

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.

## Installation, Operation and Basic Maintenance Instructions

### Description

The Powerex WhisperAir™ Rotary Tooth Compressor System is an enclosed two-stage air-cooled oil-free rotary tooth air compressor. A touch panel control is installed on the compressor enclosure.

### Air Flow

Air drawn in through intake filter (IF) and intake throttle valve (IV) is compressed in the low-pressure air end and is discharged to the intercooler (CI). Air, cooled in the intercooler (CI), is discharged to the drain separator for intercooler (DS1), removing the condensate water, and is compressed in the high-pressure air end (Eh). Then, the compressed air passes through the pulsation damper (PD) and flows into aftercooler (Ca). Air, cooled in the aftercooler (Ca), is then discharged to the drain separator for aftercooler (DS2), removing the water and is delivered to the air outlet.

The water, separated by the drain separators (DS1/DS2), will be discharged through electronic drain valves (EV1/EV2). When the compressor switches to unload operation, the air trapped in the pulsation damper (PD) and the high-pressure air end (Eh) is blown off through unload silencer (US). The check valve (CV) is installed downstream of pulsation damper (PD) to prevent compressed air blows back into the compressor during unloaded operation.

For PCCMD models, the intake air is configured for connection to the facility remote intake piping.

### Oil Flow

Oil is circulated by oil pump (OP). Oil flows from oil tank (GC), through oil cooler (Co) and oil filter (OF), to bearings and the gears. When the oil pressure reaches a given value, by-pass valve is opened to decrease the pressure.

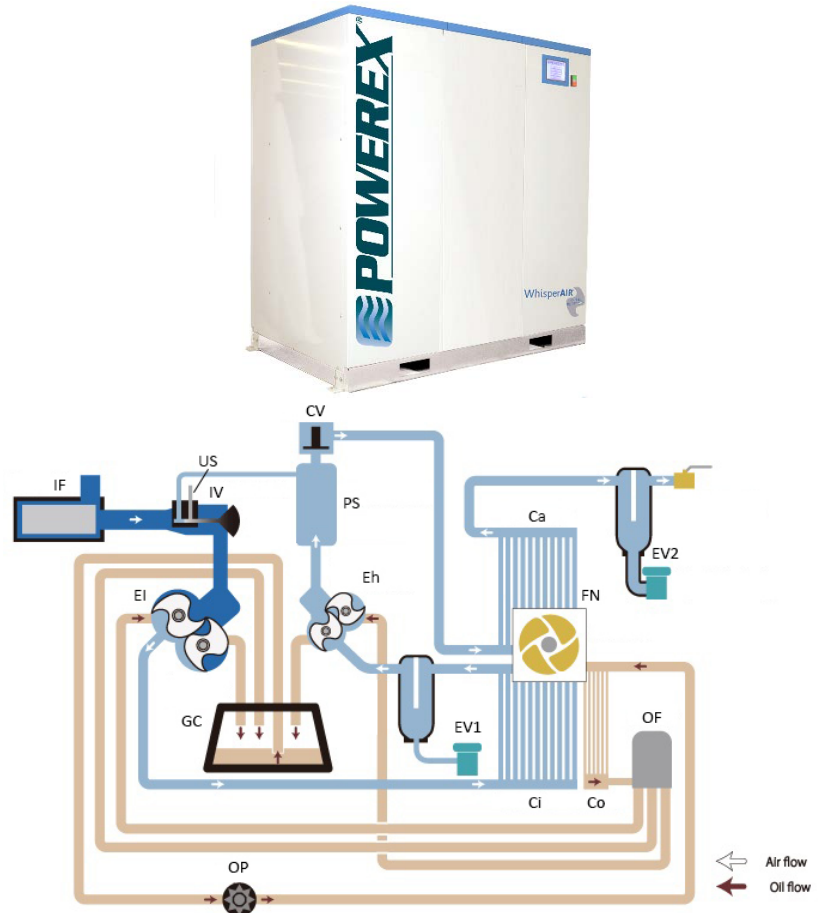


Diagram 1: Air Flow and Oil Flow

Symbol	Name	Symbol	Name
IF	Intake filter	Co	Oil cooler
US	Unload silencer	OF	Oil filter
IV	Intake valve	FN	Cooling fan
EI	Air end (low pressure)	PS	Pulsation damper
CI	Intercooler	CV	Check valve
EV1	Electronic drain valve	Ca	Aftercooler
Eh	Air end (high pressure)	EV2	Electronic drain valve (for aftercooler)
OP	Oil pump	DS1	Drain separator (combined with EV1)
GC	Oil tank (gear case)	DS2	Drain separator (combined with EV2)

## Cooling System

The compressor is equipped with an intercooler (Ci), aftercooler (Ca), and oil cooler (Co) to cool down the compressed air and oil. Cooling fan (FN) generates the cooling air.

## Load Operation

When the pressure drops down to the load setting pressure, the solenoid valve is opened, and air is supplied to intake valve (IV) through pulsation damper (PD). When the air reaches intake valve (IV), the valve is opened and the compressor starts load operation.

## Unload Operation

When the demand for compressed air is satisfied and reaches the unload setting pressure, the solenoid valve is closed, and air is released to atmosphere through unload silencer (US). When intake valve (IV) is closed, the compressor switches to unload operation.

## VFD Model operation:

At low system pressures the VFD control increases the main motor speed to 106% of nominal in order to increase air output. Because of the lower pressure, motor load is acceptable at this speed.

When the demand for compressed air is low and system pressure rises near to the final pressure, the VFD control slows down the motor to reduce air output. If the air output can match the system demand the control will seek to maintain pressure at a balance point between supply and demand. Speed can be reduced to 40% of nominal. If demand is lower than this, the system pressure will continue to rise and the unload control will take over. Speed is maintained at 40% while unloaded. When demand returns, the control will increase speed and reload the compressor. If the unit remains unloaded, an automatic shutdown will occur after 7 minutes of total run time. The system will automatically restart when pressure drops. The VFD reduces wear on the intake valve parts, reduces power consumption when demand is less than 100% and reduces the undesirable electrical supply system effects of starting and stopping the main motor.

## Safety Guidelines

**A SEPARATE SAFETY BOOKLET IS PROVIDED ALONG WITH THIS MANUAL. READ AND UNDERSTAND THE SAFETY BOOKLET.** This manual contains information that is very important to know and understand. This information is provided for SAFETY and to PREVENT EQUIPMENT PROBLEMS. To help recognize this information, observe the following symbols. MAKE SURE EVERYONE OPERATING OR SERVICING THE COMPRESSOR READS AND UNDERSTANDS ALL THE INFORMATION PROVIDED. The operator must install equipment in a safe location and is responsible for following all related local work safety requirements and regulations.

**⚠ DANGER** *Danger indicates an imminently hazardous situation which, if not avoided, WILL result in death or injury.*

**⚠ WARNING** *Warning indicates a potentially hazardous situation which, if not avoided, COULD result in death or serious injury.*

**⚠ CAUTION** *Caution indicates a potentially hazardous situation which, if not avoided, MAY result in minor or moderate injury.*

**NOTICE** *Notice indicates important information which, if not followed, may cause damage to equipment.*

Powerex shall not be responsible for any damage or injury caused by inappropriate operation, or from not following the instruction manual.

**Model Description**

<b>P C C</b>		<b>M D</b>		<b>5 0</b>		<b>0 7</b>		<b>4</b>		<b>K</b>		<b>2</b>		<b>A J</b>		<b>HP</b>	
Powerex WhisperAir Rotary Tooth Compressor				50 HP main motor		Enclosed Standard System		Voltage 4 – 460 3 – 230 2 – 208						Fully Assembled and Tested by Powerex			
	Configured for Use in Medical Air Systems – NFPA 99 compliant								Control K – Load/Unload R – VFD Operation			Automatic Condensate Drains					Configured for High Pressure Operation – Up to 140psig

**Specifications for Standard System**

Type		Unit	Model PCC500	
<b>Main Body</b>	No. of Compression Stages	–	2	
	Rotating Speed Fixed speed version	RPM	6950	
	Speed adjusting range VFD mode	–	105% at pressures below 100 psig, 100% to target setting, psig, decreasing to 40% at max pressure	
<b>Unit</b>	Suction gases, pressure, temperature	–	Air/Atmospheric Pressure 35-104°F	
	Discharge pressure	PSIG	109	
	F.A.D. (Free Air Delivery)	SCFM @ 100 PSIG	204, 209 (VFD)	
	Driving method	–	Direct driven with coupling, step-up gears	
	Control mode	–	Load/Unload with automatic start/stop (Models with R control use VFD operation of Main Drive Motor Only)	
	Working pressure	PSIG	102-109 default setting for Load/Unload 105 default target pressure for VFD	
	Cooling method	–	Radiator + cooling fan air-cooled	
	Discharge air temperature	°F	Inlet temperature +22°F	
	Air outlet connection	NPT	1-1/2" F	
	Oil volume	Quarts	27	
	Oil Type	–	ISO32 PAO Synthetic gear oil ISEL2015-32	
	Noise level	dB(A)	68	
	The level of ground vibration	dB	Below 45 (the front side of the air compressor, above concrete)	
<b>Electrical Equipment</b>	Power supply	–	Three-phase AC rated voltage ±10% 60 Hz	
	Starting method	–	Electromagnetic Star Delta starter or VFD	
	Compressor motor	Specification	–	Horizontal shaft, D-flange, 3 phase, totally enclosed fan cooled, 2-pole, type F insulation, IP55
		Power	HP	50 (Service Factor S.F. 1.25)
	Cooling fan motor	Specification	–	Three-phase, totally enclosed fan cooled, 6-pole, F insulation, IP54
		Power	kW	0.75
	Oil pump motor	Specification	–	Three-phase, totally enclosed fan, 4-pole, B insulation, IP44
Output		kW	0.4	
<b>Protection</b>	Temperature	–	Detected by temperature sensors	
	Overload current, open phase protection	–	Detected thermal overload	
	Low oil pressure	–	Detected by oil pressure sensor	
	Suction filter clogging	–	Detected by negative pressure sensor	
	Over pressurization	–	Safety valve	
<b>Other</b>	Dimensions (compressor only)	in	77"W x 40"D x 65"H	
	Weight (including oil)	lb	2940	

- NOTE:**
1. F.A.D (Free Air Delivery) means the volume of atmospheric air that can be taken in by the compressor at inlet conditions of atmospheric pressure. Equal to SCFM if inlet condition is standard.
  2. Noise level is measured at the distance of 1.5m from the front of a compressor and at the height of 1m from ground.
  3. Service factor means the allowable limit of the air compressor motor.

