

MOLEAER[®]
ADVANCING NANOBUBBLE TECHNOLOGY

MOLEAER INDALO™ NANOBUBBLE GENERATOR

OWNER'S MANUAL

IMPORTANT SAFETY INSTRUCTIONS
READ AND FOLLOW ALL INSTRUCTIONS
SAVE THESE INSTRUCTIONS

CUSTOMER SERVICE / TECHNICAL SUPPORT

If you have questions about ordering Moleaer, Inc. replacement parts and products, please use the following contact information:

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WARRANTY INFORMATION

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Limited Warranty

Warranty

Moleaer warrants that the Goods will be free from defects in material and workmanship for a period of 12 months from delivery. Moleaer shall in no event be liable for defects or damage attributable to modifications performed or repair work done other than by Moleaer personnel or to abuse, accident, catastrophe, force majeure event, shipment, improper use, maintenance, storage or application or any other external cause.

EXCEPT FOR ANY WRITTEN PERFORMANCE WARRANTY THAT MOLEAER HAS EXPRESSLY INCORPORATED IN THIS CONTRACT, MOLEAER DISCLAIMS ALL OTHER WARRANTIES, WHETHER EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NON-INFRINGEMENT.

Claims; Exclusive Remedy

Any warranty claim must be made to Moleaer in writing within 10 days of discovery of the alleged defect. After obtaining prior written authorization from Moleaer, Buyer shall return all allegedly defective Goods, freight pre-paid, for examination by Moleaer. If Moleaer finds that the Goods are defective and covered by the warranty, Moleaer's sole obligation shall be, at Moleaer's option, to repair or replace the Goods, or to refund the purchase price therefor, and to reimburse Buyer's reasonable shipping costs. The buyer shall be responsible for all charges for handling of returned items not found defective. The remedy set forth in this Paragraph 4 is Buyer's sole and exclusive remedy for any breach of warranty or claim related to the Goods other than pursuant to any written performance warranty that Moleaer has expressly incorporated in this Contract.

Limited Warranty

MOLEAER SHALL NOT BE LIABLE FOR SPECIAL, INDIRECT, CONSEQUENTIAL, OR INCIDENTAL DAMAGES, INCLUDING DAMAGES FOR LOST OR PROSPECTIVE PROFITS OR OTHER ECONOMIC DAMAGES, ARISING OUT OF OR RELATED TO THIS CONTRACT OR THE GOODS. MOLEAER'S TOTAL LIABILITY, WHETHER IN CONTRACT OR TORT OR OTHERWISE, SHALL NOT EXCEED THE PORTION OF THE PRICE PAID BY BUYER ALLOCABLE TO THE GOODS GIVING RISE TO THE LIABILITY. THE LIMITATIONS IN THIS PARAGRAPH WILL APPLY NOTWITHSTANDING THE FAILURE OF ESSENTIAL PURPOSE OF ANY LIMITED REMEDY.

This limitation shall not apply to claims for personal injury directly caused by Moleaer's willful or reckless acts.



To register your product and learn more about the limited warranty, visit our website or scan the QR code with your mobile device: <https://www.moleaer.com/warranty-management>

Additional resources can be found on the customer portal on our website, <https://www.moleaer.com/portal>

European Declaration of Conformity

We, Moleaer Inc. and Moleaer España SLU, declare under our sole responsibility that the product Moleaer nanobubble generator INDALO™ as outlined in the product information below marked with the CE mark on the nameplate to which this declaration relates conforms with the Council Directives on the approximation of the laws of the EC member states listed below, following standards or other normative document(s).

The Nanobubble Generator INDALO consists of a minimum of one pump, a pump starter, frame, pressure sensor, solenoid valve, on/off switch, nanobubble generator, pressure gauges, 24V power supply, alarm lights, and a dissolved oxygen sensor.

General Information About the Product

Product Name	General Feature
INDALO-P	Oxygen Generator, Controller, Water pump, Gas Compressor.
INDALO-G	Oxygen generator, Controller, Water Pump, Gas Compressor.

Applicable Directives

Machinery Directive (2006/42/EC); Low Voltage Directive (2014/35/EU) and EMC Directive (2014/30/EU); Pressure Equipment Directive (2014/68/EU); Standard Used: EN ISO 12100:2010; RoHS Directive: 2011/65/EU and 2015/863/EU; Standard Used: EN 50581:2012

The Technical Construction File is Maintained at:

3232 West El Segundo Boulevard, Hawthorne, CA 90250, USA

The Authorized Representative Located within the Community is:

MOLEAER ESPAÑA, Calle Escudo Portugues 7, San Isidro de Nijar 04117, Almería, Spain

Per Annex II.B of the Machinery Directive (2006/42/EC):

The machinery, product, assembly, or sub-assembly covered by this Declaration of Conformity must not be put into service until the machinery into which it is to be incorporated has been declared in conformity with the provisions of the applicable Directive(s).

This EU declaration of Conformity is only valid when published as part of the Moleaer, Inc. installation and operating instructions. (Publication numbers; 01/02/03/04/05/06 2019V1/2/3/4/5/6)

Date of Issue: August 2023

Place of issue: Hawthorne, California, USA



Bruce Scholten, CTO

SAFETY INSTRUCTIONS

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Important Notice



This guide provides installation and operation instructions for this product. Consult Moleaer with any questions regarding this equipment.

Attention Installer

This guide contains important information about the installation, operation, and safe use of this product. This information should be given to the owner and / or operator of this equipment after installation.

Attention User

This manual contains important information that will help you in operating and maintaining this product. Please retain it for future reference. Additional information and resources related to Moleaer products are available at <https://www.moleaer.com/portal>.

READ AND FOLLOW ALL INSTRUCTIONS. SAVE THESE INSTRUCTIONS.



This is the safety alert symbol. When you see this symbol, on your system or in this manual, look for one of the following signal words and be alert to the potential for personal injury.



Warns about hazards that can cause death, serious personal injury, or major property damage if ignored.



Warns about hazards that may or can cause minor personal injury or property damage if ignored.

NOTE:

Indicates special instructions not related to hazards. Carefully read and follow all safety instructions in this manual and on equipment. Keep safety labels in good condition; replace if missing or damaged.

When installing and using this electrical equipment, basic safety precautions should always be followed, including the following:

Risk of Electrical Shock

Connect only to a branch circuit protected by a ground fault circuit interrupter (GFCI). Contact a qualified electrician if you cannot verify that the circuit is protected by a GFCI.

General Warnings

Install equipment in accordance with the current local Electrical Code and all applicable codes and ordinances.

Before servicing the pump, switch OFF power to the pump by disconnecting the main circuit to the INDALO Nanobubble Generator.

This INDALO is not intended for use by persons (including children) of reduced physical, sensory, or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning the use of the appliance by a person responsible for their safety.



FAILURE TO FOLLOW ALL INSTRUCTIONS AND WARNINGS CAN RESULT IN SERIOUS BODILY INJURY OR DEATH. THIS PUMP SHOULD BE INSTALLED AND SERVICED ONLY BY A QUALIFIED SERVICE PROFESSIONAL. INSTALLERS, OPERATORS, AND OWNERS MUST READ THESE WARNINGS AND ALL INSTRUCTIONS IN THE OWNER'S MANUAL BEFORE USING THIS PUMP. THESE WARNINGS AND THE OWNER'S MANUAL MUST BE LEFT WITH THE PRODUCT OWNER.

Suction Entrapment Hazard



STAY OFF THE MAIN DRAIN AND AWAY FROM ALL SUCTION INLETS! FAILURE TO DO SO CAN RESULT IN SERIOUS BODILY INJURY OR DEATH.



This generator produces high levels of suction and creates a strong vacuum at the main drain at the bottom of the body of water. This suction is so strong that it can trap adults or children under water if they come near a drain or a loose or broken drain cover or grate.



RISK OF ELECTRICAL SHOCK OR ELECTROCUTION. PUMPS REQUIRE HIGH VOLTAGE WHICH CAN SHOCK, BURN, OR CAUSE DEATH.



BEFORE WORKING ON THE INDALO NANOBUBBLE GENERATOR PUMP, always disconnect power to the pump at the circuit breaker for the system before servicing the pump. Failure to do so could result in death or serious injury to a service person, system users, or others due to electric shock.

NOTE: All suction plumbing must be installed in accordance with the current local codes, standards, and guidelines.



A clearly labeled emergency shutoff switch for the pump must be in an easily accessible, obvious place. Verify users know where it is and how to use it in case of emergency.



Install all electrical equipment, such as on / off switches, timers, and control systems, etc., to allow the operation (startup, shutdown, or servicing) of any pump or filter so the user does not place any portion of his / her body over or near the pump or isolation valves. This installation should allow the user enough space to stand clear of the system and pump during system startup, shutdown, or servicing of the system.



This generator has been evaluated for use with water only.



Before operation, be sure to prime the system to the pump.



RISK OF ELECTRICAL SHOCK

This system is supplied with a grounding conductor. To reduce the risk of electric shock, be certain that it is connected only to a properly grounded, grounding-type receptacle.



HAZARDOUS PRESSURE. STANDARD CLEAR OF SYSTEM DURING STARTUP. CIRCULATION SYSTEMS OPERATE UNDER PRESSURE. WHEN ANY PART OF THE CIRCULATING SYSTEM IS SERVICED, AIR CAN ENTER THE SYSTEM AND BECOME PRESSURIZED. PRESSURIZED AIR CAN CAUSE THE PUMP HOUSING COVER OR VALVES TO VIOLENTLY SEPARATE WHICH CAN RESULT IN SEVERE PERSONAL INJURY OR DEATH. STAND CLEAR OF ALL CIRCULATION SYSTEM EQUIPMENT WHEN TURNING ON OR STARTING UP THE SYSTEM. BEFORE SERVICING EQUIPMENT, MAKE NOTE OF THE WATER AND GAS PRESSURE. BE SURE THAT ALL CONTROLS ARE SET TO ENSURE THE SYSTEM CANNOT INADVERTENTLY START DURING SERVICE. TURN OFF ALL POWER TO THE SYSTEM. BEFORE STARTING THE SYSTEM, PLACE ALL SYSTEM VALVES IN THE “OPEN” POSITION TO ALLOW WATER TO FLOW FREELY FROM THE TANK AND BACK TO THE TANK. STAND CLEAR OF ALL EQUIPMENT AND START THE PUMP. IMPORTANT: OBSERVE SYSTEM PRESSURE GAUGES AND BE SURE IT IS NOT HIGHER THAN THE PRE-SERVICE CONDITION.

PRODUCT INTRODUCTION

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Introduction

Moleaer™ develops industrial-scale nanobubble systems that deliver extraordinary improvements in sustainable food production, chemical-free water treatment, and the recovery of natural resources.

The Moleaer INDALO™ is a nanobubble gas-injection technology tailor-made for the food production industry. Its principal function is to harness the power of oxygen to improve the quality of irrigation water, promote plant growth, suppress, or eliminate pathogens, and remove biofilm from surfaces. With simplicity and near-perfect efficiency, the INDALO Nanobubble Generator super saturates water with dissolved oxygen and trillions of nanobubbles. Bubbles of this size exhibit extraordinary properties including neutral buoyancy, high negative surface charge, enormous surface area and strong oxidation potential. These characteristics enable Moleaer to deliver an easily implemented, sustainable, and cost-effective solution to customers seeking to improve food production and water treatment. The combination of the INDALO's high oxygen-enriched efficiency and stable oxygen-enriched nanobubbles enable higher oxygen transfer into the root zone where oxygen enrichment plays an important role in facilitating nutrient absorption and pathogen suppression.

Additional Documents

Available upon request.

1. P&ID drawings: Shows unit's process flow, general components specifications, and electrical requirements.
2. Electrical schematics: Detailed electrical wiring and general specifications of the components
3. GAD: General arrangement of the unit, dimensions and information about the inlet, outlet, and customer points of connection port sizes.
4. 3D CAD models: 3D CAD models (STEP format).
5. Installation Manual: Provides general instructions to install the product.
6. Installation Drawings: Provides visual installation schematic.

Equipment General Arrangement

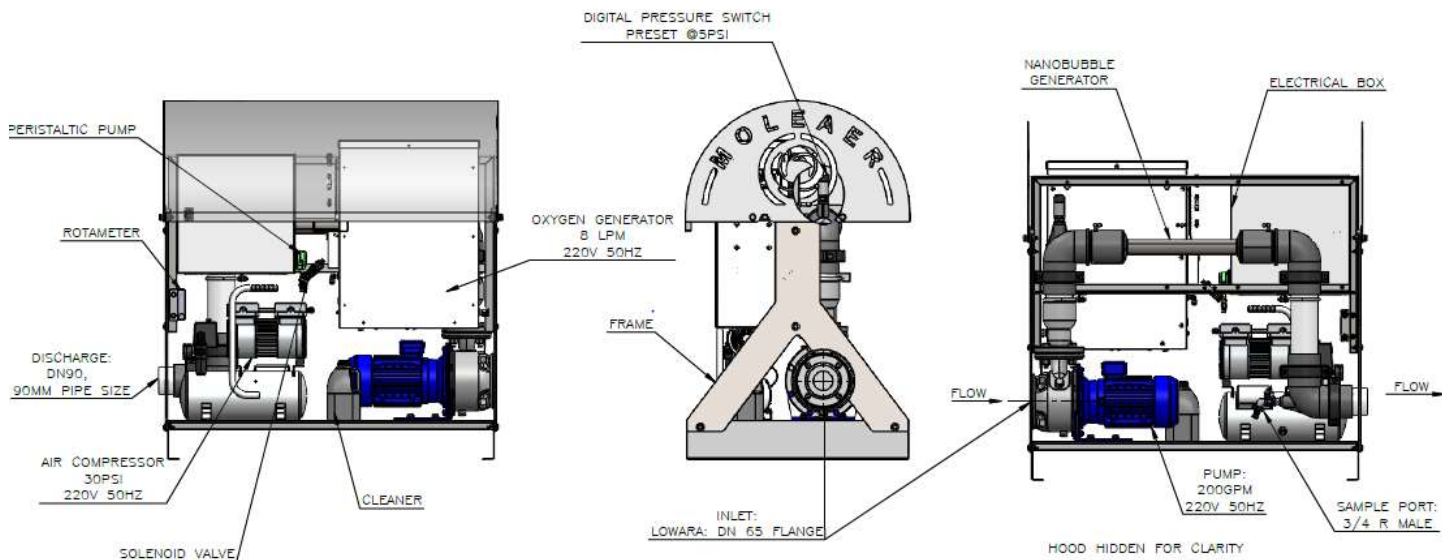


Table 1: General Arrangement

Product Models	General Features
INDALO-P (80)	On-board O2 generator, one compressor, one pump (1.06 gpm (4 lpm)), one electrical enclosure
INDALO-G (INDALO 200)	On-board O2 generator, one compressor, one pump (2.12 gpm (8 lpm)), one electrical enclosure

INSTALLATION INSTRUCTIONS

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General Information

Read these instructions thoroughly prior to assembly and installation.

