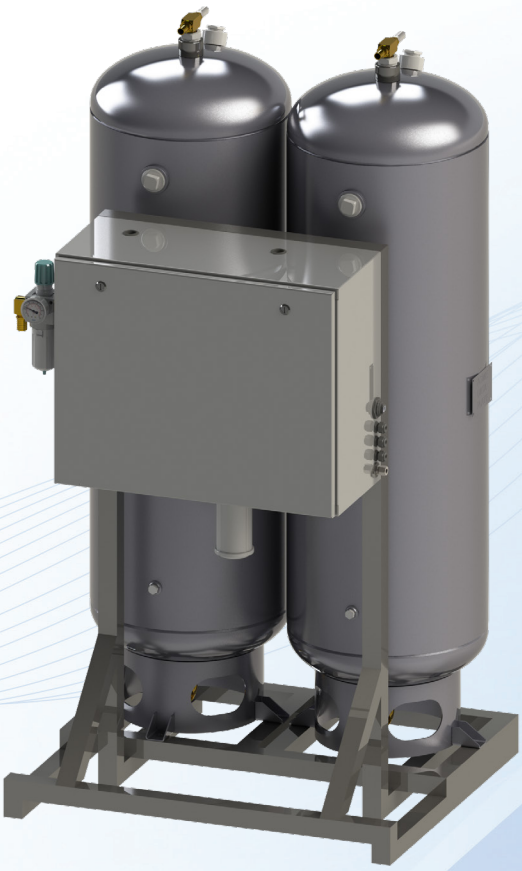
OXGS SERIES

OXYGEN GENERATION SYSTEM

MODEL: OXGS-175

INSTALLATION & OPERATIONS MANUAL



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CONTENTS

IMPORTANT SAFETY INSTRUCTIONS, READ AND FOLLOW ALL INSTRUCTIONS.

Read this manual completely before attempting installation.

SAVE THESE INSTRUCTIONS.

The OXGS Line of Oxygen Concentrators is designed and manufactured by Preservation Tech, LLC.

SECTION 1

SAFETY PRECAUTIONS

NOTE: This oxygen concentrator was not designed or manufactured to supply medical grade oxygen. In applications where the oxygen is going to be directly breathed (SCBA tanks or hospitals, for instance), use only concentrators that are assembled and tested according to locally applicable laws and regulations.

Do not attempt to modify or enhance the performance of the Generator in any way.

Fire Hazards

Although oxygen itself is not combustible, it can be very dangerous. It greatly accelerates the burning of combustible materials. Precautions should be taken to avoid a fire in the area of the concentrator.

1. Smoking should not be permitted in the area where the generator is located.
2. All oxygen connections and hoses should be kept clean and free of grease, oil, and other combustible materials.
3. Valves controlling oxygen flow should be opened and closed slowly to avoid the possibility of fires or explosions that can result from adiabatic compression.
4. When bleeding a tank or line, stand clear and do not allow oxygen to embed itself within clothing. A spark could ignite the clothing violently.

Vision and Hearing

High pressure gases may be present within the system. Valves should be opened and closed slowly. Safety glasses and hearing protection should be worn at all times while gases are being vented.

The purging of nitrogen from the system occurs through a waste gas muffler within the cabinet. This component is intended to quiet the noise created when nitrogen is purged. Hearing protection should be used when operators are spending significant time in close proximity to the machine.

Hypoxia and Suffocation

Adequate ventillation is critical to ensure a safe working environment around the machine. While nitrogen is not harmful to breath, poor ventillation can allow purged nitrogen to displace oxygen in the area. Nitrogen makes up a large percent of regular air, and is essentially undetectable to human senses.

Personnel working within a low oxygen environment are in danger of suffering from hypoxia. When the brain does not receive adequate oxygen, the person becomes impaired and begins to lose critical thinking ability, which could then make it more difficult to recognize and act upon dangerous situations. Suffocation and death become a very real threat.

Maintenance

The oxygen concentrator contains electrically powered components, as well as pressurized gases. Before performing any sort of maintenance on the machine, isolate it and disconnect all energy sources. The sieve bed tanks should be manually stabilized and vented via the PLC, the power cable should be disconnected, and both the compressed air and oxygen lines should be cut off (such as with a manual ball valve).