**Specifications for High Pressure System**

Type		Unit	Model PCC500HP	
<b>Main Body</b>	No. of Compression Stages	–	2	
	Rotating Speed Fixed speed version	RPM	6320	
	Speed adjusting range VFD mode	–	105% at pressures below 116 psig, 100% to target setting, psig, decreasing to 40% at max pressure	
<b>Unit</b>	Suction gases, pressure, temperature	–	Air/Atmospheric Pressure 36 F to 104°F	
	Discharge pressure	PSIG	125	
	F.A.D. (Free Air Delivery)	SCFM @ 100 PSIG	179, 183 (VFD)	
	Driving method	–	Direct driven with coupling, step-up gears	
	Control mode	–	Load/Unload with automatic start/stop (Models with R control use VFD operation of Main Drive Motor Only)	
	Working pressure	PSIG	118-125 default setting for Load – unload 121 default target pressure for VFD	
	Cooling method	–	Radiator + cooling fan air-cooled	
	Discharge air temperature	°F	Inlet temperature +22°F	
	Air outlet connection	NPT	1-1/2" F	
	Oil volume	Quarts	27	
	Oil Type	–	ISO32 PAO Synthetic gear oil ISEL2015-32	
	Noise level	dB(A)	68	
	The level of ground vibration	dB	Below 45 (the front side of the air compressor, above concrete)	
<b>Electrical Equipment</b>	Power supply	–	Three-phase AC rated voltage ±10% 60 Hz	
	Starting method	–	Electromagnetic Star Delta starter or VFD	
	Compressor motor	Specification	–	Horizontal shaft, D-flange, 3 phase, totally enclosed fan cooled, 2-pole, type F insulation, IP55
		Power	HP	50 (Service Factor S.F. 1.25)
	Cooling fan motor	Specification	–	Three-phase, totally enclosed fan cooled, 6-pole, F insulation, IP54
		Power	kW	0.75
	Oil pump motor	Specification	–	Three-phase, totally enclosed fan, 4-pole, B insulation, IP44
Output		kW	0.4	
<b>Protection</b>	Temperature	–	Detected by temperature sensors	
	Overload current, open phase protection	–	Detected by thermal overload	
	Low oil pressure	–	Detected by oil pressure sensor	
	Suction filter clogging	–	Detected by negative pressure sensor	
	Over pressurization	–	Safety valve	
<b>Other</b>	Dimensions (compressor only)	in	77"W x 40"D x 65"H	
	Weight (including oil)	lb	2940	

- NOTE:**
1. F.A.D (Free Air Delivery) means the volume of atmospheric air that can be taken in by the compressor at inlet conditions of atmospheric pressure. Equal to SCFM if inlet condition is standard.
  2. Noise level is measured at the distance of 1.5m from the front of a compressor and at the height of 1m from ground.
  3. Service factor means the allowable limit of the air compressor motor.

**NOTICE**

*For maximum reliability  
and life follow the*

*recommendations below:*

1. Do not install this unit outside. It is intended for indoor installation and operation protected from the effects of weather, Moisture may damage the equipment and may create hazards.
2. Install the unit where it safe from mechanical damage. Install it on a solid, level floor. (Isolation pads may be used, but may not be needed as the unit has all internal moving parts isolated already)
3. Install the unit on an electrical supply system that has the correct voltage and sufficient capacity to operate the motor loads. Make sure the supply is protected from power surges or spikes and that the voltage does not drop more than 10% below the nominal value.
4. Make sure the unit is grounded. Improper grounding can create a risk of electrical shock and may cause erratic operation of the unit controls.
5. Install the compressor unit where it can intake cool, clean air. Do not use this machine for compressing any gas other than air, or in an environment where there are corrosive gasses or liquid mists of any kind. Compressing flammable gasses may result in explosion and death or injury and damage the unit. Avoid dusty areas. The system intake filter will become loaded quickly in dusty conditions and will need to be changed frequently, and the dust will reduce the ability of the internal heat exchangers to function as desired.
6. Make sure the electrical supply is configured and installed according to national and local codes and has local service disconnect that can be easily accessed and operated when maintenance must be performed. The Powerex unit does not include a built in power disconnect.
7. Do not use this compressor as-is to provide breathing air (get the rest of this warning from other manuals).
8. Make sure the environment around this compressor is controlled to prevent operating in temperatures below 35°F (freezing will damage the unit). Also make sure that the environment has sufficient cooling to keep the temperature below 104°F under worst case conditions. Ambient temperatures higher than 90°F will reduce service life and may require more frequent than normal maintenance.
9. Avoid operating the unit for extended time with the panels off or access doors open.
10. Do not modify or alter the structure or electrical circuit. Do not install any components that are not approved by Powerex.
11. Make sure the condensate output ports are connected to suitable collection and disposal source. The unit has an oil lubricated gearbox that will generate a small amount of oil vapor under normal conditions and the condensate water may need to be treated before it is disposed of. Follow all national and local regulations for managing the condensate. Do not restrict the condensate output lines. Having condensate lines discharge into storage containers with the outlet of the line submerged will restrict the flow and may interfere in their proper operation.
12. Make sure there is adequate space and accessibility to perform required maintenance.
13. The compressor will shut down if there is a Power failure unless the Automatic Restart is engaged using the control panel. If a shutdown does occur follow the restart procedure.

### Unpacking

Immediately upon receipt of the air system, inspect for any damage which may have occurred during shipment. Repair or replace damaged items before use. The name-plate should be checked to verify the correct model and voltage.

**⚠ WARNING** *Do not operate unit if damaged during shipping, handling or use. Damage may result in bursting and cause injury or property damage.*

### Product Check List

1. Check the model name, serial number, and frequency of the compressor. Verify the information matches the order and the Powerex supply list.
2. Check the equipment for deformity or damage that may have happened during transportation.
3. Check that all the following items have been included with the compressor:
  - a. Instruction Manual – 1
  - b. Air outlet valve – 1
  - c. Panel key – 2

### Moving and Lifting

**⚠ CAUTION** *Do not lift or move unit without appropriately rated equipment. Be sure the unit is securely attached to lifting device used.*

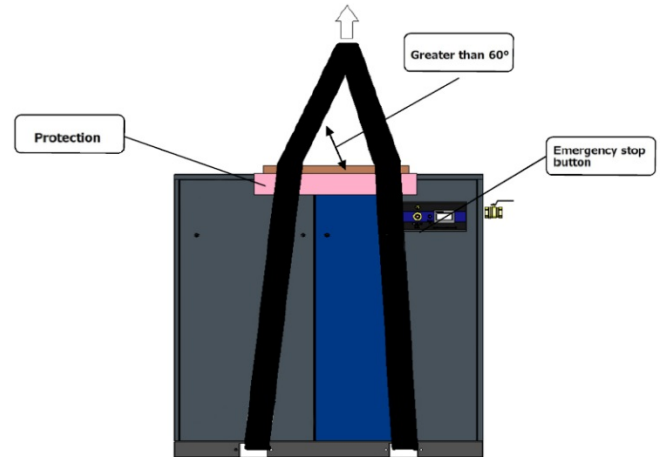
#### Moving with a forklift:

- Before moving the compressor, remove the front and the back panels and insert forks in the slots.
- Make sure that the forks protrude from the other side of the frame.



#### Lifting with a lifting device:

- As shown below, lift the compressor using forklift slots and sling belt.



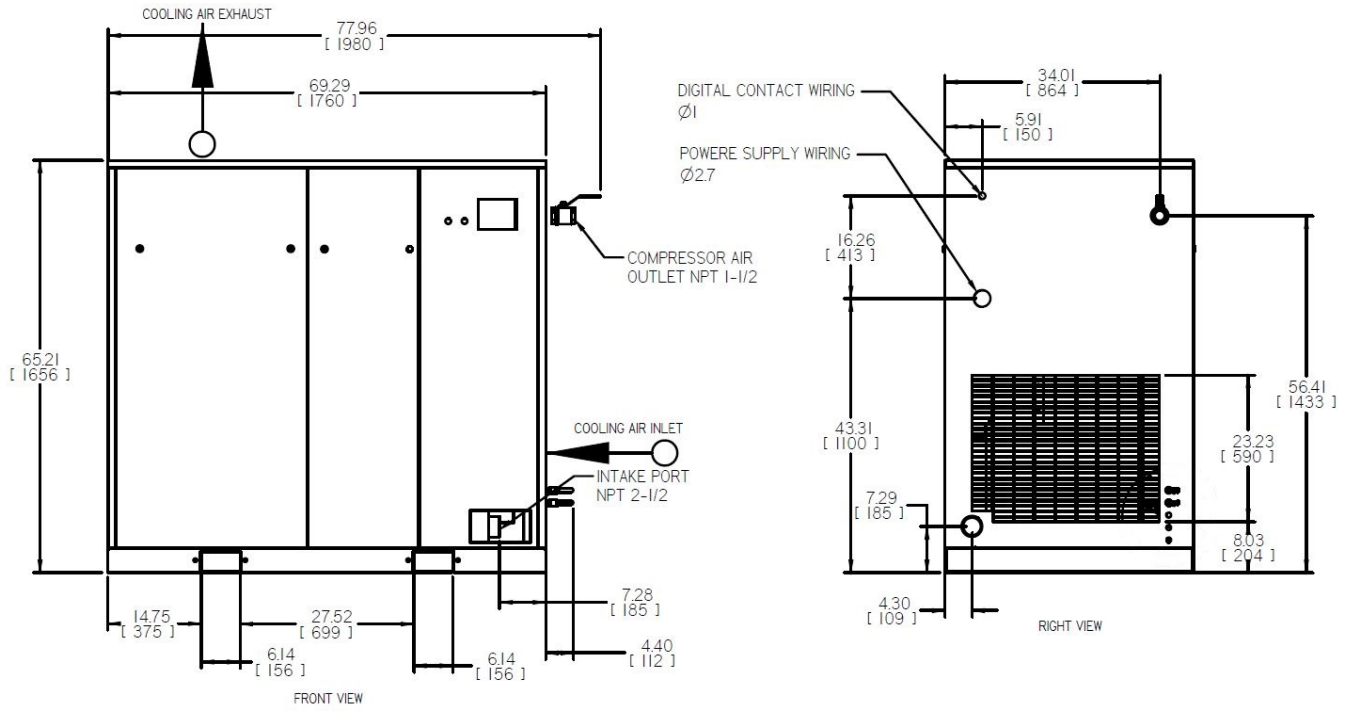
**NOTICE** *When lifting the compressor, use protection in order to avoid any damage on the compressor.*