All work must be performed by a qualified service professional and must conform to all applicable local codes.

The INDALO Nanobubble Generator will function correctly only if it is properly sized to the specific application and properly installed.

All INDALO products are factory adjusted for optimal nanobubble production. Do not adjust factory setpoints.

Location Requirements

INDALO is designed to be installed outdoor and indoor. Attention must be made to protect the product from excessive dust and water flooding. Locate and secure the INDALO on a concrete slab or firm surface with a minimum of 6 ft x 6 ft x 6 ft (2 m x 2 m x 2 m) of clearance to allow access for servicing and maintenance to the front and back of the INDALO. If installing indoors, allow sufficient ventilation around and above the unit. Since the oxygen generator requires fresh air for optimal performance, verify the unit receives air from the outside. See the product drawings section for dimensional details of the unit.



Failure to install the INDALO within the limits specified in this document may void the system warranty and result in poor nanobubble production and pump cavitation.

Power Requirements

Table 2: Power Requirements

Unit	Version	Voltage	Phase	Hz	Full Load Amps	Pump Manufacturer
INDALO-P	EU	230	1	50	25	Lowara
INDALO-G	EU	230	1	50	25	Lowara

* Moleaer reserves the right to change the pump manufacturer and model as needed without notice.

** Full Load amps are used to size the upstream breaker. See P&ID drawing for operating amps.

Piping Connections

Piping connections for all sizes of INDALO are provided below. Verify the type of pump provided with your INDALO before beginning installation.

Table 3: INDALO Piping Connections						
Unit	Tank Fitting	ISO Valve	Clean-In-Place (CIP) Valve	Unit Inlet Connection	Unit Outlet Connection	Pipe Discharge Recommended Size
INDALO-P	63 mm (EU)	63 mm (EU)	32 mm to 63 mm	DN50 mm FLANGE	63 mm	63 mm
INDALO-G	90 mm (EU)	90 mm	32 mm to 90 mm	DN65 mm FLANGE	90 mm	90 mm

Installation Guidelines

The site conditions unique to each irrigation reservoir, irrigation room, or water treatment project should be carefully considered when identifying the INDALO installation location. Refer to the Location Requirements section for additional details.

The following guidelines are recommendations for tanks with intake structure depths less than 15 ft or 4.5m.

Upon delivery, unscrew the shipping screws to remove the INDALO from the shipping crate. Inspect the INDALO for any damage or loose parts that may have occurred during transport. Tighten the loose parts.

Installation Parts and Materials

The parts and materials required to install the INDALO include:

- 3/8" or 14 mm wrench.

Pipe Assembly

Use only PN10 or PN16 PVC pipe and fittings. Use PVC cement formulated for wet conditions and fast installation to connect PVC pipe to PVC fittings. Do not use black, ABS piping or mix ABS pipe with PVC pipe or fittings.

All PVC pipe connections must be airtight and leakproof. Failure to provide airtight suction pipe connections may negatively impact nanobubble generator performance. Large bubbles visible at the pump strainer basket are an indication of suction pipe leaks. Difficulty with pump priming may also be the result of suction pipe leaks.

Gas Connection

INDALO is equipped with an oxygen generator and a re-compressor. The product pulls ambient air to generate oxygen nanobubbles. No external gas source or compressor is required. Verify a sufficient flow of fresh air is available to the oxygen generator and the ventilation vents. These requirements are especially important for indoor installation with limited or confined spaces.

INDALO Flooded Suction Installation

Refer to Figures 2 and 3 for installation with flooded suction. Flooded suction is when the waterbody surface is above the centerline of the pump suction. The pipe between the tank and the Neo-N should fill with water via gravity. Moleaer highly recommends installing clean-in-place (CIP)/sampling valves and isolation valves upstream and downstream of the Neo-N, especially in instances of unclear water. Refer to Figure 8 for Neo-N frame dimensions and suction and discharge fitting locations.

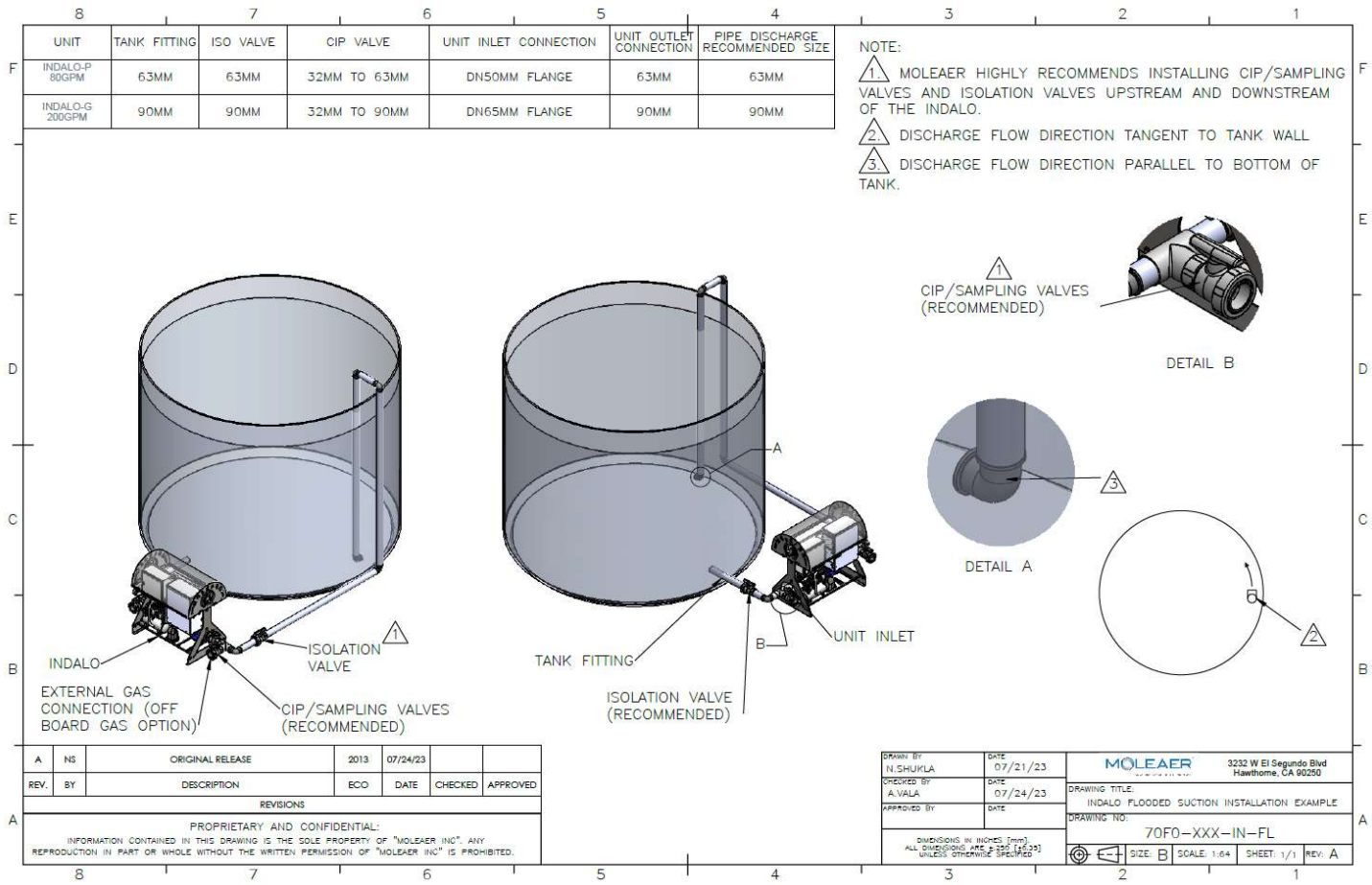


Figure 1: Isometric View of INDALO suction and discharge in a flooded suction installation.

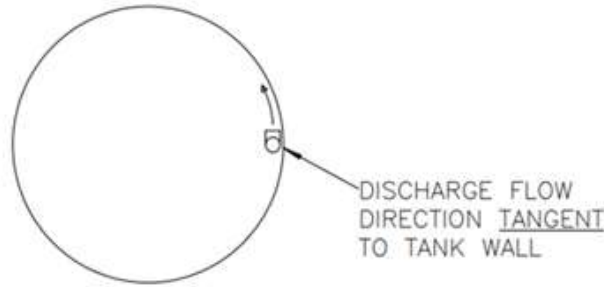


Figure 2: Plan view of INDALO discharge layout in a flooded suction installation.

INDALO Suction Lift Installation

Refer to Figure 3 and Figure 4 for installations requiring suction lift. In this type of installation type, the waterbody surface is below the centerline of the pump suction. A check valve or foot valve is required to prevent water from being discharged through the suction line and to prime the pump for operation from a fill point located in the suction piping. Moleaer recommends that the size of the check valve be twice the size of the suction pipe.

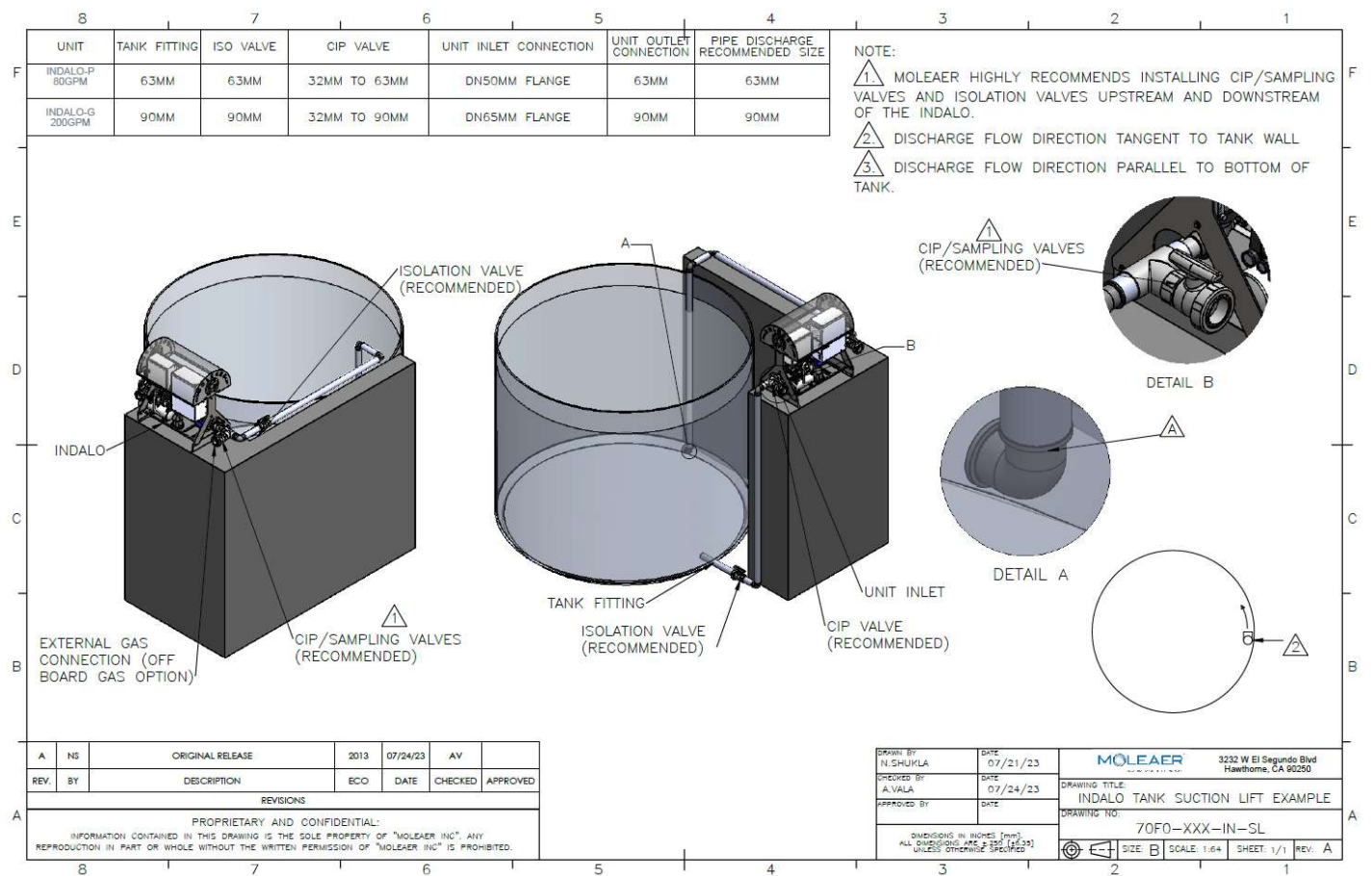


Figure 3: Isometric View of INDALO Suction and Discharge layout in self-priming installation.

