

WATER RECLAMATION MODULE

PTI Project Number: 410607



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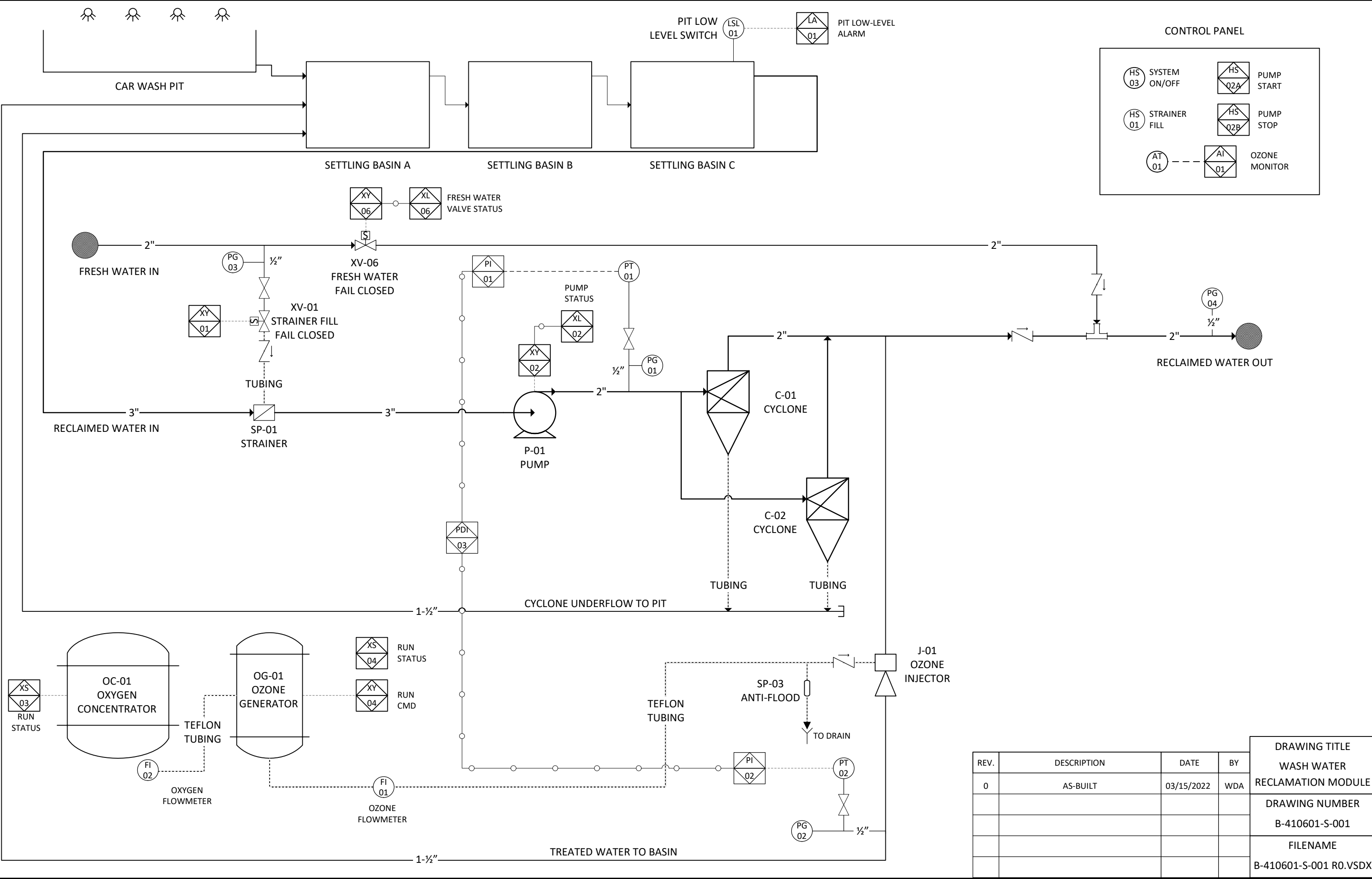
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Section 1

Process Information



DRAWING TITLE			
WASH WATER RECLAMATION MODULE			
DRAWING NUMBER			
B-410601-S-001			
FILENAME			
B-410601-S-001 R0.VSDX			
REV.	DESCRIPTION	DATE	BY
0	AS-BUILT	03/15/2022	WDA



Water Reclamation System Operating Manual

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Revision History

Revision Number	Description
0	Initial issue.
1	Clean up.
2	



1.0 INTRODUCTION

1.1. Scope of this document

This operating manual gives general descriptions of the process and equipment and is intended only for regular operation. For safety, maintenance, and electrical connections, see the equipment manufacturer installation, operating, and maintenance manuals for each piece of equipment.

1.2. Design

The water reclamation system processes settling basin water for reuse and supplies ozone to the car wash pit for odor treatment. See tables 1-1 and 1-2 below for design conditions.

1.3. Process Description

The Water Recycling System consists of a Pump Strainer (**SP-01**), Recirculation Pump (**P-01**), Cyclones (**C-01/C-02**), Oxygen Concentrator (**OC-01**), Ozone Generator (**OG-01**), Ozone Injector (**J-01**), and control and safety instrumentation.

Water to the reclamation system is sourced from the last settling basin and should not contain free oils or large solids. The self-priming Pump lifts water from the basin, through the strainer, and into the treatment system. The strainer captures any large solids in the water.

The Pump discharges into two Cyclones that use centrifugal force to separate fine solids from the water stream. The solids are discharged from the cyclones in slipstreams at the bottom. The slipstreams are combined and returned to the car wash pit.

Most processed water from the top of the cyclones flows to the reclaimed water header. A smaller stream flows through an injector that pulls in and mixes an ozone stream with the water. This stream is returned to the car wash settling basins where the ozone reacts with chemicals and bacteria to reduce odor.

Ozone is a highly reactive gas made of three oxygen atoms. It is a strong oxidizing agent and disinfectant. Because it is so reactive, it can't be stored and has to be made on site. The water reclamation system makes ozone by first concentrating oxygen from the air and then passing the concentrated oxygen stream through an electric field.

The oxygen concentrator draws air through a filter and into a compressor. The air is pressurized and discharged to one of two ceramic media beds that separate nitrogen from oxygen. Nitrogen is captured in the media while oxygen passes through. When the media is depressured, captured nitrogen is released from the media and is exhausted through a muffler. The two beds cycle back and forth so that while one is exhausting nitrogen, the other is absorbing it. This cycle provides a constant flow of concentrated oxygen.

Ozone is generated by passing the concentrated oxygen stream through an electric field. While in the field, some O₂ molecules split into separate atoms that recombine with other O₂ molecules to make O₃, ozone.