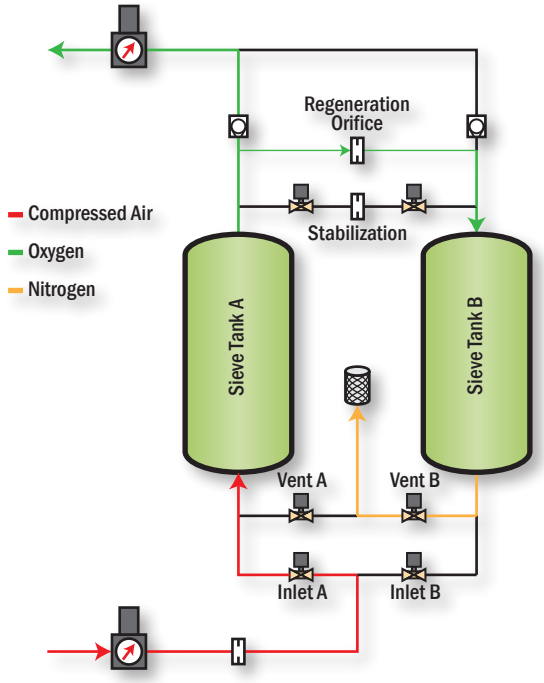
INTRODUCTION

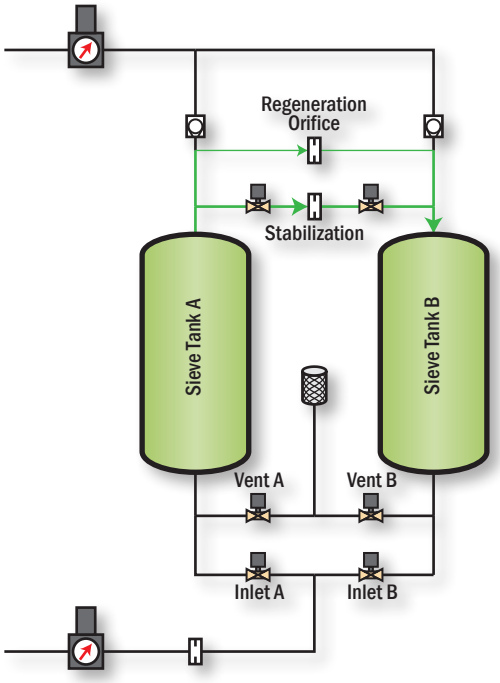
The OXGS machines are oxygen concentration systems that utilize the Pressure Swing Adsorption method to separate nitrogen from oxygen. A particular material called a molecular sieve which allows oxygen to flow through, while filtering out nitrogen and purging it back to ambient air. The machine can provide oxygen at greater than 90% purity.

THEORY OF OPERATION

The OXGS series of oxygen concentrators separates and purges nitrogen from the compressed air supply stream. The ambient atmosphere (not including water vapor) is made up of about 78% nitrogen, 21% oxygen, slightly less than 1% argon, and trace amounts of carbon dioxide and other gases.

The concentrator employs a technique to separate the gases called Pressure Swing Adsorption. Nitrogen molecules flowing through the system become embedded with the molecular sieve. Higher pressures allow the sieve material to collect more nitrogen, all





while oxygen flows past and out of the sieve tank. When tank pressure drops, the nitrogen is then released, where it can flow out of the tank through the waste gas muffler.

The concentrator has two sieve bed tanks working in an alternating cycle fashion. A description of the cycle is described below:

1. Inlet solenoid A and vent solenoid B open up to allow compressed air into sieve bed A and purge nitrogen from bed B. Oxygen begins to flow out of the top of tank A to the outflow, while a small, regulated side stream of oxygen flows to tank B to aid in purging of nitrogen. This stage is represented in the left side of the diagram above.

2. Inlet solenoid A and vent solenoid B close after a preset length of time. Stabilization solenoids on the oxygen side of the tanks then open to bring both tanks into equal pressure with quality oxygen inside tank B ready to provide to the outflow. This stage is represented in the right side of the diagram above.