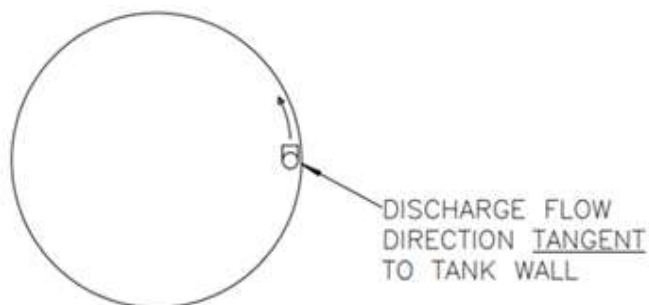


Figure 4: Plan View of INDALO discharge layout in a self-priming installation.

INDALO Multi-Tank Set Up Installation



NOTE: Contact Moleaer Engineering for multi-tank installation.

INDALO Frame Dimensions and Component Descriptions

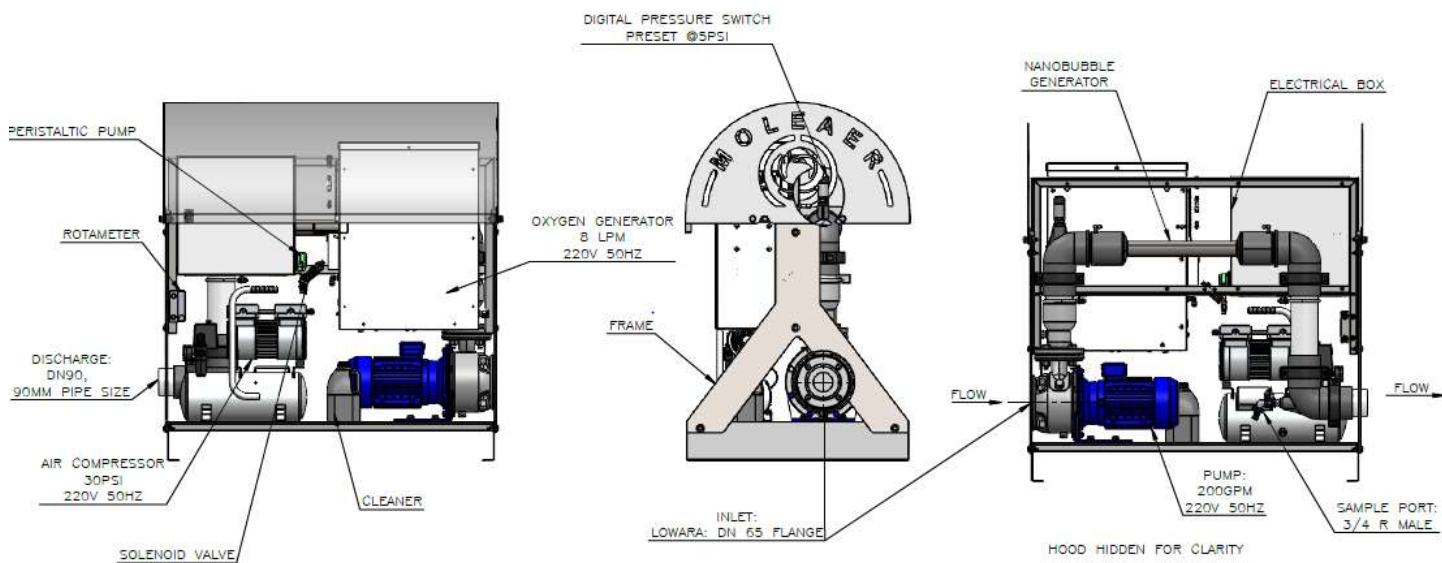


Figure 5: Back and Front View of INDALO with Component Descriptions.

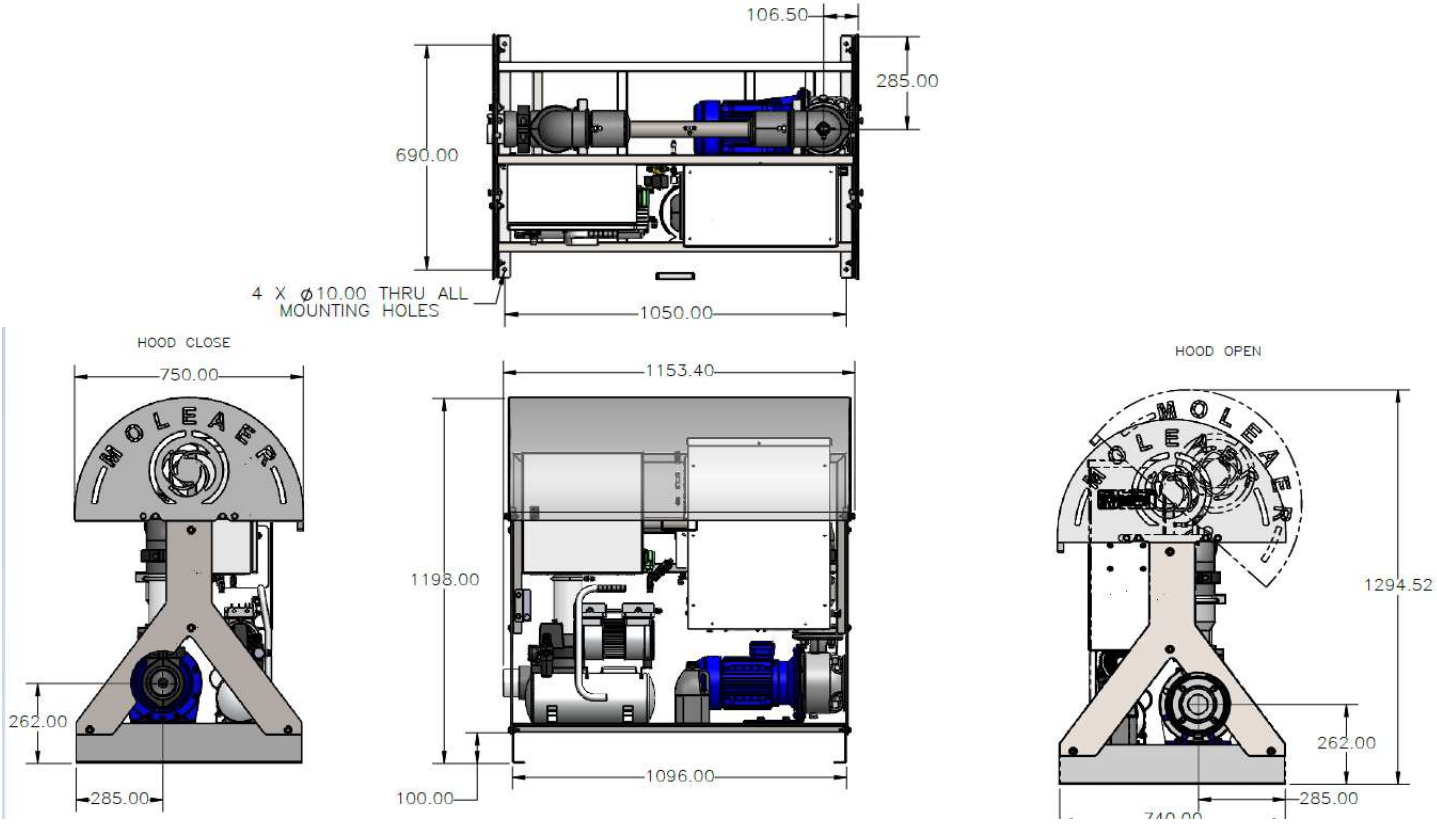


Figure 6: INDALO with suction and discharge connection locations.

Suction Piping Installation

Keep suction piping as short as possible and avoid unnecessary bends. If INDALO is in installation requiring suction lift, keep the INDALO as close as to the water level as possible.

Run a length of straight horizontal piping to the suction side of the pump. The length of this pipe should be a minimum of five (5) pipe diameters. Example: If system is to be plumbed with 90 mm diameter PVC pipe, then a straight section of pipe 38 cm long should be used immediate to the suction side of the pump.

Locate and install the suction pipe following the recommendations detailed in Figure 1 and Figure 2 for a flooded suction installation, and Figure 3 and Figure 4 for suction lift installations. Use fittings as necessary to route the suction piping from the INDALO to the tank.

Water flows through a check valve in only one direction as indicated by the flow arrow on the check valve. The check valve prevents water in the suction line from draining when the pump is stopped, preventing loss of prime. Ensure the check valve is installed with the flow arrow in the direction of suction flow so as not to restrict flow from the waterbody to the pump.

For installations where debris is approximately 1/8" or 3 mm in size, install a screen on the intake of the suction pipe to ensure that large solids do not pass through the INDALO. Verify that the intake screen is rated for the flow liquid capacity of your INDALO and does not restrict the generator's designed liquid flow rate.

For suction lift installations, install a PVC swing check valve on the suction pipe. Install the check valve above the maximum liquid level of the tank to maintain accessibility for inspection and service. Moleaer recommends the check valve size to be double the size of the suction pipe.

For suction lift installations, install a fill valve in the suction line to prime the pump.

Discharge Piping Installation

Locate and install the discharge piping following the recommendations detailed in Figure 5 and Figure 6. Use available fittings as necessary to route the discharge piping from the INDALO unit to inside the tank. Install discharge pipe at the maximum tank depth and connect a 90-degree elbow to the end. Angle the discharge tangential to the tank to create a circular current to assist with mixing.

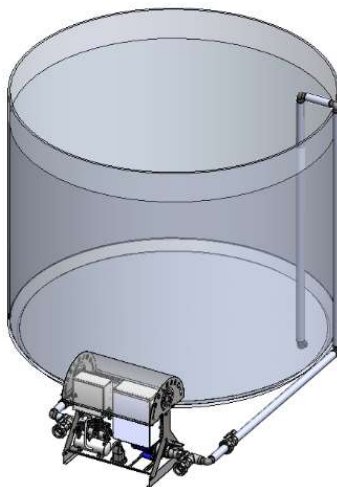


Figure 7: INDALO discharge layout at maximum tank depth.

CIP/Sampling Valve and Isolation Valve Installation (Optional)

Two optional three-way valves and two isolation valves can be used to isolate the INDALO from the rest of the system for Clean in Place (CIP) maintenance. See Table 3 for CIP/sampling and isolation valve size recommendations.

Refer to the Operations section for directions.

Connect Power



Before connecting power, verify the voltage, phase, and ampere requirements of your unit. INDALO-P and INDALO-G models are single-phase, 230 volts.



WARNING: Ensure that the ground wire from the power cable is connected to the grounding blocks inside the enclosure.

STARTUP GUIDE

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Quick Startup



WARNING: Refer to the operating manual for important safety and startup information. When all piping is installed and pipe glue cure time has been met, connect electricity in accordance with applicable Local Electrical Code and ordinances. The use of an extension cord is hazardous and should be avoided.

Flooded Suction Applications: Pump Priming Instructions

Step 1. Open the intake and discharge valves to flood piping.

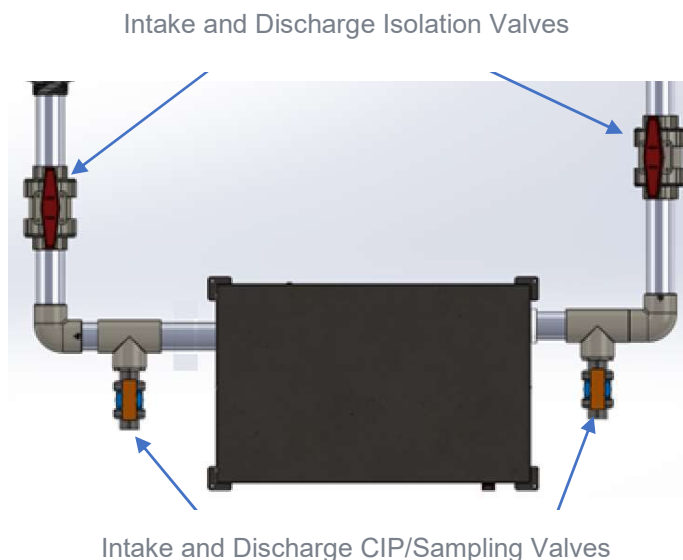


Figure 8: INDALO Intake and Discharge Valves

Step 2. Turn on main power.



WARNING: Do not use isolation valves to throttle the pump. This may cause loss of prime, excessive temperatures, and damage to the pump, voiding warranty.

Step 3. Check piping for visible leaks.

Refer to the Operation section to configure the operational mode of the INDALO.

Suction Lift Applications: Pump Priming Instructions

Step 1. Open the intake and discharge valves.

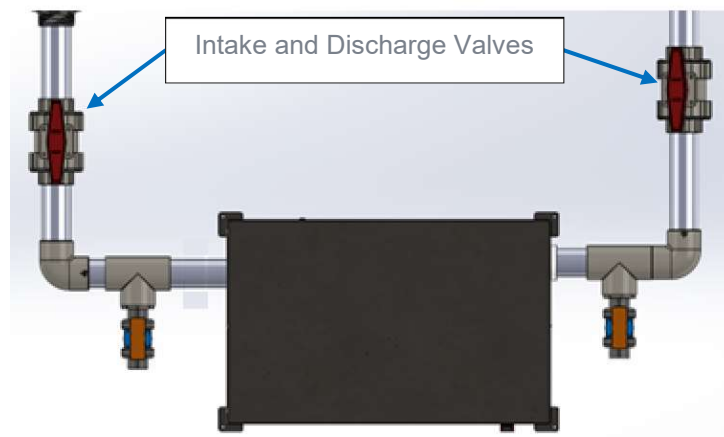


Figure 9: Intake and Discharge Valves.

Step 2. Fill the suction line with water through the fill valve in the suction line. Priming the pump may take several minutes. If the pump does not prime after 5-10 minutes, check the check valve for damage.



