

August 23, 2006

**OPERATION, MAINTENANCE  
AND MONITORING PLAN FOR THE  
CHEMICAL OXIDATION IRM IN  
OPERABLE UNIT 4**

**ExxonMobil Former Mobil Terminal  
Buffalo, New York**

**VOLUME II OF II**

**SUPPLEMENTARY O&M MANUFACTURER'S LITERATURE  
PulseOx 1000 O&M Manual**

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**VOLUME II**  
**SUPPLEMENTARY O&M MANUFACTURER'S LITERATURE**  
**PulseOx 1000 O&M Manual**

# Applied



**PulseOx 1000™ In-Situ Chemical Oxidation System**

**Serial Number J1029**

**Owner's Manual**

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**CONFIDENTIAL**

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## 1 INTRODUCTION

This document is a guide to the installation, operation, and maintenance of the HiPOx water treatment system. System-specific drawings, data sheets, and component manuals are also supplied with the system for reference.

### 1.1 OVERVIEW

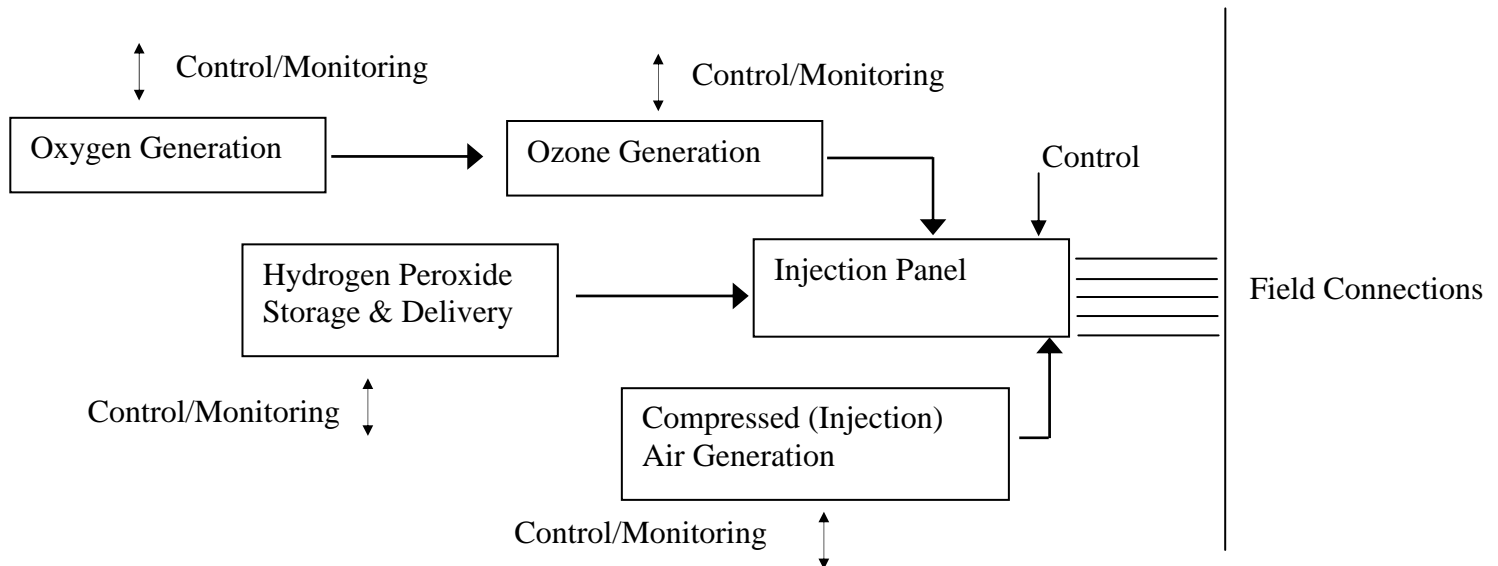
The PulseOx 1000™ system, developed by Applied Process Technology, Inc. (APT) is a Chemical Injection / Advanced Oxidation Process (AOP), which utilizes ozone and hydrogen peroxide to form hydroxyl radicals in-situ. The hydroxyl radical is an aggressive oxidizer proven effective in destroying many organic compounds. The by-products of this destruction when allowed to go to completion are CO<sub>2</sub> and water.

In addition to formation of hydroxyl radicals, ozone and hydrogen peroxide are oxidizers that are effective in destroying hydrocarbons. As these molecules degrade they release oxygen into the groundwater, usually resulting in an increase in dissolved oxygen.

The PulseOx 1000™ system uses compressed air in combination with ozone and hydrogen peroxide to distribute oxidant into the formation, thereby increasing the radius of influence from the injection well.

The PulseOx 1000™ process injects ozone, hydrogen peroxide, and compressed air into the subsurface according to an operator-defined sequence. The PulseOx 1000™ system can inject into up to ten gas injection wells and ten liquid injection wells. The injection control system can operate up to ten discrete injection combinations, or steps.

Figure 1 – PulseOx 1000™ Block Diagram



## 1.2 CONFIDENTIALITY

This document contains proprietary information. Neither this document nor the information contained herein is to be reproduced, distributed, used or disclosed, either in whole or in part, except as specifically authorized by APT.

## 1.3 RESPONSIBILITY

Applied Process Technology, Inc. offers no warranty, either expressed or implied, of system or equipment integrity or performance, if said equipment is not operated in accordance with the instructions and specifications contained within this document. Equipment processing contaminated water with oxidizing agents present inherent dangers that require care and caution from all personnel. It is the responsibility of the owner to follow instructions in this document and to exercise other normal and reasonable care or caution in order to prevent injury to personnel, property damage or interruptions of normal operation or business.

#### 1.4 CONTACT INFORMATION

General company and product information is available on APT's website, [www.APTwater.com](http://www.APTwater.com). Inquiries may also be made to the corporate headquarters:

Applied Process Technology, Inc.  
3333 Vincent Road  
Suite 222  
Pleasant Hill, CA 94523  
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## 2 SAFETY

There are potential hazards associated with the PulseOx 1000™ process; operations personnel must have read thoroughly and have been well trained in utilizing all sections of these instructions, vendor's literature and reference materials. Refer to vendor literature and operating manuals before starting or operating any equipment, instruments or control systems.

### 2.1 CORROSIVE LIQUIDS

Hydrogen peroxide (typically 35% concentration) is used as an oxidant in the PulseOx 1000™ process. **HYDROGEN PEROXIDE IS HIGHLY CORROSIVE** – Personnel should wear rubber gloves and goggles/face shield when handling this material. See attached MSDS for further information.

### 2.2 TOXIC / OXIDIZING GASSES

Oxygen and ozone gas is generated, distributed, and injected into the subsurface by the PulseOx 1000™ system. **OZONE IS HIGHLY TOXIC and VIGOROUSLY ACCELERATES COMBUSTION**; refer to the MSDS sheet for further information. The PulseOx 1000™ system has been designed to minimize the possibility of ozone leakage, but if ozone odor is detected **SHUT DOWN THE PulseOx 1000™ SYSTEM IMMEDIATELY** and contact APT.

Oxygen gas is also a strong oxidizer, refer to the MSDS sheet for further information.

### 2.3 COMPRESSED GASSES

Compressed air, oxygen, and oxygen/ozone mixtures are under pressure (30-120 psig) in the PulseOx 1000™ system. Expansion of these gasses to atmospheric pressure releases potentially dangerous amounts of energy. Care must be taken to avoid the unplanned release of compressed gasses. Proper precautions must be taken to depressurize lines prior to maintenance activities.

### 2.4 ELECTRICAL EQUIPMENT

Personnel unfamiliar with the electrical equipment supplied with the PulseOx 1000™ system should not attempt to service that equipment. The electrical currents supplied to several of the electrical components in the HiPOx system are high enough to cause severe injury or death.

Only properly trained personnel using normal commercial safety practices should perform maintenance or troubleshooting.

## 2.5 NOISE

The inside of the PulseOx 1000™ trailer contains process machinery and ventilation fans creating a sound level that exceeds 85 dBA. Prolonged exposure to this environment can permanently damage hearing. Hearing protection should be worn while working inside the PulseOx 1000™ trailer.

## 2.6 FIELD OPERATIONS

Injection lines from the PulseOx 1000™ system may at any time contain dangerous levels of ozone (in gas lines) or hydrogen peroxide (in liquid lines) under pressure. Proper care must be taken whenever field process lines are opened.

Field injection lines may also be pressurized as a result of injection of gasses into the subsurface formation. When disassembling injection lines the operator should be aware of potentially dangerous gasses and liquids back-flowing from the injection well / subsurface formation.

### 3 PROCESS & EQUIPMENT DESCRIPTION

The PulseOx 1000™ process is made up of several sub-systems working in concert. Below are descriptions of each sub-system (Refer to THS-P-401 sheets 1 and 2):

#### 3.1 OXYGEN SYSTEM

The PulseOx 1000™ system generates its own oxygen as a feedstock to the ozone generation system. Air is compressed (to 110 psig) by C-200, an oil flooded screw compressor, and dried (to 35F pdp) by AD-203, a refrigerated drier. This air flows through air tank T-201 in order to buffer the pressure variation caused by the Pressure Swing Adsorption (PSA) system, X-300. Compressed air is then filtered through F-204 in order to remove compressor lube oil aerosols from the air stream.

The PSA system is a dual-bed batch adsorption system that preferentially adsorbs nitrogen from the compressed air stream. When the first bed reaches saturation (based on pre-programmed timers), the flow will be diverted to the second bed, while the first bed exhausts its nitrogen rich contents to atmosphere (outside of trailer). The oxygen rich product stream is 92-95% pure, and flows into oxygen tank T-301 to buffer purity and pressure variations from the PSA.

The oxygen stream's pressure is regulated by PVC 302, is filtered for particulate matter by F-303, and oxygen flow is measured by FI-303.

The PulseOx 1000™ system's PLC will activate C-200, AD-203, and X-300, and will periodically open drain valves XV-201 and 203.

The discharge from XV-201 and 203 are processed through an oil/water separator, X-205.

#### 3.2 OZONE SYSTEM

This system converts a portion of the incoming oxygen to ozone at prescribed concentration for injection into the subsurface. The primary component, the ozone generator (X-401A), along with support equipment are located in the ozone cabinet PX-902.

The PulseOx 1000™ system's PLC will monitor oxygen flow to the ozone generator (via FSL 304) and oxygen pressure (via PSHL 401). In the event of a low flow, low pressure, or high pressure condition the PulseOx 1000™ system will shutdown and alarm. In addition, if an internal ozone generator fault or low generator amperage condition (via ISL-401A) are detected, the PulseOx 1000™ system will shutdown and alarm

Ozone generator operating flow and pressure are controlled by the ozone back pressure regulator PCV-403, and in the event of a shutdown, ozone solenoid block valve EBV-403 will close.

### 3.3 HYDROGEN PEROXIDE SYSTEM

This system stores hydrogen peroxide in T-800 and pumps it to the injection header via P-801. The pump rate is determined by the number of open injection valves (EBV 821-830) multiplied by the operator input rate. The pressure at the discharge of the pump is monitored by PSHL-803, if the peroxide pressure is below the low set point or above the high set point, P-801 will shut down. NOTE that the ozone/air injection system will not shutdown in the event of a P-801 shutdown.

### 3.4 INJECTION AIR SYSTEM

The injection air system draws compressed air that has been dried and filtered and is regulated by PCV-704. Regulated air is then routed to the solenoid injection cabinet PX-903.

### 3.5 OZONE GENERATOR COOLING SYSTEM

The ozone generator(s) produce heat as a byproduct. The ozone generator cooling system (chiller, CH-500) routes a water/glycol coolant through a closed loop circulation system.

CH-500 is equipped with a circulating pump, with a y-strainer on the pump suction to protect the pump from debris in the line. There is an external filter, F-502 to remove particles prior to entering the ozone generator cabinet.

### 3.6 OZONE DESTRUCT SYSTEM

This system ensures that no ozone is released to the environment by directing all vapors collected from the ozone generator cabinet and solenoid cabinet through a catalyst bed. F-600 draws the air from the cabinets and forces it through the catalyst bed and out of the container. FSL-601 monitors the flow through the system, and will cause a shutdown if there is not a minimum flow through the system. An ozone detector (XS-601) is located after the destruct bed to verify no ozone is vented to atmosphere; the HiPOx™ / Chemox system will shutdown in the event XS-601 detects ozone.

### 3.7 VENTILATION SYSTEM

Positive fresh air supply is supplied to the PulseOx 1000™ trailer by the "intake fan". This fan has a hard-wired on/off switch on the PLC panel front. The intake fan has a thermostatically controlled motorized damper to reduce the intake air volume during periods of cold ambient temperatures. The damper's stops have been adjusted so that there is always a minimum flow of fresh air into the system to supply intake air for the compressors, as well as provide a safe working environment.

The fan on HX-701 is used to discharge warm air from the PulseOx 1000™ trailer. This fan is also hard wired to a switch on the PLC panel. The warm air from HX-701 will enter a plenum fit with two thermostatically controlled motorized dampers. In warm periods the warm air will be directed outside the PulseOx 1000™ trailer, in cold periods MOST of the air will be re-directed back into the trailer.

Note that both fans must be operating or the PulseOx 1000™ system will not start up.



## 4 INSTALLATION

Upon receipt of the PulseOx 1000™ unit, inspect for indications of shipping damage. Also compare material received with the packing slip to verify a complete shipment. Make a note of any discrepancies and report to APT immediately.

### 4.1 PLACEMENT

The design of the PulseOx 1000™ installation should allow sufficient access for personnel to operate, collect analytical samples, refill hydrogen peroxide tank, and perform maintenance.

The location of the PulseOx 1000™ must have a “non-hazardous” electrical classification.

### 4.2 MECHANICAL

The PulseOx 1000™ unit should have sufficient foundation support to meet state and local codes. It is imperative that the PulseOx 1000™ unit be LEVEL for proper operation. Once on site the trailer should be put up on blocks.

### 4.3 ELECTRICAL

Electrical service (230v/3ph/60hz) should be terminated at the PulseOx 1000™ unit with a lockable disconnect. The PulseOx 1000™ unit must be properly grounded, and the entire installation should conform to National Electric Code as well as state and local codes.

### 4.4 CONTROL INTERFACE

A phone line is also required at the site in order to allow external monitoring and data interface.

## 5 OPERATION

The PulseOx 1000™ unit is designed to run unattended, except for periodic operational and calibration checks. Find below the sequence of starting up, operating, and shutting down the PulseOx 1000™ unit.

NOTE: In this section, references to the “OIT” (Operator Interface Terminal) are made for control system manipulation. Detailed procedures and keystrokes are described in Appendix B.

### 5.1 COLD START UP

The following procedure is necessary before start up of a newly installed, recently re-located, or long dormant PulseOx 1000™ system.

*Step 1 - Inspect the system for proper installation and operational status:*

- Ensure that the PulseOx 1000™ unit is properly secured and level.
- Ensure that system power has been properly installed and that the system is properly grounded.
- Visually inspect equipment, piping, wiring, etc. for signs of damage/disrepair. Repair as needed.
- Turn all breakers “on” in the main power panel.
- Verify that all valve are in their operational position

*Step 2 - Check for proper operation of the ozone generator cooling system:*

- Verify the integrity of the chiller installation; the chiller itself, chill water supply and return piping, chilled water header / ozone generator connections, etc.
- Open inspect the fluid level in the chiller surge tank. Top off with distilled water (85%) and ethylene glycol (15%). Note – do not use automotive ethylene glycol
- Once operating (see step 4), verify there are no leaks in the piping system, and that the system is able to maintain the 20C set point.

*Step 3 – Check for proper operation of the injection air system:*

- Verify all valves are in their operational positions.
- Enter a recipe in the configuration screen that will direct air to a safe location (to a well or a disconnected external bulkhead fitting)
- Once operating (see step 4), set PCV-704 to desired injection pressure. Check for leaks in the system using soapy water solution.

*Step 4 – Operate the system; check for gas leaks in the Oxygen/Ozone systems and operate the PSA system for a minimum of 4 hours to rejuvenate the beds and dry all Oxygen lines and the ozone generator:*

- Enter a recipe in the configuration screen that will direct produced oxygen to a safe location (to a well, or to a disconnected external bulkhead fitting).
- Configure the hydrogen peroxide pump P-801 to be “OFF”
- Turn the breaker on the front of the Ozone generator “OFF”.
- Defeat the ISL-401A ozone generator current interlock so the system can be run with no power being drawn by the ozone generator.
- Start the system, see Appendix C
- When oxygen flows/pressures have reached steady state, check for leaks using soapy water solution on all oxygen and ozone lines; tighten/repair as necessary.
- After 4 hours of operation, check the purity of the Oxygen gas.
- Stop the system (Appendix C), re-connect the ozone generator current interlock, and turn the ozone generator front-plate breakers back “ON”.

*Step 4a - Prime the hydrogen peroxide pump:*

- Wear rubber gloves and face shield to protect against incidental contact with hydrogen peroxide.
- Disconnect the flex line from hydrogen peroxide pump sub-panel so that pump discharge cannot go to the process and is directed to a bucket.
- With the system running, configure the P-801 pump to be “ON” with a setting of 25%
- Operate until hydrogen peroxide discharges to bucket.
- Configure the hydrogen peroxide pump P-801 to “OFF”
- Return hydrogen peroxide lines to normal operating position.
- Dispose of collected hydrogen peroxide in an appropriate manner.

*Step 4b - Calibrate the hydrogen peroxide pump:*

- Enter a recipe in the configuration screen that will direct hydrogen peroxide to a safe location (to a well, or to a disconnected external bulkhead fittings with a means to collect the liquid).
- Fill the graduated cylinder with hydrogen peroxide
- Arrange the pump intake valves so that hydrogen peroxide is drawn from the graduated cylinder.
- Configure the system to have 2 injection valves open, and set the pump output to 10%, and then configure the pump P-801 to “ON”
- Using a stopwatch, measure how much hydrogen peroxide is pumped in 2 minutes.
- Change the pump output rate to 20% and repeat the process
- Return the pump intake valves to their operating position
- Return the pump output rate to desired operating rate.

*Step 5 – Operate and calibrate the ozone generator:*

- Enter a recipe in the configuration screen that will direct produced ozone to a safe location (it is NOT safe to direct ozone to the ambient air. It should be directed to an injection well or wells that are known to be free flowing).
- Connect the ozone analyzer – consult APT.
- Configure the ozone power output to 25%.
- Start the system and operate for a minimum of 2 hours. Record Oxygen flow, purity, ozone generator input pressure, ozone purity, and ozone generator amps (L1, 2, and 3).
- Increase the ozone power setting to 35% for a minimum of 10 minutes then take the readings described above.
- Repeat the above step for 45% and 55% power.
- Stop the system; purge the ozone generator for 15 minutes using stored oxygen.
- Provide calibration results to APT.

When all PulseOx 1000™ subsystems have been successfully operated as described above, the Cold Start Up is complete. To prepare for normal operation;

- Verify that all field connections (at the HiPOx™ / Chemox unit and at the injection wells) are properly fit.
- Verify that all HiPOx™ / Chemox system valves, tubing, piping, etc are in their normal operating condition.

## 5.2 START UP

The following procedure is to be followed for starting the PulseOx 1000™ system from a non-cold condition (see section 5.1 for definition of Cold Start Up):

- Notify Owner of intent to operate PulseOx 1000™ system.
- Verify sufficient hydrogen peroxide supply levels. Fill if needed.
- Confirm incoming power is available and all breakers are in the ON position.
- Verify proper equipment configuration, control settings, and recipes have been input to OIT.
- Start the PulseOx 1000™ system via OIT as instructed in Appendix C. System start up sequence may take up to 15 minutes to reach steady state.

## 5.3 NORMAL OPERATION

The PulseOx 1000™ system is designed for unattended operation. Periodically operations personnel should inspect the system in order to:

Verify sufficient hydrogen peroxide supply

Verify that manually adjusted parameters are within specified range (oxygen pressure, ozone back pressure, chilled water pressures, etc.)

Verify the mechanical integrity of the system (water leaks, ozone odors, etc.).

#### 5.4 SHUTDOWN

The PulseOx 1000™ system can be shutdown by operator choice or by control system interlock.

In the case of an operator-initiated shutdown, refer to Appendix C for the necessary keystrokes. The system will immediately power down the ozone generator, PSA system, injection air system, and hydrogen peroxide system. The chilled water system will continue to circulate for another 5 minutes to remove heat from the ozone generator. The ventilation system will continue to operate, as they are hard wired.

For extended shutdown periods consult APT for additional action items.

In the case of a fault-condition shutdown, the system will perform a shutdown as described above and the OIT will display the cause of the shutdown.

#### 5.5 EMERGENCY STOP

The PulseOx 1000™ system has an E-Stop button located on the PLC panel near the main personnel entrance to the system. Pressing the E-Stop button will initiate an accelerated shutdown (chiller will stop immediately).

## 6 MAINTENANCE & TROUBLESHOOTING

The PulseOx 1000™ system has been designed for fully automatic operation. This section outlines the operational and scheduled maintenance requirements as well as troubleshooting.

### 6.1 MAINTENANCE

Typical operational and preventative maintenance activities for the HiPOx system are detailed in Table 6.1. For further information contact APT regional operations contact or home office. **Table 6.1 PulseOx 1000™ Operations and Maintenance Schedule:**

Activity	Weekly	Monthly	Quarterly	Semi	Annually
Inspect condensate drainage sample from X-205	X				
Manually drain condensate from F-204	X				
Inspect coolant level, inspect and clean chiller pump strainer	X				
Inspect/clean coolant filter F-502	X				
Check H2O2 tank T-800 for gassing (bubble formation)	X				
Inspect for gas, water leaks	X				
Check/refill H2O2 tank T-800	X				
Check pump P-801 tube for uneven ware	X				
Check oxygen filter F-303	X				
Check / replace container ventilation intake filter	X				
Verify operation of drain valves (XV-201, 203) / clean elements	X				
Record operating data on log sheet	X				
Check compressor C-200 intake filter		X			
Check compressor C-200 oil level, top off as needed		X			
Check PSA X-300 intake filters		X			
Calibrate hydrogen peroxide pump P-801			X		
Calibrate ozone generator (X-401A) performance			X		
Flush coolant heat exchanger			X		
Lubricate CH-500 pump motor			X		
Clean CH-500, C-200, and AD-203 cooling coils (dry air)			X		
Check tension of C-200 V-Belts			X		
Change P-801 tube				X	
Check all safety relief valves					X
Inspect/tighten low voltage wiring terminations					X
Inspect/tighten power wiring terminations					X

6.2 TROUBLESHOOTING

Table 6.2 provides a guide for diagnosing PulseOx 1000™ operational faults that may arise.

**Table 6.2 PulseOx 1000™ Troubleshooting Guide**

Symptom	Probable Cause	Remedy
System won't start	Ventilation fans not on Previous Fault not cleared Improper Configuration Settings PLC error	Turn fans on Go to faults screen and clear faults Review Configuration Screen Call APT
System shuts down during startup	Low Oxygen Flow or Low Oxygen Pressure Ozone Destruct Problem Injection Air Low Pressure	Ensure Proper Operation of PSA Verify PCV Setting Allows O2 Flow Check all Manual Block Valves Check for proper operation of fan X 600 Check for Blockages in O3 Destruct System Check T-201 tank pressure Check for leaks & closed valves
System has shutdown	Interlock has shutdown system Power failure	Go to F5 to determine Fault & Reset If power failure has occurred there will be No fault indicated on F5 screen, simply Restart the system
Ozone Odor in Trailer	Leak in O3 Gen or Solenoid Cabinet Leak in O3 Flex lines	Sniff w/ Ozone sensor, repair as indicated Sniff w/ Ozone sensor, repair as indicated
	NOTE Reduce O3 gen power level while using	Sniffer to minimize exposure

## **Appendix A**

### **Material Safety Data Sheets**



## Praxair™ Material Safety Data Sheet

### 1. Chemical Product and Company Identification

<b>Product Name:</b> Ozone from Oxygen (MSDS No. P-6220)		<b>Trade Name:</b> Not applicable
<b>Chemical Name:</b> Mixture of Ozone and Oxygen		<b>Synonyms:</b> Triatomic oxygen in oxygen
<b>Formula:</b> Mixture of O <sub>3</sub> and O <sub>2</sub>		<b>Chemical Family:</b> Not applicable
<b>Telephone:</b>	<b>Emergencies:</b> 1-800-645-4633* <b>CHEMTREC:</b> 1-800-424-9300* <b>Routine:</b> 1-800-PRAXAIR	<b>Company Name:</b> Praxair, Inc. 39 Old Ridgebury Road Danbury, CT 06810-5113

\* Call emergency numbers 24 hours a day only for spills, leaks, fire, exposure, or accidents involving this product. For routine information, contact your supplier, Praxair sales representative, or call 1-800-PRAXAIR (1-800-772-9247).

### 2. Composition/Information on Ingredients

This MSDS applies to ozone mixtures produced by passing oxygen through an electrical discharge tube or through ultraviolet radiation. For custom mixtures of this product request an MSDS for each component. See Section 16 for important information about mixtures.

INGREDIENT	CAS NUMBER	% BY WT	OSHA PEL	ACGIH TLV-TWA
Ozone	10028-15-6	16% max	0.1 ppm	See section 3.
Oxygen	7782-44-7	84% min.	None currently established	None currently established
Nitrogen Oxides	See section 3.	Trace	See section 3.	See section 3.

### 3. Hazards Identification

#### EMERGENCY OVERVIEW



**DANGER! Toxic, oxidizing gas.  
Harmful or fatal if inhaled.**



**Vigorously accelerates combustion.  
Irritates and may damage eyes, skin, and respiratory system.**

**May cause dizziness or drowsiness.**

**Symptoms may be delayed**

**Self-contained breathing apparatus and protective clothing must be worn by  
rescue workers.**

**Odor: Unpleasant, sulfur-like**

**THRESHOLD LIMIT VALUE:** *Ozone:* 0.1 ppm TLV-TWA, light work; 0.08 ppm, medium work; 0.05 ppm, heavy work (ACGIH, 1997). *Nitrogen oxides as by-products:* Nitric oxide (NO, CAS# 10102-43-9), 25 ppm TLV-TWA (PEL 25 ppm); nitrogen dioxide (NO<sub>2</sub>, CAS# 10102-44-0), 3 ppm TLV-TWA (PEL, 5 ppm ceiling); nitrous oxide (N<sub>2</sub>O, CAS# 10024-97-2), 50 ppm TLV-TWA (PEL N/A); nitrogen pentoxide (N<sub>2</sub>O<sub>5</sub>, CAS# unk.), N/A. *Acids:* nitrous acid (HNO<sub>2</sub>, CAS# 7782-77-6), N/A; nitric acid (HNO<sub>3</sub>, CAS# 7697-37-2), 2 ppm TLV-TWA (PEL 2 ppm). TLV-TWAs should be used as a guide in the control of health hazards and not as fine lines between safe and dangerous concentrations.

**EFFECTS OF A SINGLE (ACUTE) OVEREXPOSURE:**

**INHALATION**—Exposure to ozone concentrations above the TLV of 0.1 ppm may irritate the nose and throat, and cause dryness. Pain or congestion in the chest may be accompanied by wheezing and coughing. At concentrations above 0.3 ppm for 30 minutes, particularly in exercising individuals, these symptoms are more likely. Eye irritation, headache, nausea, and alterations in pulmonary function (lung impairment and breathing difficulty) may also occur. At concentrations above 0.9 ppm, respiratory effects worsen and drowsiness may occur. Levels near 9 ppm may cause pneumonia, excessive sweating, decreased blood pressure, and weak and rapid pulse. Death may occur from prolonged exposure at 2 ppm or short exposures (1-4 hours) at 10 ppm. Breathing 80% or more oxygen at atmospheric pressure for more than a few hours may cause nasal stuffiness, cough, sore throat, chest pain, and breathing difficulty. Breathing oxygen at higher pressure increases the likelihood of adverse effects within a shorter time period. Breathing pure oxygen under pressure may cause lung damage and also central nervous system effects resulting in dizziness, poor coordination, tingling sensation, visual and hearing disturbances, muscular twitching, unconsciousness, and convulsions. Breathing oxygen under pressure may cause prolongation of adaptation to darkness and reduced peripheral vision.

**SKIN CONTACT**—Contact with ozone may irritate the skin. Nitrogen oxide by-products may combine with moisture in the skin and mucous membranes to form nitrogen acids, producing chemical burns.

**SWALLOWING**—A highly unlikely route of exposure. This product is a gas at normal temperature and pressure.

**EYE CONTACT**—Exposed persons may sense eye irritation at or above the TLV of 0.1 ppm ozone. Exposure to ozone at 2 ppm over 4 hours has caused eye irritation in rabbits. Nitrous oxide is moderately irritating to the eyes and nose at 50 ppm; 25 ppm is irritating to some people. Nitrogen oxide by-products may combine with moisture in the eyes to form nitrogen acids, producing chemical burns.

**EFFECTS OF REPEATED (CHRONIC) OVEREXPOSURE:** Prolonged, low level (0.3 ppm) exposure to ozone may produce scarring and thickening of small air passages, resulting in chronic lung disease. People with existing lung disease may show earlier and more severe symptoms when exposed to ozone. An increased susceptibility to lung disease and infection may also occur.

**OTHER EFFECTS OF OVEREXPOSURE:** None known for ozone, but see section 16 for effects of nitrogen compounds produced by the breakdown of ozone.

**MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE:** People with existing lung disease may show earlier and more severe symptoms when exposed to ozone. An increased susceptibility to lung disease and infection may also occur.

**SIGNIFICANT LABORATORY DATA WITH POSSIBLE RELEVANCE TO HUMAN HEALTH**

**HAZARD EVALUATION:** There is limited evidence that ozone in concentrations of over 1.5 ppm may be lethal to rodent embryos. Studies of mutagenic effects in humans have been equivocal.

**CARCINOGENICITY:** Ozone is not listed by NTP, OSHA, and IARC.

<b>4. First Aid Measures</b>
------------------------------

**INHALATION:** Immediately remove to fresh air. If not breathing, give artificial respiration. Rescuer should avoid inhaling air from victim. Get immediate medical attention.

**SKIN CONTACT:** Immediately flush skin with plenty of water while removing contaminated clothing and shoes. Get immediate medical attention.

**SWALLOWING:** An unlikely route of exposure. This product is a gas at normal temperature and pressure.

**EYE CONTACT:** Immediately flush eyes with plenty of cool water for at least 15 minutes. Hold the eyelids open and away from the eyeballs to ensure that all surfaces are flushed thoroughly. Do not allow victim to rub eyes. Get immediate medical attention.

**NOTES TO PHYSICIAN:** *Keep victim under observation. Onset of breathing difficulties may be delayed for up to 6 hours. There is no specific antidote. Treatment of overexposure should be directed at the control of symptoms and the clinical condition of the patient. Supportive treatment for overexposure to oxygen should include immediate sedation, anti-convulsive therapy if needed, and rest. See section 11, Toxicological Information.*

<b>5. Fire Fighting Measures</b>
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<b>FLASH POINT</b> (test method):	Not applicable
<b>AUTOIGNITION TEMPERATURE:</b>	Not applicable
<b>FLAMMABLE LIMITS IN AIR</b> , % by volume:	<b>LOWER:</b> Not applicable   <b>UPPER:</b> Not applicable
<b>EXTINGUISHING MEDIA:</b> Ozone from oxygen cannot catch fire. Use media appropriate for surrounding fire.	

**SPECIAL FIRE FIGHTING PROCEDURES: DANGER! Toxic, oxidizing gas (see section 3).** Evacuate all personnel from danger area. Do not approach area without self-contained breathing apparatus and protective clothing. Immediately cool any cylinders with water spray from maximum distance. Remove ignition sources if without risk. Stop flow of gas if without risk, while continuing cooling water spray. Remove any gas cylinders from area of fire if without risk. Heat of fire can build pressure in gas cylinders and cause rupture. No part of any cylinder should be subjected to a temperature higher than 125°F (52°C). On-site fire brigades must comply with OSHA 29 CFR 1910.156.

**UNUSUAL FIRE AND EXPLOSION HAZARDS:** Oxidizing agent; vigorously accelerates combustion. Contact with flammables may cause fire or explosion. (See section 10.)

**HAZARDOUS COMBUSTION PRODUCTS:** Thermal decomposition of the nitric oxide by-product may produce highly toxic nitrogen oxides. (See section 10.)

## 6. Accidental Release Measures

**STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED: DANGER! Toxic, oxidizing gas (see section 3).** Immediately evacuate all personnel from danger area. Use self-contained breathing apparatus where needed. Toxic gas may spread. Remove all sources of ignition if without risk. Reduce gas with fog or fine water spray. Shut off flow if without risk. Ventilate area.

**WASTE DISPOSAL METHOD:** Prevent waste from contaminating the surrounding environment. Keep personnel away. Discard any product, residue, disposable container, or liner in an environmentally acceptable manner, in full compliance with federal, state, and local regulations. If necessary, call your local supplier for assistance.

## 7. Handling and Storage

**PRECAUTIONS TO BE TAKEN IN STORAGE:** This mixture is produced and used in a closed system and is not stored.

**PRECAUTIONS TO BE TAKEN IN HANDLING:** This mixture is produced and used in a closed system and should not be handled.

## 8. Exposure Controls/Personal Protection

### VENTILATION/ENGINEERING CONTROLS:

**LOCAL EXHAUST**—A corrosion-resistant system is acceptable so long as it maintains sufficient air flow to keep the ozone concentration below the TLV in the worker's breathing zone. (See SPECIAL.)

**MECHANICAL (general)**—Inadequate; see SPECIAL.

**SPECIAL**—Use only in a closed system. Corrosion-resistant, forced-draft fume hood is preferred.

**OTHER**—See SPECIAL.

**RESPIRATORY PROTECTION:** Select per OSHA 29 CFR 1910.134 and ANSI Z88.2. Use any NIOSH/MHSA-approved air-supplied respirator for concentrations up to 10 times the applicable permissible exposure limit. For concentrations from 10 to 100 times the PEL, use the above respirator fitted with a full facepiece, or use a self-contained breathing apparatus. For higher concentrations, a full-face, self-contained breathing apparatus operated in the pressure demand mode is required.

**PROTECTIVE GLOVES:** Wear plastic (not rubber) gloves wherever contact with product is possible.

**EYE PROTECTION:** Wear vapor-proof goggles and a face shield wherever contact with product is possible. Select per OSHA 29 CFR 1910.133.

**OTHER PROTECTIVE EQUIPMENT:** Protective clothing—plastic (not rubber)—and shoes whenever contact with product is possible—at a minimum, whenever the generator or process system is opened for any reason including routine inspection and maintenance. Select per OSHA 29 CFR 1910.132 and 1910.133. Regardless of protective equipment, never touch live electrical parts.

## 9. Physical and Chemical Properties

**MOLECULAR WEIGHT:** 48 (ozone component)

**SPECIFIC GRAVITY (Air = 1) at 32°F (0°C) and 1 atm:** 1.66 (ozone component)

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<b>SOLUBILITY IN WATER</b> , wt/wt at 32°F (0°C) and 1 atm:	0.494
<b>BOILING POINT</b> at 1 atm:	-170°F (-112°C) (ozone component)
<b>MELTING POINT</b> at 1 atm:	-313°F (-191.7°C) (ozone component)

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**APPEARANCE, ODOR, AND STATE:** Colorless gas mixture at normal temperature and pressure; unpleasant, sulfur-like odor.

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## 10. Stability and Reactivity

**STABILITY:**  Unstable  Stable

**INCOMPATIBILITY (materials to avoid):** Oxidizable materials, both organic and inorganic; hydrogen; iron, copper, chromium; water

**HAZARDOUS DECOMPOSITION PRODUCTS:** Nitric oxide, nitrogen dioxide, nitrogen pentoxide, nitrous oxide, nitrous acid, nitric acid

**HAZARDOUS POLYMERIZATION:**  May Occur  Will Not Occur

**CONDITIONS TO AVOID:** Avoid contact with all oxidizable materials, both organic and inorganic, including rubber. Ozone reacts with nonsaturated organic compounds to produce ozonides, which are unstable and may decompose with explosive violence. Ozone is an unstable gas that at normal temperatures decomposes to biatomic oxygen. At elevated temperatures and in the presence of certain catalysts such as hydrogen, iron, copper and chromium, this decomposition may be explosive.

## 11. Toxicological Information

**Ozone:** Human inhalation: TC<sub>LO</sub>: 1860 ppb/75 min caused watering eyes, decreased pulse rate, falling blood pressure, and cough; 1 ppm caused cough, breathing difficulty, and other changes. Rat inhalation: TC<sub>LO</sub>: 1500 ppb/24 hr (17 to 20 days pregnancy) caused behavioral disorders in newborn; 1040 ppt/24 hr (6 to 9 days pregnancy) caused developmental abnormalities of the musculoskeletal system. LC<sub>50</sub>: 4800 ppb/4-hrs (rat), LC<sub>50</sub>: 12600 ppb/3-hrs (mouse), LC<sub>50</sub>: 36ppm/3-hrs (rabbit). Oxygen: TC<sub>LO</sub>: 100 pph/14 hrs (human).

At atmospheric concentration and pressure, oxygen poses no toxicity hazards. At high concentrations, newborn premature infants may suffer delayed retinal damage (retrolental fibroplasia) that can progress to retinal detachment and blindness. Retinal damage may also occur in adults exposed to 100% oxygen for extended periods (24 to 48 hours) or at greater than atmospheric pressure, particularly in individuals whose retinal circulation has been previously compromised. All individuals exposed for long periods to oxygen at high pressure and all who exhibit overt oxygen toxicity should have ophthalmologic examinations.

At two or more atmospheres, toxicity to the Central Nervous System (CNS) occurs. Symptoms include nausea, vomiting, dizziness or vertigo, muscle twitching, vision changes, and loss of consciousness and generalized seizures. At three atmospheres, CNS toxicity occurs in less than two hours; at six atmospheres, in only a few minutes.

Patients with chronic obstructive pulmonary disease retain carbon dioxide abnormally. If oxygen is administered, raising their blood oxygen concentration, their breathing becomes depressed, and retained carbon dioxide rises to a dangerous level.

Animal studies suggest that the administration of certain drugs, including phenothiazine drugs and chloroquine, increases the susceptibility to toxicity from oxygen at high concentrations or pressures. Animal studies also indicate that vitamin E deficiency may increase susceptibility to oxygen toxicity.

Airway obstruction during high oxygen tension may cause alveolar collapse following absorption of the oxygen. Similarly, occlusion of the eustachian tubes may cause retraction of the eardrum and obstruction of the paranasal sinuses may produce vacuum-type headache.

### 12. Ecological Information

No information is available on ecological effects. Ozone from oxygen does not contain any Class I or Class II ozone-depleting chemicals. Ozone from oxygen is not listed as a marine pollutant by DOT.

### 13. Disposal Considerations

**WASTE DISPOSAL METHOD:** See section 6.

### 14. Transport Information

**DOT/IMO SHIPPING NAME:** Not shipped

HAZARD CLASS:	IDENTIFICATION NUMBER:	PRODUCT RQ:
Not applicable	Not applicable	Not applicable
<b>SHIPPING LABEL(s):</b> Not applicable		
<b>PLACARD (when required):</b> Not applicable		
<b>SPECIAL SHIPPING INFORMATION:</b> Not applicable		

### 15. Regulatory Information

The following selected regulatory requirements may apply to this product. Not all such requirements are identified. Users of this product are solely responsible for compliance with all applicable federal, state, and local regulations.

#### U.S. FEDERAL REGULATIONS:

##### EPA (ENVIRONMENTAL PROTECTION AGENCY)

**CERCLA:** COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT OF 1980 (40 CFR Parts 117 and 302):

**Reportable Quantity (RQ):** None

##### SARA: SUPERFUND AMENDMENT AND REAUTHORIZATION ACT:

**SECTIONS 302/304:** Require emergency planning based on Threshold Planning Quantity (TPQ) and release reporting based on Reportable Quantities (RQ) of extremely hazardous substances (40 CFR Part 355):

**Threshold Planning Quantity (TPQ):** 100 lbs (45.4 kg)

**Extremely Hazardous Substances (40 CFR 355):** 1 lbs (0.454 kg)

**SECTIONS 311/312:** Require submission of MSDSs and reporting of chemical inventories with identification of EPA hazard categories. The hazard categories for this product are as follows:

**IMMEDIATE:** Yes

**PRESSURE:** Yes

**DELAYED:** Yes

**REACTIVITY:** Yes

**FIRE:** Yes

**SECTION 313:** Requires submission of annual reports of release of toxic chemicals that appear in 40 CFR Part 372.

None of the components of this mixture requires reporting under Section 313.

**40 CFR 68: RISK MANAGEMENT PROGRAM FOR CHEMICAL ACCIDENTAL RELEASE PREVENTION:** Requires development and implementation of risk management programs at facilities that manufacture, use, store, or otherwise handle regulated substances in quantities that exceed specified thresholds.

None of the components of this mixture is listed as a regulated substance.

**TSCA: TOXIC SUBSTANCES CONTROL ACT:** The components of this mixture are listed on the TSCA inventory.

**OSHA: OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION:**

**29 CFR 1910.119: PROCESS SAFETY MANAGEMENT OF HIGHLY HAZARDOUS CHEMICALS:** Requires facilities to develop a process safety management program based on Threshold Quantities (TQ) of highly hazardous chemicals.

None of the components of this mixture is listed in Appendix A as a highly hazardous chemical.

#### **STATE REGULATIONS:**

**CALIFORNIA:** Ozone is not listed by California under the SAFE DRINKING WATER TOXIC ENFORCEMENT ACT OF 1986 (Proposition 65).

**PENNSYLVANIA:** This product is subject to the PENNSYLVANIA WORKER AND COMMUNITY RIGHT-TO-KNOW ACT (35 P.S. Sections 7301-7320).

### **16. Other Information**

Be sure to read and understand all labels and instructions supplied or associated with this product.

**ADDITIONAL SAFETY AND HEALTH HAZARDS:** The presence of nitrogen and oxygen in the corona discharge leads to the formation of small amounts of nitrogen oxides, mainly nitrogen pentoxide ( $N_2O_5$ ) and nitrogen dioxide ( $NO_2$ ).  $N_2O_5$  is a yellowish white solid that sublimates at 86°F (30°C) into  $NO_2$  and  $O_2$ .  $NO_2$  is a reddish brown gas that liquefies at 68°F (20°C), forming a reddish brown liquid. In contact with moisture in the feed gas,  $N_2O_5$  forms highly corrosive nitric acid ( $HNO_3$ ). Generally, the nitric acid will settle on the wall of the ozone generator. Inspection and maintenance personnel must take care not to get this acid on their skin or clothing.

An ACGIH review suggests that a 60-min exposure of humans to 100 ppm nitrogen dioxide ( $NO_2$ ) leads to pulmonary edema with possible subacute or chronic lesions in the lungs, and 25 ppm leads to respiratory irritation and chest pain. Whenever there is exposure to unusual amounts of nitrogen dioxide, the exposed persons should be under medical supervision for a period of 72 hours to detect the earliest signs of pulmonary edema. The odor of  $NO_2$  is perceptible for some persons at 0.11 ppm, and for most

at 0.22 ppm. Dark adaptation and the ability to perceive dim lights is impaired by as little as 0.074 ppm. Exposure to 0.7 to 2 ppm for 10 minutes causes increased resistance to the flow of air in the respiratory tract.

**OTHER HAZARDOUS CONDITIONS OF HANDLING, STORAGE, AND USE:** *Toxic, oxidizing gas.* Harmful or fatal if inhaled. Do not breathe gas. Do not get vapors or liquid in eyes, on skin, or on clothing. (See section 3.) Have safety showers and eyewash fountains immediately available. *Use piping and equipment adequately designed to withstand pressures to be encountered.* Use only in a closed system constructed of corrosion-resistant materials. *Never work on a pressurized system.* If there is a leak, shut the system down. Blow down the system and purge it per instructions, in an environmentally safe manner and in compliance with all federal, state, and local laws, then repair the leak. *Do not eat, drink, or smoke* in areas where ozone is used. Wash hands and face thoroughly to clean them of any residual before eating, drinking, smoking, using the toilet, or applying cosmetics.

**NOTE:** *Prior to using any plastics, confirm their compatibility with ozone by-products.*

**MIXTURES:** When you mix two or more gases or liquefied gases, you can create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an industrial hygienist or other trained person when you evaluate the end product. Remember, gases and liquids have properties that can cause serious injury or death.

#### HAZARD RATING SYSTEMS:

##### NFPA RATINGS:

HEALTH = 3  
 FLAMMABILITY = 0  
 REACTIVITY = 1  
 SPECIAL = OX

##### HMIS RATINGS:

HEALTH = 3  
 FLAMMABILITY = 0  
 REACTIVITY = 1

Ask your supplier about free Praxair safety literature. Further safety information can be found in the following pamphlets published by the Compressed Gas Association, Inc. (CGA), 1725 Jefferson Davis Highway, Arlington, VA 22202-4102, Telephone (703) 412-0900.

P-1 *Safe Handling of Compressed Gases in Containers*  
 P-14 *Accident Prevention in Oxygen-Rich, Oxygen-Deficient Atmospheres*  
 — *Handbook of Compressed Gases, Third Edition*



Praxair asks users of this product to study this MSDS and become aware of product hazards and safety information. To promote safe use of this product, a user should (1) notify employees, agents, and contractors of the information in this MSDS and of any other known product hazards and safety information, (2) furnish this information to each purchaser of the product, and (3) ask each purchaser to notify its employees and customers of the product hazards and safety information.

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The opinions expressed herein are those of qualified experts within Praxair, Inc. We believe that the information contained herein is current as of the date of this Material Safety Data Sheet. Since the use of this information and the conditions of use of the product are not within the control of Praxair, Inc., it is the user's obligation to determine the conditions of safe use of the product.

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Praxair MSDSs are furnished on sale or delivery by Praxair or the independent distributors and suppliers who package and sell our products. To obtain current Praxair MSDSs for these products, contact your Praxair sales representative or local distributor or supplier. If you have questions regarding Praxair MSDSs, would like the form number and date of the latest MSDS, or would like the names of the Praxair suppliers in your area, phone or write the Praxair Call Center (**Phone:** 1-800-PRAXAIR; **Address:** Praxair Call Center, Praxair, Inc., PO Box 44, Tonawanda, NY 14150-7891).

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Praxair, Inc.  
39 Old Ridgbury Road  
Danbury, CT 06810-5113

# PRODUCT INFORMATION

## 20%-40% hydrogen peroxide concentration material safety data sheet cas no. 7722-84-1

U.S. / Canada Version - Effective July 1, 1996  
WWW Replication - Effective June 4, 1997

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### 1. Chemical Product / Company Identification

• <b>Product name...</b>	Durox (TM) REG & LR 35% Hybrite (R) 32.5% OxyPure (R) 35% Semiconductor, REG & SEG 31% Standard 27.5 & 35% Super D (R) 25 & 35% Technical 35% Chlorate Grade 20%	
• <b>Synonyms...</b>	Hydrogen peroxide solutions 20 to 40%	
• <b>Information provided by...</b>	FMC Corporation Peroxygen Chemical Division 1735 Market Street Philadelphia, PA 19103 (215) 299-6000	FMC of Canada Ltd. Peroxygen Chemical Division PG Pulp Mill Road Prince George, BC Y2N2S6 (604) 561-4200
• <b>Emergency phone numbers...</b>	Chemtrec Medical Plant/Other	(800) 424-9300 (303) 595-9048 call collect (609) 924-6677 call collect in U.S. (613) 996-6666 CANUTEC

### 2. Composition / Information on Ingredients

• <b>CAS # and Components...</b>		
• <b>Material / Component</b>	Hydrogen Peroxide	Water
<b>Percent</b>	20 to 40%	60 to 80%
• <b>CAS #</b>	7722-84-1	7732-18-5

### 3. Hazard Identification

**Emergency Overview...**

Oxidizer. Contact with combustibles may cause fire. Decomposes yielding oxygen that supports combustion of organic matters and can cause overpressure if confined.

**Health Effects...**

Corrosive to eyes, nose, throat and lungs. May cause irreversible tissue damage to the eyes including blindness. May cause skin irritation.

**4. First Aid Measures**

**Eyes...**

Immediately flush with large amounts of water for at least 15 minutes, lifting upper and lower lids intermittently. See a physician or ophthalmologist.

**Skin...**

Wash with large amounts of water. If irritation persists, see a physician.

**Inhalation...**

Remove to fresh air. If breathing difficulty or discomfort occurs, call a physician.

**Ingestion...**

If swallowed, drink plenty of water immediately to dilute. Do not induce vomiting or give anything by mouth to an unconscious person. See a physician.

**Notes to Physician...**

Hydrogen peroxide at these concentrations is a strong oxidant. Direct contact with the eye is likely to cause corneal damage especially if not washed immediately. Careful ophthalmologic evaluation is recommended and the possibility of local corticosteroid therapy should be considered. Because of the likelihood of corrosive effects on the gastrointestinal tract after ingestion and the unlikelihood of systemic effects, attempts at evacuating the stomach via emesis induction of gastric lavage should be avoided. There is remote possibility, however, that a nasogastric or orogastric tube may be required for the reduction of severe distension due to gas formation.

**5. Fire Fighting Measures**

**Extinguishing Media...**

Preferably water or water fog. Carbon dioxide and dry chemical may also be used.

**Special Firefighting Procedures...**

Any tank or container surrounded by fire should be flooded with water for cooling. Wear full protective clothing and self-contained breathing apparatus.

**Degrees of Fire and Explosion Hazard...**

Product is noncombustible. On decomposition H<sub>2</sub>O<sub>2</sub> releases oxygen which may intensify fire.

**Hazardous Decomposition Products...**

Oxygen which supports combustion.

**6. Accidental Release Measures**

**Procedure for Release Or Spill...**

Dilute with large volume of water and hold in a pond or diked area until H<sub>2</sub>O<sub>2</sub> decomposes. Dispose according to methods outlined for waste disposal.

## 7. Handling and Storage

• <b>Handling...</b>	Wear cup type chemical safety goggles and/or full face shield, polyester or acrylic full cover clothing and rubber or neoprene gloves and shoes. Avoid cotton, wool and leather. Avoid excessive heat and contamination. Contamination may cause decomposition and generation of oxygen gas which could result in high pressures and possible container rupture. Hydrogen peroxide should be stored only in vented containers and should be transferred only in a prescribed manner (see FMC technical bulletins). Never return unused hydrogen peroxide to original container. Empty drums should be triple rinsed with water before discarding. Utensils used for handling hydrogen peroxide should be made only of glassy stainless steel, aluminum or plastic.
• <b>Ventilation...</b>	Provide mechanical general and/or local exhaust ventilation to prevent release of vapor or mist into the work environment.
• <b>Storage...</b>	Store drums in cool areas out of direct sunlight and away from combustibles. For bulk storage refer to FMC technical bulletins.

## 8. Exposure Controls / Personal Protection

• <b>Control Measures...</b>	Ventilation should be provided to minimize the release of H <sub>2</sub> O <sub>2</sub> vapors and mist into the work environment. Spills should be collected or confined immediately and diluted for disposal to prevent release into the work area. Remove contaminated clothing immediately and wash before reuse.
• <b>Recommended Personal Protective Equipment...</b>	
<b>Respiratory</b>	If concentrations in excess of 10 ppm are expected use approved self-contained breathing apparatus. Do not use oxidizable sorbants such as activated carbon.
<b>Eyes</b>	Use cup type chemical goggles and/or full face shield.
<b>Gloves</b>	Liquid proof rubber or neoprene gloves.
<b>Special Clothing and Equipment</b>	Polyester or acrylic full clothing. (avoid cottony wool and leather)
• <b>Footwear</b>	Rubber or neoprene footwear. (avoid leather)

## 9. Physical and Chemical Properties

Properties for...	20%	31%	35%
<b>Melting / Freezing Point</b>	-15°C (6°F)	-26°C (-15°F)	-33°C (-27°F)
<b>Boiling Point</b>	103°C (218°F)	107°C (225°F)	108°C (226°F)
<b>Vapor Pressure</b>	28 mm Hg @ 30°C	24 mm Hg @ 30°C	23 mm Hg @ 30°C
<b>Vapor Density (Air=1)</b>	No data available	No data available	No data available
<b>Room Temperature (appearance and state)</b>	Clear colorless liquid	Clear colorless liquid	Clear colorless liquid
<b>Vapor Density (Air=1)</b>	Odorless	Odorless	Odorless
<b>Specific Gravity (H<sub>2</sub>O = 1)</b>	1.07 @ 20 °C / 4 °C	1.11 @ 20 °C / 4 °C	1.13 @ 20 °C / 4 °C
<b>Solubility in H<sub>2</sub>O, % by wt</b>	100%	100%	100%

<b>% Volatiles</b>	100%	100%	100%
<b>Evaporation Rate (butyl acetate=1)</b>	Above 1	Above 1	Above 1
<b>pH (as is)</b>	2.0 - 3.5	2.0 - 3.5	2.0 - 3.5
<b>pH (1% solution)</b>	5.0 - 6.0	5.0 - 6.0	5.0 - 6.0
<b>Odor Threshold</b>	Not available	Not available	Not available
<b>Density (g/mL)</b>	Not available	Not available	Not available
<b>Partition Coefficient (n-octanol/water)</b>	Not available	Not available	Not available
<b>Flash Point</b>	Non-combustible	Non-combustible	Non-combustible
<b>Autoignition Temperature</b>	Non-combustible	Non-combustible	Non-combustible
<b>Flammable Limits: Upper</b>	Non-combustible	Non-combustible	Non-combustible
<b>Flammable Limits: Lower (air)</b>	Non-combustible	Non-combustible	Non-combustible
<b>Explosive Properties</b>	Not applicable	Not applicable	Not applicable
<b>Oxidizing Properties</b>	Strong oxidizer	Strong oxidizer	Strong oxidizer
<b>Solubility: Fat Solubility (solvent - oil)</b>	No data available	No data available	No data available

## 10. Stability and Reactivity

<b>Stability...</b>	Stable (heat and contamination could cause decomposition)
<b>Hazardous Polymerization...</b>	Will not occur
<b>Conditions to Avoid...</b>	Excessive heat or contamination could cause product to become unstable.
<b>Materials to Avoid...</b>	Dirt, organics, cyanides and combustibles such as wood, paper, oils, etc.
<b>Major Contaminants that Contribute to Instability...</b>	Iron and other heavy metals, copper alloys and caustic.
<b>Incompatibility...</b>	Reducing agents, wood, paper and other combustibles (see above)
<b>Hazardous Decomposition Products...</b>	Oxygen that supports combustion
<b>Sensitivity to Mech Impact...</b>	No data available
<b>Sensitivity to Static Discharge...</b>	No data available

## 11. Toxicological Information

<b>Eye Contact...</b>	Extremely irritating/corrosive (rabbit) (35% H2O2) Ref. I83-748
<b>Skin Contact...</b>	Mildly irritating after 4 hours exposure (rabbit) (35% H2O2) Ref. I83-747
<b>Skin Absorption...</b>	LD50 > 2000 mg/kg (rabbit) (35% H2O2) Ref. I83-746
<b>Inhalation...</b>	LC50 > 0.17 mg/L (rat) (50% H2O2) Ref. I89-1080
<b>Ingestion...</b>	LD50 = 1193 mg/kg (rat) (35% H2O2) Ref. I83-745

**Acute Effects from Overexposure...**

Extremely irritating/corrosive to eyes and gastrointestinal tract. May cause irreversible tissue damage to the eyes, including blindness. Inhalation of mist or vapors may be severely irritating to nose, throat and lungs. May cause skin irritation.

**Chronic Effects from Overexposure...**

There are reports of limited evidence of carcinogenicity of hydrogen peroxide to mice administered high concentrations in their drinking water (IARC Monograph 36, 1985). However, the international agency for research on cancer concluded that hydrogen peroxide could not be classified as to its carcinogenicity to humans (Group III carcinogen).

(Note: Effects considered include: Sensitivities, Carcinogenicity, Teratogenicity, Synergistic Products, and any Medical Conditions generally recognized as being aggravated by exposure.)

**12. Ecological Information**

**Environmental Fate...**

H<sub>2</sub>O<sub>2</sub> in the aquatic environment is subject to various reduction or oxidation processes and decomposes into water and oxygen. H<sub>2</sub>O<sub>2</sub> half life in freshwater ranged from 8 hours to 20 days, in air from 10-20 hrs. And in soils from minutes to hours depending upon microbiological activity and metal contaminants.

**Environmental Effects...**

Channel catfish: 96 hr LC<sub>50</sub> = 37.4 mg/L  
Fathead minnow: 96 hr LC<sub>50</sub> = 16.4 mg/L  
Daphnia magna: 24 hr EC<sub>50</sub> = 7.7 mg/L  
Daphnia pule: 48 hr LC<sub>50</sub> = 2.4 mg/L  
Physa sp.: 96 hr LC<sub>50</sub> = 17.7 mg/L (freshwater snail)

For more information refer to ECETOC "Joint Assessment of Commodity Chemicals, No.22, Hydrogen Peroxide." ISSN-0773-6339, January 1993

**13. Disposal Considerations**

**Waste Disposal Method...**

An acceptable method of disposal is to dilute with a large amount of water and allow the hydrogen peroxide to decompose followed by discharge into a suitable treatment system in accordance with all regulatory agencies. Because acceptable methods of disposal may vary by location and because regulatory requirements may change, the appropriate regulatory agencies should be contacted prior to disposal.

**14. Transport Information**

**DOT Proper Shipping Name...**

Hydrogen peroxide, aqueous solutions with not less than 20 percent but not more than 40 percent hydrogen peroxide.

**IATA...**

Hydrogen peroxide, aqueous solutions with not less than 20 percent but not more than 40 percent hydrogen peroxide.

**IMDG...**

Hydrogen peroxide, aqueous solutions with not less than 20 percent but not more than 40 percent hydrogen peroxide.

**DOT Classification...**

5.1 (Oxidizer)

**DOT Labels...**

Oxidizer, corrosive

• DOT Marking...	Hydrogen peroxide, aqueous solutions with not less than 20 percent but not more than 40 percent hydrogen peroxide. UN 2014
• DOT Placard...	5.1 (Oxidizer)
• UN Number...	UN 2014
• Hazardous Substance / RQ...	Not applicable
• 49 STCC Number...	4918776
• Precautions to be Taken in Transportation...	Protect from physical damage. Keep drums in upright position. Drums should not be stacked in transit. Do not store drums on wooden pallets.
• Other Shipping Information...	Aluminum tanks, drum/DOT 42D, Packing group II

## 15. Regulatory Information

### OSHA Exposure Limits...

Substance(s)  
OSHA: Hydrogen Peroxide

• PEL-TWA	1 ppm
• STEL	Not applicable
• Ceiling	Not applicable
• Skin Designation	Not applicable

### ACGIH:

• TLV-TWA	1 ppm
• STEL	Not applicable
• Ceiling	Not applicable
• Skin Designation	Not applicable

• Target Organ Effects... Sensory irritation, eyes and lungs

• Carcinogenic Potential... Hydrogen peroxide

• Regulated by OSHA	No
• Listed on NTP Report	No
• IARG Group 1, 2a, 2b	No

### • U.S. EPA Requirements...

• Release Reporting CERCLA (40 CFR 302)	Not listed
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**Listed Substance(s)**  
RQ No  
**Characteristic** Not applicable  
**RCRA Waste No.** Not applicable  
Not applicable

**Unlisted Substance(s)**  
RQ Hydrogen peroxide 20-40%  
**Characteristic** 100 lbs  
**RCRA Waste No.** Ignitability, Corrosivity  
D001, D002

•  
**SARA Title III Sec. 313...**

**(40 CFR 372)**  
**Listed Toxic Chemical** Not listed  
Not listed

•  
**Inventory Reporting**  
**SARA Title III, Sec 311/312**  
**(40 CFR 370)...**

**Substance(s)**  
**Hazard Category** Hydrogen peroxide 20-40%  
**Planning Threshold** Fire hazard, Immediate (acute) health hazard  
Conc. < 52% (10,000 lbs)

•  
**Emergency Planning**  
**SARA Title III, Sec 302/303**  
**(40 CFR 355)...**

**Listed Substance(s)**  
RQ Not applicable  
**Planning Threshold** Not applicable  
Not applicable

•  
**U.S. TSCA Status...** Listed

•  
**Canada Ingredient Disclosure**  
**List...**

**Substance(s)**  
**Controlled Product** Hydrogen peroxide  
**Hazard Symbols** Yes  
**Hazard Class & Division** Corrosive, Oxidizing, Materials causing other toxic effects  
**Product Ident. No.** Class C, Class D, Div. 2, Subdiv. B, Class E  
**Domestic Substance** 2014  
**List** Listed  
**CEPA Priority List** Not listed

**Carcinogenicity**  
**ACGIH Appendix A** Not listed  
**A1 - Confirmed Human** Not applicable  
**A1 - Suspected Human** Not applicable

**IARC Group 1 or 2** No

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**Label Language  
(U.S. / Canada)...**

**Health**

Danger. Corrosive to eyes. Direct eye contact may cause reversible tissue damage including blindness. Inhalation of mist or vapor could cause irritation of lungs, nose and throat, usually subsides after exposure ceases. Do not ingest. Corrosive to gastrointestinal tract. May be fatal if swallowed.

**Physical**

Oxidizer. Initiates combustion in other materials by causing fire through release of oxygen.

**Handling and Storage**

Keep container in cool place (avoid excessive heat), away from combustibles such as wood, paper, oils, etc. Store only in vented containers. Storage should conform to standards in NFPA bulletin 43a. Avoid contamination - contamination could cause decomposition and generation of oxygen which may result in high pressures and possible container rupture. Do not return unused material to the original container. Wear cup type chemical safety goggles and/or full face mask. Use only suitable protective clothing, e.g., rubber, neoprene or synthetic fibers (avoid cotton, wool and leather). Use glass, stainless steel, aluminum or plastic materials when handling hydrogen peroxide. Empty drums should be triple rinsed with water before discarding.

**First Aid**

In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. See a physician. Wash clothing before reuse. If swallowed, drink plenty of water to dilute. Do not induce vomiting. See a physician immediately.

• **State Regulations...**

Proposition 65 - California

Safe Drinking Water and Toxics Enforcement Act of 1986 requires The government of California to develop a list of carcinogens (a) and reproductive toxins (b). No persons doing business shall knowingly expose any individual to a chemical on this list. FMC's 70% hydrogen peroxide contains the indicated concentration(s) of Listed chemicals: cadmium (a) 0.1%; chromium (a) less than 0.2% and lead (b) less than 0.5%.

• (Note: Percentages less than 70% hydrogen peroxide would contain proportionately less.)

**16. Other Information**

**Product Uses...**

Durox (TM) 35% REG & LR meets food chemical codex requirements for aseptic packaging and other food related applications.

Oxypure (R) 35% certified by NSF to meet ANSI/NSF Std. 60 requirements for drinking water treatment.

Standard 27.5 & 35% grade most suitable for industrial bleaching, processing, pollution abatement and general oxidation reactions.

Semiconductor REG & SEG 31% conform to ACS and semi specs. For wafer etching and cleaning and applications requiring low residues.

Super D (R) 25 & 35% complies with pharmacopoeia specifications suitable for preparing dilute solutions for pharmaceutical and/or cosmetic applications.

Technical 35% essentially free of inorganic metals, suitable for chemical synthesis.

Hybrite (R) 32.5% used for metal treating

Chlorate grade 20% specially formulated for use in chlorate manufacture or processing.

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#### NFPA 704...

<b>Health</b>	2
<b>Flammability</b>	0
<b>Reactivity</b>	1
<b>Special Hazard</b>	OX (where degree of hazard: 0 = no hazard and 4 = severe hazard)

•

#### Hazardous Materials Identification System (HMIS)...

<b>Health</b>	2
<b>Flammability</b>	0
<b>Reactivity</b>	1
<b>Personal Protection Index (PPI)</b>	H (safety goggles, gloves, apron, and vapor respirator)

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The contents and format of this MSDS are in accordance with OSHA hazard communication standard and Canada's workplace hazardous information system (WHMIS).

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# carus CHEMICAL COMPANY

## Material Safety Data Sheet

### CARULITE® 200 Low Temperature Oxidation Catalyst

#### Section 1 Chemical Product and Company Identification

##### CARULITE® 200 Low Temperature Oxidation Catalyst

<b>MANUFACTURER'S NAME:</b> CARUS CORPORATION	<b>TELEPHONE NUMBER FOR INFORMATION:</b> (815) 223-1500
<b>MANUFACTURING FACILITY:</b> Carus Chemical Company 1500 Eighth Street P. O. Box 1500 LaSalle, IL 61301	<b>CHEMTREC TELEPHONE NO. :</b> (800) 424-9300 <b>EMERGENCY TELEPHONE NO.:</b> (800) 435-6856

#### Section 2 Composition and Information on Ingredients

<b>SYNONYMS:</b> None			
<b>CLASS:</b> Inorganic oxides			
<b>HAZARDOUS MATERIALS IDENTIFICATION SYSTEM (HMIS):</b>			
Health Hazard	1		
Flammability Hazard	0		
Reactivity Hazard	0		
Personal Protection Index	E		
<b><u>Hazardous Ingredients</u></b>			
<u>Material or Component</u>	<u>CAS No.*</u>	<u>%</u>	<u>Hazard Data</u>
Manganese Dioxide	1313-13-9	60-75 %	<b>PEL** C****</b> 5 mg Mn per cubic meter of air <b>TLV-TWA***</b> 0.2 mg Mn per cubic meter of air
Copper Oxide	1317-38-0	11-14 %	<b>PEL**</b> 1 mg Cu per cubic meter of air <b>TLV-TWA***</b> 1 mg Cu per cubic meter of air
Aluminum Oxide	1344-28-1	15-16 %	<b>TLV-TWA***</b> 10 mg per cubic meter of air
* Chemical Abstract Service Number			
** OSHA Permissible Exposure Limit, manganese compounds (as Mn), copper dusts and mists (as Cu), 29 CFR 1910.1000 Table Z-1.			
*** American Conference of Governmental Hygienists, 1998. TLV-TWA = the time weighted average concentration for a normal 8-hour workday and a 40-hour work week, to which nearly all workers may be repeatedly exposed, day after day, without adverse effect.			
**** Ceiling Exposure Limit or maximum exposure concentration not to be exceeded under any circumstances.			

# carus CHEMICAL COMPANY

## Section 3 Hazards Identification

### ROUTES OF EXPOSURE

1. Inhalation  
May cause severe respiratory irritation.
2. Skin Contact  
May cause skin irritation or burns.
3. Eye Contact  
Contact may cause eye irritation or burns.
4. Ingestion  
Irritating to mouth, throat, and stomach.

### EFFECTS OF ACUTE AND CHRONIC EXPOSURE

1. Acute Exposure  
May cause respiratory tract and eye irritation.
2. Chronic Exposure  
Prolonged inhalation of manganese compounds above the ceiling exposure limit may cause lung irritation and central nervous system disorders. The symptoms simulate Parkinson's disease.
3. Carcinogenicity  
NTP: not listed      IARC Monographs: not listed      OSHA Regulated: not listed
4. Medical Conditions Generally Aggravated by Exposure  
Dust or fine powder may further irritate mucous membranes or open wounds.

## Section 4 First Aid Measures

### EMERGENCY AND FIRST AID PROCEDURES

1. Eyes  
Immediately flush eyes with large amounts of water for at least 15 minutes holding lids apart to ensure flushing of the entire surface. Seek medical attention if irritation persists.
2. Skin  
Flush contaminated areas with large amounts of water. Remove contaminated clothing. Wash clothing before reuse.
3. Inhalation  
Remove person to fresh air. If breathing is difficult, administer oxygen. Seek medical attention.
4. Ingestion  
Never give anything by mouth to an unconscious or convulsing person. If conscious, give large quantities of water. Do not induce vomiting. Seek medical attention.

## Section 5 Fire Fighting Measures

The material itself is noncombustible but may accelerate the burning of combustible material

**FLASHPOINT** None

**FLAMMABLE OR EXPLOSIVE LIMITS** Lower: Nonflammable      Upper: Nonflammable

**EXTINGUISHING MEDIA** Use extinguishing medium appropriate for surrounding materials.

**SPECIAL FIREFIGHTING PROCEDURES** None

**UNUSUAL FIRE AND EXPLOSION HAZARDS** Should not be heated or rubbed in contact with organic matter or other oxidizable substances. Keep away from heat and flammable materials. Potentially strong oxidizer.

# carus CHEMICAL COMPANY

## Section 6 Accidental Release Measures

### STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED

Clean up spills immediately by scooping CARULITE<sup>®</sup> catalyst into a metal drum. Deactivate by soaking with water. Cover loosely. Flush contaminated floors with abundant quantities of water into sewer, if permitted by federal, state, or local regulations.

## Section 7 Handling and Storage

Store in a cool, dry area in closed container. Segregate from easily oxidizable materials, peroxides, chlorates, and acids. Protect containers against physical damage.

## Section 8 Exposure Controls and Personal Protection

### VENTILATION REQUIREMENTS

Provide sufficient mechanical and/or local exhaust to maintain exposure levels below ceiling exposure limit.

### RESPIRATORY PROTECTION

In cases where high dust exposure may exist, the use of NIOSH-MSHA dust and mist respirator or an air supplied respirator is advised. Engineering or administrative controls should be implemented to control dust.

### EYE PROTECTION

Primary eye protection (safety glasses or goggles).

### GLOVES

Rubber or plastic gloves should be worn.

### OTHER PROTECTIVE EQUIPMENT

Normal work clothing is sufficient.

## Section 9 Physical and Chemical Properties

<b>BOILING POINT, 760 mm Hg</b> Not applicable	<b>VAPOR PRESSURE (mm Hg)</b> Not applicable
<b>SOLUBILITY IN WATER % BY SOLUTION</b>	Insoluble
<b>SPECIFIC GRAVITY</b> 4.7 <b>BULK DENSITY</b> 1.0 g/cm <sup>3</sup>	<b>PERCENT VOLATILE BY VOLUME</b> Not volatile
<b>MELTING POINT</b> Starts to decompose with evolution of oxygen at 454°C (850°F)	
<b>APPEARANCE AND ODOR</b> Black extruded, granulated, or powdered solid; odorless	

## Section 10 Stability and Reactivity

<b>STABILITY</b> Stable under normal conditions. Moisture may reduce catalytic activity.
<b>CONDITIONS TO AVOID</b> Contact with incompatible materials or heat (454°C/850°F)
<b>INCOMPATIBLE MATERIALS</b> Contact with peroxides and chlorates may cause violent reaction under certain conditions, such as elevated temperature or friction. May ignite organic material, especially organic solvents. May initiate polymerization of monomers. May form unstable acetylides in contact with acetylene.
<b>HAZARDOUS DECOMPOSITION PRODUCTS</b> None
<b>CONDITIONS CONTRIBUTING TO HAZARDOUS POLYMERIZATION</b> Material is not known to polymerize.

# carus CHEMICAL COMPANY

## Section 11 Toxicological Information

Most diagnosed cases of manganese toxicity in humans have been reported following exposures to airborne concentrations of manganese above the ceiling exposure limit. The usual form of chronic manganese toxicity involves the central nervous system.

Reports of adverse effects in humans from ingestion of manganese are rare.

## Section 12 Ecological Information

Inorganic manganese compounds have negligible vapor pressures but exist in air as suspended particulate matter which settle under the influence of gravity.

The transport of manganese in water is influenced by the solubility of the form present. Insoluble forms, such as manganese dioxide, are transported as sediments.

The biomagnification of manganese in the food chain does not appear to be significant.

## Section 13 Disposal considerations

Carulite<sup>®</sup> 200 is not considered a hazardous waste under 40 CFR 261. Dispose of deactivated Carulite<sup>®</sup> in a landfill approved to accept chemical waste, after verifying that it is not contaminated with hazardous substances through usage.

## Section 14 Transport Information

Proper Shipping Name:	Manganese dioxide compound
ID Number:	Not regulated by DOT
Product R.Q. (lb.)	None

## Section 15 Regulatory Information

Carulite<sup>®</sup> 200 Low Temperature Oxidization Catalyst contains manganese compounds (CAS Reg. No. N/A) and copper compounds (CAS Reg. No. N/A) as part of the mixture and is subject to the reporting requirements of Section 313 of Title III Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

Components of this product are listed on the TSCA Inventory.

Manganese dioxide and copper oxide are considered hazardous chemicals by definition of Hazard Communication Standard (29CFR 1910.1200).

## Section 16 Other Information

MSDS Status: Revised April 1999.  
Supersedes Date: Sept 1997  
Form Number: CL 170-3 Revision 2

# **carus** CHEMICAL COMPANY

The information contained herein is accurate to the best of our knowledge. However, data, safety standards and government regulations are subject to change and, therefore, holders and users should satisfy themselves that they are aware of all current data and regulations relevant to their particular use of product. CARUS CHEMICAL COMPANY DISCLAIMS ALL LIABILITY FOR RELIANCE ON THE COMPLETENESS OR ACCURACY OR THE INFORMATION INCLUDED HEREIN. CARUS CHEMICAL COMPANY MAKES NO WARRANTY, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR PARTICULAR USE OR PURPOSE OF THE PRODUCT DESCRIBED HEREIN. All conditions relating to storage, handling, and use of the product are beyond the control of Carus Chemical Company, and shall be the sole responsibility of the holder or user of the product.

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CARUS CHEMICAL COMPANY IS A DIVISION OF CARUS CORPORATION,  
315 5<sup>TH</sup> STREET, PERU, ILLINOIS 61354

Telephone: (800) 435-6856  
(815) 223-1500  
Fax: (815) 224-6697



## Praxair™ Material Safety Data Sheet

### 1. Chemical Product and Company Identification

<b>Product Name:</b> Oxygen (MSDS No. P-4638-D)	<b>Trade Name:</b> Oxygen
<b>Chemical Name:</b> Oxygen	<b>Synonyms:</b> Not applicable
<b>Formula:</b> O <sub>2</sub>	<b>Chemical Family:</b> Not applicable
<b>Telephone:</b>	<b>Company Name:</b> Praxair, Inc.
<b>Emergencies:</b> 1-800-645-4633*	39 Old Ridgebury Road
<b>CHEMTREC</b> 1-800-424-9300*	Danbury CT 06810-5113
<b>Routine:</b> 1-800-PRAXAIR	

\*Call emergency numbers 24 hours a day only for spills, leaks, fire, exposure, or accidents involving this product. For routine information contact your supplier, Praxair sales representative, or call 1-800-PRAXAIR (1-800-772-9247).

### 2. Composition / Information on Ingredients

For custom mixtures of this product request a Material Safety Data Sheet for each component. See Section 16 for important information about mixtures.

INGREDIENT NAME	CAS NUMBER	PERCENTAGE	OSHA PEL	ACGIH TLV-TWA
Oxygen	7782-44-7	>99%*	None currently established	None currently established

\*The symbol ">" means "greater than."

### 3. Hazards Identification

#### EMERGENCY OVERVIEW

**WARNING! High-pressure, oxidizing gas.  
Vigorously accelerates combustion.  
Self-contained breathing apparatus may  
be required by rescue workers.  
Odor: None**

**THRESHOLD LIMIT VALUE:** None currently established—ACGIH 1997 recommends a TLV-TWA of 0.5 mg/m<sup>3</sup> for welding fumes not otherwise classified (NOC) that may be generated during welding with this product. See section 16 for more information on welding hazards.

#### EFFECTS OF A SINGLE (ACUTE) OVEREXPOSURE:

**INHALATION**—Breathing 80% or more oxygen at atmospheric pressure for more than a few hours may cause nasal stuffiness, cough, sore throat, chest pain and breathing difficulty. Breathing oxygen at

higher pressure increases the likelihood of adverse effects within a shorter time period. Breathing pure oxygen under pressure may cause lung damage and also central nervous system effects resulting in dizziness, poor coordination, tingling sensation, visual and hearing disturbances, muscular twitching, unconsciousness and convulsions. Breathing oxygen under pressure may cause prolongation of adaptation to darkness and reduced peripheral vision.

**SKIN CONTACT**—No harm expected.

**SWALLOWING**—This product is a gas at normal temperature and pressure.

**EYE CONTACT**—No harm expected.

**EFFECTS OF REPEATED (CHRONIC) OVEREXPOSURE:** No harm expected.

**OTHER EFFECTS OF OVEREXPOSURE:** See section 11, Toxicological Information.

**MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE:** See section 11, Toxicological Information.

**SIGNIFICANT LABORATORY DATA WITH POSSIBLE RELEVANCE TO HUMAN HEALTH HAZARD EVALUATION:** None known.

**CARCINOGENICITY:** Oxygen is not listed by NTP, OSHA, or IARC.

#### 4. First Aid Measures

**INHALATION:** Remove to fresh air. If not breathing, give artificial respiration. Keep victim warm and at rest. Call a physician. Advise the physician that the victim has been exposed to a high concentration of oxygen.**SKIN CONTACT:** No emergency care anticipated.

**SWALLOWING:** This product is a gas at normal temperature and pressure.

**EYE CONTACT:** No emergency care anticipated.

**NOTES TO PHYSICIAN:** Supportive treatment should include immediate sedation, anti-convulsive therapy if needed, and rest. See section 11, Toxicological Information.

#### 5. Fire Fighting Measures

<b>FLASH POINT (test method)</b>	Not applicable	<b>AUTOIGNITION TEMPERATURE</b>	Not applicable
<b>FLAMMABLE LIMITS IN AIR, % by volume</b>	<b>LOWER</b>	Not applicable	<b>UPPER</b> Not applicable

**EXTINGUISHING MEDIA:** Vigorously accelerates combustion. Use media appropriate for surrounding fire. Water (e.g. safety shower) is the preferred extinguishing media for clothing fires.

**SPECIAL FIRE FIGHTING PROCEDURES:**

**WARNING! High-pressure, oxidizing gas.** Evacuate all personnel from danger area. Immediately deluge cylinders with water from maximum distance until cool, then move them away from fire area if without risk. Self-contained breathing apparatus may be required by rescue workers. On-site fire brigades must comply with OSHA 29 CFR 1910.156.

**UNUSUAL FIRE AND EXPLOSION HAZARDS:** Oxidizing agent; vigorously accelerates combustion. Contact with flammable materials may cause fire or explosion. Heat of fire can build pressure in cylinder and cause it to rupture. Oxygen cylinders are equipped with a pressure relief device. (Exceptions may exist where authorized by DOT.) No part of a cylinder should be subjected to a temperature higher than

125F (52C). Smoking, flames, and electric sparks in the presence of enriched oxygen atmospheres are potential explosion hazards.

**HAZARDOUS COMBUSTION PRODUCTS:** None known.

## 6. Accidental Release Measures

### **STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:**

**WARNING! High-pressure, oxidizing gas.** Shut off flow if without risk. Ventilate area or move cylinder to well-ventilated area. Remove all flammable materials from vicinity. Oxygen must never be permitted to strike an oily surface, greasy clothes, or other combustible material.

**WASTE DISPOSAL METHOD:** Prevent waste from contaminating the surrounding environment. Keep personnel away. Discard any product, residue, disposable container or liner in an environmentally acceptable manner, in full compliance with federal, state, and local regulations. If necessary, call your local supplier for assistance.

## 7. Handling and Storage

**PRECAUTIONS TO BE TAKEN IN STORAGE:** Store and use with adequate ventilation, away from oil, grease, and other hydrocarbons. Separate oxygen cylinders from flammables by at least 20 feet or use a barricade of noncombustible material. This barricade should be at least 5 feet high and have a fire resistance rating of at least ½ hour. Firmly secure cylinders upright to keep them from falling or being knocked over. Screw valve protection cap firmly in place by hand. Store only where temperature will not exceed 125°F (52°C). Store full and empty cylinders separately. Use a first-in, first-out inventory system to prevent storing full cylinders for long periods.

**PRECAUTIONS TO BE TAKEN IN HANDLING:** Protect cylinders from damage. Use a suitable hand truck to move cylinders; do not drag, roll, slide, or drop. Never attempt to lift a cylinder by its cap; the cap is intended solely to protect the valve. Never insert an object (e.g., wrench, screwdriver, pry bar) into cap openings; doing so may damage the valve and cause a leak. Use an adjustable strap wrench to remove over-tight or rusted caps. Open valve slowly. If valve is hard to open, discontinue use and contact your supplier. Never apply flame or localized heat directly to any part of the cylinder. High temperatures may damage the cylinder and could cause the pressure relief device to fail prematurely, venting the cylinder contents. Never strike an arc on a compressed gas cylinder or make a cylinder part of an electrical circuit. For other precautions in using oxygen, see section 16.

**Precautions when using oxygen in welding and cutting:** Read and understand the manufacturer's instructions and the precautionary labels on the products. See American National Standards Institute (ANSI) Z49.1, *Safety in Welding and Cutting*, published by the American Welding Society, PO Box 351040, Miami, Florida 33135 and National Fire Protection Association (NFPA) 51, *Oxygen Fuel Gas Welding and Cutting*.

## 8. Exposure Controls/Personal Protection

### **VENTILATION/ENGINEERING CONTROLS:**

**LOCAL EXHAUST**–Use a local exhaust system, if necessary, to prevent increased oxygen concentration and, in welding, to keep hazardous fumes and gases below applicable TLVs in the worker's breathing zone.

**MECHANICAL (general)**—General exhaust ventilation may be acceptable if it can maintain a supply of air that is not too rich in oxygen and, during welding, can keep hazardous fumes and gases below the applicable TLVs in the worker's breathing zone.

**SPECIAL**—None

**OTHER**—None

**RESPIRATORY PROTECTION:** None required under normal use. However, air-supplied respirators are required while working in confined spaces with this product. For welding, use air-purifying or air-supplied respirators, as appropriate, where local or general exhaust ventilation is inadequate. Adequate ventilation must keep worker exposure below applicable TLVs for fumes, gases and other by-products of welding with oxygen. See sections 3, 10, and 16 for details. The respiratory protection use must conform with OSHA rules as specified in 29 CFR 1910.134.

**SKIN PROTECTION:** Wear work gloves when handling cylinders; welding gloves for welding. Gloves must be free of oil and grease.

**EYE PROTECTION:** Wear safety glasses when handling cylinders. For welding, wear goggles with filter lens selected as per ANSI Z49.1. Provide protective screens and goggles, if necessary, to protect others. Select as per OSHA 29 CFR 1910.33

**OTHER PROTECTIVE EQUIPMENT:** Metatarsal shoes for cylinder handling. Select in accordance with OSHA 29 CFR 1910.132 and 1910.133. As needed for welding, wear hand, head, and body protection to help prevent injury from radiation and sparks. (See ANSI Z49.1.) At a minimum this includes welder's gloves and protective goggles, and may include arm protectors, aprons, hats, shoulder protection, as well as substantial clothing. Regardless of protective equipment, never touch live electrical parts.

### 9. Physical and Chemical Properties

<b>MOLECULAR WEIGHT:</b> 31.9988	<b>EXPANSION RATIO:</b> Not applicable
<b>SPECIFIC GRAVITY (air=1):</b> At 70°F (21.1°C) and 1 atm: 1.105	<b>SOLUBILITY IN WATER:</b> vol/vol at 32°F (0°C): 0.0491
<b>GAS DENSITY:</b> At 70°F (21.1°C) and 1 atm: 0.083279 lbs/ft <sup>3</sup> (1.326 kg/m <sup>3</sup> )	<b>VAPOR PRESSURE:</b> AT 68°F (20°C): Not applicable
<b>PERCENT VOLATILES BY VOLUME:</b> 100	<b>EVAPORATION RATE (Butyl Acetate=1):</b> Gas, not applicable
<b>BOILING POINT (1 atm):</b> -297.33°F (182.96°C)	<b>pH:</b> Not applicable
<b>FREEZING POINT (1 atm):</b> -361.8°F (-218.78°C )	
<b>APPEARANCE, ODOR, AND STATE:</b> Colorless, odorless, tasteless gas at normal temperature and pressure.	

### 10. Stability and Reactivity

<b>STABILITY:</b>	Unstable	Stable	X
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**INCOMPATIBILITY (materials to avoid):** Combustible materials, asphalt, flammable materials, especially oils and greases. Oxygen reacts with many materials. See NFPA 491M, *Manual of Hazardous Chemical Reactions* for details.

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**HAZARDOUS DECOMPOSITION PRODUCTS:** None.

<b>HAZARDOUS POLYMERIZATION:</b>	<b>May Occur</b>		<b>Will Not Occur</b>	<b>X</b>
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**CONDITIONS TO AVOID:** None currently known.

### 11. Toxicological Information

At atmospheric concentration and pressure, oxygen poses no toxicity hazards. At high concentrations, newborn premature infants may suffer delayed retinal damage (retrolental fibroplasia) that can progress to retinal detachment and blindness. Retinal damage may also occur in adults exposed to 100% oxygen for extended periods (24 to 48 hours) or at greater than atmospheric pressure, particularly in individuals whose retinal circulation has been previously compromised. All individuals exposed for long periods to oxygen at high pressure and all who exhibit overt oxygen toxicity should have ophthalmologic examinations.

At two or more atmospheres, toxicity to the Central Nervous System (CNS) occurs. Symptoms include nausea, vomiting, dizziness or vertigo, muscle twitching, vision changes, and loss of consciousness and generalized seizures. At three atmospheres, CNS toxicity occurs in less than two hours; at six atmospheres, in only a few minutes.

Patients with chronic obstructive pulmonary disease retain carbon dioxide abnormally. If oxygen is administered, raising their blood oxygen concentration, their breathing becomes depressed and retained carbon dioxide rises to a dangerous level.

Animal studies suggest that the administration of certain drugs, including phenothiazine drugs and chloroquine, increases the susceptibility to toxicity from oxygen at high concentrations or pressures. Animal studies also indicate that vitamin E deficiency may increase susceptibility to oxygen toxicity.

Airway obstruction during high oxygen tension may cause alveolar collapse following absorption of the oxygen. Similarly, occlusion of the eustachian tubes may cause retraction of the eardrum and obstruction of the paranasal sinuses may produce vacuum-type headache.

### 12. Ecological Information

No adverse ecological effects expected. Oxygen does not contain any Class I or Class II ozone-depleting chemicals. Oxygen is not listed as a marine pollutant by DOT.

### 13. Disposal Considerations

**WASTE DISPOSAL METHOD:** Do not attempt to dispose of residual or unused quantities. Return cylinder to supplier. For emergency disposal, secure cylinder in a well-ventilated area or outdoors, then slowly discharge gas to the atmosphere.

<b>14. Transport Information</b>
----------------------------------

<b>DOT/IMO SHIPPING NAME:</b> Oxygen, compressed	<b>HAZARD CLASS:</b> 2.2
<b>IDENTIFICATION NUMBER:</b> UN 1072	<b>PRODUCT RQ:</b> Not applicable
<b>SHIPPING LABEL(s):</b> OXYGEN. An oxygen label may be used for domestic shipment in the United States and Canada in place of the NONFLAMMABLE GAS and OXIDIZER labels (49 CFR Part 172).	
<b>PLACARD (When required):</b> Nonflammable gas or oxygen	
<b>SPECIAL SHIPPING INFORMATION:</b> Cylinders should be transported in a secure position, in a well-ventilated vehicle. Cylinders transported in an enclosed, nonventilated compartment of a vehicle can present serious safety hazards. Shipment of compressed gas cylinders that have been filled without the owner's consent is a violation of federal law [49 CFR 173.301(b)].	

<b>15. Regulatory Information</b>
-----------------------------------

The following selected regulatory requirements may apply to this product. Not all such requirements are identified. Users of this product are solely responsible for compliance with all applicable federal, state, and local regulations.

**U.S. FEDERAL REGULATIONS:****EPA (Environmental Protection Agency)**

**CERCLA:** Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (40 CFR Parts 117 and 302):

**Reportable Quantity (RQ):** None

**SARA:** Superfund Amendment and Reauthorization Act:

- **SECTIONS 302/304:** Require emergency planning based on Threshold Planning Quantity (TPQ) and release reporting based on Reportable Quantities (RQ) of extremely hazardous substances (40 CFR Part 355):

**Threshold Planning Quantity (TPQ):** None.

**Extremely Hazardous Substances (40 CFR 355):** None.

- **SECTIONS 311/312:** Require submission of Material Safety Data Sheets (MSDSs) and chemical inventory reporting with identification of EPA hazard categories. The hazard categories for this products are as follows:

IMMEDIATE: No

PRESSURE: Yes

DELAYED: No

REACTIVITY: No

FIRE: Yes

- **SECTION 313:** Requires submission of annual reports of release of toxic chemicals that appear in 40 CFR Part 372.

