

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 Medical Air System is designed to provide medical breathing air for hospital and medical institutes. This system meets NFPA 99 requirements for Level 1 breathing air.

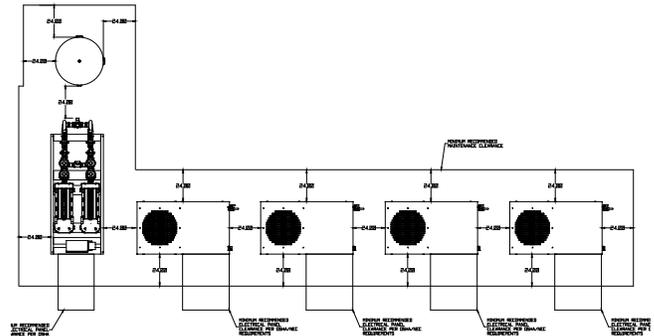
The system consists of two or more Powerex Rotary Tooth oil-free compressor units field piped together utilizing a remote intake in accordance with NFPA99 requirements. Each compressor is furnished with an isolation valve.

Three phase main power of the appropriate voltage and frequency must be supplied to each compressor unit. The compressor unit does not include a main circuit breaker or fuse or service disconnect and these items must be provided and installed when the compressor units are installed.

The compressors are field piped to the air receiver that is lined and equipped with a pressure gauge, ASME safety valve, automatic drain set, liquid sight gauge, and NFPA 99 compliant three valve bypass assembly.

Compressed air piping connecting the receiver tank outlet to the dryer skid must be field installed. The duplex desiccant dryer assembly has bypass control valves, a coalescing type pre-filter with an automatic drain, an after filter for particulates, and a carbon after-filter to meet NFPA 99 requirements for use with oil free compressors. Final line regulators, pressure gauges, and line safety valves are included in the dryer assemblies.

The fully plumbed dryer skid has an electrical control panel that serves as a system alternator, controlling the compressor units so that one is in reserve and the control triggers alarms for reserve in use and other conditions required in NFPA99. The control group is powered by field supplied 115 volt single phase power from a 15 amp circuit that is part of the facility backed up emergency power system.



The control group includes a dew point monitor that is wired to the desiccant dryer controls for purge saving operation and a CO monitor required for NFPA99 compliance. The monitor alarm signals are wired for convenient connection to the facility master alarm panel.

The system is designed for use indoors and where temperatures are controlled to be above 34 F and below 104F. Operation in temperatures exceeding 80F will require more frequent maintenance intervals than the normal schedule. (See compressor unit operating manual for details.)

## Safety Guidelines

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.

### **⚠ 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.*

**NOTE:** Information that requires special attention.

This System is provided with a separate Safety manual. Be sure to read and understand all the warnings and to know all required actions. Make sure all personnel that will use or be near the equipment are familiar with the warnings and required actions as well.

## General Safety Information

### **California Proposition 65**

### **⚠ WARNING**

*This product or its power cord may contain chemicals known to the State of California to cause cancer and birth defects or other reproductive harm. Wash hands after handling.*

### **General Safety**

Since the air compressor and other components (material pump, filters, lubricators, hoses, etc.) used, make up a high pressure pumping system, the

following safety precautions must be observed at all times:

1. Read all manuals included with this product carefully. Be thoroughly familiar with the controls and the proper use of the equipment.
2. Follow all local electrical and safety codes as well as the United States National Electrical Codes (NEC) and Occupational Safety and Health Act (OSHA).
3. Only persons well acquainted with these rules of safe operation should be allowed to use the equipment.
4. Keep visitors away and NEVER allow children in the work area.
5. Wear safety glasses and use hearing protection when operating the unit.
6. Do not stand on or use the unit as a handhold.
7. Before each use, inspect compressed air system and electrical components for signs of damage, deterioration, weakness or leakage. Repair or replace defective items before using.
8. Check all fasteners at frequent intervals for proper tightness.

