

Oxygen Concentrator

Installation and Operation Manual

AEROUS₂*nx*

ClearWater Tech, LLC.

Integrated Ozone Systems

850-E Capitolio Way, San Luis Obispo, Ca 93401 • 805-549-9724 • Fax: 805-549-0306 • E-mail: service@cwtozone.com • www.cwtozone.com

Copyright © 2019 - ClearWater Tech, LLC • Reproduction of any kind is prohibited • LIT330 • REV050319

ClearWater Tech, LLC. Limited One-Year Warranty

Summary of the Warranty

ClearWater Tech, LLC (“CWT”) makes every effort to assure that its products meet high quality and durability standards and warrants the products it manufactures against defects in materials and workmanship for a period of one (1) year, commencing on the date of original shipment from CWT, with the following exceptions: 1) The warranty period shall begin on the installation date if the installation is performed within 90 days of the original shipment from CWT; 2) The warranty period shall begin on the date of the bill of sale to the end user if the installation date is more 90 days after the original shipment date. To validate the warranty, a warranty card, accompanied by a copy of the bill of sale, must be returned to CWT and must include the following information:

- End user name
- Complete address, including telephone number
- Date installed
- Complete model and serial number information
- Name of company from which the unit was purchased

Repairs and replacement parts provided under this warranty shall carry only the unexpired portion of this warranty or 90 days, whichever is longer.

Items Excluded from the Warranty

This warranty does not extend to any product and/or part from which the factory assigned serial number has been removed or which has been damaged or rendered defective as a result of:

- An accident, misuse, alteration or abuse
- An act of God such as flood, earthquake, hurricane, lightning or other disaster resulting only from the forces of nature
- Normal wear and tear
- Operation outside the usage parameters stated in the product user’s manual
- Use of parts not sold by CWT
- Service or unit modification not authorized by CWT
- Check valve/solenoid valve failure
- Damage which may occur during shipping
- Failure to meet service requirements as outlined in this manual



Product Registration
(scan QR code)

Obtaining Service Under the Warranty

Any product and/or part not performing satisfactorily may be returned to CWT for evaluation. A Return Goods Authorization (RGA) number must first be obtained by either calling or writing your local authorized dealer, distributor or CWT direct, prior to shipping the product. The problem experienced with the product and/or part must be clearly described. The RGA number must appear prominently on the exterior of the shipped box(es). The product and/or part must be packaged either in its original packing material or in comparable and suitable packing material, if the original is not available. You are responsible for paying shipping charges to CWT and for any damages to the product and/or part that may occur during shipment. It is recommended that you insure the shipment for the amount you originally paid for the product and/or part.

If, after the product and/or part is returned prepaid and evaluated by CWT, it proves to be defective while under warranty, CWT will, at its election, either repair or replace the defective product and/or part and will return ship at lowest cost transportation prepaid to you **except for shipments going outside the 50 states of the United States of America**. If upon inspection, it is determined that there is no defect or that the damage to the product and/or part resulted from causes not within the scope of this limited warranty, then you must bear the cost of repair or replacement of damaged product and/or part and all return freight charges. Any unauthorized attempt by the end user to repair CWT manufactured products without prior permission shall void any and all warranties. For service, contact your authorized dealer or distributor or CWT direct at (805) 549-9724.

Exclusive Warranty

There is no other expressed warranty on CWT products and/or parts. Neither this warranty, nor any other warranty, expressed or implied, including any implied warranties or merchantability of fitness, shall extend beyond the warranty period. Some states do not allow limitation on how long an implied warranty lasts, so that the above limitation or exclusion may not apply to you.

Disclaimer of Incidental and Consequential Damages

No responsibility is assumed for any incidental or consequential damages; this includes any damage to another product or products resulting from such a defect. Some states do not allow the exclusion or limitation of incidental or consequential damages, so that above limitation or exclusion may not apply to you.

Legal Remedies of Purchaser

This warranty gives you specific legal rights and you may also have other rights, which vary from state to state.

THIS STATEMENT OF WARRANTY SUPERSEDES ALL OTHERS PROVIDED TO YOU AT ANY PRIOR TIME.

APPENDIX B – SERVICE PARTS

Below is a list of common replacement parts. For any unlisted parts, contact ClearWater Tech directly for further assistance.

