Information

Terminal connectors must be ordered separately. They are available in kits of three. They are not shipped with the Momentum I/O bases.

<table>
<tr><th>Type</th><th>Kit Part Number</th><th>Wire Type</th><th>Wire Size</th></tr>
<tr><td>Screw-in (set of 3)
Note: The recommended maximum torque for the screws on these connectors is 4.4 in/lb (0.5 Nm).</td><td>170 XTS 001 00</td><td>Solid or stranded</td><td rowspan="2">If one wire, use 12AWG (2.5mm^2) max.
If two wires, use 14AWG (1.5mm^2) max.</td></tr>
<tr><td>Spring-clip (set of 3)</td><td>170 XTS 002 00</td><td>Solid only</td></tr>
</table>

Busbars

Overview

This section describes:
- The function of busbars
- Types of busbars
- How to choose a busbar
- How to order a busbar

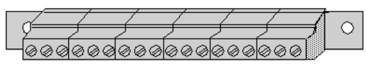
Function

A busbar may be plugged into the fourth row of an I/O base. Busbars provide a common connection for the field devices and serve as protective distribution connectors, for instance to PE. Each row of terminals on the busbar is connected internally. There is no electrical connection to the I/O base.

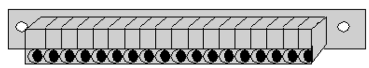
Types

Depending on the I/O base and the type and number of field devices to which it is connected, a 1-, 2-, or 3-row busbar may be used.

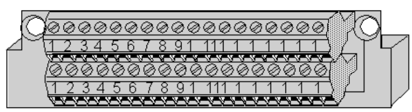
They are available in screw-in and spring-clip versions.



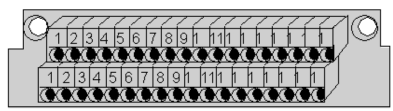
Screw-in 1 -row busbar



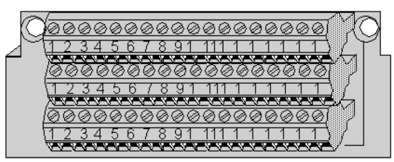
Spring-clip 1-row busbar



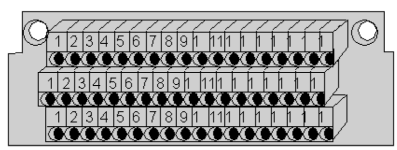
Screw-in 2 -row busbar



Spring-clip 2-row busbar



Screw-in 3 -row busbar



Spring-clip 3-row busbar

Specifications

Busbars have the following specifications:

Busbar type	Screw-in	Spring-clip
Max. load at 20 deg. C	250 V 14 A	250 V 17.5 A
Short circuit	100 A 30 s	100 A 30 s
Test voltage	2.2 kV	2.2 kV
Creepage / air dist.	per IEC 664A	per IEC 664A
Pollution	Degree 2	Degree 2
Contact derating at 70 deg. C	ca. 60% of nominal value	ca. 60% of nominal value

How to Choose a Busbar

See the internal pin connections and field wiring diagrams associated with your I/O base to determine whether or not you need a busbar and which busbar best suits your needs.

Ordering Information

Busbars should be ordered separately. They are not shipped with I/O bases.

Busbar Type	Part Number	# of Rows	Wire Size
Screw-in	170 XTS 006 01	1	If one wire, use 10AWG (4mm^2) max. If two wires, use 14AWG (2.5mm^2) max.
	170 XTS 005 01	2	One or two wires 14AWG (2.5mm^2) max.
	170 XTS 004 01	3	One or two wires 14AWG (2.5mm^2) max.
Spring-clip	170 XTS 007 01	1	If one wire, use 10AWG (4mm^2 max. If two wires, use 14AWG (2.5mm^2) max.
	170 XTS 008 01	2	One or two wires 14AWG (2.5mm^2) max.
	170 XTS 003 01	3	One or two wires 14AWG (2.5mm^2) max.

Assembly

3

Overview

This chapter describes how to assemble and disassemble the components of a TSX Momentum device:

- I/O bases
- communication adapters or processor adapters
- option adapters
- terminal connectors
- busbars
- labels

What's in this Chapter?

This chapter contains the following topics:

Assembling an Adapter and an I/O Base

Overview

A processor adapter or communication adapter can be snapped directly onto a Momentum I/O base. This section contains safety precautions for handling components and an assembly procedure.

Connection Points

The adapter and I/O base connect at these three points.

- The plastic snap extensions on the two sides of the adapter fit into the two slots on the sides of the I/O base.
- The 12-pin ATI connectors on the two units mate together.

No Tools Required

CAUTION

STATIC ELECTRICITY DAMAGE

Use proper ESD procedures when handling the adapter, and do not touch the internal elements. The adapter's electrical elements are sensitive to static electricity.

Failure to follow these instructions can result in equipment damage.

⚠ DANGER

RISK OF ELECTRICAL SHOCK

Make sure that the I/O base is not under power when it does not have an adapter mounted on it. Electrical circuitry on the I/O base may be exposed when a Momentum adapter is not mounted.

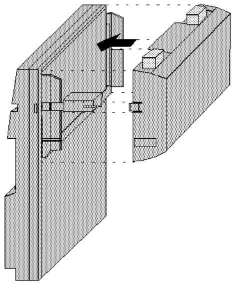
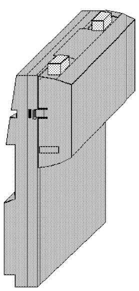
To make sure that power is not present, do not insert the wiring connectors to the I/O base until after the adapter has been mounted.

Failure to follow these instructions will result in death or serious injury.

The components can be snapped together by hand. No assembly tools are required.

Procedure

Follow the steps in the table below to assemble an adapter and an I/O base.

Step	Action
1	Choose a clean environment to assemble the I/O base and adapter to protect the circuitry from contamination.
2	Make sure that the I/O base is not under power while you assemble the module.
3	Align the two plastic snap extensions on the adapter with the slots on the sides of the I/O base. The 12-pin ATI connectors will automatically line up when the units are in this position. The two devices should be oriented such that their communication ports are facing out on the back side of the assembly. 
4	Push the adapter onto the base, gently pressing the locking tabs inward. **Result:** The locking tabs on each side of the adapter slide inside the I/O base and out through the locking slot. The 12-pin ATI connectors on the two units are mated to each other in the process. 

Next Step

Once the adapter and I/O base have been assembled, the device can be mounted on a DIN rail or surface-mounted inside a panel enclosure.

A Momentum device is classified as open equipment; i.e., electrical circuitry on the unit may be exposed. Open equipment should be installed in an industry-standard enclosure, and direct access must be restricted to qualified service personnel.

Disassembling an Adapter from an I/O Base

Overview

This section contains safety precautions and a procedure for disassembling an adapter from an I/O base.

Tools Required

⚠ DANGER

RISK OF ELECTRICAL SHOCK

Before removing an adapter from the base, disconnect the wiring connectors.

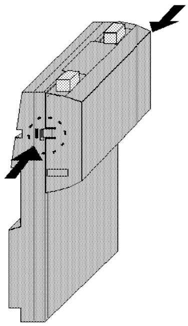
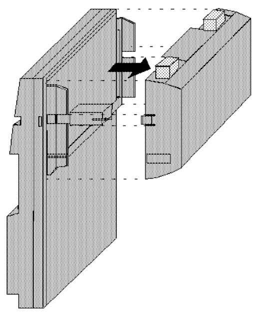
Make sure that the I/O base is not under power when it does not have a Momentum adapter mounted on it.

Failure to follow these instructions will result in death or serious injury.

A flat-head screw driver.

Procedure

Follow the steps in the table below to remove an adapter from an I/O base.

Step	Action
1	Choose a clean environment to disassemble the unit, in order to protect the circuitry from contamination.
2	Make sure that the I/O base is not under power by removing the terminal connectors from the I/O base.
3	Use a screwdriver to push the clips on both sides of the adapter inward, as shown in the illustration below. 
4	Lift off the adapter. 

Assembling a Processor Adapter and an Option Adapter

Overview

If a TSX Momentum option adapter is used, it is mounted between an M1 processor adapter and an I/O base in a three-tiered stack.

This section contains guidelines, safety precautions and a procedure for assembling a processor adapter and an option adapter.

Guidelines

We recommend that you snap together the option adapter and the M1 processor adapter before mounting them on the I/O base.

Connection Points

The option adapter and M1 processor connect at these four points.

- The plastic snap extensions on the two sides of the processor adapter fit into the two slots on the sides of the option adapter.
- The 12-pin ATI connectors on the center of the back walls of the two units mate together.
- The 34-pin processor extension connectors that run along the left sidewalls of the components mate together.

No Tools Required

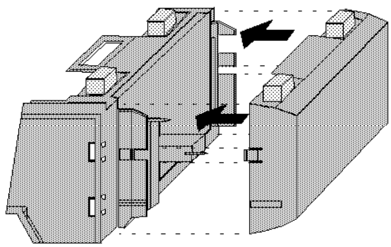
The components can be snapped together by hand; no assembly tools are required. A flat-head screw driver is required to disassemble the unit.

Procedure

Follow the steps in the table below to assemble an option adapter and an M1 processor adapter.

Step	Action
1	Choose a clean environment to assemble the option adapter and processor to protect the circuitry from contamination.
2	Align the two plastic snap extensions on the sides of the M1 processor adapter with the slots on the sides of the option adapter. The 12-pin ATI connectors and processor extension connectors will automatically line up when the units are in this position. The two devices should be oriented such that their communication ports are facing out on the back side of the assembly.

CAUTION
PIN ALIGNMENT Do not connect one side and try to rotate the M1 onto the option adapter. Proper assembly requires that the 34 pins on the processor extension connector be aligned correctly with the mating socket on the M1 processor adapter. **Failure to follow these instructions can result in equipment damage.**

Step	Action
3	Push the processor adapter onto the option adapter, gently pressing the locking tabs inward.  **Result:** The locking tabs on each side of the Processor Adapter slide inside the Option Adapter and out through the locking slot. The 12-pin ATI connectors on the two units are mated to each other in the process.

Next Step

Follow the directions in the next section to mount the assembled adapters on the I/O base.

Mounting the Assembled Adapters on the I/O Base

Overview

This section gives guidelines, safety precautions and a procedure for mounting the assembled processor and option adapter on an I/O base.

Connection Points

The assembled adapters connect with the I/O base at these seven points.

- Two plastic snaps on the front of the option adapter fit into two slots on the front of the I/O base.
- The plastic snap extensions on the two sides of the option adapter fit into the two slots on the sides of the I/O base.
- The 12-pin ATI connectors on the center of the back walls of the two units mate together.
- The plastic stirrup on the back of the option adapter clips onto the bottom of the I/O base.

No Tools Required

⚠ DANGER

RISK OF ELECTRICAL SHOCK

Make sure that the I/O base is not under power when it does not have an adapter mounted on it. Electrical circuitry on the I/O base may be exposed when a Momentum adapter is not mounted.

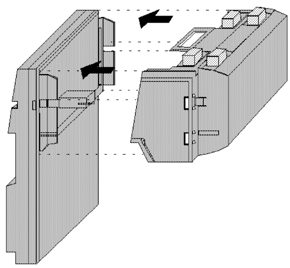
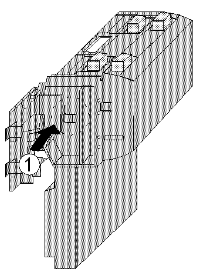
To make sure that power is not present, do not insert the wiring connectors to the I/O base until after the adapter has been mounted.

Failure to follow these instructions will result in death or serious injury.

The components can be snapped together by hand; no assembly tools are required. A flat-head screw driver is required to disassemble the unit.

Procedure

Follow the steps in the table below to mount the assembly on an I/O base

Step	Action
1	Make sure that the I/O base is not under power when you assemble the module.
2	Align the four plastic snap extensions (on the front and sides of the option adapter) with the slots on the I/O base. The 12-pin ATI connectors will automatically line up when the units are in this position. The devices should be oriented such that their communication ports are facing out on the back side of the assembly. 
3	Push the assembled adapters onto the base, gently pressing the locking tabs inward. Snap #1 shown in the illustration below will not align properly with the mating slot in the I/O base unless the option adapter is placed straight onto the base. Do not attach just one latch and rotate the option adapter onto the I/O base.  **Result:** The locking tabs on each side of the option adapter slide inside the I/O base and out through the locking slot. The 12-pin ATI connectors on the two units are mated to each other in the process.
4	Apply slight pressure to the top of the stirrup on the back of the option adapter so that it snaps into place on the bottom of the I/O base.

Disassembling a Module with an Option Adapter

Overview

The three-tiered assembly is designed to fit together tightly so it can withstand shock and vibration in an operating environment.

This section contains two procedures:
- removing the assembled adapters from the I/O base
- removing the option adapter from the processor

Tools Required

Flat-head screwdriver.

Procedure 1

Follow the steps in the table below to remove the assembled option adapter and M1 processor adapter from the I/O base.

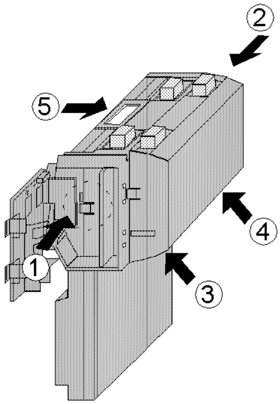
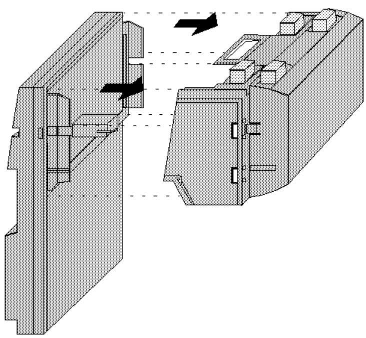
Step	Action
1	Make sure that the power is off by removing the terminal connectors from the I/O base.
2	Remove the assembled unit from its wall or DIN rail mounting surface.

CAUTION

RISK OF DETERIORATION OF CIRCUITRY IN BATTERY COMPARTMENT

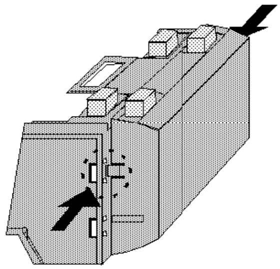
Use care when you insert a screwdriver in the battery compartment so that you do not scratch any exposed elements.

Failure to follow these instructions can result in equipment damage.

Step	Action
3	Open the battery door and use a flat-head screwdriver to release snaps 1 and 2 as shown in the illustration below. 
4	Once snaps 1 and 2 have been disengaged, use the screwdriver to release snaps 3 and 4 on the front of the assembly.
5	Gently lift the stirrup on the back of the option adapter with your fingers until it disengages from the bottom of the I/O base. Then lift the option adapter and M1 assembly from the I/O base. 
6	Follow the directions in the next procedure to remove the option adapter from the Processor.

Procedure 2

Follow the steps in the table below to remove the option adapter from the M1 processor.

Step	Action
1	Use a screwdriver to push the clips on both sides of the adapter inward. 
2	Lift off the adapter.

Using Terminal Connector Coding Keys

Overview

This section describes how to use terminal connector coding keys. It also provides an illustrated example of coded terminals.

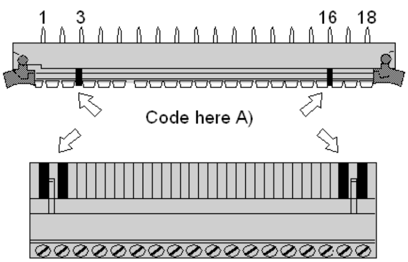
How Coding Keys Work

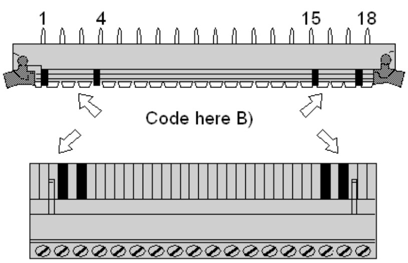
Each I/O base has a series of slots into which you can insert one or more of the coding keys. Each terminal connector has a similar series of slots into which you can insert one or more of the coding tabs. When a key and a tab are inserted into slots that should mate, the I/O base and the connector cannot be physically connected.

NOTE: For maximum protection, key coding is required during installation.

Example

An example of a key-coded screw-in terminals is shown in the figure below.





A) Coding for Voltage Range I (≤42.4 VAC / ≤60 VDC) e.g. 24 VDC
B) Coding for Voltage Range II (≥ 42.4 VAC / ≥ 60 VDC) e.g. 60 VDC

Inserting Terminal Connectors

Overview

⚠ DANGER

RISK OF ELECTRIC SHOCK

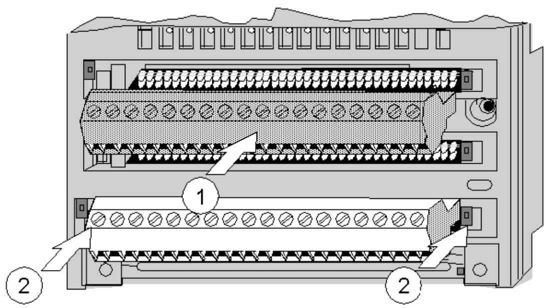
Make sure that power is not present while you are handling the coding keys on the I/O base and on the terminal connectors. Electrical voltages are present when the I/O base is under power.

Failure to follow these instructions will result in death or serious injury.

This section contains safety precautions and a diagram illustrating how to insert terminal connectors in a TSX Momentum I/O base.

Inserting a Terminal Connector

Install the terminal connectors by pushing them into the coded pin connectors (row 1 ... 3 of the I/O base).



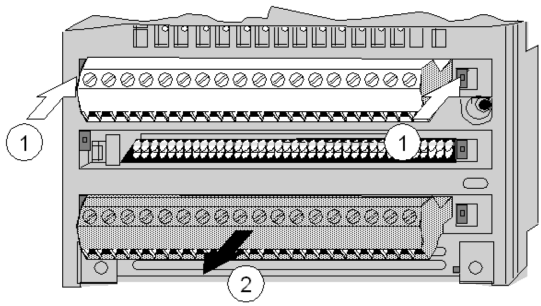
Removing a Terminal Connector

Overview

This section describes how to remove a terminal connector from a TSX Momentum I/O base.

Diagram

To remove a terminal connector, press the two tabs at the ends of the row (labeled 1 in the figure below).



Attaching a Busbar

Overview

This section describes how to attach a busbar to an I/O base.

General

An optional busbar may be inserted into the fourth row of an I/O base. Busbars provide a common connection for the field devices and serve as protective distribution connectors, for instance to PE. Each row of terminals on the busbar is connected internally. There is no connection to the I/O base.

NOTE: See the internal pin connections and field wiring diagrams associated with your I/O base to determine whether or not you need a busbar and which busbar best suits your needs.

Busbar Types

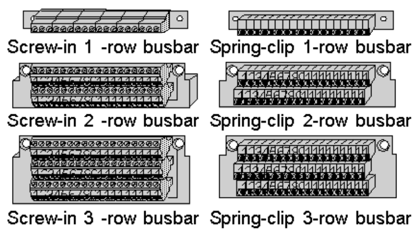
Depending on the I/O base and the type and number of field devices to which it is connected, a 1-, 2-, or 3-row busbar may be used. Busbars are separately ordered items; they are not shipped with the I/O bases. They are available in either screw-in and spring-clip versions.

Screw Size

For a screw-in type busbar, use the two, self-tapping Phillips head machine screws provided, to fasten it to the I/O base.

Busbar Numbers

The following table provides ordering information on the different busbar types:

Busbar Type	Part Number	# of Rows	Wire Size
Screw-in	170 XTS 006 01	1	One or two wires up to 10 AWG (4 mm^2
	170 XTS 005 01	2	One or two wires up to 14 AWG (1.5 mm^2)
	170 XTS 004 01	3	
Spring-clip	170 XTS 007 01	1	
	170 XTS 008 01	2	
	170 XTS 003 01	3	

Labeling the Components in the Assembly

Overview

A fill-in label is shipped with each I/O base. This label should be attached to the face of the communication adapter or M1 processor adapter that you mount on that base.

This section describes the label and provides an illustrated example.

Fill-In Label

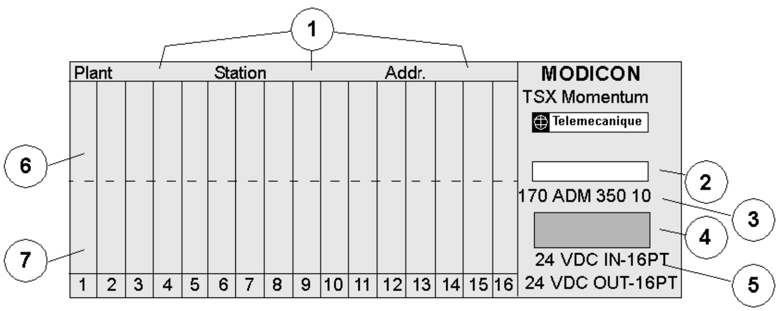
A completed label provides information about the assembled module and its I/O field devices that can be used by service and maintenance personnel.

The model number of the I/O base is pre-screened onto the fill-in label directly above the color code. The cutout area above the I/O model number allows the pre-screened model number of the adapter to show through.

NOTE: An option adapter may also be used in the assembled module. You will find its model number printed in the upper left corner of option adapter housing.

Example of a Fill-In Label

A sample fill-in label is illustrated in the diagram below. The numbered pointers in the diagram refer to the descriptions in the table that follows.



1 fields for plant name, station name and network address
2 cutout–the model number of the adapter shows through
3 model number of the I/O base
4 color code of the I/O base
5 short description of the I/O base
6 field for the symbol name of inputs
7 field for the symbol name of outputs

Dimensions and Mounting Instructions

4

Overview

This chapter gives dimensions of assembled TSX Momentum devices and describes how to mount them on a DIN rail or wall.

What's in this Chapter?

This chapter contains the following topics:

Dimensions of Assembled TSX Momentum Devices

Overview

This section contains general information about the dimensions of TSX Momentuo assemblies.

Dimension Factors

The following factors influence the dimensions of the assembly:
- the type of I/O base
- use of an option adapter
- use of busbars

Mandatory Vertical Clearances

The vertical clearances illustrated in the dimension drawings must be maintained to assure proper heat dissipation.

Horizontal Clearances

In all cases, maintain 1 in of clearance between Momentum devices and the edge of the cabinet.

Standard Adapter on a Typical Base

Overview

This section provides dimensions for a standard processor adapter or communications adapter mounted on a typical analog or VDC I/O base.

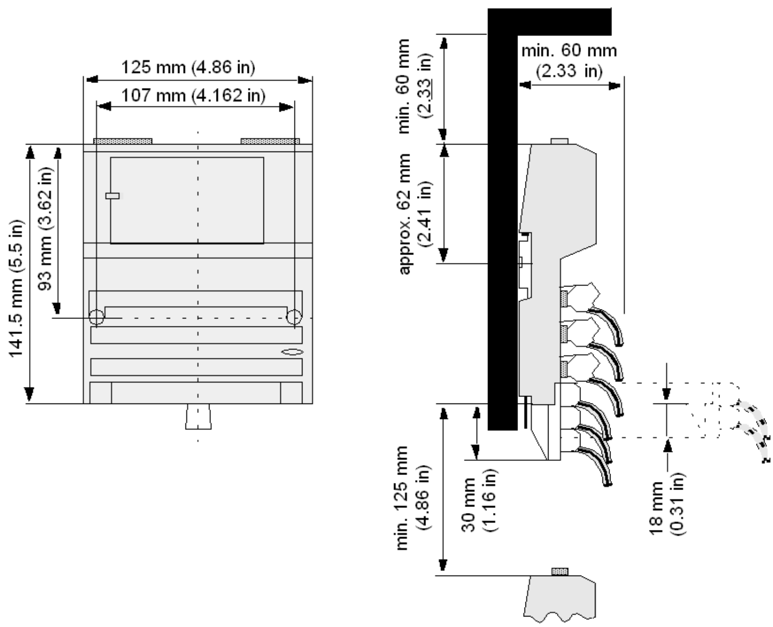
Notes

The wiring from the terminal connectors dictates the minimum depth (60 mm) of this assembly.

The figure on the right shows an additional 30 mm length dimension for an optional three-row busbar.

Illustration

The following illustration shows dimensions for this assembly.



Standard Adapter on a Discrete VAC Base

Overview

If you are using a discrete VAC I/O base such as a 170 ADI 540 50 or a 170 ADO 540 50, refer to the drawing below for your dimensions.

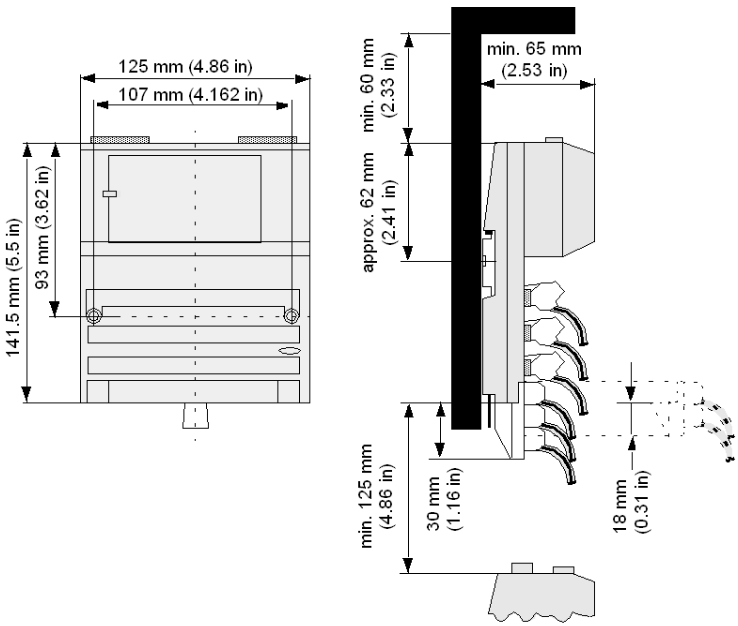
Notes

The minimum depth dimension (65 mm) is determined by the unit housings, not the wiring terminals.

The figure on the right shows an addition 30 mm length dimension for an optional three-row busbar.

Illustration

The following illustration shows dimensions for this assembly.



Processor and Option Adapter on a Typical Base

Overview

This section provides dimensions for a processor adapter and an option adapter mounted on a typical analog or VDC I/O base.

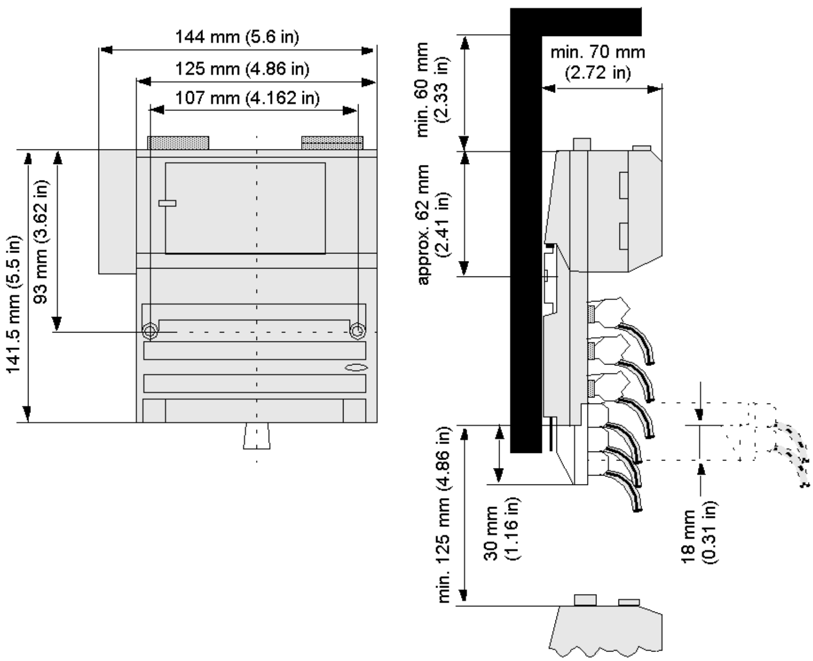
Notes

The option adapter adds to the width of this assembly (total 144 mm).

The figure on the right shows an addition 30 mm length dimension for an optional three-row busbar.

Illustration

The following illustration provides dimensions for this assembly.



Processor and Option Adapter on a Discrete VAC Base

Overview

This section provides dimensions for using processor and option adapters with a discrete VAC base.

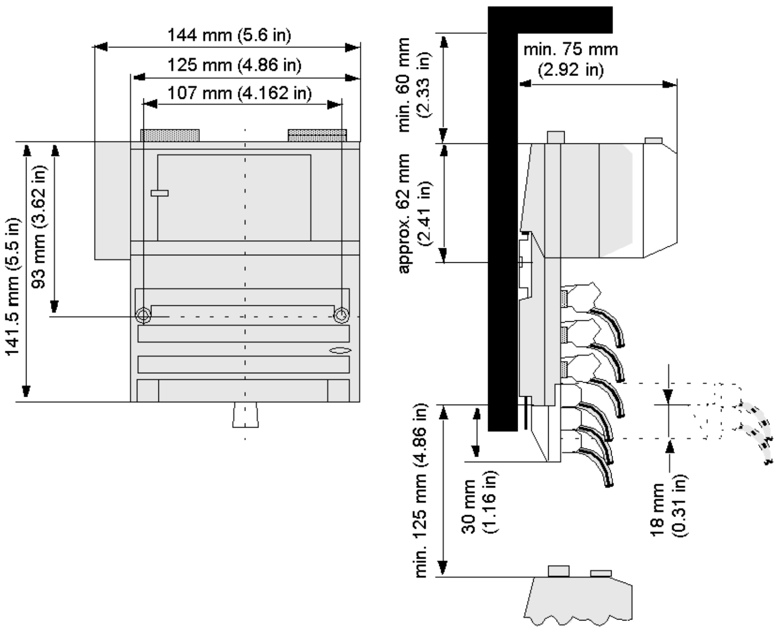
Notes

The minimum depth (75 mm) includes both the option adapter and the built-in extender ring on the I/O base.

The figure on the right shows an addition 30 mm length dimension for an optional three-row busbar.

Illustration

The following illustration shows dimensions for this assembly.



Mounting TSX Momentum Devices

Overview

This section contains guidelines for installation and drawings which illustrate how to mount a TSX Momentum assembly on a DIN rail or wall.

Guidelines

TSX Momentum components are designed as open equipment per IEC 1131-2, 1.4.20. Open equipment should be installed in industry-standard enclosures, and access should be restricted to authorized personnel.

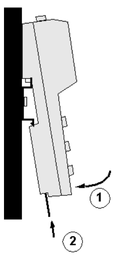
Chassis Ground

Contact springs on the back of the I/O base establish electrical contact (chassis ground) with the DIN rail mounting track.

To establish chassis ground in a wall-mount situation, you will need to obtain two mounting screws for each unit. The body of the screws should be 4mm (0.16 in) in diameter and at least 25mm (0.97 in) long. The head of the screw must not exceed 8mm (0.31 in) in diameter.

Mounting on a DIN Rail

The numbers in the following illustration refer to the steps in the procedure below.



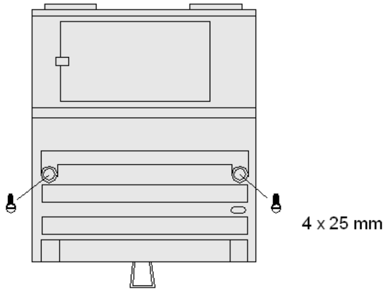
Procedure

Follow the steps in the table below to mount a TSX Momentum assembly on a DIN rail.

Step	Action
1	Hook the plastic tabs on the back of the device onto the DIN rail and swing the module down to rest against the rail.
2	Push the locking tab upward to secure the device in place.

Mounting on a Wall

Secure the device to the wall with two screws, as shown in the illustration below. The head of the screws must not exceed 8mm (0.31 in) in diameter.



Power and Grounding Guidelines

5

Overview

This chapter provides information about power supplies, circuits, and grounding.

What's in this Chapter?

This chapter contains the following topics:

Voltage Types

Overview

In planning your circuit layout, you must differentiate between operating voltage, input voltage, and output voltage.

Operating Voltage

The operating voltage feeds the internal logic of the individual I/O bases. (Abbreviations: L+ / M- for direct current; L1 / N for alternating current.)

Input Voltage

The input voltage supplies the sensors. (Abbreviations, where the leading numbers specify the groups: 1L+ / 1M-, 2L+ / 2M-, ... for direct current; 1L1 / 1N, 2L1 / 2N, ... for alternating current.)

Output Voltage

The output voltage drives the actuators. (Abbreviations equivalent to those for input voltage.)

Common Reference Potential

When two or more circuits have a common reference potential (i.e., they are not isolated), their corresponding reference conductors are abbreviated identically– for example, L+ / M- and 1L+ / M- are used when L+ and 1L+ are not isolated.

Structuring Your Power Supply System

Overview

This section contains guidelines for planning and wiring your power supply system.

Use Separate Power Supply for Outputs

Operating voltage and input voltage can be derived from one power supply (PS). We recommend that the output voltage be drawn from a separate power supply (e.g., 10 A or 25 A, referred to as PS1 and PS2).

A separate output voltage supply prevents interferences caused by switching processes from affecting the voltage supply to the electronics. Where larger output currents are involved, provide additional power supplies for the output voltage (PS3, ...).

Use Star Configuration

⚠ CAUTION

POTENTIAL FOR SHORT CIRCUITS AND/OR POWER-UP/POWER-DOWN SPIKES

Provide external fuses on the operating voltage to protect the module. Appropriate fuse values are shown in the wiring diagrams. An unprotected module may be subject to short circuits and/or power-up/power-down spikes.

Failure to follow these instructions can result in injury or equipment damage.

Each I/O base should be fed by the power supply in star configuration, i.e., separate leads from the power supply to each module.

Avoid Induction Loops

Do not create any induction loops. (This can be caused by laying out the supply conductors L+/M-, ... in pairs.) As a remedy, use twisted-pair wiring.

Avoid Series Connections

The series connections often found in automatic circuit breakers should be avoided since they increase the inductive component in the output-voltage leads.

Potential-Isolated Fieldbus Islands

The potential relationships of the bus adapters are designed so that the individual I/O stations form potential-isolated islands (e.g., by isolating the incoming remote bus of InterBus). To decide whether potential balancing is necessary, refer to the installation guidelines of the used communication adapter.

Selecting Power Supplies

Overview

This section provides guidelines for selecting power supplies.

Using Three-Phase Bridges

CAUTION

RISK OF ELECTRICAL SHOCK

Do electrically isolate the AC-to-DC converter between the input (primary) and output (secondary). Otherwise, voltage levels can be propagated to the output if the AC-to-DC converter fails.

Failure to follow these instructions can result in injury or equipment damage.

Unfiltered three-phase bridges can be used in 24 VDC power supplies for the I/O bases, the sensors, and the actuators. In view of the maximum permissible ripple of 5%, monitoring for phase failure is necessary. For single-phase rectification, the 24 VDC must be buffered to ensure conformance to the specifications in System Specifications *(see page 595)* (20...30V; max. ripple 5 %).

Provide Reserve Capacity

Startup transients, extra long cables, and low cross-sectional efficiency can lead to voltage supply breakdowns. Therefore, you should select power supplies with enough reserve capacity and select the proper cable lengths and cross sections.

Single Power Supply Configuration

Overview

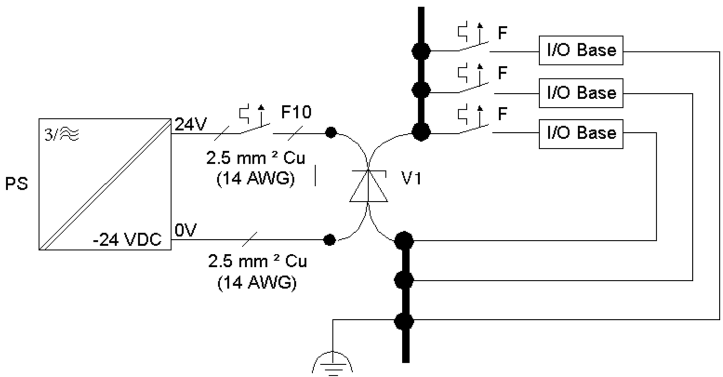
This section contains illustrations of a sample circuit layout, potential bundling, and potential isolation for a single power supply configuration.

Fusing in Circuit Layout

Each of the following circuit branches must be fuse-protected (F in the figure below). In the case of long lines, the circuit branch must be provided with a suppressor circuit OVP 001/OVP 248. This protection selectively shuts off a circuit branch through the associated fuse even if the diode is short-circuited.

Illustration

The following illustration shows a sample circuit layout for a single power supply configuration.



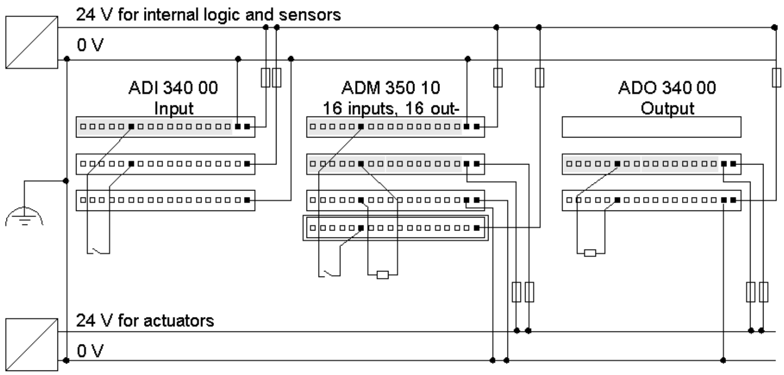
F automatic circuit breaker or fuse (see appropriate field wiring illustration in I/O base description)
F10 optional circuit breaker (with over-voltage protection)
PS power supply 24 VDC, max. 25 A
V1 overvoltage protection circuit OVP 001, OVP 002

Fusing in Wiring Illustrations

The fuses shown in the illustrations below must be selected on the basis of the type and number of the sensors and actuators used.

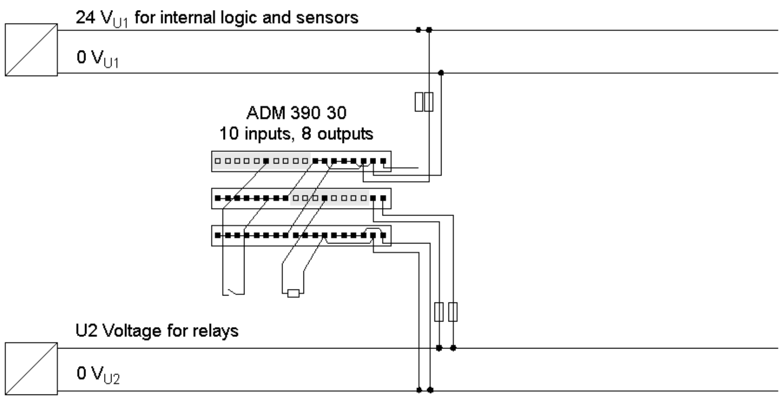
Potential Bundling

In this example, the output voltage is drawn from a separate power supply.



Potential Isolation

In this example, the output voltage is drawn from a separate power supply



Protective Circuits for DC Actuators

Overview

This section discusses specific cases when inductive loads at output points require additional protective circuits (directly on the actuator) and provides two examples of protective circuitry.

Case 1

When there are contacted circuit elements (e.g. for safety interlocks) in the output conductors.

Case 2

When the leads are very long.

Case 3

Where inductive actuators are operated via relay contacts of the I/O base (to extend contact life and for EMC considerations).

Protective Circuit Types

In all three cases, the protective circuit is a clamping diode.

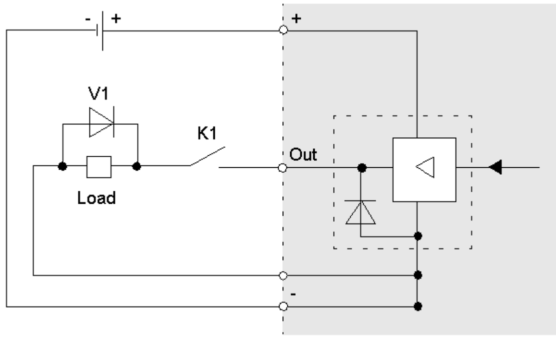
The following table provides generic selection guidelines.

Type of Load	Suppression Device	Minimum Component Rating
DC circuits	a reverse-biased clamping diode across the load	2 A and greater than twice the maximum load voltage

Consult relay and contactor manufacturers' catalogs for commercial suppression devices matched to your particular products.

Example 1

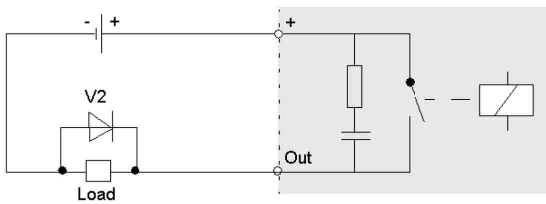
An example of a protective circuit for inductive DC actuators is illustrated below:



K1 contact, e.g., for safety interlocks
V1 clamping diode as the protective circuit

Example 2

Another example of a protective circuit for inductive DC actuators is illustrated below:



V2 clamping diode as the protective circuit

Protective Circuits for AC Actuators

Overview

To reduce noise potentials and for EMC considerations you may need to equip the inductive actuators with noise suppressors, e.g., anti-interference capacitors, at the point of interference.

Protective Circuit Types

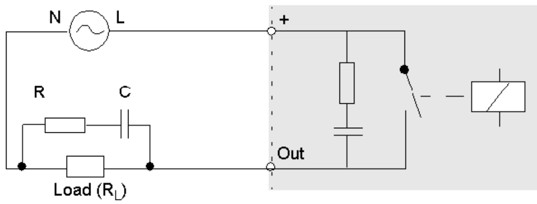
The following table provides generic selection guidelines.

Type of Load	Suppression Device	Minimum Component Rating	
AC circuits	50 Ω resistor in series with a 0.47 μfd nonpolarized capacitor across the load	for 120 VAC-powered loads	200 VAC
		for 220 VAC-powered loads	400 VAC

Consult relay and contactor manufacturers' catalogs for commercial suppression devices matched to your particular products.

Example

An example of a protective circuit for inductive AC actuators is illustrated below:



Grounding Momentum Devices

Overview

This section describes how to provide two types of grounding for assembled Momentum devices:
- functional earth (FE), used to discharge high frequency disturbances, guaranteeing proper EMC behavior
- protective earth (PE), used to protect against personal injuries according to IEC and VDE

Grounding Momentum Devices

Momentum devices consist of an I/O base assembled with a communications adapter or a processor adapter and possibly an option adapter. The PE of the adapters is electrically connected with the PE of the I/O base; you do not have to provide any further grounding of the adapter.

Grounding Guidelines

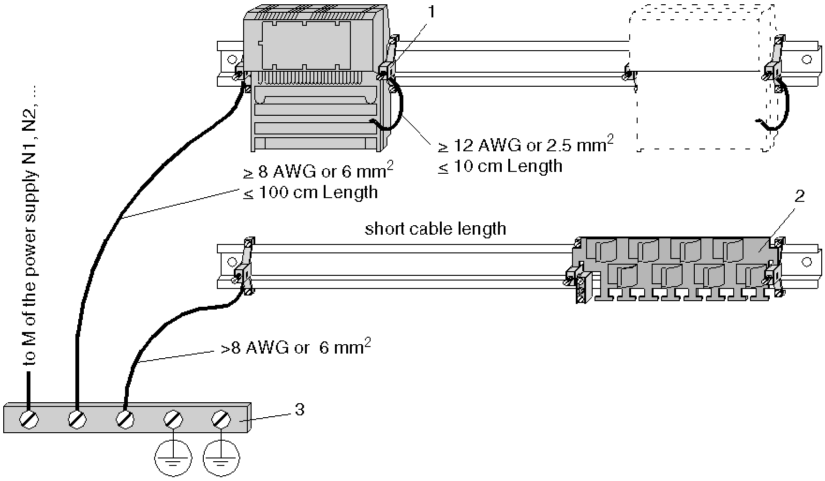
Follow these guidelines.
- Be sure you establish good ground contacts.
- Connect the grounding screw to protective earth (PE) for AC and DC modules with a recommended maximum torque of 4.4 in/lb (0.5 Nm) using a PZ2 driver.

Cable Specifications

When you are using ground cable up to 10 cm (4 in) long, its diameter should be at least 12 AWG (or 2.5 mm^2). When longer cables are used, larger cable diameters are required, as shown in the following illustration.

Grounding Scheme

The illustration below illustrates properly grounding modules and tracks.



1 grounding clamp, such as EDS 000
2 cable grounding rail (CER 001), an optional component for grounding lines close to PE/FE rail
3 PE/FE rail in the cabinet or PE/FE screw in terminal cabinet

NOTE: The lower DIN rail shows a cable grounding rail (CER 001), an optional component for grounding analog lines. For a procedure for grounding analog I/O lines, see Grounding Analog I/O Lines *(see page 74)*.

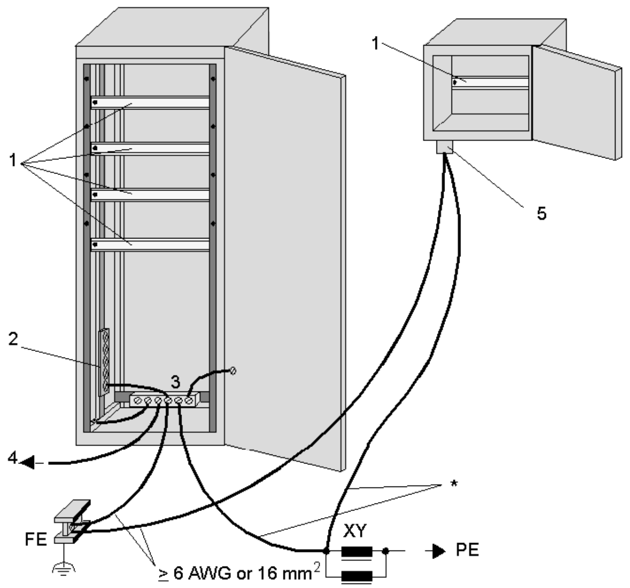
Grounding DIN Rail Terminals and Cabinets

Overview

This section shows how to ground DIN rail terminals and cabinets.

Illustration

The following illustration shows how to ground DIN rail terminals and cabinets:



1 DIN rail for connecting the Momentum device and its accessories
2 reference conductor system or rail (solid copper or connected terminals)
3 grounding bar in the cabinet
4 next cabinet
5 grounding screw (PE/FE) in cabinet
FE functional earth
PE protective earth
XY protective earth choke
* conductor cross section depends on the load of the system

Grounding Analog I/O Lines

Overview

Analog wires must be grounded directly when entering the cabinet. You may use commercial cleats or clamps or an analog cable grounding rail. This section describes both approaches.

Principle

High frequency interference can only be discharged via big surfaces and short cable lengths.

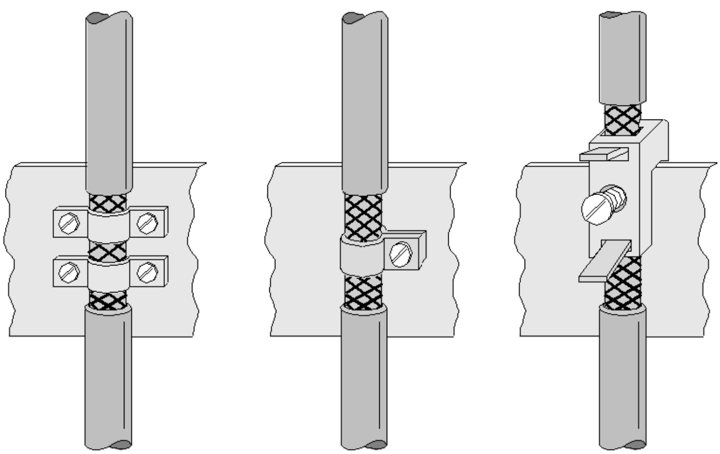
Guidelines

Follow these wiring guidelines:
- Use shielded, twisted-pair cabling
- Expose the shielding on one side (for instance, at the console exit)
- Make sure the track is properly grounded *(see page 71)*

Grounding of the bus cable is determined by the bus adapter used. Look for details in your *bus adapter manual*.

Using Cleats or Clamps

Cleats or clamps can be mounted directly on the ground rail (PE/FE rail) in the cabinet, as shown in the illustration below. Be sure the cleats or clamps make proper contact.



I/O Base Descriptions

II

Purpose

This part provides descriptions of each I/O base.

What's in this Part?

This part contains the following chapters:

170 AAI 030 00 Analog 8 Channel Differential Input Module Base

6

Overview

This chapter describes the 170 AAI 030 00 TSX Momentum I/O base.

What's in this Chapter?

This chapter contains the following topics:

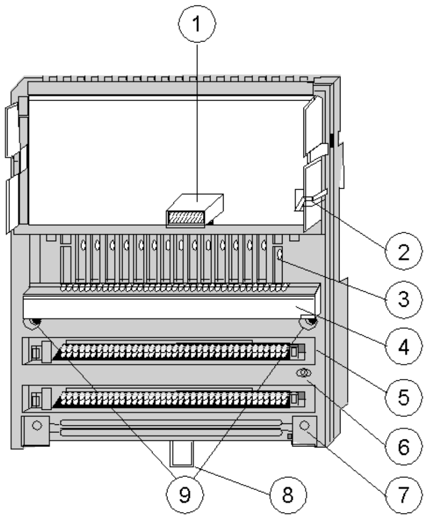
Front Panel Components

Overview

This section contains an illustration of the front panel of the 170 AAI 030 00 I/O base and a description of the LEDs.

Front Panel Illustration

The front panel of the I/O base is shown in the illustration below.

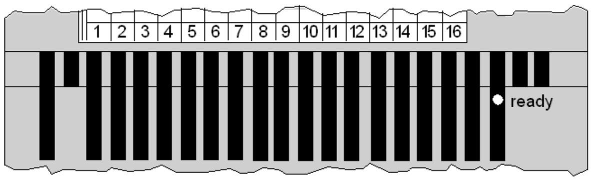


Components of the I/O module

Label	Description
1	Internal interface (ATI) connector
2	Locking and ground contact for the adapter
3	LED status display
4	Protective cover
5	Sockets for the terminal connectors
6	Grounding screw
7	Busbar mounting slot
8	Locking tab for DIN rail mount
9	Mounting holes for panel mount

LED Illustration

This I/O base has one LED, the ready indicator shown in the illustration below.



LED Descriptions

The ready indicator is described in the table below.

Indicator	Condition	Message
Ready	Green	Module is ready to communicate. Operating voltage for internal logic is present and self-test has been passed.
	Off	Module is not ready. Operating voltage is not present or module is defective.

Specifications

Overview

This section contains specifications for the 170 AAI 030 00 I/O base.

General Specifications

Module type	8 analog inputs
Input voltage range	+/- 10 V, +/- 5 V, 1 ... 5 V
Input current range	+/- 20 mA, 4 ... 20 mA
Supply voltage	24 VDC
Supply voltage range	20 ... 30 VDC
Supply current consumption	max. 362 mA at 24 VDC
Power dissipation	3.73 W typical 6.58 W maximum
I/O map	8 input words 2 output words

Isolation

Between channels	140 VAC Hz or 200 VDC, 1 min
Between input channels and ground	500 VAC

Fuses

Internal (not user-replaceable)	2 A slow-blow
External (recommended)	1 A slow-blow (Bussmann GDC-1A or equivalent)

EMC

Immunity	IEC 1131-2 Surge on auxiliary power supply 500 V
Emissions	EN 50081-2
Agency approvals	UL, CSA, CE, FM Class 1 Div.2 pending

Physical Dimensions

Width	125 mm (4.9 in)
Depth (with no adapter)	40 mm (1.54 in)
Length	141.5 mm (5.5 in) no busbar
Weight	215 g (0.45 lb)

Analog Inputs

Surge tolerance: input voltage input current	 +/- 30 VDC +/- 25 mA
Number of channels	8
Format of transmitted data	full 16 bits signed (2's complement)
Protection	polarity inversion
Error indication	none
Common mode rejection	250 VAC @ 47 ... 63 Hz or 100 VDC channel-to-ground
Update time for the inputs (in ms)	1.33 + n x 1.33 n = number of declared channels
Filtering	low pass with cutoff frequency 18 kHz

Range Specific Data

Range	**+/- 10 V**	**+/- 5 V**	**1 ... 5 V**	**+/- 20 mA**	**4 ... 20 mA**
Input impedance	20 MOhm	20 MOhm	20 MOhm	250 Ohm	250 Ohm
Error at 25 deg. C	0.27% PE*	0.21% PE*	0.13% PE*	0.32% PE*	0.28% PE*
Error at 60 deg. C	0.32% PE*	0.26% PE*	0.19% PE*	0.41% PE*	0.38% PE*
Temperature drift (60 deg. C)	14 ppm PE*/ deg. C	14 ppm PE*/ deg. C	18 ppm PE*/ deg. C	24 ppm PE*/ deg. C	30 ppm PE*/ deg. C
Resolution	14 bits + sign	14 bits + sign	15 bits	14 bits + sign	15 bits

NOTE: *Not to be confused with Protective Earth. PE is used here as a European notation for full scale, with the following values:

- 10 V in range of +/- 10 V
- 5 V in range of +/- 5 V
- 4 V in range of 1 ... 5 V
- 20 mA in range of +/- 20 mA
- 16 mA in range of 4 ... 20 mA

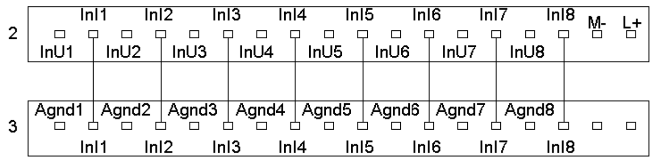
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base.

Illustration

The following illustration shows the internal connections between terminals.



Field Wiring Guidelines

Overview

This section contains wiring guidelines and precautions.

Required Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Electric sells terminal connectors in sets of three.

Type	Part Number
Screw-in	170 XTS 001 00
Spring-clip	170 XTS 002 00

Mapping Terminal Blocks

⚠ CAUTION

POTENTIAL FOR SHORT CIRCUITS AND/OR POWER-UP SPIKES

Provide external fuses on the operating voltage to protect the module. Appropriate fuse values are shown in the wiring illustration. An unprotected module may be subject to short circuits and/or power-up spikes.

Failure to follow these instructions can result in injury or equipment damage.

Mapping terminal blocks are described in the table below.

Row	Terminal No.	Description	Function
2	1, 3, 5, 7, 9,11, 13, 15	InU1 ... InU8	Voltage input, channel 1 ... 8
	2, 4, 6, 8, 10, 12, 14, 16	InI1 ... InI8	Current input, channel 1 ... 8
	17	M-	- return (of operating voltage)
	18	L+	+ 24 VDC Operating voltage
3	1, 3, 5, 7, 9,11, 13, 15	Agnd1 ... Agnd8	Analog ground, channel 1 ... 8
	2, 4, 6, 8, 10, 12, 14, 16	InI1 ... InI8	Current input, channel 1 ... 8

Signal Protection

To protect the signal from external noise induced in serial or common mode, we recommend the following precautions.

- Use shielded twisted-pair cables with a minimum conductor size of 24 AWG or 0.22 mm^2.
- Connect the cable shield to ground via the cable grounding rail (part number CER 001).
- You may combine the analog inputs on this I/O base in one multi-pair cable provided the same ground is used.
- When wiring the voltage supply, use sensors that do not have ground reference.

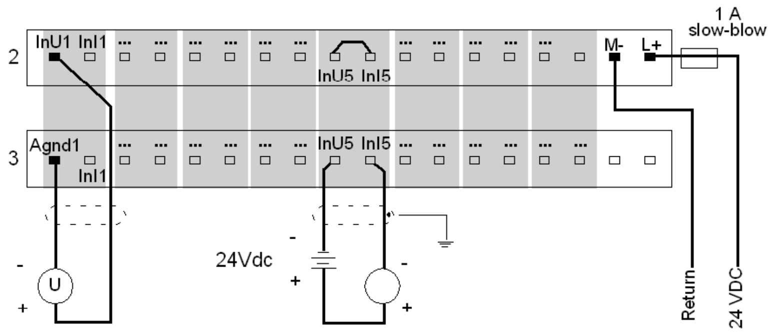
Wiring Illustrations

Overview

This section contains an illustration to assist you in wiring the I/O base.

Illustration

The illustration below shows an example of wiring for voltage input and for current input.



Examples
* Channel1, wired for voltage input
* Channel 5, wired for current input

I/O Mapping

Overview

The 170 AAI 030 00 TSX Momentum I/O base supports 8 analog inputs. This section contains information about the mapping of the analog input values into input words and the usage of output words for channel configuration.

I/O Map

The I/O base must be mapped as eight contiguous input words and two contiguous output words, as follows:

Word	Input Data	Output Data
1	Value, input channel 1	Parameters for input channels 1 ... 4
2	Value, input channel 2	Parameters for input channels 5 ... 8
3	Value, input channel 3	Not used
4	Value, input channel 4	Not used
5	Value, input channel 5	Not used
6	Value, input channel 6	Not used
7	Value, input channel 7	Not used
8	Value, input channel 8	Not used

Analog Channel Parameters

Overview

Parameters must be set for all of the analog channels before the module can be commissioned. This section provides the codes for setting the parameters and gives examples of parameter settings.

NOTE: If you set new parameters for the module, always send a complete set of parameters (all channels, inputs and outputs), even if you only want to change a single parameter. Otherwise the module will refuse the new parameters and continue working with the old ones.

Key

This section focuses on output words 1 and 2, as highlighted in the table below:

Word	Input Data	Output Data
1	Value, input channel 1	**Parameters for input channels 1 ... 4**
2	Value, input channel 2	**Parameters for input channels 5 ... 8**
3	Value, input channel 3	Not used
4	Value, input channel 4	Not used
5	Value, input channel 5	Not used
6	Value, input channel 6	Not used
7	Value, input channel 7	Not used
8	Value, input channel 8	Not used

Illustration

Parameters are set by entering a four-bit code in output words 1 and 2, as follows:

Output Word 1 (Register 4*x*)															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
for input channel 4				for input channel 3				for input channel 2				for input channel 1			

Output Word 2 (Register 4*x*+1)															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
for input channel 8				for input channel 7				for input channel 6				for input channel 5			

Codes for Analog Input Parameters

Use the following codes to set the parameters for each analog input channel:

Code (binary)	Code (hex)	Parameter
0000	0	Reserved value (see note below)
0010	2	+/-5V and +/-20mA input range
0011	3	+/-10V input range
0100	4	Channel inactive
1010	A	1 ... 5V and 4 ... 20 mA input range

NOTE: The 0000 reserved value is more a control than a parameter. It forces the I/O base into a default condition where it continues to receive field inputs according to the previous channel parameters.

Analog Inputs

Overview

This section describes how to interpret the value of the analog input channels.

Key

This section describes input words 1 ... 8, as highlighted in the table below:

Word	Input Data	Output Data
1	**Value, input channel 1**	Parameters for input channels 1 ... 4
2	**Value, input channel 2**	Parameters for input channels 5 ... 8
3	**Value, input channel 3**	Not used
4	**Value, input channel 4**	Not used
5	**Value, input channel 5**	Not used
6	**Value, input channel 6**	Not used
7	**Value, input channel 7**	Not used
8	**Value, input channel 8**	Not used

Bit Assignments

The following table tells how bits are assigned:

Analog-to-digital conversion	Carried out on 14 bits + sign for bipolar input ranges,15 bits for unipolar ranges
Bit 15	Sign bit
Bits 14 ... 0	Input channel values

Analog Input Values

Mapping of analog input values is shown below.

Input Word 1 (Register 3*x*, analog value returned on channel 1)															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Input Word 2 (Register 3*x*+1, analog value returned on channel 2)															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Input Word 3 (Register 3*x*+2, analog value returned on channel 3)															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Input Word 8 (Register 3*x*+7, analog value returned on channel 8)															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Broken Wire Indication

Broken wire detection is possible for the 4 ... 20 mA range. In this case, a current signal that is less than 2 mA on one of the inputs is detected as a broken wire. The input word of that channel returns the signed value -32,768. A broken wire indication has the following binary format:

Broken wire indication in an input word															
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

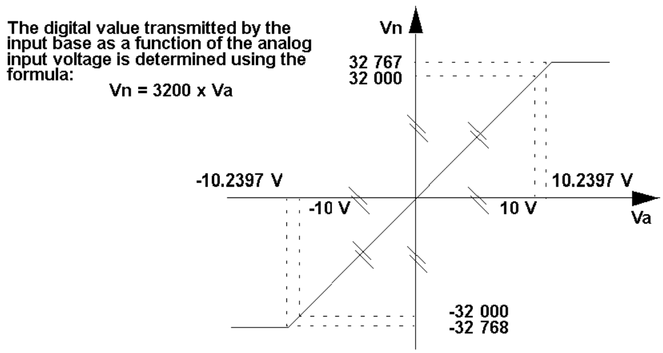
Input Measuring Ranges

Overview

This section contains illustrations explaining the analog/digital relation for the three input measuring ranges.

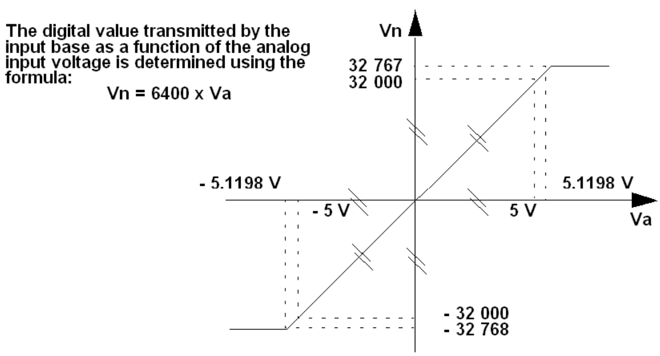
+/- 10 V

The following illustration shows the analog/digital relation at +/- 10 V:



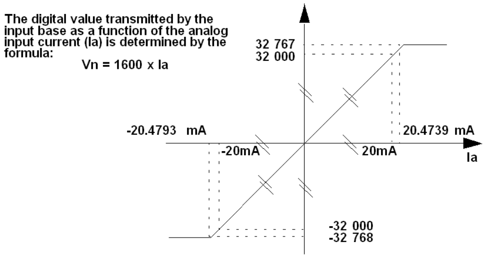
+/- 5 V

The following illustration shows the analog/digital relation at +/- 5 V:



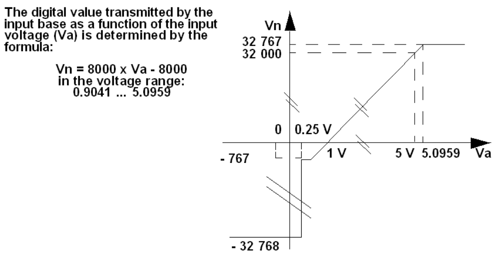
+/- 20 mA

The following illustration shows the analog/digital relation for the input measuring range +/- 20 mA



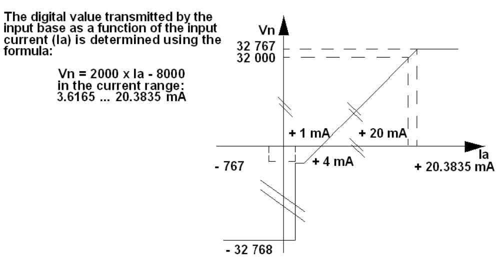
1 ... 5 V

The following illustration shows the analog/digital relation for the input measuring range 1 ... 5 V.



4 ... 20 mA

The following illustration shows the analog/digital relation at 4 ... 20 mA current:



170 AAI 140 00 Analog 16 Channel Single-Ended Input Module Base

7

Overview

This chapter describes the 170 AAI 140 00 TSX Momentum I/O base.

What's in this Chapter?

This chapter contains the following topics:

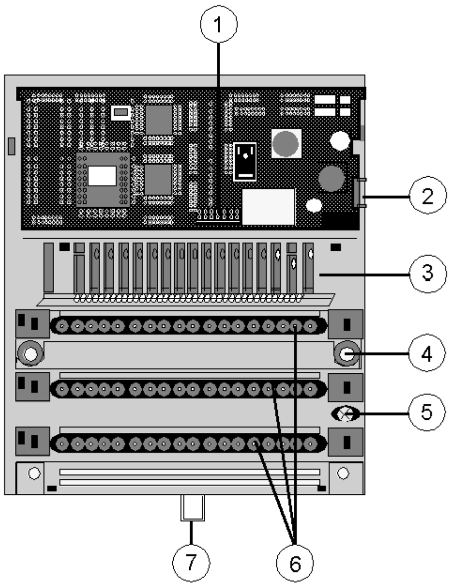
Front Panel Components

Overview

This section contains an illustration of the front panel of the 170 AAI 140 00 I/O base and a description of the LEDs.

Front Panel Illustration

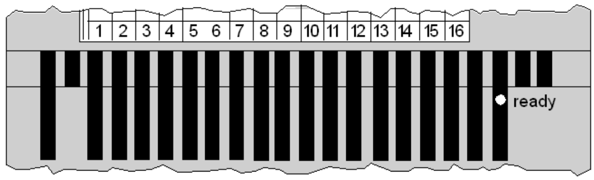
The front panel of the I/O base is shown in the illustration below.



Label	Description
1	Internal interface (ATI) connector
2	Locking and ground contact for the adapter
3	LED status display
4	Mounting holes for panel mount
5	Grounding screw
6	Sockets for the terminal connectors
7	Locking tab for DIN rail mount

LED Illustration

This I/O base has one LED, the ready indicator shown in the illustration below.



LED Descriptions

The ready indicator is described in the table below.

Indicator	Condition	Message
Ready	Green	Module is ready to communicate. Operating voltage for internal logic is present and self-test has been passed.
	Off	Module is not ready. Operating voltage is not present or module is defective.

Specifications

Overview

This section contains specifications for the 170 AAI 140 00 I/O base.

General Specifications

Module type	16 analog inputs
Input voltage range	+/- 10 V, +/- 5 V
Input current range	4 ... 20 mA
Field device output driving capability	6K or less
Supply voltage	24 VDC
Supply voltage range	20 ... 30 VDC
Supply current consumption	max. 305 mA at 24 VDC
Power dissipation	4.95 W typical 5.55 W maximum
I/O map	16 input words 4 output words

Isolation

Between channels	none
Between base supply and ground	500 VDC, 1 min
Between input channels and ground	500 VAC, 1 min

Fuses

Internal (not user-replaceable)	2 A slow-blow
External (recommended)	1 A slow-blow (Bussmann GDC-1A or equivalent)

EMC

Immunity	IEC 1131-2 Surge on auxiliary power supply 500 V
Emissions	EN 50081-2
Agency approvals	UL, CSA, CE, FM Class 1 Div. 2

Physical Dimensions

Width	125 mm (4.9 in)
Depth (with no adapter)	40 mm (1.54 in)
Length	141.5 mm (5.5 in) no busbar
Weight	215 g (0.45 lb)

Analog Inputs

Surge tolerance: input voltage input current	 +/- 30 VDC +/- 25 mA
Number of channels	16
Format of transmitted data	full 16 bits signed (2's complement)
Protection	polarity inversion
Error indication	none
Common mode rejection	250 VAC @ 47 ... 63 Hz or 100 VDC channel-to-ground
Update time for the inputs (in ms)	1 + 1.5 xn n = number of declared channels
Filtering	low pass with cutoff frequency 10 kHz
Maximum Sensor Impedance In	6K ohms with AAI 14000 at PV02
Voltage Mode	1.5K ohms with AAI 14000 at PV01

Range Specific Data

Range	**+/- 10 V**	**+/- 5 V**	**4 ... 20 mA**
Input impedance	20 MOhm	20 MOhm	250 Ohm
Error at 25 deg. C	0.27% PE*	0.21% PE*	0.28% PE*
Error at 60 deg. C	0.32% PE*	0.26% PE*	0.38% PE*
Temperature drift (60 deg. C)	14 ppm PE*/ deg. C	14 ppm PE*/ deg. C	30 ppm PE*/ deg. C
Resolution	14 bits + sign	14 bits + sign	15 bits

NOTE: *Not to be confused with Protective Earth. PE is used here as a European notation for full scale, with the following values:

- 10 V in range of +/- 10 V
- 5 V in range of +/- 5 V
- 16 mA in range of 4 ... 20 mA

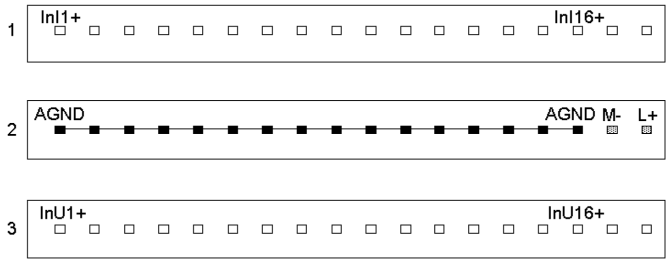
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base.

Illustration

The following illustration shows the internal connections between terminals.



Field Wiring Guidelines

Overview

This section contains wiring guidelines and precautions.

Required Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Electric sells terminal connectors in sets of three.

Type	Part Number
Screw-in	170 XTS 001 00
Spring-clip	170 XTS 002 00

Mapping Terminal Blocks

CAUTION

POTENTIAL FOR SHORT CIRCUITS AND/OR POWER-UP SPIKES

Provide external fuses on the operating voltage to protect the module. Appropriate fuse values are shown in the wiring illustration. An unprotected module may be subject to short circuits and/or power-up spikes.

Failure to follow these instructions can result in injury or equipment damage.

Mapping terminal blocks is described in the table below

Row	Terminal No.	Description	Function
1	1 ... 16	InI1+ ... InI16+	Input current mode, channel 1 ... 16
	17, 18	-	Not used
2	1 ... 16	AGND	Analog ground connections (0 V input)
	17	M-	- Return (of operating voltage)
	18	L+	+ 24 VDC Operating voltage
3	1 ... 16	InU1+ ... InU16+	Input voltage mode, channel 1 ... 16
	17, 18	-	Not used

Signal Protection

To protect the signal from external noise induced in serial or common mode, we recommend the following precautions.

- Use shielded twisted-pair cables with a minimum conductor cross section of 24 AWG or 0.22 mm^2.
- Connect the cable shield to ground via the cable grounding rail (part number CER 001).
- You may combine the analog inputs on this I/O base in one multi-pair cable provided the same ground is used.
- When wiring the voltage supply, use sensors that do not have ground reference.

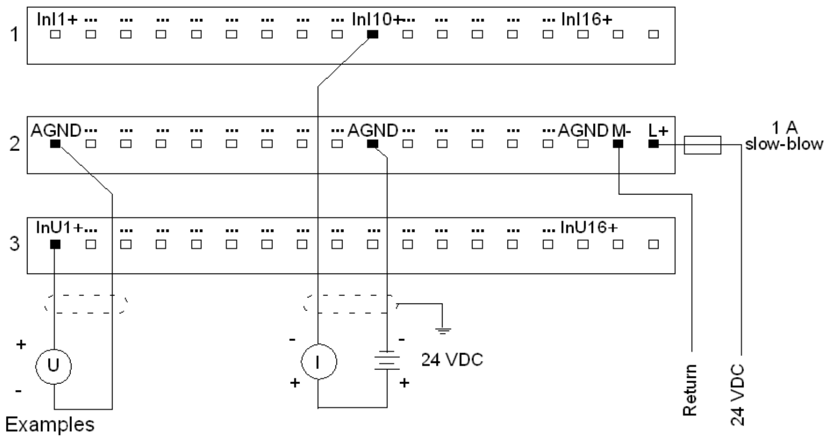
Wiring Diagrams

Overview

This section contains a diagram to assist you in wiring this I/O base for voltage input and current input.

Diagram

The diagram below shows an example of wiring for voltage input and for current input.



Examples
* Channel 1, wired for voltage input
* Channel 10, wired for current input

I/O Mapping

Overview

The 170 AAI 140 00 TSX Momentum I/O base supports 16 analog inputs. This section contains information about the mapping of the analog input values into input words and the usage of output words for channel configuration.

I/O Map

The I/O base must be mapped as 16 contiguous input words and four contiguous output words, as follows:

Word	Input Data	Output Data
1 = LSW	Value, input channel 1	Parameters for input channels 1 ... 4
2	Value, input channel 2	Parameters for input channels 5 ... 8
3	Value, input channel 3	Parameters for input channels 9 ... 12
4	Value, input channel 4	Parameters for input channels 13 ... 16
5 ... 15	Value, input channel 5 ... 15	Not used
16 = MSW	Value, input channel 16	Not used

Analog Channel Parameters

Overview

Parameters must be set for all of the analog channels before the module can be commissioned. This section provides the codes for setting the parameters and gives examples of parameter settings.

NOTE: If you set new parameters for the module, always send a complete set of parameters (all channels, inputs and outputs), even if you only want to change a single parameter. Otherwise the module will refuse the new parameters and continue working with the old ones.

Key

This section focuses on output words 1 ... 4, as highlighted in the table below:

Word	Input Data	Output Data
1 = LSW	Value, input channel 1	**Parameters for input channels 1 ... 4**
2	Value, input channel 2	**Parameters for input channels 5 ... 8**
3	Value, input channel 3	**Parameters for input channels 9 ... 12**
4	Value, input channel 4	**Parameters for input channels 13 ... 16**
5 ... 15	Value, input channel 5 ... 15	Not used
16 = MSW	Value, input channel 16	Not used

Illustration

Parameters are set by entering a four-bit code in output words 1 ... 4, as follows:

Output Word 1 (Register 4*x*)															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
for input channel 4				for input channel 3				for input channel 2				for input channel 1			

Output Word 2 (Register 4*x*+1)															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
for input channel 8				for input channel 7				for input channel 6				for input channel 5			

Output Word 3 (Register 4*x*+2)															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
for input channel 12				for input channel 11				for input channel 10				for input channel 9			

Output Word 4 (Register 4*x*+3)															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
for input channel 16				for input channel 15				for input channel 14				for input channel 13			

Codes for Analog Input Parameters

Use the following codes to set the parameters for each analog input channel:

Code (binary)	Code (hex)	Parameter
0000	0	Reserved value (see note below)
1010	A	+/-5V input range
1011	B	+/-10V input range
1100	C	Channel inactive
1110	E	4 ... 20 mA

NOTE: The 0000 reserved value is more a control than a parameter. It forces the I/O base into a default condition where it continues to receive field inputs according to the previous channel parameters.

Analog Inputs

Overview

This section describes how to interpret the value of the analog input channels.

Key

This section describes input words 1 ... 16, as highlighted in the table below:

Word	Input Data	Output Data
1 = LSW	**Value, input channel 1**	Parameters for input channels 1 ... 4
2	**Value, input channel 2**	Parameters for input channels 5 ... 8
3	**Value, input channel 3**	Parameters for input channels 9 ... 12
4	**Value, input channel 4**	Parameters for input channels 13 ... 16
5 ... 15	**Value, input channel 5 ... 15**	Not used
16	**Value, input channel 16**	Not used

Bit Assignments

The following table tells how bits are assigned:

Analog-to-digital conversion	Carried out on 12 bits + sign
Bit 15	Sign bit
Bits 14 ... 3	Input channel values
Bits 2 ... 0	Unused. Because these bits are always 0, the value of the word changes in increments of 8

Analog Input Values

Mapping of analog input values is shown below.

Input Word 1 (Register 3*x*, analog value returned on channel 1)															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Input Word 2 (Register 3*x*+1, analog value returned on channel 2)															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Input Word 3 (Register 3*x*+2, analog value returned on channel 3)															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Input Word 8 (Register 3*x*+15, analog value returned on channel 16)															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Broken Wire Indication

Broken wire detection is possible for the 4 ... 20 mA range. In this case, a current signal that is less than 2 mA on one of the inputs is detected as a broken wire. The input word of that channel returns the value -32,768. A broken wire indication has the following binary format:

Broken wire indication in an input word															
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

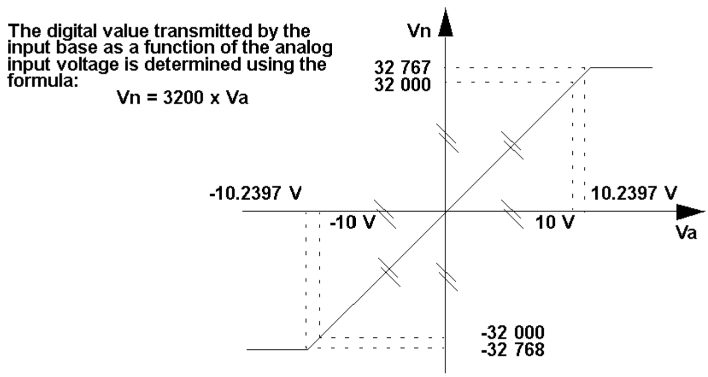
Input Measuring Ranges

Overview

This section contains illustrations explaining the analog/digital relation for the three input measuring ranges.

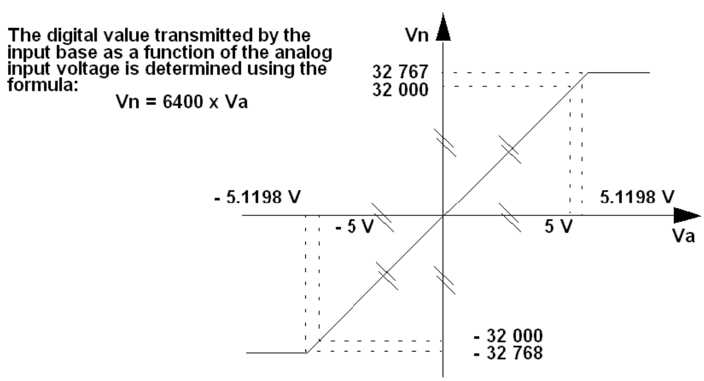
+/- 10 V

The following illustration shows the analog/digital relation at +/- 10 V:



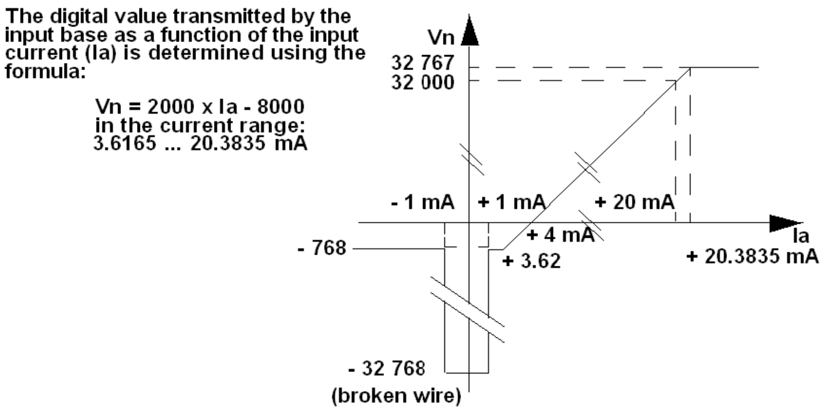
+/- 5 V

The following illustration shows the analog/digital relation at +/- 5 V:



4 ... 20 mA

The following illustration shows the analog/digital relation for the input measuring at 4 ... 20 mA current:



170 AAI 520 40 Analog 4 Channel RTD, Therm. and mV Input Module Base

8

Overview

This chapter describes the 170 AAI 520 40 TSX Momentum I/O base.

What's in this Chapter?

This chapter contains the following topics:

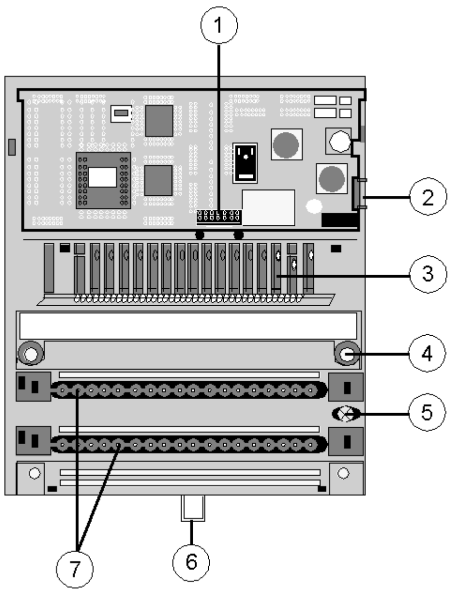
Front Panel Components

Overview

This section contains an illustration of the front panel of the 170 AAI 520 40 I/O base and a description of the LEDs.

Front Panel Illustration

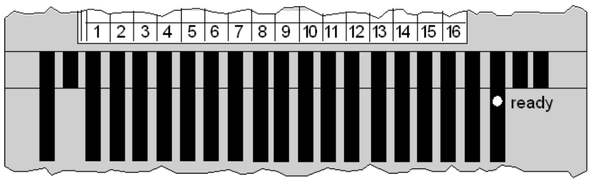
The front panel of the I/O base is shown in the illustration below.



Label	Description
1	Internal interface (ATI) connector
2	Locking and ground contact for the adapter
3	LED status display
4	Mounting holes for panel mount
5	Grounding screw
6	Locking tab for DIN rail mount
7	Sockets for the terminal connectors

LED Illustration

This I/O base has one LED, the ready indicator shown in the illustration below.



LED Descriptions

The ready indicator is described in the table below.

Indicator	Condition	Message
Ready	Green	Module is ready to communicate. Operating voltage for internal logic is present and self-test has been passed.
	Off	Module is not ready. Operating voltage is not present or module is defective.

Specifications

Overview

This section contains specifications for the 170 AAI 520 40 I/O base.