WARNING: Do not use isolation valves to throttle the pump. This may cause loss of prime, excessive temperatures, and damage to the pump, voiding warranty.

Step 3. Once the pump is primed. Turn on the main power.

Check the piping for visible leaks.

Refer to the Operation section to configure the operational mode of the INDALO.

Suction and Discharge Operation

Turn the INDALO on and observe the suction and discharge locations in the waterbody. The intake should not create a vortex at the surface. If a vortex is visible, the suction intake is not properly submerged. Verify that the suction is at least 2 ft beneath the minimum water level. The bubble pattern visible at the surface of the water above the discharge should consist primarily of small bubbles, roughly the size of a pea or smaller.



Figure 10: Bubble pattern for a proper installation

Note: If bubbles are consistently larger than the size of a pea, contact a Moleaer technical service representative by filling out a customer support form at <https://www.moleaer.com/portal>.

Operating Parameter Ranges

Normal operating ranges for the INDALO units are shown in the table below.

Table 4: Operating Range		
Parameter	INDALO-P	INDALO-G
Gas Pressure, Gauge	10 to 100 psig (0.7 to 6.7 barg)	10 to 100 psig (0.7 to 6.7 barg)
Liquid Pressure, Gauge	10 to 20 psig (0.7 to 1.4 barg)	10 to 20 psig (90.7 to 1.4 barg)
Gas Flow Rate (on Oxygen Gen.'s rotameter)	1.06 gpm (4 lpm)	2.12 gpm (8 lpm)

Note: If the INDALO unit is consistently operating outside of the ranges shown in Table 4, contact a Moleaer technical service representative by filling out a customer support form at <https://www.moleaer.com/portal>.

OPERATION MANUAL

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Gas Compression System

NOTE: INDALO is not designed for hazardous and flammable liquid except for non-medical grade oxygen.



All gas fittings and hoses must be maintained free from oil and lubricants.



DO NOT PERMIT SMOKING OR OPEN FLAMES IN ANY AREAS WHERE LIQUID OXYGEN IS STORED OR HANDLED. THE INDALO NANOBUBBLE GENERATOR MUST BE SEPARATED FROM FLAMMABLES AND COMBUSTIBLES BY AT LEAST SIX (6) METERS OR A ONE-HALF (1/2) HOUR FIREWALL IN CONJUNCTION WITH LOCAL ENVIRONMENTAL HAZARDOUS AREA CODES AND REGULATIONS.

Gas Flow and Pressure

Gas flow rates can be adjusted depending on application and desired effect. The INDALO Nanobubble Generators are designed to deliver a spectrum of nano and micro bubbles to meet the requirements of the process or application. Low gas flow rates produce more nanobubbles and have a higher gas transfer efficiency, whereas higher gas flow rates produce both nano and microbubbles that have a lower gas transfer efficiency, but higher mass transfer rate.

Nanobubble Generator Operation



The pump must be fully primed before operation. Refer to installation section for more details.



Operation at or near zero water flow can cause extreme heat, personal injury, or property damage.



THIS SYSTEM OPERATES UNDER HIGH PRESSURE.

When any part of the circulating system (e.g., Lock Ring, Pump, Filter, Valves, etc.) is serviced, air can enter the system and become pressurized. Pressurized air can result in serious injury, death, or property damage. To avoid this potential hazard, follow above instructions.



1. Open intake and discharge valves to flood piping and prime the pump.

NOTE: All INDALO models are equipped with flooded suction pumps. If the INDALO Nanobubble Generator is located above the water line of the tank or water body, it is important to order the unit with a positive suction pump or build a positive suction plumbing assembly. In either case, a check valve just above the intake screen is required to prevent backflow. Moleaer's recommended check valve size is double the size of the suction pipe.

2. Turn on the main power disconnect on the power panel. Start and test the pump in manual mode with all the valves opened. Check the piping for visible leaks. If necessary, adjust the pipe supports.
3. Flow Adjustment:

Gas flow can be adjusted using the knob on the Oxygen Generator rotameter (see oxygen generator section). The oxygen generator is factory-set at the max oxygen flow. If needed make the adjustments according to the table below while the outlet of the oxygen generator tube is disconnected from the rest of the pneumatic system. Once the flow is adjusted, reconnect the tube. The oxygen generator's

rotameter shows lower values once the tubing is connected. Do not make further adjustment to the flow once the tube is connected to the pneumatic system.

Table 4: Operating Range		
Parameter	INDALO-P	INDALO-G
Gas Pressure, Gauge	10 to 100 psig (0.7 to 6.7 barg)	10 to 100 psig (0.7 to 6.7 barg)
Liquid Pressure, Gauge	10 to 20 psig (0.7 to 1.4 barg)	10 to 20 psig (90.7 to 1.4 barg)
Gas Flow Rate (on Oxygen Gen.'s rotameter)	1.06 gpm (4 lpm)	2.12 gpm (8 lpm)

Note: Flow and pressure ranges change by ambient pressure and temperature. Measurements on this table is based on room temperature and sea-level ambient pressure.



Figure 11: O2 Rotameter

Timer Operation

Main Menu Screen

The system switch in the photograph is shown in the RUN position. In this position, all run times and watering will take place as programmed.












-  Button Increases displayed item.
-  Button Decreases the displayed item.
-  Button Advances to the next item.
-  Button Advances to the previous item.
-  Button Select program A or B for different watering requirements.

Figure 12: O2 Timer Button Controls

Set Date and Time



Figure 13: Set Date/Time Set

1. Turn the dial to the CURRENT TIME/DAY position.
2. Year will start flashing. Select year using +/- buttons. Change to month pressing the arrow .
3. Month and date. Select month and date using +/- buttons. Change to Time pressing the arrow .
4. The time will be displayed. Use the +/- buttons to select AM, PM, or 24 hour. Press the arrow  to move to hours. Hours will be flashing. Use the +/- buttons to change the hour shown on the display. Press the arrow  to move

to minute. Minutes will be flashing. Use the +/- buttons to change the minutes shown on the display. The date, day, and time have now been set.

Program Start Times



Figure 14: Program Start Times

IMPORTANT NOTE: *INDALO start times can be set up in programs 1, 2, and 3 and in a, b, and c. So, users can set up 9 different starts times.*

1. With the dial set to START TIMES position
2. Time will be flashing in the screen.
3. The factory preset is set on program A. If necessary, you can select program B or C by pressing the **PRG** button.
4. Select the start time (hour and minute) using +/- buttons.
5. Press the **▶** button to add an additional start time, or **PRG** button for the next program.
6. To eliminate a Start Time, With the dial set to START TIMES position, push the **◀** button until you reach 12:00 AM (Midnight). From here, push the button once to reach the OFF position.
7. Press the right arrow to eliminate a second start time.

Program Run Times



Figure 15: Program Run Times

1. Turn the dial to RUN TIMES position.
2. Time will be flashing in the screen.
3. Use the **PRG** button to select a program (A, B, or C).
4. Press +/- buttons to change the station run time from 1 minute to 4 hours.

Water Days



Figure 16: Water Days

1. Turn the dial to the WATER DAYS position.
2. Use the **PRG** button to select the desired program, (A, B, or C).
3. Arrows point at the specific days of the week in which watering is to occur. Press the + button to activate that day or the - button to cancel watering for that day.

Seasonal Adjustment

Always keep the Seasonal Adjustment setting at 100%.



Figure 17: Seasonal Adjustment

1. Turn the dial to the SEASONAL ADJUSTMENT position.
2. Press the +/- buttons to adjust the percentage of the seasonal adjustment to 100%.

System Off

Always keep the system on.



Figure 18: System Off

1. If the system must be switched off, turn the dial to System Off and wait 2 seconds. The display will read OFF and all active programs will be discontinued, and watering stopped.
2. To return the controller to normal automatic operation, simply return the dial to the RUN position.

Gas Compressors

This section applies to all product variants except the standard (offboard gas).

Units equipped with onboard oxygen generator have one main compressor that recompresses the oxygen from the output of the oxygen generator.

Startup

INDALO is equipped with a dump valve that vents the gas in the tubing when the system turns on. This will reduce the chances of running the compressors against pressure or vacuum.



Product surfaces become very hot during operation. Allow product surfaces to cool before handling. The air stream from product may contain solid or liquid material that can result in eye or skin damage. Wear proper eye protection. Failure to follow these instructions can result in burns, eye injury, or other serious injury.

Maintenance Tip: Regularly inspect and make necessary repairs to product to maintain proper operation. Follow this manual's preventive maintenance schedule.

Compressor Troubleshooting

NOTE: Before troubleshooting the compressor, independently power the compressor via a separate outlet and disconnect the pneumatic tubing.

Table 5: Compressor Troubleshooting	
Problem	Corrective Action
Motor Will Not Start	<ol style="list-style-type: none"> 1. Check that voltage from power source matches what is listed on the INDALO nameplate, and the compressor printed label on the housing. 2. Check wiring connections against diagram on the compressor label. Single voltage motors will operate only at the designated voltage range. 3. Reconnect electrical supply to unit. Check that the power is on. If an extension cord is used, check that it is the correct size and length to adequately supply power to the unit.
Motor Starts Intermittently	<ol style="list-style-type: none"> 1. Check points in the pressure or vacuum switch for wear or dirt. 2. Check for dirt buildup or uneven wear. Replace damaged or maintenance items.
Unit or Motor is Running More Often than When First Installed	<ol style="list-style-type: none"> 1. Check system for air leaks. If new or different pneumatic equipment has been added, the air requirements may have changed. 2. Check and clean filters. 3. Check for buildup of foreign material on head. 4. Check valves and rings for wear and damage.

Winterizing

Outdoor Nanobubble Cold Weather Bulletin

INDALO is designed for indoor and outdoor applications where the temperature is above freezing. If it is installed outdoors or in areas where temperatures can go below freezing, some precautions must be taken to avoid potential equipment and system failures. PVC pipes are in danger of freeze-cracking when the ambient temperatures approach 19°F (-7°C). Ice begins to form and gradually blocks the pipe. This blockage causes a rise in water pressure. Eventually, the pipe ruptures and damages the equipment. Some advanced planning will assist you in keeping the pipes intact during the winter months. Generally, pipes should be buried at least 12 in. (30 cm) below normal frosting depth. Both intake and discharge pipes (including goosenecks) should also be below frosting depth. The impact strength of PVC pipe decreases during cold weather. At 32°F (0 °C), however, the pipe still maintains 70% to 90% of its 73°F (23°C) strength.

Preparation For Above Water-Freezing Temperature

Insulate exposed pipes. Wrap pipes with thermal insulation or heat tape. Four types of thermal insulation are available for water pipes, and each one is assigned an R-value. The R-value indicates the heat retention for each material. spiral wrap is the lowest cost and has the lowest R-value and the most difficult installation process. R-4 foam tubing is highly recommended. Measure the insulation and trim to your pipe length. Seal your insulation using duct tape.

Preparation For Below Water-Freezing Temperature

If there is a chance that the system is going to lose power, then drain your system by opening the pump lid and removing drain valve at bottom of pump housing, draining the whole system, and then reinserting the plug, and putting the lid back on loosely. Remove the SS plug from the lower discharge side of the nanobubble generator block. If you blow the system out with air, be careful to wear appropriate eye protection and stand away from the unit. Do not pressurize above 51 PSI (3.5 bar), remove any sensors first. Do not blow the system from the pump. Close isolation valves after blowout.

Winterizing is a good time to lubricate the pump lid O-rings. Add 1 quart (1 liter) of food grade propylene glycol to any water remaining in the unit. Leave the unit off until temperature remains above 32°F (0°C) for 24 hours.



WARNING Always disconnect power to the Neo-N Nanobubble Generator at the circuit breaker before servicing the pump. Failure to do so could result in death or serious injury to service people, users, or others due to electric shock. Read all servicing instructions before draining the pump.

Cleaning and Sanitizing

In normal operation, the internal elements of the INDALO nanobubble generator can become fouled by mineral scale, biological matter, colloidal particles, and insoluble organic constituents. Deposits can build up on the internal surfaces during operation and can cause diminished operation. Best practices include routine preventive cleaning with acid and alkali chemicals. In some instances, if large solids are allowed to pass into the generator, blockages can occur. The best indication for cleaning is a rise in gas pressure to 80 Psig (5.51 Barg), Moleaer recommends that a Clean-in-Place (CIP) be performed at least every month if not more frequently depending on the local conditions. Detailed CIP instructions are included in the next section of this Owner's Manual.

System Troubleshooting

Table 6: System Troubleshooting

Problem	Possible Cause	Corrective Action
Pump Will Not Prime	<ul style="list-style-type: none"> • Air circulating in system. • Power interruption. 	<ul style="list-style-type: none"> • Check suction piping and valve on any suction gate valves. • Be sure suction lines, pump strainer (applies to Pentair pumps), and pump volute are full of water. Be sure valve on suction line is working, clean, and open.
Pump Motor Not Working	<ul style="list-style-type: none"> • Motor thermal protector tripped. • Open circuit breaker or overload tripped. • Impeller binding. • Motor improperly wired. • Defective motor. 	<ul style="list-style-type: none"> • Reset overload. • Reset breaker or replace fuse. • Clear the impeller. • Check that motor is wired correctly.
Reduced Capacity and / or Head	<ul style="list-style-type: none"> • Air pockets or leaks in suction line. • Pump will not prime - too much air. 	<ul style="list-style-type: none"> • Check suction piping and valve on any valve suction gate valves. • Secure lid on pump strainer pot and make sure lid gasket is in place. Check water level to make sure suction port is not drawing air. • Clean pump strainer pot. • Check if impeller or diffuser are clogged.
Clogged Impeller	<ul style="list-style-type: none"> • Debris in impeller. 	<ul style="list-style-type: none"> • Switch OFF electrical power at circuit breakers to the pump. Remove nuts that secure volute to the seal plate. • Slide motor and seal plate away from the volute. Clean debris from impeller. • If debris cannot be removed, complete the following steps: <ul style="list-style-type: none"> ○ Remove impeller reverse screw and O-ring. ○ Remove, clean, and reinstall impeller. ○ Reinstall anti-spin bolt. ○ Reinstall diffuser and O-ring. Reinstall motor and seal plate into volute. Reinstall hardware around seal plate and volute and tighten securely.