**⚠ WARNING** *Make sure the sling belt is strong enough to handle the weight of the compressor. When lifting, the lifting device must hold the compressor perpendicularly. Make sure to keep the balance at all times.*

*Refer to the dimension drawing on the next page for the center of gravity of the compressor.*

*If the sling belt is not strong enough to handle the weight of the compressor when moving or lifting, the compressor may fall onto the ground, causing serious injuries or serious damages to the compressor.*

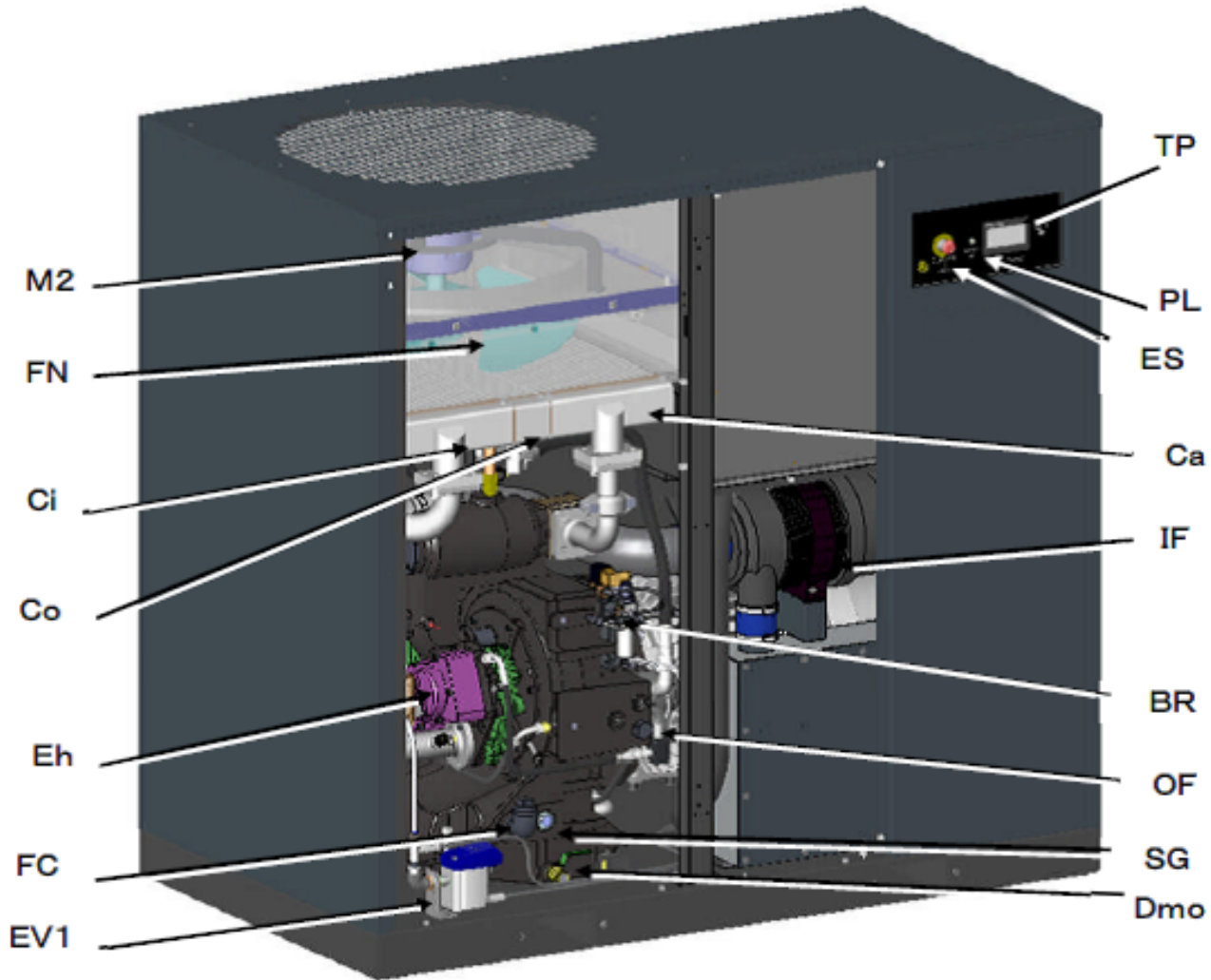
### Dimension Drawing





**Identification of Major Components:**

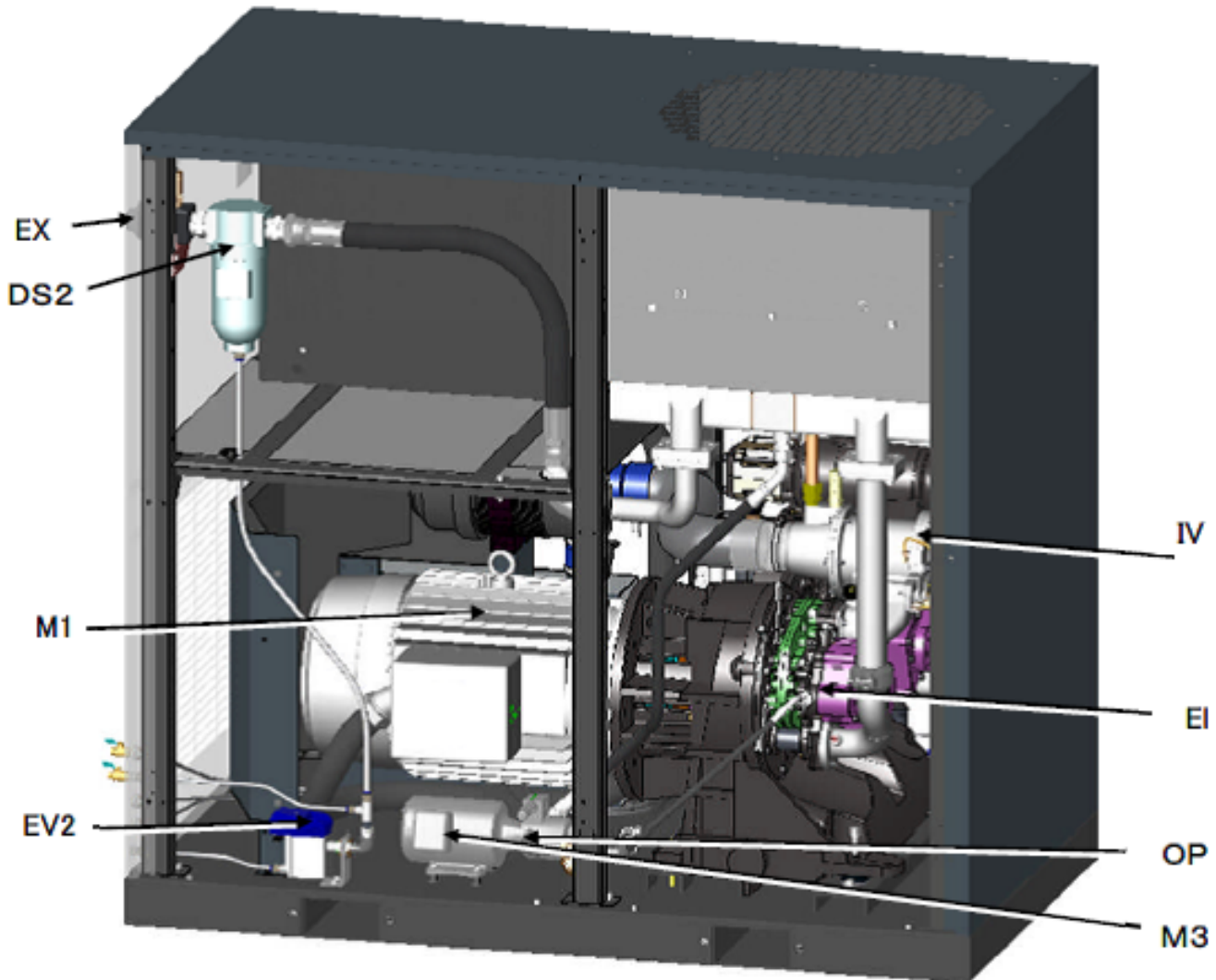
*Internal components front view*



**Front**

FN	Cooling fan	SG	Oil gauge
M2	Cooling fan motor	OF	Oil filter
Ci	Intercooler	BR	Oil mist catcher
Co	Oil cooler	IF	Intake filter
Eh	Compressor air end (High pressure)	Ca	Aftercooler
FC	Oil refilling port	ES	Emergency stop button
EV1	Electromagnetic drain valve (intercooler side)	PL	Power lamp
Dmo	Oil drain valve	TP	Touch panel