General Specifications

Module type	4 analog inputs
Range - mV	+/- 100 mV, +/- 25 mV
Types - RTD	Pt100, Pt 1000, Ni100 or Ni1000
Types - Thermocouple	B, E, J, K, N, R, S or T
Supply voltage	24 VDC
Supply voltage range	20 ... 30 VDC
Supply current consumption	max. 330 mA at 24 VDC
Power dissipation	3.5 W typical 5.5 W maximum
I/O map	4 input words 4 output words

Isolation

Between channels	400 VDC
Between base supply and ground	500 Vcc, 1 min
Between input channels and ground	500 VAC, 1 min
Common mode channel/ground voltage	+/-100 VDC, 250 VAC
Common mode voltage between channels	200 VDC, 115 VAC single- or three-phase or 250 VAC single phase
Common mode rejection between channel and ground	135 dB DC, 145 dB AC 50 Hz, 155 dB AC 60 Hz
Common mode rejection between channels	120 dB DC, 130 dB AC 50 Hz, 140 dB AC 60 Hz
Serial-mode rejection	35 dB AC 50 Hz, 45 dB AC 60 Hz
Input protection	+/- 30 VDC

Fuses

Internal (not user-replaceable)	2 A slow-blow
External (recommended)	1 A slow-blow (Bussmann GDC-1A or equivalent)

EMC

Immunity	IEC 1131-2 Surge on auxiliary power supply 500 V
Emissions	EN 50081-2
Agency approvals	UL, CSA, CE, FM Class 1 Div. 2

Physical Dimensions

Width	125 mm (4.9 in)
Depth (with no adapter)	40 mm (1.54 in)
Length	141.5 mm (5.5 in) no busbar
Weight	215 g (0.45 lb)

Analog Inputs mV Range

Surge tolerance: input voltage	+/- 30 VDC	
Number of channels	4 differential inputs	
Format of transmitted data	full 16 bits signed (2's complement)	
Current source	0.125 mA (for Pt1000 or Ni 1000 probe)	1.25 mA (for Pt 100 or Ni 100 probe)
Update time for the inputs	500 ms	
Voltage range	+/-25 mV	+/-100 mV
Input impedance	> 10 MOhm	> 10 MOhm
Error at 25 degrees C	+/- 21 microV	+/- 27 microV
Error at 60 degrees C	+/- 46 microV	+/- 94 microV
Resolution	15 bits + sign	15 bits + sign

RTD Ranges for Pt100/Pt1000

Range	Pt100 (IEC751)	Pt100 (US/JIS)	Pt1000 (IEC751)	Pt1000 (US/JIS)
Input Span	-200...+850 deg. C -328...+1562 deg. F	-200...+510 deg. C -328...+950 deg. F	-200...+850 deg. C -328...+1562 deg. F	-200...+510 deg. C -328...+950 deg. F
Resolution of conversion	0.029...0.043 deg. C 0.052...0.077 deg. F	0.029...0.037 deg. C 0.053...0.067 deg. F	0.029...0.043 deg. C 0.052...0.077 deg. F	0.029...0.037 deg. C 0.053...0.067 deg. F
Display resolution	0.1 deg. C 0.1 deg. F	0.1 deg. C 0.1 deg. F	0.1 deg. C 0.1 deg. F	0.1 deg. C 0.1 deg. F

Errors for Pt100/Pt1000

Maximum error at 25 degrees C in degrees C (1)

Temperature	Wiring Type							
	Pt100 (IEC751)		Pt100 (US/JIS)		Pt1000 (IEC751)		Pt1000 (US/JIS)	
	2/4 wires	3 wires	2/4 wires	3 wires	2/4 wires	3 wires	2/4 wires	3 wires
-200 deg. C	0.2 [0.7]	0.4 [0.8]	0.2 [0.7]	0.4 [0.8]	0.2 [0.6]	0.4 [0.8]	0.2 [0.6]	0.4 [0.8]
-100 deg. C	0.2 [0.9]	0.4 [1.0]	0.2 [0.9]	0.4 [1.0]	0.3 [0.8]	0.4 [1.0]	0.3 [0.8]	0.4 [1.0]
0 deg. C	0.3 [1.1]	0.4 [1.2]	0.3 [1.1]	0.4 [1.2]	0.3 [1.0]	0.4 [1.2]	0.3 [1.0]	0.4 [1.2]
100 deg. C	0.3 [1.2]	0.4 [1.4]	0.3 [1.3]	0.4 [1.4]	0.3 [1.2]	0.4 [1.4]	0.3 [1.2]	0.4 [1.4]
200 deg. C	0.3 [1.4]	0.4 [1.5]	0.3 [1.4]	0.4 [1.5]	0.3 [1.4]	0.5 [1.5]	0.3 [1.4]	0.5 [1.6]
300 deg. C	0.3 [1.6]	0.5 [1.8]	0.3 [1.7]	0.5 [1.8]	0.3 [1.6]	0.5 [1.8]	0.4 [1.6]	0.5 [1.8]
400 deg. C	0.3 [1.8]	0.5 [2.0]	0.3 [1.8]	0.5 [2.0]	0.4 [1.8]	0.5 [2.0]	0.4 [1.8]	0.5 [2.0]
500 deg. C	0.3 [2.1]	0.5 [2.2]	0.3 [2.1]	0.5 [2.2]	0.4 [2.0]	0.5 [2.2]	0.4 [2.0]	0.5 [2.2]
600 deg. C	0.4 [2.3]	0.5 [2.5]			0.4 [2.3]	0.5 [2.4]		
700 deg. C	0.4 [2.5]	0.5 [2.7]			0.4 [2.5]	0.6 [2.7]		
800 deg. C	0.4 [2.7]	0.6 [2.9]			0.5 [2.8]	0.6 [2.9]		
-300 deg. F	0.4 [1.3]	0.5 [1.5]	0.4 [1.3]	0.5 [1.5]	0.4 [1.2]	0.6 [1.4]	0.4 [1.1]	0.6 [1.4]
-100 deg. F	0.4 [1.6]	0.6 [1.9]	0.4 [1.6]	0.6 [1.9]	0.5 [1.5]	0.6 [1.8]	0.5 [1.5]	0.6 [1.8]
100 deg. F	0.5 [2.0]	0.6 [2.3]	0.5 [2.0]	0.6 [2.2]	0.5 [1.9]	0.7 [2.2]	0.5 [1.9]	0.7 [2.2]
300 deg. F	0.5 [2.4]	0.6 [2.6]	0.5 [2.3]	0.6 [2.6]	0.5 [2.3]	0.7 [2.6]	0.5 [2.2]	0.7 [2.5]
500 deg. F	0.5 [2.8]	0.7 [3.0]	0.5 [2.7]	0.7 [3.0]	0.5 [2.7]	0.8 [3.0]	0.5 [2.7]	0.7 [3.0]
700 deg. F	0.6 [3.1]	0.7 [3.4]	0.5 [3.1]	0.7 [3.4]	0.6 [3.1]	0.8 [3.4]	0.6 [3.1]	0.8 [3.4]

Temperature	Wiring Type							
	Pt100 (IEC751)		Pt100 (US/JIS)		Pt1000 (IEC751)		Pt1000 (US/JIS)	
	2/4 wires	3 wires	2/4 wires	3 wires	2/4 wires	3 wires	2/4 wires	3 wires
900 deg. F	0.6 [3.6]	0.8 [3.9]	0.6 [3.5]	0.8 [3.8]	0.6 [3.5]	0.8 [3.9]	0.6 [3.5]	0.8 [3.8]
1100 deg. F	0.6 [4.0]	0.9 [4.3]			0.7 [4.0]	0.9 [4.4]		
1300 deg. F	0.7 [4.6]	0.9 [4.8]			0.7 [4.5]	1.0 [4.8]		
1500 deg. F	0.7 [5.0]	0.9 [5.3]			0.8 [5.0]	1.1 [5.3]		

(1) The values shown in brackets correspond to the maximum errors for temperatures in the range 0 ... 60 degrees C or 32 and 140 degrees F.

Maximum Cable Resistance for Pt100/Pt1000

Wiring type	Pt100 (IEC751)		Pt100 (US/JIS)		Pt1000 (IEC751)		Pt1000 (US/JIS)	
	2/4 wires	3 wires	2/4 wires	3 wires	2/4 wires	3 wires	2/4 wires	3 wires
Max. resistance per cable	50 Ohms with 4 wires	20 Ohms (1)	500 Ohms with 4 wires	20 Ohms (1)	500 Ohms with 4 wires	200 Ohms (1)	500 Ohms with 4 wires	200 Ohms (1)

(1) Matching of line resistance for 3-conductor cables is < 0.02%.

RTD Ranges for Ni100/Ni1000

Range	Ni100 DIN43760	Ni1000 DIN43760
Input Span	-60...+250 deg. C -76...+482 deg. F	-60...+250 deg. C -76...+482 deg. F
Resolution of conversion	0.026...0.012 deg. C 0.047...0.022 deg. F	0.026...0.0120 deg. C 0.047...0.022 deg. F
Display resolution	0.1 deg. C 0.1 deg. F	0.1 deg. C 0.1 deg. F

Errors for Ni100/Ni1000

Maximum error at 25 degrees C in degrees C (1)

Temperature	Wiring Type			
	Ni100 DIN43760		Ni1000 DIN43760	
-50 deg. C	0.3 [0.8]	0.3 [1.0]	0.3 [0.8]	0.4 [0.9]
0 deg. C	0.2 [0.8]	0.3 [1.0]	0.3 [0.8]	0.3 [0.9]
50 deg. C	0.2 [0.8]	0.3 [0.9]	0.3 [0.8]	0.3 [0.9]
100 deg. C	0.2 [0.8]	0.3 [0.9]	0.3 [0.8]	0.3 [0.9]

Temperature	Wiring Type			
	Ni100 DIN43760		Ni1000 DIN43760	
150 deg. C	0.2 [0.8]	0.3 [0.9]	0.2 [0.8]	0.3 [0.9]
200 deg. C	0.2 [0.8]	0.3 [0.9]	0.2 [0.8]	0.3 [0.8]
250 deg. C	0.2 [0.8]	0.3 [0.8]	0.2 [0.8]	0.3 [0.8]
0 deg. F	0.4 [1.4]	0.5 [1.6]	0.4 [1.3]	0.6 [1.6]
100 deg. F	0.4 [1.4]	0.5 [1.6]	0.4 [1.4]	0.5 [1.5]
200 deg. F	0.4 [1.4]	0.5 [1.5]	0.4 [1.4]	0.5 [1.5]
300 deg. F	0.4 [1.4]	0.5 [1.5]	0.4 [1.4]	0.5 [1.5]
400 deg. F	0.4 [1.4]	0.5 [1.5]	0.4 [1.4]	0.5 [1.5]

(1) The values shown in brackets correspond to the maximum errors for temperatures in the range 0 ... 60 degrees C or 32 and 140 degrees F.

Maximum Cable Resistance for Ni100/Ni1000

Wiring Type	Ni100 DIN43760		Ni1000 DIN43760	
	2/4 wires	**3 wires**	**2/4 wires**	**3 wires**
Max. resistance per cable	1000 Ohms with 4 wires	200 Ohms (1)	1000 Ohms with 4 wires	200 Ohms (1)

(1) Matching of line resistance for 3-conductor cables is < 0.02%.

Thermocouple Ranges in Degrees C

Input span and resolution in degrees C

	Thermocouple Type							
	B	**E**	**J**	**K**	**N**	**R**	**S**	**T**
Input Span	0.0 +1802.0	-270.0 +1000.0	-210.0 +1200.0	-270.0 +1372.0	-270.0 +1300.0	-50.0 +1769.0	-50.0 +1769.0	-270.0 +400.0
Resolution of conversion	0.78... ...0.07	1.12... ...0.04	0.15... ...0.05	0.83... ...0.30	1.67... ...0.03	0.26... ...0.08	0.24... ...0.09	0.50... ...0.02
Display resolution	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1

Thermocouple Errors in Degrees C

Maximum error at 25 degrees C in degrees C (1)

Temperature	Thermocouple Type							
	B	E	J	K	N	R	S	T
-200 deg. C		5.8 [11.8]		6.9[14.6]	8.0[18.3]			6.8[14.8]
-100 deg. C		3.4 [6.7]		3.6 [7.5]	4.0 [8.9]			4.0 [8.4]
0 deg. C		2.7 [5.3]	2.8 [5.5]	2.9 [6.0]	3.3 [7.3]	6.4[13.1]	6.3[12.8]	3.0 [6.3]
100 deg. C		2.5 [4.8]	2.7 [5.2]	2.9 [5.8]	3.1 [6.6]	4.7 [9.5]	4.8 [9.6]	2.6 [5.4]
200 deg. C		2.4 [4.5]	2.7 [5.3]	3.2 [6.2]	2.8 [6.1]	4.2 [8.2]	4.4 [8.5]	2.4 [4.9]
300 deg. C		2.4 [4.5]	2.9 [5.5]	3.1 [6.1]	2.7 [5.8]	3.9 [7.7]	4.1 [8.1]	2.3 [4.7]
400 deg. C		2.4 [4.5]	3.0 [5.7]	3.2 [6.2]	2.8 [5.7]	3.8 [7.4]	4.0 [7.9]	
500 deg. C		2.4 [4.6]	3.1 [5.7]	3.3 [6.3]	2.8 [5.7]	3.7 [7.2]	4.1 [7.8]	
600 deg. C	5.1 [9.5]	2.7 [4.8]	3.1 [5.7]	3.4 [6.5]	2.8 [5.8]	3.7 [7.0]	4.1 [7.7]	
700 deg. C	4.5 [8.4]	2.8 [5.0]	3.0 [5.5]	3.6 [6.7]	3.0 [5.9]	3.7 [6.9]	4.1 [7.7]	
800 deg. C	4.2 [7.7]	3.0 [5.3]		3.8 [7.0]	3.0 [6.1]	3.7 [6.9]	4.1 [7.6]	
900 deg. C	4.0 [7.2]			4.0 [7.5]	3.2 [6.3]	3.7 [6.7]	4.1 [7.5]	
1000 deg. C	3.8 [6.8]			4.2 [7.8]	3.3 [6.5]	3.7 [6.7]	4.1 [7.5]	
1100 deg. C	3.6 [6.5]			4.5 [8.2]	3.6 [6.8]	3.7 [6.7]	4.2 [7.5]	
1200 deg. C	3.6 [6.3]			4.7 [8.7]	3.7 [7.1]	3.7 [6.7]	4.2 [7.5]	
1300 deg. C	3.6 [6.2]					3.9 [6.8]	4.3 [7.7]	
1400 deg. C	3.6 [6.2]					4.0 [6.9]	4.4 [7.8]	
1500 deg. C	3.6 [6.1]					4.1 [7.1]	4.6 [8.1]	
1600 deg. C	3.8 [6.3]					4.3 [7.4]	4.8 [8.3]	
1700 deg. C	3.8 [6.5]							
Overflow code	+ 1802.1	+ 1000.1	+ 1200.1	+ 1372.1	+ 1300.1	+ 1769.1	+ 1769.1	+ 400.1
Underflow code	- 0.1	- 270.1	- 210.1	- 270.1	- 270.1	- 50.1	- 50.1	- 270.1
Wiring default code	- 0.2	- 270.2	- 210.2	- 270.2	- 270.2	- 50.2	- 50.2	- 270.2

(1) The values shown in brackets correspond to the maximum errors for temperatures in the range 0...60 degrees C or 32 and 140 degrees F.

Thermocouple Ranges in Degrees F

Input span and resolution in degrees F

	Thermocouple Type							
	B	**E**	**J**	**K**	**N**	**R**	**S**	**T**
Input span	-32.0 +3275.6	-454.1 +1832.0	-346.1 +2192.0	-454.1 +2501.6	-454.1 +2372.0	-58.1 +3216.2	-58.1 +3216.2	-454.1 +752.0
Resolution of conversion	1.40... ...0.12	2.01... ...0.07	0.27... ...0.09	1.50... ...0.05	3.00... ...0.05	0.47... ...0.15	0.43... ...0.16	0.90... ...0.04
Display resolution	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1

Thermocouple Errors in Degrees F

Maximum error at 77 degrees F in degrees F (1)

Temperature	**Thermocouple Type**							
	B	**E**	**J**	**K**	**N**	**R**	**S**	**T**
-300 deg. F		9.1 [18.5]		10.8 [22.3]	11.9 [27.5]			10.9 [23.5]
-200 deg. F								7.8[17.1]
-100 deg. F		5.7[11.1]		6.1[12.4]	6.6[14.6]			6.5[13.8]
0 deg. F			5.1[10.0]			12.7 [26.0]	12.3 [25.2]	5.6 [11.9]
100 deg. F		4.7[9.2]		5.1[10.5]	5.8[12.8]			5.0[10.7]
200 deg. F			4.9[9.4]			8.6[17.4]	8.7[17.5]	4.7[9.8]
300 deg. F		4.4[8.3]		5.5[10.9]	5.2[11.5]			4.4[9.2]
400 deg. F			4.9[9.5]			7.5[14.8]	7.8[15.3]	4.3[8.8]
500 deg. F		4.3[8.1]		5.7[11.2]	5.1[10.8]			4.3[8.5]
600 deg. F			5.3[9.9]			6.9[13.6]	7.4[14.4]	4.2[8.3]
700 deg. F		4.4[8.1]		5.7[11.2]	4.9[10.5]			4.1[8.2]
800 deg. F			5.5[10.3]			6.8[13.1]	7.3[14.2]	
900 deg. F		4.6[8.3]		5.9[11.3]	5.1[10.4]			
1000 deg. F			5.5[10.3]			6.7[12.8]	7.4[14.0]	
1100 deg. F	9.2[17.1]	4.8[8.7]		6.1[11.7]	5.1[10.4]			
1200 deg. F			5.5[10.0]			6.7[12.6]	7.3[13.8]	
1300 deg. F	8.1[15.1]	5.0[9.1]		6.5[12.1]	5.3[10.6]			
1400 deg. F			5.3[9.8]			6.6[12.4]	7.3[13.7]	
1500 deg. F	7.4[13.7]	5.4[9.6]		6.9[12.9]	5.6[11.1]			
1600 deg. F						6.6[12.3]	7.3[13.7]	
1700 deg. F	7.1[12.8]			7.3[13.5]	5.8[11.5]			

Temperature	Thermocouple Type							
	B	E	J	K	N	R	S	T
1800 deg. F						6.7[12.1]	7.3[13.6]	
1900 deg. F	6.7[12.0]			7.8[14.2]	6.2[11.9]			
2000 deg. F						6.7[12.0]	7.4[13.6]	
2100 deg. F	6.5[11.5]			8.2[15.1]	6.6[12.4]			
2200 deg. F						6.8[11.9]	7.6[13.6]	
2300 deg. F	6.4[11.3]			8.9[16.2]	7.0[13.1]			
2400 deg. F						6.8[12.0]	7.8[13.8]	
2500 deg. F	6.4[11.1]							
2600 deg. F						6.9[11.9]	8.0[14.2]	
2700 deg. F	6.5[11.1]							
2800 deg. F						6.9[11.9]	8.3[14.7]	
2900 deg. F	6.6[11.3]							
3000 deg. F						7.0[12.0]	8.8[15.4]	
3100 deg. F	6.6[11.7]							
Overflow code	+3275.7	+1832.1	+2192.1	+2501.7	+2372.1	+3216.3	+3216.3	+752.1
Underflow code	+31.9	-454.2	-346.2	-454.2	-454.2	-58.2	-58.2	-454.2
Wiring default code	+31.8	-454.3	-346.3	-454.3	-454.3	-58.3	-58.3	-454.3

(1) The values shown in brackets correspond to the maximum errors for temperatures in the range 0...60 degrees C or 32 and 140 degrees F.

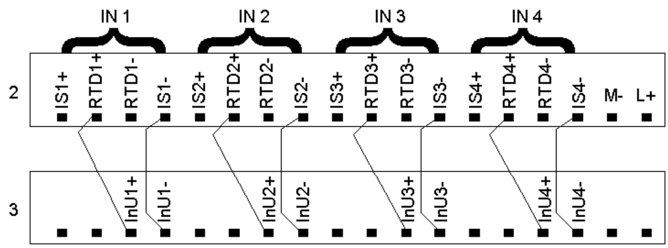
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base.

Illustration

The following illustration shows the internal connections between terminals.



Field Wiring Guidelines

Overview

This section contains wiring guidelines and precautions.

Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Electric sells terminal connectors in sets of three.

Type	Part Number
Screw-in	170 XTS 001 00
Spring-clip	170 XTS 002 00

Mapping Terminal Blocks

Mapping terminal blocks is described in the table below.

Row	Terminal No.	Description	Function
2	1, 5, 9, 13	IS1+,IS2+ IS3+,IS4+	+Current source output, Channels 1 ... 4
	2, 6, 10, 14	RTD1+, RTD2+ RTD4+, RTD4+	+RTD input, Channels 1 ... 4
	3, 7, 11, 15	RTD1-, RTD2- RTD4-, RTD4-	-RTD input, Channels 1 ... 4
	4, 8, 12, 16	IS1-,IS2- IS3-,IS4-	-Current source output, Channels 1 ... 4
	17	M-	- power supply return
	18	L+	Module power supply + 24 V
3	1, 2, 5, 6, 9,10,13, 14	-	Not used
	3, 7, 11, 15	InU1+,InU2+ InU3+,InU4+	+ thermocouple or voltage mode input, channels 1 ... 4
	4, 8, 12, 16	InU1-,InU2- InU-+,InU4-	- thermocouple or voltage mode input, Channels 1 ... 4
	17, 18	-	Not used

Signal Protection

To protect the signal from external noise induced in serial or common mode, we recommend the following precautions.

- Use shielded twisted-pair cables with a minimum conductor cross section of 24 AWG or 0.22 mm^2.
- Connect the cable shield to ground via the cable grounding rail (part number CER 01).
- You may combine the analog inputs on this I/O base in one multi-pair cable provided the same ground is used.
- When wiring the voltage supply, use sensors that do not have ground reference.

ThermocoupleMeasurement Precautions

For thermocouple measurements (except with thermocouple B), observe the following precautions to obtain the accuracies indicated in the performance tables.

- Wait 45 min. after powering up the base (the time required for the module to warm up to the temperature balance needed for internal cold junction compensation) prior to taking any measurements.
- The air circulation must not exceed a rate of 0.1 m/s; air circulation in excess of this amount will affect the thermal balance inside the base.
- Keep the rate of temperature fluctuations outside the base to less than 10 deg./hr.
- Keep the distance between the base and any heat source greater than 100 mm.

Wiring Diagrams

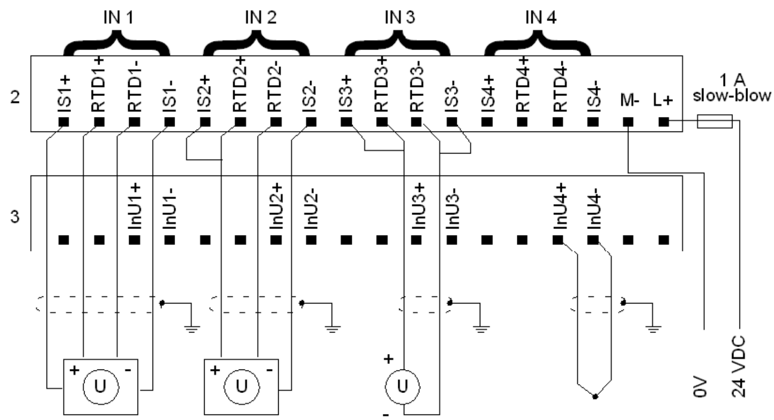
Overview

This section contains an illustration to assist you in wiring the following types of devices:

- RTD 4-wire configuration
- RTD 3-wire configuration
- RTD 2-wire configuration
- Thermocouple input

Diagram

Examples of wiring are shown in the diagram below:



Examples
* Channel 1,RTD input, 4 - wire configuration
* Channel 2,RTD input, 3 - wire configuration
* Channel 3,RTD input, 2 - wire configuration
* Channel 4,thermocouple input

I/O Mapping

Overview

The 170 AAI 520 40 TSX Momentum I/O base supports 4 analog inputs. This section contains information about the mapping of the analog input values into input words and the usage of output words for channel configuration.

I/O Map

The I/O base must be mapped as four contiguous input words and four contiguous output words, as follows:

Word	Input Data	Output Data
1 = LSW	Value, input channel 1	Parameters for input channels 1
2	Value, input channel 2	Parameters for input channels 2
3	Value, input channel 3	Parameters for input channels 3
4 = MSW	Value, input channel 4	Parameters for input channels 4

Analog Channel Parameters

Overview

Parameters must be set for all of the analog channels before the module can be commissioned. This section provides the codes for setting the parameters and gives examples of parameter settings.

NOTE: If you set new parameters for the module, always send a complete set of parameters (all channels, inputs and outputs), even if you only want to change a single parameter. Otherwise, the module will refuse the new parameters and continue working with the old ones.

Key

This section focuses on output words 1 ... 4, as highlighted in the table below:

Word	Input Data	Output Data
1 = LSW	Value, input channel 1	**Parameters for input channels 1**
2	Value, input channel 2	**Parameters for input channels 2**
3	Value, input channel 3	**Parameters for input channels 3**
4 = MSW	Value, input channel 4	**Parameters for input channels 4**

Illustration

Parameters are set by entering a four-bit code in output words 1 ... 4, as follows:

Output Word 1 (Register 4*x*, to parameterize input channel 1)															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Output Word 2 (Register 4*x*+1, to parameterize input channel 2)															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Output Word 3 (Register 4*x*+2, to parameterize input channel 3)															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Output Word 4 (Register 4*x*+3, to parameterize input channel 4)															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Parameters

For each input channel, you may set the following parameters:

Parameter	Options
Input range	Type B,E,J,K,N,R,S or T thermocouple (according to IEC584 standard, June1989) with internal cold junction compensation
RTD	Pt100 or Pt1000 RTDs (according to IEC751, June 1986; or JIS C1604, January 1989), and Ni100 or Ni1000 RTDs (according to DIN standard 43.760, September 1987), with 2-, 3- or 4 wires
Low voltage range	+/-100 mV or +/-25 mV
Broken wire detection	Enabled or disabled

NOTE: The 0000 reserved value is more a control than a parameter. It forces the I/O base into a default condition where it continues to receive field inputs according to the previous channel parameters.

Thermocouple Parameter Codes

Use the following codes to set your choice of parameters:

Input range	Temperature unit	Broken-wire detection	Parameter code (hex)
Thermocouple B	1/10 degrees C	disabled	2201
		enabled	2301
	1/10 degrees F	disabled	2281
		enabled	2381
Thermocouple E	1/10 degrees C	disabled	1202
		enabled	1302
	1/10 degrees F	disabled	1282
		enabled	1382
Thermocouple J	1/10 degrees C	disabled	1203
		enabled	1303
	1/10 degrees F	disabled	1283
		enabled	1383
Thermocouple K	1/10 degrees C	disabled	1204
		enabled	1304
	1/10 degrees F	disabled	1284
		enabled	1384

Input range	Temperature unit	Broken-wire detection	Parameter code (hex)
Thermocouple N	1/10 degrees C	disabled	1205
		enabled	1305
	1/10 degrees F	disabled	1285
		enabled	1385
Thermocouple R	1/10 degrees C	disabled	2206
		enabled	2306
	1/10 degrees F	disabled	2286
		enabled	2386
Thermocouple S	1/10 degrees C	disabled	2207
		enabled	2307
	1/10 degrees F	disabled	2287
		enabled	2387
Thermocouple T	1/10 degrees C	disabled	2208
		enabled	2308
	1/10 degrees F	disabled	2288
		enabled	2388

RTD Parameter Codes

Use the following codes to set your choice of parameters:

Input range	Wiring configuration	Temperature unit	Broken-wire detection	Parameter code (hex)
IEC PT100 RTD	2- or 4-wire	1/10 degrees C	disabled	0A20
			enabled	0B20
		1/10 degrees F	disabled	0AA0
			enabled	0BA0
	3-wire	1/10 degrees C	disabled	0E20
			enabled	0F20
		1/10 degrees F	disabled	0EA0
			enabled	0FA0

Input range	Wiring configuration	Temperature unit	Broken-wire detection	Parameter code (hex)
IEC PT1000 RTD	2- or 4-wire	1/10 degrees C	disabled	0221
			enabled	0321
		1/10 degrees F	disabled	02A1
			enabled	03A1
	3-wire	1/10 degrees C	disabled	0621
			enabled	0721
		1/10 degrees F	disabled	06A1
			enabled	07A1
US/JIS PT100 RTD	2- or 4-wire	1/10 degrees C	disabled	0A60
			enabled	0B60
		1/10 degrees F	disabled	0AE0
			enabled	0BE0
	3-wire	1/10 degrees C	disabled	0E60
			enabled	0F60
		1/10 degrees F	disabled	0EE0
			enabled	0FE0
US/JIS PT1000 RTD	2- or 4-wire	1/10 degrees C	disabled	0261
			enabled	0361
		1/10 degrees F	disabled	02E1
			enabled	03E1
	3-wire	1/10 degrees C	disabled	0661
			enabled	0761
		1/10 degrees F	disabled	06E1
			enabled	07E1
DIN Ni100 RTD	2- or 4-wire	1/10 degrees C	disabled	0A23
			enabled	0B23
		1/10 degrees F	disabled	0AA3
			enabled	0BA3
	3-wire	1/10 degrees C	disabled	0E23
			enabled	0F23
		1/10 degrees F	disabled	0EA3
			enabled	0FA3

Input range	Wiring configuration	Temperature unit	Broken-wire detection	Parameter code (hex)
DIN Ni1000 RTD	2- or 4-wire	1/10 degrees C	disabled	0222
			enabled	0322
		1/10 degrees F	disabled	02A2
			enabled	03A2
	3-wire	1/10 degrees C	disabled	0622
			enabled	0722
		1/10 degrees F	disabled	06A2
			enabled	07A2

Low Voltage Parameter Codes

Use the following codes to set your choice of parameters:

Input range	Broken-wire detection	Parameter code (hex)
+/-25mV	disabled	2210
	enabled	2310
+/-100mV	enabled	1211
	disabled	1311

Analog Inputs

Overview

This section describes how to interpret the value of the analog input channels.

Key

This section describes input words 1 ... 8, as highlighted in the table below:

Word	Input Data	Output Data
1 = LSW	**Value, input channel 1**	Parameters for input channels 1
2	**Value, input channel 2**	Parameters for input channels 2
3	**Value, input channel 3**	Parameters for input channels 3
4 = MSW	**Value, input channel 4**	Parameters for input channels 4

Analog Input Values

Mapping of analog input values is shown below.

Input Word 1 (Register 3*x*, analog value returned on channel 1)															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Input Word 2 (Register 3*x*+1, analog value returned on channel 2)															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Input Word 3 (Register 3*x*+2, analog value returned on channel 3)															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Input Word 4 (Register 3*x*+3, analog value returned on channel 4)															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Broken Wire Indication

A broken wire indication has the following values:

	+/- 25mv	+/- 100mv	Ni100	Ni1000	Pt100	Pt1000	T	S	R	N	K	J	E	B
value	-32768	-32768												
celsius			-602	-602	-2002	-2002	-2702	-502	-502	-2702	-2702	-2102	-2702	-2
Farenheit			-762	-762	-3283	-3283	-4542	-582	-582	-4542	-4542	-3462	-4542	-322

RTD, Thermocouple and mV Input Measuring Ranges

Overview

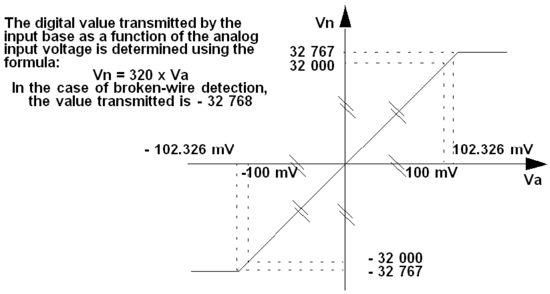
This section contains illustrations explaining the analog/digital relation for the various input measuring ranges.

RTD or Thermocouple

If a RTD or thermocouple input range is chosen, the digital value transmitted is the temperature value expressed as either a tenth of a degree Centigrade or a tenth of a degree Fahrenheit, depending on the temperature unit chosen in the configuration.

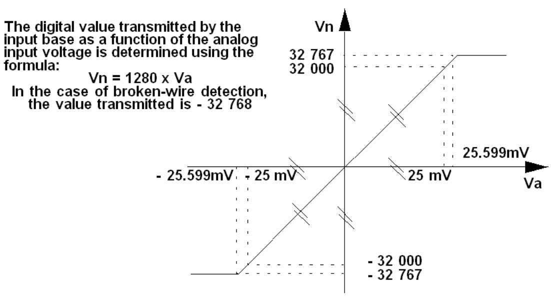
+/- 100 mV

The following illustration shows the analog/digital relation at +/- 100 mV:



+/- 25 mV

The following illustration shows the analog/digital relation at +/- 25 mV:



170 AAO 120 00 Analog 4 Channel Output Module Base +/- 10 V, 0 - 20 mA

9

Overview

This chapter describes the 170 AAO 120 00 TSX Momentum I/O base.

What's in this Chapter?

This chapter contains the following topics:

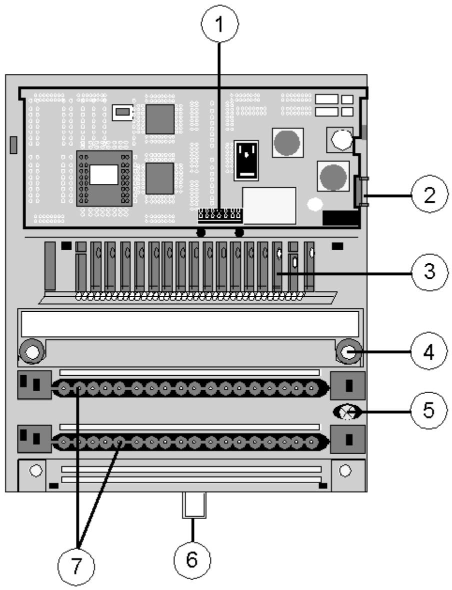
Front Panel Components

Overview

This section contains an illustration of the front panel of the 170 AAO 120 00 I/O base and a description of the LEDs.

Front Panel Illustration

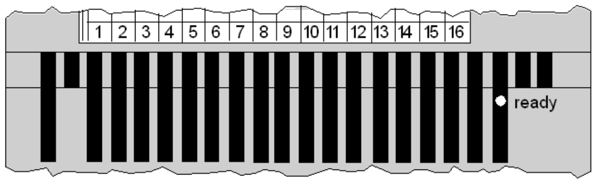
The front panel of the I/O base is shown in the illustration below.



Label	Description
1	Internal interface (ATI) connector
2	Locking and ground contact for the adapter
3	LED status display
4	Mounting holes for panel mount
5	Grounding screw
6	Locking tab for DIN rail mount
7	Sockets for the terminal connectors

LED Illustration

This I/O base has one LED, the ready indicator shown in the illustration below.



LED Descriptions

The ready indicator is described in the table below.

Indicator	Condition	Message
Ready	Green	Module is ready to communicate. Operating voltage for internal logic is present and self-test has been passed.
	Off	Module is not ready. Operating voltage is not present or module is defective.

Specifications

Overview

This section contains specifications for the 170 AAO 120 00 I/O base.

General Specifications

Module type	4 analog outputs
Output range	+/- 10 V 0 ... 20 mA
Supply voltage	24 VDC
Supply voltage range	20 ... 30 VDC
Supply current consumption (base)	max. 530 mA at 24 VDC
Supply current consumption (actuators)	max. 150 mA at 24 VDC (+/- 5 %
Power dissipation	5.6 W typical 8.5 W maximum
I/O map	5 output words

Isolation

Between channels	none
Between base power supply and ground	500 Vcc, 1 min
Between channels and ground	500 VAC, 1 min
Output protections	short circuits (in voltage) circuits open in current polarity inversion
Base power supply protection	+/- 30 V (voltage or current output)
Common mode rejection	250 VAC @ 47 ... 63 or 250 VDC Channel-to-ground

Fuses

Internal (not user-replaceable)	2 A slow-blow
External (actuator power supply)	1 A slow-blow (Bussmann GDC-1A or equivalent)
External (operating voltage)	1 A slow-blow (Bussmann GDC-1A or equivalent)

EMC

Immunity	IEC 1131-2 Surge on auxiliary power supply 500V
Radiated noise	EN 50081-2
Agency approvals	UL, CSA, CE, FM Class 1 Div.2 pending

Physical Dimensions

Width	125 mm (4.9 in)
Depth (with no adapter)	40 mm (1.54 in)
Length	141.5 mm (5.5 in) with no or one busbar
Weight	240 g (0.55 lb)

NOTE: The 24 VDC actuator power supply is protected in the same way as the analog outputs (different from the base power supply).

Analog Outputs

Number of channels	4	
Format of transmitted data	full 16 bits signed (2's complement)	
Protection (base and actuators)	polarity inversion	
Range	+/-10 V	0 ... 20 mA (current source or sink)
Load impedance	1 KOhm minimum	600 Ohms maximum
Capacitative load	< 1 micro F	< 1 micro F
Error at 25 deg. C	0.2% PE*	0.3% PE*
Error at 60 deg. C	0.25% PE*	0.4% PE*
Temperature drift (60 deg. C)	10ppmPE*/ deg. C	30ppmPE*/ deg. C
Resolution	12 bits + sign	12 bits + sign
Update time for the 4 outputs	< 2 ms	

NOTE: *Not to be confused with Protective Earth. PE is used here as a European notation for full scale, with the following values:

- 10 V in range of +/- 10 V
- 20mA in range of 0 ... 20 mA

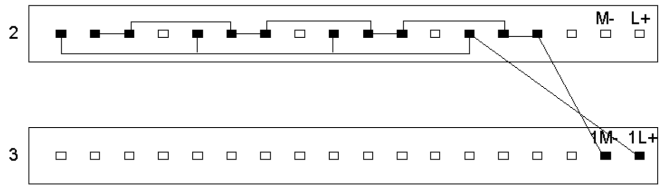
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base.

Illustration

The following illustration shows the internal connections between terminals.



Field Wiring Guidelines

Overview

This section contains wiring guidelines and precautions.

Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Electric sells terminal connectors in sets of three.

Type	Part Number
Screw-in	170 XTS 001 00
Spring-clip	170 XTS 002 00

Mapping Terminal Blocks

CAUTION

POTENTIAL FOR SHORT CIRCUITS AND/OR POWER-UP SPIKES

Provide external fuses on the operating voltage to protect the module. Appropriate fuse values are shown in the wiring illustration. An unprotected module may be subject to short circuits and/or power-up spikes.

Failure to follow these instructions can result in injury or equipment damage.

Mapping terminal blocks is described in the table below.

Row	Terminal No.	Description	Function
2	4, 8, 12, 16	-	Not used
	1, 5, 9, 13	1L+	+24 V actuator power supply output
	2, 3, 6, 7, 10, 11, 14, 15	1M-	Actuator power supply neg. 0 V return
	17	M-	Module power supply 0 V
	18	L+	Module power supply +24V

Row	Terminal No.	Description	Function
3	1, 5, 9, 13	OUTI1-, OUTI2- OUTI3-, OUTI4-	Output current mode (sink) Channels 1 ... 4
	2, 6, 10, 14	OUTI1+, OUTI2+ OUTI3+, OUTI4+	Output current mode (source) Channels 1 ... 4
	3, 7, 11, 15	OUTU1+, OUTU2+ OUTU3+, OUTU4+	Output voltage mode Channels 1 ... 4
	4, 8, 12, 16	-	Not used
	17	1M-	Actuator power supply neg. 0 V return
	18	1L+	+24 V actuator power supply output

Fuse Required

The 1 A slow-blow fuse shown in the wiring diagram *(see page 141)* must be wired into the actuator power supply.

Signal Protection

To protect the signal from external noise induced in serial or common mode, we recommend the following precautions.

- Use shielded twisted-pair cables with a minimum conductor cross section of 24 AWG or 0.22mm^2.
- Connect the cable shield to ground via the cable grounding rail (part number CER 001).
- You may combine the analog inputs on this I/O base in one multi-pair cable provided they have the same reference relative to ground.
- The actuator power supply must be protected in the same way as the signal itself.

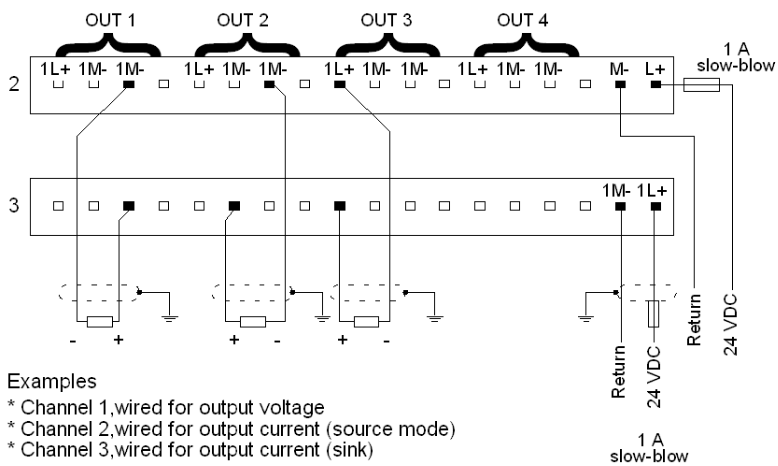
Wiring Diagrams

Overview

This section contains a diagram to assist you in wiring the following types of devices:
- output voltage
- output current (source mode)
- output current (sink) voltage

Diagram

Examples of wiring are shown in the diagram below:



I/O Mapping

Overview

The 170 AAO 120 00 TSX Momentum I/O base supports 4 analog outputs. This section contains information about the mapping of the output words into the analog output values and the usage of output words for channel configuration.

I/O Map

The I/O base must be mapped as five contiguous output words, as follows:

Word	Output Data
1 = LSW	Parameters for output channels 1 ... 4
2	Value, output channel 1
3	Value, output channel 2
4	Value, output channel 3
5 = MSW	Value, output channel 4

Analog Channel Parameters

Overview

Parameters must be set for all of the analog channels before the module can be commissioned. This section provides the codes for setting the parameters and gives examples of parameter settings.

NOTE: If you set new parameters for the module, always send a complete set of parameters (all channels, inputs and outputs), even if you only want to change a single parameter. Otherwise the module will refuse the new parameters and continue working with the old ones.

Key

This section focuses on output word 1, as highlighted in the table below:

Word	Output Data
1 = LSW	**Parameters for output channels 1 ... 4**
2	Value, output channel 1
3	Value, output channel 2
4	Value, output channel 3
5 = MSW	Value, output channel 4

Illustration

Parameters are set by entering a four-bit code in output word 1, as follows:

Output Word 1 (Register 4*x*, parameter word)															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
for output channel 4				for output channel 3				for output channel 2				for output channel 1			

Parameter Codes

The value entered in this word defines the behaviour of the I/O module in case of loss of communication. Each 4-bit nibble in output word 1 must be configured with one of the following binary codes to define the channel parameters. Parameters must be set for all four channels before the module can be commissioned.

In each case, the x may be a 0 or a 1:

Code	Output Parameter)	Function
0000	Reserved value	Forces the I/O base into a default condition where it continues to receive field inputs according to the previous received-channel parameters.
00x1	Output to Zero	Sends a value to the base that causes it to apply zero at the field output.
01x1	Full Range	Sends a value to the base that causes it to apply full scale (+10 V or + 20 mA) at the field output.
10x1	Output Last Value	Sends a value to the base that causes it to apply the last received value at the field output.

Analog Outputs

Overview

This section describes how to interpret the value of the analog output channels.

Key

This section describes output words 2 ... 5, as highlighted in the table below:

Word	Output Data
1 = LSW	Parameters for input channels 1 ... 4
2	**Value, output channel 1**
3	**Value, output channel 2**
4	**Value, output channel 3**
5 = MSW	**Value, output channel 4**

Analog Output Values

Mapping of analog output values is shown below.

Output Word 2 (Register 4*x*+1, analog value sent on channel 1)															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Output Word 3 (Register 4*x*+2, analog value sent on channel 2)															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Output Word 4 (Register 4*x*+3, analog value sent on channel 3)															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Output Word 5 (Register 4*x*+4, analog value sent on channel 4)															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

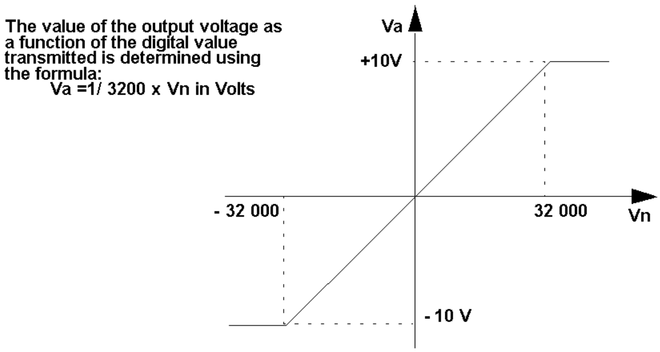
Output Ranges

Overview

This section contains illustrations explaining the analog/digital relation for the voltage and current output ranges.

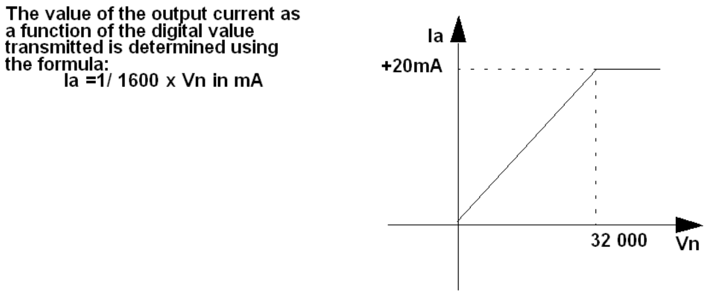
Voltage

The following illustration shows the analog/digital relation for voltage:



Current

The following illustration shows the analog/digital relation for current:



170 AAO 921 00 Analog 4 Channel Output Module Base +/- 10 V, 4 ... 20 mA

10

Overview

This chapter describes the 170 AAO 921 00 TSX Momentum I/O base.

What's in this Chapter?

This chapter contains the following topics:

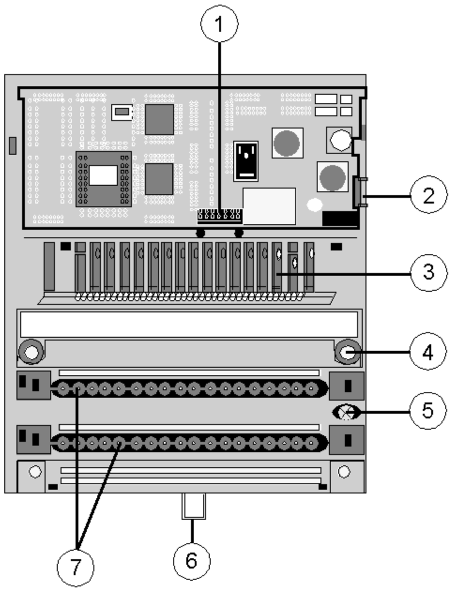
Front Panel Components

Overview

This section contains an illustration of the front panel of the 170 AAO 921 00 I/O base and a description of the LEDs.

Front Panel Illustration

The front panel of the I/O base is shown in the illustration below.

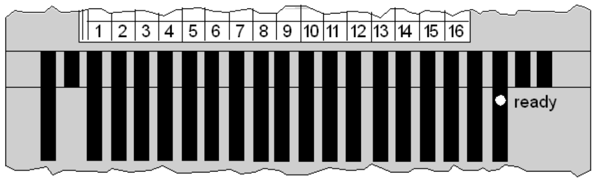


Components of the I/O module

Label	Description
1	Internal interface (ATI) connector
2	Locking and ground contact for the adapter
3	LED status display
4	Mounting holes for panel mount
5	Grounding screw
6	Locking tab for DIN rail mount
7	Sockets for the terminal connectors

LED Illustration

This I/O base has one LED, the ready indicator shown in the illustration below.



LED Descriptions

The ready indicator is described in the table below.

Indicator	Condition	Message
Ready	Green	Module is ready to communicate. Operating voltage for internal logic is present and self-test has been passed.
	Off	Module is not ready. Operation voltage is not present or module is defective.

Specifications

Overview

This section contains specifications for the 170 AAO 921 00 I/O base.

General Specifications

Module type	4 analog outputs
Output range	+/- 10 V 4 ... 20 mA
Supply voltage	24 VDC
Supply voltage range	20 ... 30 VDC
Supply current consumption (base)	max. 530 mA at 24 VDC
Supply current consumption (actuators)	max. 150 mA at 24 VDC (+/- 5 %)
Power dissipation	5.6 W typical 8.5 W maximum
I/O map	5 output words

Isolation

Between channels	none
Between base power supply and ground	500 Vcc, 1 min
Between channels and ground	500 VAC, 1 min
Output protections	short circuits (in voltage) circuits open in current polarity inversion
Base power supply protection	+/- 30 V (voltage or current output)
Common mode rejection	250 VAC @ 47 ... 63 Hz or 250 VDC Channel-to-ground

Fuses

Internal (not user-replaceable)	2 A slow-blow
External (actuator power supply)	1 A slow-blow (Bussmann GDC-1A or equivalent)

EMC

Immunity	IEC 1131-2 Surge on auxiliary power supply 500V
Emissions	EN 50081-2
Agency approvals	UL, CSA, CE, FM Class 1 Div. 2 pending

Physical Dimensions

Width	125 mm (4.9 in)
Depth (with no adapter)	40 mm (1.54 in)
Length	141.5 mm (5.5 in) with no or one busbar
Weight	215 g (0.45 lb)

NOTE: The 24 VDC actuator power supply is protected in the same way as the analog outputs (different from the base power supply).

Analog Outputs

Number of channels	4	
Format of transmitted data	full 16 bits signed (2's complement)	
Protection (base and actuators)	polarity inversion	
Range	+/-10 V	4 ... 20 mA (current source or sink)
Load impedance	1 KOhm minimum	600 Ohms maximum
Capacitative load	< 1 micro F	< 1 micro F
Error at 25 deg. C	0.2% PE*	0.4% PE*
Error at 60 deg. C	0.25% PE*	0.5% PE*
Temperature drift (60 deg. C)	10ppmPE*/ deg. C	30ppmPE*/ deg. C
Resolution	12 bits + sign	12 bits + sign
Update time for the 4 outputs	2 ms	

NOTE: *Not to be confused with Protective Earth. PE is used here as a European notation for full scale, with the following values:

- 10 V in range of +/- 10 V
- 20mA in range of 4 ... 20 mA

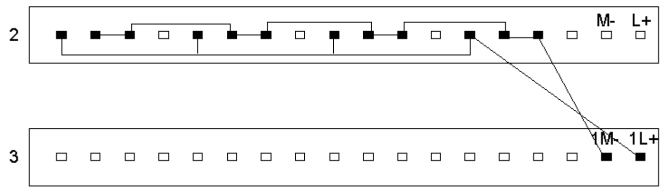
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base.

Illustration

The following illustration shows the internal connections between terminals.



Field Wiring Guidelines

Overview

This section contains wiring guidelines and precautions.

Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Electric sells terminal connectors in sets of three.

Type	Part Number
Screw-in	170 XTS 001 00
Spring-clip	170 XTS 002 00

Mapping Terminal Blocks

CAUTION

POTENTIAL FOR SHORT CIRCUITS AND/OR POWER-UP SPIKES

Provide external fuses on the operating voltage to protect the module. Appropriate fuse values are shown in the wiring illustration. An unprotected module may be subject to short circuits and/or power-up spikes.

Failure to follow these instructions can result in injury or equipment damage.

Mapping terminal blocks is described in the table below.

Row	Terminal No.	Description	Function
2	4, 8, 12, 16	-	Not used
	1, 5, 9, 13	1L+	+24 V actuator power supply output
	2, 3, 6, 7, 10, 11, 14, 15	1M-	Actuator power supply neg. 0 V return
	17	M-	Module power supply 0 V
	18	L+	Module power supply +24V

Row	Terminal No.	Description	Function
3	1, 5, 9, 13	OUTI1-, OUTI2- OUTI3-, OUTI4-	Output current mode (sink) Channels 1 ... 4
	2, 6, 10, 14	OUTI1+, OUTI2+ OUTI3+, OUTI4+	Output current mode (source) Channels 1 ... 4
	3, 7, 11, 15	OUTU1+, OUTU2+ OUTU3+, OUTU4+	Output voltage mode Channels 1 ... 4
	4, 8, 12, 16	-	Not used
	17	1M-	Actuator power supply neg. 0 V return
	18	1L+	+24 V actuator power supply output

Fuse Required

The 1 A slow-blow fuse shown in the wiring diagram *(see page 155)* must be wired into the actuator power supply.

Signal Protection

To protect the signal from external noise induced in serial or common mode, we recommend the following precautions.

- Use shielded twisted-pair cables with a minimum conductor cross section of 24 AWG or 0.22mm^2.
- Connect the cable shield to ground via the cable grounding rail (part number CER 001).
- You may combine the analog inputs on this I/O base in one multi-pair cable provided they have the same reference relative to ground.
- The actuator power supply must be protected in the same way as the signal itself.

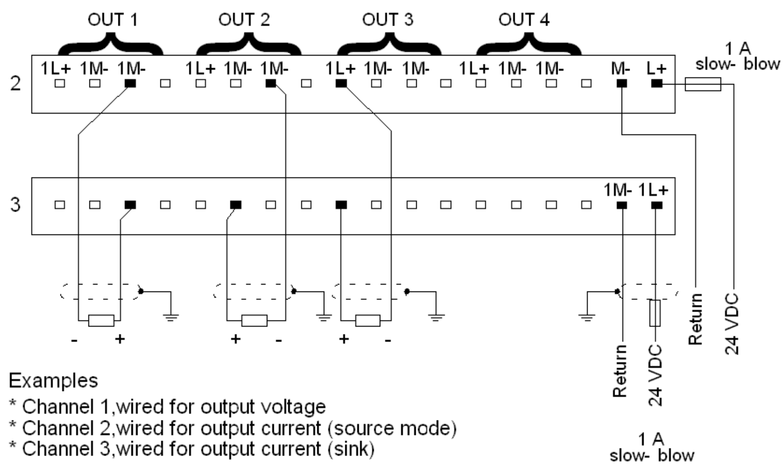
Wiring Diagrams

Overview

This section contains a diagram to assist you in wiring the following types of devices:
- output voltage
- output current (source mode)
- output current (sink) voltage

Diagram

Examples of wiring are shown in the diagram below:



Examples
* Channel 1,wired for output voltage
* Channel 2,wired for output current (source mode)
* Channel 3,wired for output current (sink)

I/O Mapping

Overview

The 170 AAO 921 00 TSX Momentum I/O base supports four analog output channels. This section contains information about the mapping of the I/O data into input words.

I/O Map

The I/O base must be mapped as five contiguos output words, as follows:

Word	Output Data
1 = LSW	Parameters for output channels 1 ... 4
2	Value for output channel 1
3	Value for output channel 2
4	Value for output channel 3
5 = MSW	Value for output channel 4

Analog Channel Parameters

Overview

Parameters must be set for all of the analog channels before the module can be commissioned. This section provides the codes for setting the parameters and gives examples of parameter settings.

NOTE: If you set new parameters for the module, always send a complete set of parameters (all channels, inputs and outputs), even if you only want to change a single parameter. Otherwise the module will refuse the new parameters and continue working with the old ones.

Key

This section focuses on output word 1, as highlighted in the table below:

Word	Output Data
1 = LSW	**Parameters for Output channels 1 ... 4**
2	Value, output channel 1
3	Value, output channel 2
4	Value, output channel 3
5= MSW	Value, output channel 4

Illustration

Parameters are set by entering a four-bit code in output word 1, as follows:

<table>
<tr><th colspan="16">Output Word 1 (Register 4x, parameter word)</th></tr>
<tr><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr>
<tr><td colspan="4">for output channel 4</td><td colspan="4">for output channel 3</td><td colspan="4">for output channel 2</td><td colspan="4">for output channel 1</td></tr>
</table>

Parameter Codes

The value entered in this word defines the behaviour of the I/O module in case of loss of communication. Each 4-bit nibble in output word 1 must be configured with one of the following binary codes to define the channel parameters. Parameters must be set for all four channels before the module can be commissioned.

In each case, the x may be a 0 or a 1:

Code	Output Parameter)	Function
0000	Reserved value	Forces the I/O base into a default condition where it continues to receive field inputs according to the previous received channel parameters.
00x1	Output to Zero	Sends a value to the base that causes it to apply zero at the field output.
01x1	Full Range	Sends a value to the base that causes it to apply full scale (+10 V or + 20 mA) at the field output.
10x1	Output Last Value	Sends a value to the base that causes it to apply the last received value at the field output.

Analog Outputs

Overview

This section describes how to interpret the value of the analog output channels.

Key

This section describes output words 2 ... 5, as highlighted in the table below:

Word	Output Data
1	Parameters for output channels 1 ... 4
2	**Value, input channel 1**
3	**Value, input channel 2**
4	**Value, input channel 3**
5	**Value, input channel 4**

Analog Output Values

Mapping of analog output values is shown below.

Output Word 2 (Register 4*x*+1, analog value sent on channel 1)															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Output Word 3 (Register 4*x*+2, analog value sent on channel 2)															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Output Word 4 (Register 4*x*+3, analog value sent on channel 3)															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Output Word 5 (Register 4*x*+4, analog value sent on channel 4)															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

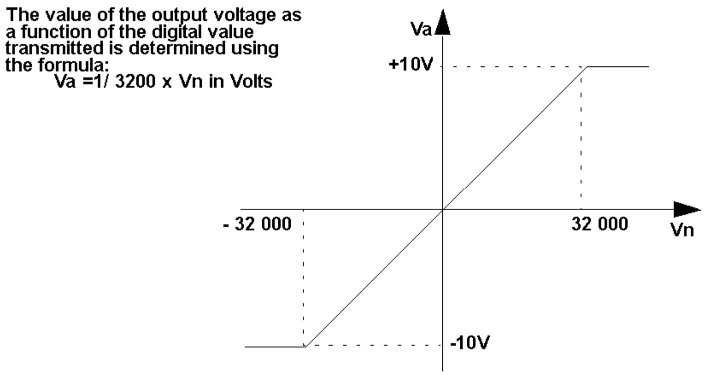
Output Ranges

Overview

This section contains illustrations explaining the analog/digital relation for the voltage and current output ranges.

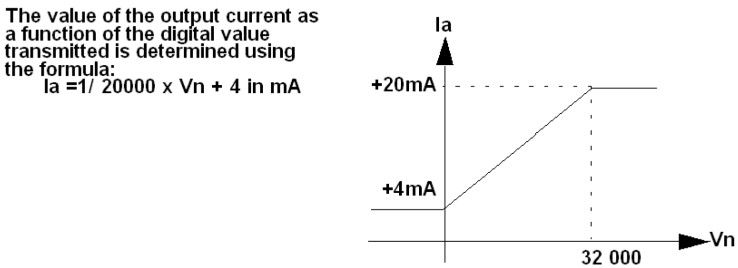
+/- 10 V

The following illustration shows the analog/digital relation at +/- 10 V:



4 ... 20 mA

The following illustration shows the analog/digital relation at 4 ... 20 mA current:



170 ADI 340 00 24 VDC - 16 Pt. Discrete Input Module Base

11

Overview

This chapter describes the 170 ADI 340 00 TSX Momentum I/O base.

What's in this Chapter?

This chapter contains the following topics:

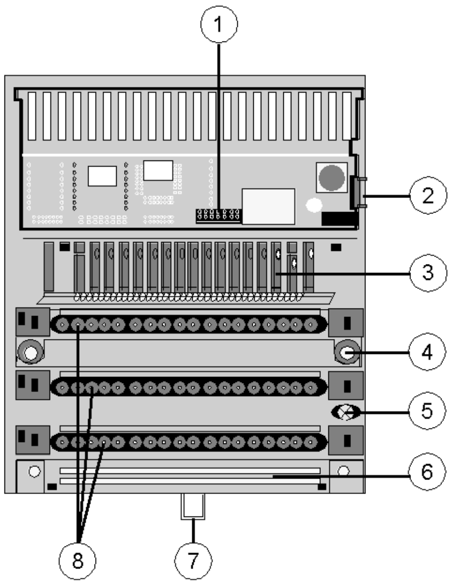
Front Panel Components

Overview

This section contains a photograph of the front panel of the 170 ADI 340 00 I/O base and a description of the LEDs.

Front Panel Illustration

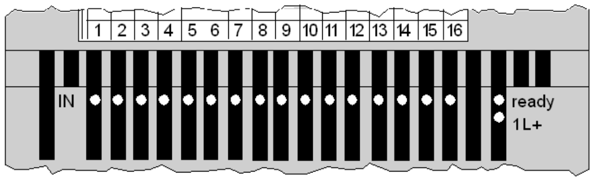
The front panel of the I/O base is shown in the illustration below.



Label	Description
1	Internal interface (ATI) connector
2	Locking and ground contact for the adapter
3	LED status display
4	Mounting holes for panel mount
5	Grounding screw
6	Busbar Mounting Slot
7	Locking tab for DIN rail mount
8	Sockets for the terminal connectors

LED Illustration

This I/O base has one LED, the ready indicator shown in the illustration below.



LED Descriptions

The ready indicator is described in the table below.

Indicator	Condition	Message
Ready	Green	Module is ready to communicate. Operating voltage for internal logic is present and self-test has been passed.
	Off	Module not ready
1L+	Green	Input voltage 1L+ of inputs 1 ... 16 is present
	Off	Input voltage of inputs 1 ... 16 is not present
IN 1...16	Green	Input status (an LED per input); input point active, i.e. input carries a 1 signal (logically ON)
	Off	Input status (an LED per input); input point inactive, i.e. input carries a 0 signal (logically OFF)

Specifications

Overview

This section contains specifications for the 170 ADI 340 00 I/O base.

General Specifications

Module type	16 discrete inputs in 1 group
Supply voltage	24 VDC
Supply voltage range	20...30 VDC
Supply current consumption	max. 250 mA at 24 VDC
Power dissipation	6 W + (# of input points on x .144 W)
I/O map	1 input word

Isolation

Input to input	none
Field to communication adapter	Defined by Communication Adapter type

Fuses

Internal	none
External: operating voltage	1 A slow-blow (Bussmann GDC-1A or equivalent)
External: input voltage	According to the supply of the connected sensors– not to exceed 4A fast-blow

EMC

Immunity	IEC 1131-2 Surge on auxiliary power supply 500V
Emissions	EN 50081-2
Agency approvals	UL, CSA, CE, FM Class 1 Div. 2

Physical Dimensions

Width	125 mm (4.9 in)
Depth (with no adapter)	40 mm (1.54 in)
Length	141.5 mm (5.5 in) no or one busbar 159.5mm (6.3in) two busbars 171.5 mm (6.75in) three busbars
Weight	190 g (0.42 lb)

Discrete Inputs

Number of points	16
Number of groups	1
Points per group	16
Signal type	True High
IEC 1131 type	1+ (See appendix *IEC 1131 Input Types, page 603* for definitions of IEC input types.)
ON voltage	+11 ... +30 VDC
OFF voltage	-3 ... +5 VDC
Input current	2.5 mA minimum ON (6 mA at 24 VDC 1.2 mA maximum OFF
Input voltage range	-3 ... +30 VDC
Input resistance	4 kOhm
Response time	2.2 ms OFF to ON 3.3 ms ON to OFF

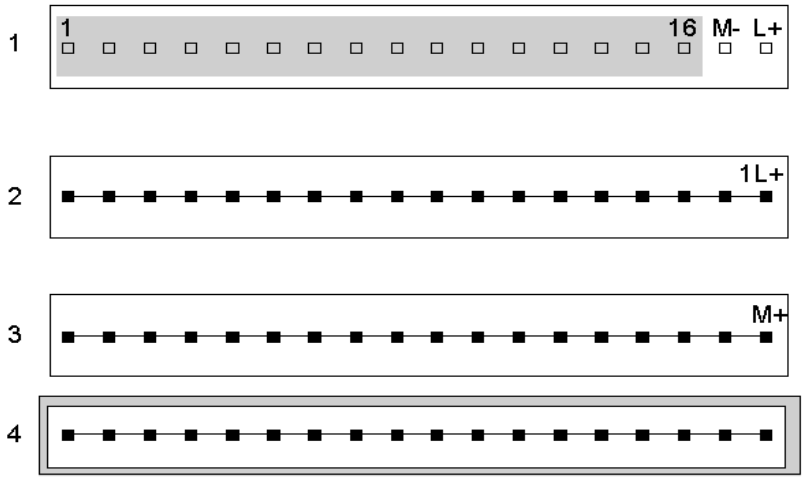
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base and an optional one-row busbar.

Illustration

Rows 1 through 3 show the internal connections between terminals on the I/O base. Row 4 shows the internal connections on the optional busbar.



Field Wiring Guidelines

Overview

Inputs are field wired to row 1 of the base. This section contains wiring guidelines and precautions.

Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Electric sells terminal connectors in sets of three.

Type	Part Number
Screw-in	170 XTS 001 00
Spring-clip	170 XTS 002 00

Busbar May Be Required

If you are using 4-wire devices, you will need a 1-row busbar to connect them to protective earth (PE).

Type	Part Number
Screw-in	170 XTS 006 01
Spring-clip	170 XTS 007 01

Mapping Terminal Blocks

⚠ CAUTION

POTENTIAL FOR SHORT CIRCUITS AND/OR POWER-UP SPIKES

Provide external fuses on the operating voltage to protect the module. Appropriate fuse values are shown in the wiring illustration. An unprotected module may be subject to short circuits and/or power-up spikes.

Failure to follow these instructions can result in injury or equipment damage.

A busbar may be attached to this I/O base to provide a fourth row for protective earth (PE).

Row	Terminal	Function
1	1...16	Inputs
	17	Return (M-)
	18	+ 24 VDC Operating voltage (L+)
2	1 ... 17	Sensor/input device voltages
	18	+ 24 VDC for inputs
3	1 ... 17	Returns for sensor/input devices (for 3-and 4-wire devices)
	18	Return for inputs
4	1 ... 18	Protective earth (PE)

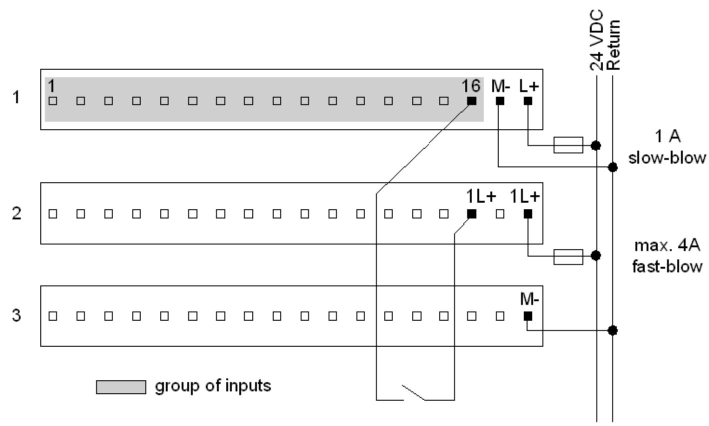
Wiring Diagrams

Overview

This section contains an illustration to assist you in wiring the following types of devices:
- 4-wire configuration
- 3-wire configuration
- 2-wire configuration

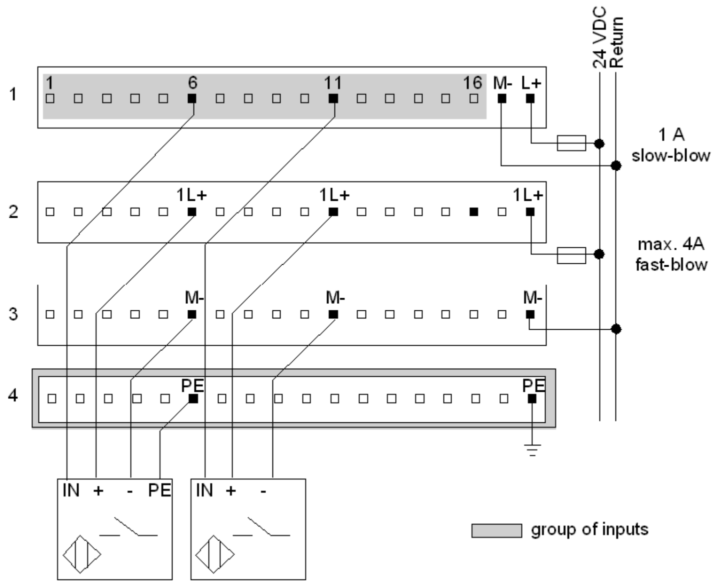
2-Wire Devices

The diagram below shows an example of wiring for 2-wire devices:



3- and 4-Wire Devices

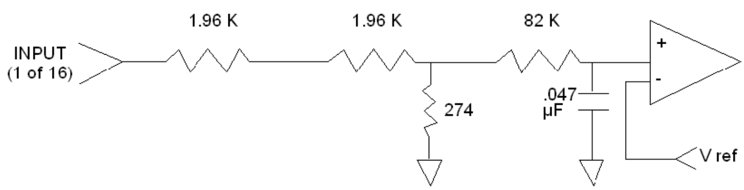
The diagram below shows an example of wiring for 3- and 4-wire devices:



A 1-row busbar is used to provide PE for the 4-wire sensor. No busbar would be required if only 2- and/or 3-wire sensors were used.

Simplified Schematics

The following diagram shows the field-side input circuitry.



I/O Mapping

Overview

The 170 ADI 340 00 TSX Momentum I/O base supports 16 discrete inputs. This section contains information about the mapping of the I/O data into input words.

I/O Map

The I/O base may be mapped as one input word, or as 16 discrete input points.

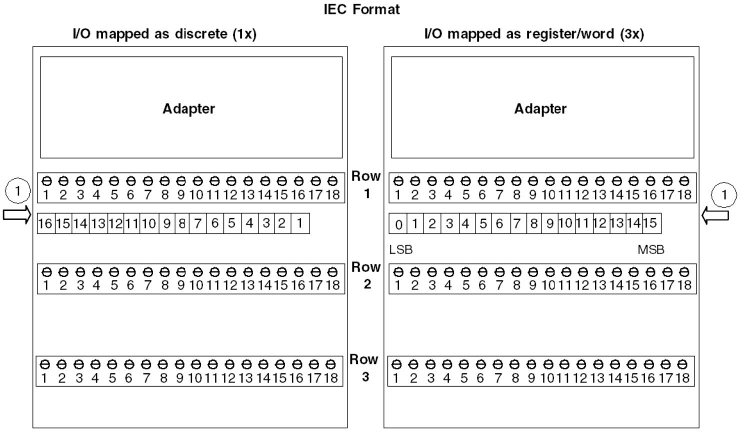
IEC vs. Ladder Logic

In order to correctly field wire the inputs and map the input data, you need to know which type of Momentum Adapter is mounted on the base. Adapters may either be IEC compliant or 984 Ladder Logic compliant.

	IEC Compliant	**984 Ladder Logic Compliant**
Momentum Processor Adapters	All	None
Momentum Communication Adapters	All, except 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01	170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01

Data Mapping

The figure below shows how data is mapped on the I/O base with an IEC Compliant adapter. When the I/O is mapped as discrete points (1x), the MSB is assigned to Pin 1 and the LSB is assigned to Pin 16. When the I/O is mapped as a word or register (3x), the MSB (bit 15) is assigned to Pin 16 and the LSB (bit 0) is assigned to Pin 1.



1 inputs

The figure below shows how data is mapped on the I/O base with a 984 Ladder Logic Compliant adapter. When the I/O is mapped as discrete points (1x), the MSB is assigned to Pin 16 and the LSB is assigned to Pin 1. When the I/O is mapped as a word or register (3x), the MSB is assigned to Pin 1(bit 15) and the LSB (bit 0) is assigned to Pin 16.

1 inputs

170 ADI 350 00 24 VDC - 32 Pt. Discrete Input Module Base

12

Overview

This chapter describes the 170 ADI 350 00 TSX Momentum I/O base.

What's in this Chapter?

This chapter contains the following topics:

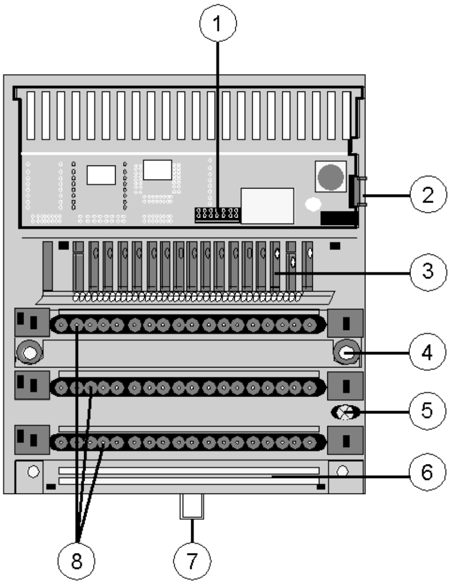
Front Panel Components

Overview

This section contains a photograph of the front panel of the 170 ADI 350 00 I/O base and a description of the LEDs.

Front Panel Illustration

The front panel of the I/O base is shown in the illustration below.

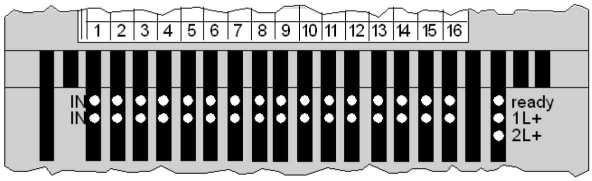


Components of the I/O module

Label	Description
1	Internal interface (ATI) connector
2	Locking and ground contact for the adapter
3	LED status display
4	Mounting holes for panel mount
5	Grounding screw
6	Busbar Mounting Slot
7	Locking tab for DIN rail mount
8	Sockets for the terminal connectors

LED Illustration

The LEDs are shown in the illustration below.



LED Descriptions

The LEDs are described in the table below.

Indicator	Condition	Message
Ready	Green	Module is ready to communicate. Operating voltage for internal logic (5 V) is present
	Off	Module not ready
1L+	Green	Input voltage 1L+ of inputs 1 ... 16 (group 1) is present
	Off	Input voltage of inputs 1 ... 16 (group 1) is not present
2L+	Green	Input voltage 2L+ of inputs 17 ... 32 (group 2) is present
	Off	Input voltage of inputs 17 ... 32 (group 2) is not present
Upper row IN 1...16	Green	Input status (an LED per input) group 1; input point active, i.e. input carries a 1 signal (logically ON)
	Off	Input status (an LED per input) group 1; input point inactive, i.e. input carries a 0 signal (logically OFF)
Middle row IN 1...16	Green	Input status (an LED per input) group 2; input point active, i.e. input carries a 1 signal (logically ON)
	Off	Input status (an LED per input) group 2; input point inactive, i.e. input carries a 0 signal (logically OFF)

Specifications

Overview

This section contains specifications for the 170 ADI 350 00 I/O base.

General Specifications

Module type	32 discrete inputs in 2 groups (16 inputs per group)
Supply voltage	24 VDC
Supply voltage range	20...30 VDC
Supply current consumption	max. 250 mA at 24 VDC
Power dissipation	6 W + (# of input points on x .144 W)
I/O map	2 input word

Isolation

Input to input	none
Field to communication adapter	Defined by Communication Adapter type

Fuses

Internal	none
External: operating voltage	1 A slow-blow (Bussmann GDC-1A or equivalent)
External: input voltage	According to the supply of the connected sensors– not to exceed 4A fast-blow

EMC

Immunity	IEC 1131-2 Surge on auxiliary power supply 500V
Emissions	EN 50081-2
Agency approvals	UL, CSA, CE, FM Class 1 Div.2 pending

Physical Dimensions

Width	125 mm (4.9 in)
Depth (with no adapter)	40 mm (1.54 in)
Length	141.5 mm (5.5 in) no or one busbar 159.5mm (6.3in) two busbars 171.5 mm (6.75in) three busbars
Weight	200 g (0.44 lb)

Discrete Inputs

Number of points	32
Number of groups	2
Points per group	16
Signal type	True High
IEC 1131 type	1+ (See appendix *IEC 1131 Input Types, page 603* for definitions of IEC input types.)
ON voltage	+11 ... +30 VDC
OFF voltage	-3 ... +5 VDC
Input current	2.5 mA minimum ON(6 mA at 24 VDC 1.2 mA maximum OFF
Input voltage range	-3 ... +30 VDC
Input resistance	4 kOhm
Response time	2.2 ms OFF to ON 3.3 ms ON to OFF

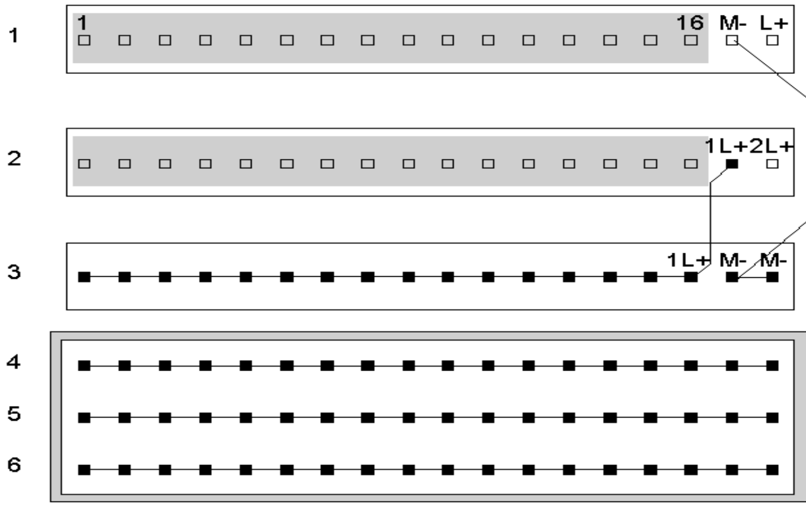
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base and an optional busbar.

Illustration

Rows 1 through 3 show the internal connections between terminals on the I/O base. Row 4 through 6 show the internal connections on the optional busbar.



Field Wiring Guidelines

Overview

This section contains wiring guidelines and precautions.

Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Electric sells terminal connectors in sets of three.

Type	Part Number
Screw-in	170 XTS 001 00
Spring-clip	170 XTS 002 00

Busbar May Be Required

Depending on the type of field devices you are using, you may need a 1-, 2-, or 3-row busbar. The following busbars are available from Schneider Electric:

Type	Number of Rows	Part Number
Screw-in	1 - row	170 XTS 006 01
	2 - row	170 XTS 005 01
	3 - row	170 XTS 004 01
Spring-clip	1 - row	170 XTS 007 01
	2 - row	170 XTS 008 01
	3 - row	170 XTS 003 01

Mapping Terminal Blocks

⚠ CAUTION

POTENTIAL FOR SHORT CIRCUITS AND/OR POWER-UP SPIKES

Provide external fuses on the operating voltage to protect the module. Appropriate fuse values are shown in the wiring illustration. An unprotected module may be subject to short circuits and/or power-up spikes.

Failure to follow these instructions can result in injury or equipment damage.

The following table shows mapping terminal blocks and optional busbars.

Row	Terminal	Function
1	1...16	Inputs for group 1
	17	Return (M-)
	18	+ 24 VDC Operating voltage (L+)
2	1 ... 16	Inputs for group 2
	17/18	+ 24 VDC for input group 1 (1L+) and group 2 (2L+)
3	1 ... 16	Input voltage for inputs 1 ... 16
	17/18	Return (M-)
4	1 ... 18	Input voltage for inputs 17 ... 32
5	1 ... 18	Return (M-)
6	1 ... 18	Return (M-) or Protective earth (PE)

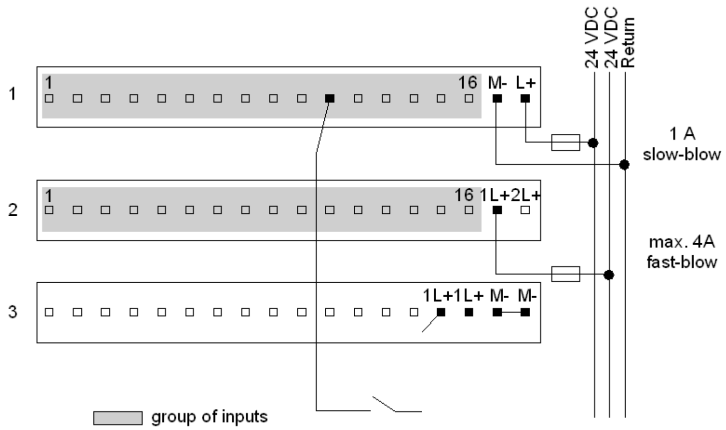
Wiring Diagrams

Overview

This section contains a diagram to assist you in wiring the following types of devices:
- 2-wire configuration
- 3-wire configuration

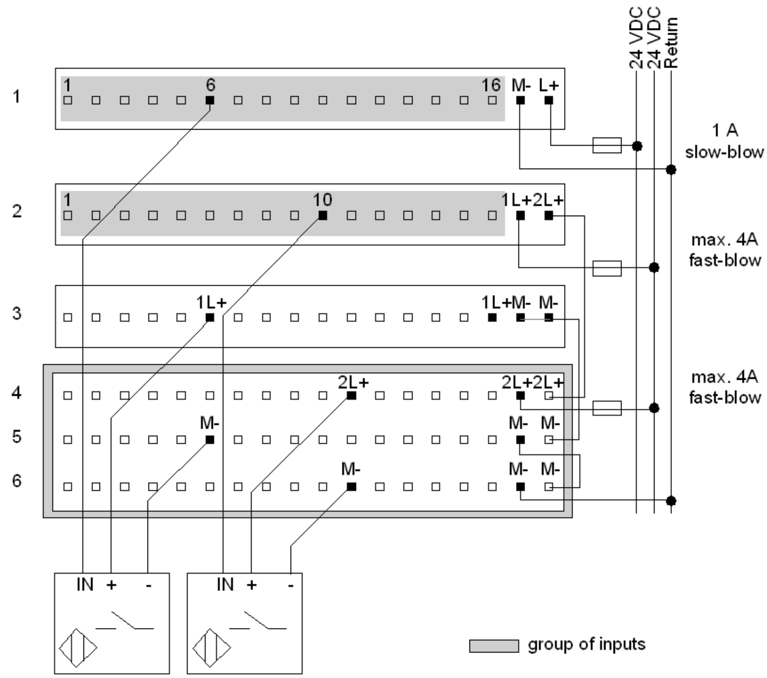
2-Wire Devices

The diagram below shows an example of wiring for two-wire devices. This example uses an input from one group of input points. If you feed inputs using points from both input groups, you will need a busbar.



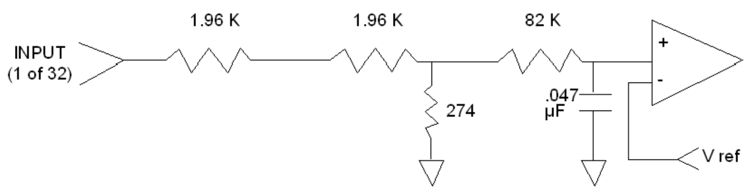
3-Wire Devices

The diagram below shows an example of wiring for 3-wire devices:



Simplified Schematics

The following diagram shows the field-side input circuitry.



I/O Mapping

Overview

The 170 ADI 350 00 TSX Momentum I/O base supports 32 discrete inputs. This section contains information about the mapping of the I/O data into input words.

I/O Map

The I/O base may be mapped as two 16-bit input words, or as 32 discrete input points.

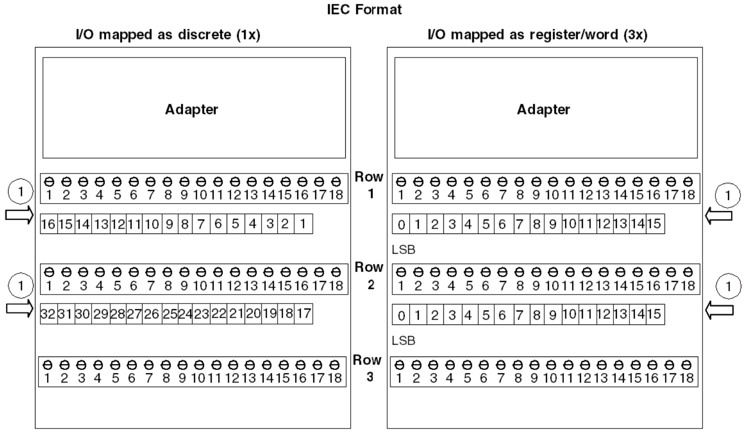
IEC vs. Ladder Logic

In order to correctly field wire the inputs and map the input data, you need to know which type of Momentum Adapter is mounted on the base. Adapters may be either IEC compliant or 984 Ladder Logic compliant:

	IEC Compliant	**984 Ladder Logic Compliant**
Momentum Processor Adapters	All	None
Momentum Communication Adapters	All, except 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01	170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01

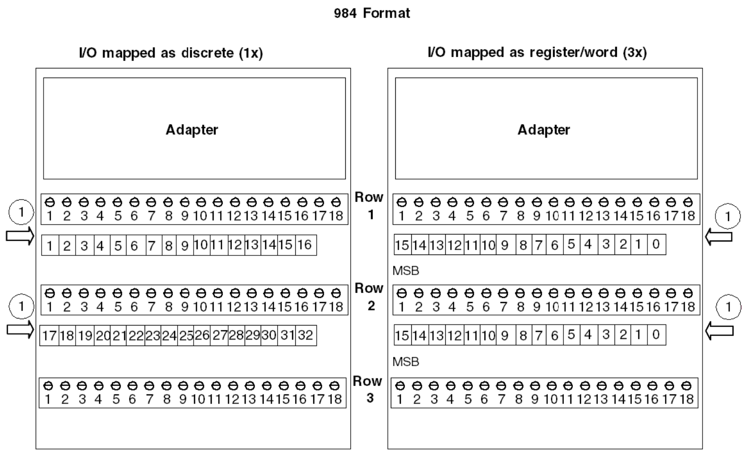
Data Mapping

The figure below shows how data is mapped on the I/O base with an IEC Compliant adapter. When the I/O is mapped as discrete points (1x), the MSB is assigned to Pin 1 and the LSB is assigned to Pin 16. When the I/O is mapped as a word or register (3x), the MSB (bit 15) is assigned to Pin 16 and the LSB (bit 0) is assigned to Pin 1.