Pump		Treated Stream		Reclaim		Injector Pressure Differential
Flow	Pressure	Flow	Pressure	Flow	Pressure	PSI
GPM	PSIG	GPM	PSIG	GPM	PSIG	
50	68	18	59	32	67	9.3
100	58	18	48	82	55	10.6
150	41	16	29	134	35	11.3

Table 1-1 Water circuit design operating rates and pressures

Stream	Ozone	Concentrated Oxygen
Flow (liters per minute, LPM)	4	4+
Pressure (psig)	20	20
Ozone	10%	
Oxygen		90%

Table 1-2 Ozone circuit design operating rates and pressures



2.0 CONTROLS

2.1. Instrumentation

Tag #	Description	Location	Action
LSL-01	Basin Low-Level Switch	Remote	Monitors the basin level.
AI-01	Ozone Monitor Indicator	Panel Screen	Displays ozone level near the System.
AY-04	Ozone Generator % Output	Ozone Generator	Controls 0-100% ozone generator output.
HS-02A	Pump Start	Panel Screen	Starts Pump.
HS-02B	Pump Stop	Panel Screen	Stops pump.
LA-01	Basin Low-Level Alarm	Panel Screen	Shuts down the Pump when the basin level is too low for pump operation.
PDI-03	Injector Differential Pressure	Panel Screen	Allows ozone generation when reading is greater than 5 psi.
PI-01	Pump Discharge Pressure	Panel Screen	Displays pump discharge pressure.
PI-02	Ozone Injector Outlet Pressure	Panel Screen	Displays injector outlet pressure.
XL-02	Pump Run Status	Panel Screen	Displays pump run status.
XS-03	Oxygen Concentrator Run Status	Panel Screen	Displays Oxygen Concentrator run status.
XS-04	Ozone Generator Run Status	Panel Screen	Displays Ozone Generator run status.
XY-04	Ozone Generator Run Command	Ozone Generator	Turns Ozone Generator electrical field on.



AT-01	Ozone Monitor	Local	Monitors ozone level near the System.
FI-01	Ozone Flowmeter	Local	Sets the flow rate of the ozone stream into the Injector.
FI-02	Oxygen Flowmeter	Local	Sets concentrated oxygen flow rate to the Ozone Generator. Set to max when connected to ozone circuit.
HS-01	Strainer Fill Pushbutton	Local	Allows fresh water flow to the pump strainer while pressed.
HS-03	System On/Off	Local	Turns the System on and off.
PG-01	Pump Discharge Pressure Gauge	Local	Displays the Pump Discharge Pressure.
PG-02	Injector Outlet Pressure Gauge	Local	Displays the Injector Outlet Pressure.
PG-03	Fresh Water Inlet Pressure Gauge	Local	Displays the Fresh Water Inlet Pressure.
PG-04	Reclaimed Water Outlet Pressure Gauge	Local	Displays the Reclaimed Water Outlet Pressure.
PT-01	Pump Discharge Pressure Transmitter	Local	Monitors the Pump Discharge Pressure.
PT-02	Injector Outlet Pressure Transmitter	Local	Monitors the Injector Outlet Pressure.
XV-01	Strainer Fill Solenoid Valve	Local	Controls the flow of water to the Pump Strainer.
XV-06	Fresh Water Solenoid Valve	Local	Controls the flow of Fresh Water to the reclaimed water header.

Table 2-1 System Instrumentation



3.0 OPERATION

3.1. Prerequisites

Before operation, users must:

- Familiarize themselves with the water reclamation system, operation, and chemical and mechanical hazards before operation.
- Verify that all on-module and facility plumbing and required electrical connections are completed and ready for service.
- Verify that ozone circuit connections are tight and do not leak.
- Verify all manual valves are open and that there are no obstructions to flow in the following piping.
 - Fresh Water In
 - Reclaimed Water In
 - Reclaimed Water Out
 - Cyclone Underflow to Pit
 - Treated Water Return to Basin
- Verify the I/O power switch on the left side of the Ozone Generator is in the O (OFF) position.
- Verify the I/O power switch on the right side of the Oxygen Concentrator is in the O (OFF) position.
- Turn on 120V and 480V feeders to the module and verify the following:
 - Low Basin Level Alarm (LAL-01) is **NOT** active.
 - Ozone Level Alarm (AI-01) is **NOT** active.
 - Freshwater Inlet Valve (XV-06) is closed.

3.2. Water Circuit Startup

3.2.1. Turn System On/Off Switch (HS-03) to the On position.

The System On/Off switch is only used for control logic. It does not turn power to the module on/off. Use facility disconnects to turn power to the unit on/off.

3.2.2. Open the Pump Strainer (SP-03) lid.

3.2.3. Press and hold the Strainer Fill Pushbutton (HS-01) and watch the water level in the strainer. When the water level in the strainer reaches the inlet piping, close the pump strainer lid and turn the T-handle bolts to tighten the lid.

3.2.4. Press the Pump Start Button (HS-02A) on the Panel Screen screen.

3.2.5. The Pump should draw a prime and develop a pressure greater than 35 psig.

The pump pressure must stay above 35 psig for the module to operate.

3.2.6. Water should be flowing through the Ozone Injector and drawing gas from the ozone circuit



into the treated water return to the pit.

The Injector Differential Pressure must be greater than 5 psi to allow ozone generation.

3.3. Ozone Generation

3.3.1. Set the I/O power switch on the right side of the Oxygen Concentrator to the I (ON) position.

On the initial startup of the Oxygen Concentrator, the low-contraction light near the on/off switch will turn on. The light should turn off within 120 seconds.

3.3.2. Set the Ozone Flowmeter to 4 LPM (liters per minute).

3.3.3. Set the I/O power switch on the left side of the Ozone Generator to the I (ON) position.

After the Pump discharge is above 35 psig AND the Oxygen Concentrator has been running for over 60 seconds, ozone generation is allowed.

3.3.4. Using the slider on the right side of the Ozone Generator display, increase ozone generation to 100%. The Ozone Generator electrical field will power up and generate ozone.

3.4. Automatic Operation

3.4.1. The Water Reclamation System is now producing ozone, supplying reclaimed water to wash headers, and supplying a treated stream to the basin for odor reduction. The following events may occur and affect the operation of the System.

Event	Effect
High Ozone Level > 0.1 ppm	The Ozone Generator electrical field will turn off. The Oxygen Concentrator remains on to purge ozone from the tubing.
Pump Discharge Pressure <35 psig for more than 30 seconds	The Ozone Generator electrical field will turn off. The Oxygen Concentrator remains on to purge ozone from the tubing. The Pump will stop. The Fresh Water Valve will open to supply water to the reclaimed water header.
Ozone Injector Pressure Differential < 5 psi	The Ozone Generator electrical field will turn off. The Oxygen Concentrator remains on to purge ozone from the tubing.
Basin Low-Level Alarm	The Pump will stop. The Ozone Generator electrical field will turn off. The Oxygen Concentrator remains on to purge ozone from the tubing.



	The Fresh Water Valve will open to supply water to the reclaimed water header.
Pump Stop Button (HS-02B) pressed	The Pump will stop. The Ozone Generator electrical field will turn off. The Oxygen Concentrator remains on to purge ozone from the tubing. The Fresh Water Valve will open to supply water to the reclaimed water header.

Table 3-1 System Shut Down Events



4.0 MAINTENANCE

4.1. Oxygen Concentrator

See Section 7.0 of the AirSep Instruction Manual for details on unit maintenance.

Time Period	Action
Bi-Weekly	Clean the gross particle filter (Section 7.1).
Monthly	Clean the enclosure (Section 7.2). Check the performance of the solenoid valves (Section 7.3).

4.2. Ozone Generator

See Section 4A of the Users Manual for details on unit maintenance.

Time Period	Action
Monthly	Clean the exterior. Blow out the interior using clean/dry compressed air, taking special care around electrical components and wiring.