Oxygen does not require reporting under Section 313.

**40 CFR 68:** Risk Management Program for Chemical Accidental Release Prevention: Requires development and implementation of risk management programs at facilities that manufacture,

use, store, or otherwise handle regulated substances in quantities that exceed specified thresholds.

Oxygen is not listed as a regulated substance.

**TSCA:** Toxic Substances Control Act: Oxygen is listed on the TSCA inventory.

**OSHA (OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION):**

**29 CFR 1910.119:** Process Safety Management of Highly Hazardous Chemicals: Requires facilities to develop a process safety management program based on Threshold Quantities (TQ) of highly hazardous chemicals.

Oxygen is not listed in Appendix A as a highly hazardous chemical.

**STATE REGULATIONS:**

**CALIFORNIA:** This product is not listed by California under the Safe Drinking Water Toxic Enforcement Act of 1986 (Proposition 65).

**PENNSYLVANIA:** This product is subject to the Pennsylvania Worker and Community Right-To-Know Act (35 P.S. Sections 7301-7320).

<b>16. Other Information</b>
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Be sure to read and understand all labels and instructions supplied with all containers of this product.

**WARNING:** Medical grades of Oxygen are subject to strict federal regulation, and are for use only under the control of a licensed physician or clinician, familiar with the product and its hazards.

**ADDITIONAL SAFETY AND HEALTH HAZARDS:** *High-pressure, oxydizing gas.* Clean all gauges, valves, regulators, piping, and equipment to be used in oxygen service in accordance with CGA pamphlet G-4.1. Keep cylinders and their valves free of oil and grease. Use piping and equipment adequately designed to withstand pressures to be encountered. Close cylinder valve after each use; keep closed even when empty. *Never use oxygen as a substitute for compressed air.* Never use an oxygen jet for cleaning purposes of any sort, especially for clothing. Oxygen increases the likelihood of an engulfing fire. *Prevent reverse flow.* Reverse flow into cylinder may cause rupture. Use a check valve or other protective device in any line or piping from the cylinder. *Never work on a pressurized system.* If there is a leak, close the cylinder valve. Blow the system down in a safe and environmentally sound manner in compliance with all federal, state and local laws; then repair the leak. *Never ground a compressed gas cylinder or allow it to become part of an electrical circuit.*

*Personnel who have been exposed to high concentrations of oxygen* should stay in a well-ventilated or open area before going into a confined space or near an ignition source.

**SPECIAL PRECAUTIONS:** *Use in welding and cutting.* Read and understand the manufacturer's instructions and the precautionary label on the product. See American Standard Z49.1, Safety in Welding and Cutting, published by the American Welding Society, PO Box 351040, Miami, FL 33135, and OSHA Publication 2206 (29CFR 1910), US Government Printing Office, Washington, DC 20402, for more information.

*Arcs and sparks can ignite combustible materials.* Prevent fires. Refer to NFPA 51B, "Cutting and Welding Processes." *Do not strike an arc on the cylinder.* The defect produced by an arc burn could lead to cylinder rupture.

**MIXTURES:** When you mix two or more gases or liquefied gases, you can create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an industrial hygienist, or other trained person when you evaluate the end product. Remember, gases and liquids have properties that can cause serious injury or death.

**HAZARD RATING SYSTEMS:**

**NFPA RATINGS:**

HEALTH = 0  
 FLAMMABILITY = 0  
 REACTIVITY = 0  
 SPECIAL = OX (Oxidizer)

**HMIS RATINGS:**

HEALTH = 0  
 FLAMMABILITY = 0  
 REACTIVITY = 0

**STANDARD VALVE CONNECTIONS FOR U.S. AND CANADA:**

<b>THREADED:</b>	0-3000 psig	CGA-540
	3001-4000 psig	CGA-577
	4001-5500 psig	CGA-701
<b>PIN-INDEXED YOKE:</b>	0-3000 psig	CGA-870 (Medical Use)
<b>ULTRA-HIGH-INTEGRITY CONNECTION:</b>	0-3000 psig	CGA-714

Use the proper CGA connections. **DO NOT USE ADAPTERS.**

Ask your supplier about free Praxair safety literature as referenced on the label for this product; you may also obtain copies by calling 1-800-PRAXAIR. Further information about oxygen can be found in the following pamphlets published by the Compressed Gas Association, Inc. (CGA), 1725 Jefferson Davis Highway, Arlington, VA 22202-4102, Telephone (703) 412-0900.

- AV-1 *Safe Handling and Storage of Compressed Gases*
- AV-8 *Characteristics and Safe Handling of Cryogenic Liquid and Gaseous Oxygen*
- G-4.3 *Commodity Specification for Gaseous and Liquid Oxygen*
- G-4.1 *Cleaning Equipment for Oxygen Service*
- G-4.3 *Commodity Specification for Oxygen*
- P-1 *Safe Handling of Compressed Gases in Containers*
- P-2 *Characteristics and Safe Handling of Medical Gases*
- P-14 *Accident Prevention in Oxygen-Rich, Oxygen-Deficient Atmospheres*
- SB-2 *Oxygen-Deficient Atmospheres*
- SB-8 *Use of Oxy-Fuel Gas Welding and Cutting Apparatus*
- V-1 *Compressed Gas Cylinder Valve Inlet and Outlet Connections*
- *Handbook of Compressed Gases, Third Edition*



Praxair asks users of this product to study this Material Safety Data Sheet (MSDS) and become aware of product hazards and safety information. To promote safe use of this product, a user should (1) notify employees, agents and contractors of the information on this MSDS and of any other known product hazards and safety information, (2) furnish this information to each purchaser of the product, and (3) ask each purchaser to notify its employees and customers of the product hazards and safety information.

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The opinions expressed herein are those of qualified experts within Praxair, Inc. We believe that the information contained herein is current as of the date of this Material Safety Data Sheet. Since the use of this information and the conditions of use of the product are not within the control of Praxair, Inc., it is the user's obligation to determine the conditions of safe use of the product.

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Praxair MSDSs are furnished on sale or delivery by Praxair or the independent distributors and suppliers who package and sell our products. To obtain current Praxair MSDSs for these products, contact your Praxair sales representative or local distributor or supplier. If you have questions regarding Praxair MSDSs, would like the form number and date of the latest MSDS, or would like the names of the Praxair suppliers in your area, phone or write the Praxair Call Center (**Phone:** 1-800-PRAXAIR; **Address:** Praxair Call Center, Praxair, Inc., PO Box 44, Tonawanda, NY 14150-7891).

Praxair is a trademark of Praxair Technology, Inc.

Praxair, Inc.  
39 Old Ridgebury Road  
Danbury CT 06810-5113





# Material Safety Data Sheet

## 1. CHEMICAL PRODUCT & COMPANY IDENTIFICATION

Page: 1

24-Hour Emergency Phone Number: 517-636-4400

Product: DOWFROST\* HEAT TRANSFER FLUID

Product Code: 23545

Effective Date: 01/08/99      Date Printed: 01/16/99      MSD: 000130

The Dow Chemical Company, Midland, MI 48674

Customer Information Center: 800-258-2436

## 2. COMPOSITION/INFORMATION ON INGREDIENTS

Propylene glycol	CAS# 000057-55-6	95%
Dipotassium phosphate	CAS# 007758-11-4	<5%
Deionized water	CAS# 007732-18-5	<5%

## 3. HAZARDS IDENTIFICATION

### EMERGENCY OVERVIEW

\*\*\*\*\*  
 \* Colorless, odorless liquid. Toxic fumes released in fire \*  
 \* situations. \*  
 \* \*  
 \*\*\*\*\*

### POTENTIAL HEALTH EFFECTS (See Section 11 for toxicological data.)

EYE: May cause slight transient eye irritation. Corneal injury is unlikely.

SKIN: Essentially nonirritating to skin on prolonged contact. A single prolonged skin exposure is not likely to result in the material being absorbed through skin in harmful amounts. Repeated exposures may cause slight flaking, tenderness and softening of skin.

INGESTION: Single dose oral toxicity is low. No hazards anticipated from swallowing small amounts incidental to normal handling operations.

(Continued on page 2 , over)

(R) Indicates a Trademark of The Dow Chemical Company



Product: DOWFROST\* HEAT TRANSFER FLUID  
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INHALATION: A single prolonged (hours) inhalation exposure is not likely to cause adverse effects. Mists are not likely to be hazardous.

SYSTEMIC (OTHER TARGET ORGAN) EFFECTS: Repeated excessive ingestion may cause central nervous system effects.

CANCER INFORMATION: Did not cause cancer in long-term animal studies.

TERATOLOGY (BIRTH DEFECTS): Birth defects are unlikely. Exposures having no adverse effects on the mother should have no effect on the fetus.

REPRODUCTIVE EFFECTS: In animal studies, has been shown not to interfere with reproduction.

#### 4. FIRST AID

EYE: Flush eyes with plenty of water.

SKIN: Wash off in flowing water or shower.

INGESTION: If swallowed, seek medical attention. Do not induce vomiting unless directed to do so by medical personnel.

INHALATION: Remove to fresh air if effects occur. Consult a physician.

NOTE TO PHYSICIAN: No specific antidote. Supportive care. Treatment based on judgment of the physician in response to reactions of the patient.

#### 5. FIRE FIGHTING MEASURES

FLASH POINT: 215F, 102C  
METHOD USED: TOC (Tag Open Cup)

FLAMMABLE LIMITS  
LFL: 2.6% @ 100C  
UFL: 12.5% @ 130C

HAZARDOUS COMBUSTION PRODUCTS: During a fire, smoke may contain the original material in addition to unidentified toxic and/or irritating compounds. Hazardous combustion products may include and are not limited to carbon monoxide, carbon dioxide.

(Continued on page 3)

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OTHER FLAMMABILITY INFORMATION: Violent steam generation or eruption may occur upon application of direct water stream. Flammable concentration of vapor can accumulate at temperatures above 215.0 deg. F. Liquid mist of this product can burn. Spills of these organic liquids on hot fibrous insulations may lead to lowering of the autoignition temperatures possibly resulting in spontaneous combustion.

EXTINGUISHING MEDIA: Water fog or fine spray, carbon dioxide, dry chemical, foam. Alcohol resistant foams (ATC type) are preferred if available. General purpose synthetic foams (including AFFF) or protein foams may function, but much less effectively. Do not use direct water stream. Will spread fire.

MEDIA TO BE AVOIDED: Do not use direct water stream.

FIRE FIGHTING INSTRUCTIONS: Keep people away. Isolate fire area and deny unnecessary entry. Burning liquids may be moved by flushing with water to protect personnel and minimize property damage. Burning liquids may be extinguished by dilution with water. Do not use direct water stream. May spread fire.

PROTECTIVE EQUIPMENT FOR FIRE FIGHTERS: Wear positive-pressure self-contained breathing apparatus (SCBA) and protective fire-fighting clothing (includes fire-fighting helmet, coat, pants, boots, and gloves). If protective equipment is not available or not used, fight fire from a protected location or safe distance.

## 6. ACCIDENTAL RELEASE MEASURES (See Section 15 for Regulatory Information)

PROTECT PEOPLE: Clear non-emergency personnel from area.

PROTECT THE ENVIRONMENT: Contain liquid to prevent contamination of soil, surface water or ground water.

CLEANUP: Clean up with absorbent material. Sweep up.

## 7. HANDLING AND STORAGE

HANDLING: Product on surfaces can cause slippery conditions.

(Continued on page 4 , over)

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Product: DOWFROST\* HEAT TRANSFER FLUID  
Product Code: 23545

Effective Date: 01/08/99 Date Printed: 01/16/99 MSD: 000130

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STORAGE: Store below 121 C, 250 F.

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS: Good general ventilation should be sufficient for most conditions.

### PERSONAL PROTECTIVE EQUIPMENT

EYE/FACE PROTECTION: Use safety glasses.

SKIN PROTECTION: For brief contact, no precautions other than clean body-covering clothing should be needed. Use impervious gloves when prolonged or frequently repeated contact could occur.

RESPIRATORY PROTECTION: No respiratory protection should be needed.

EXPOSURE GUIDELINE(S): Propylene glycol: AIHA WEEL is 50 ppm total, 10 mg/m<sup>3</sup> aerosol only.

## 9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE: Colorless.  
ODOR: Odorless liquid.  
VAPOR PRESSURE: 0.22 mmHg @ 20C, 68F  
VAPOR DENSITY: 2.62  
BOILING POINT: 370F, 188C  
SOLUBILITY IN WATER: Complete  
SPECIFIC GRAVITY: 1.050 @ 60/60F, 16C

## 10. STABILITY AND REACTIVITY

CHEMICAL STABILITY: Thermally stable at typical use temperatures.

CONDITIONS TO AVOID: Avoid temperatures above 121C/250F. Product can decompose at elevated temperatures.

INCOMPATIBILITY WITH OTHER MATERIALS: Avoid contact with oxidizing materials.

HAZARDOUS DECOMPOSITION PRODUCTS: Hazardous decomposition products depend upon temperature, air supply and the presence of other materials.

(Continued on page 5)

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Effective Date: 01/08/99 Date Printed: 01/16/99 MSD: 000130

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HAZARDOUS POLYMERIZATION: Will not occur.

**11. TOXICOLOGICAL INFORMATION (See Section 3 for Potential Health Effects. For detailed toxicological data, write or call the address or non-emergency number shown in Section 1)**

SKIN: The LD50 for skin absorption in rabbits is greater than 10,000 mg/kg.

INGESTION: The oral LD50 for female rats is about 20.3 g/kg.

MUTAGENICITY (EFFECTS ON GENETIC MATERIAL): Results of in vitro (test tube) mutagenicity tests have been negative. Results of mutagenicity tests in animals have been negative.

**12. ECOLOGICAL INFORMATION (For detailed Ecological data, write or call the address or non-emergency number shown in Section 1)**

**ENVIRONMENTAL FATE**

MOVEMENT AND PARTITIONING: Based largely or completely on data for major component(s). Bioconcentration potential is low (BCF less than 100 or Log Pow less than 3).

DEGRADATION AND PERSISTENCE: Based largely or completely on data for major component(s). Biodegradation under aerobic static laboratory conditions is high (BOD20 or BOD28/ThOD greater than 40%).

ECOTOXICITY: Based largely or completely on data for major component(s). Material is practically non-toxic to aquatic organisms on an acute basis (LC50 greater than 100 mg/L in most sensitive species).

**13. DISPOSAL CONSIDERATIONS (See Section 15 for Regulatory Information)**

DISPOSAL: DO NOT DUMP INTO ANY SEWERS, ON THE GROUND OR INTO ANY BODY OF WATER. All disposal methods must be in compliance with all Federal, State/Provincial and local laws and regulations. Regulations may vary in different locations. Waste characterizations and compliance with applicable laws are the responsibility solely of the waste generator. THE DOW CHEMICAL COMPANY HAS NO CONTROL OVER THE MANAGEMENT PRACTICES OR MANUFACTURING PROCESSES OF PARTIES HANDLING OR USING THIS MATERIAL. THE INFORMATION PRESENTED HERE PERTAINS ONLY TO THE PRODUCT AS SHIPPED IN ITS INTENDED CONDITION AS DESCRIBED IN MSDS SECTION 2 (Composition/Information On Ingredients).

(Continued on page 6 , over)

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Product: DOWFROST\* HEAT TRANSFER FLUID  
Product Code: 23545

Effective Date: 01/08/99 Date Printed: 01/16/99 MSD: 000130

FOR UNUSED & UNCONTAMINATED PRODUCT, the preferred options include sending to a licensed, permitted: recycler, reclaimer, or waste water treatment system.

As a service to its customers, Dow can provide names of information resources to help identify waste management companies and other facilities which recycle, reprocess or manage chemicals or plastics, and that manage used drums. Telephone Dow's Customer Information Center at 800-258-2436 or 517-832-1556 for further details.

14. TRANSPORT INFORMATION

CANADIAN TDG INFORMATION:  
For TDG regulatory information, if required, consult transportation regulations, product shipping papers, or your Dow representative.

15. REGULATORY INFORMATION (Not meant to be all-inclusive--selected regulations represented)

NOTICE: The information herein is presented in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied is given. Regulatory requirements are subject to change and may differ from one location to another; it is the buyer's responsibility to ensure that its activities comply with federal, state or provincial, and local laws. The following specific information is made for the purpose of complying with numerous federal, state or provincial, and local laws and regulations. See other sections for health and safety information.

U.S. REGULATIONS

SARA 313 INFORMATION: To the best of our knowledge, this product contains no chemical subject to SARA Title III Section 313 supplier notification requirements.

SARA HAZARD CATEGORY: This product has been reviewed according to the EPA "Hazard Categories" promulgated under Sections 311 and 312 of the Superfund Amendment and Reauthorization Act of 1986 (SARA Title III) and is considered, under applicable definitions, to meet the following categories:

(Continued on page 7)  
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Product Code: 23545

Effective Date: 01/08/99

Date Printed: 01/16/99

MSD: 000130

**REGULATORY INFORMATION (CONTINUED)**

Not to have met any hazard category

**TOXIC SUBSTANCES CONTROL ACT (TSCA):**

All ingredients are on the TSCA inventory or are not required to be listed on the TSCA inventory.

STATE RIGHT-TO-KNOW: The following product components are cited on certain state lists as mentioned. Non-listed components may be shown in the composition section of the MSDS.

CHEMICAL NAME	CAS NUMBER	LIST
1,2-PROPANEDIOL	000057-55-6	PA1

PA1=Pennsylvania Hazardous Substance (present at greater than or equal to 1.0%).

**CANADIAN REGULATIONS**

WHMIS INFORMATION: The Canadian Workplace Hazardous Materials Information System (WHMIS) Classification for this product is:

This product is not a "Controlled Product" under WHMIS.

**16. OTHER INFORMATION**

MSDS STATUS: Revised Section 13.

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The Information Herein Is Given In Good Faith, But No Warranty,  
Express Or Implied, Is Made. Consult The Dow Chemical Company  
For Further Information.

## **Appendix B**

### **Operator Interface and Equipment Configuration**

## APPENDIX B

### APT PulseOx 1000™ In-Situ Chemical Oxidation System SN-1029

#### Operator Interface Description and Configuration Procedure

After power-up, the Operator Interface Terminal (OIT) located on the PLC panel will display the Main Screen. This screen has a combination of menu items and equipment status.

##### On the Main Screen:

F1 will start the system – When in the Shutdown or Off mode, pressing this button will start the system.

F2 will stop the system – When in the Starting or Run mode, pressing this button will stop the system.

F3 is not used

F4 will bring up the Configuration Screen – This screen is password protected and is where selection of equipment and injection recipes is entered. See “Configuration Procedure” below for further details.

F5 will bring up the Fault Screen – In the event of a shutdown condition, pressing this button will eliminate the shutdown banner from the screen. When back to the main screen, pressing F5 again will give the Fault Screen, which will display the offending fault. While on the Fault Screen, pressing the F5 button will reset the fault condition. After reset, press F3 to return to the Main Screen.

F6 will bring up the Run Time Logging Screen – This screen is password protected. The cumulative run time for major components and valves (in hours) can be viewed from this screen.

F7 will bring up the Fault Timer Screen – This screen is used to set first stage (A) and second stage (B) start-up timers, shutdown (C) timer, fault delay (Z) timer, as well as drain valve times and intervals.

F8 will bring up the Oxygen Power Screen – This screen is used to set the power signal to the ozone generator.

Also on the main screen there are several indicators; Operating Mode (Off, Starting, Run, or Shutdown), Current Step (1 through 10), and injection valve state (where 0=off and 1=on).

### General Use of Keypad:

There is usually a few second delay from the time a button is pressed and the plc recognizes the entry, or a value is entered until the display will reflect the change.

When entering a value, place the cursor in front of the value box by using left and right arrows, enter the value, then press enter.

### Configuration Procedure:

This screen is used to determine what equipment will be utilized and what time/valve combinations are to be used.

Equipment Selection – The first configuration screen is the Pump Control Setup screen. On this screen several of the function (F) buttons act as toggle switches:

F3 will toggle P-801 “on” or “off”

F5 will toggle X-401A “on” or “off”

F6 will toggle X-401B “on” or “off”

F7 is not used on this screen

F4 and F8 can be used on all the configuration screens to move to the last and next configuration screen

If P-801 is “on” then also enter a value for “% Signal” and “Ramp Time”.

The % signal is the output signal per H<sub>2</sub>O<sub>2</sub> injection valve. If % signal is set at 25%, for every valve that is actuated in a step, the pump flow will increment by 25% (Example, if 3 valves are on the pump will operate at 75% of full flow). NOTE – review the recipes and be sure that the pump will not operate over 100% in any step.

Ramp time is usually set at 5 seconds.

On the Pump Control Setup screen, there is no way to get directly back to the Main screen. To get back to the Main screen, press F8 to go the next screen, then F3 to get back to the main screen.

Recipe Selection - From the Pump Control Setup screen, press F8 to proceed to the Step Duration screen. On this screen the length of each step of the recipe is defined, as well as the last step of the recipe.

Use the left/right arrows to place the cursor in front of the “Last Step” box. This value will define where the recipe begins to repeat itself. For instance, if the last step is designated as 7, the program will sequence through steps 1 through 7, and at the end of step 7 the program will revert to step 1 and continue.

Next move the cursor to step 1 and enter the duration (in minutes) of that step, up to 999 minutes, then press enter. Repeat for all active steps. It is not necessary to enter any values for steps higher than the “Last Step”, as these values will be ignored.

When all step durations are defined, the valve selections for each step must be entered. Press F8 from the Step Duration screen to get to the Air Valve Control screen. On this screen the PLC code for the injection air valve selections are made.

The PLC code for the valves are as follows:

Valve number	PLC Code
1	1
2	2
3	4
4	8
5	16
6	32
7	64
8	128
9	256
10	512

To designate a single valve to be actuated in a step, simply enter the “PLC Code” in the table above for that step (for example, to designate valve 5, enter the PLC Code of 16). To designate multiple valves, enter the sum of the PLC Codes of the valves to be entered (for example, to open valves 2, 5, and 9, enter the PLC Code of  $2+16+256=274$ )

Enter PLC Codes for all steps up to and including the “Last Step”. It is not necessary to enter PLC Codes for steps above the “Last Step”, as they will be ignored.

When all Air Valve PLC Codes have been entered, press F8 to get to the Ozone Valve Controls screen, and repeat the procedure for recipe entry. Press F8 again to get to the H2O2 Valve Controls screen.

When all recipe data has been entered, press F3 to get to the Main Screen.

**Appendix C**  
**Startup Procedure**

## APPENDIX C

### APT PulseOx 1000™ In-Situ Chemical Oxidation System SN-1029 Start-up Procedure

Refer to dwg J-1029-P-401 sheets 1 and 2

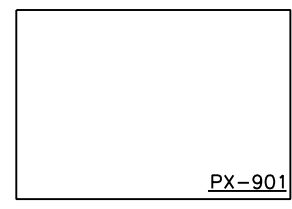
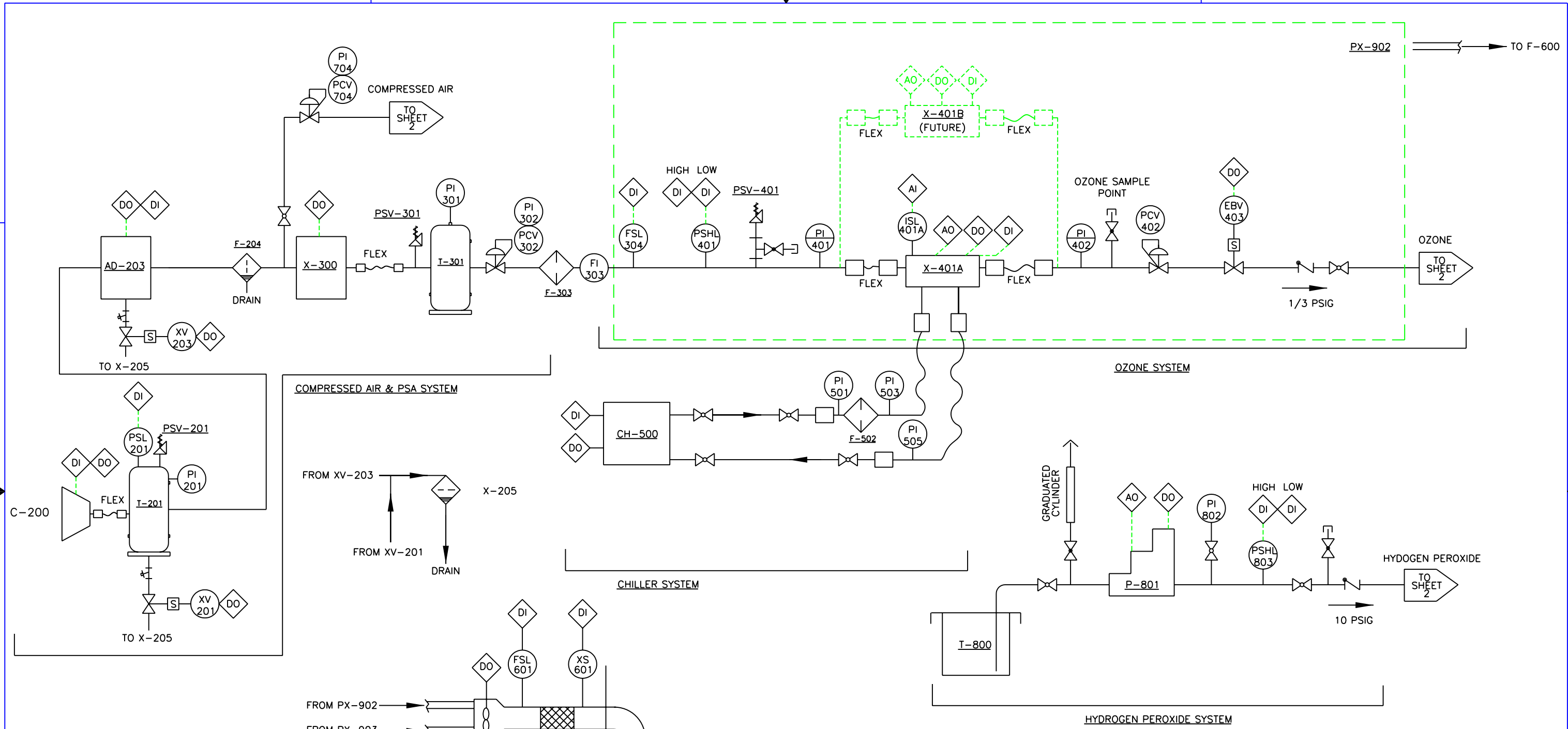
- 1) Power up the APT system – Note that PLC may take several moments to initialize.
- 2) Ensure proper connections for fluid transfer lines at bulkhead.
- 3) Check supply of H<sub>2</sub>O<sub>2</sub> in T-800
- 4) Verify that manual switches are as follows
  - a. Chiller (CH-500) “on”
  - b. Compressor (C-200) “on”
  - c. Air Drier (AD-203) “on”
  - d. PSA (X-300) “on” and “auto”
  - e. Ozone Generator (X-401a) breakers “on”, local/remote “remote”, and on/off/rst to “off/rst”
- 5) Turn the inlet and discharge fan switches, located on the plc panel front “on”.
- 6) Configure the system to as needed via the Operator Interface Terminal (OIT) on the PLC panel front – see “APT In-Situ Chemical Oxidation System Process Configuration Procedure”
- 7) Via the OIT, press F1 to start the system. The system will go through a two-stage start-up procedure as follows:
  - a. First Stage - The oxygen generation system (C-200, AD-203 and X-300) will start up immediately
  - b. The Chiller (CH-500) will start up immediately
  - c. If selected, the hydrogen peroxide pump (P-801) will start up immediately
  - d. The ozone destruct fan (F-600) will start up immediately. Positive feedback from the destruct system flow switch (FSL- 601) is required to continue to the second stage start-up
  - e. Step 1 injection valves will open
  - f. If oxygen pressure is in excess of 20 psig after 3 minutes of first-stage start-up, the system will enter the second stage of start-up. If oxygen pressure is less than 20 psig, the first stage start-up will require 15 minutes.
  - g. Second Stage – After successful completion of stage 1, the ozone generator (X-401a) will be enabled and ramp up to the power set point
  - h. The second stage start up will last five minutes. At the end of the second stage, the system will go into the Run mode.
- 8) In the run mode, the system will monitor all critical parameters while simultaneously performing the step operations / injections. The system will run indefinitely, repeating injection steps until either the operator stops the system or there is a shutdown caused by an interlock.

- 9) To stop the system, go to the main screen of the OIT and press F2. The oxygen/ozone generation system, injection air system, and the hydrogen peroxide system will stop immediately. The chiller will operate for another 5 minutes, in order to remove all heat from the ozone generator.
- 10) EMERGENCY STOP – In the event of an emergency condition, press the red “Emergency Stop” button on the lower left corner of the PLC panel. All equipment, including the chiller, will stop immediately.



## **Appendix D**

### **Drawings**



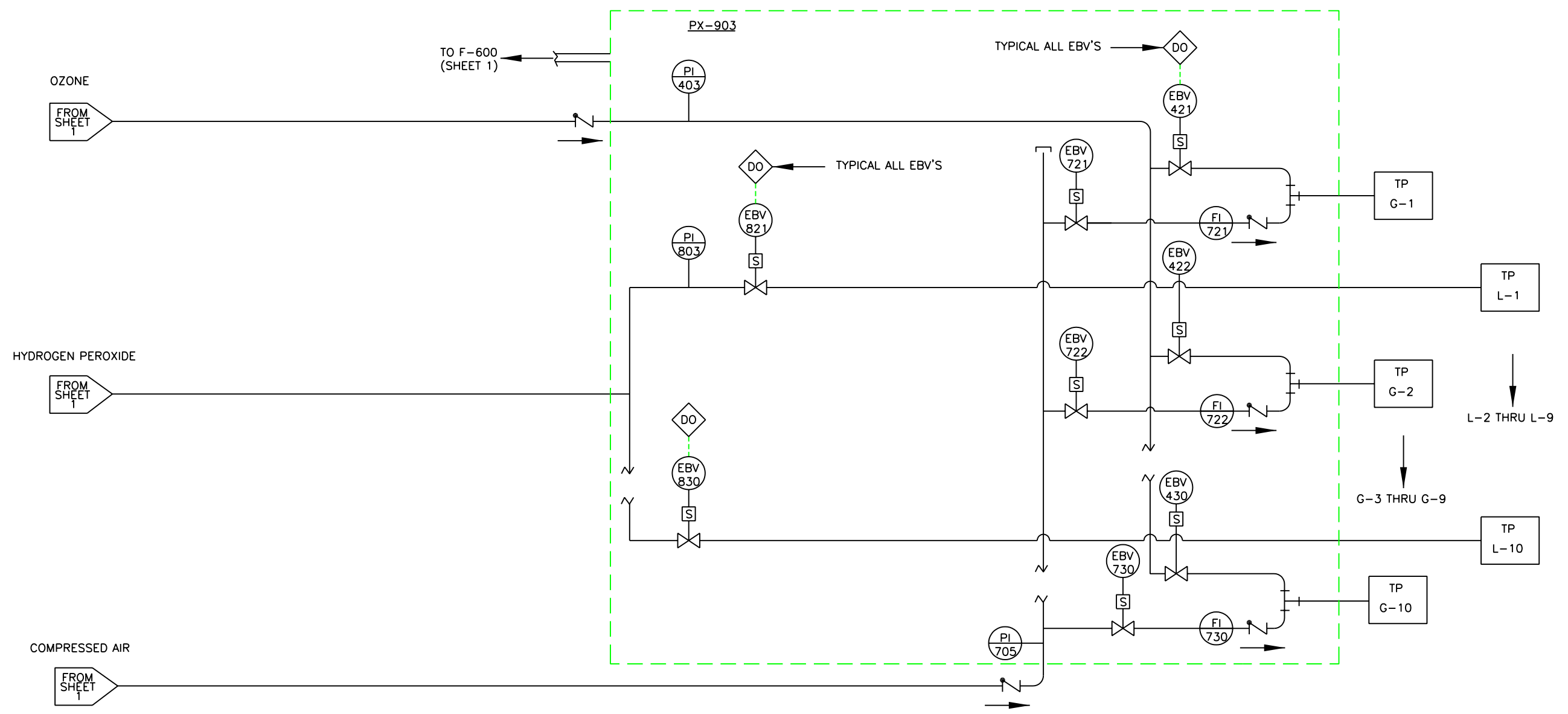
- DI DIGITAL INPUT TO PLC
- DO DIGITAL OUTPUT FROM PLC
- AO ANALOG OUTPUT FROM PLC
- NORMALLY OPEN VALVE
- NORMALLY CLOSED VALVE
- LOCALLY MOUNTED DEVICE
- PANEL MOUNTED DEVICE
- E-STOP

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APPLIED PROCESS TECHNOLOGY, INC.

REVISION #	DATE	
1	06-30-03	AS BUILT
DRAWN	CDTI	04-09-03
DESIGNED		
APPD ENGRG		
APPD MFG		

TITLE			
TRAILER MOUNTED HIPOX SYSTEM P & I DIAGRAM			
SIZE	JOB No.	DWG No.	REV
		J-1029-P-401	1
SCALE	APPRX WT	FILE	SHEET 1 OF 2



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REVISION #	DATE		TITLE		
			TRAILER MOUNTED HIPOX SYSTEM P & I DIAGRAM		
DRAWN	CDTI	04-09-03	SIZE	JOB No.	DWG No.
DESIGNED					J-1029-P-401
APPD ENGRG			SCALE	APPRX WT	FILE
APPD MFG					SHEET 2 OF 2

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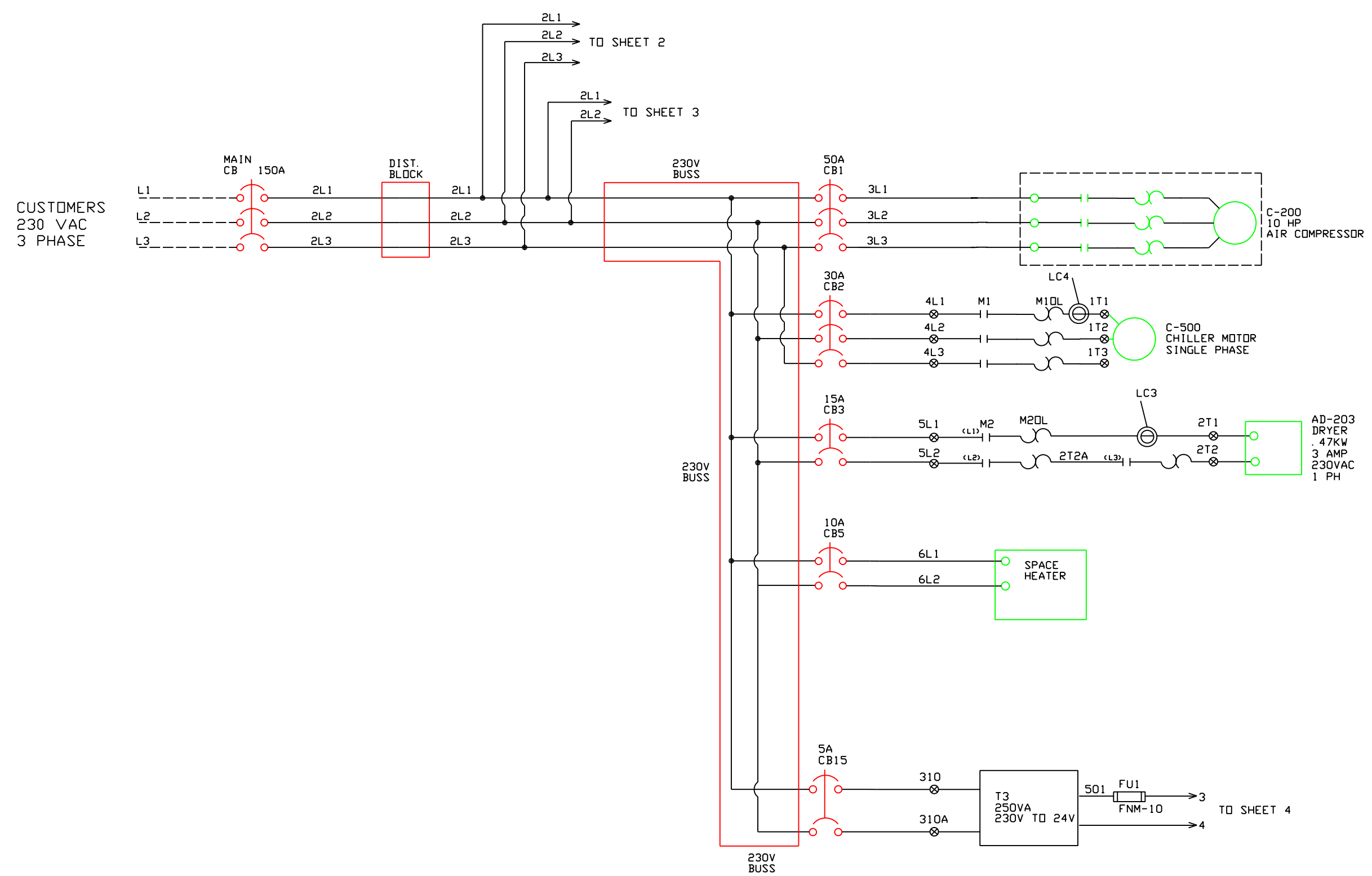
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A | B | C | D | E | F | G | H | J | K | L | M | N | O | P | S | T | V | W | X | Y | Z | AA | BB | CC | DD | EE | FF

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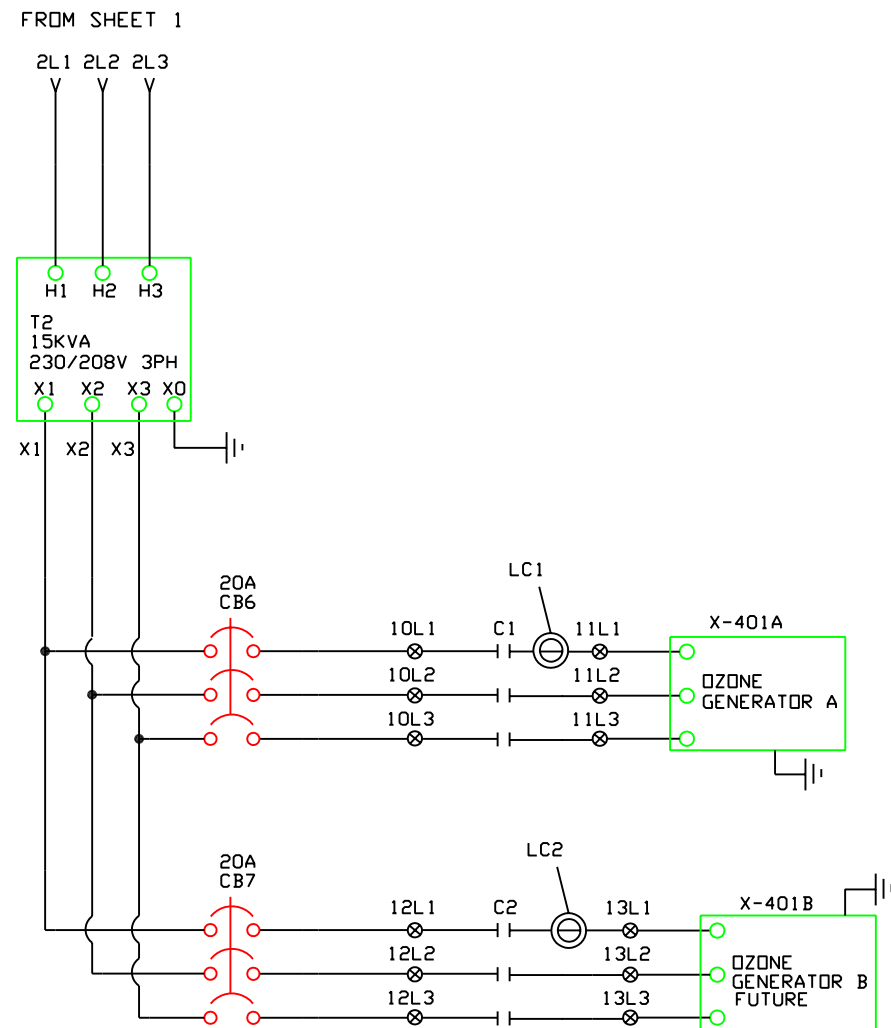
- ⊗ PLC PANEL
- △ SOLENOID PANEL
- ⊠ POWER PANEL
- TRUCK MOUNTED COMPONENTS

TRAILER #2

REVISION:	SHEET 1 OF 9
CUST: APPLIED PROCESS TECHNOLOGY	
JOB#: 319903	DATE: 6/30/03
INNOVATIVE CONTROL SYSTEMS INC. 980 HOLMAN AVENUE MONROE, OHIO 45050	

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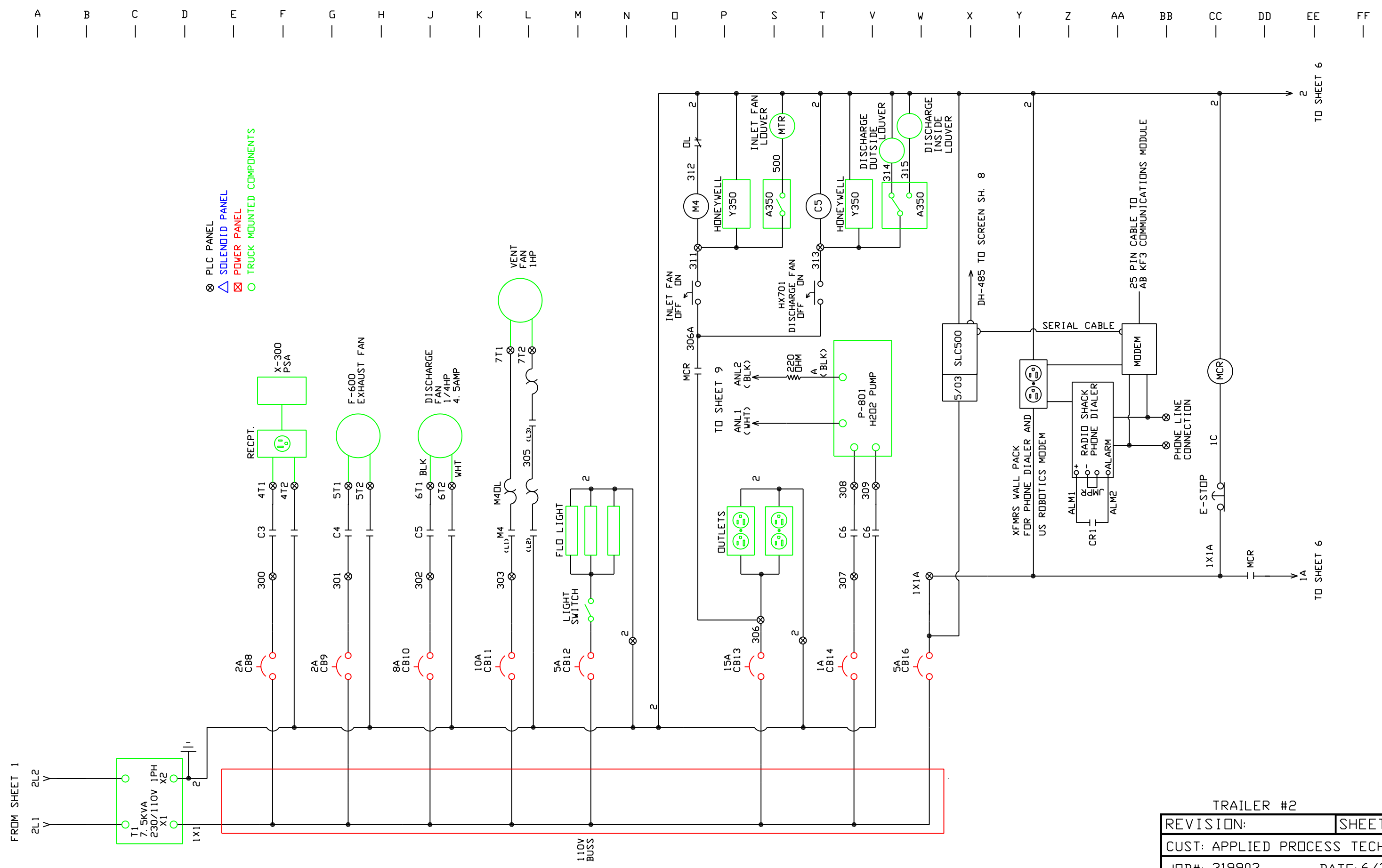
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- ⊗ PLC PANEL
- △ SOLENOID PANEL
- ⊠ POWER PANEL
- TRUCK MOUNTED COMPONENTS

TRAILER #2

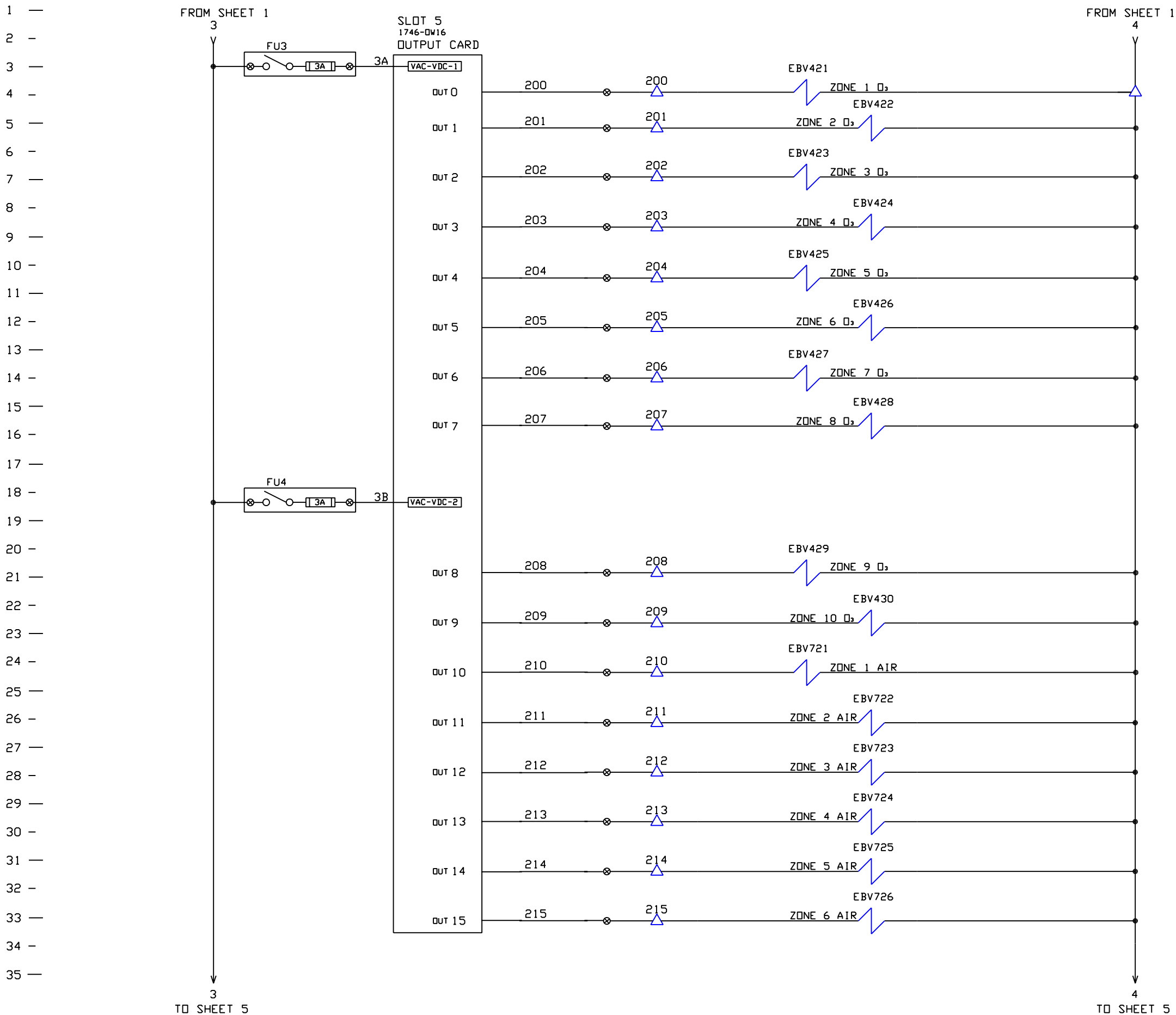
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TRAILER #2

REVISION:	SHEET 3 OF 9
CUST: APPLIED PROCESS TECHNOLOGY	
JOB#: 319903	DATE: 6/30/03
INNOVATIVE CONTROL SYSTEMS INC. 980 HOLMAN AVENUE MONROE, OHIO 45050	

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⊗ PLC PANEL  
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 ⊠ POWER PANEL  
 ○ TRUCK MOUNTED COMPONENTS

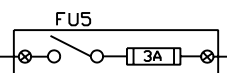
O<sub>2</sub> = OZONE

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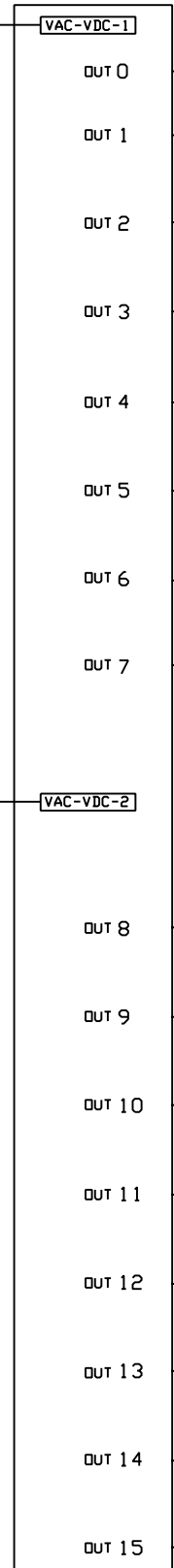
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FROM SHEET 4  
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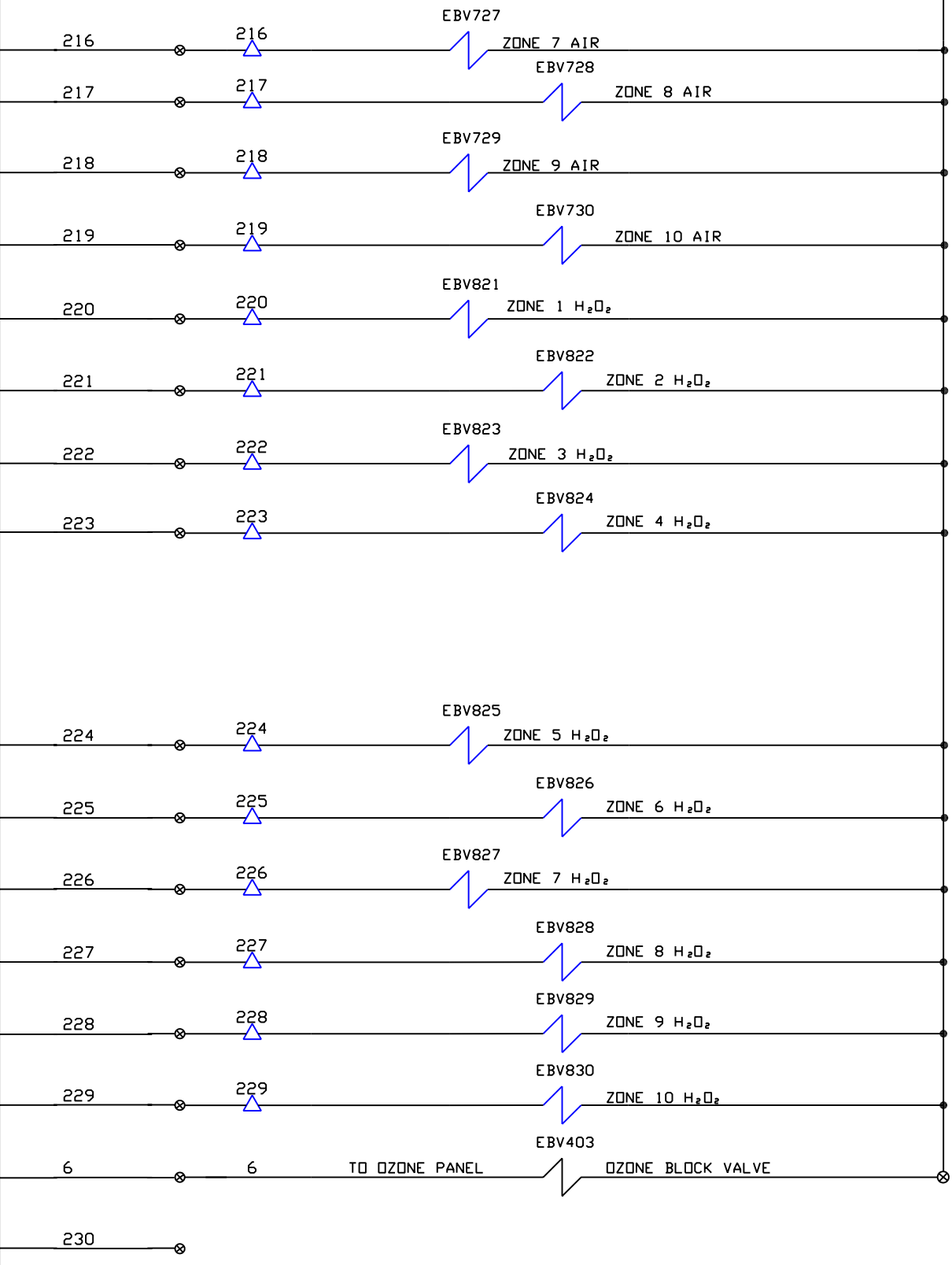
SLOT 6  
1746-DW16  
OUTPUT CARD



FROM SHEET 4  
4

⊗ PLC PANEL  
△ SOLENOID PANEL  
⊠ POWER PANEL  
○ TRUCK MOUNTED COMPONENTS

O<sub>3</sub> = OZONE  
H<sub>2</sub>O<sub>2</sub> = HYDROGEN PEROXIDE



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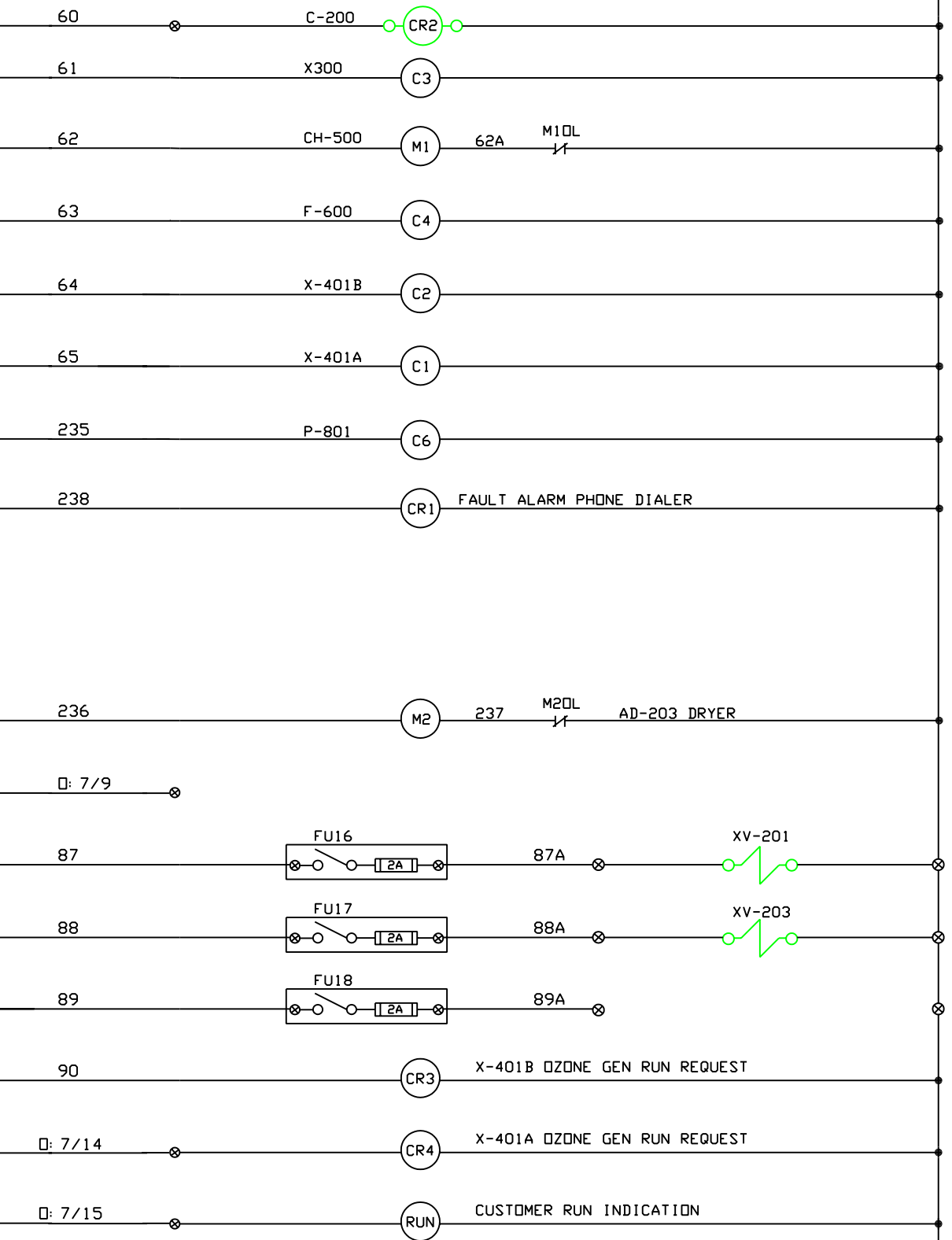


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FROM SHEET 3  
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1A  
TO SHEET 7

SLOT 7  
1746-DV16  
OUTPUT CARD  
VAC-VDC-1  
VAC-VDC-2



⊗ PLC PANEL  
△ SOLENOID PANEL  
⊠ POWER PANEL  
○ TRUCK MOUNTED COMPONENTS

FROM SHEET 3  
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Y  
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TO SHEET 7

TRAILER #2

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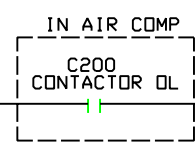
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FROM SHEET 6

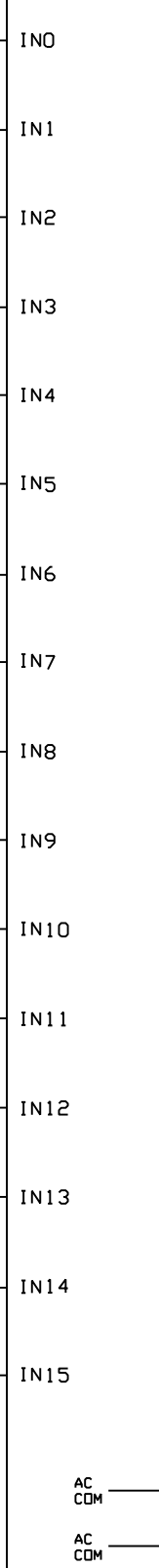
1A



TO SHEET 8

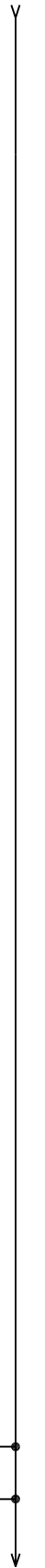


SLOT 1  
1746-1A16  
INPUT CARD



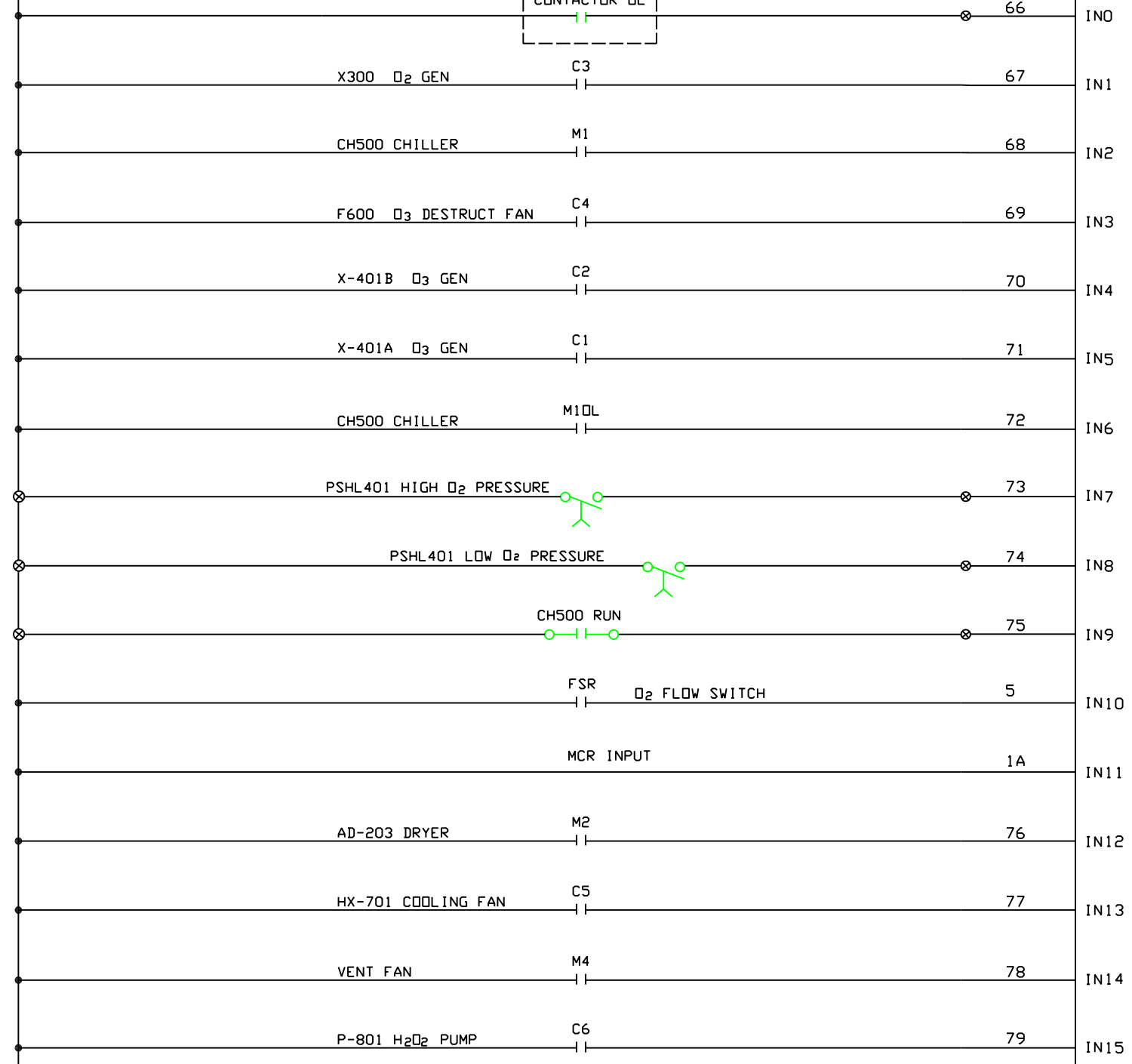
FROM SHEET 6

2



TO SHEET 8

- ⊗ PLC PANEL
- △ SOLENOID PANEL
- ⊠ POWER PANEL
- TRUCK MOUNTED COMPONENTS

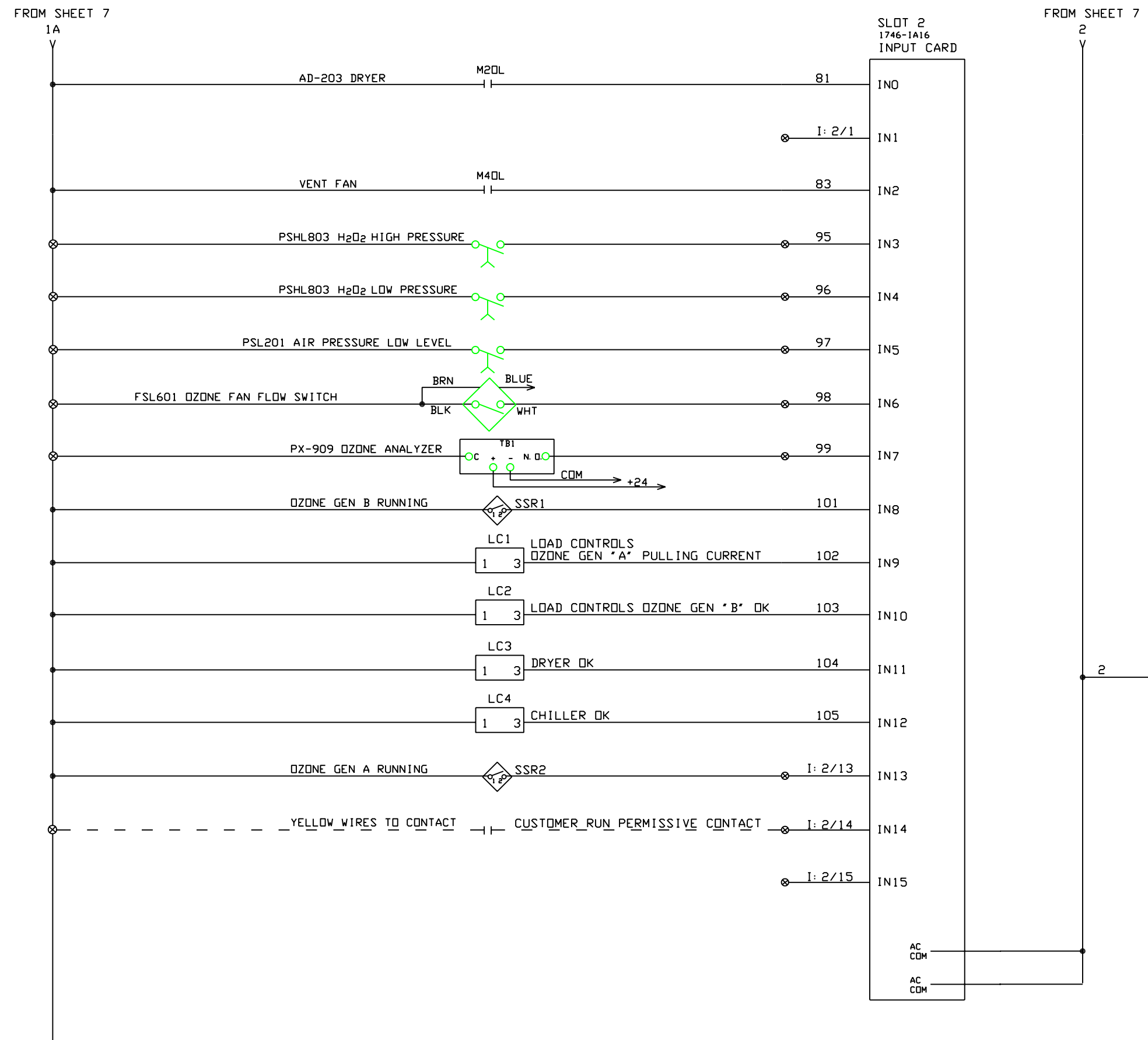


TRAILER #2

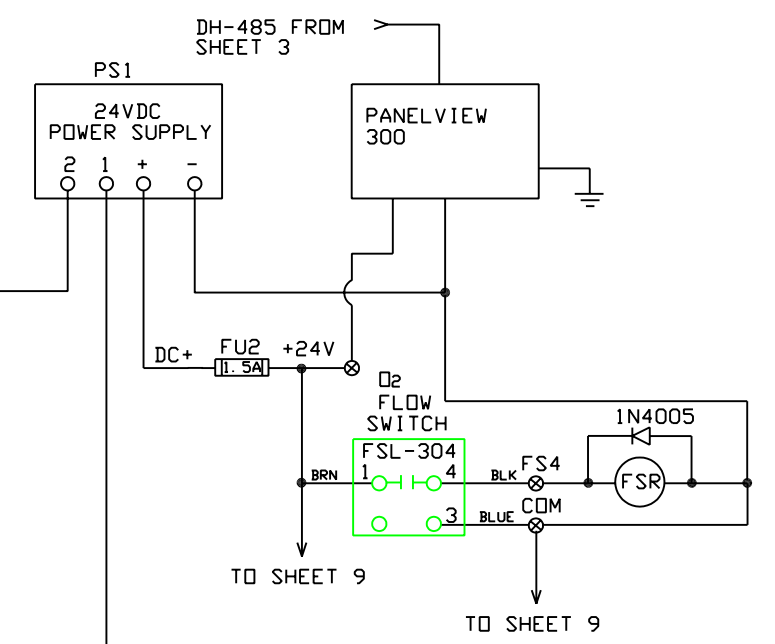
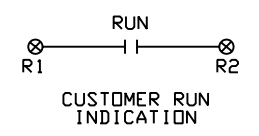
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- ⊗ PLC PANEL
- △ SOLENOID PANEL
- ⊠ POWER PANEL
- TRUCK MOUNTED COMPONENTS



TRAILER #2

REVISION:	SHEET 8 OF 9
CUST: APPLIED PROCESS TECHNOLOGY	
JOB#: 319903	DATE: 9/8/03
INNOVATIVE CONTROL SYSTEMS INC. 980 HOLMAN AVENUE MONROE, OHIO 45050	

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SLOT 9  
1746-ND4V  
ANALOG OUTPUT

<0> +24VDC — +24V  
<1> DC COM — COM

FROM SHEET 8

<0> V OUT 0 — BROWN ANL 1 — WHITE — P-801 — ANL 1

<1> ANL COM — BLACK ANL 2 — BLACK — ANL 2

<2> V OUT 1 — GRAY ANL 3 — OZONE GENERATOR PERCENT POWER LEVEL — DB 25 PIN CONNECTOR ON X-401B OZONE GENERATOR B FUTURE

<3> ANL COM — WHITE ANL 4

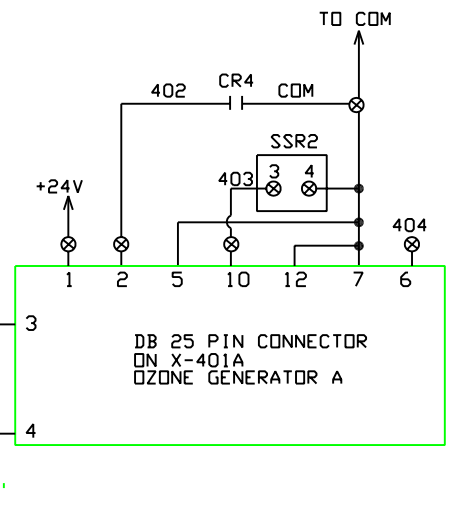
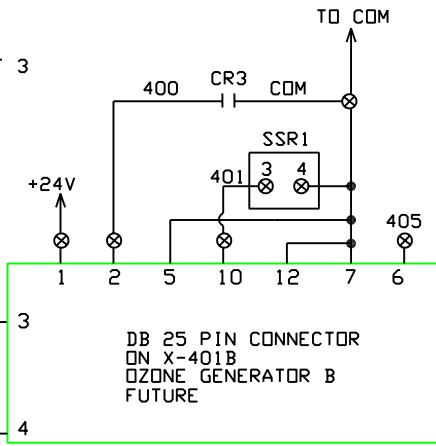
<4> V OUT 2 — RED ANL 5 — OZONE GENERATOR PERCENT POWER LEVEL — DB 25 PIN CONNECTOR ON X-401A OZONE GENERATOR A

<5> ANL COM — YELLOW ANL 6

<6> V OUT 3 — BLUE ANL 7

<7> ANL COM — GREEN ANL 8

FROM SHEET 3  
H2O2 PUMP



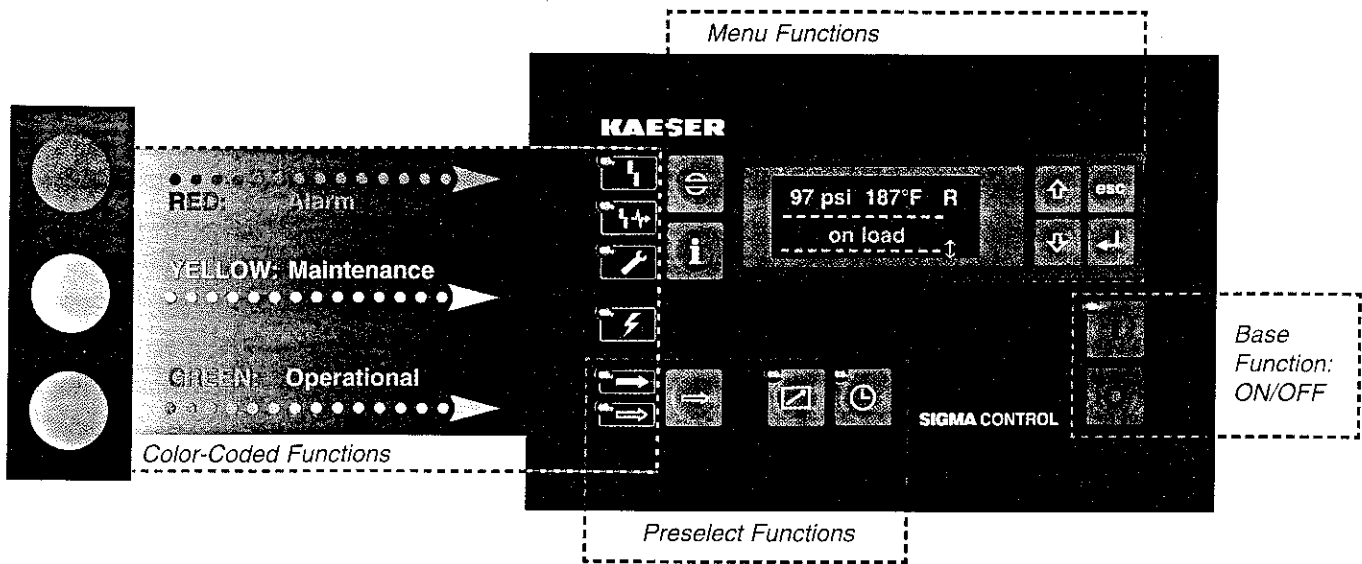
TRAILER #2

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JOB#: 319903	DATE: 6/30/03
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## **Appendix E**



### **Vendor Data**

# Technology Made Simple








## Function Keys on the Control Panel





### Base Function

-  **ON Key**  
Switches ON compressor in automatic self control operation. Green LED indicates 'Compressor ON'.
-  **OFF Key**  
Switches the compressor OFF.

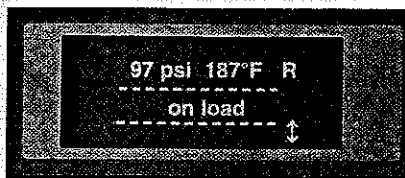
### Preselect Functions

-  **Idle Key**  
Switches the compressor from load to idle.
-  **Idle Icon**  
Green LED indicates 'Compressor idling, no air supply'.
-  **Load Icon**  
Green LED indicates 'Compressor on Load, air being supplied'.
-  **Remote ON Key**  
Switches remote control ON and OFF. Green LED illuminates under external control.
-  **Timer ON/OFF Key**  
Switches the timer ON and OFF. Green LED indicates 'Timer ON'.







### Color-Coded Functions

-  **Alarm Icon**  
Red LED indicates 'Malfunctioning compressor'. Compressor is shut down on alarm.
-  **Communication Alarm Icon**  
Red LED indicates 'Data communication to other systems interrupted'.
-  **Maintenance Icon**  
Yellow LED indicates 'Maintenance due' or 'Maintenance counter expired' or 'Warning'.
-  **Power ON Icon**  
Green LED indicates 'Main switch ON, power supply available'.

### Plain Text Display



### Menu Functions

-  **Up Key**  
Scrolls up line by line.
-  **Down Key**  
Scrolls down line by line.
-  **Escape Key**  
Returns to next higher level.
-  **Enter Key**  
Indicates jump to next sub-menu or accepts value.
-  **Acknowledge Key**  
Acknowledges alarms and, when permitted, resets the alarm memory.
-  **Info Key**  
Access to additional information or to the event information memory.

Name : MITTEILUNG  
Titel : USA, C-Plan 19.03.2003

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Besitzer : Bernd Schindler  
Erstellt : Bernd Schindler 17.03.2003 15:19:48  
Geändert : Bernd Schindler 17.03.2003 15:29:48  
Gedruckt : Monika Zeidler 18.03.2003 07:13:29  
Ablagemappe : Eingang

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Kunde: KAESER, USA  
DATUM: 17.03.2003 / Druckdatum: 18.03.2003 / 07:13:29  
IS/LOGISTICS: Schindler\*494

Sendung am: 19.03.2003, 08.00 Uhr  
Fertig bis: 18.03.2003, 12.00 Uhr

ETS Antwerpen: 24.03.2003 / ETA Richmond: 04.04.2003  
Versand per: INDEPENDENT ACTION  
Sendung: 40-Fuß-High-Cube-Container  
Plombe Nr.: 105470  
Booking-No. 43 RR 406 1148

2	SM 8	7,5	1.9620.80011	230/460V	1398884	S/N 1205,1206	X
2	SM 8	7,5	1.9620.80011	230/460V	1399521	S/N 1207,1208	X
1	SM 8	7,5	1.9620.80120	208V	1399522	S/N 1047	X
<del>4</del>	<del>SM 11</del>	<del>8,5</del>	<del>1.7322.80011</del>	230/460V	1397637	S/N 1212-1215	X
2	SM 11	7,5	1.9623.80120	208V	1397638	S/N 1151,1153	X
1	SM 11	7,5	1.9623.80120	208V	1397638	S/N 1152	X
1	ASD 25 T	8,5	100663.0	230/460V	1398887	S/N 1003	X
1	ASD 30 T	15,0	100668.0	230/460V	1397648	S/N 1001	X
2	ASD 40 S	8,5	100624.0	230/460V	1397650	S/N 1012,1013	X
1	BSD 50	8,5	100285.0	460V	1398888	S/N 2052	X
1	BSD 50 T	8,5	100362.0	460V	1397654	S/N 1034	X
1	SFC 75	7,5	100190.1	460V	1394851	S/N 1014	X
+ 1 Ablufthaube = 1 separates Packstück							
1	CSV 150		1.8803.20010	230/460V	1397660	S/N 1118	X
1	ECO CAR 201		1.5364.00020	115/230V	1400827	S/N 1001	X
2	ECO CAR 301		1.5358.10020	115/230V	1400818	S/N 1002,1003	X

# SERVICE MANUAL

USE

## Screw Compressor

### Model: SM 11

GL-Nr.: BA-SM11.L-1.9623.80011-00 03

- ... 230/460 ..... Volt
- Wye-Delta Start
- D.O.L. Start
- ..... 110 ..... psig
- .....
- .....
- Wiring Diagram:  
... SM-11.1-4101.0-00 ...
- Cabinet heaters
- 115 V receptacle
- Outdoor modification
- Rainhoods
- Switchable Modulation
- Synthetic lubricant ... M-460 .....
- Food Grade lubricant .....

Serial No.: 1540 .....



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## 1 Technical Specification

### 1.1 Compressor Unit

Model .....	SM 11
Maximum gauge working pressure .....	110/125/145/190 psig
Minimum gauge working pressure .....	80 psig
Free air delivery at max. gauge working pressure .....	42/ 40/ 36/ 29 cfm
Operating temperature approx. (Varies with ambient temperature and operating conditions) .....	167–200 °F
Weight .....	377 lbs

#### Drawings:

Dimensional drawing .....	T 7339.5
P & I flow chart (Pipework and instrument flow chart) .....	FSM11STL–00018.00
Electrical diagram .....	SSM11.Y–U1010.00

### 1.2 Noise Level

Noise level to CAGI–Pneurop at 1 m distance (free sound field measurement) .....	69 dB(A)
--	----------

### 1.3 Motor

#### Compressor motor:

Rated power .....	10 hp
Rated speed .....	3600 rpm
Specification class .....	TEFC

### 1.4 Electrical Connection

Main voltage .....	230 V 3–phase
Full load current FLA .....	25.4 A
Frequency .....	60 Hz
Recommended main disconnect fuses (Dual element or time–delay) .....	40 A
Recommended power supply cable (CU multi–stranded) cross–section .....	6 AWG

Mains voltage .....	460	V 3-phase
Full load current FLA .....	12.7	A
Frequency .....	60	Hz
Recommended main disconnect fuses (Dual element or time-delay) .....	20	A
Recommended power supply cable (CU multi-stranded) cross-section .....	12	AWG

**Attention!**

**Maximum dual element time-delay fuses are selected according to 2002 N.E.C. Article 240-6, 430-52 and Tables 430-52, 430-148 & 150.**

**Select multi-strand copper core wire at 40°C ambient temperature according to 2002 N.E.C. 110-14(c), 220-3, 310-15, Table 310-16, 430-6, 430-22, 430-24 and Tables 430-148 & 150.**

For electrical power supply please refer to chapter 2.3 and 6.3

**1.5 Set Point of the Safety Relief Valve**

110 psig Compressor Unit – Activating pressure .....	140	psig
125 psig Compressor Unit – Activating pressure .....	155	psig
145 psig Compressor Unit – Activating pressure .....	175	psig
190 psig Compressor Unit – Activating pressure .....	230	psig

**1.6 Installation Requirements**

Max. height above sea level of the place of installation ..	3000	ft.
(for all heights above please contact authorized KAESER distributor)		
Min. ambient temperature .....	40	°F
Max. ambient temperature .....	105	°F
Min. cooling air/inlet air temperature .....	40	°F
Max. cooling air/inlet air temperature .....	105	°F
Air inlet opening .....	2.2	sq.ft.
Exhaust air for solution A (see chapter 6.1):		
Forced ventilation with exhaust ventilator .....	1470	cfm at static pressure of 0.4 inches water column
Exhaust air for solution B (see chapter 6.1):		
Exhaust air used for space heating:		
Heating duct w x h .....	7 3/4" x 14"	

**1.7 Oil Capacities**

Total oil capacities .....	1.32	gal
----------------------------	------	-----

**After oil change or after long period of storage**

Quantity required for prelubrication of the airend .....	0.1	quart
--	-----	-------

(Refer to chapter 7.8.1)

**1.8 Fluid recommendations**

Lubrication of an air compressor is essential to reliable operation. Carbon and varnish can form in compressor oils. These deposits block the flow of lubricant and cause excessive wear and failure of moving parts. Contamination of the fluid can allow the formation of acids, causing extensive internal corrosion. Water may be condensed decreasing the fluid's lubricity.

Fluid in rotary compressors does much more than lubricate. During the compression process, it acts as a sealant in the airend which is important for maximum efficiency. The fluid also absorbs much of the heat of compression to cool the airend and reduce the temperature of the compressed air. It's not enough that a compressor fluid lubricates well, it must stand up to the heat, pressure and contaminants that are present in every air compressor.

**1.8.1 General Information**

KAESER synthetic lubricants should be stored in a protected location to prevent contamination. Do not re-use drums; flush and send to reconditioner.

Although the KAESER synthetic is not highly flammable, it will burn. While KAESER synthetic compressor oil is less flammable than equal viscosity mineral oils, it cannot be classified as a fire-resistant fluid. It has a flash point above 460°F. Since the user has total control over the conditions of the compressor lubricant, he assumes total responsibility for its safe usage.

Material Safety Data Sheets are available for each lubricant from your KAESER authorized distributors.

Regardless of the lubricant selected, the KAESER Sigma lubricants will separate readily from water. If condensate occurs it can easily be removed. Let the compressor sit so that any water can drain back to the separator tank and separate to the bottom. See chapter 9.14 proper draining procedure.

**1.8.2 KAESER Fluids**

KAESER COMPRESSORS has several lubricants available that are specially formulated to match these demands. They feature excellent lubricity, outstanding demulsibility (ability to separate from water), and long life.

RECOMMENDED KAESER LUBRICANTS			
SIGMA LUBRICANT	DESCRIPTION	MAXIMUM RECOMMENDED CHANGE INTERVAL*	
		First Oil Change	Subsequent Oil Change
M-460	ISO 46 Semi-Synthetic Lubricant	2,000 Hours	4,000 Hours
S-460	ISO 46 Synthetic Lubricant	6,000 Hours	8,000 Hours

\* Oil changes may need to be more frequent depending on ambient conditions. When high ambient temperatures or dirty conditions are present, oil changes may be necessary every 1,000 hours (4,000 hours for synthetic) or even shorter intervals. Oil change intervals required should be determined through periodic oil analysis.

**M-SERIES SEMI-SYNTHETIC LUBRICANTS**

- M-Series SIGMA compressor fluids are the highest quality petroleum lubricants. M-460 is specially blended to provide reliable performance in KAESER screw compressors.

**S-SERIES SYNTHETIC LUBRICANTS**

- S-Series SIGMA compressor oils are formulated from the most advanced synthetic lubricants. These "synthetic" lubricants begin as high quality petroleum feed stock. They are then refined, processed and purified into fluids with very consistent molecular structure. These oils are carefully blended to produce extremely consistent lubricants with superior properties. SIGMA synthetic lubricants feature all the advantages of both PAO and diester fluids.
- S-460 lubricant is recommended for compressors operating in ambient temperatures between 40°F and 105°F.

**Specialty KAESER LUBRICANTS**

- S-680 lubricant may be used when ambient temperatures are always between 70°F and 105°F.
- FG-460 synthetic hydrocarbon based food grade fluid is designed for use in rotary screw compressors in the application where incidental food contact may occur with the discharge air. This fluid meets the requirements of the FDA Regulation 21 CFR §178.3570 and is USDA H-1 approved. FG-460 is approved for canning, food packing, meat and poultry processing and other applications where incidental food contact may occur.

SPECIALTY KAESER LUBRICANTS (Refer to product information to determine suitability.)			
SIGMA LUBRICANT	DESCRIPTION	MAXIMUM RECOMMENDED CHANGE INTERVAL*	
		First Oil Change	Subsequent Oil Change
S-680	ISO 68 Synthetic Lubricant	6,000 Hours	8,000 Hours
FG-460	ISO 46 Food Grade Synthetic Fluid	2,000 Hours	3,000 Hours

\* Oil changes may need to be more frequent depending on ambient conditions. When high ambient temperatures or dirty conditions are present, oil changes may be necessary every 1,000 hours (4,000 hours for synthetic) or even shorter intervals. Oil change intervals required should be determined through periodic oil analysis.

**1.8.3 Compatibility of KAESER Sigma Lubricants**

All the above listed KAESER Sigma lubricants are similar to mineral oil in their compatibility with paints, seals, gaskets and hoses. The typical precautions are required when changing over from mineral oil to KAESER synthetic hydrocarbon based lubricant. Never mix lubricants of different types or brands.

When switching from mineral oil to a synthetic oil, the plant's system materials must be re-evaluated. Certain plastics are not compatible with synthetic oils. The following is a partial list of acceptable and not recommended materials:

ACCEPTABLE		NOT RECOMMENDED
Viton	Celcon	PVC
High Nitrile Buna N	Neoprene	ABS
Teflon	SBR Rubber	
Epoxy Paint	Low Nitrile Buna N	
Oil Resistant Alkyd	Acrylic Paint	
Nylon	Lacquer	
Delrin	Polystyrene	

**Attention!** Polycarbonate bowls can be etched by any synthetic lubricant. We recommend replacement with metal bowls, or the addition of metal guards.