1 inputs

The figure below shows how data is mapped on the I/O base with a 984 Ladder Logic Compliant adapter. When the I/O is mapped as discrete points (1x), the MSB is assigned to Pin 16 and the LSB is assigned to Pin 1. When the I/O is mapped as a word or register (3x), the MSB (bit15) is assigned to Pin 1 and the LSB (bit 0) is assigned to Pin 16.



1 inputs

170 ADI 540 50 120 VAC - 16 Point Discrete Input Module Base

13

Overview

This chapter describes the 170 ADI 540 50 TSX Momentum I/O base.

What's in this Chapter?

This chapter contains the following topics:

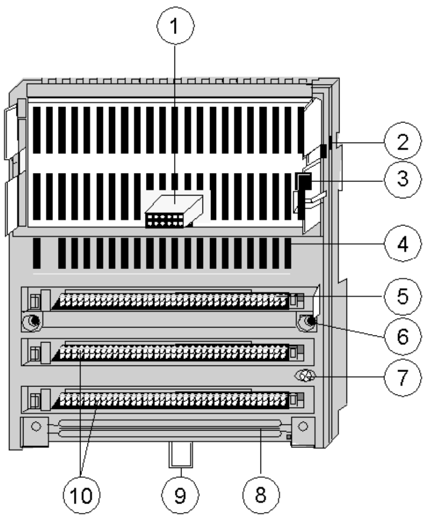
Front Panel Components

Overview

This section contains an illustration of the front panel of the 170 ADI 540 50 I/O base and a description of the LEDs.

Front Panel Illustration

The front panel of the I/O base is shown in the illustration below.

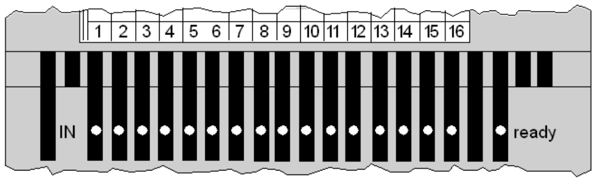


Components of the I/O module

Label	Description
1	Internal interface (ATI) connector
2	Locking tab for the adapter
3	Ground contact for the adapter
4	LED status display
5	Module power and field inputs
6	Mounting holes for panel mount
7	Grounding screw
8	Busbar Mounting Slot
9	Locking tab for DIN rail mount
10	Sockets for the terminal connectors

LED Illustration

The LEDs are shown in the illustration below.



LED Descriptions

The LEDs are described in the table below.

Indicator	Condition	Message
Ready	Green	Module is ready to communicate on network
	Off	Module not ready to communicate
Upper row IN 1 ... 16	Green	Input status (an LED per input); input point active, i.e. input carries a 1 signal (logically ON)
	Off	Input status (an LED per input); input point inactive, i.e. input carries a 0 signal (logically OFF)

Specifications

Overview

This section contains specifications for the 170 ADI 540 50 I/O base.

General Specifications

Module type	16 discrete inputs in 2 groups
Supply voltage	120 VAC
Supply voltage range	85 ... 132 VAC RMS @ 47 ... 63 Hz
Supply current consumption	125 mA at 120 VAC
Power dissipation	4 W + (# of input points on x .62 W)
I/O map	1 input word

Isolation

Input to input	none
Group to Group	1780 VAC
Field to communication adapter	1780 VAC

Fuses

Internal (non-replaceable	200 mA slow-blow
External (module power)	200 mA slow-blow (Wickmann 19502000 mA or equivalent)

EMC

Immunity	IEC 1131-2 Surge on auxiliary power supply 2 kV
Emissions	EN 50081-2
Agency approvals	UL, CSA, CE FM Class 1,Div. 2

Physical Dimensions

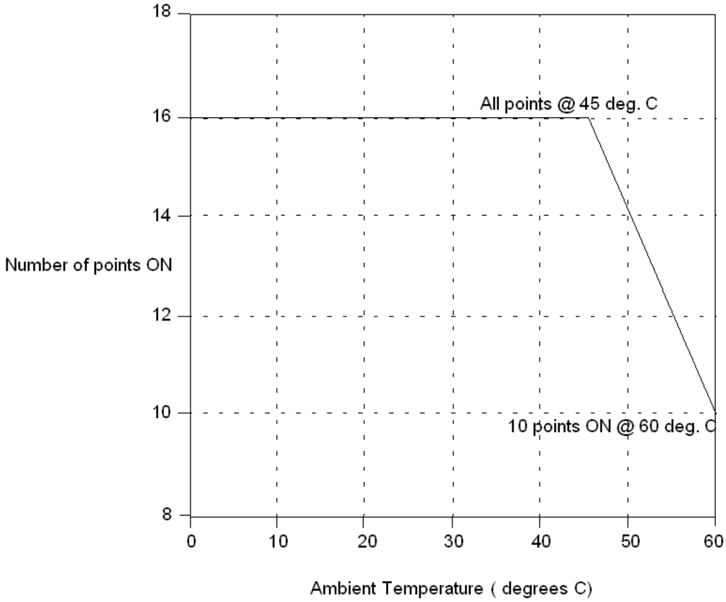
Width	125 mm (4.9 in)
Depth (with no adapter)	52 mm (2.05 in)
Length	141.5 mm (5.5 in) no or one busbar 159.5mm (6.3in) two busbars 171.5 mm (6.75in) three busbars
Weight	284 g (10 oz)

Discrete Inputs

Number of points	16
Number of groups	2
Points per group	8
Signal type	True High
Input current	10 mA minimum ON 2 mA maximum OFF
Input resistance (nominal)	9.5 kOhm @ 50 7.5 kOhm @ 60
Switching level	74 VAC minimum ON 20 VAC minimum OFF
Response time	35 ms @ 60 Hz ON to OFF 10 ms @ 60 Hz OFF to ONF

Derating Curve

The diagram below depicts the derating curve for this I/O base.



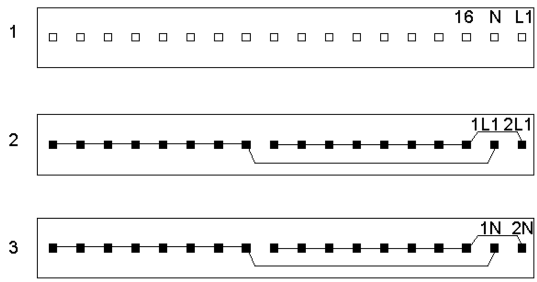
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base.

Illustration

The following illustration shows the internal connections between terminals.



Field Wiring Guidelines

Overview

Inputs are field wired to row 1 of the base. This section contains wiring guidelines and precautions.

Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Electric sells terminal connectors in sets of three.

Type	Part Number
Screw-in	170 XTS 001 00
Spring-clip	170 XTS 002 00

Mapping Terminal Blocks

CAUTION

POTENTIAL FOR SHORT CIRCUITS AND/OR POWER-UP SPIKES

Provide external fuses on the operating voltage to protect the module. Appropriate fuse values are shown in the wiring illustration. An unprotected module may be subject to short circuits and/or power-up spikes.

Failure to follow these instructions can result in injury or equipment damage.

The following table shows mapping terminal blocks.

Row	Terminal	Function
1	1...16	Inputs
	17	Neutral - 120 VAC for module (N)
	18	Line - 120 VAC for module (L1)
2	1 ... 8	Input group 1 - line (1L1)
	9 ... 16	Input group 2 - line (2L1)
	17	Line for inputs group 1 (1L1)
	18	Line for inputs group 2 (2L1)
3	1 ... 8	Input group 1 - neutral (1N)
	9 ... 16	Input group 2 - neutral (2N)
	17	Neutral for inputs group 1 (1N)
	18	Neutral for inputs group 2 (2N1)

Wiring Diagrams

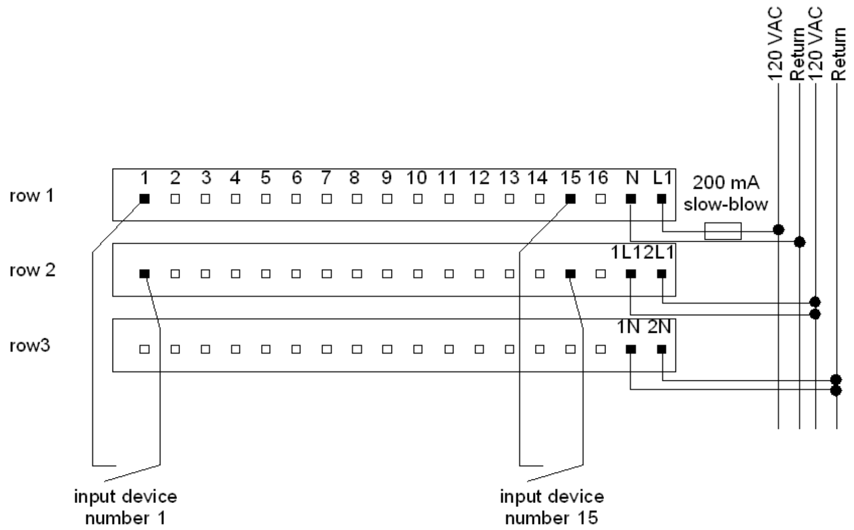
Overview

This section contains diagrams to assist you in wiring the following types of devices:

- 2-wire configuration
- 3-wire configuration

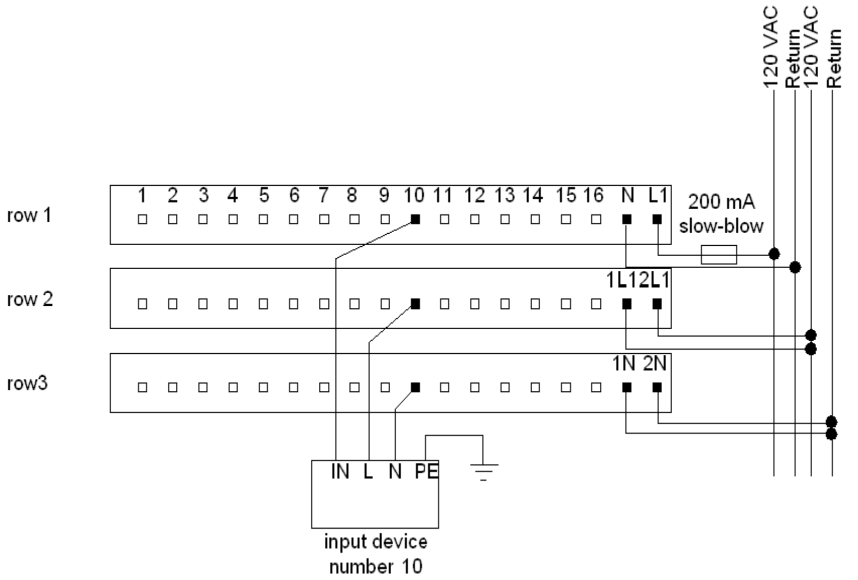
2-Wire Devices

The diagram below shows an example of wiring for 2-wire devices:



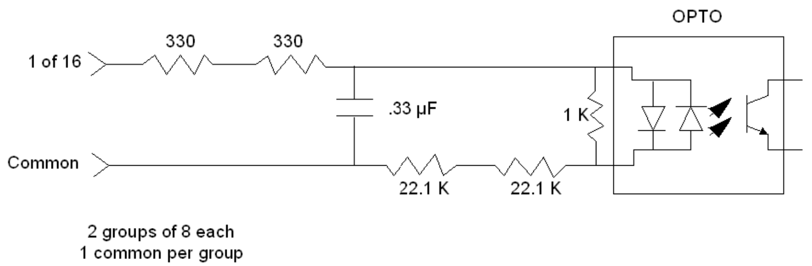
3-Wire Devices

The diagram below shows an example of wiring for 3-wire devices:



Simplified Schematics

The following diagram shows the field-side input circuitry.



I/O Mapping

Overview

The 170 ADI 540 50 TSX Momentum I/O base supports 16 discrete inputs. This section contains information about the mapping of the I/O data into input words.

I/O Map

The I/O base may be mapped as one input word, or as 16 discrete input points.

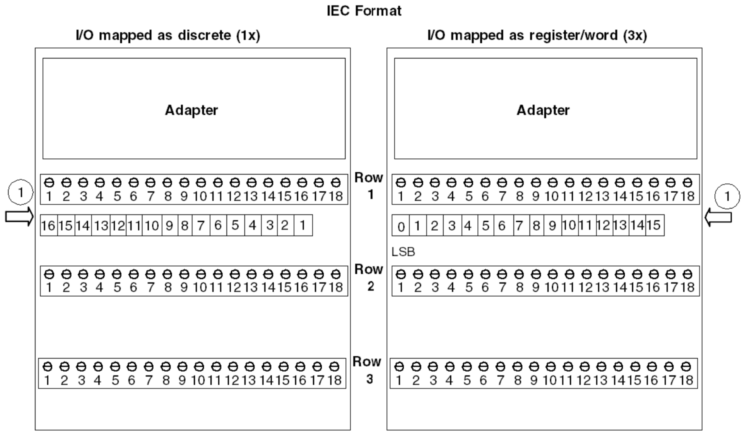
IEC vs. Ladder Logic

In order to correctly field wire the inputs and map the input data, you need to know which type of Momentum adapter is mounted on the base. Adapters may be either IEC compliant or 984 ladder logic compliant.

	IEC Compliant	**984 Ladder Logic Compliant**
Momentum Processor Adapters	All	None
Momentum Communication Adapters	All, except 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01	170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01

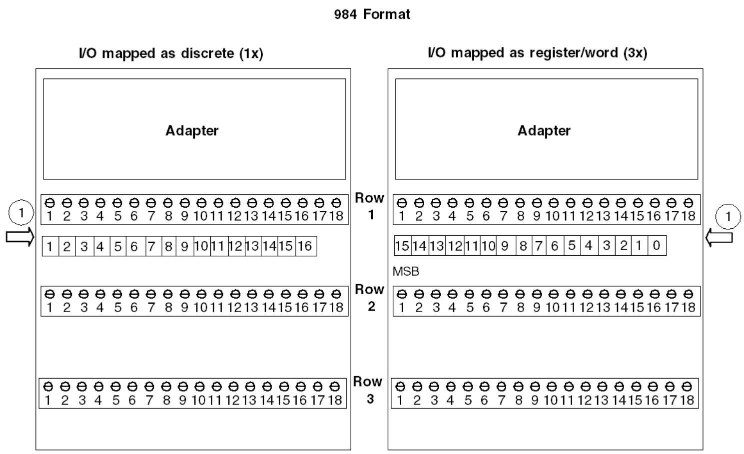
Data Mapping

The figure below shows how data is mapped on the I/O base with an IEC compliant adapter. When the I/O is mapped as discrete points (1x), the MSB is assigned to pin 1 and the LSB is assigned to pin 16. When the I/O is mapped as a word or register (3x), the MSB (bit 15) is assigned to pin 16 and the LSB (bit 0) is assigned to pin 1.



1 inputs

The figure below shows how data is mapped on the I/O base with a 984 ladder logic compliant adapter. When the I/O is mapped as discrete points (1x), the MSB is assigned to pin 16 and the LSB is assigned to pin 1. When the I/O is mapped as a word or register (3x), the MSB (bit 15) is assigned to pin 1 and the LSB (bit 0) is assigned to pin 16.



1 inputs

170 ADI 740 50 230 VAC - 16 Point Discrete Input Module Base

14

Overview

This chapter describes the 170 ADI 740 50 TSX Momentum I/O base.

What's in this Chapter?

This chapter contains the following topics:

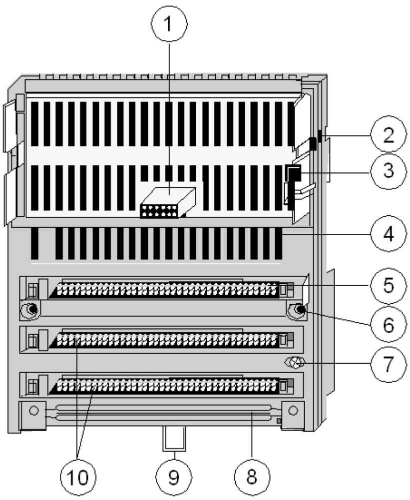
Front Panel Components

Overview

This section contains an illustration of the front panel of the 170 ADI 740 50 I/O base and a description of the LEDs.

Front Panel Illustration

The front panel of the I/O base is shown in the illustration below.

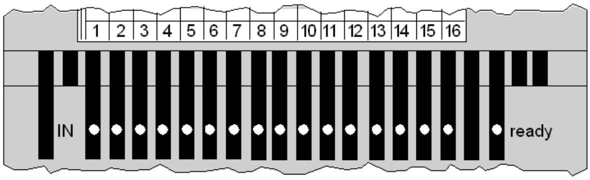


Components of the I/O module

Label	Description
1	Internal interface (ATI) connector
2	Locking tab for the adapter
3	Ground contact for the adapter
4	LED status display
5	Module power and field inputs
6	Mounting holes for panel mount
7	Grounding screw
8	Busbar Mounting Slot
9	Locking tab for DIN rail mount
10	Sockets for the terminal connectors

LED Illustration

The LEDs are shown in the illustration below.



LED Descriptions

The LEDs are described in the table below.

Indicator	Condition	Message
Ready	Green	Module is ready to communicate on network
	Off	Module not ready to communicate
Upper row IN 1 ... 16	Green	Input status (an LED per input); input point active, i.e. input carries a 1 signal (logically ON)
	Off	Input status (an LED per input); input point inactive, i.e. input carries a 0 signal (logically OFF)

Specifications

Overview

This section contains specifications for the 170 ADI 740 50 I/O base.

General Specifications

Module type	16 discrete inputs in 2 groups
Supply voltage	230 VAC
Supply voltage range	164 - 253 VAC RMS @ 47 ... 63 Hz
Supply current consumption	50 mA at 230 VAC
Power dissipation	4 W + (# of input points on x .62 W)
I/O map	1 input word

Isolation

Input to input	none
Group to Group	1780 VAC
Field to communication adapter	1780 VAC

Fuses

Internal (non-replaceable	200 mA slow-blow
External (module power)	200 mA slow-blow (Wickmann 195020000 mA or equivalent)

EMC

Immunity	IEC 1131-2 Surge on auxiliary power supply 2 kV
Emissions	EN 50081-2
Agency approvals	UL, CSA, CE FM Class 1,Div.2 pending

Physical Dimensions

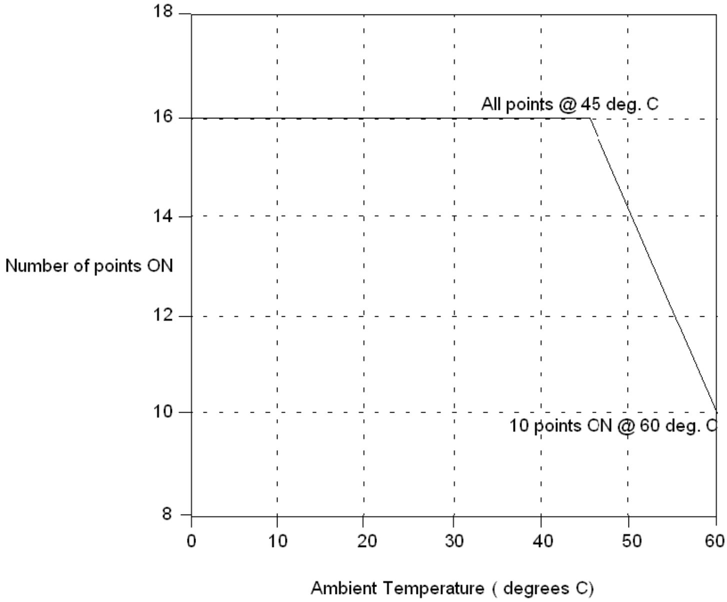
Width	125 mm (4.9 in)
Depth (with no adapter)	52 mm (2.05 in)
Length	141.5 mm (5.5 in) no or one busbar 159.5mm (6.3in) two busbars 171.5 mm (6.75in) three busbars
Weight	284 g (10 oz)

Discrete Inputs

Number of points	16
Number of groups	2
Points per group	8
Signal type	True High
Input current	10 mA minimum ON 2 mA maximum OFF
Input resistance (nominal)	9.5 kOhm @ 50 Hz 7.5 kOhm @ 60 Hz
Switching level	164 VAC minimum ON 40 VAC minimum OFF
Response time	13.3 ms @ 60 Hz ON to OFF 13.0 ms @ 60 Hz OFF to ONF

Derating Curve

The diagram below depicts the derating curve for this I/O base.



At 60 degrees C and maximum input voltage, the number of points allowed ON is 10.

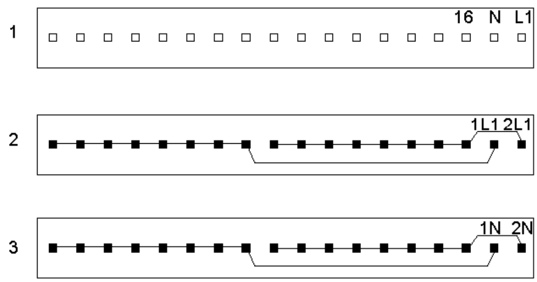
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base.

Illustration

The following illustration shows the internal connections between terminals.



Field Wiring Guidelines

Overview

Inputs are field wired to row 1 of the base. This section contains wiring guidelines and precautions.

Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Electric sells terminal connectors in sets of three.

Type	Part Number
Screw-in	170 XTS 001 00
Spring-clip	170 XTS 002 00

Mapping Terminal Blocks

⚠ CAUTION

POTENTIAL FOR SHORT CIRCUITS AND/OR POWER-UP SPIKES

Provide external fuses on the operating voltage to protect the module. Appropriate fuse values are shown in the wiring illustration. An unprotected module may be subject to short circuits and/or power-up spikes.

Failure to follow these instructions can result in injury or equipment damage.

The following table shows mapping terminal blocks

Row	Terminal	Function
1	1...16	Inputs
	17	Neutral - 230 VAC for module (N)
	18	Line - 230 VAC for module (L1)
2	1 ... 8	Input group 1 - line (1L1)
	9 ... 16	Input group 2 - line (2L1)
	17	Line for inputs group 1 (1L1)
	18	Line for inputs group 2 (2L1)
3	1 ... 8	Input group 1 - neutral (1N)
	9 ... 16	Input group 2 - neutral (2N)
	17	Neutral for inputs group 1 (1N)
	18	Neutral for inputs group 2 (2N1)

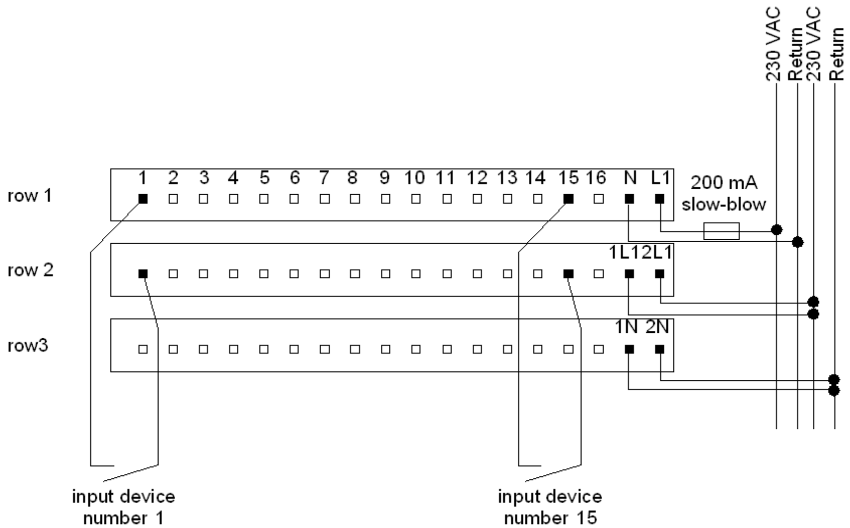
Wiring Diagrams

Overview

This section contains diagrams to assist you in wiring the following types of devices:
- 2-wire configuration
- 3-wire configuration

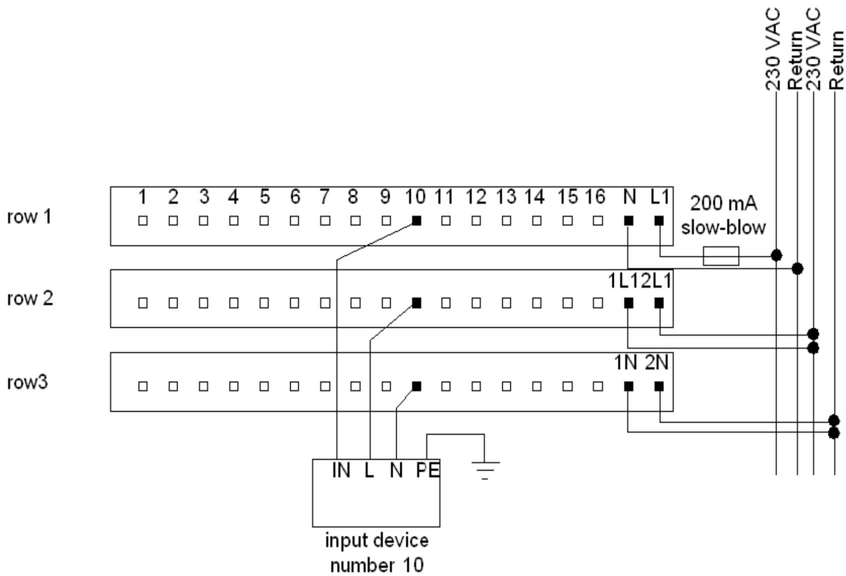
2-Wire Devices

The diagram below shows an example of wiring for 2-wire devices:



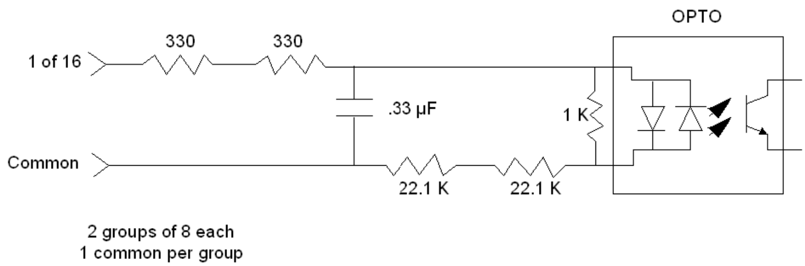
3-Wire Devices

The diagram below shows an example of wiring for 3-wire devices:



Simplified Schematics

The following diagram shows the field-side input circuitry.



I/O Mapping

Overview

The 170 ADI 740 50 TSX Momentum I/O base supports 16 discrete inputs. This section contains information about the mapping of the I/O data into input words.

I/O Map

The I/O base may be mapped as one input word, or as 16 discrete input points.

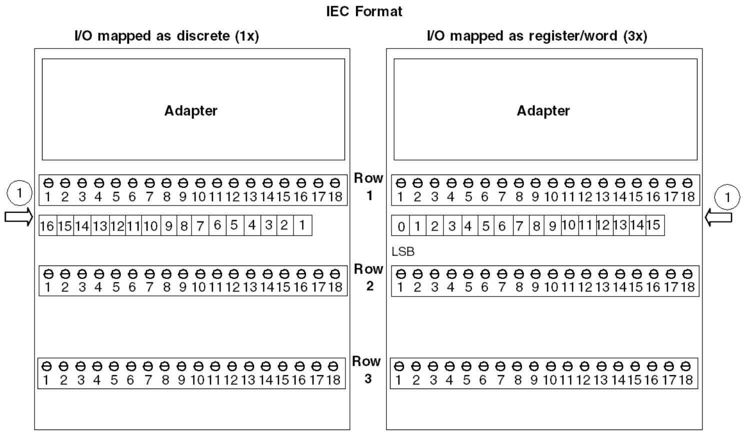
IEC vs. Ladder Logic

In order to correctly field wire the inputs and map the input data, you need to know which type of Momentum Adapter is mounted on the base. Adapters may be either IEC compliant or 984 Ladder Logic compliant.

	IEC Compliant	**984 Ladder Logic Compliant**
Momentum Processor Adapters	All	None
Momentum Communication Adapters	All, except 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01	170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01

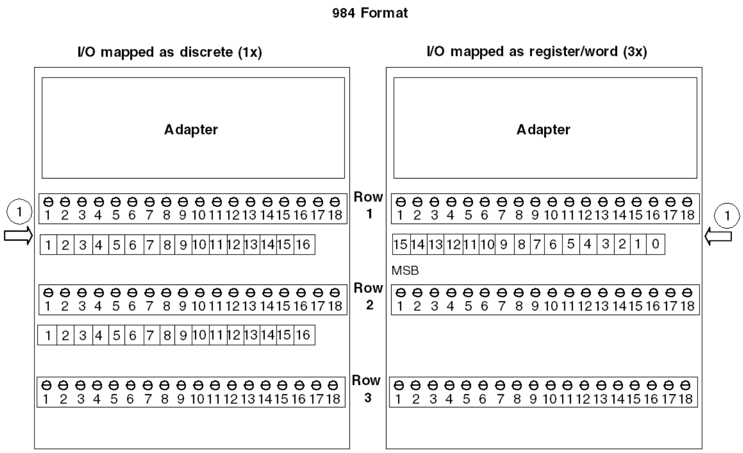
Data Mapping

The figure below shows how data is mapped on the I/O base with an IEC Compliant adapter. When the I/O is mapped as discrete ponts (1x) the MSB is assigned to Pin 1 and the LSB is assigned to Pin 16. When the I/O is mapped as a word or register (3x), the MSB (bit 15) is assigned to Pin 16 and the LSB (bit 0) is assigned to Pin 1.



1 inputs

The figure below shows how data is mapped on the I/O base with a 984 Ladder Logic Compliant adapter. When the I/O is mapped as discrete points (1x) the MSB is assigned to Pin 16 and the LSB is assigned to Pin 1. When the I/O is mapped as a word or register (3x), the MSB (bit 15) is assigned to Pin 1 and the LSB (bit 0) is assigned to Pin 16.



1 inputs

170 ADM 350 10 24 VDC - 16 Pt. In / 16 Pt. Out Module Base

15

Overview

This chapter describes the 170ADM 350 10 TSX Momentum I/O base.

See also 170 ADM 350 11 *(see page 225)* and 170 ADM 350 15 *(see page 241)*.

What's in this Chapter?

This chapter contains the following topics:

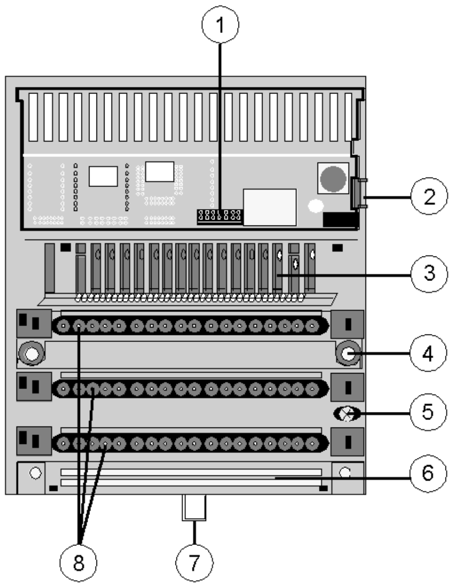
Front Panel Components

Overview

This section contains an illustration of the front panel of the 170 ADI 350 10 I/O base and a description of the LEDs.

Front Panel Illustration

The front panel of the I/O base is shown in the illustration below.

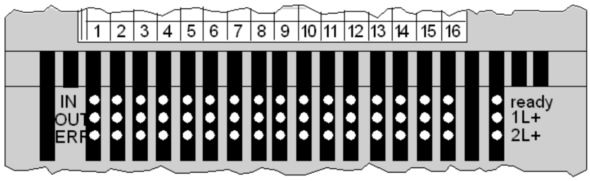


Components of the I/O module

Label	Description
1	Internal interface (ATI) connector
2	Locking and ground contact for the adapter
3	LED status display
4	Mounting holes for panel mount
5	Grounding screw
6	Busbar Mounting Slot
7	Locking tab for DIN rail mount
8	Sockets for the terminal connectors

LED Illustration

The LEDs are shown in the illustration below.



LED Descriptions

The LEDs are described in the table below.

Indicator	Condition	Message
Ready	Green	Module is ready to communicate. Operating voltage for internal logic (5 V) is present.
	Off	Module is not ready.
1L+	Green	Output voltage 1L+ for outputs 1 ... 8 (group 1) is present
	Off	Output voltage for outputs 1 ... 8 (group 1) is not present
2L+	Green	Output voltage 2L+ for outputs 9 ... 16 (group 2) is present
	Off	Output voltage for outputs 9 ... 16 (group 2) is not present
Upper row IN 1...16	Green	Input status (an LED per input); Input point active, ie. input carries a 1 signal (logically ON)
	Off	Input point inactive, ie. input carries a 0 signal (logically OFF)
Middle row OUT 1...16	Green	Output status (an LED per output); Output point active, ie. output carries a 1 signal (logically ON)
	Off	Output point inactive, ie. Output carries a 0 signal (logically OFF)
Lower row ERR 1...16	Red	Output overload (an LED per output). Short circuit or overload on the corresponding output.
	Off	Outputs 1 ... 16 operating normally.

Specifications

Overview

This section contains specifications for the 170 ADM 350 10 I/O base.

General Specifications

Module type	16 discrete inputs in 1 group 16 discrete outputs in 2 groups (8 pts/group)
Supply voltage	24 VDC
Supply voltage range	20...30 VDC
Supply current consumption	max. 250 mA at 24 VDC
Power dissipation	6 W + ((# of input points on x .144 W) + (# of output points on x .25 W))
I/O map	1 input word 1 output word

Isolation

Input to input	none
Output group to output group	none
Input to output group	none
Field to communication adapter	Defined by communication adapter type

Fuses

Internal	none
External: operating voltage	1 A slow-blow (Bussman GDC-1A or equivalent)
External: input voltage	According to the supply of the connected sensors– not to exceed 4A fast-blow
External: output voltage	According to the supply of the connected actuators– not to exceed 4 A fast-blow/ group

EMC

Immunity	IEC 1131-2 Surge on auxiliary power supply 2 kV
Emissions	EN 50081-2
Agency approvals	UL, CSA, CE, FM Class 1, Div. 2 pending

Physical Dimensions

Width	125 mm (4.9 in)
Depth (with no adapter)	40 mm (1.54 in)
Length	141.5 mm (5.5 in) no or one busbar 159.5mm (6.3in) two busbars 171.5 mm (6.75in) three busbars
Weight	200 g (0.44 lb)

Discrete Inputs

Number of points	16
Number of groups	1
Points per group	16
Signal type	True High
IEC 1131 type	1+ (See Appendix *IEC 1131 Input Types, page 603* for definitions of IEC input types.)
ON voltage	+11 ... +30 VDC
OFF voltage	-3 ... +5 VDC
Input current	10.0 mA minimum ON 2.0 mA maximum OFF
Input voltage range	-3 ... +30 VDC
Input resistance	4 kOhm
Response time	2.2 ms OFF to ON 3.3 ms ON to OFF

Discrete Outputs

Output type	Solid state switch
Output supply voltage	24 VDC
Output supply voltage range	20 ... 30 VDC
Output voltage	External supply - .5 VDC
Number of points	16
Number of groups	2
Points per group	8
Current capacity	0.5 A/point maximum 4 A/group 8 A/module
Signal type	True High

Leakage current (output out)	< 1 mA @ 24 VDC
Surge (inrush) current	5 A for 1 ms
On state voltage drop	< 0.5 VDC @ 0.5 A
Fault sensing (See Note Below)	Outputs are electronically safeguarded to assist in short circuit and overload protection
Fault reporting	1 red LED/point (row 3) ON when short current/ overload occurs
Error indication	Output overload for at least one out put (I/O-Error) to communication adapter
Response time (resistive load / 0.5 A)	< 0.1 ms OFF to ON < 0.1 ms ON to OFF
Maximum switching cycles	1000/h for 0.5 A inductive load 100/s for 0.5 A resistive load 8/s for 1.2 W Tungsten load

NOTE: Discrete 24 VDC outputs incorporate thermal shutdown and overload protection. The output current of a shortened output is limited to a nondestructive value. The short circuit heats the output driver and the output will switch off. The output will switch on again if the driver leaves the overtemperature condition. If the short circuit still exists, the driver will reach the overtemperature condition again and will switch off again.

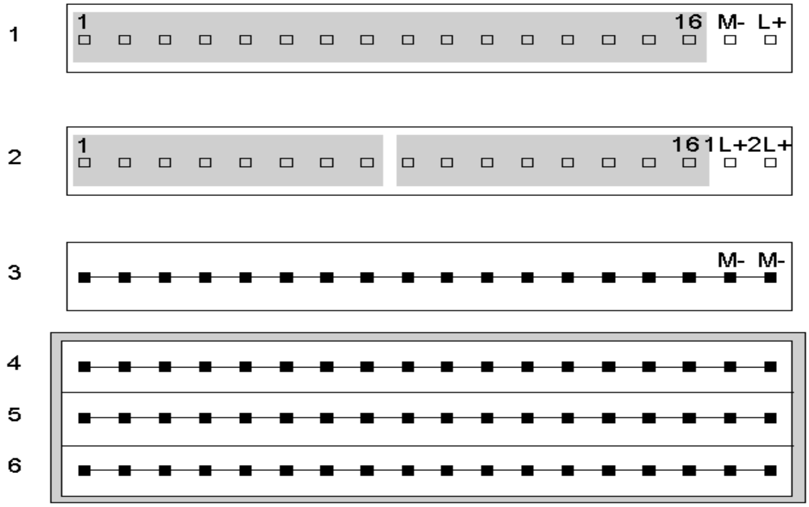
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base and an optional busbar.

Illustration

Rows 1 through 3 show the internal connections between terminals on the I/O base. Row 4 through 6 show the internal connections on the optional busbar.



Field Wiring Guidelines

Overview

Inputs are field wired to row 1 of the base. The outputs are field wired to row 2. This section contains wiring guidelines and precautions.

Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Electric sells terminal connectors in sets of three.

Type	Part Number
Screw-in	170 XTS 001 00
Spring-clip	170 XTS 002 00

Busbar May Be Required

Depending on the type of field devices you are using, you may need a 1-, 2-, or 3-row busbar. The following busbars are available from Schneider Electric.

Type	Number of Rows	Part Number
Screw-in	1 - row	170 XTS 006 01
	2 - row	170 XTS 005 01
	3 - row	170 XTS 004 01
Spring-clip	1 - row	170 XTS 007 01
	2 - row	170 XTS 008 01
	3 - row	170 XTS 003 01

Mapping Terminal Blocks

⚠ CAUTION

POTENTIAL FOR SHORT CIRCUITS AND/OR POWER-UP SPIKES

Provide external fuses on the operating voltage to protect the module. Appropriate fuse values are shown in the wiring illustration. An unprotected module may be subject to short circuits and/or power-up spikes.

Failure to follow these instructions can result in injury or equipment damage.

The following table shows mapping terminal blocks and optional busbars.

Row	Terminal	Function
1	1...16	Inputs
	17	Return (M-)
	18	+ 24 VDC Operating voltage (L+)
2	1 ... 8	Outputs for group 1
	9 ... 16	Outputs for group 2
	17/18	+ 24 VDC for output group 1 (1L+) and group 2 (2L+)
3	1 ... 16	Return for outputs
	17/18	Return (M-)
4	1 ... 18	Input voltage for inputs I1 ... I16 or PE
5	1 ... 18	Return (M-)
6	1 ... 18	Protective earth (PE)

Protective Circuit May Be Required

When contacted switches are used on the input lines or when lines to the peripherals are very long, the outputs of inductive loads require protective circuitry with a clamping/suppressor diode. Install the protective circuit prallel to the operating coil.

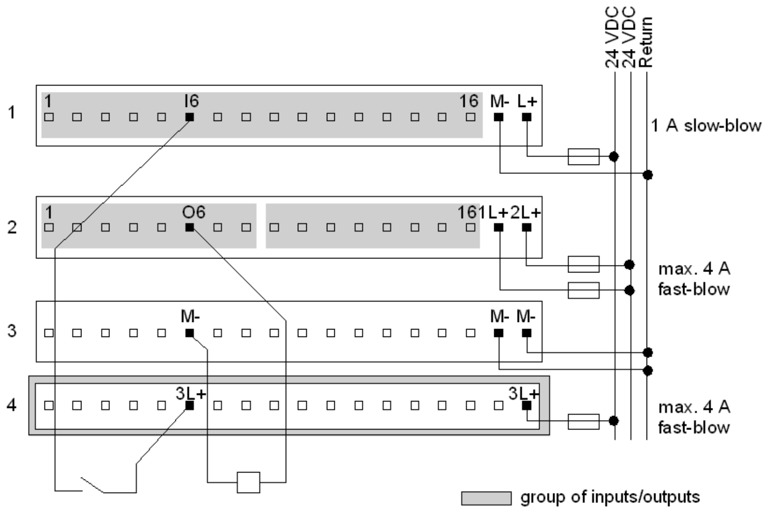
Wiring Diagrams

Overview

This section provides diagrams to assist you in wiring the following types of devices:
- 2-wire devices
- sensors activated by an output
- 4-wire sensors with a 2-wire actuator
- broken wire detection

2-Wire Devices

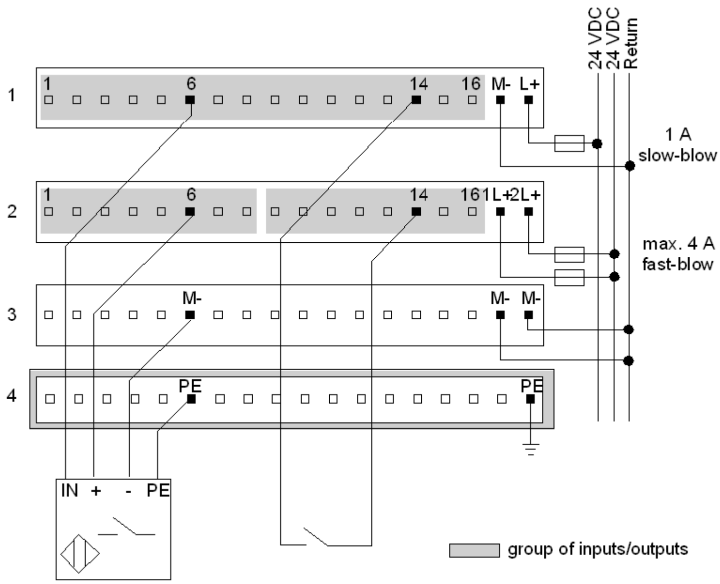
The diagram below shows an example of wiring for two-wire devices. Separate connections to pins 17 and 18 are shown on row 3, even though these two pins are internally connected. This is done to halve the load.



Sensor Activated by Output

The wiring diagram below shows an example of a sensor activated by an output. The diagram shows the sensors being supplied with voltage only when the outputs on pins 6 and 14, row 2, are high. The inputs from pins 6 and 14, row 1, can be high only when one of the associated outputs is high.

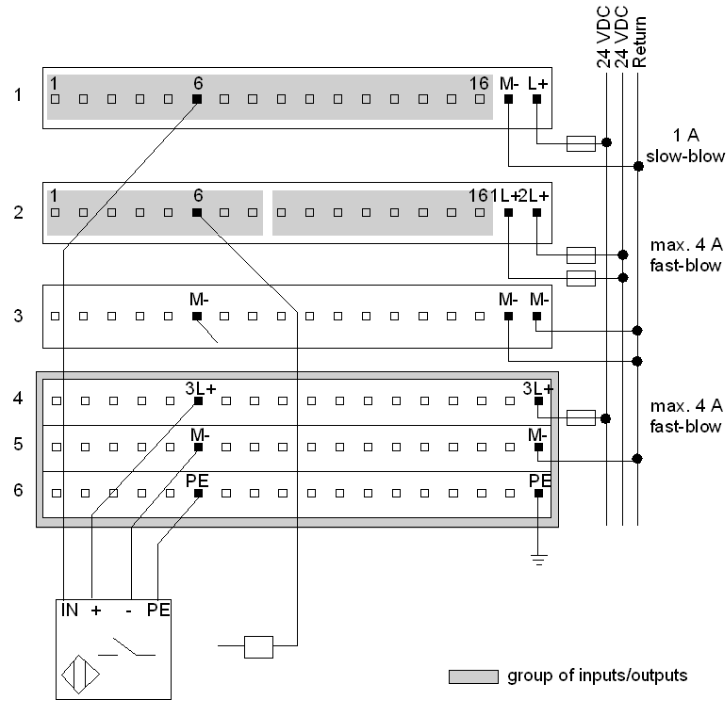
Separate connections to pins 17 and 18 are shown on row 3, even though these two pins are internally connected. This is done to halve the load.



Four-Wire Sensor with a Two-Wire Actuator

The diagram below shows a four-wire sensor with a two-wire actuator. The process of wiring a 3-wire sensor is very similar to the one below. Because 3-wire sensors do not require PE, a 2-row busbar could be used instead of the 3-row busbar shown.

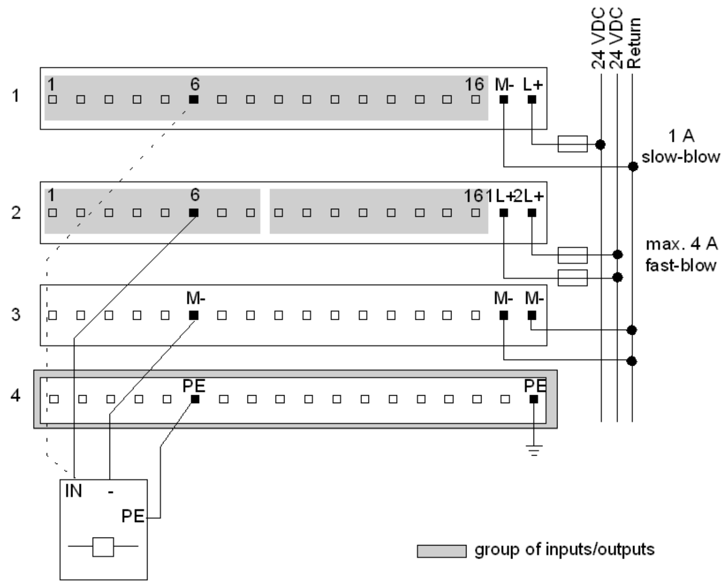
Separate connections to pins 17 and 18 are shown on row 3, even though these two pins are internally connected. This is done to halve the load.



Broken Wire Detection

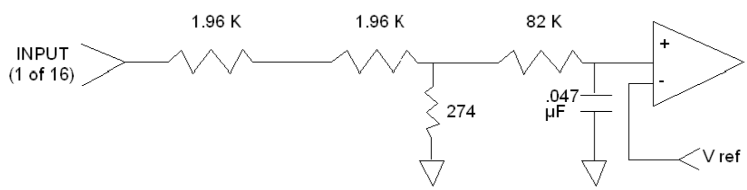
The diagram below shows a three-wire actuator with an optional wiring scheme for broken wire detection. The dotted line reads back whether or not current has reached the actuator. When the output on pin 6, row 2, is high, the input from pin 6, row 1, must also be high.

Separate connections to pins 17 and 18 are shown on row 3, even though these two pins are internally connected. This is done to halve the load.



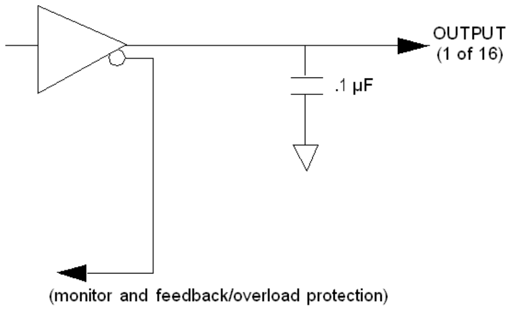
Simplified Input Schematics

The following diagram shows the field-side input circuitry.



Simplified Output Schematics

The following diagram shows the field-side output circuitry.



I/O Mapping

Overview

The 170 ADM 350 10 TSX Momentum I/O base supports 16 discrete inputs and 16 discrete outputs. This section contains information about the mapping of the I/O data into input words and output words.

I/O Map

The I/O base may be mapped as one input word and as one output word, or as 16 discrete input points and as 16 discrete output points.

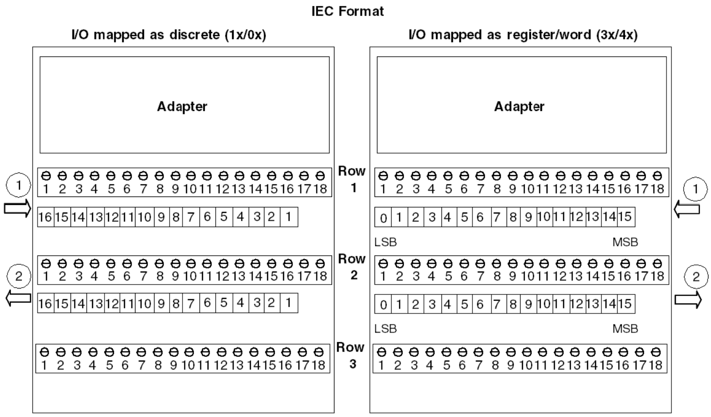
IEC vs. Ladder Logic

In order to correctly field wire the inputs/outputs and map the input/outputs data, you need to know which type of Momentum Adapter is mounted on the base. Adapters may be either IEC compliant or 984 Ladder Logic compliant.

	IEC Compliant	**984 Ladder Logic Compliant**
Momentum Processor Adapters	All	None
Momentum Communication Adapters	All, except 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01	170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01

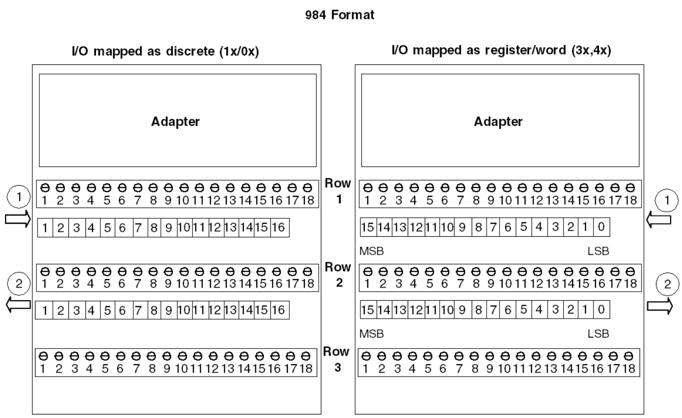
Data Mapping

The figure below shows how data is mapped on the I/O base with an IEC Compliant adapter. When the I/O is mapped as discrete points (1x/0x), the MSB is assigned to Pin 1 and the LSB is assigned to Pin 16. When the I/O is mapped as a word or register (3x/4x), the MSB (bit 15) is assigned to Pin 16 and the LSB (bit 0) is assigned to Pin 1.



1 inputs
2 outputs

The figure below shows how data is mapped on the I/O base with a 984 Ladder Logic Compliant adapter. When the I/O is mapped as discrete points (1x/0x), the MSB is assigned to Pin 16 and the LSB is assigned to Pin 1. When the I/O is mapped as a word or register (3x/4x), the MSB (bit 15) is assigned to Pin 1 and the LSB (bit 0) is assigned to Pin 16



1 inputs
2 outputs

170 ADM 350 11 24 VDC - 16 Pt. In / 16 Pt. Out Module Base

16

Overview

This chapter describes the 170 ADM 350 11 TSX Momentum I/O base.

What's in this Chapter?

This chapter contains the following topics:

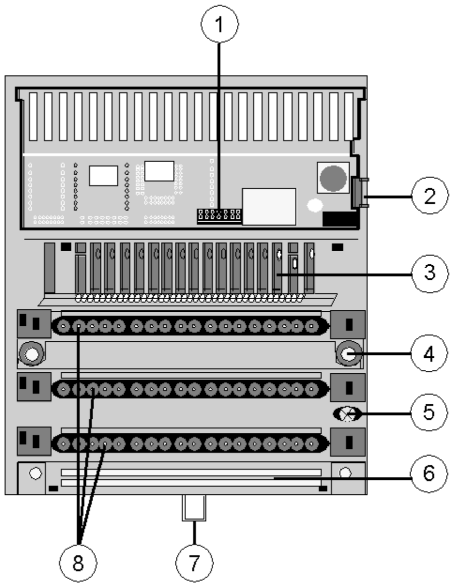
Front Panel Components

Overview

This section contains an illustration of the front panel of the 170 ADI 350 11 I/O base and a description of the LEDs.

Front Panel Illustration

The front panel of the I/O base is shown in the illustration below.

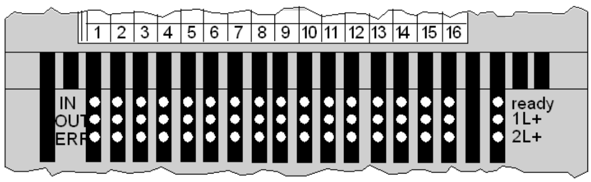


Components of the I/O module

Label	Description
1	Internal interface (ATI) connector
2	Locking and ground contact for the adapter
3	LED status display
4	Mounting holes for panel mount
5	Grounding screw
6	Busbar Mounting Slot
7	Locking tab for DIN rail mount
8	Sockets for the terminal connectors

LED Illustration

This I/O base has one LED, the ready indicator shown in the illustration below.



LED Descriptions

The ready indicator is described in the table below.

Indicator	Condition	Message
Ready	Green	Module is ready to communicate. Operating voltage for internal logic (5 V) is present.
	Off	Module is not ready.
1L+	Green	Output voltage 1L+ of inputs 1 ... 8 (group 1) is present
	Off	Output voltage of inputs 1 ... 8 (group 1) is not present
2L+	Green	Output voltage 2L+ of inputs 9 ... 16 (group 2) is present
	Off	Output voltage of inputs 9 ... 16 (group 2) is not present
Upper row IN 1...16	Green	Input status (an LED per input); Input point active, ie. input carries a 1 signal (logically ON)
	Off	Input point inactive, ie. input carries a 0 signal (logically OFF)
Middle row OUT 1...16	Green	Output status (an LED per output); Output point active, ie. output carries a 1 signal (logically ON)
	Off	Output point inactive, ie. Output carries a 0 signal (logically OFF)
Lower row ERR 1...16	Red	Output overload (an LED per output). Short circuit or overload on the corresponding output.
	Off	Outputs 1 ... 16 operating normally.

Specifications

Overview

This section contains specifications for the 170 ADM 350 11 I/O base.

General Specifications

Module type	16 discrete inputs in 1 group 16 discrete outputs in 2 groups (8 pts/group)
Supply voltage	24 VDC
Supply voltage range	20...30 VDC
Supply current consumption	max. 250 mA at 24 VDC
Power dissipation	6 W + ((# of input points on x .144 W) + (# of output points on x .25 W))
I/O map	1 input word 1 output word

Isolation

Input to input	none
Output group to output group	none
Input to output group	none
Field to communication adapter	Defined by Communication Adapter type

Fuses

Internal	none
External: operating voltage	1 A slow-blow (Bussmann GDC-1A or equivalent)
External: input voltage	According to the supply of the connected sensors– not to exceed 4A fast-blow
External: output voltage	According to the supply of the connected actuators– not to exceed 4 A fast-blow/ group

EMC

Immunity	IEC 1131-2 Surge on auxiliary power supply 500V
Emissions	EN 50081-2
Agency approvals	UL, CSA, CE, FM Class 1, Div. 2 pending

Physical Dimensions

Width	125 mm (4.9 in)
Depth (with no adapter)	40 mm (1.54 in)
Length	141.5 mm (5.5 in) no or one busbar 159.5mm (6.3in) two busbars 171.5 mm (6.75in) three busbars
Weight	200 g (0.44 lb)

Discrete Inputs

Number of points	16
Number of groups	1
Points per group	16
Signal type	True High
IEC 1131 type	1+ (See Appendix *IEC 1131 Input Types, page 603* for definitions of IEC input types.)
ON voltage	+11 ... +30 VDC
OFF voltage	-3 ... +5 VDC
Input current	2.5 mA minimum ON (6 mA at 24 VDC) 1.2 mA maximum OFF
Input voltage range	-3 ... +30 VDC
Input resistance	4 kOhm
Response time	60 microsec OFF to ON 80 microsec ON to OFF

Discrete Outputs

Output type	Solid state switch
Output supply voltage	24 VDC
Output supply voltage range	20 ... 30 VDC
Output voltage	External supply - .5 VDC
Number of points	16
Number of groups	2
Points per group	8
Current capacity	0.5 A/point maximum 4 A/group 8 A/module
Signal type	True High

Leakage current (output out)	< 1 mA @ 24 VDC
Surge (inrush) current	5 A for 1 ms
On state voltage drop	< 0.5 VDC @ 0.5 A
Fault sensing (See Note Below)	Outputs are electronically safeguarded to assist in short circuit and overload protection
Fault reporting	1 red LED/point (row 3) ON when short current/ overload occurs
Error indication	Output overload for at least one out put (I/O-Error) to communication adapter
Response time (resistive load / 0.5 A)	< 0.1 ms OFF to ON < 0.1 ms ON to OFF
Maximum switching cycles	1000/h for 0.5 A inductive load 100/s for 0.5 A resistive load 8/s for 1.2 W Tungsten load

NOTE: Discrete 24 VDC outputs incorporate thermal shutdown and overload protection. The output current of a shortened output is limited to a nondestructive value. The short circuit heats the output driver and the output will switch off. The output will switch on again if the driver leaves the overtemperature condition. If the short circuit still exists, the driver will reach the overtemperature condition again and will switch off again.

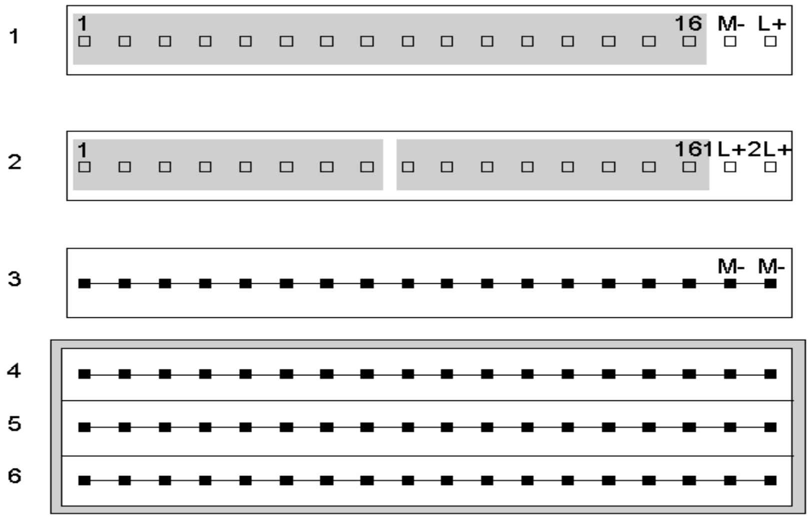
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base and an optional busbar.

Illustration

Rows 1 through 3 show the internal connections between terminals on the I/O base. Row 4 through 6 show the internal connections on the optional busbar.



Field Wiring Guidelines

Overview

Inputs are field wired to row 1 of the base. The outputs are field wired to row 2. This section contains wiring guidelines and precautions.

Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Electric sells terminal connectors in sets of three.

Type	Part Number
Screw-in	170 XTS 001 00
Spring-clip	170 XTS 002 00

Busbar May Be Required

Depending on the type of field devices you are using, you may need a 1-, 2-, or 3-row busbar. The following busbars are available from Schneider Electric.

Type	Number of Rows	Part Number
Screw-in	1 - row	170 XTS 006 01
	2 - row	170 XTS 005 01
	3 - row	170 XTS 004 01
Spring-clip	1 - row	170 XTS 007 01
	2 - row	170 XTS 008 01
	3 - row	170 XTS 003 01

Mapping Terminal Blocks

⚠ CAUTION

POTENTIAL FOR SHORT CIRCUITS AND/OR POWER-UP SPIKES

Provide external fuses on the operating voltage to protect the module. Appropriate fuse values are shown in the wiring illustration. An unprotected module may be subject to short circuits and/or power-up spikes.

Failure to follow these instructions can result in injury or equipment damage.

The following table shows mapping terminal blocks and optional busbars.

Row	Terminal	Function
1	1...16	Inputs
	17	Return (M-)
	18	+ 24 VDC Operating voltage (L+)
2	1 ... 8	Outputs for group 1
	9 ... 16	Outputs for group 2
	17/18	+ 24 VDC for output group 1 (1L+) and group 2 (2L+)
3	1 ... 16	Return for outputs
	17/18	Return (M-)
4	1 ... 18	Input voltage for inputs I1 ... I16 or PE
5	1 ... 18	Return (M-)
6	1 ... 18	Protective earth (PE)

Protective Circuit May Be Required

When contacted switches are used on the input lines or when lines to the peripherals are very long, the outputs of inductive loads require protective circuitry with a clamping/suppressor diode. Install the protective circuit prallel to the operating coil.

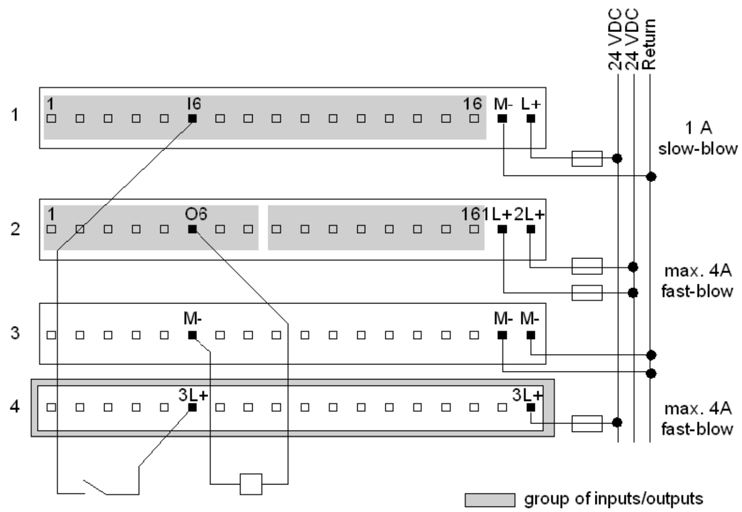
Wiring Diagrams

Overview

This section provides diagrams to assist you in wiring the following types of devices:
- 2-wire devices
- sensors activated by an output
- 4-wire sensors with a 2-wire actuator
- broken wire detection

2-Wire Devices

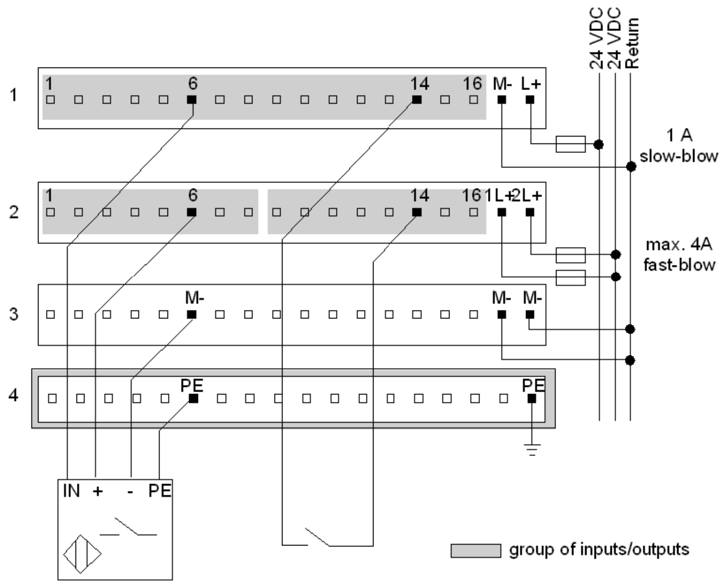
The diagram below shows an example of wiring for two-wire devices. Separate connections to pins 17 and 18 are shown on row 3, even though these two pins are internally connected. This is done to halve the load.



Sensor Activated by Output

The wiring diagram below shows an example of a sensor activated by an output. The diagram shows the sensors being supplied with voltage only when the outputs on pins 6 and 14, row 2, are high. The inputs from pins 6 and 14, row 1, can be high only when one of the associated outputs is high.

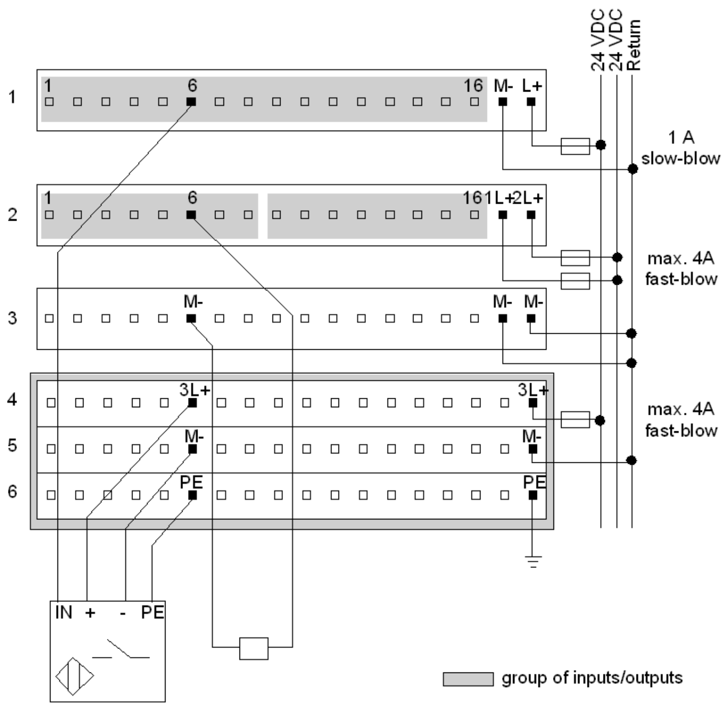
Separate connections to pins 17 and 18 are shown on row 3, even though these two pins are internally connected. This is done to halve the load.



Four-Wire Sensor with a Two-Wire Actuator

The diagram below shows a four-wire sensor with a two-wire actuator. The process of wiring a 3-wire sensor is very similar to the one below. Because 3-wire sensors do not require PE, a 2-row busbar could be used instead of the 3-row busbar shown.

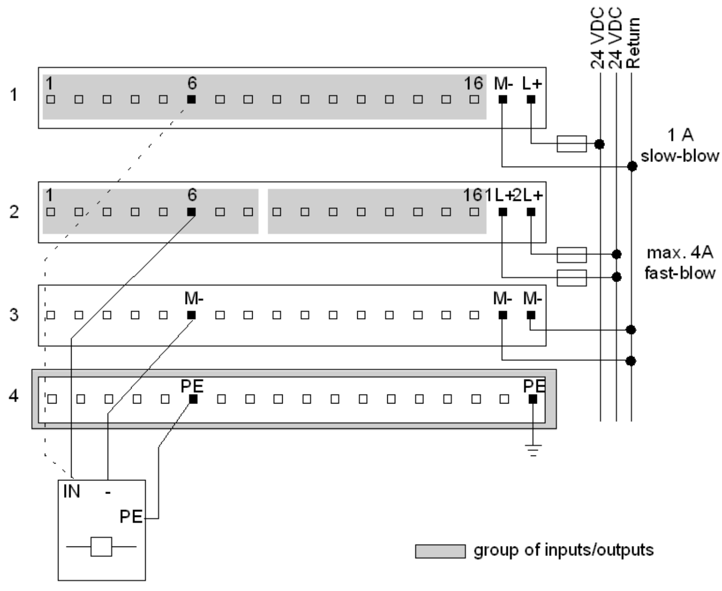
Separate connections to pins 17 and 18 are shown on row 3, even though these two pins are internally connected. This is done to halve the load.



Broken Wire Detection

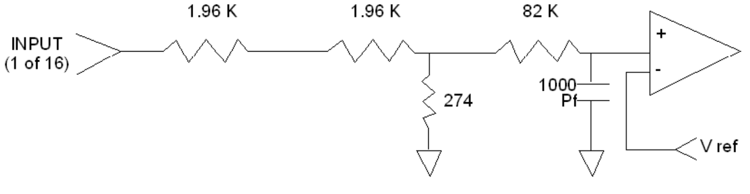
The diagram below shows a three-wire actuator with an optional wiring scheme for broken wire detection. The dotted line reads back whether or not current has reached the actuator. When the output on pin 6, row 2, is high, the input from pin 6, row 1, must also be high.

Separate connections to pins 17 and 18 are shown on row 3, even though these two pins are internally connected. This is done to halve the load.



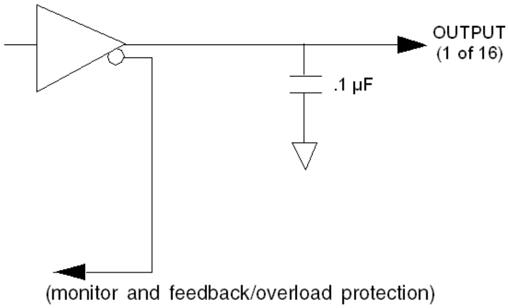
Simplified Input Schematics

The following diagram shows the field-side input circuitry.



Simplified Output Schematics

The following diagram shows the field-side output circuitry.



I/O Mapping

Overview

The 170 ADM 350 11 TSX Momentum I/O base supports 16 discrete inputs and 16 discrete outputs. This section contains information about the mapping of the I/O data into input words and output words.

I/O Map

The I/O base may be mapped as one input word and one output word, or as 16 discrete input points and 16 discrete output points.

IEC vs. Ladder Logic

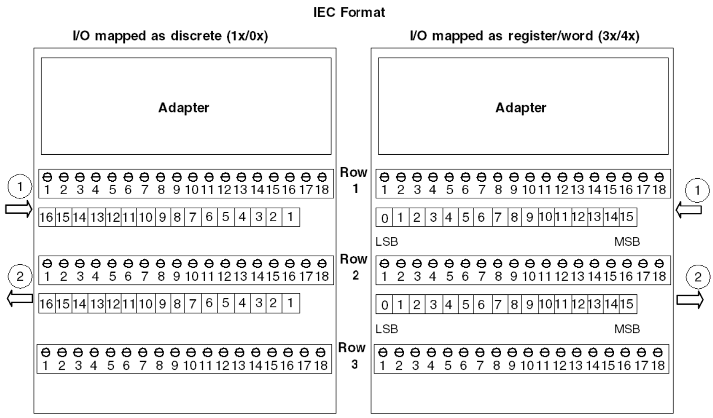
In order to correctly field wire the inputs/outputs and map the input/output data, you need to know which type of Momentum Adapter is mounted on the base.

Adapters may be either IEC compliant or 984 Ladder Logic compliant.

	IEC Compliant	**984 Ladder Logic Compliant**
Momentum Processor Adapters	All	None
Momentum Communication Adapters	All, except 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01	170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01

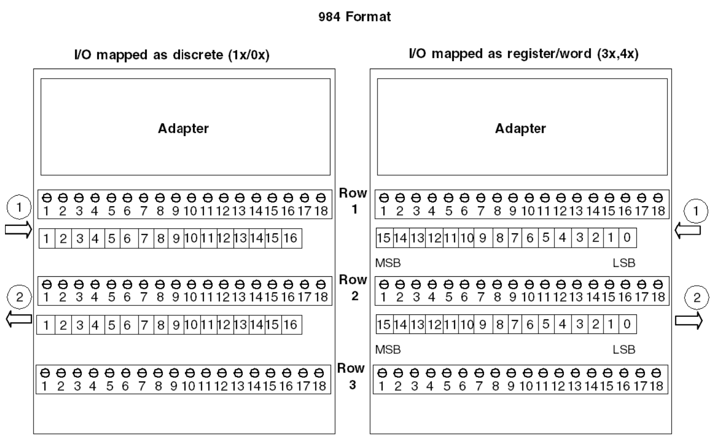
Data Mapping

The figure below shows how data is mapped on the I/O base with an IEC Compliant adapter. When the I/O is mapped as discrete points (1x/0x), the MSB is assigned to Pin 1 and the LSB is assigned to Pin 16. When the I/O is mapped as a word or register (3x/4x), the MSB (bit 15) is assigned to Pin 16 and the LSB (bit 0) is assigned to Pin 1.



1 inputs
2 outputs

The figure below shows how data is mapped on the I/O base with a Ladder Logic Compliant adapter. When the I/O is mapped as discrete points (1x/0x), the MSB is assigned to Pin 16 and the LSB is assigned to Pin 1. When the I/O is mapped as a word or register (3x/4x), the MSB (bit 15) is assigned to Pin 1 and the LSB (bit 0) is assigned to Pin 16.



1 inputs
2 outputs

170 ADM 350 15 24 VDC - 16 Pt. In / 16 Pt. Out Module Base

17

Overview

This chapter describes the 170 ADM 350 15 TSX Momentum I/O base.

What's in this Chapter?

This chapter contains the following topics:

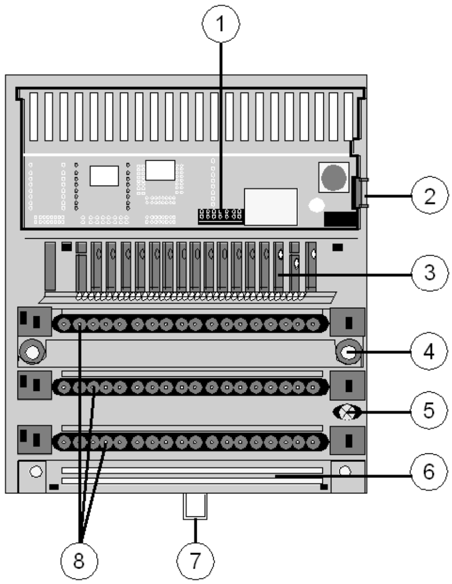
Front Panel Components

Overview

This section contains an illustration of the front panel of the 170 ADI 350 15 I/O base and a description of the LEDs.

Front Panel Illustration

The front panel of the I/O base is shown in the illustration below.

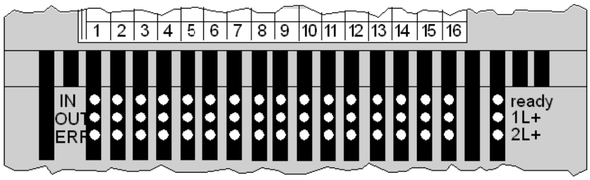


Components of the I/O module

Label	Description
1	Internal interface (ATI) connector
2	Locking and ground contact for the adapter
3	LED status display
4	Mounting holes for panel mount
5	Grounding screw
6	Busbar Mounting Slot
7	Locking tab for DIN rail mount
8	Sockets for the terminal connectors

LED Illustration

This I/O base has one LED, the ready indicator shown in the illustration below.



LED Descriptions

The ready indicator is described in the table below.

Indicator	Condition	Message
Ready	Green	Module is ready to communicate. Operating voltage for internal logic (5 V) is present.
	Off	Module is not ready.
1L+	Green	Output voltage 1L+ of inputs 1 ... 8 (group 1) is present
	Off	Output voltage of inputs 1 ... 8 (group 1) is not present
2L+	Green	Output voltage 2L+ of inputs 9 ... 16 (group 2) is present
	Off	Output voltage of inputs 9 ... 16 (group 2) is not present
Upper row IN 1...16	Green	Input status (an LED per input); Input point active, ie. input carries a 1 signal (logically ON)
	Off	Input point inactive, ie. input carries a 0 signal (logically OFF)
Middle row OUT 1...16	Green	Output status (an LED per output); Output point active, ie. output carries a 1 signal (logically ON)
	Off	Output point inactive, ie. Output carries a 0 signal (logically OFF)
Lower row ERR 1...16	Red	Output overload (an LED per output). Short circuit or overload on the corresponding output.
	Off	Outputs 1 ... 16 operating normally.

Specifications

Overview

This section contains specifications for the 170 ADM 350 15 I/O base.

NOTE: In order for the 170 ADM 350 15 module to comply with the Directives 73/23/EEC (LV) and 89/336/EEC (EMC) and the IEC standards, EN 61131-2:2003 and EN 55011, the module must be used with a Telemecanique power supply, model numbers ABL7 RE2403, ABL RE2405, or ABL RE2410.

General Specifications

Module type	16 discrete inputs in 1 group 16 discrete outputs in 2 groups (8 pts/group)
Supply voltage	24 VDC
Supply voltage range	20-30 VDC
Supply current consumption	max. 250 mA at 24 VDC
Power dissipation	6 W + ((# of input points on x .144 W) + (# of output points on x .25 W))
I/O map	1 input word 1 output word

Isolation

Input to input	none
Output to output	none
Input to output group	500 VAC for 1 minute
I/O Points to Communication Interface	500 VAC for 1 minute
Module power to logic	none
Module power to I/O points	500 VAC for 1 minute

Fuses

Internal	none
External: module power	1 A slow-blow (Bussmann GDC-1A or equivalent)
External: input power	1 A slow-blow (Bussmann GDC-1A or equivalent)
External: output power	According to the supply of the connected actuators–not to exceed 6.3 A fast-blow/ group

EMC

Immunity	IEC 1131-2 Surge on auxiliary power supply 500V
Emissions	EN 50081-2
Agency approvals	UL, CSA, CE, FM Class 1, Div. 2 pending

Physical Dimensions

Width	125 mm (4.9 in)
Depth (with no adapter)	40 mm (1.54 in)
Length	141.5 mm (5.5 in) no or one busbar 159.5mm (6.3in) two busbars 171.5 mm (6.75in) three busbars
Weight	200 g (0.44 lb)

Discrete Inputs

Number of points	16
Number of groups	1
Points per group	16
Signal type	True Low
IEC 1131 type	1 (See Appendix *IEC 1131 Input Types, page 603* for definitions of IEC input types.)
ON voltage	0 ... 5 VDC
OFF voltage	15 ... 30 VDC
Input current	2.0 mA minimum ON 0.5 mA maximum OFF
Input voltage range	0 ... +30 VDC
Input resistance	4 kOhm
Response time	2.2 ms OFF to ON 3.3 ms ON to OFF

Discrete Outputs

Output type	Solid state switch (sinking)
Output supply voltage	24 VDC
Output supply voltage range	20-30 VDC
Number of points	16
Number of groups	1
Current capacity	0.5 A/point maximum 5 A/module
Signal type	True Low
Leakage current (output out)	< 1 mA @ 24 VDC
Surge (inrush) current	1 A for 1 ms Current limited
On state voltage drop	< 0.5 VDC @ 0.5 A
Fault sensing (See Note Below)	Outputs are electronically safeguarded to assist in short circuit and overload protection
Fault indication	1 red LED/point (row 3) ON when short current/ overload occurs
Error reporting	none
Response time (resistive load / 0.5 A)	< 1 ms OFF to ON < 1 ms ON to OFF
Maximum switching cycles	1000/h for 0.5 A inductive load 100/s for 0.5 A resistive load 8/s for 1.2 W Tungsten load
Loads	
Inductive	500 mH @ 0.5 Hz
Capacitance	50 microfarads
Tungsten Load	12 W
Input Voltage Surge	45 Volt for 10 ms 56 Volt for 1.3 mS decaying pulse

NOTE: Discrete 24 VDC outputs incorporate thermal shutdown and overload protection. The output current of a shortened output is limited to a nondestructive value. The short circuit heats the output driver and the output will switch off. The output will switch on again if the driver leaves the over temperature condition. If the short circuit still exists, the driver will reach the over temperature condition again and will switch off again.

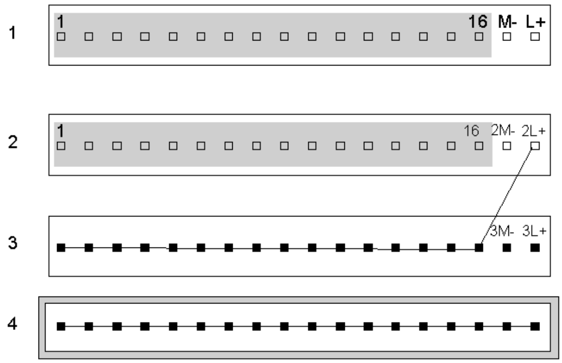
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base and an optional busbar.

Illustration

Rows 1 through 3 show the internal connections between terminals on the I/O base. Row 4 through 6 show the internal connections on the optional busbar.



Field Wiring Guidelines

Overview

Inputs are field wired to row 1 of the base. The outputs are field wired to row 2. This section contains wiring guidelines and precautions.

Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Electric sells terminal connectors in sets of three.

Type	Part Number
Screw-in	170 XTS 001 00
Spring-clip	170 XTS 002 00

Busbar May Be Required

Depending on the type of field devices you are using, you may need a 1-, 2-, or 3-row busbar. The following busbars are available from Schneider Electric.

Type	Number of Rows	Part Number
Screw-in	1 - row	170 XTS 006 01
	2 - row	170 XTS 005 01
	3 - row	170 XTS 004 01
Spring-clip	1 - row	170 XTS 007 01
	2 - row	170 XTS 008 01
	3 - row	170 XTS 003 01

Mapping Terminal Blocks

CAUTION

POTENTIAL FOR SHORT CIRCUITS AND/OR POWER-UP SPIKES

Provide external fuses on the operating voltage to protect the module. Appropriate fuse values are shown in the wiring illustration. An unprotected module may be subject to short circuits and/or power-up spikes.

Failure to follow these instructions can result in injury or equipment damage.

The following table shows mapping terminal blocks and optional busbars.

Row	Terminal	Function
1	1...16	Inputs
	17	Return Inputs
	18	+ 24 VDC Power inputs
2	1 ... 16	Outputs
	17	Return for outputs
	18	+ 24 VDC Power for outputs
3	1 ... 16	+ 24 VDC Power for outputs (2L+)
	17	Return Module power
	18	+ 24 VDC Power
4	1 ... 18	Return (M-)

Protective Circuit May Be Required

When contacted switches are used on the input lines or when lines to the peripherals are very long, the outputs of inductive loads require protective circuitry with a clamping/suppressor diode. Install the protective circuit prallel to the operating coil.

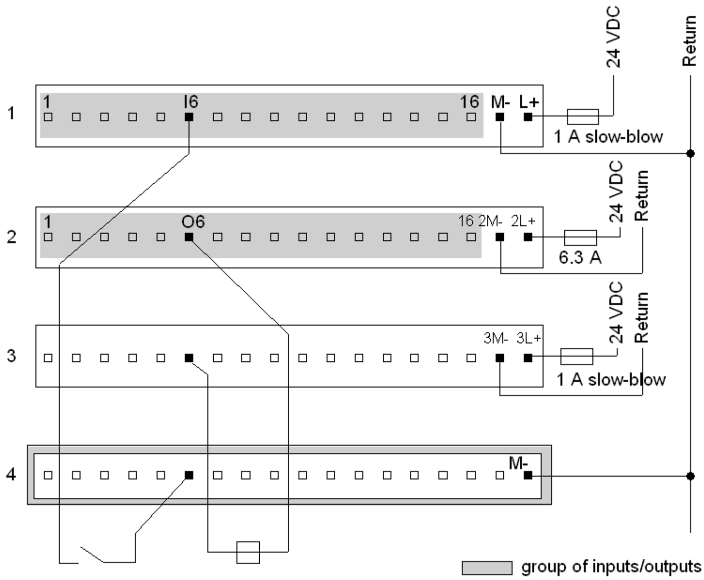
Wiring Diagrams

Overview

This section provides a diagram to assist you in wiring 2-wire devices.

2-Wire Devices

The diagram below shows an example of wiring for two-wire devices.