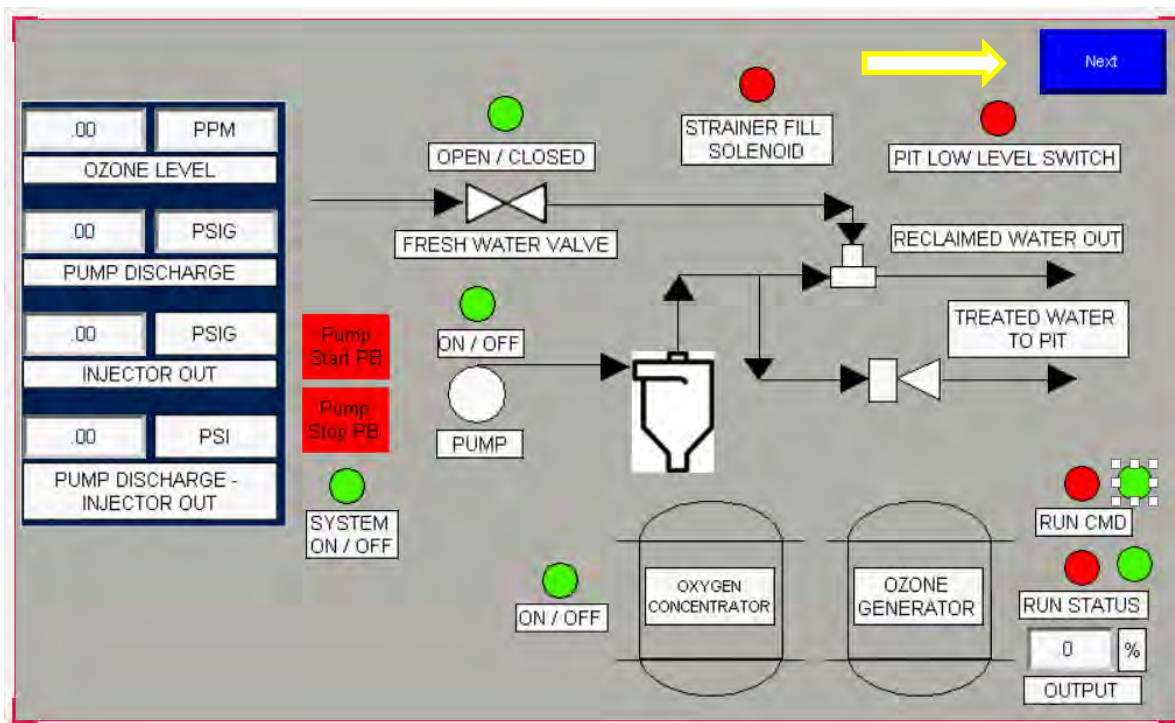


5.0 CONTROLS BYPASSES

The System comes programmed with control bypasses that allow authorized personnel to override inputs and outputs. These bypasses can be used for maintenance, operation changes, ranging transmitters, and checking instrumentation and logic. Bypasses should always be disabled, and the authorized user should log out of the bypass screens when work involving bypasses is completed. Not doing so could result in ozone hazards and mechanical equipment damage.

5.1. Login Screen

To reach the Maintenance Login Screen, press the “Next” button on the top right of the Main Screen.





Press the “Login” button on the Maintenance Login Screen.



The default user id is **User1**. Type in the user id and then tap the password field.

The default password is **123456**. Type in the password, then press enter.

Press “Bypass” to enter the Bypass Screens.

5.2. Bypass Screens

There are four Bypass Screens

- Override Transmitter Readings
- Override On / Off Inputs
- Digital Output Bypass
- Delay and Transmitter Range Entry



Press “Bypass” on the Maintenance Login Screen to access the Bypass Screens.



You can return to the Main Screen from any Bypass Screen by pressing “Main Screen”.

5.2.1. Override Transmitter Readings

This screen allows you to enter a value for analog inputs that will replace the actual value read by the transmitter. Three values can be replaced.

- Pump Discharge Pressure – PI-01
- Injector Discharge Pressure – PT-02
- Ozone Monitor Reading – AI-01



OVERRIDE TRANSMITTER READINGS

ENABLE OVERRIDE OF PUMP PRESSURE READING

ENABLE OVERRIDE OF INJECTOR PRESSURE READING

ENABLE OVERRIDE OF OZONE MONITOR READING

Are you sure you want to Bypass AT-01 Enable OFF?

YES NO

Main Screen

Next Screen

Goto Config

To override any value:

- 5.2.1.1. Touch the text input box next to the transmitter reading you want to change. A number entry box keypad will appear.
- 5.2.1.2. Type the value you want input into the control system and press enter.

Note: Number entry starts from the right. You must enter zeroes to get the numbers to move left to the proper decimal place.



- 5.2.1.3.** To enable the override, press the “Enable Override” button to the left of the value you entered.
- 5.2.1.4.** A text box will appear asking if you are sure you want to enable the bypass. Read the text carefully to make sure you are about to enable the intended bypass. If so, press YES. If not, press NO.
- 5.2.1.5.** The Enable Override ride button will turn green when the bypass is enabled.
- 5.2.1.6.** After enabling the bypass, return to the Main Screen, and the number you entered should appear as the transmitter reading. If it does not appear, return to step 5.2.1.1.
- 5.2.1.7.** To disable a bypass, press the button for the active bypass you want to disable.
- 5.2.1.8.** A text box will appear asking if you are sure you want to disable the bypass. Read the text carefully to make sure you are about to disable the intended bypass. If so, press YES. If not, press NO.
- 5.2.1.9.** The Enable Override ride button will turn red when the bypass is disabled.

5.2.2. Override On / Off Inputs

This screen allows you to turn digital inputs to the controller on or off. Two inputs can be changed.

- Pit Level OK / Not OK– LA-01
- Oxygen Concentrator Running / Not Running – XS-03





To override any input:

- 5.2.2.1.** Touch the button for the input you want.
- 5.2.2.2.** A text box will appear asking if you are sure you want to enable the bypass. Read the text carefully to make sure you are about to enable the intended bypass. If so, press YES. If not, press NO.
- 5.2.2.3.** The input button will turn green when the bypass is enabled.
- 5.2.2.4.** After enabling the bypass, return to the Main Screen, and the input should appear as you set it. If it does not appear correctly, return to step 5.2.2.1.
- 5.2.2.5.** To disable a bypass, press the Remove Bypass button next to the active bypass you want to disable.
- 5.2.2.6.** A text box will appear asking if you are sure you want to disable the bypass. Read the text carefully to make sure you are about to disable the intended bypass. If so, press YES. If not, press NO.
- 5.2.2.7.** The input button will turn red when the bypass is disabled.

5.2.3. Override On / Off Outputs

This screen allows you to turn digital outputs from the controller on or off. Two inputs can be changed.

- Pump Run Command On / Off – XY-02
- Strainer Fill Valve Open / Closed – XY-01
- Fresh Water Valve Closed / Open – XY-06
- Ozone Generation On / Off – XY-04



To override any output:

- 5.2.3.1. Touch the button for the output you want.
- 5.2.3.2. A text box will appear asking if you are sure you want to enable the bypass. Read the text carefully to make sure you are about to enable the intended bypass. If so, press YES. If not, press NO.
- 5.2.3.3. The output button will turn green when the bypass is enabled.
- 5.2.3.4. After enabling the bypass, return to the Main Screen, and the output should appear as you set it. If it does not appear correctly, return to step 5.2.3.1.
- 5.2.3.5. To disable a bypass, press the Remove Bypass button next to the active bypass you want to disable.
- 5.2.3.6. A text box will appear asking if you are sure you want to disable the bypass. Read the text carefully to make sure you are about to disable the intended bypass. If so, press YES. If not, press NO.
- 5.2.3.7. The output button will turn red when the bypass is disabled.



5.3. Delay and Transmitter Range Entry

The Delay and Transmitter Range Screen allows authorized users to change the length of control timers used in control logic and set ranges for process transmitters. Changes should only be made by authorized users who understand the control logic and instrumentation.