**1.9 Maintenance for the Electrical Motor**

**Relubricate the compressor motor bearings:**

Under normal operating conditions, after ..... 12000 h\*  
(ambient temperature up to 77°F)

Under unsuitable conditions, after ..... 6000 h\*  
(ambient temperature up to 105°F)

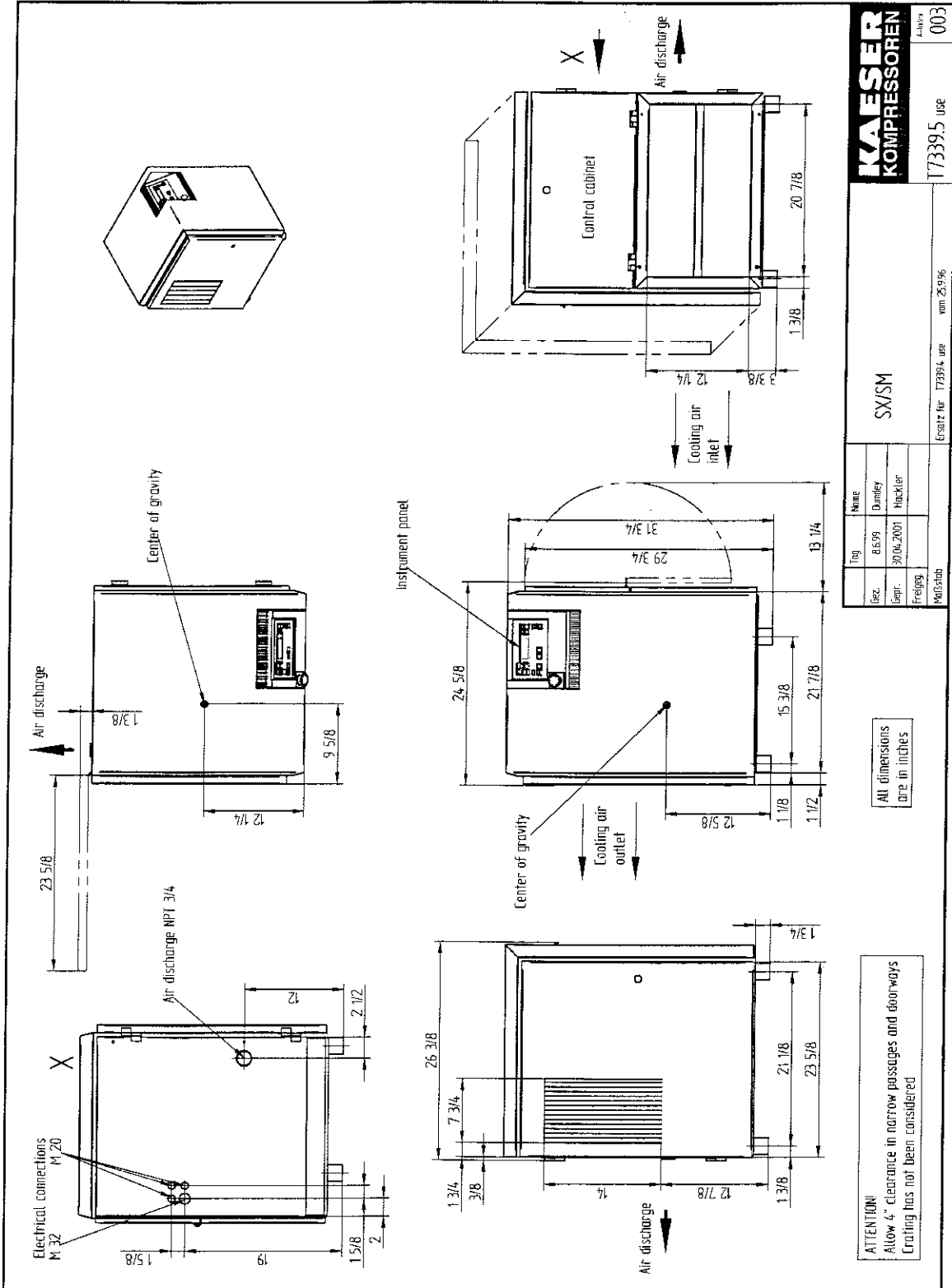
but no later than ..... 3 Years

\*operating hours

**1.10 Dimensional Drawing**

(see following page)





Entwicklungsbedingte Änderungen vorbehalten. Zeichnung darf nur über die CAD geändert werden.

## 2 Safety Regulations

Read this service manual carefully and observe cautionary references before putting this compressor package into operation and before carrying out any maintenance.

### 2.1 Explanation of Symbols and References



This symbol is placed before all references to safety where danger to life and limb can occur during work. It is especially important that these rules are observed and that extreme care is taken in these cases. For their own protection, all other users must be informed of these safety rules. Observe general safety and accident prevention regulations as well as the safety rules laid down in this service manual.



This symbol is placed by text where considerable attention must be paid so that recommendations, regulations, references and correct sequence of work are adhered to and that damage and/or destruction of the compressor unit and/or other equipment is prevented.



This symbol identifies environmental protection measures.



This symbol indicates operations to be carried out by the operator or service technician.



This bullet identifies listings.

#### Explanation of warning labels:



Beware of hot surface. Do not touch surface; danger of burning.



Beware of high voltage. Do not touch electrical components; danger of electric shock.



Beware! Machine starts automatically. Machine can start automatically or by remote start command.



Beware of rotating parts. Do not touch rotating parts as this can cause pinching/injury.

## 2.2 General Safety Precautions



Work on power driven systems may only be carried out by trained or specialized personnel.

Work on the electrical equipment of the refrigerated dryer may only be carried out by a qualified electrician or trained personnel under the supervision of a qualified electrician according to the NEC and any applicable local codes.



Prior to working on electrical systems of the compressor always perform the following steps in the sequence shown.

1. Lock the main disconnect in the "off" position in accordance with applicable lock out/ tag out procedures (example: OSHA CFR 29 § 1910.147) to ensure the compressor does not restart.
2. Ensure the package cannot be switched on again
3. Check that no voltage is present
4. Lock the isolation shut-off valve in the "closed" position and vent all compressed air trapped between the compressor and the isolation shut-off valve in accordance with applicable lock out/ tag out procedures (example: OSHA CFR 29 § 1910.147).



Unless the Service Manual states otherwise, all pressure lines must be vented or shut off.

**Attention!**

Any alterations or reconstruction carried out without the prior written authorization of KAESER COMPRESSORS Inc. will invalidate the warranty.

**Attention!**

No welding, heat-treatment or mechanical modifications may be carried out on pressurised components such as. pipework, air receivers, etc.

**Attention!**

Safety devices may not be modified or deactivated.

Signs and labels of reference may not be removed or rendered unreadable.

### These instructions must also be observed:

- Allow no open flames and flying sparks at the place of installation.
- Ensure that sparks or high temperatures cannot cause fire or explosion if welding is carried out on or near the compressor.
- Ensure that the compressor unit can breathe clean intake air that contains no damaging components.
- Do not allow the maximum ambient temperature to be exceeded (see chapter 1.6), otherwise special measures must be agreed between the manufacturer and the customer.

- Carry out oil changes according to the service manual.
- Use only oils recommended by the manufacturer.
- Do not mix cooling oils of different types.
- The operating temperature stipulated must be kept to and checked constantly to avoid condensate in the oil circulation.
- If maintenance work is carried out on any part of the oil circulation system, top up the oil in the oil separator tank to the maximum level afterwards, run the compressor for a short period and keep it under constant observation. Check the oil level again and top up with oil to replace the oil taken up by the piping and the cooling system.
- Use the filter cartridge of the oil separator tank only as long as the pressure drop across the filter is less than the 14.5 psi specified. Check constantly.
- This machine is not explosion-proof.  
It may not be operated in areas in which specific requirements with regard to explosion protection are applied.

### 2.3 Electrical Power Supply

**Attention!**

The main power supply and overcurrent protection must be installed by a qualified electrician in accordance with NEC, OSHA and any applicable local codes.

Compressor packages must be installed with a lockable main disconnect and fuses or other short-circuit and ground fault protection device.

For fuse and wire recommendations, see chapter 1.4

Please note that the conductors, fuses and procedure are KAESER's recommendations. These recommendations do not supersede other applicable codes.

### 2.4 Spare Parts

Safe and reliable operation of the compressor package is guaranteed only with KAESER original spare parts and KAESER SIGMA cooling oil.

**Attention!**

Use only original parts in assemblies subject to pressure.

### 2.5 Compressed Air System

If a compressed air system is extended or changed, verify that the blowoff pressure and capacities of the safety relief valves on the air receiver tanks and in the system match the rating of all the compressor packages installed.

**2.6 Environmental Protection****Condensate drainage**

The condensate accumulating during compression must be fed via a suitable drainage system, collected in special canisters and disposed of according to environmental regulations.

**Maintenance materials/wear items/replacement parts**

Ensure that all wear items, maintenance and replacement parts accumulating during operation of the compressor package are disposed of according to environmental regulations.



The following points must be observed:

Avoid contact with skin and eyes.  
Do not inhale vapors and oil mist.  
Do not eat or drink when handling such materials.  
Fire, open flame and smoking are strictly forbidden.

### 3 General



**The service manual must always be available for use at the location of the compressor package.**

The right is reserved to make technical changes and improvements to equipment which may then result in discrepancies in the details of that equipment contained in this manual.

#### 3.1 Proper use of the Compressor

The compressor package is intended solely for the purpose of generating compressed air. Any further use outside of this purpose is considered improper. The manufacturer cannot accept liability for any damage caused by such improper use; the user alone is liable for any risks incurred.

Proper use of the compressor also includes adherence to the installation, removal, application, operational and maintenance instructions laid down by the manufacturer.

If the compressor package is operated in an air distribution network, the maximum network pressure may not exceed 232 psig.

**Attention!**

**The equipment may only be used or serviced by authorized and trained personnel.**

#### 3.2 Improper use



**Never direct compressed air toward persons. Compressed air is a concentrated form of energy and as such is dangerous to life.**

**Attention!**

**Inlet air may not contain any explosive or chemically unstable gas or vapour.**

#### 3.3 Compressed Air Treatment



**Never use compressed air from oil injected compressor packages for breathing purposes and production methods where the air has direct contact with food, without subjecting the compressed air to additional treatment.**

#### 3.4 Copyright

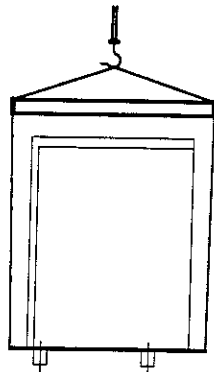
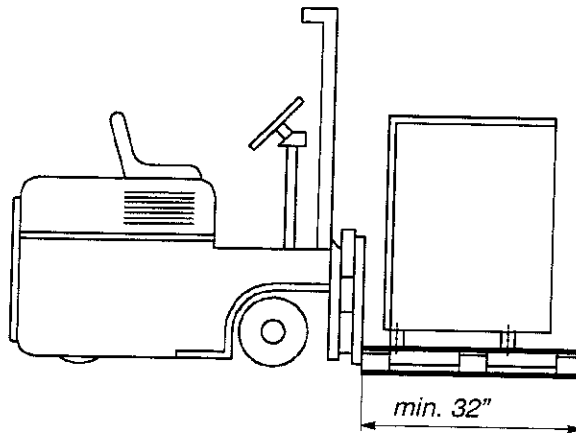
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## 4 Transport

### 4.1 Transport Instructions

We recommend a fork lift truck or lifting equipment for transporting the compressor package to avoid damage to the cabinet and framework.

**Attention!**

Do not exert any side forces on the compressor package when transporting with lifting equipment!

### 4.2 Packaging

Always observe the instructions in chapter 4.3 when packaging the machine for storage. Use packaging suitable for the intended route if the machine is to be transported further by the customer.

#### Overland

The machine should be protected from mechanical damage by a sturdy crate and from moisture by plastic sheeting.

#### By sea or air

Special packaging instructions can be obtained from KAESER.



Dispose of the packaging according to environmental regulations and recycle where possible.

### 4.3 Storage

If the equipment is to stand idle for a long period the prescribed measures must be taken to avoid damage.

If any measures can not be taken, advice should be sought from an authorized KAESER distributor.

**Attention!**

**Basically, the equipment should be stored in a dry, frost-free room. Protect against ingress of moisture or formation of condensation. See chapter 7.8 for instructions on start-up.**

#### **Storage up to 6 months (temporarily out of service):**

As an alternative to storage, the equipment can be run once a week for 30 minutes at operating temperature to ensure adequate corrosion protection. Otherwise, the measures described under "Storage for longer than 6 months" are to be taken.

#### **Storage for longer than 6 months:**

Ensure the equipment is dry and cover in plastic sheeting. Protect the interior with sufficient quantities of desiccant (silica gel or similar).

#### **Storage for longer than 12 months:**

Carry out the following additional maintenance tasks before putting into operation:

- ☞ Change the oil filter (see chapter 9.12).
- ☞ Change the oil separator cartridge (see chapter 9.15).
- ☞ Change the oil (see chapter 9.14).
- ☞ Have the motor bearings checked by an authorized KAESER service technician.

#### **Storage for longer than 3 years:**

After 3 years at the latest the complete technical condition of the equipment must be checked before start-up.

**Attention!**

**Starting up the equipment without a full inspection can lead to damage.**

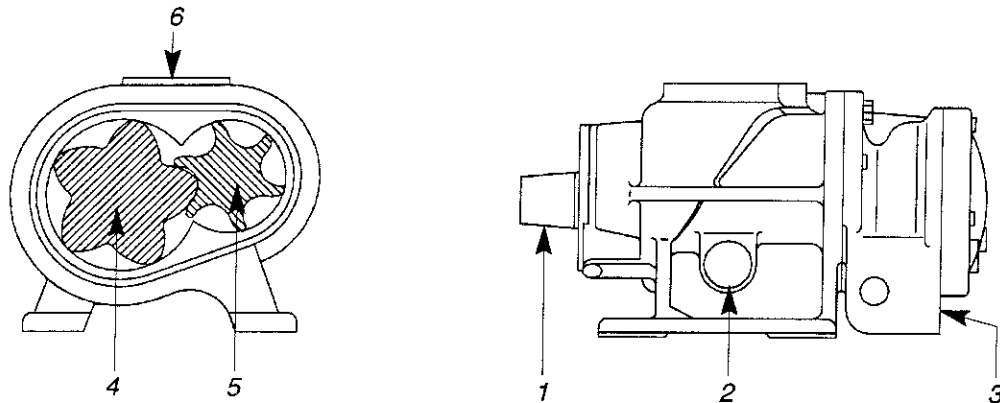
- ☞ Have the the start-up carried out by an authorized KAESER service technician.



## 5 Construction and Operation

### 5.1 Principle of Compression

The stationary compressor package is fitted with a single stage, oil-injected airend. The two rotors, the driven male rotor and the female rotor, both mounted in antifriction bearings, are fitted into the airend. As the rotors rotate, air is drawn into the upper side through the inlet port and is compressed on the lower side. The oil that is injected into the lower side absorbs heat generated by compression, prevents metal to metal contact between the rotors, seals the rotors and the housing from each other and also lubricates the antifriction bearings. The compressed air and oil mixture leaves the airend via the discharge port.



1 Drive shaft  
 2 Oil injection  
 3 Discharge port

4 Male rotor  
 5 Female rotor  
 6 Air inlet port

### 5.2 Brief Description

The compressor block is driven by an electric motor via V-belts.

An oil separator cartridge is fitted into the oil separator tank allowing practically oil free compressed air supply.

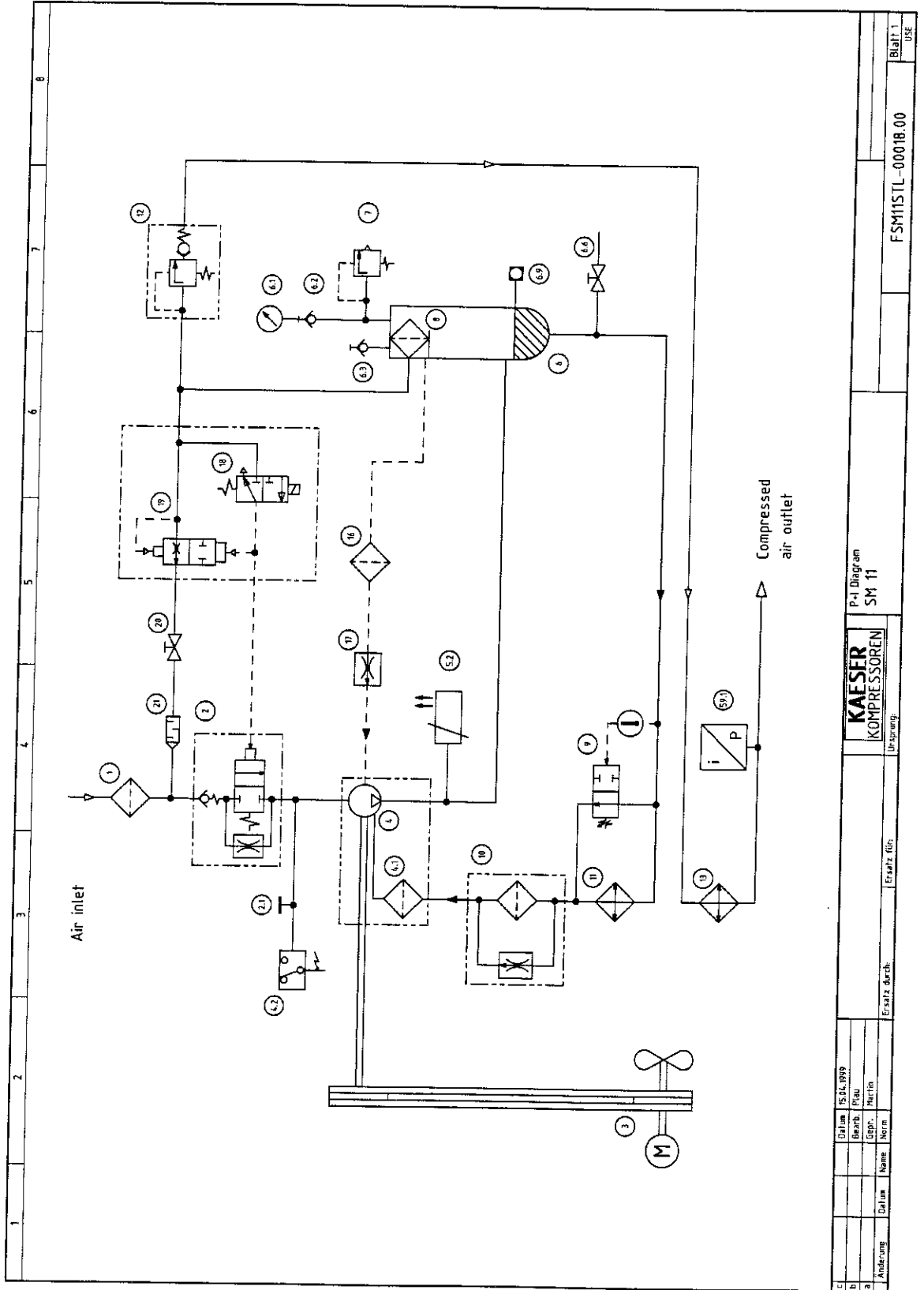
The control system of the compressor package ensures that compressed air is generated within the set pressure limits.

Safety devices protect the compressor package against failure of important systems through automatic shut-down.

The fan ensures ventilation of the compressor package and sufficient cooling air for the air-cooled oil cooler and air aftercooler.

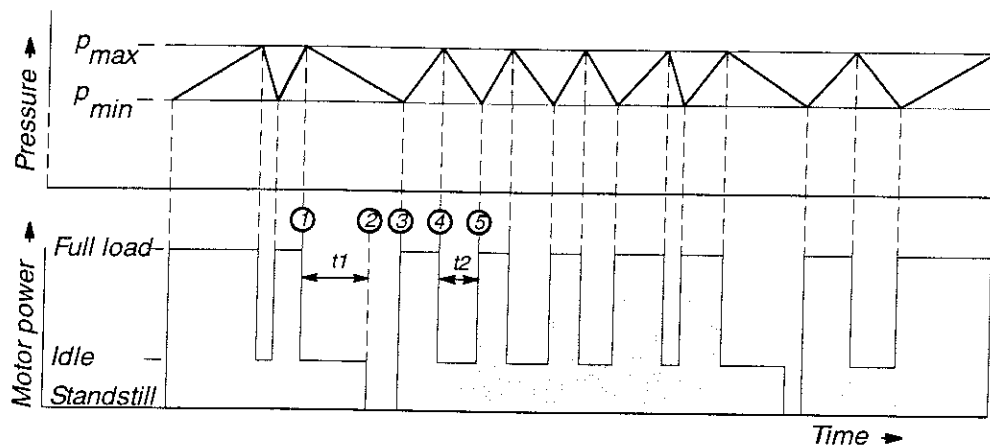
### 5.3 Pipe and Instrument Flow Diagram (P & I Diagram)

(see following pages)



1		2		3		4		5		6		7		8	
1	Air filter														
2	Inlet valve														
2.1	Oil filter with plug														
3	Drive motor														
4	Airend														
4.1	Strainer														
4.2	Pressure switch - Wrong direction of rotation														
5.2	PT100 sensor														
6	Oil separator tank														
6.1	Pressure gauge														
6.2	Hose coupling (oil side)														
6.3	Hose coupling (air side)														
6.6	Shut-off valve - Oil drain														
6.9	Oil level sight glass: minimum/maximum oil level														
7	Safety relief valve														
		8	Oil separator cartridge												
		9	Oil temperature controller												
		10	Oil filter												
		11	Oil cooler												
		12	Minimum pressure check valve												
		13	Air aftercooler												
		16	Dirt trap												
		17	Nozzle												
		18/19	Combined control/vent valve												
		18	Control valve												
		19	Vent valve												
		20	Shut-off valve - Vent line												
		21	Silencer												
		59.1	Pressure transducer Air system pressure												

4	Datum	15.04.1999			KAESEKOMPRESSOREN		P-1 Diagram legend		Blatt 2	
5	Bearb.	Plau			Ur-sprung		SM 11		F5M11STL - 00018.00	
6	Gepr.	Herrth								
7	Andrerung	Datum	Name	Nr.	Ersatz durch:		Ersatz für:		LUST	

**5.4 DUAL Control**

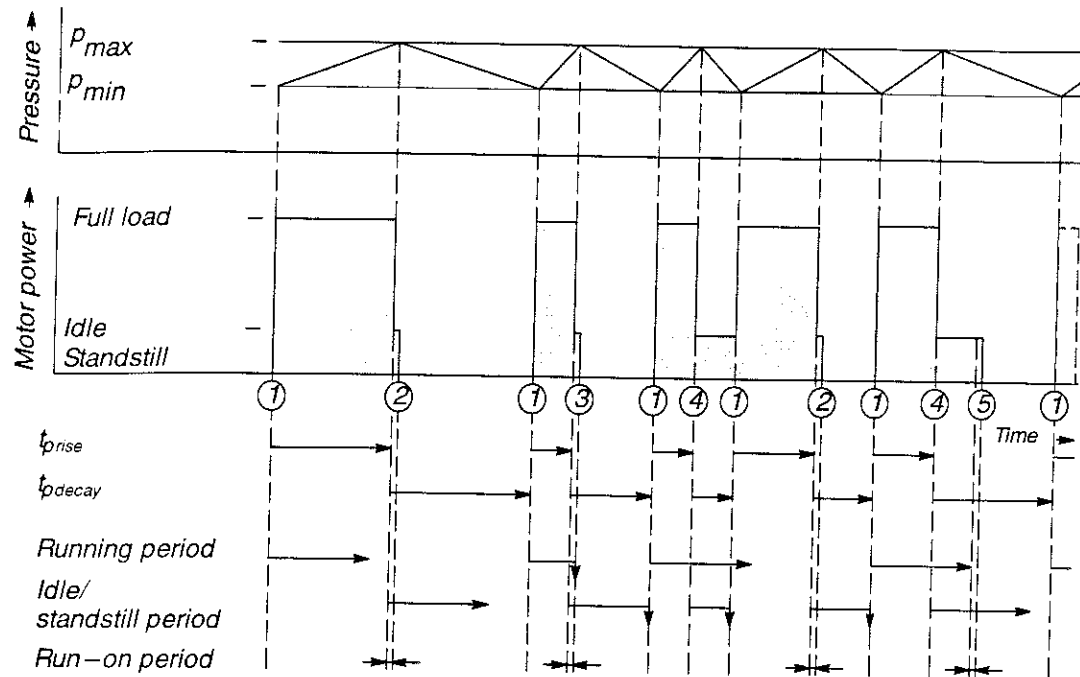
In DUAL Control (combined idle and start–stop) the compressor normally runs at **full–load, idle** or **standstill**.

The controller regulates the compressor package between **full–load** and **idle**.

If the compressor package runs in idle for longer than the preset period (1) to (2), for example  $t_1 = 6$  min, the drive motor is stopped completely (2). When the lower switching point  $p_{min}$  (3) is reached the compressor package is automatically started again. Pressure rises to the upper switching point  $p_{max}$  (4), and the compressor package switches to idle. If the pressure falls again to, for example,  $p_{min}$  (5) within a shorter period (4) to (5), then the compressor is automatically switched from idle to full–load.

The idle period is dependent on the maximum motor starting frequency.

5.5 QUADRO Control



▽ Stop point for the running period or idle / standstill period

$p_{max}$  upper switching point

$p_{min}$  lower switching point

$t_{rise}$  pressure rise time (the time during which the air system pressure rises from the lower to the upper switching point)

$t_{decay}$  pressure decay time (the time during which the air system pressure decays from the upper to the lower switching point)

**Functional description**

Two fixed periods – the **running period** and **idle/standstill period** – are taken as the criterion for selection of the operating mode of the compressor package when the air mains pressure reaches the upper switching point. These two periods are set according to the maximum permissible cut-in frequency of the compressor motor.

The running period starts every time the compressor package is switched on. It lasts as long as the compressor motor runs and stops when the compressor package switches to full stop.

The idle/standstill period starts every time the operating mode changes from full load to off load running. It runs during idle and also when the compressor package is switched to standstill after the idle period. It stops when the compressor package switches to full load.

Every switching off point is delayed by the run-on period, during which time the compressor package vents.

The following switching cycles are possible:

- If the air systems pressure decays to the lower switching point, the compressor package switches to full load (1) irrespective of its previous operating mode. If the compressor motor was at a standstill the opening of the inlet valve is delayed to allow an unloaded compressor package start.

- If the air systems pressure rises to the upper switching point and the running period has already expired, the compressor package is switched off after the run-on period has expired (2).
- If the air systems pressure rises to the upper switching point before the running period has expired then the pressure decay time of the previous switching cycle is taken as the criterium for the selection of the operating mode:
  - If the pressure decay time  $t_{pdecay}$  was longer than the period set for the idle/standstill period, the compressor is switched to standstill after the run-on period has expired (3).
  - If the pressure decay time  $t_{pdecay}$  was shorter than the period set for the idle / standstill period, the idle mode is selected (4), that is, the inlet valve closes and the compressor is vented with running motor. When the running period expires the compressor package switches to standstill only after the run-on period has also expired (5).

## 5.6 VARIO Control

### Functional description:

The idle period is automatically lengthened or shortened by the variable idle control in relation to the number of motor starts. The number of motor starts during the preceding hour are measured.

A high switching frequency leads to longer idle periods.

A low switching frequency leads to shorter idle periods.

**6 Installation**

**6.1 Installation Requirements**

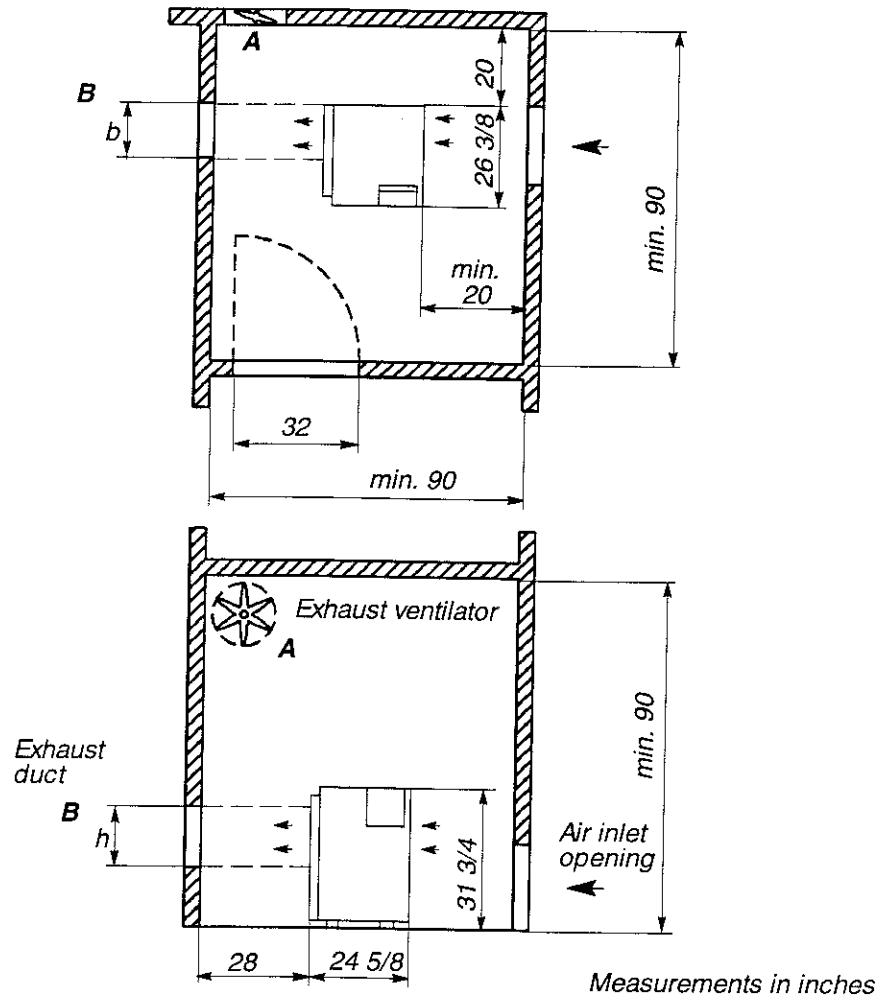
**Attention!** The compressor should be mounted on level surface.  
For any special application please consult with the manufacturer.

Safe operation of the compressor package is only ensured if the ambient temperature remains within the limits stated in chapter 1.6).

If the compressor is used in the open, take care that it is protected against the direct rays of the sun and against the ingress of dust and rain.

Install the compressor according to the following diagram. Adhere to the minimum distances shown to allow free access to the compressor package.

Adequate ventilation of the compressor space is ensured only if the minimum values (see chapter 1.6) are adhered to.



**Solution A: Forced Ventilation**

The ventilator intended for the compressor room must provide adequate ventilation in relation to the size of the compressor package (see chapter 1.6).

**Solution B: Exhaust Air used for Space Heating**

The hot air is forced through a conduit (see chapter 1.6) into the room to be heated.

**Attention!** Consult the manufacturer with regard to length of conduit and for maximum allowable pressure drop for this compressor package.

Safe operation of the compressor package is guaranteed only if the temperature limits (see chapter 1.6) of the cooling air are adhered to.

**6.2 Connection of the Compressed Air Supply**

**Attention!** The unit is set up ready to operate. Connect the discharge outlet of the compressor to the system pipework using a flexible hose line and isolation shut-off valve with drain. Use the NPT adapter if necessary.

**6.3 Electrical Connection**

The main power supply and overcurrent protection must be installed by a qualified electrician in accordance with NEC, OSHA and any applicable local codes.

For fuse and wire recommendations, see chapter 1.4

The compressor is wired ready for connection to the main supplies. Feed the supply cable with cores marked L1, L2, L3 and PE through the cable inlet in the base frame into the control box and connect to the terminals marked L1, L2, L3 and PE in this box.

**Attention!** Maximum dual element time-delay fuses are selected according to 2002 N.E.C. Article 240-6, 430-52 and Tables 430-52, 430-148 & 150.

Select multi-strand copper core wire at 40°C ambient temperature according to 2002 N.E.C. 110-14(c), 220-3, 310-15, Table 310-16, 430-6, 430-22, 430-24 and Tables 430-148 & 150.

Wire temperature rating:

1.25 x FLA (see chapter 1.4)	wire temperature rating	correction factor for 40°C
≤ 100A	60°C	0.82
> 100A	75°C	0.88



## 7 Putting into Operation

### 7.1 Points to be Observed before Putting into Operation

Every compressor package is given a test run at the factory and carefully inspected before shipment. The test run confirms that the package conforms to the specification data and runs perfectly. However, the compressor package could be damaged during transport. For this reason, we recommend that the package be examined for possible shipping damage. It is recommended that an operator observe the compressor package carefully during the first hours of operation for any possible malfunction.

**Attention!**

**Important functional components in the compressor package (such as minimum pressure check valve, safety relief valve, inlet valve and combination valve) are adjusted and fitted to factory standards and specifications. Alterations to these components are not allowed without prior written authorization with the manufacturer.**



**Do not disassemble the minimum pressure check valve, safety relief valve and inlet valve. They are heavily spring loaded.**

**Disassembly by unqualified personnel may result in personal injury or equipment damage.**

### 7.2 Points to be Observed before Starting the Compressor Unit



**ANY NON-OBSERVANCE OF THIS OR OTHER REFERENCES (WARNING; ATTENTION; DANGER) CAN LEAD TO ACCIDENTS CAUSING INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.**

**If a power failure occurs, the compressor package starts again automatically (normal setting) provided the line pressure is lower than the pressure threshold parameter entered in SIGMA CONTROL.**

**Do not operate the compressor with open maintenance doors or with cover panels removed as personnel could be injured by rotating parts and electrical equipment.**

- ☞ Remove all packaging materials, tools and transport securing devices on and in the compressor package.
- The operator is expected to practice safe working techniques and to follow all recommended operating and safety regulations when operating this compressor package.
- The operator of this compressor unit is responsible for its safe operating condition.
- Do not operate this compressor unit in locations where high dust conditions, poisonous, or inflammable gases could exist.
- Do not connect the compressor package to a supply voltage other than that stated on the nameplate.
- Do not install the compressor package in a location subject to freezing temperatures. The air temperature requirements at the air intake must be complied with (see chapter 1.6).
- If exhaust air ducts are to be installed the duct cross section must be equal or larger than the cooling air outlet of the compressor package and may not exceed the permitted pressure loss prescribed by the compressor manufacturer.

- During installation of the compressor unit, ensure that a distance of at least 40 " is kept between the cooling air intake of the unit and any wall.
- ☞ Check the oil level in the oil separator tank (see chapter 9.13).
- Check that the airend rotates in the correct direction (see chapter 7.4).
- ☞ Check the tension of the drive belts (see chapter 9.4).
- ☞ The ball valve (6.6, see chapter 5.3) must be closed.
- ☞ The ball valve (20, see chapter 5.3) must be open.



**Lock the main disconnect in the "off" position in accordance with applicable lock out/tag out procedures (example: OSHA CFR 29 § 1910.147) to ensure the compressor does not restart.**

**Check all screws on the electrical connections for tightness and tighten if necessary (carry out this check again after 50 hours of operation).**

- This compressor is fitted with a run-in oil filter cartridge. Replace the filter cartridge after the run-in period of 200 hours (see chapter 9.12).

**7.3 Checklist**

- Is the floor at the place of installation solid and level?  
 yes  no
  - Is the space large enough for the compressor package or its components?  
 yes  no
  - Are inlet and exhaust air apertures available in sufficient size and number?  
 yes  no
  - Are all components of the compressor package easily accessible?  
 yes  no
  - Is the power supply cable of sufficient cross-section?  
(have electrical connection carried out by qualified electrician or company familiar with local conditions)  
 yes  no
  - Is a shut off valve fitted by the user?  
 yes  no
  - Is a flexible connecting hose or axial compensator fitted between the compressor package and the compressed air system?  
 yes  no
  - Have all screws, bolts and electrical connections been checked for tightness?  
 yes  no
  - Has the oil level in the oil separator been checked?  
 yes  no
  - Is a main disconnect switch fitted (suited to the motor starting characteristics)?  
 yes  no
  - Has the setting of the drive motor overload current trip been checked?  
 yes  no
  - Have you ensured that there are no other air components located in the exhaust air flow of the compressor package?  
 yes  no
  - Have service personnel been instructed on safety regulations?  
 yes  no
-

**7.4 Direction of Rotation Check****Attention!**

The compressor is wired for connection to a clockwise phase sequence power supply.

A check of the direction of rotation can be made by testing the phase sequence.

Arrows showing the direction of rotation are located on the motor and on the airend housing.

☞ On your initial start, "bump" the unit and verify the direction of rotation.

If the direction of rotation is incorrect, change over the supply conductors L1 and L2.

**Attention!**

If the airend rotates in the wrong direction, the compressor is automatically shut down by the safety air pressure switch (4.2, see chapter 5.3).

## 7.5 Motor Overload Relay Adjustment and Changing



Lock the main disconnect in the "off" position in accordance with applicable lock out/tag out procedures (example: OSHA CFR 29 § 910.147) to ensure that the compressor does not restart. See chapter 2.3 for the main disconnect switch.

**Attention!**

The power supply voltage (see circuit diagram) must be fitted and connected with the compatible motor overload relay, and the set point must be adjusted.

The relay is set to the standard adjustment at the factory.

**Compressor motor: Wye – delta start**

Overload relays set points see wiring diagram.

In the Wye–delta configuration the phase current is fed through the motor overload relay. This phase current is 0.58 times the nominal motor current.

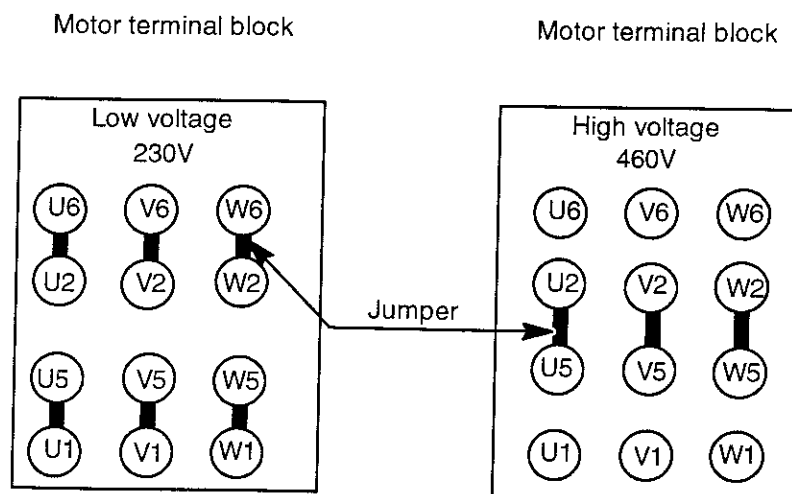
For the nominal motor current see motor nameplate.

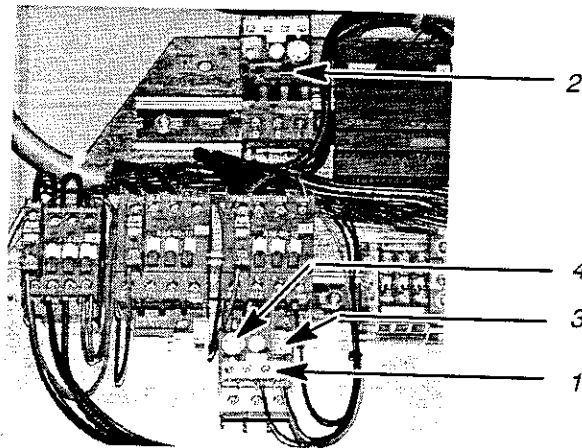
**Adjustment:**

To prevent the overload relay from tripping (because of voltage fluctuations, temperature influences or component tolerances), the value can be set up to 15% higher than the calculated phase current.

**Attention!**

If the power supply voltage is changed, the jumpers inside the motor terminal box, the motor overload relay and the cutout in the control cabinet must be changed.





- 1 Motor overload (rated power supply)
- 2 Motor overload (alternative power supply)
- 3 Reset button
- 4 Motor overload adjustment

## 7.6 Setting the Air System Pressure

The air system pressure is preset at the factory. It can be changed in SIGMA CONTROL to match customer's operational requirements if the password is known. For further details, consult the SIGMA CONTROL service manual.

**Attention!**

**Switching from full load to idle running may take place no more frequently than 2 times per minute.**

Switching frequency can be improved by increasing the difference between cut-in and cut-out pressure.

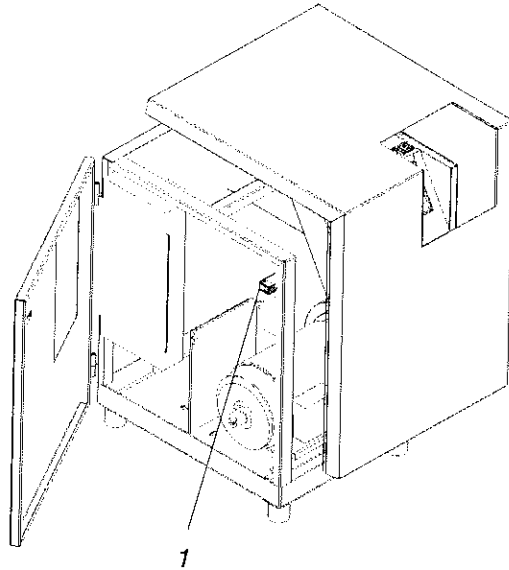
In addition, a larger air receiver can be installed to increase buffer capacity.

## 7.7 Functional Check of the Door Interlock Switch



Do not operate the compressor unit with a malfunctioning door interlock switch.

Do not attempt to modify or by-pass the door interlock switch.



1 Door interlock switch

### Visual door interlock switch check

- ☞ Check that the interlock switch operates smoothly by opening and closing the left-hand maintenance door.

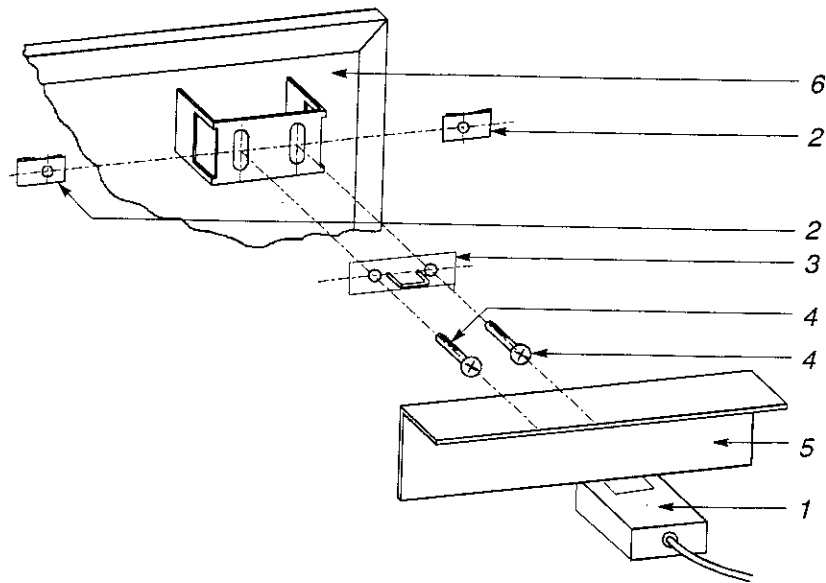
**Attention!**

If the insertion key (3) at the door interlock is incorrectly aligned, inadvertent shutdown of the compressor package can occur.

**The insertion key (3) aligns with the door interlock switch (1) without binding against the sides of the interlock switch when the maintenance door is closed.**

If necessary, re-align the insertion key (3).

- ☞ Loosen the bolts (4).
- ☞ Align the insertion key (3) so that it glides smoothly into the interlock switch (1).
- ☞ If necessary, use washers to help align the insertion key (3) with the interlock switch (1).
- ☞ Tighten the bolts (4) again.



1 Door interlock switch  
2 Clamping nut  
3 Insertion key

4 Bolt  
5 Frame  
6 Maintenance door

#### Functional check of the interlock switch

**Attention!**

A functional check of the door interlock switch must be made after initial start.

- ☞ Start the compressor package (see chapter 8.3).
- ☞ Open the left-hand maintenance door – the compressor package will shut down immediately if the door interlock switch functions correctly.
- ☞ Close the left-hand maintenance door.
- ☞ Reset the alarm message by pressing the acknowledge (reset) key (11, see chapter 8.2.2) on SIGMA CONTROL.

The compressor package is now ready to start again.



## 7.8 Measures to be taken before Initial Start

Follow the procedure detailed below before initial start, after an oil change or if the compressor has not been operated for a period of three months or longer before starting the compressor:

### 7.8.1 Pour a small quantity of oil into the air inlet port



Lock the main disconnect in the "off" position in accordance with applicable lock out/tag out procedures (example: OSHA CFR 29 § 1910.147) to ensure the compressor does not restart.



Do not add oil unless the compressor package is completely vented.

See chapter 9.10 to vent the compressor.

- ☞ To pour in the oil, unscrew the filler plug (1) on the inlet valve (2) and then pour the prescribed quantity of oil (see chapter 1.7) into the airend.
- ☞ Manually rotate the airend in a counter clockwise direction with the drive belts.
- ☞ Screw the filler plug (1) back in.

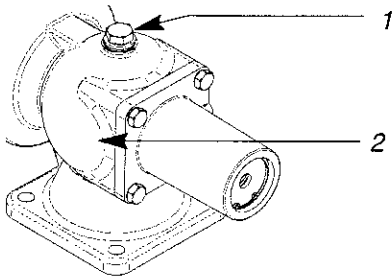
**Attention!**

This oil must be of the same type as the oil used to operate the compressor (see label near the oil filler plug on the oil separator tank).

If no additional oil is available, remove required amount of oil from the oil separator tank. See chapter 9.14 for this procedure.

If the compressor unit was at standstill for more than 12 months, additional precautionary steps have to be taken before putting the unit back into operation. In this case consult the manufacturer.

- ☞ Open the isolation shut-off valve between the compressor and the compressed air system.



- 1 Filler plug
- 2 Inlet valve

### 7.8.2 Running the compressor in idle

At initial start run the compressor package in idle for 20 seconds by pressing the load/idle key (5, see chapter 8.2.2).

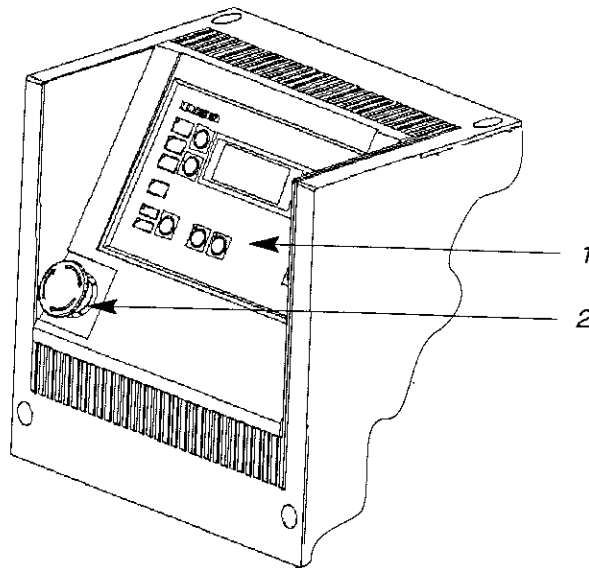
This measure ensures that the compressor package has sufficient time to flood the oil circulation.



If a power failure occurs, the compressor package will start again automatically (normal setting) when the power is restored provided the system pressure is lower than the cut-in pressure entered in the SIGMA CONTROL.

## 8 Operation

### 8.1 Control Panel



- 1 SIGMA CONTROL
- 2 EMERGENCY STOP pushbutton

### 8.2 SIGMA controller

The SIGMA controller (1) is fitted in the control cabinet in the compressor package and serves as the control panel. It has 11 keys and 9 LEDs. Operation of the compressor package is determined by the settings programmed into the controller.

Further details on individual function keys, LEDs and plain text display relating to possible alarms and service messages, display of events, etc. are given in the service manual supplied for the SIGMA CONTROL controller.

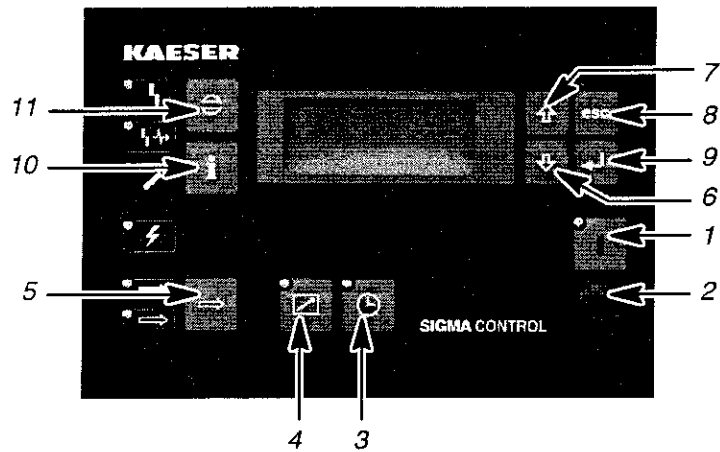
#### 8.2.1 Emergency Stop Pushbutton

The Emergency Stop pushbutton shuts down the compressor package immediately.

If the Emergency Stop pushbutton is pressed because of an existing hazard, then this must be eliminated before the compressor package is reset. To accomplish this the following procedure must be carried out:

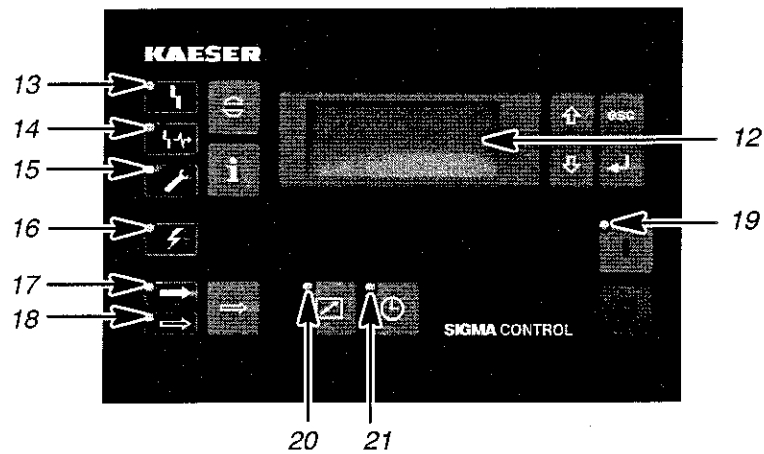
- ☞ Unlatch the Emergency Stop pushbutton by turning in the direction of the arrows.
- ☞ Acknowledge the alarm message on the controller by pressing the acknowledge (reset) key. (function keys see chapter 8.2.2.)

8.2.2 Function keys



- |                    |                            |
|--------------------|----------------------------|
| 1 ON key ("I")     | 6 Menu scroll – DOWN key   |
| 2 OFF key ("0")    | 7 Menu scroll – UP key     |
| 3 Timer ON/OFF key | 8 Escape key               |
| 4 Remote ON key    | 9 Return key               |
| 5 Load/idle key    | 10 Info – event key        |
|                    | 11 Acknowledge (reset) key |

8.2.3 Light emitting diodes and plain text display



- |                                 |                      |
|---------------------------------|----------------------|
| 12 Four–line display            | 17 Load LED          |
| 13 Alarm LED                    | 18 Idle LED          |
| 14 Communication alarm LED      | 19 Compressor ON LED |
| 15 Warning – maintenance LED    | 20 Remote ON LED     |
| 16 Power ON LED (to controller) | 21 Timer ON LED      |

### 8.3 Starting and Stopping the Compressor Unit

**Attention!**

Do not start and stop the compressor package with the main disconnect switch. The compressor must always be switched ON and OFF with keys (1) and (2).

**To turn the compressor ON (local):**

- ☞ Switch on the main disconnect switch.

The controller carries out a self-test. The self-test sequence is visible in the display (12). Afterwards, the green LED (16) illuminates permanently.

- ☞ Press the ON key (1) – LED (19) illuminates.

The compressor status is indicated by LEDs (17) and (18):

**Attention!**

If LED (19) is illuminated and both LEDs (17) and (18) are extinguished the compressor package is at standstill but on duty.

**The compressor package can start at any moment.**

**To turn the compressor OFF (local):**

- ☞ Press the OFF key (2) – LED (19) extinguishes.
- ☞ Lock the main disconnect in the "off" position in accordance with applicable lock out/tag out procedures (example: OSHA CFR 29 § 1910.147) to ensure the compressor does not restart.

See chapter 2.3 for the main disconnect switch.

### 8.4 Acknowledgement of Alarms

If an alarm occurs the compressor package is shut down immediately and the red LED (13) on SIGMA CONTROL flashes.

The bottom line in the display (12) shows the actual fault causing the alarm. A list of alarms that may occur during operation is included in the SIGMA CONTROL service manual.

- ☞ Remove the fault.
- ☞ Acknowledge alarm with the reset key (11) – LED (13) extinguishes.

The compressor package is now ready to start again.

**Attention!**

If the compressor was shut down with the EMERGENCY STOP push-button, then reset by rotating the latched pushbutton in the direction of the arrow before acknowledging the alarm.

## 8.5 Acknowledgement of Service Messages

When maintenance is due the yellow LED (15) on SIGMA CONTROL flashes.

Maintenance due is shown in the display (12).

A list of service messages that may occur during operation is included in the SIGMA CONTROL service manual.

- ☞ Carry out the maintenance work.
- ☞ Acknowledge service message with the reset key (11) – LED (15) extinguishes.

**Attention!**

**When the respective maintenance has been carried out, the remaining interval period (programmed interval until the next maintenance is due) must be reset.**

Detailed information on resetting service counters is to be found in the service manual for SIGMA CONTROL.

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**8.6 Faults: Possible cause – Remedy**

The removal of faults that are not explicitly described in this service manual may only be carried out by KAESER or by an authorised KAESER service agency.

**8.6.1 Working temperature too high****Possible cause:**

The distance from the cooling air inlet or outlet is too small.

Insufficient cooling air flow.

Ambient temperature too high.

If ducting is used for cooling air discharge it could be too narrow or too long.

If the machine is air-cooled, the fluid/air cooler could be clogged.

If the machine is water-cooled, the heat exchanger could be clogged by deposits.

Air inlet filter mats clogged.

Fluid level too low.

Thermostatic valve not functioning correctly.

Wrong cooling fluid used.

Fluid filter clogged.

Airend defective.

**Remedy:**

Keep to the minimum distance and ensure sufficient ventilation.

Ensure sufficient ventilation.

Arrange for a supply of cooler air or move the machine to a cooler place (see chapter 1.6).

Have an authorised KAESER service agent install adequately sized ducting.

Clean the fluid/air cooler (see chapter 9.11).

Have an authorised KAESER service agent inspect, clean or replace the heat exchanger as necessary.

Clean or replace the filter mats.

Top up to the correct level with recommended cooling fluid.

Check and clean the dirt trap strainer in the fluid scavenge line.

Check valve spring and activating piston. Replace defective parts.

Drain off old cooling fluid and replace with recommended type.

Ask an authorized KAESER service agent for recommendations on cooling fluid types.

Change the fluid filter (see chapter 9.12).

Have the airend checked by an authorised KAESER service agent.

**8.6.2 Motor overload protection relay trips****Possible cause:**

Protection relay is defective or incorrectly set.

Motor runs on two phases; motor defective or one of the customer's fuses blown.

**Remedy:**

Check the wiring and reset the relay if necessary.

Replace a defective overload relay.

Check power supply and wiring.

Change fuse(s) or motor as necessary.

**Possible cause:**

Oil separator cartridge clogged.

Motor starts against pressure as the compressor has not vented.

Airend defective.

Ambient temperature too high.

Motor defective; bearing damage or winding short

**Remedy:**

Check pressure drop over the oil separator cartridge. If necessary, change oil separator cartridge and dirt trap sieve.

Check that the vent line ball valve is open.

Check the venting valve diaphragm and change if necessary.

Have the minimum pressure/check valve inspected by an authorized KAESER Service Technician.

Have the airend inspected by an authorized KAESER Service Technician.

Arrange a supply of cooler air or move the machine to a cooler place (see chapter 1.6)

Have the motor repaired or replaced by an authorized KAESER Service Centre.

**8.6.3 Compressor runs but does not reach pressure.****Possible cause:**

Motor turning in the wrong direction.

Inlet valve not opening or only opening partially.

Venting valve not closing under full load.

Minimum pressure/check valve defective.

Leaks in the machine.

Leaks in the air supply system.

The air demand is greater than the capacity of the compressor.

The maintenance hose/coupling is still plugged into the oil separator or after-cooler.

Pressure relief valve blowing off.

**Remedy:**

Check motor connections.

Have the valve inspected by an authorized KAESER Service Technician.

Check the combination control/venting valve and lines and pipework. Replace defective parts.

Have the valve inspected by an authorized KAESER Service Technician.

Tighten all loose connections, repair or replace defective parts.

Check for open valves, loose connections, defective parts or gaskets, etc. and seal or replace.

Reduce the air demand or install additional compressor capacity.

Remove hose/coupling from the connection point.

see chapter 8.6.6.

**8.6.4 Oil leaks out of air filter****Possible cause:**

Oil level in separator tank is too high.

Inlet valve faulty.

**Remedy:**

Drain oil to correct level.

Find the fault and replace the defective part.

**8.6.5 Full-load/Idle sequence occurs too frequently (short cycles)****Possible cause:**

Receiver tank size is too small or there is no tank.

Diameter of hose connecting the unit to the receiver tank is too small.

Minimum pressure check valve leaks.

Flow is restricted at discharge.

**Remedy:**

Consult authorized KAESER distributor for recommended tank size.

Connecting hose diameter should not be smaller than the air discharge pipe diameter. Install larger hose if necessary.

Check the valve and replace defective parts.

Look for plugged filters, partially closed valves, frozen pipes or malfunctioning pressure regulators.

**8.6.6 Safety relief valve blows off****Possible cause:**

System does not discharge at idle.

Oil separator cartridge is contaminated.

Minimum pressure check valve does not open.

Safety relief valve not properly sized for the pressure of the compressor unit.

**Remedy:**

Make sure ball valve in vent line is open. Check the control lines, inlet valve and combined control/vent valve. Replace defective parts as needed.

Check the cartridge pressure differential and replace cartridge if necessary.

Check the valve for blockage and replace defective parts as necessary.

Check blow-off pressure and compare to name plate of the compressor. Replace if necessary.

**8.6.7 Oil in the package****Possible cause:**

Maintenance hose or coupling still plugged into the air receiver connection point.

Pressure relief valve blowing off.

Oil running out of air filter.

Air receiver hose coupling loose.

Oil cooler leaking.

**Remedy:**

Remove hose/coupling from the connection point.

see chapter 8.6.6.

see chapter 8.6.4.

Tighten up hose coupling or replace as necessary.

Have the oil cooler replaced by an authorized KAESER Service Technician.

**8.6.8 Excessive oil consumption****Possible cause:**

Wrong oil is being used in the unit.

Oil separator cartridge has ruptured.

**Remedy:**

Replace with correct oil type.

Consult authorized KAESER distributor for other oil types not listed.

Check pressure differential and replace oil separator cartridge if necessary.



**Possible cause:**

Oil separator cartridge mountings are loose.

Oil level in separator tank is too high.

Scavenger line is clogged.

**Remedy:**

Tighten mounting bolts.

Drain oil to correct level.

Inspect dirt trap strainer in scavenger line. Clean or replace clogged parts as necessary.

**9 Maintenance****9.1 Observe the following rules during all maintenance and servicing work:**

Work on power driven equipment may only be carried out by trained or specialized personnel. Follow all applicable OSHA and local safety regulations.

If a power failure occurs, the compressor package starts again automatically (normal setting) provided the line pressure is lower than the pressure threshold parameter entered in SIGMA CONTROL.

Lock the main disconnect switch in the "off" position in accordance with applicable lock out/tag out procedures to ensure the compressor does not restart (see chapter 2.3 for main disconnect switch).

Ensure that no maintenance personnel is working on the compressor unit, that all panels are latched back on again and all maintenance doors are closed before restarting the compressor unit.

To start the compressor unit see chapter 8.3).

**Attention!**

The venting nozzle required to vent the oil separator tank (for maintenance work such as topping up the oil, oil change and filter change) is fitted to the hose coupling (3, see chapter 9.10).



Carry out a visual and functional check of the door interlock switch after any maintenance and servicing work.

See chapter 7.7 for details.



The following points must be observed when handling lubricating and cooling materials:

Avoid contact with skin and eyes.  
Do not inhale vapors and oil mist.  
Do not eat or drink when handling such materials.  
Fire, open flame and smoking are strictly forbidden.



Ensure that all lubricants, consumable materials and replacement parts accumulating during operation and servicing of the compressor package are disposed of according to environmental regulations.

9.2 Regular Maintenance

Interval*	Work to be done	See chapter
2 and 24 h after initial start	Check the v-belt tension	9.4
50 h after initial start	Check all electrical connections for tightness and tighten if necessary	
200 h after initial start	Replace the oil filter	9.12
Weekly	Check the oil level	9.13
	Check the filter mats for contamination	9.6
500 h	Check the v-belt tension	9.4
	Clean or replace the air filter	9.7
1000 h	Check the oil cooler and air aftercooler for contamination	9.11
	Clean or replace the filter mats	9.6
up to 3000 h or at least annually	Replace the oil filter	9.12
Proper interval varies. See chapter 1.8	Change the oil	9.14
up to 9000 h or at least every 3 years	Change the oil separator cartridge	9.15
Annually	Check all electrical connections for tightness and tighten if necessary	
12000 h	Have the valves inspected by an authorized KAESER Service agent	
Annually	Have the safety relief valve checked by authorized KAESER Service agent	9.9
6000/12000 hours or at least within three years	Have the compressor motor bearings relubricated by authorized KAESER distributors*	9.8

\* The maintenance period can vary depending on the cycle rate and environmental conditions.

We urgently recommend that a record is kept of the maintenance work done (see chapter 9.16).

### 9.3 Opening and Closing the Compressor Cabinet

**To open:**

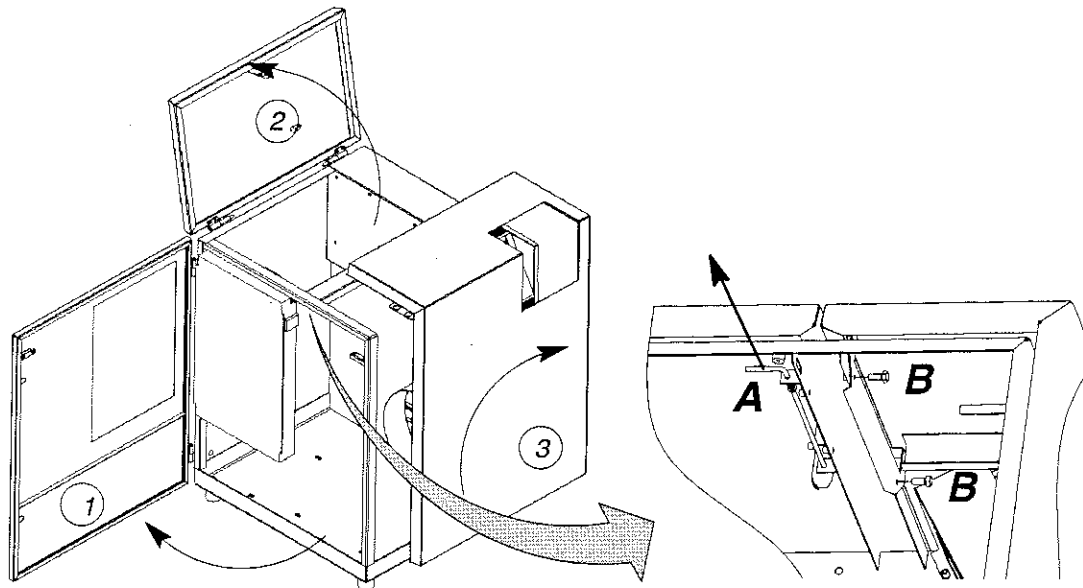
- ☞ Open the access door (1).
- ☞ Pull the locking lever (3, photo A) outwards, turn 90° in the direction of the arrow and latch onto the frame.
- ☞ Lift the panel (2) and remove.

**To close:**

- ☞ Turn the locking lever (3) to its initial position.
- ☞ Attach the panel (2) making sure that it latches.
- ☞ Close the access door (1).



**Close all maintenance doors and panels correctly before starting the compressor package.**



- 1 Maintenance door
- 2 Cover panel
- 3 Unlocking lever

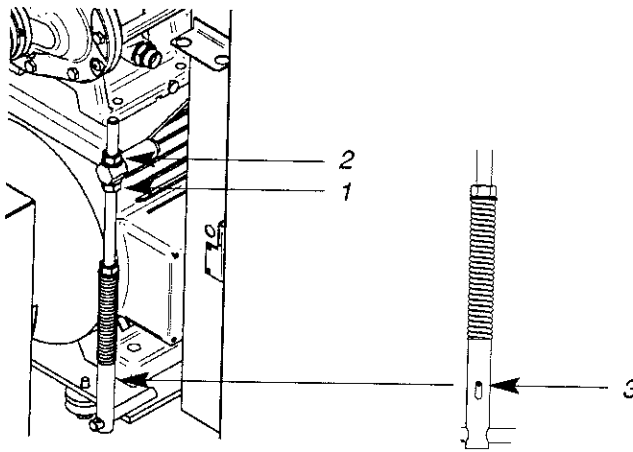
## 9.4 Checking the Drive Belt Tension

- ☞ Switch off the compressor unit (see chapter 8.3).



**Lock the main disconnect switch in the "off" position in accordance with applicable lock out/tag out procedures to ensure the compressor does not restart.**

Check the tension of the belt drive after the first 2 and 24 hours of operation and thereafter every 500 hours of operation.



- 1 Hexagonal nut
- 2 Hexagonal nut
- 3 Indicator pin

The belt drive tension is automatically adjusted within a limited range by the pressure spring of the belt tensioning device.

Re-tension the belt drive if the belts have stretched to the point where the indicator pin (3) is situated at the **top end of its indicator slot**.

- ☞ Loosen the hexagonal nut (2).
- ☞ Tension the belt drive with the hexagonal nut (1) until the indicator pin (3) is situated at the **bottom end of its indicating slot**.
- ☞ Tighten the hexagonal nut (2).

## 9.5 Drive Belt Change

- ☞ Switch off the compressor unit (see chapter 8.3).



**Lock the main disconnect switch in the "off" position in accordance with applicable lockout/tagout procedures to ensure the compressor does not restart.**

- ☞ Loosen the hexagonal nut (2, see chapter 9.4).
- ☞ Screw the hexagonal nut (1, see chapter 9.4) until the V-belts are loose.
- ☞ Remove the V-belts.

**Attention!**

**It is essential that replacement belts are all precisely the same length (each set) and absolutely oil-proof. For this reason we recommend that only original KAESER drive belts are used.**

- ☞ Place the new V-belts over the motor and compressor pulleys without straining them.
- ☞ Set the belt drive tension (see chapter 9.4).

**Attention!**

**Check the belt drive tension after 2 hours of operation and then again after 24 hours of operation, as experience shows that the belts stretch mostly during this period.**

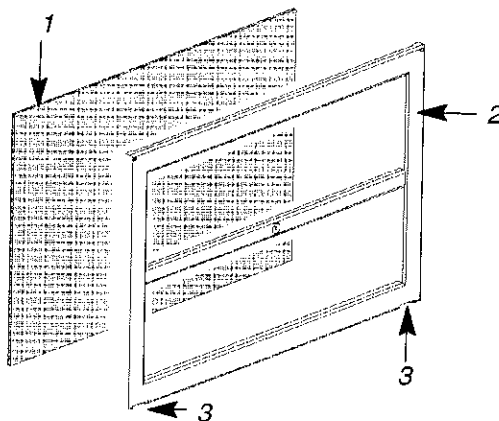
## 9.6 Cleaning or Replacing the Filter Mat

Clean the filter mat every week depending on the dust content of the intake air and replace if necessary as detailed in the maintenance schedule (see chapter 9.2).

- ☞ Switch off the compressor package (see chapter 8.3).



**Lock the main disconnect switch in the "off" position in accordance with applicable lockout/tagout procedures to ensure the compressor does not restart.**



- 1 Filter
- 2 Holding frame
- 3 Closure

- ☞ Press closures (3) inwards and remove the holding frame.

**Cleaning:**

Rinse the mat in warm water (approximately 105°F), if necessary, use a mild detergent soap to rinse out oily dust. The mat can also be tapped, vacuum cleaned or blown out with compressed air (not in excess of 30 psig).

**Attention!**

**If the mat is heavily soiled or has been cleaned often (maximum five times), replace it.**

- ☞ Locate the holding frame and press into position.

The holding frame is secure when the closures engage.

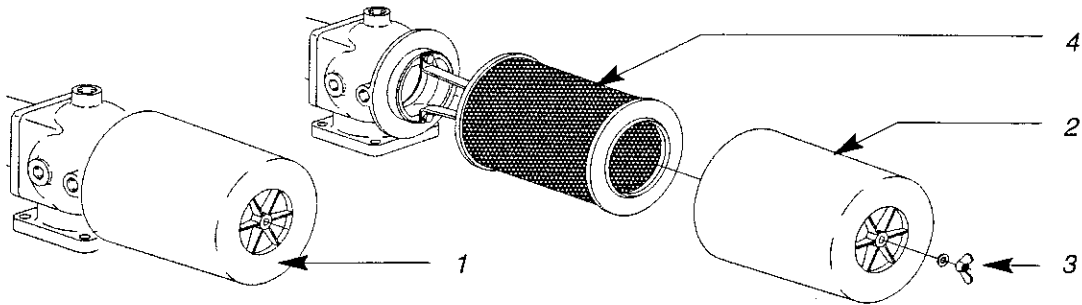
## 9.7 Cleaning or Replacing the Air Filter

Clean the air filter after every 500 service hours.

- ☞ Stop the compressor package (see chapter 8.3).



**Lock the main disconnect switch in the "off" position in accordance with applicable lock out/tag out procedures to ensure the compressor package does not restart.**



- 1 Air filter
- 2 Air filter cap
- 3 Wing nut for opening air filter housing
- 4 Air filter cartridge

### To open the air filter housing:

- ☞ Unscrew the wing nut (3) and remove the air filter cap (2) and the filter cartridge (4).
- ☞ Clean the air filter cap and sealing surfaces.

### Cleaning the air filter cartridge (4) by tapping:

- ☞ Tap the air filter cartridge several times on the front with the ball of the hand.

**Attention!**

**Do not use excessive force otherwise the air filter cartridge may be damaged.**

- ☞ Clean all sealing surfaces.

### Cleaning the air filter cartridge with compressed air:

- ☞ Use dry, compressed air blowing at a pressure of not more than 30 psig at a slant from the inside to the outside of the air filter cartridge surfaces.

**Attention!**

**Do not clean the air filter cartridge with fluids. If the air filter cartridge is heavily contaminated or was already cleaned several times (max. five times), replace.**

**Compressed air shall not be used for cleaning purposes except where reduced to less than 30 psig and then only with effective chip guarding and personal protective equipment. (OSHA CFR 29 § 1910.242)**

### To close the filter housing:

- ☞ Insert the filter cartridge (4) and replace the air filter cap (2).
- ☞ Screw on the wing nut (3) tightly.

## 9.8 Servicing the Electric Motor

### Compressor motor:

The electrical motor bearings are permanently greased.

**Attention!**

**Have the motor bearings replaced by authorized KAESER distributors in accordance with the maintenance schedule (see chapter 1.9).**

**9.9 Testing the Safety Relief Valve on the Oil Separator Tank**

To test the set point of the safety relief valve, the compressor must be run so that its discharge pressure exceeds the maximum pressure set on the SIGMA CONTROL.

See chapter 1.5 for the safety relief valve activating pressure.

**Attention!**

Have the safety relief valve tested by an authorized KAESER distributor in accordance with the maintenance schedule (see chapter 9.2).

For more details see SIGMA CONTROL manual.

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**9.10 Venting the compressor unit**

- ☞ Switch off the compressor unit (see chapter 8.3).

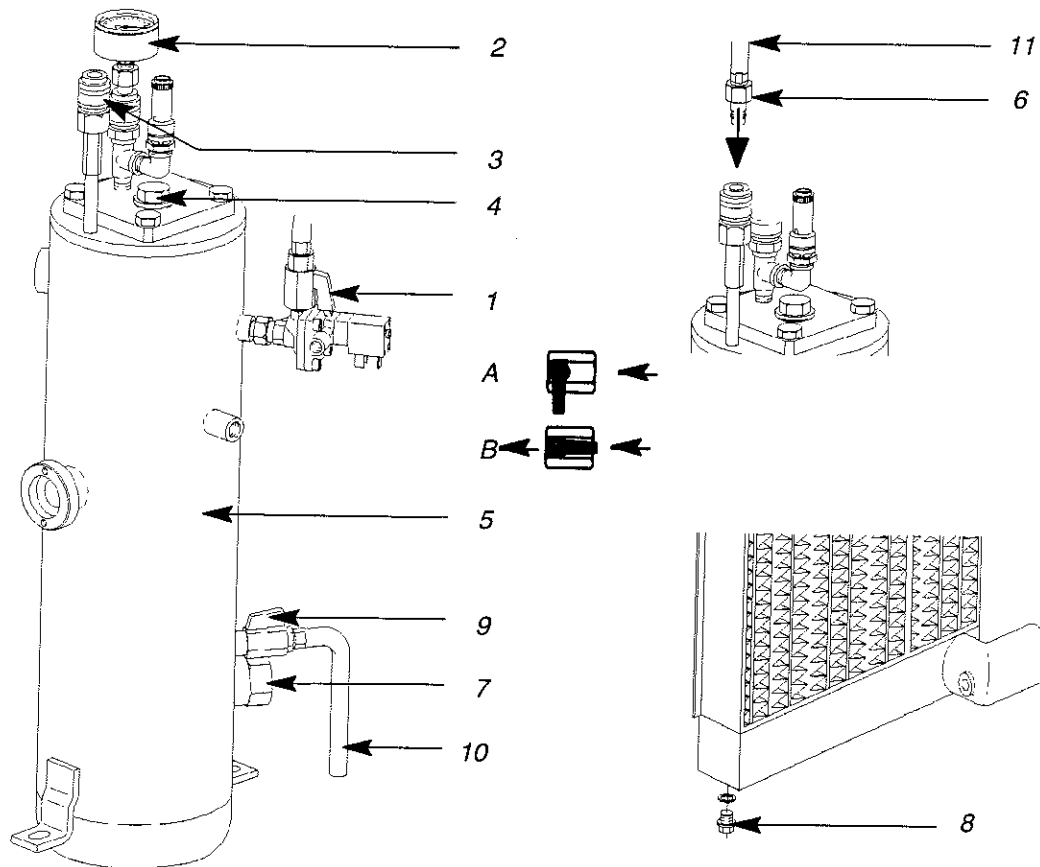


Lock the main disconnect in the "off" position in accordance with applicable lock out/tag out procedures to ensure the compressor does not restart.

Lock the isolation shut-off valve in the "closed" position and vent all compressed air trapped between the compressor and the isolation shut-off valve in accordance with applicable lock out/ tag out procedures.

The oil circulation system of the compressor package vents automatically.

**Venting the oil separator tank:**



- |                                  |                                |  |
|----------------------------------|--------------------------------|--|
| 1 Ball valve<br>A shut<br>B open | 4 Filler plug<br>(oil top-off) | 8 Screwed sealing plug<br>(oil cooler) |
| 2 Pressure gauge                 | 5 Oil separator tank           | 9 Ball valve – oil drain               |
| 3 Hose coupling                  | 6 Nozzle                       | 10 Hose coupling                       |
|                                  | 7 Oil level                    | 11 External pressure source            |

- ☞ The pressure gauge on the oil separator tank must indicate zero psig.



**Oil mist can escape when the oil separator tank is vented.**

- ☞ Insert the nozzle (6) in the hose coupling (3) on the oil separator tank. The residual pressure in the oil separator tank escapes.

- ☞ Remove the nozzle (6) from the hose coupling (3).

**Venting the air aftercooler:**

When the compressor package is vented, pressure is still present in the air aftercooler and the pipework up to the minimum pressure check valve. For this reason the compressor package must be isolated from the compressed air system by closing the shut-off valve between the compressor package and the compressed air system. If isolation shut-off valve is not available, vent the compressed air system completely.

- ☞ Carefully remove the screw fitting (4, see chapter 9.11). The air aftercooler vents.
- ☞ Tighten the screw fitting again.



**Close all maintenance doors and panels correctly before starting the compressor package.**

### 9.11 Cleaning the Oil Cooler and Aftercooler

The oil cooler and air aftercooler must be checked for clogging regularly. Heavy contamination could lead to excessive temperatures in the oil circulation system.

See regular maintenance schedule for cooler maintenance interval (chapter 9.2).

☞ Switch off the compressor package under full load (see chapter 8.3).



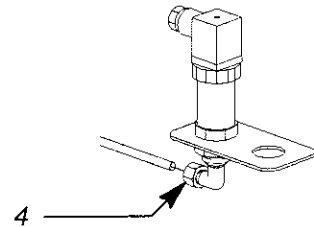
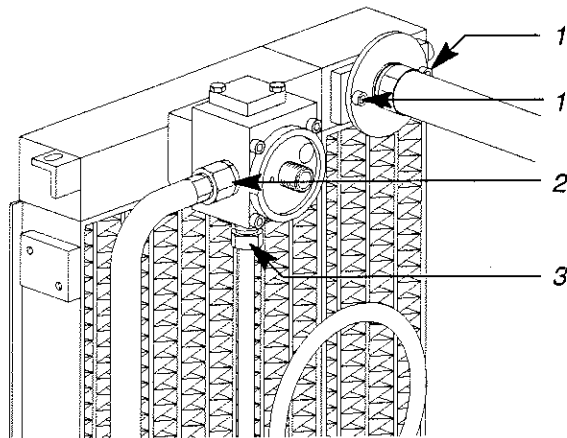
**Lock the main disconnect in the "off" position in accordance with applicable lock out/tag out procedures to ensure the compressor does not restart.**



**Before opening or removing pressurized components (pipes, hoses, tanks, etc.) it is imperative that the compressor package is completely depressurized.**

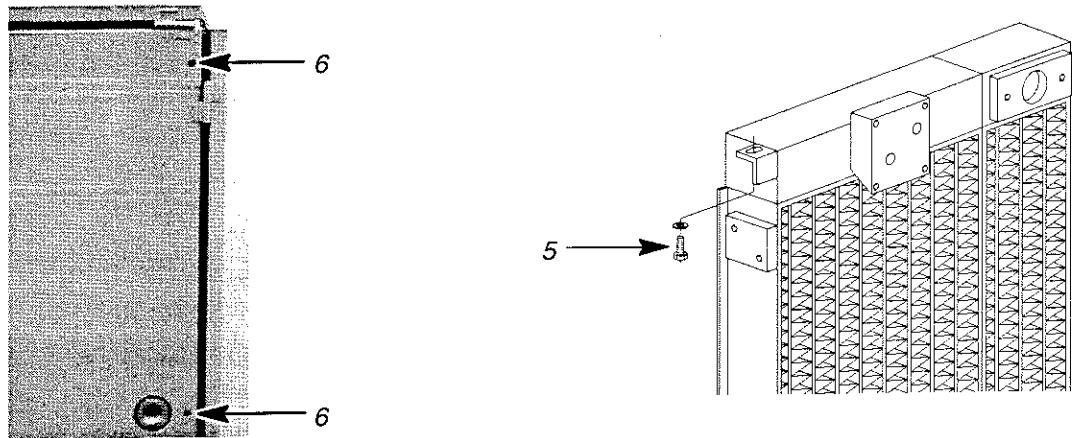
☞ Venting the compressor package (see chapter 9.10).

#### 9.11.1 Removing and cleaning the oil cooler/air aftercooler



- 1 Allen screw
- 2 Hose screw fitting
- 3 Pipe screw fitting
- 4 Pipe screw fitting

- ☞ Unscrew the hose connector (2) and the pipe connector (3) from the combination valve.
- ☞ Unscrew the Allen screws (1) on the aftercooler.
- ☞ Remove and check the O-ring on the aftercooler.
- ☞ Close up the pipes and openings on the combination valve, and aftercooler.



- 5 Hexagonal nut  
6 Allen screw

☞ Unscrew the hex bolt (5).

The hex socket head bolts (6) are located behind two protective caps.

**Attention!**

**Before unscrewing the two hex socket head bolts (6) prop up the combination oil/air aftercooler.**

- ☞ Remove the protective caps and unscrew the two hex socket head bolts (6).  
☞ Take out the aftercooler.



**Do not direct compressed air, water or steam jets toward any person. These represent contained energy and as such, are dangerous to life.**



**The soiled cooler laminations may be cleaned with water or steam jet only in designated cleaning areas with oil separators suited for such purpose!**

- ☞ Clean the cooler laminations with compressed air, water or steam jet.

**Attention!**

**Seat the O-rings correctly in the compressed air inlet of the oil/air aftercooler during reassembly.**

- ☞ Reassemble in the reverse order.  
☞ See chapter 9.13 for topping off the oil.  
☞ Open the isolation shut-off valve between the compressor and the compressed air system.

**Perform a test run**

**When the operating temperature is reached (see chapter 1.1), shut down the compressor package (see chapter 8.3) and lock the main disconnect in the "off" position in accordance with applicable lock out/tag out procedures (example: OSHA CFR 29 § 1910.147) to ensure the compressor does not restart.**

**Afterwards, carry out a visual check for leaks.**

**9.12 Oil Filter Change**

Hot oil; beware of scalding.

**Attention!**

Replace the run-in oil filter cartridge with a standard oil filter cartridge (supplied with the compressor) after approximately 200 operating hours.

Change the oil filter cartridge according to the regular maintenance schedule (see chapter 9.2) or when the corresponding service message is displayed on SIGMA CONTROL (see chapter 8.1).

It is recommended that the oil filter cartridge is replaced always when the oil is changed.

**9.12.1 Removal and replacement of the oil filter cartridge**

- ☞ Stop the compressor package under full load (see chapter 8.3).

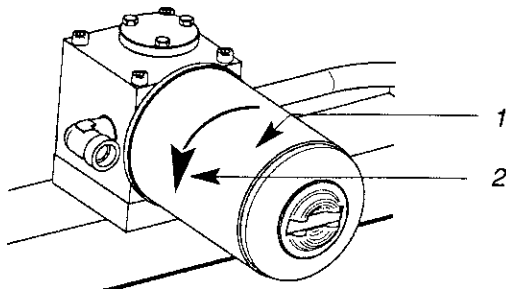


Lock the main disconnect in the "off" position in accordance with applicable lock out/tag out procedures (example: OSHA CFR 29 § 1910.147) to ensure the compressor does not restart.



Before opening or removing pressurized components (pipes, hoses, tanks, etc.) it is imperative that the compressor package is completely depressurized.

- ☞ Venting the compressor package (see chapter 9.10).



- 1 Oil filter cartridge
- 2 Turn in this direction to unscrew the cartridge

- ☞ Twist the used or contaminated oil filter cartridge counter clockwise to remove and catch escaping oil in a suitable container.



**Dispose of the old oil filter and any used, accumulated oil according to environmental care regulations!**

- ☞ Clean the face of the combination block with a lint free cloth.
- ☞ Lightly oil the gasket of the new filter cartridge before screwing into position.
- ☞ Screw in the new filter cartridge clockwise by hand until the gasket fits tightly.

**Attention!**

**Do not use a tool as this may cause damage to the oil filter cartridge and the gasket.**

- ☞ Check the oil level (see chapter 9.13).

- ☞ Open the isolation shut-off valve between the compressor and the compressed air system.

**Perform a test run**

When the operating temperature is reached (see chapter 1.1), shut down the compressor package (see chapter 8.3) and lock the main disconnect in the "off" position in accordance with applicable lock out/tag out procedures (example: OSHA CFR 29 § 1910.147) to ensure the compressor does not restart.

Afterwards, carry out a visual check for leaks.

---

**9.13 Oil Top-Off**

Check the oil level weekly with the oil level sight gauge when the compressor package is shut down. If necessary, top off the oil to the maximum level. To do this, it is imperative that the compressor package is switched off under full load conditions and that the oil level is allowed to settle for five minutes. Do not exceed the maximum level.

☞ Stop the compressor package under full load (see chapter 8.3).

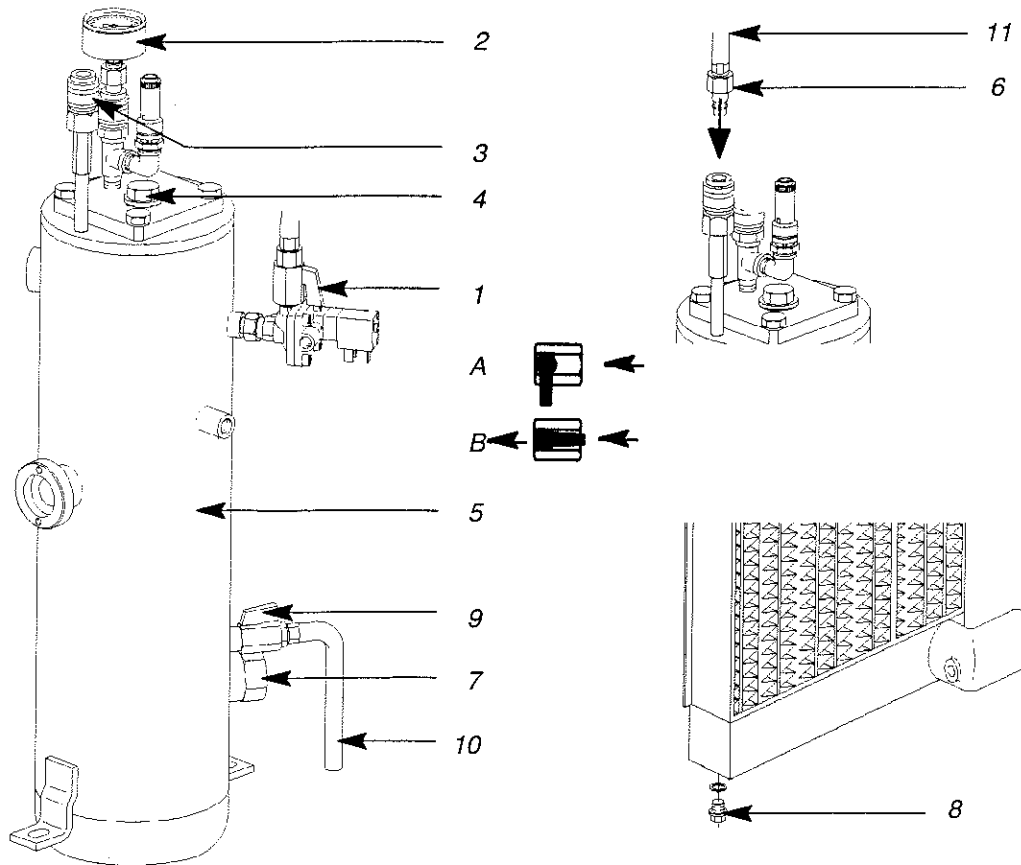


Lock the main disconnect in the "off" position in accordance with applicable lock out/tag out procedures (example: OSHA CFR 29 § 1910.147) to ensure the compressor does not restart.



Before opening or removing pressurized components (pipes, hoses, tanks, etc.) it is imperative that the compressor package is completely depressurized.

☞ Venting the compressor package (see chapter 9.10).



- 1 Ball valve  
A shut  
B open
- 2 Pressure gauge
- 3 Hose coupling

- 4 Filler plug  
(oil top-off)
- 5 Oil separator tank
- 6 Nozzle
- 7 Oil level

- 8 Screwed sealing plug  
(oil cooler)
- 9 Ball valve – oil drain
- 10 Hose coupling
- 11 External pressure source

- ☞ Unscrew the oil filler plug (4) on the oil separator tank.
- ☞ Top off the oil to the maximum mark.

- ☞ Check the gasket ring of the filler plug (4) for damage and then screw in the filler plug.
- ☞ Open the isolation shut-off valve between the compressor and the compressed air system.

**Attention!**

After an oil change or oil cooler cleaning (with removal of the oil cooler) run the compressor package up to operating temperature to ensure that the combination valve closes and that the oil cooler is flooded with oil.

Afterwards, repeat the procedures "Venting the Compressor Package" (chapter 9.10) and "Topping off the Oil" (chapter 9.13).

**Attention!**

Always use the same brand and type of oil when topping off the oil. (see label on the oil separator tank).

During an oil change, drain the old oil completely and always replace the oil filter.

Never mix different oil types or brands.

Oil recommendations see chapter 1.8

## 9.14 Oil Change (Oil Separator Tank and Oil Cooler)

For type of oil and frequency of oil change see chapter 1.8

Oil change must be carried out with warm to the touch condition of the compressor package (Oil temperature approx. 104°F).



**Danger of scalding with hot oil.**

When inserting the maintenance hose into the compressor's hose couplings, always have the ball valve closed and the hose end secured before slowly opening the ball valve. Beware of air/oil mist that could blow out of the hose. Unrestricted air/oil flow through the hose end will result in a whipping action which could cause severe injury or death.

If the compressor package operates in ambient temperatures close to the maximum ambient temperature (see chapter 1.6), change the oil more often (e.g. 1/2 or 1/4 of recommended interval).