I/O Mapping

Overview

The 170 ADM 350 15 TSX Momentum I/O base supports 16 discrete inputs and 16 discrete outputs. This section contains information about the mapping of the I/O data into input words and output words.

I/O Map

The I/O base may be mapped as one input word, and one input word, or as 16 discrete input points and 16 discrete output points.

IEC vs. Ladder Logic

In order to correctly field wire the inputs/outputs and map the input/output data, you need to know which type of Momentum Adapter is mounted on the base.

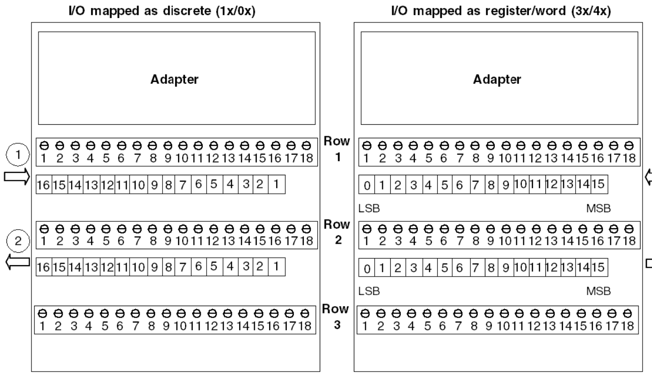
Adapters may be either IEC compliant or 984 Ladder Logic compliant.

	IEC Compliant	**984 Ladder Logic Compliant**
Momentum Processor Adapters	All	None
Momentum Communication Adapters	All, except 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01	170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01

Data Mapping

The figure below shows how data is mapped on the I/O base with an IEC Compliant adapter. When the I/O is mapped as discrete points (1x/0x), the MSB is assigned to Pin 1 and the LSB is assigned to Pin 16. When the I/O is mapped as a word or register (3x/4x), the MSB (bit 15) is assigned to Pin 16 and the LSB (bit 0) is assigned to Pin 1.

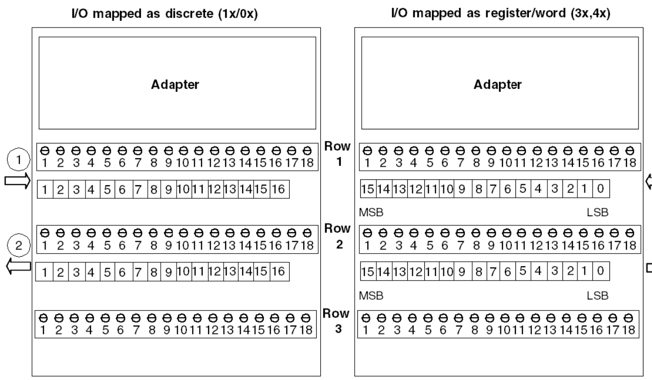
IEC Format



1 inputs
2 outputs

The figure below shows how data is mapped on the I/O base with a Ladder Logic Compliant adapter. When the I/O is mapped as discrete points (1x/0x), the MSB is assigned to Pin 16 and the LSB is assigned to Pin 1. When the I/O is mapped as a word or register (3x/4x), the MSB (bit 15) is assigned to Pin 1 and the LSB (bit 0) is assigned to Pin 16.

984 Format



1 inputs
2 outputs

170 ADM 370 10 24 VDC - 16 Pt. In / 8 Pt. Out @ 2 Amp. Module Base

18

Overview

This chapter describes the 170 ADM 370 10 TSX Momentum I/O base.

What's in this Chapter?

This chapter contains the following topics:

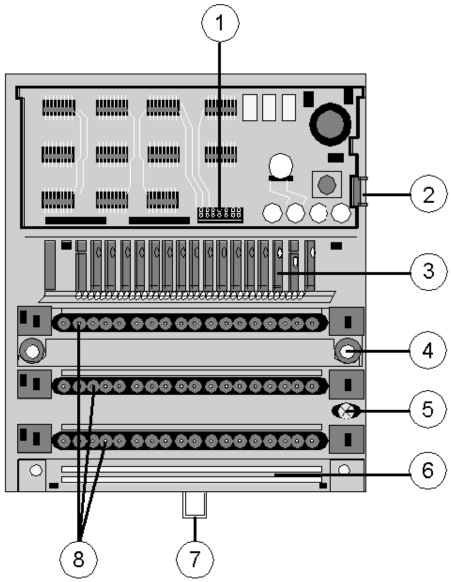
Front Panel Components

Overview

This section contains an illustration of the front panel of the 170 ADM 370 10 I/O base and a description of the LEDs.

Front Panel Illustration

The front panel of the I/O base is shown in the illustration below.

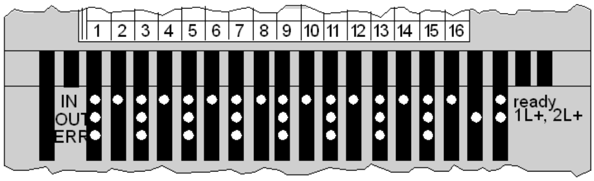


Components of the I/O module

Label	Description
1	Internal interface (ATI) connector
2	Locking and ground contact for the adapter
3	LED status display
4	Mounting holes for panel mount
5	Grounding screw
6	Busbar Mounting Slot
7	Locking tab for DIN rail mount
8	Sockets for the terminal connectors

LED Illustration

The LEDs are shown in the illustration below.



LED Descriptions

The LEDs are described in the table below.

Indicator	Condition	Message
Ready	Green	Module is ready to communicate. Operating voltage for internal logic (5 V) is present.
	Off	Module not ready.
1L+	Green	Output voltage 1L+ of inputs 1 ... 4 (group 1) is present
	Off	Output voltage of inputs 1 ... 4 (group 1) is not present
2L+	Green	Output voltage 2L+ of inputs 5 ... 8 (group 2) is present
	Off	Output voltage of inputs 5... 8 (group 2) is not present
Upper row IN 1...16	Green	Input status (an LED per input); Input point active, ie. input carries a 1 signal (logically ON)
	Off	Input status (an LED per input); Input point inactive, ie. input carries a 0 signal (logically OFF)
Middle row OUT 1,3, 5, 7, 9, 11, 13, 15	Green	Output status (an LED per output); Output point active, ie. output carries a 1 signal (logically ON)
	Off	Output status (an LED per output); Output point inactive, ie. Output carries a 0 signal (logically OFF)
Lower row ERR 1,3, 5, 7, 9, 11, 13, 15	Red	Output overload (an LED per output). Overload on the corresponding output.
	Off	Outputs 1 ... 8 operating normally.
The following functionality and LEDs have been removed in PV02 units and later.		
Lower row ERR 2, 6, 10, 14	Red	Input sensor leads shorted circuit or overloaded (one LED per sensor supply line).
	Off	Input sensor current applied

Specifications

Overview

This section contains specifications for the 170 ADM 370 10 I/O base.

General Specifications

Module type	16 discrete inputs in 1 group 8 discrete outputs in 2 groups (4 pts/group)
Supply voltage	24 VDC
Supply voltage range	20...30 VDC
Supply current consumption	max. 250 mA at 24 VDC
Power dissipation	6 W + (# of input points on x .144 W) + (# of output points on x 1 W))
I/O map	1 input word 1 output word

Isolation

Input to input	none
Output group to output group	500 VAC
Input to output group	500 VAC
Field to communication adapter	Defined by communication adapter type

Fuses

Internal	none
External: operating and input voltage	According to the supply of the connected sensors– not to exceed 4A fast-blow
External: output voltage	According to the supply of the connected actuators– not to exceed 8 A slow-blow

EMC

Immunity	IEC 1131-2 Surge on auxiliary power supply 500V
Emissions	EN 50081-2
Agency approvals	UL, CSA, CE, FM Class 1 Div. 2 pending

Physical Dimensions

Width	125 mm (4.9 in)
Depth (with no adapter)	40 mm (1.54 in)
Length	141.5 mm (5.5 in) no or one busbar 159.5mm (6.3in) two busbars 171.5 mm (6.75in) three busbars
Weight	220 g (0.49 lb)

Discrete Inputs

Number of points	16
Number of groups	4
Points per group	4
Signal type	True High
IEC 1131 type	1+ (See Appendix *IEC 1131 Input Types, page 603* for definitions of IEC input types.)
ON voltage	+11 ... +30 VDC
OFF voltage	-3 ... +5 VDC
Input current	2.5 mA minimum ON (6 mA at 24 VDC) 1.2 mA maximum OFF
Input voltage range	-3 ... +30 VDC
Input resistance	4 kOhm
Response time	2.2 ms OFF to ON 3.3 ms ON to OFF

Discrete Outputs

Output type	Solid state switch
Output supply voltage	24 VDC
Output supply voltage range	20 ... 30 VDC
Output voltage	External supply - .5 VDC
Number of points	8
Number of groups	2
Points per group	4
Current capacity	2 A/point maximum 8 A/group 16 A/module
Signal type	True High

Leakage current (output out)	< 1 mA @ 24 VDC
Surge (inrush) current	2.8 A for 10 s max.
On state voltage drop	< 0.5 VDC @ 2 A
Fault sensing	Outputs are electronically safeguarded to assist in short circuit and overload protection
Fault reporting outputs	1 red LED/point (row 3) ON when overload occurs
Fault reporting input voltage	1 red LED (row 3) signals the state of 4 inputs belonging to the input power supply group
Error indication	In the event of an overload for on least 1 output, for a short-circuit or overload in one of the 4 encoder supply groups, (I/O-Error) to communication adapter
Response time (resistive load / 2 A)	< 0.1 ms OFF to ON < 0.1 ms ON to OFF
Maximum switching cycles	1000/h for 2 A inductive load (for inductances > 100 mH and switching currents > 1A, a clamping diode must be installed 100/s for 2 A resistive load 10/s for 1.2 W Tungsten load (when the startup-current factor <= 10 the nominal current)

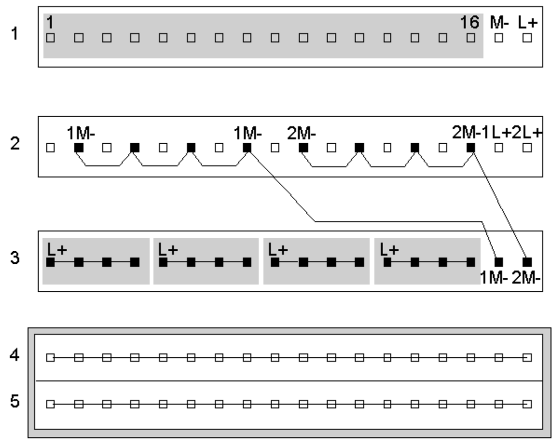
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base and an optional busbar.

Illustration

Rows 1 through 3 show the internal connections between terminals on the I/O base. Row 4 through 5 show the internal connections on the optional busbar.



Field Wiring Guidelines

Overview

Inputs are field wired to row 1 of the base. The outputs are field wired to row 2. This section contains wiring guidelines and precautions.

Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Electric sells terminal connectors in sets of three.

Type	Part Number
Screw-in	170 XTS 001 00
Spring-clip	170 XTS 002 00

Busbar May Be Required

Depending on the type of field devices you are using, you may need a 1-, 2-, or 3-row busbar. The following busbars are available from Schneider Electric.

Type	Number of Rows	Part Number
Screw-in	1 - row	170 XTS 006 01
	2 - row	170 XTS 005 01
Spring-clip	1 - row	170 XTS 007 01
	2 - row	170 XTS 008 01

Mapping Terminal Blocks

⚠ CAUTION

POTENTIAL FOR SHORT CIRCUITS AND/OR POWER-UP SPIKES

Provide external fuses on the operating voltage to protect the module. Appropriate fuse values are shown in the wiring illustration. An unprotected module may be subject to short circuits and/or power-up spikes.

Failure to follow these instructions can result in injury or equipment damage.

The following table shows mapping terminal blocks and optional busbars.

Row	Terminal	Function
1	1...16	Inputs
	17	Return (M-)
	18	+ 24 VDC Operating voltage (L+)
2	1, 3, 5, 7	Outputs for group 1
	9, 11, 13, 15	Outputs for group 2
	2, 4, 6, 8	Return (1M-) group 1 outputs
	10, 12, 14, 16	Return (2M-) group 2 outputs
	17/18	+ 24 VDC for output group 1 (1L+) and group 2 (2L+)
3	1 ... 4	Input voltage for terminal pins 1 ... 4 (L+)
	5 ... 8	Input voltage for terminal pins 5 ... 8 (L+)
	9 ... 12	Input voltage for terminal pins 9 ... 12 (L+)
	13 ... 16	Input voltage for terminal pins 13 ... 16 (L+)
	17/18	Return (1M-, 2M-)
4	1 ... 18	Return (M-) for sensors
5	1 ... 18	Protective earth (PE)

Protective Circuit May Be Required

When contacted switches are used on the input lines or when lines to the peripherals are very long, the outputs of inductive loads require protective circuitry with a clamping/suppressor diode. Install the protective circuit prallel to the operating coil.

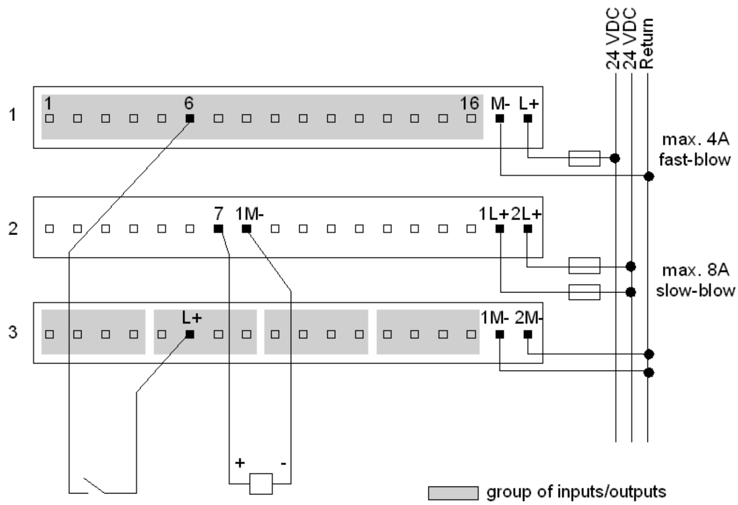
Wiring Diagrams

Overview

This section provides diagrams to assist you in wiring the following types of devices:
- 2-wire devices
- sensors activated by an output
- 4-wire sensors with a 2-wire actuator
- broken wire detection

2-Wire Devices

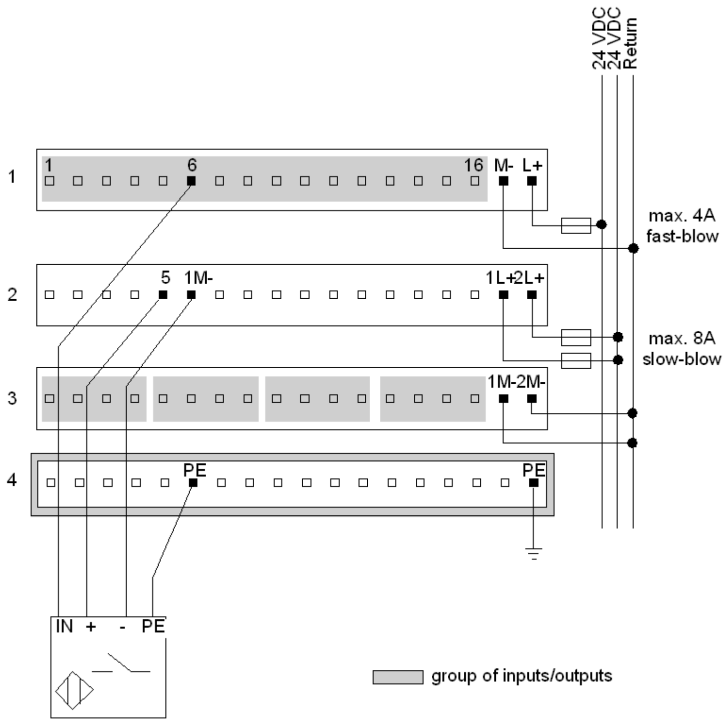
The diagram below shows an example of wiring for two-wire devices.



Sensor Activated by Output

The wiring diagram below shows an example of a sensor activated by an output.

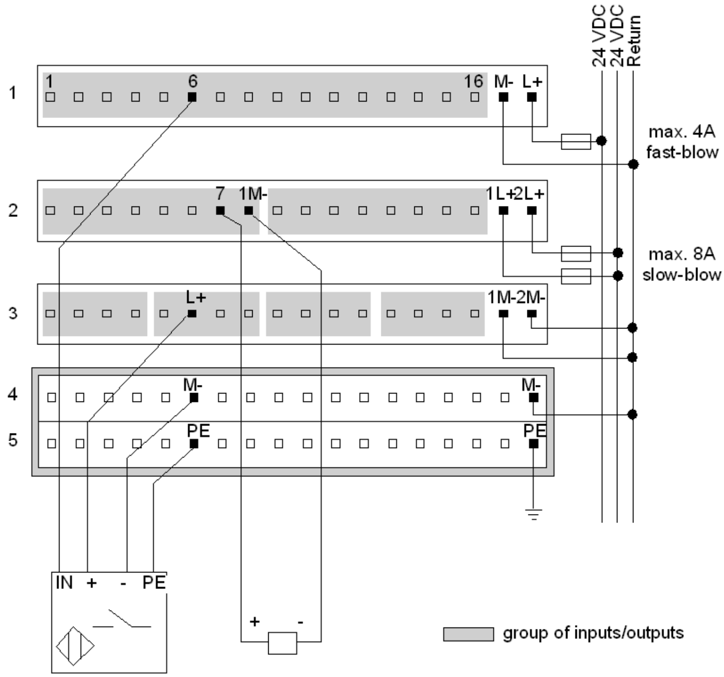
The diagram shows the sensors being supplied with voltage only when the corresponding output delivers a high signal. A similar wiring connection scheme can be used with 2- and 3-wire sensors.



Four-Wire Sensor with a Two-Wire Actuator

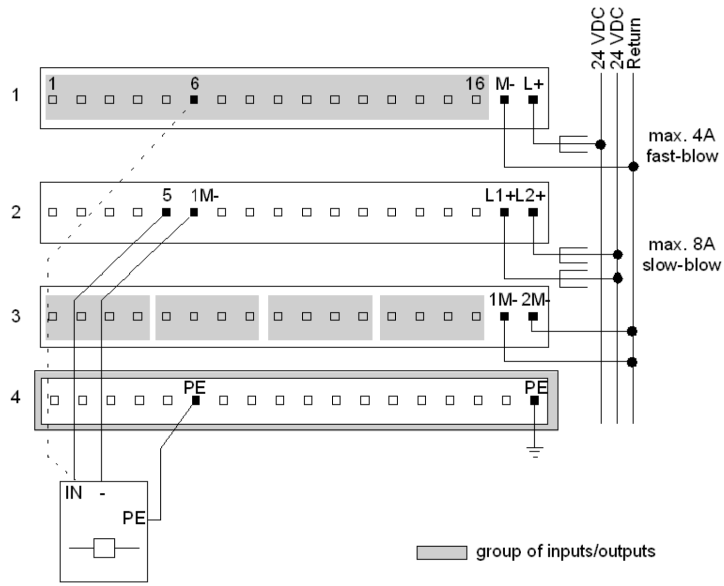
The diagram below shows a four-wire sensor with a two-wire actuator. The process of wiring a 3-wire sensor is very similar to the one below. Because 3-wire sensors do not require PE, a 1-row busbar could be used instead of the 2-row busbar shown.

Separate connections to pins 17 and 18 are shown on row 3, even though these two pins are internally connected. This is done to halve the load.



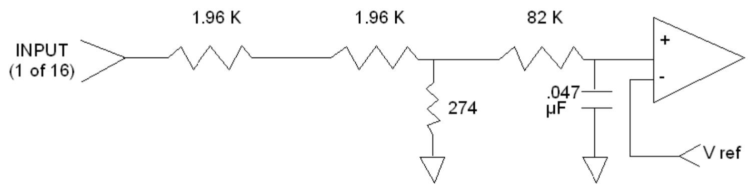
Broken Wire Detection

The diagram below shows a three-wire actuator with an optional wiring scheme for broken wire detection. The dotted line reads back whether or not current has reached the actuator. When the output on pin 5, row 2, is high, the input from pin 6, row 1, must also be high.



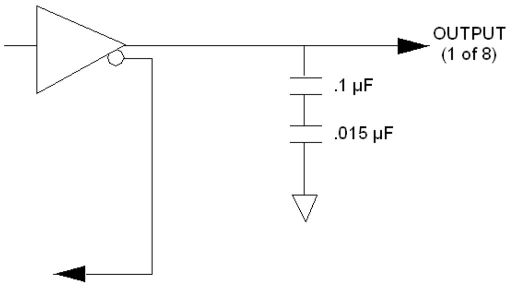
Simplified Input Schematics

The following diagram shows the field-side input circuitry.



Simplified Output Schematics

The following diagram shows the field-side output circuitry.



(monitor and feedback/overload protection)

I/O Mapping

Overview

The 170 ADM 370 10 TSX Momentum I/O base supports 16 discrete inputs and 8 discrete outputs. This section contains information about the mapping of the I/O data into input words and output words.

I/O Map

The I/O base may be mapped as one input word and one output word or as 16 discrete input points and 8 discrete output points.

IEC vs. Ladder Logic

In order to correctly field wire the inputs/output and map the input/output data, you need to know which type of Momentum Adapter is mounted on the base.

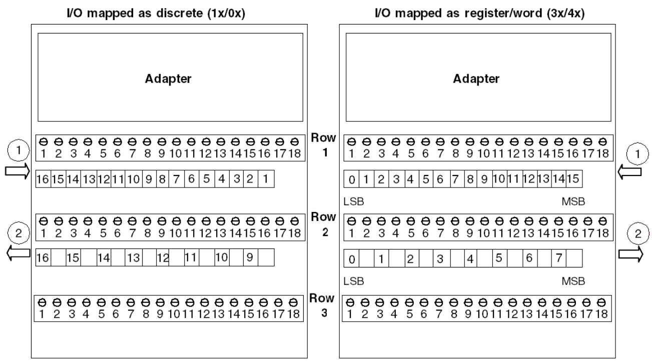
Adapters may be either IEC compliant or 984 Ladder Logic compliant.

	IEC Compliant	**984 Ladder Logic Compliant**
Momentum Processor Adapters	All	None
Momentum Communication Adapters	All, except 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01	170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01

Data Mapping

The figure below shows how data is mapped on the I/O base with an IEC Compliant adapter. When the I/O is mapped as discrete points (1x/0x) , the MSB is assigned to Pin 1and the LSB is assigned to Pin 16. When the I/O is mapped as a word or register (3x/4x), the MSB (bit 15) is assigned to Pin 16 and the LSB (bit 0) is assigned to Pin 1.

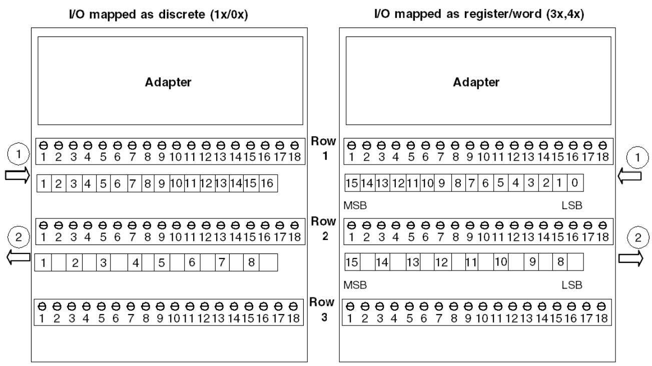
IEC Format



1 inputs
2 outputs

The figure below shows how data is mapped on the I/O base with a Ladder Logic Compliant adapter. When the I/O is mapped as discrete points (1x/0x), the MSB is assigned to Pin 16 and the LSB is assigned to Pin 1. When the I/O is mapped as a word or register, the MSB (bit 15) is assigned to Pin 1and the LSB (bit 0) is assigned to Pin 16.

984 Format



1 inputs
2 outputs

170 ADM 390 10 24 VDC - 16 Pt. In / 12 Pt. Out Monitored Module Base

19

Overview

This chapter describes the 170 ADM 390 10 TSX Momentum I/O base.

What's in this Chapter?

This chapter contains the following topics:

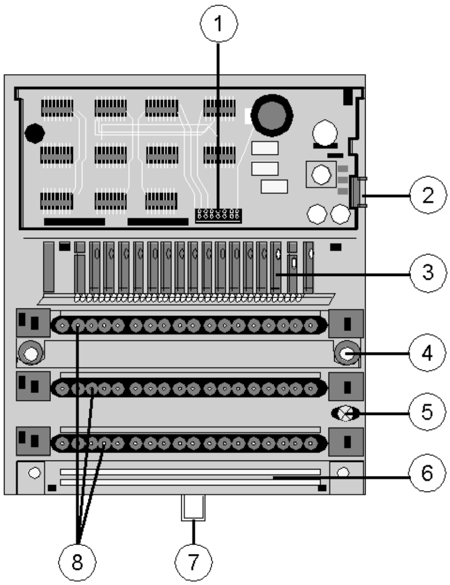
Front Panel Components

Overview

This section contains an illustration of the front panel of the 170 ADM 390 10 I/O base and a description of the LEDs.

Front Panel Illustration

The front panel of the I/O base is shown in the illustration below.

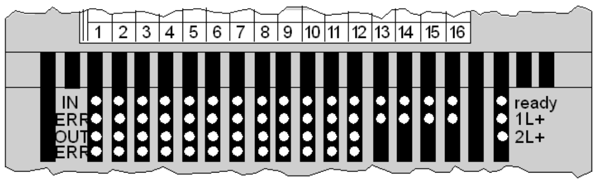


Components of the I/O module

Label	Description
1	Internal interface (ATI) connector
2	Locking and ground contact for the adapter
3	LED status display
4	Mounting holes for panel mount
5	Grounding screw
6	Busbar Mounting Slot
7	Locking tab for DIN rail mount
8	Sockets for the terminal connectors

LED Illustration

The LEDs are shown in the illustration below.



LED Descriptions

The LEDs are described in the table below.

Indicator	Condition	Message
Ready	Green	Module is ready to communicate. Operating voltage L+ for internal logic (5 V) is present.
	Off	Module is not ready.
1L+	Green	Output voltage 1L+ of inputs 1 ... 8 (group 1) is present
	Off	Output voltage of inputs 1 ... 8 (group 1) is not present
2L+	Green	Output voltage 2L+ of inputs 9 ... 12 (group 2) is present
	Off	Output voltage of inputs 9 ... 12 (group 2) is not present
Row 1 IN 1...16	Green	Input status (an LED per input); Input point active, ie. input carries a 1 signal (logically ON)
	Off	Input point inactive, ie. input carries a 0 signal (logically OFF)
Row 2 ERR 1...16	RED	Input detects broken wire (an LED per input)
	Off	Inputs 1 ... 16 operating normally.
Row 3 OUT 1...12	Green	Output status (an LED per output); Output point active, ie. output carries a 1 signal (logically ON)
	Off	Output status (an LED per output); Output point inactive, ie. Output carries a 0 signal (logically OFF)
Row 4 ERR 1...12	Red	Output overload (an LED per output). Short circuit or overload on the corresponding output.
	Off	Outputs 1 ... 16 operating normally.

Specifications

Overview

This section contains specifications for the 170 ADM 390 10 I/O base.

General Specifications

Module type	16 discrete inputs in 1 group 12 discrete outputs in 2 groups (8 pts/group 1 and 4 pts/group 2)
Supply voltage	24 VDC
Supply voltage range	20...30 VDC
Supply current consumption	max. 180 mA at 24 VDC
Power dissipation	6 W + ((# of input points on x .125 W) + (# of output points on x .25 W))
I/O map	3 input word 1 output word

Isolation

Input to input	none
Output group to output group	none
Input to output group	none
Field to communication adapter	Defined by communication adapter type

Fuses

Internal	none
Operating voltage	1 A slow-blow (Bussmann GDC-1A or equivalent)
Input voltage	According to the supply dimensioning of the connected sensors–not to exceed 4 A fast-blow/group
Output voltage	According to the supply dimensioning of the connected actuators–not to exceed 4 A fast-blow/group

EMC

Immunity	IEC 1131-2 Surge on auxiliary power supply 500V
Emissions	EN 50081-2
Agency approvals	UL, CSA, CE, FM Class 1, Div. 2

Physical Dimensions

Width	125 mm (4.9 in)
Depth (with no adapter)	40 mm (1.54 in)
Length	141.5 mm (5.5 in) no or one busbar 159.5mm (6.3in) two busbars 171.5 mm (6.75in) three busbars
Weight	200 g (0.495lb)

Discrete Inputs

Number of points	16
Number of groups	1
Points per group	16
Signal type	True High
IEC 1131 type	1+ (see appendix *IEC 1131 Input Types, page 603* for definitions of IEC input types)
ON voltage	+11 ... +30 VDC
OFF voltage	-3 ... +5 VDC
Input current	2.5 mA minimum ON (5.7 mA at 24 VDC) 1.2 mA maximum OFF
Broken wire detection	Input current less than 0.2 mA (0.3 mA required as minimum current for logical zero)
Input resistance	4 kOhm
Response time	2.2 ms OFF to ON 3.3 ms ON to OFF
Fault reporting	1 red LED/point (row 2) ON when indicating a broken wire
Error indication	Broken wire detection for on least 1 input (I/O-Error) to communication adapter

Discrete Outputs

Output type	Solid state switch
Output supply voltage	24 VDC
Output supply voltage range	20 ... 30 VDC
Output voltage	External supply - .5 VDC
Number of points	12
Number of groups	2
Points per group	8 (Group 1) and 4 (Group 2)
Current capacity	0.5 A/point maximum 4 A/group 1 2 A/group 2 6 A/module
Signal type	True High
Leakage current (output out)	< 1 mA @ 24 VDC
On state voltage drop	< 0.5 VDC @ 0.5 A
Fault sensing	Outputs are electronically safeguarded to assist in short circuit and overload protection
Fault reporting	1 red LED/point (row 4) ON when overload occurs
Fault reporting input voltage	1 red LED (row 3) signals the state of 4 inputs belonging to the input power supply group
Response time (resistive load / 0.5 A)	< 0.1 ms OFF to ON < 0.1 ms ON to OFF
Maximum switching cycles	1000/h for 0.5 A inductive load 100/s for 0.5 A resistive load 8/s for 1.2 W bulb load

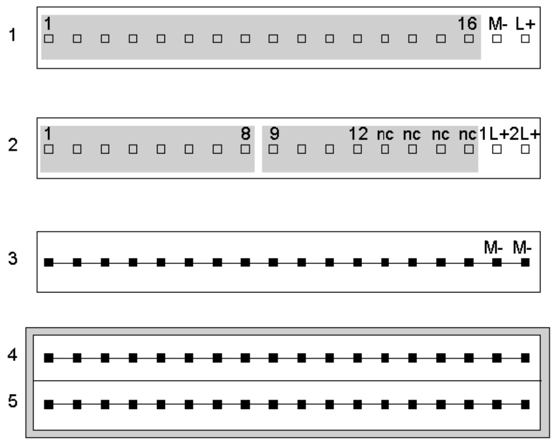
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base and an optional busbar.

Illustration

Rows 1 through 3 show the internal connections between terminals on the I/O base. Row 4 through 5 show the internal connections on the optional busbar.



Field Wiring Guidelines

Overview

Inputs are field wired to row 1 of the base. The outputs are field wired to row 2. This section contains wiring guidelines and precautions.

Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Electric sells terminal connectors in sets of three.

Type	Part Number
Screw-in	170 XTS 001 00
Spring-clip	170 XTS 002 00

Busbar May Be Required

Depending on the type of field devices you are using, you may need a 1-, 2-, or 3-row busbar. The following busbars are available from Schneider Electric.

Type	Number of Rows	Part Number
Screw-in	1 - row	170 XTS 006 01
	2 - row	170 XTS 005 01
Spring-clip	1 - row	170 XTS 007 01
	2 - row	170 XTS 008 01

Mapping Terminal Blocks

⚠ CAUTION

POTENTIAL FOR SHORT CIRCUITS AND/OR POWER-UP SPIKES

Provide external fuses on the operating voltage to protect the module. Appropriate fuse values are shown in the wiring illustration. An unprotected module may be subject to short circuits and/or power-up spikes.

Failure to follow these instructions can result in injury or equipment damage.

The following table shows mapping terminal blocks and optional busbars.

Row	Terminal	Function
1	1...16	Inputs
	17	Return (M-)
	18	+ 24 VDC Operating voltage (L+)
2	1...8	Outputs for group 1
	9...12	Outputs for group 2
	13...16	not connected (nc)
	17/18	+ 24 VDC for output group 1 (1L+) and group 2 (2L+)
3	1 ... 18	- Return (M-)
4	1 ... 18	Input voltage for terminal pins 1...16, row 1, or PE
5	1 ... 18	Protective earth (PE)

Protective Circuit May Be Required

When contacted switches are used on the input lines or when lines to the peripherals are very long, the outputs of inductive loads require protective circuitry with a clamping/suppressor diode. Install the protective circuit prallel to the operating coil.

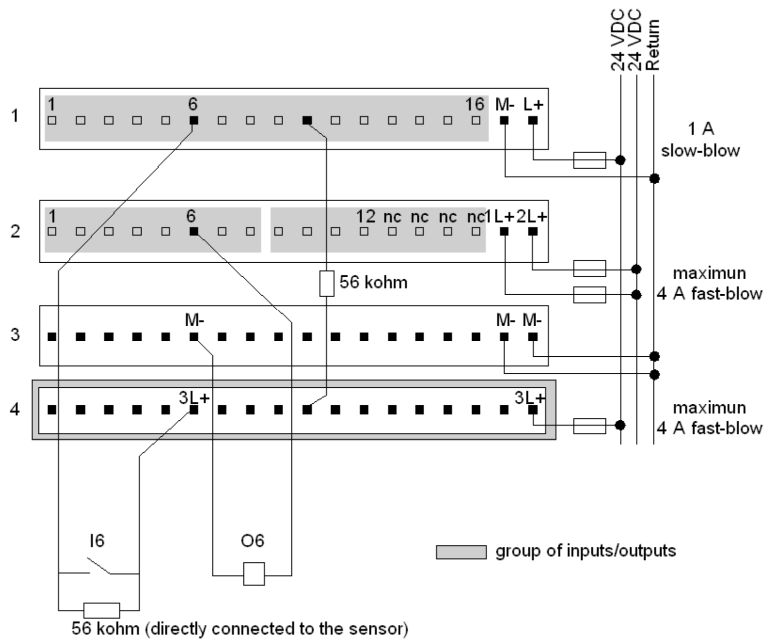
Wiring Diagrams

Overview

This section provides diagrams to assist you in wiring the following types of devices:
- 2-wire configuration
- 3-wire configuration
- 4-wire configuration

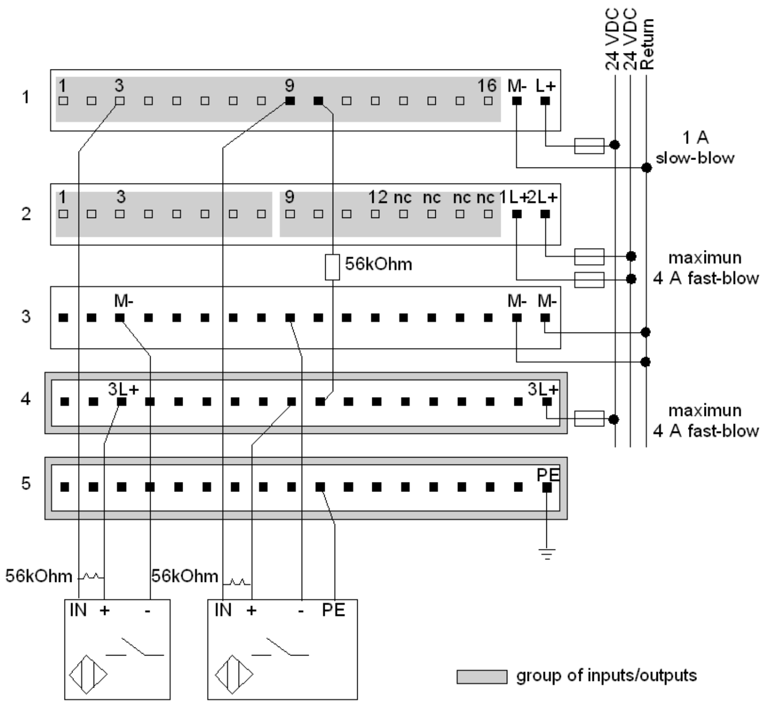
2-Wire Devices

The diagram below shows an example of wiring for 2-wire devices. Use a 1-row busbar for this configuration.



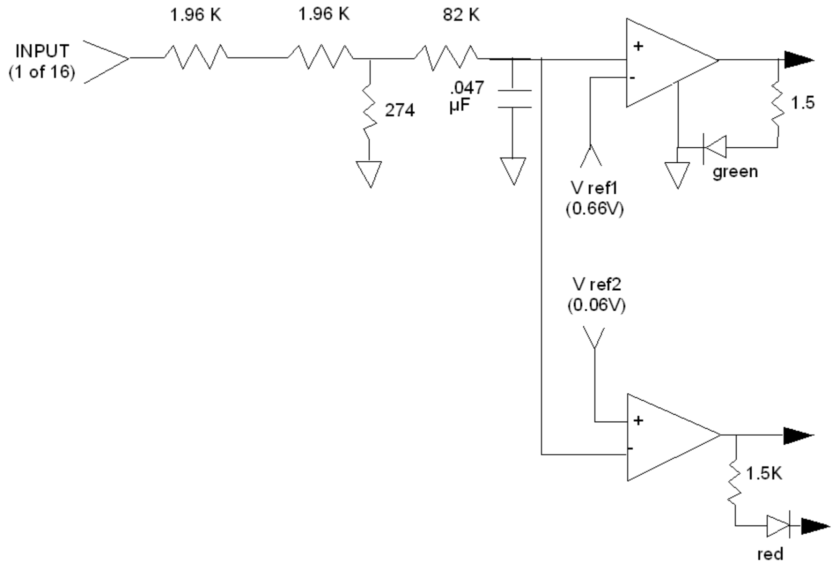
3- and 4-Wire Devices

To connect a 3- or 4-wire sensor, you need a 2-row busbar.



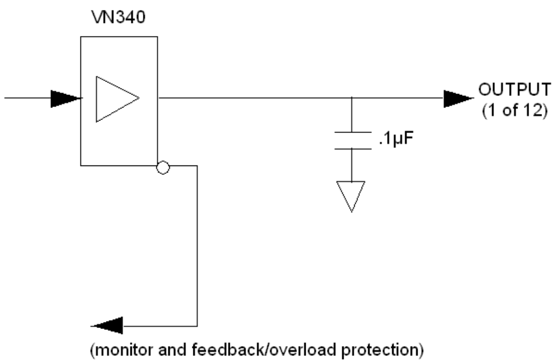
Simplified Input Schematics

The following diagram shows the field-side input circuitry.



Simplified Output Schematics

The following diagram shows the field-side output circuitry.



I/O Mapping

Overview

The 170 ADM 390 10 TSX Momentum I/O base supports 16 discrete inputs and 12 discrete outputs. This section contains information about the mapping of the I/O data into input words and output words.

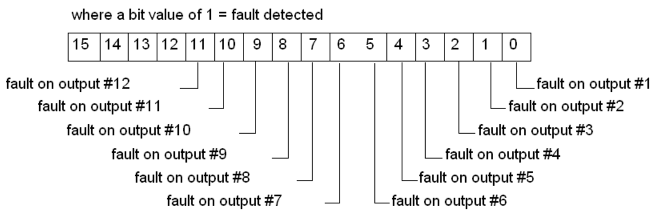
I/O Map

The I/O base must be mapped as three input word and one output word, as follows:

Word	Input Data	Output Data
1	Fault detection status on the 12 outputs	Value for output channels 1 ... 12
2	Fault detection status on the 16 inputs	not used
3	Value for input channels 1 ... 16	not used

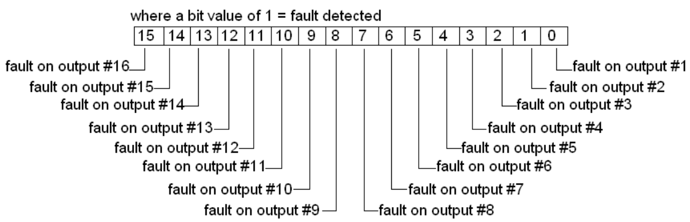
Fault Detection for Outputs

The following diagram shows how bits are assigned in the first input word:



Fault Detection for Inputs

The following diagram shows how bits are assigned in the second input word:



IEC vs. Ladder Logic

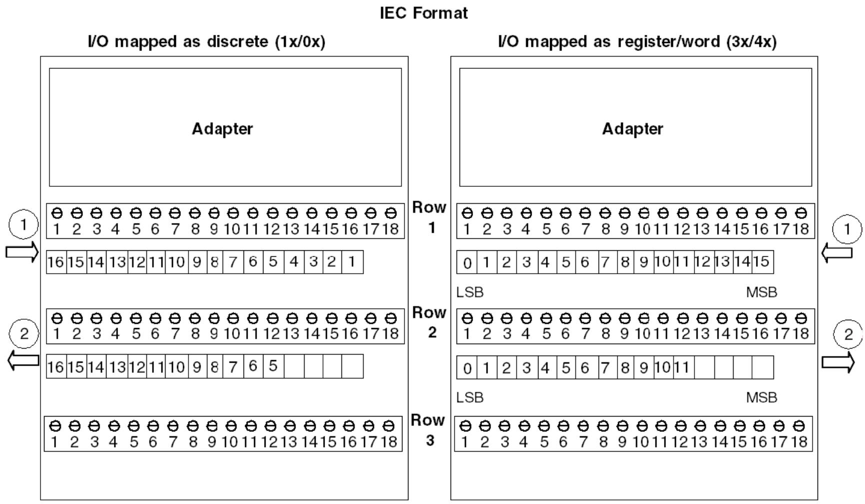
In order to correctly field wire the inputs/outputs and map the input/output data, you need to know which type of Momentum Adapter is mounted on the base.

Adapters may be either IEC compliant or 984 Ladder Logic compliant.

	IEC Compliant	**984 Ladder Logic Compliant**
Momentum Processor Adapters	All	None
Momentum Communication Adapters	All, except 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01	170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01

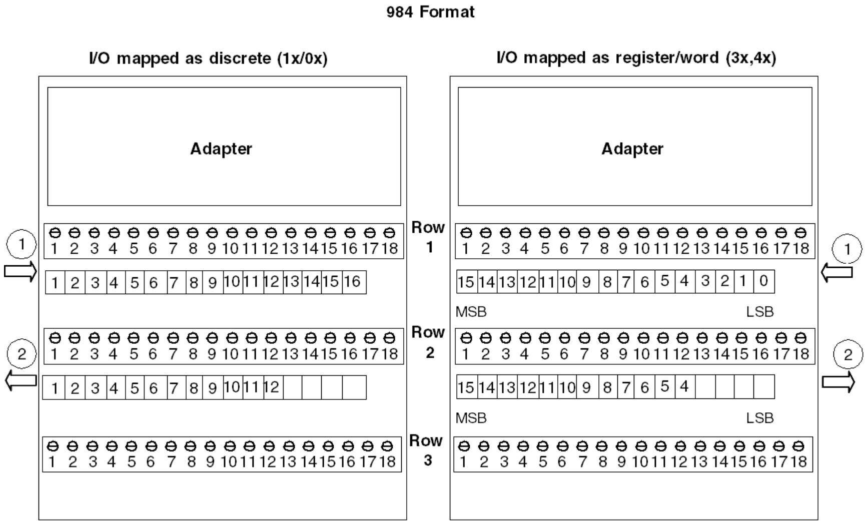
Data Mapping

The figure below shows how data is mapped on the I/O base with an IEC Compliant adapter. When the I/O is mapped as discrete points (1x/0x) the MSB is assigned to Pin 1 and the LSB is assigned to Pin 16. When the I/O is mapped as a word or register (3x/4x) the MSB is assigned to Pin 16 and the LSB is assigned to Pin 1.



1 inputs
2 outputs

The figure below shows how data is mapped on the I/O base with a Ladder Logic Compliant adapter. When the I/O is mapped as discrete points (1x/0x) the MSB is assigned to Pin16 and the LSB is assigned to Pin 1. When the I/O is mapped as a word or register (3x/4x) the MSB is assigned to Pin 1 and the LSB is assigned to Pin 16.



1 inputs
2 outputs

170 ADM 390 30 24 VDC - 10 Pt. In / 8 Pt. Relay Out Module Base

20

Overview

This chapter describes the 170 ADM 390 30 TSX Momentum I/O base.

What's in this Chapter?

This chapter contains the following topics:

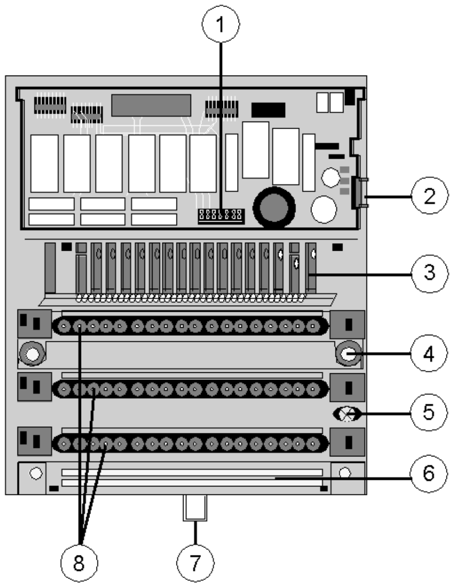
Front Panel Components

Overview

This section contains an illustration of the front panel of the 170 ADM 390 30 I/O base and a description of the LEDs.

Front Panel Illustration

The front panel of the I/O base is shown in the illustration below.

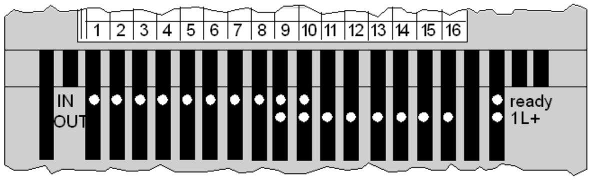


Components of the I/O module

Label	Description
1	Internal interface (ATI) connector
2	Locking and ground contact for the adapter
3	LED status display
4	Mounting holes for panel mount
5	Grounding screw
6	Busbar Mounting Slot
7	Locking tab for DIN rail mount
8	Sockets for the terminal connectors

LED Illustration

The LEDs are shown in the illustration below.



LED Descriptions

The LEDs are described in the table below.

Indicator	Condition	Message
Ready	Green	Module is ready to communicate. Operating voltage for internal logic (5 V) is present.
	Off	Module is not ready.
1L+	Green	Input voltage 1L+ of inputs 1 ... 10 is present
	Off	Input voltage of inputs 1 ... 10 is not present
Upper row IN 1...10	Green	Input status (an LED per input); Input point active, ie. input carries a 1 signal (logically ON)
	Off	Input status (an LED per input); Input point inactive, ie. input carries a 0 signal (logically OFF)
Middle row OUT 9 ...16	Green	Output status (an LED per output); Output point active, ie. output carries a 1 signal (logically ON)
	Off	Output status (an LED per output) Output point inactive, ie. Output carries a 0 signal (logically OFF)

Specifications

Overview

This section contains specifications for the 170 ADM 390 30 I/O base.

General Specifications

Module type	10 discrete inputs in 1 group 8 relay outputs as normally open contacts in 2 groups, 4 pts/group
Supply voltage	24 VDC
Supply voltage range	20...30 VDC
Supply current consumption	max. 250 mA at 24 VDC
Power dissipation	6 W + (# of input points on x .144 W)
I/O map	1 input word 1 output word

Protective Circuit Required

To reduce the effects of radiated noise, you must add snubbing components across inductive load devices. The following table provides generic selection guidelines.

Type of Load	Suppression Device	Minimum Component Rating	
AC circuits	50 Ω resistor in series with a 0.47 µfd nonpolarized capacitor across the load	for 120 VAC-powered loads	200 VAC
		for 220 VAC-powered loads	400 VAC
DC circuits	a reverse-biased clamping diode across the load	2 A and greater than twice the maximum load voltage	

Consult relay and contactor manufacturers' catalogs for commercial suppression devices matched to your particular products.

Isolation

Input to input	none
Output group to output group	1 780 VAC RMS
Input to output	1 780 VAC RMS
Output group to communication adapter	1 780 VAC RMS
Field to communication adapter	Defined by communication adapter type

Fuses

Internal	none
External: operating voltage (L+)	1 A slow-blow (Bussmann GDC-1A or equivalent)
External: input voltage (1L+)	max. 4 A fast-blow (Wickmann 19193-4A or equivalent)
External: output voltage (1L1, 2L1)	According to the supply of the connected actuators– not to exceed 8 A slow-blow/ group.

EMC

Immunity	IEC 1131-2 Surge on auxiliary power supply AC 2 KV to PE, 1 KV to differential surge on auxiliary power supply DC 0.5 KV,
Emissions	EN 50081-2
Agency approvals	UL, CSA, CE, FM Class 1 Div. 2 pending

Physical Dimensions

Width	125 mm (4.9 in)
Depth (with no adapter)	40 mm (1.54 in)
Length	141.5 mm (5.5 in) no or one busbar 159.5mm (6.3 in) two busbars 171.5 mm (6.75 in) three busbars
Weight	260 g (0.57lb)

Discrete Inputs

Number of points	10
Number of groups	1
Signal type	True High
IEC 1131 type	1+ (See Appendix *IEC 1131 Input Types, page 603* for definitions of IEC input types.)
ON voltage	+11 ... +30 VDC
OFF voltage	-3 ... +5 VDC

Input current	2.5 mA minimum ON (6 mA at 24 VDC) 1.2 mA maximum OFF
Input voltage range	-3 ... +30 VDC
Input resistance	4 kOhm
Response time	2.2 ms OFF to ON 3.3 ms ON to OFF

Relay Outputs

Output type		Relay normally open output
Number of points		8
Number of groups		2
Points per group		4
Current capacity	20 VDC	> 5 mA (but only for new contacts) max 2 A (switching current <= 5 A) ohmic load max 1 A (L/R <= 40 ms) inductive load
	115 VDC	max. 0.5 A (switching current <= 1.5 A) ohmic load max. 0.15 A (L/R <= 40 ms) inductive load
	24 VAC	max. 2A (switching current <= 5 A) cos = 1 max. 1 A cos = 0.5
	230 VAC	max. 2A (switching current <= 5 A) cos = 1 max. 1 A cos = 0.5
Relay type		Normally Open
Leakage current (output out)		< 1.2 mA @ 230 VAC
Fault sensing		These contacts have an internal suppressor circuit.
Fault reporting		None
Error indication		None
Response time (resistive load / 0.5 A)		10 ms @ 60 Hz OFF to ON 10 ms @ 60 Hz ON to OFF
Maximum switching cycles		> 30 x 106 (mechanical) >=1 x 105 (inductive load with external protective circuitry)

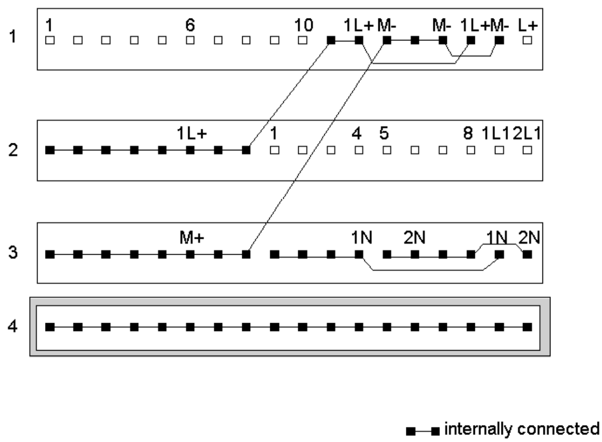
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base.

Illustration

Rows 1 through 3 show the internal connections between terminalson the I/O base. Row 4 shows the internal connections on the optional busbar.



Field Wiring Guidelines

Overview

Inputs are field wired to row 1 of the base. The outputs are field wired to row 2. This section contains wiring guidelines and precautions.

Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Electric sells terminal connectors in sets of three.

Type	Part Number
Screw-in	170 XTS 001 00
Spring-clip	170 XTS 002 00

Busbar May Be Required

Depending on the type of field devices you are using, you may need a 1-row busbar. The following busbars are available from Schneider Electric.

Type	Part Number
Screw-in	170 XTS 006 01
Spring-clip	170 XTS 007 01

Mapping Terminal Blocks

⚠ CAUTION

POTENTIAL FOR SHORT CIRCUITS AND/OR POWER-UP SPIKES

Provide external fuses on the operating voltage to protect the module. Appropriate fuse values are shown in the wiring illustration. An unprotected module may be subject to short circuits and/or power-up spikes.

Failure to follow these instructions can result in injury or equipment damage.

The following table shows mapping terminal blocks and optional busbars.

Row	Terminal	Function
1	1...10	Inputs
	11, 12, 16	Input voltage for terminal pins 1 ... 10, (1L+)
	13, 14, 15	Return (M-) for the inputs
	17	Return (M-) for the module
	18	+ 24 VDC Operating voltage (L+)
2	1 ... 8	Input voltage for pins 1 ... 8, (1L+)
	9 ... 12	Outputs for group 1
	13 ... 16	Outputs for group 2
	17	Output Voltage for relays 1 ... 4 (1L1, 20 ... 115 VDC or 24 ... 230 VDC
	18	Output Voltage for relays 5 ... 8 (2L1, 20 ... 115 VDC or 24 ... 230 VDC
3	1 ... 8	Return (M-) for the inputs
	9, 10, 11, 12	Return (1N) for the relays 1 ... 4
	13, 14, 15, 16	Return (1N) for the relays 5 ... 8
	17/18	Return/Neutral for relay outputs
4	1 ... 18	Protective earth (PE)

Protective Circuit Required

To reduce the effects of radiated noise, you must add snubbing components across inductive load devices. The following table provides generic selection guidelines.

Type of Load	Suppression Device	Minimum Component Rating	
AC circuits	50 Ω resistor in series with a 0.47 μfd nonpolarized capacitor across the load	for 120 VAC-powered loads	200 VAC
		for 220 VAC-powered loads	400 VAC
DC circuits	a reverse-biased clamping diode across the load	2 A and greater than twice the maximum load voltage	

Consult relay and contactor manufacturers' catalogs for commercial suppression devices matched to your particular products.

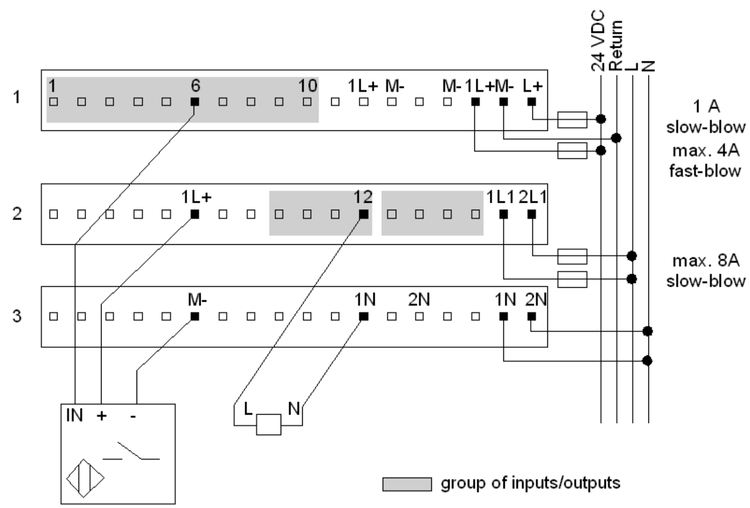
Wiring Diagrams

Overview

This section provides diagrams to assist you in wiring the following types of devices:
- 3-wire sensor with a 2-wire actuator
- 4-wire sensor with a 3-wire actuator

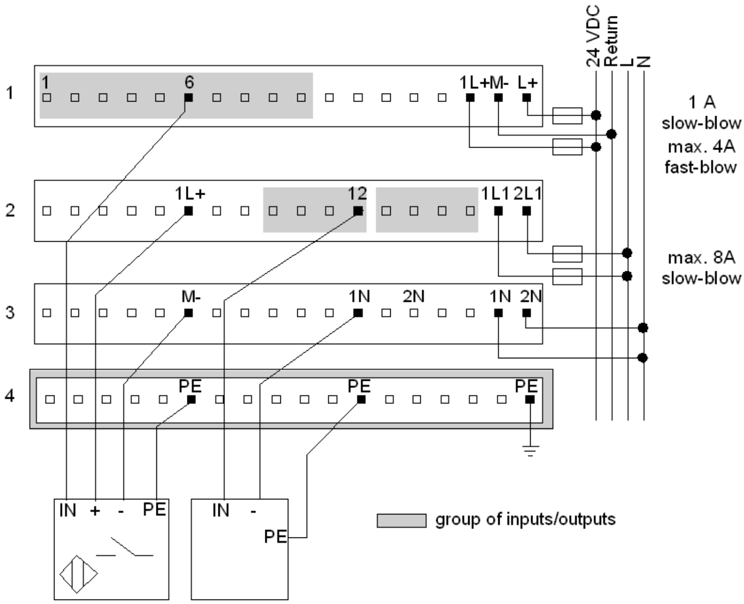
3-Wire Sensor with a 2-Wire Actuator

The diagram below shows field wiring for a 3-wire (24 VDC) sensor and a 2-wire (230 VAC) actuator.



4-Wire Sensor with a 3-Wire Actuator

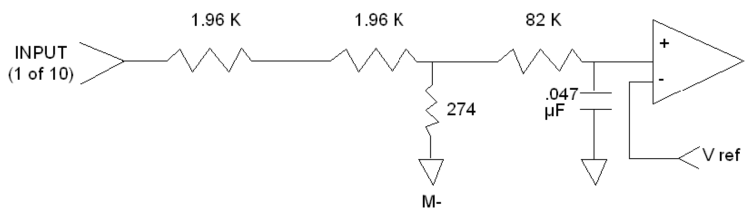
The diagram below shows field wiring for a 4-wire (24 VDC) sensor and a 3-wire (230 VAC) actuator.



A 1-row busbar is used to provide PE for the 4-wire sensor. No busbar would be required if only 2- and/or 3-wire sensors were used.

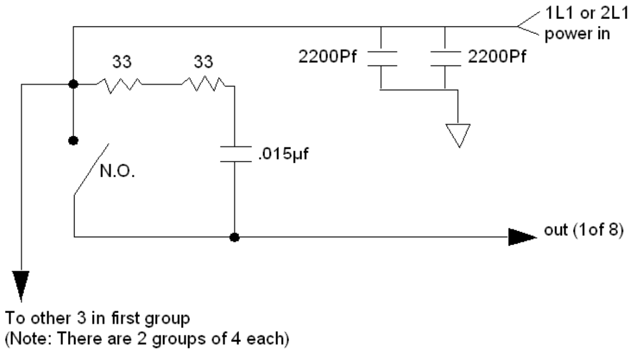
Simplified Input Schematics

The following diagram shows the field-side input circuitry.



Simplified Output Schematics

The following diagram shows the field-side output circuitry.



I/O Mapping

Overview

The 170 ADM 390 30 TSX Momentum I/O base supports 10 discrete inputs and 8 discrete outputs. This section contains information about the mapping of the I/O data into input words and output words.

I/O Map

The I/O base may be mapped as one input word and one output word, or as 10 discrete input points and 8 discrete output points.

IEC vs. Ladder Logic

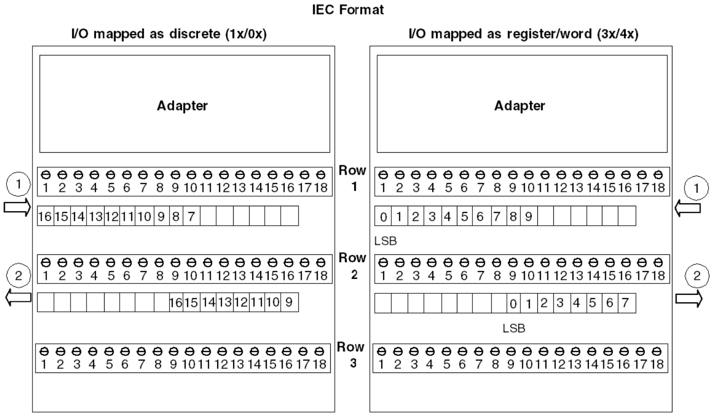
In order to correctly field wire the inputs/outputs and map the input/output data, you need to know which type of Momentum Adapter is mounted on the base.

Adapters may be either IEC compliant or 984 Ladder Logic compliant.

	IEC Compliant	**984 Ladder Logic Compliant**
Momentum Processor Adapters	All	None
Momentum Communication Adapters	All, except 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01	170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01

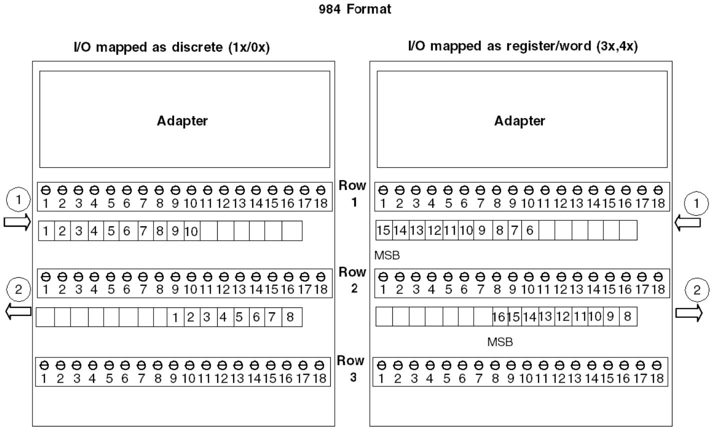
Data Mapping

The figure below shows how data is mapped on the I/O base with an IEC Compliant adapter. When the I/O is mapped as discrete points (1x/0x), the MSB is assigned to Pin 1 and the LSB is assigned to Pin 16. When I/O is mapped as a word or register (3x/4x), the MSB (bit 15) is assigned to Pin 16 and LSB (bit 0) is assigned to Pin 1.



1 inputs
2 outputs

The figure below shows how data is mapped on the I/O base with a Ladder Logic Compliant adapter. When the I/O is mapped as discrete points (1x/0x), the MSB is assigned to Pin 16 and the LSB is assigned to Pin 1. When I/O is mapped as a word or register (3x/4x), the MSB (bit 15) is assigned to Pin 1 and LSB (bit 0) is assigned to Pin 16.



1 inputs
2 outputs

170 ADM 540 80 120 VAC - 6 Pt. In / 3 Pt. Out Discrete MCC Module Base

21

Overview

This chapter describes the 170 ADM 540 80 TSX Momentum I/O base.

What's in this Chapter?

This chapter contains the following topics:

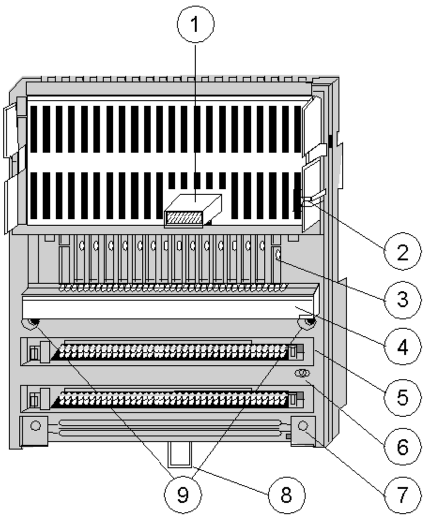
Front Panel Components

Overview

This section contains a photograph of the front panel of the 170 ADM 540 80 I/O base and a description of the LEDs.

Front Panel Illustration

The front panel of the I/O base is shown in the illustration below.

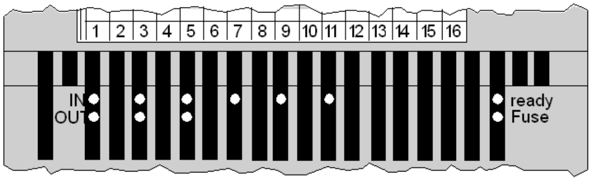


Components of the I/O module

Label	Description
1	Internal interface (ATI) connector
2	Locking and ground contact for the adapter
3	LED status display
4	Protective cover
5	Sockets for the terminal connectors
6	Grounding screw
7	Busbar mounting slot
8	Locking tab for DIN rail mount
9	Mounting holes for panel mount

LED Illustration

The LEDs are shown in the illustration below.



LED Descriptions

The LEDs are described in the table below.

Indicator	Condition	Message
Ready	Green	Module has power.
	Off	Module has no power. Check the L1 voltage source.
FUSE	Green	Output voltage present and fuse 1 (group output) and field power is OK.
	Off	Output voltage not present or fuse 1 or field power is not OK.
IN 1 ... 6	Green	Input status (an LED per input); input point active.
	Off	Input status (an LED per input); input point inactive.
OUT 1 ... 3	Green	Output status (an LED per output); output point active.
	Off	Output status (an LED per output); output point inactive.

Specifications

Overview

This section contains specifications for the 170 ADM 540 80 I/O base.

General Specifications

Module type	6 inputs / 3 outputs, 120VAC
Operating Voltage	120 VAC
Range	85 ... 132 VAC @ 47 ... 63 Hz
Current	125 mA

Isolation

Point to Point	None
I.O points to communication adapter	1250V RMS for one minute
Module field power to communication adapter	1250V RMS for one minute
Module power to I.O field power	1250V RMS for one minute
Field input to field input	1250V RMS for one minute
Modbus Port RS485 to communication adapter	Not isolated

Fuses

Internal (replaceable)	2.5 A slow-blow (Wickmann 195125000 or equivalent)
Internal (non-replaceable)	200 mA slow-blow
External (field power)	2 A slow-blow (Wickmann 195120000 or equivalent)
External (module power)	200 mA slow-blow (Wickmann 195020000 or equivalent)

EMC

Immunity	IEC 1131-2
Emissions	EN 50081-2
Agency Approvals	UL, CSA, CE FM Class 1, Div. 2 pending

Physical Dimensions

Width	125 mm (4.9 in)
Depth (with no adapter)	52 mm (2.05 in)
Length	141.1 mm (5.6 in) no or one busbar 159.5 mm (6.3 in) two busbars 171.5 mm (6.75 in) three busbars
Weight	284 g (10 oz)

Discrete Inputs

Number of Points	6
Number of Groups	1, Non-isolated
Points per Group	6
For range 47 ... 53 Hz	
ON Voltage Off Voltage ON current OFF current	85VAC 20VAC 5.5mA rms 1.9mA rms
For range 57 ... 63 Hz	
ON Voltage Off Voltage ON current OFF current	79VAC 20VAC 5.5mA rms 1.9mA rms
Absolute Maximum Input	132VAC rms continuous
Input Response	1 line cycle maximum ON to OFF, 1 line cycle maximum OFF to ON
Internal Impedance	12k ohms (nominal) @ 60Hz, predominantly capaci tive
Input Protection	Resistor limited

Discrete Outputs

.

Number of Points	3
Number of Groups	1 fuse group
Points per Group	3
Output Voltage	85 ... 120 ... 132 VACVAC @ 47 ... 63 Hz
Surge Voltage	150 VAC for 10 sec 200 VAC for 1 cycle

On State Voltage Drop	1.5 VAC max @ 0.5 A
Output (Load) Current	0.5 A / point, 1.5 A / module
Minimum Output Current	30 mA
Maximum Surge Current (rms)	7.5 A per point, one cycle 5 A per point, two cycles
Output Protection	RC snubber suppression, varistor
Leakage Current	1.9 mA @ 120 VAC
Applied dV / dT	400 V / microseconds
Response Time	0.5 of one line cycle max OFF to ON 0.5 of one line cycle max ON to OFF

Modbus Port

Baud	9600, 19200
Parity	Even, odd or none
Mode/data bits	8 bit RTU, 7 bit ASCII
Stop bit	1 or 2
Modbus Address	0 ... 247
RS485	2 or 4 wire
Timeout	150ms (after transmission, waiting for reception)

Modbus Port Tests

Test	**Spec Reference**	**Conditions/Levels**
Radiated	EN61000-4-3	80 ... 1000Mhz, 10V/M
Fast transients	EN61000-4-4	1kV, CM, cap clamp
Surge withstand (transients)	EN61000-4-5	1kV, CM, 42Ω source Z
Electrostatic discharge	EN61000-4-2	8kV, air discharge, 4kV, contact
Conducted RF	ENV61000-4-6	0.15 ... 80Mhz 10 VRMS
Pulsed modulated field	ENV 50140	10V/M

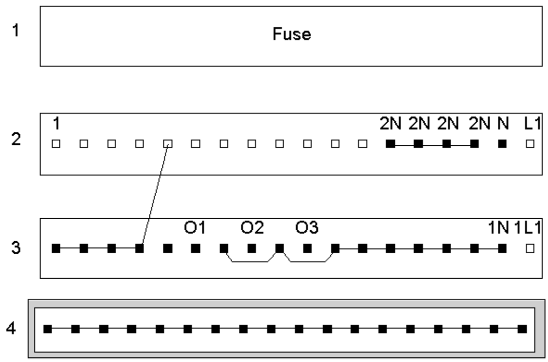
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base and an optional one-row busbar.

Illustration

Rows 1 through 3 show the internal connections between terminals on the I/O base. Row 4 shows the internal connections on the optional busbar.



Field Wiring Guidelines

Overview

Inputs are field wired to row 2 of the base. The outputs are field wired to row 3. This section contains wiring guidelines and precautions.

Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Electric sells terminal connectors in sets of three.

Type	Part Number
Screw-in	170 XTS 001 00
Spring-clip	170 XTS 002 00

Busbar May Be Required

Depending on the type of field devices you are using, you may need a 1-row busbar. The following busbars are available from Schneider Electric.

Type	Part Number
Screw-in	170 XTS 006 01
Spring-clip	170 XTS 007 01

Mapping Terminal Blocks

⚠ CAUTION

VOLTAGE SPIKE MAY BE SUFFICIENT TO DAMAGE OR DESTROY MODULE

If an external switch is wired to control an inductive load in parallel with the module output, then an external varistor (Harris V390ZA05 or equivalent) must be wired in parallel with the switch.

Failure to follow these instructions can result in injury or equipment damage.

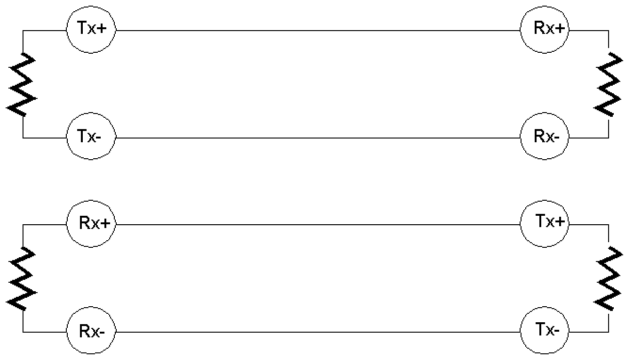
The following table shows mapping terminal blocks and optional busbars.

Row	Terminal	Connection	
2	1	RxHi	Modbus Master RS485
	2	RxLo	Modbus Master RS485
	3	TxHi	Modbus Master RS485
	4	TxLo	Modbus Master RS485
	5	PE	Earth Ground
	6	-	Not Used
	7 ... 12	I1 ... I6	Inputs 1 ... 6
	13 ... 16	2N	Voltage for input field devices, Neutral
	17	N	Module operating voltage, Neutral
	18	L1	Module operating voltage, Line
3	1 ... 4	PE	Earth Ground
	5	-	Not Used
	6, 8, 10	O1 ... O3	Outputs 1 ... 3
	7, 9, 11 ... 16	1N	Voltage for output field devices, Neutral
	17	1N	Voltage for output field devices, Neutral
	18	1L1	Voltage for field devices, Line
4	18	PE	Earth Ground

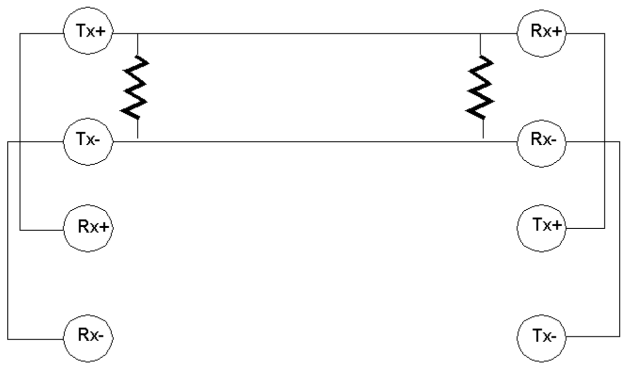
NOTE: Rows 4, 5, 6 may be added by mounting a separate terminal block to the I/O base at the grounding busbar slot.

Module RS-485 Termination

The illustration below shows how to properly terminate the module's RS-485 connector. Y-wire terminals with 120 Ohm only at each end of the network.



OR: 2 wire the terminals with 120 Ω only at each end of the network.



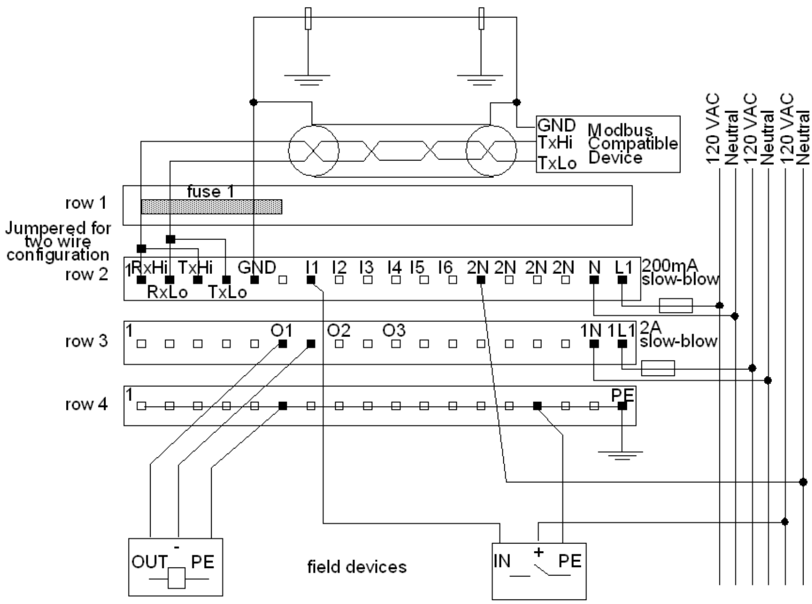
Wiring Diagrams

Overview

This section contains a diagram to assist you in wiring 2-wire field devices.

2-Wire Devices

The diagram below shows an example of wiring for 2-wire devices.



The communication cable should be twisted shielded cable. Tie shield on both ends to earth ground near the associated Modbus equipment.

I/O Mapping

Overview

The 170 ADM 540 80 TSX Momentum I/O base supports 6 discrete inputs and 3 discrete outputs. This section contains information about the mapping of the I/O data into input words and output words.

I/O Map

This module is I/O mapped as 6 input words and 3 output words. The Processor sends 3 bits of discrete output data to the 170 ADM 540 80 base as a single low byte (8-bits), and the base returns 6 input data bits in a single low byte (8-bits) to the processor. The inputs are field wired to row 2, and the outputs are field wired to row 3 of the base.

IEC vs. Ladder Logic

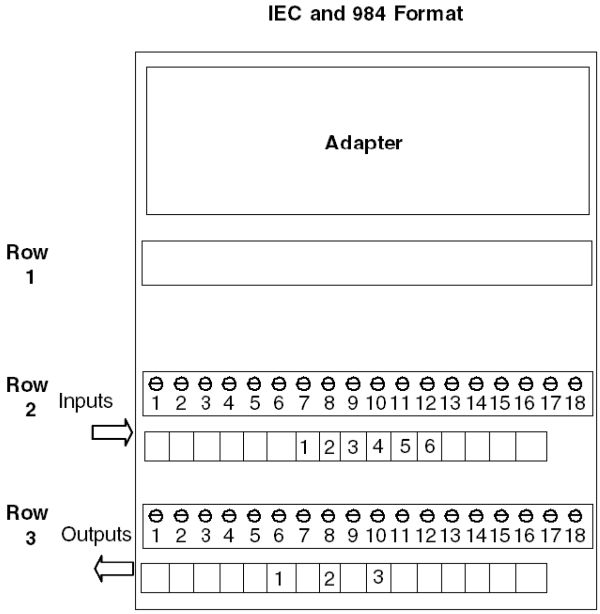
In order to correctly field wire the inputs/outputs and map the input /output data, you need to know which type of Momentum Adapter is mounted on the base.

Adapters are either IEC compliant or 984 Ladder Logic compliant.

	IEC Compliant	**984 Ladder Logic Compliant**
Momentum Processor Adapters	All	None
Momentum Communication Adapters	All, except 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110.01	170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01

Data Mapping

The figure below shows how data is mapped.



General Modbus Message Rules

Purpose

The following rules state what is expected of the user and what the expected response is.

Sequence Numbe

A change in the sequence number starts any and all Modbus transactions. The I/O module contains the last sequence number written and starts with 0 at power-up. The sequence number is echoed to the input buffer after the Modbus message is complete. Continuous read data can be obtained after the first initial read, by incrementing the sequence number only every scan.

Command and Response

See Output Words Control Modes *(see page 318)* and Input Words Control Modes *(see page 324)*. No more than 4 commands can be requested at any one time (Control Modes 4 ... 8). The response for the requests are returned in the response registers.

Block Read Response

All read commands are contiguous, incrementing up from the starting address to the numbers specified by length.The first read command with a length of zero or a length that is larger than the allocated response buffer will end further Modbus processing and the remainder of the input data field will be zeroed. The first read command starts at the end of the buffer, (words 15 and 16). The first word of the response data is placed in word 5 of the input buffer. After word 5 all read data values fill in consecutively as executed.

Block Write Response

All block write commands (Control Modes 2 and 3) are contiguous, incrementing up from the starting address to the numbers specified by length. Block write commands with a length of zero or a length that is larger than the allocated command buffer will not be executed. However, the read in control mode 3 will be executed regardless of the write command.

Single Write Response

All single write commands (Control Modes 4 ... 8) will be executed. Zero is a legal start address and a legal data value.

Read / Write Commands

All Write commands precede the read response.

Modbus Message Time Out

The Modbus message time out is fixed in the firmware at 200 msec and cannot be altered.

Start Address

Start address of 0 = Modbus register 400001. For example: A Modbus start address of 0 is actually Modbus register 400001. A value of 9 is actually 400010.

Modbus Protocol

For a better understanding of Modbus protocol, refer to PI-MBus-300, Modbus Protocol Reference Guide.

General Modbus Response

The table below lists the possible Modbus response codes.

Response	Code
Illegal function	01 Hex
Illegal data address	02 Hex
Illegal data value	03 Hex
Device failure	04 Hex
Acknowledge	05 Hex
Busy, message rejected	06 Hex
Bad Modbus state Rcv_int	1C Hex
Bad comm state trn_asc	1F Hex
Bad comm state trn_rtu	1D Hex
Bad comm state rcv_asc	20 Hex
Command buffer full error	21 Hex
Bad comm state rcv_rtu	22 Hex
Bad frame type put_chr	23 Hex
Bad transmit comm state	25 Hex
Bad receive comm state	26 Hex
Bad Modbus state tmr0_evt	27 Hex
3 char timeout ASCII mode	28 Hex
No message requested	29 Hex

Response	Code
Bad data length	2A Hex
CRC error	2B Hex
Illegal control mode (> 8)	2C Hex
Control mode 0 failed	30 Hex
Control mode 1 failed	31 Hex
Control mode 2 failed	32 Hex
Control mode 3 failed	33 Hex
Control mode 4 failed	34 Hex
Control mode 5 failed	35 Hex
Control mode 6 failed	36 Hex
Control mode 7 failed	37 Hex
Control mode 8 failed	38 Hex
Message Mismatch	50 Hex
Message accepted	55 Hex

Output Words

Output Words 4x ... 4x + 15

16 words of output data are used for 3 120VAC output points and commands for the Modbus master device.

The following table shows the function of the output words.

Output Words		
Word 1	Sequence #	
Word 2	Output configuration	AC output
Word 3	Control mode	
Word 4	Port configuration	Slave Node
Word 5 ... 16	Message data field	

Depending on how the application is written, moving a block of data to the registers, which includes a change in the sequence number, is acceptable.

Output Word 1

⚠ CAUTION

INVALID DATA - OUTPUT SHUT DOWN

Do not use a zero value in word one, which will cause an output shut down state.

Failure to follow these instructions can result in injury or equipment damage.

- Valid settings are 1 ... FFFF.
- The module defaults to zero at power-up (module shut down).
- Whenever the module is set to zero, it goes to the module shut down state.
- When the value in the first output word is not equal to the first input word, then a Modbus message will be sent.. When they are equal, there will be no message activity.
- A change in the sequence word value starts the Modbus command execution. It is your responsibility to change the output data for the Modbus message. The sequence number must be the last word of information written in order to ensure Modbus messages are correctly handled.

Module Shut Down Definition

The Module shut down behaviour may be set to:
- hold last value
  - or -
- user defined
  - or -
- minimum output (OFF)

NOTE: When the sequence number is 1 ... FFFF, the 120 VAC output and input data are collected every scan and are not affected by the sequence number. A sequence number of zero causes shutdown status, but inputs continue to be updated.

Output Word 2

Output word 2 contains 3 bits of 120 VAC discrete output data, 3 bits of user defined output data shut down values, and 2 bits for user shut down state.

Word 2 High Byte (Shut down states)	
Bit 15	0= Shut down state minimum output 1= Check bit 14 for shut down state
Bit 14	0= Hold last value (shut down state) 1= User defined (shut down state)
Bit 13 ... 11	Not used
Bit 10	User defined value for output 3 (shut down)
Bit 9	User defined value for output 2 (shut down)
Bit 8	User defined value for output 1 (shut down)

Word 2 Low Byte (120 VAC output data)	
Bit 7 ... 3	Not used
Bit 2	Output 3
Bit 1	Output 2
Bit 0	Output 1

Output Word 3

Output word 3 contains the Modbus message control mode.

Word 3 Control Modes			
Mode	Value	Function	Description
Mode 0	0	Idle	No Modbus activity. Input buffer to zero
Mode 1	1	Modbus message	The I/O module executes the data field from a user-defined Modbus message

Word 3 Control Modes			
Mode 2	2	Block write	The I/O module performs a block write command (Modbus function code 16)
Mode 3	3	Block write and Block read	The I/O module performs mode 2 plus a block read command
Mode 4	4	4 single writes	The I/O module performs 4 Modbus function code 06 commands (single writes)
Mode 5	5	3 single writes and 1 block read	The I/O module performs 3 Modbus function code 06 commands (single writes) and Modbus function code 03 (1 block read command)
Mode 6	6	2 single writes and 2 block reads	The I/O module performs 2 Modbus function code 06 commands (single writes) and Modbus function code 03 (2 block read commands)
Mode 7	7	1 single writes and 3 block reads	The I/O module performs 1 Modbus function code 06 commands (single writes) and Modbus function code 03 (3 block read commands)
Mode 8	8	4 block reads	The I/O module performs Modbus function code 03 (4 block read commands)
Others	-	Illegal command	Response = illegal control mode

Output Word 4

Output word 4 contains the port configuration parameters (high byte) and the Modbus slave address (low byte).

Word 4 - Port Configuration	
High Byte	
Bit 15	0= 1 stop bit 1= 2 stop bits
Bit 14	0= 7 data bits 1= 8 data bits
Bit 13	0= no parity 1= parity enabled
Bit 12	0= odd parity 1= even parity
Bits 11 ... 8	0010= 19.2 baud others= 9600 baud
Low Byte	
Bits 7 ... 1	Modbus slave node address

Output Words Control Modes

Purpose

This section describes output words 5 ... 16 control modes.