O₂

Service Part	Quantity	Part Number
Control Board	1	CCA1787
Power Supply	1	PSR12
Solenoid Valve Assembly	1	SV600
Cooling Coil Service Assembly	1	TUB42SA
Sieve Bed Assembly	1	OXU500
Tubing Kit	1	TBK140
Compressor 120VAC 60Hz	1	AC100
Compressor 220/240VAC 50/60Hz	1	AC105
Pressure Relief Valve (45PSI)	1	OXS362
Fuse	1	FUS55
Enclosure Filter	1	FLT58
Inlet Filter	1	FLT65
Coalescing Filter	1	FLT75
Air Filter Maintenance Kit ¹	1	ASP600
Compressor Rebuild Kit	1	AC92
System Rebuild Kit ²	1	ASP601
Tool – Oxygen Concentration Meter	1	CMT200
Tool – 0-60 PSI Pressure Gauge	1	GAG510

¹Air filter maintenance kit includes one each of FLT65 and FLT58.

²System rebuild kit includes one each of FLT65, FLT58, TBK140, SV600, OXU500, OXS362, and AC92.

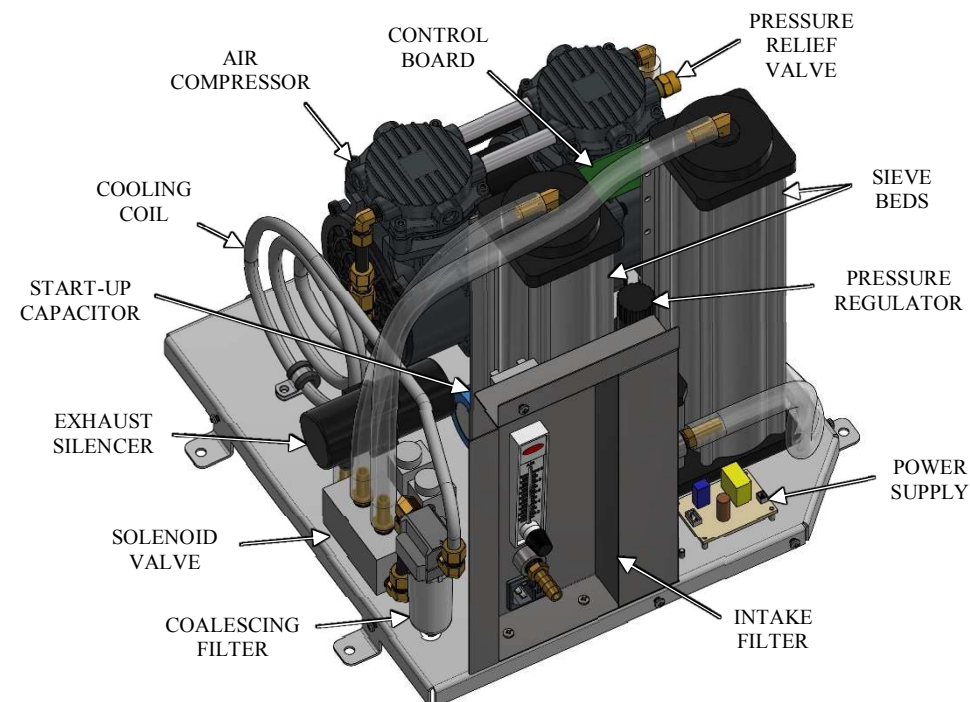


Figure 4: Internal Components

INTRODUCTION

This Installation and Operation Manual was written to assist in the installation, operation and maintenance of systems manufactured by ClearWater Tech, LLC. The equipment has been designed using the most modern materials and technology available.

Please read this manual carefully and in its entirety before proceeding with any installation, operation, or maintenance procedures associated with this equipment. Failure to follow these instructions could result in personal injury, damage to the equipment, or reduced product performance.

In an ongoing effort to improve reliability and operating efficiency, ClearWater Tech may find it necessary to make changes to its products. Therefore, the information contained in this manual may not conform in every respect to earlier versions of ClearWater Tech systems found in the field. If you have any questions, please contact your ClearWater Tech dealer or the ClearWater Tech service department.

