POWEREX®
PURE AIR TECHNOLOGY

Enclosed Scroll Laboratory Air Systems

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.

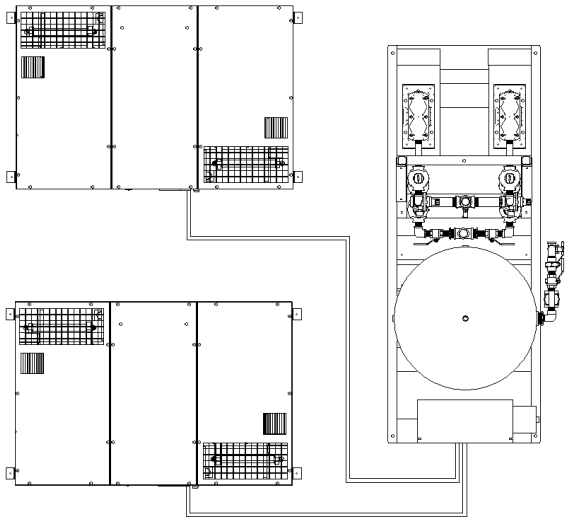
DESCRIPTION

GENERAL

The Powerex Laboratory Enclosed Scroll Air Compressor System is designed to provide clean, dry air for applications where the quality of the compressed air is critical and a quiet enclosed compressor set is desired. The standard unit is rated for a maximum of 116 PSIG. Each system includes multiple oil-less scroll compressors in a sound reducing enclosure or multiple enclosures, corrosion resistant air receiver, desiccant air dryers with purge control, a control panel and integrated dew point monitor. Systems are also equipped with dry type inlet filters, aftercoolers internal to the enclosure, check valves and ball valves for each pump. The air receiver tank has an automatic no-loss condensate drain and manual back up drain. The twin tower desiccant dryers are installed with ball valves and sized so that one dryer can meet full system flow needs. Final regulators are factory installed and set for a stable final pressure. A dew point monitor is included to provide feedback and control of the dryer option. Various options are available to make the system suit your needs, including a CO monitor or remote air intake capability.

The Powerex scroll air compressor has advanced scroll compressor technology through the development of a completely oil-less unit. The Powerex Scroll Compressor offers a dynamically balanced air end and rubber isolated pump motor assemblies which insures vibration-free operation. The rotary design permits a continuous 100% duty cycle. No oil separation, oil filtration, or inlet valves are required on the Powerex scroll unit. The compressor is virtually maintenance free.

Systems are available with advanced PXMI touch screen controls to allow operation and monitoring of the unit. The systems utilize a programmable logic controller (PLC) to operate the number of pump motors required to meet demand. If the system consists of multiple units, the main control automatically alternates the units to equalize usage.



SPECIFICATIONS

Product	Laboratory Air Enclosed Scroll Systems (Simplex and Duplex)
Operating Voltages	208V, 230V, 460V
Control Panel	UL508A
Pressure Settings	Cut in: 115 psig Cut out: 145 psig
Tank	ASME Rated for 200 psi MAWP
Drive	3V Belt
Tank Sizes	80 Gallon to 240 Gallon
Performance	See Cut Sheet

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.

⚠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, that if not followed, may cause damage to equipment.***

UNPACKING

Immediately upon receipt of the compressor 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.***

COMPONENTS

OILLESS SCROLL COMPRESSOR PUMPS

Powerex laboratory open scroll systems are designed to supply continuous oil-free air by using the most advanced scroll technology.

The Powerex scroll compressor offers a dynamically balanced air end which insures vibration-free operation. The rotary design permits a continuous 100% duty cycle. No oil separation, oil filtration, or inlet valves are required on the Powerex Scroll unit. Each compressor shall be belt driven oil -less rotary scroll single stage, air-cooled construction with absolutely no oil needed for operation. Direct drive compressors shall not be used. The rotary design shall not require any inlet or exhaust valves and shall be rated for 100% continuous duty. Systems consist of multiple compressor pumps that are automatically controlled and alternated to equalize usage and wear.