3. Inlet solenoid B and vent solenoid A open up to allow compressed air into sieve B and purge nitrogen from bed A. Oxygen flows out of tank B to the outflow, while a small regulated side stream of oxygen flows back to tank A to aid in purging of nitrogen. This portion of the cycle is a mirror of step 1, as described above.

4. Inlet solenoid B and vent solenoid A close after a preset length of time. Stabilization solenoids on the outflow side of the tanks open to bring both tanks into equal pressure with quality oxygen in tank A ready to provide to the outflow. This step is a mirror of step 2, as described above.

5. The process repeats, alternating between sieve beds to provide a continued supply of oxygen.

SECTION 2

INSTALLATION GUIDELINES

The oxygen concentrator must be installed indoors, in a clean, dry environment. The ambient operating temperature should be between 40 degrees and 95 degrees Fahrenheit. The concentrator should be installed with access to compressed air upstream, and a minimum 120 gallon oxygen receiver tank downstream of the unit.

The unit must be installed in an upright configuration, with a fully packed sieve bed. Sight glasses have been installed on the sieve bed tanks to allow operators and installers to verify the sieve has not settled.

After the unit has been moved or transported, it is necessary to repack the sieve bed to fill empty space from settling. Isolating the machine from vibration and movement will ensure that repacking the sieve bed is not a frequent occurance.

After installation, check fitting locations for leaks using a small spray bottle filled with soapy water. Leaks will cause agitation in the water applied to the fittings. Be sure not to allow spray to contact powered electrical components.

VENTILLATION

The system should be installed in a well-ventilated area. While this machine does not create a large quantity of excess heat, it frequently purges nitrogen. Ventillation around the concentrator replenishes oxygen levels to maintain a safe working area. Proper ventillation around the compressor will also ensure that the compressed air feed gas has enough oxygen to be concentrated to maintain good purity.

LOCATION

The system is designed as a fixed placement skid. When locating a place to install the system, the following should be kept in consideration:

- Placement must be indoors, in a climate controlled environment.
- Sufficient space around the machine should be provided for access during maintenance procedures, such as repacking the sieves with new material. The sight glass ports are located toward the rear of the tops of each sieve tank.
- The unit must have access to an adequate compressed air supply, including appropriate receiver tanks.
- A minimum 120 gallon oxygen receiver should be installed nearby, with a pressure transducer attached and connected to the onboard PLC system. This is required to operate the automatic mode on the PLC.

REMOTE OPERATION

On the interior of the cabinet will be remote terminals to allow for remote on/off control. Inputting a 24V signal to this remote terminal will operate the machine. When the signal ends, the concentrator will enter idle mode. Remote operation must be enabled in the settings screen on the HMI before it will respond to inputs.

COMPRESSED AIR

A compressed air system is required upstream of the oxygen concentrator. This compressor or compressed air system must be able to provide a minimum of 80 scfm of clean, dry air at 90 psig. Include an air receiver tank according to your specific compressor manufacturer's recommendations.

It is also recommended that the compressed air stream be cooled to near ambient temperatures. Warmer air has the ability to hold more moisture, which can permanently ruin the operational capacity of the concentrator.

AIR DRYER

The sieve bed material is highly sensitive to moisture and oil content in the compressed air supply stream. It is highly recommended to use a standalone air dryer, or preferably an air compressor with an air dryer built in.

FILTRATION

Include appropriate coalescing filters downstream of the compressor to remove oil (if the compressor system is oil lubricated). Oil entrained in the compressed air supply stream also degrades machine performance.

BUFFER/RECEIVER TANKS

An oxygen buffer tank is required downstream of the oxygen concentrator. The alternating nature of the PSA method means that the pressures and flows of oxygen from the machine is going to vary significantly. Flow of oxygen out will even drop to 0 lpm during the stabilization phases of the cycle. The oxygen buffer tank should be a minimum of 120 gallons capacity.

It should also be noted that the interior of the tank is recommended to have an enamel coating to prevent oxidation that could compromise the tank. As the tank will hold high purity oxygen, the risk of rusting is very high for iron and plain steel receiver tanks.