APPENDIX A – SPECIFICATIONS

Oxygen Output	90±5% by volume @ 15 scfh (7 lpm), 10 psig (0.7 bar) in laboratory conditions
Electrical Input	120VAC, 60Hz, 5.8A, 1Φ 220/240VAC, 50/60Hz, 3.4/3.1A, 1Φ
Physical Characteristics	16.6" H x 17.1" W x 15.7" D (422mm H x 435mm W x 400mm D) 50 lbs (22.7 kg) 60 dB(A)
Environmental Limits	Operating temperature: 41°F to 104°F (5°C to 40°C) non-condensing Storage temperature: 0°F to 140°F (-18°C to 60°C) Humidity: 0 to 95% RH Barometric Pressure Range: 28 to 31 inches of Hg Ambient Oxygen Concentration: 20% minimum

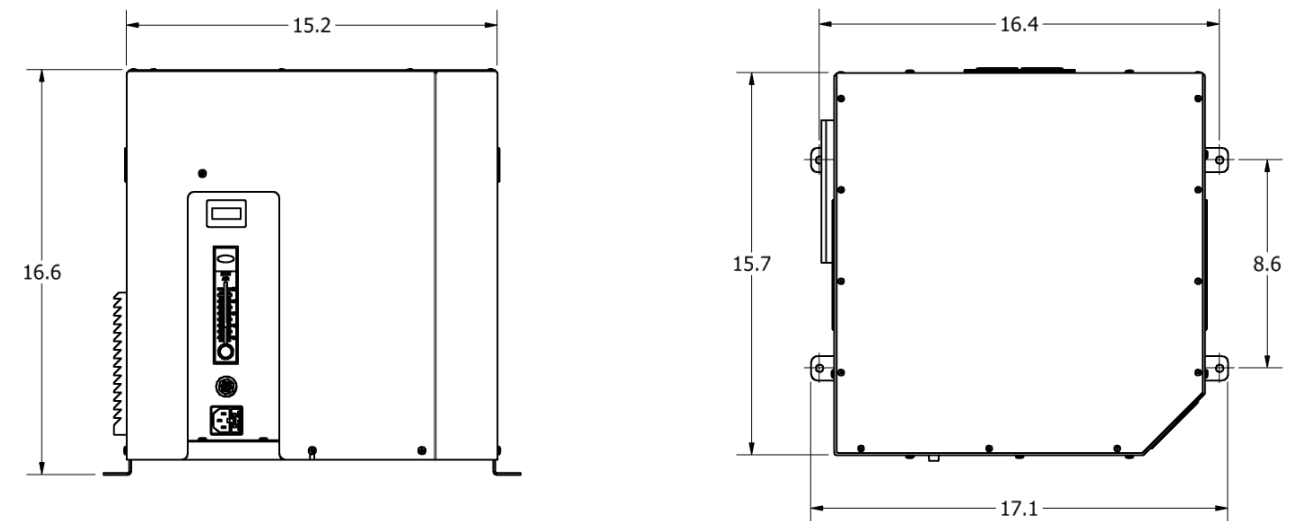


Figure 3: Overall Dimensions

MAINTENANCE

See the *Service Parts* section for information on replacement air filters, compressor rebuild kits, coalescing filters, and sieve bed assemblies. Be sure to disconnect or reconnect the fan when removing or installing the cover. Contact ClearWater Tech if further assistance is needed.

- **Filters:** Inspect enclosure and intake filters monthly for dirt and debris build-up. Clean filters with warm soapy water as needed. Allow filters to dry before re-installing. When re-installing the intake filter, make sure the air distribution screen on the inside of the filter housing has not become dislodged. It is recommended to replace enclosure filter and intake filters after one year. Cleaning and replacement schedules are dependent on usage and environmental conditions, so frequency may vary.
- **Compressor:** Rebuild the air compressor after 18,000 hours of operation. Once refurbished, the compressor should be replaced after an additional 18,000 hours (36,000 total hours) of operation. Compressor life is dependent on environmental conditions as well as the air inlet quality. Properly maintaining the air intake filter will help to prolong the life of the compressor.
- **Sieve Beds:** Sieve material can wear out. Higher humidity and temperature environments are more taxing on sieve material. Depending on the installation, oxygen purity may begin to drop below acceptable levels in 1 to 3 years. At this point the sieve beds will need to be replaced.
- **High Humidity:** Check on the water level inside the coalescing filter. Under normal working conditions, the filter will periodically discharge water out the bottom of the oxygen concentrator. In very humid environments, this bowl can always have water in it and begin to develop biofilm. Eventually the biofilm can clog the drain mechanism causing the bowl to completely fill with water. If this happens replace the bowl of the coalescing filter.
- **Storage:** If the AEROUS nx is not going to be used for a period longer than 1 month, close off the outlet needle valve. This precaution will prevent moisture from migrating into the system and potentially saturating the sieve material.