Oxygen Concentrator On Time Delay (sec)	
Pump Discharge Pressure for Ozone Generation Delay (Sec)	
Pump Discharge Pressure on Startup Delay	

Pump Discharge Pressure Min (PSIG)	
Pump Discharge Pressure Max (PSIG)	
Injector Discharge Pressure Min (PSIG)	
Injector Discharge Pressure Max (PSIG)	
Ozone Level Min (PPM)	
Ozone Level Max (PPM)	
These ranges must match the transmitter ranges.	

[Main Screen](#)
[Previous Screen](#)



5.4. Configuration

The Configuration screen is accessed from the Override Transmitter Readings Screen.

The Configuration Screen allows authorized users to change the date and time, change the display language, upload program files, and change the running program file.



6.0 OZONE HAZARDS

Following are excerpts from the Ozone Generator Manufacturer's Operator's Manual. See Section 5 of the manual for more information.

Ozone Properties:

- Colorless to blue gas (greater than -169°F)
- Characteristic odor often associated with electrical sparks or lightning in concentrations of less than 0.02 ppm
- Highly chemically reactive
- Non-flammable, non-carcinogenic
- Hazardous polymerization can occur in some rare materials
- Spontaneously decomposes to oxygen gas

Health Hazards – Detection Levels

Gaseous ozone can be detected in the air by its distinctive odor at concentrations of about 0.02 ppm. Although each nose varies, olfactory fatigue occurs quickly. Initial small exposure may reduce cell sensitivity and / or increase mucous thickness, producing odor resistance to low gaseous ozone levels.

DO NOT RELY ON ODOR AS A WARNING OF HIGH OZONE CONCENTRATIONS. The Permissible Exposure Level (PEL) or time-weighted concentration for gaseous ozone to which workers may be exposed is 0.1 ppm averaged over 8 hours, 5 days a week (OSHA). The short-term exposure limit is 0.3 ppm averaged over 15 minutes. The concentration of 5.0 ppm ozone in the air is generally accepted as Immediately Dangerous to Life or Health (IDLH).

Gaseous ozone acts as a primary irritant, affecting mainly the eyes, upper respiratory tract, and lungs. Inhalation produces various respiratory effects, from irritation to pulmonary edema (fluid in lungs). Short exposure to 1-2 ppm concentrations causes headaches and respiratory system irritation, but symptoms subside when exposure ends. High concentrations of ozone produce severe irritation to the eyes and respiratory system. Exposure above the ACGIH/OSHA limits may produce nausea, chest pain, coughing, fatigue, reduced visual acuity, and pulmonary edema. Symptoms of edema from excessive exposure can be delayed one or more hours.



TOXIC EFFECTS OF GASEOUS OZONE

OZONE CONCENTRATION (PPM)	EFFECT
0.01 - 0.10	Range of Odor Threshold
0.1	Permissible concentration (8 hour work day)*
0.3	Permitted short-term exposure (15min.)*
0.01 - 0.1	Headaches, irritation to respiratory tract, severe irritation to eyes
1.0 - 10.0	Nausea, chest pain, coughing, fatigue, reduced visual acuity, pulmonary edema
5.0	Immediately Dangerous to Life or Health (I.D.L.H)*
>20.0	Can be fatal after 1 hour
>50.0	Can be fatal after 30 minutes

*Regulatory Levels

Section 2

Equipment Data

RKHC225, RKHC350



2" & 3" Hydrocyclone Sand Separators

Specifications:

RKHC225

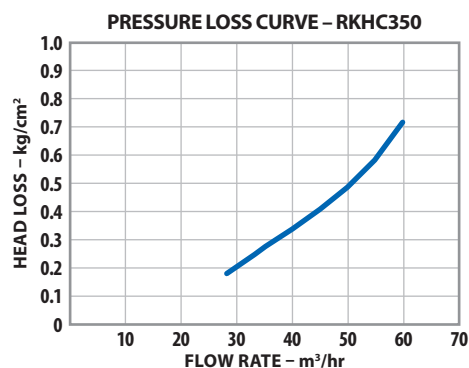
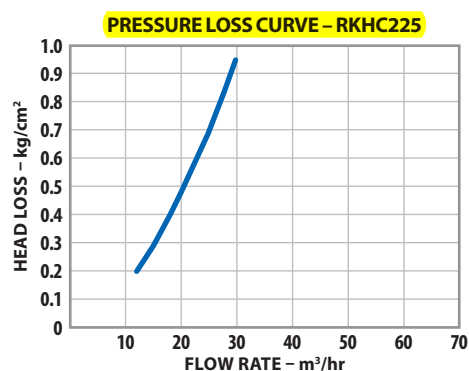
	Standard	Metric
Inlet / Outlet:	2"	-
Maximum Operating Pressure:	110 PSI	8 kg/cm ²
Range of Flow Rate:	65-110 GPM	15-25 m ³ /hr
Nominal Flow Rate:	110 GPM	5 m ³ /hr
Capacity of Underflow Chamber:	2.1 gal.	8 liters

Material: Polyamide Reinforced

RKHC350

	Standard	Metric
Inlet / Outlet:	3"	-
Maximum Operating Pressure:	110 PSI	8 kg/cm ²
Range of Flow Rate:	155-230 GPM	35-52 m ³ /hr
Nominal Flow Rate:	220 GPM	50 m ³ /hr
Capacity of Underflow Chamber:	2.1 gal.	8 liters

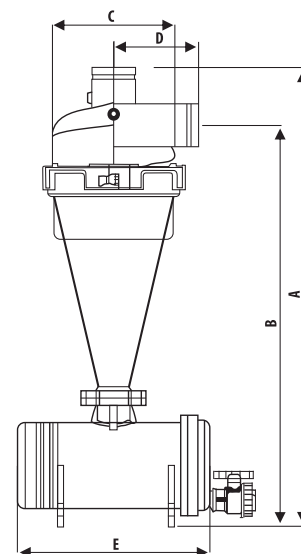
Material: Polyamide Reinforced



Dimensions:

RKHC225 (mm)				
A	B	C	D	E
940	808	206	151	395

RKHC350 (mm)				
A	B	C	D	E
990	868	248	175	395



ALD 2000 FLOOD PREVENTION DEVICE



Water back-up into the ozone generator can become a recurring problem if proper instrumentation is not installed especially if the ozone system is regularly shut-off. In order to prevent water back-up into the ozone generator from the water line and to protect your investment, we recommend to install the the ALD 2000 Flood Prevention Device, a ozone compatible turn-key solution equipped with SS316 non-return check valves, 1/4" or 3/8" tubing connectors to effectively drain any excess water backing up into the ozone generator.