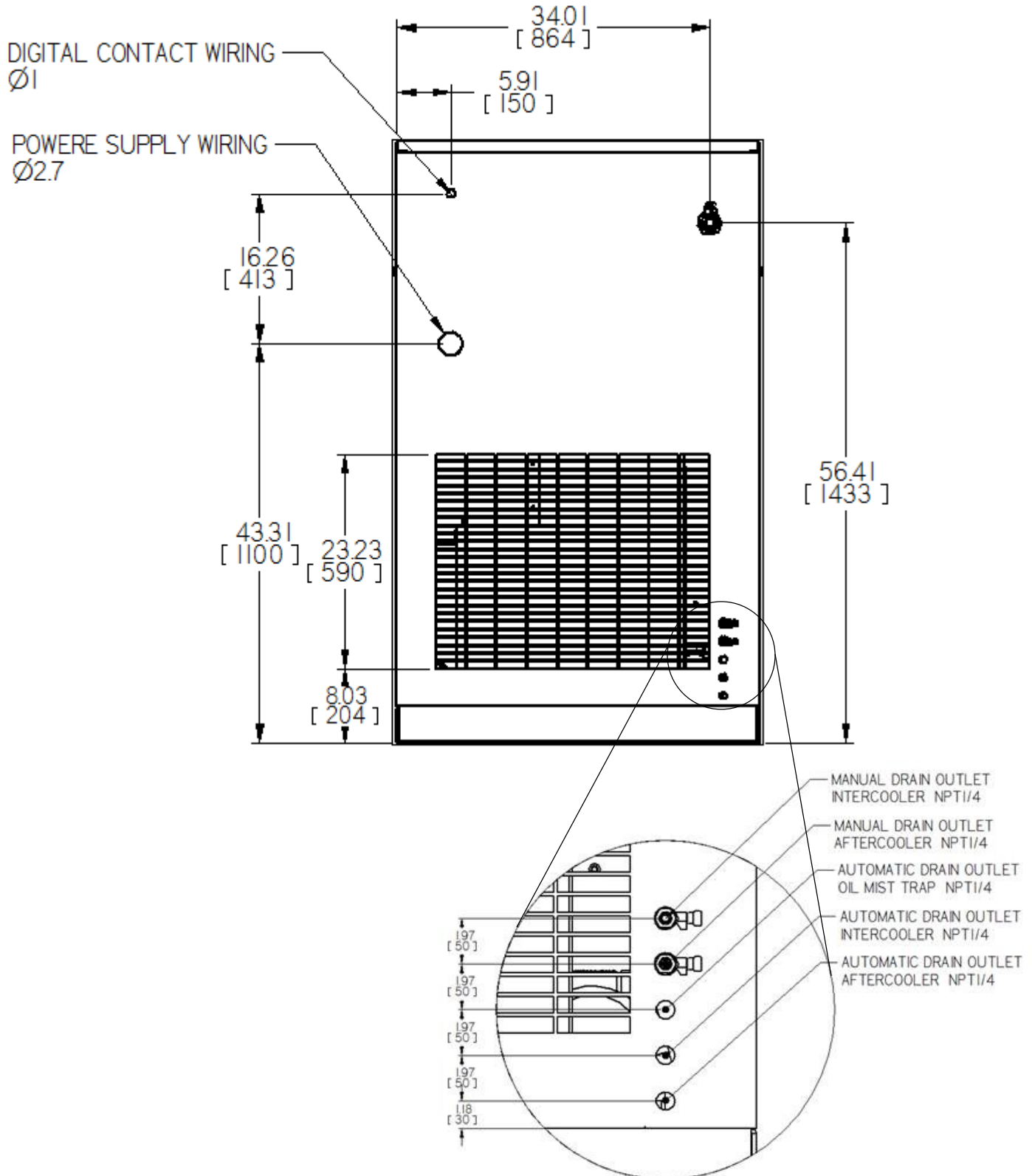
Internal components rear view:



Back

EX	Air outlet connection	M3	Oil pump motor
M1	Air compressor motor	EI	Compressor air end (Low pressure)
EV2	Electronic drain valve (For aftercooler)	IV	Inlet throttle valve
OP	Oil pump	DS2	Drain separator (For aftercooler)

**Details of Outlet Ports:**



## Installation

1. Do not install outside.
2. The compressor system must be located in a clean, well lit and well-ventilated area.
3. The area should be free of excessive dust, toxic or flammable gases and moisture.
4. Never install the system where the surrounding temperature is higher than 104°F or where humidity is high.
5. Clearance must allow for safe, effective inspection and maintenance.
6. Install the compressor on a level floor. If necessary, use metal shims or leveling pads to level the system. Never use wood to shim the unit. Unlevel floor may cause vibration, noise, or failure of the compressor.
7. Do not block the air compressor intake or exhaust grating.

**NOTE:** Minimum of 36 in. of clearance is recommended on all sides. Minimum recommended distance between the top of the compressor and the ceiling is 48 in.

## Piping

1. The drain pipes, from five drain outlets on the right side of the compressor, to the drain collector, must not be restricted. Do not allow the pipe outlet to extend into the accumulated water in whatever container is used.

**⚠ WARNING** *Discharged drain may contain oil. Condensate disposal methods must account for conditions where some oil mist from the gearbox ventilation system is contained in the condensate.*

2. When determining the diameter and the length of compressed air outlet pipes, consider the pressure drop and allow for the possible expansion of piping network in the future. Avoid sharp bends. Keep pressure drop to less than 1.5 psi. Refer to pipe sizing charts as needed.

3. When installing branch pipes, make sure the pipes are connected to the top side of the main pipes in order not to let condensation water in the branch pipes.
4. The main pipe shall have about 1/100 downward slope away from the compressor to the end. When encountering a U-shaped bend in piping and rising piping, be sure to install a drip leg and drain valve at the bottom.
5. Install the air receiver after setting up the compressor. Do not place check valves or filters, other than water separators, between the compressor and the air receiver.
6. If you install an air dryer, install it after the air receiver.

## **NOTICE**

*As the compressor is regulated by load/unload system, always install an air receiver.*

*Using an undersized air receiver will increase the use of electricity and will decrease the product life. The minimum size requirement of air receiver is **240 gal** for model PCC500.*

*For the pipe connection of the compressor, the flange or union connection is recommended for easier maintenance. When connecting outlet pipes to the compressor use a union to facilitate maintenance in the future. An isolation valve may be installed, make sure it is open when the compressor is in use. Do not install a check valve between the compressor unit and the air receiver/tank.*

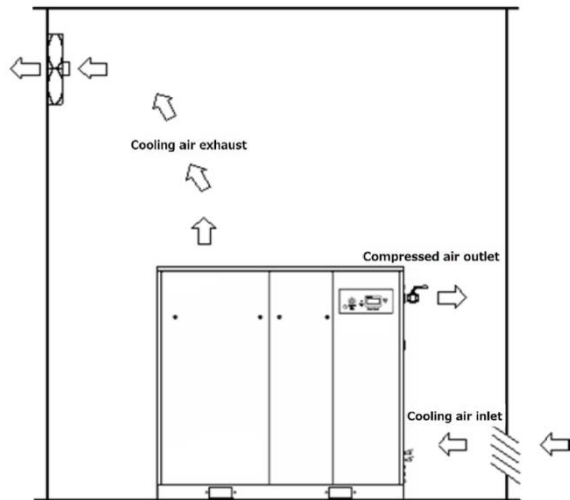
### Ventilation

1. Installation area of the compressor must be ventilated at all time for efficient operation.

### NOTICE

While operating the compressor, ventilate the workplace to maintain the temperature in the range of 35-104°F. Operating the compressor with ambient temperature above 104°F will damage the compressor and will cause shut down of the equipment. Temperatures above 90°F decrease the product. Cooler temperatures increase operating efficiency, decrease the product reliability, and requires reduced maintenance intervals.

2. For general ventilation, as in the figure below, the minimum amount of ventilation required to prevent temperature rise is 16,500cfm for model PCC500.

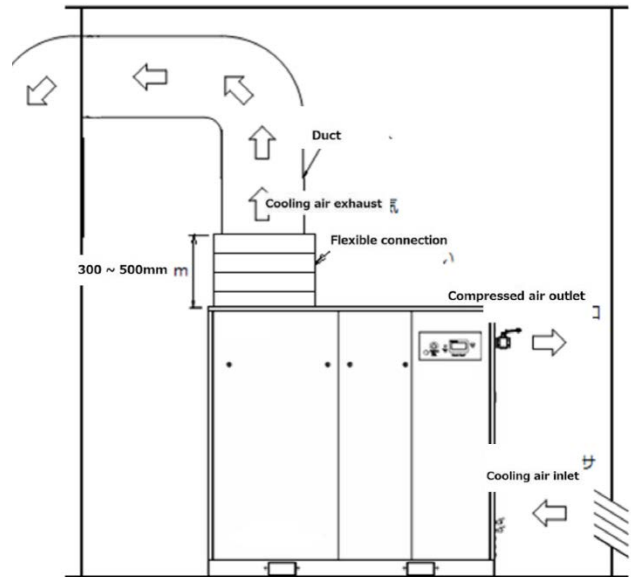


3. When installing ventilation fans, consider the positions of cooling air inlet and cooling air outlet. Inappropriate installation of fans will disturb the air circulation in the workplace and may affect performance of the compressor.
4. The ventilation air speed at cooling air inlet must be slower than 980 ft/min.

Local ventilation A (auxiliary duct with no fan)

A duct only, without a fan may be utilized to channel warmed cooling airflow out of the

compressor room if the duct backpressure is below

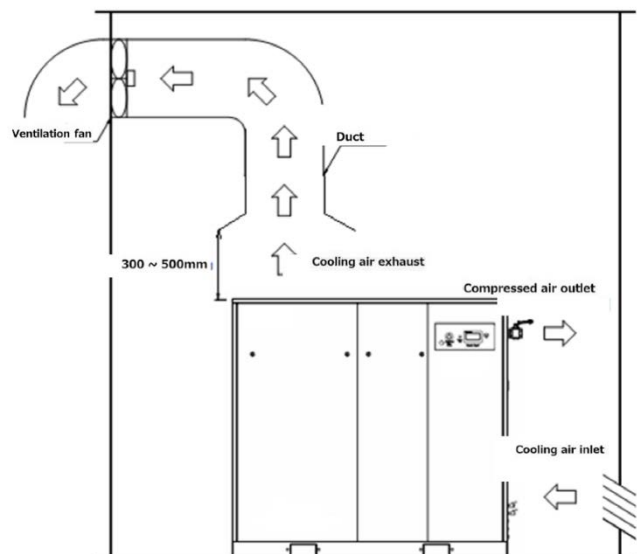


0.11 inches WC. At a flow of 4240 scfm.

### NOTICE

In order to facilitate maintenance and repair, a flexible connection must be installed that is removable at your convenience, as shown above. Make sure that duct weight is completely supported by the wall or ceiling, not by the compressor enclosure.

5. For local ventilation B (duct installed with a ventilation fan), refer to the figure below for the details.



- The ventilation air speed at cooling air inlet must be slower than 980 ft/min.
- Minimum volume of ventilation for local ventilation B is 4,240cfm for model PCC500.

**NOTICE**

*As shown in Figures above, when the exhaust fan is installed, make sure to leave 12-20 in. space between the compressor and duct to facilitate maintenance.*

*A flexible connector may be installed if desired. Make sure the duct is supported by the ceiling or wall and not by the compressor enclosure.*

**Wiring**

Internal electrical wiring of the compressor has been completed. Refer to the internal wiring, circuit diagram that is packed into the control panel in the document pocket.

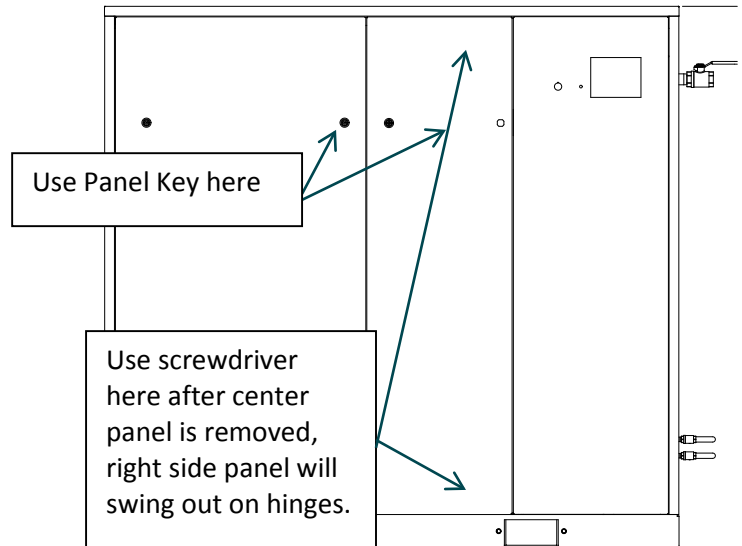
A service disconnect must be installed ahead of the compressor. The service disconnect may be a circuit breaker.