Table 6: System Troubleshooting

Problem	Possible Cause	Corrective Action
Insufficient Dissolved Oxygen Saturation	<ul style="list-style-type: none"> • Vacuum leaks in suction line. • Gas flow too low. 	<ul style="list-style-type: none"> • Check plumbing connections and suction piping. Check to be sure suction port is not drawing air into the system. • Increase gas flow. • Increase system run time.
Excessive Power Consumption	<ul style="list-style-type: none"> • Impeller binding. • NPSH too low - excessive suction lift or losses. • Discharge head too low - excessive flow rate. 	<ul style="list-style-type: none"> • Clear the impeller. • Check the pump curve for NPSH requirements. • Check the flow.
Pump Flow Too Low	<ul style="list-style-type: none"> • Voltage too low. 	<ul style="list-style-type: none"> • Check and correct the voltage.
Pump Back Pressure Too High	<ul style="list-style-type: none"> • Discharge nozzle or piping obstructed. • Discharge valve engaged too much. 	<ul style="list-style-type: none"> • Check for blockage in piping. • Ensure all valves are fully open.
Low Gas Pressure on System Gauge	<ul style="list-style-type: none"> • Feed gas pressure too low. • Internal fouling. 	<ul style="list-style-type: none"> • Follow specified “clean-in-place” procedures to internal cleaning. • Increase flow rate.
Gas Flow Meter Not Working	<ul style="list-style-type: none"> • Excessive Moisture in the rotameter. • Blockage in needle valve. 	<ul style="list-style-type: none"> • Clean rotameter.
Too Many Large Bubbles	<ul style="list-style-type: none"> • Gas flow too high. 	<ul style="list-style-type: none"> • Reduce gas flow on rotameter or flowmeter on the oxygen generator (for O2 models only)
Insufficient Gas Transfer	<ul style="list-style-type: none"> • Feed gas pressure too low. • Delta gas pressure out of range. • Excessive moisture and / or contaminant in the gas line. • Internal system fouling. 	<ul style="list-style-type: none"> • Increase feed gas pressure at the gas regulator. • Clean rotameter, gas lines, and fittings. • Follow specified “clean-in-place” procedures for internal cleaning.

Table 6: System Troubleshooting

Problem	Possible Cause	Corrective Action
Excessive Noise and Vibration	<ul style="list-style-type: none"> • Impeller binding. • Pump is not primed fully. • NPSH too low - excessive suction lift or losses. • Incorrect rotation (three phase only). • Defective motor. • Discharge, suction plugged, or valve closed. • Impeller worn or plugged. 	<ul style="list-style-type: none"> • Replace impeller if damaged. • Complete flood intake piping to prime fully. • Repair or replace motor if damaged. • Open discharge valve or reduce restriction.

CLEAN IN PLACE (CIP) INSTRUCTIONS

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Clean-In-Place Procedures

Parts Required

The CIP Syringe Kit, P/N 99K0-031, is required to inject cleaning solutions into the nanobubble generator.

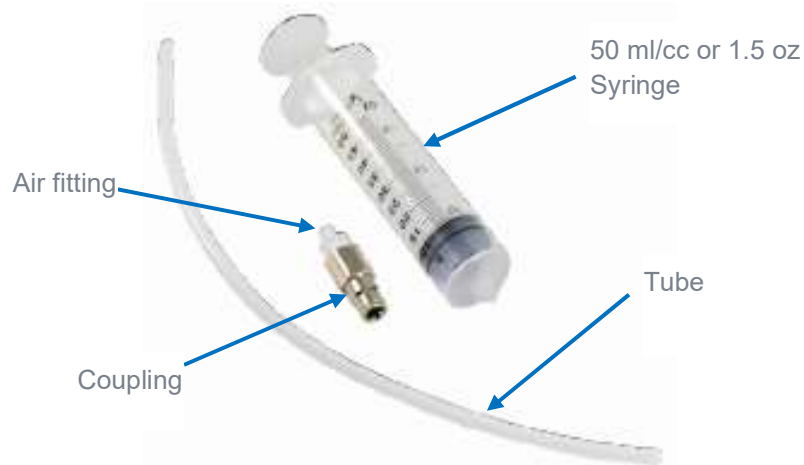






Figure 18: CIP Syringe Kit, P/N 99K0-031

Syringe Kit Assembly Instructions	
1. Hand screw the plastic coupling into the air fitting. Verify it is hand tight.	
2. Insert the tube into the air fitting.	
3. Insert the coupling into the syringe and press firmly.	
4. The final assembly.	

Cleaning Procedure

1. Isolate the unit system and turn the power off.
2. Locate the nanobubble generator and remove the downstream air fitting tube only.

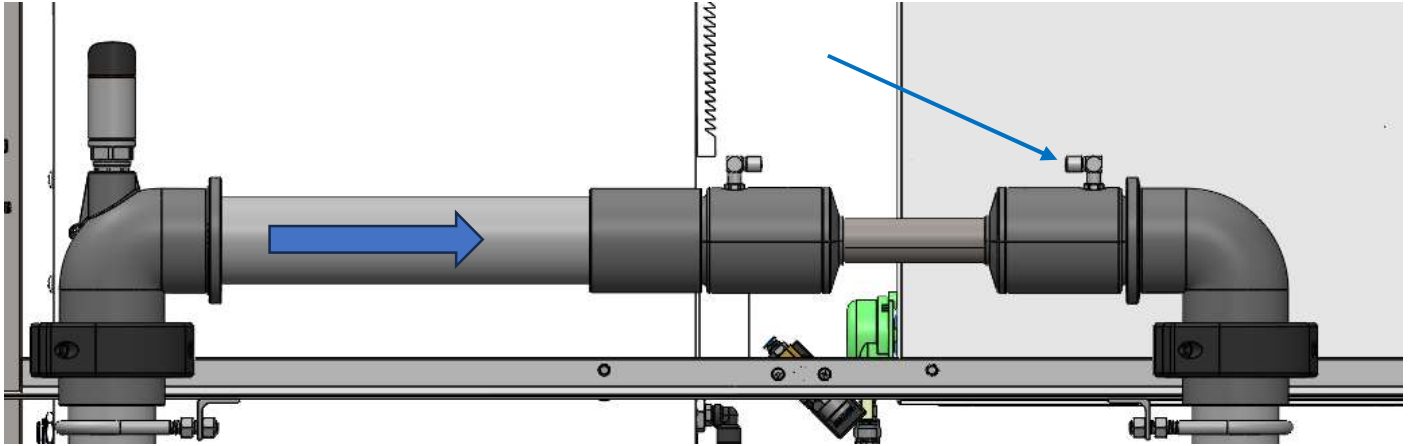


Figure 19: System Off

3. Select the cleaning solution.
 - a. US Market: Lysol (Power Toilet Bowl) or Multi-Use CLR.
 - b. EU Market: Descaler PH = 0.5
4. Prepare the syringe with cleaning solution.



Figure 20: Filling syringe with cleaning solution

- Inject about 0.8 fl oz (25 ml) of cleaning solution into the nanobubble generator. Keep injecting the solution until it comes out from the other end. Clean any spilled solution with a piece of cloth.

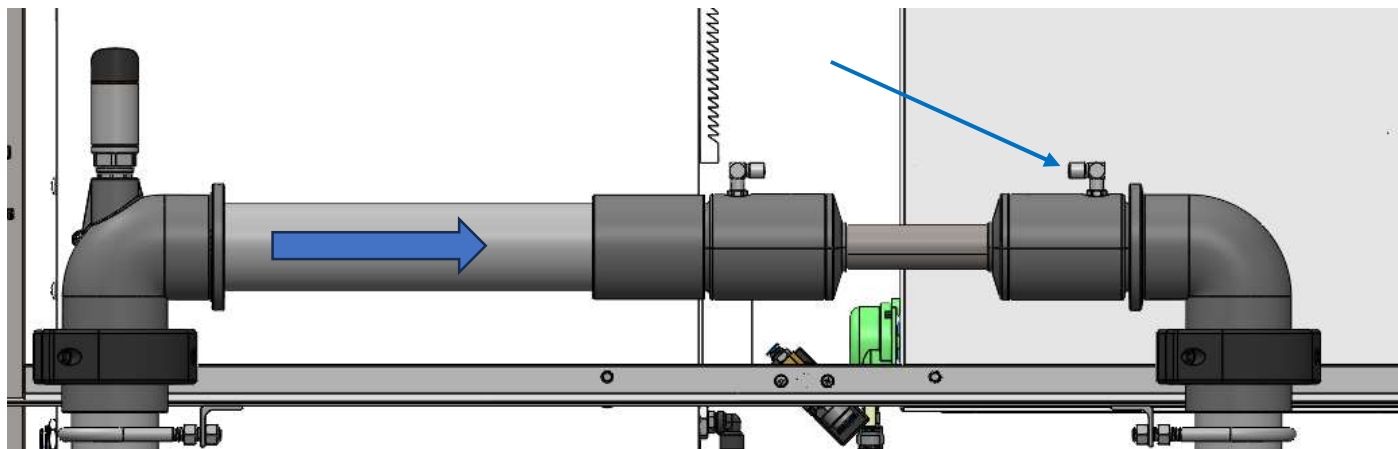


Figure 19: System Off

- Keep the solution in the nanobubble generator for 15 minutes with the syringe tube still attached.
- Using the same syringe, inject clean water into the nanobubble generator to flush the CIP solution out. Repeat 3 times. Generally, after 3 flushes, the remainder of the solution is very small and can be left inside the system.
- Reconnect the air fitting tube to the air fittings of the nanobubble generator.
- Turn the system on.
- Run the system for 10 minutes. Gas pressure should decrease, and gas flow should improve.

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EU Lowara Pumps Specifications Sheets

INDALO units are equipped with Lowara centrifugal flooded suction pumps. Always check your unit's pump model and brand before referring to this section. For pump specifications and curves please contact Moleaer.

NOTE: A flooded suction in a centrifugal pump is where liquid originates. The liquid is held at a level above the suction port of the pump and allows liquid to arrive at the pump through gravity. To operate this pump, liquid must already be within the flooded suction.

Air Compressor Operation Manual

Hyundai Air Compressor, Rocking Piston Pump

HYUNDAI

AIR COMPRESSOR

ROCKING PISTON

Operation and Maintenance Manual



General Security

WARNING! When using power tools, basic safety precautions should always be followed to reduce the risk of fire, electric shock, and personal injury, including the following safety information. Please read all these instructions before attempting to operate this product and save these instructions for future use.

WARNING: This product should not be used by persons (including children) with reduced mental or physical capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety. Children must be supervised to ensure that they do not play with the appliance.

CAUTION: Use the power tool, accessories, and bits, etc. in accordance with these instructions, taking into account the working conditions and the work to be performed. Using the power tool for operations other than those intended could result in a hazardous situation.

The term "power tool" in the warning refers to your mains-operated (corded) power tool or battery-operated (cordless) power tools.

1. Keep work area clear - cluttered work areas and benches can lead to injuries.
2. In the workspace environment:
 - a. Do not expose tools to rain.
 - b. Do not use tools in damp or wet locations.
 - c. Keep the work area with good lighting.
 - d. Do not use tools in the presence of flammable liquids or gases.
3. Protect yourself against electric shock - avoid body contact with grounded or grounded surfaces (for example, pipes, radiators, stoves, refrigerators).
4. Keep other people away. Do not allow people, especially children, who are not involved in the work to touch the tool or extension cord and keep them away from the work area.
5. Store idle tools - when not in use, tools should be stored in a dry, locked-up place out of the reach of children.
6. Don't force the tool - it will do the job better and safer at the rate for which it was designed.
7. Use the right tool - don't force small tools to do the job of a heavy-duty tool. Do not use tools for purposes not intended; for example, do not use circular saws to cut branches or tree trunks.
8. Dress appropriately
 - a. Do not wear loose clothing or jewelry, which may get caught in moving parts.
 - b. Proper safety footwear is recommended when working outdoors.
 - c. Use some utensil to contain long hair.
9. Wear protective gear.
 - a. Wear safety glasses.
 - b. Wear face or dust mask if work operations create dust.

WARNING: Failure to wear proper clothing or protective equipment may cause personal injury or increase the severity of an injury.

10. Connect dust extraction equipment - if the tool is provided for the connection of dust extraction and collection equipment, verify they are connected and used correctly.
11. Do not abuse the power cord - never pull on the power cord to disconnect it from the socket. Keep the power cord away from heat, oil, and sharp edges. Damaged or entangled power cords increase the risk of electric shock.
12. Safe work - where possible use clamps or a vise to hold the work. It is safer than using your hand.
13. Don't overdo it - maintain proper posture and balance at all times.
14. Keep tools with care.
 - a. Keeping cutting tools sharp and clean makes the tool easier to control and less likely to jam or block the work piece.
 - b. Follow instructions for lubricating and changing accessories.
 - c. Periodically inspect the power cords of the tool and, if damaged, have them repaired by an authorized technical service.
 - d. Inspect extension cords periodically and replace if damaged.
 - e. Keep handles dry, clean, and free of oil and grease.

WARNING: Many accidents are caused by poorly maintained power tools.

15. Unplug the machine - when not in use, before servicing and changing accessories such as blades and bits, unplug the machine from the power source.

WARNING: The use of accessories not recommended by the manufacturer may cause personal injury.

16. Remove wrenches - Get in the habit of checking to see that wrenches are removed from the tool before turning it on.
17. Avoid Unintentional Starting - Verify the switch is in the "off" position when plugging into an outlet or inserting a battery pack, or when lifting or carrying the tool.