TABLE OF CONTENTS

Theory of Operation	1
<i>Figure 1: Pneumatic Diagram</i>	1
General Instructions	2
Installation	3
Unpacking	3
<i>Figure 2: Feature Callout</i>	3
Placing the AEROUS nx.....	4
Connecting the Oxygen Output.....	4
Starting the System.....	4
Operation	5
Calculating Flowrates	5
Elevation	5
Vacuum.....	5
Troubleshooting	6
Maintenance	7
Appendix A – Specifications	8
<i>Figure 3: Overall Dimensions</i>	8
Appendix B – Service Parts	9
<i>Figure 4: Internal Components</i>	9
Warranty Information	10

THEORY OF OPERATION

The AEROUS nx oxygen concentrator takes ambient air, which contains approximately 21% oxygen, and separates water, carbon dioxide, and nitrogen from the mixture, leaving behind up to 95% pure oxygen.

First, air is drawn in through a particulate filter located on the front of the unit by an oil-free compressor, which then compresses the air to 20-30 psig. Afterwards, the compressed air is sent through an aluminum heat exchanger to cool the air and a coalescing filter to remove water droplets. From the coalescing filter, the air is pushed into a solenoid valve which switches the air flow between two sieve beds.

The sieve beds are the heart of the oxygen concentrator. When pressurized, water vapor, carbon dioxide, and nitrogen are attracted or “adsorbed” to the material inside the sieve bed. Oxygen is allowed to pass through. Eventually, the surface of the sieve material saturates and can no longer remove unwanted gases from the air stream. Before this point is reached, the solenoid valve switches and begins sending air into the second sieve chamber. Meanwhile, the first chamber is depressurized, allowing nitrogen atoms to release from the sieve material. A small amount of oxygen is diverted from the output of the other sieve bed to push the unwanted gases out of the depressurized sieve bed. This purges all the water, carbon dioxide, and nitrogen that the sieve had separated and prepares the sieve bed for when the solenoid switches again.

By continuously switching between the two sieve beds, the system is always able to have one sieve bed concentrating oxygen, and one sieve bed regenerating. This method is called pressure swing adsorption (PSA). The AEROUS nx oxygen concentrator is capable of delivering 90±5% oxygen concentration flows up to 15 SCFH.

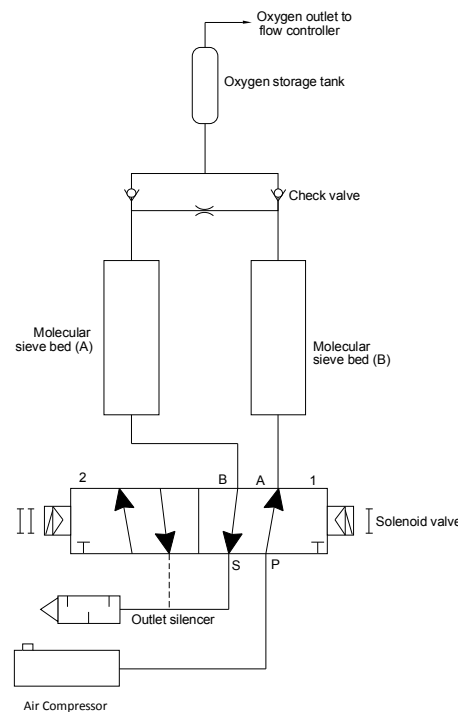


Figure 1: Pneumatic Diagram

TROUBLESHOOTING

Below are some causes and solutions for common problems. Be sure to disconnect or reconnect the fan when removing or installing the cover. A pressure gauge and an oxygen concentration meter are recommended for diagnosing the AEROUS nx. See the *Service Parts* section for ordering information.