### **⚠ WARNING**

*Electrical equipment and controls can cause electrical arcs that will ignite a flammable gas or vapor. Never operate or repair in or near a flammable gas or vapor. Never store flammable liquids or gases in the vicinity of the compressor.*

### **⚠ WARNING**

*An ASME code safety relief valve, with a setting no higher than the tank maximum allowable working pressure, MUST be installed in the air lines or in the tank. The ASME safety valve must have sufficient flow and pressure ratings to protect the pressurized components from bursting. The flow rating can be found in the parts manual.*

### **⚠ CAUTION**

*Do not operate with pressure switch or pilot valves set higher than the tank maximum allowable working pressure.*

9. Never attempt to adjust ASME safety valve. Keep safety valve free from paint and other accumulations.

**⚠ DANGER**

*Never attempt to repair or modify a tank! Welding, drilling or any other modification will weaken the tank resulting in damage from rupture or explosion. Always replace worn, cracked or damaged tanks.*

**NOTICE**

*Drain liquid from tank daily.*

10. Tanks rust from moisture build-up, which weakens the tank. Make sure to drain tank regularly and inspect periodically for unsafe conditions such as rust formation and corrosion.
11. Fast moving air will stir up dust and debris which may be harmful. Release air slowly when draining moisture or depressurizing.

**Unpacking**

Immediately upon receipt of the oilless compressor, inspect for any damage which may have occurred during shipment. The compressor nameplate should be checked to verify the correct model and voltage as ordered.

**⚠ WARNING**

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

**Installation****⚠ WARNING**

*Disconnect, tag and lock out power source then release all pressure from the system 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 unit to lift other attached equipment.*

**⚠ WARNING**

*Installation of inlet / outlet air plumbing from the*

*compressor flange and electrical connection must be in accordance with National Fire Protection Association (NFPA99) Code Compliance for Medical Gas Breathing Air (Level 1).*

**Installation Site**

1. The oilless compressor 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 where the surrounding temperature is higher than 104° F or where humidity is high.
4. Clearance must allow for safe, effective inspection and maintenance. Electrical panels may require additional clearance. Consult local NEC codes for proper clearances.
5. If necessary, use metal shims or leveling pads to level the compressor. Never use wood to shim the compressor.

**Ventilation**

1. If the oilless compressor is located in a totally enclosed room, an exhaust fan with access to outside air must be installed.
2. Never restrict the cooling fan exhaust air. Maintain a minimum of 3 feet of clearance around entire unit.
3. Never locate the compressor where hot exhaust air from other heat generating units may be pulled into the unit.

**Wiring**

All electrical hook-ups must be performed by a qualified electrician. Installations must be in accordance with local and national electrical codes.

Use solderless terminals to connect the electric power source.

## Piping

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.
4. Never use any piping smaller than the compressor connection.
5. Use flexible hose to connect the outlet of the compressor to the piping so that the vibration of the compressor does not transfer to the piping.

## Safety valves

Medical package systems are shipped from the factory with safety valves installed in the tank assembly. The flow capacity of the safety valve is equal to or greater than the flow capacity of the compressor system. There are also safety valves installed where compressor modules isolate from the system, and safety valves are installed where the air purification system isolates.

1. The pressure setting of the safety valve must be no higher than the maximum working pressure of the tank.
2. Safety valves are placed ahead of any possible blockage point in the system, i.e. shutoff valves.
3. Avoid connecting the safety valve with any tubing or piping.
4. Manually operate each safety valve every six months to avoid sticking or freezing.

## Assembling Modular Medical System

### Modular Placement

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

2. Locate the compressor units, air receiver and dryer skid as needed.
3. Make sure to leave adequate clearance for maintenance and for electrical panel access as required by applicable codes and regulations.
4. Secure the units to the floor using the brackets provided for shipping or using the foot holes in the air receiver base and the holes in the dryer skid frame.
5. The compressor units have internal vibration isolation and no additional isolation is required, but if desired; cork rubber anti vibration pads may be installed under the corners at the foot brackets.
6. Similarly, the receiver and dryer skid do not require isolation, but it may be installed if desired.

## Connecting Piping

1. Locate connection for piping at rear of unit for compressors module to receiver tank module.
2. Remove plastic caps that protect piping against contamination.
3. Connect flex joint to frame securely making sure flex line is not pinched or kinked.
4. Follow steps 1 to 3 for flex line from outlet of receiver tank to dryer package.

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

5. 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. Make sure inlet drip legs are installed to prevent moisture from entering the compressor system intake filters.
6. Connect outlet source from filter package located on dryer module to outlet source piping.