WARNING: Unintentional starting of a tool can cause serious injury.

18. Use outdoor extension cords - when the tool is used outdoors, use only outdoor extension cords marked as such. Using an extension cord suitable for outdoor use reduces the risk of electric shock.
19. Stay alert:
 - a. Watch what you are doing, use common sense and do not operate the machine when you are tired.
 - b. Do not use the machine while under the influence of drugs, alcohol, or medication.

WARNING: A moment of inattention while operating the machine can result in serious personal injury.

20. Check for damaged parts.
 - a. Before continuing to use the tool, it should be carefully checked to determine if it will function properly and perform its intended function.
 - b. Check the alignment of the moving parts, the binding of the moving parts, the folding of the parts, the assembly and any other condition that may affect its operation.
 - c. -A guard or other part that is damaged should be properly repaired or replaced by an authorized service center unless otherwise stated in this instruction manual.
 - d. Have faulty switches replaced by an authorized service center.

WARNING: Do not use the machine if the on/off switch does not turn it on and off. The switch must be repaired before using the machine.

21. Have your tool serviced by a qualified person - this power tool complies with relevant safety standards. Repairs must only be carried out by qualified persons, otherwise this may cause considerable danger to the user.

WARNING: When performing maintenance, use only identical replacement parts.

WARNING: If the power cord is damaged, it must be replaced by the manufacturer or an authorized service center.

22. Mains plugs must match the outlet - Never modify the plug in any way. Do not use adapter plugs with grounded power tools. Unmodified plugs and matching outlets will reduce the risk of electric shock.
23. If using a power tool outdoors, use a Residual Current Device (RCD) – Verify the switch is in the "off" position when plugging into an outlet or inserting a battery pack, or when lifting or carry the tool.

NOTE: The term residual current device (RCD) may be replaced by the term ground fault circuit interrupter (GFCI) or earth leakage circuit interrupter (ELCB).

WARNING: Before connecting a tool to a power source (receptacle, outlet, etc.), verify that the supply voltage is the same as that specified for the tool, it can cause serious injury to the user and damage to the property. tool. If in doubt, do not connect the tool. Using a power supply with a voltage lower than the nameplate rating is detrimental to the motor.

Tool Safety

- For multiple hazards, read and understand the safety instructions before installing, operating, servicing, maintaining, changing accessories, or working near this tool. Otherwise, it may cause serious bodily injury.
- Only qualified and trained operators should install, adjust, or use this tool.
- Do not modify this tool. Modifications may reduce the effectiveness of safety measures and increase risks to the operator.
- Do not discard the safety instructions; give them to the operator.
- Do not use this tool if it is damaged.
- Tools should be inspected periodically to verify that the qualifications and markings required by this part of ISO 11148 are legibly marked on the tool. The employee/user must contact the manufacturer to obtain replacement marking labels when necessary.

WARNING: This product is not intended for use by persons (including children) with reduced mental or physical capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety. Children must be supervised to ensure that they do not play with the appliance.

Projectile Hazards

- Be aware that failure of the work piece or accessory, or even the inserted tool, can result in high-velocity projectiles.
- Always wear impact resistant eye protection while operating this tool. The degree of protection required must be evaluated for each use.
- For aerial work, wear a safety helmet.
- The risk to others must also be assessed at this time.
- Make sure the workpiece is securely fastened.

Entanglement Hazards

- Shocks, burns, or lacerations can occur if loose clothing, personal jewelry, neck, hair, or gloves are not kept away from the tool and its accessories.

Operating Hazards

- Using the tool can expose the operator's hands to hazards, including cuts, abrasions, and heat.
- Wear suitable gloves to protect your hands.
- Operators and maintenance personnel must be physically able to handle the load, weight, and power of the tool.
- Hold the tool correctly; be prepared to counter normal or sudden moves and have both hands available.
- Maintain a balanced body position and a secure posture.
- Release the start-stop device in the event of a power supply interruption.
- Use only lubricants recommended by the manufacturer.
- Personal protective safety glasses must be worn; suitable gloves and protective clothing are recommended.
- Avoid direct contact with moving parts to avoid pinching or cutting hands or other body parts.
- Wear suitable gloves to protect your hands.
- There is a risk of electrostatic discharge if used on plastic and other nonconductive materials.

Repetitive Motion Hazards

- When using this tool to perform work-related activities, the operator may experience discomfort in the hands, arms, shoulders, neck, or other parts of the body.
- When using this tool, the operator must assume a comfortable posture while maintaining a safe posture and avoiding awkward or off-balance postures. The operator must change posture during extended tasks; this can help prevent discomfort and fatigue.
- If the operator experiences symptoms such as persistent or recurring discomfort, pain, throbbing, aching, tingling, numbness, burning sensation, or stiffness, these warning signs should not be ignored. The operator should consult a qualified health professional.

Danger Accessories

- Disconnect the tool from the power supply before installing or changing the inserted tool or accessory.
- Avoid direct contact with the inserted tool during and after use as it may be hot or sharp.
- Use only sizes and types of accessories and consumables recommended by the manufacturer of this tool; do not use other types or sizes of accessories or consumables.

Workplace Hazards

- Slips, trips, and falls are the leading causes of injuries in the workplace. Be aware of slippery surfaces caused by tool use as well as trip hazards caused by the air line or hydraulic hose.

- This tool is not designed for use in potentially explosive atmospheres and is not isolated from contact with electrical energy.

Dust and Smoke Hazards

- Dust and fumes generated from using this tool can cause health problems (for example, cancer, birth defects, asthma, and/or dermatitis); Risk assessment and implementation of appropriate controls for these risks are essential.
- The risk assessment must include the dust created using the tool and the possibility of disturbing existing dust.
- Direct exhaust to minimize dust disturbance in a dusty environment.
- Where dust or fumes are created, the priority should be to control them at the point of creation.
- Select, maintain, and replace the consumable / insert tool as recommended in the instruction manual, to avoid unnecessary buildup of dust or fumes.
- Wear respiratory protection in accordance with the employer's instructions and as required by occupational health and safety regulations.

Noise Risks

- Exposure to high noise levels can cause permanent and disabling hearing loss and other problems, such as tinnitus (ringing, buzzing, hissing, or ringing in the ears). Therefore, risk assessment and the implementation of appropriate controls for these risks are essential.
- Appropriate controls to reduce risk may include such actions as cushioning materials to prevent work pieces from 'ringing'.
- Wear hearing protection in accordance with the employer's instructions and as required by occupational health and safety regulations.
- Operate and maintain this tool as recommended in the instruction manual to avoid an unnecessary increase in noise level.
- Select, maintain, and replace the consumable / insert tool as recommended in the instruction manual, to avoid unnecessary noise increase.
- If the tool has a muffler, always make sure it is in place and in good condition when the tool is running.

Vibration Risks

- This information should draw attention to vibration hazards that have not been eliminated by design and construction and remain residual vibration hazards. It shall enable employers to identify the circumstances in which the operator is at risk of vibration exposure. If the vibration emission value obtained using ISO 28927-3 does not adequately represent the vibration emission in the intended uses (and prevent minimum loads) of the machine, additional information and/or warnings must be provided to enable Risks arising from vibration evaluated and managed.
- Vibration exposure can cause disabling damage to the nerves and blood supply of the hands and arms.

Vibration Hazards

- Wear warm clothing when working in cold conditions and keep your hands warm and dry.
- Operate and maintain the sander or polisher as recommended in the instruction manual to avoid an unnecessary increase in vibration levels.
- Hold the tool with a light but secure grip, considering the required manual reaction forces, as the risk of vibration is generally greater when the grip force is higher.

Compressor Safety

When using machinery, there are certain precautions that must be taken to promote safe operation. Always apply caution and respect to machinery in use; If the following safety precautions are ignored, damage or injury may be subject to the operator, property, or a bystander. It is in the interest of the user to read and pay attention to the following guidelines.

WARNING: This air compressor does not produce breathable air. Swallowing compressed air is dangerous and can cause harm.

WARNING: hot surfaces are present. DO NOT touch the engine, cylinder, heads, and tubes as they may be damaged by combustion.

WARNING: DO NOT use in potentially explosive atmospheres. Verify the atmosphere is free of combustible gases and high concentrations of fine dust.

- a. NEVER use compressed air for unintended use. Compressed air has the potential to cause damage. Avoid directing compressed air at animals or people, and NEVER release compressed air at skin.
- b. Do not expose tools to rain.
- c. Do not use tools in damp or wet locations.
- d. Keep the work area with good lighting.
- e. Do not use tools in the presence of flammable liquids or gases.
- f. Keep bystanders away. Children and bystanders should be kept away from the compressor. Unintentional intercalation with the compressor is dangerous.
- g. Do not abuse cables and hoses. Keep cables and hoses away from heat, liquids, and sharp edges. NEVER try to force cables and hoses beyond their fully extended reach or allow them to become entangled.
- h. The air compressor must be stored properly and depressurized. During storage and transportation, the compressor must be free of pressure. Always exhaust air from compressor after use.
- i. Verify the pressure rating meets the tool. Always check that the air tool has a safe working pressure that exceeds the working pressure of the machine.
- j. Wear the proper protection for the task at hand. Appropriate protection for the application; masks will protect from spray paints and goggles protect against flying debris.
- k. Operate the air compressor correctly. Follow the operating instructions provided in the manual. NEVER allow children or persons unfamiliar with the operation of the air compressor to use this product.
- l. Disconnect accessories carefully. Depressurize tank and ensure air supply is turned off before removing air tools and accessories.
- m. Wear appropriate clothing. Hanging moving clothing, jewelry, or long hair can be caught in moving parts.
- n. Keep the air compressor dry and free of moisture. Condensation can be trapped inside the system. A specified release valve will remove moisture from the air compressor.
- o. Verify the compressor complies with local rules and regulations. Regular testing will determine if the air compressor is suitable for service in certain regions.
- p. Take the correct precautions when performing maintenance. Verify ALL compressed air is expelled from the compressor tank and the power supply is disconnected before beginning any maintenance procedures.
- q. Operate the air compressor in an appropriate environment. DO NOT use in ambient temperatures below 0°C, in damp or wet conditions. ONLY indoor use is allowed for air compressor operation.

Familiarization with the Product

1. Reserve tank
2. Compressor
3. Crankcase breather
4. Cylinder head (not shown)
5. On/Off switch
6. Pressure gauge
7. Carrying handle
8. Quick connector
9. Pressure regulator
10. Rubber foot
11. Purge tap
12. Transport wheel
13. Air filter
14. Axis
15. Fixing bolt.



Unpacking the Product

WARNING: This device is very heavy and should NOT be unpacked and handled by one person.

- Unpack and carefully inspect your tool. Become fully familiar with all its features and functions.
- Verify all parts of the tool are present and in good condition. If any parts are missing or damaged, have them replaced before using this tool.

Before Use

Installing Transport Wheels:

1. Place the air compressor unit on a secure flat surface ready for mounting and locate the transport wheels (14) and fixings.
2. Carefully lay the air compressor unit on its side to access the wheel mounting hole.
3. Slide the axle (16) through the center of the transport wheel, followed by the mounting hole in the wheel.
4. Secure using matching nut and lock washer.
5. Repeat steps 1 through 4 for the other side.

Rubber Foot Installation:

1. Place the air compressor unit on a secure, flat surface to reveal the foot mounting hole (Image I). Locate the rubber foot (12) and the fixings.
2. Slide the supplied fixing bolt through the bottom of the rubber foot (Picture II), then through the foot mounting hole secure with the corresponding nut.
3. Access to the other foot mounting hole is available from the current position of the air compressor. Repeat steps 1-2.

Air Filter Installation:

1. The threaded air intake port is located on the side of the cylinder head (Image III).
2. Screw the air filter (15) into the air inlet port.

Functioning

WARNING: Always wear proper protective equipment, including eye, respiratory, and hearing protection, when working with this tool.

Turn On and Stop

1. Check that the compressor is disconnected from all air tools or air lines and that the ON/STOP switch (6) is pressed.
2. Connect the machine to the main power supply.
3. Pull the ON/OFF switch (6) up. This will start the compressor.

Line Pressure Setting:

- The pressure of the air supplied to the tool (line pressure) can be adjusted using the pressure regulator (11). Line pressure is displayed on the gauge.
- Increase the line pressure by turning the pressure regulator clockwise. To reduce line pressure, turn the pressure regulator counterclockwise.

Maintenance

WARNING: ALWAYS wear proper personal protective equipment, including eye protection and oil resistant gloves, when servicing this compressor. ALWAYS ensure adequate ventilation.

WARNING: ALWAYS turn off the compressor and wait until all components have completely cooled before cleaning or performing any maintenance.

NOTE: The maintenance schedule should be adjusted according to usage and environment. If the compressor is used frequently and/or if it is used in harsher environments, shorter maintenance intervals are required.

WARNING: Always remove the plug from the main power supply before performing any maintenance/cleaning.

- Do not attempt to perform any maintenance when the air tank is pressurized.
- Residual air will escape from the valve until the ring is released or all air pressure is released.

Maintenance Schedule

Description	Action	Before Each Use	Every 3 Months / 50 Hours	Every 6 Months / 100 Hours	Every 12 Months / 300 Hours
Air Filter	Inspection	X			
	Cleaning		X		
Accessories and Fasteners	Check, Tighten, and Replace if necessary			X	
Valve Maintenance	Cleaning and Clearance Adjustment				X (Requires Qualified Technician)

WARNING: Maintenance not covered by this manual MUST be performed by an authorized technician. Attempting such maintenance or repair will void the warranty.

WARNING: Some of the maintenance procedures described in this manual require some general technical skills and experience. This compressor MUST ONLY be serviced by persons with the required skill level. If in doubt, have the machine repaired at an authorized service center.