Output Words 5 ... 16

Output words 5 ... 16 are used as data for specific control modes.

NOTE: Be sure you read General Modbus Message Rules *(see page 312)*.

Output Words Mode Memory Allocation

Output word modes are used for message data. The table below describes the specific memory allocation for each control mode.

Control Mode 0

Control Mode 0 - Idle, Clear Response Buffer

Word 1	Sequence #	
Word 2	Output Configuration	Output
Word 3	**Control Mode 0**	
Word 4	Port Configuration	Slave node address
Words 5 ... 16	**Not used**	

Control Mode 1

Control Mode 1 - Modbus Message

Word 1	Sequence #	
Word 2	Output Configuration	Output
Word 3	**Control Mode 1**	
Word 4	Port Configuration	**Message length**
Words 5 ... 16	**12 words of message output data**	

Control Mode 2

Control Mode 2 - Block Write

Word 1	Sequence #	
Word 2	Output Configuration	Output
Word 3	**Control Mode 2**	

Word 4	Port Configuration	Slave node address
Word 5	**Start address - value of 0 = 400001**	
Word 6	**Number of data words, 1 ... 10 are valid**	
Words 7 ... 16	**10 words of message output data**	

Control Mode 3

Control Mode 3 - 1 Block Write And 1 Block Read Command

Word 1	Sequence #	
Word 2	Output Configuration	Output
Word 3	**Control Mode 3**	
Word 4	Port Configuration	Slave node address
Word 5	**First write command address - value of 0 = 400001**	
Word 6	**Number of data words, 1 ... 8 are valid**	
Words 7 ... 14	**8 words of message output data**	
Word 15	**First read command address**	
Word 16	**Number of data words to read, 1 ... 12 are valid**	

Control Mode 4

Control Mode 4 - 4 Single Write Commands

Word 1	Sequence #	
Word 2	Output Configuration	Output
Word 3	**Control Mode 4**	
Word 4	Port Configuration	Slave node address
Word 5	**First single write command address - value of 0 = 400001**	
Word 6	**1 word of message output data**	
Word 7	**Second single write command address - value of 0 = 400001**	
Word 8	**1 word of message output data**	
Word 9	**Third single write command address - value of 0 = 400001**	
Word 10	**1 word of message output data**	
Word 11	**Fourth single write command address - value of 0 = 400001**	
Word 12	**1 word of message output data**	
Words 13 ... 16	**Not used**	

Control Mode 5

Control Mode 5 - 3 Single Writes and 1 Block Read Command

Word 1	Sequence #	
Word 2	Output Configuration	Output
Word 3	**Control Mode 5**	
Word 4	Port Configuration	Slave node address
Word 5	**First single write command address - value of 0 = 400001**	
Word 6	**1 word of message output data**	
Word 7	**Second single write command address - value of 0 = 400001**	
Word 8	**1 word of message output data**	
Word 9	**Third single write command address - value of 0 = 400001**	
Word 10	**1 word of message output data**	
Words 11 ... 14	**Not used**	
Word 15	**First block read command address**	
Word 16	**Number of data words to read, 1 ... 12 are valid**	

Control Mode 6

Control Mode 6 - 2 Single Writes And 2 Block Read Commands

Word 1	Sequence #	
Word 2	Output Configuration	Output
Word 3	**Control Mode 6**	
Word 4	Port Configuration	Slave node address
Word 5	**First single write command address - value of 0 = 400001**	
Word 6	**1 word of message output data**	
Word 7	**Second single write command address - value of 0 = 400001**	
Word 8	**1 word of message output data**	
Words 9 ... 12	**Not used**	
Word 13	**Second block read command address**	
Word 14	**Number of data words to read**	
Word 15	**First block read command address**	
Word 16	**Number of data words to read**	

NOTE: With control mode 6, words 14 and 16 combined length must be 1 ... 12.

Control Mode 7

Control Mode 7 - 1 Write And 3 Block Read Commands

Word 1	Sequence #	
Word 2	Output Configuration	Output
Word 3	**Control Mode 7**	
Word 4	Port Configuration	Slave node address
Word 5	**First single write command address - value of 0 = 400001**	
Word 6	**1 word of message output data**	
Words 7 ... 10	**Not used**	
Word 11	**Third block read command address**	
Word 12	**Number of data words to read**	
Word 13	**Second block read command address**	
Word 14	**Number of data words to read**	
Word 15	**First block read command address**	
Word 16	**Number of data words to read**	

NOTE: With control mode 7, words 14 and 16 combined length must be 1 ... 12.

Control Mode 8

Control Mode 8 - 4 Block Read Commands

Word 1	Sequence #	
Word 2	Output Configuration	Output
Word 3	**Control Mode 8- 4 block read commands**	
Word 4	Port Configuration	Slave node address
Words 5 ... 8	**Not used**	
Word 9	**Fourth block read command address**	
Word 10	**Number of data words to read**	
Word 11	**Third block read command address**	
Word 12	**Number of data words to read**	
Word 13	**Second block read command address**	
Word 14	**Number of data words to read**	
Word 15	**First block read command address**	
Word 16	**Number of data words to read**	

NOTE: With control mode 8, words 10, 14 and 16 combined length must be 1 ... 12.

Input Words

Purpose

This section describes input words.

Input Words 3x ... 3x + 15

16 words of input data are used for 6 120VAC input points and the Modbus master response buffer.

Input Words Control Mode 1

Word 1	Sequence #	
Word 2	Status	AC input
Word 3 ... 16	Message response data field	

Input Words Control Modes 2 ... 8

Word 1	Sequence #	
Word 2	Status	AC input
Word 3	Message 1 response	Message 2 response
Word 4	Message 3 response	Message 4 response
Word 5 ... 16	Message response data field	

Input Word 1

Input word 1 contains an echo of the sequence number.

- Valid settings are 1 ... FFFF
- Whenever the module is set to zero, it goes to the module shut down state.
- When the value in the first input word is not equal to the output word then a Modbus message will be sent. If not, when they are equal, there will be no message activity.
- A change in the sequence word value starts the Modbus command execution. It is your responsibility to change the output data for the Modbus message. The sequence number must be the last word of information written in order to ensure Modbus messages are correctly handled.

Input Word 2

Input word 2 contains 6 bits of 120 VAC input data and 8 bits for module status.

Input Word 1 High Byte (Status).

Bit 15 (MSB)	0= message processing done 1= message in process
Bit 14	Copy of output 3
Bit 13	Copy of output 2
Bit 12	Copy of output 1
Bit 11	Not used
Bit 9	1= fuse ok 0= fuse blown
Bit 8	1= module healthy 0= module not healthy

Input Word 1 Low Byte (Input Data Values).

Bit 7 ... 6	Not used
Bit 5	Input 6
Bit 4	Input 5
Bit 3	Input 4
Bit 2	Input 3
Bit 1	Input 2
Bit 0 (LSB)	Input 1

Input Words Control Modes

Purpose

This section describes input words control modes.

Input Words 3 ... 4

NOTE: In control mode 0, input words 3 and 4 are zeroed.

NOTE: The message response code is contained in the Modbus message itself, so control mode 1, input buffer words 3 ... 16 are used as the actual message.

NOTE: For control modes 2 ... 8, all four response fields are present whether used or not. The table below shows the input message responses to words 3 and 4.

Control Modes 2 ... 8

Input Word 3 High Byte	**Input Word 3 Low Byte**
Message 1 response	Message 2 response
Input Word 4 High Byte	**Input Word 4 Low Byte**
Message 3 response	Message 4 response

Input Words 5 ... 16

Input words 5 ... 16 contain Modbus message response data.

NOTE: Refer to *General Modbus Message Rules, page 312*.

Input Words Mode Memory Allocation

The tables below describe the specific memory allocation for each control mode.

Control Mode 0

Control Mode 0 - Idle, Clear Response Buffer

Word 1	Sequence #	
Word 2	Status	6 120Vac inputs
Word 3 ... 16	**Message data field = (00) hex**	

Control Mode 1

Control Mode 1 - Modbus Message

Word 1	Sequence #	
Word 2	Status	6 120Vac inputs
Word 3 ... 16	**Modbus Message data response**	

Control Mode 2 and 4

Control Mode 2 and 4 - Write Commands

Word 1	Sequence #	
Word 2	Status	6 120Vac inputs
Word 3	Message 1 response	Message 2 response
Word 4	Message 3 response	Message 4 response
Word 5 ... 16	**Not used. Input data values are 0**	

Control Mode 3 and 5

Control Mode 3 and 5 - 1 Write Command and 1 Block Read Command

Word 1	Sequence #	
Word 2	Status	6 120Vac inputs
Word 3	Message 1 response	Message 2 response
Word 4	Message 3 response	Message 4 response
Word 5 ... 16	**12 words of message input data**	

Control Mode 6

Control Mode 6 - 2 Single Write Commands and 2 Block Read Commands

Word 1	Sequence #	
Word 2	Status	6 120Vac inputs
Word 3	Message 1 response	Message 2 response
Word 4	Message 3 response	Message 4 response
Word 5 ... 16	**12 words shared between 2 input responses**	

Control Mode 7

Control Mode 7 - 1 Write Command and 3 Block Read Commands

Word 1	Sequence #	
Word 2	Status	6 120Vac inputs
Word 3	Message 1 response	Message 2 response
Word 4	Message 3 response	Message 4 response
Word 5 ... 16	**12 words shared between 3 input responses**	

Control Mode 8

Control Mode 8 - 4 Block Read Commands

Word 1	Sequence #	
Word 2	Status	6 120Vac inputs
Word 3	Message 1 response	Message 2 response
Word 4	Message 3 response	Message 4 response
Word 5 ... 16	**12 words shared between 4 input responses**	

170 ADM 690 50 120 VAC - 10 Pt. In / 8 Pt. Out Module Bases

22

Overview

This chapter describes the 170 ADM 690 50 TSX Momentum I/O base.

What's in this Chapter?

This chapter contains the following topics:

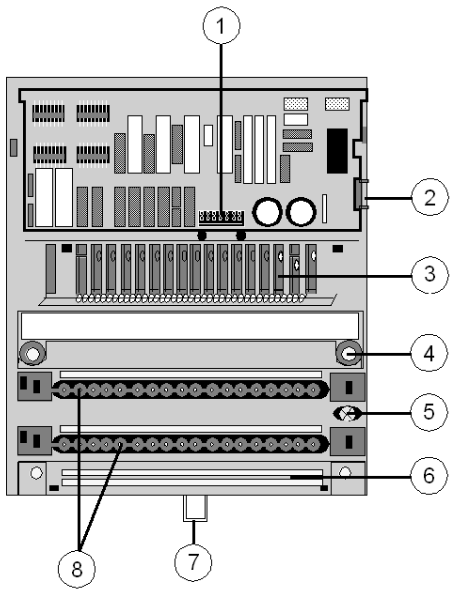
Front Panel Components

Overview

This section contains an illustration of the front panel of the 170 ADM 690 50 I/O base and a description of the LEDs.

Front Panel Illustration

The front panel of the I/O base is shown in the illustration below.

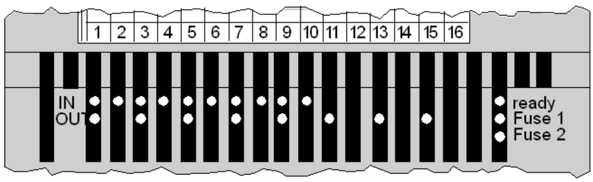


Components of the I/O module

Label	Description
1	Internal interface (ATI) connector
2	Locking and ground contact for the adapter
3	LED status display
4	Mounting holes for panel mount
5	Grounding screw
6	Busbar Mounting Slot
7	Locking tab for DIN rail mount
8	Sockets for the terminal connectors

LED Illustration

TheLEDs are shown in the illustration below.



LED Descriptions

The LEDs are described in the table below.

Indicator	Condition	Message
Ready	Green	Module is ready to communicate. Operating voltage for internal logic (5 V) is present.
	Off	Module not ready.
FUSE 1	Green	Output voltage of outputs 1 ... 4 (one common output voltage for group 1) present and fuse 1 is OK.
	Off	Output voltage of outputs 1 ... 4 (one common output voltage for group 1) is not present and/or fuse 1 is defective
FUSE 2	Green	Output voltage of outputs 5 ... 8 (one common output voltage for group 2) present and fuse 1 is OK.
	Off	Output voltage of outputs 5 ... 8 (one common output voltage for group 2) is not present and/or fuse 1 is defective
Upper row IN 1...10	Green	Input status (an LED per input); Input point active, ie. input carries a 1 signal (logically ON)
	Off	Input status (an LED per input); Input point inactive, ie. input carries a 0 signal (logically OFF)
Middle row OUT 1,3 ,5 ,7 , 9, 11, 13, 15	Green	Output status (an LED per output); Output point active, ie. output carries a 1 signal (logically ON)
	Off	Output status (an LED per output) Output point inactive, ie. Output carries a 0 signal (logically OFF)

Specifications

Overview

This section contains specifications for the 170 ADM 690 50 I/O base.

General Specifications

Module type	10 discrete inputs in 1 group 8 triac outputs in 1 group (in 2 fuse groups)
Supply voltage	120 VAC
Supply voltage range	100 ... 132 VAC @ 47...63Hz
Supply current consumption	max. 160 mA at 120 VAC
Power dissipation	6 W + ((# of input points on x .144 W) + (# of output points on x .75 W))
I/O map	1 input word 1 output word

Isolation

Input to input	none
Output group to output group	none
Input to output group	125 VAC, tested with 1780 VAC
Field to communication adapter	125 VAC, tested with 1780 VAC

Fuses

Internal	Wickman 19195-2.5 ANote If you replace this fuse, you must use a Ferraz type W 020547 (UL listed).
External: operating voltage (L1)	315 mA fast-blow, 250 V
External: input voltage (2L1)	max. 4 A fast-blow, 250 V
External: output voltage (1L1)	According to the supply of the connected actuators–not to exceed 8 A slow-blow

EMC

Immunity	IEC 1131-2 Surge on auxiliary power supply 2 KV to PE, 1 KV to differential
Emissions	EN 50081-2
Agency approvals	UL, CSA, CE, FM Class 1 Div. 2

Physical Dimensions

Width	125 mm (4.9 in)
Depth (with no adapter)	40 mm (1.54 in)
Length	141.5 mm (5.5 in) no or one busbar 159.5mm (6.3in) two busbars 171.5 mm (6.75in) three busbars
Weight	220 g (0.49 lb)

Discrete Inputs

Number of points	10
Number of groups	1
Signal type	120 VAC
IEC 1131 type	2 (See Appendix *IEC 1131 Input Types, page 603* for definitions of IEC input types.)
ON voltage	74 AC
OFF voltage	20 AC
Input current	6 mA minimum ON 2.6 mA maximum OFF
Input voltage range	74 ... 132 VAC
Input resistance	4 kOhm
Response time	max. 1/2 x 1/f ms OFF to ON max. 1/2 x 1/f ms ON to OFF

Discrete Outputs

Output type	Triac
Output supply voltage	120 AC
Output supply voltage range	100 ... 132 VAC
Output voltage	External supply - 1.5 VAC
Number of points	8
Number of groups	1
Points per group	8, but 2 fuses
Current capacity	0.5 A/point maximum, 30 mA/point minimum 2 A/group 4 A/module
Signal type	True High
Leakage current (output out)	< 1.3 mA @120 VAC

On state voltage drop	< 1.5 VAC @ 0.5 A
Fault sensing	One common voltage supply for output 1 .. 4 and output 5 ... 8, each is protected by an internal fuse against short-circuits (but not against overload). Each output is provided with an RC network (normal mode noise voltage rejection) and a Varistor (surge protection).
Fault reporting	none
Error indication	none
Response time (resistive load / 0.5 A)	max. 1/2 x 1/f ms OFF to ON max. 1/2 x 1/f ms ON to OFF
Maximum switching cycles	3000/h for 0.5 A inductive load

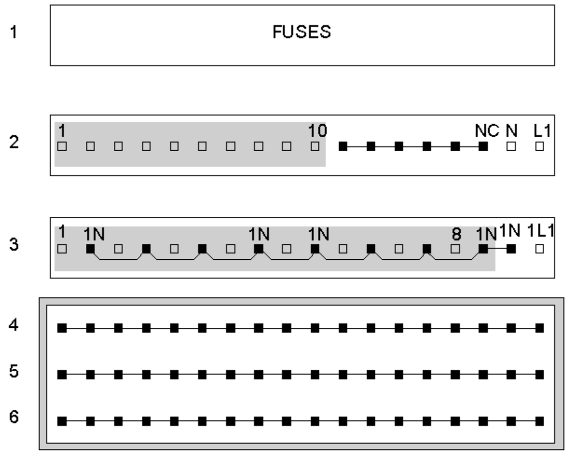
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base and an optional busbar.

Illustration

Rows 1 through 3 show the internal connections between terminals on the I/O base. Row 4 through 6 show the internal connections on the optional busbar.



Field Wiring Guidelines

Overview

Inputs are field wired to row 2 of the I/O base. Outputs are field wired to row 3. This section contains wiring guidelines and precautions for wiring the 170 ADM 690 50 TSX Momentum I/O base.

Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Electric sells terminal connectors in sets of three.

Type	Part Number
Screw-in	170 XTS 001 00
Spring-clip	170 XTS 002 00

Busbar May Be Required

Depending on the type of field devices you are using, you may need a 1-, 2-, or 3-row busbar. The following busbars are available from Schneider Electric.

Type	Number of Rows	Part Number
Screw-in	1 - row	170 XTS 006 01
	2 - row	170 XTS 005 01
	3 - row	170 XTS 004 01
Spring-clip	1 - row	170 XTS 007 01
	2 - row	170 XTS 008 01
	3 - row	170 XTS 003 01

Mapping Terminal Blocks

⚠ CAUTION

POTENTIAL FOR SHORT CIRCUITS AND/OR POWER-UP SPIKES

Provide external fuses on the operating voltage to protect the module. Appropriate fuse values are shown in the wiring illustration. An unprotected module may be subject to short circuits and/or power-up spikes.

Failure to follow these instructions can result in injury or equipment damage.

The following table shows mapping terminal blocks and optional busbars.

Row	Terminal	Function
1	FUSE 1, FUSE 2	Internal fuses for output voltages
2	1 ... 10	Inputs
	11 ... 16	Connected internally within the row, for general purpose use
	17	Return (N)
	18	120 VAC Operating voltage (L1)
3	1, 3, 5, 7, 9, 11, 13, 15	Outputs
	2, 4, 6, 8, 10, 12, 14, 16	Return (1N) for the actuators
	17	Return for the output voltage
	18	20 ... 132 VAC Output voltage for terminal pins 1 ... 8 (1L1)
4	1 ... 18	120 VAC Input voltage (2L1)
5	1 ... 18	Return (2N) for sensors
6	1 ... 18	Protective earth (PE)

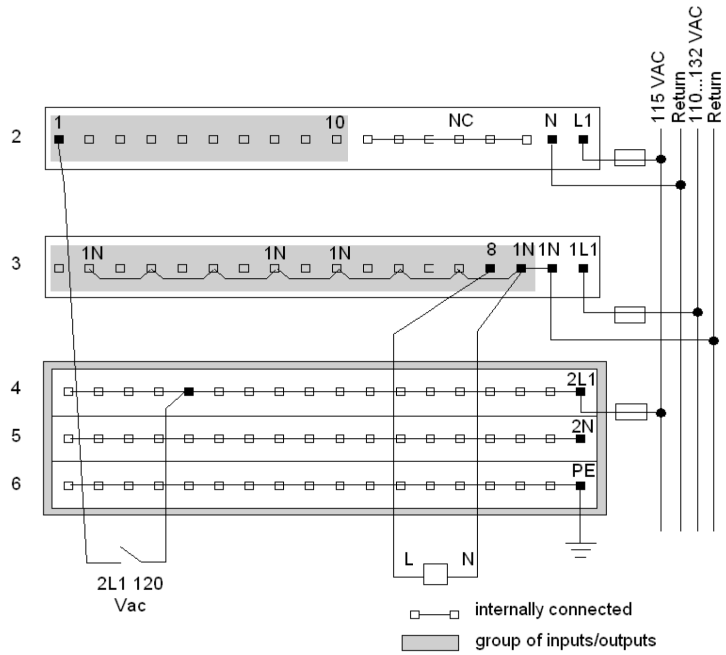
Wiring Diagrams

Overview

This section provides diagrams to assist you in wiring the following types of devices:
- 2-wire sensor with a 2-wire actuator
- 4-wire sensor with a 3-wire actuator

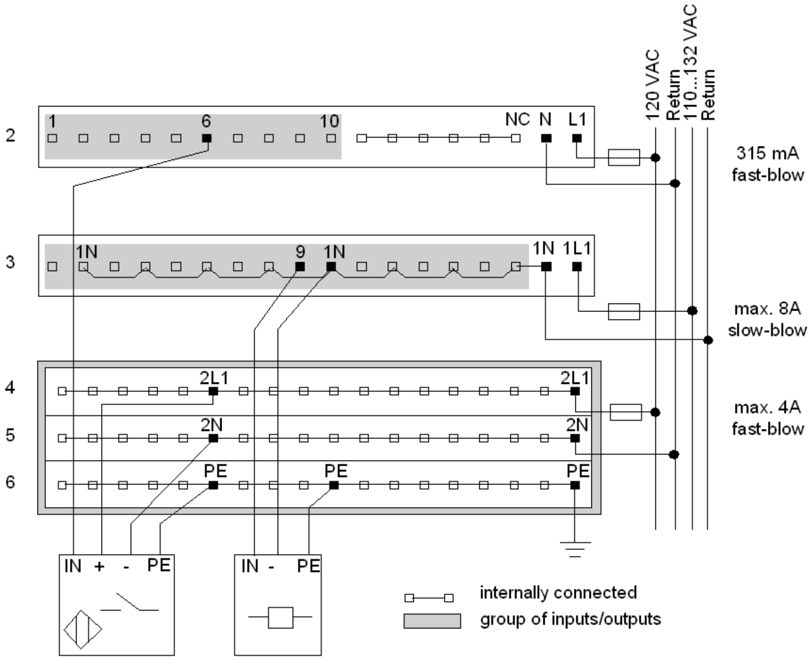
2-Wire Sensor with a 2-Wire Actuator

The diagram below shows field wiring for a 2-wire sensor and a 2-wire actuator.



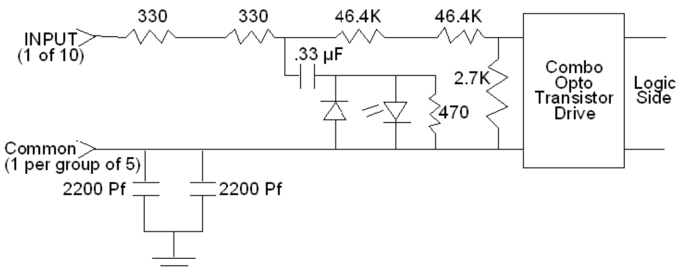
4-Wire Sensor with a 3-Wire Actuator

The diagram below shows field wiring for a 4-wire sensor and a 3-wire actuator. When using 3-phase current for supply L1, 1L1 and 2L1 must come from one phase.



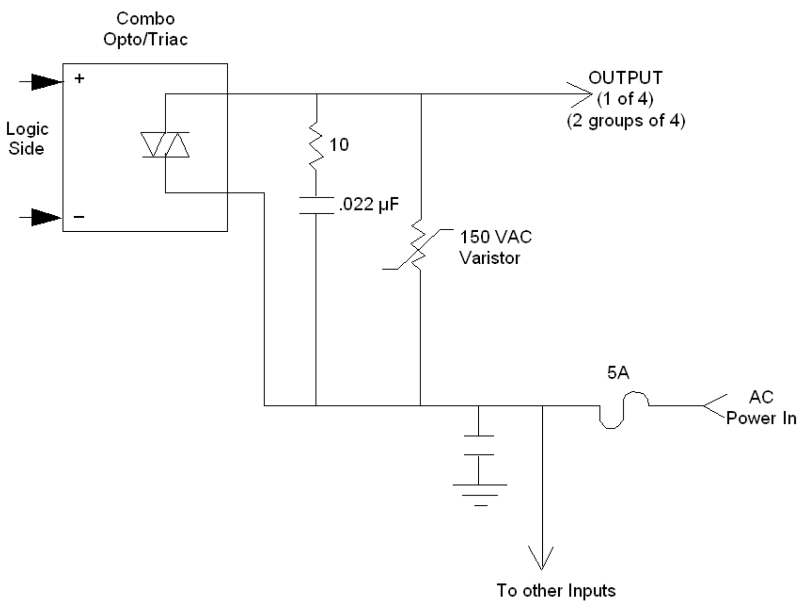
Simplified Input Schematics

The following diagram shows the field-side input circuitry.



Simplified Output Schematics

The following diagram shows the field-side output circuitry.



I/O Mapping

Overview

The 170 ADM 690 50 TSX Momentum I/O base supports 10 discrete inputs and 8 discrete outputs. This section contains information about the mapping of the I/O data into input words and output words.

I/O Map

The I/O base may be mapped as one input word and one output word, or as 10 discrete input points and 8 discrete output points.

IEC vs. Ladder Logic

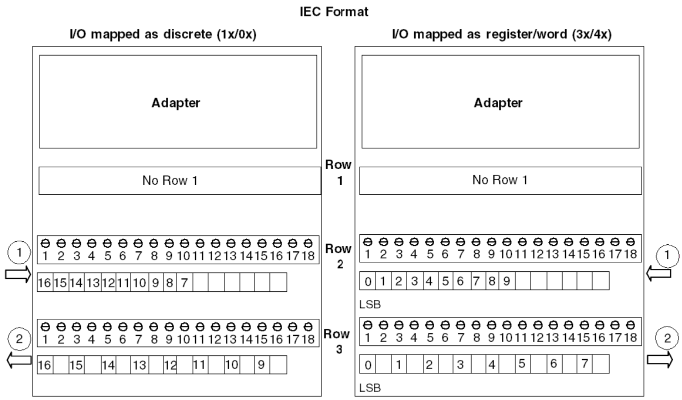
In order to correctly field wire the inputs/outputs and map the input /output data, you need to know which type of Momentum Adapter is mounted on the base.

Adapters may be either IEC compliant or 984 Ladder Logic compliant.

	IEC Compliant	**984 Ladder Logic Compliant**
Momentum Processor Adapters	All	None
Momentum Communication Adapters	All, except 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01	170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01

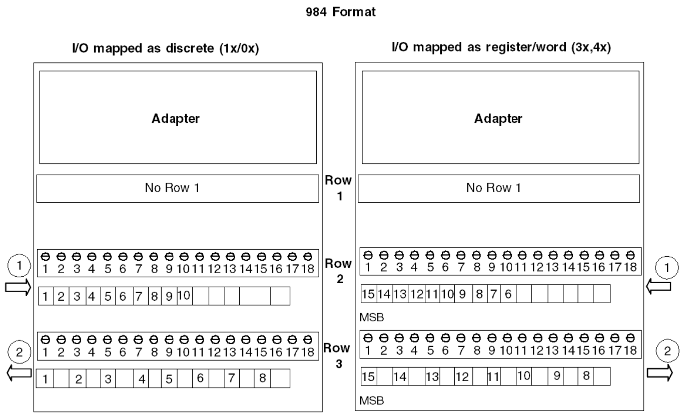
Data Mapping

The figure below shows how data is mapped on the I/O base with an IEC Compliant adapter. When the I/O is mapped as discrete points (1x/0x), the MSB is assigned to Pin1 and the LSB is assigned to Pin 16. When the I/O is mapped as a word or register (3x/4x), the MSB (bit 15) is assigned to Pin 16 and the LSB (bit 0) is assigned to Pin 1.



1 inputs
2 outputs

The figure below shows how data is mapped on the I/O base with a Ladder Logic Compliant adapter. When the I/O is mapped as discrete points (1x/0x), the MSB is assigned to Pin16 and the LSB is assigned to Pin 1. When the I/O is mapped as a word or register (3x/4x), the MSB (bit 15) is assigned to Pin 1 and the LSB (bit 0) is assigned to Pin 16.



1 inputs
2 outputs

170 ADM 690 51 120 VAC - 10 Pt. In / 8 Pt. Out Module Bases

23

Overview

This chapter describes the 170 ADM 690 51 TSX Momentum I/O base.

What's in this Chapter?

This chapter contains the following topics:

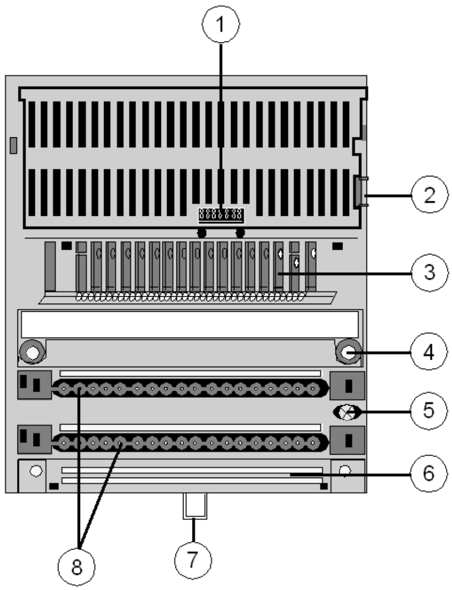
Front Panel Components

Overview

This section contains an illustration of the front panel of the 170 ADM 690 51 I/O base and a description of the LEDs.

Front Panel Illustration

The front panel of the I/O base is shown in the illustration below.

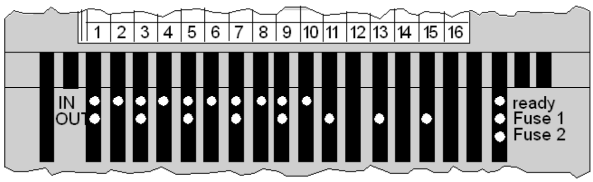


Components of the I/O module

Label	Description
1	internal interface (ATI) connector
2	locking and ground contact for the adapter
3	LED status display
4	mounting holes for panel mount
5	grounding screw
6	busbar mounting slot
7	locking tab for DIN rail mount
8	sockets for the terminal connectors

LED Illustration

TheLEDs are shown in the illustration below.



LED Descriptions

The LEDs are described in the table below.

Indicator	Condition	Message
Ready	Green	Module is ready to communicate. Operating voltage for internal logic (5 V) is present.
	Off	Module not ready.
FUSE 1	Green	Output voltage of outputs 1 ... 4 (one common output voltage for group 1) present and fuse 1 is OK.
	Off	Output voltage of outputs 1 ... 4 (one common output voltage for group 1) is not present and/or fuse 1 is defective
FUSE 2	Green	Output voltage of outputs 5 ... 8 (one common output voltage for group 2) present and fuse 1 is OK.
	Off	Output voltage of outputs 5 ... 8 (one common output voltage for group 2) is not present and/or fuse 1 is defective
Upper row IN 1...10	Green	Input status (an LED per input); Input point active, i.e., input carries a 1 signal (logically ON)
	Off	Input status (an LED per input); Input point inactive, i.e., input carries a 0 signal (logically OFF)
Middle row OUT 1,3 ,5 ,7 , 9, 11, 13, 15	Green	Output status (an LED per output); Output point active, i.e., output carries a 1 signal (logically ON)
	Off	Output status (an LED per output) Output point inactive, i.e., output carries a 0 signal (logically OFF)

Specifications

Overview

This section contains specifications for the 170 ADM 690 51 I/O base.

General Specifications

Module type	10 discrete inputs in 1 group 8 triac outputs in 1 group (in 2 fuse groups)
Supply voltage	120 VAC
Supply voltage range	100 ... 132 VAC @ 47...63Hz
Supply current consumption	max. 160 mA at 120 VAC
Power dissipation	6 W + ((# of input points on x .144 W) + (# of output points on x .75 W))
I/O map	1 input word 1 output word

Isolation

Input to input	none
Output group to output group	none
Input to output group	125 VAC, tested with 1780 VAC
Field to communication adapter	125 VAC, tested with 1780 VAC

Fuses

Internal	Wickman 19195-2.5 ANote If you replace this fuse, you must use a Ferraz type W 020547 (UL listed).
External: operating voltage (L1)	315 mA fast-blow, 250 V
External: input voltage (2L1)	max. 4 A fast-blow, 250 V
External: output voltage (1L1)	According to the supply of the connected actuators–not to exceed 8 A slow-blow

EMC

Immunity	IEC 1131-2 Surge on auxiliary power supply 2 KV to PE, 1 KV to differential
Emissions	EN 50081-2
Agency approvals	UL, CSA, CE, FM Class 1 Div. 2

Physical Dimensions

Width	125 mm (4.9 in)
Depth (with no adapter)	40 mm (1.54 in)
Length	141.5 mm (5.5 in) no or one busbar 159.5mm (6.3in) two busbars 171.5 mm (6.75in) three busbars
Weight	220 g (0.49 lb)

Discrete Inputs

Number of points	10
Number of groups	1
Signal type	120 VAC
IEC 1131 type	2 (See Appendix *IEC 1131 Input Types, page 603* for definitions of IEC input types.)
ON voltage	74 AC
OFF voltage	20 AC
Input current	6 mA minimum ON 2.6 mA maximum OFF
Input voltage range	74 ... 132 VAC
Input resistance	4 kOhm
Response time	max. 1/2 x 1/f ms OFF to ON max. 1/2 x 1/f ms ON to OFF

Discrete Outputs

Output type	Triac
Output supply voltage	120 AC
Output supply voltage range	100 ... 132 VAC
Output voltage	External supply - 1.5 VAC
Number of points	8
Number of groups	1
Points per group	8, but 2 fuses
Current capacity	0.5 A/point maximum, 30 mA/point minimum 2 A/group 4 A/module
Signal type	True High
Leakage current (output out)	< 1.3 mA @120 VAC

On state voltage drop	< 1.5 VAC @ 0.5 A
Fault sensing	One common voltage supply for output 1 .. 4 and output 5 ... 8, each is protected by an internal fuse against short-circuits (but not against overload). Each output is provided with an RC network (normal mode noise voltage rejection) and a Varistor (surge protection).
Fault reporting	none
Error indication	none
Response time (resistive load / 0.5 A)	max. 1/2 x 1/f ms OFF to ON max. 1/2 x 1/f ms ON to OFF
Maximum switching cycles	3000/h for 0.5 A inductive load

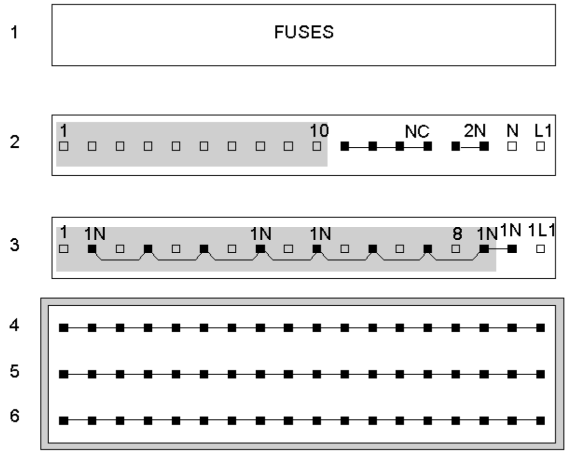
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base and an optional busbar.

Illustration

Rows 1 through 3 show the internal connections between terminals on the I/O base. Row 4 through 6 show the internal connections on the optional busbar.



Field Wiring Guidelines

Overview

Inputs are field wired to row 2 of the I/O base. Outputs are field wired to row 3. This section contains wiring guidelines and precautions for wiring the 170 ADM 690 51 TSX Momentum I/O base.

Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Electric sells terminal connectors in sets of three.

Type	Part Number
Screw-in	170 XTS 001 00
Spring-clip	170 XTS 002 00

Busbar May Be Required

Depending on the type of field devices you are using, you may need a 1-, 2-, or 3-row busbar. The following busbars are available from Schneider Electric.

Type	Number of Rows	Part Number
Screw-in	1 - row	170 XTS 006 01
	2 - row	170 XTS 005 01
	3 - row	170 XTS 004 01
Spring-clip	1 - row	170 XTS 007 01
	2 - row	170 XTS 008 01
	3 - row	170 XTS 003 01

Mapping Terminal Blocks

CAUTION

POTENTIAL FOR SHORT CIRCUITS AND/OR POWER-UP SPIKES

Provide external fuses on the operating voltage to protect the module. Appropriate fuse values are shown in the wiring illustration. An unprotected module may be subject to short circuits and/or power-up spikes.

Failure to follow these instructions can result in injury or equipment damage.

The following table shows mapping terminal blocks and optional busbars.

Row	Terminal	Function
1	FUSE 1, FUSE 2	Internal fuses for output voltages
2	1 ... 10	Inputs
	11 ... 14	Connected internally within the row, for general purpose use
	15 ... 16	2N for inputs
	17	Return (N)
	18	120 VAC Operating voltage (L1)
3	1, 3, 5, 7, 9, 11, 13, 15	Outputs
	2, 4, 6, 8, 10, 12, 14, 16	Return (1N) for the actuators
	17	Return for the output voltage
	18	20 ... 132 VAC Output voltage for terminal pins 1 ... 8 (1L1)
4	1 ... 18	120 VAC Input voltage (2L1)
5	1 ... 18	Return (2N) for sensors
6	1 ... 18	Protective earth (PE)

Wiring Diagrams

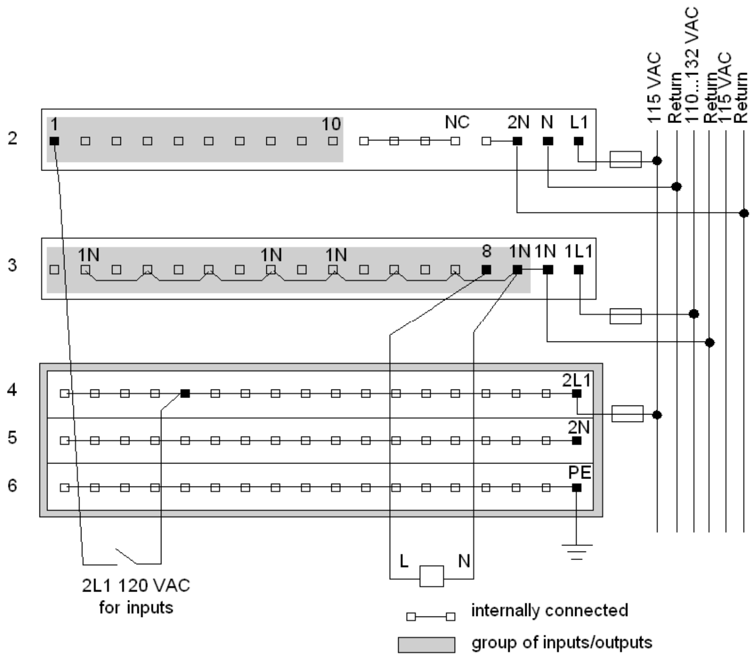
Overview

This section provides diagrams to assist you in wiring the following types of devices:

- 2-wire sensor with a 2-wire actuator
- 4-wire sensor with a 3-wire actuator
- Wiring a 170 ADM 690 51 as a 170 ADM 690 50

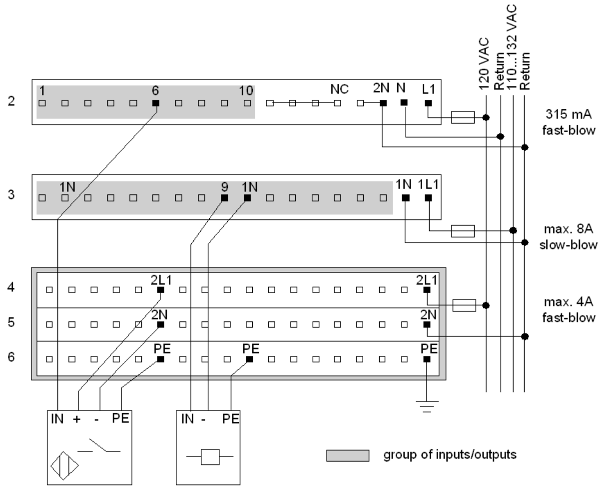
2-Wire Sensor with a 2-Wire Actuator

The diagram below shows field wiring for a 2-wire sensor and a 2-wire actuator.



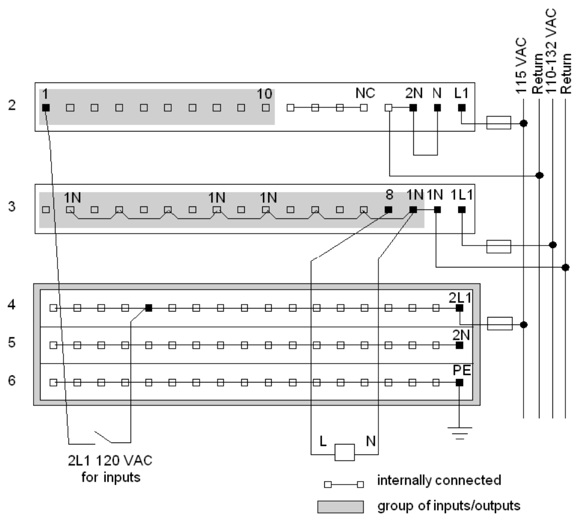
4-Wire Sensor with a 3-Wire Actuator

The diagram below shows field wiring for a 4-wire sensor and a 3-wire actuator. When using 3-phase current for supply L1, 1L1 and 2L1 must come from one phase.



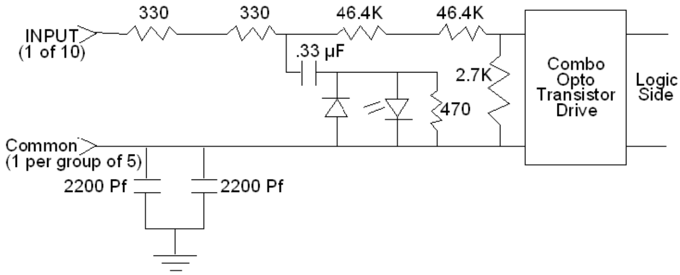
Wiring a 170 ADM 690 51 as a 170 ADM 690 50

The following diagram shows the field-side input circuitry.



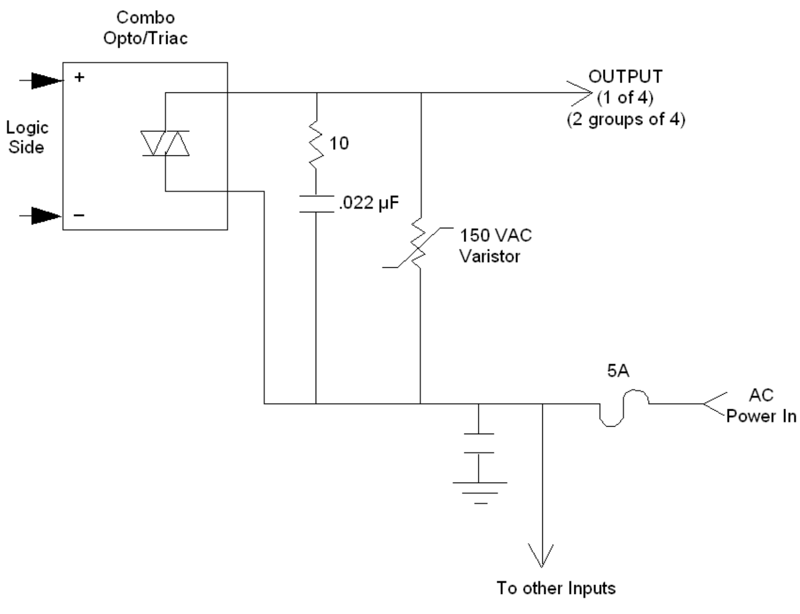
Simplified Input Schematics

The following diagram shows the field-side input circuitry.



Simplified Output Schematics

The following diagram shows the field-side output circuitry.



I/O Mapping

Overview

The 170 ADM 690 51 TSX Momentum I/O base supports 10 discrete inputs and 8 discrete outputs. This section contains information about the mapping of the I/O data into input words and output words.

I/O Map

The I/O base may be mapped as one input word and one output word, or as 10 discrete input points and 8 discrete output points.

IEC vs. Ladder Logic

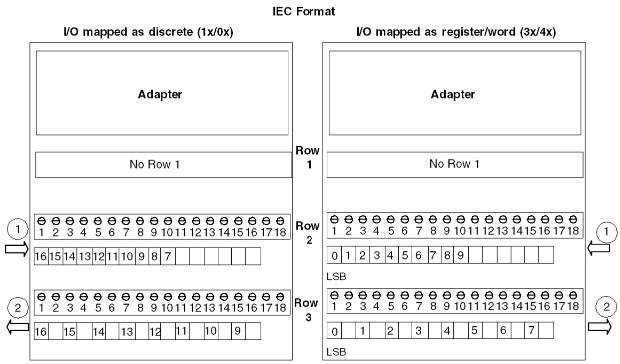
In order to correctly field wire the inputs/outputs and map the input/output data, you need to know which type of Momentum Adapter is mounted on the base.

Adapters may be either IEC compliant or 984 Ladder Logic compliant.

	IEC Compliant	**984 Ladder Logic Compliant**
Momentum Processor Adapters	All	None
Momentum Communication Adapters	All, except 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01	170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01

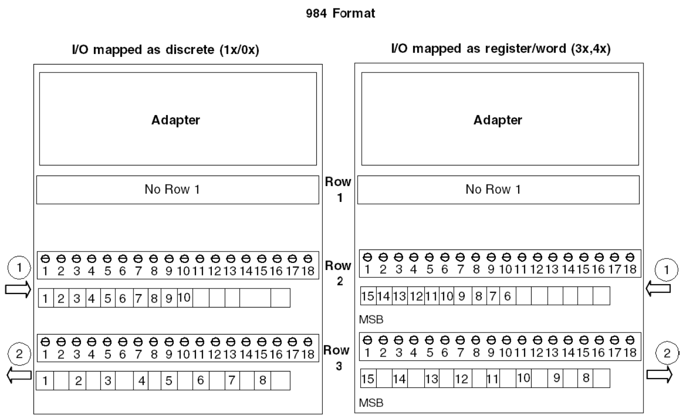
Data Mapping

The figure below shows how data is mapped on the I/O base with an IEC Compliant adapter. When the I/O is mapped as a discrete (1x/0x), the MSB is assigned to Pin 1 and the LSB is assigned to Pin 16. When the I/O is mapped as a word or register (3x/4x), the MSB (bit 15) is assigned to Pin 16 and the LSB (bit 0) is assigned to Pin 1.



1 inputs
2 outputs

The figure below shows how data is mapped on the I/O base with a Ladder Logic Compliant adapter. When the I/O is mapped as a discrete (1x/0x), the MSB is assigned to Pin 16 and the LSB is assigned to Pin 1. When the I/O is mapped as a word or register (3x/4x), the MSB (bit 15) is assigned to Pin 1 and the LSB (bit 0) is assigned to Pin 16.



1 inputs
2 outputs

170 ADM 850 10 10 to 60 VDC Module Base

24

Overview

This chapter describes the 170 ADM 850 10 module base.

What's in this Chapter?

This chapter contains the following topics:

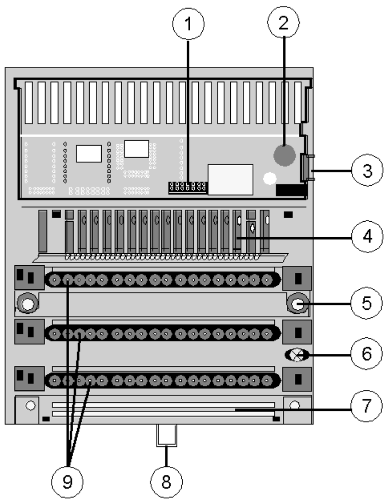
Front Panel Components

Overview

This section contains an illustration of the front panel of the 170 ADM 850 10 Momentum I/O base and a description of the LEDs.

Front Panel Illustration

The front panel of the I/O base is shown in the illustration below.

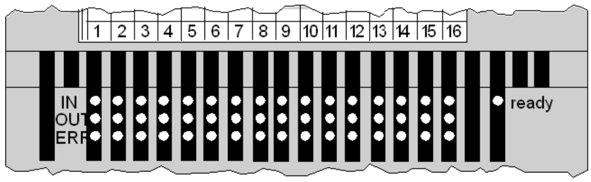


Components of the I/O module:

Label	Description
1	Internal interface (ATI) connector
2	Ground nut standoff
3	Locking and ground contact for the adapter
4	LED status display
5	Mounting holes for panel mount
6	Grounding screw
7	Busbar Mounting Slot
8	Locking tab for DIN rail mount
9	Sockets for the terminal connectors

LED Illustration

The LEDs are shown in the illustration below.



LED Descriptions

The LEDs are described in the table below.

Indicator	Condition	Message
Ready	Green	Module is ready to communicate. Operating voltage for internal logic (5 V) is present.
	Off	Module not ready.
Upper row IN 1...16	Green	Input status (an LED per input); Input point active, ie. input carries a 1 signal (logically ON)
	Off	Input point inactive, ie. input carries a 0 signal (logically OFF)
Middle row OUT 1...16	Green	Output status (an LED per output); Output point active, ie. output carries a 1 signal (logically ON)
	Off	Output point inactive, ie. Output carries a 0 signal (logically OFF)
Lower row ERR 1...16	Red	Output overload (an LED per output). Short circuit or overload on the corresponding output.
	Off	Outputs 1 ... 16 operating normally.

Specifications

Overview

This section contains specifications for the 170 ADM 850 10 Momentum I/O base.

General Specifications

Module type	16 discrete inputs in 1 group 16 discrete outputs in 1 group
Supply voltage	10-60 VDC
Supply voltage range	10-60 VDC
Supply current consumption max	500 mA at 12 VDC 250 mA at 24 VDC 125 mA at 48 VDC
Power dissipation	6 W + ((# of input points on x .144 W) + (# of output points on x .25 W))
I/O map	1 input word or 16 discrete inputs 1 output word or 16 discrete outputs

Isolation

Input to input	none
Output group to output group	none
Input to output	707 VDC
Logic to output	707 VDC
Field to protective earth	707 VDC
Input to output	707 VDC
Field to communication adapter	Defined by Communication Adapter type

Fuses

Internal	none
External: operating voltage (row 1)	12 VDC-630 mA fast-blow 24 VDC-315 mA fast-blow 48 VDC-200 mA fast-blow
External: input reference voltage (row 3)	1 A slow-blow (Bussmann GDC-1A or equivalent)
External: output voltage (row 2)	According to the supply of the connected actuators, not to exceed 8 A fast-blow.

EMC

Immunity	IEC 1131-2 Surge on auxiliary power supply, 500V
Emissions	EN 50081-2 (limitation A)
Agency approvals	UL, CSA, CE, FM Class 1, Div. 2 pending

Physical Dimensions

Width	125 mm (4.9 in)
Depth (with no adapter)	40 mm (1.54 in)
Length	141.5 mm (5.5 in) with or without one busbar 159.5mm (6.3in) two busbars 171.5 mm (6.75in) three busbars
Weight	200 g (0.44 lb)

Discrete Inputs

Number of points	16
Number of groups	1
Points per group	16
Signal type	True High
IEC 1131 type	1+ (See Appendix for definitions of IEC input types.)
Input Voltage Level	
12 VDC +20%,-15% 24 VDC +25%,-20% 48 VDC +25%,-20%	>7.5 VDC On, <2.5 VDC Off >11 VDC On, <5 VDC Off >30 VDC On, <10 VDC Off

OFF State Leakage Current	
12 VDC 24 VDC 48 VDC	1.5 mA and lower 1.5 mA and lower 1.5 mA and lower
Input Operating Current	
12 VDC ON Current 24 VDC ON Current 48 VDC ON Current	2.3 mA 2.7 mA 2.9 mA
Input voltage range	10-60 VDC
Input voltage surge	75 volts peak for 10ms
Response time	2.2 ms OFF to ON 3.3 ms ON to OFF

NOTE: Discrete 10-60 VDC inputs require an Input Voltage Reference (row 3 terminal block, terminals 17 and 18). The Input Voltage Reference must be the same voltage level as the voltage level as supplied to the inputs. This reference is required for the module to select the correct Turn On and Turn Off thresholds for the inputs.

Discrete Outputs

Output type	Solid state switch
Output supply voltage	10-60 VDC
Number of points	16
Number of groups	1
Current capacity	0.5 A/point maximum 8 A/module up to 50 degrees C 7 A/module from 50 degrees C to 60 degrees C
Signal type	True High (sourcing)
Leakage current (output out)	< 1 mA @ 60 VDC
Surge (inrush) current	5 A for 1 ms
On state voltage drop	< 1.0 VDC @ 0.5 A
Fault sensing (See Note Below)	Outputs are electronically safeguarded to assist in short circuit and overload protection
Fault reporting	1 red LED/point (row 3) ON when short current/ overload occurs
Error indication	Output overload for at least one output (I/O-Error) to communication adapter

Response time (resistive load / 0.5 A)	< 2.5 ms OFF to ON < 2.5 ms ON to OFF
Maximum switching cycles	1000/h for 0.5 A inductive load 100/s for 0.5 A resistive load 8/s for 1.2 W Tungsten load

NOTE: Discrete 10-60 VDC outputs incorporate thermal shutdown and overload protection. The output current of a shortened output is limited to a nondestructive value. The short circuit heats the output driver and the output will switch off. The output will switch on again if the driver drops below the overtemperature threshold. If the short circuit still exists, the driver will reach the overtemperature condition again and will switch off again.

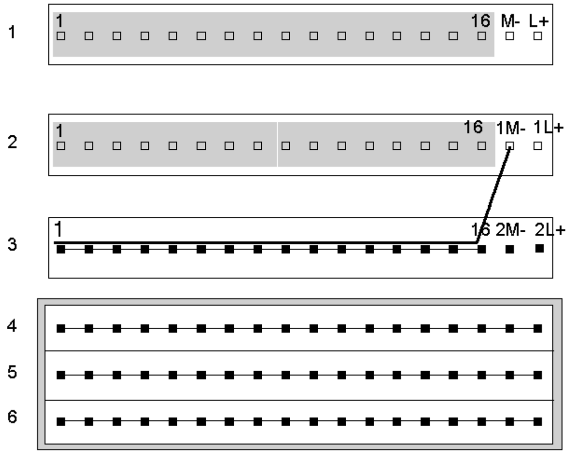
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base and an optional busbar.

Illustration

Rows 1 through 3 show the internal connections between terminals on the I/O base. Row 4 through 6 show the internal connections on the optional busbar.



Field Wiring Guidelines

Overview

Inputs are field wired to row 1 of the base. The outputs are field wired to row 2. This section contains wiring guidelines and precautions.

Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Automation sells terminal connectors in sets of three.

Type	Part Number
Screw-in	170 XTS 001 00
Spring-clip	170 XTS 002 00

Busbar May Be Required

Depending on the type of field devices you are using, you may need a 1-, 2-, or 3-row busbar. The following busbars are available from Schneider Automation.

Type	Number of Rows	Part Number
Screw-in	1 - row	170 XTS 006 01
	2 - row	170 XTS 005 01
	3 - row	170 XTS 004 01
Spring-clip	1 - row	170 XTS 007 01
	2 - row	170 XTS 008 01
	3 - row	170 XTS 003 01

Mapping Terminal Blocks

⚠ CAUTION

POTENTIAL FOR SHORT CIRCUITS AND/OR POWER-UP SPIKES

Provide external fuses on the operating voltage to protect the module. Appropriate fuse values are shown in the wiring illustration. An unprotected module may be subject to short circuits and/or power-up spikes.

Failure to follow these instructions can result in injury or equipment damage.

The following table shows mapping terminal blocks and optional busbars.

Row	Terminal	Function
1	1 through 16	Inputs 1 through 16
1	17	Power supply return for module (M-)
1	18	+10 to 60 VDC power for module (L+
2	1 through 16	Outputs 1 through 16
2	17	Power supply return for outputs (1M-)
2	18	+10 to 60 VDC power for outputs (1L+)
3	1 through 16	Return connections for outputs
3	17	Power supply return for input voltage reference (2M-)
3	18	+10 to 60 VDC input reference voltage (2L+)
4	1 through 18	Input voltage for I1...I16 or PE
5	1 through 18	Return (M-)
6	1 through 18	Protective Earth (PE)

Protective Circuit May Be Required

When contacted switches are used on the input lines or when lines to the peripherals are very long, the outputs of inductive loads require protective circuitry with a clamping/suppressor diode. Install the protective circuit parallel to the operating coil.

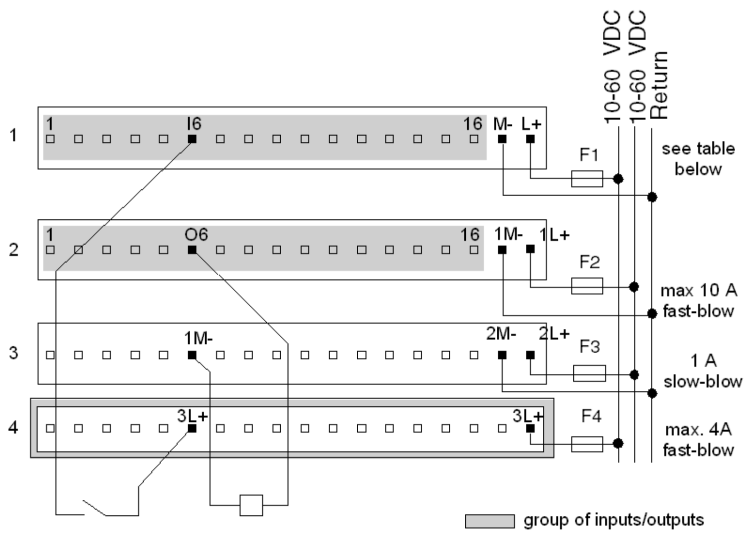
Wiring Diagrams

Overview

This section provides diagrams to assist you in wiring the following types of devices:
- 2-wire devices
- sensors activated by an output
- 4-wire sensors with a 2-wire actuator
- broken wire detection

2-Wire Devices

The diagram below shows an example of wiring two-wire devices.

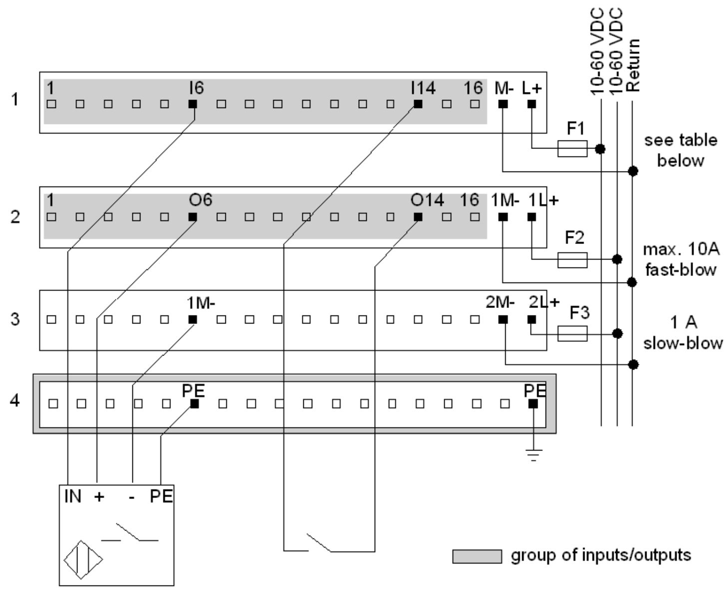


Fuse table for F1

Voltage	Fuse
12 VDC	1 A slow-blow
24 VDC	1 A slow-blow
48 VDC	1 A slow-blow

Sensor Activated by Output

The wiring diagram below shows an example of a sensor activated by an output. The diagram shows the sensors being supplied with voltage only when the outputs on pins 6 and 14, row 2, are high. The inputs from pins 6 and 14, row 1, can be high only when the associated outputs are high.

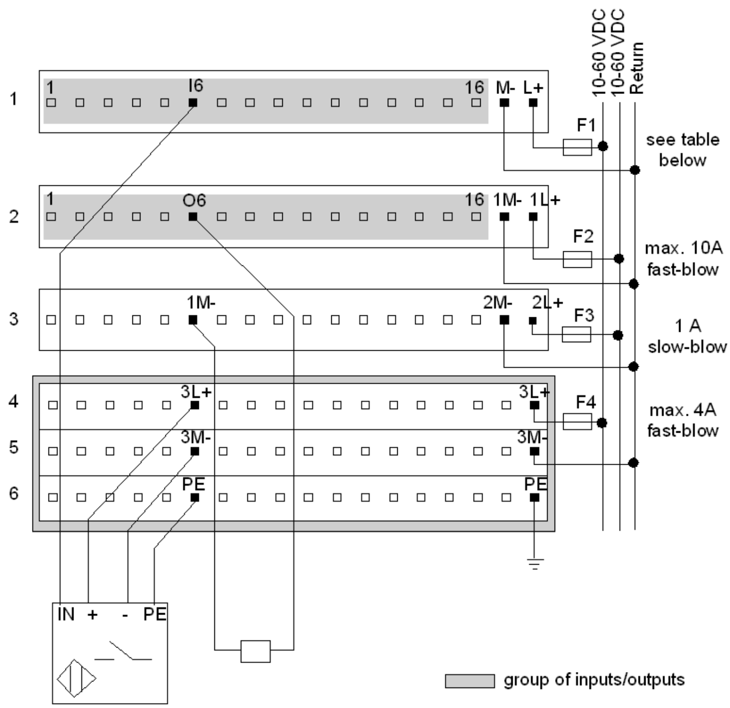


Fuse table for F1

Voltage	Fuse
12 VDC	1 A slow-blow
24 VDC	1 A slow-blow
48 VDC	1 A slow-blow

Four-Wire Sensor with a Two-Wire Actuator

The diagram below shows a four-wire sensor with a two-wire actuator. The process of wiring a three-wire sensor is very similar to the one below. Because three-wire sensors do not require PE, a two-row busbar could be used instead of the three-row busbar shown.

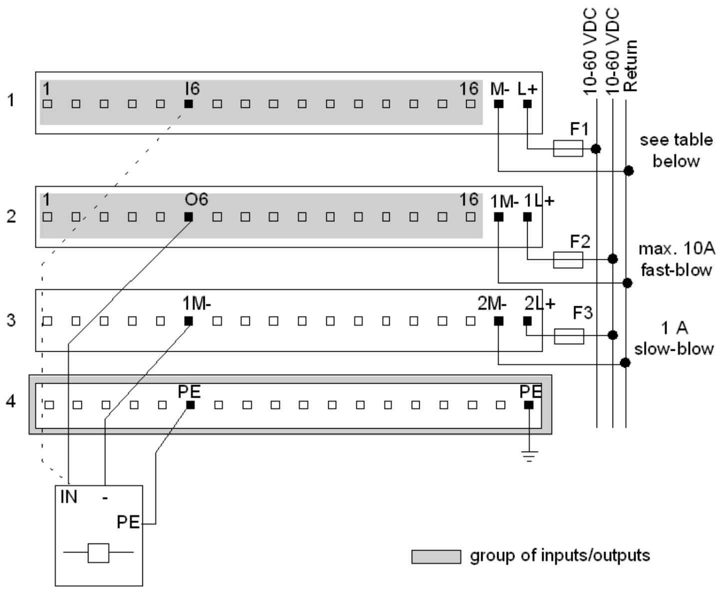


Fuse table for F1

Voltage	Fuse
12 VDC	1 A slow-blow
24 VDC	1 A slow-blow
48 VDC	1 A slow-blow

Broken Wire Detection

The diagram below shows a three-wire actuator with an optional wiring scheme for broken wire detection. The dotted line reads back whether or not current has reached the actuator. When the output on pin 6, row 2, is high, the input from pin 6, row 1, must also be high.

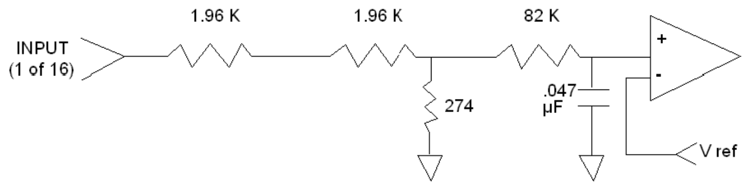


Fuse table for F1

Voltage	Fuse
12 VDC	1 A slow-blow
24 VDC	1 A slow-blow
48 VDC	1 A slow-blow

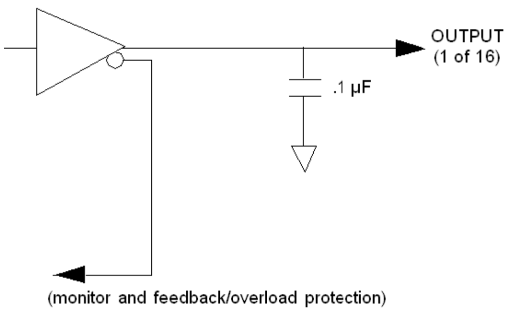
Simplified Input Schematics

The following diagram shows the field-side input circuitry.



Simplified Output Schematics

The following diagram shows the field-side output circuitry.



I/O Mapping

Overview

The 170 ADM 850 10 TSX Momentum I/O base supports 16 discrete inputs and 16 discrete outputs. This section contains information about the mapping of the I/O data into input words and output words.

I/O Map

The I/O base may be mapped as one input word and as one output word, or as 16 discrete input points and as 16 discrete output points.

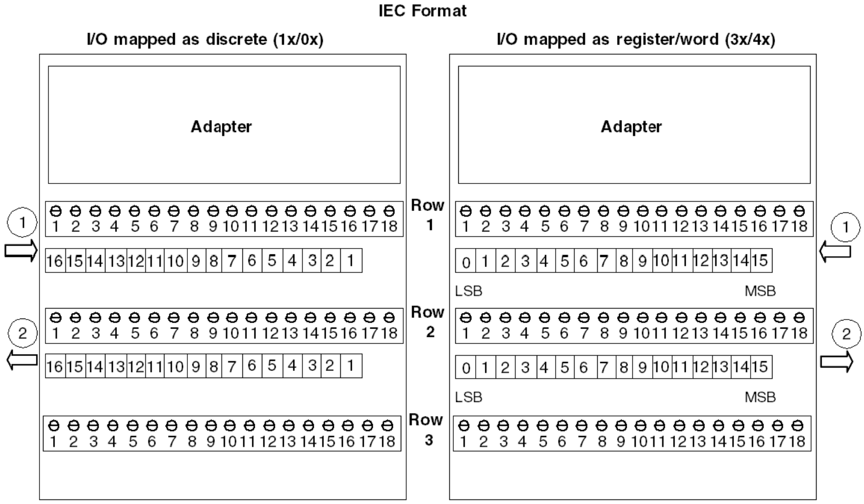
IEC vs. Ladder Logic

In order to correctly field wire the inputs/outputs and map the inputs/outputs data, you need to know which type of Momentum Adapter is mounted on the base. Adapters may be either IEC compliant or 984 Ladder Logic compliant.

	IEC Compliant	**984 Compliant**
Momentum Processor Adapters	All	None
Momentum Communication Adapters	All, except 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01	170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01

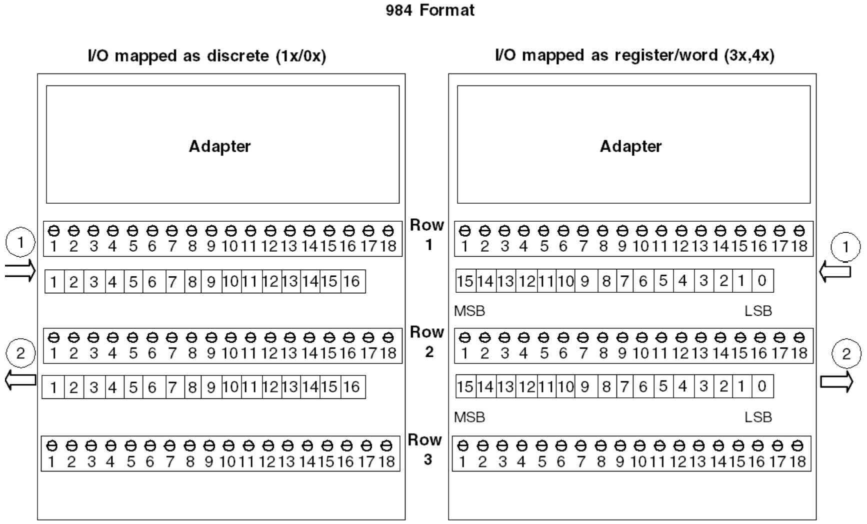
Data Mapping

The figure below shows how data is mapped on the I/O base with an IEC Compliant adapter. When the I/O is mapped as discrete points (1x/0x), the MSB is assigned to Pin 1 and the LSB is assigned to Pin 16. When the I/O is mapped as a word or register (3x/4x), the MSB (bit 15) is assigned to Pin 16 and the LSB (bit 0) is assigned to Pin 1.



1 inputs
2 outputs

The figure below shows how data is mapped on the I/O base with a 984 Ladder Logic Compliant adapter. When the I/O is mapped as discrete points (1x/0x), the MSB is assigned to Pin 16 and the LSB is assigned to Pin 1. When the I/O is mapped as a word or register (3x/4x), the MSB (bit 15) is assigned to Pin 1 and the LSB (bit 0) is assigned to Pin 16.



1 inputs
2 outputs

170 ADO 340 00 24 VDC - 16 Pt. Discrete Output Module Base

25

Overview

This chapter describes the 170 ADO 340 00 TSX Momentum I/O base.

What's in this Chapter?

This chapter contains the following topics:

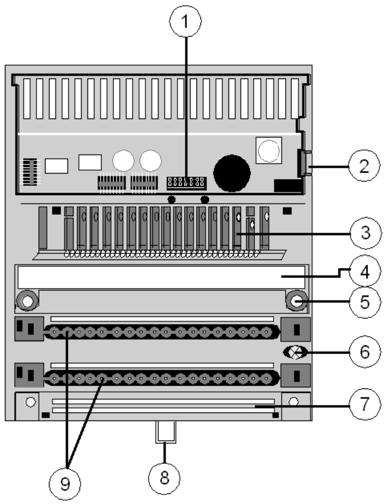
Front Panel Components

Overview

This section contains an illustration of the front panel of the 170 ADO 340 00 I/O base and a description of the LEDs.

Front Panel Illustration

The front panel of the I/O base is shown in the illustration below.

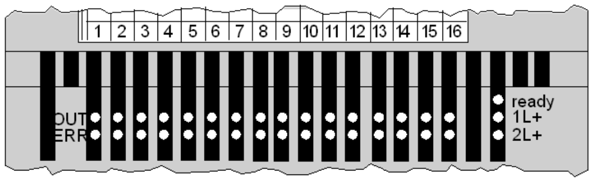


Components of the I/O module

Label	Description
1	Internal interface (ATI) connector
2	Locking and ground contact for the adapter
3	LED status display
4	Protective cover
5	Mounting holes for panel mount
6	Grounding screw
7	Grounding Busbar Mounting Slot
8	Locking tab for DIN rail mount
9	Sockets for the terminal connectors

LED Illustration

The LEDs are shown in the illustration below.



LED Descriptions

The LEDs are described in the table below.

Indicator	Condition	Message
Ready	Green	Module is ready to communicate. Operating voltage for internal logic (5 V) is present.
	Off	Module not ready.
1L+	Green	Output voltage 1L+ of inputs 1 ... 8 (group 1) is present
	Off	Output voltage of inputs 1 ... 8 (group 1) is not present
2L+	Green	Output voltage 2L+ of inputs 9 ... 16 (group 2) is present
	Off	Output voltage of inputs 9 ... 16 (group 2) is not present
Middle row OUT 1...16	Green	Output status (an LED per output); Output point active, ie. output carries a 1 signal (logically ON)
	Off	Output status (an LED per output); Output point inactive, ie. output carries a 0 signal (logically OFF)
Lower row ERR 1...16	Red	Output overload (an LED per output). Short circuit or overload on the corresponding output.
	Off	Outputs 1 ... 16 operating normally.

Specifications

Overview

This section contains specifications for the 170 ADO 340 00 I/O base.

General Specifications

Module type	16 discrete outputs in 2 groups (8 pts/group)
Supply voltage	24 VDC
Supply voltage range	20...30 VDC
Supply current consumption	max. 250 mA at 24 VDC
Power dissipation	6 W + (# of output points on x .25 W)
I/O map	1 output word

Isolation

Output group to output group	none
Field to communication adapter	Defined by communication adapter type

Fuses

Internal	none
External: operating voltage	1 A slow-blow (Bussmann GDC-1A or equivalent)
External: output voltage	According to the supply of the connected actuators– not to exceed 4 A slow-blow/ group

EMC

Immunity	IEC 1131-2 Surge on auxiliary power supply 500 V
Emissions	EN 50081-2
Agency approvals	UL, CSA, CE, FM Class 1 Div. 2 pending

Physical Dimensions

Width	125 mm (4.9 in)
Depth (with no adapter)	40 mm (1.54 in)
Length	141.5 mm (5.5 in) no or one busbar 159.5mm (6.3in) two busbars 171.5 mm (6.75in) three busbars
Weight	210 g (0.46 lb)

Discrete Outputs

Output type	Solid state switch
Output supply voltage	24 VDC
Output supply voltage range	20 ... 30 VDC
Output voltage	External supply - .5 VDC
Number of points	16
Number of groups	2
Points per group	8
Current capacity	0.5 A/point maximum 4 A/group 8 A/module
Signal type	True High
Leakage current (output out)	< 1 mA @ 24 VDC
Surge (inrush) current	5 A for 1 ms
On state voltage drop	< 0.5 VDC @ 0.5 A
Fault sensing	Outputs are electronically safeguarded to assist in short circuit and overload protection
Fault reporting	1 red LED/point (row 3) ON when short current/ overload occurs
Error indication	Output overload for at least one output (I/O-Error) to communication adapter
Response time (resistive load / 0.5 A)	< 0.1 ms OFF to ON < 0.1 ms ON to OFF
Maximum switching cycles	1000/h for 0.5 A inductive load 100/s for 0.5 A resistive load 8/s for 1.2 W Tungsten load

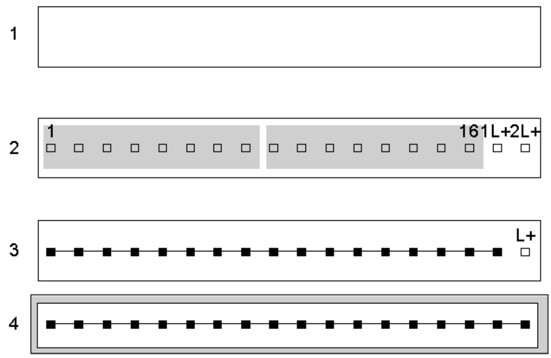
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base and an optional one-row busbar.

Illustration

Rows 1 through 3 show the internal connections between terminalson the I/O base. Row 4 shows the internal connections on the optional busbar.



Field Wiring Guidelines

Overview

The outputs are field wired to row 2 of the base. This section contains wiring guidelines and precautions.

Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Electric sells terminal connectors in sets of three.

Type	Part Number
Screw-in	170 XTS 001 00
Spring-clip	170 XTS 002 00

Busbar May Be Required

Depending on the type of field devices you are using, you may need a 1-row busbar. The following busbars are available from Schneider Electric.

Type	Part Number
Screw-in	170 XTS 006 01
Spring-clip	170 XTS 007 01

Mapping Terminal Blocks

⚠ CAUTION

POTENTIAL FOR SHORT CIRCUITS AND/OR POWER-UP SPIKES

Provide external fuses on the operating voltage to protect the module. Appropriate fuse values are shown in the wiring illustration. An unprotected module may be subject to short circuits and/or power-up spikes.

Failure to follow these instructions can result in injury or equipment damage.

The following table shows mapping terminal blocks and optional busbars.

Row	Terminal	Function
1	Not used	
2	1 ... 8	Outputs for group 1
	9 ... 16	Outputs for group 2
	17/18	24 VDC for output groups 1 and 2 (1L+, 2L+)
3	1 ... 16	Return (M-) for outputs
	17	Return (M-) for module and outputs
	18	+ 24 VDC Operating voltage (L+)
4	1 ... 18	Protective earth (PE)

Protective Circuit Required

When contacted switches are used on the input lines or when lines to the peripherals are very long, the outputs of inductive loads require protective circuitry with a clamping/suppressor diode. Install the protective circuit prallel to the operating coil.

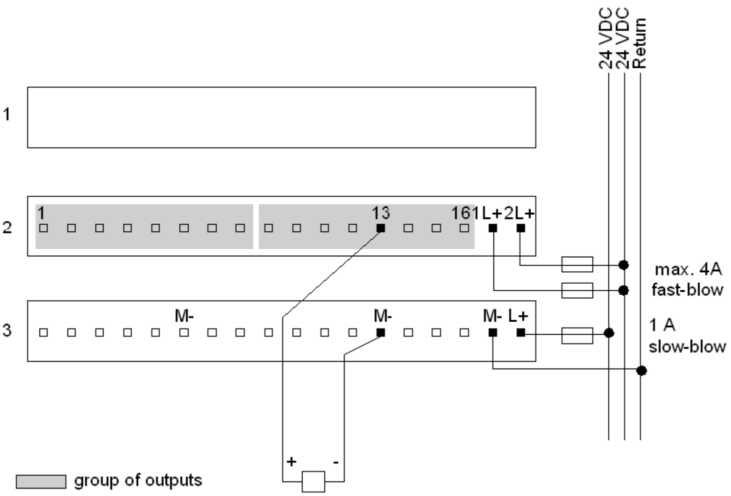
Wiring Diagrams

Overview

This section provides diagrams to assist you in wiring the following types of devices:
- 2-wire actuators
- 3-wire actuators

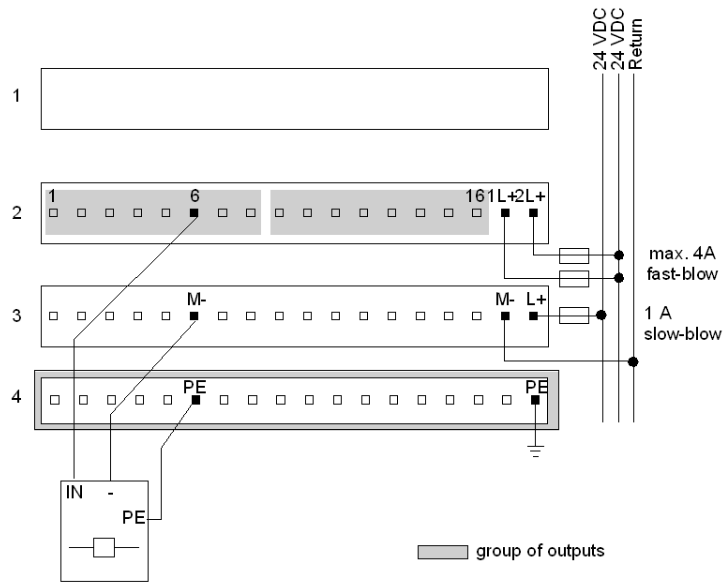
2-Wire Actuators

The diagram below shows an example of wiring for a 2-wire actuator.



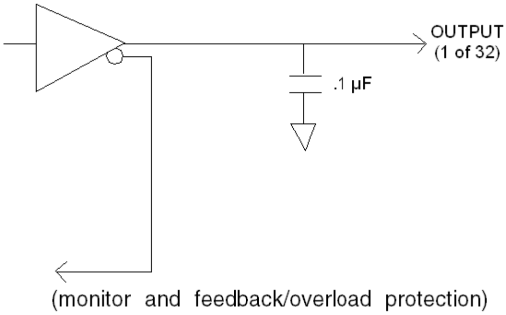
3-Wire Actuator

The diagram below shows an example of wiring for 3-wire actuator.



Simplified Schematics

The following diagram shows the field-side output circuitry.



I/O Mapping

Overview

The 170 ADO 340 00 TSX Momentum I/O base supports 16 discrete outputs. This section contains information about the mapping of the I/O data into output words.

I/O Map

The I/O base may be mapped as one output word,or as 16 discrete output points.

IEC vs. Ladder Logic

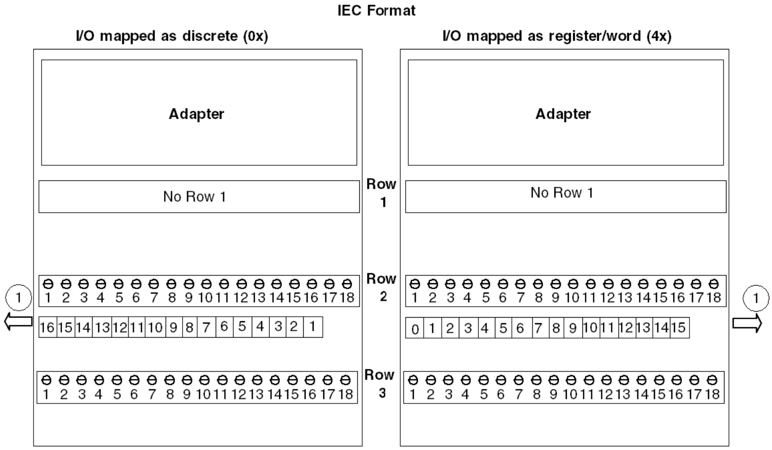
In order to correctly field wire the outputs and map the output data, you need to know which type of Momentum Adapter is mounted on the base.

Adapters may be either IEC or 984 Ladder Logic Compliant.

	IEC Compliant	**984 Ladder Logic Compliant**
Momentum Processor Adapters	All	None
Momentum Communication Adapters	All, except 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01	170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01

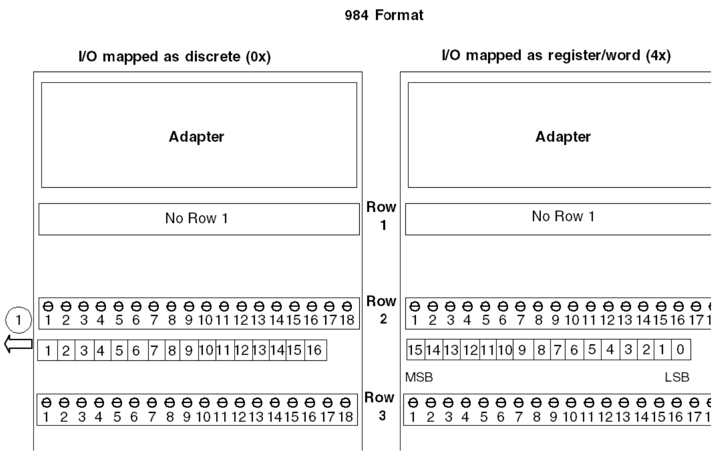
Data Mapping

The figure below shows how data is mapped on the I/O base with an IEC Compliant adapter. When the I/O is mapped as discrete points (0x), the MSB is assigned to Pin 1 and the LSB is assigned to Pin 16. When the I/O is mapped as a word/register (4x), the MSB (bit 15) is assigned to Pin 16 and the LSB (bit 0) is assigned to Pin 1.



1 outputs

The figure below shows how data is mapped on the I/O base with a Ladder Logic Compliant adapter. When the I/O is mapped as discrete points (0x), the MSB is assigned to Pin 16 and the LSB is assigned to Pin 1. When the I/O is mapped as a word/register (4x), the MSB (bit 15) is assigned to Pin 1 and the LSB (bit 0) is assigned to Pin 16.



1 outputs

170 ADO 350 00 24 VDC - 32 Pt. Discrete Output Module Base

26

Overview

This chapter describes the 170 ADO 350 00 TSX Momentum I/O base.

What's in this Chapter?