Problem	Cause	Solution
System not starting	<ul style="list-style-type: none"> Blown fuse Unit not plugged in Compressor is pressurized and cannot start up 	<ul style="list-style-type: none"> Replace fuse Plug in the unit Wait for compressor to depressurize (approximately 5 min)
Pressure relief valve opening	<ul style="list-style-type: none"> Control board isn't switching the solenoid valve properly Solenoid valve isn't switching properly Sieve beds are saturated 	<ul style="list-style-type: none"> Replace control board Replace solenoid valve Replace sieve beds
Pressure output low	<ul style="list-style-type: none"> Pressure regulator not set properly Compressor can no longer generate enough pressure Sieve beds are saturated 	<ul style="list-style-type: none"> Adjust pressure regulator Rebuild or replace compressor Replace sieve beds
Oxygen output flow is low	<ul style="list-style-type: none"> Flow is not set properly System receiving the oxygen flow is producing too much back pressure 	<ul style="list-style-type: none"> Adjust the needle valve on the flow meter Adjust the back pressure in the system receiving the oxygen flow
Oxygen concentration is low	<ul style="list-style-type: none"> Output flow too high Air leak in system Compressor pressure low Sieve beds underperforming 	<ul style="list-style-type: none"> Adjust flow to be less than or equal to 15 SCFH, see <i>Operation</i> section for details Check all tubing and fittings for an air leak, repair as necessary Check output pressure of compressor, rebuild or replace as necessary Close off needle valve and run system for 24 hours to push built up moisture and nitrogen out of the sieve beds, regenerating them Replace sieve beds
Compressor cycling on/off	<ul style="list-style-type: none"> Compressor is overheating Compressor is over pressurizing 	<ul style="list-style-type: none"> Make sure cooling fan is plugged in and working Clean the enclosure air filter Make sure the enclosure air inlet and outlet have sufficient space around them for free air flow Replace the Pressure Relief Valve

OPERATION

The AEROUS nx is rated to produce a maximum oxygen flowrate of 15 SCFH (standard cubic feet per hour). Having a flow greater than 15 SCFH will result in the system overdrawing. When this happens, sieve material adsorbs more moisture than it can expel during the regeneration cycle. The sieve material will eventually become saturated and no longer be able to separate oxygen, decreasing output concentration. If left unchecked, the sieve beds will become permanently damaged and will need to be replaced.

Calculating Flowrates

The flow meter installed on the AEROUS nx only reads accurately when the discharge is at atmospheric pressure or 0 PSIG (pounds per square inch gauge). If the discharge pressure is above atmospheric pressure, the actual reading on the meter is in CFH (cubic feet per hour). To determine SCFH from CFH or vice versa, use the following formula:

$$(scfh) = (cfh) \sqrt{\frac{(psig) + 14.7}{14.7}} \quad \longleftrightarrow \quad (cfh) = \frac{(scfh)}{\sqrt{\frac{(psig) + 14.7}{14.7}}}$$

Conversely

For example, to set the output to 15 SCFH at 10 PSIG, the equation for finding CFH should read:

$$(cfh) = \frac{(15)}{\sqrt{\frac{(10) + 14.7}{14.7}}} \Rightarrow (cfh) = 11.6$$

Therefore, at 10 PSIG the flow meter must read 11.6 CFH or less to keep the system under the maximum of 15 SCFH. Use the needle valve on the flow meter to make these adjustments. Correcting the flow based on pressure ensures that the sieve beds are not overdrawn, and the system is not damaged.

Elevation

The flowrate of oxygen the AEROUS nx can produce is affected by elevation. The thinner atmosphere lowers the efficiency of the compressor. A good rule of thumb is to reduce the max output by 3% for every 1000ft in elevation. For example, if the system is operating at 2000ft above sea level, the max allowable output is 94% of 15 SCFH, which equals 14.1 SCFH.

Vacuum

Do not apply vacuum to an unpowered oxygen concentrator. Vacuum without the compressor running or solenoid valve switching will cause moisture to build up in the sieve beds, damaging the material inside.