**Attention!**

Drain the oil out of the oil separator tank, cooler and the oil pipes completely. See chapter 9.14.4 for putting back into operation.

**Attention!**

If a heat recovery system is fitted drain all the oil in the heat exchanger during the oil change.

- ☞ Stop the compressor package under full load (see chapter 8.3).



Lock the main disconnect in the "off" position in accordance with applicable lock out/tag out procedures (example: OSHA CFR 29 § 1910.147) to ensure the compressor does not restart.



- ☞ Hang the oil drain hose (10) into the container and secure.
- ☞ Slowly open the ball valve (9). The remaining pressure in the oil circulation forces out the oil. When air escapes, close the ball valve (9) immediately.



**Before opening or removing pressurized components (pipes, hoses, tanks, etc.) it is imperative that the compressor package is completely depressurized.**

- ☞ Venting the compressor package (see chapter 9.10).

#### **Draining the cooling fluid at the fluid cooler:**

- ☞ Place a container under the fluid cooler.
- ☞ Slowly unscrew the drain plug (8) (cooling fluid flows out without pressure).
- ☞ Screw in and tighten the drain plug (8) again.



**Dispose of the used oil according to environmental regulations.**

#### **9.14.2 Oil top-off**

- ☞ Unscrew the oil filler plug (4) on the oil separator tank.

#### **Attention!**

**Always use the same brand and type of oil when topping off the oil. (see label on the oil separator tank).**

**During an oil change, drain the old oil completely and always replace the oil filter.**

**Never mix different oil types or brands.**

**Oil recommendations see chapter 1.8**

- ☞ Top off the oil to the maximum mark.  
See chapter 1.7 for the quantity of oil.
- ☞ Check the gasket ring of the filler plug (4) for damage and then screw in the filler plug.

#### **9.14.3 Draining the oil using own compressed air**

- ☞ Shut down the compressor unit under full load (see chapter 8.3).



**Lock the main disconnect in the "off" position in accordance with applicable lock out/tag out procedures to ensure the compressor does not restart.**

**Lock the isolation shut-off valve in the "closed" position and vent all compressed air trapped between the compressor and the isolation shut-off valve in accordance with applicable lock out/ tag out procedures.**

The compressor unit oil circulation system vents automatically.

- ☞ The pressure gauge on the oil separator tank must indicate zero psig.
- ☞ Close the vent line ball valve (1).



**Close all maintenance doors and panels correctly before starting the compressor package.**

- ☞ Start the compressor package (see chapter 8.3) and allow to run for approximately 30 seconds.
- ☞ Stop the compressor package under full load (see chapter 8.3).



**Lock the main disconnect in the "off" position in accordance with applicable lock out/tag out procedures (example: OSHA CFR 29 § 1910.147) to ensure the compressor does not restart.**

- ☞ Check the actual pressure on the pressure gauge (2). Open the shut-off valve (1), let the pressure on the pressure gauge (2) sink to approximately 40 psig and then close the shut-off valve (1) again.
- ☞ Drain the oil from the oil separator tank and the oil cooler. Proceed as detailed in chapter 9.14.1).
- ☞ Open the shut-off valve (1).
- ☞ Top off the oil. Proceed as detailed in chapter 9.14.2).
- ☞ Close all maintenance doors and reattach all cover panels.

#### **9.14.4 Procedure for putting back into operation**

- ☞ Refer to chapter 7.8.1 and follow the instructions in section "Pouring a small quantity of oil into the air inlet port".
- ☞ Refer to chapter 7.8.2 and follow the instructions in section "Running the compressor package in idle".
- ☞ Refer to chapter 9.10 and follow the instructions in section "Venting the compressor package".
- ☞ Top off with oil again (see chapter 9.14.2).
- ☞ Open the shut-off valve between the compressor package and the air system.
- ☞ Start the compressor package (see chapter 8.3) and run until working temperature is reached (see chapter 1.1).
- ☞ Top off the oil, see chapter 9.13.



#### **Perform a test run**

**When the operating temperature is reached (see chapter 1.1), shut down the compressor package (see chapter 8.3) and lock the main disconnect in the "off" position in accordance with applicable lock out/tag out procedures (example: OSHA CFR 29 § 1910.147) to ensure the compressor does not restart.**

**Afterwards, carry out a visual check for leaks.**

### 9.15 Changing the Oil Separator Cartridge

The service life of the oil separator cartridge is strongly influenced by the degree of contamination of inlet air and on strict adherence to the recommended maintenance intervals of the air and oil filters.

We recommend that the oil separator cartridge is changed with the oil or when the relevant service message / alarm message is displayed on SIGMA CONTROL (see chapter 8.1).

☞ Stop the compressor package under full load (see chapter 8.3).

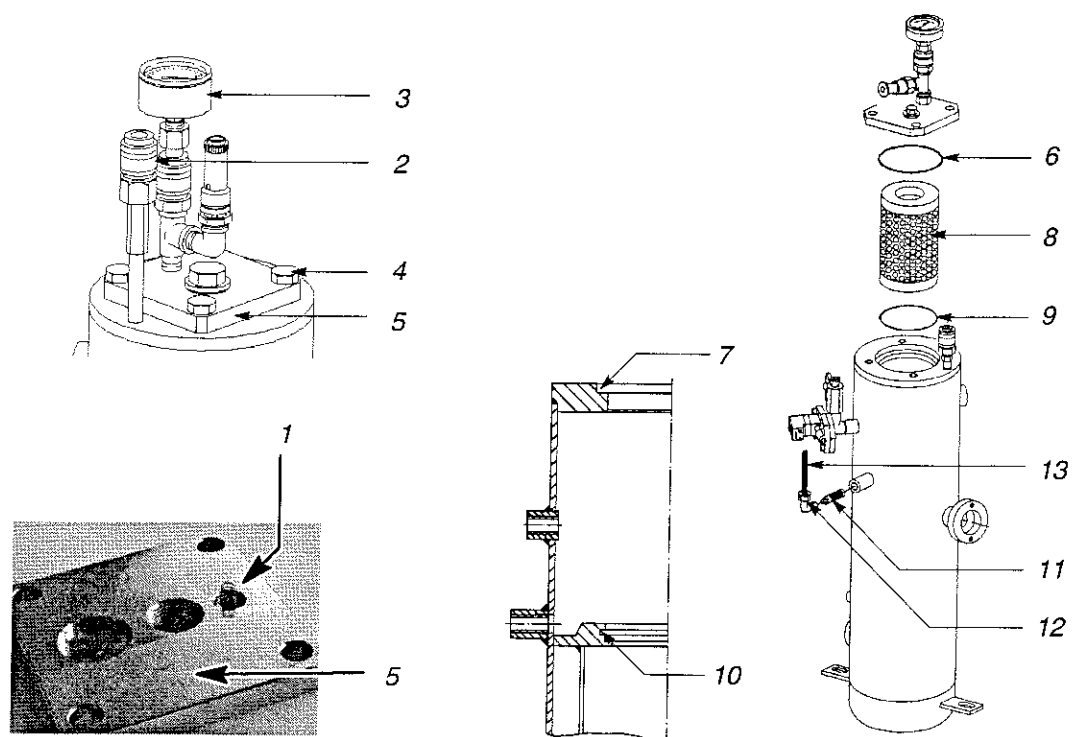


**Lock the main disconnect in the "off" position in accordance with applicable lock out/tag out procedures (example: OSHA CFR 29 § 1910.147) to ensure the compressor does not restart.**



**Before opening or removing pressurized components (pipes, hoses, tanks, etc.) it is imperative that the compressor package is completely depressurized.**

☞ Venting the compressor package (see chapter 9.10).



- 1 Spring
- 2 Hose coupling
- 3 Pressure gauge
- 4 Hexagonal nut
- 5 Cover

- 6 O-Ring (dia.80x8mm)
- 7 Groove
- 8 Oil separator cartridge
- 9 O-Ring (dia.80x3,5mm)
- 10 Groove

- 11 Dirt trap
- 12 Elbow fitting
- 13 Control line



**Grounding the oil separator cartridge is by means of a spring, inset and clamped in the separator cover (5).**

**Do not damage the spring when changing the separator cartridge because grounding can only be ensured when it is in perfect condition.**

- ☞ Unscrew the hexagonal bolts (4) and remove the cover plate (5).
- ☞ Take out the old oil separator cartridge (8) with the O ring (6) and O ring (9) and dispose of according to environmental regulations.
- ☞ Clean the sealing surfaces of the oil separator tank.

**Attention!**    **The oil separating cartridge is disposable and cannot be cleaned.**

- ☞ Insert the new O ring (9) into the groove (10) in the oil separator tank.
- ☞ Insert the new oil separator cartridge (8) and then insert the new O ring (6) into the groove (7).
- ☞ Fit the cover plate (5) and tighten down with the hexagonal bolts (4).
- ☞ Unscrew the union nut of the elbow fitting (12) and pull out the control air pipe (13).
- ☞ Unscrew and remove the elbow fitting (12) from the oil separator tank together with the dirt trap screen filter (11).
- ☞ Replace the old dirt trap screen filter with a new one.
- ☞ Wrap teflon tape around the outside thread of the elbow fitting (12) and screw back into the oil separator tank.
- ☞ Insert the control air pipe (13) into the elbow fitting (12) and tighten up the union nut.
- ☞ Open the isolation shut-off valve between the compressor and the compressed air system.



#### **Perform a test run**

**When the operating temperature is reached (see chapter 1.1), shut down the compressor package (see chapter 8.3) and lock the main disconnect in the "off" position in accordance with applicable lock out/tag out procedures (example: OSHA CFR 29 § 1910.147) to ensure the compressor does not restart.**

**Afterwards, carry out a visual check for leaks.**



**10 Spare Parts and After Sales Service**

**10.1 Service parts and maintenance parts**



The removal of faults that are not explicitly described in this service manual may only be carried out by KAESER or by an authorised KAESER service agent. (see chapter 9.1).

<b>KAESER</b> COMPRESSORS		
Model		Part No.
Year		Serial No.
psig	cfm	Voltage
Hz/RPM		Package FLA
Phase	HP	Drive Motor FLA
Wiring Diagram		
FOR SERVICE, REFER TO EQUIPMENT NUMBER		MADE IN GERMANY

**Important for spare parts orders:**

☞ Enter the data on the compressor name plate in the name plate shown above.

**Always** quote the data on the name plate when ordering spare parts.

**Attention!**

**Always order original spare parts from the compressor manufacturer to avoid lower quality spare parts in your compressor unit.**

Supplementary information for specialised personnel concerning spare parts is found in chapter 11.2.

Description	No. off	Order No.
Oil filter	1	1200
Air filter cartridge	1	1250
Filter mat	1	1050

Description	No. off	Order No.
Oil separator cartridge, complete set, Comprising: Separating cartridge	1	1450
O Ring	2	
Dirt trap screen filter	1	
Hose pipe from the minimum pressure check valve to the air/oil cooler	1	7150
Hose pipe from the air/oil cooler to the compressor air end	1	7100
V-belt set	1	1800

**10.2 Service and Maintenance Agreement**

We recommend that you take out a service and maintenance agreement with an authorized KAESER distributor. This is your best guarantee of reliable air supplies.

✉	.....
	.....
	.....
	.....
☎	.....

11 Appendix

11.1 Wiring Diagram



Wiring Diagram  
 compressor SM 11  
 wye-delta changeover  
 230V 3Ø 60CY or 460V 3Ø 60CY

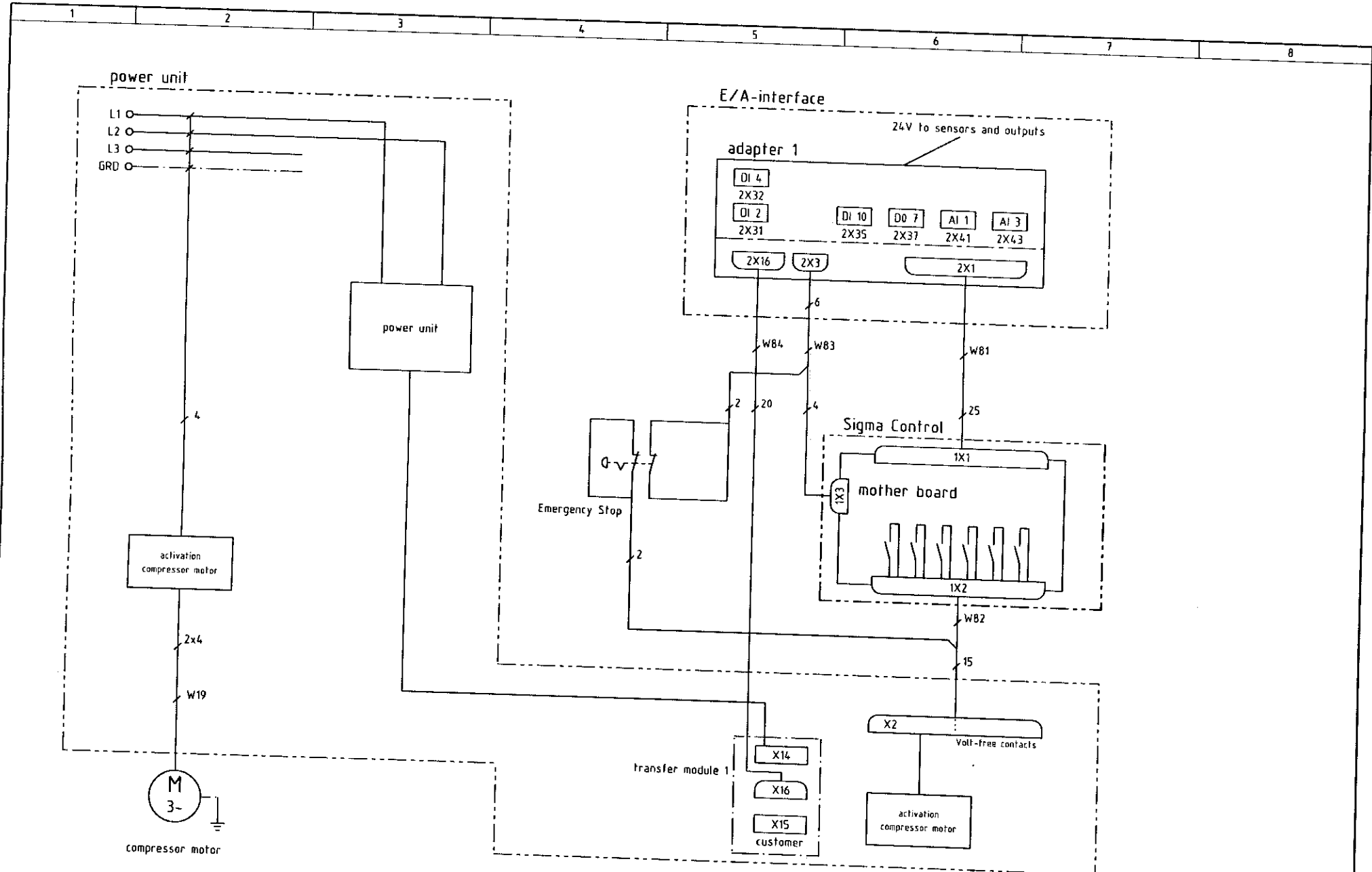
manufacturer: KAESER COMPRESSORS  
 96450 COBURG  
 GERMANY

c			Datum	11.07.2000	USE	<b>KAESER</b> KOMPRESSOREN	cover page compressor SM 11	= *	
b		Bearb.	Sittler						
a		Gepr.	Büchner						
A	Anderung	Datum	Name	Norm.	Ersatz durch:	Ersatz für:	Ursprung: USMU1009	Sigma Control DSM11.Y-U1010.00	Blatt 1 Bl.

a				Bearb. Siffer																
A	Anderung	Datum	Name	Gepr. Büchner	Ersatz durch:	Ersatz für:	Ursprung: USMU1009	cover page compressor SM 11						Sigma Control	DSM11.Y-U1010.	Blatt 1	Bl.			

Lfd. Nr. No.	Benennung Name	Zeichnungsnummer (Kunde) Drawing No. (customer)	Zeichnungsnummer (Hersteller) Drawing No. (manufacturer)	Blatt Page	Anlagenkennzeichen Unit designation
1	cover page				
2	list of contents		DSM11.Y-U1010.00	1	
3	block diagram		ZSM11.Y-U1010.00	1	
4	wiring diagram power unit		USM11.Y-U1010.00	1	
5	wiring diagram control voltage tapping		SSM11.Y-U1010.00	1	
6	wiring diagram power supply unit		SSM11.Y-U1010.00	2	
7	wiring diagram mother board/inputs		SSM11.Y-U1010.00	3	
8	wiring diagram mother board/inputs		SSM11.Y-U1010.00	4	
9	wiring diagram mother board/inputs		SSM11.Y-U1010.00	5	
10	wiring diagram mother board/outputs		SSM11.Y-U1010.00	6	
11	wiring diagram mother board/outputs		SSM11.Y-U1010.00	7	
12	component legend		SSM11.Y-U1010.00	8	
13	electrical component parts list controller		SSM11.Y-U1010.00	9	
14	terminal connection terminal strip -X11,-X2		GSM11.Y-U1010.00	1	
15	terminal connection terminal strip -X14,-X15		KSM11.Y-U1010.00	1	
16	lay-out control panel		KSM11.Y-U1010.00	2	
			ASM11.Y-U1010.00	1	

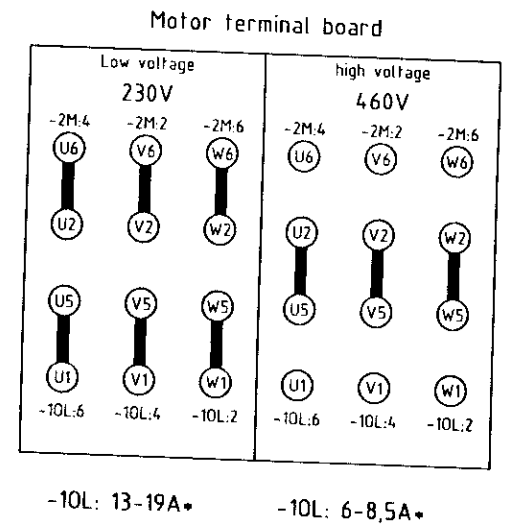
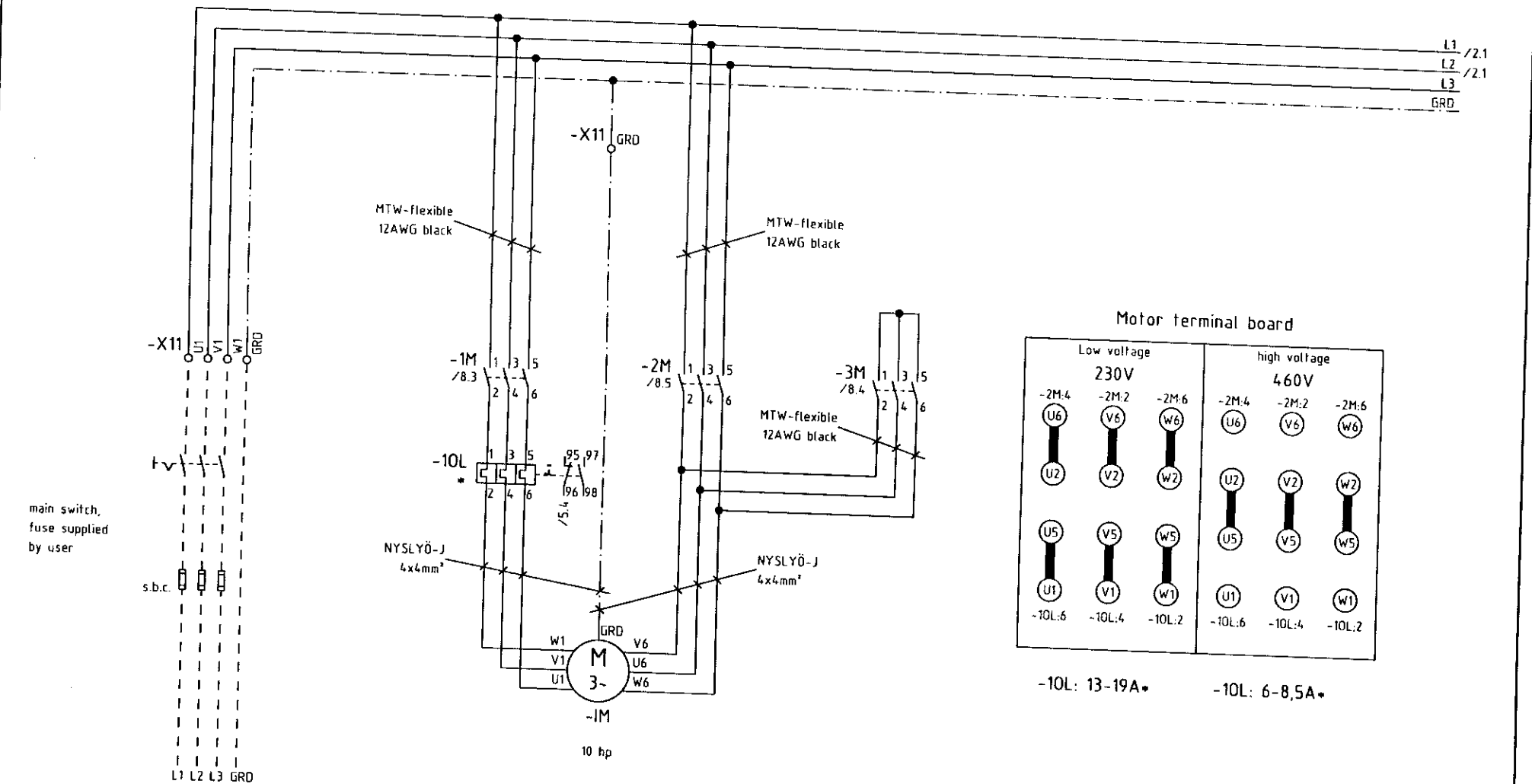
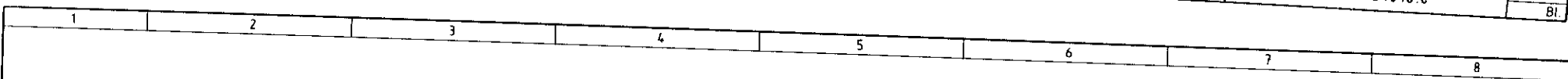
c				Datum	11.07.2000															
b				Bearb. Siffer																
a				Gepr. Büchner																
B	Anderung	Datum	Name	Norm	Ersatz durch:	Ersatz für:	Ursprung:	list of contents compressor SM 11							ZSM11.Y-U1010.00	Blatt 1	Bl.			



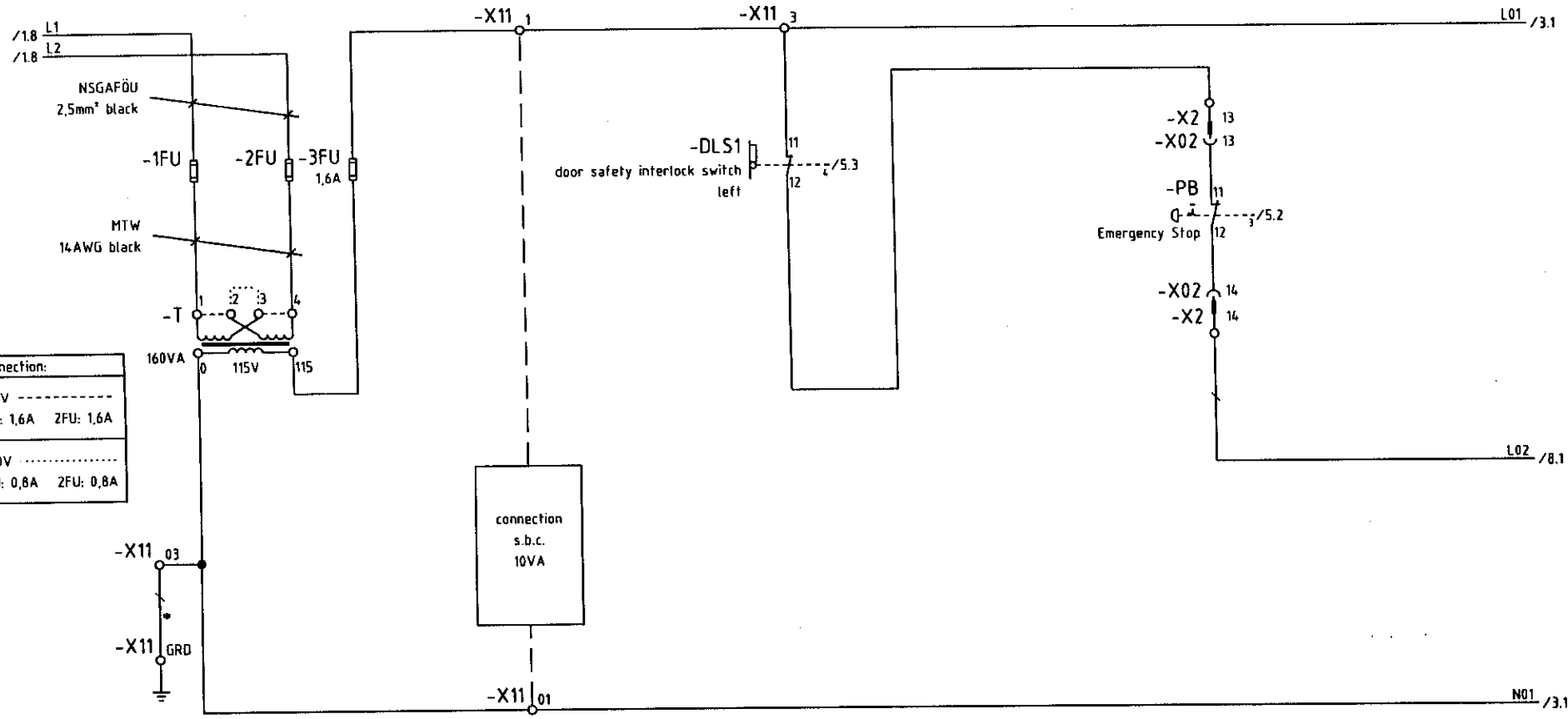
c			Datum	11.07.2009
b			Bearb.	Sifler
a			Gepr.	Büchner

Anderung	Datum	Name	Norm

Ersatz durch:	Ersatz für:	Ursprung: USMU009	<b>KAESER</b> KOMPRESSOREN	block diagram compressor SM 11
---------------	-------------	-------------------	-------------------------------	-----------------------------------



Input voltage 230V 3∅ 60CY or 460V 3∅ 60CY  
supply line cross-section and fusing see service manual

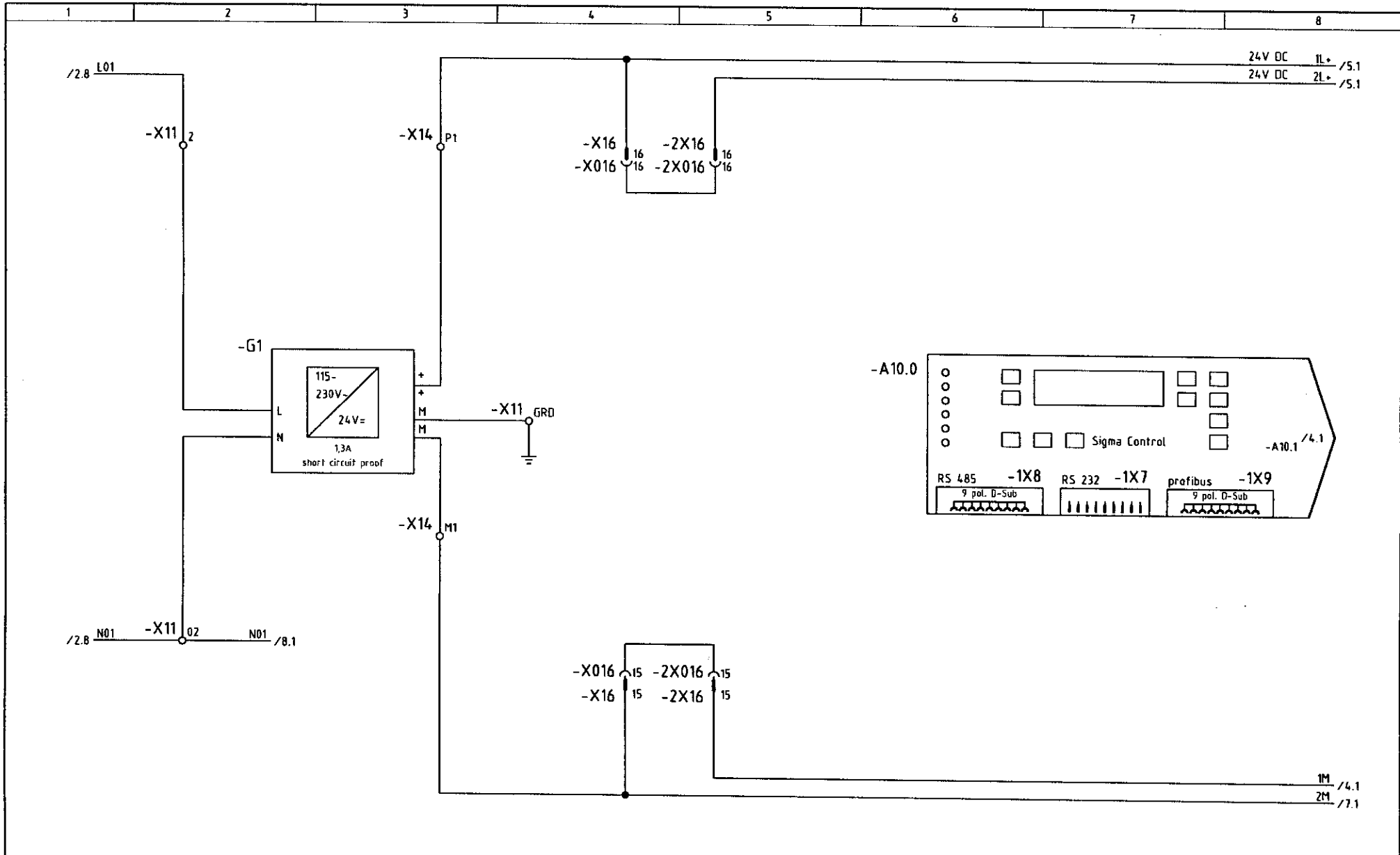


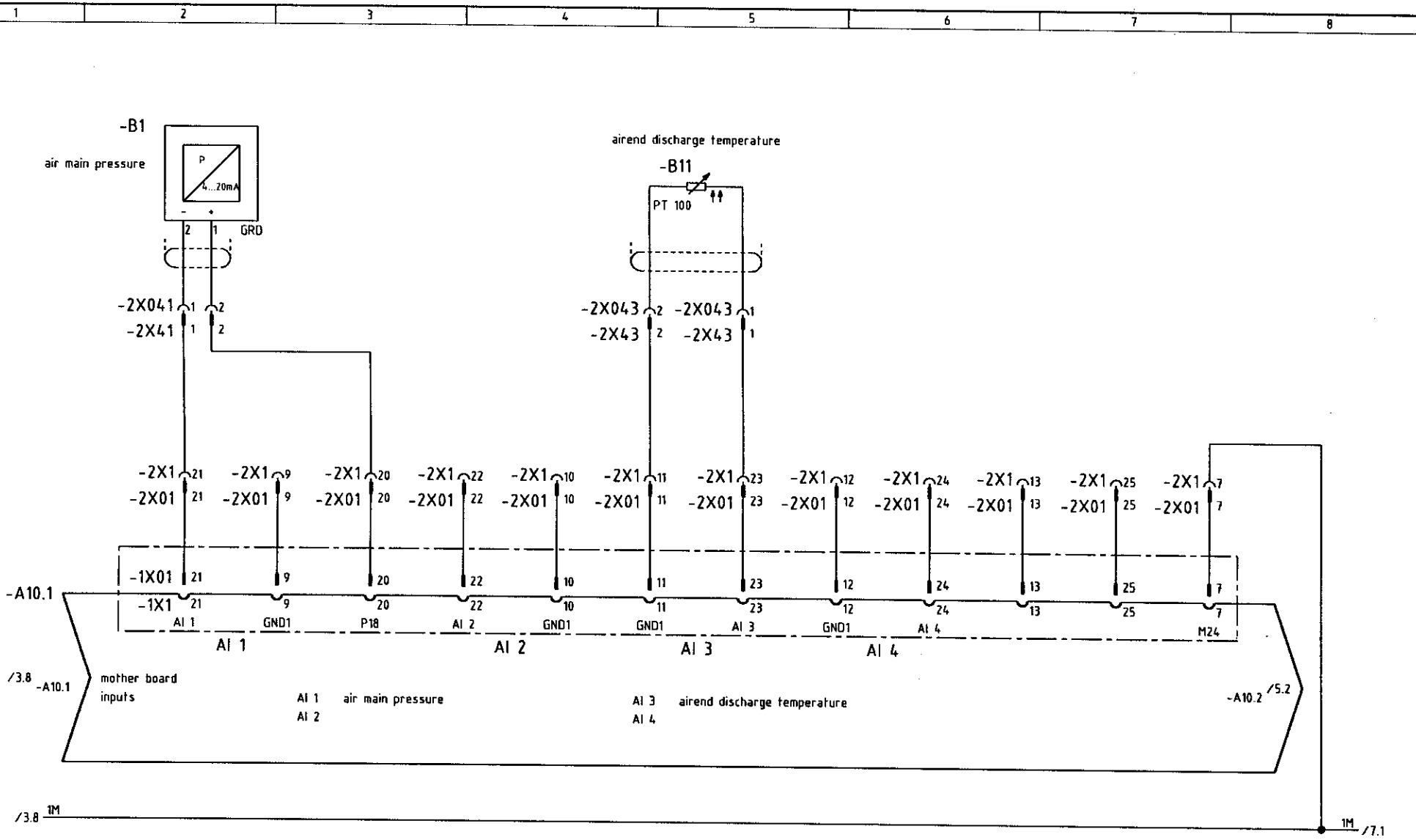
connection:	
230V -----	
1FU: 1,6A	2FU: 1,6A
460V -----	
1FU: 0,8A	2FU: 0,8A

connection  
s.b.c.  
10VA

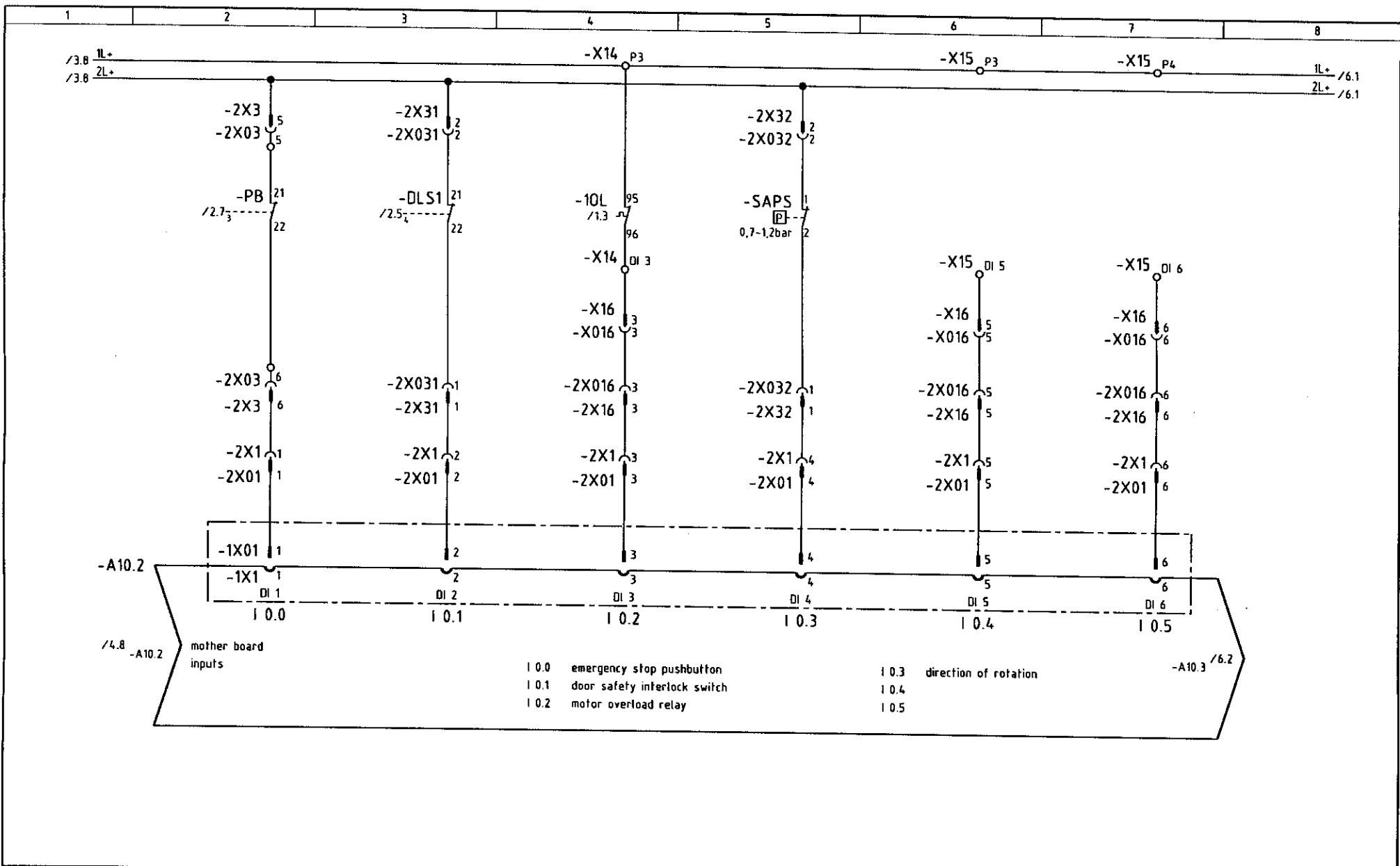
Secondary side is ground.  
 • While extracting the connecting cable control of insulation is required.  
 control cabinet wiring:  
 all non-designated conductors  
 115V AC: 16AWG red MTW-flexible  
 24V DC: 18AWG blue MTW-flexible

Function: 115V/1-/60CY		door safety interlock switch		Emergency Stop					
Group of function: control voltage tapping		safety chain							
c	Datum	11.07.2000	KAESER KOMPRESSOREN	wiring diagram compressor SM 11 control voltage tapping	SSM11.Y-U1010.00				
b	Bearb.	Sittler							
a	Gepr.	Büchner							
D	Anderung	Datum	Name	Norm	Ersatz durch:	Ersatz für:	Ursprung: USMU1009	Blatt z	Bl.

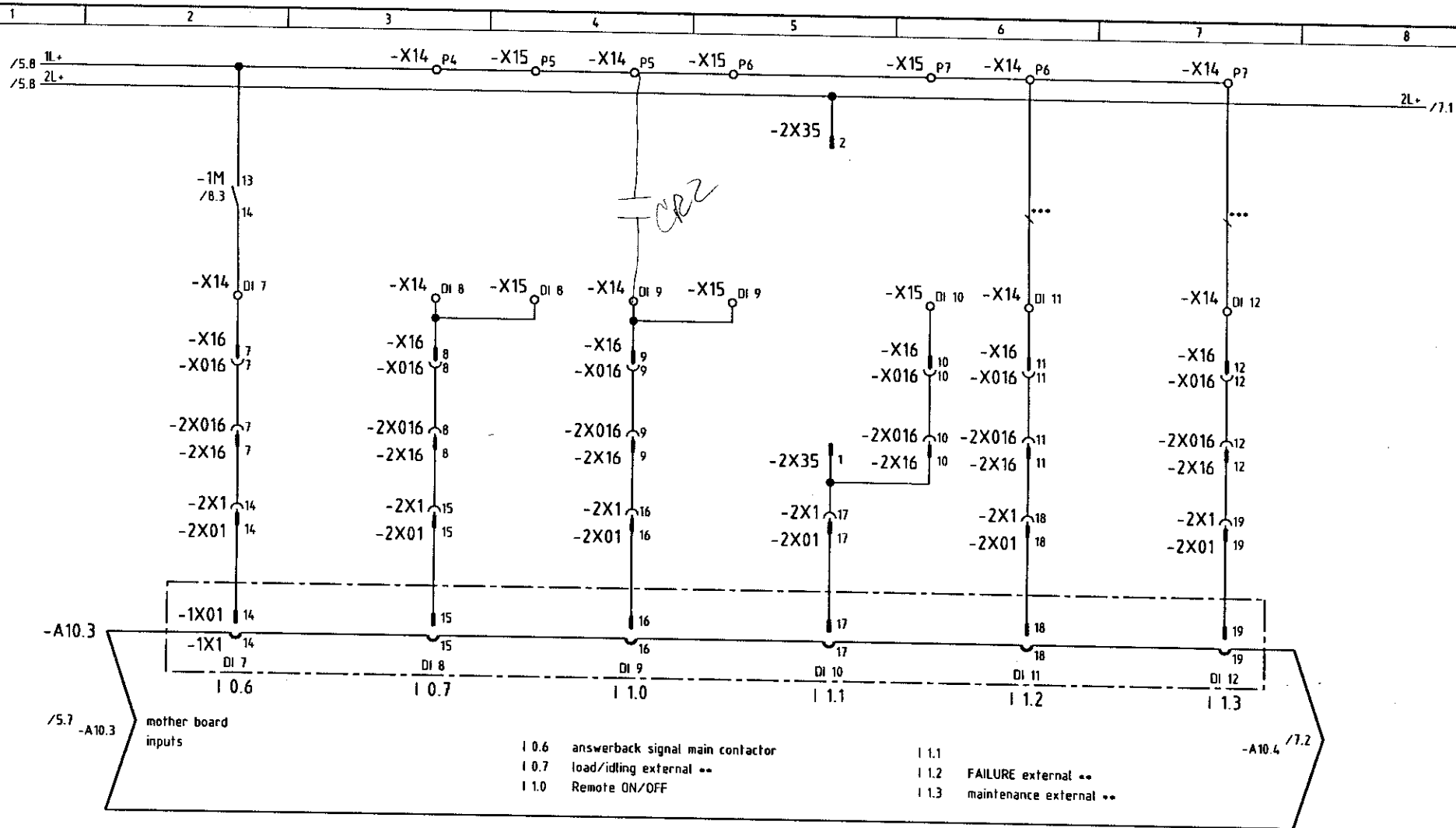




Function: pressure control										
Group of function: pressure control										
c			Datum	11.07.2000						
b			Bearb.	Silber						
a			Gepr.	Büchner						
U	Anderung	Datum	Name	Norm	Ersatz durch:	Ersatz für:	Ursprung: USMU1009	wiring diagram compressor SM 11 mother board/inputs	SSM11.Y-U1010.00	Blatt 4 Bl.







\*\* default setting  
 can be changed  
 through the user interface

\*\*\* Remove the link when an alarm  
 sensor is connected.

Function:

Group of function:

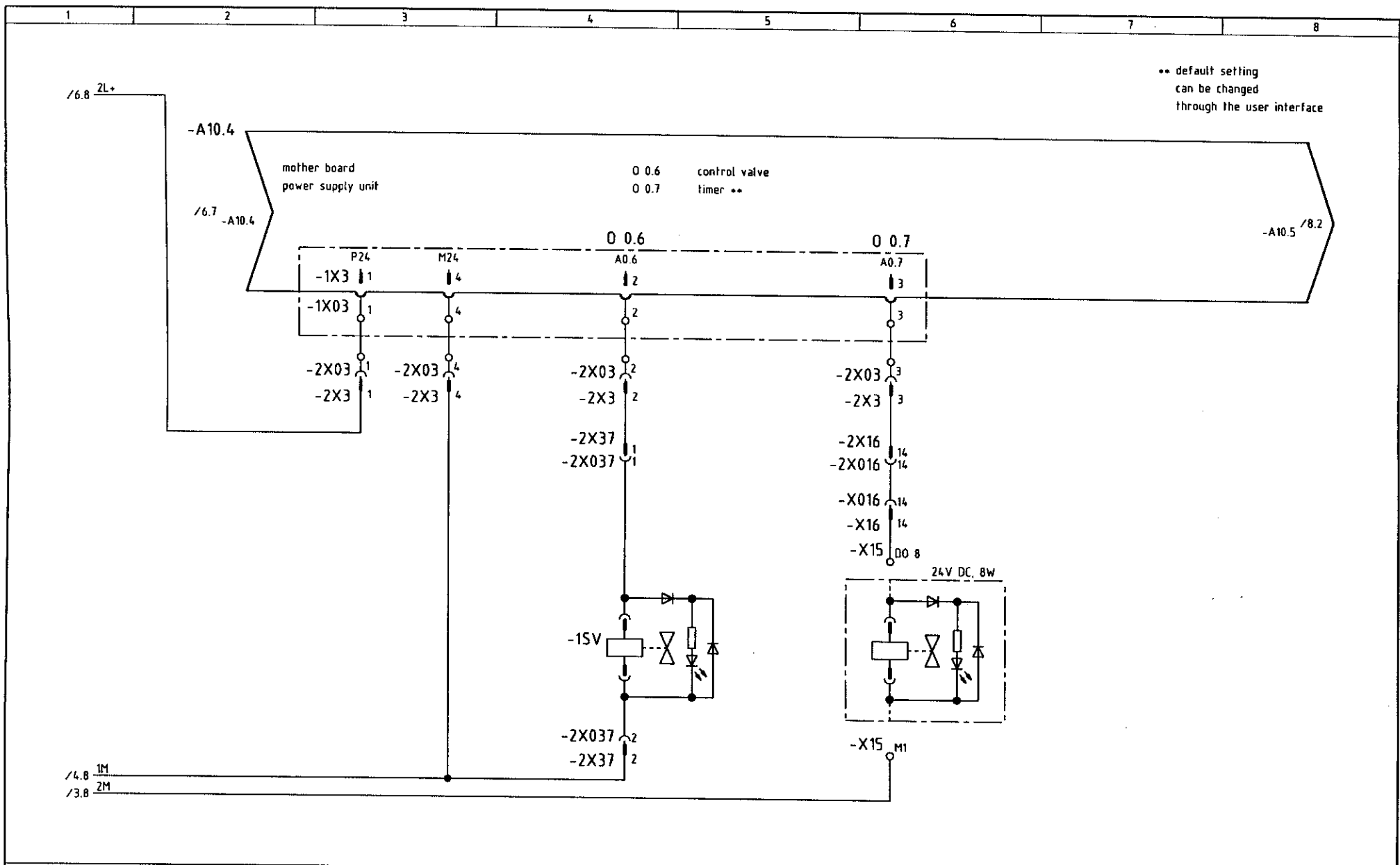
alarm/maintenance indications

c			Datum	11.07.2000							
b			Bearb.	Sitter							
a			Gepr.	Büchner							
D	Anderung	Datum	Name	Norm	Ersatz durch:	Ersatz für:	Ursprung:	USMU1009	wiring diagram compressor SM 11 mother board/inputs		

SSM11.Y-U1010.00

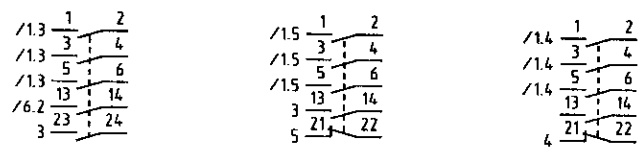
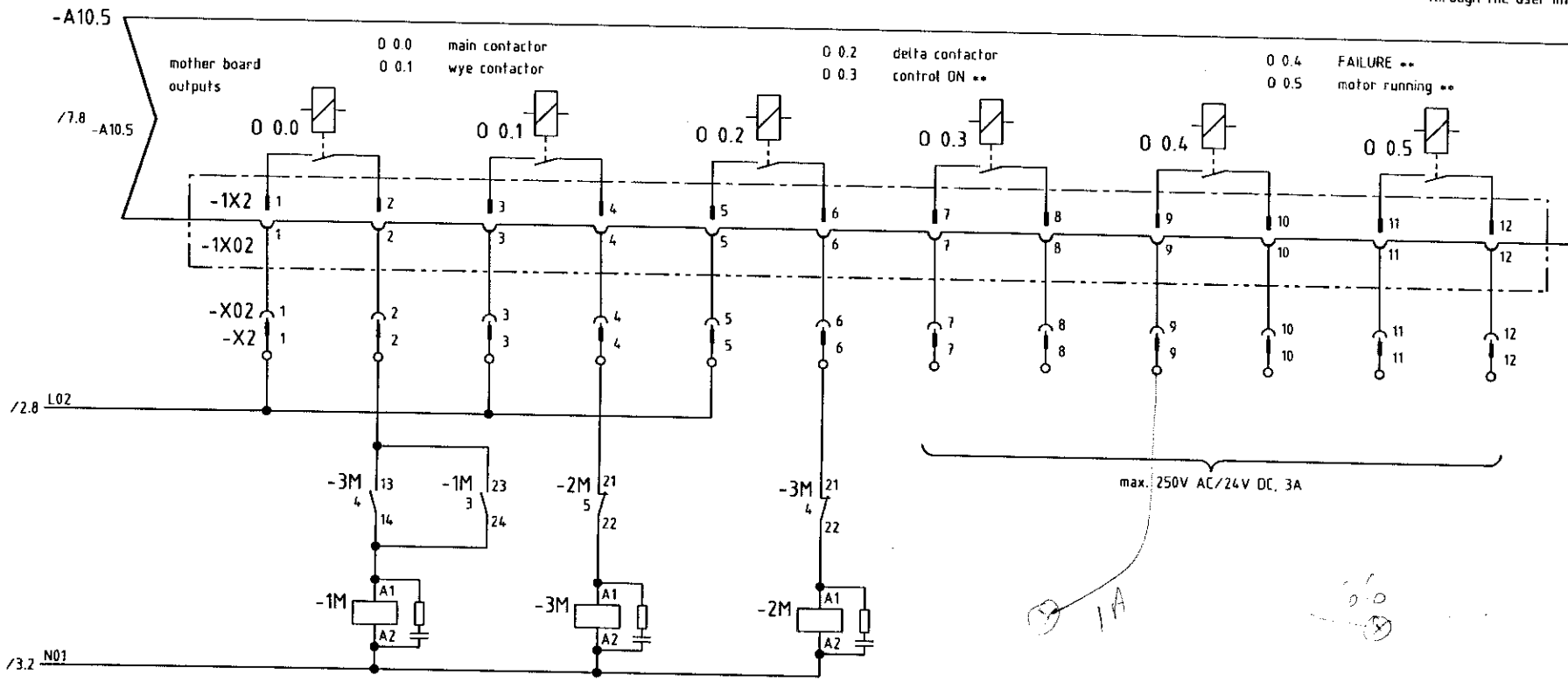
Blatt 6  
Bl.

Datum: 11.07.2000		Bearb.: Sittler		Gepr.: Büchner		Norm:		Ersatz durch:		Ersatz für:		Ursprung: USMU1009		wiring diagram compressor SM 11 mother board/inputs		SSM11.Y-U1010.0		Blatt 6 Bl.		
b																				
a																				
D	Anderung	Datum																		



Function:		combined control/vent valve		condensate drain, User's connection		mother board							
Group of function:		mother board		mother board		mother board							
c		Datum:	11.07.2000	Bearb.:		Sittler							
b		Gepr.:	Büchner	Ursprung:		USMU1009							
a		Norm:		Ersatz durch:		Ersatz für:							
D	Anderung	Datum	Name	Norm	Ersatz durch:	Ersatz für:	Ursprung:	USMU1009	wiring diagram compressor SM 11 mother board/outputs	SSM11.Y-U1010.00		Blatt 7 Bl.	

-- default setting  
can be changed  
through the user interface



Function:				Group of function: wye-delta changeover				Volt-free contacts, user's connection			
c		Datum	11.07.2000	<b>KAESER</b> KOMPRESSOREN Ursprung: USMU1009				wiring diagram compressor SM 11 mother board/outputs			
b		Bearb.	Sittler								
a		Gepr.	Büchner								
d	Änderung	Datum	Name	Norm	Ersatz durch	Ersatz für	SSM11.Y-U1010.00				
											Blatt 8
											Bl.

1	2	3	4	5	6	7	8
---	---	---	---	---	---	---	---

-A10	Sigma Control	-1X01...-1X03	connector plug, Sigma Control		
-A10.1...-A10.5	mother board, inputs/outputs	-2X1,-2X3	connector strip adapter 1, inside		
-G1	power unit	-2X16	connector strip adapter 1, inside		
-1M	main contactor	-2X01,-2X03	connector plug adapter 1, inside		
-2M	delta contactor	-2X016	connector plug adapter 1, inside		
-3M	wye contactor	-2X31...-2X43	connector strip adapter 1, external		
-IM	compressor motor	-2X031...-2X043	connector plug adapter 1, external		
-1FU,-2FU	primary control fuse	-1SV	control valve		
-3FU	secondary control fuse				
-PB	emergency stop pushbutton				
-DLS1	door safety interlock switch				
-T	control transformer				
-X11	terminal strip, control				
-X2	terminal strip, outputs/Volt-free contacts	-10L	motor overload relay	}	
-X14,-X15	terminal strip, digital inputs transfer module 1	-SAPS	safety air pressure switch - direction of rotation		automatic shutdown
-X16	connector strip digital inputs transfer module 1	-B11	temperature probe air end discharge temperature		and indicating function
-X016	connector plug, transfer module 1				
-X02	connector plug, outputs/Volt-free contacts				
-1X1...-1X3	connector strip Sigma Control, mother board	-B1	pressure transducer, air main pressure	}	
-1X7...-1X9	connector strip Sigma Control, interface				indicating function

**malfunction indicators**

1	2		3		4		5		6		7		8				
A Stück- zahl Qty.	B Benennung und Verwendung Description and function		C Fabrikatsbezeichnung Typ: Bestell-Nr.; Unterlagen-Nr.; Normkürzelbezeichnung notwendige techn. Daten, z.B. Steuerspannung, Frequenz, Einstellbereich Identification data Type: order No.; document No.; equipment code No.; basic technical data				D Lfd. Nr. Item	E Betriebsmittel-Kennz. nach DIN 40719, Teil 2 Identifying symbol of device	F Stromlaufplan Planabschnitt Circuit diagramm sheet No.; section No.	G Einbauort Location	Concerns only the manufacturer						
											Wst.-Nr.						
											H Schabl. Nr.	I BZ- Pos.	J VA Kz. -)	K Eingangs- vermerk			
1	control panel																
2	motor starter		206202.0 CKC														
1	motor starter		A 26-30-10-89 7.5753.00010 ABB					-1M,-2M									
3	interference suppressor		A 16-30-10-89 7.5752.00010 ABB					-3M									
1	overload relay, 230V		RC5-1/250 7.3946.00060 ABB					-1M,-2M,-3M									
2	auxiliary switch		TA25 DU19 13-19A 7.5773.0 ABB					-10L									
1	auxiliary switch		CA5-01 7.4835.0 ABB					-2M,-3M									
1	control transformer		CA5-10 7.4834.0 ABB					-1M									
1	fuse socket		160VA 2x230V/115V 7.2221.1 EMB					-T1									
2	primary control fuse, 230V		USM 3 3-pole 7.3320.00010 Gould					-1FU,-2FU,-3FU									
1	secondary control fuse		TRM-1 6/10 1,6A/250V 7.3301.0 Gould					-1FU,-2FU									
1	power supply		TRM-1 6/10 1,6A/250V 7.3301.0 Gould					-3FU									
1	terminal strip		115-230V AC/24V 1,3A DC 7.7025.0 Siemens					-G1									
1	transfer module		SM 7.7111.00020 Wieland					-X2,-X11									
			FLB20/8191 E 36 pole 7.7012.0 Wieland					-X14,-X15,-X16									
	power supply 460V:																
1	overload relay, 460V		TA25 DU8,5 6-8,5A 7.5792.0 ABB					-10L									
1	adapter, 460V		DB25/25A 7.5763.0 ABB					-10L									
2	primary control fuse, 460V		ATQ 0,8 0,8A/460V 7.3311.0 Gould					-1FU,-2FU									
1	adapter		C6 7.7021.0 Wieland					-2X...									
1	compressor control "Sigma Control"		Typ 1 7.7000.0 Siemens					-A10									
1	emergency stop pushbutton		PTD-4-RT 7.3629.0 ABB					-PB									
1	auxiliary contact		KBH3-02 2 DE 7.3169.00080 ABB					-PB									

Bei Nachbestellung von Geräten und Maschinen sind alle in den stark umrandelten Spalten B und C angegebenen Daten aufzuführen. Die Daten in den Spalten D bis G sind zusätzlich unter Nennung dieser Gerätestücklisten-Nummer anzugeben, soweit sie die Beantwortung technischer Rückfragen erleichtern. Für Ersatzteilbestellung ist zusätzlich die Angabe der Fabriknummer erforderlich, falls diese auf dem Typenschild des Erzeugnisses genannt ist.

When reordering the equipment, all data enclosed by the heavy lines of columns B and C should be stated. In addition, the data in columns D to G should be given together with the No. of this list of equipment, insofar as they are helpful in answering technical enquiries. When ordering spare parts, also quote the serial No. of the product if stated on the rating plate.

=) Versandanschrift - Kennzeichen

In Zweifelsfällen gilt die deutsche Fassung.

The German version applies in cases of doubt.

c	Datum	11.07.2000	Ersatz durch:	Ersatz für:	Urprung: USMU1009	KAESER KOMPRESSOREN	electrical component parts list compressor SM 11 controller	=	+	GSM11.Y-U1010.00	Blatt 1
b	Bearb.	Sitter									
a	Gepr.	Büchner									
f	Änderung	Datum	Name	Norm							



terminal strip	connection	name of device	location	jumper wire	terminal legend link	terminal-no.	
terminal strip -X14						DI 2	
						DI 3	
						DI 7	
						DI 8	
						DI 9	
						DI 11	
						DI 12	
						P1	
						P2	
						P3	
						P4	
						P5	
						P6	
						P7	
						M1	
						M2	
						M3	
						M4	
Total 18 terminals							
terminal strip -X15						DI 1	
						DI 4	
						DI 5	
						DI 6	
						DI 8	
						DI 9	
						DI 10	
						DI 7	
						DI 8	
						DI 9	
						DI 10	
						DI 10	
						DI 10	
						DI 10	
						DI 10	
						DI 10	
	Total 18 terminals						

1) FAILURE external \*\*  
 2) Remote ON/OFF  
 3) load/riding external \*\*

4) maintenance external \*\*

\*\* default setting can be changed through the user interface  
 \*\*\* Remove the link when an alarm sensor is connected.

Erstellung	Datum	Name	Norm
Änderung	Datum	Name	Norm
Erstellung	Datum	Name	Norm
Änderung	Datum	Name	Norm

terminal connection compressor SM 11 terminal strip -X14,-X15

KAESER KOMPRESSOREN  
 Ursprung: USH01009  
 Ersatz durch:  
 Ersatz für:

KSM11.Y-U1010.00





**KAESER**

<http://www.kaeser.com>

Dok.Nr. SEL-1045\_01D

## Ersatzteilliste

Schraubenkompressor Typ SM

## Spare parts list

Rotary screw compressor series SM

## Liste de pièces de rechange

Compresseur à vis Type SM

## Lista de las piezas de recambio

Compresor de tornillo modelo SM

<b>Inhalt</b>	Ersatzteilzeichnung und Legende Wartungspakete
<b>Contents</b>	Spare parts drawing and legend Maintenance packages
<b>Contenu</b>	Vue éclatée et légende Packages d'entretien courant
<b>Indice</b>	Dibujo y leyenda de las piezas de recambio Paquetes de mantenimiento

Typ  
Model  
Type  
Modelo

Materialnummer  
Part number  
Référence  
Número material

Serialnummer  
Serial number  
No. de série  
Número de serie

### **ACHTUNG !**

Bitte geben Sie bei der Ersatzteilbestellung Material- und Seriennummer der Anlage sowie Positionsnummer und Bezeichnung der Ersatzteile an.

### **ATTENTION !**

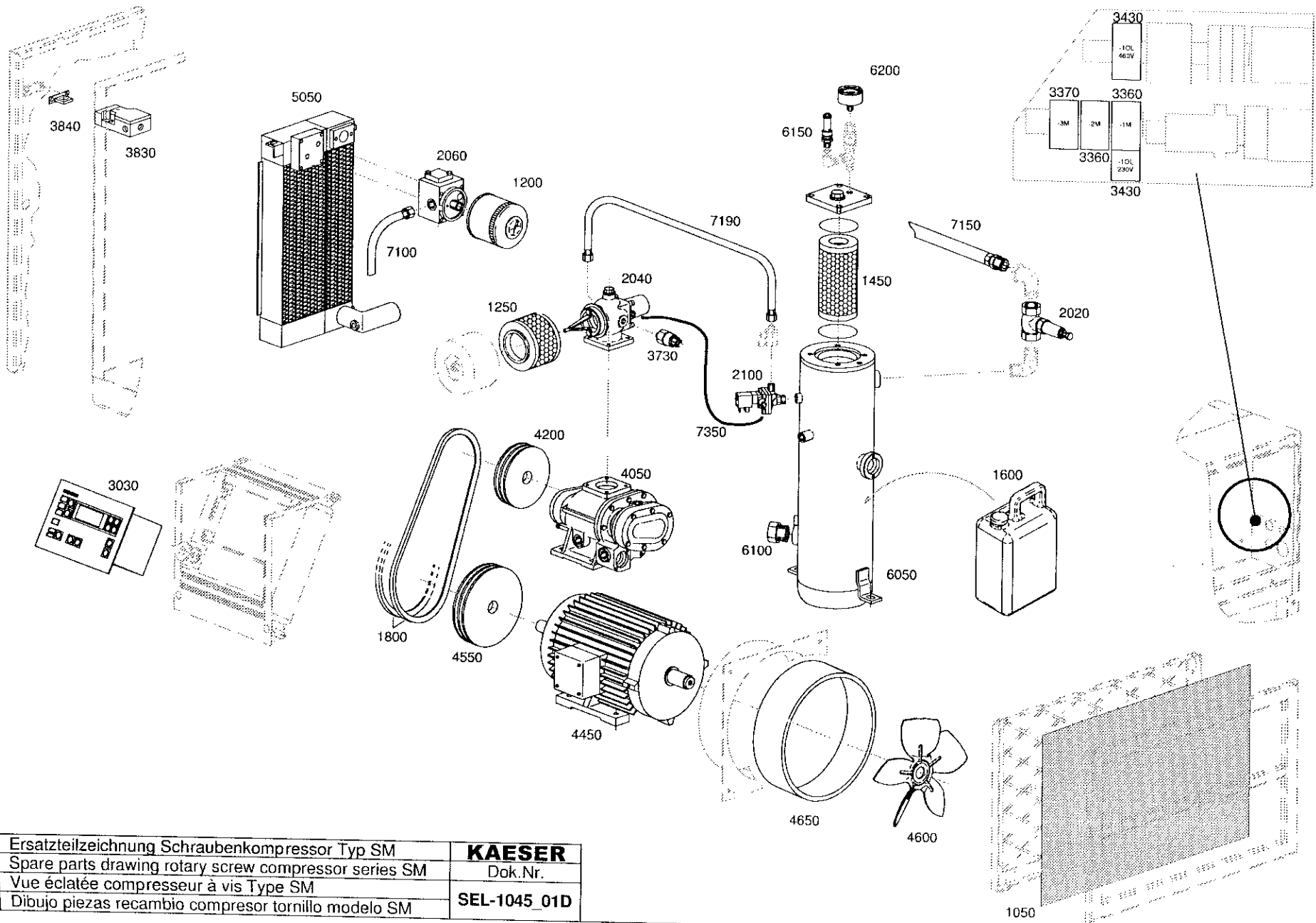
Please quote the part number and serial number of the package together with the item number and the description of the part when ordering.

### **ATTENTION !**

Indiquer sur chaque commande de pièces de rechange la référence et le No. de série de l'appareil, de même que le No. du repère et la désignation de la pièce de rechange.

### **¡ ATENCION !**

Cuando pidan piezas de recambio les rogamos nos indiquen el número de material y de la serie, así como el número de la posición y la designación de las piezas de recambio.



DE	Ersatzteilzeichnung Schraubenkompressor Typ SM	<b>KAESER</b>
EN	Spare parts drawing rotary screw compressor series SM	Dok.Nr.
FR	Vue éclatée compresseur à vis Type SM	
ES	Dibujo piezas recambio compresor tornillo modelo SM	<b>SEL-1045_01D</b>

EN	Spare parts drawing rotary screw compressor series SM	Dok.Nr.
FR	Vue éclatée compresseur à vis Type SM	
ES	Dibujr zas recambio compresor tornillo modelo SM	SEL-1045_01D

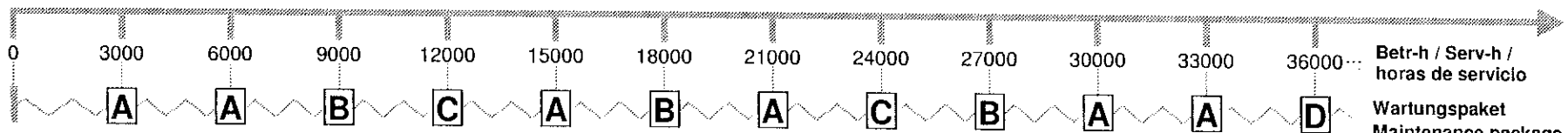


1050

**KAESER**

Dok.Nr. SEL-1045\_01D

Nr./No.	Stck/Qty	Bezeichnung	Description	Désignation	Designación
1050	1	Ansaugfiltermatte	Inlet filter mat	Natte filtrante d'aspiration	Esterilla filtrante de aspiración
1200	1	Ölfilterpatrone	Oil filter element	Cartouche du filtre à huile	Cartucho filtrante de aceite
1250	1	Luftfilterpatrone	Air filter element	Cartouche du filtre à air	Cartucho filtrante de aire
1450	1	Ölabscheidepatrone kpl.	Oil separator cartridge cpl.	Cartouche séparateur cpl.	Cartucho separador de aceite cpl.
1600	1	Kühlmittel	Coolant	Agent réfrigérant	Fluido refrigerante
1800	1	Keilriemensatz	Set of V-belts	Jeu de courroies trapézoïdales	Juego de correas trapezoidales
2020	1	Mindestdruckrückschlagventil kpl.	Minimum pressure / check valve cpl.	Soupape pression mini cpl.	Válvula de retención pres.mínima cpl.
2022	1	Wartungs-Kit Mind.dr.rücks.vtl.	Maintenance kit min.press./check v.	Kit d'entretien Soup. pression min	Kit de mantenimiento Vál.rete./pres.mín
2024	1	Reparatur-Kit Mind.dr.rücks.vtl.	Repair kit min.press./check v.	Kit de réparation Soup. pression min	Kit de reparación Vál.rete./pres.mín
2040	1	Einlassventil kpl.	Inlet valve cpl.	Soupape d'aspiration d'air cpl.	Válvula de admisión cpl.
2042	1	Wartungs-Kit Einlassventil	Maintenance kit inlet valve	Kit d'entretien Soup.d'aspir.d'air	Kit de mantenimiento Vál. de admisión
2044	1	Reparatur-Kit Einlassventil	Repair kit inlet valve	Kit de réparation Soup.d'aspir.d'air	Kit de reparación Vál. de admisión
2060	1	Kombiventil kpl.	Combination valve cpl.	Vanne thermostatique cpl.	Valvula combinada cpl.
2062	1	Wartungs-Kit Kombiventil	Maintenance kit combination valve	Kit d'entretien Vanne thermostat.	Kit de mantenimiento Valvula combinada
2064	1	Reparatur-Kit Kombiventil	Repair kit combination valve	Kit de réparation Vanne thermostat.	Kit de reparación Valvula combinada
2100	1	Kombiniertes Entlüftungs-Hilfsventil kpl.	Combined discharge / auxiliary valve cpl.	Vanne auxiliaire et de décharge combinée	Válvula auxiliar combinada de despresurización cpl.
2102	1	Wartungs-Kit komb.Entl.HV	Maintenance kit com.aux./vent.valve	Kit d'entretien Van. aux. décharge	Kit de mantenimiento Vál.aux.comb.desp.
2104	1	Reparatur-Kit komb.Entl.HV	Repair kit com.aux./vent.valve	Kit de réparation Van. aux. décharge	Kit de reparación Vál.aux.comb.desp.
3030	1	Kompressorsteuerung Sigma Control	Sigma Control compressor controller	Sigma Control	Sigma Control
3360	2	Schütz (-1M, -2M)	Contacteur (-1M, -2M)	Contacteur (-1M, -2M)	Contacteur (-1M, -2M)
3370	1	Schütz (-3M)	Contacteur (-3M)	Contacteur (-3M)	Contacteur (-3M)
3430	2	Überstromauslöser Antriebsmotor	Drive motor overcurrent relay	Relais de surcharge moteur de commande	Relé de sobreintensidad motor de accionamiento
3730	1	Sicherheitsdruckschalter kpl.	Safety pressure switch cpl.	Pressostat de sécurité cpl.	Presostato de seguridad cpl.
3732	1	Schutzkappe	Protective cap	Protection caoutchouc	Cubierta de protección
3830	1	Türenscharter	Door interlock switch	Contact de sécurité de porte	Interruptor final de puerta
3840	1	Betätiger für Türenscharter	Door interlock switch activator	Commande du contact de sécurité de porte	Accionador para interruptor final de la puerta
4050	1	Tauschblock kpl.	Exchange airend cpl.	Bloc échange standard cpl.	Bloque de cambio cpl.
4052	1	Gleitringdichtung kpl.	Sliding ring seal cpl.	Joint tournant cpl.	Cierre de anillo deslizante
4100	1	Montage-Kit Tauschblock	Exchange airend fitting kit	Kit montage bloc	Kit montage bloque de cambio
4200	1	Keilriemenscheibe Block	Airend pulley	Poulie à gorges bloc	Polea de correa bloque
4450	1	Antriebsmotor	Drive motor	Moteur de commande	Motor de accionamiento
447	1	Motorlager A-Seite	Motor bearings D-end	Roulement moteur côté A	Rodamientos del motor lado A
448	1	Motorlager B-Seite	Motor bearings N-end	Roulement moteur côté B	Rodamientos del motor lado B
4550	1	Keilriemenscheibe Antriebsmotor	Motor pulley	Poulie à gorges moteur de commande	Polea de correa motor de accionamiento
4600	1	Lüfterflügel	Fan impeller	Ailette de ventilateur	Paleta del ventilador
4650	1	Schaumstoff Lüfterzarge	Foam fan casing	Mousse Caisse à ventilateur	Plástico celular Caixilho do ventilador
5050	1	Kombi Öl-/Luftkühler kpl.	Combined air/oil cooler	Réfrigérant air/huile	Refrigerador combinado air/aceite
6050	1	Ölabscheidebehälter kpl.	Oil separator tank cpl.	Réservoir séparateur d'huile cpl.	Depós.separ.aceite cpl.
6100	1	Ölschauglas	Oil sight glass	Viseur de graissage, voyant d'huile	Visor de aceite
6150	1	Sicherheitsventil kpl.	Pressure relief valve cpl.	Soupape de sûreté	Válvula de seguridad
6200	1	Manometer	Pressure gauge	Manomètre	Manómetro
7100	1	Schlauchleitung Kühler-Block	Hose line cooler-airend	Tuyau flexible Refroidisseur - Bloc	Tubo flexible Refrigerador bloque
7150	1	Schlauchleitung Ölabscheideb.-Luftkühler	Hose line oil separator-air cooler	Tuyau flexible Réservoir sépar.d'huile - Refroid.d'air	Tubo flexible Depósito sep.de aceite refrige.de aire
7190	1	Schlauchleitung komb.Entl.HV-Einlassvtl.	Hose line com.aux.vent.valve-inlet valve	Tuyau flexible Van.aux.décharge-Soup.d'aspir.d'air	Tubo flexible Vál.aux.comb.desp.-Vál. de admisión
7350	1	Steuerleitungs-Kit	Control line kit	Kit conduite de régulation	Kit conducto de control



Betr-h / Serv-h /  
horas de servicio

Wartungspaket  
Maintenance package  
Package d'entretien  
Paquete de manten.

Wartungsintervalle bei günstigen Umgebungs- und Betriebsbedingungen wie kühle bis mäßige Umgebungstemperatur, niedrige Luftfeuchtigkeit und saubere Ansaugluft.  
Maintenance intervals under good ambient and operating conditions, such as low to moderate ambient temperature and dry, clean inlet air.  
Périodicités d'entretien dans des conditions ambiantes et de service favorables telles que température ambiante basse à modérée, faible degré d'humidité de l'air et air d'aspiration propre.  
Intervalos de mantenimiento en condiciones de ambiente y de servicio favorables, así como temperaturas frescas hasta moderadas, humedad atmosférica baja y aire de aspiración limpio.



Abhängig von den Umgebungs- und Betriebsbedingungen können sich die Wartungsintervalle verkürzen.  
Maintenance intervals may decrease due to ambient and operating conditions.  
Les périodicités d'entretien peuvent se réduire en fonction des conditions ambiantes et de service.  
Los intervalos de mantenimiento pueden acortarse según las condiciones del entorno y del servicio.

Wartungspaket Maintenance package Package d'entretien Paquete de mantenimiento		<b>A</b>
Nr. / No.	Stück / Qty.	
1050	1	
1200	1	
1250	1	
1600*)	1	

Wartungspaket Maintenance package Package d'entretien Paquete de mantenimiento		<b>B</b>
Nr. / No.	Stück / Qty.	
1050	1	
1200	1	
1250	1	
1450	1	
1600*)	1	

Wartungspaket Maintenance package Package d'entretien Paquete de mantenimiento		<b>C</b>
Nr. / No.	Stück / Qty.	
1050	1	
1200	1	
1250	1	
1600*)	1	
1800	1	
2022	1	
2042	1	
2062	1	
2102	1	
447	1	
448	1	

Wartungspaket Maintenance package Package d'entretien Paquete de mantenimiento		<b>D</b>
Nr. / No.	Stück / Qty.	
1050	1	
1200	1	
1250	1	
1450	1	
1600*)	1	
1800	1	
2024	1	
2044	1	
2064	1	
2104	1	
447	1	
448	1	
7100	1	
7150	1	
7190	1	

Vor und bei Ausführung aller Arbeiten sind die Sicherheits- und Servicehinweise in der Betriebsanleitung der Maschine zu beachten!  
Before and during all work, be sure to read and follow the safety and service instructions contained in the machine Service Manual!  
Avant et lors de l'exécution de travaux, il est impératif de respecter les consignes de sécurité et de maintenance décrites dans la notice d'utilisation de la machine.  
¡Se ruega observar las indicaciones de seguridad y mantenimiento en las instrucciones de servicio de la máquina antes de efectuar cualquier trabajo y durante el mismo!

DE	Wartungspakete Schraubenkompressor Typ SM	<b>KAESER</b> Dok.Nr. <b>SEL-1045_01D</b>
EN	Maintenance packages rotary screw compressor series SM	
FR	Packages d'entretien courant compresseur à vis Type SM	
ES	Paquetes de mantenimiento compresor de tornillo modelo SM	

\*) siehe Kühlmittlempfehlung  
\*) see cooling fluid recommendations  
\*) voir agent réfrigérant conseillé  
\*) ver recomendaciones para el fluido

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# KAESER KOMPRESSOREN

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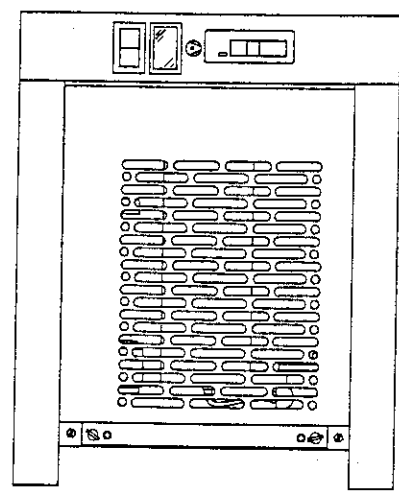
## KRD Series

### Refrigerated Type Compressed Air Dryers Models: 25, 35, 50, 75, 100, 125, 150

# INSTRUCTION MANUAL

#### CONTENTS

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## GENERAL SAFETY INFORMATION



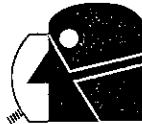
### 1. PRESSURIZED DEVICES:

This equipment is a pressure containing device. Do not exceed maximum operating pressure as shown on equipment serial number tag. Make sure equipment is depressurized before working on or disassembling it for service.



### 2. ELECTRICAL:

This equipment requires electricity to operate. Install equipment in compliance with all applicable electrical codes. Standard equipment is supplied with electrical enclosures not intended for installation in hazardous environments. Disconnect power supply to equipment when performing any electrical service work.



### 3. BREATHING AIR:

Air treated by this equipment may not be suitable for breathing without further purification. Refer to applicable standards and specifications for the requirements for breathing quality air.

## RECEIVING, MOVING, AND UNPACKING

### A. RECEIVING

This shipment has been thoroughly checked, packed and inspected before leaving our plant. It was received in good condition by the carrier and was so acknowledged.

Check for Visible Loss or Damage.

If this shipment shows evidence of loss or damage at time of delivery to you, insist that a notation of this loss or damage be made on the delivery receipt by the carrier's agent.

### B. UNPACKING

Check for Concealed Loss or Damage.

When a shipment has been delivered to you in apparent good order, but concealed damage is found upon unpacking, notify the carrier immediately and insist on his agent inspecting the shipment. Concealed damage claims are not our responsibility as our terms are F.O.B. point of shipment.

### C. MOVING

In moving or transporting dryer, do not tip dryer onto its side.

### D. STORAGE

Important - Do not store dryer in temperatures above 130°F, 54.4°C.



**IMPORTANT:**  
 READ PRIOR TO STARTING THIS EQUIPMENT

**1.0 Installation**

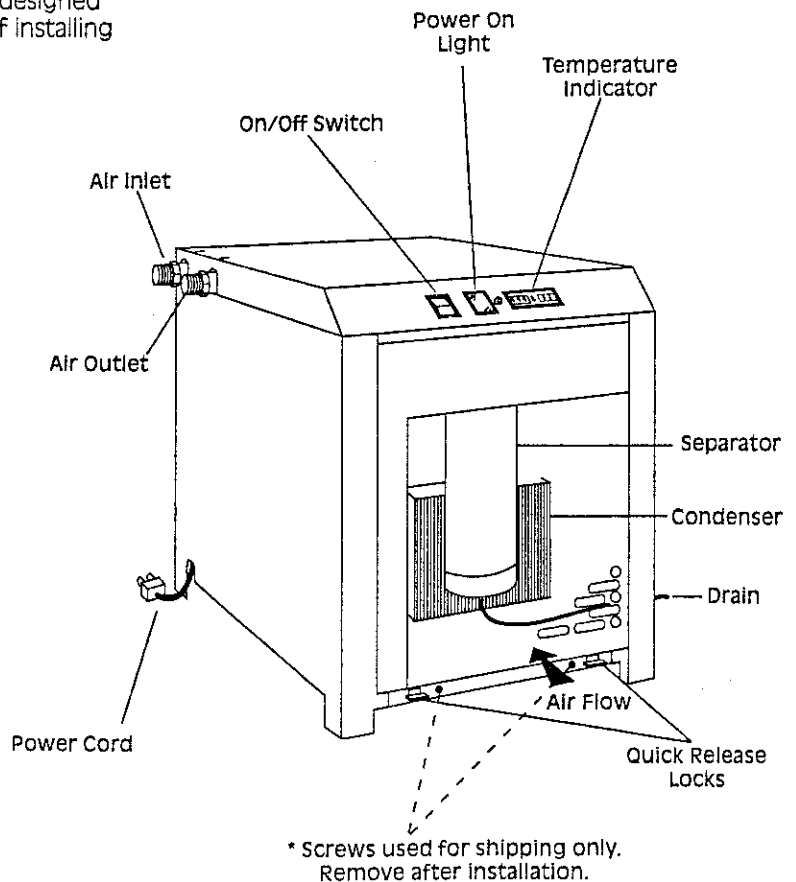
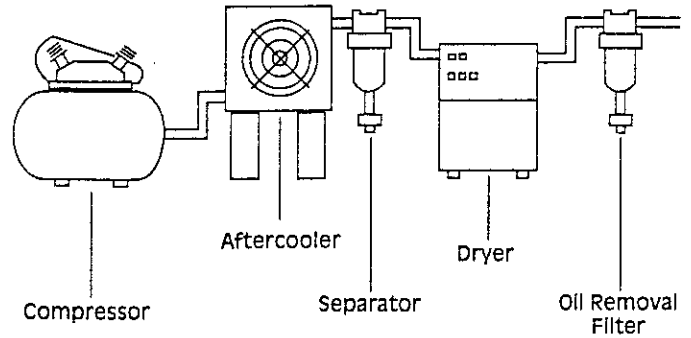
1.1 Location

- A. For typical placement in a compressed air system, see drawing.
- B. Air compressor intake—Locate air compressor so that contaminants potentially harmful to the dryer (e.g. ammonia) are not drawn into the air system.
- C. Clearances  
 Free air flow - Allow at least 12 inches (305 mm) on the front and each side of the cabinet and 6 inches (152 mm) at the back of the cabinet for free air flow.  
 Service - To facilitate maintenance leave 24 inches (610 mm) of clearance in front of dryer.
- D. Standard units are designed to operate in ambients from 45 to 110°F (7 to 43°C).
- E. Installations in altitudes above 4500 feet (1370 meters) – Dryer is adjusted to operate in altitudes up to 4500 feet (1370 meters). If dryer is installed in an altitude above this, and has not been preset at the factory for this altitude, contact manufacturer's Service Department.

NOTE: Outdoor installation—Standard units are designed for indoor installation. Contact manufacturer if installing outdoors.

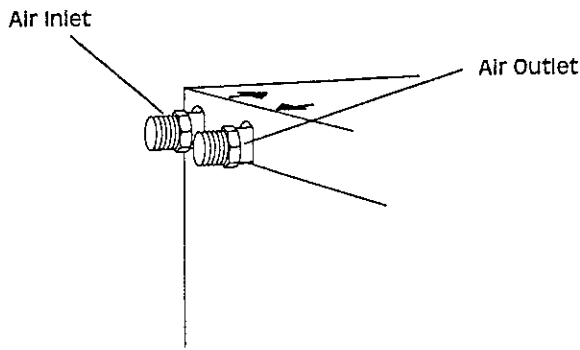
1.2 Mounting

Mount on floor or shelf free from vibration.



### 1.3 Piping connections

- A. Air Inlet—Connect compressed air line from air source to air inlet.



**WARNING:** Refer to Serial Number Tag for maximum working pressure. Do not exceed dryer's Maximum Working Pressure.

**NOTE:**  
Install dryer in air system at highest pressure possible (e.g. before pressure reducing valves).

**NOTE:**  
Install dryer at coolest compressed air temperature possible. Maximum inlet compressed air temperature: 120°F (49°C). If inlet air exceeds this temperature, precool the air with an aftercooler.

- B. Air Outlet—Connect air outlet to downstream air lines.
- C. By-pass piping—  
If servicing the dryer without interrupting the air supply is desired, piping should include inlet and outlet valves and an air by-pass valve.
- D. Water cooled models—cooling water inlet and outlet
1. Connect cooling water supply to cooling water inlet.
  2. Connect cooling water return line to cooling water outlet connection.

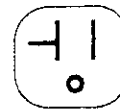
**NOTE:**  
Strainer and water regulating valve are supplied on water cooled models.

### 1.4 Electrical connections

- A. Dryer is designed to operate on the voltage, phase, and frequency listed on the serial number tag.
- B. Dryer is supplied with a cord and plug. Install in a receptacle of proper voltage.

**NOTE:**  
Refrigeration condensing unit is designed to run continuously and should NOT be wired to cycle on/off with the air compressor.

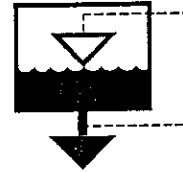
**NOTE:**  
Models 150 (115V only)—install plug in receptacle rated for 20 amps.



### 1.5 Moisture separator

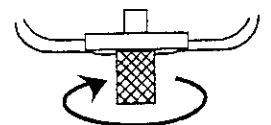
- A. Separator has an internal drain which automatically discharges collected condensate. It may be desirable to pipe the condensate from the Automatic Drain outlet to a suitable drain.

**NOTE:**  
Discharge is at system pressure. Drain line should be anchored.



**NOTE:**  
Condensate may contain oil. Comply with applicable laws concerning proper disposal.

- B. Separator has a knurled fitting with flexible drain tubing attached. Be sure knurled fitting is tightened by turning it counter-clockwise before operating dryer.



TO CLOSE  
TURN COUNTERCLOCKWISE

## 2.0 Operation

### 2.1 Minimum/Maximum operating conditions

- A. Maximum inlet air pressure: refer to dryer serial number tag
- B. Minimum inlet air pressure: 30 psig (2.1 kgf/cm<sup>2</sup>)
- C. Maximum inlet air temperature: 120°F (49°C)
- D. Maximum ambient temperature:
  - Air-cooled models: 110°F (43°C)
  - Water-cooled models: 130°F (54°C)
- E. Minimum ambient temperature: 45°F (7°C)

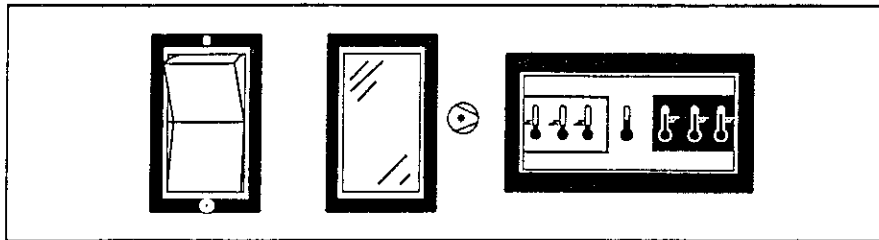
### 2.2 Start-up

Energize compressor by positioning the on/off switch in the on (I) position. Compressor on light will illuminate.

### 2.3 Operating check points

Check the following on a periodic basis:

- A. Green power on light is illuminated.
- B. Dewpoint indicator is in green area.
- C. Condensate is discharging from drain.



On/Off Switch

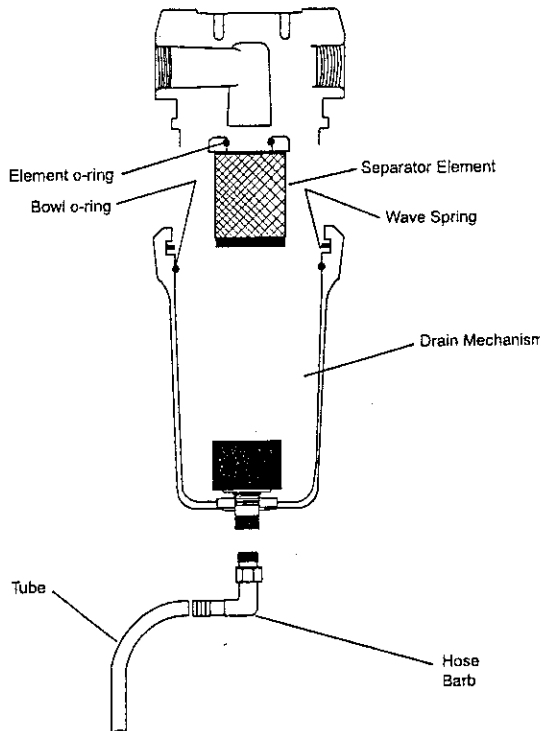
Power-On Light

Dewpoint Indicator (Green)

### 3.0 Maintenance

- 3.1 Condenser coil—  
Clean off accumulated dust and dirt monthly.
- 3.2 Moisture separator—  
Replace filter element when pressure drop across dryer is excessive or annually.
- 3.3 Check separator daily to be sure automatic drain is discharging.
- 3.4 Replace drain mechanism annually.

To facilitate service, maintenance kits are available.



### Sizing

#### Determining dryer capacity at actual operating conditions

To determine the maximum inlet flow capacity of a dryer at various operating conditions, multiply the rated capacity from Table 1 by the multipliers shown in Table 2.

**Example:** How many scfm can an air-cooled model 125 handle when compressed air to be dried is at 80 psig and 90°F; ambient air temperature is 80°F; and a 35°F dew point temperature is desired?