The Powerex oil-less rotary scroll air compressor is based on the theory of scroll compression. A scroll is a free-standing, intricate spiral bounded on one side by a solid, flat plane or base. A scroll set, the basic compression element of a scroll compressor, is made up of two identical spirals which form right and left hand parts. One of these scroll components is indexed or phased 180^{o} with respect to the other so the scrolls can mesh. Crescent-shaped gas pockets are formed and bounded by the spirals and the base plate of both scrolls. As the moving scroll is orbited around the fixed scroll, the pockets formed by the meshed scrolls follow the spiral toward the center and diminish in size. The moving scroll is prevented from rotating during this process so that the 180^{o} phase relationship of the scrolls is maintained. The compressor's inlet is at the outer boundary of the scrolls. The entering gas is trapped in two completely opposite gas pockets and compressed as the pockets move toward the center. The compressed gas is discharged through the outlet at the center of the fixed scroll so no valves are needed.

Each compressor shall have flexible connectors on intake and discharge, an electric drive motor, a discharge check valve, an air-cooled aftercooler and a high discharge temperature shut down switch. Each compressor module shall have an isolation valve and a moisture separator with automatic drain.

The scroll pump is driven by a three phase electric motor and a dual V-belt drive. The drive belts are engineered to provide trouble free service. Some dust is generated as the belts run to match the grooves on the motor pulley and pump. As long as no slippage is detected, the belts do not need to be tightened.

The system includes an after cooler for each pump and condensate separators with float type auto drains. Each pump module or stack of two pumps for 10 HP models is equipped with an isolation valve so that the pump or module may be removed for service and the valve closed leaving the system operable with partial capacity. (If the valve is used to isolate the system while a person is working or risk of injury exists, appropriate energy lock out tag out procedures must be employed.)

COMPRESSOR UNITS

Powerex Enclosed Scroll compressor units SED, SET, SEQ, SEH and SEO. For laboratory applications, the intended operating mode and rated flow from each compressor set is based on the installed pumps less one. The standard product line utilizes compressor sets with a maximum operating pressure of 116 psig.

Please see the product installation and operation manuals of the SE series compressor unit or units supplied for details of installation, set up, operation and maintenance. Note that the

compressor units themselves are rated for operation at ambient temperatures up to 104°F, but that as part of an Enclosed Scroll Laboratory Compressor system, the ambient temperature around the compressor cabinets must be limited to 85°F. Operation in higher temperatures will result in reduced dryer performance.

RECEIVER TANK & AIR DRYER (DESICCANT)

The ASME, National Board registered air receiver is provided in sizes from 80 to 200 gallons. Each receiver is rated at 200 psig working pressure. Receivers are provided with sight gauge, moisture drain (manual and electric), and internal lining to prevent corrosion.

The system receiver tank with bypass valves and duplex twin tower desiccant dryers are sized to provide adequate air storage and provide a pressure dew point of –40°F with one dryer operating. The system is not intended to operate with both dryers simultaneously. Doing so will result in back flow into one of the regulators and leakage of air from that device.

The receiver tank is equipped with a no-loss auto drain that is powered from the main control panel. The no-loss drain has a manual test feature. The automatic action of the drain will be confirmed by the lack of water accumulation.

CONDENSATE DRAIN VALVE (MANUAL)

A condensate drain valve must be installed on any tank. This valve removes liquid that collects during compressor operation. Drain liquid from tank daily.

⚠DANGER ***Never drill holes in, or perform any welding on receiver tanks (unless qualified by ASME to do so) or use them beyond the rated pressure settings. Never mount other machinery or equipment on receivers.***

DUPLEX DESICCANT DRYERS

The dryers for the system are duplexed and are sized for a dew point of –40°F at rated system flow. The system is designed to use one dryer at a time. Use the isolating valves and the power selector switch on the control panel to alternate dryers. The dew point monitor is connected to the dryer controllers. Setting the dryer controls to the variable mode allows the controllers to reduce purge air consumption when the air demand is below the dryer capacity. The dew point monitor triggers the purge saver mode when dew point is below –25°F and will trigger fixed mode if the dew point rises to –20°F. Settings are not user adjustable.

The dryer system includes condensate separators with automatic drains before each dryer followed by a pre-filter. After the dryer an additional filter assures that any particulates are removed from the compressed air before final use. The pre-filter and after filter have differential pressure indicators to signal when the filter elements are in need of replacement. The desiccant dryers have purge air silencers. Do not restrict the flow through these silencers or modify them as dryer performance will be reduced. Replace the filter elements, silencers and other components as called for in the dryer maintenance manuals.