Cleaning

- Keep your tool clean at all times. Dirt and dust will cause internal parts to wear out quickly and shorten the life of the machine. Clean the body of your machine with a soft brush or dry cloth. If available, use clean, dry compressed air to blow through the vent holes.
- Use a mild detergent and a damp cloth to clean oil-contaminated parts. Rinse with fresh water and dry completely.
- Keep all electrical and electronic components dry at all times.

Sewer system

- During use, atmospheric moisture will condense in the air storage tank. The tank must be drained of moisture regularly to prevent corrosion damage.
- To drain the moisture, open the drain cock (13), located at the bottom of the tank, approx. 3 turns counterclockwise.
- Allow all moisture to drain out and retighten the plug.

Air Filter Maintenance

WARNING: Never operate this compressor without the air cleaner element installed, as this will cause rapid wear of internal components, causing permanent internal damage and shortening the life of this compressor.

1. Separate the air filter (15) from the cylinder head (4), turning it counterclockwise.
2. Remove the wing nut from the top of the air cleaner assembly and remove the air cleaner element from inside the assembly.
3. Wash the filter element thoroughly in a solution of warm water with non-foaming household detergent or clean it with a special non-flammable solvent.

WARNING: DO NOT use gasoline or other flammable solvents to clean the filter element as this could cause a fire or explosion.

4. Dry the filter element thoroughly.

WARNING: DO NOT wring out the element as this will damage the sponge material.

WARNING: NEVER install a wet filter element, as water in the air intake will cause permanent engine damage.

- Soak the dry filter element in clean engine oil or alternatively apply specialized air filter oil to the filter element. Gently squeeze (but DO NOT squash) to remove excess oil.

NOTE: If the filter element is installed soaked in excessive amounts of oil, the engine will produce large amounts of smoke after it has been started.

- Reinstall the air filter in the cylinder head. Verify the air filter is tight in the intake port.

Storage

WARNING: Verify that the ON/OFF switch (6) is in the "OFF" position, that the electrical current is disconnected from the mains and that the air storage tank (1) is depressurized before transporting or storing the air compressor.

Air Compressor Bearing

- This air compressor provides a carrying handle (9) located at the front. Due to its weight and size, the device should always be moved with the carrying handle and wheels.

Compressor Storage

Store carefully in a safe, dry place, out of the reach of children.

Preparation for Long-term Storage

- Whenever the machine is out of use for a long period of time, proceed as follows:
- Manage the unit, general cleaning, and minute control.
- Clean the air filter as described in "Air Filter Maintenance".
- Protect all metal parts from corrosion by coating with oil or machine preservative.

Waste Disposal

Always follow national regulations when disposing of power tools that are no longer functional and are not suitable for repair.

- Do not dispose of power tools or other waste electrical and electronic equipment with household waste.
- Contact your local waste disposal authority for information on the proper way to dispose of tools.

Troubleshooting

Problem	Possible Cause	Solution
Compressor motor does not start	Compressor storage tank full	Depressurize the tank using the release valve
Air compressor storage tank cannot hold pressure	Air leaks at hose connection points	Operate air compressor at maximum pressure, turn off. Apply soap solution to the connection points and check for leaks. Tighten leaking connection points. If the problem persists, contact a qualified technician
The air compressor is producing increasing sound / vibration / metal knock levels	Bearing, piston or valve damage	Contact a qualified technician

Technical Data

	HYAC6-07S
Power	550W / 0.75 Hp
Tension	230V / 50 Hz
Tank	6L
Sound Level	59 db(A) @ 7m
Air Flow	93 l/min
Pressure	8 bar
Revolutions	1380 rpm
Transmission	Direct WITHOUT OIL
Dimensions	50 x 21 x 50 cm
Weight	16 kg

Oxygen Generator

Safety

Oxygen, the most abundant of the elements, makes up approximately 50% of the earth's crust. In its free state, it forms about 1/5 of our air by volume. Although oxygen is classified as a nonflammable gas, it supports combustion. As an active element, it combines directly or indirectly with all elements, except the rare gases. It is an invisible gas that is colorless, odorless, and tasteless.

To ensure your safety, thoroughly read and familiarize yourself with this section of the manual. AirSep Corporation strongly recommends that you review this section periodically.

Potential Hazards

Before you attempt to install, operate, or repair the oxygen generator, read, and thoroughly understand this manual. Improper operation can result in severe bodily injury, damage to the unit, or poor performance.



Oxygen vigorously accelerates the burning of combustible materials. In some oxygen-enriched atmosphere, many materials that do not burn in normal air require only a slight spark or moderate heat to set them aflame.

To avoid fire or an explosion, keep gasoline, kerosene, oil, grease, cotton fibers, paint, and any other combustible material away from any part of the oxygen generator.

Do not smoke or use an open flame near the oxygen generator.

Post "NO SMOKING OR OPEN FLAMES" signs in the area where the oxygen generator is located. AirSep Corporation STRONGLY recommends that only individuals trained and experienced in the safe handling of oxygen operate this unit.



Take extreme care to keep all oxygen piping and vessels clean. To avoid fire or an explosion, oxygen clean all surfaces that can come in contact with oxygen. Check all oxygen fittings / joints for leaks with an oxygen compatible leak detecting solution.



ELECTRICAL SHOCK HAZARD

Only trained personnel may open the oxygen generator. The interior of the oxygen generator contains electrical parts that can produce an electrical hazard if not handled properly.



Connect the oxygen generator power cord to a properly grounded wall outlet on a circuit that cannot be accidentally turned off. Do not use extension cords. Do not position the generator in an area that makes it difficult to disconnect the power.



To prevent fire or electrical shock, locate the oxygen generator indoors away from rain or any other type of moisture.

Safety Publications

This section is not a complete summary of required safety procedures. Review the following publications for additional information on the safe handling of oxygen.

1. "Standard for Bulk Oxygen Systems at Consumer Sites," NFPA No. 50, National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101 USA.
2. "Oxygen," Pamphlet G-4, Compressed Gas Association, 1725 Jefferson Davis Highway, Arlington, VA 22202-4102 USA.
3. "Cleaning Equipment for Oxygen Service," Pamphlet G-4.1, Compressed Gas Association, 1725 Jefferson Davis Highway, Arlington, VA 22202-4102 USA.

System Description

General

The ProO2 Oxygen Generator is a self-contained unit that uses Pressure Swing Adsorption (PSA) technology to produce oxygen onsite. The PSA process extracts oxygen from ambient air to deliver product oxygen continuously to an application that requires feed oxygen.

The oxygen generator uses compressed air from its internal air compressor as a feed gas to produce the product oxygen. Ambient air enters the air intake, passes through a gross particle filter to remove large airborne particulate matter, then flows into the internal air compressor. The air compressor pressurizes the feed air and delivers the feed air to a heat exchanger for cooling. The cooled, pressurized air then enters one of the adsorber vessels.

The oxygen generator uses in its adsorber vessels an inert ceramic material called molecular sieve to separate compressed air into oxygen and other gases. The unique properties of molecular sieve allow it to attract, or adsorb, nitrogen physically from air under pressure. This allows oxygen to exit the adsorbers as a product gas and flow into a mixing tank, which maintains stable flow and purity of the product oxygen. The product oxygen flows from the mixing tank through a pressure regulator that allows the delivery pressure to be set as required for your application. Finally, the product oxygen flows through a flowmeter, which allows you to set the flow rate required for your application.

While one adsorber produces oxygen, the other depressurizes to exhaust the waste gases it adsorbed (collected) during the oxygen production cycle. The entire oxygen generating process is completely regenerative, which makes it both reliable and virtually maintenance free. The molecular sieve does not normally require replacement when maintained and used according to this instruction manual.

Water Cooled Kits:

It is preferred to use some degree of chilled-water filtering, prior to circulation, with water cooling kits. The water-cooled radiator utilizes a series of very narrow, microchannel “fins” that increase surface area and shed heat better. If the water has an element of hardness to it (i.e., dissolved calcium and magnesium salts that leave a residue once liquid has evaporated) or if the water has a large amount of dissolved or suspended solids in it, deposits of these contaminants can clog the microchannels on the radiator side. This can back up the system and prevent water from continuing to circulate forward. Blockages can cause leaks to develop in the water-cooled portion on the system. The objective is to keep the water continuously circulating through the MAX unit and avoid potential obstructions of the narrow fins on the radiator side. If clean water, not stagnant or particle-infested water, is used, this issue can be avoided.

Cold Temperature “Limits” Of The System:

The minimum temperature the system can tolerate is approximately -55 to -60 degrees Fahrenheit (-48 to -51 degrees Celsius), which is the low point for the silibraided tubing. The metal portions of the system should easily be able to support the cooling element.

Potential For Atmospheric Condensation On Device:

It may be helpful to include a small consumable desiccant (Silica Gel; Alumina; etc.) inside of the water-chilled MAX unit. Place the desiccant inside the unit, away from any moving components or sources of heat. The desiccant should keep the potential for humidity to condense on the cool metal portions of the system to a minimum. However, the overall system itself is relatively hardened/grounded, so condensation is a concern.

Components Description

The drawings in this section illustrate the location of the main components of the Max 5LPM, Max 8LPM, and Max 10LPM oxygen generators. All models include similar components, unless noted otherwise. Refer to Appendix A of this manual for general layout drawings and specifications. Oxygen Generator Model designation is as follows.

Moleaer Product	Oxygen Generator Model
INDALO-P	Max 5LPM
INDALO-G	Max 8LPM or Max 10LPM

Components

Enclosure

The enclosure protects the components inside the unit (e.g., circuit board, air compressor, and valves.)

Gross Particle Filter

The washable gross particle filter removes airborne particulate matter from the room air drawn into the unit.

Oxygen Pressure Gage

This gauge indicates the delivery pressure of the product oxygen.

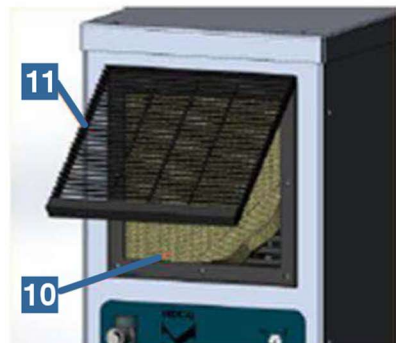
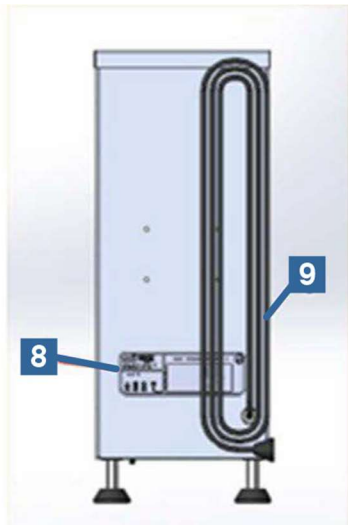
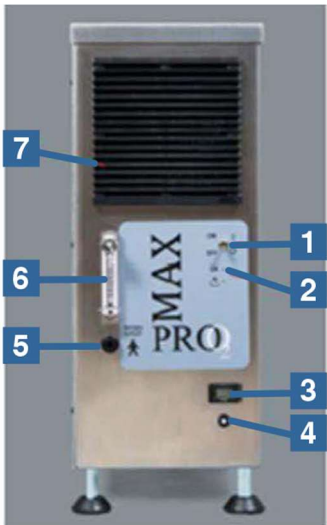
Flowmeter

The flowmeter allows you to view and adjust the flow rate of the product oxygen. The flowmeter should never be adjusted beyond the setpoint designated for the unit.

NOTE: Increasing the flowmeter beyond the setpoint designed for the particular model can potentially cause damage to the molecular sieve and will void the warranty.

Moleaer Product	Max Allowable Flow*
INDALO-P	1.06 gpm (4 lpm)
INDALO-G	2.12 gpm (8 lpm)
* Reading on the O2 generator flowmeter.	

Max Oxygen Generator



- 1. Power Switch (On and Off)
- 2. Indicator Lights (Ok and Caution)
- 3. Hour Meter
- 4. Circuit Breaker
- 5. Oxygen Outlet
- 6. Flow Meter (with Adjustment Knob)
- 7. Intake Ventilation (see 10 and 11 for detail)
- 8. Technical Label
- 9. Power Cord
- 10. Cabinet Air Filter
- 11. Air Filter Grille

Accessories

Accessories used with this device must be oxygen compatible and rated for the pressure. The filters notated in this section, available from your distributor, comply with these requirements.

Filters

Filters	
Description	Part Number
Cabinet Air Filter	9600-1053
Inlet Filter / Element	9800-1027 / 9800-1012
Filter Kit (3 Cabinet Filters, 3 Inlet Filter Elements, 1 Product Filter)	9800-1027K

Installation and Operation

The Max oxygen generator is packaged to protect the device from damage while being transported and stored. After the device is removed from the package, inspect for damage. If damage is detected, please contact your equipment supplier.

Instructions for lifting and carrying The Max 5, 8, and 10 devices are heavy and are not suited to be carried by a single person. The device should be carried by two people and only lifted from the bottom surface. Do not attempt to lift the unit by the flow meter and flow knob.

Reference the previous illustration. The Max oxygen generator should be placed and operated in a space where the Intake Filter Ventilation (7) is not obstructed, and the Power Cord (9) is accessible for easy disconnection but does not present a tripping hazard.

To use your device safely, follow the directions below.

1. Ensure that the Power Switch (1) is in the "O" (OFF) position.
2. Ensure the Intake Ventilation (7) is not obstructed or blocked.
3. Plug the Power Cord (9) into an outlet of the correct voltage and frequency as defined on the Technical Label (8).
4. Connect supply tubing, that is rated for oxygen use at the designated pressure, to the Oxygen Outlet (5).
5. Move the Power Switch (1) to the "I" (ON) position.
6. Turn the Flow Adjustment Knob (6) to the desired flow rate.
7. At the end of use, move the Power Switch (1) to the "O" (OFF) position to stop the device.