**Answer:** 125 x 1.17 x 1.12 x 1.0 = 163.8 scfm.

**TABLE 1**

Rated capacity (scfm) and pressure drop @ 100 psig inlet pressure, 100°F inlet temperature, and 100°F ambient temperature

MODEL		25	35	50	75	100	125	150
Rated capacity of air-cooled models (scfm)	60 Hz	25	35	50	75	100	125	150
	50 Hz	21	29	42	63	84	105	125

**TABLE 2**

Air capacity correction factors (Multipliers)

INLET PRESSURES		INLET COMPRESSED AIR CONDITIONS				
		INLET TEMPERATURES				
psig	kgf/cm <sup>2</sup>	80°F 27°C	90°F 32°C	100°F 38°C	110°F 43°C	120°F 49°C
50	3.5	1.35	1.05	0.84	0.69	0.56
80	5.6	1.50	1.17	0.95	0.79	0.66
100	7.0	1.55	1.23	1.00	0.82	0.70
125	8.8	1.63	1.31	1.07	0.91	0.74
150	10.5	1.70	1.37	1.13	0.95	0.80
175	12.3	1.75	1.42	1.18	0.99	0.84
200	14.0	1.80	1.47	1.22	1.03	0.89

COOLING MEDIUM*			OUTLET DEWPOINT		
AMBIENT TEMPERATURE		MULTIPLIER	DEW POINT TEMPERATURE		MULTIPLIER
°F	°C		°F	°C	
80	27	1.12	38	3	1.0
90	32	1.06	40	4	1.1
100	38	1.00	45	7	1.2
110	43	0.94	50	10	1.3

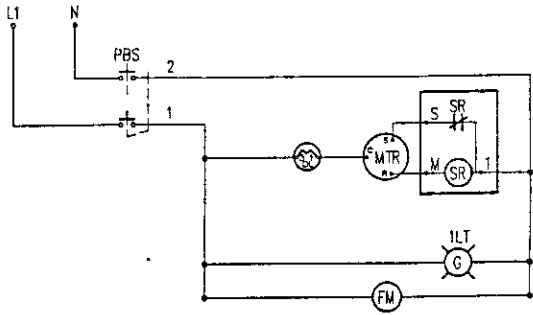
\*Air-cooled models; water-cooled models use 1.15 multiplier if cooling water is below 35°C, 95°F.

# ENGINEERING DATA

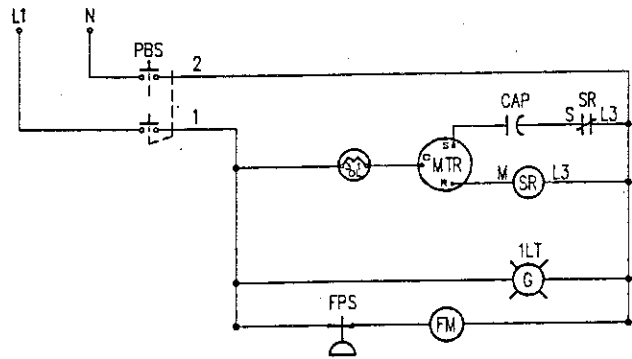
Minimum – Maximum Operating Conditions			25	35	50	75	100 / 125	150	
Min.-Max. Inlet Air Pressure (compressed air at inlet to dryer)			30 psig (2.1 kg/cm <sup>2</sup> ) - 250 psig (17.6 kg/cm <sup>2</sup> )						
Max. Inlet Air Temp. (compressed air at inlet to dryer)			120°F (49°C)						
Min.-Max. Ambient Temperature			Air-cooled 45°F (7°C) - 110°F (43°C) Water-cooled 45°F (7°C) - 130°F (54°C)						
<b>Refrigeration System Data</b>			Hermetic - Resistance Start, Induction Run - Non-Cycling						
Compressor Type			Hermetic - Resistance Start, Induction Run - Non-Cycling						
Refrigeration Compressor Horsepower			1/6	1/5	1/4	1/3	1/2	3/4	
BTU/HR – Refrigeration Only @ 35°F Evaporator & 100°F Ambient			60 Hz / 50 Hz	1010 / 842	1380 / 1150	2160 / 1800	2780 / 2317	4430 / 3692	6020 / 5017
Refrigerant Type			R-134a	R-134a	R-134a	R-134a	R-134a	R-134a	
Refrigerant Charge			See dryer serial number tag						
Suction Pressure Setting (controlled by hot gas by-pass valve)			31.5 psig	31.5 psig	31.5 psig	31.5 psig	31.5 psig	31.5 psig	
Condenser Fan Switch Setting (in-out) (psig)			NA	NA	NA	NA	NA	110-70	
Air Flow Across Condenser (cfm)			60 Hz / 50 Hz	105 / 98	235 / 196	275 / 229	220 / 183	350 / 292	530 / 440
Condenser Cooling Water Requirements (gpm @ 85°F) (water-cooled models only) (40 psig min. pressure)			NA	NA	NA	NA	NA	2.2 / 1.8	
<b>Electrical</b>			115/1/60						
<b>Nominal Voltages</b>			115/1/60						
Max.-Min. Voltage			127-104	127-104	127-104	127-104	127-104	127-104	
Rated Load Amps			3.4	3.9	5.9	7.4	10.3	14.7	
Locked Rotor Amps			18.0	22.0	28.0	35.0	48.0	66.3	
Minimum Circuit Ampacity			4.0	4.7	7.3	9.1	12.4	18.3	
Branch Circuit Fuse Size (amps)			15	15	15	15	20	25	
Watts @ 35°F Evaporator & 100°F Ambient			280	290	465	600	815	1060	
Resistance (ohms)			Single phase	Start C/S	---	---	---	---	3.15
			Run C/R	---	---	---	---	0.416	
Overload			Thermal & Current (Auto reset)						
<b>Nominal Voltages</b>			208-230/1/60						
Max.-Min. Voltage			253-187	253-187	253-187	253-198	253-187	253-198	
Rated Load Amps			1.8	2.1	3.0	4.1	5.1	8.3	
Locked Rotor Amps			8.5	13.7	14.4	19.0	23.0	33.5	
Minimum Circuit Ampacity			2.2	2.6	3.7	5.1	5.2	10.5	
Branch Circuit Fuse Size (amps)			15	15	15	15	15	15	
Watts @ 35°F Evaporator & 100°F Ambient			280	290	470	600	815	1060	
Resistance (ohms)			Single phase	Start C/S	---	---	---	---	7.92
			Run C/R	---	---	---	---	1.55	
Overload			Thermal & Current (Auto reset)						
<b>Nominal Voltages</b>			220-240/1/50						
Max.-Min. Voltage			264-198	264-198	264-198	264-198	264-198	264-198	
Rated Load Amps			1.6	1.8	2.6	3.5	4.2	7.6	
Locked Rotor Amps			8.7	10.7	14.5	15.2	21.0	53.0	
Minimum Circuit Ampacity			2.0	2.2	3.2	4.4	5.2	9.9	
Branch Circuit Fuse Size (amps)			15	15	15	15	15	15	
Watts @ 35°F Evaporator & 100°F Ambient			223	257	395	507	669	930	
Resistance (ohms)			Single phase	Start C/S	---	---	---	---	10.49
			Run C/R	---	---	---	---	1.8	
Overload			Thermal & Current (Auto reset)						

# ELECTRICAL SCHEMATIC

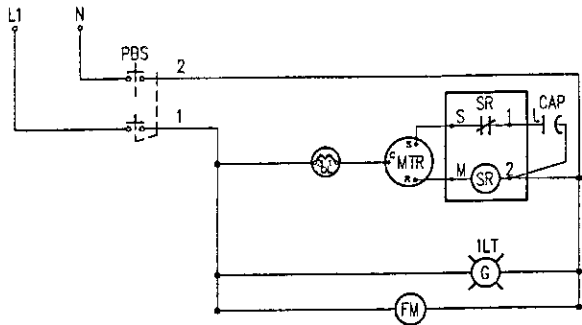
Models 25, 35 - 115V/60 Hz; 208-230V/60Hz; 220-240V/50 Hz  
 Model 50 - 115V/60 Hz; 220-240V/50 Hz  
 Model 75 - 115V/60 Hz



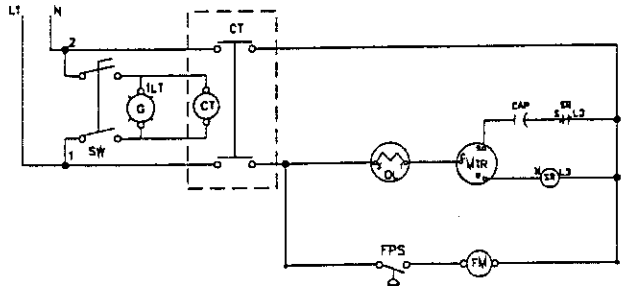
Model 150 - 230V/60 Hz



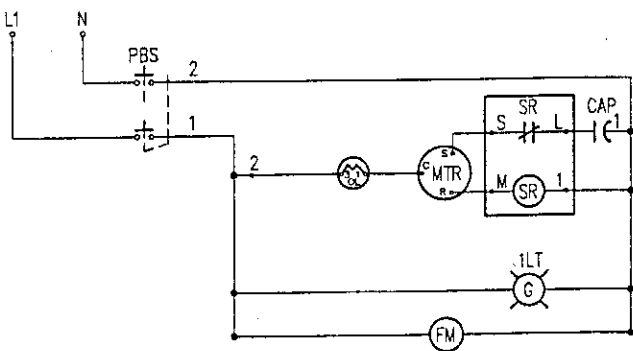
Model 50 - 208-230V/60Hz  
 Model 75 - 208-230V/60 Hz; 220-240V/50 Hz



Model 150 - 115V/60 Hz



Models 100, 125 - All Voltages

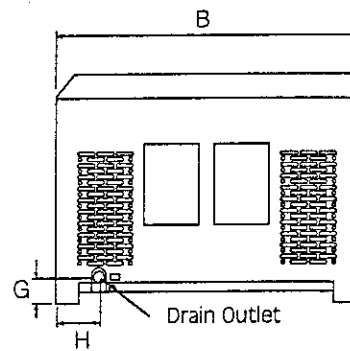
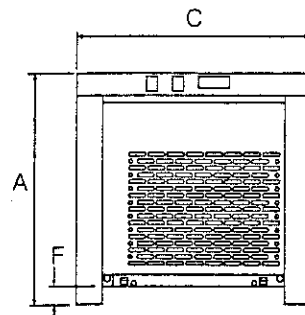
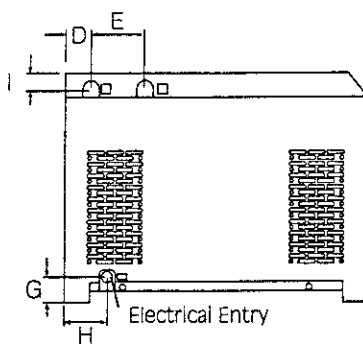


## Legend

- PBS - Push button switch
- 1LT - Power-on light
- SR - Start Relay
- CAP - Start Capacitor
- MTR - Compressor
- FM - Fan Motor
- OL - Overload
- FPS - Fan Pressure Switch (Only on 150 scfm)
- CT - Contactor w/115v coil
- SW - On/Off Switch

# DIMENSIONS/WEIGHTS

Model	Dimensions inches						
	25	35	50	75	100	125	150
A	17	17	19-15/16	21-9/16	21-9/16	26-15/16	26-15/16
B	22	22	24-7/16	28-11/16	28-11/16	30-1/8	30-1/8
C	17	17	17	20	20	23-3/4	23-3/4
D	1-13/16	1-13/16	1-15/16	1-15/16	1-15/16	2-3/16	2-3/16
E	4	4	5	5	5	5	5
F	15/16	15/16	15/16	15/16	15/16	15/16	15/16
G	1-7/8	1-7/8	1-7/8	1-7/8	1-7/8	1-7/8	1-7/8
H	3	3	3	3	3	3	3
I	1-3/16	1-3/16	1-3/16	1-3/16	1-3/16	1-3/16	1-3/16
Inlet/Outlet Connections	3/4	3/4	1	1	1	1-1/2	1-1/2
Weights lbs	105	118	156	180	198	229	230



## TROUBLESHOOTING GUIDE

SYMPTOM	POSSIBLE CAUSE(S)	CORRECTIVE ACTION
<b>A. Water downstream of dryer</b>	<ol style="list-style-type: none"> <li>1. Residual free moisture remaining in downstream pipelines</li> <li>2. Air by-pass system is open</li> <li>3. Inlet and Outlet connections are reversed</li> <li>4. Temperatures surrounding air lines downstream of dryer have dropped below dryers dew point rating</li> <li>5. Excessive free moisture (bulk liquid) at dryer inlet</li> <li>6. Condensate not being automatically drained Drain mechanism is clogged or inoperative. Drain line is restricted or frozen. Electric drains-timer not set to allow for sufficient condensate removal</li> <li>7. Dryer overloaded resulting in elevated dew point.</li> <li>8. Refrigeration system not functioning properly resulting in elevated dew point.</li> </ol>	<p>Blow out system with dry air</p> <p>Check valve positions Check for correct connection</p> <p>Insulate or heat trace air lines exposed to low ambients or dry air to lower dew point</p> <p>Install separator ahead of dryer</p> <p>Replace drain mechanism if inoperative</p> <p>Open drain line Electric drains-reset time so that all liquid is discharged</p> <p>Check inlet air temperature and pressure, flow rate (compressor capacity) and ambient air or water temperature. See D below</p>
<b>B. High pressure drop across dryer</b>	<ol style="list-style-type: none"> <li>1. Excessive air flow</li> <li>2. Freezing of moisture in evaporator because of refrigeration system improperly functioning.</li> <li>3. Separator filter element clogged.</li> </ol>	<p>Check flow rate See D below</p> <p>Replace filter element.</p>
<b>C. Dew point indicator in red area</b>	<ol style="list-style-type: none"> <li>1. Dryer overloaded resulting in high air outlet temperature.</li> <li>2. Refrigeration system not functioning properly resulting in high air outlet temperature.</li> </ol>	<p>See A 7</p> <p>See D below</p>
<b>D. Refrigeration system not functioning properly</b> <ol style="list-style-type: none"> <li>1. Power on light off</li> <li>2. Refrigerant compressor cycles on and off</li> </ol>	<ol style="list-style-type: none"> <li>a. Power failure</li> <li>b. Line disconnect switch open</li> <li>c. Blown fuses, open breaker</li> <li>d. Faulty wiring, loose terminals</li> </ol> <ol style="list-style-type: none"> <li>a. High or low ambient conditions</li> <li>b. Air-cooled models-Dirty, clogged condenser fins, obstructed air flow across condenser, or non functioning fan motor or fan control switch.</li> <li>c. Water-cooled models-Cooling water temperature too high, or flow too low, faulty water regulating valve, clogged water strainer.</li> </ol>	<p>Check power to unit Close disconnect switch Check for continuity Have electrician check electrical connections</p> <p>Check min./max. temperature ranges Clean condenser and check for free air flow, if problem persists contact qualified refrigeration repairman or manufacturer's service department.</p> <p>Clean strainer, check water flow and temperature, if problem persists contact qualified refrigeration repairman or manufacturer's service department.</p>



# Parts List

PARTS DESCRIPTION	25			35			50		
	115/1/60 100/1/50	208-230/1/60	220-240/1/50	115/1/60 100/1/50	208-230/1/60	220-240/1/50	115/1/60 100/1/50	208-230/1/60	220-240/1/50
Condensing Unit (air-cooled)	4130.120.7	4130.120.8	4130.120.9	4130.121.8	4130.121.9	4130.121.10	4130.122.10	4130.122.11	4130.122.15
Compressor Only	4130.108.34	4130.108.61	4130.108.35	4130.108.38	4130.108.39	4130.108.40	4130.108.41	4130.108.42	4130.108.43
Overload	5925.570.2	5925.578.24	5925.570.3	5925.578.1	5925.578.2	5925.578.3	5925.578.4	5925.578.5	5925.578.6
Start Relay	5945.655.5	5945.683.24	5945.655.6	5945.683.1	5945.683.2	5945.683.3	5945.683.4	5945.683.5	5945.683.6
Start Capacitor	—	—	—	—	—	—	—	5910.103.23	—
Fan Motor	6105.239.1	6105.237.4	6105.237.4	6105.238.27	6105.238.28	6105.238.28	6105.238.29	6105.238.30	6105.238.30
Fan Blade	4140.228.2	4140.228.2	4140.228.2	4140.227.17	4140.227.17	4140.227.17	4140.227.18	4140.227.18	4140.227.18
Condenser (air-cooled)	4130.110.26	4130.110.26	4130.110.26	4130.111.18	4130.111.18	4130.111.18	4130.111.19	4130.111.19	4130.111.19
Dryer	4130.165.14	4130.165.14	4130.165.14	4130.165.14	4130.165.14	4130.165.14	4130.165.14	4130.165.14	4130.165.14
Hot gas by-pass valve	9802-1	9802-1	9802-1	9802-1	9802-1	9802-1	9802-1	9802-1	9802-1
By-pass valve strainer	4130.701.8	4130.701.8	4130.701.8	4130.701.8	4130.701.8	4130.701.8	4130.701.8	4130.701.8	4130.701.8
Light assy., green	6350.457.25	6350.457.25	6350.457.23	6350.457.25	6350.457.23	6350.457.23	6350.457.25	6350.457.23	6350.457.23
Dew Point Indicator	6685.283.1	6685.283.1	6685.283.1	6685.283.1	6685.283.1	6685.283.1	6685.283.1	6685.283.1	6685.283.1
On/off switch	6110.706.13	6110.706.13	6110.706.13	6110.706.13	6110.706.13	6110.706.13	6110.706.13	6110.706.13	6110.706.13
Maintenance Kit	KRDKT2	KRDKT2	KRDKT2	KRDKT2	KRDKT2	KRDKT2	KRDKT3	KRDKT3	KRDKT3
Element	FS-35	FS-35	FS-35	FS-35	FS-35	FS-35	FS-60	FS-60	FS-60
Drain	4460.151.10	4460.151.10	4460.151.10	4460.151.10	4460.151.10	4460.151.10	4460.151.10	4460.151.10	4460.151.10

PARTS DESCRIPTION	75			100 & 125			150		
	115/1/60 100/1/50	208-230/1/60	220-240/1/50	115/1/60 100/1/50	208-230/1/60	220-240/1/50	115/1/60 100/1/50	208-230/1/60	220-240/1/50
Condensing Unit (air-cooled)	4130.122.12	4130.122.13	4130.122.14	4130.123.12	4130.123.13	4130.123.14	4130.134.31	4130.134.32	4130.134.33
Compressor Only	4130.108.44	4130.108.45	4130.108.46	4130.108.47	4130.108.48	4130.108.49	4130.108.50	4130.108.51	4130.108.52
Overload	5925.578.7	5925.578.8	5925.578.9	5925.578.10	5925.578.11	5925.578.12	5925.578.13	5925.578.14	5925.578.15
Start Relay	5945.683.7	5945.683.8	5945.683.9	5945.683.10	5945.683.11	5945.683.12	5945.683.13	5945.683.14	5945.683.15
Start Capacitor	—	5910.103.26	5910.103.27	5910.103.28	5910.103.29	5910.103.29	5910.103.37	5910.103.38	5910.103.39
Fan Motor	6105.238.31	6105.238.32	6105.238.32	6105.238.33	6105.238.34	6105.238.34	6105.238.35	6105.238.36	6105.238.36
Fan Blade	4140.227.19	4140.227.25	4140.227.25	4140.227.20	4140.227.20	4140.227.20	4140.227.21	4140.227.21	4140.227.21
Condenser (air-cooled)	4130.111.20	4130.111.20	4130.111.20	4130.111.21	4130.111.21	4130.111.21	4130.111.22	4130.111.22	4130.111.22
Dryer	4130.165.14	4130.165.14	4130.165.14	4130.165.14	4130.165.14	4130.165.14	4130.165.14	4130.165.14	4130.165.14
Fan Pressure Switch	—	—	—	—	—	—	4130.138.13	4130.138.13	4130.138.13
Hot gas by-pass valve	9802-1	9802-1	9802-1	9802-1	9802-1	9802-1	9802-1	9802-1	9802-1
By-pass valve strainer	4130.701.8	4130.701.8	4130.701.8	4130.701.8	4130.701.8	4130.701.8	4130.701.8	4130.701.8	4130.701.8
Light assy., green	6350.457.11	6350.457.4	6350.457.4	6350.457.11	6350.457.4	6350.457.4	6350.457.11	6350.457.4	6350.457.4
Dew Point Indicator	6685.283.1	6685.283.1	6685.283.1	6685.283.1	6685.283.1	6685.283.1	6685.283.1	6685.283.1	6685.283.1
On/off switch	6110.706.6	6110.706.6	6110.706.6	6110.706.6	6110.706.6	6110.706.6	6110.706.6	6110.706.6	6110.706.6
Condenser (water-cooled)	—	—	—	—	—	—	4130.134.34	4130.134.35	4130.134.36
Water Control Valve	—	—	—	—	—	—	4130.145.22	4130.145.22	4130.145.22
Water Strainer	—	—	—	—	—	—	4731.735.1	4731.735.1	4731.735.1
Screen, water strainer	—	—	—	—	—	—	4731.735.5	4731.735.5	4731.735.5
Contactors	—	—	—	—	—	—	5910.134.11	—	—
Maintenance Kit	KRDKT4	KRDKT4	KRDKT4	*	*	*	KRDKT5	KRDKT5	KRDKT5
Element	FS-100	FS-100	FS-100	**	**	**	FS-170	FS-170	FS-170
Drain	4460.151.10	4460.151.10	4460.151.10	4460.151.10	4460.151.10	4460.151.10	4460.151.10	4460.151.10	4460.151.10

\* Model 100 - KRDKT4  
Model 125 - KRDKT5

\*\* Model 100 - FS-100  
Model 125 - FS-170

## **WARRANTY**

The manufacturer warrants the product manufactured by it, when properly installed, operated, applied, and maintained in accordance with procedures and recommendations outlined in manufacturer's instruction manuals, to be free from defects in material or workmanship for a period as specified below, provided such defect is discovered and brought to the manufacturer's attention within the aforesaid warranty period.

The manufacturer will repair or replace any product or part determined to be defective by the manufacturer within the warranty period, provided such defect occurred in normal service and not as a result of misuse, abuse, neglect or accident. Normal maintenance items requiring routine replacement are not warranted. The warranty covers parts and labor for the warranty period unless otherwise specified. Repair or replacement shall be made at the factory or the installation site, at the sole option of the manufacturer. Any service performed on the product by anyone other than the manufacturer must first be authorized by the manufacturer.

Unauthorized service voids the warranty and any resulting charge or subsequent claim will not be paid. Products repaired or replaced under warranty shall be warranted for the unexpired portion of the warranty applying to the original product.

The foregoing is the exclusive remedy of any buyer of the manufacturer's product. The maximum damages liability of the manufacturer is the original purchase price of the product or part.

THE FOREGOING WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, WHETHER WRITTEN, ORAL, OR STATUTORY, AND IS EXPRESSLY IN LIEU OF THE IMPLIED WARRANTY OF MERCHANTABILITY AND THE IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE. THE MANUFACTURER SHALL NOT BE LIABLE FOR LOSS OR DAMAGE BY REASON OF STRICT LIABILITY IN TORT OR ITS NEGLIGENCE IN WHATEVER MANNER INCLUDING DESIGN, MANUFACTURE OR INSPECTION OF THE EQUIPMENT OR ITS FAILURE TO DISCOVER, REPORT, REPAIR, OR MODIFY LATENT DEFECTS INHERENT THEREIN.

THE MANUFACTURER, HIS REPRESENTATIVE OR DISTRIBUTOR SHALL NOT BE LIABLE FOR LOSS OF USE OF THE PRODUCT OR OTHER INCIDENTAL OR CONSEQUENTIAL COSTS, EXPENSES, OR DAMAGES INCURRED BY THE BUYER, WHETHER ARISING FROM BREACH OF WARRANTY, NEGLIGENCE OR STRICT LIABILITY IN TORT.

The manufacturer does not warrant any product, part, material, component, or accessory manufactured by others and sold or supplied in connection with the sale of manufacturer's products.

### **Warranty Period**

Parts and labor for two (2) years from the date of shipment from the factory; heat exchangers are covered (parts only) for an additional three (3) years (total of five (5)). On units that manufacturer requests be returned to the factory, a one time removal/reinstallation labor allowance as noted in the Service Warranty Policies and Procedures Handbook will apply. Freight to the factory from the installation site and to the installation site from the factory will be paid by the manufacturer; means of transportation to be specified by manufacturer.

**AUTHORIZATION FROM THE SERVICE DEPARTMENT IS NECESSARY BEFORE MATERIAL IS RETURNED TO THE FACTORY OR IN-WARRANTY REPAIRS ARE MADE.**

**Authorized Distributor**

**24-Hour Hotline No.: (65) 96178200**

**KAESER  
KOMPRESSOREN**

KAESER KOMPRESSOREN PTE LTD  
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Singapore 638091  
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## COMPRESSED AIR FILTERS

Filter Types KLS, KFS, KPF, KPF-RF, KOR, KOX, and KVF  
20 - 780 scfm (0.58 - 22.08 m<sup>3</sup>/min)

# INSTRUCTION MANUAL



### Contents

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### General Safety Information

#### 1. Pressurized devices

##### ▲ WARNING

- Do not exceed maximum operating pressure indicated on serial number tag.
- Make certain filter is fully depressurized before servicing.

#### 2. Breathing Air

- Air treated by this equipment may not be suitable for breathing without further purification. Refer to OSHA standard 1910.134 for breathing air requirements.

#### 3. Flammable gases

##### ▲ WARNING

While the materials of construction are compatible with many flammable gases, the following application limitations must be considered:

- Housing materials are slightly porous. The product must be used in a well ventilated area in the absence of sparks or ignition sources. Do not use in Class 1, Division 1, Group D environments.
- The type of area - forced exhaust system used (i.e., high or low level) would be dependent on the gas involved.
- Each application (other than for air or inert gas) must be reviewed to minimize fire or explosion hazard.

## Type Identification

Type	Description	Function	Outer foam color
KLS	Mechanical Separator	Impaction type Separator	none
KFS	Separator/filter	Mechanical separator and 3 micron coalescer	none
KPF	General purpose air line filter	1 micron coalescer	none
KPF-RF	Dry Desiccant afterfilter	1 micron afterfilter for desiccant dryers	none
KOR	High efficiency oil removal filter	High efficiency (99.99+%) coalescer	Red
KOX	Maximum efficiency oil removal filter	Maximum efficiency (99.999+%) coalescer	Blue
KVF	Oil vapor removal filter	Activated carbon adsorber	Green

# 1.0 Installation

## A. Where Used/Air Quality After Filtration

Type	Where used	Solid particle removal (maximum size in microns)	Liquid removal efficiency (at rated conditions)	Maximum inlet liquid loading ppm w/w	Remaining oil content ppm w/w
KLS	Separator - downstream of an aftercooler Point-of-use - where no aftercooler is installed upstream	---	95% of water	30,000 bulk liquids	---
KFS	Separator - downstream of an aftercooler Point-of-use - where no aftercooler is installed upstream or as prefilter to refrigerated dryer	3	99+% of water	25,000 aerosols and bulk liquids	5 aerosols
KPF	Prefilter - • Prefilter to KOR, KOX high efficiency coalescing filters Point-of-use - where aftercooler is installed upstream	1	100% of water	2,000 aerosols	1 aerosols
KPF-RF	Afterfilter - downstream of a pressure-swing (heatless) desiccant dryers Downstream of an Activated Carbon or Desiccant Tower	1	No liquid should be present at inlet	No liquid should be present at inlet	---
KOR	Prefilter - ahead of desiccant and membrane dryers Afterfilter • Downstream of refrigerated dryer • Downstream of pressure-swing (heatless) desiccant dryers for finer solid particle removal • Oil removal at point-of-use	0.01	99.99+% of oil	1,000 aerosols	0.008 aerosols
KOX	Prefilter - ahead of desiccant and membrane dryers (use after KPF to reduce liquid and solids load, prolong element life and ensure filtration efficiency) Afterfilter - downstream of refrigerated dryer	0.01	99.999+% of oil	100 aerosols	0.0008 aerosols
KVF	Afterfilter to KOR & KOX for true oil free applications	0.01	Removes vapors only	No liquid should be present at inlet	0.003 vapor

## B. Mounting

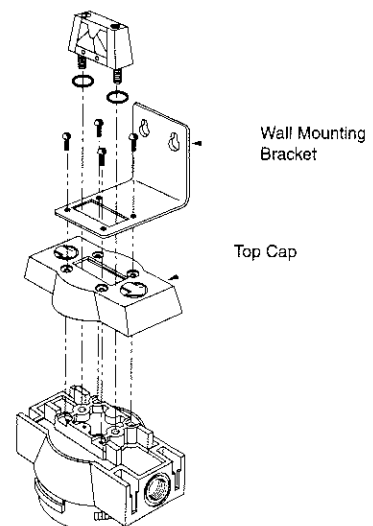
### 1. Wall mounting brackets - Mount bracket to filter head:

- (1) remove four (4) screws holding black plastic top cap to filter head
- (2) place bracket on head over plastic cap
- (3) install screws supplied with bracket.

### 2. Differential Pressure Gauge Mounting to Filterhead

- (1) make certain o-rings are in place on the bottom of the gauge body.
- (2) connect the low pressure transmission bolt (bolt next to the RED band on gauge) to the gauge port at the filter outlet (downstream side of filter).
- (3) connect the high pressure transmission bolt (bolt next to GREEN band on gauge) to the gauge port at the filter inlet (upstream side of the filter).

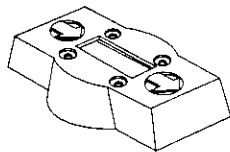
(4) use a coin or a flathead screwdriver to tighten/loosen bolts. The tip width of the screwdriver should be at least 3/8" inch (9.5 mm). Torque bolts to 25 +/- 5 inch oz. **DO NOT OVER TIGHTEN**



### C. Piping

1. Before installing, blow out pipe line to remove scale and other foreign matter.
2. This unit has DRYSEAL pipe threads; use pipe compound or tape sparingly to male threads only.
3. Mounting (Types KLS, KFS, KPF, KPF-RF, KOR, KOX) - mount so that inlet and outlet connections are horizontal (filter bowl vertical) to ensure proper liquid drainage.
4. Flow Direction - install so that the air flow is in the direction of arrows on the filter head. Flow through the element is inside to outside.

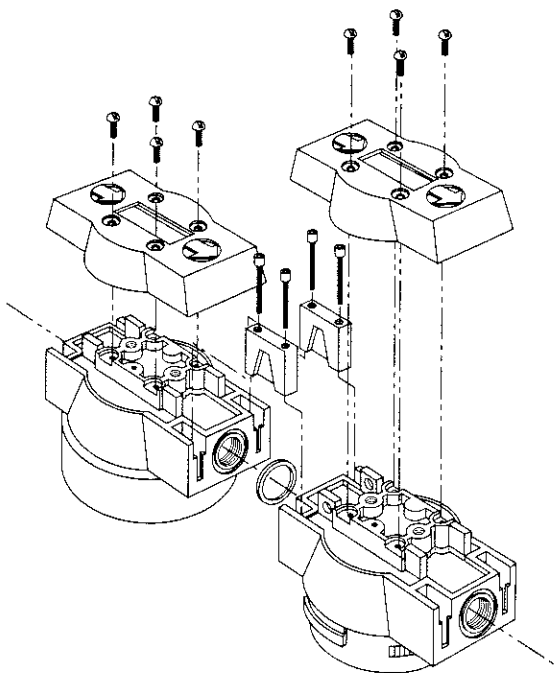
NOTE: Type KPF-RF flows from outside to inside the element. All other types flow from inside to outside the element.



5. Direct filter-to-filter (modular) connection - Filter heads may be joined without using a pipe nipple

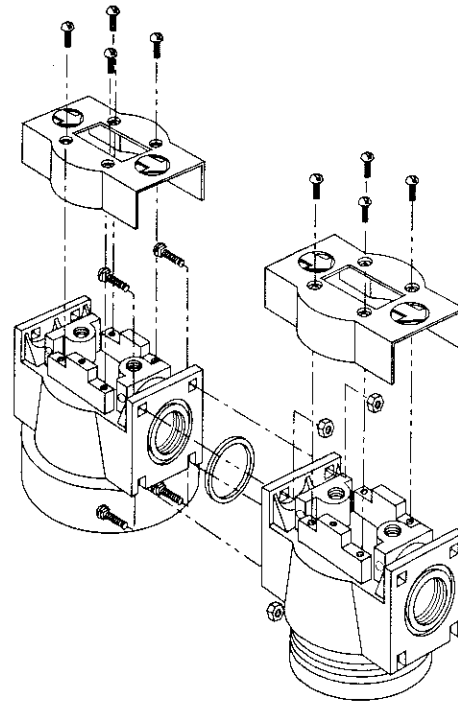
- a. Bayonet type heads - Use two (2) modular connectors, o-ring, and four (4) socket head cap screws (sold as kit)

Remove black plastic top cap, apply generous amount of lubricant to o-ring, install o-ring in groove, and insert connectors. Screw connectors to head using socket head cap screws.



- b. Threaded heads

Use four carriage bolts, nuts and o-ring (sold as kit). Remove black plastic top caps, apply generous amount of lubricant to o-ring, install o-ring in groove, and install bolts and nuts.



NOTE: Make certain flow direction through filters is correct (pin holes used for aligning top caps should be in the same position on all filters; when hole is in the front, inlet is to the left). Type KPF-RF when hole is on the side farther from you, inlet is to left.

NOTE: Lubricate o-ring with generous amount of lubricant before installation.

6. Isolation valves and by-pass piping - For ease of service, isolation and by-pass valves are desirable. In critical applications, two filters installed in parallel may be necessary to avoid interruption of air supply.

### D. Drain provisions

1. Internal Automatic Drains - Drain line  
The bottom of internal automatic drains are provided with 1/8" (inside threads) for connection of a drain line if desired.
2. External Auto Drains - External auto drains may be added as follows:

Models with flow ratings of 20 through 170 scfm (0.58-4.83 m<sup>3</sup>/min) - remove internal drain and install adapter (available from factory). Adapter outlet connection is 1/8" (inside threads).

Models with flow ratings 250 through 780 scfm (7.08-10.67 m<sup>3</sup>/min) - remove adaptor fitting from bottom of bowl; 1/2" (inside threads) port is available for external drain connection

**▲WARNING** Discharge at system pressure; anchor drain line.

## 2.0 Operation

**⚠ WARNING** Do not operate filter at pressures in excess of Maximum Working Pressure indicated on Serial Number Tag.

NOTE: Maximum Operating Temperature - 150°F, 66°C. Liquid filtration above 120°F, 49°C is not recommended since there is typically oil present in a vapor state which passes through the filter and condenses downstream.

NOTE: KVF Type Filter - If operated above 100°F, 38°C may experience less than 1000 hours of life because of greater oil vapor content.

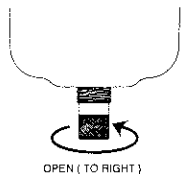
### A. Liquid Draining - Types KLS, KFS, KPF, KOR, and KOX

NOTE: Collected liquids must be removed to ensure proper operation.

NOTE: Depressurize slowly, to avoid filter element damage.

- Manual Drain - Turn to your right (clockwise) to open and to your left (counterclockwise) to close.
- Automatic Drain - Liquids will automatically discharge when sufficient accumulation occurs.
  - Internal Auto Drains - These drains may be manually drained by turning to your right (clockwise) to open and to your left (counterclockwise) to close.

NOTE: Manually drain internal auto drains daily to verify drain function.



### B. Operational Checkpoints

#### All Types

Check flow, pressure, and temperature to make certain filter is being operated within design conditions.

#### Types KLS, KFS, KPF, KPF-RF, KOR, and KOX

Check pressure drop across the filter

- Pressure differential in excess of 10 psi (0.7 kgf/cm<sup>2</sup>) - pressure indicator in red area - indicates that the filter sleeve or element should be replaced.

NOTE: Element should be changed annually or when indicator changes to red, whichever occurs first.

NOTE: Pressure drop should never exceed 50 psi (3.5 kgf/cm<sup>2</sup>).

- Check for sudden reduction in pressure drop. This might indicate:
  - Possible leak across element o-ring seal
  - Leak through the element due to physical damage

- Check to see that filter is installed level to insure proper drainage.
- Check that manual drains are drained periodically or that automatic drains are functioning.
- On models with Liquid Level Sight glass - Check that liquid level is below top of Sight glass.

### Type KVF

- Check for an oily smell by opening the manual valve. If an oily smell exists, the following should be checked:
  - Filter element adsorption capacity exhausted
  - Leak across element o-ring seal
  - Leak through element due to physical damage
  - Presence of liquids because of lack of or failure of prefilters
  - Flow, pressure and temperatures outside design conditions
  - Presence of gaseous impurities which cannot be adsorbed

**⚠ CAUTION** Methane, carbon monoxide, carbon dioxide and various inorganic gases cannot be removed by a Type KVF filter.

### C. Flow Capacity

Maximum air flow for the various filters at 100 psig (7 kgf/cm<sup>2</sup>) is indicated in Table 1. To determine maximum air flows at inlet pressures other than 100 psig (7 kgf/cm<sup>2</sup>), multiply flow from Table 1 by air flow correction factor from Table 2 that corresponds to the minimum operating pressure at the inlet of the filter.

NOTE: Filters should not be selected by pipe size. Select using flow rate and operating pressure only.

Table 1 - Maximum Flow @100 psig [7 kgf/cm<sup>2</sup>]

Types KLS, KFS, KPF, KPF-RF, KOR, KOX, KVF Model Number	scfm [m <sup>3</sup> /hr]
20	20 [35]
35	35 [60]
60	60 [105]
100	100 [170]
170	170 [290]
250	250 [425]
375	375 [640]
485	485 [825]
625	625 [1060]
780	780 [1325]

Table 2 - Air Flow Correction Factor

Minimum Inlet Pressure	psig	20	30	40	60	80	100	120	150	200	250	300
	kgf/cm <sup>2</sup>	1.4	2.1	2.8	4.2	5.6	7.0	8.4	10.6	14.1	17.6	21.1
Correction Factor		0.30	0.39	0.48	0.65	0.82	1.00	1.17	1.43	1.87	2.31	2.74



### 3.0 Maintenance

NOTE: Types KPF, KPF-RF, KOR, KOX, and KVF - complete element is replaced; Type KFS - unless separator core is damaged outer sleeve only is replaced.

1. KPF-RF (dry desiccant afterfilter)
  - Initial drop: 1 psi (0.07 kgf/cm<sup>2</sup>). Pressure drop increases as element loads with solid particles. Replace when pressure drop reaches 10 psi (0.7 kgf/cm<sup>2</sup>) (indicator in red area) or annually, whichever occurs first.
2. Type KLS (Mechanical Separator)
  - Element should not require replacement unless physically damaged. If sludge accumulates, element can be removed and cleaned with soap and water.
3. Types KFS, KPF, KOR, and KOX
  - a. Initial (dry) pressure drop: 1 psi (0.07 kgf/cm<sup>2</sup>) to 2 psi (0.14 kgf/cm<sup>2</sup>)
  - b. Operating pressure drop: As filter becomes liquid loaded (wetted), (except for KPF-RF) pressure drop will increase to 2 to 6 psi (0.14 to 0.42 kgf/cm<sup>2</sup>). Further pressure drop occurs as element loads with solid particles.
  - c. FOR MAXIMUM FILTRATION EFFICIENCY, REPLACE ELEMENT WHEN PRESSURE DROP REACHES 10 PSI (0.7 KGF/CM<sup>2</sup>) (INDICATOR IN RED AREA) OR ANNUALLY, WHICHEVER OCCURS FIRST.

NOTE: Pressure drop may temporarily increase when flow is resumed after flow stoppage. Pressure drop should return to normal within one hour.

NOTE: Type KOR and KOX - During normal operation bottom of foam sleeve will have a band of oil. Spotting above the band indicates that liquids are accumulating faster than they can be drained and that prefiltration is required.

4. Type KVF
  - a. Adsorption capacity - 1000 hours at rated capacity. Element life is exhausted when odor can be detected downstream of the filter.

#### B. Procedure for Element Replacement

**WARNING** THIS FILTER IS A PRESSURE CONTAINING DEVICE. DEPRESSURIZE BEFORE SERVICING. If filter has not been depressurized before disassembly, an audible alarm will sound when the bowl begins to be removed from the head. If this occurs, stop disassembly, isolate and completely depressurize filter before proceeding.

1. Isolate filter (close inlet and outlet valves if installed) or shut off air supply.
2. Depressurize filter by slowly opening manual drain valve.
3. Remove bowl
  - a. For models rated for 20-170 scfm (35 - 290 m<sup>3</sup>/hr) - bayonet mount - push bowl up, turn bowl 1/8th turn to your left, and pull bowl straight down
  - b. For models rated for 250-780 scfm (425 - 1325 m<sup>3</sup>/hr) - threaded bowls - unscrew bowl from head using hand, strap wrench or C spanner.
4. Clean filter bowl

5. Replace element
  - a. Replacing complete element
    - 1) Pull off old element and discard
    - 2) Make certain o-rings on top of replacement element are in place and push element onto filter head. For models rated 485-780 scfm (825-1325 m<sup>3</sup>/hr), place element in bowl & secure with centering device.

NOTE: Types KOR, KOX, and KVF - Do not handle elements by outside foam cover. Handle by bottom end cap only.

#### b. Type KFS - replacing sleeve only

- 1) Pull element straight down to remove.
- 2) Remove bolt and bottom cap and remove disposable filter sleeve.
- 3) Clean separator core with soap and water if necessary.
- 4) Slide new filter sleeve over separator core and replace bottom cap and hand tighten bolt.
- 5) Make certain o-ring inside top of element is in place and push element onto filter head.

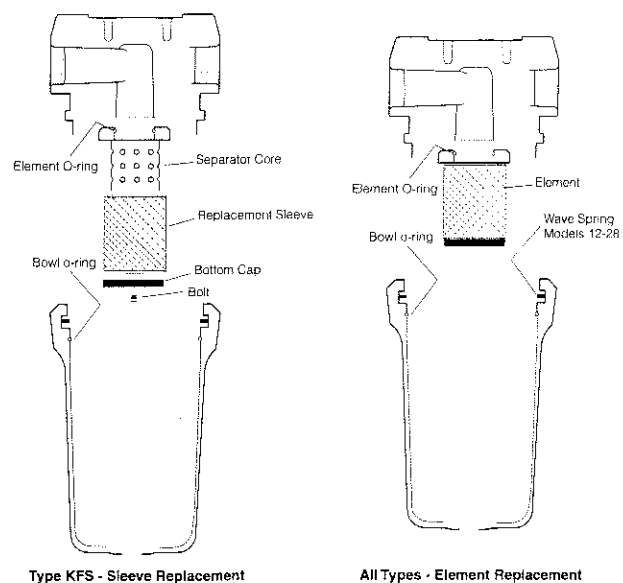
6. After making certain that o-ring inside top of bowl (and on bayonet mount heads, wave spring) are in place, reassemble bowl to head.

NOTE: Make certain o-ring is generously lubricated.

NOTE: Wave spring ends should be pointed down to prevent the wave spring from interfering with reassembly.

NOTE: Threaded bowl to head connection, generously lubricate threads with a high grade/temperature lubricant good for 150°F, 66°C.

NOTE: For Models with flow rating of 20 scfm (35 m<sup>3</sup>/hr) manufactured before 12/99 make certain spacer in bowl is in place before reassembling.

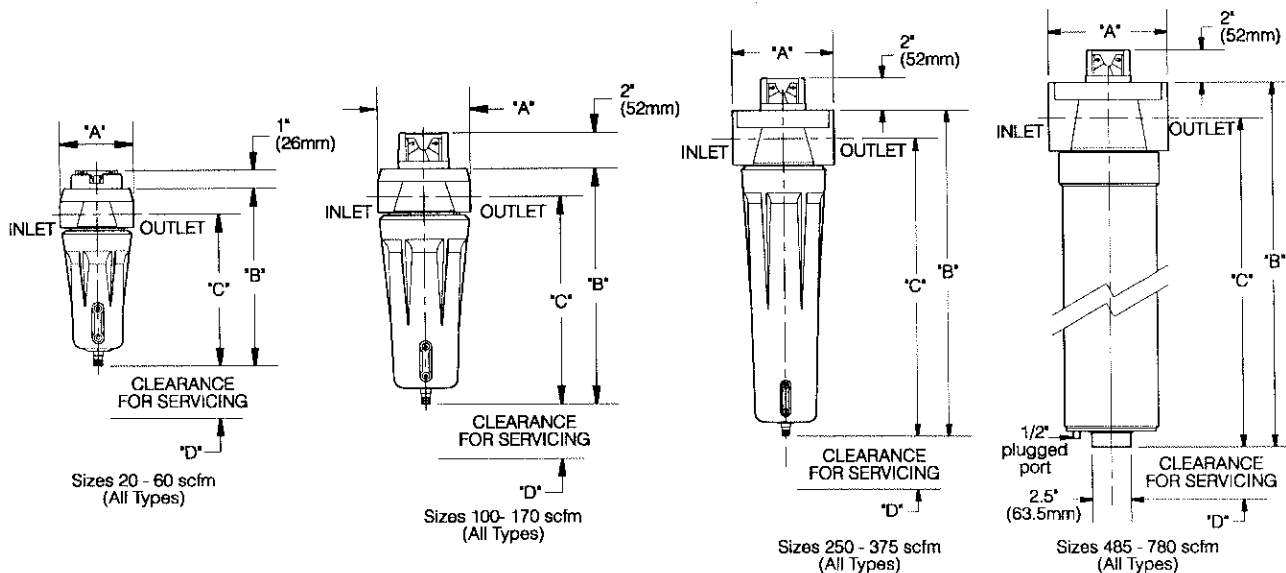


#### C. Auto Drain Mechanism

It is recommended that drain mechanism be replaced annually.

Filter Type <i>KLS, KFS, KPF, KPF-RF, KOR, KOX and KVF</i>	20	35	60	100	170	250	375	485	625	780
Replacement Element <i>FS, PF, PF-RF, OR, OX, and VF</i>	20 or 20SS	35 or 35SS	60 or 60SS	100 or 100SS	170 or 170SS	250 or 250SS	375 or 375SS	485 or 485SS	625 or 625SS	780 or 780SS
Nominal Air Flow scfm @100 psig (m <sup>3</sup> /hr @ 7.0 bar)	20 (35)	35 (60)	60 (105)	100 (170)	170 (290)	250 (425)	375 (640)	485 (825)	625 (1060)	780 (1325)
In/Out Connection <i>NPT or BSP</i>	3/8, 1/2	3/8, 1/2	3/8, 1/2	3/4, 1	3/4, 1	1, 1-1/4, 1-1/2	1, 1-1/4, 1-1/2	2, 2-1/2	2-1/2	2-1/2
"A"	4.13 (105)	4.13 (105)	4.13 (105)	5.25 (133)	5.25 (133)	6.44 (164)	6.44 (164)	7.63 (194)	7.63 (194)	7.63 (194)
"B"	8.15 (207)	10.05 (255)	12.40 (316)	13.32 (338)	17.57 (446)	20.80 (528)	25.29 (642)	29.08 (739)	34.83 (885)	40.96 (1040)
"C"	6.40 (163)	8.59 (224)	10.97 (285)	11.74 (298)	15.99 (406)	18.98 (482)	23.47 (596)	26.83 (681)	32.58 (827)	38.71 (983)
"D"	3.00 (76)	3.00 (76)	3.00 (76)	3.50 (89)	3.50 (89)	4.00 (102)	4.00 (102)	4.00 (102)	4.00 (102)	4.00 (102)
Weight	4.14 (1.88)	4.5 (2.04)	4.7 (2.13)	6.3 (2.9)	6.9 (3.1)	10.2 (4.63)	11.3 (5.13)	28 (12.70)	33 (14.97)	38 (17.24)
Maximum Working Pressure	Housing - 300 psig, 21.1 kgf/cm <sup>2</sup> Models with Internal Drain or Liquid level indicator - 250 psig, 17.6 kgf/cm <sup>2</sup>					Housing - 300 psig, 21.1 kgf/cm <sup>2</sup> Models with Internal Drain or Liquid level indicator - 250 psig, 17.6 kgf/cm <sup>2</sup>				
Maximum Operating Temperature	150°F, 66°C					50°F, 66°C				
Head Material	Zinc			Aluminum		Aluminum				
Bowl Material	Aluminum					Aluminum			Steel	
Liquid Level Indicator Material	Isoplast					Isoplast			-----	

NOTE: Dimensions and Weights are for reference only. Request certified drawings for construction purposes.



## **WARRANTY**

The manufacturer warrants the product manufactured by it, when properly installed, operated, applied, and maintained in accordance with procedures and recommendations outlined in manufacturer's instruction manuals, to be free from defects in material and workmanship for a period of one (1) year from date shipment to the buyer by the manufacturer or manufacturer's authorized distributor provided such defect is discovered and brought to the manufacturer's attention within the aforesaid warranty period.

The manufacturer will repair or replace any product or part determined to be defective by the manufacturer within the warranty period, provided such defect occurred in normal service and not as a result of misuse, abuse, neglect or accident. Normal maintenance items requiring routine replacement are not warranted. The warranty covers parts and labor for the warranty period. Repair or replacement shall be made at the factory or the installation site, at the sole option of the manufacturer. Any service performed on the product by anyone other than the manufacturer must first be authorized by the manufacturer.

Unauthorized service voids the warranty and any resulting charge or subsequent claim will not be paid.

Products repaired or replaced under warranty shall be warranted for the unexpired portion of the warranty applying to the original product.

The foregoing is the exclusive remedy of any buyer of the manufacturer's product. The maximum damages liability of the manufacturer is the original purchase price of the product or part.

THE FOREGOING WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, WHETHER WRITTEN, ORAL, OR STATUTORY, AND IS EXPRESSED IN LIEU OF THE IMPLIED WARRANTY OF MERCHANTABILITY AND THE IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE. THE MANUFACTURER SHALL NOT BE LIABLE FOR LOSS OR DAMAGE BY REASON OF STRICT LIABILITY IN TORT OR ITS NEGLIGENCE IN WHATEVER MANNER INCLUDING DESIGN, MANUFACTURE OR INSPECTION OF THE EQUIPMENT OR ITS FAILURE TO DISCOVER, REPORT, REPAIR, OR MODIFY LATENT DEFECTS INHERENT THEREIN.

THE MANUFACTURER, HIS REPRESENTATIVE OR DISTRIBUTOR SHALL NOT BE LIABLE FOR LOSS OF USE OF THE PRODUCT OR OTHER INCIDENTAL OR CONSEQUENTIAL COSTS, EXPENSES, OR DAMAGES INCURRED BY THE BUYER, WHETHER ARISING FROM BREACH OF WARRANTY, NEGLIGENCE OR STRICT LIABILITY IN TORT.

The manufacturer does not warrant any product, part, material, component, or accessory manufactured by others and sold or supplied in connection with the sale of manufacturer's products. 1/96

**AUTHORIZATION FROM THE SERVICE DEPARTMENT IS NECESSARY BEFORE MATERIAL IS RETURNED TO THE FACTORY OR IN-WARRANTY REPAIRS ARE MADE.**



**SERVICE DEPARTMENT: (724) 745-3038**

P.O. Box 946 • Fredericksburg, VA 22404

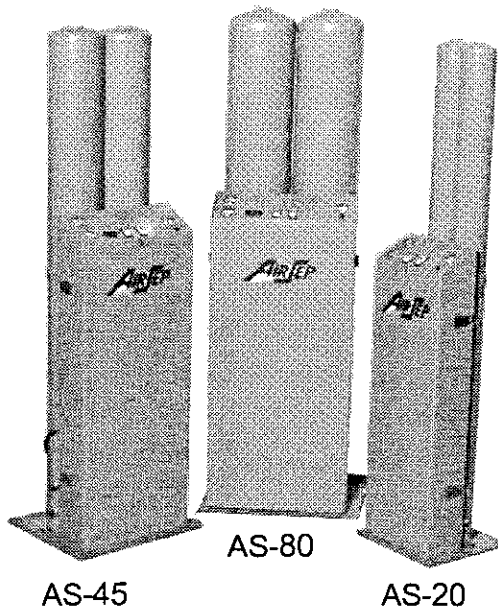
Tel: 540/898-5500 • FAX: 540/898-5520



Suggested List Price \$25.00 (U.S.D.)

## AS-20/45/80 PSA Oxygen Generator

### *Instruction Manual*



AS-45

AS-80

AS-20



INDUSTRIAL & MEDICAL  
OXYGEN GENERATING SYSTEMS

MN010-1 A10/99

AirSep® Corporation • 260 Creekside Drive • Buffalo, NY 14228-2075 USA  
Telephone: (716) 691-0202 • 24-Hour Fax: (716) 691-1255

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## 1.0 General Information

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### 1.1 AirSep Oxygen Generators

This AirSep Oxygen Generator is an on-site oxygen generating machine. Coupled with your air compressor (\*), it takes air and separates the oxygen from the other gases. The separation is accomplished with an inert ceramic material that does not require replacement (when maintained and used according to this instruction manual). The process is completely regenerative which makes it reliable and virtually maintenance free. The delivery pressure can be set from 0 to 45 psig. (0 to 310 kPa) to meet the needs of your operation.

*(\* It Is Important To Note That Your Compressor Is An Integral Part Of Your Total Operation. It Should Be Maintained In Accordance With The Manuals Received With The Compressor. An Improperly Maintained Compressor Could Affect The Operation Of Your Oxygen Generator.*

**WARNING -- AirSep Oxygen Generators are sold for use in industrial applications only. Unless specifically modified by the manufacturer (AirSep Corporation), these generators must not be used for any "respiratory" medical application.**

## 1.2 Product Warranty

AirSep Corporation ("AirSep") warrants to the party purchasing from AirSep (the "original purchaser") the PSA oxygen generator to be free from defect in parts and workmanship for one year from the date of start-up, not to exceed eighteen (18) months from the date of shipment to the original purchaser, under normal use, maintenance and operation\*. TO THE EXTENT PERMITTED UNDER APPLICABLE LAW, ALL WARRANTIES WITH RESPECT TO SUCH UNIT SHALL ONLY EXTEND TO AND BE FOR THE BENEFIT OF THE ORIGINAL PURCHASER AND SHALL NOT BE ASSIGNABLE TO, EXTEND TO OR BE FOR THE BENEFIT OF ANY OTHER PARTY. AirSep's obligations under this warranty are limited, at AirSep's option, to the repair, replacement or refunding the purchase price of any such unit of equipment (or part thereof) found by AirSep to be defective in parts or workmanship; provided, however, that AirSep shall have no obligation hereunder with respect to a defective part unless it receives written notice of such defect prior to the expiration of the applicable warranty period as referenced above.

Each unit of equipment for which a warranty claim is asserted shall, at the request of AirSep, be returned on a prepaid basis with proof of purchase date to the AirSep factory specified by AirSep at the expense of the original purchaser. Replacement parts shall be warranted as stated above for the unexpired portion of the original warranty. This warranty does not extend to any unit or part subjected to misuse, accident, improper maintenance or application, or which has been repaired or altered outside of the AirSep factory without the express prior written authorization of AirSep.

Notwithstanding anything to the contrary contained herein, during the applicable warranty period, as specified above, AirSep will pay the cost of return freight charges to the original purchaser, provided an authorized AirSep representative approved return of the unit or parts, for any equipment found by AirSep to be defective. For warranty repairs performed during the first 90 days from the date of invoice, AirSep will pay freight both ways. After the applicable parts warranty period has expired, the original purchaser is responsible for freight both ways.

\*Please refer to the appropriate product documentation for applicable installation and operating requirements.

### 1.3 Limits Of Liability

THE FOREGOING WARRANTY IS THE ONLY WARRANTY MADE BY AIRSEP WITH RESPECT TO THE EQUIPMENT (OR ANY PART THEREOF) AND IS IN LIEU OF ANY OTHER WARRANTY, EXPRESSED OR IMPLIED, IN FACT OR IN LAW, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. IT IS EXPRESSLY UNDERSTOOD THAT THE SOLE AND EXCLUSIVE REMEDY FOR ANY DEFECT IN PARTS OR WORKMANSHIP IS LIMITED TO ENFORCEMENT OF AIRSEP'S OBLIGATIONS AS SET FORTH ABOVE, AND AIRSEP SHALL NOT BE LIABLE TO ORIGINAL PURCHASER OR ANY OTHER PARTY FOR LOSS OF USE OF THE EQUIPMENT, LOST PROFITS OR FOR ANY OTHER SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES (EVEN IF AIRSEP HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES).

AirSep oxygen generators are sold for use in industrial applications only. Contact AirSep Corporation or an authorized AirSep Corporation representative before you use this unit for any medical application.

### 1.4 Conditions and Procedure For Returning The Unit For Service

Follow the procedures below to return a generator or component for service or credit:

1. Obtain a Return Goods Authorization (RGA) Number from the AirSep Industrial Service Department. **Before you call for service assistance, have the following information readily available** (it should be noted on the Ownership Data page of this manual):
  - The Model Number of the Generator
  - The Serial Number of the Generator
  - The Invoice Date

**NOTE:** AirSep issues no credit for any warranted item(s) until the serial number of the generator involved is presented.

2. Write the RGA Number clearly on the outside of the shipping container. AirSep accepts no item(s) for service or credit unless prior written authorization was issued by AirSep.
3. Return item(s) with the original packaging material. Be sure merchandise is packed for a safe return. AirSep is not responsible for damage that occurs in transit. Any damage that occurs to the generator or a component because of failure to follow this procedure is the sole responsibility of the customer.
4. Items(s) must be returned freight prepaid.

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## 2.0 Product Specifications

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### 2.1. Model AS-20

Oxygen Output	20 SCF/hr @ 0-45 psig 0.53 Nm <sup>3</sup> /hr @ 0-310 kPa
Oxygen Purity	90-95%
Dewpoint	-100 °F (-73 °C)
Air Requirements	320.0 SCF/hr @ 90-150 psig 8.4 Nm <sup>3</sup> /hr @ 620-1,035 kPa
Sound Level	70 dba @ 1 meter, open field conditions.
Dimensions	13 x 11 x 57 in. (W x D x H) 33 x 28 x 145 cm (W x D x H)
Weight	132 lb (60 kg)
Oxygen Receiver Tank (If supplied)	60 gal (227 l), 145 lb (65 kg) 20 x 52 in. (Dia x H) 51 x 132 cm (Dia x H)
Power Requirements	<b>Domestic Model:</b> 120 VAC, 60 HZ, Single Phase, 1.5 ampere <b>International Model:</b> 220 VAC, 50 Hz, Single Phase, 1.5 ampere

## 2.2. Model AS-45

Oxygen Output	45 SCF/hr @ 0-45 psig 1.2 Nm <sup>3</sup> /hr @ 0-310 kPa
Oxygen Purity	90-95%
Dewpoint	-100 F (-73 °C)
Air Requirements	660.0 SCF/hr @ 90-150 psig 17.4 Nm <sup>3</sup> /hr @ 620-1,035 kPa
Sound Level	78 dba @ 1 meter, open field conditions.
Dimensions	17 x 15 x 58 in. (W x D x H) 43 x 38 x 147 cm (W x D x H)
Weight	236 lb (107 kg)
Oxygen Receiver Tank (If supplied)	60 gal (227 l), 145 lb (65 kg) 20 x 52 in. (Dia x H) 51 x 132 cm (Dia x H)
Power Requirements	<b>Domestic Model:</b> 120 VAC, 60 HZ, Single Phase, 1.5 ampere  <b>International Model:</b> 220 VAC, 50 Hz, Single Phase, 1.5 ampere

### 2.3. Model AS-80

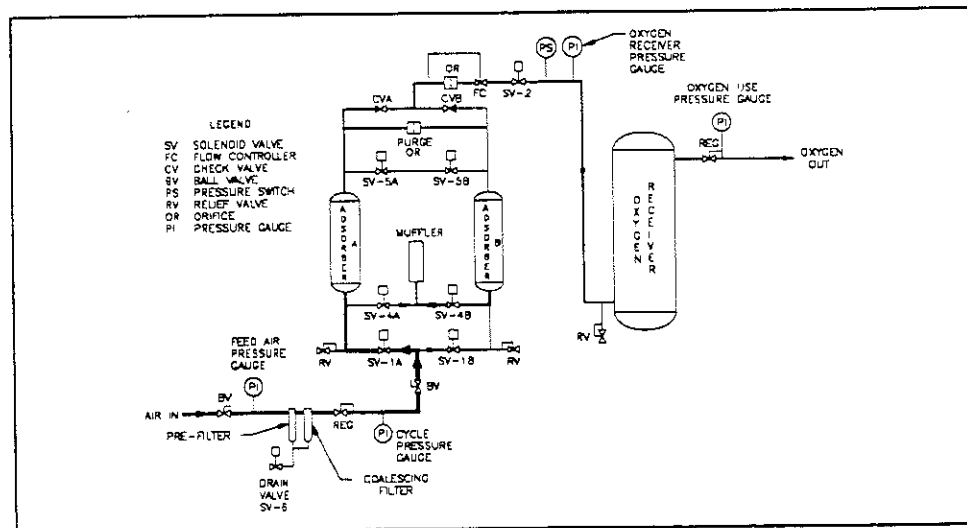
Oxygen Output	80 SCF/hr @ 0–45 psig 2.1 Nm <sup>3</sup> /hr @ 0–310 kPa
Oxygen Purity	90–95%
Dewpoint	-100 °F (-73 °C)
Air Requirements	1200.0 SCF/hr @ 90–150 psig 31.8 Nm <sup>3</sup> /hr @ 620–1,035 kPa
Sound Level	79 dba @ 1 meter, open field conditions.
Dimensions	20 x 16 x 60 in. (W x D x H) 51 x 41 x 152 cm (W x D x H)
Weight	320 lb (145 kg)
Oxygen Receiver Tank (If supplied)	60 gal (227 l), 145 lb (65 kg) 20 x 52 in. (Dia x H) 51 x 132 cm (Dia x H)
Power Requirements	<b>Domestic Model:</b> 120 VAC, 60 HZ, Single Phase, 1.5 ampere  <b>International Model:</b> 220 VAC, 50 Hz, Single Phase, 1.5 ampere

## 3. Oxygen Generator Parts And Controls

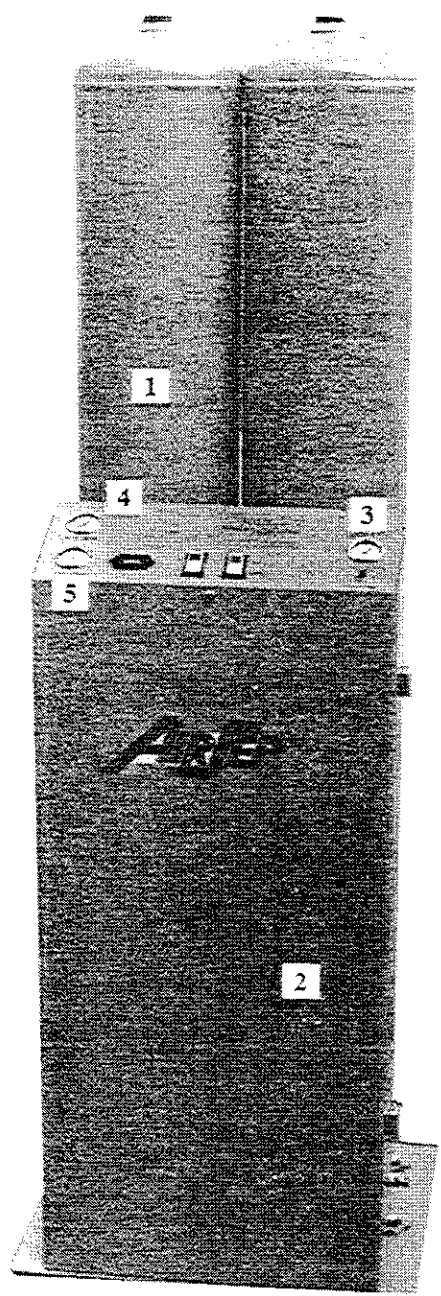
### 3.1 Basic Process Flow Description

This AirSep Oxygen Generator is designed to accept compressed air at 90-150 psig (620-1035 kPa) into its filter assembly. The prefilter (if present) removes condensed water and oil, dirt, scale, etc. The coalescing filter removes oil vapor. The normal flow of air through the unit is shown in the diagram below. After leaving the filter, the compressed air is regulated down to 65-70 psig (480 kPa) then directed by solenoid valves into one of two adsorbers containing molecular sieve. Molecular sieve has the unique property that it physically attracts or adsorbs nitrogen from air, leaving the oxygen to pass through to the receiver. Since there are two adsorbers, while one is producing oxygen the other is being purged of the nitrogen it adsorbed while making oxygen. The oxygen from the adsorbers is stored in the receiver. From the receiver the oxygen is regulated to 0-45 psig (0-310 kPa) depending upon your particular use pressure.

Since there are two adsorbers, while one is producing oxygen the other is being purged of the nitrogen it adsorbed while making oxygen. The oxygen from the adsorbers is stored in the receiver. From the receiver the oxygen is regulated to 0-45 psig (0-310 kPa) depending upon your particular use pressure.







- 1. Adsorbers
- 2. Cabinet
- 3. Oxygen Receiver Pressure Gauge
- 4. Feed Air Pressure Gauge
- 5. Cycle Pressure Gauge

Figure 2: Generator Parts

## 3.2 Parts Description

### 3.2.1. Generator Parts

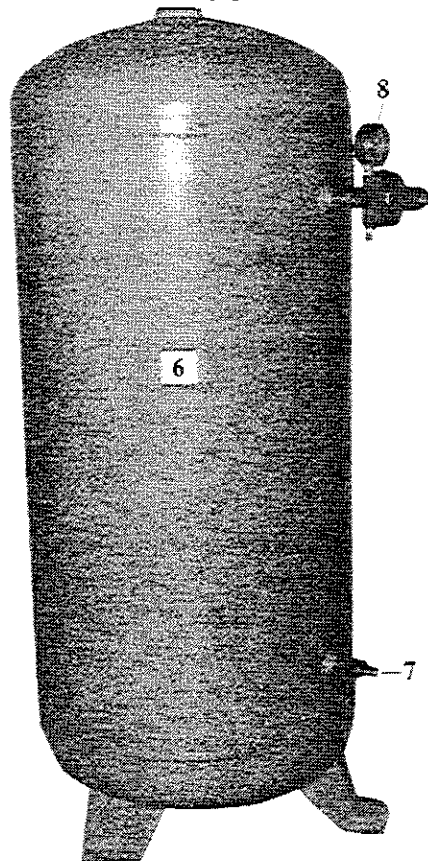
(Refer to Figure 2, Front View )

1.     **Adsorbers**  
Adsorbers contain Molecular Sieve that concentrates the oxygen from the air.
  
2.     **Cabinet**  
Contains all the internals that make the generator work.  
(e.g. Circuit board, pressure switch, valves, and flow controller, etc.)
  
3.     **Oxygen Receiver Pressure Gauge**  
Indicates the pressure of oxygen available for use in the receiver.
  
4.     **Feed Air Pressure Gauge**  
Indicates feed air pressure. With proper hook up and adequate feed air supply, the feed air pressure gauge should not at any time read below 70 psig (480 kPa) while the unit is in operation.
  
5.     **Cycle Pressure Gauge**  
Indicates approximate adsorber pressures as the unit cycles. It is controlled by the feed air pressure regulator, that is factory set. The gauge should read between 65-70 psig (480 kPa) at any time while the unit is in operation.

### 3.2.2 Receiver Parts

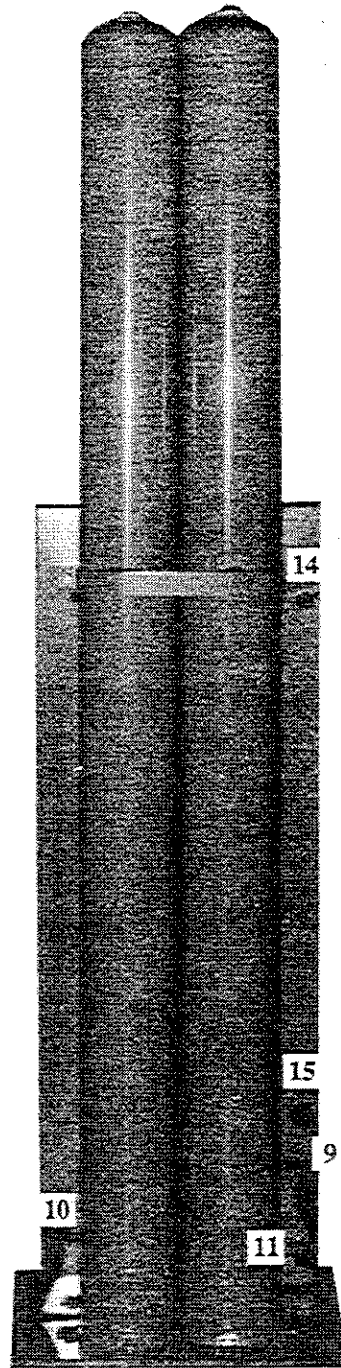
(Refer to Figure 3, Below)

6. **Oxygen Receiver Tank**  
Stores oxygen produced by the oxygen generator. The receiver tank provides stable flow and purity or short term surges of oxygen above rated capacity of generator.
7. **Relief Valve Assembly**  
Prevents excessive pressure from building up should a malfunction occur.
8. **Oxygen Pressure Regulator**  
The oxygen pressure regulator is connected to the oxygen supply port and is used to set the oxygen delivery pressure.



6. Oxygen Receiver Tank
7. Relief Valve Assembly
8. Oxygen Pressure Regulator

Figure 3: Receiver Parts



- 9. Air Inlet
- 10. Oxygen Outlet
- 11. Condensate Outlet

Figure 4: Generator Connections

## 3.3 CONNECTIONS

### 3.3.1. Generator Connections

(Refer to Figure 4, back view)

9. **Air Inlet**

AS-20/AS-45: 1/4" NPT Female bulkhead fitting with a  
1/4" NPT Male x 1/4" NPSM Ball-End Joint adapter.

AS-80: 1/4" NPT Female bulkhead fitting with a  
1/4" NPT Male x 3/8" NPSM Ball-End Joint adapter.

90 - 150 psig (620 - 1035 kPa) air supply from your compressor is connected to this fitting. *Feed Air Temperature 40° F / 5° C Minimum To 110° F / 43° C Maximum*

10. **Oxygen Outlet**

1/4" NPT Female bulkhead fitting with a 1/4" NPT Male x "B" size oxygen adapter. Connects to oxygen receiver--lower port.

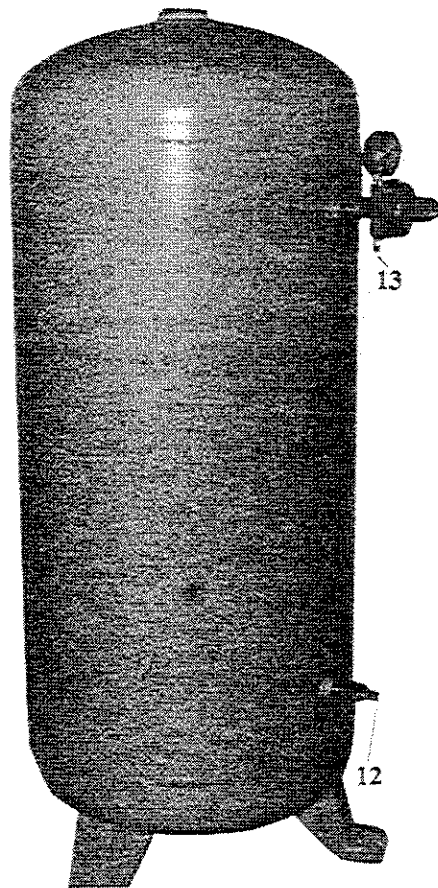
11. **Condensate Outlet**

1/4" NPT Female bulkhead fitting with a 1/4" NPT Male x 3/8" OD nylon tube adapter. Removes moisture from air filters. *This Port Must Not Be Plugged.* Tubing may be connected as needed for proper disposal of condensate.

### 3.3.2. Receiver Connections

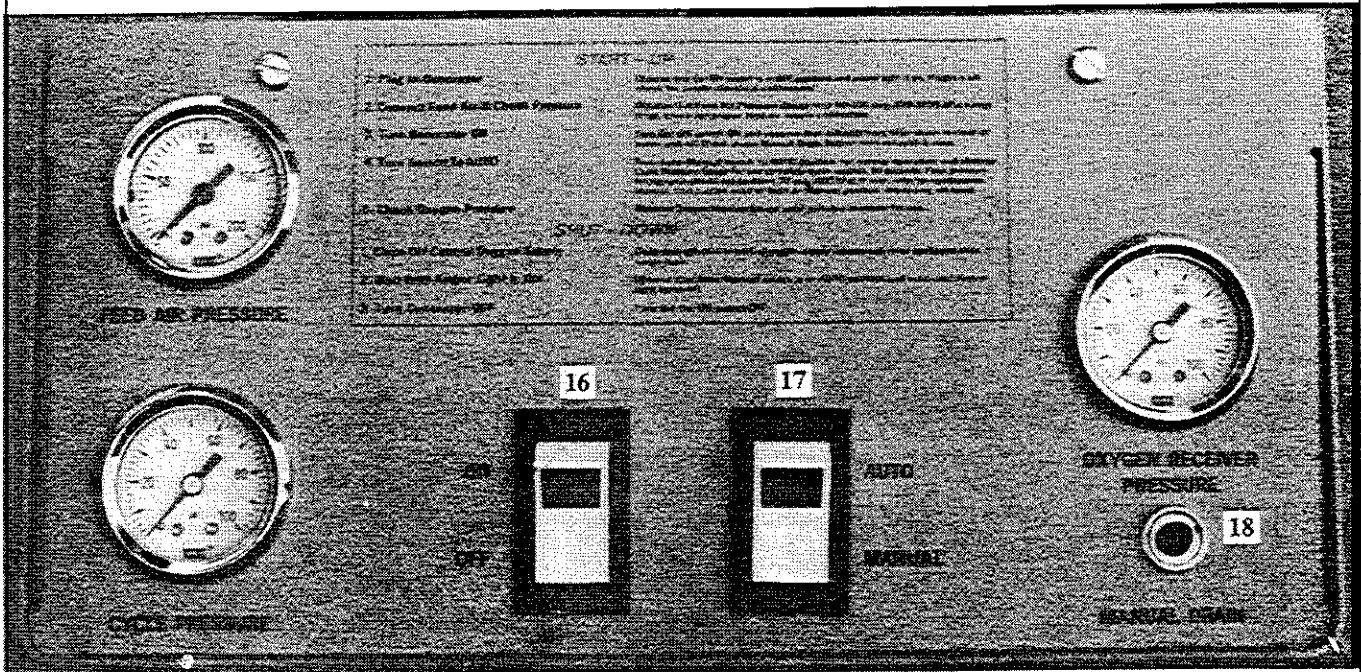
(Refer to Figure 5, Below)

- 12. **Oxygen Inlet Port**  
1/4" NPT female fitting.  
Oxygen from the generator enters the receiver through this port.
  
- 13. **Oxygen Supply Port**  
1/4" NPT female fitting.  
Oxygen is delivered for use, from this port through the Oxygen Pressure Regulator.



- 12. Oxygen Inlet Port
- 13. Oxygen Supply Port

**Figure 5: Receiver Connections**



- 16. On/Off Switch
- 17. Auto/Manual Switch
- 18. Manual Drain Push Button

Figure 6: Control Panel

## 3.4 Controls

(Refer to figure 4)

14. **Fuse**  
BUSS 3AG type, 250 volt, 3 amp.
15. **Power Cord**  
Three (3) prong grounded electrical plug. Supplies power to the unit.

(Refer to Control Panel figure 6)

16. **On/Off Switch**  
The On/Off Switch includes a GREEN power indicator light. When power is being supplied to the unit, the GREEN light will be on, irrespective of whether the switch is in the "ON" or "OFF" position.
17. **Auto/Manual Switch**  
The Auto/Manual Switch includes an AMBER cycle indicator light. Placing the switch in the AUTO position allows the unit to cycle on and off with oxygen demand. Placing the switch in the MANUAL position forces the generator to run continuously. When the AMBER light is on, it indicates that the generator is in operation and producing oxygen.
18. **Manual Drain Push Button**  
The Manual Drain Push Button is used to drain the filter bowls manually.



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## 4.0 Installation

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### 4.1 Unpacking

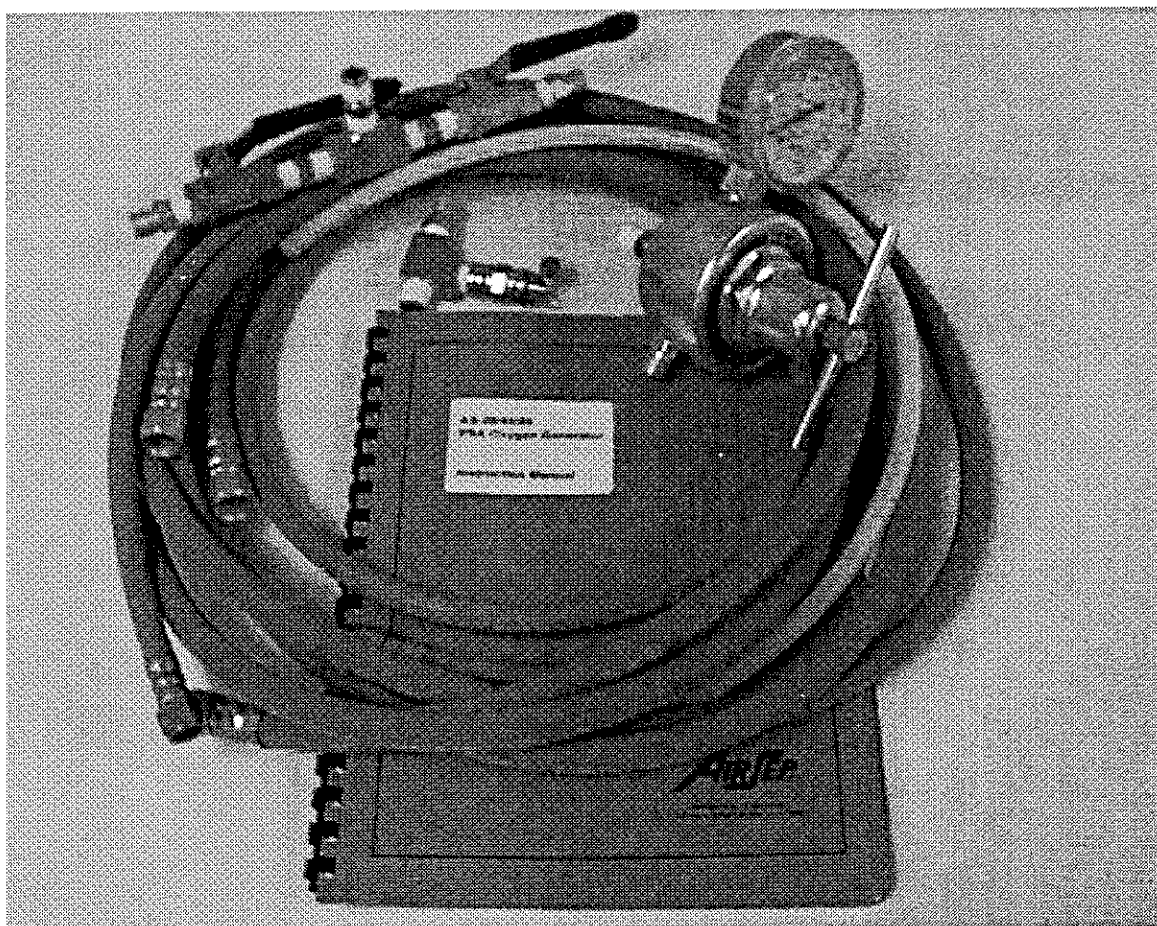
You should have received the AirSep Oxygen Generator on a wooden skid covered by a container. The container also includes an Accessory Box containing all the accessories and an Instruction Manual needed for proper installation of the unit. The Oxygen Receiver Tank (if supplied) is shipped separately. Place the unit at the pre-determined location. If damage is found after unpacking and inspection, notify the freight company at once. The Manufacturer is not liable for damage caused during shipment.

**Important Notice:** *Upon receiving your AirSep Oxygen Generator, inspect the unit thoroughly for signs of damage. Any signs of damage, either external or internal, should be noted on the delivery receipt, and also reported immediately to both the freight company and AirSep. Contact AirSep Corporation at (716)691-0202.*

- A. Be sure the container is right side up.
- B. Inspect exterior of the container for any obvious damage that may have occurred during shipment.
- C. Exercise care in opening the container.
  - 1. It may be necessary to return the unit in the event that the unit has been damaged in shipment.
  - 2. Cut the straps that go around the container and remove them.
  - 3. Remove Accessory Kit.
  - 4. Remove the unit from the container and carefully stand it on its base plate.
- D. Inspect the exterior of the generator for damage in shipment. Pay special attention to the cabinet (gauges, lights, switches, etc.). Remove the cabinet cover and inspect interior of generator for damage.

F. Unpack Accessory Kit. It should contain:

- 1 ea. Instruction Manual
- 1 ea. Oxygen Regulator Assembly
- 1 ea. Oxygen Pressure Relief Assembly
- 1 ea. Oxygen Ball Valve/"T" Assembly With Fittings
- 2 ea. Oxygen Hose (green)
- 1 ea. Compressed Air Hose (red) With Adapter Fitting
- 1 ea. Drain Tubing



**Accessory Kit**

## 4.2 Pre-Installation Instructions

It is necessary to consider the location, space available, air supply, and power supply prior to installing your AirSep Oxygen Generator.

### A. Location

1. The generator must be located in an area which remains above 40° F / 5° C and below 110° F / 43° C. Operating the oxygen generator in an area below 40° F / 5° C or above 110° F / 43° C, will cause damage not covered under the manufacturer's warranty.

### 2. Physical Characteristics

**Model AS-20:** Floor Space (13 x 11 inch / 33 x 28 cm)  
Height (57 inch / 145 cm)  
Weight (132 lb / 60 kg)

**Model AS-45:** Floor Space (17 x 15 inch / 43 x 38 cm)  
Height (58 inch / 147 cm)  
Weight (236 lb / 107 kg)

**Model AS-80:** Floor space (20 x 16 inch / 51 x 41 cm)  
Height (60 inch/152 cm)  
Weight (320 lb/145 kg)

**Oxygen Receiver:** Floor space (20 inch/51 cm dia.)  
(all models) Height (51 inch/130 cm )  
Weight ( 145 lb/65 kg)

### B. Air Supply

1. Air from your compressor must be less than 110°F/ 43° C and above 40°F/5°C before it reaches the Oxygen Generator. High feed air temperature will reduce the performance of the Oxygen Generator and will cause damage not covered under the manufacturer's warranty. Low feed air temperatures may cause freezing of components and damage not covered under the manufacturer's warranty.

2. **Model AS-20:** The hose/piping used to bring air to the unit should be properly sized to handle 320 SCF/hr @ 90 - 150 psig (8.4 Nm<sup>3</sup>/hr @ 620-1035 kPa). (at least 1/4" ID hose)
- Model AS-45:** The hose/piping used to bring air to the unit should be properly sized to handle 660 SCF/hr @ 90-150 psig (17.4 Nm<sup>3</sup>/hr @ 620-1035 kPa). (at least 1/4" ID hose)
- Model AS-80:** The hose/piping used to bring air to the unit should be properly sized to handle 1200.0 SCF/hr @ 90-150 psig (31.8 Nm<sup>3</sup>/hr @ 620-1035 kPa). (at least 3/8" ID hose)

**With a properly sized hose/piping, the feed air gauge should not read less than 70 psig (480 kPa) during operation. *The Use Of An Improperly Sized Hose/Piping Will Result In Reduced Oxygen Generating Capacity.***

It is recommended that a shut off valve be installed where the air inlet hose/piping is connected to the compressed air supply to facilitate safe depressurization of the hose/piping before removal.

### C. Power Supply

1. **Domestic Models:** 120 VAC, 60 Hz, Single Phase, 1.5 ampere
- International Models:** 220 VAC, 50 Hz, Single Phase, 1.5 ampere

*Proper Voltage Must Be Provided To The Generator At All Times (110 VAC +/- 10% For Domestic Models And 220 VAC +/- 10% For International Models). Improper Voltage Will Cause Damage Not Covered Under The Manufacturer's Warranty.*

2. Power should be supplied to the unit from a grounded electrical outlet with a 3-prong plug. It is recommended to use a circuit that will not be accidentally turned off, as this will cause the unit to stop cycling. If power is off and the unit is being used, the reservoir will depressurize. Repressurization of a 60 gallon (227 liter) oxygen receiver will take approximately:

AS-20 : 90 minutes

AS-45: 45 minutes

AS-80: 25 minutes

## 4.3 Installation

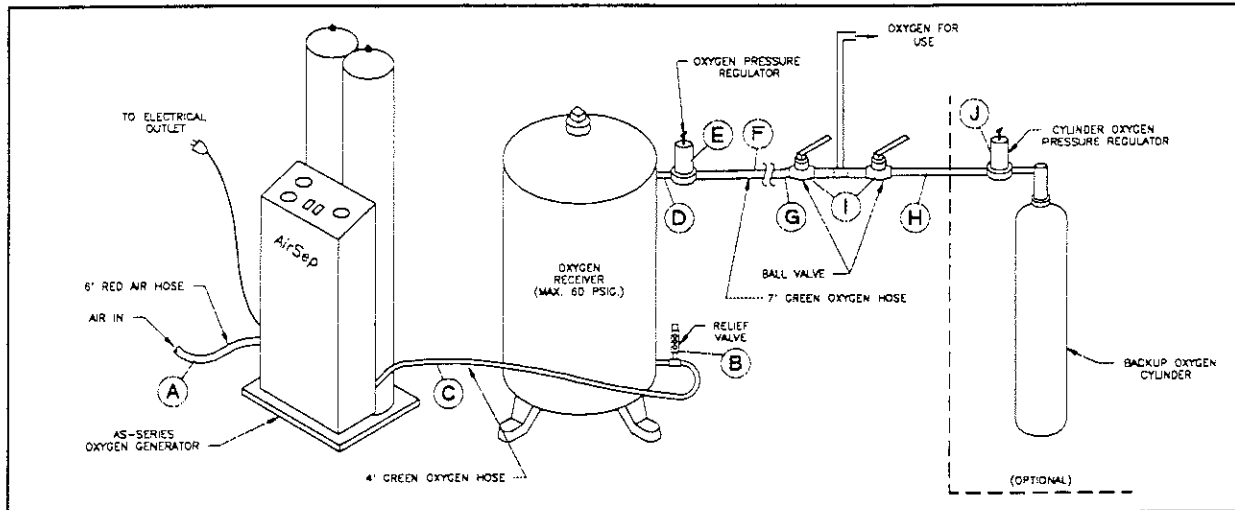


Figure 7: Installation Setup

- A. Connect RED air hose from air inlet port at lower rear of cabinet to your air supply.
- B. Tighten relief valve assembly to oxygen inlet port of the receiver.
- C. Connect the 4 foot GREEN oxygen hose from oxygen outlet port at lower rear of cabinet to receiver relief valve assembly.
- D. Tighten Hex Nipple to oxygen supply port of receiver tank.
- E. Tighten oxygen regulator to Hex Nipple.
- F. Connect one end of the 7 foot GREEN oxygen hose to oxygen regulator.
- G. Connect the other end of the 7 foot green oxygen hose to the ball valve assembly. Use this valve as the primary oxygen supply, or shut-off valve from the unit. Insure that all fittings of the ball valve assembly are tight.
- H. Connect a standby oxygen bottle to the other ball valve fitting. Make sure the standby oxygen cylinder has an oxygen regulator on it and it is adjusted to suit your needs.
- I. Close both ball valves. If you need oxygen at this time, SLOWLY open ONLY the ball valve for the standby oxygen cylinder until the oxygen generator is operating, and then SLOWLY open the oxygen generator ball valve and close the oxygen cylinder ball valve.
- J. OPTIONAL - For on-line back-up or surge needs, leave oxygen cylinder ball valve open and set the oxygen cylinder regulator approximately 5 psig below the regulator setting on the oxygen receiver tank.
- K. Check all fittings for leaks using an oxygen compatible leak detecting solution.

**NOTE:** The installation of the back-up oxygen cylinder as described in steps H & I, although not required, is strongly recommended.