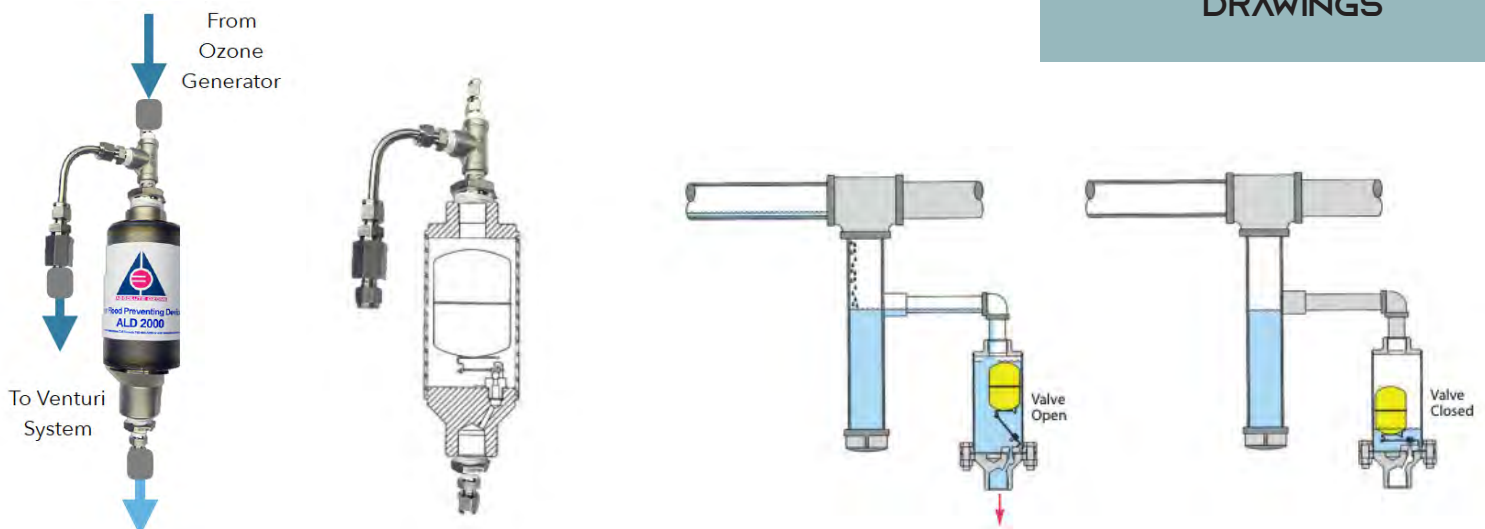
SPECIFICATIONS

Model:	ALD 2000 Flood Prevention Device
Connection Sizes:	1/4" or 3/8" NPT
Body Material:	Stainless Steel 304 (Body), SS 316 (Internal/Fittings)
PMO Max Operating Pressure:	400PSIG
Max Operating Temperature:	500F @ 400PSIG

How it Works: The ALD 2000 contains a stainless steel float and and hardend- stainless steel seat and disc to drain out liquids from pressurized ozone systems without the loss of pressured gas.

Installation: The ALD 2000 should be installed after the ozone generator and flow meter on the ozone line before the injection point to prevent vaccum from backing up the water into the ozone generator

DRAWINGS





Topaz and Topaz Ultra

PSA Oxygen Generators



INSTRUCTION MANUAL

TOPAZ SERIES

Ownership Data

Please take a moment to note below important information about the purchased AirSep® Corporation PSA Oxygen Generator. Retain this instruction manual, along with the invoice, to serve as a permanent record of purchase.

PSA Oxygen Generator

Model Number

Serial Number

Invoice Date

Start-up Date

AirSep Representative

Company

Contact

Address

City/Town

State

Zip/Postal Code

Country

Fax

Phone

Cell



WARNING

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

Only trained personnel should install, operate, or repair the oxygen generator.

Symbols/Abbreviations

Symbols are frequently used on equipment in preference to words with the intention of lessening any possibility of misunderstanding caused by language differences. Symbols can also permit easier comprehension of a concept within a restricted space.

The following table is a list of symbols and definitions that may be used with AirSep's Topaz Series Oxygen Generator. These symbols are referenced from the appropriate International Electro-technical Commission (IEC) standards:

Symbol	Description	Symbol	Description
	ON (power switch on)		OFF (power switch off)
	No smoking		Do not disassemble
	Date of manufacture		Consult instructions for use
	Warning – Describes a hazard or unsafe practice that if not avoided can result in severe bodily injury, death or property damage		See Instructions
	Caution – Describes a hazard or unsafe practice that if not avoided can result in minor bodily injury or property damage		Complies with both the 2014/68/ EU Pressure Equipment Directive (PED), Notified Body 0029 and Council Directive 93/42/EEC concerning medical devices, Notified Body 0459
	Note – Provides information important enough to emphasize or repeat		Safety agency for CAN/CSA C22.2 No. 601.1 M90 for medical electrical equipment
	Consult the accompanying documents		Keep unit and accessories dry
	Use no oil or grease		Proper disposal of waste of electrical and electronic equipment required
	Catalog number		Do not expose to open flames
	Safety agency for CAN/CSA C22.2 No. 601.1 M90 for medical electrical equipment		Keep in the vertical position
	Fragile – handle with care		Serial number
	Manufacturer		Authorized Representative in the European Community

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1.0 Introduction

1.1 GENERAL

This instruction manual provides a description of the AirSep Pressure Swing Adsorption (PSA) Oxygen Generator models Topaz and Topaz Ultra, as well as instructions for their installation, operation, and maintenance. The Appendix of this instruction manual also includes pertinent drawings.

To ensure safe operation and proper maintenance of the oxygen generator, AirSep Corporation recommends keeping this instruction manual readily available for reference.

1.2 WARNINGS, CAUTIONS, AND NOTES

When reading this instruction manual, pay special attention to the WARNING, CAUTION, and NOTE messages. They identify safety guidelines or other important information as follows:

	Provides information that can prevent severe bodily injury or death.
	Provides information that can prevent minor bodily injury or property damage.
	Provides information important enough to emphasize or repeat.

1.3 REFERENCES TO CONTROLS AND INDICATORS

This instruction manual uses uppercase characters (e.g., ON/OFF switch) to refer to controls and indicators identified by tags or labels.

2.0 Safety

2.1 GENERAL

Oxygen, the most abundant of the elements, makes up approximately 50 percent of the earth's crust. In its free state, oxygen forms approximately one-fifth of air by volume. Although classified as a non-flammable gas, oxygen supports combustion. As an active element, it combines directly or indirectly with all the elements except the rare gases. Oxygen is an invisible gas that is colorless, odorless, and tasteless.

To ensure safety, thoroughly read and become familiar with the entire section of this instruction manual. In addition, AirSep Corporation strongly recommends to review this section periodically.

2.2 POTENTIAL HAZARDS

 WARNING	Oxygen vigorously accelerates the burning of combustible materials. In an 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 a 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 allow smoking, open flame, or usage of electronic devices that may generate sparks (e.g., cellular telephones) near the oxygen generator or oxygen receiver (if supplied). Post "NO SMOKING OR OPEN FLAMES" signs in the area where the oxygen generator and optional auxiliary oxygen receiver are located. AirSep STRONGLY recommends that only individuals trained and experienced in the safe handling of oxygen operate this generator.
 WARNING	Take extreme care to keep all oxygen piping and vessels clean. To avoid fire or explosion, oxygen clean all surfaces that can come in contact with the oxygen gas. Check all oxygen fittings/joints for leaks with an oxygen-compatible, leak-detecting solution.
 WARNING	To prevent fire or electrical shock, locate the oxygen generator and the auxiliary oxygen receiver (if supplied) indoors away from rain or any other type of moisture.