CONTROLS

The disconnects and protection devices in the Powerex control system are for the motor branch circuits, accessory branch circuits, accessory supply circuits and for the control circuit only. The controls on the Powerex Laboratory Open Scroll System do not include a service disconnect and circuit protection for the supply circuit. Selection and installation of these items must be provided in compliance to local and national codes in accordance with each facility's need.

The PLC automatically alternates the lead designation and brings on lag pumps as needed, equalizing run time on the pumps in the system. The touch screen HMI (Human Machine Interface) panel on the front allows operation and monitoring of the unit. The touch screen provides the user with displays showing the operating status and allows the user to access features of the control system. The compressor control panel can also be configured with the optional PBMI feature which allows communication using the BacNet® protocol.

The compressor control panel includes Hand-Off-Auto selector switches for each pump so that a pump can be held on (or off). This can be useful if maintenance or diagnostic procedures are being performed.

The controls have a transformer to provide control circuit voltage. The transformer is sized for the loads imposed by the Powerex factory controls and should not be utilized for any other purpose.

Local alarms and dry contacts are provided low pressure and general fault. The general fault alarm includes high temperature, reserve transformer in use and motor overload. The wiring connection point for the alarms is on the terminal strip in the control panel box, with good conditions being contacts closed. (If a wire connection is lost, the result is an alarm.)

DEW POINT MONITOR

The Powerex dew point monitor provides indication of dew point temperature. It's microprocessor is controlled with alarm and self-calibration sensor.

Regen dryers paired with the Powerex dew point monitor may be operated in Econ Mode where the dew point monitor would signal the dryer to cease purge if system dew point is below the set point.

FRAMES OR TANK MOUNT STRUCTURE

Powerex designed the system to bear the weight and stress of the compressor pumps, controls, and receiver tank. When lifting the system, use the designated fork lift slots or rig straps to lift the main system skid. Do not attempt to lift the system using individual component lifting hooks and eyes. Piping may need to be supported to avoid damaging the supplied flex connectors for intake and exhaust.

OPERATION AT HIGH ALTITUDES:

Compressor pumps are sensitive to reduced atmospheric pressure encountered as altitude increases. Powerex will adjust the operating set points to compensate for altitude if the original order is designated for high altitude and the expected conditions provided to us.

NOTE: If the system is installed at an altitude of more than 3,300 feet, and was not originally specified for altitude installation, contact Powerex for appropriate adjustments.

INSTALLATION

For questions concerning assembling and start-up, contact Powerex at 1-888-769-7979 for technical assistance.

NOTE: The compressor does not need any oil—do not install any oil.

Remove the compressor unit or units from the shipping crates and skids. Check for any hidden freight or shipping damage. Correct whatever damage may be detected.

⚠WARNING ***Disconnect, tag and lockout power before attempting to install, service, relocate or perform any maintenance.***

⚠CAUTION ***Do not lift or move unit without appropriately rated equipment. Be sure the unit is securely attached to lifting device used. Do not lift unit by holding onto tubes or coolers. Do not use pumps to lift other attached equipment.***

INSTALLATION SITE

1. The compressor system must be located in a clean, well lit and **well ventilated** area.
2. The area should be free of excessive dust, toxic or flammable gases and moisture.
3. Never install the compressor system where the surrounding temperature is higher than 85°F or where humidity is high.
4. Clearance must allow for safe, effective inspection and maintenance.

MINIMUM CLEARANCES	
Above	36 inches
Other sides	36 inches

5. If necessary, use metal shims or leveling pads to level the system. Never use wood to shim the unit.

VENTILATION

1. If the oil-less compressor system is located in a totally enclosed room, an exhaust fan with access to outside air make up air must be installed. Room temperature must remain below 85°F.
2. Never restrict the cooling fan exhaust air. Maintain a minimum of 3 feet of clearance around the entire unit.
3. Never locate the compressor where hot exhaust air from other heat generating units may be pulled into the unit.

WIRING

⚠DANGER ***Lock out and tag out the electrical supply before servicing the equipment.***

⚠DANGER ***Electrical shock hazard. Make sure the system is grounded in accordance with NEC and local requirements.***

All electrical hook-ups must be performed by a qualified electrician. Installations must be in accordance with local and national electric codes. Make sure power supply conductors are sized adequately for full system demand.