---

## 5.0 Operation

---

### 5.1 Start-Up Procedure

- A. **Electrical Connection**  
Insert 3-prong plug into a properly grounded electrical outlet. Observe that the ON/OFF switch is in the OFF position and the power indicator light is on. If light is off, check fuse or electrical connection.
- B. **Check Feed Air Pressure And Connections**  
Turn on compressed air supply. Observe that the Feed Air Pressure Gauge is in the 90 -150 psig (620-1035 kPa) range. If not, check for proper feed air supply connection.
- C. **Turn The Generator "ON"**  
Turn ON/OFF switch "ON". Air will exhaust for 3-5 seconds from filter drain port on the left rear bottom of cabinet. This is normal. It ensures removal of any condensate that may be present in the filter bowls before air is fed into the adsorbers. Observe that exhaust from the filter drain port is clear of water and oil. If not, manually press Drain Push Button until exhaust is clear of liquid. Under normal operating conditions, air should exhaust from the filter drain port for 3-5 seconds every 10 minutes.
- D. **Turn Auto/Manual Switch To "Auto"**  
Turn Auto/Manual Switch to AUTO position for normal operation and observe Feed Air Pressure Gauge and Cycle Pressure Gauge for one complete cycle (approx 100 seconds). As the unit cycles (amber cycle indicator light is on), feed air pressure should not fall below 70 psig (480 kPa) and peak cycle pressure should not go above 70 psig (480 kPa). If it does, refer to section on trouble shooting ( section H).

With the selector switch in the AUTO POSITION, observe the oxygen receiver pressure gauge. When the pressure reaches ap-

proximately 55 psig (378 kPa), the amber light will go off indicating oxygen production has stopped. When oxygen is used and the receiver pressure falls to approximately 45 psig (325 kPa), the amber light will come on and oxygen production will resume. Re-adjustment of the pressure switch should not be necessary, but if required, refer to section on trouble shooting (see section 7.3 figure 9).

The oxygen generator can be operated in the AUTO or MANUAL position depending upon use. To obtain maximum oxygen purity at less than maximum flow, or delivery pressure requirements of 50 psig (345 kPa); place selector switch to MANUAL position. This forces continuous operation of the unit regardless of oxygen receiver pressure.

**E. Check Oxygen Pressure**

Observe Oxygen Receiver Pressure Gauge on the generator until suitable pressure for use is attained. Adjust oxygen pressure regulator on oxygen receiver tank to suit your need(s). Begin oxygen use.

**IMPORTANT:**

When the generator is being turned on for the first time, or after a long shut-down time, it is possible that the oxygen receiver tank is full of air. Before the generator can supply oxygen of design purity, any air in the oxygen receiver tank must be purged. To do this, run the unit in MANUAL position while venting the oxygen from the receiver tank until purged. Allow the oxygen receiver tank to refill.

**WARNING:**

Always vent oxygen outside. While venting oxygen, make sure there is no smoking or open flame. Do not allow venting oxygen to come in contact with clothing or hydrocarbon materials.



## 5.2 Shut-Down

- A. **Turn Off Central Oxygen Supply**  
Close shut-off valve to central oxygen supply (ball valve located after the oxygen receiver tank). This will insure that the oxygen receiver tank is full the next day even if an oxygen discharge valve is left open.
  
- B. **Wait Until Amber Light Is Off**  
Observe that the Auto/Manual Switch is in the AUTO position, and wait until Amber light turns off. This allows the receiver tank to fill completely with oxygen for immediate use when next required. It also allows the unit to shutdown at the proper point in the cycle. **NOTE:** Failure to wait will result in temporary lower oxygen purity during subsequent use.
  
- C. **Turn Generator OFF**  
Turn the ON/OFF switch "OFF".

---

## 6.0 Maintenance

---

**WARNING:** The interior of the cabinet contains electrical parts that may produce electrical hazard if not handled properly. To prevent electrical shock, care must be used when servicing this equipment.

Figures 13 and 14 show internal parts of the generator and should always be referred to when performing maintenance or servicing the unit. Monitoring the operation of the unit on a regular schedule is the best way to insure a long life for your AirSep Oxygen Generator. The generator's operation should be monitored both daily and monthly as described in the following sections.

### 6.1 Daily Monitoring

The daily monitoring of the oxygen generator consists of simply observing for a few minutes each day the operation of the unit to **make sure that the automatic filter bowl drain system is functioning properly.** *Plugging Of The Drain System Will Cause Water/Oil Carry-Over Into The Adsorber, And Will Cause Severe Damage To The Adsorbent Which Is Not Covered Under The Manufacturer's Warranty .*

1. Observe that the Filter Drain Port is not plugged. Air should discharge from this port (or the end of the tube if connected) for 3-5 seconds every 10 minutes when the ON/OFF switch is in the "ON" position.
2. Press Manual Drain button to test the operation of the Filter Drain Solenoid Valve. Air should discharge freely and be water/oil free within 5 seconds.

**WARNING: If bowls do not drain see Trouble Shooting Section**

15. Install the bowl(s) and slowly open the inlet and outlet ball valves. Check for leaks.
16. Replace the front cover.

## 6.3 Filter Elements

The expected life of the coalescing filter element is one year with proper maintenance of the prefilter element. The prefilter element's life expectancy depends on air and piping quality. It should be changed every six (6) months. The prefilter element has a rating of 5 microns, and the coalescing element a 0.01 micron rating.

Improper compressed air quality could affect the operation of your oxygen generator. The filter element(s) supplied with each unit have been factory selected based upon the units feed air requirements.

***CAUTION: The Following Will Cause Damage Not Covered Under The Manufacturer's Warranty .***

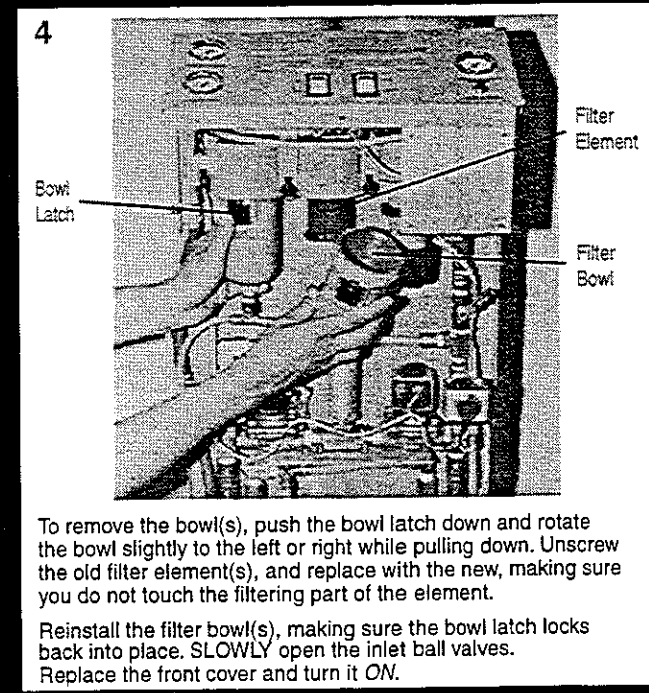
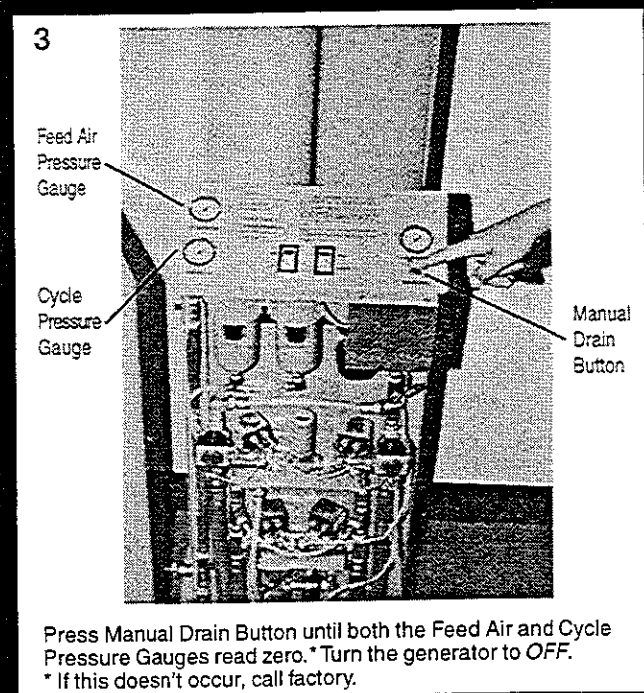
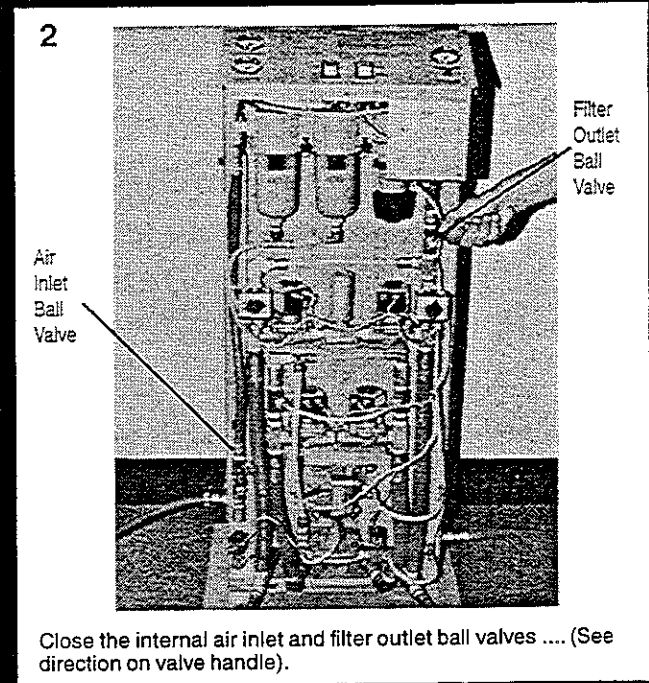
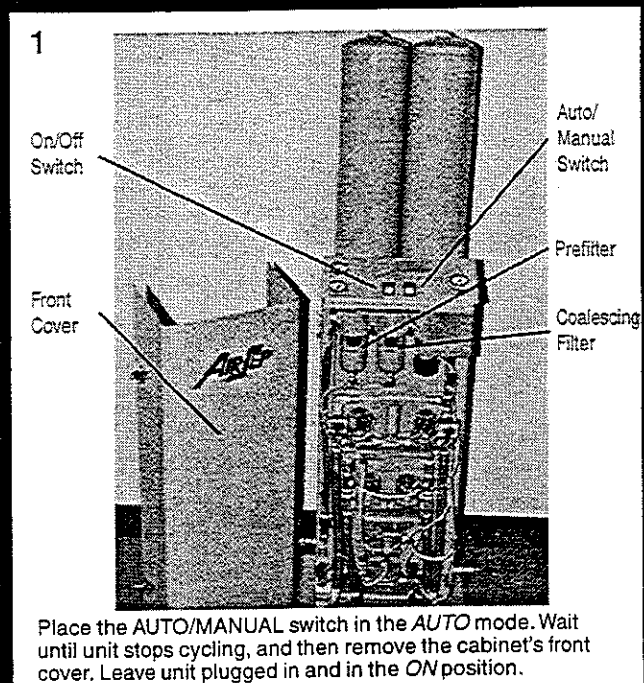
1. Feed air at a temperature above 110°F/43°C.
2. Water, oil, rust, scale and/or other foreign objects carryover in the feed air due to damaged filter elements and /or plugged drains.

**WARNING: AirSep filter elements have been selected based upon their ability to function in severe operating conditions. Use of other than original equipment manufacturer filters could cause damage not covered under the AirSep warranty.**

# Oxygen Generator Filter Element Replacement

The only maintenance required on your AirSep Oxygen Generator is periodically changing the filter element(s). If you perform this simple, inexpensive procedure, you can assure yourself years of trouble-free use.

The following procedures are appropriate for AS series models AS-20 through AS-450. Note: the AS-20 has only one filter — a coalescing filter.



## 6.4 Prefilter Element Replacement AS-45 And AS-80

(see "Oxygen Generator Filter Maintenance " pg 31)

The left hand filter is called a prefilter. It removes rust, pipe scale, and other foreign particles from the air. It also separates most of the condensed water and oil from the incoming air. Replace the prefilter element every 6 months using the following procedure:

1. Follow Steps 1-7 of the MONTHLY Maintenance Procedure. (Section 6.2)
2. The prefilter element is removed by gently unscrewing the white baffle which retains the element. Remove the old element and replace with a new one.
3. Follow Steps 9-16 of the MONTHLY Maintenance Procedure. (Section 6.2)

## 6.5 Coalescing Element Replacements AS-20, AS-45 And AS-80

(see "Oxygen Generator Filter Maintenance " pg 31)

The filtering element used in the AS-20 (coalescing) is the right hand filter in the AS-45 and AS-80. It causes oil and water "fog" which may be present in feed air to collide (coalesce) and form larger droplets which fall to the bottom of the bowl. This filter element should be replaced once per year. The AS-20 filter element also performs the same function of the prefilter found on the AS-45 and AS-80 models.

1. Follow Steps 1 - 7 of the MONTHLY Maintenance Procedure. (Section 6.2)
2. The Coalescing element is removed by gently unscrewing it (counterclockwise) from the filter body. Make sure the old black gasket is removed and discarded. The old element CANNOT be cleaned.

**WARNING: Do not handle the filtering part of the element and do not over-tighten. The old element cannot be cleaned.**

3. Check to be sure a black gasket is attached to the top of the new element before mounting.
4. Follow Steps 9 - 16 of the MONTHLY Maintenance Procedure. (Section 6.2)

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## 7.0 Servicing/Trouble Shooting

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**WARNING:** The Interior Of The Oxygen Generator Cabinet Contains Electrical Parts That May Produce An Electrical Hazard If Not Handled Properly. To Prevent Electrical Shock, Care Must Be Used When Servicing The Unit.

AirSep Oxygen Generators run pressurized while operating normally. **THESE UNITS MUST BE DEPRESSURIZED BEFORE ATTEMPTING ANY REPAIRS.** To Depressurize The System Safely, Use The Following Procedure:

- A. Turn Oxygen Generator "OFF" following the shut-down procedures on the control panel.
- B. Find Air Inlet Ball Valve. Refer to page 54. Close this ball valve. Note: Filter Outlet Valve (#11) must stay open.
- C. Turn Oxygen Generator "ON" and put the Auto/Manual Switch in the MANUAL position. (The system should be running at this time.)
- D. Run system until you hear or feel no exhaust gasses coming out of the Exhaust Muffler.
- E. At this time, all air and cycle gauges should read zero. If they do not, stop and contact your AirSep Service Representative or the Industrial Service Department for further instructions.

The AirSep Industrial Service Department can be contacted via phone or fax between 7:30am and 4:30pm Eastern Standard Time, Monday thru Friday at (716) 691-0202 or Fax (716)691-0707.

- F. If the system air and cycle gauges read zero, proceed to repair the problem.

The following chart is a guide for trouble shooting the AS-20, AS-45, and AS-80 models.

## 7.1 Trouble Shooting

PROBLEM	PROBABLE CAUSE	SOLUTION
A. Oxygen generator does not cycle. No green power light.	<ol style="list-style-type: none"> <li>1. Unit not plugged in.</li> <li>2. Blown fuse (unit).</li> <li>3. Blown breaker (wall outlet).</li> </ol>	<ol style="list-style-type: none"> <li>1. Plug in unit.</li> <li>2. Replace fuse (unit).</li> <li>3. Turn breaker on or replace fuse (wall outlet).</li> </ol>
B. Oxygen generator turns on, no green power light.	<ol style="list-style-type: none"> <li>1. Light burned out.</li> <li>2. Defective wire.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace switch.</li> <li>2. Repair or replace wire.</li> </ol>
C. Oxygen generator does not turn on and power light is on (green). Auto/Manual Switch is in MANUAL position (amber) light off.	<ol style="list-style-type: none"> <li>1. Power switch is off.</li> <li>2. Defective power switch.</li> <li>3. Defective power wire to circuit board.</li> <li>4. Defective circuit board.</li> <li>5. Low voltage.</li> </ol>	<ol style="list-style-type: none"> <li>1. Turn on.</li> <li>2. Replace power switch.</li> <li>3. Repair or replace wire.</li> <li>4. Replace circuit board.</li> <li>5. Call power company.</li> </ol>
D. Oxygen generator turns on and cycles, amber light does not work (manual position).	<ol style="list-style-type: none"> <li>1. Light burned out.</li> <li>2. Defective wire.</li> <li>3. Defective circuit board.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace switch.</li> <li>2. Repair or replace wire.</li> <li>3. Replace circuit board.</li> </ol>



PROBLEM	PROBABLE CAUSE	SOLUTION
E. Oxygen generator does not turn on. Power light is on (green), Auto Manual Switch in auto position, amber light off. Oxygen pressure under 40 psig.	<ol style="list-style-type: none"> <li>1. Power switch is off.</li> <li>2. Defective power switch.</li> <li>3. Defective power wire to circuit board.</li> <li>4. Pressure switch adjusted improperly.</li> <li>5. Pressure switch defective.</li> <li>6. Defective circuit board.</li> </ol>	<ol style="list-style-type: none"> <li>1. Turn switch to "ON" position.</li> <li>2. Replace power switch.</li> <li>3. Repair or replace wire.</li> <li>4. Readjust pressure switch.</li> <li>5. Replace pressure switch.</li> <li>6. Replace circuit board.</li> </ol>
F. Oxygen generator runs continuously (amber light is on), oxygen supply pressure 58 psig or higher (auto position).	<ol style="list-style-type: none"> <li>1. Pressure switch not adjusted properly.</li> <li>2. Defective pressure switch.</li> <li>3. Defective wire going to pressure switch.</li> <li>4. Defective switch (auto/manual).</li> <li>5. Defective circuit board.</li> </ol>	<ol style="list-style-type: none"> <li>1. Readjust pressure switch.</li> <li>2. Replace pressure switch.</li> <li>3. Repair or replace wire to pressure switch.</li> <li>4. Replace switch (auto/manual).</li> <li>5. Replace circuit board.</li> </ol>
G. Oxygen generator runs continuously, receiver pressure is less than 40 psig. (good oxygen)	<ol style="list-style-type: none"> <li>1. Air supply pressure too low.</li> <li>2. Cycle pressure too low.</li> <li>3. Oxygen usage is greater than capacity of generator.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check air lines for restrictions.</li> <li>2. Re-adjust air regulator/replace.</li> <li>3. Check oxygen usage.</li> <li>4. Check generator and oxygen system for leaks.</li> </ol>

PROBLEM	PROBABLE CAUSE	SOLUTION
H. Low purity oxygen 50% - 70% oxygen, (Unit designed for 90%).	1. Initial start up.	1. See start-up procedure (Section 5.1)
	2. Long shut-down (system oxygen pressure down to zero).	2. See start-up procedure (Section 5.1).
	3. Momentary power loss .	3. Must purge system (see start-up procedure pg. 23).
	4. Low supply air.	4. Check air lines for restric- tions.
	5. Low feed air.	5. Re-adjust air regulator or replace.
	6. Valves not cycling prop- erly.	6. See valve sequence (pg. 58).
	7. Improperly wired or de- fective circuit board.	7. Replace circuit board.
	8. Valve diaphragm torn.	8. Identify and rebuild valve.
I. Low purity oxygen, Sole- noid Valve not function- ing properly.	1. Defective coil.	1. Replace coil.
	2. Defective wire to valve.	2. Repair or replace wire.
	3. Defective circuit board. (No power output to valve.)	3. Replace circuit board.
	4. Defective valve.	4. Rebuild valve.
J. Low purity oxygen, a valve remains open.	1. Valve internal parts worn.	1. Rebuild valve.
	2. Valve remains energized.	2. Replace circuit board.


PROBLEM	PROBABLE CAUSE	SOLUTION
K. Valve chattering loudly.	1. Low voltage.	1. Check power supply.
	2. Low voltage circuit board output.	2. Replace circuit board.
	3. Dirty valve.	3. Clean or rebuild valve.
	4. Worn valve core.	4. Rebuild valve.
	5. Defective EMI filter.	5. Replace EMI filter.
L. Very low oxygen output 50% - 21% oxygen.	1. Leaky check valves.	1. Clean or replace check valves.
	2. Plugged muffler.	2. Replace muffler.
	3. Contaminated molecular sieve.	3. Replace molecular sieve.
M. System Dusting.	1. Supply pressure too high to generator.	1. Maximum pressure should be 150 psig.
	2. Regulator air pressure over 70 psig.	2. Re-adjust to 70 psig maximum.
	3. Oil and water in system.	3. Replace sieve material.
	4. System not cycling properly.	4. Check and repair faulty wiring and/or circuit board.
N. Air regulator leaks out bleed hole.	1. Main regulator valve assembly is stuck.	1. Clean and lubricate main regulator valve assembly.
	2. Main valve assemble seat no good.	2. Rebuild or replace regulator.

PROBLEM	PROBABLE CAUSE	SOLUTION
O. Filter Drain (valve stays open) Valve not energized.	1. Valve plugged.	1. Clean valve. 2. Replace valve.
Filter Drain Valve remains energized.	1. Manual push button stuck. 2. Circuit board defective.	1. Replace push button. 2. Replace circuit board.
Filter drain valve will not energize.	1. Defective push button. 2. Defective wire to valve. 3. Defective coil. 4. Valve core stuck closed. 5. Defective circuit board. (no voltage output on board)	1. Replace push button. 2. Repair or replace wire. 3. Replace valve. 4. Replace valve. 5. Replace board.
Filter Drain valve energizes but no air comes out. (system pressurized)	1. Valve stuck closed or plugged. 2. Tubing plugged or pinched.	1. Clean or replace valve. 2. Clean or replace tubing.
P. Oxygen Generator relief valve(s) pop off.	1. Cycle pressure set too high. Should be 70 psig maximum. 2. Air regulator stuck. 3. Air regulator frozen. 4. Cycle pressure gauge defective. 5. Relief valve defective.	1. Re-adjust air regulator. 2. Rebuild or replace regulator. 3. Do not operate system below 40° F. 4. Replace gauge and re-adjust air regulator. 5. Replace relief valve.

# 7.2 Air Regulator Adjustment Procedure

(for AS-20 adjustment see below. For AS-45 & AS-80 See figure 9)

1. Unlock lock nut on adjustment knob.
2. To increase pressure turn clockwise.
3. To decrease pressure turn counter clockwise
4. Make small adjustments and let system cycle through one cycle before making another adjustment. If readings are still incorrect, make another adjustment until you are within manufacturer's specifications.

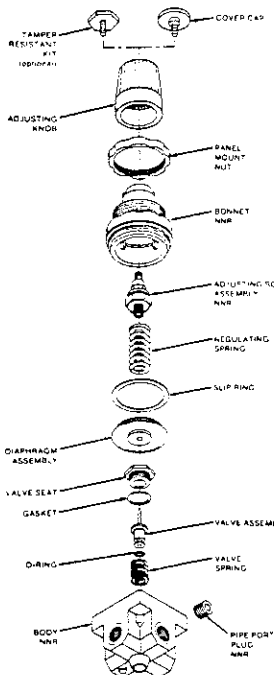


WILKERSON  
CORPORATION • 11111 WOOD RD • BOYD, MO 64604

**SERVICE MANUAL**  
Miniature Regulator  
Models R00-01-000 and R00-02-000  
with Variations and Accessories

**9SM-MH-R00**  
AUGUST 1989



**CAUTION**

EXCEPT as otherwise specified by the manufacturer this product is specifically designed for compressing air service and use with any other fluid (oil or gas) is an application. For example, use with an inert gas or compressed gas without fluids or gases in the system may cause embrittlement and failure. It could be harmful to the unit or result in a combustion explosion of hazardous material. Neither the manufacturer's signature nor seal in the name of the manufacturer and manufacturer assumes no responsibility for any resulting loss.

The rated flow capacity of reducing type regulators is limited. Under some operating conditions, the secondary output pressure could increase above the initial setting. If over pressure conditions could cause malfunction or failure of downstream equipment, additional external pressure relief devices or suitable capacity must be installed.

Before using with fluids other than air for non-adjuster applications in hydraulic systems, consult manufacturer for approval.

**INSTALLATION**

1. Install as close as possible to where regulated air is needed in systems with a cyclic demand, the regulator should be located upstream of cycling device.
2. Install the unit with the air flowing through the body in the direction indicated by the arrow.
3. System piping should be same pipe size as regulator porting. Avoid using fittings, couplings, etc. that restrict the flow of air.
4. Gauge ports (1/8" are provided on either side of the regulator body for installation of a gauge or use as an additional outlet port. Plug unused ports).
5. Panel mount regulators require a 1 1/2" (31.32 mm) diameter hole and are mountable on panels up to 1/2" (13 mm) thick.

**OPERATION**

1. Maximum inlet pressure and operating temperature ratings are 300 PSIG (21 bar) and 175°F (79°C).
2. Before turning on the supply air pressure, turn the adjusting knob counterclockwise until there is no load on the regulating spring. Turn on the supply air pressure and then turn the adjusting knob clockwise until the desired secondary pressure is reached. When making a change in pressure setting, always approach the desired pressure from a lower one. When reducing from a higher to a lower setting, first reduce to some pressure less than that desired and then increase to the desired pressure.

**MAINTENANCE**

1. The regulator can be disassembled for servicing without removal from line.
2. TO DISASSEMBLE - shut off air to regulator and vent air line on both sides of regulator. Turn adjusting screw counterclockwise to relieve compression on spring. Remove knob, bonnet, adjusting screw, regulating spring and slip ring. Diaphragm assembly, valve seat, valve stem assembly and valve spring can now be removed.
- CAUTION: When assembling, tighten bonnet to 3 foot-pounds of torque and valve seat to 7 inch-pounds of torque. Re-lubricate O-ring with Parker O-Ring Lube or Dow Corning 44 silicone grease.
3. Occasionally disassemble and clean body and valve seat.
4. IF UNIT WILL NOT REGULATE TO DESIRED PRESSURE OR IF PRESSURE BECOMES EXCESSIVE - disassemble, clean and check O-ring, valve stem and valve seat for wear or damage. Replace worn or damaged parts.
5. IF UNIT LEAKS AT RELIEF PORT - install proper repair kit as listed on this Service Manual.

**REPAIR KITS AND REPLACEMENT PARTS**

Regulating Springs	
0-50 psi	GRP-95-221
0-125 psi	GRP-95-222
Self-Relieving Diaphragm Kit	RRP-95-446
Nonrelieving Diaphragm Kit	RRP-95-447
Valve Assembly	RRP-95-445

**ACCESSORIES**

Panel Mount Nut (Aluminum)	RPA-95-114
Panel Mount Nut (Plastic)	RRP-95-217
Wall Mounting Bracket (1/2" NPT)	RRP-95-581
Pipe Mounting Bracket	GRP-95-734
Wall Mounting Bracket with Panel Nut	GRP-95-747
Wall Mounting Bracket	GRP-95-754
Tamper Resistant Kit (Newer Push/Pull Models Only)	RPA-95-326
Tamper Resistant Kit (Old Style Knob)	RRP-95-581
Gauges	GRP-95-228
O-100 psi	GRP-95-227
O-160 psig	GRP-95-227

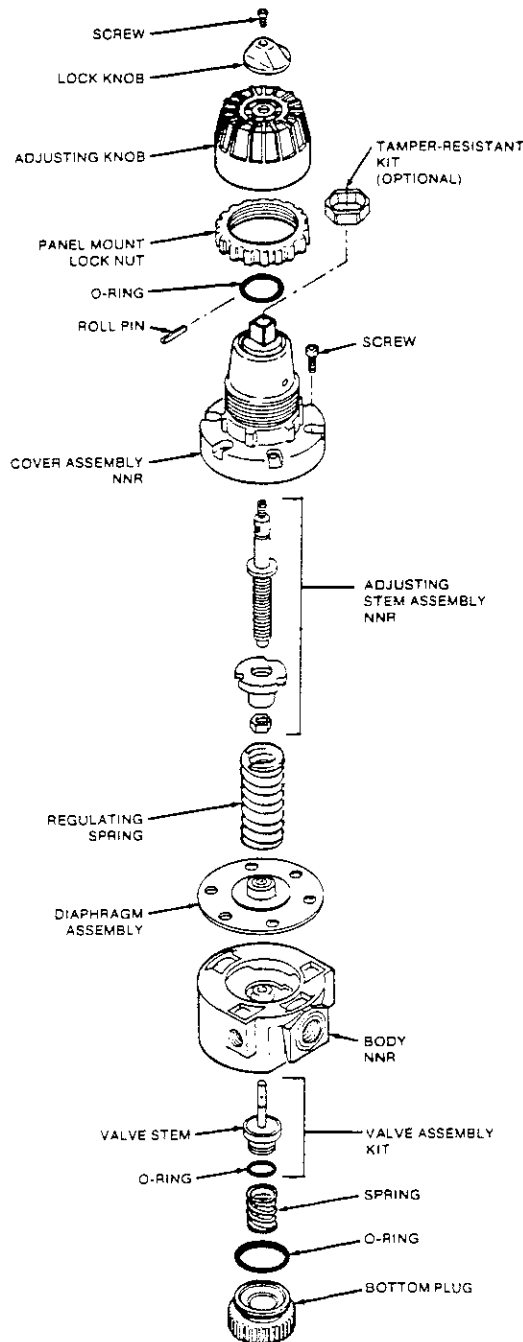
NUT - NOT NORMALLY REPLACED

Figure 8: AS-20 Regulator



**SERVICE MANUAL**  
Modular Regulator  
Models R26-02-000, R26-03-000 & R26-04-000  
with Variations and Accessories

**9SM-KC-R26**  
**AUGUST 1989**



NNR = NOT NORMALLY REPLACED

**CAUTION**

EXCEPT as otherwise specified by manufacturer, this product is specifically designed for compressed air service, and use with any other fluid (liquid or gas) is a misapplication. For example, use with or injection of certain hazardous liquids or gases in the system (such as alcohol or liquid petroleum gas) could be harmful to the unit or result in a combustible condition or hazardous external leakage. Manufacturer's warranties are void in the event of misapplication and manufacturer assumes no responsibility for any resulting loss.

The relief flow capacity of relieving type regulators is limited. Under some operating conditions, the secondary (outlet) pressure could increase above the initial setting. If over-pressure conditions could cause malfunction or failure of downstream equipment, additional external pressure relief devices of suitable capacity must be installed.

Before using with fluids other than air for non-industrial applications or for life support systems, consult manufacturer for written approval.

**INSTALLATION**

1. Install as close as possible to where regulated air is needed.
2. Install the unit with the air flowing through the body in the direction indicated by the arrow.
3. Install the same pipe size unit as the pipe line in use. Avoid using fittings, couplings, etc., that restrict the airflow, unless maximum flow is not needed.
4. Regulator may be installed so that the adjusting handle is in any position. Attach gauge to one 1/4" female gauge port and plug the other 1/4" female port, or use it as a regulated outlet port.
5. Turning the adjusting screw clockwise raises the regulated pressure and turning it counterclockwise lowers the regulated pressure.
6. Panel mount regulators require a 1 3/8" diameter hole and are mountable on panels from 1/8" to 1/2" thick.
7. Maximum inlet pressure and operating temperature ratings are 300 psig (21 bar) and 175°F (79°C).

**MAINTENANCE**

1. The regulator can be disassembled for servicing without removal from line.
2. Occasionally remove bottom plug and clean plug, body, and valve seat (vent air line on both sides of regulator).
3. TO DISASSEMBLE - shut off air to regulator and vent air line on both sides of regulator. Turn adjusting screw counterclockwise to relieve compression on spring. (Use 1/2" Allen Wrench on tamper-resistant models.) Remove screws, cover, spring, and spring disk. Diaphragm assembly can now be removed. By removing bottom plug and spring, the valve can be removed from the bottom of the regulator.
4. IF UNIT WILL NOT REGULATE TO PRESSURE NEEDED OR IF PRESSURE BECOMES EXCESSIVE - remove bottom plug, spring, and valve assembly. Clean and check o-ring, valve stem and valve seat for water damage. Replace worn or damaged parts. Install Repair Kit No. RRP-95-952 for self-relieving models, and Repair Kit No. RRP-95-953 for nonrelieving models for complete overhaul.
5. IF UNIT LEAKS AT RELIEF PORT - install proper repair kit as listed on the back of this Service Manual.
6. TO REPLACE BODY O-RING - This o-ring is above a metal washer which cannot be removed. Using a pointed probe of some kind, pull o-ring out. Force new o-ring through washer hole into o-ring cavity.

(see reverse side for Repair Kits and Accessories)

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Figure 8a: AS-45 & AS-80 Regulator

## 7.3 Pressure Switch Adjustment Procedure

### Adjustment (Signal Setting) Of Normally Closed And Normally Open Adjustable Deadband Switch Increasing Signal.

1. If the adjustable deadband switch is in the line of final application when adjustment (signal setting) is made, be sure switch can be test operated without affecting other equipment.
2. On general purpose and watertight constructions, remove switch cover.
3. Turn low adjustment nut until low signal setting indicator is fully down. Turn high adjustment nut until high signal setting indicator is fully up. Use a 1/4 inch wrench for adjusting nuts. **CAUTION:** Adjusting nut will turn easily until it hits a stop. Do not over torque; over torquing may cause damage.
4. Follow steps in the chart below to make signal settings.
5. Cycle between two desired signals and make minor adjustments to nuts as required to achieve exact signal settings.
6. After settings have been made, make permanent electrical connections. **WARNING:** Be sure power is off when electrical connections are made.

Steps of Adjustment	Normally Open	
	Electrical Connection to Switch	Position Of Test Lamp On-Off
1. Starting at zero, signal connect test lamp to common and ...	Normally Open Terminal	Off
2. Apply desired actuation signal. Then back off high signal adjusting nut until switch actuates.	Normally Open Terminal	On (Switch Closed)
3. Lower signal to desired reactivation signal. Then advance low signal adjusting nut until switch reactuates.	Normally Open Terminal	Off (Switch Open)

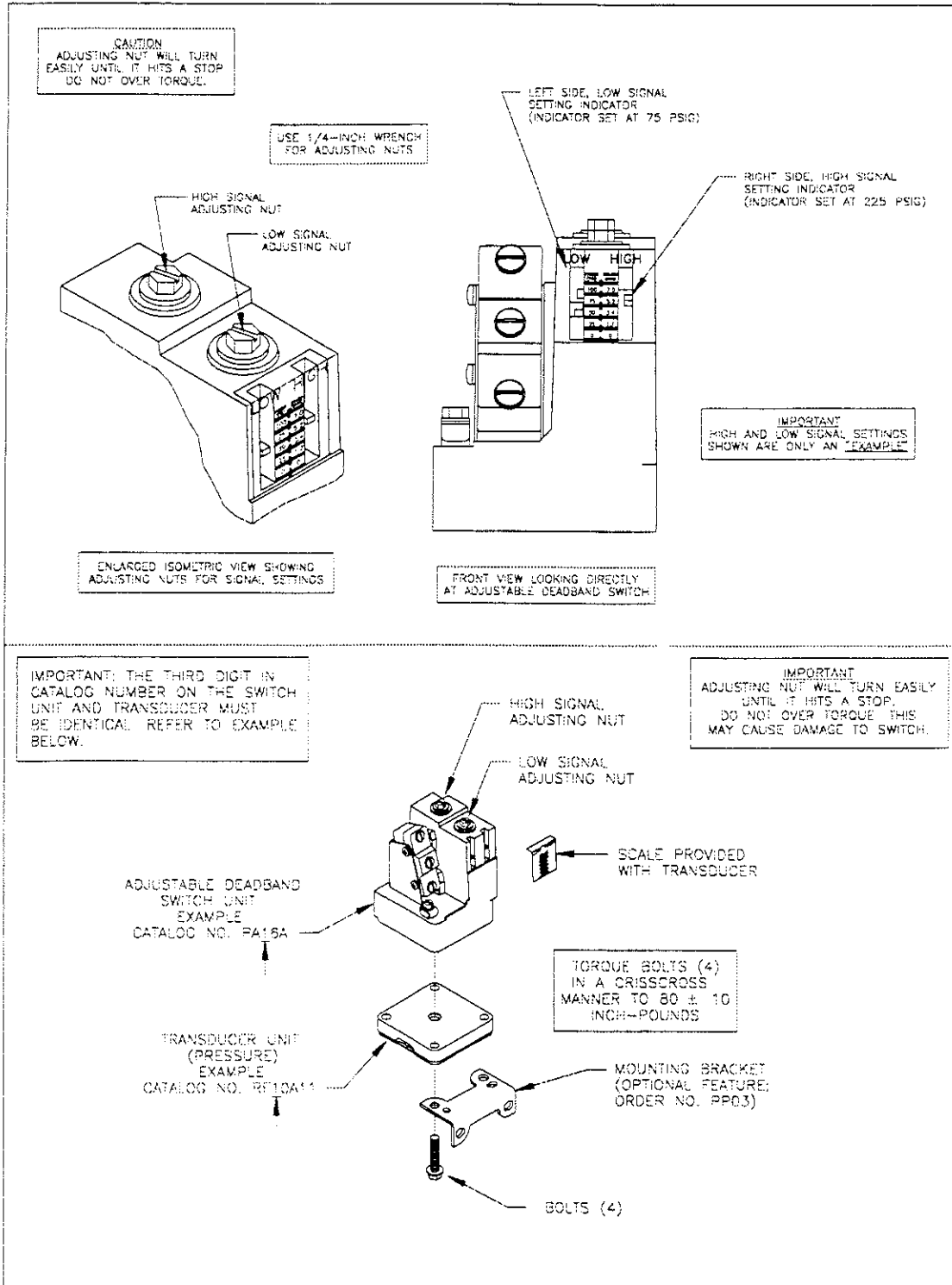


Figure 9: Switch



### Adjustment (Signal Setting) Of Normally Closed and Normally Open Adjustable Deadband Switch Decreasing Signal.

1. If the adjustable deadband switch is in the line of final application when adjustment (signal setting) is made, be sure switch can be test operated without affecting other equipment.
2. On general purpose and watertight constructions, remove switch cover.
3. Turn low adjustment nut until low signal setting indicator is fully down. Turn high adjustment nut until high signal setting indicator is slightly beyond desired actuation setting. Use a 1/4 inch wrench for adjusting nuts. **CAUTION:** Adjusting nut will turn easily until it hits a stop. Do not over torque; over torquing may cause damage.
4. Follow steps in chart below to make signal settings.

Steps of Adjustment	Normally Open	
	Electrical Connection to Switch	Position Of Test Lamp On-Off
1. Starting with initial signal above desired actuation, connect test lamp to common and ...	Normally Open Terminal	On
2. Decrease signal to desired actuation signal. Then advance low adjusting nut until switch actuates.	Normally Open Terminal	Off (Switch Open)
3. Apply desired reactivation signal. Then back-off high signal adjusting nut until switch reactuates.	Normally Open Terminal	ON (Switch Closed)

5. Cycle between two desired signals and make minor adjustments to nuts as required to achieve exact signal settings.
6. After settings have been made, make permanent electrical connections.

**WARNING:** Be sure power is off when electrical connections are made.

### Testing of Installation

If the adjustment of the switch has been made outside of the line of final application, the switch should be retested when installed in the line of final application. Follow adjustment instructions. Be sure switch can be test operated without affecting other equipment.

---

## 8.0 Spare Parts List

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A complete spare parts list for each model is described below. However, only the parts marked with asterisks (\*) could be considered for purchase as spare parts with the unit.

### 8.1 Model AS-20 Spare Parts

Item	Part Number	Description
1.....	BT-9-04 .....	Sleeve & nut assembly (1/4")
2.....	BT-9-06 .....	Sleeve & nut assembly (3/8")
3.....	EL-21-21 .....	Pressure switch
4.* .....	EL-30-06 .....	PC board
5.....	EL-41-01 .....	Switch (on-off)
6.....	EL-41-04 .....	Switch (auto-main)
7.....	EL-44-01 .....	Push button auto drain
8.* .....	EL-70-03 .....	3 Amp fuse
9.* .....	FI-20-05.....	Microalescer element
10.....	FR-01-05 .....	Filter/ regulator assembly
11.....	GA-11-24-16.....	0-100 PSI guage
12.....	GA-11-24-18.....	0-200 PSI guage
13.....	HO-11-01-04.....	Air hose (1/4") (hose does not inc. fittings)
14.....	HO-11-01-06.....	Air hose (3/8")(hose does not inc. fittings)
15.....	HO-21-01-04 .....	Oxygen hose (1/4")
	.....	(hose does not inc. fittings)

Item	Part Number	Description
16.....	HO-21-01-06 .....	Oxygen hose (3/8")(hose does not inc. fittings)
17.....	MU-11-04 .....	Muffler (1/4")
18.....	RE-01-020 .....	Regulator (1/4")
19.....	TU-02-04-03 .....	Nylon tubing (1/4")
20.....	TU-02-06-04 .....	Nylon tubing (3/8")
21.* .....	VA-11-02-01.....	1/8" Solenoid product valve
22.* .....	VA-11-02-02.....	1/8" Solenoid drain valve
23.....	VA-11-04-01.....	1/4" Feed and waste valve
24.* .....	VA-11-04-01C.....	1/4" Feed and waste valve coil
25.* .....	VA-11-04-01S .....	1/4" Feed and waste valve re-build kit
26.....	VA-11-04-01N .....	Equalization valve
27.* .....	VA-11-04-01C.....	Equalization valve coil
28.* .....	VA-11-04-01R.....	Equalization valve re-build kit
29.....	VA-60-04-100 .....	1/4" Relief valve
30.....	VA-73-04.....	1/4" Check valve
31.* .....	EL-00-01 .....	EMI Filter
32.....	EL-80-01 .....	Transformer (220/110 VAC 50/60 Hz 3 wire)
33.....	EL-80-02 .....	Transformer (100/115 VAC 50/60 Hz 3 wire)
34.....	EL-80-03 .....	Transformer (220/110 VAC 50/60 Hz 4 wire)

## 8.2 Model AS-45 Spare Parts

Item	Part Number	Description
1.....	BT-9-04 .....	Sleeve & nut assembly (1/4")
2.....	BT-9-06 .....	Sleeve & nut assembly (3/8")
3.....	EL-21-11 .....	Pressure switch
4.* .....	EL-30-06 .....	PC board
5.....	EL-41-01 .....	Switch (on-off)
6.....	EL-41-04 .....	Switch (auto-main)
7.....	EL-44-01 .....	Push button auto drain
8.* .....	EL-70-03 .....	3 Amp fuse
9.* .....	FI-10-06.....	prefilter element
10.* .....	FI-20-06.....	Microalescer element
11.....	FR-01-06 .....	Filter/Regulator assembly
12.....	GA-11-24-16.....	0-100 PSI guage
13.....	GA-11-24-18.....	0-200 PSI guage
14.....	HO-11-01-04.....	Air hose (1/4")(hose does not inc. fittings)
15.....	HO-11-01-06.....	Air hose (3/8")(hose does not inc. fittings)
16.....	HO-11-01-08.....	Air hose (1/2")(hose does not inc. fittings)
17.....	HO-21-01-04 .....	Oxygen hose (1/4")(hose does not inc. fittings)
18.....	HO-21-01-08 .....	Oxygen hose (1/2")(hose does not inc. fittings)
19.....	MU-11-06 .....	Muffler (3/8")
20.....	RE-01-045 .....	Feed pressure regulator (1/4")
21.....	TU-02-04-03 .....	Nylon tubing (1/4")
22.....	TU-02-06-04 .....	Nylon tubing (3/8")

Item	Part Number	Description
23.*	VA-11-02-01	1/8" Solenoid product valve
24.	VA-11-02-02	1/8" Solenoid drain valve
25.	VA-11-04-01	1/4" Feed valve
26.*	VA-11-04-01C	1/4" Feed valve coil
27.*	VA-11-04-01S	1/4" Feed valve spare part kit
28.	VA-11-06-01	3/8" Waste valve
29.*	VA-11-06-01C	3/8" Waste coil
30.*	VA-11-06-01S	3/8" Waste re-build kit
31.	VA-11-06-01N	3/8" Equalization valve
32.	VA-11-06-01C	3/8" Equalization valve coil
33.	VA-11-06-01R	3/8" Equalization re-build kit
34.	VA-60-04-100	1/4" Relief valve
35.	VA-73-04	1/4" Check valve
36.	VA-81-04	Moore flow controller
37.*	EL-00-01	EMI Filter
38.	EL-80-01	Transformer (220/110 VAC 50/60 Hz 3 wire)
39.	EL-80-02	Transformer (100/115 VAC 50/60 Hz 3 wire)
40.	EL-80-03	Transformer (220/110 VAC 50/60 Hz 4 wire)
41.	EL-HM-50-01	Hour meter (230VAC, 50 Hz)
42.	EL-HM-60-01	Hour meter (120VAC, 60 Hz)

## 8.3 AS-80 Spare Parts

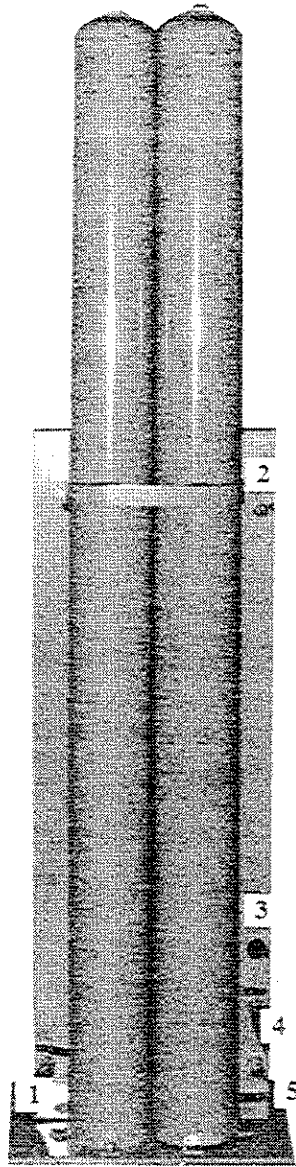
Item	Part Number	Description
1.....	BT-9-04.....	Sleeve & nut assembly (1/4")
2.....	BVT-9-06.....	Sleeve & nut assembly (3/8")
3.....	EL-21-21 .....	Pressure switch
4.* .....	EL-30-06 .....	PC board
5.....	EL-41-01 .....	Switch (on-off)
6.....	EL-41-04 .....	Switch (auto-main)
7.....	EL-44-01 .....	Push button auto drain
8.* .....	EL-70-03 .....	3 Amp fuse
9.* .....	FI-10-06.....	Prefilter element
10.* .....	FI-20-06.....	Microalescer element
11.....	GA-11-24-16.....	0-100 PSI guage
12.....	GA-11-24-18.....	0-200 PSI guage
13.....	HO-11-01-06.....	Air hose (3/8")(hose does not inc. fittings)
14.....	HO-11-01-08.....	Air hose (1/2")(hose does not inc. fittings)
15.....	HO-21-01-06 .....	Oxygen hose (3/8")(hose does not inc. fittings)
16.....	HO-21-01-08 .....	Oxygen hose (1/2")(hose does not inc. fittings)
17.....	MU-11-06.....	Muffler (3/8")
18.....	RE-01-045 .....	Feed pressure regulator (1/4")
19.....	TU-02-04-03 .....	Nylon tubing (1/4")
20.....	TU-02-06-04 .....	Nylon tubing (3/8")
21.....	VA-11-02-02.....	1/8" Solenoid dump valve
22.....	VA-11-04-02.....	1/4" Product valve
23.* .....	VA-11-06-01c.....	1/4" Product coil

Item	Part Number	Description
24.*	VA-11-04-02S	1/4" Product re-build kit
25	VA-11-06-01	3/8" Feed valve
26.*	VA-11-06-01C	3/8" Feed valve coil
27.*	VA-11-06-01S	3/8" Feed valve re-build kit
28	VA-11-06-01	3/8" Waste valve
29.*	VA-11-06-01C	Waste coil
30.*	VA-11-06-01S	Waste re-build kit
31	VA-11-06-01N	3/8" Equalization valve
32	VA-11-06-01C	3/8" Equalization valve coil
33	VA-11-06-01R	3/8" Equalization re-build kit
34	VA-60-04-100	1/4" Relief valve
35	VA-73-04	1/4" Check valve
36	VA-81-04	Moore flow controller
37.*	EL-00-01	EMI Filter
38	EL-80-01	Transformer (220/110 VAC 50/60 Hz 3 wire)
39	EL-80-02	Transformer (100/115 VAC 50/60 Hz 3 wire)
40	EL-80-03	Transformer (220/110 VAC 50/60 Hz 4 wire)
41	EL-HM-50-01	Hour meter (230VAC, 50 Hz)
42	EL-HM-60-01	Hour meter (120VAC, 60 Hz)
43	FR-01-06	Filter/regulator assembly



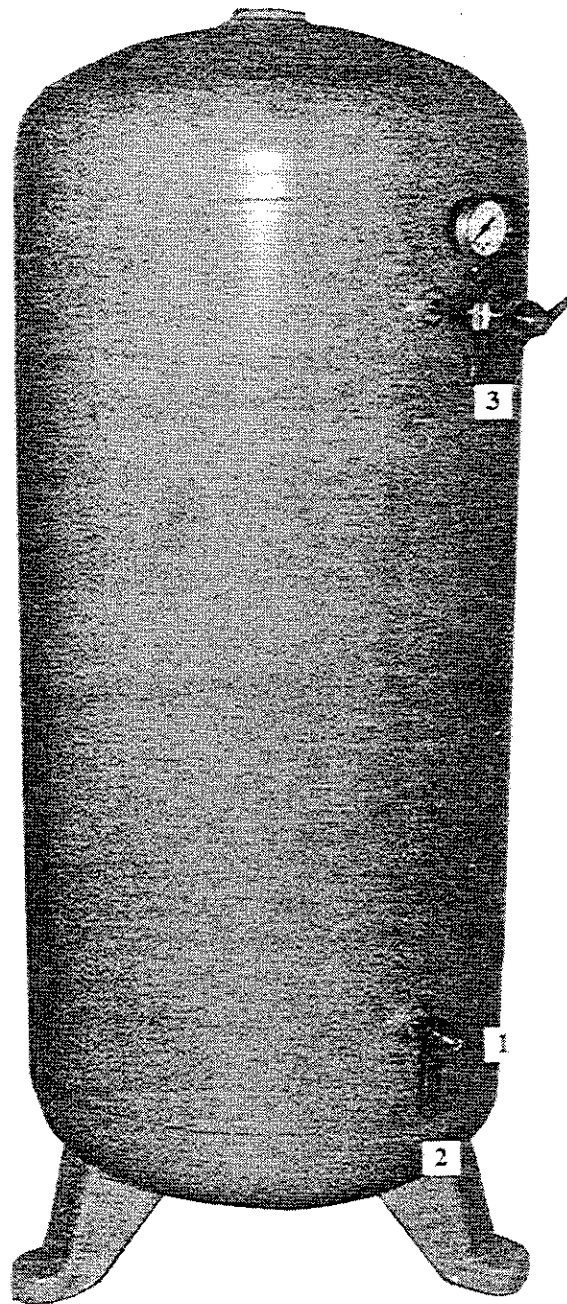
# APPENDIX A

## Illustrated Parts Identification



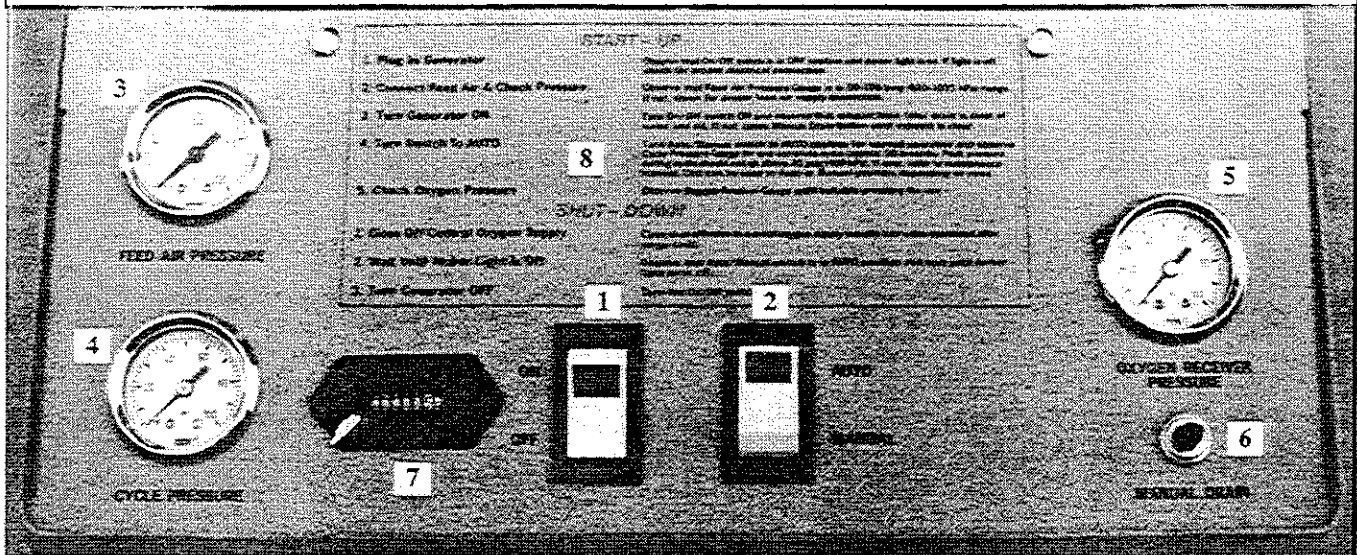
1. Green Oxygen Hose Outlet
2. Fuse
3. Power Cord
4. Red Air Hose Inlet
5. Filter Drain Outlet(Do Not Plug)

Figure 10: A-20, AS-45, AS-80 Back View



1. Oxygen Inlet Port
2. Relief Valve
3. Oxygen Pressure Regulator & Oxygen Outlet Port

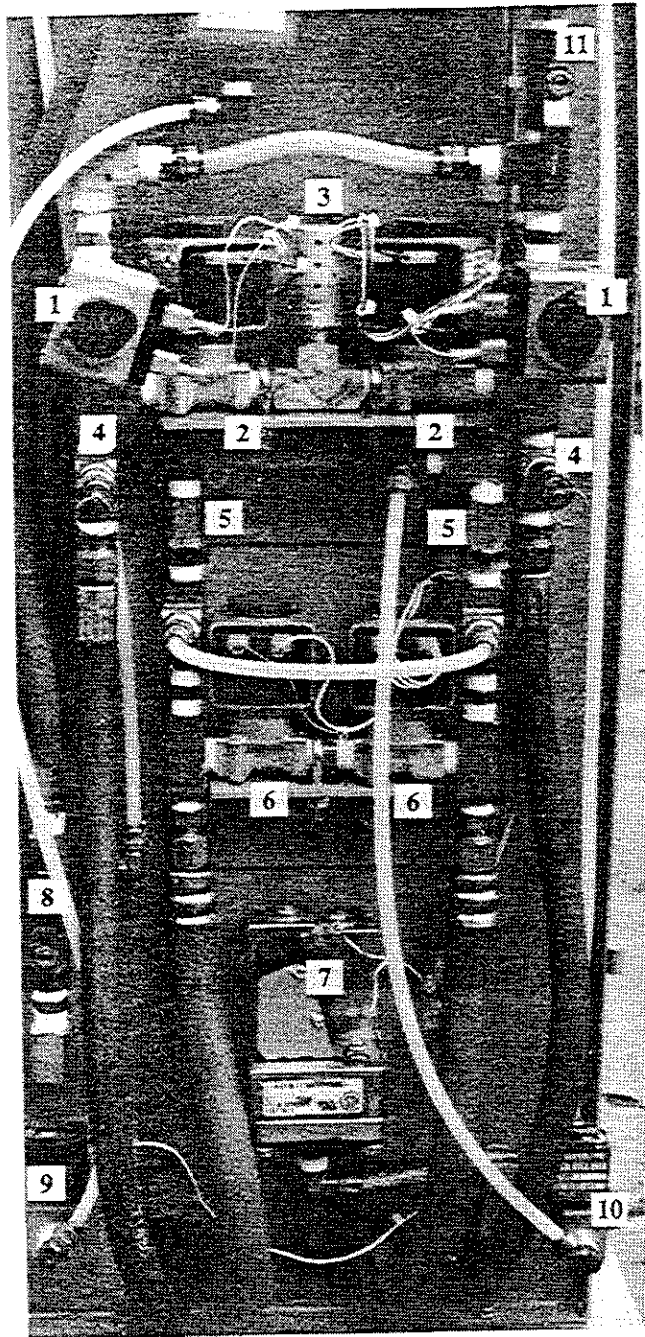
Figure 11: Oxygen Receiver Tank



- 1. ON/OFF Switch
- 2. Auto/Manual Switch
- 3. Feed Air Pressure Gauge
- 4. Cycle Pressure Gauge

- 5. Oxygen Receiver Pressure Gauge
- 6. Manual Drain Push Button
- 7. Hour Meter (except AS-20)
- 8. Operating Instruction

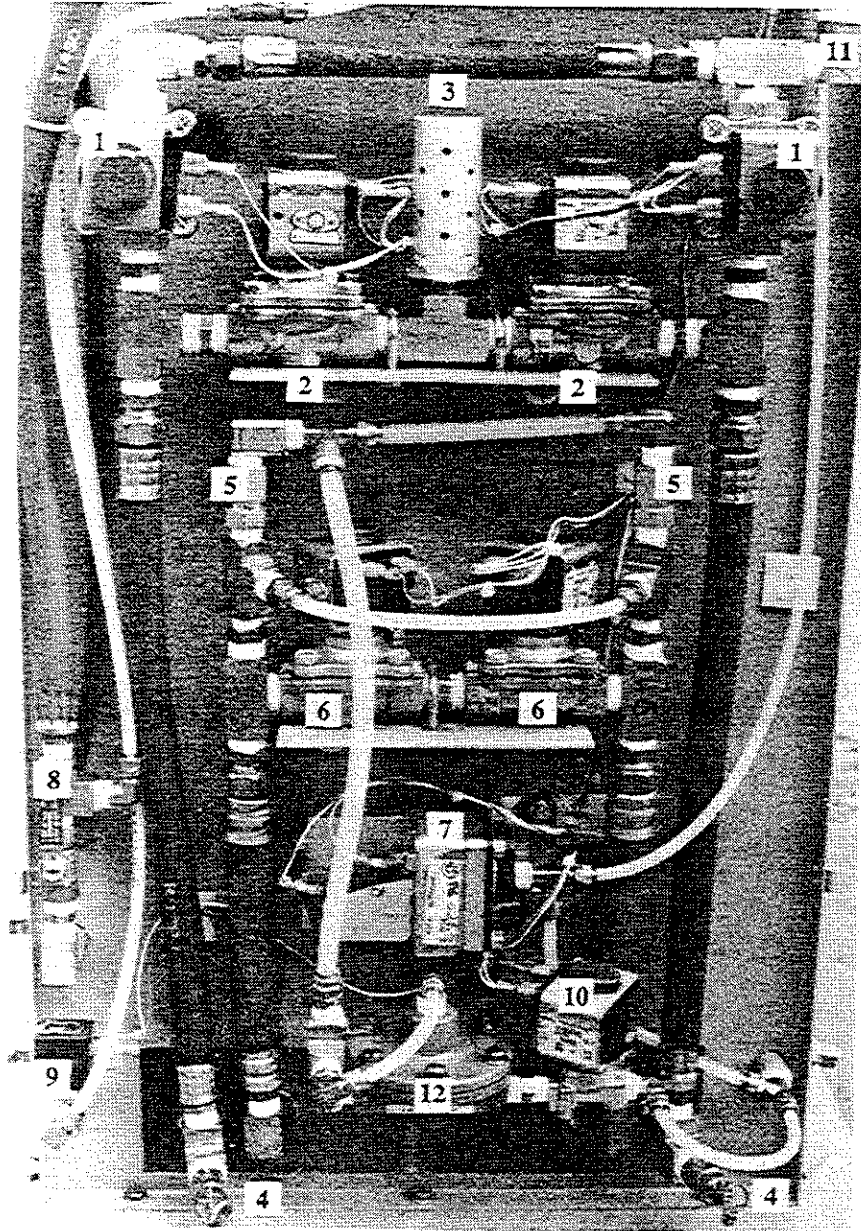
Figure 12: Control Panel



- 1. Feed Air Valve (#1A & 1 B)
- 2. Waste Valves (# 4A & 4B)
- 3. Muffler
- 4. Relief Valve
- 5. Check Valve
- 6. Equalization Valve (#5A & 5B)

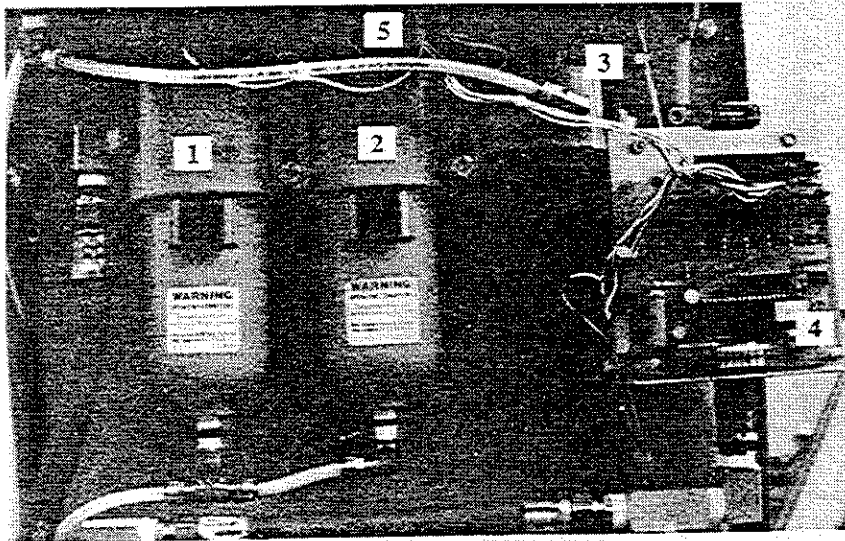
- 7. Pressure Switch
- 8. Air Inlet Ball Valve
- 9. Filter Drain Valve (#6)
- 10. Oxygen Outlet Valve (#2)
- 11. Filter Outlet Ball Valve

Figure 13: AS-20 Internal Parts



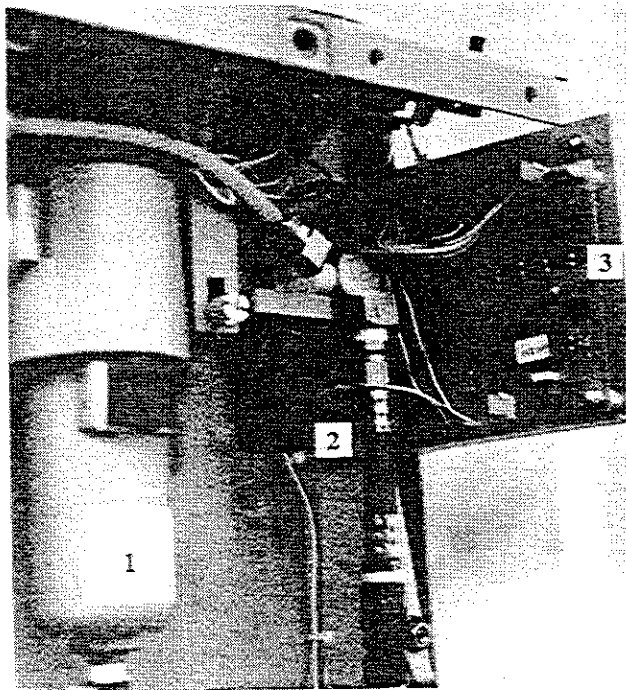
- |                                  |                              |
|----------------------------------|------------------------------|
| 1. Feed Air Valve (#1A & 1 B)    | 7. Pressure Switch           |
| 2. Waste Valves (# 4A & 4B)      | 8. Air Inlet Ball Valve      |
| 3. Muffler                       | 9. Filter Drain Valve (#6)   |
| 4. Relief Valve                  | 10. Oxygen Outlet Valve (#2) |
| 5. Check Valve                   | 11. Filter Outlet Ball Valve |
| 6. Equalization Valve (#5A & 5B) | 12. Flow Controller          |

Figure 14: AS-45, AS-80 Internal Parts



1. Prefilter
2. Coalescing Filter
3. Feed Air Regulator
4. Circuit Board
5. EMI Filter

Figure 15: AS-45, AS-80 Filter & Regulator Assembly



1. Coalescing Filter
2. Feed Air Regulator
3. Circuit Board

Figure 16: AS-20 Filter & Regulator Assembly

## Valve Timing (values Are In Seconds)

Model	Valve # 1A		Valve # 1B		Valve # 4 A		Valve # 4B		Valve # 5A		Valve #5B		Valve #2	
	On	Off	On	Off	On	Off	On	Off	On	Off	On	Off	On	Off
AS-20	28	42	28	42	28	42	28	42	7	28	7	28	18	17
AS-45	28	42	28	42	28	42	28	42	7	63	7	63	18	17
AS-80	38	58	38	58	38	58	38	58	10	86	10	86	23	25

Figure 18: Valve Timing



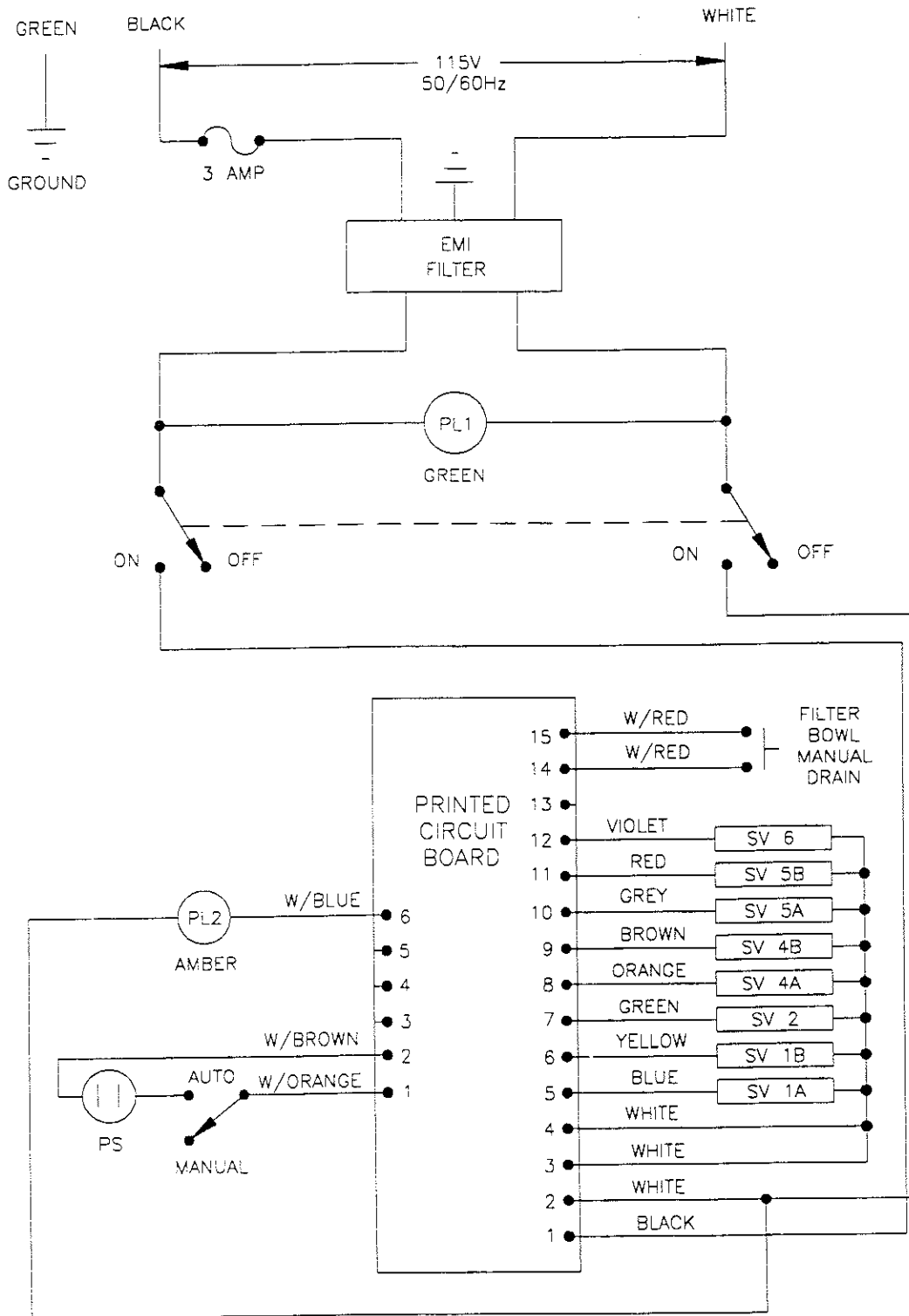
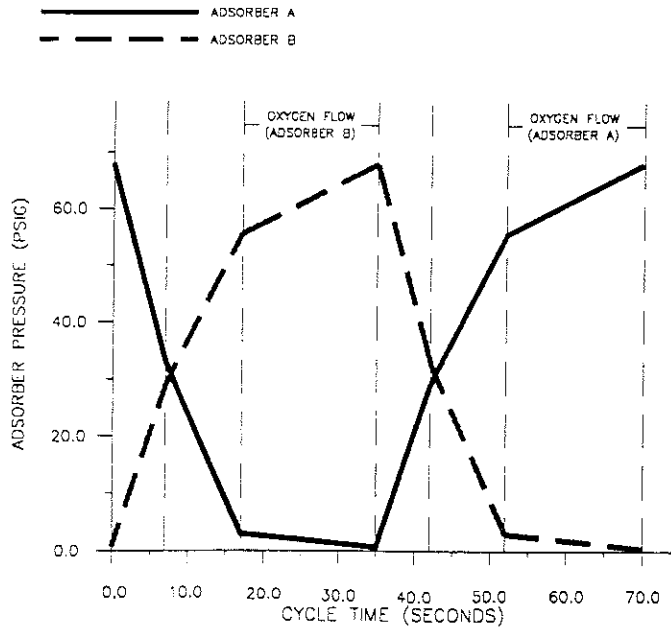
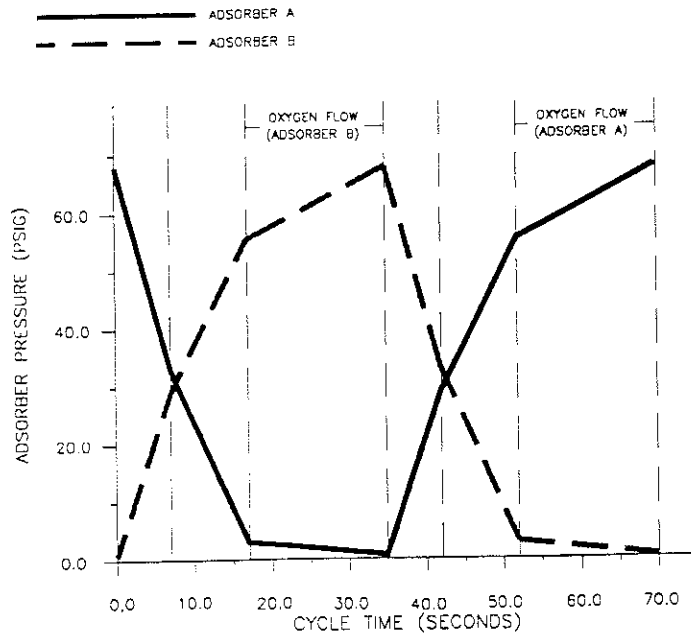


Figure 17: Wiring Schematic



ADSORBER A				ADSORBER B			
STEP	TIME (SEC.)	PROCESS	PRESSURE (PSIG)	PROCESS	PRESSURE (PSIG)	VALVE OPEN	AIR USAGE
1	7	EQUALIZATION	68-33	EQUALIZATION	0.5-29	5A, 5B	NO
2	10	BLOWDOWN	33-3	PRESSURIZATION	29-56	1B, 4A	YES
3	18	PURGE	3-0.5	OXYGEN FLOW	56-68	1B, 2, 4A	YES
4	7	EQUALIZATION	0.5-29	EQUALIZATION	68-33	5A, 5B	NO
5	10	PRESSURIZATION	29-56	BLOWDOWN	33-3	1A, 4B	YES
6	18	OXYGEN FLOW	56-68	PURGE	3-0.5	1A, 2, 4B	YES
TOTAL CYCLE TIME		70 SEC.					

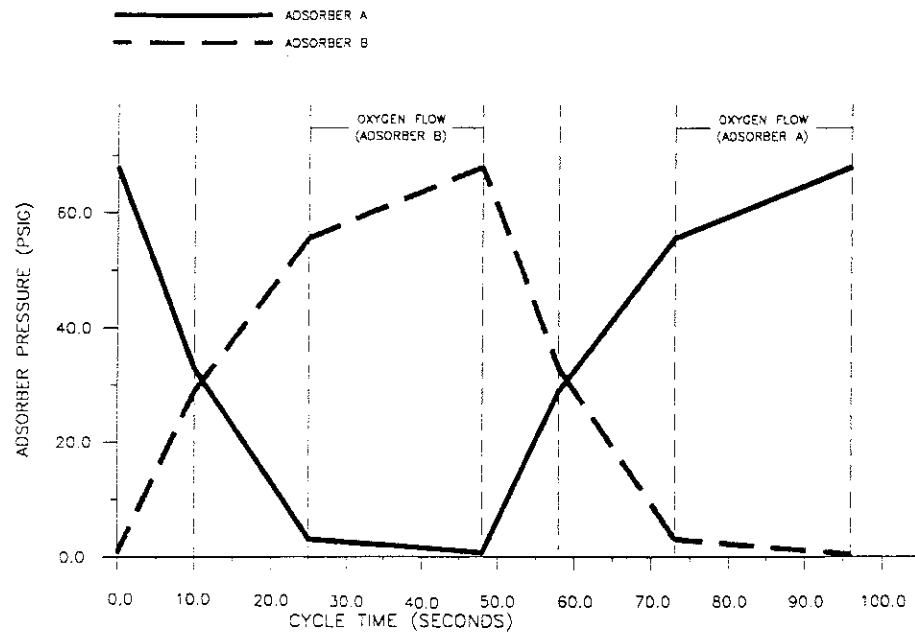
Figure 19: AS-20 Oxygen Generator Adsorber Pressure Profiles



ADSORBER A				ADSORBER B			
STEP	TIME (SEC.)	PROCESS	PRESSURE (PSIG)	PROCESS	PRESSURE (PSIG)	VALVE OPEN	AIR USAGE
1	7	EQUALIZATION	68-33 ↓	EQUALIZATION	0.5-29 ↑	5A	NO
2	10	BLOWDOWN	33-3 ↓	PRESSURIZATION	29-56 ↑	1B, 4A	YES
3	18	PURGE	3-0.5 ↓	OXYGEN FLOW	56-68 ↑	1B, 2, 4A	YES
4	7	EQUALIZATION	0.5-29 ↑	EQUALIZATION	68-33 ↓	5A, 5B	NO
5	10	PRESSURIZATION	29-56 ↑	BLOWDOWN	33-3 ↓	1A, 4B	YES
6	18	OXYGEN FLOW	56-68 ↑	PURGE	3-0.5 ↓	1A, 2, 4B	YES

TOTAL CYCLE TIME 70 SEC.

Figure 20: AS-45 Oxygen Generator Adsorber Pressure Profiles



ADSORBER A

ADSORBER B

STEP	TIME (SEC.)	PROCESS	PRESSURE (PSIG)	PROCESS	PRESSURE (PSIG)	VALVE OPEN	AIR USAGE
1	10	EQUALIZATION	68-33	EQUALIZATION	0.5-29	5A	NO
2	15	BLOWDOWN	33-3	PRESSURIZATION	29-56	1B, 4A	YES
3	23	PURGE	3-0.5	OXYGEN FLOW	56-68	1B, 2, 4A	YES
4	10	EQUALIZATION	0.5-29	EQUALIZATION	68-33	5A, 5B	NO
5	15	PRESSURIZATION	29-56	BLOWDOWN	33-3	1A, 4B	YES
6	23	OXYGEN FLOW	56-68	PURGE	3-0.5	1A, 2, 4B	YES

TOTAL CYCLE TIME 70 SEC.

Figure 21: AS-80 Oxygen Generator Adsorber Pressure Profiles

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## APPENDIX C

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### New York City Fire Department Regulations

For customers who fall under the City of New York Fire Department Regulations, your AirSep Oxygen Generator is approved for use in New York City. The model number and the Fire Department Certificate of Approval code are found on the serial number label placed on the rear of the unit. For customers in the New York City Fire Department jurisdiction, the following should be noted:

1. In accordance with Section 27-4100.5 of the Administrative Code, a Fire Department permit shall be obtained for oxygen receiver storage exceeding thirty cubic feet total or individual receivers exceeding six cubic feet. These units of volume are measured in water container capacity.
2. As operating conditions warrant, in accordance with Section 27-4099 of the Administrative Code, a Fire Department permit to operate an air compressor shall be obtained. A permit will be required if the air receiver contains more than 30 cubic feet or if the air gauge is capable of indicating 100 psi.
3. Operation of an air compressor and generation of oxygen to a pressure exceeding 15 psig shall be performed under the supervision of a person holding a certificate of Fitness from the Fire Department.
4. A permit for the use of oxygen and a combustible gas in a blowpipe for heating, melting or welding must be obtained from the Fire Department.



**FIRE DEPARTMENT**  
9 METROTECH CENTER      BROOKLYN, N.Y. 11201-3857

**CERTIFICATE OF APPROVAL # 4693**  
**THIS CERTIFICATE IS REVOCABLE, NOT TRANSFERABLE**  
**AND EXPIRES ON June 30, 2003**

July 19, 2000

Mr. Peter Weisenborn  
Vice President  
AirSep Corporation  
290 Creekside Drive  
Buffalo, NY 14228

By order of Fire Commissioner, Thomas Von Essen and pursuant to §27-4015 of the Administrative Code, the following equipment or material may be acceptable for use provided the conditions as outlined below are in full compliance.

**Manufacturer:** AirSep Corporation

**Product:** Portable oxygen generator for industrial use

**Pertinent Code Section:** §27-4102.d and §27-4100.d of the NYC Administrative Code

**Laboratory:** Canadian Standards Association

**Test Report:** File #: LR83232-1      Dated: 12/30/94  
File #: LR83232-5      Dated: 03/28/95  
File #: CB838102329      Dated: 03/28/95

**Trade Name / Model Number:**

1. New Life	Operating Pressure: 30 PSI
2. Reliant	Operating Pressure: 30 PSI
3. AS-10	Operating Pressure: 30 PSI
4. AS-12	Operating Pressure: 30 PSI
5. AS-20	Operating Pressure: 67 PSI
6. AS-45	Operating Pressure: 67 PSI
7. AS-80	Operating Pressure: 67 PSI
8. AS-160	Operating Pressure: 67 PSI
9. AS-250	Operating Pressure: 67 PSI
10. AS-450	Operating Pressure: 67 PSI

**Description:** Model # AS-10, AS-12, Reliant and New Life have internal compressor.  
Model # AS-20, 45, 80, 160, 250, 450 are connected to shop air.

## **CONDITIONS OF APPROVAL:**

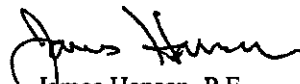
1. Use shall be only in ventilated room and free of oil and grease. Manufacturer's safety and maintenance practices must be observed.
2. Post decals on unit cautioning against blocking gas inlet and outlet and air inlet and against using oil or grease. ASME code pressure vessel must be re-tested every five (5) years.
3. The installation shall conform to the manufacturer's recommendations and the NYC Electrical Code. The operation of this equipment with a combustible gas shall be under the supervision of a person holding a Certificate of Fitness from the Fire Department and a Fire Department permit must be obtained.
4. A permit will be required if the air compressor used to run this equipment has a receiver exceeding 30 cubic feet capacity, has a pressure gauge calibrated to greater than 100 PSI or operates over 100PSI.
5. The use of the above mentioned product and/or system shall be limited to the indicated intent and has not been acceptable for other uses or applications. All CSA. requirements and follow-up service procedures must be complied with.
6. Each equipment of a type for which a Certificate of Approval shall have been issued must have number of such certificate plainly and permanently stamped or otherwise fixed upon it by the manufacturer.
7. The Certificate of Approval will be issued upon condition that the equipment's technology does not violate any patent, trade name, trade secret or other intellectual right.
8. The Fire Department Certificate of Approval does not constitute an endorsement or recommendation of your product by the Fire Department, but is a certification that your product, as represented, meets the standards as of the date of issuance.

Certificate of Approval#4693 for AirSep Corp.  
July 19, 2000  
Page 3 of 3

9. The Fire Department reserves the right to withdraw this approval at any time in the event there is a reasonable doubt that the product does not operate or perform as required by code, the conditions of this resolution or as represented in your application.
10. The Fire Department's conditions of approval shall be enumerated in the installation manuals and brochures which will be provided to buyers, users and installers.
11. As the manufacturer of this equipment/material, you should be aware that any end users who fail to comply with the condition as outlined in the acceptance will be subject to enforcement action which may include fines and imprisonment.

Any change in product original design, product name, material of construction, model number, company name or ownership of any product included on this certificate must be immediately reported to this Department in writing.

Very truly yours,



James Hansen, P.E.  
Director of Engineering and  
Technical Standards Management

JH:AH / 46930603





# INSTALLATION AND MAINTENANCE INSTRUCTIONS

## 2-WAY DIRECT ACTING SOLENOID VALVES NORMALLY CLOSED OPERATION — 1/4 N.P.T.

BULLETIN

8262

ASCO

FORM NO. V-5927

### DESCRIPTION

Bulletin 8262's are 2-way normally closed, direct acting solenoid valves having bodies of brass construction. Standard valves have a General Purpose NEMA Type 1 Solenoid Enclosure. Valves may also be equipped with a solenoid enclosure which is designed to meet NEMA Type 4 - Watertight, NEMA Type 7 (C or D) Hazardous Locations - Class I, Groups C or D and NEMA Type 9 (E, F or G) Hazardous Locations - Class II, Groups E, F or G. Installation and Maintenance Instructions for Explosion-Proof/Watertight Solenoid Enclosures are shown on Form Nos. V-5391 or V-5380.

### OPERATION

Normally Closed: Valve is closed when solenoid is de-energized. Valve opens when solenoid is energized.

NOTE: Inlet port will either be marked "1" or "IN." Outlet port will be marked "2."

**IMPORTANT: No minimum operating pressure required.**

### INSTALLATION

Check nameplate for correct catalog number, pressure, voltage and service.

### TEMPERATURE LIMITATIONS

For maximum valve ambient and fluid temperatures, refer to chart below. For higher ambient and fluid temperatures, consult factory. Check catalog number and watt rating on nameplate to determine the maximum temperatures.

WATTAGE	CATALOG NUMBER PREFIX	COIL CLASS	MAXIMUM AMBIENT TEMP. °F	MAXIMUM FLUID TEMP. °F
6	NONE	A	77	180
	FT	F	122	200
	HT	H	140	200
9	NONE	F	77	180
9.7	NONE, FT OR HT	A, F OR H	77	120
11.2*	NONE, FT OR HT	A, F OR H	77	150
16.7*	NONE	F	77	200

\*Catalog Nos. 8262C200 and 8262B200 and valves with suffix "W" in the catalog number are limited to 140°F fluid temperature.

### POSITIONING

Valve is designed to perform properly when mounted in any position. However, for optimum life and performance, the solenoid should be mounted vertical and upright so as to reduce the possibility of foreign matter accumulating in the core tube area.

### MOUNTING

For valve body and mounting bracket mounting dimensions, refer to Figures 1 and 2.

### PIPING

Connect piping according to markings on valve body. Apply pipe compound sparingly to male pipe threads only; if applied to valve threads, it may enter valve and cause operational difficulty. Pipe strain should be avoided by proper support and alignment of piping. When tightening the pipe, do not use valve as a lever. Wrenches applied to valve body or piping are to be located as close as possible to connection point.

**IMPORTANT: For the protection of the solenoid valve, install a strainer or filter suitable for the service involved in the inlet side as close to the valve as possible. Periodic cleaning is required depending upon service conditions. See Bulletins 8600, 8601 and 8602 for strainers.**

### WIRING

Wiring must comply with Local and National Electrical Codes. Solenoid housings are provided with a 7/8 diameter hole for 1/2 inch conduit. The general purpose solenoid enclosure may be rotated to facilitate wiring by removing the retaining cap or clip. CAUTION: When metal retaining clip disengages, it will spring upward. Rotate enclosure to desired position. Replace retaining cap or clip before operating.

NOTE: Alternating Current (A-C) and Direct Current (D-C) solenoids are built differently. To convert from one to the other, it is necessary to change the complete solenoid including the core assembly and solenoid base sub-assembly.

### SOLENOID TEMPERATURE

Standard catalog valves are supplied with coils designed for continuous duty service. When the solenoid is energized for a long period, the solenoid enclosure becomes hot and can be touched with the hand only for an instant. This is a safe operating temperature. Any excessive heating will be indicated by the smoke and odor of burning coil insulation.

### MAINTENANCE

**WARNING: Turn off electrical power supply and depressurize valve before making repairs. It is not necessary to remove the valve from the pipe line for repairs.**

### CLEANING

A periodic cleaning of all solenoid valves is desirable. The time between cleanings will vary depending upon media and service conditions. In general, if the voltage to the coil is correct, sluggish valve operation, excessive noise or leakage will indicate that cleaning is required. Clean valve strainer or filter when cleaning solenoid valve.

### PREVENTIVE MAINTENANCE

1. Keep the medium flowing through the valve as free from dirt and foreign material as possible.
2. While in service, operate the valve at least once a month to insure proper opening and closing.
3. Periodic inspection (depending on media and service conditions) of internal valve parts for damage or excessive wear is recommended. Thoroughly clean all parts. Replace any parts that are worn or damaged.

### IMPROPER OPERATION

1. **Faulty Control Circuit:** Check the electrical system by energizing the solenoid. A metallic click signifies the solenoid is operating. Absence of the click indicates loss of power supply. Check for loose or blown-out fuses, open-circuited or grounded coil, broken lead wires or splice connections.
2. **Burned-Out Coil:** Check for open-circuited coil. Replace coil if necessary.
3. **Low Voltage:** Check voltage across the coil leads. Voltage must be at least 85% of nameplate rating.
4. **Incorrect Pressure:** Check valve pressure. Pressure to valve must be within range specified on nameplate.
5. **Excessive Leakage:** Disassemble valve and clean all parts. Replace worn or damaged parts with a complete Spare Parts Kit for best results.