MECHANICAL CONNECTIONS

Compressed Air In

Compressed air is supplied to the brass barb elbow on the left side of the control enclosure. The pressure regulator that prepares incoming compressed air is located on the outside of the control cabinet. The barb is attached to this regulator.

Oxygen Out

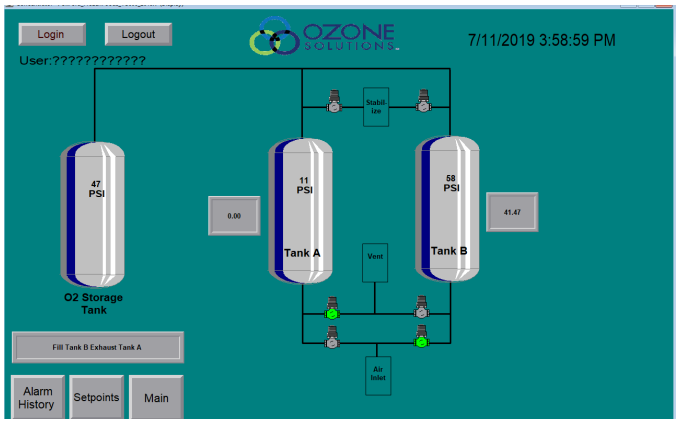
Concentrated oxygen is supplied from the 0.5" compression fitting on the right side of the control cabinet.

SPECIFICATIONS

OXGS-Series	OXGS-175
O2 Production (lpm [scfm])	175 [6.18]
Compressed Air Requirement (lpm [scfm])	2265 [80]
Minimum Air Supply Pressure (psig)	90
Supply Voltage (VAC)	120
Supply Current (amps)	1
Dimensions - HxWxD (in [cm])	77x41x38 [196x104x97]

SECTION 3

HMI HOME SCREEN

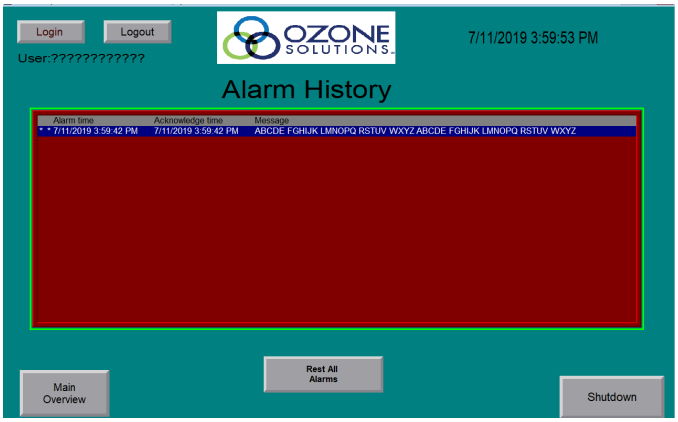


The HMI home screen provides a visual overview of the various critical functions of the concentrator.

- Numerical indicators on each sieve tank display the pressure measured in each. A numerical pressure indicator also appears on the buffer tank.
- A numerical readout next to the sieve bed graphics will show the timed countdown of the current stage of the cycle, in seconds.
- A status box in the lower left displays a short message to describe the current cycle status. The options in this box are "Idle", "Fill Tank A", "Stabilize A to B", "Fill Tank B", "Stabilize B to A", and "Tank PSI at Max".
- Valve indicator dots will display when a specific solenoid valve is open to allow flow. Typically the "Air In" valve on one tank is activated simultaneously to the "Exhaust" valve on the opposite tank. The "stabilize" valves will open individually depending on which tank is feeding the other.

- An Alarm History button will take the user to a log of alarms which have been triggered. This screen can be used to troubleshoot and acknowledge alarm conditions.
- A “Setpoints” button will take the user to a screen where the set values of automatic operation can be modified to alter system performance.

HMI ALARM HISTORY SCREEN



The alarm history screen on the HMI allows users to review and acknowledge alarm conditions as part of the troubleshooting process. Tapping individual alarms allows for more information and the option to acknowledge it. At the bottom of the alarm history screen is a button to reset all inactive alarms accrued in the log.