The Enclosed Scroll Laboratory Air Compressor units may be placed directly onto a solid floor. Composite cork and rubber isolation pads may be placed under of the corners of the frame if desired, but the internal moving parts are already rubber isolated from the frame. If fixing bolts are desired, use the L brackets that secure the frame to the shipping skid as mounting brackets. The tank dryer skid may also be placed directly on the floor or installed with pads at the corners. If desired, fixing bolts may be installed through the holes provided.

Compressed air piping must be installed from the outlet port of the compressor units to the inlet port of the tank dryer skid. This piping is not provided by Powerex. Do not install any check valves between the compressor and the tank dryer skid. It is recommended that an isolation valve be installed.

The compressed air piping must be able to withstand the pressure and temperature generated. Clean, corrosion resistant metal pipe is preferred. **DO NOT USE PVC PIPE.**

ELECTRICAL WIRING OF UNIT SHIPPED IN SEPARATE MODULES

⚠CAUTION ***Provide electrical power in accordance to NEC and local codes. Connection of wiring should be performed by a qualified electrician.***

NOTE: Circuit protection and disconnects must be installed in accordance with electrical code.

Electrical power must be brought to the main control panel on the tank dryer skids and to the compressor units. Control wiring is pre-installed by Powerex and must be restored to the appropriate tie-in terminals according to the wiring diagram provided with the system. If the wiring diagram is not present, contact Powerex for a copy. Have your model and serial number handy in order to obtain the correct diagram.

PIPING

General Guidelines

Refer to the general product manual.

1. Make sure the piping is lined up without being strained or twisted when assembling the piping for the compressor.
2. Appropriate expansion loops or bends should be installed at the compressor to avoid stresses caused by changes in hot and cold conditions.
3. Piping supports should be anchored separately from the compressor to reduce noise and vibration.

Remote Intake Piping

Powerex Compressor Systems with pipe thread connectors on the intake filters are intended for installation with remote air intake. Piping for remote intake system must be installed at the final operating site.

Under some conditions, the intake piping may facilitate the condensation of humidity in the intake air stream into liquid water.

NOTICE ***The intake filters supplied by Powerex will not stop ingestion of liquid water by the pumps. Liquid water going into the pumps will damage the pumps and void the warranty.***

Always install drip legs with sufficient capacity to capture liquid water in the intake piping before the air filters. Drip legs must be sized with low enough air velocity to make sure they are effective at capturing liquid water in the intake air and must be maintained (drained) at frequent intervals to make sure they remain effective.

SAFETY VALVES, PRESSURE VESSELS AND PIPING

⚠DANGER

1. Powerex systems are shipped with ASME safety valves sized so that the maximum system flow is less than the capacity of the valve or valves at the rated pressure. The rated pressure of the valve is equal to or higher than the maximum allowable working pressure of the vessel or upstream pressure bearing parts. **DO NOT MODIFY** or install any valves with different specifications unless appropriate evaluations are completed. Do not modify the structure of the pressure vessel or weld on the vessel.
2. Do not install any shut off valves between the safety valve and the vessel or between the compressor pump and the first system safety valve. Doing so can result in a dangerous condition and lead to death or injury.
3. Do not install shut off valves in the system that create trapped compressed air.
4. Manually operate the safety valve every six months or 2,500 operating hours to provide assurance that the mechanism is free to operate. Replace valve if it is leaking when it is closed or if it fails to vent when actuated.
5. Any piping or pressure bearing connection hose or tubing used in the system must be rated equal to or higher than the safety valve pressure rating. Inadequate pressure rating could result in bursting.

MODULAR PLACEMENT

1. Unpack each module and discard all wood shipping materials.

2. Some systems consist of multiple modules. The steel frames are intended to be bolted together using the supplied fasteners and connecting hoses provided (found in the parts pack box with the isolation pads). Modules may be spaced farther apart without any structural problems, but electrical connections may need to be modified—additional isolation pads and longer hoses may be needed.
3. Place modules at location designated. Provide sufficient clearance around unit for servicing (see minimum clearance section).
4. Install frame assembly fastners to each frame joining the frames together.
5. Lift corners of each frame assembly and install isolation pads provided.