This chapter contains the following topics:

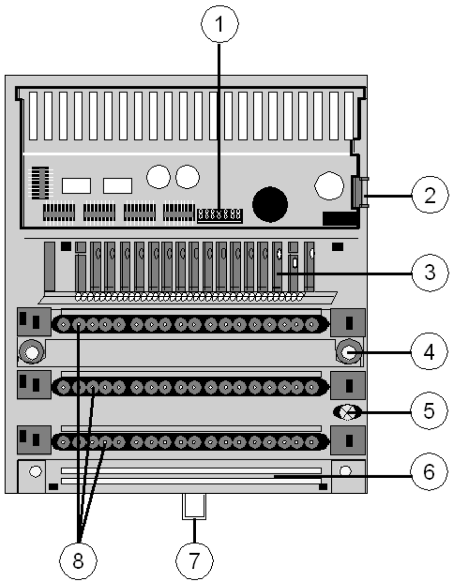
Front Panel Components

Overview

This section contains an illustration of the front panel of the 170 ADO 350 00 I/O base and a description of the LEDs.

Front Panel Illustration

The front panel of the I/O base is shown in the illustration below.

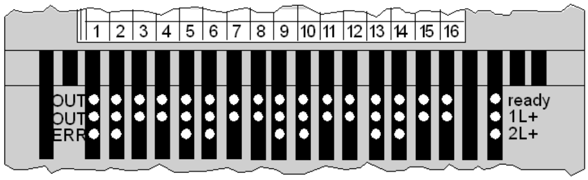


Components of the I/O module

Label	Description
1	Internal interface (ATI) connector
2	Locking and ground contact for the adapter
3	LED status display
4	Mounting holes for panel mount
5	Grounding screw
6	Grounding busbar mounting Slot
7	Locking tab for DIN rail mount
8	Sockets for the terminal connectors

LED Illustration

The LEDs are shown in the illustration below.



LED Descriptions

The LEDs are described in the table below.

Indicator	Condition	Message
Ready	Green	Module is ready to communicate. Operating voltage for internal logic (5 V) is present.
	Off	Module not ready.
1L+	Green	Output voltage 1L+ of inputs 1 ... 8 (group 1) is present
	Off	Output voltage of inputs 1 ... 8 (group 1) is not present
2L+	Green	Output voltage 2L+ of inputs 9 ... 16 (group 2) is present
	Off	Output voltage of inputs 9 ... 16 (group 2) is not present
Upper row OUT 1...16	Green	Status of outputs 1 ... 16 (an LED per output); Output point active, ie. output carries a 1 signal (logically ON)
	Off	Status of outputs 1 ... 16 (an LED per output); Output point inactive, ie. output carries a 0 signal (logically OFF)
Middle row OUT 1...16	Green	Status of outputs 17 ... 32 (an LED per output); Output point active, ie. output carries a 1 signal (logically ON)
	Off	Status of outputs 17 ... 32 (an LED per output); Output point inactive, ie. output carries a 0 signal (logically OFF)
Lower row ERR 1, 5, 9, 13	Red	Output overload in group 1 (one LED for every 4 outputs). Short circuit or overload on the corresponding output.
	Off	Outputs 1 ... 16 operating normally.
Lower row ERR 2, 6, 10, 14	Red	Output overload in group 2 (one LED for every 4 outputs). Short circuit or overload on the corresponding output.
	Off	Outputs 7 ... 32 operating normally.

Specifications

Overview

This section contains specifications for the 170 ADO 350 00 I/O base.

General Specifications

Module type	32 discrete outputs in 2 groups (16 pts/group)
Supply voltage	24 VDC
Supply voltage range	20...30 VDC
Supply current consumption	max. 250 mA at 24 VDC
Power dissipation	6 W + (# of output points on x .25 W)
I/O map	2 output word

Isolation

Output group to output group	none
Field to communication adapter	Defined by communication adapter type

Fuses

Internal	none
External: operating voltage	1 A slow-blow (Bussmann GDC-1A or equivalent)
External: output voltage	According to the supply of the connected actuators– not to exceed 8 A slow-blow/ group

EMC

Immunity	IEC 1131-2 Surge on auxiliary power supply 500 V
Emissions	EN 50081-2
Agency approvals	UL, CSA, CE, FM Class 1 Div. 2 pending

Physical Dimensions

Width	125 mm (4.9 in)
Depth (with no adapter)	40 mm (1.54 in)
Length	141.5 mm (5.5 in) no or one busbar 159.5mm (6.3in) two busbars 171.5 mm (6.75in) three busbars
Weight	210 g (0.46 lb)

Discrete Outputs

Output type	Solid state switch
Output supply voltage	24 VDC
Output supply voltage range	20 ... 30 VDC
Output voltage	External supply - .5 VDC
Number of points	32
Number of groups	2
Points per group	16
Current capacity	0.5 A/point maximum 8 A/group 16 A/module
Signal type	True High
Leakage current (output out)	< 1 mA @ 24 VDC
Surge (inrush) current	5 A for 1 ms
On state voltage drop	< 0.5 VDC @ 0.5 A
Fault sensing	Outputs are electronically safeguarded to assist in short circuit and overload protection
Fault reporting	1 red LED/point (row 3) ON when short current/ overload occurs
Error indication	Output overload for at least one out put (I/O-Error) to communication adapter
Response time (resistive load / 0.5 A)	< 0.1 ms OFF to ON < 0.1 ms ON to OFF
Maximum switching cycles	1000/h for 0.5 A inductive load 100/s for 0.5 A resistive load 8/s for 1.2 W Tungsten load

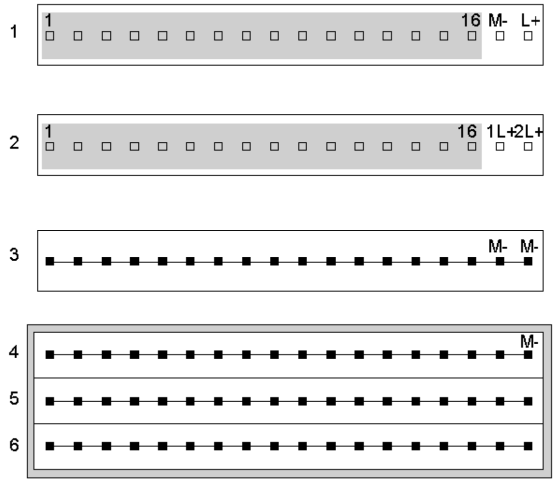
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base and an optional busbar.

Illustration

Rows 1 through 3 show the internal connections between terminals on the I/O base. Row 4 through 6 show the internal connections on the optional busbar.



Field Wiring Guidelines

Overview

This section contains wiring guidelines and precautions.

Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Electric sells terminal connectors in sets of three.

Type	Part Number
Screw-in	170 XTS 001 00
Spring-clip	170 XTS 002 00

Busbar May Be Required

Depending on the type of field devices you are using, you may need a 1-, 2-, or 3-row busbar. The following busbars are available from Schneider Electric.

Type	Number of Rows	Part Number
Screw-in	1 - row	170 XTS 006 01
	2 - row	170 XTS 005 01
	3 - row	170 XTS 004 01
Spring-clip	1 - row	170 XTS 007 01
	2 - row	170 XTS 008 01
	3 - row	170 XTS 003 01

Mapping Terminal Blocks

CAUTION

POTENTIAL FOR SHORT CIRCUITS AND/OR POWER-UP SPIKES

Provide external fuses on the operating voltage to protect the module. Appropriate fuse values are shown in the wiring illustration. An unprotected module may be subject to short circuits and/or power-up spikes.

Failure to follow these instructions can result in injury or equipment damage.

The following table shows mapping terminal blocks and optional busbars

Row	Terminal	Function
1	1...16	Outputs for group 1
	17	Return (M-) for the module
	18	+ 24 VDC Operating voltage (L+)
2	1 ... 16	Outputs for group 2
	17/18	+ 24 VDC for output group 1 (1L+) and group 2 (2L+)
3	1 ... 16	Return (M-)for the outputs
	17/18	Return (M-)for the output groups
4	1 ... 18	Return (M-)
5	1 ... 18	Protective earth (PE)
6	1 ... 18	Protective earth

Protective Circuit May Be Required

When contacted switches are used on the input lines or when lines to the peripherals are very long, the outputs of inductive loads require protective circuitry with a clamping/suppressor diode. Install the protective circuit prallel to the operating coil.

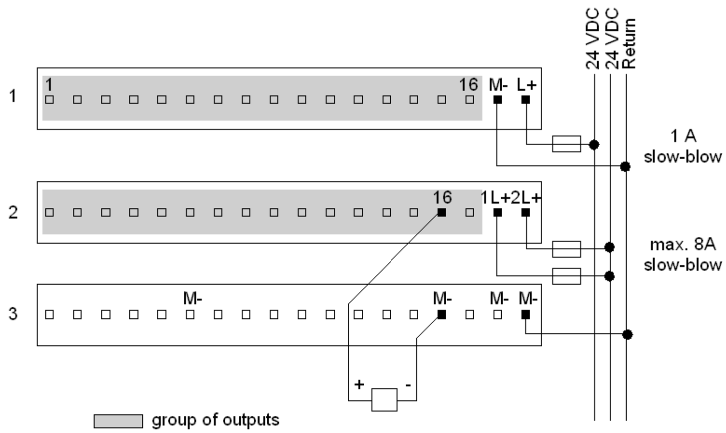
Wiring Diagrams

Overview

This section provides diagrams to assist you in wiring the following types of devices:
- 2-wire actuators
- 3-wire actuators

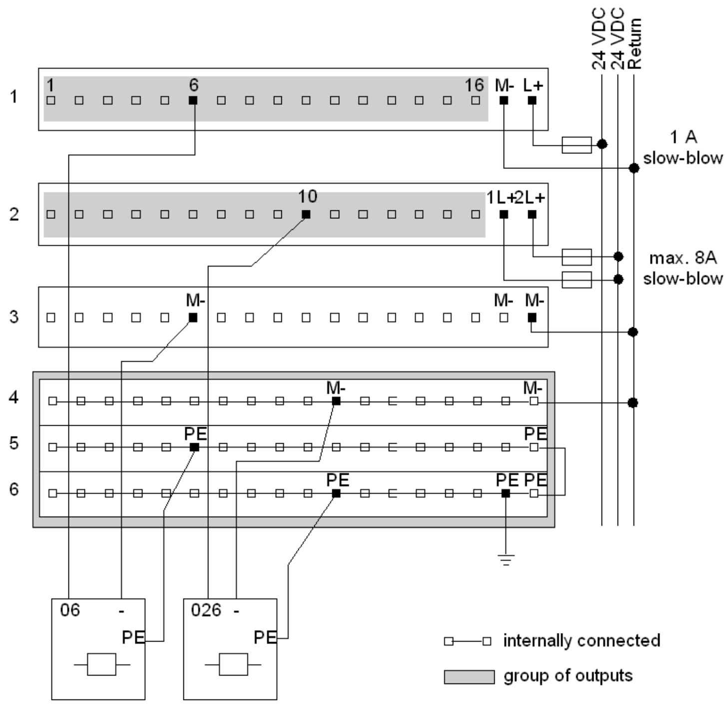
2-Wire Actuators

The diagram below shows an example of wiring for a 2-wire actuator.



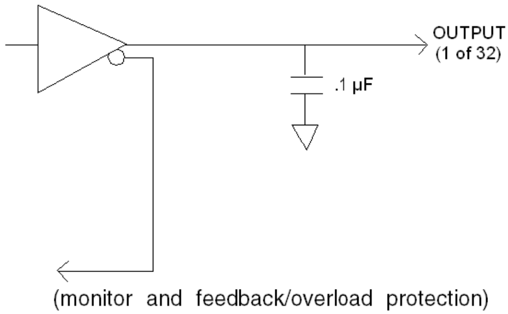
3-Wire Actuator

The diagram below shows an example of wiring for 3-wire actuator.



Simplified Schematics

The following diagram shows the field-side output circuitry.



I/O Mapping

Overview

The 170 ADO 350 00 TSX Momentum I/O base supports 32 discrete outputs. This section contains information about the mapping of the I/O data into output words.

I/O Map

The I/O base may be mapped as two output words, or as 32 discrete output points.

IEC vs. Ladder Logic

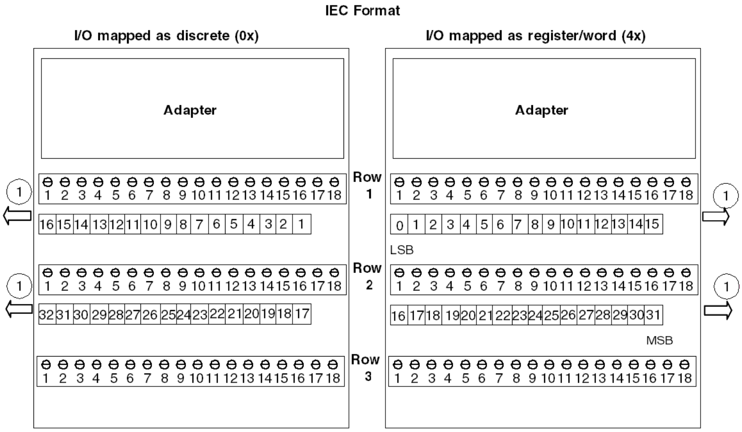
In order to correctly field wire the outputs and map the output data, you need to know which type of Momentum Adapter is mounted on the base.

Adapters may be either IEC compliant or 984 Ladder Logic compliant.

	IEC Compliant	**984 Ladder Logic Compliant**
Momentum Processor Adapters	All	None
Momentum Communication Adapters	All, except 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01	170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01

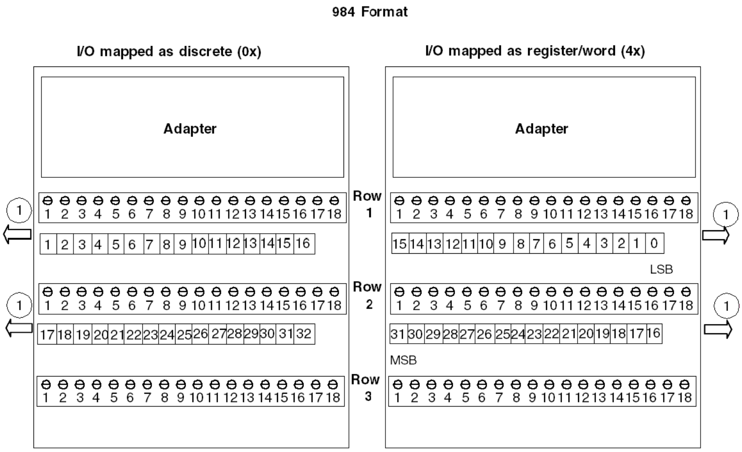
Data Mapping

The figure below shows how data is mapped on the I/O base with an IEC Compliant adapter. When the I/O is mapped as discrete points (0x), the MSB is assigned to Pin 1 and the LSB is assigned to Pin 16. When the I/O is mapped as word or register (4x), the MSB (bit 15) is assigned to Pin 16 and the LSB (bit 0) is assigned to Pin 1.



1 outputs

The figure below shows how data is mapped on the I/O base with a Ladder Logic Compliant adapter. When the I/O is mapped as discrete points (0x), the MSB is assigned to Pin 16 and the LSB is assigned to Pin 1. When the I/O is mapped as word or register (4x), the MSB (bit 15) is assigned to Pin 1 and the LSB (bit 0) is assigned to Pin 16.



1 outputs

170 ADO 530 50 120 VAC - 8 Point Discrete Output @ 2A Module Base

27

Overview

This chapter describes the 170 ADO 530 50 TSX Momentum I/O base.

What's in this Chapter?

This chapter contains the following topics:

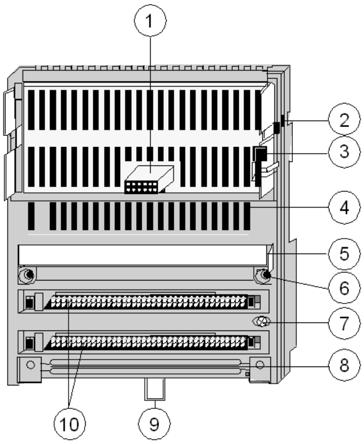
Front Panel Components

Overview

This section contains an illustration of the front panel of the 170 ADO 530 50 I/O base and a description of the LEDs.

Front Panel Illustration

The front panel of the I/O base is shown in the illustration below.

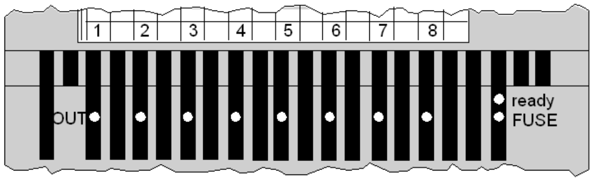


Components of the I/O module

Label	Description
1	Internal interface (ATI) connector
2	Locking tab for the adapter
3	Ground contact for the adapter
4	LED status display
5	Fuses (under the cover)
6	Mounting holes for panel mount
7	Grounding screw
8	BGrounding busbar Mounting Slot
9	Locking tab for DIN rail mount
10	Sockets for the terminal connectors

LED Illustration

The LEDs are shown in the illustration below.



LED Descriptions

The LEDs are described in the table below.

Indicator	Condition	Message
Ready	Green	Module is ready to communicate on network
	Off	Module is not ready to communicate
FUSE	Green	Output voltage is present and fuse 1 and fuse 2 are OK.
	Off	Output voltage is not present or fuse 1 or fuse 2 is not OK.
OUT 1 ... 8	Green	Output status (an LED per output); Output point active, i.e. Output carries a 1 signal (logically ON)
	Off	Output status (an LED per output); Output point inactive, i.e. Output carries a 0 signal (logically OFF)

Specifications

Overview

This section contains specifications for the 170 ADO 530 50 I/O base.

General Specifications

Module type	8 discrete outputs in 2 groups (4 points/group)
Supply voltage	120 VAC
Supply voltage range	85 ... 132 VAC @ 47...63Hz
Supply current consumption	125 mA
Power dissipation	5 W + (# of output points on x 3 W)
I/O map	1 output word

Isolation

Point to point	none
Group to group	none
Field to communication adapter	1780 VAC

Fuses

Internal (replaceable)	5 A slow-blow (Wickmann 195150000 or equivalent)
Internal (non-replaceable)	200 mA slow-blow
External (field power)	10 A slow-blow (Wickmann 195210000 or equivalent)
External (module power)	200 mA slow-blow (Wickmann 195020000 or equivalent)

EMC

Immunity	IEC 1131-2 Surge on auxiliary power supply 2 KV
Emissions	EN 50081-2
Agency approvals	UL, CSA, CE FM Class 1, Div. 2

Physical Dimensions

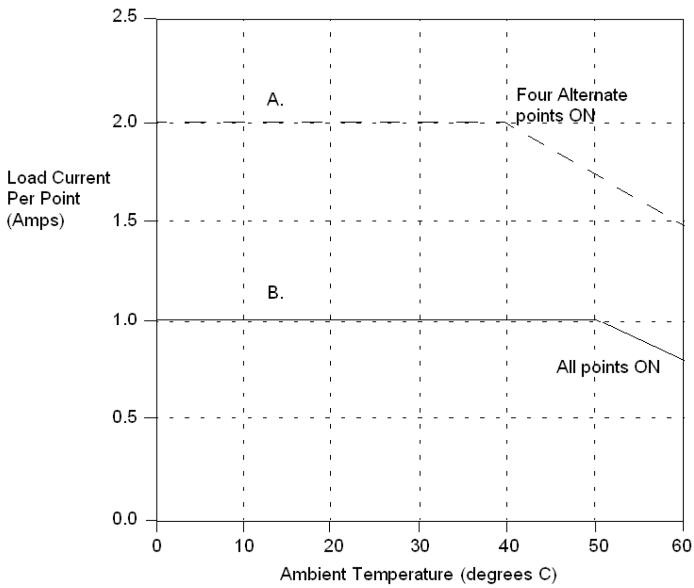
Width	125 mm (4.9 in)
Depth (with no adapter)	52 mm (2.05 in)
Length	141.5 mm (5.5 in) no or one busbar 159.5mm (6.3in) two busbars 171.5 mm (6.75in) three busbars
Weight	319 g (11.25 oz)

Discrete Outputs

Number of points	8
Number of groups	2 fuse groups, non-isolated
Points per group	4
Output supply voltage	120 AC
Output supply voltage range	85 ... 132 VAC
Output voltage	External supply - 1.5 VAC
Surge voltage	300 VAC for 10 s 400 VAC for 1 cycle
On state voltage drop	1.5 VAC max @ 2 A
Output (load) current	2 A/point (see derating curve) 4 A/group 8 A/module
Minimum output current	5 mA
Maximum surge current (rms)	15 A/point, one cycle 10 A/point, two cycle 5 A/point, three cycle
Output protection	RC snubber
Signal type	True High
Leakage current	1.9 mA @ 120 VAC max
Applied dV / dT	400 V / microsecond
Response time	.5 of one line cycle max OFF to ON .5 of one line cycle max ON to OFF

Derating Curve

The diagram below shows the ambient temperature in relation to the load current per point in amps.



A. Four alternate points. Maximum current per group is 4 A at 0 ... 60 degrees C.

B. All points ON.

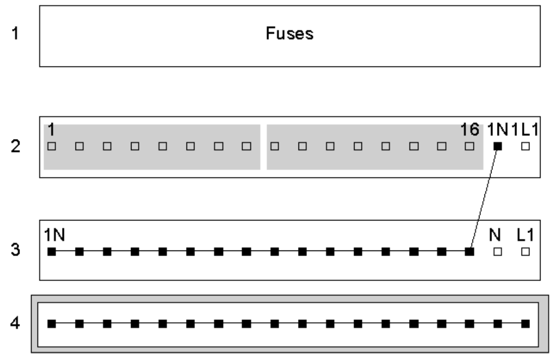
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base and an optional one-row busbar.

Illustration

Rows 1 through 3 show the internal connections between terminalson the I/O base. Row 4 shows the internal connections on the optional busbar.



Field Wiring Guidelines

Overview

This section contains wiring guidelines and precautions.

Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Electric sells terminal connectors in sets of three.

Type	Part Number
Screw-in	170 XTS 001 00
Spring-clip	170 XTS 002 00

Busbar May Be Required

Depending on the type of field devices you are using, you may need a 1-row busbar. The following busbars are available from Schneider Electric.

Type	Part Number
Screw-in	170 XTS 006 01
Spring-clip	170 XTS 007 01

Mapping Terminal Blocks

⚠ CAUTION

VOLTAGE SPIKE MAY BE SUFFICIENT TO DAMAGE OR DESTROY MODULE

If an external switch is wired to control an inductive load in parallel with the module output, then an external varistor (Harris V390ZA05 or equivalent) must be wired in parallel with the switch.

Failure to follow these instructions can result in injury or equipment damage.

The following table shows mapping terminal blocks and optional busbars.

Row	Terminal	Function
1	Fuse 1, Fuse 2	Output fuses
2	1, 3, 5, 7	Outputs for group 1
	9, 11, 13, 15	Outputs for group 2
	17	Neutral for outputs (1N)
	18	Line for outputs (1L1)
3	1 ... 16	Neutral for individual outputs (1N)
	17	Neutral 120 VAC for module (N)
	18	Line 120 VAC for module (L1)
4	1 ... 18	Protective earth (PE)

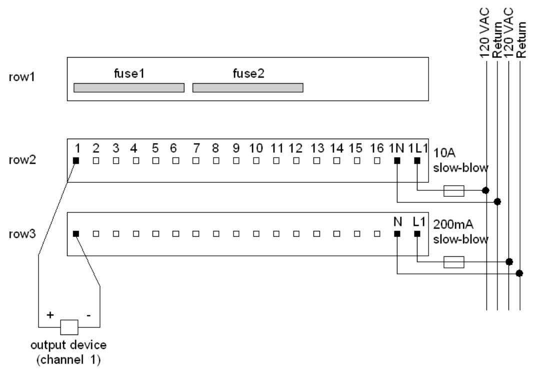
Wiring Diagrams

Overview

This section provides diagrams to assist you in wiring the following types of devices:
- 2-wire field devices
- 3-wire field devices

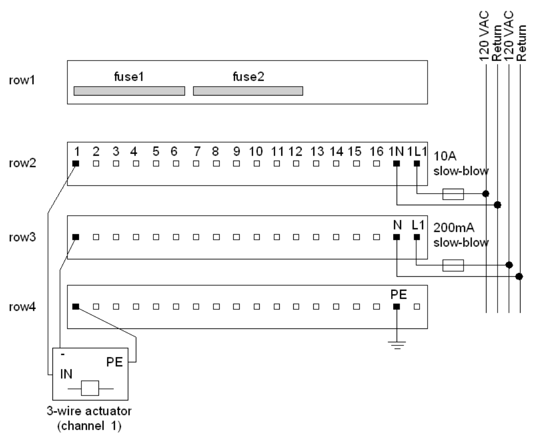
2-Wire Devices

The diagram below shows an example of wiring for 2-wire devices:



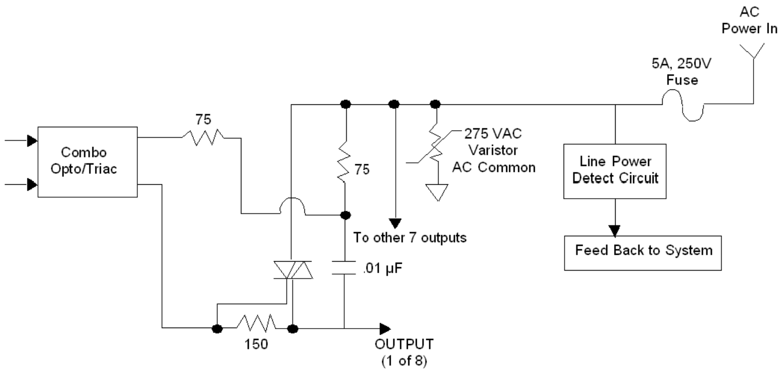
3-Wire Devices

The diagram below shows an example of wiring for 3-wire devices:



Simplified Schematics

The following diagram shows the field-side output circuitry.



Output Behavior

The snubber circuit is there to protect the triac. When the triac is turned on, it is almost a short and AC voltage and current travels through it to the output. When the triac is not turned on, AC voltage will still pass through the snubber, as AC will pass through a capacitor, but the impedance through the snubber circuit is so high that usually only 5 mA maximum can flow. (This is generally referred to as leakage current.) Read the specifications for the field device to make sure it cannot be turned on by this leakage current.

I/O Mapping

Overview

The 170 ADO 530 50 TSX Momentum I/O base supports 8 discrete outputs. This section contains information about the mapping of the I/O data into output words.

I/O Map

The I/O base may be mapped as one output word, or as 8 discrete output points.

IEC vs. Ladder Logic

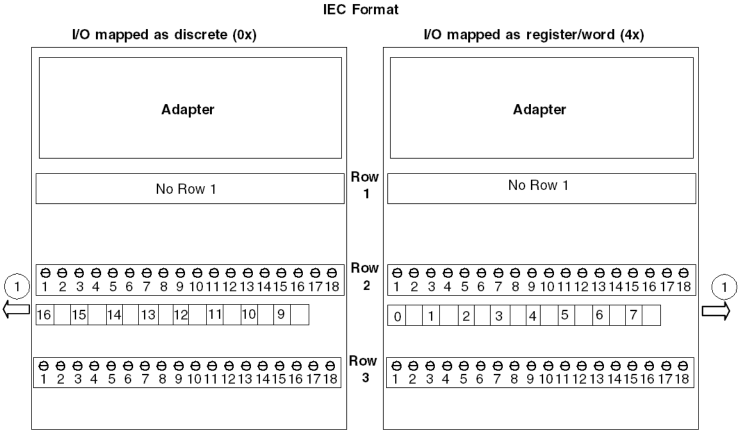
In order to correctly field wire the outputs and map the output data, you need to know which type of Momentum Adapter is mounted on the base.

Adapters may be either IEC compliant or 984 Ladder Logic compliant.

	IEC Compliant	**984 Ladder Logic Compliant**
Momentum Processor Adapters	All	None
Momentum Communication Adapters	All, except 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01	170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01

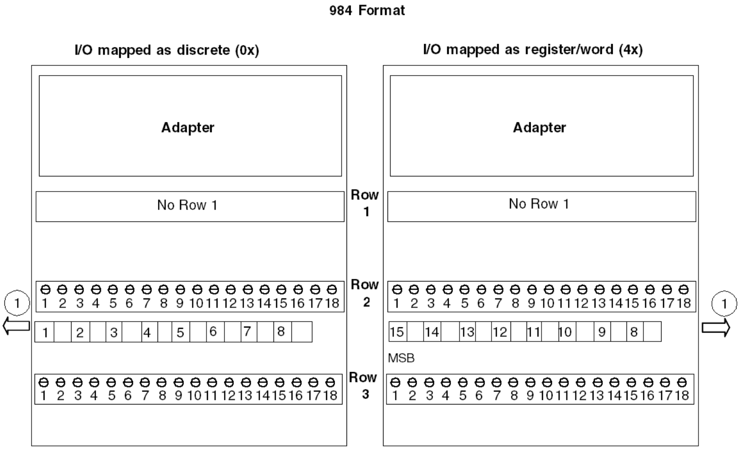
Data Mapping

The figure below shows how data is mapped on the I/O base with an IEC Compliant adapter. When the I/O is mapped as discrete points (0x), the MSB is assigned to Pin 1. When the I/O is mapped as a word or register (4x) the LSB (bit 0) is assigned to Pin 1.



1 outputs

The figure below shows how data is mapped on the I/O base with a Ladder Logic Compliant adapter. When the I/O is mapped as discrete points (0x), the LSB is assigned to Pin 1. When the I/O is mapped as a word or register (4x) the MSB (bit 15) is assigned to Pin 1.



1 outputs

170 ADO 540 50 120 VAC - 16 Point Discrete Output Module Base

28

Overview

This chapter describes the 170 ADO 540 50 TSX Momentum I/O base.

What's in this Chapter?

This chapter contains the following topics:

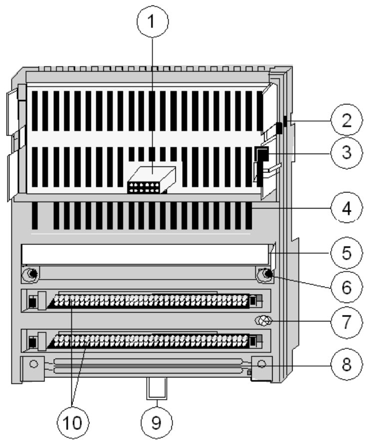
Front Panel Components

Overview

This section contains an illustration of the front panel of the 170 ADO 540 50 I/O base and a description of the LEDs.

Front Panel Illustration

The front panel of the I/O base is shown in the illustration below.

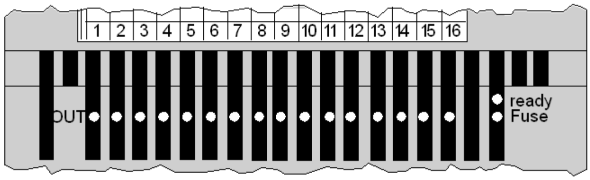


Components of the I/O module

Label	Description
1	Internal interface (ATI) connector
2	Locking tab for the adapter
3	Ground contact for the adapter
4	LED status display
5	Fuses (under the cover)
6	Mounting holes for panel mount
7	Grounding screw
8	Busbar Mounting Slot
9	Locking tab for DIN rail mount
10	Sockets for the terminal connectors

LED Illustration

The LEDs are shown in the illustration below.



LED Descriptions

The LEDs are described in the table below.

Indicator	Condition	Message
Ready	Green	Module is ready to communicate on network
	Off	Module is not ready to communicate
FUSE	Green	Output voltage is present and fuse 1 and fuse 2 are OK.
	Off	Output voltage is not present or fuse 1 or fuse 2 is not OK.
OUT 1 ... 8	Green	Output status (an LED per output); Output point active, i.e. Output carries a 1 signal (logically ON)
	Off	Output status (an LED per output); Output point inactive, i.e. Output carries a 0 signal (logically OFF)

Specifications

Overview

This section contains specifications for the 170 ADO 540 50 I/O base.

General Specifications

Module type	16 discrete outputs in 2 groups (8 points/group)
Supply voltage	120 VAC
Supply voltage range	85 ... 132 VAC @ 47...63Hz
Supply current consumption	125 mA
Power dissipation	5 W + (# of output points on x .75 W)
I/O map	1 output word

Isolation

Point to point	none
Group to group	none
Field to communication adapter	1780 VAC

Fuses

Internal (replaceable)	5 A slow-blow (Wickmann 195150000 or equivalent)
Internal (non-replaceable)	200 mA slow-blow
External (field power)	10 A slow-blow (Wickmann 195210000 or equivalent)
External (module power)	200 mA slow-blow (Wickmann 195020000 or equivalent)

EMC

Immunity	IEC 1131-2 Surge on auxiliary power supply 2 KV
Emissions	EN 50081-2
Agency approvals	UL, CSA, CE FM Class 1, Div. 2

Physical Dimensions

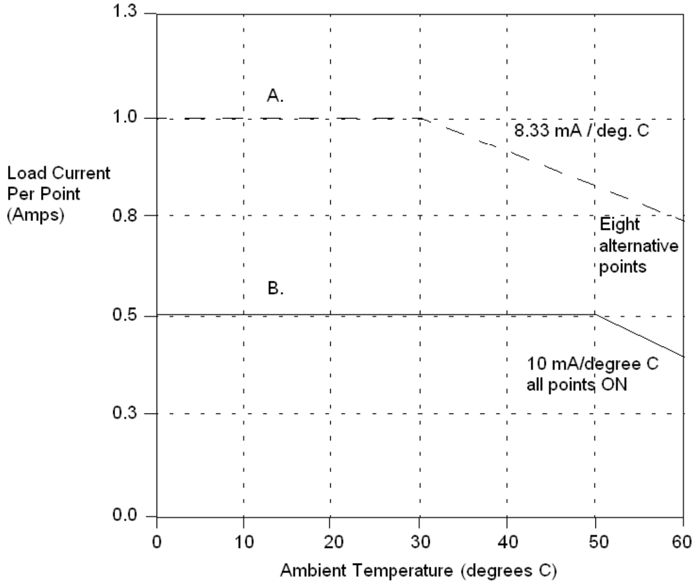
Width	125 mm (4.9 in)
Depth (with no adapter)	52 mm (2.05 in)
Length	141.5 mm (5.5 in) no or one busbar 159.5mm (6.3in) two busbars 171.5 mm (6.75in) three busbars
Weight	284 g (10 oz)

Discrete Outputs

Number of points	16
Number of groups	2 fuse groups, non-isolated
Points per group	8
Output supply voltage	120 AC
Output supply voltage range	85 ... 132 VAC
Output voltage	External supply - 1.5 VAC
Surge voltage	300 VAC for 10 s 400 VAC for 1 cycle
On state voltage drop	1.5 VAC max @ 0.5 A
Output (load) current	0.5 A/point (see derating curve in next section) 4 A/group 8 A/module
Minimum output current	30 mA
Maximum surge current (rms)	15 A/point, one cycle 10 A/point, two cycle 5 A/point, three cycle
Output protection	RC snubber
Signal type	True High
Leakage current	1.9 mA @ 120 VAC max
Applied dV / dT	400 V / microsecond
Response time	.5 of one line cycle max OFF to ON .5 of one line cycle max ON to OFF

Derating Curve

The diagram depicts the derating curve for this I/O base.



A. Eight alternate points. Maximum current per group is 3 A at 60 degrees C.
B. Sixteen points. Maximum current per point is .4 A at 60 degrees C. Maximum current per group is 3.2 A at 60 degrees C.

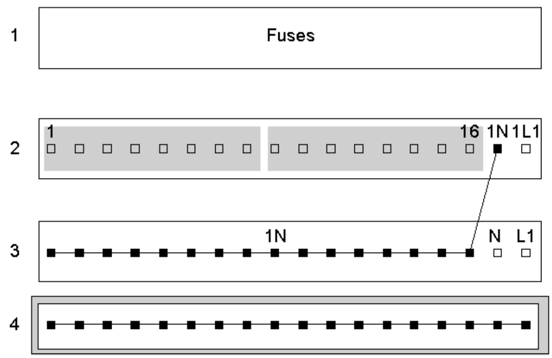
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base and an optional one-row busbar.

Illustration

Rows 1 through 3 show the internal connections between terminalson the I/O base. Row 4 shows the internal connections on the optional busbar.



Field Wiring Guidelines

Overview

Inputs are field wired to row 2 of the base. This section contains wiring guidelines and precautions.

Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Electric sells terminal connectors in sets of three.

Type	Part Number
Screw-in	170 XTS 001 00
Spring-clip	170 XTS 002 00

Busbar May Be Required

Depending on the type of field devices you are using, you may need a 1-row busbar. The following busbars are available from Schneider Electric.

Type	Part Number
Screw-in	170 XTS 006 01
Spring-clip	170 XTS 007 01

Mapping Terminal Blocks

CAUTION

POTENTIAL FOR SHORT CIRCUITS AND/OR POWER-UP SPIKES

Provide external fuses on the operating voltage to protect the module. Appropriate fuse values are shown in the wiring illustration. An unprotected module may be subject to short circuits and/or power-up spikes.

Failure to follow these instructions can result in injury or equipment damage.

The following table shows mapping terminal blocks and optional busbars.

Row	Terminal	Function
1	Fuse 1, Fuse 2	Output fuses
2	1 ... 8	Outputs for group 1
	9 ... 16	Outputs for group 2
	17	Neutral for outputs (1N)
	18	Line for inputs (1L1)
3	1 ... 16	Neutral for individual outputs (1N)
	17	Neutral for module (N)
	18	Line 120 VAC for module (L1)
4	1 ... 18	Protective earth (PE)

Protective Circuit Required

When contacted switches are used on the input lines or when lines to the peripherals are very long, the outputs of inductive loads require protective circuitry with a clamping/suppressor diode. Install the protective circuit prallel to the operating coil.

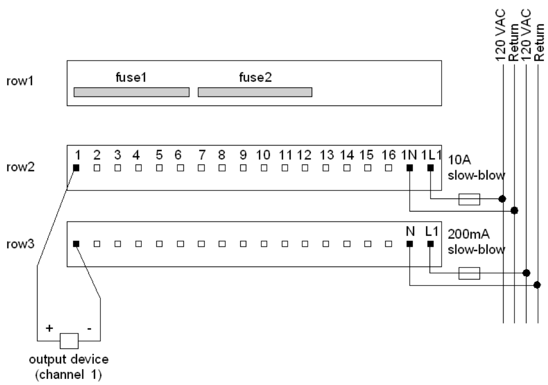
Wiring Diagrams

Overview

This section provides diagrams to assist you in wiring the following types of devices:
- 2-wire field devices
- 3-wire field devices

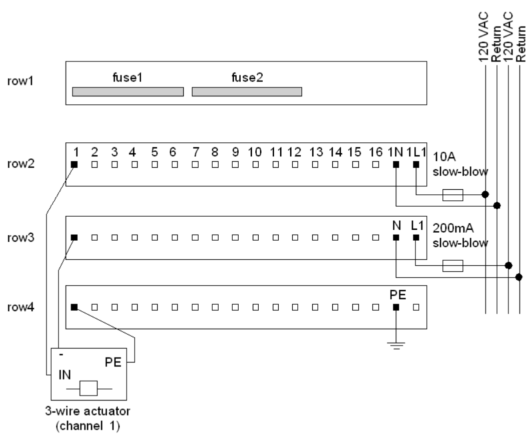
2-Wire Devices

The diagram below shows an example of wiring for 2-wire devices:



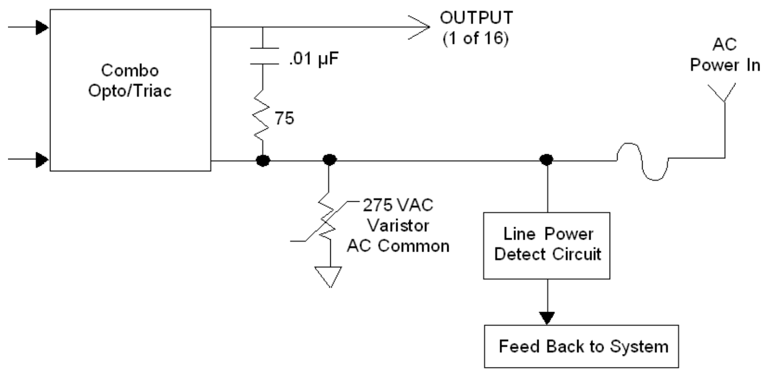
3-Wire Devices

The diagram below shows an example of wiring for 3-wire devices:



Simplified Schematics

The following diagram shows the field-side output circuitry.



Output Behavior

The snubber circuit is there to protect the triac. When the triac is turned on, it is almost a short and AC voltage and current travels through it to the output. When the triac is not turned on, AC voltage will still pass through the snubber, as AC will pass through a capacitor, but the impedance through the snubber circuit is so high that usually only 5 mA maximum can flow. (This is generally referred to as leakage current.) Read the specifications for the field device to make sure it cannot be turned on by this leakage current.

I/O Mapping

Overview

The 170 ADO 540 50 TSX Momentum I/O base supports 16 discrete outputs. This section contains information about the mapping of the I/O data into output words.

I/O Map

The I/O base may be mapped as one output word, or as 16 discrete output points.

IEC vs. Ladder Logic

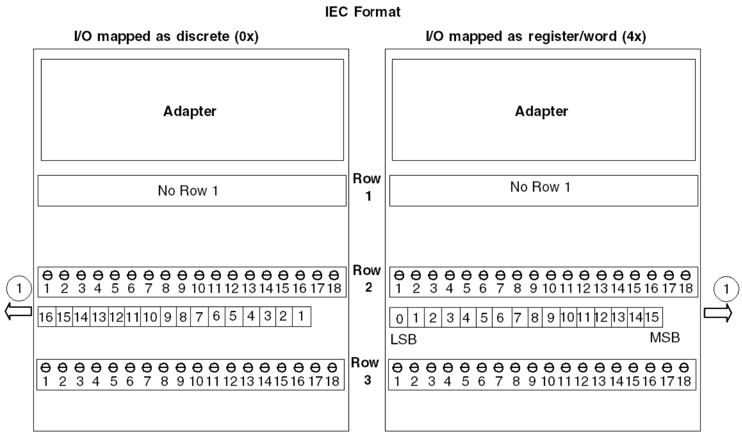
In order to correctly field wire the outputs and map the output data, you need to know which type of Momentum adapter is mounted on the base.

Adapters may be either IEC compliant or 984 Ladder Logic compliant.

	IEC Compliant	**984 Ladder Logic Compliant**
Momentum Processor Adapters	All	None
Momentum Communication Adapters	All, except 170 NEF 110 21 170 NEF 160 21 170 FNT 1100 00 170 FNT 1100 01	170 NEF 110 21 170 NEF 160 21 170 FNT 1100 00 170 FNT 1100 01

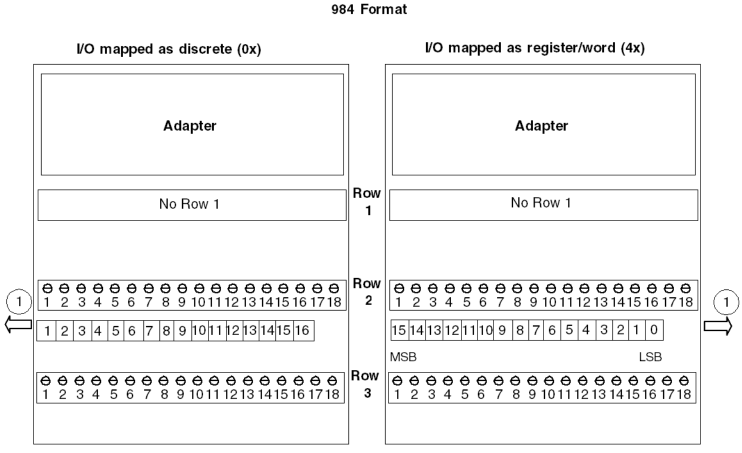
Data Mapping

The figure below shows how data is mapped on the I/O base with an IEC Compliant adapter. When the I/O is mapped as discrete points (0x) , the MSB is assigned to Pin 1, and the LSB is assigned to Pin 16. When the I/O is mapped as a word or register (4x), the MSB (bit 15) is assigned to Pin 16, and the LSB (bit 0) is assigned to Pin 1.



1 outputs

The figure below shows how data is mapped on the I/O base with a Ladder Logic Compliant adapter. When the I/O is mapped as discrete points (0x), the MSB is assigned to Pin 16 and the LSB is assigned to Pin 1. When the I/O is mapped as a word or register (4x), the MSB (bit 15) is assigned to Pin 1, and the LSB (bit 0) is assigned to Pin 16.



1 outputs

170 ADO 730 50 230 VAC - 8 Point Discrete Output @ 2A Module Base

29

Overview

This chapter describes the 170 ADO 730 50 TSX Momentum I/O base.

What's in this Chapter?

This chapter contains the following topics:

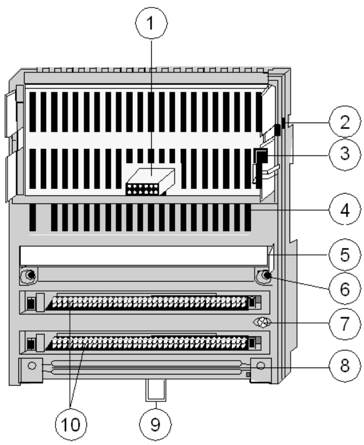
Front Panel Components

Overview

This section contains an illustration of the front panel of the 170 ADO 730 50 I/O base and a description of the LEDs.

Front Panel Illustration

The front panel of the I/O base is shown in the illustration below.

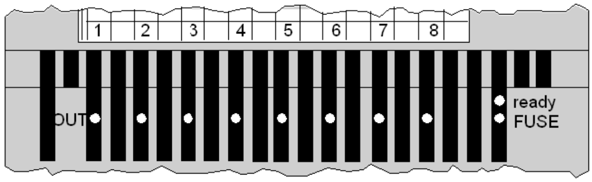


Components of the I/O module

Label	Description
1	Internal interface (ATI) connector
2	Locking tab for the adapter
3	Ground contact for the adapter
4	LED status display
5	Fuses (under the cover)
6	Mounting holes for panel mount
7	Grounding screw
8	Busbar Mounting Slot
9	Locking tab for DIN rail mount
10	Sockets for the terminal connectors

LED Illustration

The LEDs are shown in the illustration below.



LED Descriptions

The LEDs are described in the table below.

Indicator	Condition	Message
Ready	Green	Module is ready to communicate on network
	Off	Module is not ready to communicate
FUSE	Green	Output voltage is present and fuse 1 and fuse 2 are OK.
	Off	Output voltage is not present or fuse 1 or fuse 2 is not OK.
OUT 1 ... 8	Green	Output status (an LED per output); Output point active, i.e. Output carries a 1 signal (logically ON)
	Off	Output status (an LED per output); Output point inactive, i.e. Output carries a 0 signal (logically OFF)

Specifications

Overview

This section contains specifications for the 170 ADO 730 50 I/O base.

General Specifications

Module type	8 discrete outputs in 2 groups (4 points/group)
Supply voltage	230 VAC
Supply voltage range	170 ... 264 VAC @ 47...63Hz
Supply current consumption	65 mA
Power dissipation	5 W + (# of output points on x 3 W)
I/O map	1 output word

Isolation

Point to point	none
Group to group	none
Field to communication adapter	1780 VAC

Fuses

Internal (replaceable)	5 A slow-blow (Wickmann 195150000 or equivalent)
Internal (non-replaceable)	200 mA slow-blow
External (field power)	10 A slow-blow (Wickmann 195210000 or equivalent)
External (module power)	200 mA slow-blow (Wickmann 195020000 or equivalent)

EMC

Immunity	IEC 1131-2 Surge on auxiliary power supply 2 KV
Emissions	EN 50081-2
Agency approvals	UL, CSA, CE, FM Class 1, Div. 2

Physical Dimensions

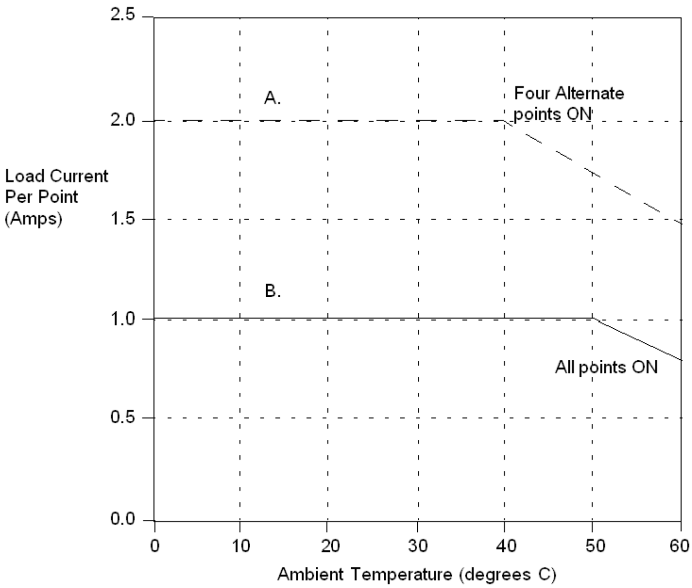
Width	125 mm (4.9 in)
Depth (with no adapter)	52 mm (2.05 in)
Length	141.5 mm (5.5 in) no or one busbar 159.5mm (6.3in) two busbars 171.5 mm (6.75in) three busbars
Weight	284 g (10 oz)

Discrete Outputs

Number of points	8
Number of groups	2 fuse groups, non-isolated
Points per group	4
Output supply voltage	230 AC
Output supply voltage range	170 ... 264 VAC
Output voltage	External supply - 1.5 VAC
Surge voltage	300 VAC for 10 s 400 VAC for 1 cycle
On state voltage drop	1.5 VAC max @ 2 A
Output (load) current	2 A/point (see derating curve) 4 A/group 8 A/module
Minimum output current	5 mA
Maximum surge current (rms)	15 A/point, one cycle 10 A/point, two cycle 5 A/point, three cycle
Output protection	RC snubber
Signal type	True High
Leakage current	2.5 mA @ 230 VAC max
Applied dV / dT	400 V / microsecond
Response time	.5 of one line cycle max OFF to ON .5 of one line cycle max ON to OFF

Derating Curve

The diagram below shows the ambient temperature in relation to the load current per point in amps.



A. Four alternate points. Maximum current per group is 4 A at 0 ... 60 degrees C.

B. All points ON.

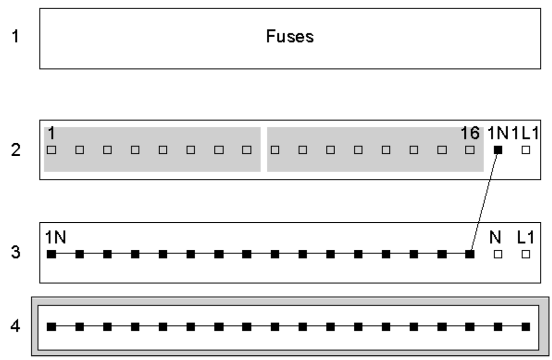
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base and an optional one-row busbar.

Illustration

Rows 1 through 3 show the internal connections between terminals on the I/O base. Row 4 shows the internal connections on the optional busbar.



Field Wiring Guidelines

Overview

This section contains wiring guidelines and precautions.

Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Electric sells terminal connectors in sets of three.

Type	Part Number
Screw-in	170 XTS 001 00
Spring-clip	170 XTS 002 00

Busbar May Be Required

Depending on the type of field devices you are using, you may need a 1-row busbar. The following busbars are available from Schneider Electric.

Type	Part Number
Screw-in	170 XTS 006 01
Spring-clip	170 XTS 007 01

Mapping Terminal Blocks

⚠ CAUTION

POTENTIAL FOR SHORT CIRCUITS AND/OR POWER-UP SPIKES

Provide external fuses on the operating voltage to protect the module. Appropriate fuse values are shown in the wiring illustration. An unprotected module may be subject to short circuits and/or power-up spikes.

Failure to follow these instructions can result in injury or equipment damage.

The following table shows mapping terminal blocks and optional busbars.

Row	Terminal	Function
1	Fuse 1, Fuse 2	Output fuses
2	1, 3, 5, 7	Outputs for group 1
	9,11 ,13, 15	Outputs for group 2
	17	Neutral for outputs (1N)
	18	Line for outputs (1L1)
3	1 ... 16	Neutral for individual outputs (1N)
	17	Neutral 120 VAC for module (N)
	18	Line 120 VAC for module (L1)
4	1 ... 18	Protective earth (PE)

Wiring Diagrams

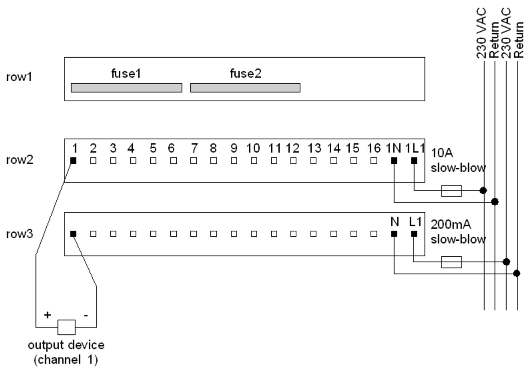
Overview

This section provides diagrams to assist you in wiring the following types of devices:

- 2-wire field devices
- 3-wire field devices

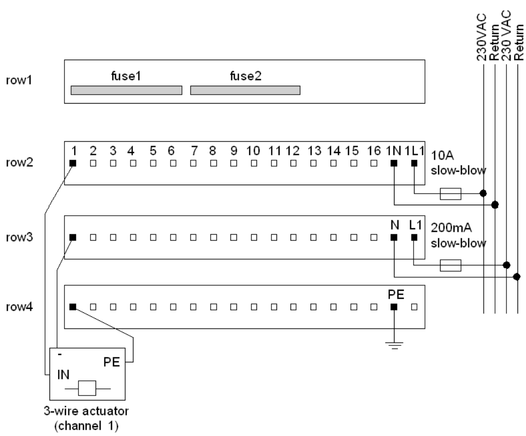
2-Wire Devices

The diagram below shows an example of wiring for 2-wire devices:



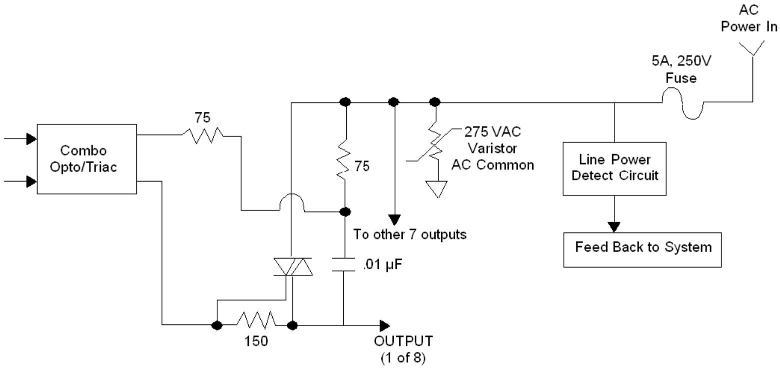
3-Wire Devices

The diagram below shows an example of wiring for 3-wire devices:



Simplified Schematics

The following diagram shows the field-side output circuitry.



Output Behavior

The snubber circuit is there to protect the triac. When the triac is turned on, it is almost a short and AC voltage and current travels through it to the output. When the triac is not turned on, AC voltage will still pass through the snubber, as AC will pass through a capacitor, but the impedance through the snubber circuit is so high that usually only 5 mA maximum can flow. (This is generally referred to as leakage current.) Read the specifications for the field device to make sure it cannot be turned on by this leakage current.

I/O Mapping

Overview

The 170 ADO 730 50 TSX Momentum I/O base supports 8 discrete outputs. This section contains information about the mapping of the I/O data into output words.

I/O Map

The I/O base may be mapped as one output word, or as 8 discrete output points.

IEC vs. Ladder Logic

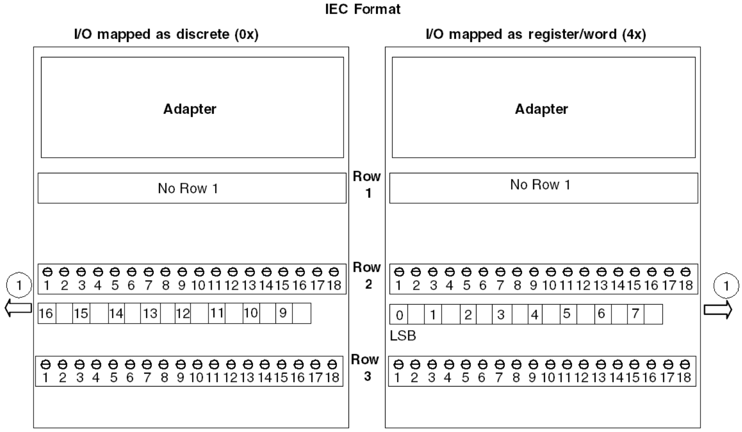
In order to correctly field wire the outputs and map the output data, you need to know which type of Momentum Adapter is mounted on the base.

Adapters may be either IEC compliant or 984 Ladder Logic compliant.

	IEC Compliant	**984 Ladder Logic Compliant**
Momentum Processor Adapters	All	None
Momentum Communication Adapters	All, except 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01	170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01

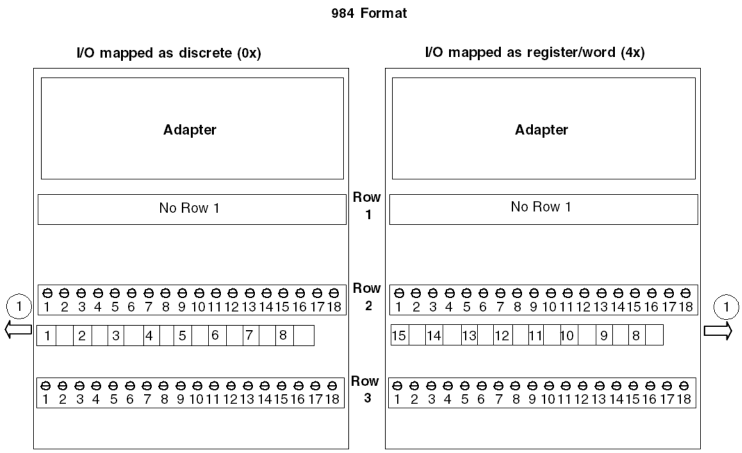
Data Mapping

The figure below shows how data is mapped on the I/O base with an IEC Compliant adapter. When the I/O is mapped as discrete points (0x), the MSB is assigned to Pin 1. When the I/O is mapped as word or register (4x), the LSB (bit 0) is assigned to Pin 1.



1 outputs

The figure below shows how data is mapped on the I/O base with a Ladder Logic Compliant adapter. When the I/O is mapped as discrete points (0x), the LSB is assigned to Pin 1. When the I/O is mapped as word or register (4x), the MSB (bit 15) is assigned to Pin 1.



1 outputs

170 ADO 740 50 230 VAC - 16 Point Discrete Output Module Base

30

Overview

This chapter describes the 170 ADO 740 50 TSX Momentum I/O base.

What's in this Chapter?

This chapter contains the following topics:

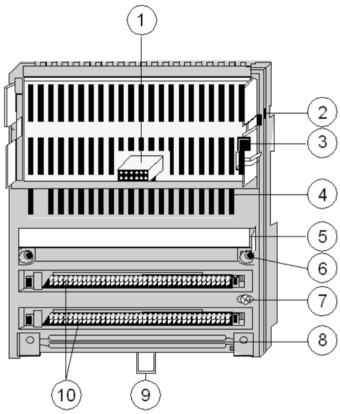
Front Panel Components

Overview

This section contains an illustration of the front panel of the 170 ADO 740 50 I/O base and a description of the LEDs.

Front Panel Illustration

The front panel of the I/O base is shown in the illustration below.

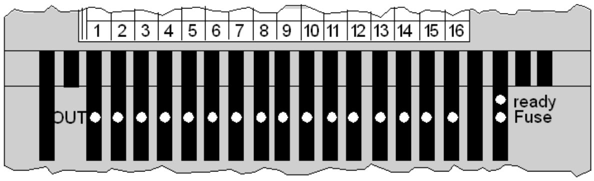


Components of the I/O module

Label	Description
1	Internal interface (ATI) connector
2	Locking tab for the adapter
3	Ground contact for the adapter
4	LED status display
5	Fuses (under the cover)
6	Mounting holes for panel mount
7	Grounding screw
8	Grounding busbar Mounting Slot
9	Locking tab for DIN rail mount
10	Sockets for the terminal connectors

LED Illustration

The LEDs are shown in the illustration below.



LED Descriptions

The LEDs are described in the table below.

Indicator	Condition	Message
Ready	Green	Module is ready to communicate on network
	Off	Module is not ready to communicate
FUSE	Green	Output voltage is present and fuse 1 and fuse 2 are OK.
	Off	Output voltage is not present or fuse 1 or fuse 2 is not OK.
OUT 1 ... 16	Green	Output status (an LED per output); Output point active, i.e. Output carries a 1 signal (logically ON)
	Off	Output status (an LED per output); Output point inactive, i.e. Output carries a 0 signal (logically OFF)

Specifications

Overview

This section contains specifications for the 170 ADO 740 50 I/O base.

General Specifications

Module type	16 discrete outputs in 2 groups (8 points/group)
Supply voltage	230 VAC
Supply voltage range	170 ... 264 VAC @ 47...63Hz
Supply current consumption	65 mA
Power dissipation	5 W + (# of output points on x .75 W)
I/O map	1 output word

Isolation

Point to point	none
Group to group	none
Field to communication adapter	1780 VAC

Fuses

Internal (replaceable)	5 A slow-blow (Wickmann 195150000 or equivalent)
Internal (non-replaceable)	200 mA slow-blow
External (field power)	10 A slow-blow (Wickmann 195210000 or equivalent)
External (module power)	200 mA slow-blow (Wickmann 1915020000 or equivalent)

EMC

Immunity	IEC 1131-2 Surge on auxiliary power supply 2 KV
Emissions	EN 50081-2
Agency approvals	UL, CSA, CE FM Class 1, Div. 2

Physical Dimensions

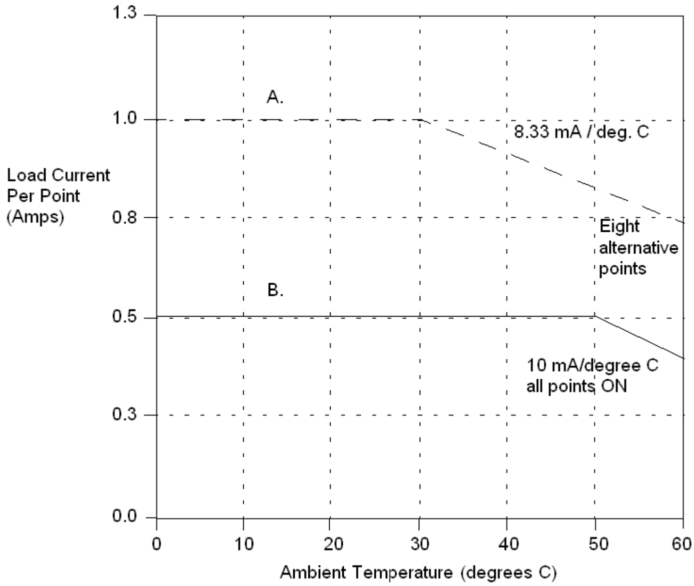
Width	125 mm (4.9 in)
Depth (with no adapter)	52 mm (2.05 in)
Length	141.5 mm (5.5 in) no or one busbar 159.5mm (6.3 in) two busbars 171.5 mm (6.75 in) three busbars
Weight	284 g (10 oz)

Discrete Outputs

Number of points	16
Number of groups	2 fuse groups, non-isolated
Points per group	8
Output supply voltage	230 AC
Output supply voltage range	170 ... 264 VAC
Output voltage	External supply - 1.5 VAC
Surge voltage	300 VAC for 10 s 400 VAC for 1 cycle
On state voltage drop	1.5 VAC max @ 2 A
Output (load) current	0.5 A/point (see derating curve) 4 A/group 8 A/module
Minimum output current	30 mA
Maximum surge current (rms)	15 A/point, one cycle 10 A/point, two cycle 5 A/point, three cycle
Output protection	RC snubber
Signal type	True High
Leakage current	2.4 mA @ 230 VAC max
Applied dV / dT	400 V / microsecond
Response time	.5 of one line cycle max OFF to ON .5 of one line cycle max ON to OFF

Derating Curve

The diagram below shows the ambient temperature in relation to the load current per point in amps.



A. Eight alternate points. Maximum current per group is 3 A at 60 degrees C.

B. Sixteen points. Maximum current per point is .4 A at 60 degrees C. Maximum current per group is 3.2 A at 60 degrees C.

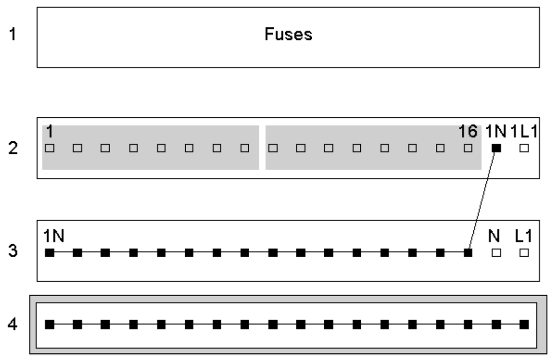
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base and an optional one-row busbar.

Illustration

Rows 1 through 3 show the internal connections between terminalson the I/O base. Row 4 shows the internal connections on the optional busbar.



Field Wiring Guidelines

Overview

The outputs are field wired to row 2 of the base. This section contains wiring guidelines and precautions.

Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Electric sells terminal connectors in sets of three.

Type	Part Number
Screw-in	170 XTS 001 00
Spring-clip	170 XTS 002 00

Busbar May Be Required

Depending on the type of field devices you are using, you may need a 1-row busbar. The following busbars are available from Schneider Electric.

Type	Part Number
Screw-in	170 XTS 006 01
Spring-clip	170 XTS 007 01

Mapping Terminal Blocks

⚠ CAUTION

VOLTAGE SPIKE MAY BE SUFFICIENT TO DAMAGE OR DESTROY MODULE

If an external switch is wired to control an inductive load in parallel with the module output, then an external varistor (Harris V390ZA05 or equivalent) must be wired in parallel with the switch.

Failure to follow these instructions can result in injury or equipment damage.

The following table shows mapping terminal blocks and optional busbars.

Row	Terminal	Function
1	Fuse 1, Fuse 2	Output fuses
2	1 ... 8	Outputs for group 1
	9 ... 16	Outputs for group 2
	17	Neutral for outputs (1N)
	18	Line for outputs (1L1)
3	1 ... 16	Neutral for individual outputs (1N)
	17	Neutral 230 VAC for module (N)
	18	Line 230 VAC for module (L1)
4	1 ... 18	Protective earth (PE)

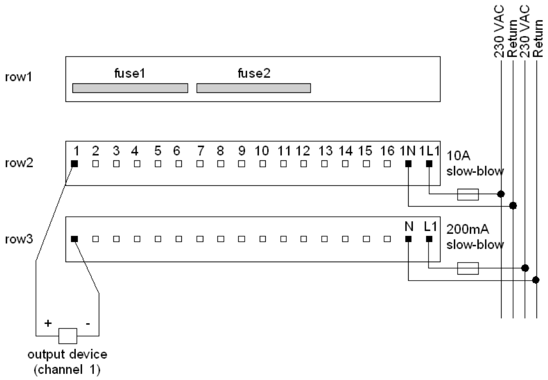
Wiring Diagrams

Overview

This section provides diagrams to assist you in wiring the following types of devices:
- 2-wire field devices
- 3-wire field devices

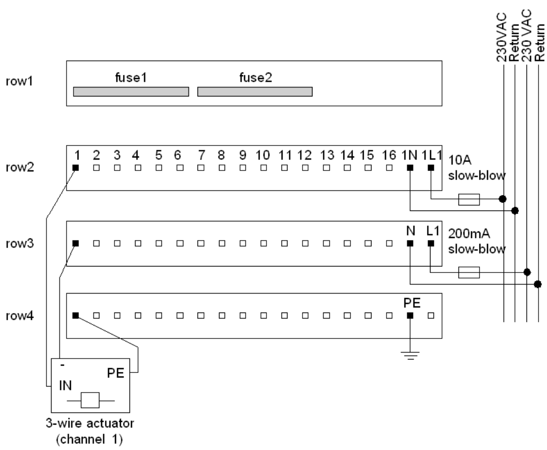
2-Wire Devices

The diagram below shows an example of wiring for 2-wire devices:



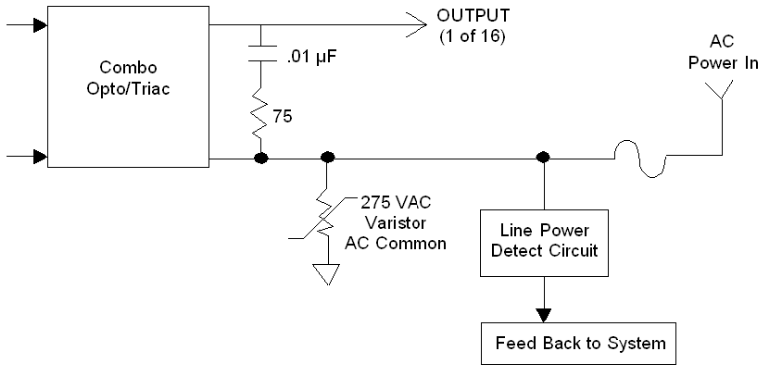
3-Wire Devices

The diagram below shows an example of wiring for 3-wire devices:



Simplified Schematics

The following diagram shows the field-side output circuitry.



Output Behavior

The snubber circuit is there to protect the triac. When the triac is turned on, it is almost a short and AC voltage and current travels through it to the output. When the triac is not turned on, AC voltage will still pass through the snubber, as AC will pass through a capacitor, but the impedance through the snubber circuit is so high that usually only 5 mA maximum can flow. (This is generally referred to as leakage current.) Read the specifications for the field device to make sure it cannot be turned on by this leakage current.

I/O Mapping

Overview

The 170 ADO 740 50 TSX Momentum I/O base supports 16 discrete outputs. This section contains information about the mapping of the I/O data into output words.

I/O Map

The I/O base may be mapped as one output word, or as 16 discrete output points.

IEC vs. Ladder Logic

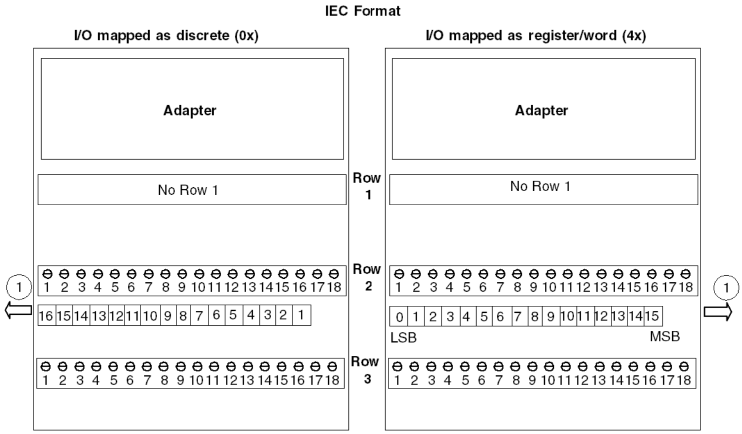
In order to correctly field wire the outputs and map the output data, you need to know which type of Momentum Adapter is mounted on the base.

Adapters may be either IEC compliant or 984 Ladder Logic compliant.

	IEC Compliant	**984 Ladder Logic Compliant**
Momentum Processor Adapters	All	None
Momentum Communication Adapters	All, except 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01	170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01

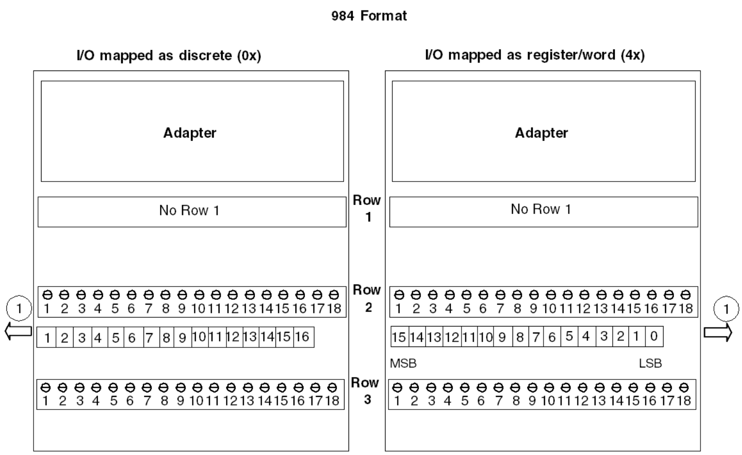
Data Mapping

The figure below shows how data is mapped on the I/O base with an IEC Compliant adapter. When the I/O is mapped as discrete points (0x), the MSB is assigned to Pin 1 and the LSB is assigned to Pin 16. When the I/O is mapped as a word or register (4x), the MSB (bit 15) is assigned to Pin 16 and the LSB (bit 0) is assigned to Pin 1.



1 outputs

The figure below shows how data is mapped on the I/O base with a 984 Ladder Logic Compliant adapter. When the I/O is mapped as discrete points (0x), the MSB is assigned to Pin 16 and the LSB is assigned to Pin 1. When the I/O is mapped as a word or register (4x), the MSB (bit 15) is assigned to Pin 1 and the LSB (bit 0) is assigned to Pin 16.



1 outputs

170 ADO 830 30 6 Pt. Relay Out Module Base

31

Overview

This chapter describes the 170 ADO 830 30 Momentum I/O base.

What's in this Chapter?

This chapter contains the following topics:

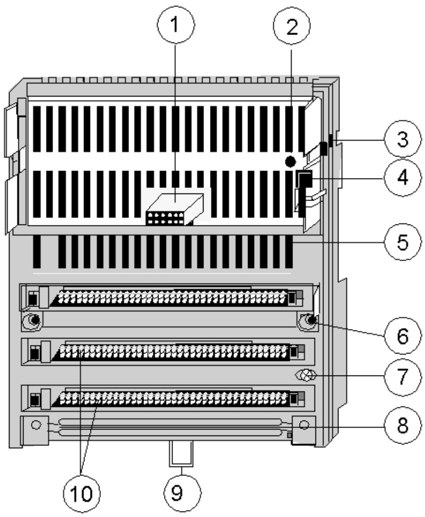
Front Panel Components

Overview

This section contains an illustration of the front panel of the 170 ADO 830 30 Relay I/O base and a description of the LEDs.

Front Panel Illustration

The front panel of the I/O base is shown below.

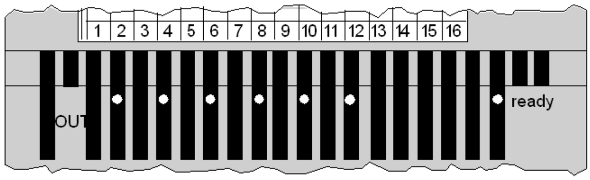


Components of the I/O module

Label	Description
1	Internal interface (ATI) connector
2	Ground nut standoff
3	Locking tab for the adapter
4	Ground contact for the adapter
5	LED status display
6	Mounting holes for panel mount
7	Grounding screw
8	Grounding busbar mounting slot
9	Locking tab for DIN rail mount
10	Sockets for the terminal connectors

LED Illustration

The LEDs are shown in the illustration below.



LED Descriptions

The LEDs are described in the table below.

Indicator	Condition	Message
Ready	Green	Module is ready to communicate. Operating voltage for internal logic (5 V) is present.
	Off	Module not ready.
OUT 2,4,6,8,10,12	Green	Output status (an LED per output); Output point active, (logically ON): For Normally Closed (N/C) Relay wiring, the output relay opens. For Normally Open (N/O) Relay wiring, the output relay closes.
	Off	Output status (an LED per output); Output point inactive, (logically OFF): For Normally Closed (N/C) Relay wiring, the output relay is closed. For Normally Open (N/O) Relay wiring, the output relay is opened.

Specifications

Overview

This section contains specifications for the 170 ADO 830 30 I/O base.

General Specifications

Module type	6 relay outputs normally open /normally closed
Module supply voltage	120 to 230 VAC
Module supply current consumption	125 mA at 120 VAC; 65 mA at 230 VAC
Power dissipation	15 W
I/O map	1 output word

Isolation

Output to output	1780 VAC RMS for 1 minute
Field to logic	1780 VAC RMS for 1 minute 2500 VDC RMS for 1 minute
Field to Protective Earth	1780 VAC RMS for 1 minute
Field to communication adapter	Defined by communication adapter type

Fuses

Internal	none
External: operating voltage (L+)	315 mA fast-blow (Wickman1930315000)

EMC

Immunity	IEC 1131-2 Surge on auxiliary power supply AC 2 KV to PE, 1 KV to differential surge on auxiliary power supply DC 0.5 KV.
Emissions	EN 50081-2
Agency approvals	UL, CSA, CE FM Class 1 Div.2 pending

Physical Dimensions

Width	125 mm (4.9 in)
Depth (with no adapter)	40 mm (1.54 in)
Length	141.5 mm (5.5 in) with or without one busbar 159.5mm (6.3 in) two busbars 171.5 mm (6.75 in) three busbars
Weight	260 g (0.57lb)

Relay Outputs

Output type	Form C relay, NO/NC contact
Relay contact material	Gold lash over silver alloy
Number of points	6
Number of groups	6
Points per group	1
Switched Output Voltage	
AC	20-250 VAC
DC	30-150 VDC
Maximum Load Current	
AC	5A @ 250 VAC @ 60 degrees C resistive load 2A Tungsten lamp load 3A @ power factor 0.4
DC	300mA resistive @ 60 degree C resistive load 100mA (L/R=10msec) 5A @ 5-30VDC @ 60 degrees C resistive load
Minimum Load Current	
AC	0.5mA
DC	0.5mA
Maximum surge current	20A each point (cap. load @ 10 ms.)
Maximum switching capability	1250 VAC (resistive load)
Maximum module current	21A at 60 degrees C 25A at 30 degrees C
Output leakage current	< 100 microamps

Fault sensing	None
Fault reporting	None
Error indication	None
Response time	10 ms @ 60 Hz OFF to ON 20 ms @ 60 Hz ON to OFF
Maximum switching cycles	> 30 x 10^6 (mechanical) >=1 x 10^5 (inductive load with external protective circuitry)

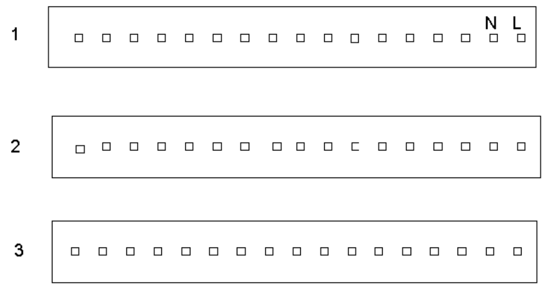
Internal Pin Connections

Overview

This section contains an illustration of the I/O base.

Illustration

There are no internal connections between terminals on the I/O base.



Field Wiring Guidelines

Overview

This section contains wiring guidelines and precautions.

Terminal Connector

With respect to the terminal connector, the guidelines are as follows:

- Screw type, 17 pin, field connectors are included with this module and do not have to be ordered separately.
- Note that pin 1 has been removed and the connector begins at pin 2.
- 18 pin connectors that are used on other Momentum I/O Bases, cannot be used with this module.

Busbar May Be Required

Depending on the type of field devices you are using, you may need a 1-row busbar. The following busbars are available from Schneider Automation.

Type	Part Number
Screw-in	170 XTS 006 01
Spring-clip	170 XTS 007 01

Mapping Terminal Blocks

⚠ CAUTION

POTENTIAL FOR SHORT CIRCUITS AND/OR POWER-UP SPIKES

Provide external fuses on the operating voltage to protect the module. Appropriate fuse values are shown in the wiring illustration. An unprotected module may be subject to short circuits and/or power-up spikes.

Failure to follow these instructions can result in injury or equipment damage.

The following table shows mapping terminal blocks and optional busbars.

Row	Terminal	Function
1	2,4,6,8,10,12	Relay Output 1 through 6 (normally open)
	17	module neutral
	18	120 to 230 VAC module power
2	2,4,6,8,10,12	Relay Output 1 through 6 (normally closed)
3	2,4,6,8,10,12	Relay Output Common 1 through 6
4	1 ... 18	Protective earth (PE)

Protective Circuit Required

When contacted switches are used on the input lines or when lines to the peripherals are very long, the outputs of inductive loads require protective circuitry with a clamping/suppressor diode. Install the protective circuit parallel to the operating coil.

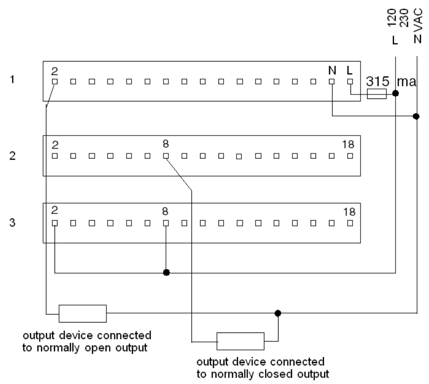
Wiring Diagrams

Overview

This section provides a diagram to assist you in wiring a 2-wire actuator.

2-Wire Actuator

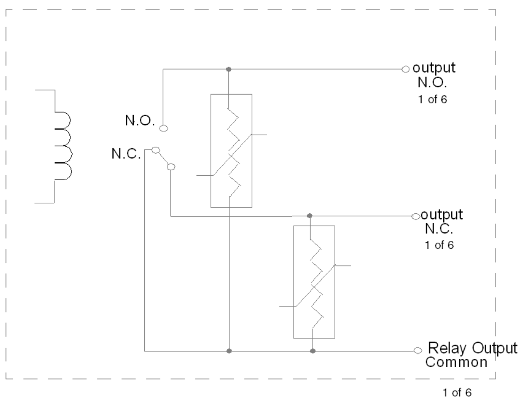
The diagram below shows field wiring for 2-wire 120 VAC actuators using a normally open and normally closed relay output.



NOTE: The 6 relay outputs are individually isolated. This allows for the use of separate power sources for each output if individual isolation is required.

Simplified Output Schematics

The following diagram shows the relay output circuitry.



I/O Mapping

Overview

The 170 ADO 830 30 TSX Momentum I/O base supports 6 relay outputs. This section contains information about the mapping of the I/O data into one output word.

I/O Map

The I/O base may be mapped as one output word, or as 16 discrete output points.

IEC vs. Ladder Logic

In order to correctly field wire the outputs and map the output data, you need to know which type of Momentum Adapter is mounted on the base.

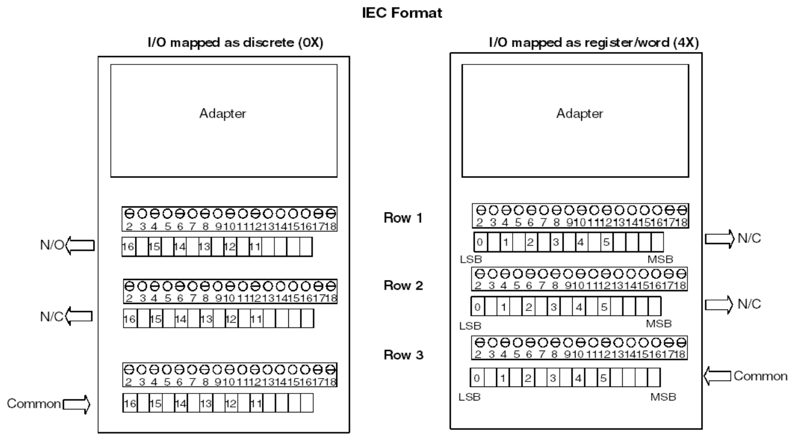
NOTE: Pin 1 of the module has been eliminated and the relay begins with pin 2. The field connectors come with the relay module and do not need to be ordered separately.