### COIL REPLACEMENT

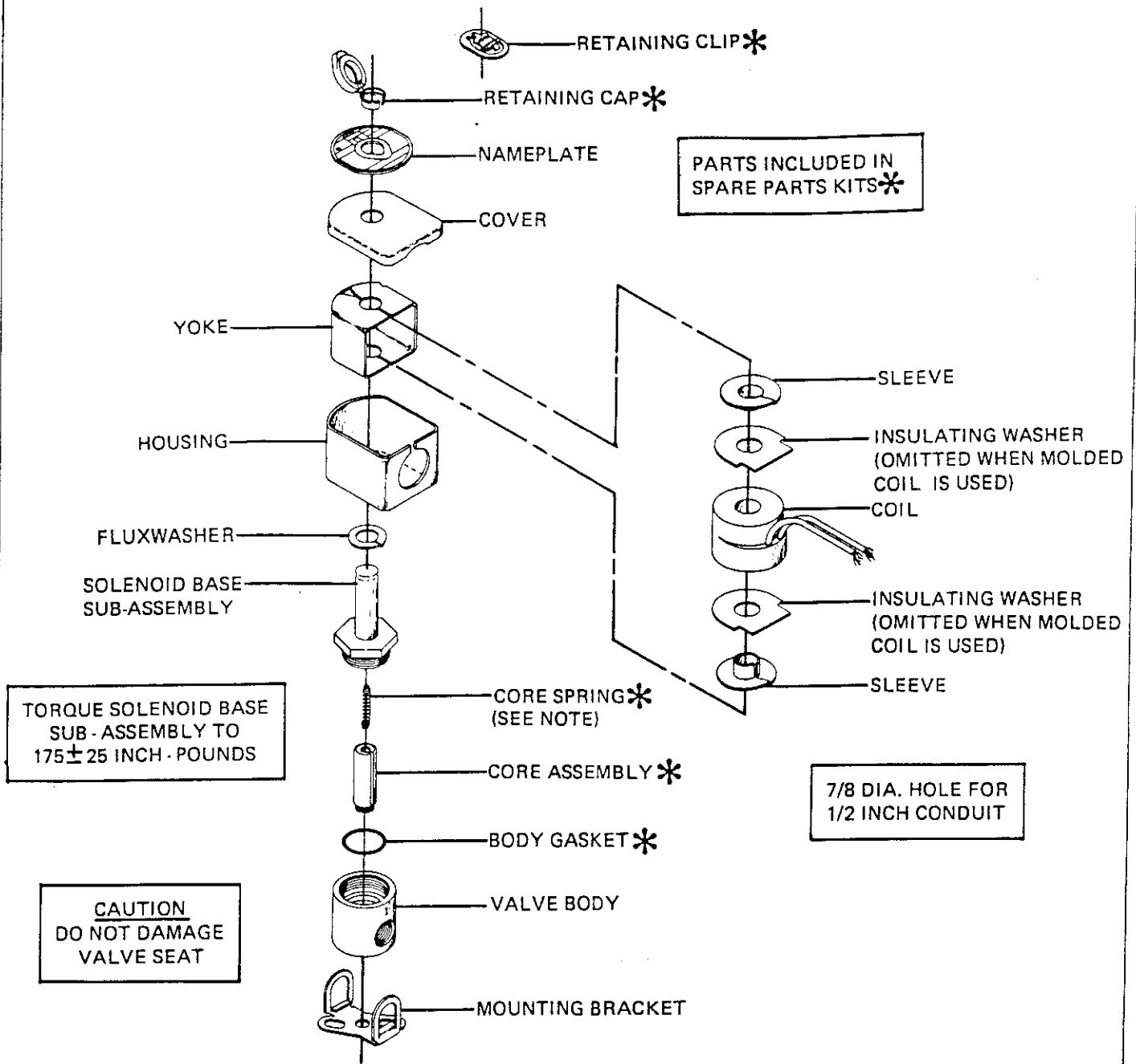
Turn off electrical power supply and disconnect coil lead wires. Refer to watt rating stamped on nameplate for identification of solenoid construction. When you have determined the watt rating of solenoid, select the correct paragraph below.

### FIGURE 3 SHOWS A SOLENOID WITH A WATT RATING OF 6 A-C, 9.7 D-C OR 9 A-C.

1. Remove retaining cap or clip, nameplate and cover. CAUTION: When metal retaining clip disengages, it will spring upward.
2. Slip the yoke containing a coil, sleeves and insulating washers off the the solenoid base sub-assembly. Insulating washers are omitted when a molded coil is used.
3. Slip coil, sleeves and insulating washers from yoke.
4. Reassemble in reverse order of disassembly paying careful attention to exploded view provided for identification and placement of parts.

ASCO Valves

ASCO



NOTE: A-C (ALTERNATING CURRENT) CONSTRUCTION SHOWN. FOR A-C CONSTRUCTION, EITHER END OF THE SPRING MAY BE INSTALLED INTO TOP OF CORE ASSEMBLY. FOR D-C (DIRECT CURRENT) CONSTRUCTION, INSTALL WIDE END OF CORE SPRING IN CORE ASSEMBLY FIRST, CLOSED END OF CORE SPRING PROTRUDES FROM TOP OF CORE ASSEMBLY.

Figure 3.

Bulletin 8262 (6 A-C, 9.7 D-C Or 9 Watts A-C)  
 General Purpose Solenoid Enclosure Shown  
 For Explosion-Proof/Watertight Solenoid Enclosure, See Form No. V-5391

## Torque Chart

Part Name	Torque Value in Inch-Pounds	Torque Value in Newton-Meters
terminal block screws	$10 \pm 2$	$1,1 \pm 0,2$
socket head screw	$15 - 20$	$1,7 - 2,3$
center screw	$5 \pm 1$	$0,6 \pm 0,1$

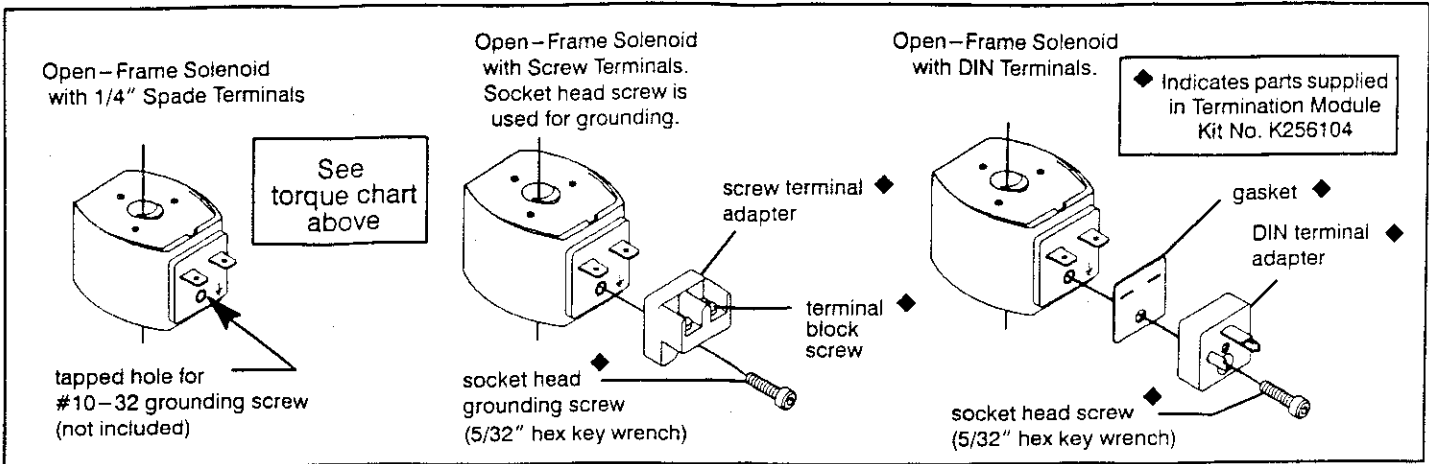


Figure 4. Open-frame solenoids

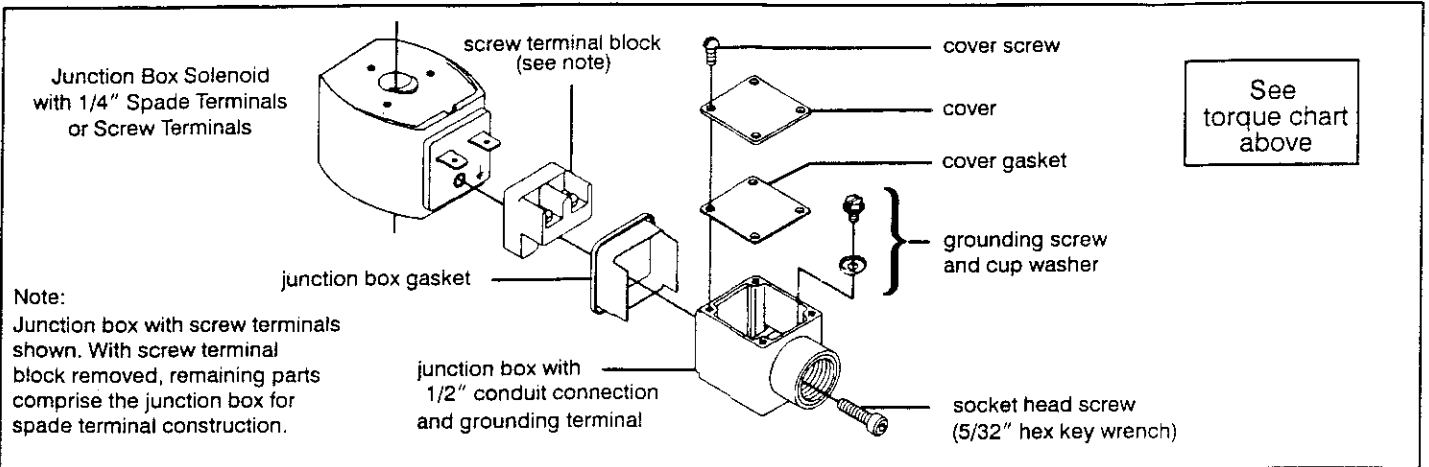


Figure 5. Junction box (optional feature)

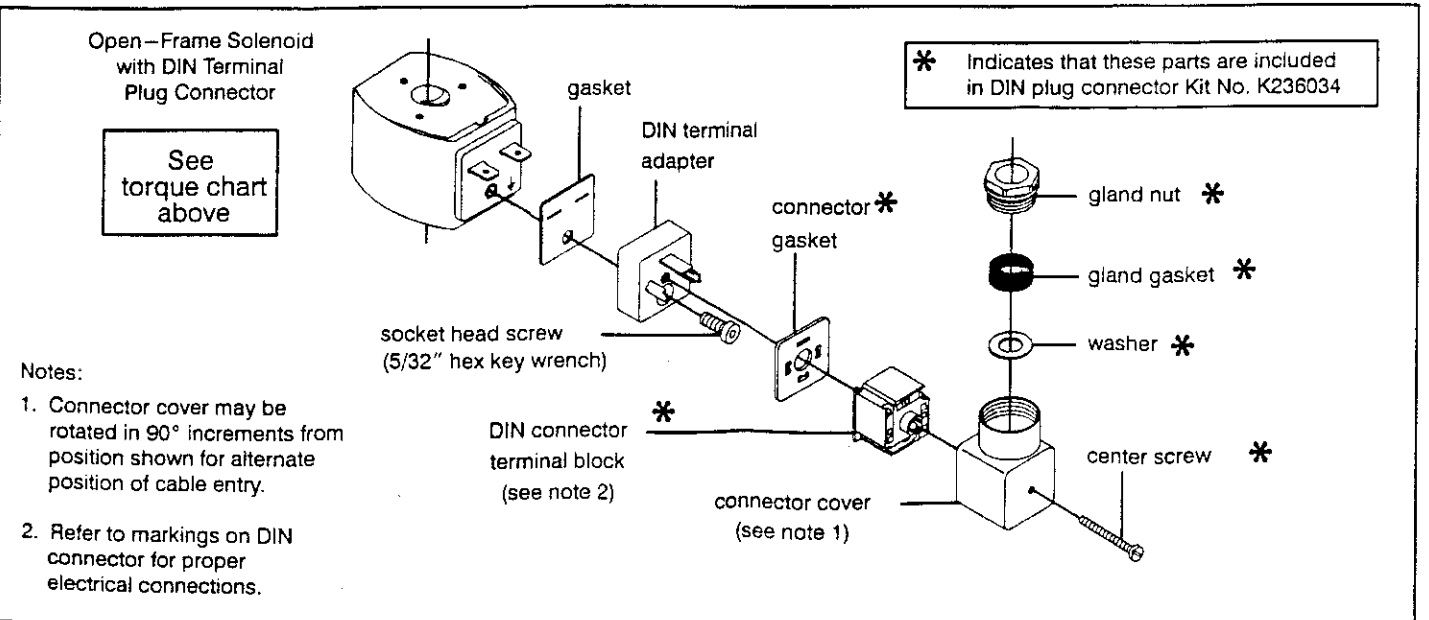


Figure 6. DIN plug connector kit No. K236034 (optional feature)

GB

**GENERAL INSTALLATION AND MAINTENANCE INSTRUCTIONS**

Note: These General Installation and Maintenance Instructions must be read in conjunction with the Instruction Sheet for the specific product.

**INSTALLATION**

ASCO/JOUCOMATIC components are intended to be used only within the technical characteristics as specified on the nameplate. Changes to the equipment are only allowed after consulting the manufacturer or its representative. Before installation depressurize the piping system and clean internally. The equipment may be mounted in any position if not otherwise indicated on the product by means of an arrow. The flow direction and pipe connection of valves are indicated on the body.

The pipe connections have to be in accordance with the size indicated on the nameplate and fitted accordingly.

**Caution:**

- Reducing the connections may cause improper operation or malfunctioning.
- For the protection of the equipment install a strainer or filter suitable for the service involved in the inlet side as close to the product as possible.
- If tape, paste, spray or a similar lubricant is used when tightening, avoid particles entering the system.
- Use proper tools and locate wrenches as close as possible to the connection point.
- To avoid damage to the equipment, DO NOT OVERTIGHTEN pipe connections.
- Do not use valve or solenoid as a lever.
- The pipe connections should not apply any force, torque or strain to the product.

**ELECTRICAL CONNECTION**

In case of electrical connections, they are only to be made by trained personnel and have to be in accordance with the local regulations and standards.

**Caution:**

- Turn off electrical power supply and de-energize the electrical circuit and voltage carrying parts before starting work.
- All electrical screw terminals must be properly tightened according to the standards before putting into service.
- Dependent upon the voltage electrical components must be provided with an earth connection and satisfy local regulations and standards

The equipment can have one of the following electrical terminals:

- Spade plug connections according to ISO-4400 or 3 x DIN-46244 (when correctly installed this connection provides IP-65 protection).
- Embedded screw terminals in metal enclosure with "Pg" cable gland.
- Spade terminals (AMP type).
- Flying leads or cables.

**PUTTING INTO SERVICE**

Before pressurizing the system, first carry-out an electrical test. In case of solenoid valves, energize the coil a few times and notice a metal click signifying the solenoid operation.

**SERVICE**

Most of the solenoid valves are equipped with coils for continuous duty service. To prevent the possibility of personal or property damage do not touch the solenoid which can become hot under normal operation conditions.

**SOUND EMISSION**

The emission of sound depends on the application, medium and nature of the equipment used. The exact determination of the sound level can only be carried out by the user having the valve installed in his system.

**MAINTENANCE**

Maintenance of ASCO/JOUCOMATIC products is dependent on service conditions. Periodic cleaning is recommended, the timing of which will depend on the media and service conditions. During servicing, components should be examined for excessive wear. A complete set of internal parts is available as a spare parts or rebuild kit. If a problem occurs during installation/maintenance or in case of doubt please contact ASCO/JOUCOMATIC or authorized representatives.

A separate Declaration of Incorporation relating to EEC Directive 89/392/EEC Annex II B is available on request. Please provide product identification number and serial numbers of products concerned.

The product complies with the essential requirements of the EMC Directive 89/336/EEC and amendments and the Low Voltage Directives 73/23/EEC and 93/68/EEC. A separate Declaration of Conformity is available on request. Please provide product identification number and serial numbers of the products concerned.

**AUTOMATIC SWITCH CO.**  
50-60 Hanover Road  
Floram Park, New Jersey 07932  
Tel. (973) 966-2000  
Fax (973) 966-2628

**AUTOMATIC SWITCH CO.**  
1561 Columbia Highway  
Aiken, South Carolina 29801  
Tel. (803) 641-9200  
Fax (803) 641-9290

FR

**INSTRUCTIONS GÉNÉRALES D'INSTALLATION ET D'ENTRETIEN**

Note : Ces instructions générales d'installation et d'entretien complètent la notice spécifique du produit.

**MONTAGE**

Les composants ASCO/JOUCOMATIC sont conçus pour les domaines de fonctionnement indiqués sur la plaque signalétique ou la documentation. Aucune modification ne peut être réalisée sur le matériel sans l'accord préalable du fabricant ou de son représentant. Avant de procéder au montage, dépressuriser les canalisations et effectuer un nettoyage interne. A moins qu'une flèche ou la notice n'indique un sens de montage spécifique de la tête magnétique, le produit peut être monté dans n'importe quelle position. Le sens de circulation du fluide est indiqué par repères sur le corps et dans la documentation.

La dimension des tuyauteries doit correspondre au raccordement indiqué sur le corps, l'étiquette ou la notice.

**Attention :**

- Une restriction des tuyauteries peut entraîner des dysfonctionnements.
- Afin de protéger le matériel, installer une crépine ou un filtre adéquat en amont, aussi près que possible du produit.
- En cas d'utilisation de ruban, pâte, aérosol ou autre lubrifiant lors du serrage, veiller à ce qu'aucun corps étranger ne pénètre dans le circuit.
- Utiliser un outillage approprié et placer les clés aussi près que possible du point de raccordement.
- Afin d'éviter toute détérioration, NE PAS TROP SERRER les raccords des tuyauteries.
- Ne pas se servir de la vanne ou de la tête magnétique comme d'un levier.
- Les tubes de raccordement ne doivent exercer aucun effort, couple ou contrainte sur le produit.

**RACCORDEMENT ÉLECTRIQUE**

Le raccordement électrique doit être réalisé par un personnel qualifié et selon les normes et règlements locaux.

**Attention :**

- Avant toute intervention, couper l'alimentation électrique pour mettre hors tension les composants.
- Toutes les bornes à vis doivent être serrées correctement avant la mise en service.
- Selon la tension, les composants électriques doivent être mis à la terre conformément aux normes et règlements locaux.

Selon les cas, le raccordement électrique s'effectue par :

- Connecteur débrochable ISO4400 ou 3 x DIN46244 avec degré de protection IP65 lorsque le raccordement est correctement effectué.
- Bornes à vis solitaires du bobinage, sous boîtier métallique avec presse-étoupe "Pg" ...
- Cosses (type AMP).
- Fils ou câbles solitaires de la bobine.

**MISE EN SERVICE**

Avant de mettre le circuit sous pression, effectuer un essai électrique. Dans le cas d'une électrovanne, mettre la bobine sous tension plusieurs fois et écouter le "clic" métallique qui signale le fonctionnement de la tête magnétique.

**FONCTIONNEMENT**

La plupart des électrovannes comportent des bobinages prévus pour mise sous tension permanente. Pour éviter toute brûlure, ne pas toucher la tête magnétique qui, en fonctionnement normal et en permanence sous tension, peut atteindre une température élevée.

**BRUIT DE FONCTIONNEMENT**

Le bruit de fonctionnement varie selon l'utilisation, le fluide et le type de matériel employé. L'utilisateur ne pourra déterminer avec précision le niveau sonore émis qu'après avoir monté le composant sur l'installation.

**ENTRETIEN**

L'entretien nécessaire aux produits ASCO/JOUCOMATIC varie avec leurs conditions d'utilisation. Il est souhaitable de procéder à un nettoyage périodique dont l'intervalle varie suivant la nature du fluide, les conditions de fonctionnement et le milieu ambiant. Lors de l'intervention, les composants doivent être examinés pour détecter toute usure excessive. Un ensemble de pièces internes est proposé en pièces de rechange pour procéder à la réparation. En cas de problème lors du montage/entretien ou en cas de doute, veuillez contacter ASCO/JOUCOMATIC ou ses représentants officiels.

Conformément à la directive CEE 89/392/CEE Annexe II B, une Déclaration d'Incorporation peut être fournie sur demande. Veuillez nous indiquer le numéro d'accusé de réception (AR) et les références ou codes des produits concernés.

Ce produit est conforme aux prescriptions les plus importantes de la directive CEM 89/336/CEE et amendements et aux directives bases tension 73/23/CEE et 94/68/CEE. Une déclaration de conformité peut être fournie sur simple demande. Veuillez nous indiquer le numéro d'accusé de réception (AR) ainsi que les numéros de série des produits concernés.

**ANGAR SCIENTIFIC**  
52 Horsehill Road  
Cedar Knolls, New Jersey 07927  
Tel. (973) 538-9700  
Fax (973) 538-5937

DE

**ALLGEMEINE BETRIEBSANLEITUNG**

ACHTUNG: Diese Allgemeine Betriebsanleitung gilt in Zusammenhang mit der jeweiligen Betriebsanleitung für die speziellen Produkte.

**EINBAU**

Die ASCO/JOUCOMATIC-Komponenten dürfen nur innerhalb der auf den Typenschildern angegebenen Daten eingesetzt werden. Veränderungen an den Produkten sind nur nach Rücksprache mit ASCO/JOUCOMATIC zulässig. Vor dem Einbau der Ventile muß das Rohrleitungssystem drucklos geschaltet und innen gereinigt werden. Die Einbaulage der Produkte ist generell beliebig. Ausnahme: Die mit einem Pfeil gekennzeichneten Produkte müssen entsprechend der Pfeilrichtung montiert werden. Die Durchflußrichtung und der Eingang von Ventilen sind gekennzeichnet.

Die Rohranschlüsse sollten entsprechend den Größenangaben auf den Typenschildern mit handelsüblichen Verschraubungen durchgeführt werden. Dabei ist folgendes zu beachten:

- Eine Reduzierung der Anschlüsse kann zu Leistungs- und Funktionsminderungen führen.
- Zum Schutz der Ventile sollten Schmutzfänger oder Filter so dicht wie möglich in den Ventileingang integriert werden.
- Bei Abdichtung am Gewinde ist darauf zu achten, daß kein Dichtungsmaterial in die Rohrleitung oder das Ventil gelangt.
- Zur Montage darf nur geeignetes Werkzeug verwendet werden.
- Konische Verschraubungen sind sorgfältig anzuziehen. Es ist darauf zu achten, daß beim Anziehen das Gehäuse nicht beschädigt wird.
- Spule und Führungsrohr von Ventilen dürfen nicht als Gegenhalter benutzt werden.
- Die Rohrleitungsanschlüsse sollen fluchten und dürfen keine Spannungen auf das Ventil übertragen.

**ELEKTRISCHER ANSCHLUß**

Der elektrische Anschluß ist von Fachpersonal entsprechend den geltenden VDE- und CEE-Richtlinien auszuführen. Es ist besonders auf folgendes zu achten:

- Vor Beginn der Arbeiten ist sicherzustellen, daß alle elektrischen Leitungen und Netzteile spannungslos geschaltet sind.
- Alle Anschlußklemmen sind nach Beendigung der Arbeiten vorschriftsmäßig entsprechend den geltenden Regeln anzuziehen.
- Je nach Spannungsbereich muß das Ventil nach den geltenden Regeln einen Schutzleiteranschluß erhalten.

Der Magnetantrieb kann je nach Bauart folgende Anschlüsse haben:

- Anschluß für Gerätesteckdose nach DIN 43650 Form A/ISO 4400 oder 3x DIN 46244 (durch ordnungsgemäße Montage der Gerätesteckdose wird Schutzklasse IP 65 erreicht).
- Anschlüsse innerhalb eines Blechgehäuses mittels Schraubklemmen, Kabeleinführung ins Gehäuse mit PG-Verschraubung.
- Offene Spulen mit Flachsteckem (AMP-Fahren) oder mit eingegossenen Kabelenden.

**INBETRIEBNAHME**

Vor Druckbeaufschlagung des Produktes sollte eine elektrische Funktionsprüfung erfolgen:

Bei Ventilen Spannung an der Magnetspule mehrmals ein- und ausschalten. Es muß ein Klicken zu hören sein.

**BETRIEB**

Die meisten Ventile sind mit Spulen für Dauerbetrieb ausgerüstet. Zur Vermeidung von Personen- und Sachschäden sollte jede Berührung mit dem Ventil vermieden werden, da die Magnetspule bei längerem Betrieb sehr heiß werden kann.

**GERÄUSCHEMISSION**

Diese hängt sehr stark vom Anwendungsfall, den Betriebsdaten und dem Medium, mit denen das Produkt beaufschlagt wird, ab. Eine Aussage über die Geräuschemission des Produktes muß deshalb von demjenigen getroffen werden, der das Produkt innerhalb einer Maschine in Betrieb nimmt.

**WARTUNG**

Die Wartung hängt von den Einsatzbedingungen ab. In entsprechenden Zeitabständen muß das Produkt geöffnet und gereinigt werden. Für die Überholung der ASCO/JOUCOMATIC-Produkte können Ersatzteilsätze geliefert werden. Treten Schwierigkeiten bei Einbau, Betrieb oder Wartung auf, sowie bei Unklarheiten, ist mit ASCO/JOUCOMATIC Rücksprache zu halten.

(ASCO/JOUCOMATIC Produkte sind entsprechend der EG-Richtlinie 89/392/EWG gefertigt.)

Eine separate Herstellererklärung im Sinne der Richtlinie 89/392/EWG Anhang II B ist auf Anfrage erhältlich. Geben Sie bitte für die Produkte die Nummer der Auftragsbestätigung und die Seriennummer an.

Dieses Produkt entspricht den grundlegenden Bestimmungen der EMV-Richtlinie 89/336/EWG, einsch. Nachträge, sowie den Niederspannungsrichtlinien 73/23/EWG u. 93/68/EWG. Bitte geben Sie die Auftragsbestätigungsnummer und die Seriennummern der betreffenden Produkte an.



**Instructions for installation and operation**

english

**Instrucciones de instalación y de servicio**

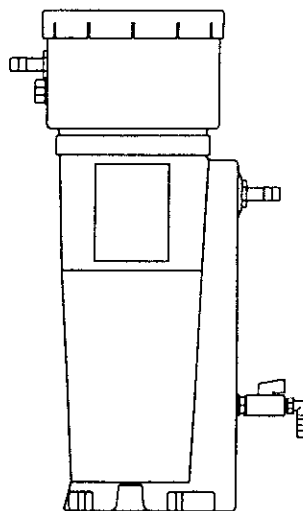
español

**Instructions de montage et de service**

français

**Instruções de instalação e de serviço**

português



## **AQUAMAT 1**

Dear Customer,

Thank you for deciding in favour of the Oil Water Separator AQUAMAT. Please read the present instructions carefully before installing your AQUAMAT unit and putting it into service. The perfect functioning of the Oil Water Separator AQUAMAT - and thus reliable condensate treatment - can only be guaranteed if the recommendations and conditions stated here are adhered to.

Muy estimado cliente

Muchas gracias por decidirse a adquirir el sistema AQUAMAT para separación de aceite y agua. Por favor, antes de proceder a montar y poner en funcionamiento el equipo, lea cuidadosamente las instrucciones de montaje y uso, y siga nuestras indicaciones. Sólo si se observan estrictamente estas prescripciones e instrucciones, se garantizará un perfecto funcionamiento del equipo y el tratamiento eficaz del condensado.

Cher client,

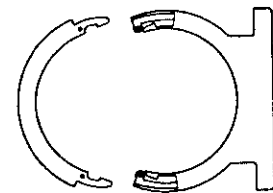
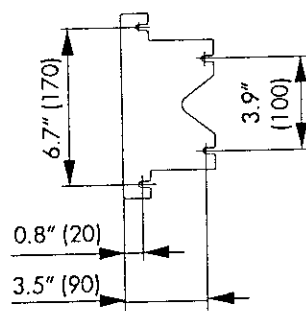
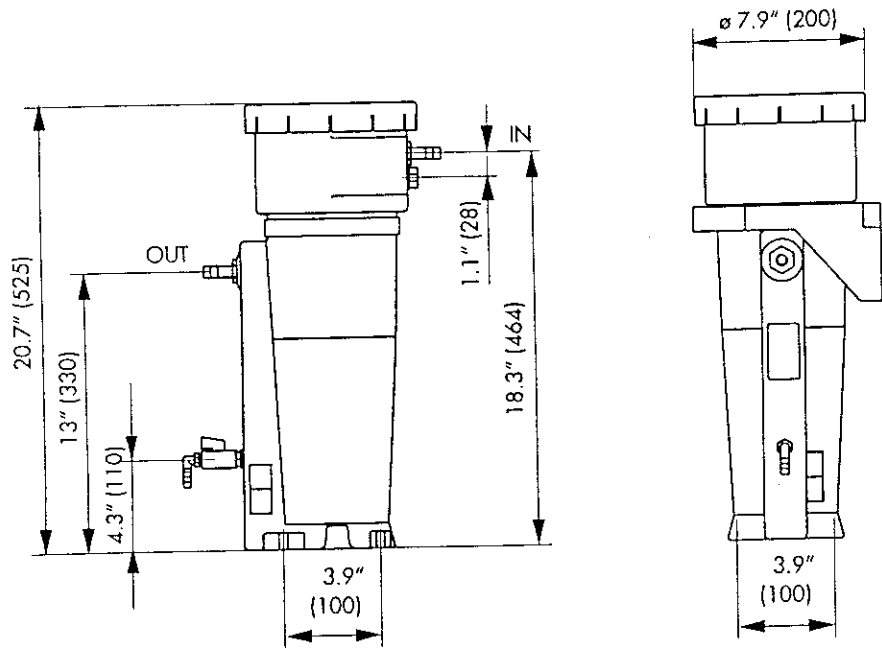
Vous venez d'acquérir un séparateur huile-eau AQUAMAT et nous vous en félicitons. Nous vous recommandons de lire attentivement ces instructions avant le montage et la mise en service de l'AQUAMAT et de suivre nos conseils. Car, seul le respect scrupuleux des prescriptions et consignes données peut garantir le parfait fonctionnement de l'AQUAMAT et une séparation huile-eau fiable des condensats.

Estimado cliente,

muito obrigado por ter escolhido o sistema de separação de óleo e água AQUAMAT. Por favor, leia atentamente estas instruções de instalação e serviço, antes de montar e colocar em funcionamento o AQUAMAT, e siga as nossas indicações. Para garantir uma perfeita função do AQUAMAT e, por conseguinte, uma preparação segura do condensado, é imprescindível respeitar fielmente os regulamentos e instruções descritos.

**AQUAMAT 1**

Technical Data • Datos técnicos  
Caracteristiques Techniques • Datos técnicos





**Technical Data • Datos técnicos**  
**Characteristiques Techniques • Dados técnicos**

min/max temperature Temperatura min/max Température min/max Temperatura mín/máx	33...140°F +1...+60°C
Condensate feed (hose) Entrada condensado Entrée de condensat (flexible) Entrada de condensado	½" G½ (di=10 mm)
Water outlet (hose) Salida de agua Sortie d'eau (flexible) Escoamento de água	½" G½ (di=10 mm)
Weight empty Peso en vacío Poids à vide Peso sem carga	approx. 9 lbs ca. 4 kg

Container capacity Recipiente - capacidad Capacité du réservoir Capacidade do recipiente	Gallons litros Litres Litros	2,6 10
Filling volume Recipiente - capacidad de llenado Volume de réservoir Volume de enchimento d recipiente	Gallons litros Litres litros	1,1 4,3
AQUAMAT 1	order reference Referencia No. de comm. N.º de encom.	ANAQUAMAT 1

Oleophilic prefilter Prefiltro oleófilo Préfiltre oleophil Filtro de entrada oleófilo	Gallons litros Litres Litros	0,5 2
Adsorption filter Filtro de adsorción Filtre d'adsorption Filtro adsorbente	Gallons litros Litres Litros	0,8 3
Filter set Kits de filtro Set de filtre Conjunto de filtro	order reference Referencia No. de comm. N.º de encom.	ANAQUA2FLTR

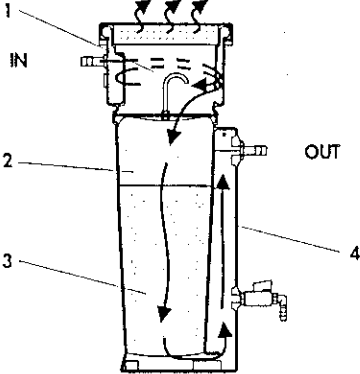
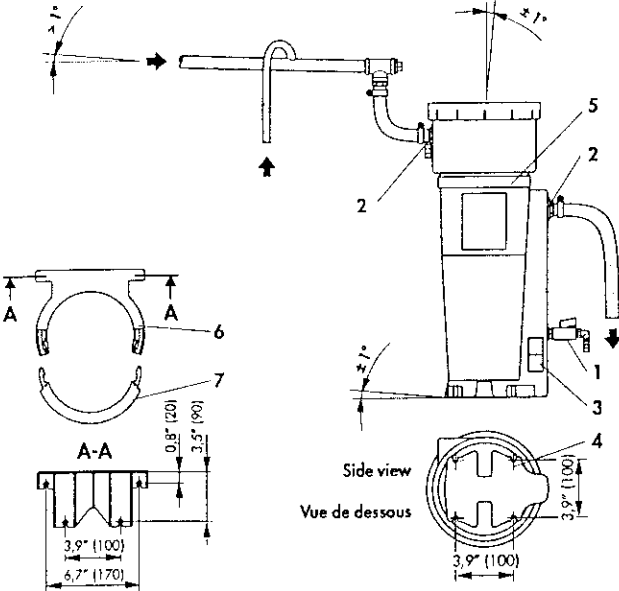
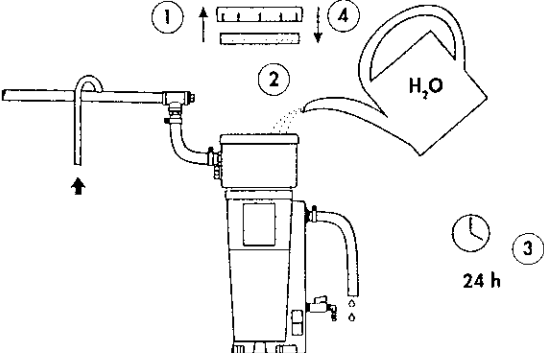
**Technical Data • Datos técnicos**  
**Caracteristiques Techniques • Dados técnicos**

Compressor performance / Potencia de compresor  
 Puissance des compresseurs / Potência do compressor  
 [scfm]

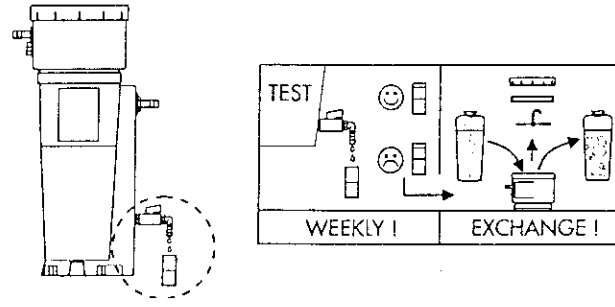
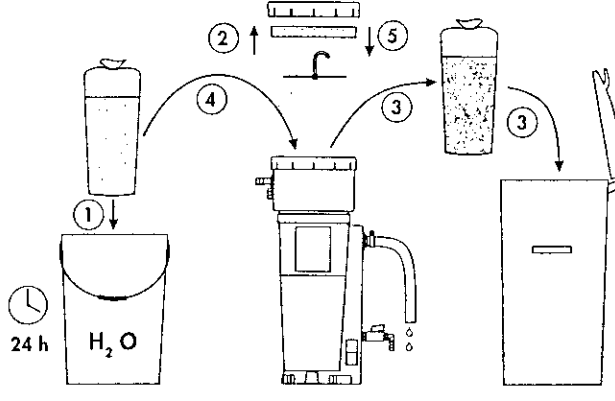
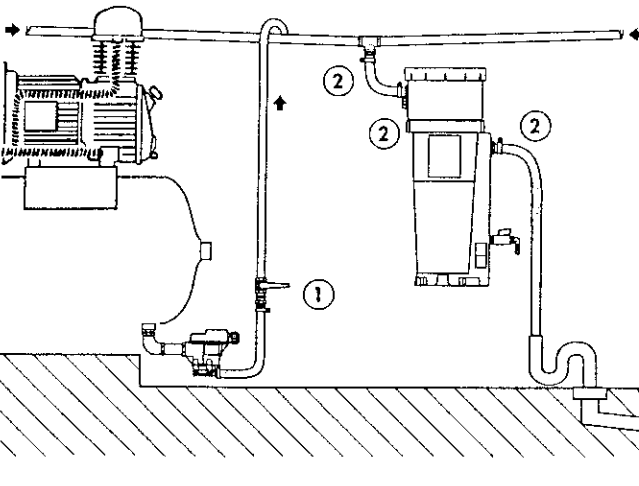
NOTE! Increase capacities by 30 % if condensate from dryers and filters is not being collected!	Screw compressors Compresor helicoidal Compresseurs à vis Compresor de parafusos			Piston compress., 1- and 2-stage Compresor de êmbolo de 1 o 2 escalones Compre. à pistons, 1- et 2-étages Compresor de êmbolo de uma ou duas vias	
	Mineral oil Turbine oil (additive free)	<del>Diesters PAO</del>	Polyglycol	Mineral oil Turbine oil (additive free)	Synthetic oil
<b>AQUAMAT 1</b>	55	40	20 - 35	39	10 - 39
<b>AQUAMAT 2</b>	120	100	44 - 78	85	20 - 85
<b>AQUAMAT 4</b>	350	300	125 - 230	245	60 - 245
<b>AQUAMAT 5R</b>	775	665	280 - 515	550	140 - 550
<b>AQUAMAT 6</b>	1200	950	440 - 790	840	210 - 840
<b>AQUAMAT 8</b>	3600	2850	1300 - 2375	2500	625 - 2500

~~Royal PAO~~ PAO

english	español	français	português
<p><b>IMPORTANT NOTES</b></p> <ol style="list-style-type: none"> <li>1. Only use the AQUAMAT unit for the separation of demulsifiable compressor condensates. Otherwise the manufacturer's guarantee will no longer be valid.</li> <li>2. Only use compressor oils according to the classification in the performance table (page 2)</li> <li>3. In the event of damage to the AQUAMAT unit, condensate must not be allowed to get into the public sewer system.</li> <li>4. Do not install the AQUAMAT in areas where there is a danger of frost.</li> <li>5. The clean water being discharged must be checked regularly. If the water shows the cloudiness of the reference jar, the filter unit must be replaced.</li> <li>6. The operator must check the state.</li> <li>7. Only use original filters for replacement, otherwise the guarantee will no longer be valid.</li> <li>8. If condensate is discharged manually or by means of time-controlled solenoid valves, there is a risk of overflowing or emulsification.</li> <li>9. The container must be regularly checked to ensure that there is no leakage.</li> </ol> <p><b>10. PLEASE NOTE:</b> The local regulations for operation of the oil-water separator and indirect clean-water discharge may be different from the ones referred to here. Please check with the environmental authority for your area.</p>	<p><b>NOTA IMPORTANTE</b></p> <ol style="list-style-type: none"> <li>1. AQUAMAT se debe usar sólo para la separación de condensados de compresores que se puedan desmenujar. De lo contrario, no existirá garantía de parte del fabricante.</li> <li>2. Usar sólo los aceites para compresor que cumplan los criterios de clasificación de la tabla de capacidades (pág. 2)</li> <li>3. Si el AQUAMAT llegara a dañarse, se deberá evitar que el condensado que se escape llegue a los canales públicos del alcantarillado.</li> <li>4. El AQUAMAT no se debe instalar en zonas expuestas a heladas o congelamiento.</li> <li>5. Controlar regularmente el agua depurada que sale. Si la turbiedad alcanza el nivel de referencia, se deberá cambiar la unidad filtrante.</li> <li>6. La revisión del estado de los filtros.</li> <li>7. Se deben utilizar únicamente filtros originales de recambio, de lo contrario, no será válida la garantía.</li> <li>8. La evacuación manual de los condensados, o mediante electroválvulas temporizadas, puede causar la sobrecarga del equipo o la formación de emulsiones.</li> <li>9. Verificar con regularidad la impermeabilidad del depósito.</li> </ol> <p><b>10. ¡ATENCIÓN!</b> La reglamentación local para la operación del equipo y para la descarga indirecta del agua limpia de salida puede discrepar de las indicaciones de estas instrucciones. Comuníquese con las autoridades ambientales locales pertinentes.</p>	<p><b>CONSIGNES IMPORTANTES</b></p> <ol style="list-style-type: none"> <li>1. N'utiliser l'AQUAMAT que pour la séparation de condensats de compresseurs désémulsifiables. Dans le cas contraire, la garantie du constructeur n'est pas valable.</li> <li>2. N'utiliser que des huiles pour compresseurs conformes aux classifications du tableau de la puissance installée des compresseurs (Page 2)</li> <li>3. En cas d'endommagement de l'AQUAMAT, le condensat s'en échappant ne doit pas s'écouler dans les égouts publics.</li> <li>4. Ne pas installer l'AQUAMAT dans des endroits présentant un risque de gel.</li> <li>5. Contrôler régulièrement l'eau traitée évacuée. Si le degré de turbidité de référence est atteint, remplacer l'unité de filtre.</li> <li>6. La vérification de l'état du filtre.</li> <li>7. N'utiliser que des filtres de rechange d'origine. Sinon la garantie n'est plus valable.</li> <li>8. La purge du condensat réalisée manuellement ou à l'aide d'électrovannes temporisées peut entraîner une surcharge de l'appareil ou une formation d'émulsion.</li> <li>9. Vérifier régulièrement l'étanchéité du réservoir.</li> </ol> <p><b>10. ATTENTION !</b> La réglementation locale relative au rejet indirect de l'eau traitée évacuée peut diverger des indications données dans cette notice. Adressez-vous à l'organisme compétent pour la protection de l'environnement.</p>	<p><b>INDICAÇÕES IMPORTANTES</b></p> <ol style="list-style-type: none"> <li>1. Utilizar o AQUAMAT apenas para a separação de condensados de compressor desmenuzáveis. Caso contrário, a garantia do fabricante perderá a sua validade.</li> <li>2. Utilizar apenas óleos de compressor que correspondam às classificações referidas na tabela de capacidades (página 2).</li> <li>3. No caso de danificação do AQUAMAT, o condensado transbordante não deverá escoar para dentro da rede de esgotos pública.</li> <li>4. Não instalar o AQUAMAT em áreas sujeitas a perigo de geada.</li> <li>5. Controlar regularmente a água pura escoante. Substituir a unidade de filtros, quando se atingir o grau de turvação de referência.</li> <li>6. A verificação do estado do filtro.</li> <li>7. Utilizar apenas filtros de substituição originais. Caso contrário, a garantia perderá a sua validade.</li> <li>8. A drenagem de condensado feita manualmente ou por meio de válvulas magnéticas comandadas por temporizador poderá provocar uma sobrecarga do aparelho ou a formação de emulsão.</li> <li>9. Verificar regularmente a estanqueidade dos recipientes.</li> </ol> <p><b>10. ATENÇÃO!</b> A regulamentação local relativa ao funcionamento do aparelho e à introdução indirecta da água de escoamento pura poderá divergir das indicações aqui referidas. É favor dirigir-se aos seus serviços de protecção ao meio ambiente competentes.</p>

<b>Function • Funcionamiento</b> <b>Functionnement • Funcionamento</b>	<b>english</b>
	<p>The oil-contaminated condensate can be discharged under pressure into the AQUAMAT oil-water separator. The overpressure is reduced in the pressure-relief chamber (1) without creating turbulence in the separation container. The calmed condensate flows into the filter stage where it passes slowly through the 2-stage filter unit. Free oils and entrained dirt particles are adsorbed in the oleophilic prefilter (2). After this preliminary cleaning of the condensate, the residual mineral hydrocarbons (mineral hydrocarbons are removed in the activated carbon stage (3). The clean water is discharged through a riser (4).</p>
	<p><b>INSTALLATION</b></p> <p>Screw sampling cock (1) and hose connectors (2) for inlet and outlet are in tightly. Attach test device (3). See enclosed assembly drawing!</p> <p><u>Floor mounting</u> Use elongated holes of the 4 mounting (4) feet. Screws and dowels supplied with unit. Install the AQUAMAT unit true to plumb line (<math>\pm 1^\circ</math>).</p> <p><u>Wall mounting</u> Fix mounting brackets (6) perpendicularly on the wall. Push in AQUAMAT with mounting area (5) and lock home clamp (7). Lay condensate feed line(s) along the wall with a downward slope. Lay water discharge line with a continuous downward slope to the wastewater discharge point. Install siphon to avoid disagreeable smells. The installation area must be such that <b>untreated</b> condensate cannot get into the public sewer system.</p>
	<p><b>PUTTING INTO OPERATION</b></p> <ol style="list-style-type: none"> <li>1. Remove cap and aerosol filter mat.</li> <li>2. Fill fresh water into AQUAMAT unit until water comes out of the outlet.</li> <li>3. Wait for 24 hours, top up with water if required.</li> <li>4. Put back cap and aerosol filter mat.</li> </ol> <p>The AQUAMAT oil-water separator is now ready for operation.</p> <p>The outflowing water may initially look black (carbon dust).</p>

español	français	português
<p>El condensado oleoso se puede alimentar a presión en el AQUAMAT. La sobrepresión se compensa en la cámara de descarga (1) de presiones, sin que se produzcan turbulencias en el recipiente de separación. El condensado reposado llega a la etapa de filtración y circula lentamente a través de la unidad de filtración de dos niveles. El aceite libre y las partículas de suciedad que hayan entrado son adsorbidas por un filtro oleófilo previo (2). En el nivel siguiente de carbón activado, el condensado pretreatado se libera de los hidrocarburos minerales residuales. El agua tratada sale a través de un canal ascendente (4).</p>	<p>Le condensat huileux peut être amené sous pression à l'AQUAMAT. La décompression s'effectue dans la chambre de détente (1), évitant ainsi toute turbulence dans le réservoir séparateur. Le condensat stabilisé arrive dans l'étage de filtration et traverse lentement l'unité de filtre à 2 étages. Les huiles libres et les particules d'impuretés véhiculées sont adsorbées dans un préfiltre oléophile (2). Dans l'étage placé immédiatement après le préfiltre et contenant du charbon actif (3), le condensat prénettoyé est débarrassé des hydrocarbures résiduels. L'eau propre s'écoule via un canal montant (4).</p>	<p>O condensado oleoso pode ser introduzido no AQUAMAT, sob pressão. O excesso de pressão é eliminado na câmara de alívio de pressão (1), sem que ocorram turbulências no recipiente de separação. O condensado acalmado alcança o estágio do filtro e percorre lentamente a unidade do filtro de dois estágios. O óleo livre e as impurezas nele contidas são adsorvidas num filtro de entrada oleófila (2). No estágio de carvão ativo (3) que se lhe segue, libertam-se do condensado previamente purificado os hidrocarbonetos de óleo mineral residuais. A água limpa escorre por um canal ascendente (4).</p>
<p><b>INSTALACIÓN</b>  Atornillar el grifo para toma de muestras y las boquillas para tubería flexible (2) para la entrada y la salida del fluido, y colgar el tubo para muestras.  ¡Observar la hoja de montaje incluida en el suministro!  <u>Montaje sobre el piso</u>  Utilizar los orificios oblongos de los 4 pies de fijación (4). Con el equipo se han incluido los tacos y los tornillos. Montar el AQUAMAT perpendicularmente (<math>\pm 1^\circ</math>).  <u>Montaje en la pared</u>  Montar perpendicularmente (<math>\pm 1^\circ</math>) en la pared el ángulo de soporte (6). Enganchar la superficie de montaje del AQUAMAT y encajar el gancho de cierre (7). Colocar la tubería de alimentación del condensado por encima del AQUAMAT con un desnivel constante. Montar la tubería de descarga del agua, con un desnivel constante y, de ser posible, con un sifón. La zona de montaje del AQUAMAT debe estar ubicada de tal forma, que si se presentan fugas de condensado <b>sin tratar</b>, éstas no puedan llegar al alcantarillado público.</p>	<p><b>INSTALLATION</b>  Visser le robinet de prélèvement (1) et les douilles pour flexible (2) pour les conduites d'arrivée et d'évacuation et accrocher le tube de prélèvement (3). Respecter les indications mentionnées sur la notice de montage jointe au matériel livré.  <u>Montage au sol</u>  Utiliser les trous oblongs des 4 pieds de fixation (4). Les vis et chevilles sont fournies. Monter l'AQUAMAT en le mettant de niveau (<math>\pm 1^\circ</math>).  <u>Fixation au mur</u>  Fixer l'étrier de maintien (6) au mur en les mettant de niveau (<math>\pm 1^\circ</math>). Accrocher l'AQUAMAT en se servant des surfaces de fixation (5) et encliqueter l'étrier de fixation (7). Poser avec une pente continue les conduites d'amenée de condensat au-dessus du niveau supérieur de l'AQUAMAT.  Poser la conduite d'écoulement d'eau avec une pente continue et installer si possible un siphon.  La zone d'installation doit être conçue de manière à ce que le condensat <b>non traité</b> ne puisse parvenir dans les égouts publics.</p>	<p><b>INSTALAÇÃO</b>  Aparafusar a torneira de ensaio (1) e os conectores dos tubos flexíveis (2) para afluência e descarga e fixar os tubinhos de ensaio (3). Ter em atenção a folha de montagem inclusa!  <u>Montagem no chão</u>  Utilizar os furos oblongos dos 4 pés de fixação (4). Os parafusos e as buchas necessários acompanham o aparelho. Montar o AQUAMAT na vertical (<math>\pm 1^\circ</math>).  <u>Montagem na parede</u>  Montar os ângulos de suporte (6) na parede, colocando-os na vertical (<math>\pm 1^\circ</math>). Encaixar o AQUAMAT com a superfície de aceitação (5) e engatar o arco de fecho (7). Colocar a tubagem de afluência de condensado acima do ponto mais alto do AQUAMAT, com uma inclinação contínua. Colocar a tubagem de escoamento de água com inclinação contínua e instalar, tanto quanto possível, um sifão. A área de montagem deverá ser concebida de forma a impossibilitar que o condensado <b>não tratado</b> escoe para dentro da rede de esgotos pública.</p>
<p><b>PUESTA EN MARCHA</b>  1. Retirar la tapa y la lámina de los filtros de aerosoles.  2. Llene el AQUAMAT con agua limpia, hasta que salga agua por el desagüe.  3. Esperar 24 horas, se da el caso, se debe llenar más agua.  4. Colocar la tapa y la lámina del filtro de aerosoles</p> <p>AQUAMAT está listo para funcionar</p> <p>En un principio, el agua que sale puede ser un poco oscura (polvo de carbón)</p>	<p><b>MISE EN SERVICE</b>  1. Retirer le couvercle et la cartouche filtrante retenant les aérosols.  2. Remplir l'AQUAMAT avec de l'eau claire jusqu'à ce que de l'eau sorte par l'écoulement.  3. Attendre 24 h, le cas échéant rajouter de l'eau.  4. Remettre en place le couvercle et la cartouche filtrante retenant les aérosols.</p> <p>L'AQUAMAT est prêt à fonctionner.</p> <p>Au début, l'eau s'en écoulant peut être noire (poussière de charbon).</p>	<p><b>COLOCAÇÃO EM FUNCIONAMENTO</b>  1. Retirar a cobertura e a esteira de filtro de aerossol.  2. Encher o AQUAMAT com água fresca, até a água sair para fora do escoamento.  3. Aguardar 24 h e, caso necessário, proceder ao reenchimento.  4. Colocar a cobertura e a esteira de filtro de aerossol.</p> <p>O AQUAMAT está pronto para entrar funcionamento.</p> <p>Ao princípio, a água escoada poderá apresentar uma coloração preta (pó de carvão).</p>

<b>Installation • Instalación</b> <b>Installation • Instalação</b>	<b>english</b>
	<p><b>FILTER CHECK</b></p> <p>The quality of the discharged clean water must be checked every week.</p> <p>For this purpose, a water sample should be taken at the sampling valve on the riser and compared (visual check) with the cloudiness of the reference jar.</p> <p>If the sampled water is as cloudy as the reference liquid, or even cloudier, the filter unit will need to be replaced.</p>
	<p><b>FILTER REPLACEMENT</b></p> <p>Carry out steps ① - ⑤</p> <p>Depending upon operational conditions, there may be up to 3 filter replacements necessary per year.</p> <p>According to the „operator's duty of care“ under the Water Resources Act, the operator must always keep an original replacement filter set in stock.</p> <p>Spent filters must be properly disposed of.</p>
	<p><b>MAINTENANCE</b></p> <p>① Shut off all inlets before maintenance work. Where appropriate, switch off compressor.</p> <p>② Hoses and hose connections must be inspected regularly</p> <p>In the case of dirt accumulation, replace filter and thoroughly clean the unit with water (do not use detergents or rinsing agents). Recommended once a year!</p> <p>Fill fresh water into the AQUAMAT unit.</p> <p>Spent filters must be properly disposed of.</p>

español	français	português
<p><b>REVISIÓN DE LOS FILTROS</b></p> <p>Verificar una vez por semana la calidad del agua depurada que sale.</p> <p>A través del grifo para la toma de muestras ubicado en el canal ascendente, tomar una muestra con el tubo (1) destinado para este fin. Comparar visualmente con la turbiedad de referencia.</p> <p>Si la turbiedad de la muestra es igual o mayor que la de referencia, se deberá cambiar la unidad filtrante.</p>	<p><b>VÉRIFICATION DE L'ETAT DU FILTRE</b></p> <p>Vérifier une fois par semaine la qualité de l'eau traitée évacuée.</p> <p>Prélever par la vanne d'échantillonnage située sur le canal montant un échantillon dans le tube de prélèvement (1) et comparer visuellement la turbidité de l'échantillon avec celle du liquide de référence.</p> <p>Si la turbidité de l'échantillon prélevé est similaire ou plus intense, il faut remplacer l'unité de filtre.</p>	<p><b>CONTROLO DO FILTRO</b></p> <p>Verificar semanalmente a qualidade da água de escoamento pura.</p> <p>Recolher, através da válvula de recolha de amostras instalada no canal ascendente, uma amostra para o tubinho de ensaio (1) e compará-la visualmente com a turvação de referência.</p> <p>Caso a turvação seja igual ou superior à de referência, terá de se substituir a unidade de filtro.</p>
<p><b>CAMBIO DE FILTRO</b></p> <p><b>Efectuar los pasos ① a ⑤</b></p> <p>Dependiendo de las condiciones de operación, se pueden llegar a requerir hasta tres cambios de filtro por año.</p> <p>De acuerdo con la legislación vigente acerca de las obligaciones del usuario, se debe disponer siempre de un filtro de recambio original.</p> <p>Los filtros usados se deben disponer de acuerdo con la legislación ambiental.</p>	<p><b>REPLACEMENT DU FILTRE</b></p> <p>Effectuer les opérations ① - ⑤</p> <p>Selon les conditions d'exploitation, il peut s'avérer nécessaire d'effectuer jusqu'à 3 remplacements de filtre par an.</p> <p>Les filtres usagés doivent être éliminés selon les prescriptions légales en vigueur.</p>	<p><b>SUBSTITUIÇÃO DO FILTRO</b></p> <p><b>Execução dos passos ① a ⑤</b></p> <p>Consoante as condições de serviço, poderá ser necessário substituir o filtro até 3 vezes por ano.</p> <p>Segundo os deveres de diligência do operador previstos pela lei, deverá guardar-se sempre um jogo original de filtros de substituição em stock.</p> <p>Proceder à eliminação dos filtros usados, de acordo com a regulamentação em vigor.</p>
<p><b>MANTENIMIENTO</b></p> <p>① Al efectuar trabajos de mantenimiento se debe cerrar la entrada de condensado. Si es necesario, se debe apagar el compresor.</p> <p>② Las tuberías flexibles y sus acoples y boquillas se deben revisar periódicamente.</p> <p>Si el equipo se ensucia, habrá que lavarlo muy bien con agua (nunca use detergente!) y cambiar el filtro. Se recomienda una vez al año.</p> <p>Llenar el AQUAMAT con agua limpia.</p> <p>Los filtros usados se deben disponer de acuerdo con la legislación ambiental.</p>	<p><b>MAINTENANCE</b></p> <p>① Pour les opérations de maintenance, fermer les conduites d'amenée. Le cas échéant, arrêter le compresseur.</p> <p>② Vérifier régulièrement les flexibles et les raccords de flexibles.</p> <p>En cas d'encrassement de l'appareil, remplacer le filtre et rincer soigneusement l'appareil avec de l'eau (ne pas utiliser de produit de rinçage). Périodicité recommandée : annuelle !</p> <p>Remplir l'AQUAMAT avec de l'eau claire.</p> <p>Les filtres usagés doivent être éliminés selon les prescriptions légales en vigueur.</p>	<p><b>MANUTENÇÃO</b></p> <p>① Antes de executar operações de manutenção, fechar os condutos de alimentação, desligando, caso necessário, o compressor.</p> <p>② Controlar regularmente os tubos flexíveis e as uniões dos tubos flexíveis.</p> <p>No caso de sujidade do aparelho, substituir o filtro e limpar o aparelho a fundo, com água. (Não utilizar detergente!) Recomendação: anualmentel</p> <p>Encher o AQUAMAT com água fresca.</p> <p>Proceder à eliminação dos filtros usados, de acordo com a regulamentação em vigor.</p>

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<p><b>Notes on AQUAMAT functions and service life of filters</b></p> <p>The AQUAMAT oil-water separator is not suitable for separating stable emulsions. If emulsifiable oils are used, the function of the device can no longer be guaranteed.</p> <p>The maximum capacity of the AQUAMAT (installed compressor performance) depends on the type of compressor and on the grade of lubricating oil employed (see performance data page 2). If the manufacturer's recommendations are not followed, this can reduce the service life of the filters and affect the separating efficiency of the device. The better the demulsifying properties of the lube oil employed, the longer the service life of the filters.</p> <p>Poor compressor ventilation, high final compression temperatures, long oil-change intervals, time-controlled condensate drains, etc., are all factors that can shorten the service life of your filters.</p> <p>The values listed in the performance table should be understood as guide values only in view of the different lube compositions, the variety of available lube grades and compressor types, and the different operating conditions.</p> <p>Optimum condensate discharge is provided by our electrically level-controlled condensate drain ECO-DRAIN 21.</p>	<p><b>Indicaciones sobre el funcionamiento del AQUAMAT y la duración del filtro</b></p> <p>El AQUAMAT no es apropiado para la separación de emulsiones estables. Si se utilizan aceites emulsionables, no se garantizará el buen funcionamiento del separador de agua y aceite.</p> <p>La carga máxima del AQUAMAT (capacidad instalada del compresor) depende del tipo de compresor y de la clase de aceite utilizado (ver los datos de capacidad en la página 2). Si no se observan las recomendaciones, la duración del filtro puede reducirse considerablemente, o la calidad de la separación no será suficiente. Cuanto mejores sean las características de desemulsibilidad del aceite usado, mayor será la vida útil del filtro.</p> <p>Un mala ventilación del compresor, temperaturas elevadas de compresión, períodos largos entre cambios de aceite, elementos de drenaje temporizados para el condensado, pueden acortar la vida del filtro.</p> <p>Debido a las diferencias en la composición de los aceites, a la gran variedad de los mismos y de los tipos de compresores, al igual que a las diversas condiciones de operación, los valores indicados en la tabla de capacidades se deben comprender sólo como valores de referencia.</p> <p>Para una descarga óptima del condensado, se debe emplear el purgador de condensado, con control electrónico de nivel, ECO-DRAIN 21.</p>	<p><b>Indications concernant le fonctionnement de l'AQUAMAT et la durée de vie du filtre.</b></p> <p>L'AQUAMAT n'est pas conçu pour la séparation d'émulsions stables. Si des huiles émulsifiables sont utilisées, le fonctionnement du séparateur huile-eau n'est pas garanti.</p> <p>La charge maximale de l'AQUAMAT (puissance installée du compresseur) dépend du type de compresseur et du type d'huile de lubrification utilisé (voir caractéristiques Page 2). Si ces recommandations ne sont pas respectées, la durée de vie du filtre peut s'en trouver considérablement réduite ou la séparation huile-eau peut être insuffisante. Plus le comportement à la désémulsification sera bon, et d'autant plus la durée de vie du filtre sera prolongée.</p> <p>Une mauvaise prise d'air du compresseur, des températures finales de compression élevées, de longs intervalles de vidange d'huile, des purgeurs automatiques temporisés, etc. peuvent réduire la durée de vie du filtre.</p> <p>En raison des différentes compositions des huiles, de la diversité des qualités d'huile disponibles et des types de compresseurs ainsi que des différentes conditions d'exploitation, les valeurs mentionnées dans le tableau de la puissance installée des compresseurs ne sont à considérer que comme des valeurs indicatives.</p> <p>Pour une purge automatique optimale du condensat, utiliser le ECO-DRAIN 21 à régulation de niveau électronique.</p>	<p><b>Indicações relativas à função do AQUAMAT e à vida útil do filtro.</b></p> <p>O AQUAMAT não foi concebido para a separação de emulsões estáveis. Se forem utilizados óleos emulsionáveis, não estará garantida a função do separador de óleo e água.</p> <p>O rendimento máximo do AQUAMAT (capacidade do compressor instalada) depende do tipo de compressor e do tipo de óleo lubrificante utilizado (ver as características na página 2). Se não se respeitarem as recomendações, poderá verificar-se uma considerável redução da vida útil do filtro ou um resultado de separação insuficiente. Quanto melhor for o comportamento desemulsificante do óleo de lubrificação utilizado, maior será a vida útil do filtro.</p> <p>Uma ventilação deficiente do compressor, elevadas temperaturas finais de compressão, longos intervalos de substituição do óleo, drenos de condensado comandados por temporizador, etc., poderão reduzir a vida útil do filtro.</p> <p>Devido às diferentes composições dos óleos, à diversidade dos tipos de óleo e de compressores disponíveis, bem como às variáveis condições de serviço, os valores indicados na tabela de capacidades apenas deverão ser considerados como valores aproximativos.</p> <p>Para uma drenagem ideal do condensado, deverá utilizar-se o aparelho de drenagem ECO-DRAIN 21, com regulação electrónica de nível.</p>



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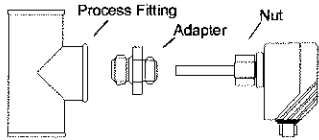
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Tel: (540) 898-5500 • Fax: (540) 898-5520  
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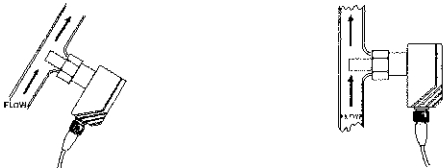


## Mounting

1. Screw adapter (supplied separately E40096 - E40107) into the process fitting.
  2. Place the unit on the adapter. While keeping the unit aligned, tighten the nut.
- Maximum torque rating of nut is 50 N·m (443 in-lbs).  
Note: At least 12mm of the probe tip should be exposed to the flow medium.



Mount the flow switch so the tip remains immersed in the medium at a point where flow is non-turbulent. It is preferable to install the flow switch at a point of upward liquid

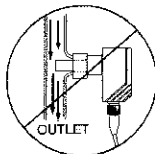


flow to insure total immersion. If installed in a horizontal pipe, mounting from the bottom or side is recommended.

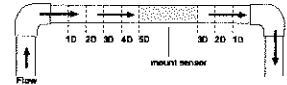


ed to maintain tip immersion. Avoid locations where sediment may accumulate.

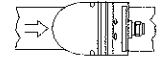
If in a vertical gravity flow, the flow switch must be distant enough from an open outlet that air cavitation does not extend to the sensor and cause a false flow signal. A constriction at the outlet avoids the problem.



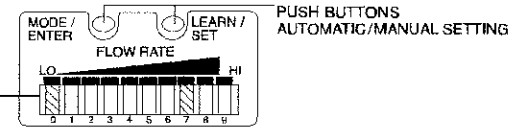
To avoid turbulence the flow switch should be positioned at least five pipe diameters downstream and three pipe diameters upstream of any elbow-bends or valves.



For high temperature gradients, orient the unit in reference to the direction of flow as shown.



## Controls and Visual Indication



Green LEDs indicate flow in 10% increments within the display range (Low... High)

1. LED 0 flashes: flow is lower than display range
2. LED 0 to 9 are lit: flow has reached the high value of the display range
3. LED 0 to 8 are lit, LED 9 flashes: flow is considerably higher (2 LEDs) than the display range.

Yellow and red LEDs indicate output status

1. Yellow LED indicates that the output is switched
2. Red LED indicates that the output is not switched
3. LED 0 to 8 are lit, LED 9 flashes: the switch point is displayed within 10%. To view the switch point within 1%, press the MODE/ENTER button once.

A short circuit is indicated when the display alternately switches between all red LEDs and the flow indication.

## Locking/Unlocking

This unit may be locked to prevent unwanted adjustment of the set parameters. To lock, press both push buttons for 10 seconds. The LEDs briefly extinguish to acknowledge locking. Reverse the procedure to unlock the unit.


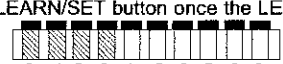
## SI Adjustment

The majority of water based applications may be set using the High Flow Automatic Adjustment only. Difficult mediums to sense may require that the Low Flow Automatic Adjustment also be set. Manual set-up allows for adjustment of the switch-point. Additionally, all parameters set automatically may be set manually.

### Automatic Adjustment

#### High Flow Automatic Adjustment

This adjustment calibrates the sensor so that all LEDs are lit when the high flow velocity is reached. The switch point is factory preset to LED 7 which represents 70% of the displayed flow range.


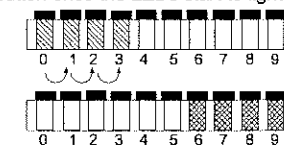
1. Set the system to the high flow velocity and keep it constant.
2. Press the LEARN/SET button\* and hold. Green LEDs 0 and 9 flash.  

3. After 5 seconds, the green LEDs begin to light from left to right. Release the LEARN/SET button once the LEDs start to light.  

4. Once all LEDs have lit, the unit stores the current flow velocity as the high flow. The unit now passes into the operating mode.  
\* For remote programming, positive voltage is applied to the programming wire (pin 2) for 6 to 8 seconds.

For all Adjustments:

1. If no button is pressed within 20 seconds during adjustment, the unit will return to operating mode with the parameters unchanged.
2. If the adjustment was not successful, all the red LEDs flash. The unit returns to the operating mode with the parameters unchanged.

#### Low Flow Automatic Adjustment (Optional)

This adjustment calibrates the sensor so that LED 0 corresponds to the low flow velocity. This is useful for applications (typically oil) where LED 0 is flashing due to the low flow velocity being below the displayed range. Note: This adjustment may only be done after the high flow automatic adjustment has been completed.

1. Set the system to the low flow velocity and keep it constant.
2. Press the LEARN/SET button\* and hold. Green LEDs 0 and 9 flash.  

3. After 5 seconds, the green LEDs begin to light from left to right. Continue to hold the button a further 5 seconds until all LEDs have lit, extinguished and begun to light from right to left. Release the LEARN/SET button once the LEDs start to light from right to left.  

4. The current flow velocity is stored as the low flow velocity.  
\*For remote programming, positive voltage is applied to the programming wire (pin 2) for 11 to 15 seconds.

ifm efector inc.



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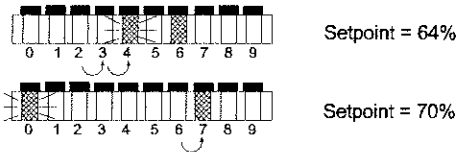
Manual Adjustments

Manual Switch Point Adjustment

The switch point is factory preset to LED 7. (70% of displayed flow range). It can be manually adjusted between 5% and 94% of the displayed flow range.

1 Press the MODE/ENTER button once to enter the programming mode.

2 Press the LEARN/SET button and hold. After 5 seconds, the flashing LED begins to move from left to right. The switch point may be increased continuously by keeping the button pressed or incremented by pressing and releasing the button repeatedly. Flashing LEDs increment in 1% steps and steady LEDs increment in 10% steps. When the flashing LED reaches the right side of the display, it jumps to the left side of the display and the steady LED increments one position.



3 Once the desired set point has been reached, press the MODE/ENTER button briefly.

Manual Adjustment- High Flow (Monitoring Excess Flow)

When the flow rate is considerably higher (2 LEDs) than the display range, LED 9 flashes. This adjustment sets the high flow rate to either LED 5, 6, 7, 8 or 9 so it is visible on the display range.

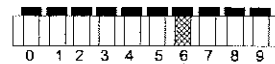
1 Set the system to the high flow velocity and keep it constant.

2 Press the MODE/ENTER button twice (LED 9 flashes).

3 Press and hold the LEARN/SET button. After 5 seconds, the green LEDs begin to light from left to right. Release the button.



4 Press and hold the LEARN/SET button repeatedly to select LED 9 through LED 5. This determines where the high end of the range is displayed.



5 Press the MODE/ENTER button once to store the current flow velocity as high flow.

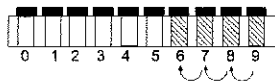
Manual Adjustment- Low Flow

This adjustment calibrates the low end of the sensor display so that LED 0 corresponds to the low flow velocity.

1 Set the system to the low flow velocity and keep it constant.

2 Press the MODE/ENTER button three times (LED 0 flashes).

3 Press and hold the LEARN/SET button. After 5 seconds, the green LEDs begin to light from right to left. Release the button once they begin to move. After a further 5 seconds, LED 0 lights.



4 Press the MODE/ENTER button once to store the current flow velocity as low flow. The unit now passes into the operating mode.

Manual Adjustment- High Flow (Monitoring Decreased Flow)

When the full display range is not used, this adjustment displays the high end of the flow range on LED 9.

1 Set the system to the high flow velocity and keep it constant.

2 Press the MODE/ENTER button twice (LED 9 flashes).

3 Press and hold the LEARN/SET button. After 5 seconds, the green LEDs begin to light from left to right. Release the button. After a further 5 seconds, LED 9 lights.



4 Press the MODE/ENTER button once to store the current flow velocity as high flow.



# SQUARE D

## Instruction Bulletin

Bulletin No. 65013-101-35C

August, 1992

Raleigh, NC, U.S.A.

### Industrial Pressure Switches

Type/Tipo/Typ

Class/Classe/Klasse 9012

Adjustable Differential: GNO, GNG, GPO, GPG, GQO, GQG

Non-adjustable Differential: GRO, GRG, GSO, GSG, GTO, GTG

Series B

#### USE LIMITATIONS

##### Pressure Ratings

### NOTE

If the pressure actuators are exposed to system or surge pressures greater than the maximum pressure rating printed on the device nameplate, leakage from the actuator and/or a change of operating set points may result.

Maximum Allowable Pressure is the maximum pressure, including surges, to which an actuator of the pressure switch may be exposed for brief or extended periods of time without altering the performance characteristics of the switch. For types GNO, GNG, GRO, GRG periodic retorquing of actuator mounting screws to 8-10 in-lb is recommended.

### NOTE

Pressure on a switch during use should be within the stated range of the switch. For maximum mechanical life, maximum system pressure applied on a continual basis, including surges, should not exceed maximum stated range. The mechanical life of any diaphragm actuated switch will be decreased if pressure exceeds the stated maximum range value. The more frequent the application and the greater the value of excessive pressure, the more diaphragm life will be decreased.

#### Temperature Ratings

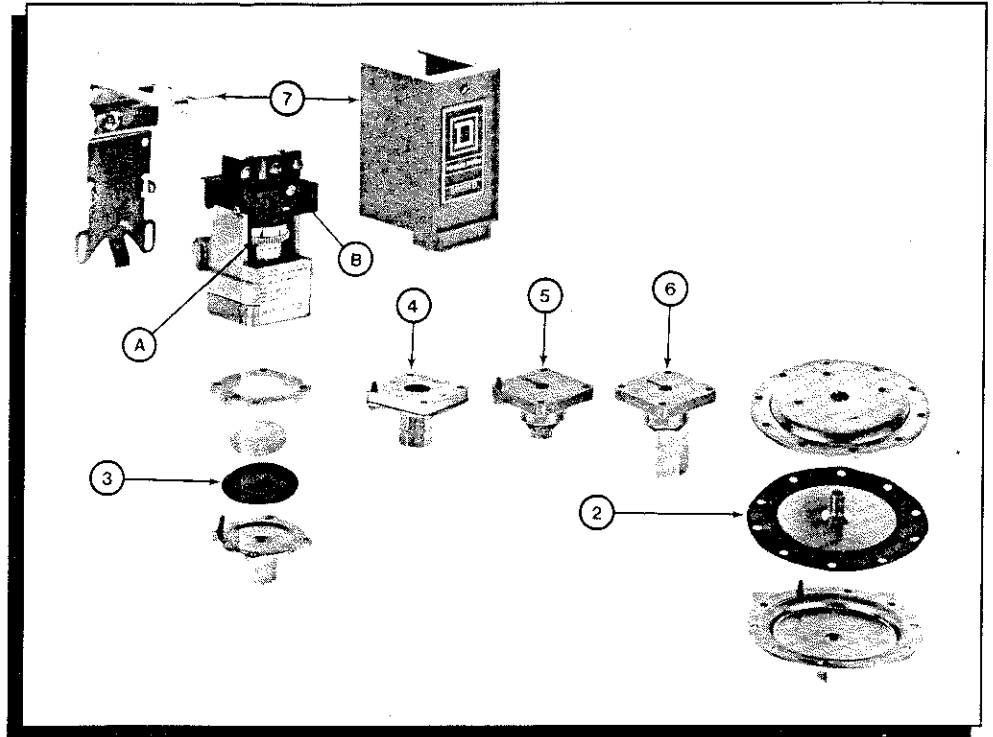
These devices are continuous use rated as below, provided that the media fluid does not freeze and the conditions of application do not give rise to the formation of frost or ice inside the pressure switch.

**Table 1**

	Ambient		Pressure Media	
	C	F	C	F
Minimum	-25	-10	-25	-10
Maximum	+85	+185	+120	+250

#### Use on Steam

Do not use directly on steam in excess of 15 psig (1 bar). Indirect use may be accomplished by attaching a minimum of 10 feet of capillary tubing between the steam source and the actuator. Class 9049 A7 is recommended. This permits use on steam up to 250 psig (17 bars) subject to maximum allowable pressure and temperature ratings of the switch.



## **⚠ WARNING**

### **HAZARDOUS VOLTAGE CAN CAUSE SEVERE INJURY OR DEATH**

To reduce the hazard of electrical shock always disconnect power from the circuit before installing the pressure switch or exposing the electrical terminals for maintenance.

Per ridurre il pericolo di infortuni da shock elettrico, prima di installare l'interruttore a pressione o prima di accedere ai terminali per manutenzione togliere sempre tensione dal circuito.

Um die Gefahr von Stromschlägen zu mindern, vor Einbau des Druckwächters oder Öffnen des Klemmendeckels zu Wartungszwecken die Versorgungsspannung abschalten.

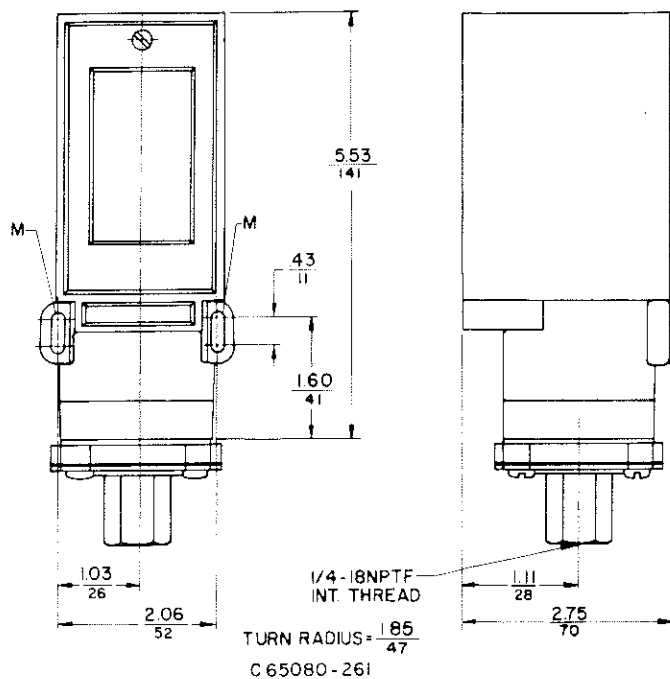
Avant toute intervention sur ce matériel, couper l'alimentation électrique de l'appareil afin d'éviter tout risque d'électrocution.

**ANTES de instalar el interruptor a presión o ANTES de exponer las terminales eléctricas para dar mantenimiento, DESCONECTE LA ENERGÍA y reduzca el peligro de una sobrecarga eléctrica.**

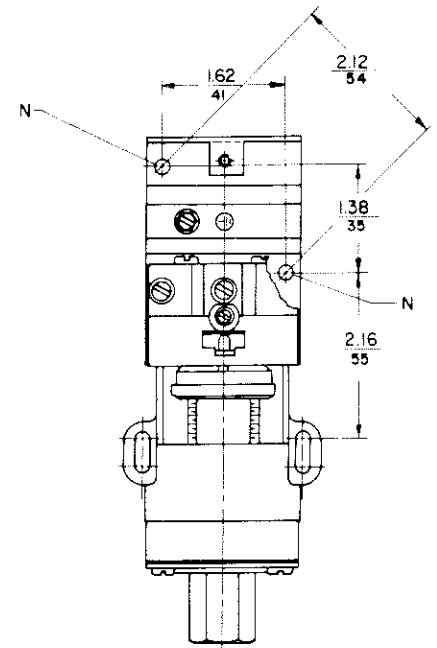
## **MOUNTING**

It is not recommended to mount the switch by its pressure connection only. The holes and slots identified as "M" or "N" are for surface mounting the switch. When connecting the switch to the pressure system piping, turn the switch onto the pipe using a wrench on the hexagonal body of the actuator. Do not apply leverage through the switch housing.

For type G\*O, G\*G the standard pressure connection is 1/4-18 NPTF, the dryseal thread should seal against a new external 1/4 NPT thread without the use of sealing tape or compounds. Alternate pressure connections include: Form Z for GNO, GNG, GRO, GRG only which is 1/4-18 NPT external thread, Form Z16 for GNO, GNG, GRO, GRG only is 1/2-14 NPT external and 1/4-18 NPTF internal thread. Form Z18 for all G\*O, G\*G is 7/16-20 UNF-2A.



Dual Dimensions: **INCHES**  
Millimeters



NOTE:  
MOUNTING HOLES "N" AND  
MOUNTING SLOTS "M" ARE  
SIZED FOR #10 MOUNTING  
SCREWS.

**NOTE**

Do not plug the 1/4 inch diameter holes on types GPO, GPG, GSO, GSG.

## WIRING

Class 9012 Type G pressure switches are suitable for #12, 14, 16 AWG or 1.0-2.5mm solid or stranded copper wire. Tighten terminal screws to 6-9 in-lbf (0.7-1 Nm). They are not suitable for use with aluminum wire. For enclosed types G\*G grounding (earthing) provision is located above the snap switch on the enclosure backplate and is marked ⊕.

The single pole, double throw snap switch contains single break contacts offering one normally open circuit and one normally closed circuit. These circuits are electrically separate but are not for use on circuits of opposite polarity. For proper wiring, refer to the wiring diagram on the snap switch not the terminal identification on the snap switch.

## SET POINT ADJUSTMENTS

The pressure switch is set at the factory to the operating point(s) marked on the outside of the mechanism housing. It is good practice to cycle the switch to determine actual operating points before proceeding with readjustment. Refer to the illustration on page 2 for location of adjustment.

### Range Adjustment

**For non-adjustable differential types GRO, GRG, GSO, GSG, GTO, GTG**  
The range adjustment may be used to set either set point and completes the adjustment sequence. To increase the operating points; with the switch mounted as shown in the illustration on page 2 and facing the switch, place a flat bladed screwdriver in the slots of range adjustment nut (A) and rotate from right to left.

**For adjustable differential types GNO, GNG, GPO, GPG, GQO, GQG**  
The range adjustment is used to set the decreasing set point and must be made first. This adjustment is made in the same manner as for non-adjustable differential types.

**Differential Adjustment**

**For types GNO, GNG, GPO, GPG, GQO, GQG**

An independent adjustment of the set point on increasing pressure is available. This adjustment must be performed after the decreasing pressure set point has been adjusted. Turn adjusting screw (B) clockwise to raise the set point on increasing pressure. The decreasing pressure set point is not affected by this adjustment.

**REPLACEMENT PARTS**

Note: When ordering any of these replacement parts, Class, Type, and Form of switch on which the replacement is to be used must be specified with the order.

**Table 2**

Item	Description	Class	Order Type	Form	Used On
2	Diaphragm Assembly	9998	PC 265		GNO, GNG, GRO, GRG-1
3	Diaphragm Assembly	9998	PC 266		GNO, GNG, GRO, GRG-3
		9998	PC 267		GNO, GNG, GRO, GRG-4
4	Diaphragm Assembly	9998	PC 268		GNO, GNG, GRO, GRG-5
		9998	PC 269		GNO, GNG, GRO, GRG-6
5	Diaphragm Actuator Assy	9998	PC 177		GPO, GPG, GSO, GSG-1
		9998	PC 178		GPO, GPG, GSO, GSG-2
6	Piston Actuator Assy	9998	PC 270		GQO, GQG, GTO, GTG-1
		9998	PC 271		GQO, GQG, GTO, GTG-2
		9998	PC 272		GQO, GQG, GTO, GTG-3
		9998	PC 273		GQO, GQG, GTO, GTG-4
7	Enclosure Assembly	9049	UE-1		Converts Type G*O to G*G

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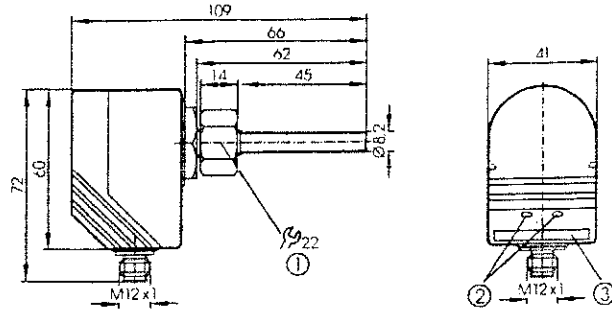


Flow monitors

**SI1000**

SID10ADBFPKG/US

Compact type for adapter  
Quick disconnect



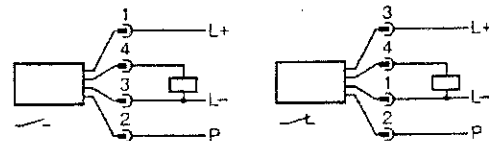
1: internal thread M18x1.5, 2: setting push buttons, 3: LED display



<b>Application</b>	
<b>Electrical design</b>	
<b>Output</b>	
Operating voltage	[V]
Current rating	[mA]
Short-circuit protection	
Reverse polarity protection / overload protection	
Voltage drop	[V]
Current consumption	[mA]
Max. temperature gradient of medium	[K/min]
Pressure rating	[bar]
<b>Liquids</b>	
Medium temperature	[°C]
Setting range	[cm/s]
Greatest sensitivity	[cm/s]
<b>Gases</b>	
Medium temperature	[°C]
Setting range	[cm/s]
Greatest sensitivity	[cm/s]
<b>Adjustment of the switch point</b>	
Power-on delay time	[s]
Response time	[s]
Function display	LED
Operating temperature	[°C]
Protection	
Housing material	
Material sensor surface	
Connection	

	<b>liquids and gases</b>
	<b>DC PNP</b>
	<b>normally open / closed programmable</b>
	20...36 DC
	400
	•
	•
	< 2,5
	< 80
	300
	300
	-25...+80
	3...300
	3...60
	-25...+80
	200...3000
	200...800
	<b>push buttons</b>
	15 *)
	1...10
	10 LEDs, three-colour
	-25...+80
	IP 67
	PBT-GF 20
	stainless steel (316S12); O-ring: FPM 8x1.5 gr 80° Shore A
	M12 connector

wiring



Remarks

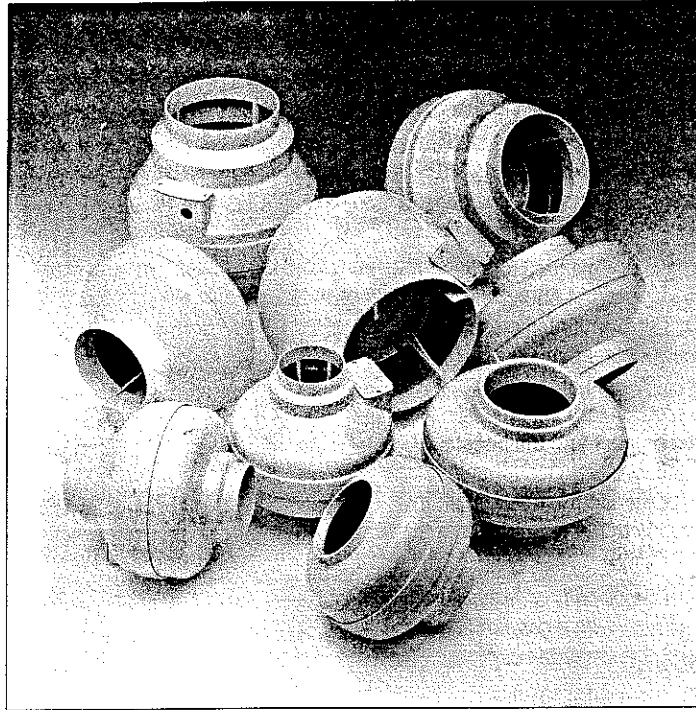
\*) optically indicated





# Fantech

*Your Ventilation Solutions Company*



**INSTALLATION AND MAINTENANCE  
INSTRUCTIONS FOR MODEL FR**

**INSTRUCTIONS POUR L'INSTALLATION  
ET L'ENTRETIEN DU MODÈLE FR**

**INSTRUCCIONES DE INSTALACION Y  
MANTENIMIENTO DEL MODELO FR**

**IMPORTANT: Read These Instructions Completely Before Installing Fan And Save These Instructions For Future Reference.**

**Items Included:** One FR fan, one mounting bracket, mounting hardware

**Regular Kits Also Include:** Grill with mounting collar/backdraft damper combination, duct mounting clamps

**Deluxe Kits Also Include:** 2 Grills with mounting collar/backdraft damper combination, "we" transition, duct mounting clamps, balancing damper

**Additional Items Needed:** Duct work, duct tape or mounting clamps, duct termination device (roof cap, louvered shutter, etc.)

**Tools Required:** Electric drill, drill bits, regular screwdriver, phillips screwdriver, razor knife, keyhole saw (optional)

## Installing Mounting Bracket & Fan

1. When selecting fan mounting location, the following criteria should be considered: a) *mounting to minimize noise generated by fan operation;* b) *type of application;* and c) *service accessibility*

a) Mounting the fan as far as possible from the exhaust point will minimize fan operating noise from being transmitted back through the duct work. If the fan is to be used as a booster for moving the air between two rooms, a central point along the duct may be optimal. Insulated flexible type duct work (recommended for all bathroom exhaust applications) will result in much quieter operation. Fantech recommends minimum 8' of insulated flexible duct between any exhaust grill and fan for low noise level.

b) For dryer boosting applications, the recommended location of the booster fan is a minimum of 15 linear (not equivalent) feet of duct from the dryer outlet. If the fan is mounted closer than the recommended 15 feet, it may develop enough pressure to pull wet lint into the fan impeller resulting in excessive lint loading in the fan. **EXCEPTION:** If a secondary lint filter is installed between the dryer and the booster fan, the booster fan may be mounted within the minimum distance otherwise recommended. The best location for the fan to be mounted, in any application, is as close as possible to the termination of the duct work.

**IMPORTANT NOTICE:** To prevent the possibility of fire hazards when using a booster fan in conjunction with a gas fired dryer, booster fan air flow must not exceed the dryer fan capacity.

c) Fan location should allow sufficient access for service.

2. Using the wood screws provided, attach the mounting bracket (NB or MB) to a support beam at the selected location. Fan mounting can be at any point along the duct and in any angle, however, vertical mounting is recommended to reduce condensation buildup in the fan. If a horizontal installation is necessary and condensation buildup may pose a problem, either wrap insulation around the fan or drill a 1/4" hole in the bottom of the housing (along with an NPT insert and drain tubing) allowing condensation to drain.
3. Attach fan to the mounting bracket with the sheet metal screws provided. Wiring box should be positioned for easy access. Bracket is provided with rubber vibration isolation grommets to prevent the transmission of sound through the structure. Be careful not to overtighten. Also, care should be taken not to strip the plastic housing. Screws are self tapping and do not require pilot holes. However, pilot holes (no larger than 3/32") are recommended.
4. Connect duct work to inlet and outlet of fan using CB clamps or duct tape. When using insulated duct, it is recommended that the inner vinyl core be clamped or taped to the inlet and outlet and that the vapor barrier surrounding the insulation be duct taped to the fan housing.

**NOTE:** Steps 2 & 3 may be reversed.

Mount Bracket (NB).



Mount Fan.



Mount Bracket (MB).



Mount Fan.



## Installing DG Supply/Exhaust Grill

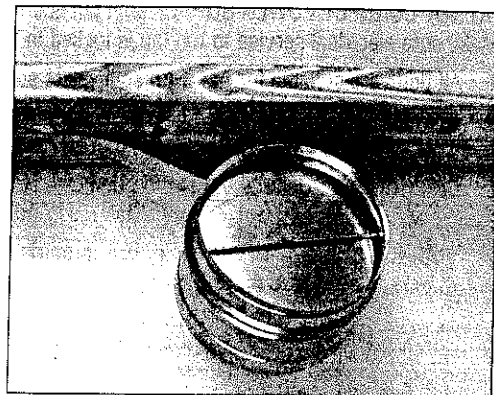
**PLEASE NOTE:** When items are purchased as an exhaust kit, the grill mounting collar may include a collar/backdraft damper combination. If so, ignore steps 5 and 6: installation for the combination is the same as installation for the collar alone.