**⚠ WARNING**

**RISK OF ELECTRICAL SHOCK.** Lock out and tag out all sources of energy before servicing.

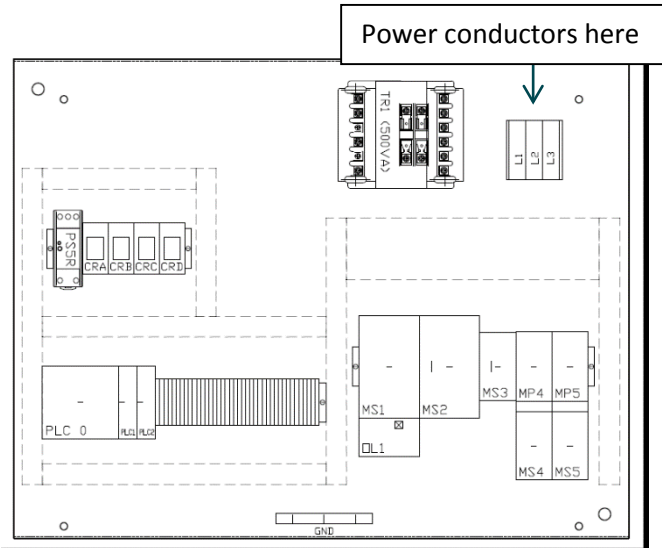
*Wiring must be performed by a specialist in accordance with national and local electric regulations. Inappropriate wiring may cause electric shock or fire, and may decrease the product life or cause failure of the compressor.*

- Open each panel as shown in the figure below.



- Connect the power cable (L1, L2, L3) to the terminal block.

3. Connect the ground wire to the ground terminal as shown in the figure below – 1 X 3.



### NOTICE

*Input power and ground connection for VFD models are similar, panel layout will vary.*

### WARNING

*Grounding resistance must be no more than 100Ω. Inadequate grounding may cause malfunction of the compressor and decrease the product life.*

### Remote Signals and Remote Monitoring

The Remote Control feature is enabled from the touch screen. Activating this feature allows an external contact closure to turn the unit on, open contacts turn the unit off.

For remote control signals and remote monitoring, connect appropriate wiring to the designated terminals in the control box.

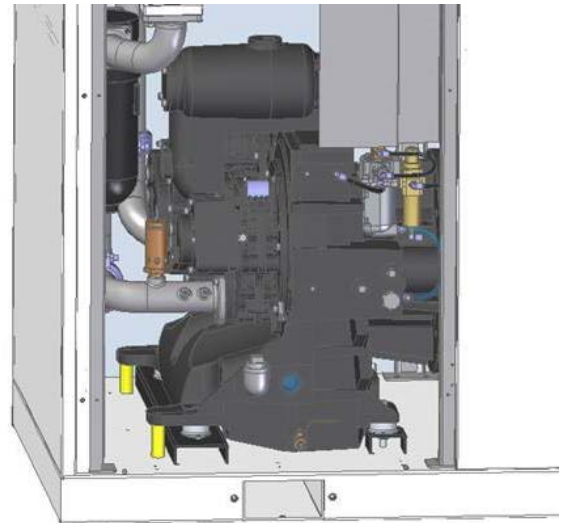
Refer to the circuit diagram for detailed information and terminal numbers.

Alarm Signals: Terminals on the terminal strip provide external alarm connection points as indicated on the wiring diagram.

### Commissioning

#### Preparation

1. Open the center front panel and the back panels.
2. Unscrew the yellow bolts on the gear case and the motor and remove the shipping supports (yellow) – (4)



3. Check the oil level on the sight glass.
  - a. Appropriate oil level is above the center of oil gauge.
  - b. If the oil level is below the venter of the oil gauge, add oil before performing test operation (Use only Powerex Rotary Tooth compressor gear oil or approved equivalent).
4. Open the control box and make sure all the wires, including the power cable, are connected.
5. Confirm the power supply and voltage of the compressor match and turn on the circuit breaker or service disconnect.  
Close the front panels.
6. Make sure the touch panel display is illuminated.

#### Check the Direction of Rotation

1. Touch “ON” on the switch to start the compressor and touch “OFF” immediately. While the compressor is being stopped, check the direction of rotation to see if it is the same as the direction

marked on the gear box. There is a small window in the casting of the coupling housing between the motor and gearbox to allow viewing of the rotating parts.

2. If the compressor operates in the opposite direction, the air compressor will stop due to the low oil pressure. At this time, alarm message will appear.
3. The oil pump motor and cooling fan motor are wired at the factory to have the correct rotation when the main motor is correct. You can check the fan motor rotation by confirming that airflow is upward from the top of the unit. If the oil pump rotation is incorrect the pump will not generate any oil pressure.
4. After correct rotation is confirmed, close the back panels.

### **Starting**

1. Open the compressed air outlet valve at the outlet fitting. If possible open the outlet valves from the receiver tank as well so the unit can start without any compression load.
2. Close the manual drain valves (manual drain outlet).
3. Push “ON” on the switch. On the touch panel, push the “STATUS” button. As the compressor starts running, the operation indicator on the lower right will illuminate.

### **During Operation**

1. Close the air outlet valves at the exit of the receiver tank slowly. Check the display of touch panel to see if the outlet pressure rises.
2. When outlet pressure reaches unloading pressure, the compressor will be automatically switched to unloaded operation. After the compressor runs in unloaded operation for a total run time of 7 minutes the compressor will automatically stop. Check the status of the compressor by touching “STATUS” on the touch panel.
3. Open the air outlet valve slowly. Check the display of the touch panel to confirm the outlet pressure decreases.

4. When outlet pressure drops to the loading pressure, the compressor will be automatically switched to loaded operation. If the compressor stopped automatically, it will automatically restart.
5. For VFD modes the operating sequence is similar, except that as the pressure increase to be near to the unload pressure, the main motor is slowed down. When pressure decreases the main motor speed is increased. The minimum motor speed is 40% of nominal and if the pressure continues to rise under this condition, the unload operation will take over. If the machine remains unloaded an automatic shutdown will occur.
6. Operate the compressor in loaded operation for an hour and check if there is any unusual noise, vibration, or oil leakage.
7. If problems are detected, shut down the unit and make corrections.

### **Stopping**

1. Push “OFF” on the control panel switch. As the compressor is being stopped, a message will be displayed on the touch panel. If the compressor was in loaded mode when the OFF button was pushed, the control will force an unload condition. The unit will run 30 seconds unloaded before stopping.
2. After the compressor is completely stopped, disconnect the circuit breaker.
3. Open the manual drain valve, and empty condensate remaining in the separator.

### **Operation**

#### **Before Operation**

1. Open the front panel and check the oil level. Appropriate oil level is above the center of the oil gauge. If the oil level is below the center of oil gauge, add oil before operation.
2. Open the air outlet valves.
3. Close the manual drain valves (manual drain port).
4. Close the front panel.



### Starting

1. Switch the power supply on. Check that the touch panel is illuminated.
2. Push “ON” on the switch and select “STATUS” on the touch panel. As the compressor starts running, the operation indicator lights up. The compressor switches from Star operation to Delta operation 10 seconds after the start-up. Two seconds after Delta operation, the compressor switches to loaded operation.

Components	Function
Emergency Stop button	Press the button to stop the compressor immediately
Power lamp (combined with the ON-OFF switch)	The lamp lights up when the compressor has been turned ON
Touch panel	Touch the screen to operate or to manage the compressor

### During Operation

1. Regularly check the status of the compressor by touching “STATUS” on the touch panel. Refer to the controls section for more information.
2. The touch panel will provide warnings or shut down the unit if necessary. The display will indicate the reason if a shutdown occurs.

### Minimum Stop Time

Frequent starting and stopping can damage the main motor. The control is programmed to prevent stopping at short intervals. If necessary, using the Emergency Stop will override the program settings. **DO NOT USE EMERGENCY STOP UNLESS NEEDED.**

### Stopping

1. Push “OFF” on the control panel switch. As the compressor is being stopped, a message will be displayed on the touch panel. If the compressor was in loaded mode when the OFF button was pushed, the control will force an unload condition. The unit will run 30 seconds unloaded before stopping.
2. Open the manual drain valve, empty the drain remained in the separator.

3. Close the air outlet valves and disconnect the circuit breaker.

### Removal

At the end of service life of the compressor, perform the following procedures:

1. Stop the compressor and close the air outlet valves.
2. Disconnect the circuit breaker and then remove the wires.
3. Discharge the pressure in pipes connected to air outlet valves.
4. Remove the pipes.
5. Drain the oil.
6. Remove the compressor.

### Control Panel

#### Components

#### Automatic Control

Depending on air consumption, the control panel automatically switches load / unload operation within the range of pressure setting. In order to reduce the power consumption, the control panel stops the compressor whenever possible to reduce the power consumption and restarts it automatically when the pressure drops to setting pressure. If the time of unload operation is too short, the compressor will continue to run unload operation without stopping.

On VFD models, the control will automatically slow down the main motor to reduce compressed air delivery as pressure rises near the unloading set point. If pressure drops the control will speed up the motor again. This operating mode minimizes the power use associated with operating at higher line pressure than needed and reduces the unloaded run time (which is consuming power but making compressed air) and reduces the total number of starts and stops.

#### Compressor Protection

The control panel will stop the compressor if necessary. Refer to the table on the next page for the list of conditions that may affect the compressor. In case of “Caution”, messages will be displayed on the

touch panel. In case of “Emergency stop”, alarm conditions will be displayed on the touch panel.

#### **Pressure Bands**

The control panel provides the function that can change the pressure band of the compressor.

#### **Remote Control**

Remote control is the function that you can start/stop the compressor remotely. The setting of the compressor needs to be changed in order to activate the function. Use the SET UP menu.

#### **Automatic Restart after Voltage Failure**

Automatic restart is the function that automatically restarts the compressor after the voltage is restored. This function is disabled at the initial set-up. If you wish to enable this function, contact a local Powerex distributor.