Adapters may be either IEC compliant or 984 Ladder Logic compliant.

	IEC Compliant	**984 Compliant**
Momentum Processor Adapters	All	None
Momentum Communication Adapters	All, except 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01	170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01

Data Mapping

The figure below shows how data is mapped on the I/O base with an IEC Compliant adapter. When the I/O is mapped as discrete points (0x), the MSB is assigned to Pin 2. When I/O is mapped as a word or register (4x), the LSB (bit 0) is assigned to Pin 2.

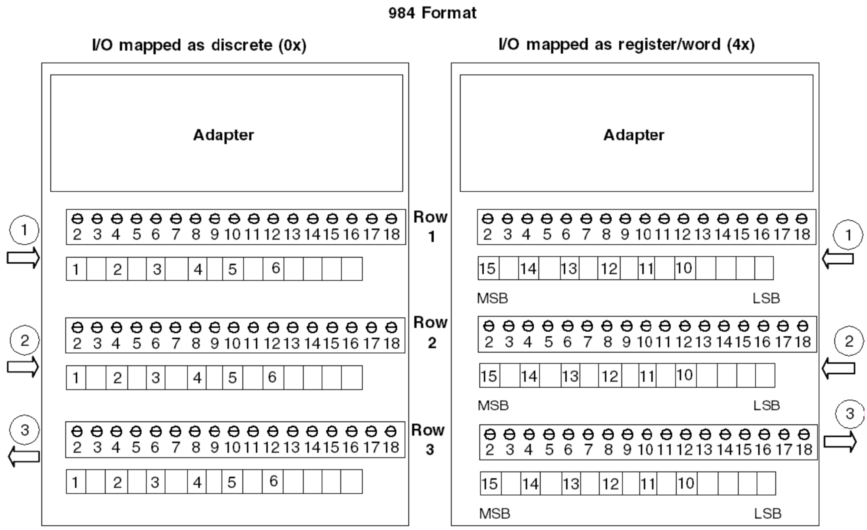


NOTE: The terminal connectors have the following features:

- Screw type, 17 pin, field connectors that are included with this module and do not have to be purchased separately.
- Pin 1 has been removed and the connector begins at pin 2.
- 18 pin connectors that are used on other Momentum I/O Bases, cannot be used with this module.
- Connector part number: 170XTS01000 (contains 3 connectors).

Data Mapping

The figure below shows how data is mapped on the I/O base with a 984 Ladder Logic Compliant adapter. When the I/O is mapped as discrete points (0x), the LSB is assigned to Pin 2. When I/O is mapped as a word or register (4x), the MSB (bit 15) is assigned to Pin 2.



1 NO
2 NC
3 Common

NOTE: The terminal connectors have the following features:

- Screw type, 17 pin, field connectors that are included with this module and do not have to be purchased separately.
- Pin 1 has been removed and the connector begins at pin 2.
- 18 pin connectors that are used on other Momentum I/O Bases, cannot be used with this module.
- Connector part number : 170XTS01000 (contains 3 connectors).

170 AMM 090 00 Analog 4 Ch. In / 2 Ch. Out Module Base w/ 24 VDC I/O Pts

32

Overview

This chapter describes the 170 AMM 090 00 TSX Momentum I/O base. See also 170 AMM 090 01 *(see page 493)*.

What's in this Chapter?

This chapter contains the following topics:

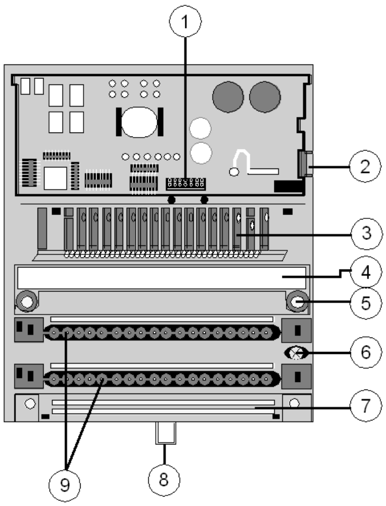
Front Panel Components

Overview

This section contains an illustration of the front panel of the 170 AMM 090 00 I/O base and a description of the LEDs.

Front Panel Illustration

The front panel of the I/O base is shown in the illustration below.

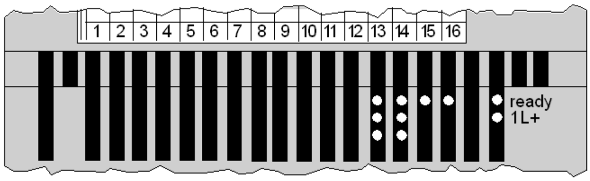


Components of the I/O module

Label	Description
1	Internal interface (ATI) connector
2	Ground contact for the adapter
3	LED status display
4	Protective cover
5	Mounting holes for panel mount
6	Grounding screw
7	Busbar Mounting Slot
8	Locking tab for DIN rail mount
9	Sockets for the terminal connectors

LED Illustration

The LEDs are shown in the illustration below.



LED Descriptions

The LEDs are described in the table below.

Indicator	Condition	Message
Ready	Green	Module is ready to communicate on network. Operating voltage for internal logic is present and self-test has been passed.
	Off	Module is not ready.
1L+	Green	Supply voltage for outputs 1, 2 applied.
	Off	Supply voltage for outputs 1, 2 not applied.
Top row 13 ... 16	Green	Discrete input status (an LED per input). Input point active, i.e. input carries "1" signal (logically "ON").
	Off	Discrete input status (an LED per input). Input point inactive, i.e. input carries "0" signal (logically "OFF").
Middle row 13 , 14	Green	Discrete output status (an LED per output). Output point active, i.e. output carries "1" signal (logically "ON").
	Off	Discrete output status (an LED per output). Output point inactive, i.e. output carries "0" signal (logically "OFF").
Bottom row 13 , 14	Red	Discrete output overload (one LED per output). Output concerned short-circuited or overloaded.
	Off	Discrete outputs 1 ... 2 operating normally.

Specifications

Overview

This section contains specifications for the 170 AMM 090 00 I/O base.

General Specifications

Module type	4 differential inputs, 2 outputs (analog) 4 inputs, 2 outputs (discrete)
Supply voltage	24 VDC
Supply voltage range	20 ... 30 VDC
Supply current consumption	max. 350 mA at 24 VDC
Power dissipation	4 W typical 6 W maximum
I/O map	5 input words 5 output words

Isolation

Discrete inputs from outputs	none
Analog inputs from outputs	none
Analog inputs and outputs from operating voltage	500 VDC, 1 min
Operating voltage and all inputs and outputs from ground	500 VDC, 1 min

Fuses

Internal	none
Operating voltage L+	1 A slow-blow (Bussmann GDC-1A or equivalent)
Output voltage 1L+	Depending on the application, max. 5 A fast-blow
Input voltage 1L+	Depending on the application, max. 1 A fast-blow

EMC

Immunity	IEC 1131-2 (500 V disturbance pulse in operating voltage)
Radiated noise	EN 50081-2
Agency approvals	UL, CSA, CE, FM Class 1, Div 2

Physical Dimensions

Width	125 mm (4.9 in)
Depth (with no adapter)	40 mm (1.54 in)
Length	141.5 mm (5.5 in) no busbar 159.5 mm (6.3 in) with two-row busbar 171.5 mm (6.75) with three-row busbar
Weight	240 g (0.55 lb)

Analog Inputs

Number of channels	4 differential inputs
Common mode voltage	Input voltage from Ag +/- 11 V
Common mode suppression	> 54 dB
Overvoltage (1 input) Static Dynamic	Voltage ranges +/- 30 V when voltage source is 24 V +/- 50 V max. 100 s Current ranges, input current < 48 mA
Input resistance	> 1 MOhm voltage range 250 Ohm current range
Input filter time constant	120 microsec. (typ.)
Crosstalk	Input channel from input channel approx -80 dB

Range Specific Data

Range	**+/- 10 V**	**+/- 5 V**	**1 ... 5 V**	**+/- 20 mA**	**4 ... 20 mA**
Conversion time	10 ms for all channels	10 ms for all channels	10 ms for all channels	10 ms for all channels	10 ms for all channels
Conversion error at 25 deg. C	max. 0.08 % of upper measuring range value	max. 0.16 % of upper measuring range value	max. 0.16 % of upper measuring range value	max. 0.16 % of upper measuring range value	max. 0.16 % of upper measuring range value
Error at 0 ... 60 deg. C	max. 0.15 % of upper measuring range value	max. 0.3 % of upper measuring range value	max. 0.3 % of upper measuring range value	max. 0.3 % of upper measuring range value	max. 0.3 % of upper measuring range value
Conversion consistency	max. 0.02 % of upper measuring range value	max. 0.04 % of upper measuring range value	max. 0.04 % of upper measuring range value	max. 0.04 % of upper measuring range value	max. 0.04 % of upper measuring range value
Resolution)	14 bits	13 bits	12 bits	13 bits	12 bits

Analog Outputs

Number of channels	2	
Conversion time	1 ms for all channels	
Conversion error at 25 deg. C	max +/- 0.35 % of upper measuring range value	
Loop power supply	None required	
Error at 0 ... 60 deg. C	max +/- 0.7 % of upper measuring range value	
Linearity	+/- 1 LSB (monotonous)	
Crosstalk	Output channel from output channel approx. - 80 dB	
Range	**+/-10 V Voltage**	**0 ... 20 mA Current**
Output load	>= 3 KOhm	<= 600 Ohms
Resolution	12 bits	12 bits

Discrete Inputs

Number of points	4
Number of groups	1
Points per group	4
Signal type	True High
IEC 1131 type	1+ (See Appendix *IEC 1131 Input Types, page 603* for definitions of IEC input types.)
ON voltage	+11 ... +30 VDC
OFF voltage	-3 ... +5 VDC
Input current	2.5 mA minimum ON (6 mA at 24 VDC) 1.2 mA maximum OFF
Input voltage range	-3 ... +30 VDC
Input resistance	4 kOhm
Response time	2.2 ms OFF to ON 2.2 ms ON to OFF

Discrete Outputs

A 2-point temperature monitoring circuit protects each discrete output against short-circuiting and overload. The outputs will keep disconnecting and reconnecting until the cause of the error has been eliminated.

Output type	Semiconductor
Output voltage	External supply - .5 VDC
Number of points	2
Number of groups	1
Points per group	2
Current capacity	1 A/point maximum 2 A/group 2 A/module
Signal type	True High
Leakage current (output out)	< 1 mA @ 24 VDC
On state voltage drop	< 0.5 VDC @ 0.5 A
Output protection (See Note Below)	Outputs are electronically safeguarded to assist in short circuit and overload protection
Fault reporting	1 red LED/point (row 3) ON when short current/ overload occurs
Error indication	Message "I/O Error" on bus adapter if module is defective
Response time (resistive load / 0.5 A)	< 0.1 ms OFF to ON < 0.1 ms ON to OFF
Maximum switching cycles	1000/h for 0.5 A inductive load 100/s for 0.5 A resistive load 8/s for 1.2 W Tungsten load

NOTE: Discrete 24 VDC outputs incorporate thermal shutdown and overload protection. The output current of a shortened output is limited to a nondestructive value. The short circuit heats the output driver and the output will switch off. The output will switch on again if the driver leaves the overtemperature condition. If the short circuit still exists, the driver will reach the overtemperature condition again and will switch off again.

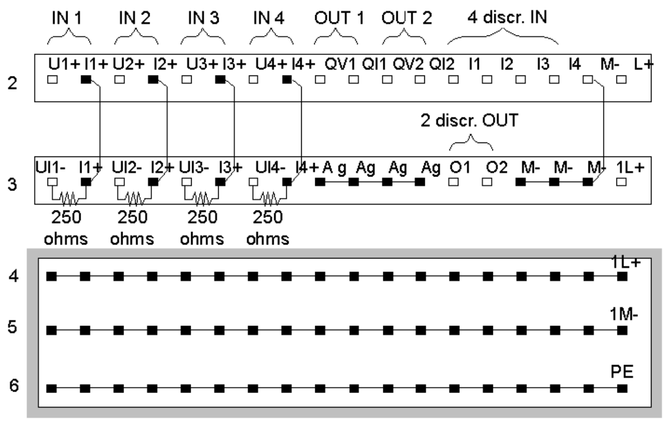
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base and an optional busbar.

Illustration

Rows 1 through 3 show the internal connections between terminals on the I/O base. Row 4 through 6 show the internal connections on the optional busbar.



Field Wiring Guidelines

Overview

The discrete input points are field wired to row 2 of the base. The discrete output points are wired to row 3. This section contains wiring guidelines and precautions.

Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Electric sells terminal connectors in sets of three.

Type	Part Number
Screw-in	170 XTS 001 00
Spring-clip	170 XTS 002 00

Busbar May Be Required

Depending on the type of field devices you are using, you may need a 1-, 2-, or 3-row busbar. The following busbars are available from Schneider Electric.

Type	Number of Rows	Part Number
Screw-in	1 - row	170 XTS 006 01
	2 - row	170 XTS 005 01
	3 - row	170 XTS 004 01
Spring-clip	1 - row	170 XTS 007 01
	2 - row	170 XTS 008 01
	3 - row	170 XTS 003 01

Mapping Terminal Blocks

CAUTION

POTENTIAL FOR SHORT CIRCUITS AND/OR POWER-UP SPIKES

Provide external fuses on the operating voltage to protect the module. Appropriate fuse values are shown in the wiring illustration. An unprotected module may be subject to short circuits and/or power-up spikes.

Failure to follow these instructions can result in injury or equipment damage.

Mapping terminal blocks and busbars is described in the table below.

Row	Connection	Signal	Meaning
2	1, 3, 5, 7	U1+ ... U4+	pos. voltage input (analog)
	2, 4, 6, 8	IS1 ... IS4	current sensing inputs (analog)
	9, 11	QV1, QV2	analog output channels 1 ... 2 (voltage mode)
	10, 12	QI1, QI2	analog outputs, channels 1 ... 2 (current mode)
	13 ... 16	I1 ... I4	discrete inputs 1...4
	17/ 18	M-/ L+	reference potential and operating voltage
3	1, 3, 5, 7	UI1- ... UI4-	neg. voltage mode and current mode inputs (analog)
	2, 4, 6, 8	I1+ ... I4+	pos. analog inputs, channels 1 ... 4 (current mode)
	9 ... 12	Ag	reference potential for analog channels
	13, 14	O1, O2	discrete outputs 1,2
	15, 16, 17	M-	reference potential for discrete outputs
	18	1L+	output voltage mode for discrete outputs
4	1 ... 18	1L+	sensor supply
5	1 ... 18	1M-	reference potential for sensors
6	1 ... 18	PE	protective ground

Protective Circuit May Be Required

When contacted switches are used on the input lines or when lines to the peripherals are very long, the outputs of inductive loads require protective circuitry with a clamping/suppressor diode. Install the protective circuit prallel to the operating coil.

Wiring Diagrams

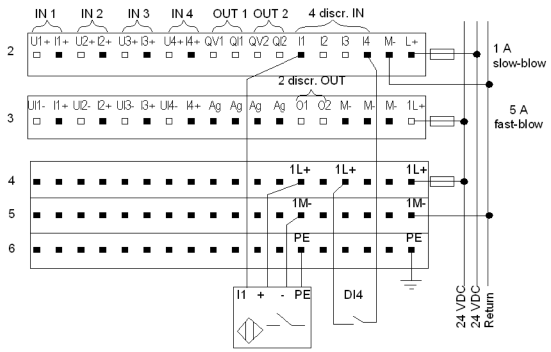
Overview

This section contains diagrams to assist you in wiring the following types of devices:

I/O Type	Diagram
Discrete input	2- and 4-wire sensors
Discrete output	3-wire actuators
Analog output	2-wire actuators
Analog input	3-wire sensors

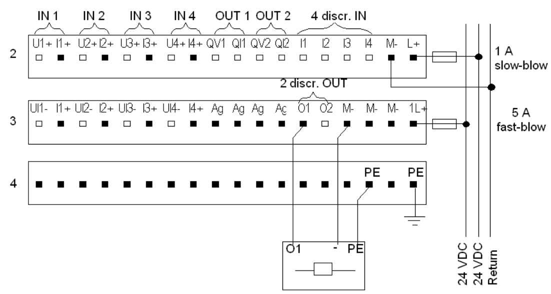
Discrete Inputs

The diagram below shows an example of wiring for discrete inputs:



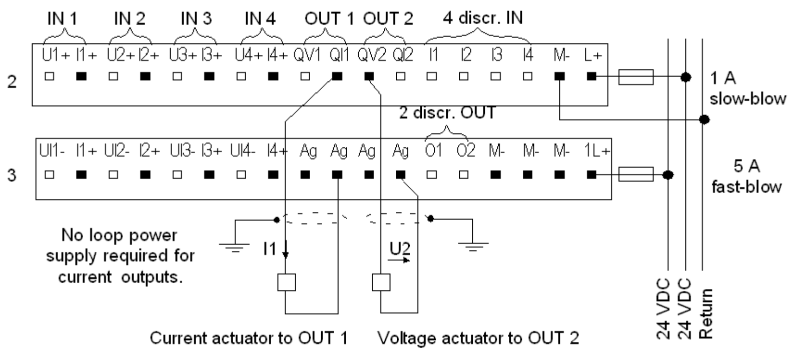
Discrete Outputs

The diagram below shows an example of wiring for discrete outputs:



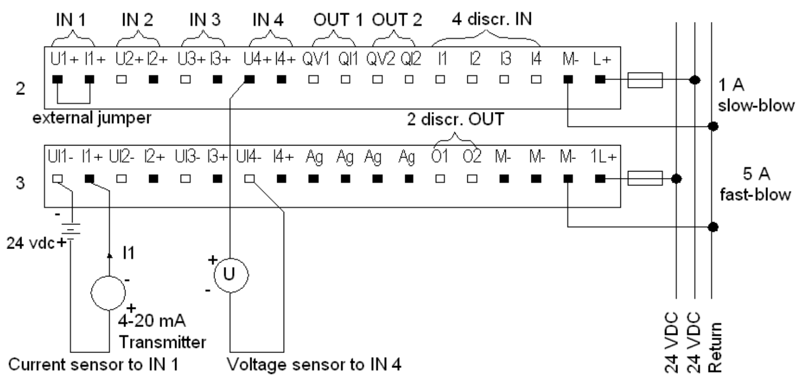
Analog Outputs

The diagram below shows an example of wiring for analog outputs:



Analog Inputs

The diagram below shows an example of wiring for analog inputs:



I/O Mapping

Overview

The 170 AMM 090 00 TSX Momentum I/O base supports 4 analog inputs, 2 analog outputs,4 discrete inputs and 2 discrete outputs. This section contains information about the mapping of the output words into the analog/discrete output values, the usage of output words for channel configuration and the mapping of analog/discrete input values into input words.

I/O Map

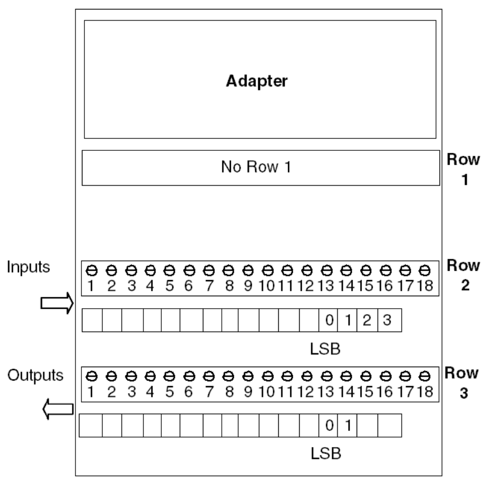
The I/O base may be mapped as five contiguous input words and five contiguous output words, as follows:

Word	Input Data	Output Data
1 = LSW	Value, input channel 1	Parameters for input channels 1 ... 4
2	Value, input channel 2	Parameters for output channels 1,2
3	Value, input channel 3	Value, output channel 1
4	Value, input channel 4	Value, output channel 2
5 = MSW	Discrete inputs	Discrete outputs

Discrete I/O Mapping

The figure below shows how data is mapped with an IEC Compliant adapter.

IEC and 984 Format



Analog Channel Parameters

Overview

Parameters must be set for all of the analog channels before the module can be commissioned. This section provides the codes for setting the parameters and gives examples of parameter settings.

NOTE: If you set new parameters for the module, always send a complete set of parameters (all channels, inputs and outputs), even if you only want to change a single parameter. Otherwise the module will refuse the new parameters and continue working with the old ones.

Key

This section focuses on output words 1 and 2, as highlighted in the table below:

Word	Input Data	Output Data
1 = LSW	Value, input channel 1	**Parameters for input channels 1 ... 4**
2	Value, input channel 2	**Parameters for input channels 5 ... 8**
3	Value, input channel 3	Not used
4	Value, input channel 4	Not used
5 = MSW	Value, input channel 5	Not used

Illustration

Parameters are set by entering a four-bit code in output words 1 and 2, as follows:

Output Word 1															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
for input channel 4				for input channel 3				for input channel 2				for input channel 1			

Output Word 2															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
not used				not used				for output channel 2				for output channel 1			

Codes for Analog Input Parameters

Use the following codes to set the parameters for each analog input channel:

Code (binary)	Code (hex)	Parameter
0100	4	Channel inactive
0010	2	+/-5V or +/-20mA input range
0011	3	+/-10V input range
1010	A	1 ... 5V or 4 ... 20 mA input range

Example of Analog Input Parameters

If output word 1 is initialized as A324 hex, then the input channels have the following parameters:

Channel	Parameter
1	Disabled
2	at +/- 5 V
3	at +/- 10 V
4	at 1 ... 5 V

Codes for Analog Output Parameters

Use the following codes to set the codes for each analog output channel. The remaining bit combinations are reserved.

Code (Binary)	Code (Hex)	Parameter	Reset Behavior of Outputs
0 1 0 0	4	Channel inactive	0 V / 0 mA
0 0 0 1	1	0 ... 20 mA	0 mA
0 0 1 1	3	+ / - 10 VDC	0 V
0 1 0 1	5	0 ... 20 mA	20 mA
0 1 1 1	7	+ / - 10 VDC	+ 10 VDC
1 0 0 1	9	0 ... 20 mA	Output is held
1 0 1 1	B	+ / - 10 VDC	Output is held

Example of Analog Output Parameters

If output word 2 is initialized as 0091 hex, then the output channels have the following parameters:

Channel	Parameter
1	0 ... 20 mA with reset to 0
2	0 ... 20 mA with reset to hold

Analog Outputs

Overview

This section describes how to interpret the value of the analog output channels.

Key

This section describes output words 3 and 4, as highlighted in the table below:

Word	Input Data	Output Data
1 = LSW	Value, input channel 1	Parameters for input channels 1 ... 4
2	Value, input channel 2	Parameters for output channels 1, 2
3	Value, input channel 3	**Value, output channel 1**
4	Value, input channel 4	**Value, output channel 2**
5 = MSW	Discrete inputs	Discrete outputs

Diagram

The following diagrams explain how to interpret the value of output words 3 and 4. .

Output Word 3															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
sign	value output channel 1														

Output Word 4															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
sign	value output channel 2														

Analog Inputs

Overview

This section describes how to interpret the value of the analog input channels.

Key

This section describes input words 1 ... 4, as highlighted in the table below:

Word	Input Data	Output Data
1 = LSW	**Value, input channel 1**	Parameters for input channels 1 ... 4
2	**Value, input channel 2**	Parameters for output channels 1, 2
3	**Value, input channel 3**	Value, output channel 1
4	**Value, input channel 4**	Value, output channel 2
5 = MSW	Discrete inputs	Discrete outputs

Analog Input Values

Mapping of analog input values is shown below.

Intput Word 1															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
sign	value input channel 1														

Input Word 4															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
sign	value input channel 4														

Resolution

The resolution of the module is 12-, 13- or 14-bit, depending on the range.

Discrete Inputs and Outputs

Overview

The 170 AMM 090 00 TSX Momentum I/O base supports 4 discrete inputs and 2 discrete outputs. This section describes how to map I/O data between the I/O base and the CPU.

NOTE: You cannot commision the discrete I/O until parameters have been set for all six analog channels.

You must configure analog inputs and outputs, even if they are not being used, for the discrete inputs and outputs to operate.

Key

The discrete inputs and outputs are I/O mapped as word 5, the most significant word, as shown in the table below:

Word	Input Data	Output Data
1 = LSW	Value, input channel 1	Parameters for input channels 1 ... 4
2	Value, input channel 2	Parameters for output channels 1,2
3	Value, input channel 3	Value, output channel 1
4	Value, input channel 4	Value, output channel 2
5 = MSW	**Discrete inputs**	**Discrete outputs**

Number of Words

The processor sends two discrete output data bits in one 16-bit word to the I/O base.

The base returns four discrete input data bits, and possibly an error message, if one has been detected, to the processor in one 16-bit word.

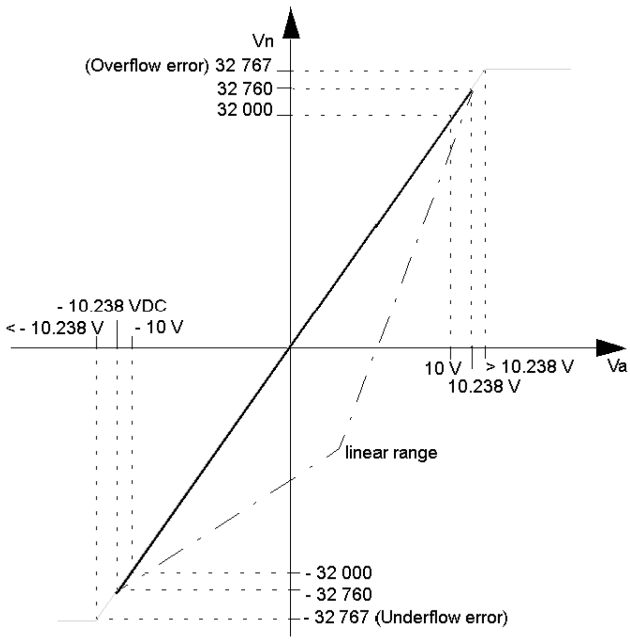
Input Measuring Ranges

Overview

This section contains illustrations explaining the analog/digital relation for the various input and output measuring ranges.

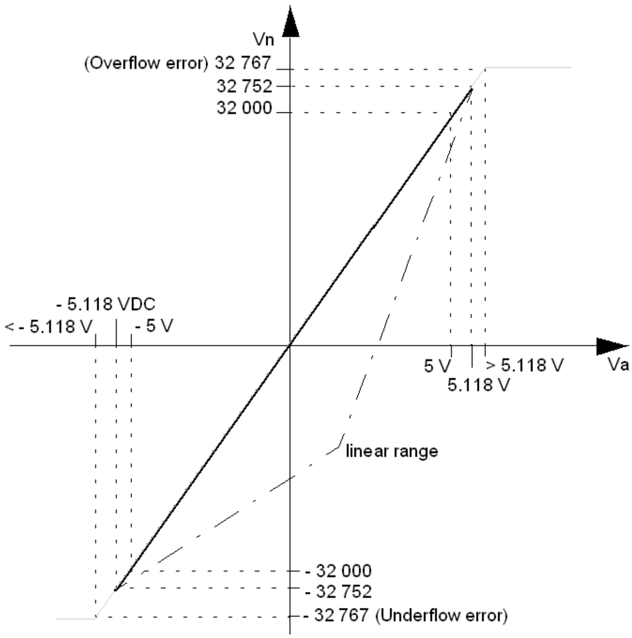
Input Range +/- 10 V

The following diagram shows the analog/digital relation for the input measuring range +/- 10 V. The voltage value is calculated along the following formula using the digital measurand: Vn = 3200 x Va (for the linear range):



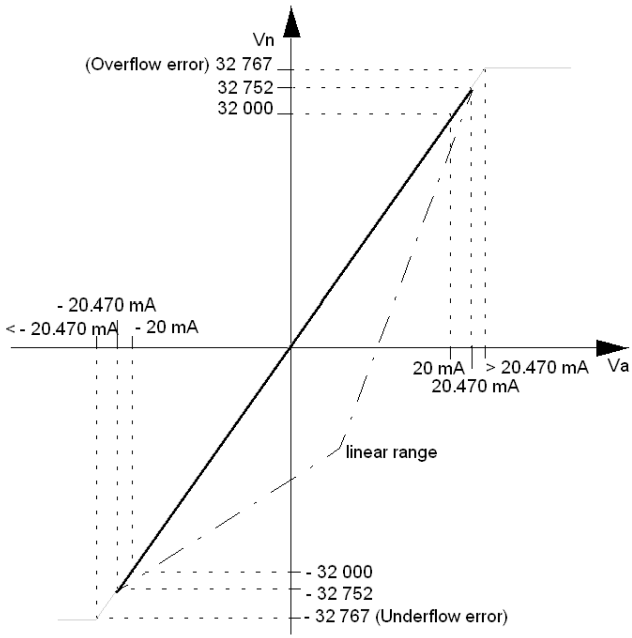
Input Range +/- 5 V

The following diagram shows the analog/digital relation for the input measuring range +/- 5 V. The voltage value is calculated along the following formula using the digital measurand: Vn = 6400 x Va (for the linear range):



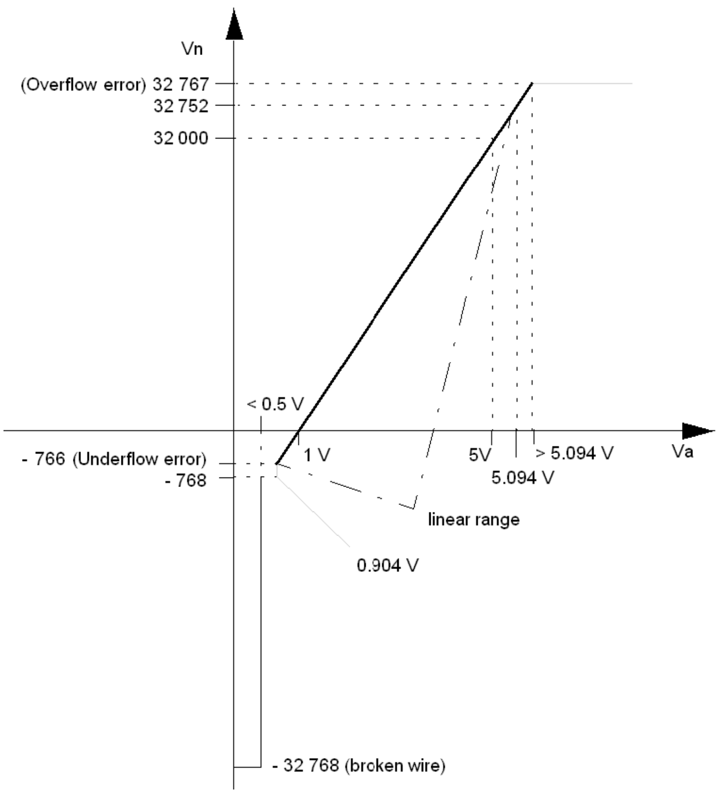
Input Range +/- 20 mA

The following diagram shows the analog/digital relation for the input measuring range +/- 20 mA. The current value is calculated along the following formula using the digital measurand: Vn = 1600 x Ia (for the linear range):



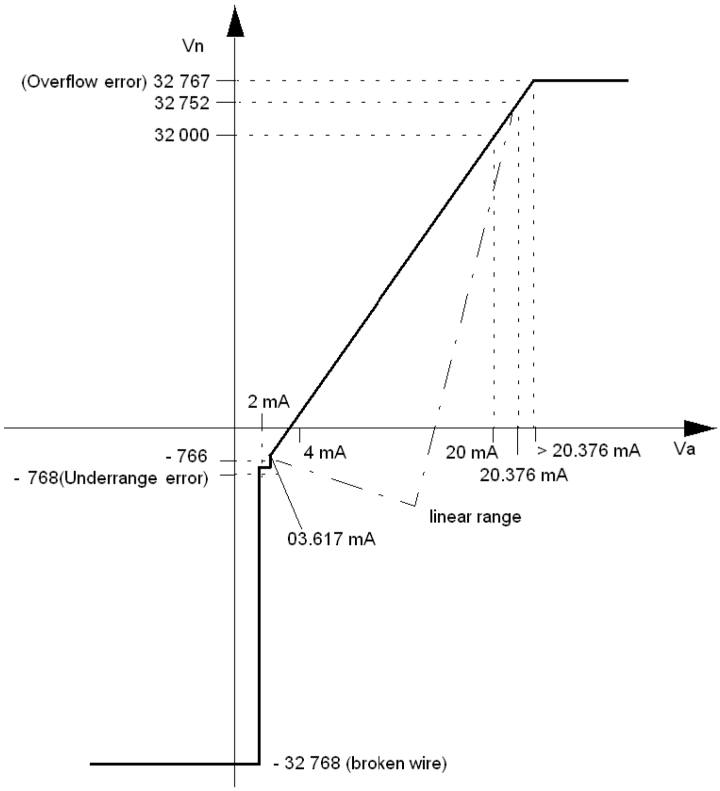
Input Range 1 ... 5 V

The following diagram shows the analog/digital relation for the input measuring range 1 ... 5 V. The voltage value is calculated along the following formula using the digital measurand: Vn = 8000 x Va - 8000 (for the linear range):



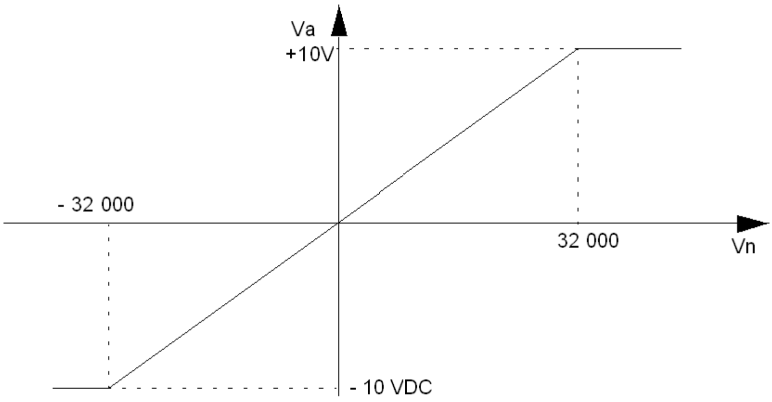
Input Range 4 ... 20 mA

The following diagram shows the analog/digital relation for the input measuring range 4 ... 20 mA. The current value is calculated along the following formula using the digital measurand: Vn = 2000 x Ia - 8000 (for the linear range). Disabled channels deliver a value of 0.



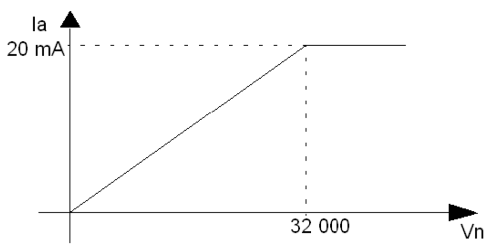
Output Range +/- 10 V

The following diagram shows the analog/digital relation for the output range +/- 10 V. When the bus is reset, the outputs use the configured parameters. If the module does not have valid parameters, the outputs will go to 0 V resp. 0 mA.The output voltage value is calculated along the following formula using the digital default value:Va = 1/3200 x Vn.



Output Range 0 ... 20 mA

The following diagram shows the analog/digital relation for the output range 0 ... 20 mA. When the bus is reset, the outputs use the configured parameters. If the module does not have valid parameters, the outputs will go to 0 V resp. 0 mA.The output current value is calculated along the following formula using the digital default value:Ia = 1/1600 x Vn.



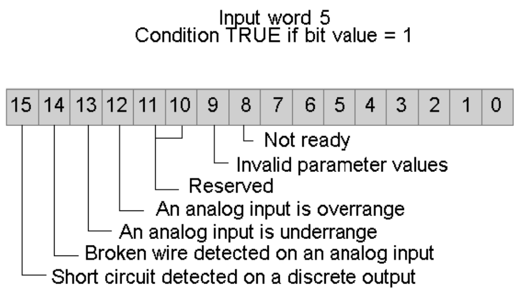
Error Messages

Overview

Error messages are stored in input word 5 (the 3x +4 register). This section explains how to interpret the bits in that register.

Diagram

This diagram explains the error message displayed by each bit. A value of 1 indicates the error has occurred.



Not Ready (Bit 8)

This error occurs when the I/O base has not yet received valid parameters or has just received parameters for the first time and is checking them.

Invalid Parameters (Bit 9)

This error occurs when the I/O base refuses one or more invalid parameters. The base will continue working with the old parameters until it receives a complete set of valid parameters.

Overrange Indication (Bit 12)

This error occurs when the I/O base detects an overrange analog input value. The threshold is range-dependent.

Underrange Indication (Bit 13)

This error occurs when the I/O base detects an underrange analog input value. The threshold is range-dependent.

Broken Wire Detection (Bit 14))

Broken wire detection is possible for the 4 ... 20 mA range. In this case, a current signal that is less than 2 mA on one of the inputs is detected as a broken wire. The input word of that channel returns the value -32,768.

In the 1 ... 5 VDC range, broken wire detection is correctly seen as undervoltage detection. A voltage of less than 0.5 VDC on on of the input channels is recognized as broken wire. The input word of that channel returns the value -32,768.

In case of a broken wire, the input floats and bit 14 is not set in all cases. A reliable broken wire detection is only possible if a resistor is wired in parallel to the input terminals. This resistor will discharge the input capacity and broken wire detection will be available.

The value of this resistor depends on internal resistance of the sensor. Values too low might influene the input signal and values too high lengthen the time for broken wire detection. Normally, values of less than 100 kOhm are appropriate.

Short Circuit (Bit 15)

This error occurs when the I/O base detects a short circuit on a discrete output.

170 AMM 090 01 Analog 4 Ch. In / 2 Ch. Out Module Base w/ 12 VDC I/O Pts

33

Overview

This chapter describes the 170 AMM 090 01 Momentum I/O base.

What's in this Chapter?

This chapter contains the following topics:

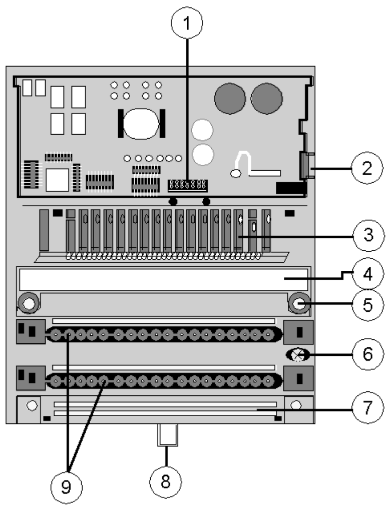
Front Panel Components

Overview

This section contains an illustration of the front panel of the 170 AMM 090 01 I/O base and a description of the LEDs.

Front Panel Illustration

The front panel of the I/O base is shown in the illustration below.

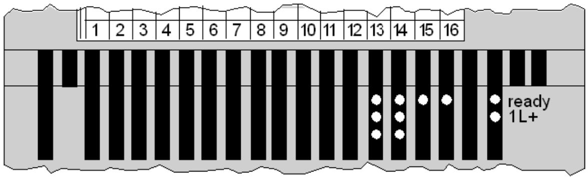


Components of the I/O Module

Label	Description
1	Internal interface (ATI) connector
2	Ground contact for the adapter
3	LED status display
4	Protective cover
5	Mounting holes for panel mount
6	Grounding screw
7	Busbar Mounting Slot
8	Locking tab for DIN rail mount
9	Sockets for the terminal connectors

LED Illustration

The LEDs are shown in the illustration below.



LED Descriptions

The LEDs are described in the table below.

Indicator	Condition	Message
Ready	Green	Module is ready to communicate on network. Operating voltage for internal logic is present and self-test has been passed.
	Off	Module is not ready.
1L+	Green	Supply voltage for outputs 1, 2 applied.
	Off	Supply voltage for outputs 1, 2 not applied.
Top row 13 ... 16	Green	Discrete input status (an LED per input). Input point active, i.e. input carries "1" signal (logically "ON").
	Off	Discrete input status (an LED per input). Input point inactive, i.e. input carries "0" signal (logically "OFF").
Middle row 13 , 14	Green	Discrete output status (an LED per output). Output point active, i.e. output carries "1" signal (logically "ON").
	Off	Discrete output status (an LED per output). Output point inactive, i.e. output carries "0" signal (logically "OFF").
Bottom row 13 , 14	Red	Discrete output overload (one LED per output). Output concerned short-circuited or overloaded.
	Off	Discrete outputs 1 ... 2 operating normally.

Specifications

Overview

This section contains specifications for the 170 AMM 090 01 I/O base.

General Specifications

Module type	4 differential inputs, 2 outputs (analog) 4 inputs, 2 outputs (discrete)
Supply voltage	12 VDC
Supply voltage range	9.6 ... 14.4 VDC
Supply current consumption	max. 750 mA at 12 VDC
Power dissipation	4 W typical 6 W maximum
I/O map	5 input words 5 output words

Isolation

Discrete inputs from outputs	none
Analog inputs from outputs	none
Analog inputs and outputs from operating voltage	500 VDC, 1 min
Operating voltage and all inputs and outputs from ground	500 VDC, 1 min

Fuses

Internal	none
Operating voltage L+	1 A slow-blow (Bussmann GDC-1A or equivalent)
Output voltage 1L+	Depending on the application, max. 5 A fast-blow
Input voltage 1L+	Depending on the application, max. 1 A fast-blow

EMC

Immunity	IEC 1131-2 (500 V disturbance pulse in operating voltage)
Radiated noise	EN 50081-2
Agency approvals	UL, CSA, CE

Physical Dimensions

Width	125 mm (4.9 in)
Depth (with no adapter)	40 mm (1.54 in)
Length	141.5 mm (5.5 in) no busbar 159.5 mm (6.3 in) with two-row busbar 171.5 mm (6.75) with three-row busbar
Weight	240 g (0.55 lb)

Analog Inputs

Number of channels	4 differential inputs
Common mode voltage	Input voltage from Ag +/- 11 V
Common mode suppression	> 54 dB
Overvoltage (1 input) Static Dynamic	Voltage ranges +/- 30 V when voltage source is 24 V +/- 50 V max. 100 s Current ranges, input current < 48 mA
Input resistance	> 1 MOhm voltage range 250 Ohm current range
Input filter time constant	120 microsec. (typ.)
Crosstalk	Input channel from input channel approx -80 dB

Range Specific Data

Range	**+/- 10 V**	**+/- 5 V**	**1 ... 5 V**	**+/- 20 mA**	**4 ... 20 mA**
Conversion time	10 ms for all channels	10 ms for all channels	10 ms for all channels	10 ms for all channels	10 ms for all channels
Conversion error at 25 deg. C	max. 0.08 % of upper measuring range value	max. 0.16 % of upper measuring range value	max. 0.16 % of upper measuring range value	max. 0.16 % of upper measuring range value	max. 0.16 % of upper measuring range value
Error at 0 ... 60 deg. C	max. 0.15 % of upper measuring range value	max. 0.3 % of upper measuring range value	max. 0.3 % of upper measuring range value	max. 0.3 % of upper measuring range value	max. 0.3 % of upper measuring range value
Conversion consistency	max. 0.02 % of upper measuring range value	max. 0.04 % of upper measuring range value	max. 0.04 % of upper measuring range value	max. 0.04 % of upper measuring range value	max. 0.04 % of upper measuring range value
Resolution)	14 bits	13 bits	12 bits	13 bits	12 bits

Analog Outputs

Number of channels	2	
Conversion time	1 ms for all channels	
Conversion error at 25 deg. C	max +/- 0.35 % of upper measuring range value	
Loop power supply	None required	
Error at 0 ... 60 deg. C	max +/- 0.7 % of upper measuring range value	
Linearity	+/- 1 LSB (monotonous)	
Crosstalk	Output channel from output channel approx. - 80 dB	
Range	**+/-10 V Voltage**	**0 ... 20 mA Current**
Output load	>= 3 KOhm	<= 600 Ohms
Resolution	12 bits	12 bits

Discrete Inputs

Number of points	4
Number of groups	1
Points per group	4
Signal type	True High
ON voltage	+7.5 ... +15 VDC
OFF voltage	-1.5 ... +2.5 VDC
Input current	2.5 mA minimum ON (5.5 mA at 12 VDC) 1.5 mA maximum OFF
Input voltage range	-1.5 ... +15 VDC
Input resistance	2.1 kOhm
Response time	2.2 ms OFF to ON 3.3 ms ON to OFF

Discrete Outputs

A 2-point temperature monitoring circuit protects each discrete output against short-circuiting and overload. The outputs will keep disconnecting and reconnecting until the cause of the error has been eliminated.

Output type	Semiconductor
Output voltage	External supply - .5 VDC
Number of points	2
Number of groups	1
Points per group	2
Current capacity	1 A/point maximum 2 A/group 2 A/module
Signal type	True High
Leakage current (output out)	< 1 mA @ 12 VDC
On state voltage drop	< 0.5 VDC @ 0.5 A
Output protection (See Note Below)	Outputs are electronically safeguarded to assist in short circuit and overload protection
Fault reporting	1 red LED/point (row 3) ON when short current/ overload occurs
Error indication	Message "I/O Error" on bus adapter if module is defective
Response time (resistive load / 0.5 A)	< 0.1 ms OFF to ON < 0.1 ms ON to OFF
Maximum switching cycles	1000/h for 0.5 A inductive load 100/s for 0.5 A resistive load 8/s for 1.2 W Tungsten load

NOTE: Discrete 12 VDC outputs incorporate thermal shutdown and overload protection. The output current of a shortened output is limited to a nondestructive value. The short circuit heats the output driver and the output will switch off. The output will switch on again if the driver leaves the overtemperature condition. If the short circuit still exists, the driver will reach the overtemperature condition again and will switch off again.

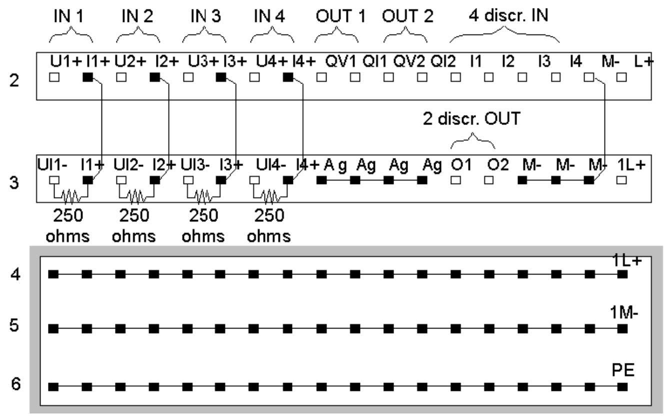
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base and an optional busbar.

Illustration

Rows 1 through 3 show the internal connections between terminals on the I/O base. Row 4 through 6 show the internal connections on the optional busbar.



Field Wiring Guidelines

Overview

The discrete input points are field wired to row 2 of the base. The discrete output points are wired to row 3. This section contains wiring guidelines and precautions.

Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Electric sells terminal connectors in sets of three.

Type	Part Number
Screw-in	170 XTS 001 00
Spring-clip	170 XTS 002 00

Busbar May Be Required

Depending on the type of field devices you are using, you may need a 1-, 2-, or 3-row busbar. The following busbars are available from Schneider Electric.

Type	Number of Rows	Part Number
Screw-in	1 - row	170 XTS 006 01
	2 - row	170 XTS 005 01
	3 - row	170 XTS 004 01
Spring-clip	1 - row	170 XTS 007 01
	2 - row	170 XTS 008 01
	3 - row	170 XTS 003 01

Mapping Terminal Blocks

⚠ CAUTION

POTENTIAL FOR SHORT CIRCUITS AND/OR POWER-UP SPIKES

Provide external fuses on the operating voltage to protect the module. Appropriate fuse values are shown in the wiring illustration. An unprotected module may be subject to short circuits and/or power-up spikes.

Failure to follow these instructions can result in injury or equipment damage.

Mapping terminal blocks and busbars is described in the table below.

Row	Connection	Signal	Meaning
2	1, 3, 5, 7	U1+ ... U4+	pos. voltage input (analog)
	2, 4, 6, 8	IS1 ... IS4	current sensing inputs (analog)
	9, 11	QV1, QV2	analog output channels 1 ... 2 (voltage mode)
	10, 12	QI1, QI2	analog outputs, channels 1 ... 2 (current mode)
	13 ... 16	I1 ... I4	discrete inputs 1...4
	17/ 18	M-/ L+	reference potential and operating voltage
3	1, 3, 5, 7	UI1- ... UI4-	neg. voltage mode and current mode inputs (analog)
	2, 4, 6, 8	I1+ ... I4+	pos. analog inputs, channels 1 ... 4 (current mode)
	9 ... 12	Ag	reference potential for analog channels
	13, 14	O1, O2	discrete outputs 1,2
	15, 16, 17	M-	reference potential for discrete outputs
	18	1L+	output voltage mode for discrete outputs
4	1 ... 18	1L+	sensor supply
5	1 ... 18	1M-	reference potential for sensors
6	1 ... 18	PE	protective ground

Protective Circuit May Be Required

When contacted switches are used on the input lines or when lines to the peripherals are very long, the outputs of inductive loads require protective circuitry with a clamping/suppressor diode. Install the protective circuit prallel to the operating coil.

Wiring Diagrams

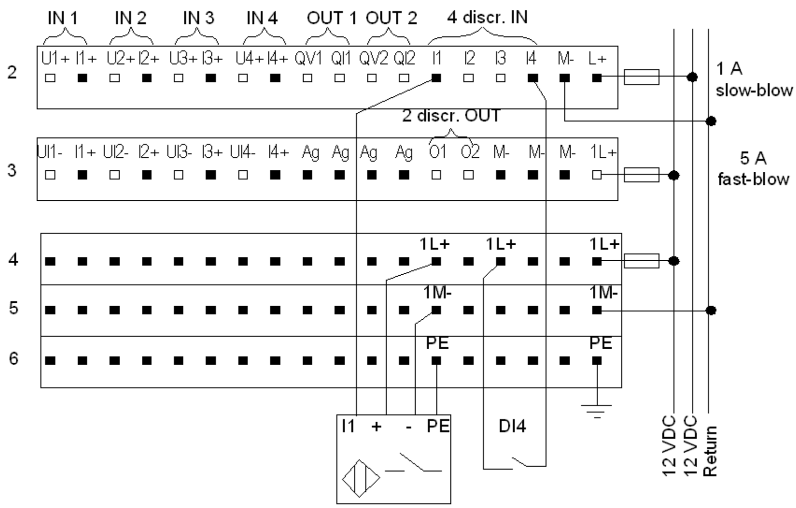
Overview

This section contains diagrams to assist you in wiring the following types of devices:

I/O Type	Diagram
Discrete input	2- and 4-wire sensors
Discrete output	3-wire actuators
Analog output	2-wire actuators
Analog input	3-wire sensors

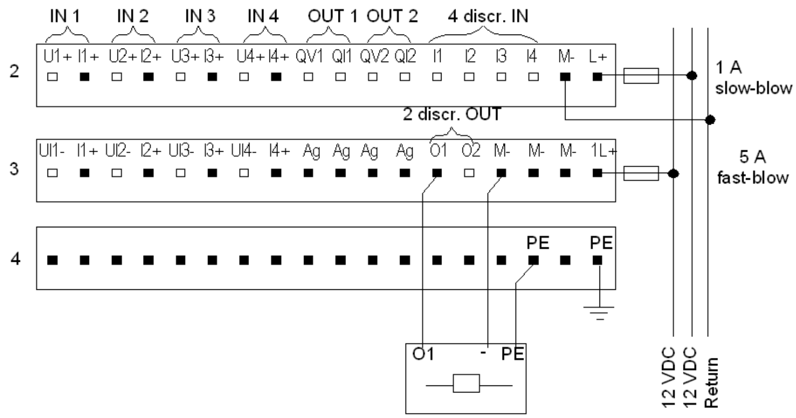
Discrete Inputs

The diagram below shows an example of wiring for discrete inputs:



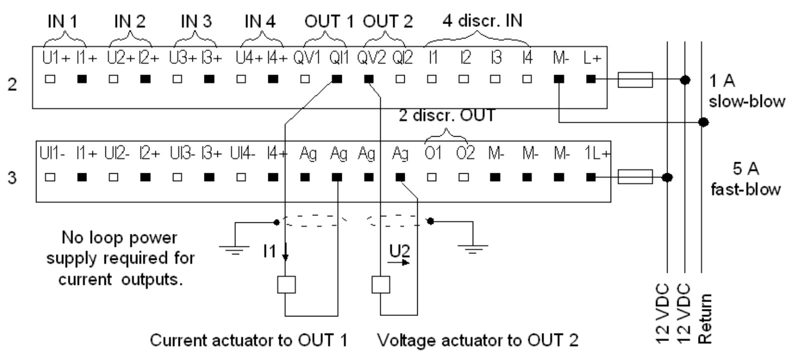
Discrete Outputs

The diagram below shows an example of wiring for discrete outputs:



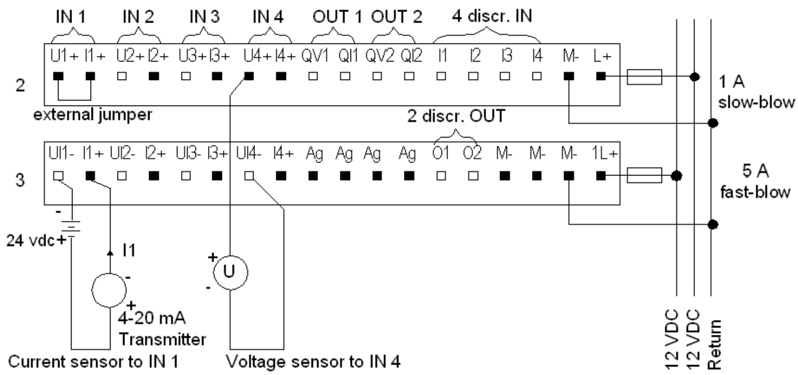
Analog Outputs

The diagram below shows an example of wiring for analog outputs:



Analog Inputs

The diagram below shows an example of wiring for analog inputs:



I/O Mapping

Overview

The 170 AMM 090 01 TSX Momentum I/O base supports 4 analog inputs, 2 analog outputs,4 discrete inputs and 2 discrete outputs. This section contains information about the mapping of the output words into the analog/discrete output values, the usage of output words for channel configuration and the mapping of analog/discrete input values into input words.

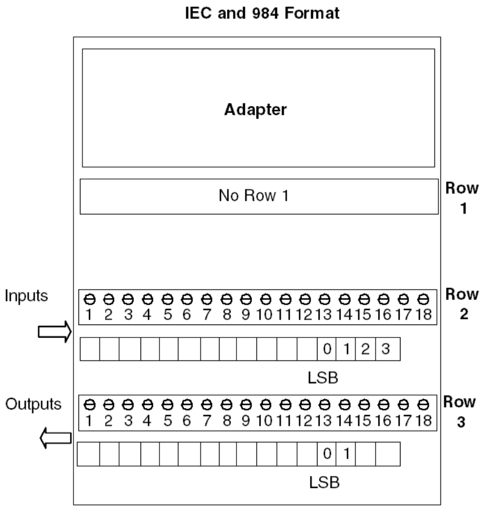
I/O Map

The I/O base may be mapped as five contiguous input words and five contiguous output words, as follows:

Word	Input Data	Output Data
1 = LSW	Value, input channel 1	Parameters for input channels 1 ... 4
2	Value, input channel 2	Parameters for output channels 1,2
3	Value, input channel 3	Value, output channel 1
4	Value, input channel 4	Value, output channel 2
5 = MSW	Discrete inputs	Discrete outputs

Discrete I/O Mapping

The figure below shows how data is mapped with an IEC Compliant adapter.



Analog Channel Parameters

Overview

Parameters must be set for all of the analog channels before the module can be commissioned. This section provides the codes for setting the parameters and gives examples of parameter settings.

NOTE: If you set new parameters for the module, always send a complete set of parameters (all channels, inputs and outputs), even if you only want to change a single parameter. Otherwise the module will refuse the new parameters and continue working with the old ones.

Key

This section focuses on output words 1 and 2, as highlighted in the table below:

Word	Input Data	Output Data
1 = LSW	Value, input channel 1	**Parameters for input channels 1 ... 4**
2	Value, input channel 2	**Parameters for input channels 5 ... 8**
3	Value, input channel 3	Not used
4	Value, input channel 4	Not used
5 = MSW	Value, input channel 5	Not used

Illustration

Parameters are set by entering a four-bit code in output words 1 and 2, as follows:

Output Word 1															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
for input channel 4				for input channel 3				for input channel 2				for input channel 1			

Output Word 2															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
not used				not used				for output channel 2				for output channel 1			

Codes for Analog Input Parameters

Use the following codes to set the parameters for each analog input channel:

Code (binary)	Code (hex)	Parameter
0100	4	Channel inactive
0010	2	+/-5V or +/-20mA input range
0011	3	+/-10V input range
1010	A	1 ... 5V or 4 ... 20 mA input range

Example of Analog Input Parameters

If output word 1 is initialized as A324 hex, then the input channels have the following parameters:

Channel	Parameter
1	Disabled
2	at +/- 5 V
3	at +/- 10 V
4	at 1 ... 5 V

Codes for Analog Output Parameters

Use the following codes to set the codes for each analog output channel. The remaining bit combinations are reserved.

Code (Binary)	Code (Hex)	Parameter	Reset Behavior of Outputs
0 1 0 0	4	Channel inactive	0 V / 0 mA
0 0 0 1	1	0 ... 20 mA	0 mA
0 0 1 1	3	+ / - 10 VDC	0 V
0 1 0 1	5	0 ... 20 mA	20 mA
0 1 1 1	7	+ / - 10 VDC	+ 10 VDC
1 0 0 1	9	0 ... 20 mA	Output is held
1 0 1 1	B	+ / - 10 VDC	Output is held

Example of Analog Output Parameters

If output word 2 is initialized as 0091 hex, then the output channels have the following parameters:

Channel	Parameter
1	0 ... 20 mA with reset to 0
2	0 ... 20 mA with reset to hold

Analog Outputs

Overview

This section describes how to interpret the value of the analog output channels.

Key

This section describes output words 3 and 4, as highlighted in the table below:

Word	Input Data	Output Data
1 = LSW	Value, input channel 1	Parameters for input channels 1 ... 4
2	Value, input channel 2	Parameters for output channels 1, 2
3	Value, input channel 3	**Value, output channel 1**
4	Value, input channel 4	**Value, output channel 2**
5 = MSW	Discrete inputs	Discrete outputs

Diagram

The following diagrams explain how to interpret the value of output words 3 and 4.

Output Word 3															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
sign	value output channel 1														

Output Word 4															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
sign	value output channel 2														

Analog Inputs

Overview

This section describes how to interpret the value of the analog input channels.

Key

This section describes input words 1 ... 4, as highlighted in the table below:

Word	Input Data	Output Data
1 = LSW	**Value, input channel 1**	Parameters for input channels 1 ... 4
2	**Value, input channel 2**	Parameters for output channels 1, 2
3	**Value, input channel 3**	Value, output channel 1
4	**Value, input channel 4**	Value, output channel 2
5 = MSW	Discrete inputs	Discrete outputs

Analog Input Values

Mapping of analog input values is shown below.

Input Word 1															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
sign	value input channel 1														

Input Word 4															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
sign	value input channel 4														

Resolution

The resolution of the module is 12-, 13- or 14-bit, depending on the range.

Discrete Inputs and Outputs

Overview

The 170 AMM 090 01 TSX Momentum I/O base supports 4 discrete inputs and 2 discrete outputs. This section describes how to map I/O data between the I/O base and the CPU.

NOTE: You cannot commission the discrete I/O until parameters have been set for all six analog channels.

You must configure analog inputs and outputs, even if they are not being used, for the discrete inputs and outputs to operate.

Key

The discrete inputs and outputs are I/O mapped as word 5, the most significant word, as shown in the table below:

Word	Input Data	Output Data
1 = LSW	Value, input channel 1	Parameters for input channels 1 ... 4
2	Value, input channel 2	Parameters for output channels 1,2
3	Value, input channel 3	Value, output channel 1
4	Value, input channel 4	Value, output channel 2
5 = MSW	**Discrete inputs**	**Discrete outputs**

Number of Words

The processor sends two discrete output data bits in one 16-bit word to the I/O base.

The base returns four discrete input data bits, and possibly an error message, if one has been detected, to the processor in one 16-bit word.

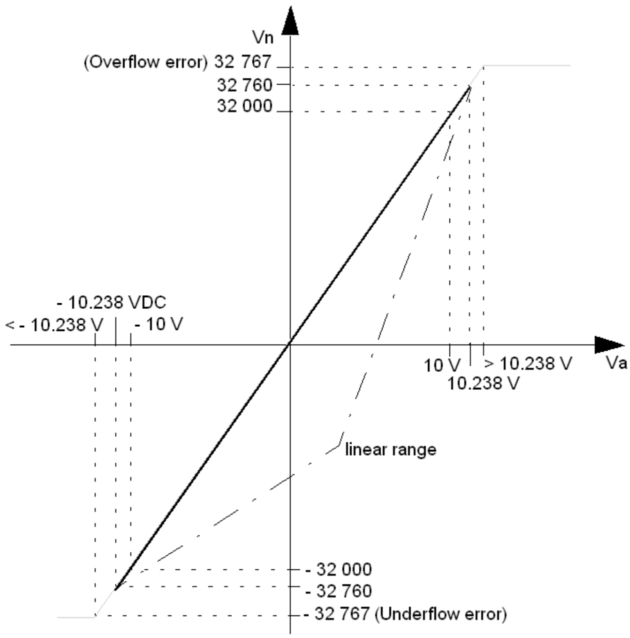
Input and Output Measuring Ranges

Overview

This section contains illustrations explaining the analog/digital relation for the various input and output measuring ranges.

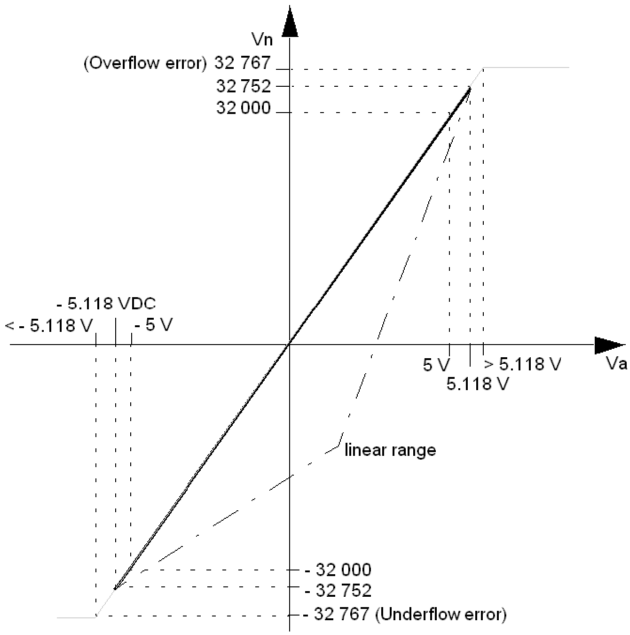
Input Range +/- 10 V

The following diagram shows the analog/digital relation for the input measuring range +/- 10 V. The voltage value is calculated along the following formula using the digital measurand: Vn = 3200 x Va (for the linear range):



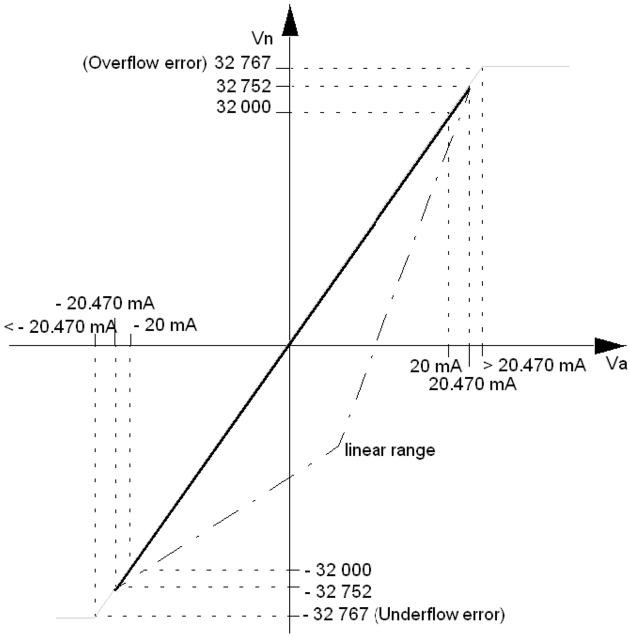
Input Range +/- 5 V

The following diagram shows the analog/digital relation for the input measuring range +/- 5 V. The voltage value is calculated along the following formula using the digital measurand: Vn = 6400 x Va (for the linear range):



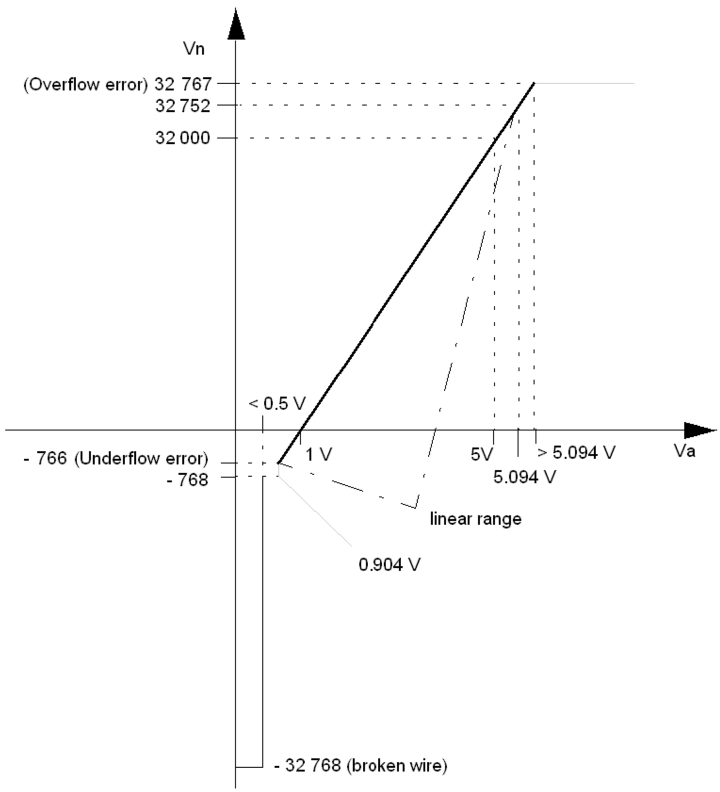
Input Range +/- 20 mA

The following diagram shows the analog/digital relation for the input measuring range +/- 20 mA. The current value is calculated along the following formula using the digital measurand: Vn = 1600 x Ia (for the linear range):



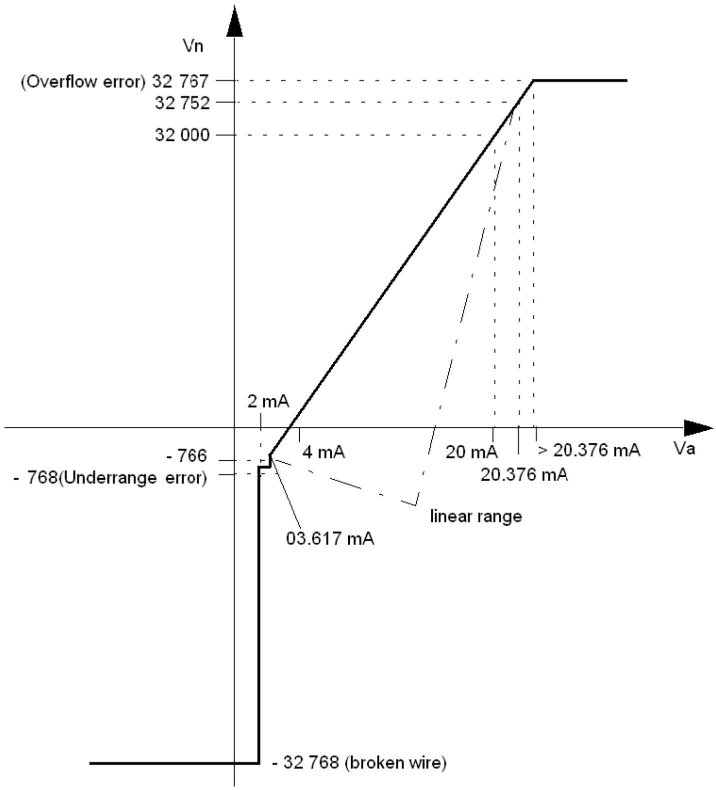
Input Range 1 ... 5 V

The following diagram shows the analog/digital relation for the input measuring range 1 ... 5 V. The voltage value is calculated along the following formula using the digital measurand: Vn = 8000 x Va - 8000 (for the linear range):



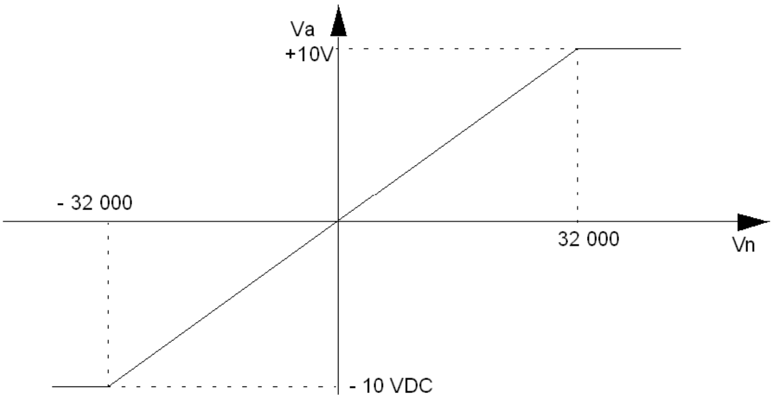
Input Range 4 ... 20 mA

The following diagram shows the analog/digital relation for the input measuring range 4... 20 mA. The current value is calculated along the following formula using the digital measurand: Vn = 2000 x Ia - 8000 (for the linear range). Disabled channels deliver a value of 0.



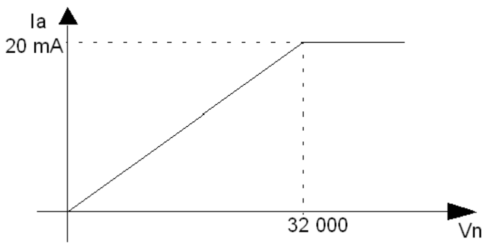
Output Range +/- 10 V

The following diagram shows the analog/digital relation for the output range +/- 10 V. When the bus is reset, the outputs use the configured parameters. If the module does not have valid parameters, the outputs will go to 0 V resp. 0 mA.The output voltage value is calculated along the following formula using the digital default value:Va = 1/3200 x Vn.



Output Range 0 ... 20 mA

The following diagram shows the analog/digital relation for the output range 0 ... 20 mA. When the bus is reset, the outputs use the configured parameters. If the module does not have valid parameters, the outputs will go to 0 V resp. 0 mA.The output current value is calculated along the following formula using the digital default value:Ia = 1/1600 x Vn



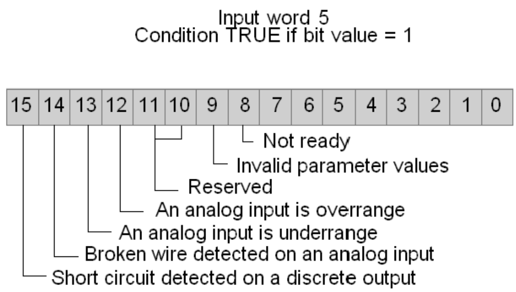
Error Messages

Overview

Error messages are stored in input word 5 (the 3x +4 register). This section explains how to interpret the bits in that register.

Diagram

This diagram explains the error message displayed by each bit. A value of 1 indicates the error has occurred



Not Ready (Bit 8)

This error occurs when the I/O base has not yet received valid parameters or has just received parameters for the first time and is checking them.

Invalid Parameters (Bit 9)

This error occurs when the I/O base refuses one or more invalid parameters. The base will continue working with the old parameters until it receives a complete set of valid parameters.

Overrange Indication (Bit 12)

This error occurs when the I/O base detects an overrange analog input value. The threshold is range-dependent.

Underrange Indication (Bit 13)

This error occurs when the I/O base detects an underrange analog input value. The threshold is range-dependent.

Broken Wire Detection (Bit 14))

Broken wire detection is possible for the 4 ... 20 mA range. In this case, a current signal that is less than 2 mA on one of the inputs is detected as a broken wire. The input word of that channel returns the value -32,768.

In the 1 ... 5 VDC range, broken wire detection is correctly seen as undervoltage detection. A voltage of less than 0.5 VDC on one of the input channels is recognized as broken wire. The input word of that channel returns the value -32,768.

In case of a broken wire, the input floats and bit 14 is not set in all cases. A reliable broken wire detection is only possible if a resistor is wired in parallel to the input terminals. This resistor will discharge the input capacity and broken wire detection will be available.

The value of this resistor depends on internal resistance of the sensor. Values too low might influence the input signal and values too high lengthen the time for broken wire detection. Normally, values of less than 100 kOhm are appropriate.

Short Circuit (Bit 15)

This error occurs when the I/O base detects a short circuit on a discrete output.

170 ANR 120 90 Unipolar Analog 6 Ch. In / 4 Ch. Out Module Base with 24 VDC I/O Points

34

Overview

This chapter describes the 170 ANR 120 90 TSX Momentum I/O base.

What's in this Chapter?

This chapter contains the following topics:

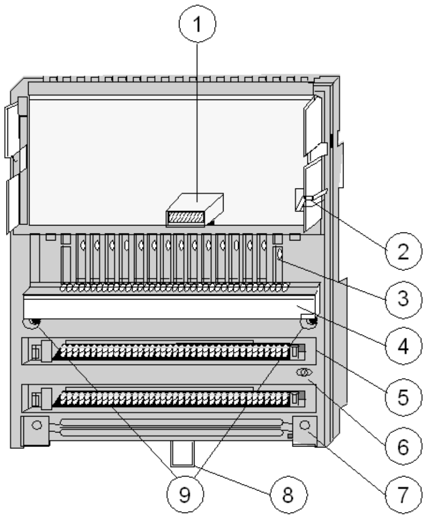
Front Panel Components

Overview

This section contains a photograph of the front panel of the 170 ANR 120 90 I/O base and a description of the LEDs.

Front Panel Illustration

The front panel of the I/O base is shown in the illustration below.

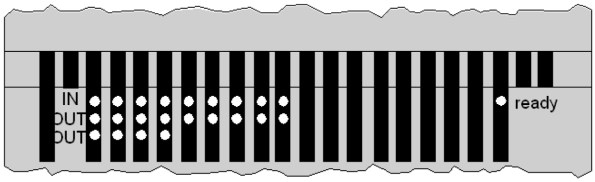


Components of the I/O module

Label	Description
1	Internal interface (ATI) connector
2	Locking and ground contact for the adapter
3	LED status display
4	Protective cover
5	Sockets for the terminal connectors
6	Grounding screw
7	Busbar mounting slot
8	Locking tab for DIN rail mount
9	Mounting holes for panel mount

LED Illustration

The LEDs are shown in the illustration below.



LED Descriptions

The LEDs are described in the table below.

LED	Color	Status	Meaning
Ready	Green	ON	I/O base is communicating with the comm adapter/CPU top hat. CPU must be in RUN state.
O1, O2, O3, O4, O5, O6, O7, O8	Green	ON	Indicates the corresponding discrete output point is ON
I1, I2, I3, I4, I5, I6, I7, I8	Green	ON	Indicates the corresponding input point is ON
AO1, AO2, AO3, AO4	Green	ON	Indicates the corresponding analog output channel is active

Specifications

Overview

This section contains specifications for the 170 ANR 120 90 I/O base.

NOTE: In order for the 170 ANR 120 90 module to comply with the Directives 73/23/EEC (LV) and 89/336/EEC (EMC) and the IEC standards, EN 61131-2:2003 and EN 55011, the module must be used with a Telemecanique power supply, model numbers ABL7 RE2403, ABL RE2405, or ABL RE2410.

General Specifications

Module type	Analog 6 inputs / 4 outputs Discrete 8 inputs / 8 outputs
Supply voltage	24 VDC
Supply voltage range	20-30 VDC
Supply current consumption	max. 400 mA
I/O map	12 input words 12 output words

Isolation

Between points	none
Between groups	none
Field to protective Earth	500 VAC

Protection

Discrete outputs	protected against overload and short-circuiting

EMC

Immunity	IEC 1131-2 Surge on auxiliary power supply 500 V
Emissions	EN 50081-2
ENV 50140	10 V/M
Agency Approval	UL, CSA, CE

Environment

Storage temperature	-40 TO 85 °C
Operating temperature	0 TO 60 °C
Humidity operating	95% RH @ 60 °C
Humidity non-operating	95% RH @ 60 °C
Vibration operating	10 - 57 HZ 0.075 MMDA 57-150 HZ 1
Shock non-operating	15 G, 11MS, 3 shocks/axis
Free fall (unpackaged)	0.1 meter

Physical Dimensions

Width	125 mm (4.9 in)
Depth (with no adapter)	40 mm (1.54 in)
Length	141.5 mm (5.5 in) no or one busbar 159.5 mm (6.3 in) two busbars 171.5 mm (6.75 in) three busbars
Weight	220 g (0.49 lb)

Analog Inputs

Number of input channels	Six single-ended
Range	0 to 10V
Input impedance	>1 megohm
Resolution	14 bits
Accuracy, 25 °C	0.2%
Linearity	
Integral linearity Differential linearity	0.006% Guaranteed monotonic
Temp coefficient	+ 100PPM/° C
Update time	0.75msec for all six channels
Data format	Left justified

Analog Outputs

Number of output channels	4
Range	0 to 10V
Resolution	14 bits
Accuracy, 25 °C	0.4%
Linearity	
Integral linearity Differential linearity	0.018% Guaranteed monotonic
Temp coefficient	+ 100PPM/° C
Update time	1.20 msec for all four channels
Data format	Left justified

Discrete Inputs

Number of points	8 sinking, type 2
Voltage and current thresholds	
ON (voltage)	>11VDC
OFF (voltage)	<5VDC
ON (current)	>6mA
OFF (current)	<2mA
Absolute maximum input Continuous	 32VDC
Input response ON - OFF, OFF - ON	 1.20msec maximum
Input protection	Resistor limited, varistors

Discrete Outputs

NOTE: The output current of a shortened output is limited to a nondestructive value. The short circuit heats the output driver and the output will switch off.

The output will switch on again if the driver leaves the overtemperature condition and the user resets the output under program control.

If the short circuit still exists after the output point is reset, the driver will reach the overtemperature condition again and will switch off again.

Number of output points	8 sourcing
Operating voltage	
Working	10 ... 30VDC
Absolute maximum	50VDC for 1msec
ON state drop / point	0.4VDC max at 0.25A
Maximum load current	
Each point	0.25A
Per module	2A
Off state leakage / point (max)	0.4mA @ 30VDC
Surge current maximum Per point	 2.5A for 1msec
Response OFF-ON, ON-OFF	 1.20msec max
Output protection (internal)	Voltage suppressor diodes, Wickman 2.5A Fuse

High-Speed Inputs and Electrical Noise

NOTE: When using high speed inputs on the 170 ANR 120 90 and 170 ANR 120 91 modules, the normal filtering of electrical transient events is not as effective as with other modules, and the inputs may respond to electrical noise in some environments.

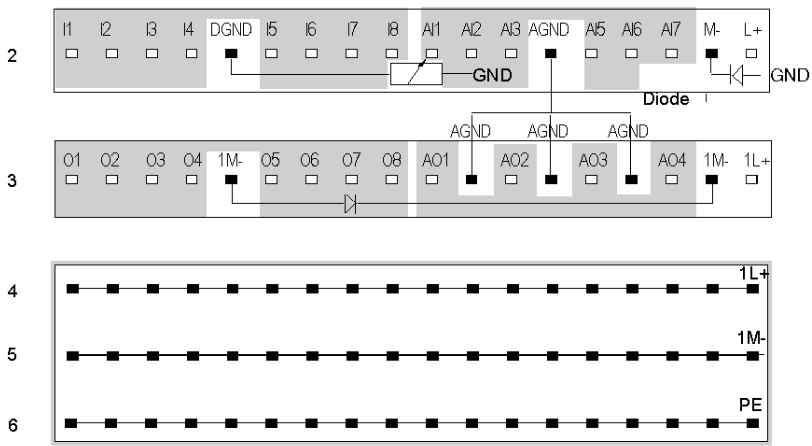
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base and an optional busbar.

Illustration

Rows 2 and 3 show the internal connections between terminals on the I/O base. Row 4 through 6 show the internal connections on the optional busbar.



NOTE: AGND and DGND are seperated internally inside the module. External digital inputs must be returned the the DGND terminal. External analog circuits must be returned to AGND terminals.

Field Wiring Guidelines

Overview

Inputs are field wired to row 2 of the I/O base. Outputs are field wired to row 3. This section contains wiring guidelines and precautions for wiring the 170 ANR 120 90 TSX Momentum I/O base.

Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Electric sells terminal connectors in sets of three.

Type	Part Number
Screw-in	170 XTS 001 00
Spring-clip	170 XTS 002 00

Busbar May Be Required

Depending on the type of field devices you are using, you may need a 1-, 2-, or 3-row busbar. The following busbars are available from Schneider Electric.

Type	Number of Rows	Part Number
Screw-in	1 - row	170 XTS 006 01
	2 - row	170 XTS 005 01
	3 - row	170 XTS 004 01
Spring-clip	1 - row	170 XTS 007 01
	2 - row	170 XTS 008 01
	3 - row	170 XTS 003 01

Mapping Terminal Blocks

The folowing table shows mapping terminal blocks and optional busbars.