CONNECTING PIPING (if applicable)

1. Locate connection for piping at rear of unit for compressors module to receiver tank module.
2. Remove plastic caps or adhesive covering on ports and connectors.
3. Connect flex line to the ports making sure flex line is not pinched or kinked.
4. Follow steps 1 to 3 for flex line from dryer package to outlet of receiver tank.

NOTE: All piping is provided and sealed for this portion of installation.

5. If applicable, locate and attach intake inline air filter to outside source air or header. Flex line is provided when attaching intake of compressors to rigid piping.
6. Connect outlet of tank/dryer package located on dryer module to outlet source piping.

OPERATION

BEFORE START UP

1. Make sure all safety warnings, labels and instructions have been read and understood before continuing.
2. Remove any shipping materials, brackets, etc.
3. Confirm that the electric power source and ground have been firmly connected.
4. Be sure all pressure connections are tight.
5. Check to be certain all safety relief valves, etc. are correctly installed.
6. Check that all fuses, circuit breakers, etc. are the proper size.
7. Make sure the inlet filter is properly installed.
8. Confirm that the drain valve is closed.
9. Once power is connected to the unit, visually check the rotation of the compressor pump. If the rotation is incorrect, have a qualified electrician correct the motor wiring.

NOTICE ***If all pumps are running in the wrong direction, change the incoming power leads to correct rotation.***

The system must be checked for rotation before being run. Open the outlet air valves and jog the unit to determine if the rotation direction is correct. If it is incorrect, switch two incoming power phases on the power supply. **Verify that each pump in the enclosure is running correctly.**