### Compressor Protection

Signs	Conditions	Status	Touch Panel
Emergency Stop conditions	Outlet temperature of low pressure/high pressure air end or inlet temperature of high pressure air end rises above the emergency value set-up	Stop	Sign displayed
	Oil pressure decreases below the set-up value		
	Motor is overloaded with the emergency value set-up		
	Outlet temperature sensor of low pressure/high pressure air end or inlet temperature sensor of high pressure air end malfunctions		
	Inlet pressure of high pressure air end malfunctions		
	Outlet pressure sensor of the compressor malfunctions		
	Oil pressure sensor malfunctions		
	Protection device is activated by overload of cooling fan motor or oil pump motor		
Emergency stop button is pressed			
Caution Conditions	Outlet temperature of low pressure/high pressure air end or inlet temperature of high pressure air end rises above the caution value set-up	Continue to operate	Sign displayed
	Pressure differential of an air filter is above the caution value set-up		
	Pressure differential sensor of an air filter malfunctions		
	The total operating hours exceed the scheduled maintenance time		

## NOTICE

*For PCCMD models, the fault alarms output contacts are field wired to the system control panel for connection to the facility master alarm system.*

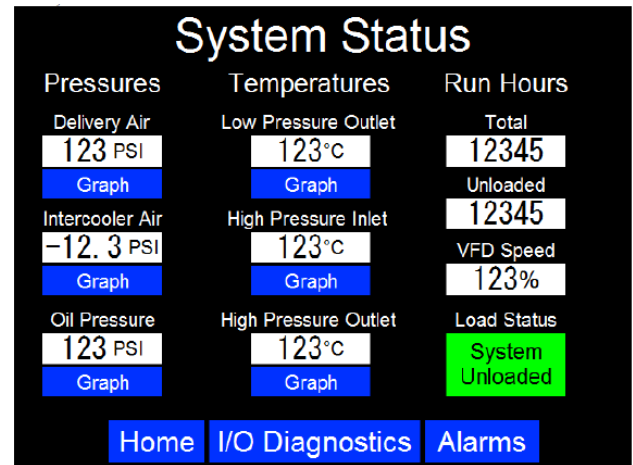
### Control Panel

#### General Description

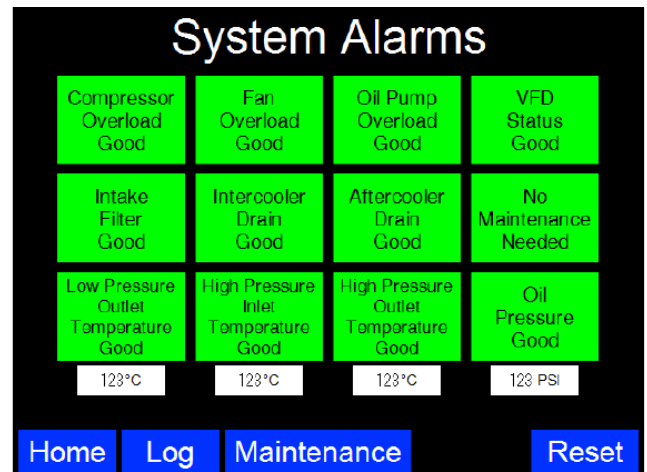
- Everything in blue is a button and can be pushed to execute a function.
- Things in green are indicators and will light up and display messages to signal something has happened.
- Things in white are gauges. The gauges can display historical data graphs.
- The touch panel will open to the HOME screen below.



- The three blue rectangles at the bottom are selection buttons.
- STATUS will lead a display of the operating conditions.
- ALARMS will display a history of Alarms and warnings.
- SETUP will allow changing the operating pressures and enabling REMOTE CONTROL and AUTOMATIC RESTART.



- The SYSTEM STATUS screen shows the condition of pressure and temperature and other operating parameters. At the lower right is the operating indicator that shows whether the unit is loaded, unloaded or off (waiting for an automatic restart)
- The blue rectangles are buttons and can be pressed to access graphs of the various displays and to go to other screens. The I/O DIAGNOSTICS button is useful if troubleshooting an operating control problem.
- The Alarms button takes you to the SYSTEM ALARMS screen.



- The green indicators show what each alarm pane is. The green background color indicates the condition is good. The color will change to red if the alarm is tripped. If an alarm has a yellow background, it indicates the level is near a trip condition.

- The lower four alarm indicators are tied to numerical values and the current value is shown in the white box.
- If an alarm occurs, the touch panel display will automatically bring up the alarm screen. You can navigate away from the alarm screen but the navigation buttons will flash after you do to indicate that an alarm still exists. When the alarm is reset the flashing stops.
- The LOG button brings up a screen with a list of alarm events.

TIME	EVENT
05/26 16:17	COMPRESSOR OVERLOAD TRIP
05/26 16:17	VENT FAN OVERLOAD TRIP
05/26 16:17	OIL PUMP OVERLOAD TRIP
05/26 16:17	LOW PRSR OUTLET TEMP ALARM
05/26 16:17	HI PRSR INLET TEMP ALARM
05/26 16:17	HI PRSR OUTLET TEMP ALARM
05/26 16:17	LOW PRSR OUTLET TEMP ALERT
05/26 16:17	HI PRSR INLET TEMP ALERT
05/26 16:17	HI PRSR OUTLET TEMP ALERT
05/26 16:17	LOW OIL PRESSURE

Back Select Alarm Scroll Up Scroll Down

- You can scroll through the list after pressing SELECT ALARM.
- The Diagnostics screen shows the status of the PLC inputs and outputs. This is normally only used to troubleshoot control problems.

Diagnostics	
Inputs	Outputs
I:0.0 Compressor Overload	Q:0.0 VFD Start / Stop
I:0.1 Cooling Fan Overload	Q:0.1 VFD Fault Reset
I:0.2 Oil Pump Overload	Q:0.2 N/A
I:0.3 Drain Error Intercooler	Q:0.3 Run Mode Light
I:0.4 Drain Error Aftercooler	Q:0.4 System Alarm (NC)
I:0.5 Intake Vacuum Switch	Q:0.5 System Alert (NC)
I:0.6 Emergency Stop	Q:0.6 System Running
I:0.7 VFD Fault	Q:0.7 System Loaded
I:0.10 N/A	Q:0.10 Load / Unload Solenoid
I:0.11 N/A	Q:0.11 Electric Drain Solenoid
I:0.12 N/A	
I:0.13 External Control	
I:0.14 System Stop	
I:0.15 System Run	

Home Status Alarms

- The SYSTEM SETUP screen allows you to customize the operating pressure of your compressor.

### System Setup

For service, call your authorized Powerex distributor:  
 ABCDEFGHIJKLMNOPQRSTUVWXYZ 123-123-1234  
 Tue. 05/26/15 16:17

123 PSI Target Pressure    Manual Unload Off    Auto Restart Off    External Control Off

123 PSI Unload Pressure    On Off    On Off    On Off

Home Screen    Set Time and Date    Adjust Contrast    Sequence of Operation    Reset Maint. Counter

- It also allows selection of the Auto Restart mode and operation by remote control.
- The blue fields are buttons. Touch them to bring up number entry screens for pressure settings or to actuate the ON or OFF function.
- To set your max operating pressure, touch the Unload Pressure button. You can enter the desired value between 57 and 109 psig.

1234567890

7	8	9	CLR
4	5	6	CAN
1	2	3	ENT
0	+/-	.	

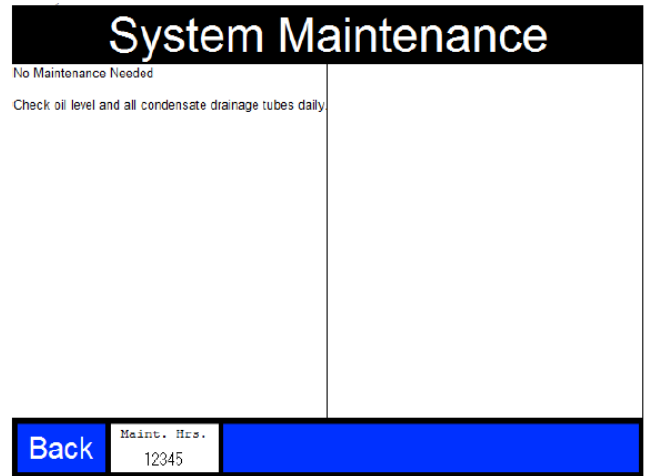
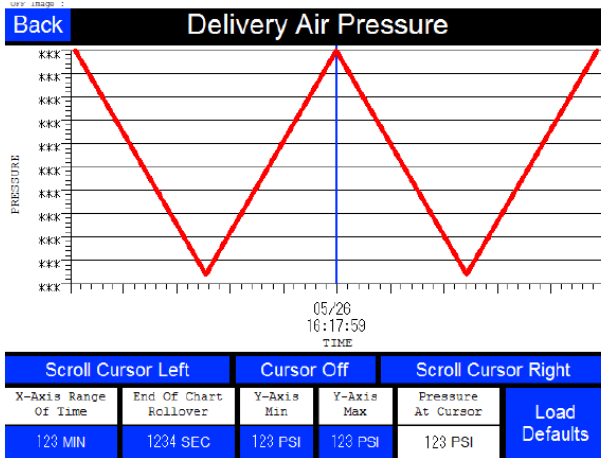
Min: 57    Max: 109  
 Default: 109

- To set your min operating pressure, touch the Load Pressure button. You can enter the desired value between 50 and 102 psig. VFD models have a Target Pressure instead which can be set between 50 and 105 psig.



- Viewing these screens can help you understand how your system is operating. You can use the blue buttons to change the scale and zoom in or out and to move the cursor left and right. The indicator field shows the value at the cursor. Use the LOAD DEFAULTS button to restore the screen to its factory scale conditions.
- The System Maintenance screen will automatically appear when maintenance is due. The screen will give instructions. The maintenance detail is found in the following sections or in the Maintenance Manual available from Powerex.

- On the SYSTEM STATUS screen the graph button under the numerical gauge panels bring up a screen like this:



**Maintenance**

**NOTICE**

*Operating Conditions Affect Maintenance*

Operating the Rotary Tooth Compressor in ambient temperature over 90F for sustained time periods requires reducing the maintenance period by 25%. If ambient temperature is above 100F reduce the maintenance interval by 50%.

**NOTICE**

*Perform Maintenance regularly. Failure to perform maintenance actions may lead to reduced equipment life or damage and may void the warranty.*

In the chart below, items in bold must be performed by a trained Powerex authorized technician. If work is performed by unauthorized persons, the warranty may be void. For other items, maintain records of performing inspections and any actions taken. Failure to document inspections and actions may void warranty.