START UP PROCEDURE

When starting the concentrator, either for the first time or any time the oxygen buffer tank has been drained of pressure, the user should follow this start up procedure. This procedure will ensure a proper oxygen purity when the machine is brought to full operation.

1. Ensure the sieve tanks are properly packed with the sieve material. Repack if necessary.
2. Ensure there is no process flow (oxygen demand) on the buffer tank for the first 15 minutes of concentrator operation. This will ensure that the oxygen buffer tank can start to build internal pressure and oxygen purity.
3. Start process flow at approximately 50 lpm for an additional 45 minutes. This will allow the tank to continue to build purity.
4. Raise process flow to your desired level, a maximum of 175 lpm.

COMPRESSED AIR FLOW MEASUREMENT

When using an analog flow meter to measure compressed gases, it is necessary to keep in mind the compressibility of the gas and how it affects flow measurement. If gas pressure is significantly higher than atmospheric pressure, an equation can be used to find actual flow through the flow meter (using psig for the pressure values):

$$(adjustedflow) = (measuredflow)x\sqrt{\frac{oxygenpressure + 14.7}{14.7}}$$

SECTION 4

REPACKING THE SIEVE BEDS

The sieve bed material within the tanks is exceptionally fragile when it comes to moisture. Occasionally it becomes necessary to repack the sieve beds to return the machine to proper performance. With proper air drying and filtering, this should not be a frequent issue. Contact the Ozone Solutions Service Department at 712.439.6880 if a complete replacement of sieve material is necessary, or if the machine has poor performance and troubleshooting steps have not solved the issue.

WARRANTY

Ozone Solutions warrants all equipment assembled, manufactured, and sold to be free from defects in material and workmanship under normal use and service for a period of one (1) year after date of sale to the original purchaser.

Some products may have a specific warranty period other than what is outlined in this document. For such products, the manufacturer warranty will supercede this warranty. Ozone Solutions will honor the manufacturer’s warranty, but if and when advised

by the manufacturer, may have the customer deal directly with the manufacturer. This warranty covers all parts that are not outlined in a product maintenance schedule. This warranty will be void if any piece of the equipment is used in a manner other than what is explicitly outlined in the product manuals.

If any part of the equipment manufactured by Ozone Solutions proves to be defective during the warranty period, please call Ozone Solutions at 712.439.6880, or email service@ozonesolutions.com.

Prior authorization is required before working on or shipping a product back to us. Failure to get prior authorization may result in denial of your claim. Once authorized, you may return the defective equipment to Ozone Solutions with the transportation charges prepaid. If Ozone Solutions finds the equipment to be defective, it will be repaired or replaced at our discretion, free of charge, to the original purchaser (F.O.B. factory).

This warranty shall not place any liability on Ozone Solutions for any transportation charges, labor, or cost for, or during the replacement of any parts. The replaced part(s) or product will then continue the original warranty duration. The replaced parts will not start a new one (1) year coverage period. The purchaser by acceptance of the equipment will assume all liability for the consequences of its use or misuse by the purchaser, employees, or others. This warranty shall not apply to any piece of equipment, or part thereof sold by this company which has been subject to any accident caused in transit, alterations by unauthorized service, negligence, abuse, or damage by flood, fire, or act of God.

This warranty shall constitute the entire warranty and/or agreement between Ozone Solutions and the original purchaser, and in lieu of all other warranties, expressed or implied, either oral or written, including the warranty of merchantability and fitness for a particular use and of all other obligations or liabilities on our part. Ozone Solutions neither assumes nor authorizes any other person or entity to assume for us any liability associated with the sale of its products or equipment.

The term “original purchaser,” as used in this warranty, means whom the product was originally sold to by Ozone Solutions or by an authorized dealer. Ozone Solutions reserves the right to make changes in its products without notice. Because of this, Ozone Solutions is not obligated to replace warranty defective part(s) and/or product with the same original part or product.