GENERAL INSTRUCTIONS

1. **Save these instructions.**
2. **Read the owner's manual carefully before using the system.**
3. **Disconnect power before servicing.**
4. **Do not use an extension cord.**
5. **The AEROUS nx should be cleaned with a damp cloth only. Avoid using harsh chemicals, abrasives, or cleaners.**
6. **WARNING – Use caution when using oxygen. Oxygen is a powerful oxidizer. Improper use can result in fire or even an explosion. Inspect all delivery lines and all systems receiving concentrated oxygen to ensure they are free of combustible material.**
7. **GROUNDING INSTRUCTIONS – This appliance must be grounded. In the event of a malfunction or breakdown, grounding will reduce the risk of electric shock by providing a path of least resistance for electric current. This appliance is equipped with a cord having an appliance-grounding conductor and a grounding plug. The plug must be plugged into an appropriate outlet that is installed and grounded in accordance with all local codes and ordinances.**
8. **WARNING – Improper connection of the appliance-grounding conductor can result in a risk of electric shock. Check with a qualified electrician or service representative if you are in doubt whether the appliance is properly grounded. Do not modify the plug provided with the appliance; if it will not fit the outlet, have a proper outlet installed by a qualified technician.**
9. **If the supply cord is damaged, it must be replaced by the manufacturer, its service agent or similarly qualified persons to avoid a hazard.**

Additional information and best practices for oxygen systems can be found in the following Compressed Gas Association Guides:

P-8.1, "Safe Installation and Operation of PSA and Membrane Oxygen and Nitrogen Generators".

G-4.1 "Cleaning Equipment for Oxygen Service"

G-4.4 "Industrial Practices for Gaseous Oxygen Transmission and Distribution Piping Systems."

INSTALLATION

Unpacking

Make sure all components are in the box before beginning installation of the AEROUS nx. In addition to this manual, standard units are supplied with a parts bag containing the following:

- 10ft 3/8-inch ID braided tubing
- 2x hose clamps
- 1x IEC320 C13/C14 power cord, 8 ft (2.5 m)
- Oxygen Safety Data Sheet (SDS)

There is also a spare fuse located in the fused power inlet. Contact ClearWater Tech if any parts are missing. Thoroughly inspect all components for damage before installing the system. If damage is noticed, promptly notify the freight carrier and request an on-site inspection.



Figure 2: Feature Callout

Placing the AEROUS nx

Find a flat, stable surface close to the application requiring concentrated oxygen. Consider the following when picking a location:

- There should be enough space around the oxygen concentrator to allow for normal maintenance and service on the unit.
- Make sure that there is a free flow of air around the compressor. Do not block the enclosure filter on the side of the unit or the exhaust at the rear.
- The oxygen concentrator must be in a well-ventilated area. A minimum of 6 air changes per hour in the room is recommended to prevent the build-up of low oxygen concentration waste gas around the unit. Failing to do so will reduce the final oxygen concentration that the unit is able to produce and could create an unhealthy environment for the operator.
- It is not recommended to place the oxygen concentrator outside where it will be exposed to rain or condensation.
- The AEROUS nx may be anchored to the floor with Ø5/16-inch bolts (not included).

Connecting the Oxygen Output

Standard AEROUS nx units come equipped with a 3/8-inch barb outlet, allowing the oxygen concentrator to quickly connect to a wide range of equipment. Using the braided tube supplied, connect the barbed output of the AEROUS nx to the application requiring concentrated oxygen. Secure both ends of the tube with the hose clamps provided.

Other fittings may be installed by removing the barb fitting, giving access to a 1/4-FNPT threaded bulkhead on the front panel. Optional fittings are available from ClearWater Tech for purchase by request.

Once the equipment receiving the oxygen has been connected, the needle valve may need to be adjusted to make sure the sieve beds are not being overdrawn. See the *Operation* section for more details on adjusting the system.

Starting the System

Connect the unit to a grounded power source rated for the voltage and current requirements stated on the label of the unit. For 220/240VAC units, it may be necessary to hard-wire the unit to main power. To do so, cut the plug off the cord provided and use the following color codes for wiring:

- Black or Brown: Line or L1
- White or Blue: Neutral or L2
- Green or Green/Yellow: Ground or Earth