 WARNING	Before attempting to install, operate, or repair the oxygen generator, read and thoroughly understand this instruction manual. Improper operation can result in severe bodily injury, damage to the oxygen generator, or poor performance. Only trained personnel should install, operate, or repair the oxygen generator.
 WARNING	In the event there is a serious incident occurring with this device, the user should immediately report the incident to the provider and/or the manufacturer. A serious incident is defined as an injury, death, or potential to cause injury/death should there be a reoccurrence of the incident. The user can also report the incident to the competent authority in the country where the incident occurred.
 CAUTION	Only trained personnel should remove the enclosure, if applicable. To prevent electrical shock, shutdown the oxygen generator and disconnect the main power supply before servicing or cleaning the enclosure. Refer to the "Troubleshooting" section in the manual before servicing the oxygen generator.
 CAUTION	Do not disconnect protective earth
 CAUTION	Always place power cords in a manner that prevents a trip hazard.
 CAUTION	Connect the oxygen generator power cord to a properly grounded outlet on a circuit that cannot be accidentally turned off. Do not use extension cords.
 CAUTION	An alternate source of supplemental oxygen must be available if a power outage, alarm condition or equipment malfunction occurs.
 CAUTION	To prevent fire or product oxygen contamination, locate the unit away from hazardous fumes, chemical or pollutants.

	AirSep oxygen generators are sold for use in commercial applications only, unless otherwise specified. Contact AirSep for equipment intended for medical use.
	No modification of this equipment is permitted.
	AirSep oxygen generators are not intended to be used for or with any life-supporting applications.
	Replacement fuses/circuit breakers must be the same type and amp rating as the original.
	Operation at a flow rate or delivery pressure outside standard specifications requires system modification(s). Please contact AirSep for further assistance.
	Cet appareil produit de l'oxygène à concentration élevée, favorisant une combustion rapide. Ne pas permettre de fumer ou des flammes nues dans la même chambre: (1) cet appareil ou (2) tout accessoire contenant de l'oxygène. Ne pas utiliser de produits à base d'huile, de graisse ou de pétrole sur ou à proximité de l'unité. Déconnecter le cordon d'alimentation de la prise électrique avant de nettoyer ou de faire l'entretien de l'unité. Risque de choc électrique. Seuls votre fournisseur d'équipement ou un technicien de service qualifié devrait faire l'entretien de l'unité.

2.3 SAFETY PUBLICATIONS

The safety section of this instruction manual is not a complete summary of required safety precautions. Review the following publications for additional information on the safe handling of oxygen:

- “Compressed Gases and Cryogenic Fluids Code,” NFPA No. 55; National Fire Protection Association; www.nfpa.org.
- “Oxygen,” Compressed Gas Association; www.cganet.com.
- “Cleaning of Equipment for Oxygen Service,” Compressed Gas Association; www.cganet.com.

3.0 System Description

3.1 GENERAL

Air Contains 21% oxygen, 78% nitrogen, 0.9% argon, and 0.1% other gases. AirSep PSA Oxygen units separate oxygen from compressed air through a unique Pressure Swing Adsorption (PSA) process. The compressed air flows through a filter assembly before the air enters the adsorber vessels. A particulate filter removes condensed water, oil, dirt, scale, etc. from the feed air and then a separate coalescing filter (mounted on most of the models) removes additional oil and water vapor.

The oxygen generator uses, in its adsorber vessels, an inert ceramic material called molecular sieve to separate compressed air into oxygen and the 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. The process valves on the oxygen generator then direct the oxygen to the oxygen receiver for storage until needed by the 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.

This instruction manual serves as the guidelines for the Topaz and Topaz Ultra models. Refer to the illustrations, located in the Appendix, for the detailed flow diagram, electrical schematic, and the general arrangement drawings of the oxygen generator models referenced in this instruction manual.

4.0 Components Description

The figures in this section illustrate the location of the main components of the Topaz and Topaz Ultra oxygen generators. All models include similar components unless noted otherwise. Refer to the Appendix of this instruction manual for general layout drawings and specifications.

4.1 INTERNAL COMPONENTS

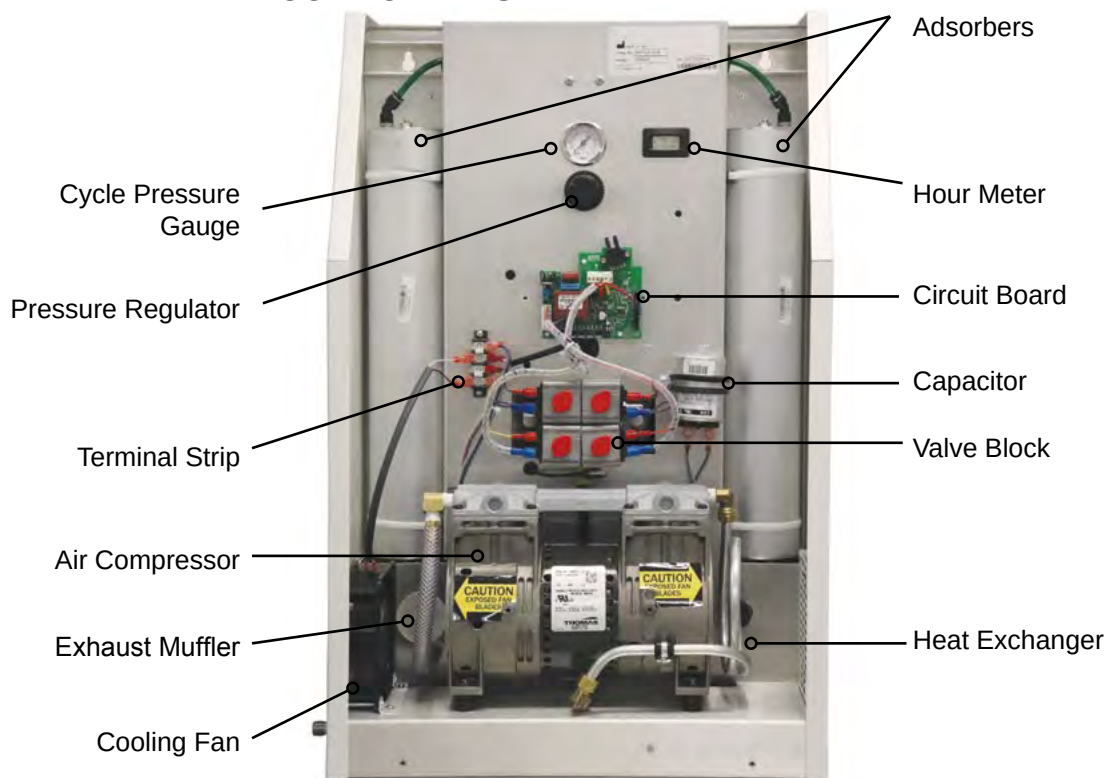


Figure 4.1: Internal Components — Front View

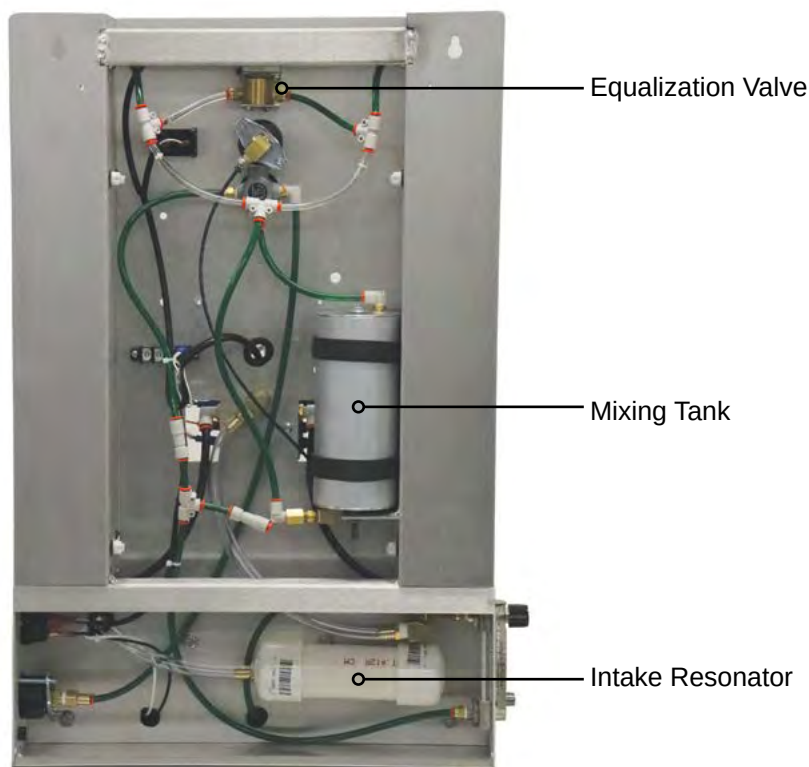


Figure 4.2: Internal Components — Rear View

Intake Resonator

The intake resonator reduces noise from the air compressor.