CONTACT INFORMATION

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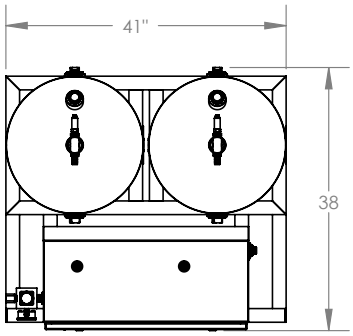
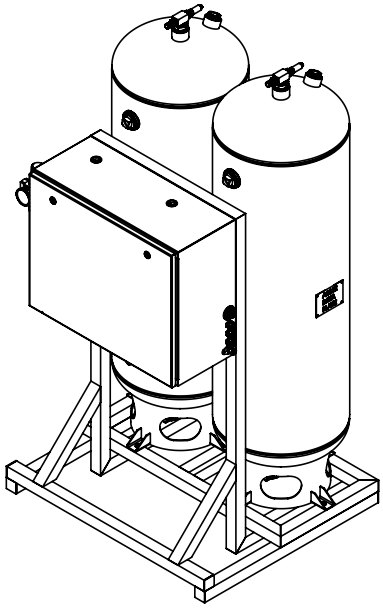
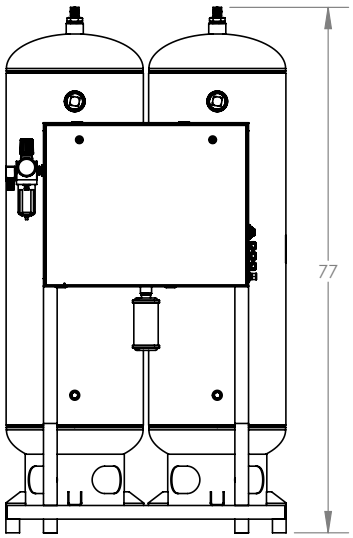
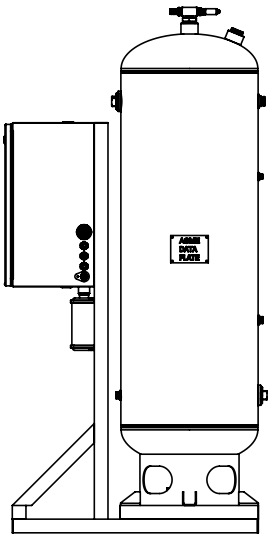
APPENDIX A - CAD DRAWING









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OXGS-175

APPENDIX B - MAINTENANCE

All major components requiring maintenance have guidelines listed in the respective operation manuals. Refer to those individual operation manuals for other preventative maintenance and regular maintenance information.

Maintenance Table

Component	Action	Time Period
Pressure Regulator+Filter	Replace filter element	3 months/as needed
Coalescing Filter	Replace filter element	3 months/as needed
Sieve Beds	Replace sieve bed material	2-5 Years

The Oxygen Concentrator sieve beds will require replacement after approximately 5 years of ideal conditions. Replacement may be necessary earlier if operated in dirty or humid conditions, or if the compressed air supply contains oil or water.

APPENDIX C - TROUBLESHOOTING

Symptom	Possible Cause	Repair
System does not run	No Power	Check and repair incoming power
Low oxygen purity	Low Supply Pressure	Check incoming pressure regulator setting
		Replace incoming air filter
		Check for upstream leaks
	Degraded Sieve Material	Replace sieve material
		Check for excess moisture in supply air
		Replace incoming air/coalescing filter
	Leak	Use soapy water to find and repair leaks
	Plugged Orifice Plates	Remove and clean orifice plates in regeneration, stabilization, and inlet lines
Low oxygen flow	Plugged Orifice Plates	Remove and clean orifice plates in regeneration, stabilization, and inlet lines
	Leak	Use soapy water to find and repair leaks
	Low Supply Pressure	Check incoming pressure regulator setting
		Replace incoming air filter
		Check for upstream Leaks
Sieve Bed Dusting	Moisture in compressed air line	Check air dryer operation
		Replace Sieve Material
Low oxygen pressure	Poorly set back pressure regulator	Check back pressure regulator setting
	Leak	Use soapy water to find and repair leaks

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