For items with ●, check, measure or clean; items with ▲, replace to maintain warranty coverage, or to assure future reliability.

**Maintenance Schedule**

Item	Action Needed	Maintenance Intervals (time/hours – whichever comes first)							Remarks
		Every day	Every 6 months or 4000	Every year or 8000	Every 2 years or 16000	Every 3 years or 24,000	Every 4 years or 32,000	Every 5 years or 40,000	
Gear Oil	Check oil level	●							Add oil to keep level above the center of the sight glass
	Perform Oil Change			▲					
Oil Filter	Replace			▲					
Intake Air Filter	Clean Element and housing		●						
	Replace element			▲					
<b>SPM Measurement</b>				●					<b>Consult Powerex if High</b>
Overall Condition	Check alarm log, correct any problems	●							
	Check output pressure and verify unit is unloading/loading and VFD is working if applicable	●							
	Check for oil leaks	●							Repair oil leak if detected
	Clean Inside of enclosure cabinet		●						
Moisture separators	Operate manual drains; if significant water is detected, automatic system is malfunctioning;	●							Replace if necessary
	<b>Clean system components</b>		●						

Maintenance Schedule table continued on next page

Item	Action Needed	Maintenance Intervals (time/hours – whichever comes first)							Remarks
		Every day	Every 6 months or 4000	Every year or 8000	Every 2 years or 16000	Every 3 years or 24,000	Every 4 years or 32,000	Every 5 years or 40,000	
Electronic Drain Valve	Check outlet connection is not-restricted	•							
	<b>Clean solenoid valve body and housing</b>			•					
	<b>Replace valve</b>			▲					
Oil cooler Intercooler aftercooler	Clean the fins		•						
Cooling fan	Clean blades and motor body		•						
	<b>Check fan motor assembly</b>				•				<b>Replace if malfunctioning</b>
Piping	Check for leaks or looseness		•						Tighten if loose, replace if leaking
	<b>Replace O-rings, gaskets</b>				▲				
Oil Mist Catcher	Check for presence of oil in condensate discharge		•						Investigate reason for oil content
	<b>Replace element</b>			▲					
Y type strainers	Clean			•					<b>Replace if damaged or clogged</b>
Inlet valve	<b>Switching diaphragm replacement</b>			▲					<b>Replace</b>
	<b>Operating diaphragm</b>			▲					<b>Replace</b>
	<b>Valve and spring clean and inspect</b>			•					<b>Replace if damaged</b>
	<b>Valve and spring replace</b>				▲				
	<b>Slide bearing replacement</b>				▲				
	<b>Shaft Inspect</b>				•				<b>Replace if damaged or worn</b>
Temperature sensors	<b>Verify sensors are operating and indicating a reasonable temperature</b>			•					<b>Replace if reading is always low or if intermittent</b>
Pressure sensors	<b>Verify sensors are operating and indicating a reasonable temperature</b>			•					<b>Replace if reading is incorrect</b>
Thermal overload (manually trip and reset)	<b>Verify trip condition is recognized on alarm</b>			•					<b>Replace if trip is not possible or if not possible to reset</b>
Contactors	<b>Verify no chattering or signs of heat damage</b>			•					<b>Replace if malfunction or damage</b>
Control relays	<b>Verify no chattering or signs of heat damage</b>			•					<b>Replace if malfunction or damage</b>

Maintenance Schedule table continued on next page



Item	Action Needed	Maintenance Intervals (time/hours – whichever comes first)							Remarks
		Every day	Every 6 months or 4000	Every year or 8000	Every 2 years or 16000	Every 3 years or 24,000	Every 4 years or 32,000	Every 5 years or 40,000	
Outlet check valve	Verify function (no leak back)			•					
	Replace				▲				
Unload silencer	clean			•					
	replace					▲			
Oil seal (at gearbox input shaft)	Check for leakage			•					
	Replace					▲			
Coupling Element	Check for wear debris			•					Replace early if significant wear debris is detected
	Replace					▲			
Rubber isolation mounts	Under compressor gear case feet, motor mount and cooler assembly					•			Replace if cracked or damaged
Main Motor	Check phase to phase resistance			•					Check phase to ground resistance
	Add Grease to main bearings			•					
	Evaluate bearings with SPM			•					Replace motor if SPM is high
Cooling fan motor	Replace					▲			Replace assembly
Oil pump	Check for leaks			•					Replace if pump leaks
	Replace along with pump						▲		
Low-pressure/high pressure air end, drive shaft and gear assembly	Replace based on SPM							•	Contact Powerex for SPM detail

**Consumable Parts (not covered under warranty)**

1. Intake air filter element.
2. Oil mist catcher filter element.
3. Oil and oil filter.
4. O-rings or gaskets (when used in maintenance actions).
5. Inlet Valves diaphragms (when used in maintenance actions).

**⚠ WARNING** *Inlet valve assembly has springs under load. Spring may pop out and cause injury.*

Contact Powerex for instructions.

**Oil Type:** Use Powerex Rotary Tooth Compressor oil for best results. Improper oil may damage compressor, reduce life or void warranty. Improper oil may lead to failure of the oil mist catcher and entry of oil into compressed air.

**Motor Greasing:** Use Polyrex EM grease. Contact Powerex for details of motor greasing.

**Overhaul:** When operating hours reach 40,000 or after 5 years, SPM can be used to determine the need for air end replacement.

**Instructions for Inspection and Maintenance:**

**⚠ DANGER** *Lock out and tag out all sources of energy (power supply) before servicing. Drain pressure from system and close and lock out isolation valve if multiple compressors are connected to the same systems.*

**Intake Filter Replacement:**

1. Open right front panel, disassemble intake filter.
2. Remove old filter, clean inside of filter housing; replace with new filter.
3. Install filter cover.
4. Replace panel.

**Oil and Oil Filter Replacement**

1. Run compressor until warm.

2. Turn off unit, lock and tag out electric power and all sources of energy.
3. Connect a hose or position a pan to collect oil from oil drain valve.
4. Remove plug and open oil drain valve.
5. Remove oil filter and clean surfaces. Apply a film of clean oil to new filter gasket and thread. Install new filter by hand only.
6. Close oil drain valve and install plug. Remove fill plug and fill with clean new oil to center of sight glass. Be careful not to allow dirt or dust to enter oil fill.
7. Replace oil fill plug.
8. Run the compressor for few minutes (no more than 3 minutes).
9. Stop the compressor, lock out power and check oil level. Add oil if needed to return level to center of sight glass.

**To Access Cooling Fan for Cleaning and Checking**

1. Stop the compressor, lock out and tag out power and all sources of energy.
2. Open left front, back and left panels.
3. Remove screws holding cooler panel cover in place.
4. Cover electronic drain valve assembly (below coolers) for protection.
5. Use a fiber or plastic brush to clean fan – DO NOT USE A METAL BRUSH – Vacuum off dust. Blow off if necessary. Use eye and breathing protection as needed.
6. Uncover electronic drain valves and close panels.

**For Long Term Storage if Compressor Will Not Be in Use:**

1. Run the compressor at least 30 minutes once a week to maintain oil flow in the system.
2. If unit has been off for a more than 90 days, contact Powerex to restart the unit as if new.

**Troubleshooting**

The Powerex Whisper-Air Rotary Tooth compressor has Caution and Emergency modes programmed into the controller.

The CAUTION modes will allow the compressor to continue to run, but will indicate what the condition is.

An emergency shut-down will occur if conditions are detected that could be damaging to the compressor unit.

Caution Conditions		
Problem	Cause	Corrective Action
High Temperature	Ambient temperature too high	Room ventilation inadequate, or no circulation in room so warm air is being recirculated.
	Insufficient cooling	Cooling air inlet or outlet of unit restricted by nearby wall or other items.
		Outlet duct from unit cooling outlet too restrictive. Check backpressure
		Intercooler, oil cooler or aftercooler fins are clogged with dirt or dust
	Poor room ventilation or insufficient room ventilation	
Pressure ration of 1 <sup>st</sup> stage to 2 <sup>nd</sup> stage is incorrect	One or both air ends are malfunctioning and providing insufficient compression	
Other	Discharge pressure is too high. (Important for units operated at high altitude above 3000 ft.)	
Low Inlet pressure	Inlet system	Filter element is clogged
		Other restriction, check hoses and silencer box. (check remote inlet if present)
Drain Valve	Electronic drains	Outlet restricted
		Malfunction of liquid sensor or solenoid
Maintenance required	Early warning	Message indicates maintenance is required within the next 200 hours
		Unit can be operated with a maintenance override, Failure to perform maintenance may void warranty

Emergency Stop Conditions		
Problem	Problem	Problem
E-Stop button pressed	Manual emergency stop (Use "Off" button for normal shut down)	<p>Check condition of unit and perform restart.</p> <p><b>To Reset the E-Stop button</b></p> <ol style="list-style-type: none"> <li>1. Turn off circuit breaker</li> <li>2. Turn button clockwise to release. Restore power and restart compressor unit.</li> </ol>
High Temperature (beyond Caution range, or rapid rise)	Use temperature history (graph) screens to determine conditions at time of stop.	<p>Allow unit to cool. Correct high temperature related conditions. (see Caution – High Temperature)</p> <p>If necessary replace sensor or test sensor using an external heat source.</p>
Low Oil Pressure	Oil pump	<p>If rotation direction is incorrect, oil pressure will be low and unit will not run. Correct rotation is set at the factory with the main motor, check if wiring or motor has been changed.</p> <p>Oil pump is malfunctioning. Contact an authorized Powerex service technician to replace the oil pump.</p>
	Oil pipe or hose	If there is a leak or restriction the oil pressure may be low. Contact an authorized Powerex service technician to replace if necessary.
	Oil filter	If the oil filter becomes clogged, the oil pressure may be low. Replace the filter.
	Oil level too low	Add oil to proper level
	Incorrect oil	If the oil type is incorrect, low oil pressure may result. Drain the incorrect oil and install Powerex Rotary Tooth Compressor gear oil or equivalent.
Motor Overload (reset motor overload and touch panel)	Incoming Power	<p>Low voltage, loss of one phase</p> <p>Inadequate circuit to support start up amperage.</p> <p>Have a qualified electrician resolve the electrical supply problem.</p>
	Motor malfunction	<p>Motor has internal winding failure.</p> <p>Motor has mechanical failure.</p> <p>Contact an authorized Powerex service technician to replace the motor.</p>
	Too much load- compressor malfunction	<p>One or both air ends have mechanical failure. Contact an authorized Powerex service technician to replace the failed air end.</p> <p>Gear case has mechanical failure. Contact an authorized Powerex service technician to replace the gear case parts.</p> <p>Discharge pressure too high. (Important for units operated at high altitude) Reduce the unload pressure setting.</p> <p>Compressor air passage restricted. Contact an authorized Powerex service technician to repair the compressor.</p>