Air Compressor

The air compressor pressurizes ambient air and delivers it to the adsorbers. Relief valves mounted on the air compressor relieve air pressure higher than its set-point.

Cooling Fan

The cooling fan increases airflow inside the enclosure to cool the air compressor. The models without enclosures do not have a fan installed.

Capacitor

The capacitor stores additional electrical power to enable the air compressor to start.

Heat Exchanger

The heat exchanger cools the pressurized air from the air compressor.

Adsorbers (Sieve Beds)

The adsorbers, or sieve beds, contain the molecular sieve that adsorbs (attracts) nitrogen from compressed air and allows oxygen to pass through as the product gas.

Cycle Pressure Gauge

The cycle pressure gauge indicates the pressure inside the sieve beds.



The oxygen pressure gauge on the right side of the enclosure indicates the pressure set by the regulator.

Valve Block

The valve block houses the solenoid valves.

Equalization Valve

The equalization valve balances the pressure between the two sieve beds.

Circuit Board

The circuit board controls the cycle time and sequence of each solenoid valve.

Terminal Strip

The terminal strip provides a connection point for the wiring to the circuit board and the air compressor.

Mixing Tank

The mixing tank provides stable flow and lower oxygen concentration for short-term surge in oxygen demand.

Pressure Regulator

The pressure regulator controls the delivery pressure of the product oxygen. This regulator is factory set and should never be adjusted.



Changing the air regulator set point can cause damage to the molecular sieve and will void the warranty.



AirSep Corporation recommends the connection of the oxygen generator's terminal block to a circuit that cannot be accidentally turned off. An accidental shutdown causes the oxygen generator to stop cycling randomly and results in initially lower concentration oxygen during the subsequent start-up. If electrical power is off while the application uses oxygen, the oxygen receiver depressurizes.

Exhaust Muffler

The exhaust muffler allows waste gas to exit the adsorbers.

Hour Meter

The hour meter indicates the total number of hours that the unit cycles.



When turning the unit on, it is normal for the amber oxygen monitor (optional) light to turn on and remain on for up to five minutes.

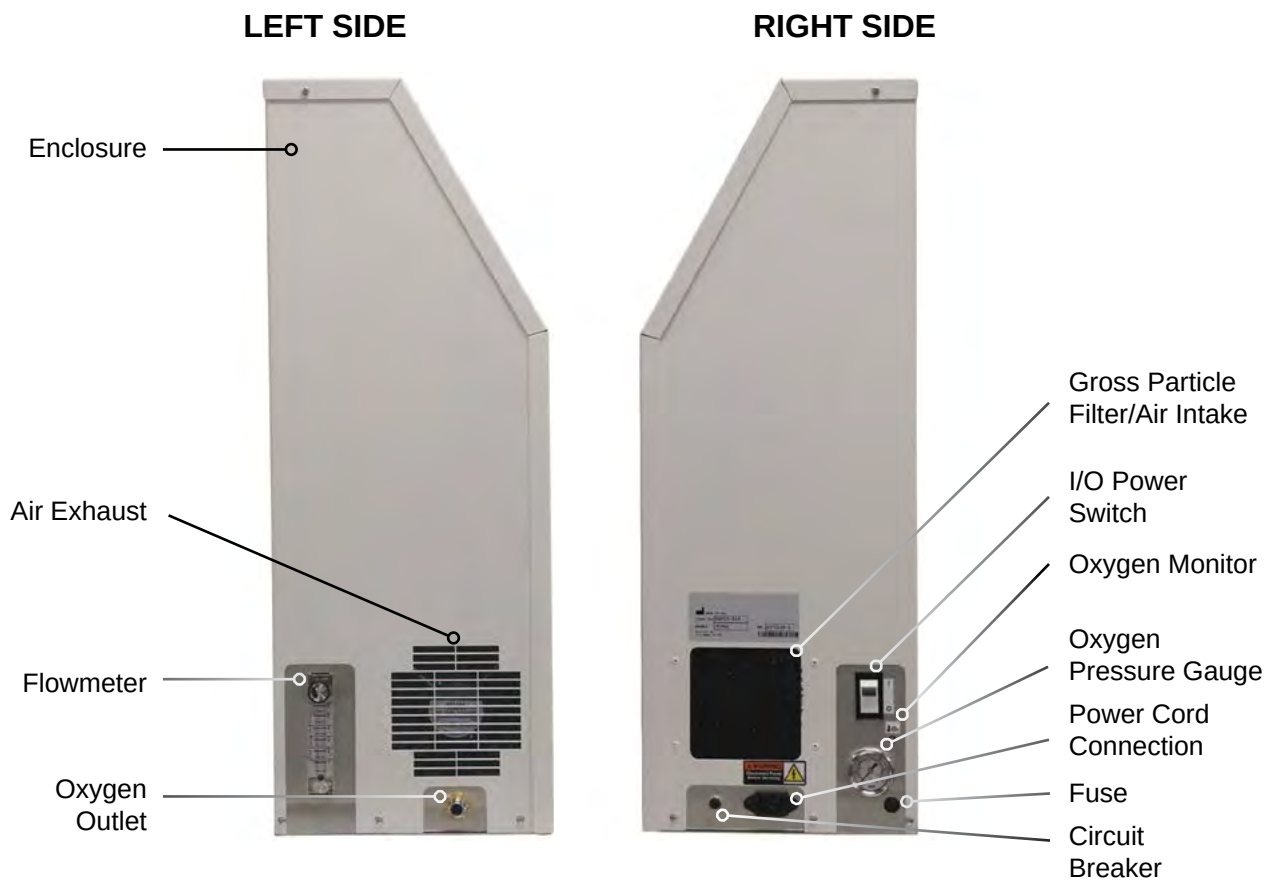
4.2 EXTERNAL COMPONENTS

Figure 4.3: External Components — Side Views

Enclosure

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



To prevent electrical shock, make sure the main power supply is disconnected prior to removing the enclosure (if applicable), inspect the internal components, and installing the oxygen generator and auxiliary oxygen receiver (if supplied).

Gross Particle Filter

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

Oxygen Pressure Gauge

This gauge indicates the delivery pressure of the product oxygen.

Flowmeter

The flowmeter allows for viewing and adjust the flow rate of the product oxygen. The flowmeter should never be adjusted beyond the set point designated for the unit in the Appendix.



Increasing the flow of the product oxygen above the flow specified in the Appendix of this instruction manual results in reduced concentration of the product oxygen, potential damage to the molecular sieve and the warranty will be voided.



To prevent electrical shock, make sure the main power supply is disconnected prior to removing the enclosure (if applicable), inspect the internal components, and installing the oxygen generator and auxiliary oxygen receiver (if supplied).