If a Vent/Light combination kit is purchased, the VLC vent/lights are supplied with a separate installation instruction replacing steps 1 through 4.

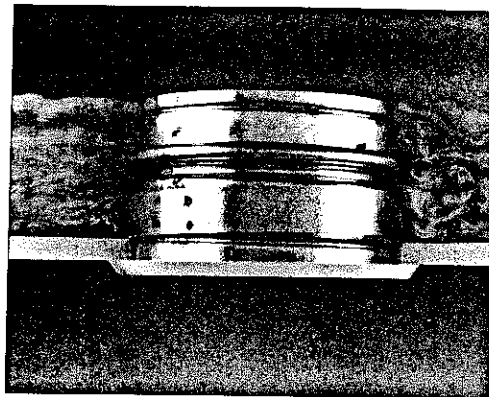
1. Select the grill mounting point within the area to be ventilated. To ease installation, locations of framing beams within the walls or joists supporting the ceiling should be considered. Collar/damper is provided with a perforated hanging strap for attachment directly to a beam or joist. Allow sufficient space between the collar/damper and the beam to attach the duct work. If the location of the grill does not allow direct attachment, a cross-member mounted to the framing should be used.
2. Place the mounting collar/damper in the selected location and trace a circle onto the surface. From the interior side of the room, cut through the surface. Please note: In order to assure a smoother finish when mounting through a sheetrock or tile type ceiling, it is recommended that a razor knife be used to make the cut.
3. From within the attic or crawl space, place the mounting collar into the hole until the edge of the collar is flush with the interior wall or ceiling surface. Attach collar to the support beam with the 2" wood screws provided. Attach duct work. Secure using CB or FC clamps and/or duct tape. When installing the damper into rigid type ducting, FC clamps or duct tape should be used.

**PLEASE NOTE:** When attaching flex duct to the collar/damper combination and an immediate elbow is necessary, be certain that the elbow is installed with a "soft" bend to allow damper blades to operate properly.

4. Snap the grill into the mounting collar/damper. Grill should be pushed tightly into place for an airtight fit. If there is a gap between the collar and the ceiling it should be caulked to avoid air leakage. For subsequent cleaning the grill can be pulled out and cleaned.



Mount Collar.



Side view grill and collar.

## Installing DG Supply/Exhaust Grill

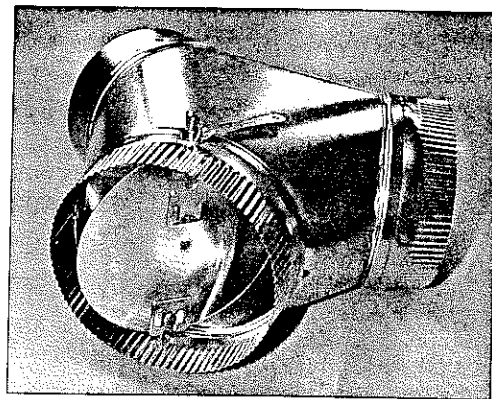
When installing a DLX kit, a balancing damper has been included to allow for adjustment of the system. The damper may be used where the grills will be connected using branches of unequal length or where the flow will need to be balanced for any reason.

### To Install The Damper:

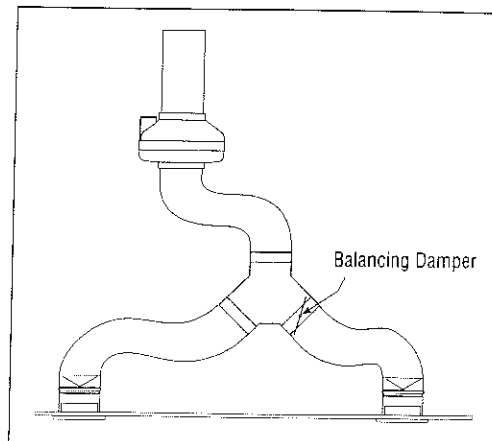
1. First determine the branch with the least restriction (generally the shortest duct or fewest bends). The damper should be installed in the leg of the wye which connects to this branch.
2. Drill two opposing  $\frac{5}{16}$ " holes approximately  $1\frac{1}{4}$ " to  $1\frac{1}{2}$ " in from the edge.
3. Insert damper by first placing fix shaft into bottom hole, then compressing spring and inserting the threaded shaft into the other hole.
4. Attach handle using wing nut.
5. Adjust damper to balance air flow and tighten wing nut to secure.

### Flexible Duct Installation Hints

Flexible insulated duct is strongly recommended where allowed by local code for bathroom exhaust applications, where ducting passes through unconditioned space or where noise is a factor. Failure to use insulation could result in excessive condensation buildup within the duct, and undesirable sound levels within the room. For the quietest possible installations, Fantech recommends a minimum of 8' of insulated flexduct between any exhaust grill and fan. When using flexible type duct work, duct should be stretched as tight and straight as possible. Failure to do so could result in dramatic loss of system performance. Flexible duct should be connected to the fan with CB type clamps or duct tape. All connections should be as airtight as possible to maximize system performance.



Wye with balancing damper.



FR Series Fan and balancing damper.

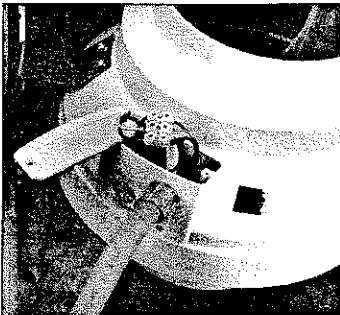
## Warning

DO NOT CONNECT POWER SUPPLY until fan is completely installed. Make sure electrical service to the fan is locked in "OFF" position

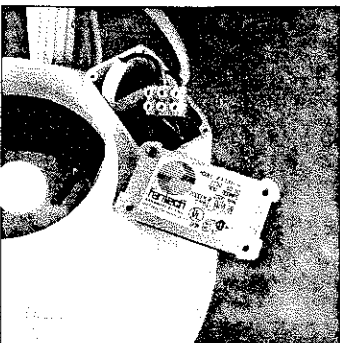
All units are suitable for use with solid-state speed control.

2. This unit has rotating parts and safety precautions should be exercised during installation, operation and maintenance.
3. **CAUTION:** "For General Ventilation Use Only. Do Not Use To Exhaust Hazardous Or Explosive Materials And Vapors."
4. **WARNING: To reduce the risk of fire, electrical shock, or injury to persons-observe the following:**
  - a. Use this unit only in the manner intended by the manufacturer. If you have questions, contact the factory.
  - b. Before servicing or cleaning, switch power off at service panel and lock service panel to prevent fan from being switched on accidentally.
  - c. Installation work and electrical wiring must be done by qualified person(s) in accordance with all applicable codes and standards, including fire-rated construction.
  - d. The combustion airflow needed for safe operation of fuel burning equipment may be affected by this unit's operation. Follow the heating equipment manufacturer's guidelines and safety standards such as those published by the National Fire Protection Association (NFPA), the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) and the local code authorities.
  - e. When cutting or drilling into wall or ceiling, do not damage electrical wires or other hidden utilities.
  - f. Exhaust fans must always be vented to the outdoors.
  - g. Install fan at least five feet above the floor.
  - h. Acceptable for use over a bathtub or shower.
  - i. NEVER place a switch where it can be reached from a tub or shower.
5. **WARNING!** Check voltage at the fan to see if it corresponds to the motor nameplate.

GUARDS MUST BE INSTALLED WHEN FAN IS WITHIN REACH OF PERSONNEL OR WITHIN SEVEN (7) FEET OF WORKING LEVEL OR WHEN DEEMED ADVISABLE FOR SAFETY.



Liquid tight wiring – Top View  
(For outside applications).



Romex wiring – Top View

## Electrical Connection

1. Remove the screws securing the terminal box cover plate located on the side of the fan. All fan motor connections are pre-wired to an electrical terminal strip. A 3/8" romex type cable restraint connector will be needed to secure the wiring through the knockout provided on the side of the terminal box.
2. Bring incoming electrical service through the romex connector and the fan knockout. Be sure to place the connector nut over the wiring coming into the terminal box. There are two open ports on the terminal strip. Using a small regular screwdriver, tighten the neutral (white) wire of the incoming supply under the open terminal strip port labelled "N". Tighten the line (black) wire of the incoming supply under the open terminal strip port labelled "L". Since the fan motor is isolated within a plastic housing, grounding is not necessary.
3. Secure the romex connector. Secure the incoming supply with the romex connector. Replace the fan terminal box cover. All fan motor and capacitor connections have been pre-wired from the factory. No additional fan wiring is necessary.

## Troubleshooting

If fan fails to operate, please check the following:

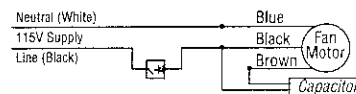
1. Consult wiring diagrams (see below) to assure proper connection.
2. Check motor lead wiring, capacitor leads and incoming supply leads to assure definite contact.
3. If possible, use a meter to test for continuity across the fan motor leads. In order to do this, the capacitor must be disconnected (do not test the capacitor - it will not meter continuity). If motor leads show continuity, consult factory for a replacement capacitor.

## Maintenance Instructions

1. Since fan bearings are sealed and provided with an internal lubricating material, no additional lubrication is necessary.
2. When using in a dryer boosting application, **DISCONNECT POWER SUPPLY** and check impeller periodically for any lint buildup. No other maintenance is necessary.

## Wiring Diagrams

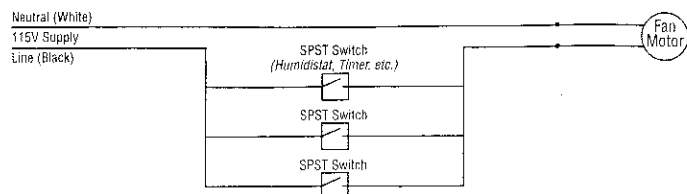
### All Models With Motor Speed Controller



### Without Motor Speed Controller



### Multiple Location Switching Wiring Diagram



## Five (5) Year Warranty

---

*This warranty supersedes all prior warranties*

### **For factory return you must:**

- 1) Have a return materials authorization (RMA) number. This number may be obtained by calling FANTECH, INC. at 1-800-747-1762. Please have bill of sale available.
- 2) The RMA number must be clearly displayed on the outside of the carton, or delivery will be refused.
- 3) All product being returned must be shipped prepaid and be accompanied with a copy of the bill of sale.
- 4) Product will be replaced/repaired and shipped back to buyer. No credits will be issued.

### **During the First Thirty (30) Days:**

FANTECH, INC. will replace any product which has a factory defect in workmanship or material. Product may be returned to either the point of purchase or the fantech factory, together with bill of sale, for an immediate replacement.

### **During The First Three (3) Years (excluding the above 30 day period):**

FANTECH, INC. will replace any product which has a factory defect in workmanship or material. Product must be returned to the FANTECH factory, together with bill of sale, and identified with an RMA number.

### **During Years Four (4) And Five (5):**

FANTECH, INC. will repair or replace any product which has a factory

defect in workmanship or material. Product must be returned to the FANTECH factory, together with a bill of sale, and identified with an RMA number.

### **The following warranties do not apply:**

Damages from shipping, either concealed or visible. Claim must be filed with the carrier.

Damages resulting from improper wiring or installation.

Damages caused by acts of nature, or resulting from improper consumer procedures such as:

Improper maintenance,

Misuse, abuse, abnormal use, or accident, or

Incorrect electrical voltage or current.

Removal or alteration made on the FANTECH label control number or date of manufacture.

Any other warranty, expressed, written or implied, and to any consequential or incidental damages, loss of property, revenues, or profit, or costs of removal, installation or reinstallation, for any breach of warranty.

### **Warranty validation:**

The end user must keep a copy of the bill of sale to verify purchase date.



# Fantech

*Your Ventilation Solutions Company*

### **United States**

1712 Northgate Boulevard • Sarasota, Florida 34234

Phone: (800) 747-1762 • Fax: (800) 487-9915

Phone: (941) 351-2947 • Fax: (941) 359-3828

Website: [www.fantech-us.com](http://www.fantech-us.com)

E-mail: [info@fantech-us.com](mailto:info@fantech-us.com)

### **Canada**

50 Kanalfakt Way • Bouctouche, New Brunswick E4S 3M5

Phone: (800) 565-3548 • Fax: (877) 747-8116



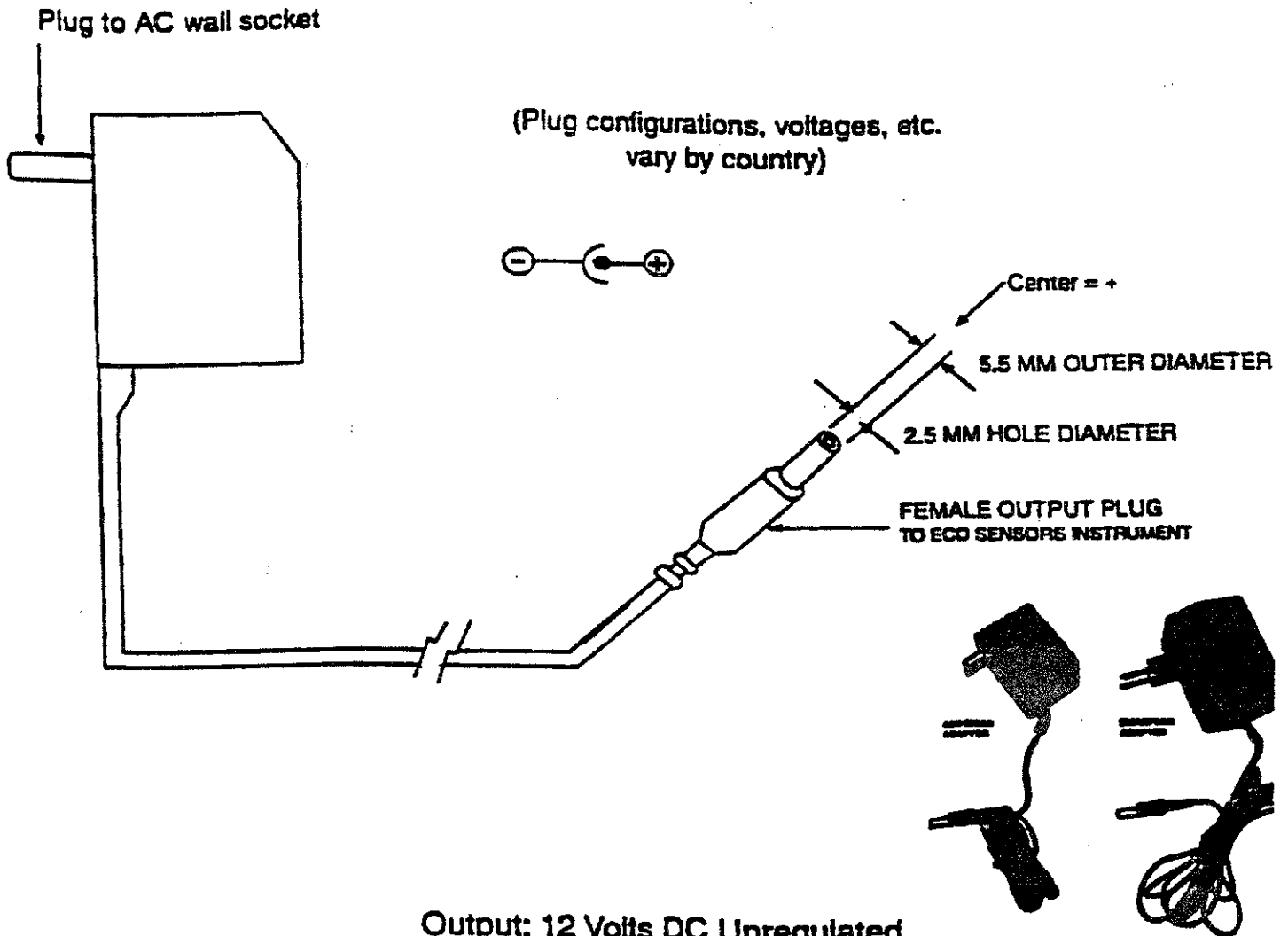




ECO SENSORS, INC.  
 1451 OLD PECOS TRAIL  
 SANTA FE, NM 87505-4737 USA  
 PHONE: (505) 988-1421  
 FAX: (505) 988-1315  
 www.ecosensors.com

## Tech Note P-101

### AC Adapter for Eco Sensors Equipment



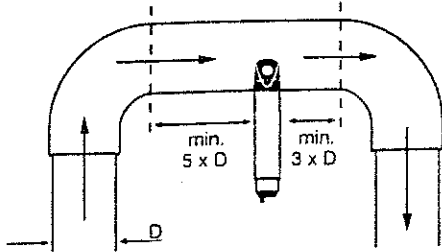
**Output: 12 Volts DC Unregulated  
 300-500 mA**

**Female output plug, 5.5 mm/2.5 mm, Center +**

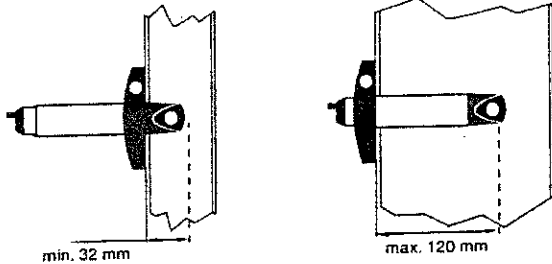
This size AC adapter is found in electronic stores and distributors worldwide. The adapters vary from country to country by plug geometries, voltage input, HZ rate, and conformity to local codes. The output plug which mates with our instruments is an international standard. While the Eco Sensors instruments will work with a 300 mA output adapter, the 500 mA size commonly available is preferred so that the adapter will run cooler and will have the additional capacity available to power the EE-2 Environmental Enclosure, RAP-7800 Alarm Panel, and other accessories. Eco Sensors only stocks the 120 volt 60 Hz North American size adapter.

## Mounting

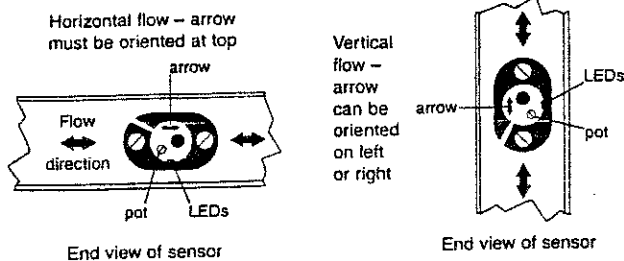
1. To avoid turbulence, the ifm efector air flow switch should be positioned at least five pipe diameters downstream and three pipe diameters upstream of any elbow-bends or valves. If possible, it should be in the area of the duct where it will experience the highest flow velocity.



2. Drill a 24mm diameter mounting hole.
3. Place the flat edge of the clamp provided against the duct and fasten in place with two of the screws provided. If the mounting needs to be airtight, place the gasket provided between the duct and clamp.
4. Insert the flow sensor through the clamp and into the duct. The sensing head must be completely immersed in the air flow - the minimum insertion depth is 32mm, the maximum insertion depth is 120mm.



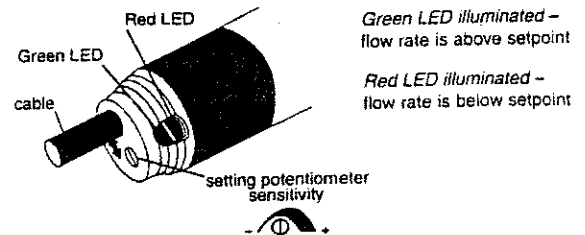
5. Align the unit so that the black arrow near the potentiometer is parallel to the direction of flow. IF THE FLOW IS IN THE HORIZONTAL DIRECTION, POSITION THE SENSOR SO THAT THE ARROW IS ORIENTED AT THE TOP.



6. Once the proper insertion depth and orientation are achieved, insert the third screw into the top hole of the mounting clamp and tighten to secure the sensor's position.

## Set-up

1. Set the airflow to the setpoint flow rate (flow rate at which a change in output is needed). Keep the flow constant.
2. Apply power to the switch. Both the green and red LEDs will illuminate for up to 60 seconds. This is the power-on delay time for the switch. During this time, the relay output is energized. After approximately 60 seconds, one of the LEDs will turn off.



### For sensing loss of flow:

1. After the time delay, if only the green LED remains on, turn the potentiometer slowly counter-clockwise until the red LED turns on. Then, turn the potentiometer clockwise until the green LED just turns on.

After the time delay, if only the red LED remains on, turn the potentiometer slowly clockwise until the green LED just comes on.

2. If flow rate fluctuations need to be compensated for, continue to turn the potentiometer clockwise after the green LED turns on. Turn until the fluctuations do not affect the status of the LEDs.

3. The setup is now complete. The flow rate has now been programmed and the relay output will de-energize when the flow rate falls below this programmed setpoint.

### For sensing increase in flow:

1. After the time delay, if only the red LED remains on, turn the potentiometer slowly clockwise until the green LED just comes on. Then, turn the potentiometer slowly counter-clockwise until the red LED turns on.

After the time delay, if only the green LED remains on, turn the potentiometer slowly counter-clockwise until the red LED just turns on.

2. If flow rate fluctuations need to be compensated for, continue to turn the potentiometer further counter-clockwise after the red LED turns on. Turn until the fluctuations do not affect the status of the LEDs.

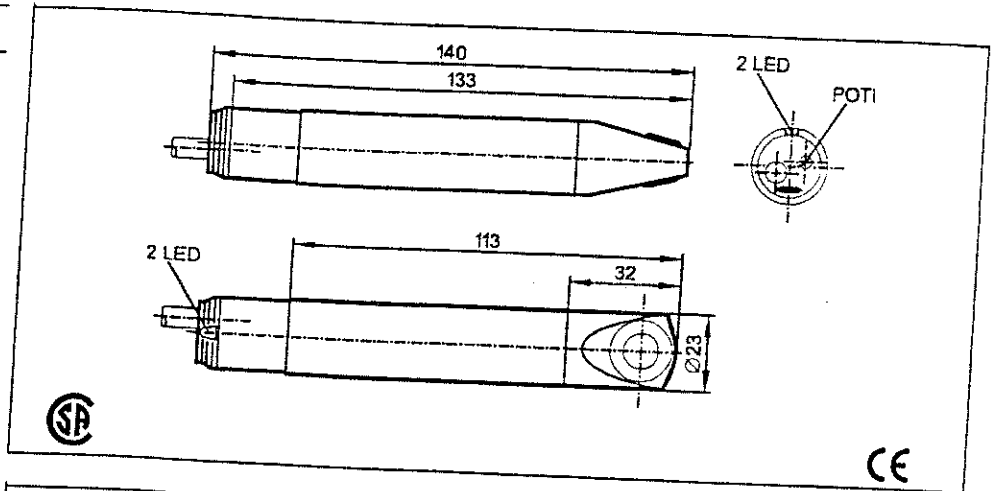
3. The setup is now complete. The flow rate has now been programmed and the relay output will energize when the flow rate rises above this programmed setpoint.

Airflow monitors

## SL0301

SLG23CEEAKOA

Cylindrical type  
 Ø 23 mm  
 Cable



### Electrical design Output

Operating voltage	[V]
Contact rating	
Power consumption	[VA]
Max. temperature gradient of medium	[K/min]
Pressure rating	[bar]
Medium temperature	[°C]
Setting range	[cm/s]
Greatest sensitivity	[cm/s]
Max. relative air humidity	[%]

Adjustment of the switch point	
Power-on delay time	[s]
Response time	[s]
Function display	LED
Operating temperature	[°C]
Protection	
Housing material	
Material sensor surface	

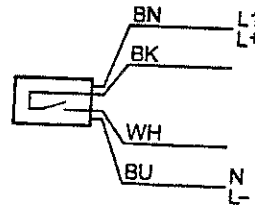
### Connection

### Wiring

Core colours  
 BN brown  
 BU blue  
 BK black  
 WH white

### AC / DC relay energised when flow is present

80...250 AC/DC (47...63 Hz AC)
3A, 30V DC / 250V AC
3
5
1
-10...+50
100...1000
100...400
90
with pot.
60
3...60
1x red / 1x green
-10...+50
IP 65
Pocan
sensor surface; titanium
PUR cable / 2m; 4 x 0,5mm <sup>2</sup>







## SPECIFICATIONS AND APPLICATIONS OPEN FRAME SERIES

### SERIES DESCRIPTION

The INTERNATIONAL POWER open frame series is a high reliability line of power supplies designed to operate over a wide range of AC power sources found worldwide. This feature simplifies your inventory and service consideration by allowing the use of one standard power supply regardless of destination.

These models are designed to meet many domestic and European regulatory agency requirements. If you plan to distribute your products worldwide, obtaining necessary agency approvals can be greatly simplified by specifying the INTERNATIONAL POWER open frame series.

### FEATURES

- VDE transformer construction
- 100/120/220/230-240 VAC input
- OVP on 5V outputs
- $\pm .05\%$  Regulation
- Remote sense on most outputs
- Industry standard case size
- Full rated to 50 degrees C
- Foldback/Current Limit
- Two hour burn-in
- Two-year warranty
- U.L. Recognized, for U.S.A. and CANADA File E133338
- TUV Rheinland Licensed
- Chassis notched for AC Input
- Input accepts .110 x .032 fast-on or solder connection

### SPECIFICATIONS

AC INPUT:	100/120/220/230-240 VAC +10% -13%, 47-63 Hz. See chassis AC connection table for jumper and line fusing requirements. Derate output current 10% for 50Hz operation. Tolerance for 230-240 volt operation is +15% - 10%
DC OUTPUT:	Adjustment range $\pm 5\%$ minimum.
LINE REGULATION:	$\pm .05\%$ for a 10% line change.
LOAD REGULATION:	$\pm .05\%$ for a 50% load change.
TRANSIENT RESPONSE:	Less than 50 $\mu$ SEC for a 50% load change.
OUTPUT RIPPLE:	5 Volt to 28 Volt units: 5mV pk-pk maximum. 48 Volt to 155 Volt units: .02% pk-pk maximum. 200 Volt & 250 Volt units: .05% pk-pk maximum.
SHORT CIRCUIT AND OVERLOAD PROTECTION:	Automatic current limit/foldback.
OVERVOLTAGE PROTECTION:	Built in on all 5 Volt output. Set at 6.2 $\pm .4$ Volts. Other outputs use overvoltage protection modules.
REMOTE SENSING:	Provided on most models. Open sense lead protection built in on most models.
EFFICIENCY (TYPICAL):	5 Volt units: 45%; 12 and 15 Volt units: 55%; 24 through 250 Volt units: 60%.
STABILITY:	$\pm .3\%$ for 24 hour period after 1 hour warm up.
TEMPERATURE RATING:	0° C to 50° C for full rated, derated linearly to 40% at 70° C.
TEMPERATURE COEFFICIENT:	.01%/°C typical, .03%/°C Maximum.
VIBRATION:	Per MIL-STD-810D, Method 514.3, Category 1, Procedure 1.
SHOCK:	Per MIL-STD-810D, Method 516.3, Procedure 3.
EMI/RFI:	These linear power supplies have inherently low conducted and radiated noise levels. For most systems applications, they meet the requirements of FCC Docket 20780 class B equipment and VDE 0871 class B equipment.

### SAFETY SPECIFICATIONS

The INTERNATIONAL POWER supplies are in compliance with the requirements for the following specifications: For U.S. and Canadian (Bi-National) Standards UL 1950, Third Edition, CAN/CSA C22.2 No. 950-95, IEC950, TUV Rheinland EN 60950: 1992 + A1 + A2 + A3 + A4 + A11 Specifically, field terminal to terminal spacing is 5.25 mm with 9.0 mm creepage to other metal, leakage current is less than 50uA and dielectric withstand voltages are 3750 VAC input to chassis, 3750 VAC input to output and 750 VDC output chassis. UL tested at 4242 VDC input to output, 2121 VDC input to dead metal.

### OVERVOLTAGE PROTECTION

An overvoltage protection circuit, commonly referred to as a crowbar, is used to prevent damage to voltage-sensitive loads such as TTL logic. Trip point of the OVP is usually set at 115%-135% of the output voltage. The OVP will short the output terminals upon sensing a fault condition. The primary fuse of the supply will blow if the supply is not foldback current limited. Nuisance tripping of the OVP is a common problem. Noise from input line spikes or load noise can cause an OVP to fire. INTERNATIONAL POWER has incorporated OVP noise filtering to prevent nuisance tripping and reduced transformer interwinding capacitance to minimize input line susceptibility.

### COMMON-MODE LATCH UP

In certain instances dual power supplies can exhibit a problem known as common-mode latch up. This occurs when the positive supply comes up first and forces a reverse bias condition on the negative supply. The negative supply latches up in a current limit condition. INTERNATIONAL POWER has incorporated a unique anti-latch circuit into every dual power supply which will minimize this problem.

### WARRANTY

INTERNATIONAL POWER warrants each power supply of its manufacture that does not perform to published specifications as a result of defective materials or workmanship for a period of two full years from the date of original delivery.

INTERNATIONAL POWER assumes no liabilities for consequential damages of any kind through the use or misuse of its products by the purchaser or others. No other obligations or liabilities are expressed or implied.

### CUSTOMER SERVICE REPAIR

Please follow this procedure when returning product for repair:

Contact INTERNATIONAL POWER for a returned material authorization (RMA) number. The RMA number must appear on all shipping documents and containers. Returns must be freight prepaid. Returns shipped freight collect or without an RMA will not be accepted.

INTERNATIONAL POWER  
360 Bernoulli Circle  
Oxnard, CA 93030-5167

Phone: (805) 981-1188  
FAX: (805) 981-1184

## Remote Sense

Remote sense terminals may be used to compensate for output line losses and provide for a remote point of regulation. *Figure 1* shows the proper termination for a power supply with remote sensing.

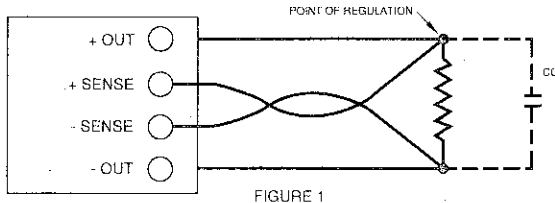


FIGURE 1

Load lines must be sized to prevent an excessive voltage drop from the output to the load. Since the point of regulation is at the load, the power supply must compensate for line losses. Excessive load line losses may affect current limiting, AC line dropout point and OVP margin (if applicable).

Leads should be sized to drop no more than 0.5V – the less the better. Use of a twisted pair or shielded pair for the sense lines is recommended for noise immunity. In problem applications, the use of a small AC decoupling capacitor (.1 to 10 $\mu$  Fd) across the sense terminals is highly recommended. In some applications there may be a tendency for the power supply to oscillate due to the additional phase shift caused by the series resistance and inductance in the load leads. The addition of capacitor Co will reduce output impedance and provide stability. The recommended value of Co is 100 $\mu$  Fd per ampere or 50 $\mu$  Fd per foot and can be the sum of the distributed decoupling capacitors found in most systems. INTERNATIONAL POWER supplies have open sense lead protection on most outputs to protect the load from an overvoltage condition if the sense leads are removed. There is no need to strap the sense terminals to the output terminals in the local sense mode.

## Overvoltage Protection (OVP)

An overvoltage protection circuit, commonly referred to as a crowbar, is used to prevent damage to voltage sensitive loads such as TTL logic. Trip point of the OVP is usually set at 115% - 135% of the output voltage. The OVP will short the output terminals upon sensing a fault condition. The primary fuse of the supply will blow if the supply is not foldback current limited. Nuisance tripping of the OVP is a common problem. Noise from input line spikes or load noise can cause an OVP to fire. INTERNATIONAL POWER has provided OVP noise filtering to prevent nuisance tripping and reduced transformer interwinding capacitance to minimize input line susceptibility.

## Common-Mode Latch UP

In certain instances dual power supplies can exhibit a problem known as common-mode latch up. This occurs when the positive supply comes up first and forces a reverse bias condition on the negative supply. The negative supply latches up in a current limit condition. INTERNATIONAL POWER has incorporated a unique antilatch circuit into every dual power supply which will minimize this problem.

## Grounding

Grounding considerations in designing a power distribution system are often overlooked but can have a significant impact on overall system performance. A single point system ground should be employed where possible to eliminate ground loops and improve regulation.

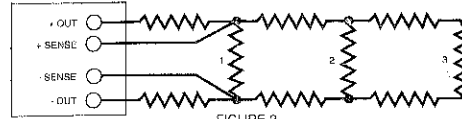


FIGURE 2

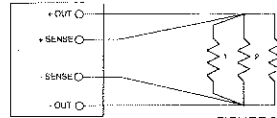


FIGURE 3

*Figure 2* shows a simple but *undesirable* connection scheme. Regulation at loads 2 and 3 becomes progressively worse due to voltage drops in the finite wire resistance between loads. *Figure 3* shows an improved connection system in which regulation is maintained at all three loads because wire losses are not cumulative.

## AC Connection and Fusing

The five wire input provides four voltage ranges: 100/120/220/230-240\*\* +10%, -13%. See chassis AC connection table for the jumpering requirements. Extended low line tolerance provides additional drop out margin in areas where line voltages are marginal. Inputs must be fused.

	AC Input 47-63-Hz			
For use at	100 VAC	120 VAC	220 VAC	230/240 VAC
JUMPER	1 & 3 2 & 4	1 & 3 2 & 4	2 & 3	2 & 3
Apply AC	1 & 5	4 & 1	1 & 5	4 & 1

FUSING REQUIREMENTS ARE SILKSCREENED ON EACH INDIVIDUAL POWER SUPPLY

FIGURE 4

\*\*Tolerance for 230VAC operation is +15%, -10%.

## Jumpering Example

*Figure 5* is an example of proper jumpering of the primary for 100/120 VAC operation.

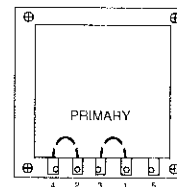


FIGURE 5

## Warranty

INTERNATIONAL POWER warrants each power supply of its manufacture that does not perform to published specifications as a result of defective materials or workmanship for a period of two full years from the date of original delivery.

INTERNATIONAL POWER assumes no liabilities for consequential damages of any kind through the use or misuse of its products by the purchaser or others. No other obligations or liabilities are expressed or implied.

## Customer Service/Warranty Repair

Please follow this procedure when returning product for customer service: Contact INTERNATIONAL POWER DC POWER SUPPLIES, INC. for a returned material authorization (RMA) number. The RMA number must appear on all shipping containers. Returns must be returned freight prepaid. Returns shipped freight collect or without an RMA number will not be accepted.

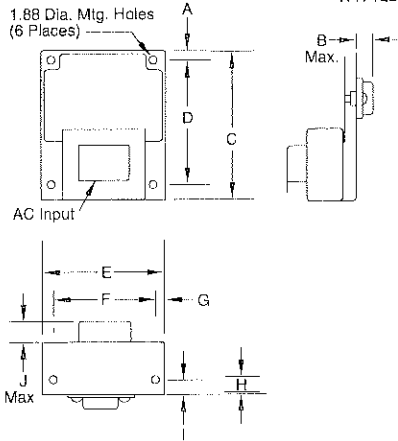
Ship to: INTERNATIONAL POWER

360 Bernoulli Circle • Oxnard, CA 93030-5167 • (805) 981-1188 • FAX (805) 981-1184 • (800) 845-5386

# Outline and Mounting Drawings

## A Case

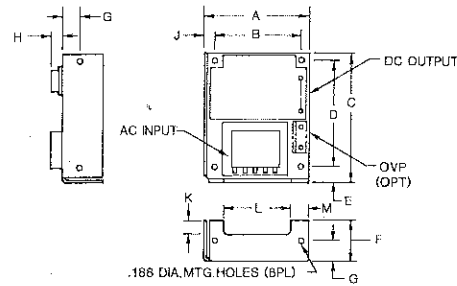
Overall Size: 3.75" x 3.00" x 2.20"  
 Overall Size: 3.75" x 3.00" x 2.20"  
 WT. 1LB.



	INCH	mm
A	.250	6.35
B	.450	11.43
C	3.75	95.25
D	3.100	78.74
E	3.00	76.20
F	2.500	63.50
G	.250	6.35
H	1.25	31.75
I	.350	8.89
J	.500	12.70

## B Case

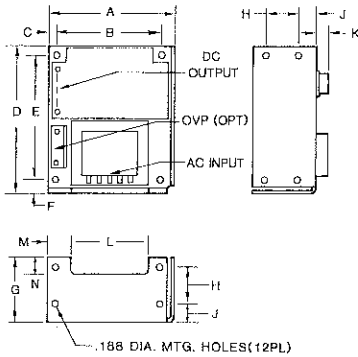
Overall Size: 4.87" x 4.00" x 2.10"  
 Overall Size: 123.70mm x 101.60mm x 53.34mm  
 Weight 2 lbs.



	INCH	mm
A	4.00	101.60
B	3.375	85.73
C	4.87	123.70
D	4.125	104.78
E	0.50	12.70
F	1.62	41.15
G	0.75	19.05
H	0.450	11.43
J	0.38	9.65
K	0.57	14.48
L	2.60	66.04
M	0.794	20.17

## C Case

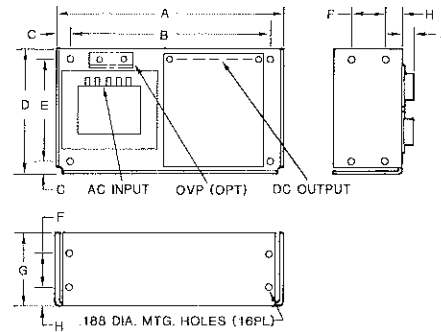
Overall Size: 5.62" x 4.87" x 2.95"  
 Overall Size: 142.75mm x 123.70mm x 74.93mm  
 Weight 4 lbs.



	INCH	mm
A	4.87	123.70
B	4.125	104.78
C	0.25	6.35
D	5.62	142.75
E	4.875	123.83
F	0.50	12.70
G	2.50	63.50
H	1.250	31.75
J	0.75	19.05
K	0.450	11.43
L	2.85	72.39
M	1.025	26.04
N	0.665	16.89

## D Case

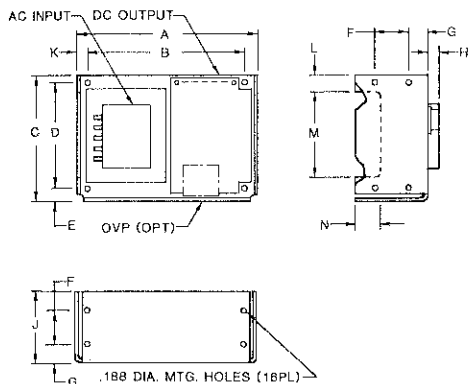
Overall Size: 9.00" x 4.87" x 3.28"  
 Overall Size: 228.60mm x 123.70mm x 83.83mm  
 Weight 7.5 lbs.



	INCH	mm
A	9.00	228.60
B	8.000	203.20
C	0.50	12.70
D	4.87	123.70
E	4.125	104.78
F	1.250	31.75
G	2.75	69.85
H	0.75	19.05
J	0.450	11.43

## N Case

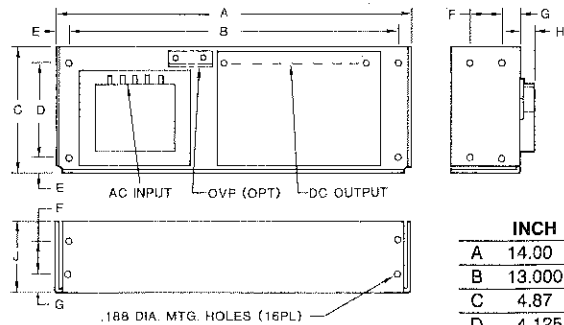
Overall Size: 7.00" x 4.87" x 3.20"  
 Overall Size: 177.80mm x 123.70mm x 81.28mm  
 Weight 6 lbs.



	INCH	mm
A	7.00	177.80
B	6.250	158.75
C	4.87	123.70
D	4.125	104.78
E	0.50	12.70
F	1.250	31.75
G	0.75	19.05
H	0.450	11.43
J	2.75	69.85
K	0.38	6.35
L	0.640	16.26
M	3.345	84.96
N	1.00	25.40

## E Case

Overall Size: 14.00" x 4.87" x 3.53"  
 Overall Size: 355.60mm x 123.70mm x 89.66mm  
 Weight 10 lbs.



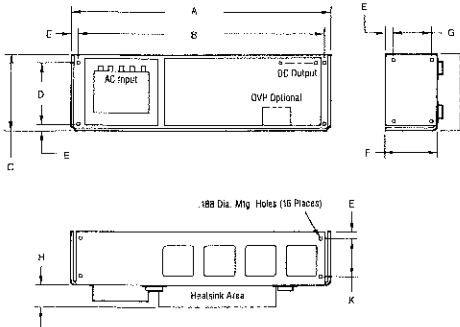
	INCH	mm
A	14.00	355.60
B	13.000	330.20
C	4.87	123.70
D	4.125	104.78
E	0.50	12.70
F	1.250	31.75
G	0.75	19.05
H	0.650	16.51
J	2.75	69.85



# Outline and Mounting Drawings

## F Case

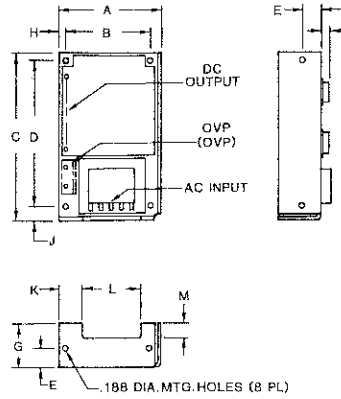
Overall Size: 16.75" x 5.50" x 4.88"  
Weight 19 lbs.



INCH	mm
A	16.75 425.45
B	16.00 406.40
C	4.88 123.95
D	4.125 104.80
E	0.375 9.53
F	5.00 127.00
G	2.50 63.50
H	1.50 36.10
J	3.50 88.90
K	2.50 63.50

## AA Case

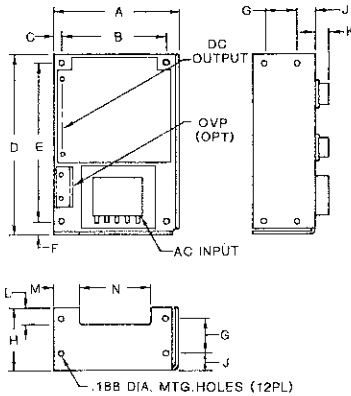
Overall Size: 6.50" x 4.00" x 2.10"  
165.10mm x 101.60mm x 53.34mm  
Weight 2 lbs.



INCH	mm
A	4.00 101.60
B	3.375 85.73
C	6.50 165.10
D	5.750 146.05
E	0.75 19.05
F	0.450 11.43
G	1.62 41.15
H	0.25 6.35
J	0.50 12.70
K	0.955 24.26
L	2.37 60.20
M	0.57 14.48

## BB Case

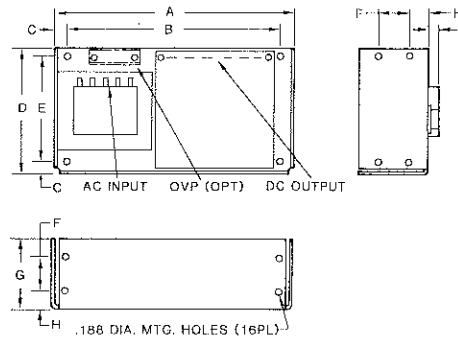
Overall Size: 7.00" x 4.88" x 2.95"  
177.80mm x 123.95mm x 74.93mm  
Weight 4 lbs.



INCH	mm
A	4.87 123.70
B	4.125 104.78
C	0.25 6.35
D	7.00 177.80
E	6.250 158.75
F	0.50 12.70
G	1.250 31.75
H	2.50 63.50
J	0.75 19.05
K	0.450 11.43
L	0.665 16.89
M	1.025 26.03
N	2.85 72.39

## CC Case

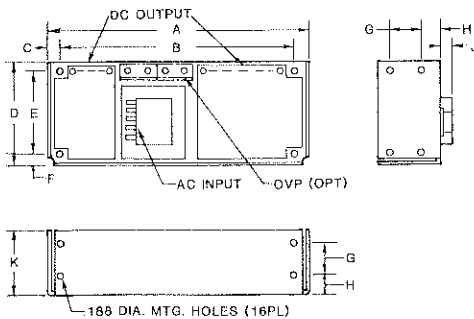
Overall Size: 9.38" x 4.87" x 3.28"  
238.25mm x 123.70mm x 83.31mm  
Weight 7 lbs.



INCH	mm
A	9.38 238.25
B	8.375 212.73
C	0.50 12.70
D	4.87 123.70
E	4.125 104.78
F	1.250 31.75
G	2.75 69.85
H	0.75 19.05
J	0.450 11.43

## BAA Case

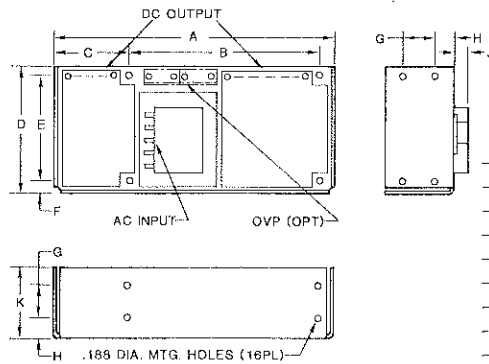
Overall Size: 10.25" x 4.00" x 2.95"  
260.35mm x 101.60mm x 74.93mm  
Weight 5 lbs.



INCH	mm
A	10.25 260.35
B	9.250 234.95
C	0.50 12.70
D	4.00 101.60
E	3.375 85.73
F	0.37 9.40
G	1.250 31.75
H	0.75 19.05
J	0.450 11.43
K	2.50 63.50

## CBB Case

Overall Size: 11.00" x 4.87" x 3.28"  
279.40mm x 123.70mm x 83.31mm  
Weight 8 lbs.



INCH	mm
A	11.00 279.40
B	7.50 190.50
C	3.00 76.20
D	4.87 123.70
E	4.125 104.78
F	0.50 12.70
G	1.250 31.75
H	0.75 19.05
J	4.50 11.43
K	2.75 69.85

## System 350™ Y350R Power Module

*The Y350R is a rectified Class 2, 24 VAC power supply module designed specifically for use with System 350™ Modular Control Systems.*

*As with all System 350 products, the Y350R is housed in a compact NEMA 1, high-impact plastic enclosure. The modular design provides easy, plug-in connections for quick installation and future expandability.*

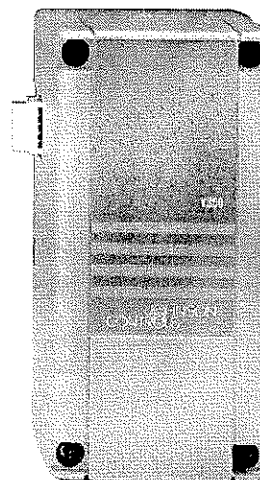


Figure 1: Y350R Power Module

Features and Benefits	
<input type="checkbox"/> <b>Modular Design</b>	Enables stage, display, and power modules to be purchased and installed as necessary
<input type="checkbox"/> <b>Plug-in Connectors and 35 mm DIN Rail Mounting</b>	Eliminates wiring between modules and reduces installation costs
<input type="checkbox"/> <b>Accepts Input Voltages of 120 or 240 VAC, 50/60 Hz</b>	Reduces inventory by encompassing the primary voltage requirements

# Application

The Y350R Power Module provides the power necessary to operate all System 350 controls and add-on modules. For system capabilities, see Table 1.

**Table 1: Maximum Number of Add-on Modules when Powered by a Y350R**

Control Module	Stage Module	Display Module
A350A	9 S350A's or S350C's	1 D350
A350B	6 S350A's or S350C's with 1 S350P	
A350E	4 S350A's or S350C's with 2 S350P's	
A350P	4 S350A's or S350C's 2 S350A's or S350C's with 1 S350P	1 D350
A350R	9 S350A's or S350C's	2 D350
A350S	6 S350A's or S350C's with 1 S350P	
	4 S350A's or S350C's with 2 S350P's	
W351A	5 S351's	1 D351
W351P	4 S351's	1 D351
P352A	5 S352's	1 D352
P352P	No additional stages available	1 D352
R353	5 S353's	No display available

All System 350 add-on modules snap on to a DIN rail and plug into the control and to each other via 5-pin connectors. Add-on modules can be arranged in any order and there is no wiring required to interconnect the System 350 components.

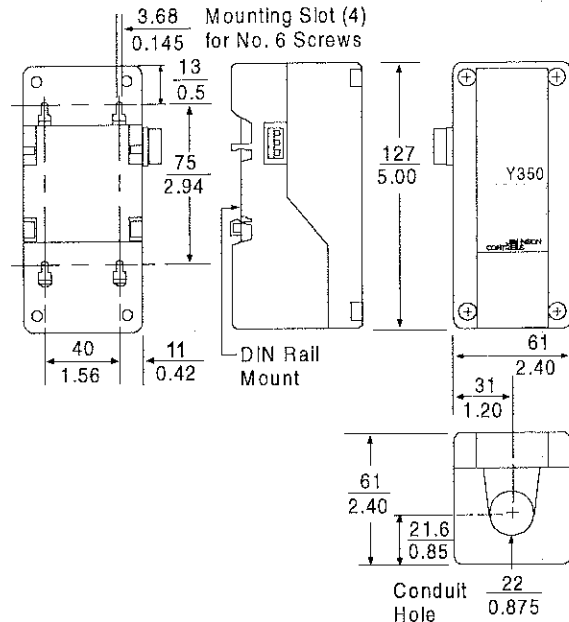
# Operation

The Y350R operates from 240 VAC or 120 VAC power. A 24 VAC, Class 2, step-down transformer brings the voltage to a level which the System 350 modules will accept. There are no adjustments for the power module.

**IMPORTANT:**

All Series Y350R Power Modules are designed for use only in conjunction with operating controls. Where an operating control failure would result in personal injury and/or loss of property, it is the responsibility of the installer to add devices (safety, limit controls) that protect against, or systems (alarm, supervisory systems) that warn of, control failure.

# Dimensions



**Figure 2: Y350R Dimensions, mm/in.**

# Installation and Wiring

The Y350R case has provisions for mounting to a standard 35 mm DIN rail, or can be mounted using the four key slot mounting holes located in the rear of the case.

Mount System 350 modules in any convenient location using either the DIN rail mounts or the mounting holes located on the back of the control case. The components are not position sensitive, but should be mounted so they can be easily wired and adjusted.

**IMPORTANT:** All wiring must be installed to conform to the National Electrical Code and local regulations.

1. Secure the module to the DIN rail, wall, or panel.

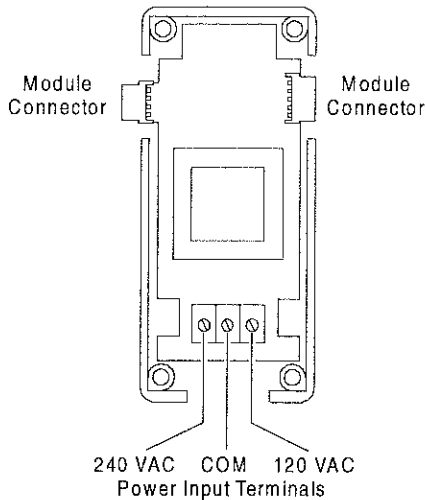


**WARNING: Electrical Shock Hazard.**

Disconnect power supply before modules are interconnected and wiring connections are made to avoid possible electrical shock or damage to the equipment.

2. Connect input wiring to the Y350R power module. Strip approximately 3/8 inch from the wire insulation, insert the wire under each terminal screw, and tighten. (See Figure 3.)

**Note:** If conduit is used when installing System 350 components, be sure to connect the hub to the conduit before the hub is secured to the enclosure.



**Figure 3: Interior of the Y350R Power Module**

## Ordering Information

**Table 2: Product Available**

Item	Product Code	Description
Power Module	Y350R-1C	Rectified, Class 2, 24 VAC Power Supply

## Checkout Procedure

Before applying power, make sure installation and wiring connections are according to job specifications. After necessary adjustments and electrical connections have been made, put the system in operation and observe at least three complete operating cycles before leaving the installation.

## Troubleshooting

If the control system does not function properly and the Y350R is suspect, proceed as follows:

1. Connect a Digital Voltmeter (DVM) between the 24V (+) and COM (-) terminals located on the control module's left-side connector. (Terminal designations are marked on the control module.)
2. Select DC volts on the DVM and verify that the voltage is between 16 and 38 VDC. If the DVM reading is within range, the Y350R is functioning properly.

**Note:** Consult the *Troubleshooting* section of the appropriate control bulletin for a complete system troubleshooting procedure.

3. If the DVM reading is not within the indicated voltage range, check wiring and correct if necessary. If the wiring is correct and the reading remains out of range, replace the Y350R.

## Repairs and Replacement

Field repairs or calibration must not be made. Replacement modules are available through the nearest Johnson Controls representative. (See Table 2.)

# Specifications

<b>Product</b>	Y350R Power Module
<b>Input Voltage</b>	120/240 VAC, 50/60 Hz
<b>Output Voltage</b>	Rectified 24 VAC, 10 VA, Class 2
<b>Material</b>	Case and cover: NEMA 1 high-impact plastic
<b>Ambient Temperature</b>	Operating: -34 to 66°C (-30 to 150°F) Shipping: -40 to 85°C (-40 to 185°F)
<b>Ambient Humidity</b>	0 to 95% RH non-condensing
<b>Mounting</b>	Wall or DIN rail
<b>Agency Listing</b>	UL Guide No. XAPX, File E27734 CUL Guide No. XAPX7, File E27734 CSA Class No. 4813 02, File LR948

*The performance specifications are nominal and conform to acceptable industry standards. For application at conditions beyond these specifications, consult the local Johnson Controls office. Johnson Controls, Inc. shall not be liable for damages resulting from misapplication or misuse of its products.*

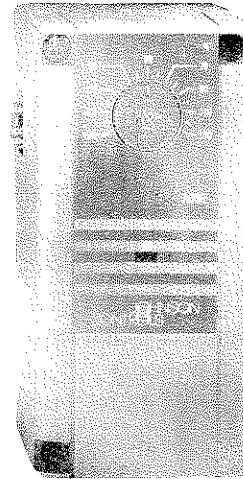


**Controls Group**  
507 E. Michigan Street  
P.O. Box 423  
Milwaukee, WI 53201

Printed in U.S.A.

## System 350™ A350A/B Electronic Temperature Control

The A350A/B Series is an on/off electronic temperature control with a Single-Pole, Double-Throw (SPDT) relay output and a Light-Emitting Diode (LED) relay status indicator. Designed to operate with both heating and cooling equipment, this control includes an adjustable differential and an interchangeable temperature sensor.



**Figure 1: A350 Series Electronic Temperature Control**

As are all System 350™ products, the A350A/B is housed in a NEMA 1, high-impact plastic enclosure. The modular design provides easy, plug-together connections for quick installation and future expandability.

<b>Features and Benefits</b>	
<input type="checkbox"/> <b>Modular Design</b>	Enables stage, display, and power modules to be purchased and installed as needed
<input type="checkbox"/> <b>Plug-together Connectors and 35 mm DIN Rail Mounting</b>	Eliminates wiring between modules and reduces installation costs
<input type="checkbox"/> <b>Two Standard Models Cover Wide Setpoint Ranges -30 to 130°F (-34 to 55°C) or 90 to 250°F (32 to 121°C)</b>	Reduces inventory by encompassing temperature ranges required to support the majority of Heating, Ventilation, Air Conditioning, and Refrigeration (HVAC/R) applications
<input type="checkbox"/> <b>Wide Adjustable Differential of 1 to 30F° (0.6 to 16.7C°)</b>	Enables the user to match equipment cycle rate and/or sequencing for a given application
<input type="checkbox"/> <b>Field-Selectable Mode Jumpers</b>	Operates in both heating and cooling applications
<input type="checkbox"/> <b>Available with Either External or Concealed Setpoint</b>	Helps deter accidental and unauthorized adjustments
<input type="checkbox"/> <b>Interchangeable Temperature Sensors</b>	Increases versatility and serviceability

Please read and save these instructions. Read carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. Failure to comply with instructions could result in personal injury and/or property damage! Retain instructions for future reference.

# Dayton® Heavy-Duty Venturi-Mounted Exhaust Fans

## Description

Dayton Venturi-Mounted Exhaust fans are widely used to ventilate factories, shops, foundries, laundries, farm buildings, etc. 4-wing cast aluminum propellers designed for up to 1/2" static pressure applications. Steel intake guards comply with OSHA regulations. Totally enclosed, 1725 RPM, 115V, 60 Hz., 1-PH motor. Wire guard has baked-on charcoal grey metallic polyester finish to resist corrosion. Air deliveries are based on AMCA test codes. Shipped completely assembled.



Dayton Electric Mfg. Co. certifies that the ventilators shown hereon are licensed to bear the AMCA seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 211 and AMCA Publication 311 comply with the requirements of the AMCA Certified Ratings Program.

The Sound Ratings shown are loudness values in fan zones at five (5) feet in a hemispherical free field calculated per AMCA Standard 301. Values shown for ventilators listed are for: Installation Type A: Free inlet fan zone levels.

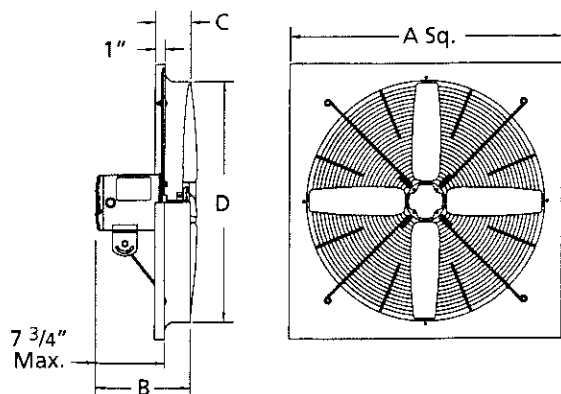


Figure 1 - Dimensions

## Dimensions

Model	Propeller Dia.	A-Sq.	B	C	D
4YC81	12"	16"	10 1/8"	2 1/2"	12 3/8"
4C163B	16	20	10 1/4	2 3/4	16 7/16
4C164B	18	22	10 1/8	2 15/16	18 7/16
4C367A	20	24	10 3/8	3 3/16	20 1/2
4C127B	20	24	10 3/8	3 3/16	20 1/2
4C165B	20	24	10 3/4	3 3/16	20 1/2
4C059B	24	28	10 3/4	3 5/8	24 3/8
4C167B	24	28	11 1/4	3 5/8	24 3/8

## Performance

Model	Propeller Dia.	CFM Air Delivery @ Static Pressure Shown						HP	Motor RPM	Operating Amps
		Sones @ 0.0" SP	0.0" SP	0.125" SP	0.250" SP	0.375" SP	0.500" SP			
4YC81	12"	10.1	1190	1055	870	685	505	1/4	1725	3.4
4C163B	16	16.5	2640	2370	2020	1460	1190	1/4	1725	4.4
4C164B	18	17.4	2840	2490	2085	1625	1295	1/4	1725	4.3
4C367A	20	22	2970	2565	2110	1690	1335	1/4	1725	4.3
4C127B	20	24	3510	3030	2535	2120	1735	1/3	1725	4.5
4C165B	20	22	4245	3665	3085	2635	2135	1/2	1725	5.9
4C059B	24	29	3850	3285	2745	2180	1630	1/3	1725	4.3
4C167B	24	32	5545	4895	4220	3585	2825	1/2	1725	6.6

# Dayton® Heavy-Duty Venturi-Mounted Exhaust Fans

## General Safety Information

**▲ WARNING** Do not depend on any switch as sole means of disconnecting power when installing or servicing the fan. If the power disconnect is out-of-sight, lock it in the open position and tag to prevent application of power. Failure to do so may result in fatal electrical shock.

**▲ AVERTISSEMENT** Lors de l'installation ou d'une réparation du ventilateur, ne pas compter sur un sélecteur comme seul moyen de coupure de l'alimentation électrique. Si l'interrupteur d'alimentation est hors de vue, le verrouiller en position d'arrêt et apposer une plaquette interdisant son utilisation. À défaut, un choc électrique pourrait être fatal.

1. Follow all local electrical and safety codes in the United States and Canada, as well as the National Electrical Code (NEC) and the Occupational Safety and Health Act (OSHA) in the United States, and the Canadian Electric Code (CEC) in Canada.

**▲ CAUTION** Do not use in explosive atmospheres.

2. Motor must be properly grounded by wiring with a grounded, metal-clad raceway system, by using a separate ground wire connected to the bare metal of the motor frame, or other suitable means.
3. Always disconnect power source before working on or near a motor or its connected load. If the power disconnect point is out-of-sight, lock it in the open position and tag to prevent unexpected application of power.

**▲ WARNING** Motor will restart without warning after protector trips.

**▲ CAUTION** In United States to reduce the risk of injury to persons, OSHA complying

guards are required when fan is installed within 7 feet of floor or working level.

**▲ CAUTION** In Canada to reduce the risk of injury to persons, CSA complying guards are required when fan is installed below 2.5 meters (8.2 feet) above floor or grade level.

**▲ WARNING** Do not touch motor. May be hot enough to cause injury.

4. Be careful when touching the exterior of an operating motor. It may be hot enough to be painful or cause injury. With modern motors this condition is normal if operated at rated load and voltage; modern motors are built to operate at higher temperatures.
5. Protect the power cable from coming in contact with sharp objects.
6. Do not kink power cable and never allow the cable to come in contact with oil, grease, hot surfaces, or chemicals

**▲ WARNING** To reduce the risk of fire or electric shock, do not use this fan with any solid state speed control device.

7. Make certain that the power source conforms to the requirements of your equipment.

## Installation

1. The unit should be securely mounted in a rigid framework.

**NOTE:** Allowing the fan frame to flex or move will result in undue vibrations and possible premature motor or propeller failure.

2. Connect power to motor, using an approved wiring method.
3. Install any auxiliary components.

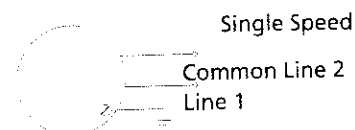


Figure 2 - Wiring Diagram

**▲ CAUTION** The fan motor must be securely and adequately grounded to a suitable electrical ground such as a grounded water pipe or ground wire system!

4. Before activating the fan, double-check to ensure that there are no obstructions (framing, stud, shutter, etc.) which would interfere with proper fan operation.

## Operation

1. For proper air circulation, keep the area free of objects that could impede air flow on either the intake side or exhaust side of fan.
2. For proper exhaust operation, a window, door, or louver should be opened on the opposite side of the area to be ventilated.

## Maintenance

**▲ WARNING** Do not depend on any switch as sole means of disconnecting power when installing or servicing the fan. If the power disconnect is out-of-sight, lock it in the open position and tag to prevent application of power. Failure to do so may result in fatal electrical shock.

**▲ AVERTISSEMENT** L'installation ou d'une réparation du ventilateur, ne pas compter sur un sélecteur comme seul moyen de coupure de l'alimentation électrique. Si l'interrupteur d'alimentation est hors de vue, le verrouiller en position d'arrêt et apposer une plaquette interdisant son utilisation. À défaut, un choc électrique pourrait être fatal.



# For Replacement Parts, call 1-800-323-0620

**24 hours a day - 365 days a year**

Please provide following information:

- Model number
- Serial number (if any)
- Part description and number as shown in parts list

Address parts correspondence to:

Grainger Parts  
P.O. Box 3074  
1657 Shermer Road  
Northbrook, IL 60065-3074 U.S.A.

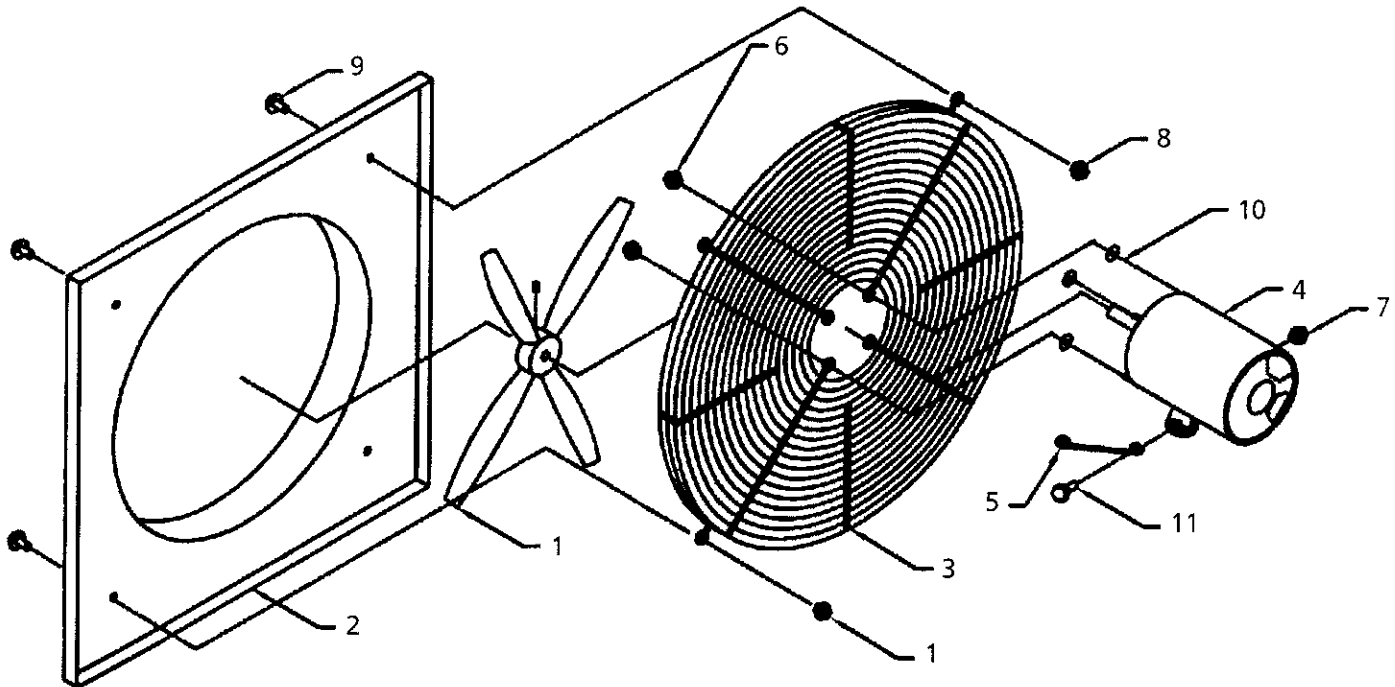


Figure 3 — Replacement Parts Illustration

## Replacement Parts List

Ref. No.	Description	Part Number For Models:								Qty.
		4YC81	4C059B	4C127B	4C163B	4C164B	4C165B	4C167B	4C367B	
1	Propeller (setscrew included)	03450001	4C144A	4C140A	4C132A	4C134A	4C143A	4C147A	4C138A	1
2	Venturi panel	09365003	09370003	09369003	09367003	09368003	09369003	09370003	09369003	1
3	Guard	09776001	09628002	09625002	09622002	09624002	09625002	09628002	09625002	1
4	Motor	13547001	9K389	9K389	9K388	9K388	9K390	9K390	3K388	1
5	Yoke brace	01488001	01132003	01131003	01131003	01131003	01131003	01132003	01131003	1
6	#10-32 Flange spinlock nut	*	*	*	*	*	*	*	*	4
7	3/8"-24 Flange spinlock nut	*	*	*	*	*	*	*	*	1
8	1/4"-20 Flange spinlock nut	*	*	*	*	*	*	*	*	4
9	1/4-20 x 1/2" HHC screw	*	*	*	*	*	*	*	*	4
10	#10 x 3/4" Flatwasher	*	*	*	*	*	*	*	*	4
11	3/8"-24 x 1" Hex head capscrew	*	*	*	*	*	*	*	*	1

\*) Standard hardware items, available locally.

# Dayton® Heavy-Duty Venturi-Mounted Exhaust Fans

## Maintenance (Continued)

**▲ CAUTION** All electrical connections should be made by a qualified electrician.

### MINOR AND ROUTINE

1. Lubricate the motor sleeve bearings every six months using S.A.E. 20 non-detergent oil.
2. Periodically clean the propellers and motor of any excessive accumulation of dirt.

### PARTS REPLACEMENT

1. Refer to Figure 3 for correct positioning of parts.

2. Refer to "Replacement Parts List" for ordering information

3. Disconnect power before servicing.

**▲ CAUTION** The fan motor must be securely and adequately grounded to a suitable electrical ground such as a grounded water pipe or ground wire system!

4. Remove the four screws holding the guard to the venturi panel. Remove guard, yoke, motor, and propeller.
5. Loosen and remove bolt and nut holding wire brace to motor yoke tabs.

6. Loosen the setscrew on blade hub and remove the propeller.

**▲ CAUTION** Do not repair damaged propellers, they should be replaced with a properly balanced replacement.

7. Loosen the nuts holding motor on guard and remove.
8. Reassemble the unit in reverse order of disassembly

## Troubleshooting Chart

Symptom	Possible Cause(s)	Corrective Action
Excessive noise	<ol style="list-style-type: none"> <li>1. Noisy motor bearings</li> <li>2. Loose propeller</li> <li>3. Crooked or damaged propeller</li> </ol>	<ol style="list-style-type: none"> <li>1. Relubricate or replace motor</li> <li>2. Tighten setscrews in hub</li> <li>3. Replace</li> </ol>
Fan inoperative	<ol style="list-style-type: none"> <li>1. Blown fuse or open circuit breaker</li> <li>2. Defective motor</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace fuse or reset circuit breaker</li> <li>2. Repair or replace</li> </ol>
Insufficient air flow	<ol style="list-style-type: none"> <li>1. Damper (shutter) stuck shut</li> <li>2. Low voltage</li> </ol>	<ol style="list-style-type: none"> <li>1. Repair</li> <li>2. Determine cause and correct</li> </ol>

### LIMITED WARRANTY

**DAYTON ONE-YEAR LIMITED WARRANTY.** Heavy-Duty Venturi-Mounted Exhaust Fans, covered in this manual, are warranted by Dayton Electric Mfg. Co. (Dayton) to the original user against defects in workmanship or materials under normal use for one year after date of purchase. Any part which is determined to be defective in material or workmanship and returned to an authorized service location, as Dayton designates, shipping costs prepaid, will be, as the exclusive remedy, repaired or replaced at Dayton's option. For limited warranty claim procedures, see PROMPT DISPOSITION below. This limited warranty gives purchasers specific legal rights which vary from jurisdiction to jurisdiction.

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## ELECTRICAL CONNECTION DIAGRAMS

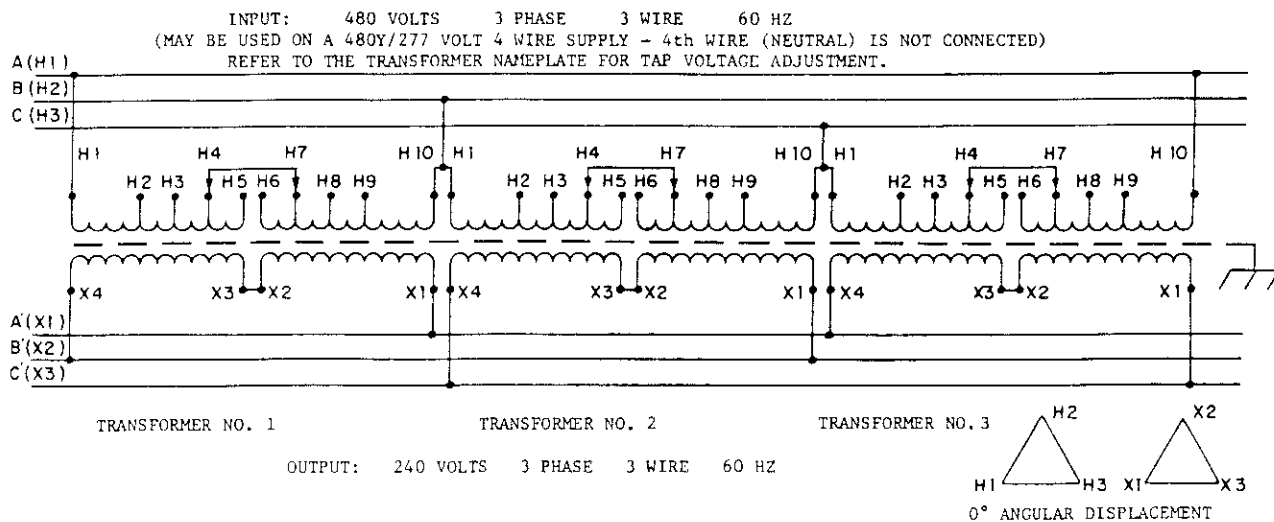
The electrical connection diagram illustrates how to use single phase transformers for three phase applications.

**FIRST,** Determine the voltage the installation requires. Example: Input 480V, 3 Phase; Output 208Y/120V, 3 Phase, 4 wire.

**SECOND,** Find the transformer catalog number shown on the connection diagram, which matches the transformer you are installing. This tabulation will show you the number of transformers required, the KVA, and ampere capacity of the installation.

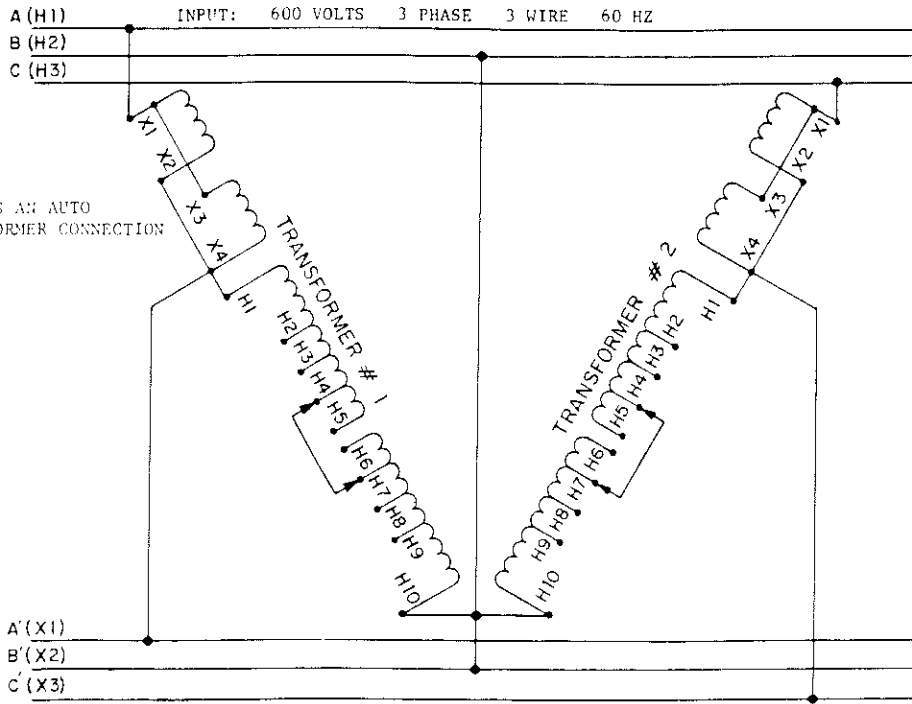
In the connection diagram employing auto transformer connections, the KVA rating is considerably larger than the sum of the nameplate KVA ratings of the individual transformers. An auto transformer connection is made when the transformer primary (terminals having H markings) and secondary (terminals having X markings) are joined together.

For overcurrent protection, grounding and other installation requirements, refer to the National Electrical Code, Articles 240, 250 and 450 and other appropriate sections. Likewise, local codes are to be observed.



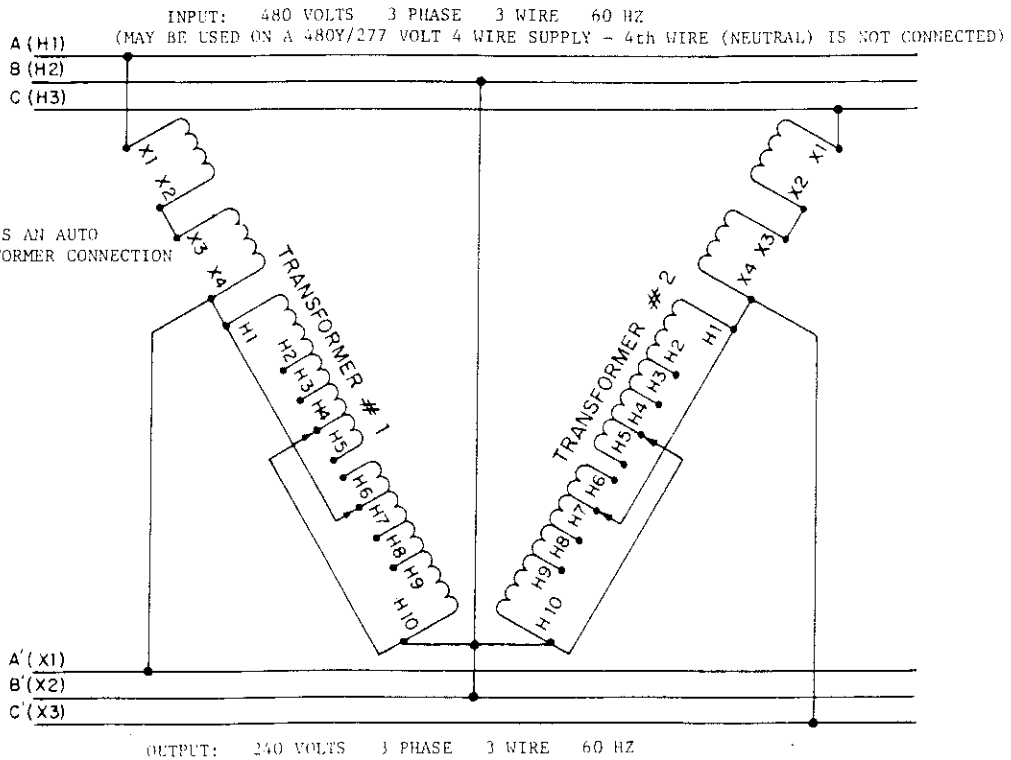
Catalog No.	Nameplate KVA Per Transformer	Number of Trans. Req'd.	3 Phase KVA	Full Load 3 Phase Amps @	
				240V	480V
T-2-53515-3S	7.5	3	22.5	54	27
T-2-53516-3S	10	3	30.0	72	36
T-2-53517-3S	15	3	45.0	108	54
T-2-53518-3S	25	3	75.0	180	90

NOTE: INPUTS AND OUTPUTS MAY BE REVERSED; KVA CAPACITY REMAINS CONSTANT.



Catalog No.	Nameplate KVA Per Transformer	Number of Trans. Req'd.	3 Phase KVA	Full Load 3 Phase Amps @	
				480V	600V
T-2-53515-3S	7.5	2	64	77	62
T-2-53516-3S	10	2	86	103	83
T-2-53517-3S	15	2	129	156	124
T-2-53518-3S	25	2	216	260	208

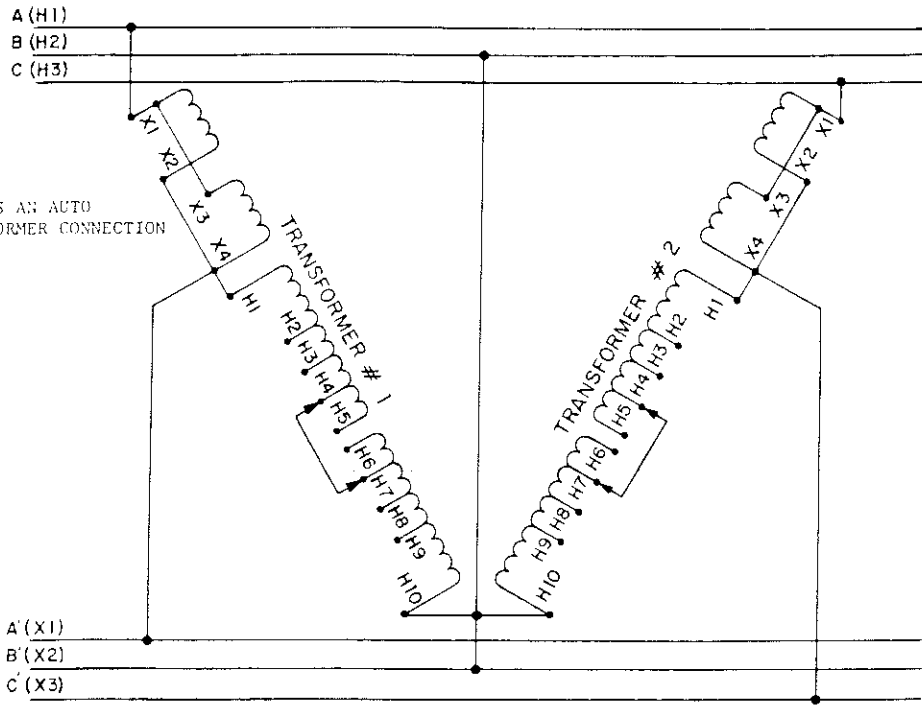
INPUT AND OUTPUT MAY BE REVERSED; KVA CAPACITY REMAINS CONSTANT.



Catalog No.	Nameplate KVA Per Transformer	Number of Trans. Req'd.	3 Phase KVA	Full Load 3 Phase Amps @	
				240V	480V
T-2-53515-3S	7.5	2	36	62	31
T-2-53516-3S	10	2	34	82	41
T-2-53517-3S	15	2	52	125	62
T-2-53518-3S	25	2	86	207	103

INPUT AND OUTPUT MAY BE REVERSED; KVA CAPACITY REMAINS CONSTANT.

INPUT: 480 VOLTS 3 PHASE 3 WIRE 50/60 HZ  
 (MAY BE USED ON A 480Y/277 VOLT 4 WIRE SUPPLY - 4th WIRE (NEUTRAL) IS NOT CONNECTED)



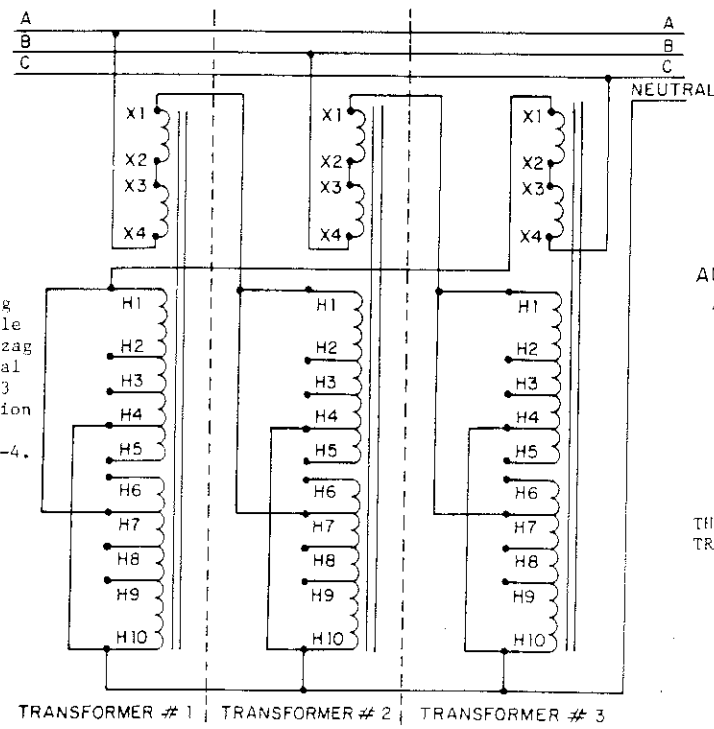
THIS IS AN AUTO TRANSFORMER CONNECTION

OUTPUT: 380 VOLTS 3 PHASE 3 WIRE 50/60 HZ

Catalog No.	Nameplate KVA Per Transformer	Number of Trans. Req'd.	3 Phase KVA	Full Load 3 Phase Amps	
				380V	480V
T-2-53515-3S	7.5	2	51	77	61
T-2-53516-3S	10	2	68	103	82
T-2-53517-3S	15	2	103	156	124
T-2-53518-3S	25	2	172	262	207

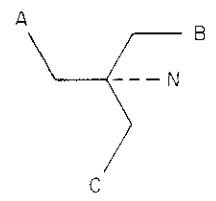
INPUT AND OUTPUT MAY BE REVERSED; KVA CAPACITY REMAINS CONSTANT.

INPUT 480 V 3 PHASE 3 WIRE 50 / 60 HZ.



OUTPUT 480Y/277V 3 PHASE 4 WIRE 50 / 60 HZ.

AUTO ZIG - ZAG

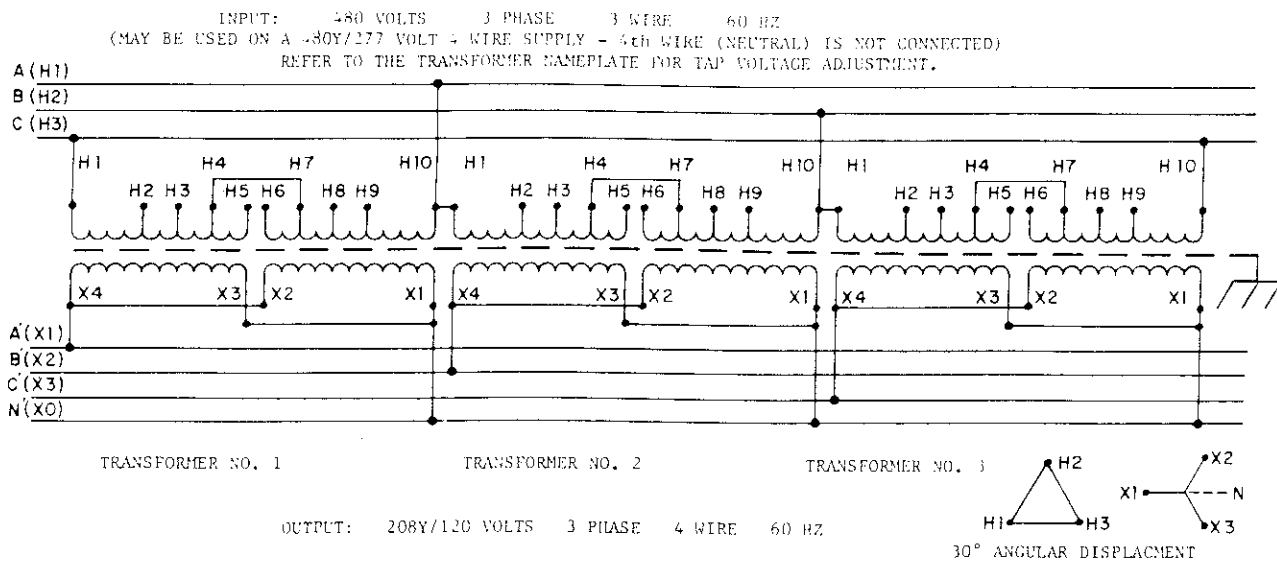
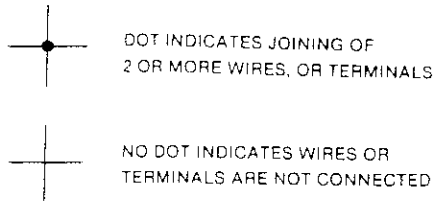


THIS IS AN AUTO TRANSFORMER CONNECTION

Connection diagram for using 3 pieces of 1 phase, 60 cycle transformers connected zig-zag auto for developing a neutral (4th wire) from a 3 phase, 3 wire supply. For installation information, see National Electrical Code Article 450-4.

Catalog No.	Nameplate KVA Per Transformer	Number of Trans. Req'd.	Max. Continuous Load (KVA) Per Phase (277 Volts)	Max. Continuous Amp Load Per Phase (277 Volts)
T-2-53515-3S	7.5	3	26	91.5
T-2-53516-3S	10	3	34.6	125
T-2-53517-3S	15	3	52	187.5
T-2-53518-3S	25	3	86.5	312

## LEGEND FOR INTERPRETATION OF CONNECTION DIAGRAMS



Catalog No.	Nameplate KVA Per Transformer	Number of Trans. Req'd.	3 Phase KVA	Full Load	
				3 Phase Amps @ 208V	480V
T-2-53515-3S	7.5	3	22.5	62	27
T-2-53516-3S	10	3	30.0	83	36
T-2-53517-3S	15	3	45.0	124	54
T-2-53518-3S	25	3	75.0	208	90

NOTE: INPUTS AND OUTPUTS MAY BE REVERSED; KVA CAPACITY REMAINS CONSTANT.



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## **Appendix F**

### **Logsheets**