Other Troubleshooting Topics		
Problem	Cause	Corrective Action
Power lamp does not come on or touch screen does not light up	Faulty wire connection in electrical panel	Check connections to transformer and to control. Clean and reconnect problem connection.
	Control circuit fuse open	Check for cause and replace fuse after correcting.
	Lamp out on switch	Replace lamp/switch assembly
	E-stop has been activated	Reset and restart
Touch panel is on, unit will not turn on	Contactors malfunction	Replace, check other contactors for proper operation
	E-stop has not been reset properly	Reset and restart
	Incorrect control signal	(use diagnostics screen to confirm)
	Motor failure	Contact an authorized Powerex service technician to replace the motor.
	Oil pressure low	Correct oil problem. If necessary, contact an authorized Powerex service technician to replace the oil pump.
Compressor does not unload properly (High Temperature may be indicated)	Inlet valve malfunction, not closing	Contact an authorized Powerex service technician to rebuild or replace inlet valve.
	Check valve failure or unload silencer clogged; causing incorrect pressure ratio in unload mode	Contact an authorized Powerex service technician to rebuild or replace check valve.
	VFD type: Confirm unit goes to low speed before unload	Contact an authorized Powerex technician to adjust settings or replace VFD.
Compressor unit runs, will not load	Pressure not low enough to reach load setting	Check settings and actual pressure, correct as needed.
	Air leak on signal line to inlet valve	Contact an authorized Powerex service technician to repair or replace air signal lines.
	Diaphragm malfunction (torn or leaking)	Contact an authorized Powerex service technician to rebuild or replace inlet valve.
	Unload solenoid malfunction	Contact an authorized Powerex service technician to rebuild or replace solenoid valve.
	Control solenoid not getting operating signal	Use diagnostics screen to confirm. Contact an authorized Powerex technician to repair or replace malfunctioning control components.
Compressor runs load condition, will not unload; Safety valve opens	Faulty safety valve	Verify with pressure readout on screen. Replace malfunctioning valve with a Powerex replacement part.
	Solenoid valve malfunction	Confirm and replace if faulty
	Inlet valve malfunction, will not close	Contact an authorized Powerex service technician to rebuild or replace inlet valve.
	Final Pressure sensor malfunction	Contact an authorized Powerex service technician to replace the sensor or cable as needed.
	Control signal malfunction	Use diagnostics screen to confirm. Contact an authorized Powerex technician to repair or replace malfunctioning control components.

Low Outlet air pressure unit is loaded.	Air consumption more than capacity of compressor	Check consumption. Contact a Powerex distributor to increase air system supply capability.
---	--	--

	(VFD type – confirm VFD is going to full speed)	Contact an authorized Powerex technician to adjust settings or replace malfunctioning VFD.
	Severe air leak	Check all separator drains and other possible leak areas. Contact an authorized Powerex technician to repair leaks.
	Air end failure	Contact an authorized Powerex technician to replace malfunctioning air end.
Intercooler pressure is low during load operation	Intake filter clogged	Replace element, verify no other restriction.
	Leakage between stages	Locate leak and repair
	Intercooler leak	Locate leak and repair
	Leak from Low pressure outlet valve	Leak from Low pressure outlet valve
	Low pressure air end malfunction	Contact an authorized Powerex technician to replace malfunctioning air end.
Intercooler pressure is high during load operation	Failure of high pressure air end Verify the condensate separator and automatic drain is working. Water intake into high pressure air end will damage compressor	Contact an authorized Powerex technician to replace malfunctioning air end and separator components.
Mist in Compressor discharge air	Condensate drain lines restricted	Eliminate restrictions, assure that lines remain unrestricted.
	Electronic Automatic drain valves malfunctioning	Contact an authorized Powerex technician to replace malfunctioning drain valve.
Noise when running	Shipping brackets in place – remove before running compressor	Make sure shipping brackets are removed before running compressor.
	Air end malfunction	Contact an authorized Powerex technician to replace malfunctioning air end.
	Main motor malfunction	Contact an authorized Powerex technician to replace malfunctioning motor.
	Cooling fan motor malfunction	Contact an authorized Powerex technician to replace malfunctioning fan motor or assembly.
	Electronic drain valves malfunctioning, water into high pressure air end	Contact an authorized Powerex technician to replace malfunctioning air end and drain valve.

**Powerex Limited Warranty – Applicable to Non-OEM Customers in the U.S. & Canada Only**

**Warranty and Remedies. (a) General.** Powerex warrants each Compressor System, Vacuum System, Vacuum Pump, Compressor Air-End, or Powerex branded Accessory (collectively “Products”, individually each a “Product”) to be free from defects in material and workmanship (“Defects”) at the date of shipment. This warranty shall apply only to Products that are purchased and used in the United States of America and in Canada. **EXCEPT AS SET FORTH BELOW, NO OTHER WARRANTY, WHETHER EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, SHALL EXIST IN CONNECTION WITH THE SALE OR USE OF SUCH PRODUCTS. TO THE EXTENT PERMITTED BY LAW, ANY AND ALL IMPLIED WARRANTIES ARE EXCLUDED.** All warranty claims must be made in writing and delivered to Powerex in accordance with the procedures set forth on its website ([www.powerexinc.com](http://www.powerexinc.com)), or such claim shall be barred. Upon timely receipt of a warranty claim, Powerex shall inspect the Product claimed to have a Defect, and Powerex shall repair, or, at its option, replace, free of charge, any Product which it determines to have had a Defect; provided, however, that if circumstances are such as to preclude the remedying of Defect by repair or replacement, Powerex shall, upon return of the Product, refund to buyer any part of the purchase price of such Products paid to Powerex. Freight for returning Products to Powerex for inspection shall be paid by buyer. The warranties and remedies herein are the sole and exclusive remedy for any breach of warranty or for any other claim based on any Defect, or non-performance of the Products, whether based upon contract, warranty or negligence.

**(b) (i) Standard Period of Warranty – Parts and Labor.** The purchase of any system includes our standard warranty. Powerex warrants and represents all Products shall be free from Defects for the first thirty (30) months from the date of shipment by Powerex, or twenty-four (24) months from the documented date of startup, or eight thousand (8,000) hours of use, whichever occurs first. During such warranty period, Powerex shall be fully liable for all Defects in the Products (the “Product Defects”), i.e., all costs of repair or replacement, which may include “in and out” charges, so long as the Products are located in the United States or Canada, and the Products are reasonably located and accessible by service personnel for removal. “In and out” charges include the costs of removing a Product from buyer’s equipment for repair or replacement.

**(c) Coverage.** The warranty provided herein applies to Powerex manufactured units or systems only.

**(d) Exceptions.** Notwithstanding anything to the contrary herein, Powerex shall have no warranty obligations with respect to Products:

- (i)** That have not been installed in accordance with Powerex’s written specifications and instructions;
- (ii)** That have not been maintained in accordance with Powerex’s written instructions;
- (iii)** That have been materially modified without the prior written approval of Powerex; or
- (iv)** That experience failures resulting from operation, either intentional or otherwise, in excess of rated capacities or in an otherwise improper manner.

The warranty provided herein shall not apply to: **(i)** any defects arising from corrosion, abrasion, use of insoluble lubricants, or negligent attendance to or faulty operation of the Products; **(ii)** ordinary wear and tear of the Products; or **(iii)** defects arising from abnormal conditions of temperature, dirt or corrosive matter; **(iv)** any OEM component which is shipped by Powerex with the original manufacturer’s warranty, which shall be the sole applicable warranty for such component.

**Limitation of Liability.** NOTWITHSTANDING ANYTHING TO THE CONTRARY HEREIN, TO THE EXTENT ALLOWABLE UNDER APPLICABLE LAW, UNDER NO CIRCUMSTANCES SHALL POWEREX BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL, PUNITIVE, SPECULATIVE OR INDIRECT LOSSES OR DAMAGES WHATSOEVER ARISING OUT OF OR IN ANY WAY RELATED TO ANY OF THE PRODUCTS OR GOODS SOLD OR AGREED TO BE SOLD BY POWEREX TO BUYER. TO

THE EXTENT ALLOWABLE UNDER APPLICABLE LAW, POWEREX'S LIABILITY IN ALL EVENTS IS LIMITED TO, AND SHALL NOT EXCEED, THE PURCHASE PRICE PAID.

**Warranty Disclaimer.** Powerex has made a diligent effort to illustrate and describe the Products in its literature, including its Price Book, accurately; however, such illustrations and descriptions are for the sole purpose of identification, and do not express or imply a warranty that the Products are merchantable, or fit for a particular purpose, or that the Products will necessarily conform to the illustrations or descriptions.

**Product Suitability.** Many jurisdictions have codes and regulations governing sales, construction, installation, and/or use of Products for certain purposes, which may vary from those in neighboring areas. While Powerex attempts to assure that its Products comply with such codes, it cannot guarantee compliance, and cannot be responsible for how the product is installed or used. Before purchase and use of a Product, please review the Product applications, and national and local codes and regulations, and be sure that the Product, installation, and use will comply with them.

**Claims.** Any non-warranty claims pertaining to the Products must be filed with Powerex within 6 months of the invoice date, or they will not be honored. Prices, discounts, and terms are subject to change without notice or as stipulated in specific Product quotations. Powerex shall not be liable for any delay or failure arising out of acts of the public enemy, fire, flood, or any disaster, labor trouble, riot or disorder, delay in the supply of materials or any other cause, whether similar or dissimilar, beyond the control of Company. All shipments are carefully inspected and counted before leaving the factory. Please inspect carefully any receipt of Products noting any discrepancy or damage on the carrier's freight bill at the time of delivery. Discrepancies or damage which obviously occurred in transit are the carrier's responsibility and related claims should be made promptly directly to the carrier. Returned Products will not be accepted without prior written authorization by Powerex and deductions from invoices for shortage or damage claims will not be allowed. **UNLESS OTHERWISE AGREED TO IN WRITING, THE TERMS AND CONDITIONS CONTAINED IN THIS LIMITED WARRANTY WILL CONTROL IN ANY TRANSACTION WITH POWEREX.** Any different or conflicting terms as may appear on any order form now or later submitted by the buyer will not control. All orders are subject to acceptance by Powerex.