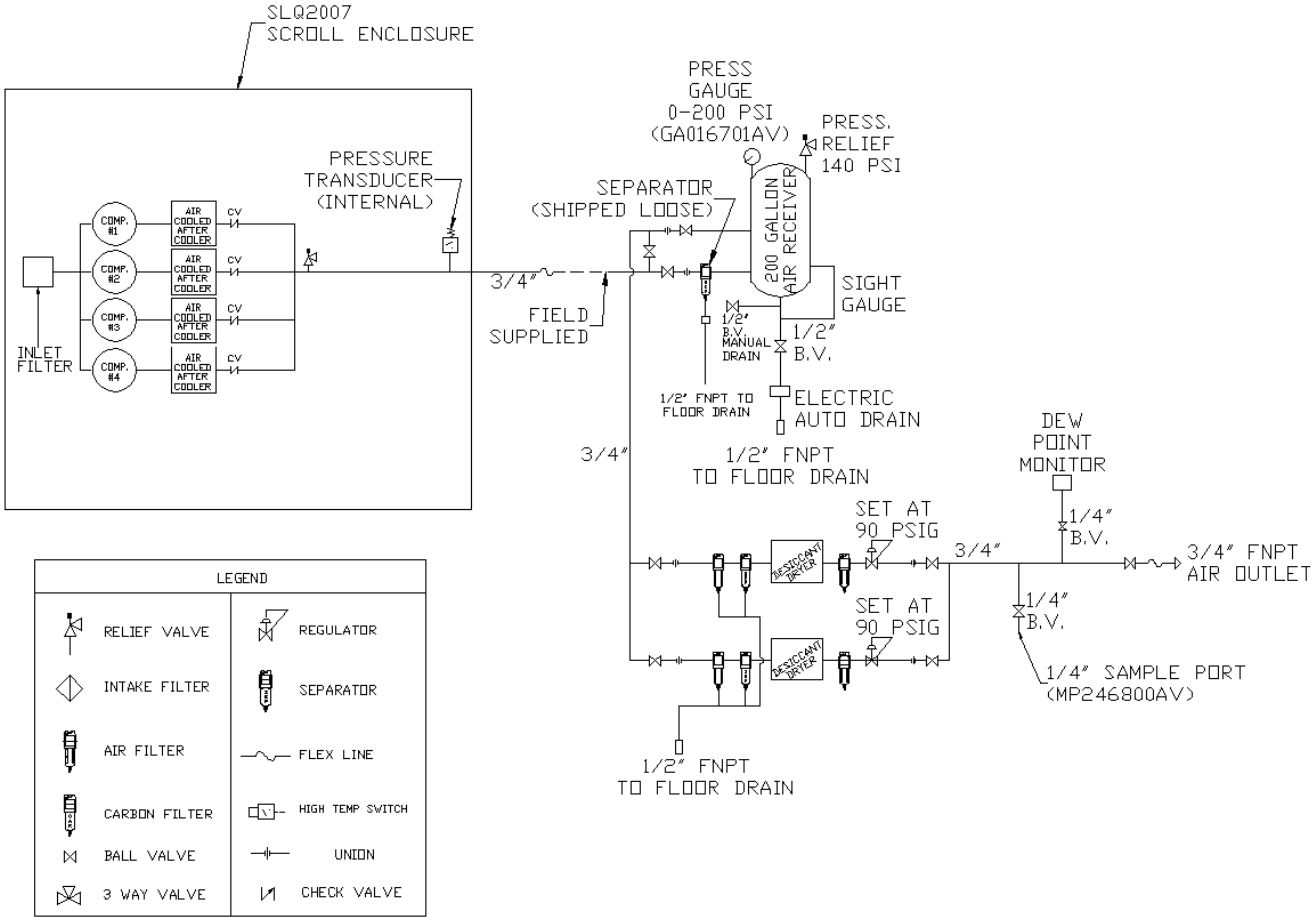
START-UP AND OPERATION

1. Follow all procedures under “Before Start-Up” before attempting operation of the vacuum pump.
2. Make sure all selector switches are in the OFF position.
3. Switch on electric source.
4. Open tank connection valve or valves completely.
5. Using the selector switches on the control panel, turn on each pump—motor in the “Auto” mode until all are running.
6. Check for excessive vibration, unusual noises or leaks during operation. If problems are detected, shut down the system and make corrections or repair as needed before operating the system.
7. In normal operation, leave all selector switches in the “Auto” position and allow the controls to cycle the pumps as needed based on compressor demand.

SERVICE PARTS

For service parts, see the instruction manual for each component section (compressor module, dryer, monitor, etc.).

LABORATORY AIR SCHEMATIC (THIS IS ONLY A REPRESENTATIVE SCHEMATIC DIAGRAM)



PARTS LIST FOR DUPLEX CONTROLLER & DRYER MODULE

Ref. No.	Description	Part No.	Qty.
1	(Duplex Only) Lag Pressure Switch (90-110)	CW207591AV	1
	Low Pressure Switch (85-105)	CW207592AV	1
2	Control Transformer	PS005849AV	As needed
3	Primary Fuses (2 Per Transformer) 3A	JP007708AV	As needed
4	Secondary Fuse 2.5A	JP007712AV	As needed
5	Reserve Transformer Relay (Duplex Systems)	PE000411AV	As needed
6	PLC with Program	PE000418AJ	Consult factory
7	No loss drain assembly	SL300702AV	Consult factory
8	Control Relay (4 Pole)	PE000403AV	As needed
9	Lighted HOA Switch	PE000552AV	As needed

INTEGRATED DIGITAL DEW POINT MONITOR

Specifications

Dew Point Range	-60°F to +54°F
Sensor Output	0 V-5 V Scaled as: below -60°F to over +54°F
Alarm Indication	Audible Alarm, HMI display
Alarm Output	Dry contacts. See drawing for contact ratings.
Alarm Set Point	HIGH ALARM: -20°F (-28.8°C)
Dryer Control Signals	10 AMP @ 115 VAC Rated Contact. (Normally Open) Contact Open for Purge rate fixed mode: -40°F to +54°F Contact Closed for Purge Saver mode: Below –45°F
Accuracy	±2°C dew point
Operating Pressure	10 psig—150 psig with a minimal flow rate
Operating Temperature	32°F to 131°F

SENSOR CALIBRATION AND ADJUSTMENT

The sensor is fully calibrated as shipped from the factory (see calibration sheet included in the main system manual). With the Daily Auto-Calibration feature (listed below) the sensor may not need replacement for up to 10 years. The manufacturer recommended replacement interval is 2 years from system start-up or if sensor should malfunction.

REPLACING THE FILTER

The sensor is protected with a stainless steel sintered filter. The filtering grade is 34 um.

The filter is recommended to be changed whenever it looks dirty or as a part of the periodical maintenance procedure. The recommended replacement interval depends heavily on the application and can vary from less than a year to several years. Dirty or corroded filter may cause increased response times. In case the sensor is used in a drying system with silica gel (or other drying agent) the dust from the dryer may collect on the sensor slowing the response but also generating a micro climate around the sensor altering the dew point at the sensor. This is easily corrected by changing or cleaning the filter.