**WARNING**  
Attach all inlet and outlet source piping in accordance with NFPA 99 for Medical Gas.

*Attach all inlet and outlet source piping in accordance with NFPA 99 for Medical Gas.*

### Connecting Wiring

#### **CAUTION**

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

1. Connect the Dryer skid control panel to a 115VAC power supply. (make sure the power source is energized when the facility back up generators are on.)
2. Connect the control circuit signal wires to and from each compressor as shown in the detailed wiring diagrams provided with each system. The timer drain on the air receiver must be connected to a 115VAC power source. The control panel on the dryer skid has terminals for supplying the required power that may be used if desired.

### Operation

The system is designed so that the compressors automatically turn on and off in response to air demand as indicated by pressure measured at the dryer skid inlet and the compressor outlets. The control will energize the lead compressor and the compressor internal control will take over operation. The program settings of each compressor unit in the system must be set to the same pressure values.

When air demand is low enough that the system pressure rises to the programmed cut out point, the compressor unit control will engage the unloaded operating mode or turn off the compressor or engage the VFD reduced speed operating mode. For details of the compressor control operation, see the compressor unit manual.

When there is sufficient demand, a second or third compressor unit is engaged. The control of each compressor unit will act independently of the other units while it is called for by the main control panel. (If the last available unit is called for, a Reserve in Use alarm is triggered.) Once a call for is issued, the main control will hold that call for a fixed amount of time to prevent rapid on-off cycling. In systems with VFD controls on the compressors, the VFDs will trim the rpm of all active units as needed. The control will

alternate lead and reserve status to equalize run time on all available units.

Each system is equipped with an air receiver and a fully duplexed air dryer and treatment system. Only one of the available air treatment paths should be open at any given time. Open the valves in one branch and close the valves in the other branch. The branches should be manually alternated once per month to maintain the off line one in readiness for unexpected events. Use the selector switch on the control panel to provide electrical power to the on line branch. The regulators in each branch stabilize the air pressure to the required value for the facility.

The dryer and treatment system is followed by dew point and CO monitors display the conditions and trigger alarms if the conditions exceed the values required by NFPA99. The dew point monitor will also send a signal to the dryer controls to suspend use of purge air if the air demand and dryer operating conditions are producing air in excess of the required dryness.

Condensate water is produced by the heat exchangers in each compressor unit, the automatic drain from the air receiver and the automatic drains from the dryer pre-filters. A very small amount of condensed oil mist may be discharged from the compressor unit as well. (See the compressor manual for details) The condensate should be piped to appropriate disposal points depending on applicable codes and regulations.

Details of compressor unit operation and maintenance and dryer operation and maintenance are covered in the individual unit manuals.

### Start Up

When the system is started, each compressor unit will require a start-up procedure to be performed by an authorized Powerex distributor. Failure to follow the required procedure and provide the data to Powerex may result in equipment failure and the warranty being void.

The valves on the compressed air lines should be opened so that all active compressors are on line, the tank is on line and one dryer branch is on line. When

the system has completed all start up actions and meets the requirements of NFPA the valve connecting the system to the facility piping may be opened.

## Maintenance

The maintenance requirements of the compressor unit are found in the compressor unit manual.

Similarly the maintenance for the dryer is described in the dryer manual.

Other Maintenance actions: (Additional maintenance, especially concerning sensors and monitor calibration may be required to meet local and NFPA99 requirements).

| Item   | Every day | Every week | Every Month | Every Quarter | Every Year | Every two years |
|--|-----------|------------|-------------|---------------|------------|-----------------|
| Check the receiver tank sight glass to make sure no water is accumulating  | X         |            |             |               |            |                 |
| Check the function of the receiver tank automatic drain by pushing the test button and verifying any liquid is expelled along with air |           | X          |             |               |            |                 |
| Alternate dryers   |           |            | X           |               |            |                 |
| Verify the condensate trap on the dryer prefilter is working; clean the particulate after filters                                      |           |            | X           |               |            |                 |
| Follow the CO monitor requirement for sensor calibration   |           |            |             | X             |            |                 |
| Verify air is flowing from the dew point sampling orifice, clean if necessary and check the dew point sensor filter, clean if dirty    |           |            |             | X             |            |                 |
| Replace the dew point sensor   |           |            |             |               |            | X               |







**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.