Row	Terminal	Connection	Description
2	1-4	I1 ... I4	Discrete inputs 1 through 4
	5	Digital ground	Return for discrete inputs
	6-9	I5 ... I8	Discrete inputs 5 through 8
	10-12	AI1 ... AI3	Analog inputs 1, 2, 3
	13	Analog ground	Return for analog inputs
	14-16	AI4 ... AI6	Analog inputs 4, 5, 6
	17	M-	Module operating voltage, 24VDC return
	18	L+	Module operating voltage, 24VDC
3	1-4	O1 ... O4	Discrete outputs 1 through 4
	5	1M-	Return for discrete outputs
	6-9	O5 ... O8	Discrete outputs 5 through 8
	10, 12, 14, 16	AO1, AO2, AO3, AO4	Analog outputs 1, 2, 3, 4
	11, 13, 15	Analog ground	Return for analog outputs
	17	1M-	Voltage for field devices, 24VDC return
	18	1L+	Voltage for field devices, 24VDC
4	1-18	PE	Earth ground for field devices

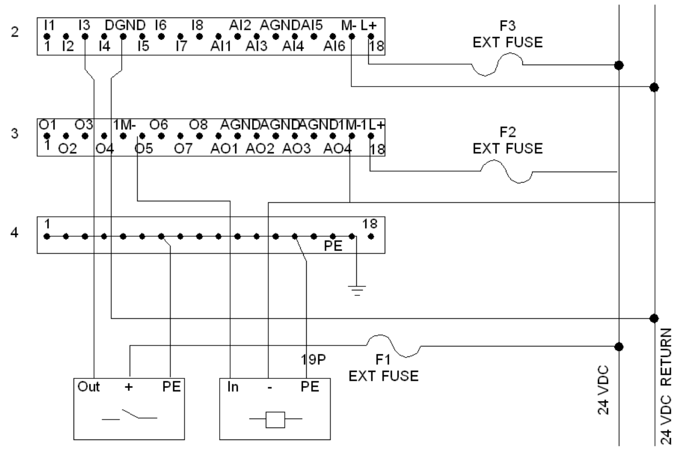
Wiring Diagrams

Overview

This section contains diagrams to assist you in wiring the following types of devices:
- Discrete input and output
- Analog input and output

Discrete I/O Devices

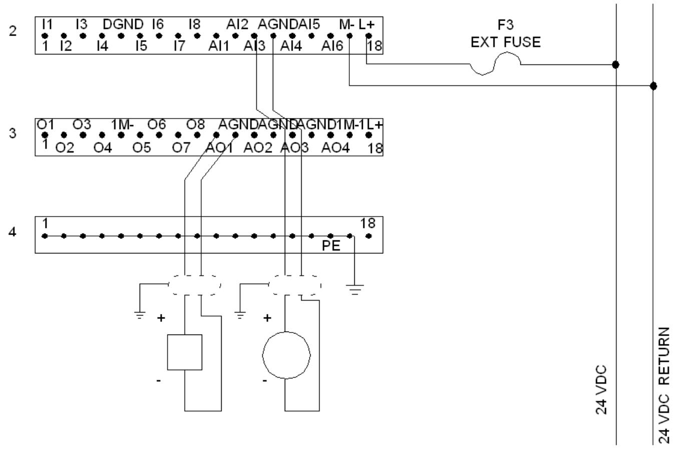
The diagram below shows an example of wiring for discrete I/O devices:



Recommended fuses:
- F1,F3-use a 1A fuse, Wickman 181110000 or equivalent
- F2 -use a 2.5A fuse, Wickman 181125000 or equivalent

Analog I/O Devices

The diagram below shows an example of wiring for Analog I/O devices:



Recommended fuses:
- F3-use a 1A fuse, Wickman 18111000 or equivalent

I/O Mapping

Overview

The 170 ANR 120 90 TSX Momentum I/O base supports 6 analog inputs, 4 analog outputs,8 discrete inputs and 8 discrete outputs. This section contains information about the mapping of the output words into the analog/discrete output values, the usage of output words for channel configuration and the mapping of analog/discrete input values into input words.

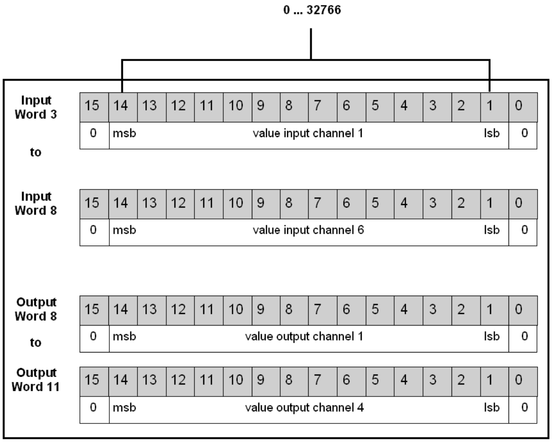
I/O Map

The I/O base must be mapped as 12 contiguous input words and 12 contiguous output words, as follows:

Word	Input Data	Output Data
1	Status word (module status)	System information
2	State of the 8 discrete inputs	Register for discrete reaction in a fail state
3	Analog input word channel 1	Register for analog reaction in a fail state
4	Analog input word channel 2	User defined analog fail state values for channel 1
5	Analog input word channel 3	User defined analog fail state values for channel 2
6	Analog input word channel 4	User defined analog fail state values for channel 3
7	Analog input word channel 5	User defined analog fail state values for channel 4
8	Analog input word channel 6	State of the 8 discrete outputs
9	Not used	Analog output word channel 1
10	Not used	Analog output word channel 2
11	Not used	Analog output word channel 3
12	Not used	Analog output word channel 4

Analog I/O MAP

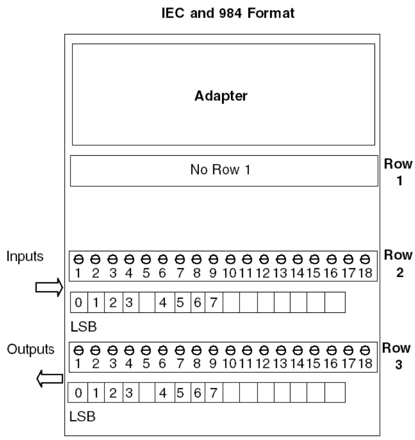
170 ANR 120 90 analog values are mapped as follows:



NOTE: The display is standardized and in each case the analog value will appear flush left.

Discrete I/O MAP

The 170 ANR 120 90 base returns eight discrete input bits to the Processor in one 16-bit word (3x). The input points are field wired to row 2 of the base. The Processor sends eight discrete output bits to the base as a single 16-bit word (4x). The output points are field wired to row 3. The figure below shows how the data is mapped between the base and the CPU.



Output Words

Overview

This section describes how to use the output words to configure the analog and discrete I/O channels.

Words Used

170 ANR 120 90 analog and discrete output channels are configured by entering the appropriate information in output words 1 through 7 as follows.

NOTE: If you are using Modsoft, the parameter words are modified through the zoom screen.

The I/O base must be mapped as 12 contiguous input words and 12 contiguous output words, as follows:

Word	Output Data
1	System information
2	Register for discrete reaction in a fail state
3	Register for analog reaction in a fail state
4	User defined analog fail state values for channel 1
5	User defined analog fail state values for channel 2
6	User defined analog fail state values for channel 3
7	User defined analog fail state values for channel 4
8	State of the 8 discrete outputs
9	Analog output word channel 1
10	Analog output word channel 2
11	Analog output word channel 3
12	Analog output word channel 4

Word 1

⚠ CAUTION

INVALID DATA CAUSE OUTPUT SHUT DOWN

Do not use a zero value in word one because it causes an output shut down state, and no inputs or outputs are updated.

Failure to follow these instructions can result in injury or equipment damage.

System information

The following table tells how bits are assigned:

Word 1	Description
Bits 0 ... 14	Not used or can be used to start the module. (Turns on the Ready LED with any value greater than zero.)
Bit 15	1= Enable user defined shutdown values 2= Disables user defined shutdown values

- Valid setting for word one are 0001 ... FFFF It is essential for the module's operation to have a value larger than 0 in this register.
- The module's default value at power-up for this register is zero (module shut down.

Word 2

Discrete Fail State Reaction and Value Register

This word combines the value and reaction in a fail state:

Word 2	Description
Bits 0 ... 7	Discreet fail state value for outputs 1 8
Bits 8 ... 13	Not used
Bit 14	0= hold last value, 1= user defined value
Bit 15	0= all outputs reset, 1=check bit 14

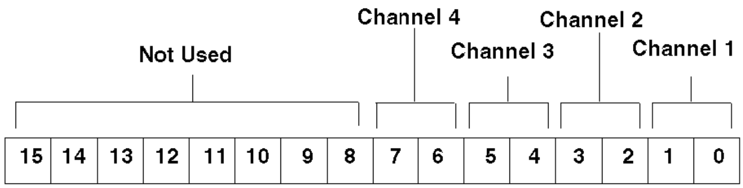
Word 3

Analog Fail State Reaction Register

This word contains four 2 bit fields which define the fail state for each channel. The four possible values of fail state are as follows:

2 bit value	Fail State
00	Minimum output voltage
01	Hold last value (default)
10	User defined shutdown value
11	Hold last value

The following picture shows how the channels are mapped into word 3:



Words 4 ... 7

Analog Fail State Value Register

The module always expects four words of user defined data, even if the data is not used. The first word of the user shutdown field is used for channel 1, the second for channel 2, . . .

Word 8

Discrete Output RegisterThis word contains a right justified binary eight bit data field.

Words 9 ... 12

Map to Analog Output Register

Each word in this range contains a left justified, binary 15 bit data field. The range is 0 ... 7FFE hex (0 ... 32766 decimal), but the resolution is only 14 bit (See *Analog I/O MAP, page 534*).

NOTE: If a user shutdown value is greater than the count range for the channel, then the count range maximum value will be used as the shutdown value.

4x Registers

The 4x registers traffic copped to this module are used for output data as follows.

I/O Map Register	Data Type
4x + 7	Data for discrete output
4x + 8	Data for analog output channel 1
4x + 9	Data for analog output channel 2
4x + 10	Data for analog output channel 3
4x + 11	Data for analog output channel 4

Range

Output operating range

	Output Voltage	Data is left justified	Comment
Output Range	0 ... 10.000V	0 ... 32000	Nominal Output Voltage Range
Output Over Range	10.000 ... 10.238V	32002 ... 32764	Linear Over Range Output Voltage
Output Out of Range	>=10.238	32766 (7FFE Hex)	Threshold Will Be Limited To 32766 Decimal

Inputs Words

Overview

This section describes how to interpret the value of the input words.

Words Used

The status of the 170 ANR 120 90 module and the values of the analog and discrete input channels are contained in input words 1 through 8 as follows:

Word	Input Data
1	Status word (module status)
2	State of the 8 discrete inputs
3	Analog input word channel 1
4	Analog input word channel 2
5	Analog input word channel 3
6	Analog input word channel 4
7	Analog input word channel 5
8	Analog input word channel 6
9 ... 12	Not used

Word 1

The Status word (word 1) contains information about the health of the module and the status of the discrete outputs. Word 1 also contains network communication loss, over temperature of the discrete outputs and short circuit at the discrete outputs.

Bits 15 ... 9	Bit 8	Bits 7 ... 4	Bit 3 (Channel 7, 8)
Not used	0 = Bad module health (module lost communication) 1 = Healthy module	Not used	0 = Fault 1 = No fault

Bit 2 (Channel 5, 6)	Bit 1 (Channel 4, 3)	Bit 0 (Channel 1, 2)
0 = Fault 1 = No fault	0 = Fault 1 = No fault	0 = Fault 1 = No fault

Word 2

Discrete input register

This word contains a right justified binary eight bit data field.

Words 3 ... 8

Analog input register

Words 3 ... 8 map to the analog input register. Each word in this range contains a left justified 15 bit data field. The range is from 0H to 7FFE hex, but the resolution is 14 bit. (0 ... 32766 decimal or 0 ... 7FFE hex). See Analog I/O Map *(see page 534)*.

Words 9 ...12

Words 9 ... 12 are not used.

3x Registers

The 3x registers traffic copped to this module are used for input data as follows.

I/O Map Register	Data Type
3x + 1	Data for discrete input
3x + 2	Data for analog input channel 1
3x + 3	Data for analog input channel 2
3x + 4	Data for analog input channel 3
3x + 5	Data for analog input channel 4
3x + 6	Data for analog input channel 5
3x + 7	Data for analog input channel 6

Range

Input operating range

	Input Voltage	Data is left justified	Comment
Input Range	0 ... 10.000V	0 ... 32000	Nominal Input Voltage Range
Input Over Range	10.000 ... 10.238V	32002 ... 32764	Nondestructive Tolerated Input Over Range Voltage
Input Out of Range	>=10.238	32766 (7FFE Hex)	Input Voltage Exceeding This Threshold May Damage The Module

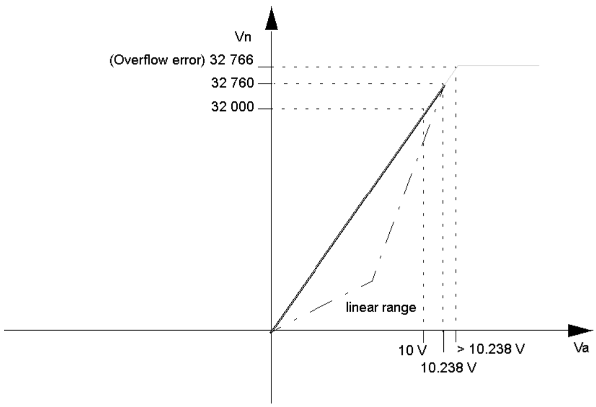
Input and Qutput Measuring Ranges

Overview

This section contains illustrations explaining the analog/digital relation for the various input and output measuring ranges.

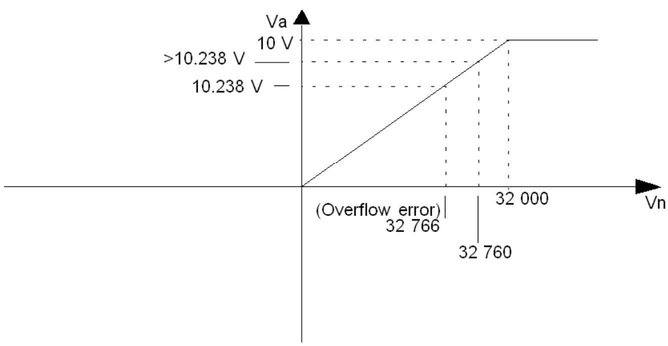
Input Range 0 -10 V

The following diagram shows the analog/digital relation for the input measuring range 0 - 10 V. The voltage value is calculated along the following formula using the digital measurand: Vn = 3200 x Va (for the linear range):



Output Range 0 -10 V

The following diagram shows the analog/digital relation for the output measuring range 0 -10 V. The voltage value is calculated along the following formula using the digital measurand: Vn = 3200 x Va (for the linear range):



Error Messages

Interpreting the Error Bits

If an internal error is detected in the module, the module becomes nonoperational. Other error messages are posted in the four least significant bits of the status word.

170 ANR 120 91 Bipolar Analog 6 Ch. In / 4 Ch. Out Module Base with 24 VDC I/O Points

35

Overview

This chapter describes the 170 ANR 120 91bipolar analog TSX Momentum I/O base.

What's in this Chapter?

This chapter contains the following topics:

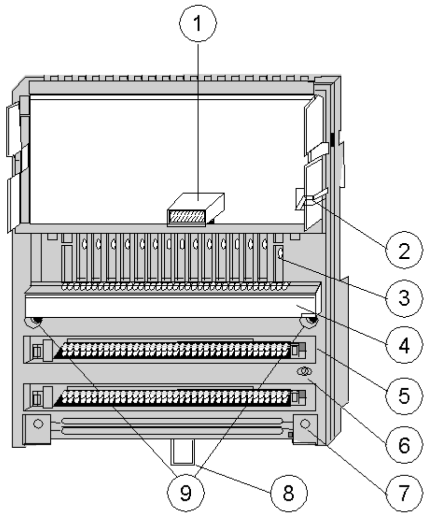
Front Panel Components

Overview

This section contains an illustration of the front panel of the 170 ANR 120 91 I/O base and a description of the LEDs.

Front Panel Illustration

The illustration below shows the front panel of the I/O base.

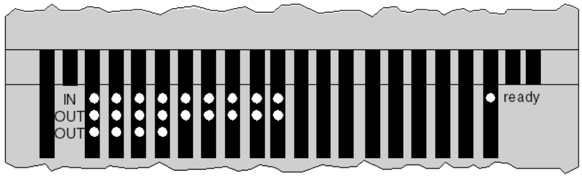


Components of the I/O Module:

Label	Description
1	Internal interface (ATI) connector
2	Locking and ground contact for the adapter
3	LED status display
4	Protective cover
5	Sockets for the terminal connectors
6	Grounding screw
7	Busbar mounting slot
8	Locking tab for DIN rail mount
9	Mounting holes for panel mount

LED Illustration

The illustration below shows the LEDs.



LED Descriptions

The following table describes the LEDs.

LED	Color	Status	Meaning
Ready	Green	ON	I/O base is communicating with the comm adapter/CPU top hat. CPU must be in RUN state.
O1, O2, O3, O4, O5, O6, O7, O8	Green	ON	Indicates the corresponding discrete output point is ON.
I1, I2, I3, I4, I5, I6, I7, I8	Green	ON	Indicates the corresponding input point is ON.
AO1, AO2, AO3, AO4	Green	ON	Indicates the corresponding analog output channel is active.

Specifications

Overview

This section contains specifications for the 170 ANR 120 91 TSX Momentum I/O base.

NOTE: In order for the 170 ANR 120 91 module to comply with the Directives 73/23/EEC (LV) and 89/336/EEC (EMC) and the IEC standards, EN 61131-2:2003 and EN 55011, the module must be used with a Telemecanique power supply, model numbers ABL7 RE2403, ABL RE2405, or ABL RE2410.

General Specifications

The following table contains general specifications for the I/O base. Each discrete output is protected against short-circuiting and overload.

Electrical	
Module current	400 mA at 19.2 Vdc to 30 Vdc
EMC for industrial environment	
Immunity	IEC 1131-2 Surge on auxiliary power supply 500 V
Emissions	EN 50081-2
ENV 50140	10 V/M
Agency approvals	UL, CSA, CE
Isolation	
Between points	None
Between groups	None
Field to protective Earth	500 VAC
Environmental	
Storage temperature	-40 to 85° C
Operating temperature	0 to 60° C
Humidity operating	95% RH @ 60° C
Humidity non-operating	95 RH @ 60° C
Vibration operating	10 - 57 HZ 0.075 MMDA 57 - 150 HZ 1 G
Shock non-operating	15 G, 11 MS, 3 shocks/axis
Free fall (unpackaged)	0.1 meter

Analog Inputs

Number of input channels	Six single-ended
Range	±10V
Input impedance	>1 megohm
Resolution	14 bits
Accuracy, 25 °C	0.2%
Linearity integral Linearity differential	0.006% Guaranteed monotonic
Temp coefficient	+ 100PPM/° C
Update time	0.75 msec for all six channels
Data format	Left justified

Analog Outputs

Number of input Channels	4
Range	±10V
Resolution	14 bits
Accuracy, 25 °C	0.4%
Linearity integral Linearity differential	0.018% Guaranteed monotonic
Temp coefficient	+ 100PPM/° C
Update time	1.20 msec for all four channels
Data format	Left justified

Discrete Inputs

Number of points	8 sinking, type 2
Voltage and current thresholds ON (voltage) OFF (voltage) ON (current) OFF (current)	 >11 VDC <5 VDC >6 mA <2 mA
Absolute maximum input Continuous	 32 VDC
Input response ON - OFF, OFF - ON	 1.20 msec maximum
Input protection	Resistor limited, varistors

Discrete Outputs

NOTE: The output current of a shortened output is limited to a nondestructive value. The short circuit heats the output driver, and the output will switch off.

The output will switch on again if the driver leaves the over temperature condition and the user resets the output under program control.

If the short circuit still exists after the output point is reset, the driver will reach the over temperature condition again, and will switch off again.

Number of output points	8 sourcing
Operating voltage Working Absolute maximum	 10 ... 30 VDC 50 VDC for 1 msec
ON state drop / point	0.4 VDC max at 0.25 A
Maximum load current Each point Per module Off state leakage / point (max)	 0.25 A 2A 0.4 mA @ 30 VDC
Surge current maximum Per point	 2.5 A for 1 msec
Response OFF-ON, ON-OFF	 1.20 msec max
Output protection (internal)	Voltage suppressor diodes, Wickman 2.5A fuse

Physical Dimensions

Width	125 mm (4.9 in)
Depth (with no adapter)	40 mm (1.54 in)
Length	141.5 mm (5.5 in) no or one busbar 159.5 mm (6.3 in) two busbars 171.5 mm (6.75 in) three busbars
Weight	220 g (0.49 lb)

High-Speed Inputs and Electrical Noise

NOTE: When using high speed inputs on the 170 ANR 120 90 and 170 ANR 120 91 modules, the normal filtering of electrical transient events is not as effective as with other modules, and the inputs may respond to electrical noise in some environments.

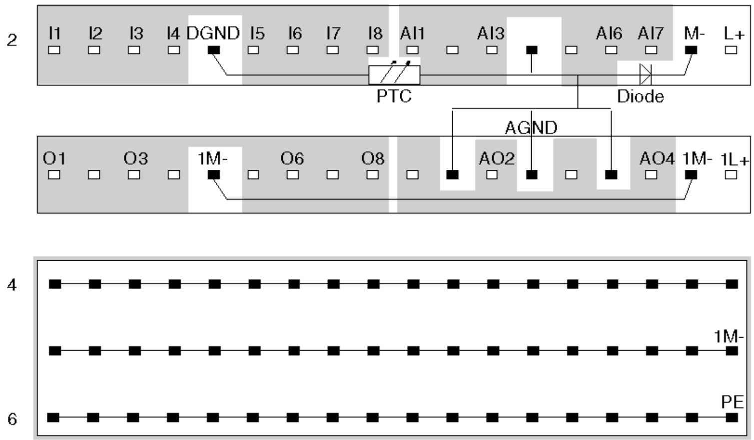
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base and an optional busbar.

Illustration

The following illustration shows the internal connections between terminals.



NOTE: AGND and DGND are connected at a single point inside the module. External digital inputs must be returned to the DGND terminal. External analog circuits must be returned to AGND terminals.

Field Wiring Guidelines

Overview

This section contains wiring guidelines and precautions for wiring the 170 ANR 120 91 TSX Momentum I/O base.

Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Automation sells terminal connectors in sets of three.

Type	Part Number
Screw-in	170 XTS 001 00
Spring-clip	170 XTS 002 00

Busbar May Be Required

Depending on the type of field devices you are using, you may need a 1-, 2-, or 3-row busbar. The following busbars are available from Schneider Automation.

Type	Number of Rows	Part Number
Screw-in	1 - row	170 XTS 006 01
	2 - row	170 XTS 005 01
	3 - row	170 XTS 004 01
Spring-clip	1 - row	170 XTS 007 01
	2 - row	170 XTS 008 01
	3 - row	170 XTS 003 01

Mapping Terminal Blocks and Busbars

The following table shows mapping terminal blocks and optional busbars.

Row	Terminal	Connection	Description
2	1-4	I1 ... I4	Discrete inputs 1 through 4
	5	Digital ground	Return for discrete inputs
	6-9	I5 ... I8	Discrete inputs 5 through 8
	10-12	AI1 ... AI3	Analog inputs 1, 2, 3
	13	Analog ground	Return for analog inputs
	14-16	AI4 ... AI6	Analog inputs 4, 5, 6
	17	M-	Module operating voltage, 24VDC return
	18	L+	Module operating voltage, 24VDC
3	1-4	O1 ... O4	Discrete outputs 1 through 4
	5	1M-	Return for discrete outputs
	6-9	O5 ... O8	Discrete outputs 5 through 8
	10, 12, 14, 16	AO1, AO2, AO3, AO4	Analog outputs 1, 2, 3, 4
	11, 13, 15	Analog ground	Return for analog outputs
	17	1M-	Voltage for field devices, 24VDC return
	18	1L+	Voltage for field devices, 24VDC
4	1-18	PE	Earth ground for field devices

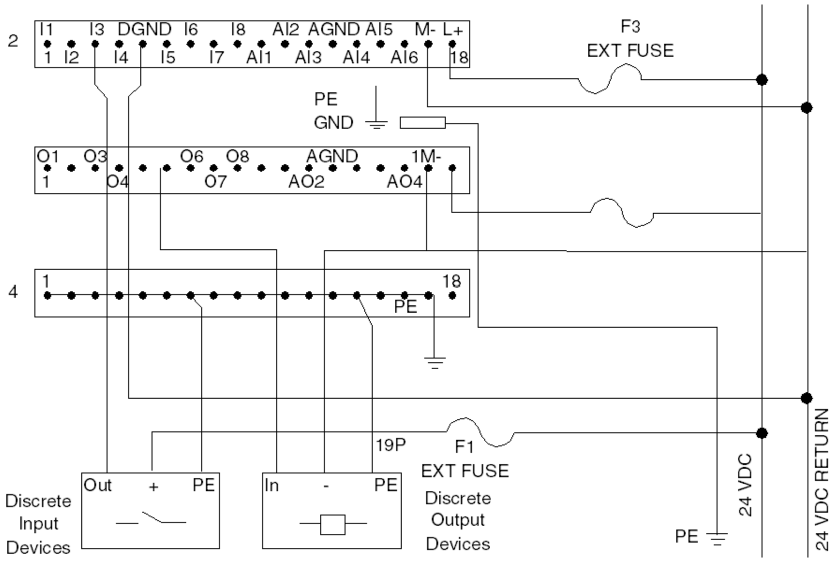
Wiring Diagrams

Overview

This section contains diagrams to assist you in wiring the following types of devices:
- Discrete input and output
- Analog input and output

Discrete I/O Devices

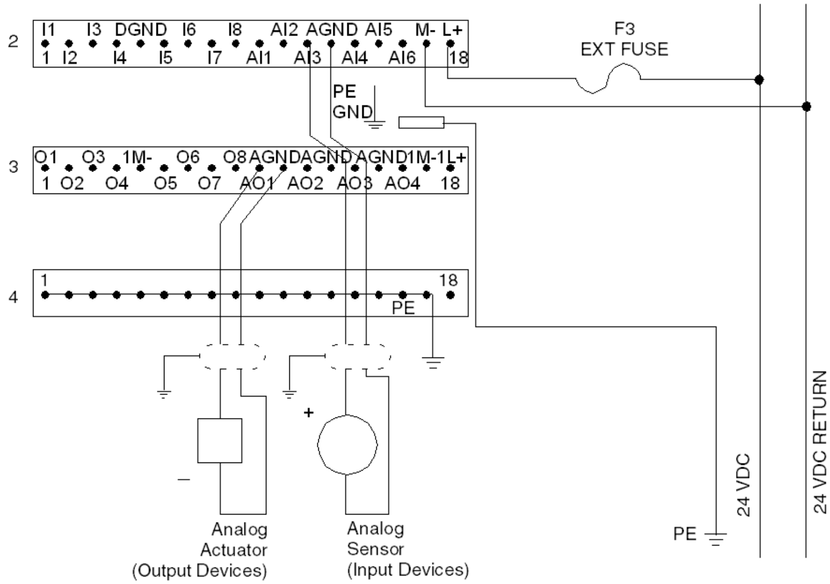
The diagram below shows field wiring for discrete input and discrete output devices.



Recommended fuses:
- F1,F3-use a 1A fuse, Wickman 19181-1A or equivalent
- F2 -use a 2.5A fuse, Wickman 19181-2.5A or equivalent

Analog I/O Devices

The diagram below shows field wiring for analog input and analog output devices.



Recommended fuses:
- F3-use a 1A fuse, Wickman 19181-1A or equivalent

I/O Map

I/O Map Module Configuration

The module must be I/O mapped as 12 contiguous input and output words. The first 7 output words are parameter data.

Register for Outputs

Overview

170 ANR 120 91 analog and discrete output channels are configured by entering the appropriate information in output words 1 through 7 as follows.

NOTE: The module will go to fail state values if network or communication adapter ATI communication is lost.

Word	Function
1	System information
2	Register for discrete reaction in a fail state
3	Register for analog reaction in a fail state
4	User defined analog fail state values for channel 1
5	User defined analog fail state values for channel 2
6	User defined analog fail state values for channel 3
7	User defined analog fail state values for channel 4
8	State of the 8 discrete outputs
9	Analog output word channel 1
10	Analog output word channel 2
11	Analog output word channel 3
12	Analog output word channel 4

Word 1

⚠ CAUTION

INVALID DATA CAUSE OUTPUT SHUT DOWN

Do not use a zero value in word one because it causes an output shut down state, and no inputs or outputs are updated.

Failure to follow these instructions can result in injury or equipment damage.

System Info Register

This word enables the module's operation, and specifies if user shutdown values are expected.

Word 1	Description
Bits 0 ... 14	Not used or can be used to start the module. (Turns on the Ready LED with any value greater than zero.)
Bit 15	1 = Enable user defined shutdown values. 2 = Disables user defined shutdown values.

- Valid setting for word one are 0001 ... FFFF.
  It is essential for the module's operation to have a value larger than 0 in this register.
- The module's default value at power-up for this register is zero (module shut down).

Word 2

Discrete Fail State Reaction and Value Register

This word combines the value and reaction in a fail state.

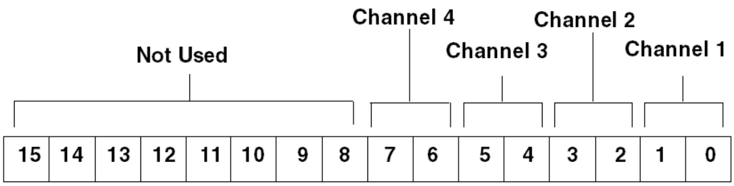
Word 2	Description
Bit 0 ... 7	Discrete fail state value for outputs 1 ... 8
Bits 8 ... 13	Not used
Bit 14	0 = hold last value, 1 = user defined value
Bit 15	0 = all outputs reset, 1 = check bit 14

Word 3

Analog Fail State Reaction Register

This word contains four 2 bit fields that define the fail state for each channel. The four possible values of fail state are as follows.

2 Bit Value	Fail State
00	Minimum output voltage
01	Hold last value (default)
10	User defined shutdown value
11	Hold last value (not normally used)



Words 4 ... 7

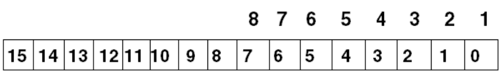
Analog Fail State Value Register

The module always expects four words of user defined data, even if the data is not used. The first word of the user shutdown field is used for channel 1, the second for channel 2, . . .

Word 8

Discrete Output Register

This word contains a right justified binary eight bit data field.



Words 9 ... 12

Map to Analog Output Register

Each word in this range contains a left justified binary 15 bit data field. The range is 0 ... 7FFE hex (0 ... 32766 decimal), but the resolution is only 14 bit *(see page 561)*.

NOTE: If a user shutdown value is greater than the count range for the channel, then the count range maximum value will be used as the shutdown value.

4x Registers

Overview

The 4x registers traffic copped to this module are used for output data as follows.

I/O Map Register	Data Type
4x + 7	Data for discrete output
4x + 8	Data for analog output channel 1
4x + 9	Data for analog output channel 2
4x + 10	Data for analog output channel 3
4x + 11	Data for analog output channel 4

Range

Output Operating Range

	Output Voltage	Data is Left Justified	Comment
Output Range	-10.000 ... +10.000	00382 ... 32382	Nominal output voltage range
Output Over Range	+10.000 ... +10.238	32384 ... 32764	Linear over range output voltage
Output Out of Range	≥10.238	32766 (7FFE Hex)	Threshold will be limited to 32766 decimal.
Output Under Range	-10.238 ... -10.000	00002 ... 00382	Linear under voltage range
Output Out of Range	≤10.238	00000	Threshold limited to 00000.

Register for Inputs

Overview

The Input Register is arranged as follows.

Word	Function
1	Status word (module status)
2	State of the eight discrete inputs
3	Analog input word channel 1
4	Analog input word channel 2
5	Analog input word channel 3
6	Analog input word channel 4
7	Analog input word channel 5
8	Analog input word channel 6
9 ... 12	Not used

Word 1

The status word (word 0) contains information about the health of the module and the status of the discrete outputs. Word 0 also contains network communication loss, over temperature of the discrete outputs and short circuit at the discrete outputs.

Bits 15 ... 9	Bit 8	Bits 7 ... 4	Bit 3 (Channel 7, 8)
Not used	0 = Bad module health (module lost communication) 1 = Healthy module	Not used	0 = Fault 1 = No Fault

Bit 2 (Channel 5, 6)	Bit 1 (Channel 4, 3)	Bit 0 (Channel 1, 2)
0 = Fault 1 = No fault	0 = Fault 1 = No fault	0 = Fault 1 = No fault

Word 2

Discrete Input Register

This word contains a right justified binary eight bit data field.

								8	7	6	5	4	3	2	1
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Words 3 ... 8

Analog Input Register Words 3 ... 8 map to the analog input register. Each word in this range contains a left justified 15 bit data field. The range is from 0H to 7FFE hex, but the resolution is 14 bit (0 ... 32766 decimal or 0 ... 7FFE hex). See *(see page 561)*.

Words 9 ... 12

Words 9 ... 12 are not used.

3x Registers

The 3x registers traffic copped to this module are used for input data as follows.

I/O Map Register	Data Type
3x + 1	Data for discrete input
3x + 2	Data for analog input channel 1
3x + 3	Data for analog input channel 2
3x + 4	Data for analog input channel 3
3x + 5	Data for analog input channel 4
3x + 6	Data for analog input channel 5
3x + 7	Data for analog input channel 6

Range

Input Operating Range

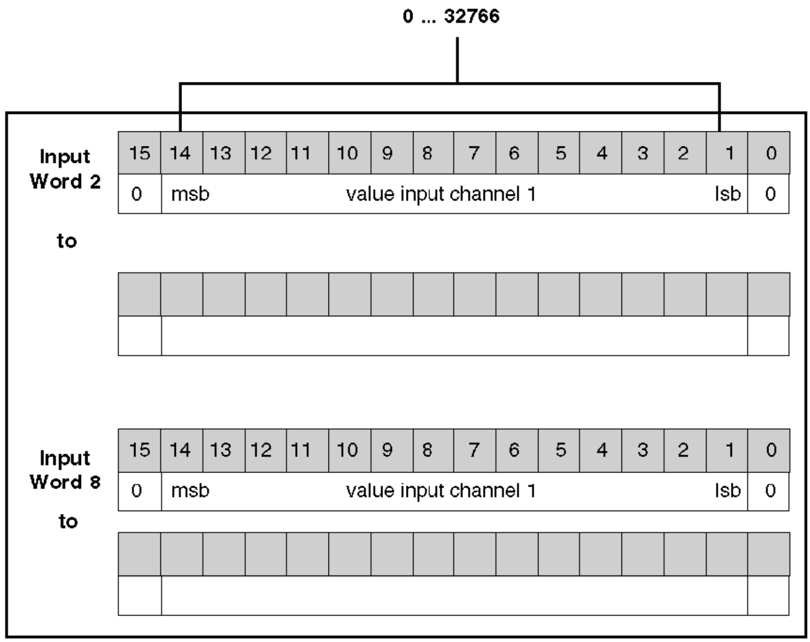
	Input Voltage	Data is Left Justified	Comment
Input Range	-10.000 ... +10.000	00382 ... 32382	Nominal input voltage range
Input Over Range	+10.000 ... +10.238	32384 ... 32764	Linear over range input voltage
Input Out of Range	≥10.238	32766 (7FFE Hex)	Input voltage exceeding threshold may damage the module.
Input Under Range	-10.238 ... -10.000	00002 ... 00382	Linear under voltage range
Input Out of Range	≤10.238	00000	Input voltage exceeding threshold may damage the module.

Analog Map

Overview

170 ANR 120 91 analog values are mapped as follows.

NOTE: The display is standardized, and, in each case, the analog value will appear flush left.

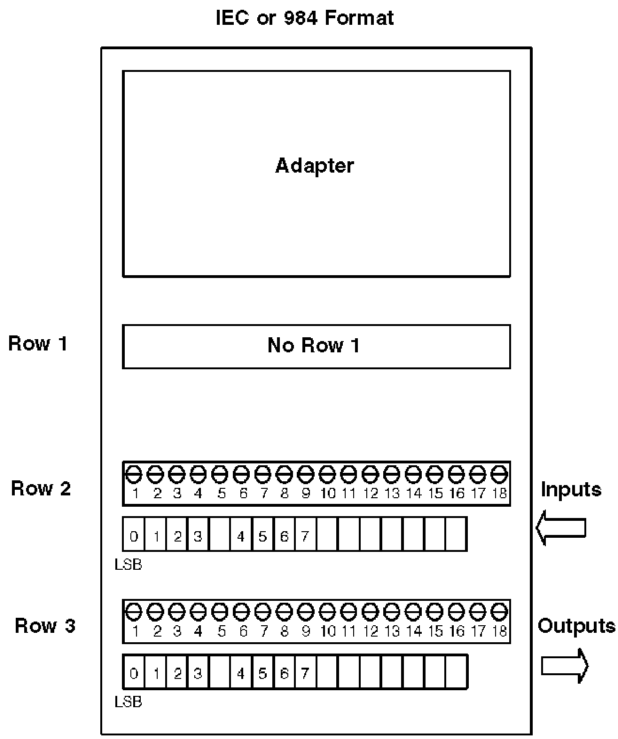


NOTE: The module resolution is 14-bit (0 ... 32766 decimal or 0 ... 7FFE hex).

Discrete I/O Points and IEC Compliant Data Mapping

Overview

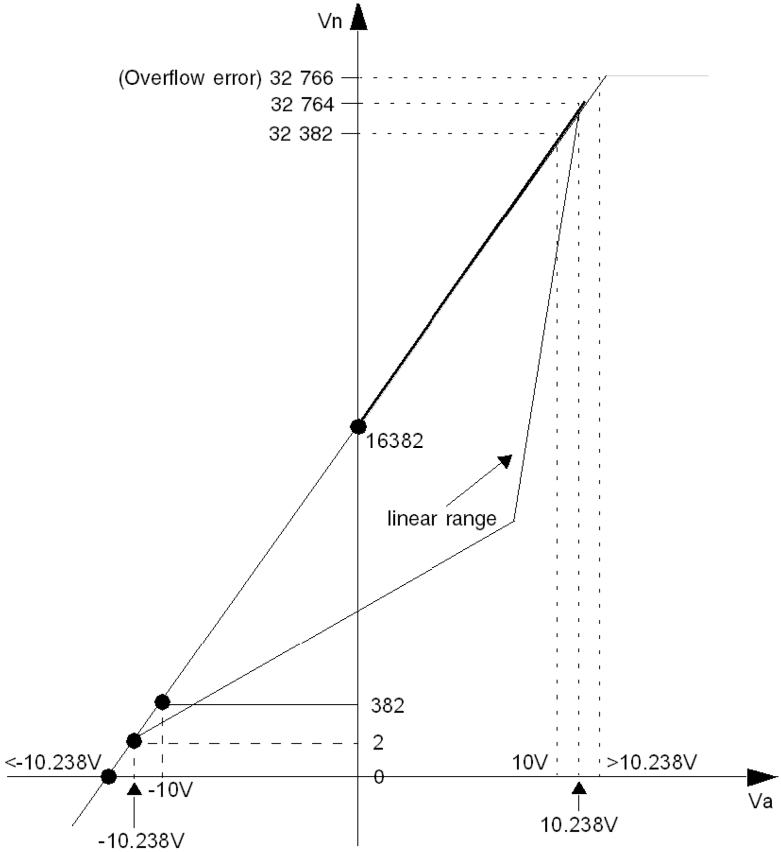
The 170 ANR 120 91 base returns eight discrete input bits to the processor in one 16-bit word (3x). The input points are field wired to row 2 of the base. The processor sends eight discrete output bits to the base as a single 16-bit word (4x). The output points are field wired to row 3.



Input and Output Ranges

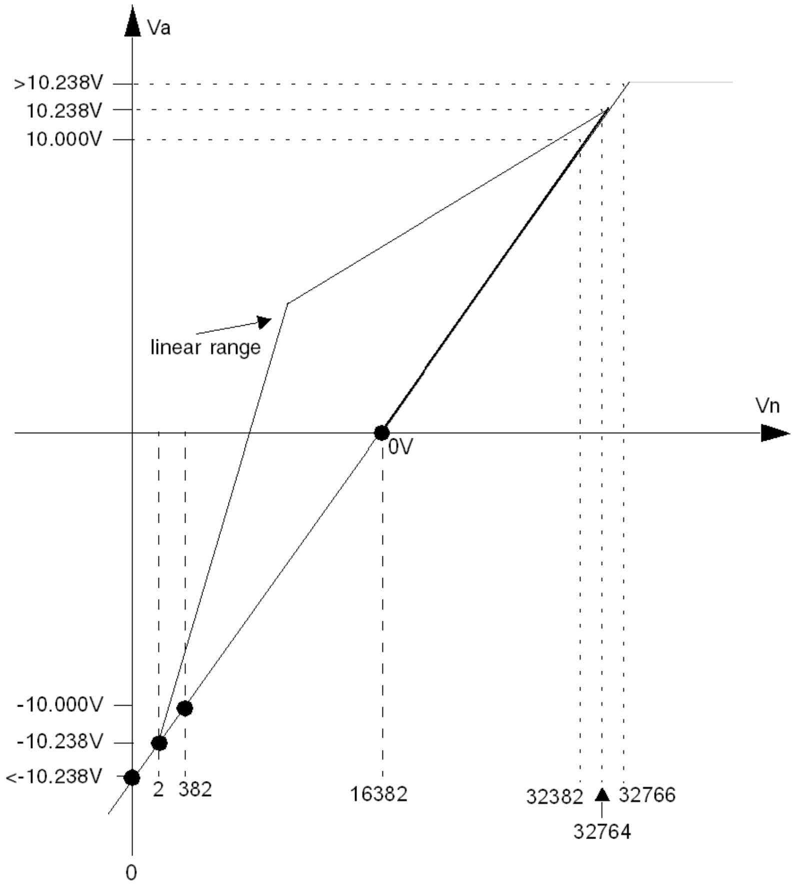
Ranges and Decimal Values Input Measuring Range ±10 V

The voltage value is calculated with the following formula using the digital measurand: Vn = 1600 Va + 16382 (for the linear range).



Output Measuring Range ±10 V

The voltage value is calculated with the following formula using the digital measurand: Vn = 1600 Va + 16382 (for the linear range).



Interpreting the Error Bits

Overview

If an internal error is detected in the module, the module becomes non-operational. Other error messages are posted in the four least significant bits of the status word.

170 ARM 370 30 24 VDC - 10 Pt. In / 8 Pt. Relay Out Module Base (120 VAC Powered)

36

Overview

This chapter describes the 170 ARM 370 30 TSX Momentum I/O base.

What's in this Chapter?

This chapter contains the following topics:

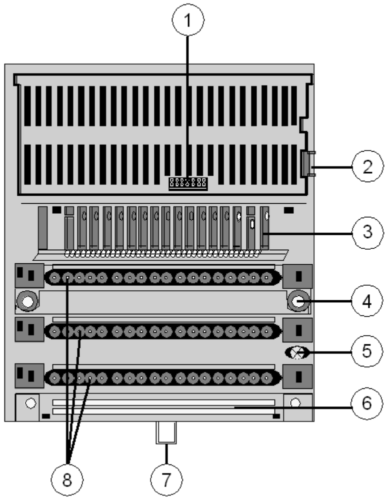
Front Panel Components

Overview

This section contains an illustration of the front panel of the 170 ARM 370 30 I/O base and a description of the LEDs.

Front Panel Illustration

The front panel of the I/O base is shown in the illustration below.

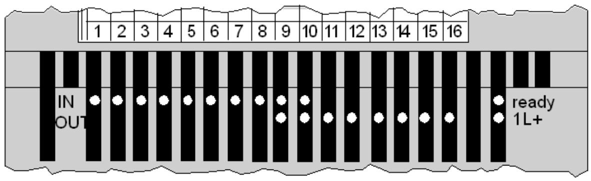


Components of the I/O module

Label	Description
1	Internal interface (ATI) connector
2	Locking and ground contact for the adapter
3	LED status display
4	Mounting holes for panel mount
5	Grounding screw
6	Busbar Mounting Slot
7	Locking tab for DIN rail mount
8	Sockets for the terminal connectors

LED Illustration

The LEDs are shown in the illustration below.



LED Descriptions

The LEDs are described in the table below.

Indicator	Condition	Message
Ready	Green	Module is ready to communicate. Operating voltage for internal logic (5 V) is present.
	Off	Module not ready.
1L+	Green	Input voltage of inputs 1 ... 10 is present
	Off	Input voltage of inputs 1 ... 10 is not present
Upper row IN 1...10	Green	Input status (an LED per input); Input point active, ie. input carries a 1 signal (logically ON)
	Off	Input status (an LED per input); Input point inactive, ie. input carries a 0 signal (logically OFF)
Middle row OUT 9 ...16	Green	Output status (an LED per output); Output point active, ie. output carries a 1 signal (logically ON)
	Off	Output status (an LED per output) Output point inactive, ie. Output carries a 0 signal (logically OFF)

Specifications

Overview

This section contains specifications for the 170 ARM 370 30 I/O base.

General Specifications

Module type	10 discrete inputs in 1 group 8 relay outputs as normally open contacts in 2 groups, 4 pts/group
Supply voltage	120 VAC
Supply voltage range	85 ... 132 VAC RMS @ 47 ... 63 Hz
Supply current consumption	max. 250 mA at 120 VAC
Power dissipation	5.5 W typical 8.5 W max
I/O map	1 input word 1 output word

Isolation

Input to input	none
Output group to output group	1 780 VAC RMS
Input to output	1 780 VAC RMS
Output group to communication adapter	1 780 VAC RMS
Field to communication adapter	Defined by communication adapter type

Fuses

Internal	1A slowblow
External: input voltage (1L+)	max. 4 A fast-blow (193140000 or equivalent)
External: output voltage (1L1, 2L1)	According to the supply of the connected actuators–not to exceed 8 A slow-blow/ group.

Physical Dimensions

Width	125 mm (4.9 in)
Depth (with no adapter)	40 mm (1.54 in)
Length	141.5 mm (5.5 in) no or one busbar 159.5mm (6.3in) two busbars 171.5 mm (6.75in) three busbars
Weight	260 g (0.57lb)

Discrete Inputs

Number of points	10
Number of groups	1
Signal type	True High
IEC 1131 type	1+ (see appendix *(see page 603)* for definitions of IEC input types)
ON voltage	+11 ... +30 VDC
OFF voltage	-3 ... +5 VDC
Input current	2.5 mA minimum ON (6 mA at 24 VDC) 1.2 mA maximum OFF
Input voltage range	-3 ... +30 VDC
Input resistance	4 kOhm
Response time	2.2 ms OFF to ON 3.3 ms ON to OFF

Relay Outputs

Output type		Relay normally open output
Number of points		8
Number of groups		2
Points per group		4
Current capacity	20 VDC	> 5 mA (but only for new contacts) max 2 A (switching current <= 5 A) ohmic load max 1 A (L/R <= 40 ms) inductive load
	115 VDC	max. 0.5 A (switching current <= 1.5 A) ohmic load max. 0.15 A (L/R <= 40 ms) inductive load
	24 VAC	max. 2A (switching current <= 5 A) cos ϕ = 1 max. 1 A cos ϕ = 0.5
Relay type		Normally Open

Leakage current (output out)	< 1.2 mA @ 115 VAC
Fault sensing	None
Fault reporting	None
Error indication	None
Response time (resistive load / 0.5 A	10 ms @ 60 Hz OFF to ON 10 ms @ 60 Hz ON to OFF
Maximum switching cycles	> 30 x 10^6 (mechanical) >=1 x 10^5 (inductive load with external protective circuitry)

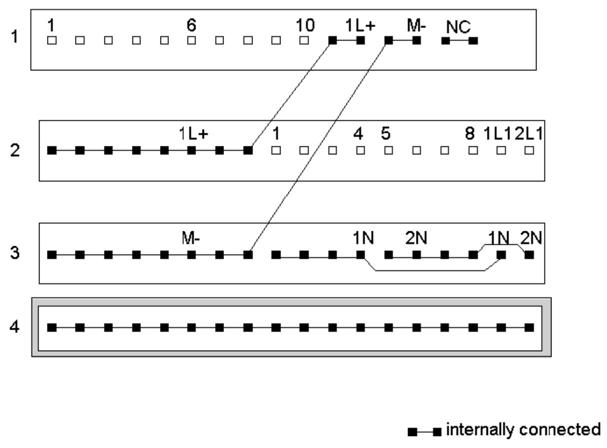
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base.

Illustration

Rows 1 through 3 show the internal connections between terminalson the I/O base. Row 4 shows the internal connections on the optional busbar.



Field Wiring Guidelines

Overview

Inputs are field wired to row 1 of the base. The outputs are field wired to row 2. This section contains wiring guidelines and precautions.

Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Electric sells terminal connectors in sets of three.

Type	Part Number
Screw-in	170 XTS 001 00
Spring-clip	170 XTS 002 00

Busbar May Be Required

Depending on the type of field devices you are using, you may need a 1-row busbar. The following busbars are available from Schneider Electric.

Type	Part Number
Screw-in	170 XTS 006 01
Spring-clip	170 XTS 007 01

Mapping Terminal Blocks

CAUTION

POTENTIAL FOR SHORT CIRCUITS AND/OR POWER-UP SPIKES

Provide external fuses on the operating voltage to protect the module. Appropriate fuse values are shown in the wiring illustration. An unprotected module may be subject to short circuits and/or power-up spikes.

Failure to follow these instructions can result in injury or equipment damage.

The following table shows mapping terminal blocks and optional busbars.

Row	Terminal	Function
1	1...10	Inputs
	11, 12	Input voltage for terminal pins 9 ... 10, (1L+)
	13, 14	Return (M-) for the inputs
	15, 16	Not connected
	17	Return (N) for the module's operating voltage
	18	120 VAC Operating voltage (L1)
2	1 ... 8	Input voltage for pins 1 ... 8, (1L+)
	9 ... 12	Outputs for group 1
	13 ... 16	Outputs for group 2
	17	Output Voltage for relays 1 ... 4 (1L1, 20 ... 115 VDC or 24 ... 115 VAC
	18	Output Voltage for relays 5 ... 8 (2L1, 20 ... 115 VDC or 24 ... 115 VAC
3	1 ... 8	Return (M-) for the inputs
	9, 10, 11, 12	Return (1N) for the relays 1 ... 4
	13, 14, 15, 16	Return (2N) for the relays 5 ... 8
	17/18	Return/Neutral for relay outputs
4	1 ... 18	Protective earth (PE)

Protective Circuit Required

To reduce the effects of radiated noise, you must add snubbing components across inductive load devices. The following table provides generic selection guidelines:

Type of Load	Suppression Device	Minimum Component Rating
AC circuits	50 Ω resistor in series with a 0.47 μfd nonpolarized capacitor across the load	for 120 VAC-powered loads 200_VAC
DC circuits	a reverse-biased clamping diode across the load	2 A and greater than twice the maximum load voltage

Consult relay and contactor manufacturers' catalogs for commercial suppression devices matched to your particular products.

Wiring Inputs to Avoid Error Messages

To avoid I/O error messages, follow these guidelines when wiring.

- Inputs require a 56 kΩ resistor parallel to the contact. Otherwise the I/O error signal will be active as long as the input carries 0 signal.
- Unused inputs have to be wired to the sensor supply or to L+ on row 3 directly (logical 1) or with 56 kΩ (logical 0) to avoid permanently active I/O error message.

Wiring Diagrams

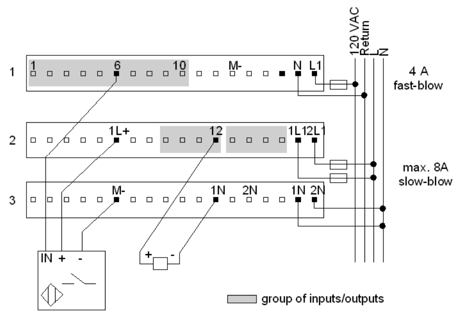
Overview

This section provides diagrams to assist you in wiring the following types of devices:

- 3-wire sensor with a 2-wire actuator
- 4-wire sensor with a 3-wire actuator

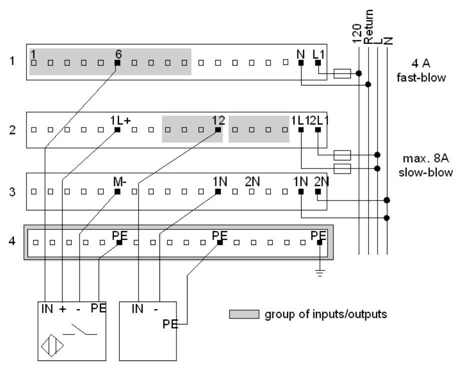
3-Wire Sensor with a 2-Wire Actuator

The diagram below shows field wiring for a 3-wire (24 VDC) sensor and a 2-wire (115 VAC) actuator.



4-Wire Sensor with a 3-Wire Actuator

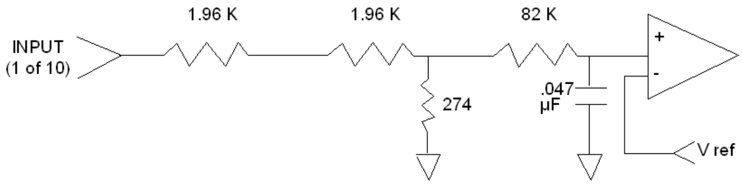
The diagram below shows field wiring for a 4-wire (24 VDC) sensor and a 3-wire (115 VAC) actuator.



A 1-row busbar is used to provide PE for the 4-wire sensor. No busbar would be required if only 2- and/or 3-wire sensors were used.

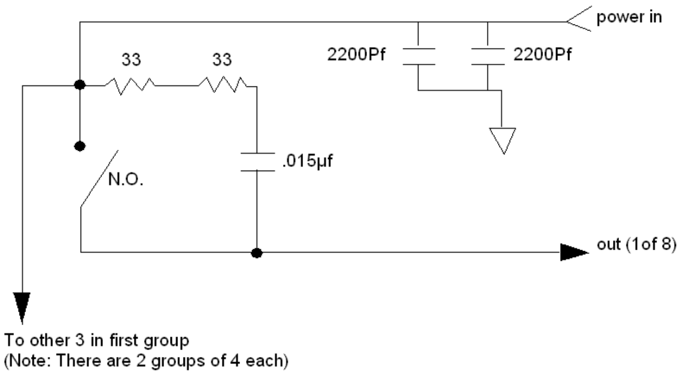
Simplified Input Schematics

The following diagram shows the field-side input circuitry.



Simplified Output Schematics

The following diagram shows the field-side output circuitry.



I/O Mapping

Overview

The 170 ARM 370 30 TSX Momentum I/O base supports 10 discrete inputs and 8 relay outputs. This section contains information about the mapping of the I/O data into input words and output words.

I/O Map

The I/O base must be mapped as one input word and one output word, or as 10 discrete inputs and 8 discrete outputs.

IEC vs. Ladder Logic

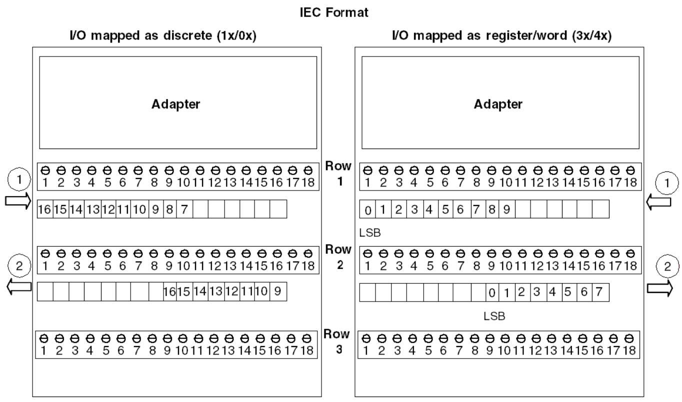
In order to correctly field wire the inputs/outputs and map the input/output data, you need to know which type of Momentum Adapter is mounted on the base .

Adapters may be either IEC compliant or 984 Ladder Logic compliant.

	IEC Compliant	**984 Ladder Logic Compliant**
Momentum Processor Adapters	All	None
Momentum Communication Adapters	All, except 170 NEF 110 21 170 NEF 160 21 170 FNT110 00 170 FNT 110 01	170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01

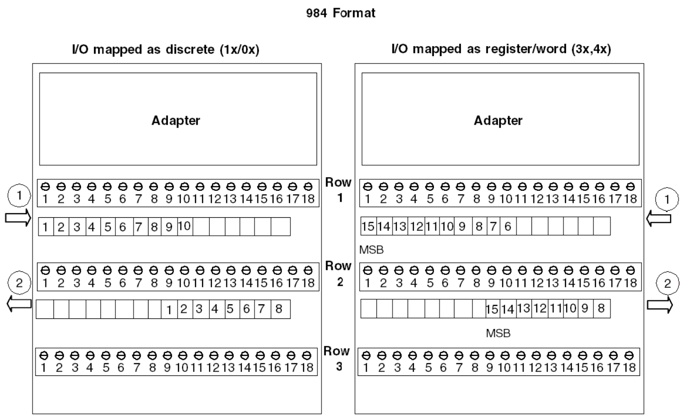
Data Mapping

The figure below shows how data is mapped with an IEC Compliant Adapter. When the I/O is mapped as a discrete input point (1x) the MSB is assigned to Pin 1. When mapped as a discrete output (0x) the MSB is assigned to Pin 9. When the I/O is mapped as an input word/register (3x) the LSB is assigned to Pin 1.When mapped as an output word/register, the LSB is assigned to Pin 9.



1 inputs
2 outputs

The figure below shows how data is mapped with a Ladder Logic Compliant Adapter. When the I/O is mapped as discrete input points (0x) the LSB is assigned to Pin 1. When mapped as a discrete output points, the LSB is assigned to Pin 9. When the I/O is mapped as an input word/register (3x) the MSB is assigned to Pin 1. When mapped as an output word/register (4x) , the MSB is assigned to Pin 9.



1 inputs
2 outputs

170 CPS 111 00 TIO Power Supply Module

37

Overview

This chapter describes the 170 CPS 111 00 TIO power supply module. The module provides a regulated output voltage with protection against overload and overvoltage. It can be used to power TSX Momentum I/O bases.

What's in this Chapter?

This chapter contains the following topics:

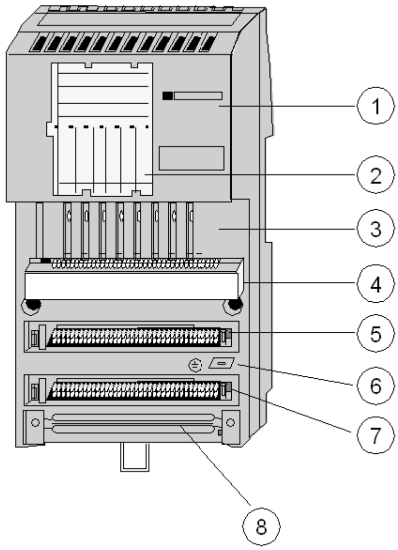
Front Panel Components

Overview

This section contains an illustration of the front panel of the 170 CPS 111 00 Power Supply and a description of the LEDs.

Front Panel Illustration

The front panel of the power supply module is shown in the illustration below.

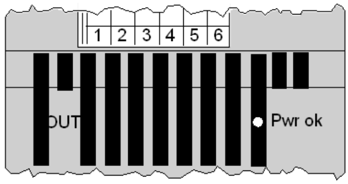


Components of the power supply module

Label	Description
1	Module identifier
2	Identification label
3	LED status display
4	Protective cover
5	Input voltage (AC) terminal strip connector mounting slot
6	PE spade-lug connector
7	Output voltage (DC) terminal strip connector mounting slot
8	Grounding busbar connector mounting slot

LED Illustration

This Module has one LED which is shown in the illustration below.



LED Descriptions

The Pwr OK LED is described in the table below.

Indicator	Condition	Message
Pwr ok	Green	Power supply module is ready
	Off	Power supply module not ready

Specifications

Overview

This section contains specifications for the 170 CPS 111 00 power supply module.

General Specifications

Module type	Power Supply
Nominal Input voltage	230 VAC or 120 VAC (jumper selectable)
Nominal Output voltage	24 VDC
Maximum Output Current (isolated)	0.7 A

Protective Circuitry

Inputs	Self-restoring fuse
Outputs	Overvoltage protection: limited by a transzorb diode (type: SM6T30A)
	Overload protection: by thermal current limiting (should the thermal current limiting respond, the input voltage must be switched -- off/on for reactivation).

Power

Frequency	
Input voltage	50/60 Hz + 5%
Internal chopper frequency	90 ... 110 kHz
Power	
Efficiency	Typically 0.76 for IA = 0.7 A
Apparent power	Typically 32 VA for IA = 0.7 A
Effective power	Typically 21 W for IA = 0.7 A

Isolation

Input/Output voltage	L, N, PE isolated from UB, M
Between base supply and ground	500 VDC, 1 min
Between input channels and ground	500 VDC, 1 min

Fuses

Internal (not user-replaceable)	Internal self-restoring fuse
External	Min external F1: for 230 VAC, 0.315 A, slow-blow Min external F1: for 120 VAC, 0.63 A, slow-blow

Fault Information

Inputs	None
Outputs	Green status LED for output voltage ok

Physical Dimensions

Width	74.2 mm
Depth	40 mm
Length	141.5 mm

Environmental Conditions

Regulations	VDE 0160, UL 508
Permissable operating and ambient temperatures	GUF (-40 ... +60 deg. C) adhering to DIN 40040, refer to the derating curve for uninhibited convection, operation orientation is vertical
Permissable storage temperature	-40 ... +85 deg. C
Internal power dissipation	Roughly 1.2 + 5 x IA (in W, IA in A)
Noise immunity	EN 50081-2
Safety classification	Class 1 (VDE 0160, IEC 1131-2)

AC Input Voltage

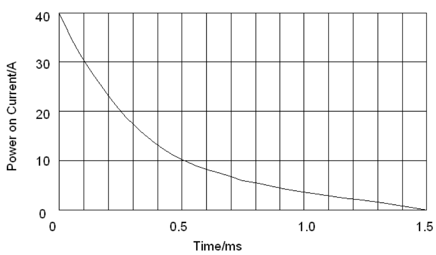
Selectable by jumper

Input Voltage	
EX - EY not jumpered	L/N = 230 VAC
EX - EY jumpered	L/N = 120 VAC
Limiting Values	
With jumper	100 Veff -15% to 120 Veff +10%
Without jumper	230 Veff -15% to 240 Veff +10%
Power Failure	

Half wave loss at	100 Veff -15%
Min. of a half wave at	>= 100 Veff
Min. of a half wave at	230 Veff -15%
Input Current	
For 85 Veff	Typically 0.366 Aeff, IA = 0.7 A
For 170 Veff	Typically 0.188 Aeff, IA = 0.7 A
For 230 Veff	Typically 0.188 Aeff, IA = 0.7 A
Power on Current	
I2T	0.3 A^2s
IT	0.02 As

Power on Surge Current Curve

The following chart shows power on surge current for 120 VAC + 10% or 240 VAC + 10%

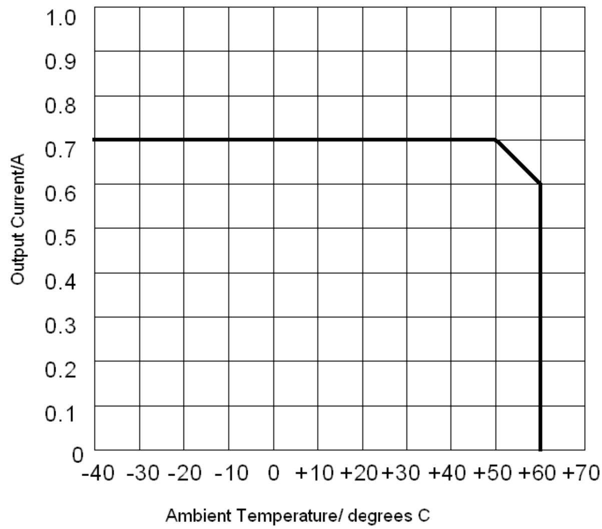


DC Output Voltage

Number	1 x UB = 24 VDC, max. 0.7 A, isolated
Limiting Values	
UBmin	21 VDC
UBmax	30 VDC
Output Current	
IA	0 ... 0.7 A
Output Ripple	
Typical	150 mV/p-p (max. 20 MHz)
Max.	250 mV/p-p (max. 20 MHz) - measured with a 0.1 microF capacitor
Voltage Regulation	Typically +500 mV for 0.7A after 0.35 A Typically -500 mV for 0.35A after 0.7 A

Output Current Chart

The following chart shows output current (derating) for uninhibited vertical convection.



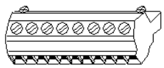
Terminal Connectors

Available Types

Power is supplied to the module through an 8-pole terminal connector. Two types of terminal connectors are available:
- screw-in
- spring-clip

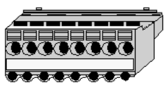
Screw-In Version

Screw-in terminals can be used with cable with a diameter of up to 12 AWG (2.5 mm^2). They come in sets of three. The part number is 170 XTS 011 00.



Spring-Clip Version

Spring-clip terminals can be used with cable with a diameter of up to 14 AWG (1.5 mm^2). They come in sets of three. The part number is 170 XTS 012 00.



Safety Requirement

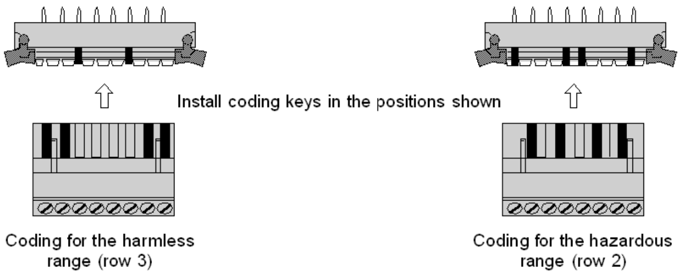
This module is used in hazardous and harmless voltage ranges. For safety, code the terminal connectors and the power supply module to prevent inadvertent exchanges of terminal blocks.

Coding Set

To complete the coding described below, order the 170 XCP 200 00 coding set. This set contains coding keys and combs.

Coding Illustration

Install coding keys in the positions shown in the following illustration:



Mounting the Terminal Connectors

To mount a terminal connector, press it into the module's pin connector.

Mounting the Terminal Connectors

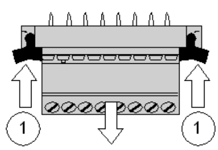
⚠ DANGER

RISK OF ELECTRIC SHOCK

Only mount and remove terminal connectors when the module is not under power.

Failure to follow these instructions will result in death or serious injury.

To remove a terminal connector, press both extractors, as shown in the illustration below:



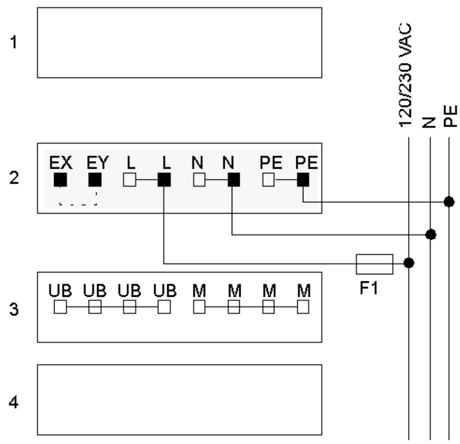
External Operating Voltage Connections

Overview

This section contains a illustration of the external operating voltage connections and explanatory notes.

Illustration

The following illustration shows the external operating voltage connections for the 170 CPS 111 00 Power Supply module:



Row	Terminal	Connection	Function
2	1	EX	Jumper connection
2	2	EY	Jumper connection
2	3, 4	L	AC input voltage, line
2	5, 6	N	AC input voltage, neutral
2	7, 8	PE	Earth ground
3	1, 2, 3, 4	UB	DC output voltage
3	5, 6, 7, 8	M	DC output voltage return

Grounding

The spade-lug connector on the front of the module provides a short, secure PE grounding surface.

Electrical safety

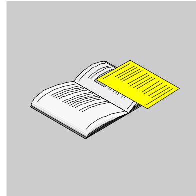
Power supply modules may not be operated in parallel. Physically separate input cabling from output cabling.

Fusing

Dimension the F1 fuse to match the operative load, observing the minimum values in the following table:

Voltage	Jumper Placement	External Fusing (min. F1)
120 VAC	Mounted	0.63 A slow-blow
230 VAC	Removed	0.315 A slow-blow

Appendices



Overview

The appendices contain general information common to the Momentum I/O bases.

What's in this Appendix?

The appendix contains the following chapters:

System Specifications

A

Overview

This appendix provides system specifications for all TSX Momentum I/O bases.

What's in this Chapter?

This chapter contains the following topics:

Power Supply Specifications

Overview

This section contains power supply specifications for the following types of TSX Momentum I/O bases:

- 24 VDC
- AC voltages

24 VDC

Power supply specifications for 24 VDC modules are contained in the table below.

Operating voltage (internal logic)	20 ... 24 ... 30 VDC
Input voltage (discrete inputs)	20 ... 24 ... 30 VDC
Output voltage for electronic outputs	20 ... 24 ... 30 VDC
Output voltage for relay outputs	24 ... 115 VDC
Ripple	max. 5 % effective, corresp. to relat. total oscillation amplitude per DIN 40 110 (unfiltered three-phase bridge permissible)
Periodic peak values (including ripple)	18 ... 33 VDC
Nonperiodic peak values	max. 35 V at t <500 ms max. 45 V at t <10 ms
Line power dropout	max. 1 ms, repetition rate 1 s

AC Voltages

Power supply specifications for AC voltage modules are contained in the table below.

Operating voltage (internal logic)	100 ... 115 ... 132 VAC, 47 ... 63 Hz
Input voltage (discrete inputs)	85 ... 115 ... 132 VAC, 47 ... 63 Hz
Output voltage for electronic outputs	20 ... 115 ... 132 VAC, 47 ... 63 Hz
Output voltage for relay outputs	24 ... 230 VAC
Line power dropout	max. 10 ms or 1 half-wave, repetition rate 1s

Field Device Interfaces

Overview

This section contains specifications for:

- operating thresholds, input current
- discrete outputs
- relay outputs

Operating Thresholds, Input Current

The table below contains specifcations for operating thresholds, input current.

Rated voltage	24 VDC	115 VAC
Signal level of "1"-signal	+11 ... +30 VDC	74 ... 132 VAC
Signal level of "0"-signal	-3 ... +5 VDC	0 ... 20 VAC
Minimum ON-voltage	min. 2.5 mA, 6 mA at 24 VDC	min. 6 mA
Maximum OFF-voltage	max. 1.2 mA	max. 2.6 mA
Input delay	0 -> 1: 2.2 ms 1 -> 0: 3.3 ms	< 1 half-wave

Discrete Outputs

The table below contains specifications for discrete outputs.

Rated voltage	24 VDC	115 VAC	230 VAC
Voltage drop on "1"-Signal	max. 0.5 V	max. 1.5 V	max. 1.5 V
Leakage current on "0"-Signal	max. 1 mA	max. 1.3 mA	-
Load current per output	max. 500 mA 2 A at ADM 370 10	30 ... 500 mA	-
Simultaneity factor	100 %	100 %	100 %
Operating delay	3 ms	< 1 half-wave	-

Relay Outputs

The table below contains specifications for relay outputs.

Rated voltage	24 ... 230 VAC 20 ... 115 VDC
Relay type	Normally open (NO) contact
Rated current per output	0.5 ... 2 A, depending on operating voltage and power factor

Environmental Specifications

Overview

All Momentum I/O bases share the following environmental specifications.

General

The table below contains general environmental specifications:

Safety Class	Class 1, IEC 536
Safety Type	IEC 529: IP20
Temperature range (operating)	0 ... +60 oC air intake temperature (without forced ventilation). Under more difficult ventilation conditions, power dissipation must be taken into account (refer to the module descriptions).
Temperature range (storage)	-40 ... +85 oC (without battery) -40 ... +70 oC (with battery)
Relative humidity	95 % continuous for 30 days 75 % annual average, noncondensing
Atmospheric pressure (operating)	>=700 hPa (700 mbar)
Atmospheric pressure (transport)	>=230 hPa (230 mbar)
Pollutants	Maximum at 60% relative humidity, noncondensing S02 <= 0.5 ml/m^3 H2S <= 0.1 ml/m^3
Shock	15 g at 147 m/s2 for 11 ms Three shocks/axis per IEC 68.2-6EC
Vibration	10...57 Hz @ 0.075mm d.a.57...150Hz @ 1 g per IEC 68.2-27EA
Dielectric strength	Conforms to IEC 664
Norms and Standards	CE, UL, CSA, FM
Equipment definition	Open equipment (IEC 1131-2)

Noise Immunity

The tables below contain specifications for noise immunity to line-conducted phenomena.

Circuits	RatedVoltage	Fast transients / Burst per IEC61000-4-4
Power mains	24 VDC / 230 VAC	+/-2 kV
BinaryDiscrete inputs	24 VDC 230 VAC	+/-1 kV +/-2 kV
Analog inputs	-	+/-1 kV
Discrete outputs (electronic)	24 VDC	+/-1 kV
Analog outputs	-	+/-1 kV
Relay outputs	24 VDC / 230 VAC	+/-1 kV
Shielded cables	-	+/-1 kV

Noise immunity to electrostatic discharge	+/-4 kV for indirect contact discharge
Noise immunity to electromagnetic fields	10 V/m
RFI suppression	Limit curve A

Interference Suppression

B

Interference Suppression

Overview

This section explains the interference suppression properties of TSX Momentum components, guidelines for interference suppression of your system, and recommendations for obtaining permits.

TSX Momentum Components

Under the RF Equipment Act, individual components and individually nonoperational subassemblies are not subject to the mandatory PT&T classification or registration rules.

The components of the TSX Momentum are interference-suppressed to within EN 55011 Limit Curve A.

Your System

Assuming adherence to the configuration guidelines, even a total system constructed from TSX Momentum components typically meets this requirement, if:

- all third-party add-on equipment and components are equally RFI-suppressed
- the operating instructions regarding RF suppression are adhered to, e.g.:
  - filtering the line voltage using RFI filters
  - noise filtering using anti-interference capacitors
  - equipping inductive consumers with clamping diodes (suppressor diodes) to prevent the injection of RF noise potentials into neighboring lines

Permits

In some cases, so-called operating permits may be required. Obtaining the operating permit for the total system from the local RFI control agency is the responsibility of the user. It usually applies to systems operated in residential and mixed-zoning areas, government offices, hospitals and airports, but not within industrial zones.

In the event of any problems with the operating permit or license, consult the system supplier first. In case of doubt, the latter can direct questions to the local distributor.

IEC 1131 Input Types

C

Input Voltage and Current Thresholds

Overview

This section describes the voltage and current thresholds for three types of input, as defined by IEC 1131.

Thresholds

The following table shows the voltage and current thresholds for three input types at 24 VDC, as defined by IEC 1131.

Input Type	On Voltage	On Current	Off Voltage	Off Current
Type 1	+15 ... +30 V	2 ... 15 mA	-3 ... +5 V	... 15 mA
Type 1+	+11 ... +30 V	2.5 ... 10 mA	-3 ... +5 V	... 10 mA
Type 2	+11 ... +30 V	6 ... 30 mA	-3 ... +5 V	... 30 mA

Type 1+

This type is often used for active sensors and relays because the minimum on and maximum off current thresholds are higher.

Field Wire Length

D

Calculating Field Wire Length for AC and DC Devices

Introduction

This section describes some considerations in calculating field wire length.

Effect of IR Drop

The IR drop is the product of the resistance of the wire (depends on wire gauge size) and the current drawn by the load. (IR = volts) After calculating the IR drop of the field wire, what you have left is available at the module input.

Example

The following example shows how to calculate the IR drop to see if enough is left over to turn on an I/O base's input point.

Step	Action
1	Assume an I/O base needs 80 VAC minimum to turn on voltage and assume a field source of 120 VAC.
2	Assume the current drawn by the I/O base is 6 mA.
3	Consult the vendor of the wire to get the resistance of the wire (usually given in Ohms per 1000 feet, this depends on the gauge and length of the wire). For this example, assume the total resistance of the wire length is 1000 Ohms.
4	Calculate .006 A x 1000 Ohms = 6 VAC. This is the IR drop.
5	Calculate 120 VAC - 6 VAC = 114 VAC. This is plenty to turn on the inputs, as the minimum required is 80 VAC.

Empirical Testing Required

The IR drop calculation can only be a rough estimate. Empirical testing is required to fine-tune the wiring length. The result will depend on the following variables:

- shielded vs. unshielded wire
- single vs. wiring pairs
- wire impedance
- electrical noise
- routing of wiring, such as running in parallel with high voltage that can indudce capacitive and inductive coupling of noise spikes

IEC Symbols

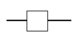
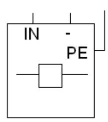
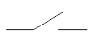
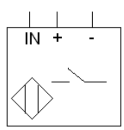
E

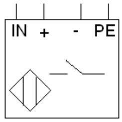
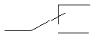
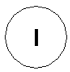
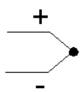
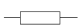
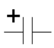
Glossary of IEC Symbols

Overview

This appendix contains illustrations and definitions of common IEC symbols used in describing TSX Momentum components.

IEC Symbols

Symbol	Definition
. 	Actuator/output, e.g. contactor, lamp, valve, heating, etc.
. 	3-wire actuator
. 	Digital sensor/input, e.g. contact, switch, initiator, light barrier, etc.
. 	3-wire sensor

Symbol	Definition
. 	4-wire sensor
. 	Change-over break
. 	Analog sensor (voltage)
. 	Analog sensor (current)
. 	Thermocouple Element
. 	Resistor, general symbol
. 	Fuse
. 	Electrolytic Capacitator
. 	Earth Ground

Index

0-9

A

B

C

D

G

I

M

P

S

T

V

W

APPENDIX F

AGENCY CORRESPONDENCE

New York State Department of Environmental Conservation
Division of Solid & Hazardous Materials
Bureau of Hazardous Waste & Radiation Management
625 Broadway, 9th Floor, Albany, New York 12233-7258
Phone: (518) 402-8594 • **Fax:** (518) 402-9024
Website: www.dec.ny.gov

Alexander B. Grannis
Commissioner

May 19, 2010

David E. Speed, Ph.D.
IBM Systems and Technology Group
Hudson Valley Research Park, Bldg 325
2070 Route 52
Hopewell Junction, New York 12533-6531

Dear Dr. Speed:

Re: Design Basis – Subslab Vapor Extraction and Treatment System
Building 330D 80K Area
IBM East Fishkill Facility, Hopewell Junction, New York
EPA ID No.: NYD000707901, DOH Site ID: 314054

The New York State Departments of Health and Environmental Conservation (the Agencies) have reviewed your letter dated April 28, 2010 providing a design basis for a proposed subslab vapor extraction and treatment system for the 80K Area of Building 330D. The design basis is acceptable to the Agencies and IBM may proceed with construction and operation of the system. The Agencies infer from your letter that testing of the system will be conducted after initialization. Such testing will be required. Please keep the Agencies updated as to the status of the project.

If you have any questions regarding this letter, please contact me at (518) 402-8584.

Sincerely,

Alex G. Czuhanich
Engineering Geologist

cc: N. Azzam (USEPA Region 2)
N. Walz (NYSDOH, Troy)

ecc: R. Phaneuf
K. Brezner (DEC Region 3)
D. Radtke
D. Evans
H. Wilkie

New York State Department of Environmental Conservation
Division of Environmental Remediation
Remedial Bureau E, 12th Floor
625 Broadway, Albany, New York 12233-7017
Phone: (518) 402-9814 • **Fax:** (518) 402-9819
Website: www.dec.ny.gov

Joe Martens
Commissioner

March 13, 2013

David E. Speed, Ph.D.
IBM Systems and Technology Group
Hudson Valley Research Park, Bldg 325
2070 Route 52
Hopewell Junction, New York 12533-6531

RE: Status Report on RFI Work Plan Implementation
IBM East Fishkill Facility, Hopewell Junction, New York
EPA ID No. NYD000707901, NYSDEC Site No. 314054

Dear Dr. Speed:

The New York State Departments of Health and Environmental Conservation (collectively, the Agencies) have reviewed your letter on the above-referenced subject dated October 19, 2012. The numbered section headings in your letter are re-stated below, followed by the Agencies' responses.

1. Buildings Designated as No Further Assessment

Agency Response: The Agencies agree that the buildings listed in Table 1 of your letter require no further assessment (Buildings 300, 322, 323, 334, and 386). In addition, we offer the following comments.

- *Building 322 (B322)*: Per our recent telephone and email communications, our agreement to no further assessment in B322 is based in part on your January 3, 2013 email notification to the Agencies that B322 is now unoccupied with no present plans for re-occupancy. In the event B322 is re-occupied, the Agencies anticipate that subslab sampling will be required in the building to determine if low levels of TCE (1.9 $\mu g/m^3$) found in the northern half of the building (location J8) in 2008 and reported in the approved RFI Work Plan dated June 15, 2009, are the result of vapor intrusion into the building. A VOC plume in overburden groundwater beneath the northern half of B322 supports this possibility.

- *Building 323 (B323) and Building 323A (B323A)*: B323 and B323A are currently occupied and are maintained at a positive pressure relative to ambient air. B323 was sampled as part of the RFI work plan and no significant impacts to indoor air were found. However, the northern portion of B323 overlies a VOC plume in overburden groundwater. Therefore, if the buildings no longer require or maintain positive pressure, and if the buildings remain occupied, the Agencies anticipate that additional sampling of indoor air and/or subslab soil vapor may be required in the buildings.

- *Building 386 (B386)*: No significant impacts to indoor air were found in B386. However, since this building overlies a VOC plume in overburden groundwater, changes in building infrastructure or HVAC modifications which could lead to vapor intrusion may result in a requirement for further assessment.

2. Buildings for which Agencies' Response is Pending or Requested

Agency Response: IBM is requesting a determination of no further assessment for Buildings 309, 316, 320B, and 338. The Agencies agree that Buildings 309, 316, and 338 require no further assessment. The Agencies disagree that Building 320B requires no further assessment. Additional comments follow.

- *Building 309 (B309)*: B309 overlies a VOC plume in overburden groundwater and low levels of contamination were detected in indoor air in the building. However, the building also houses the facility's shipping and receiving operations for virgin chemicals and chemical waste, so occupational use is presumed. If building use changes such that occupational exposure is no longer a consideration, the Agencies anticipate that additional sampling of indoor air and/or subslab soil vapor may be required in the building.

- *Building 320B (B320B)*: The Agencies believe that additional reasonable and practical actions should be taken to identify the source(s) of persistent low-level vinyl chloride detections in the eastern half of B320B. Figure C-9 in the RFI Work Plan identifies solvent waste and industrial waste lift stations in close proximity which could have led to spills and contamination/saturation of building materials in this area, which continue to off-gas vinyl chloride. IBM should evaluate building materials to determine if they are a source for low levels of vinyl chloride in indoor air. In addition, IBM has not ruled out the potential for vapor intrusion to account for vinyl chloride detections. IBM should conduct subslab vapor sampling to assess the potential.

- *Building 338 (B338)*: No significant impacts to indoor air were found in B338. However, since this building overlies a VOC plume in overburden groundwater, changes in building infrastructure or HVAC modifications which could lead to vapor intrusion may result in a requirement for further assessment.

3. Buildings Subject to On-going Assessment/Work

Agency Response: The Agencies concur with ongoing assessments in Buildings 308, 310, 330C, and 330D and will await updates and reports as stated in your letter. For Building 330D (B330D), the Agencies also find IBM's response regarding sampling locations in the 80K area of B330D to be acceptable. No further assessment is required in this area and no further assessment is required in B330D. However, as indicated in your re-statement of "Agency Comment 2", if the Core 20D Area (or other areas served by MAU-79) of B330D becomes re-occupied (or is planned for re-occupancy), the Agencies anticipate additional indoor air sampling will be required in this area of B330D.

Summary

- The Agencies concur that the following buildings where Source Investigation or Confirmatory Sampling was conducted, require no further assessment: 300, 309, 316, 322, 323/323A, 330D, 334, 338, 386.

- The Agencies concur that the following buildings are undergoing further assessment and reports or updates are pending: 308, 310, 330C.

- The Agencies are recommending additional investigation in the following building where IBM has requested a designation of no further assessment: 320B.

As indicated in several of our comments above, and consistent with our comments on the approved RFI work plan, the Agencies reiterate that a number of on-site buildings may require further assessment in the event that the occupancy, function, or physical status of those buildings changes. The Agencies will require periodic review and reporting to track the status of on-site buildings. The nature and schedule of such reports will be the subject of future discussions.

If you have any questions regarding this letter, please call me at 518-402-9813 or Nate Walz of the New York State Department of Health at 518-402-7880.

Sincerely,

Alex G. Czuhanich
Project Manager
Remedial Section B, Remedial Bureau E
Division of Environmental Remediation

ec: A. Everett, USEPA, Region 2
N. Walz, NYSDOH
E. Moore, NYSDEC, Region 3
M. Cruden, NYSDEC
D. Radtke, NYSDEC
H. Wilkie, NYSDEC