<input checked="" type="checkbox"/>	The required oxygen concentration is normally obtained within five minutes of the start-up of the device.
<input checked="" type="checkbox"/>	The oxygen enriched air flow continues for approximately one minute after shut down of the device.

Cleaning and Maintenance

Only the outside of the device is to be cleaned. After making sure the Power Switch (1) is in the "O" (OFF) position, use a soft, dry cloth or, if necessary, a damp sponge with mild soap. Do not use acetone, solvents, abrasive powders, or any inflammable products to clean the cabinet.

The removable Cabinet Air Filter (10) must be cleaned, at least weekly, in warm water and household detergent. It should be rinsed thoroughly and dried completely before reinstalling. The Inlet Filter / Element (not pictured, located inside the device) should be inspected monthly and replaced if required, or at least annually. The product filter (PN 7631-1053, not pictured, located inside the device) should only be replaced by a technician, if required (not common).

Performance Specifications and Alarm/Safety Features

Model	605MC	705MC	665MC	765MC	685MC	785MC	695MC	795MC
Description	1.5 LPM 115V	1.5 LPM 230V	5 LPM 115V	5 LPM 230V	8 LPM 115V	8 LPM 230V	10 LPM 115V	10 LPM 230V
Frequency	60Hz	50Hz	60Hz	50Hz	60Hz	50Hz	60Hz	50Hz
Average Power	120 Watts	120 Watts	410 Watts	420 Watts	500 Watts	490 Watts	700 Watts	600 Watts
Protection Class	Class I							
Mains Protection	5A	10A	5A	10A	5A	10A	5A	5A
Average Oxygen Content	At 0.25 LPM >93% ± 3%		At 2 LPM >93% ± 3%		At 2 LPM >93% ± 3%		At 2 LPM >93% ± 3%	
Average Oxygen Content	At 1.5 LPM 87% to 93%		At 5 LPM 87% to 93%		At 8 LPM 87% to 93%		At 10 LPM 87% to 93%	
Liter Flow	0.1 to 1.5 LPM		1 to 5 LPM		2 to 8 LPM		2 to 10 LPM	
Outlet Pressure	5 Psig		12 Psig		15 Psig		18 Psig	
Dimensions (LxWxH)	210 x 200 x 250 mm (9.5 x 7.8 x 9.8 in.)		508 x 254 x 610 mm (20 x 10 x 24 in.)					
Weight	6.8 kg (15 lbs.)		26 kg (56 lbs.)					

INDICATOR LIGHTS AND ALARM CONDITIONS

Green indicator: This light indicates that power is applied to the concentrator and that it is ready to provide oxygen enriched product gas.

Yellow indicator: This light indicates that a system fault has occurred (if equipped).

Power Failure detection: In the event of a loss of power, an intermittent audible alarm is activated (if equipped) and the green light deactivates.

Process Failure detection: In the event of a process failure, an audible alarm and the yellow light is activated (if equipped).

Electrical Protection: In the event of a surge or drop in power supply, the circuit breaker will trip. To restart the device, depress the Circuit Breaker button (4).

Storage and Operating Conditions

The device should be stored in a dry area, with an ambient temperature between 0°F to 140°F (-20°C to 60°C) at 15 to 95 percent relative humidity. It must be stored, transported, and used in the vertical position only. Oxygen concentration can be affected after prolonged periods of storage – check the device before use.

The device should be operated in a dry area, with an ambient temperature between 50°F to 105°F (10°C to 40°C) at 15 to 95 percent relative humidity. The device can be operated at an altitude of up to 5000 ft (1500 m) at a temperature of 70°F (21°C) without causing product degradation. Consult your equipment provider for further information regarding 5000 ft to 13000 ft (1500 m to 4000 m).

Maintenance

The oxygen generator requires little maintenance. Use the following chart for preventive maintenance at the required intervals.

Interval	Maintenance
Every Month	Verify product oxygen remains within specifications of this instruction manual. Clean enclosure. (Refer to “Cleaning the Enclosure.” In this section.) Clean or replace the compressor particulate filter.
Every Month	Check performance of solenoid valves. Rebuild or replace, as necessary.

CLEANING THE ENCLOSURE



WARNING Only trained personnel may open the oxygen generator. To prevent electrical shock, shutdown the oxygen generator and disconnect the main power supply before you clean the enclosure.

Use the following procedure to clean the enclosure:

1. Shutdown the unit
2. Use a dry, lint-free cloth on the enclosure, taking care to wipe the enclosure clean.



DRY CLOTH CLEAN ONLY

Do not apply liquid directly to the enclosure or use any petroleum-based solvents or cleaning agents.

AIR COMPRESSOR MAINTENANCE

The typical preventive maintenance interval for the air compressor is 10,000 hours (if installed indoors) or 1 year (if installed outdoors). Refer to preventive maintenance schedule in this manual.

Disposal

This device has been supplied by an environmentally aware manufacturer. Most of the parts in the device are recyclable. Follow local governing ordinances and recycling plans regarding disposal of the device or components normally used in operation. Any accessories not original to the device must be disposed of in accordance with the individual product markings for disposal.

Troubleshooting



ELECTRICAL SHOCK HAZARD

The interior of the oxygen generator contains electrical parts that can produce an electrical shock if not handled properly. Disconnect the main power supply before removing the enclosure.



Because the capacitor stores electrical power, it presents an electrical shock hazard even when the main power is disconnected. Never touch both leads on the capacitor simultaneously. Before handling the capacitor, safely discharge the power from the capacitor by using an insulated screwdriver to contact both leads simultaneously.

Oxygen Generator Troubleshooting		
Problem	Possible Cause	Corrective Action
The Power Switch (1) ON position but device does not operate The audible alarm sounds continuously	Power Cord (9) is not plugged into outlet	Check that device is properly plugged into electrical outlet
	Power failure	Check that Circuit Breaker (4) and reset if necessary
Yellow Light Indicator (2) remains lit	Product pressure or concentration is not at an acceptable level	Contact your Equipment Supplier
The audible alarm does not sound when device is first turned on	Super capacitors not charged	Leave device plugged in for approximately 10 minutes and retest.
	Internal electrical fault	Contact your Equipment Supplier
The device is operating but the Green Light Indicator (2) is not lit	Faulty indicator	Contact your Equipment Supplier
The device is operating but there is no flow (flowmeter ball not moving)	Internal system failure	Stop device immediately and contact your Equipment Supplier
The device is operating but the audible alarm sounds continuously	Internal fault	Stop device immediately and contact your Equipment Supplier
The device suddenly stops and then starts again in a few moments.	Dirty Filters	Clean External Cabinet Filter (10)
	Compressor Thermal Shut-Off	Contact your Equipment Supplier
The oxygen flow is interrupted, or the flow is irregular	Tubing is disconnected or leaking	Check tubing connections Straighten tubing
	Tubing is restricted	Contact your Equipment Supplier
Unit does not operate	No electrical power to unit	Verify power cord connects to electrical outlet and that electrical outlet receives power
	Circuit breaker on I/O power switch tripped	Reset the circuit breaker and set I/O power switch to I to restart unit

Oxygen Generator Troubleshooting		
Problem	Possible Cause	Corrective Action
	Blown fuse	Replace the fuse
	Faulty electrical connections	Disconnect main power supply, remove enclosure, and make sure all electrical connections, connect securely
Unit stops unexpectedly	No electrical power to unit	Verify power cord connects to electrical outlet and that electrical outlet receives power
Air compressor stops unexpectedly or does not operate when cooling fan operates	Restricted air flow to compressor	Clean gross particle filter or remove obstruction
	Thermal shutdown activated on air compressor	Allow air compressor to cool, then restart unit
	Faulty electrical connections	Disconnect main power supply, remove enclosure, and make sure all electrical connections, including air compressor leads, connect securely
	Improper power voltage	Verify power meets specifications on the Data Sheet in section 3
	Defective capacitor	Replace capacitor
	Defective air compressor	Rebuild or replace air compressor as applicable
Unit operates, but air does not circulate into unit	<ul style="list-style-type: none"> Faulty electrical connections to cooling fan Defective cooling fan 	<ul style="list-style-type: none"> Disconnect main power supply, remove enclosure, and make sure all electrical connections, including cooling fan leads, connect securely Replace cooling fan

Oxygen Generator Troubleshooting		
Problem	Possible Cause	Corrective Action
Flowmeter fluctuates or flow rate of product oxygen changes unexpectedly	<ul style="list-style-type: none"> Leak in unit Improperly set or defective pressure regulator Defective solenoid valve(s) Defective air compressor Defective circuit board 	<ul style="list-style-type: none"> Pressurize unit, set I/O power switch to O, and disconnect power supply. Remove enclosure and make sure tubing remains connected to fittings. Use soapy water to check all hoses, tubing, and fittings in unit. Most leaks are audible when area is quiet. Repair leaks and replace hoses or tubing as necessary Check regulator setting or replace defective regulator Repair or replace solenoid valve(s) Replace air compressor Replace circuit board
Pressure of product oxygen changes unexpectedly	<ul style="list-style-type: none"> Leak in unit Improperly set or defective pressure regulator Relief valves release Defective air compressor 	<ul style="list-style-type: none"> Pressurize unit, set I/O power switch to O, and disconnect main power supply. Remove enclosure and make sure tubing remains connected to fittings. Use soapy water to check all hoses, tubing, and fittings in unit. Most leaks are audible when area is quiet. Repair leaks as necessary Check regulator setting or replace defective regulator Refer to “Popping sound indicates release of relief valves” problem in troubleshooting chart Rebuild or replace air compressor, as applicable
“Popping” sound indicates release of relief valves	<ul style="list-style-type: none"> Obstructed exhaust muffler Improperly set or defective pressure regulator Defective solenoid valve(s) Defective circuit board Contaminated adsorbers	<ul style="list-style-type: none"> Replace exhaust muffler Check regulator setting or replace defective regulator Repair or replace solenoid valve(s) Replace circuit board Replace adsorbers
Chattering or buzzing noise from solenoid valve(s)	<ul style="list-style-type: none"> Defective or worn solenoid valve(s) 	<ul style="list-style-type: none"> Repair or replace solenoid valve(s)

Pressure Switch Manual

Mechanical Pressure Switches



Technical Data

Mechanical Pressure Switch Technical Data	
Description	Specification
Range	1-0 BAR, 0 to 1000 bar
Pressure overload range:	1.5 x Full Scale (FS)
Operating temperature range:	(-20 to 85°C)
Compensation temperature range:	(-10 to 70°C)
Output signal:	4-20mA; 0 to 5 VDC
Power (Vs):	12 to 36 VDC wide voltage input
Pressure accuracy:	0.5% FS
Nonlinear:	0.5% FS
Reliability:	0.2% FS
Housing:	304 stainless steel
Diaphragm:	316L stainless steel
Waterproof rating:	IP65 (standard)
Connection thread:	1/4 NPT male

INSPECTION AND PREVENTIVE MAINTENANCE

Section 9 Contents

Monthly Inspection Checklist.....	9-2
Preventive Maintenance Schedule	9-2

Monthly Inspection Checklist

Checked	Component	Description
<input type="checkbox"/>	Gas leakage	Use soap water to check the gas leakage on the joints and fittings. Check for signs of cracking on the tubes
<input type="checkbox"/>	Water pressure	Check water pressure gauge (0.7 to 1.4bar). Compare historical values on the remote monitoring dashboard (requires subscription).
<input type="checkbox"/>	Compressors visual inspection	Check for erratic vibration or heat marks on the housing.
<input type="checkbox"/>	Rotameter	Check rotameter value and compare with previous readings
<input type="checkbox"/>	Visual inspection	Check gas tubing and look for spots with condensation, and heat marks
<input type="checkbox"/>	Oxygen generator intake filter	Open the oxygen generator enclosure and clean or replace the air intake filter.
<input type="checkbox"/>	Gas pressure	Check gas pressure gauge (0.7 to 6.7 bar). Compare with historical values.
<input type="checkbox"/>	Rotameter	Note rotameter value and compare with previous readings. Adjust flow by using rotameter knob.
<input type="checkbox"/>	Rotameter	Note rotameter value and compare with previous readings. Adjust flow by using oxygen generator rotameter knob

Preventive Maintenance Schedule

Preventive Maintenance Schedule	
Schedule	Description
Day 1	Perform monthly inspection
Week 1	Perform monthly inspection
Week 2	Perform monthly inspection
Week 4	Perform monthly inspection

INSPECTION AND PREVENTIVE MAINTENANCE
PREVENTIVE MAINTENANCE SCHEDULE

6 Months	Perform monthly inspection
	Replace air intake filter of oxygen generator
	Clean O2 generator enclosure
1 Year	Perform monthly inspection
	Visually inspect electrical enclosure. Look for heat marks and loose wires. Wipe out condensed water.
	Perform CIP
	Replace air intake filter of oxygen generator
	Swap O2 generator foam filter
	Clean O2 generator enclosure
	Perform 6 months maintenance
1.5 Years	Perform 1 year maintenance
2 Years	Rebuild O2 generator feed and waste solenoid valve.
	Reseal O2 generator compressor.
	Replace O2 generator mount sandwich.
	Replace O2 generator equalization valve.
	Perform 6 months maintenance.

INSPECTION AND PREVENTIVE MAINTENANCE
PREVENTIVE MAINTENANCE SCHEDULE

2.5 Years	Perform 1 year maintenance items
3 Years	Check and adjust set pressure of the main back pressure regulator
	Perform 6 months maintenance
3.5 Years	Perform 1 year maintenance
4 Years	Rebuild O2 generator feed and waste solenoid valve
	Replace O2 generator compressor
	Replace O2 generator Equalization valve
	Optional: Reseal pump
	Optional: Replace pressure switch



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Document Revision History

Revision	Description	ECO No.	Assignee	Date Finished
A	Initial Release	2012	NS	07/24/23