⚠CAUTION ***Touching the sensor may damage it. Special attention shall be paid to avoid touching the sensor when removing and replacing filters.***

DAILY AUTO-CALIBRATION

The Daily Auto-Calibration feature of the sensor is an automatic procedure which greatly reduces the possible drift in the dry end of the dew point measurement. It is performed at one hour intervals, and when the power is switched on. During auto-calibration the sensor is warmed for a short period (< 1 min) and the sensor capacitance values are evaluated at the elevated temperature. The possible dry end drift is then corrected to correspond to the calibrated values. During the auto-calibration the transmitter outputs the Td value prior to the procedure. Auto-calibration is carried out only if several criteria for the measurement environment are fulfilled. This ensures the reliability of the adjustments, and maintains the excellent long term stability that the patented technology offers. These criteria include e.g. a sufficiently stable enough moisture level in the measured atmosphere. If the conditions are not fulfilled, the auto-calibration function is postponed until the satisfied conditions are reached.

SENSOR PURGE

Sensor purge is also an automatic procedure that minimizes the drift at the wet end readings of the dew point measurement. Sensor purge is performed once a day or when the power is switched on. The sensor is heated for several minutes which will then evaporate all excess molecules out of the sensor polymer. This, together with the auto-calibration results in a very small drift of the sensor due to the very linear behavior of the polymer technology.

SENSOR WARMING IN HIGH HUMIDITIES

Additionally the sensor has a warming feature which prevents the sensor and filter from becoming wet in high humidities. High humidity can be present when the dew point temperature rises close to the gas temperature. Sensor warming is switched on automatically when the humidity level in the measured gas increases to a level where dew can start to form. The advantage of sensor warming is rapid response of dew point measurement. A wet sensor and filter would otherwise result in a dew point equal to ambient temperature (i.e. RH=100%). If the sensor becomes soaked in any way, it will fully recover and return back to normal operation after it dries out.

MAINTENANCE SCHEDULE

COMPRESSOR		Operating Hours						
Item	**Action Needed**	**500**	**2500**	**5000**	**10,000**	**15,000**	**20,000**	**Remarks**
Inlet air filter	Inspect, Replace	●	▲	▲	▲			Replace every 2500 hours or every 5000 hours if duplex-remote. Alternate duplex-remote filters monthly.
Blower fan	Clean			▲	▲	▲	▲	
Fan duct	Clean			▲	▲	▲	▲	
Compressor fins	Clean		●					Every 2500 hours or less
Bearings (116 psig scroll units)	Grease				▲		▲	Replace every 10,000 hrs.on116 psig pumps; replace every 5,000 hrs. on 145 psig pumps
Tip seal (116 psig scroll units)	Replace				▲		▲	Replace every 10,000 hrs.on116 psig pumps; replace every 5,000 hrs. on 145 psig pumps
Dust seal	Replace				▲		▲	Replace every 10,000 hrs.on116 psig pumps;
V-belt	Replace				▲		▲	See Note 3
Pressure switch/ transducer	Confirm operation				●		●	
Magnetic starter	Inspect				●		●	Replace if contact point is deteriorated
Check valve	Replace						▲	
Heat Insulation Pipe	Replace				▲		▲	Replace every 10,000 hrs.on116 psig pumps; replace every 5,000 hrs. on 145 psig pumps

PIPING SYSTEM		Operating Hours						
Item	**Action Needed**	**500**	**2500**	**5000**	**10,000**	**15,000**	**20,000**	**Remarks**
Safety valve	Confirm operation		●					Every 2500 hours or less
Pressure gauge	Inspect		●					Every 2500 hours or less
Tank	Drain moisture	Daily						Verify proper drain operation
Air leaks	Inspect		●		●		●	
Filter element	Replace		▲	▲	▲	▲	▲	
Moisture drain traps	Inspect	●		●		●		View delta pressure indication

AIR DRYERS		Operating Hours						
Item	**Action Needed**	**500**	**2500**	**5000**	**10,000**	**15,000**	**20,000**	**Remarks**
Desiccant Dryer	Switch dryer Online/offline							Each month (see Dryer manual for Maintenance Instructions)

● Inspect

▲ Replace

NOTES:

1. Inspect and perform maintenance periodically according to the maintenance schedule.
2. The maintenance schedule relates to the normal operating conditions. If the circumstances and load condition are adverse, shorten the cycle time and perform maintenance accordingly.
3. Belts require no attention unless slippage is detected. (Chirping sound on start up or while running.) Re-tension as indicated when tip seals are replaced for the first time. Proper belt tension should be 0.25 inch deflection when 6 pounds of force is applied on the center of the belt span.
4. If the pumps reach 4 years and have not yet accumulated 5,000 hours, perform the greasing operation for the bearings, with the number of pumps reduced by 25%. (See details of pump grease operation.) Tip seals do not require early replacement, but must be done before or at 5,000 hours of run time.

Notes

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), 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 eighteen (18) months from the date of shipment by Powerex, or twelve (12) months from the documented date of startup, or five thousand (5,000) 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.

(ii) Premium Period of Warranty – Parts and Labor – In order to be eligible for premium warranty coverage, a premium warranty for each system must be purchased when order is placed. 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 seven thousand five hundred (7,500) 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) Additional Period of Warranty – Parts Only (No Labor). In addition to the above, Powerex warrants each Powerex branded Compressor Air- End and Vacuum Pump shall be free of Defects for a period of forty-two (42) months from the date of shipment by Powerex, or thirty-six (36) months from the documented date of startup, or ten thousand (10,000) hours of use, whichever occurs first. Supplier's repair or replacement of any Product shall not extend the period of any warranty of any Product. This warranty applies to the exchange of part(s) found to be defective by an Authorized Powerex Service Representative only.

(d) Replacement Pumps – Parts Only (No Labor). For any replacement Air-End or Vacuum Pumps installed on a Powerex manufactured system or unit after any initial warranty period has expired or where another warranty does not apply for any reason, Powerex warrants that the Air-End or Vacuum Pumps shall be free of Defects for a period of thirty-six (36) months from the date of shipment by Powerex or ten thousand (10,000)hours of use, whichever comes first. For any replacement Air-End or Vacuum Pumps installed on a system that was not manufactured by Powerex after any initial warranty period has expired or where another warranty does not apply for any reason, Powerex warrants that the Air-End or Vacuum Pumps shall be free of Defects for the first twelve (12) months from the date of shipment by Powerex. Supplier's repair or replacement of any Product shall not extend the period of any warranty of any Product. This warranty applies to the exchange of part(s) found to be defective by an Authorized Powerex Service Representative only.

(e) Replacement Motors – Parts Only (No Labor). For any replacement motor installed on a Powerex manufactured system or unit after any initial warranty period has expired or where another warranty does not apply for any reason, Powerex warrants that the replacement motor shall be free of Defects for the first twelve (12) months from the date of shipment by Powerex. For any replacement motor installed on a system or unit that was not manufactured by Powerex after any initial warranty period has expired or where another warranty does not apply for any reason, Powerex warrants that the replacement motor shall be free of Defects for the first ninety (90) days from the date of shipment by Powerex. Supplier's repair or replacement of any Product shall not extend the period of any warranty of any Product. This warranty applies to the exchange of part(s) found to be defective by an Authorized Powerex Service Representative only.

(f) Replacement Parts – Parts Only (No Labor). For other replacement parts besides motors, Air-End or Vacuum Pumps installed on a Powerex manufactured system or unit after any initial warranty period has expired or where another warranty does not apply for any reason, Powerex warrants that such replacement parts will be free from Defects for the first twelve (12) months from the date of shipment by Powerex. For other replacement parts besides motors, Air-End or Vacuum Pumps installed on a system or unit that was not manufactured by Powerex after any initial warranty period has expired or where another warranty does not apply for any reason,

Powerex warrants that such replacement parts will be free from Defects for the first twelve (12) months from the date of shipment by Powerex. For other replacement parts besides motors, Air-End or Vacuum Pumps installed on a system or unit that was not manufactured by Powerex after any initial warranty period has expired or where another warranty does not apply for any reason, Powerex makes no warranties. Supplier's repair or replacement of any Product shall not extend the period of any warranty of any Product. This warranty applies to the exchange of part(s) found to be defective by an Authorized Powerex Service Representative only.

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

(h) 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.

(i) 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, CONSEQUENTAL, 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.