Oxygen Outlet

The 'B' size adapter at the oxygen outlet connects to the application.

Air Exhaust

Heat from the unit escapes through the air exhaust, located on the left side of the enclosure.

ON/OFF Power Switch

The I/O power switch starts and stops the operation of the unit. When setting the switch to *I*, the green indicator light illuminates.

Circuit Breaker

Use the circuit breaker button to reset the unit after an electrical overload shutdown.

Fuse

For the 240 V units, an additional fuse safety is provided as per the CE regulations.



Replacement fuses/circuit breakers must be the same type and amp rating as the original.

4.3 POWER SUPPLY CORD

The power cord, and its grounded plug, connects the oxygen generator to a properly grounded electrical outlet to supply electrical power to the oxygen generator. In the event of different type electrical connection, a fully qualified electrician must install the appropriate electrical connection on the end of the power cord for a properly grounded electrical outlet to supply electrical power to the oxygen generator.

5.0 Installation

 CAUTION	Only trained personnel should remove the enclosure, if applicable. To prevent electrical shock, shutdown the oxygen generator and disconnect the main power supply before servicing or cleaning the enclosure. Refer to the “Troubleshooting” section in the manual before servicing the oxygen generator.
 NOTE	Follow these unpacking guidelines carefully to protect against loss from any damage caused during shipment.
 NOTE	Report all freight damaged equipment and apply for a claim upon receipt for it to be processed correctly.
 NOTE	To prevent damage not covered by the product warranty, the oxygen generator should only be used in the manner specified in the instruction manual. This warranty does not extend to any unit or part subjected to misuse.
 NOTE	In the event of freight damage, a damage claim must be submitted within 24 hours of delivery. A claim can be filed only by the consignee. The AirSep Product Warranty does not cover shipping damage.
 NOTE	Do not connect power to the oxygen generator until the installation is complete.

5.1 HANDLING AND UNPACKING

AirSep Corporation ships the oxygen generator in a heavy-duty cardboard carton with two cutout carrying handles. The unit's size and weight allow easy transport by manual lifting; however, the enclosure does not provide handles or wheels because it is intended for stationary operation. To facilitate transport of the oxygen generator, place the unit in the carton and use the handles on the carton to lift the package. Use a hand cart to transport the unit safely to a different location.

To unpack the oxygen generator, follow these guidelines:

1. Inspect the shipping carton, and open it immediately upon receipt.
2. If the exterior of the carton is severely damaged, note it on the freight bill before signing it.
3. Unpack the unit, and remove any protective wrapping and packaging. Retain the carton and packaging to facilitate future shipping and transporting of the unit.
4. Place the unit in an upright position, and thoroughly inspect the enclosure and all external components (e.g., flowmeter) for damage.
5. Remove the enclosure, and inspect the interior for loose or damaged parts.
6. Inspect all wiring to ensure that no wires are broken and no push-on connector is off its terminal.
7. After inspecting the interior of the enclosure, re-install the enclosure on the unit.
8. Locate the plastic bag that contains the instruction manual, extra gross particle filter, and a barb connection for the oxygen outlet. Be sure to read the entire manual before installing and operating the unit.

5.2 PRE-INSTALLATION GUIDELINES

 WARNING	To prevent fire or electrical shock, locate the oxygen generator and the auxiliary oxygen receiver (if supplied) indoors away from rain or any other type of moisture.
 CAUTION	Do not disconnect protective earth
 CAUTION	In order to avoid the risk of bodily harm, AirSep recommends that TWO or more people be employed whenever it is necessary to lift or move the oxygen generator.

 CAUTION	Before installation or servicing, make sure the oxygen generator has been disconnected from its power source.
 NOTE	Locate the oxygen generator in an area where the ambient air temperature remains between 4°C (40°F) and 44°C (112°F) to prevent damage not covered under the AirSep Corporation Product Warranty.
 NOTE	AirSep oxygen generators are sold for indoor use only. Make sure the area that surrounds the oxygen generator is well ventilated, and provide sufficient space around the unit [at least one meter (three feet)] to allow for cool air flow, safe operation, and maintenance.
 NOTE	AirSep oxygen generators are sold for use in commercial applications only, unless otherwise specified. Contact AirSep for equipment intended for medical use.

Although every oxygen generator is tested thoroughly after it is manufactured, perform the following test to ensure that no damage occurred during shipping and handling:

1. Make sure the enclosure fastens securely to the unit.
2. Make sure the gross particle filter completely covers the air intake.
3. Make sure the power cord connects securely to the power cord connection on the unit.
4. Connect the power cord to a properly grounded electrical outlet.
5. Set the I/O power switch I (ON) position. Verify that the green indicator light on the switch illuminates.
6. Listen for the sound of the air compressor in operation.
7. Verify that exhaust air emits from the air vent on the left side of the enclosure.
8. Rotate the flowmeter knob clockwise until it stops at the fully-closed position. Verify that the flowmeter indicates zero flow.

9. With the oxygen outlet disconnected, rotate the flowmeter knob counterclockwise until the flowmeter indicates maximum flow. The ball in the flowmeter should rise to the top of the flowmeter and the oxygen pressure gauge should register 62 kPa (9 psig) for *Topaz* and 138 kPa (20 psig) for *Topaz Ultra*. If this does not occur, contact the AirSep Commercial Products Service Department.
10. To turn off the unit, set the ON/OFF power switch to the O (OFF) position.

Electrical Connections

The oxygen generator provides the connections described below.

Air Inlet

The feed air inlet provides a connection for the feed air hose from the air compressor.

Oxygen Outlet

The oxygen outlet provides a connection for the oxygen hose to the oxygen receiver.

Condensate Drain Outlet

The condensate drain outlet provides a connection for a hose to drain condensate from the oxygen generator filters (not applied for all the models).

5.3 INSTALLATION INSTRUCTIONS

This section illustrates the standard installation arrangement for the oxygen generator.

 WARNING	Take extreme care to keep all oxygen piping and vessels clean. To avoid fire or explosion, oxygen clean all surfaces that can come in contact with the oxygen gas. Check all oxygen fittings/joints for leaks with an oxygen-compatible, leak-detecting solution.
 NOTE	Remove packaging carefully. The oxygen generator may need to be returned if it was damaged during shipment.
 NOTE	Make sure the backup source of oxygen is equipped with an oxygen multi-stage regulator.

	Clean hands thoroughly before handling the outlet connections. Make sure the tools used to secure the connection between the oxygen outlet and the application does not contaminate the hoses, tubing, or connections with oil or other petroleum-based products.
	Use only oxygen-compatible materials for the hoses, tubing, and connections between the oxygen outlet and the inlet to the application.

1. To ensure optimum performance of the oxygen generator and prevent damage not covered under the AirSep Corporation Product Warranty, make sure location of the unit meets the following conditions:

- Locate the unit in an area that is protected from the weather elements and where the ambient temperature remains within the specifications in the Appendix of this instruction manual.
- To enable adequate airflow to cool the unit, locate the unit away from any source of heat, and make sure the sides of the unit remain at least six inches away from any wall or other obstruction.
- Locate the unit within ten feet of a grounded electrical outlet that cannot be turned off accidentally.

	Connect the oxygen generator power cord to a properly grounded outlet on a circuit that cannot be accidentally turned off. Do not use extension cords.
	Provide proper voltage from a grounded outlet to the oxygen generator. Improper voltage causes damage not covered under the AirSep Corporation Product Warranty.
	An alternate source of supplemental oxygen must be available if a power outage, alarm condition or equipment malfunction occurs.



AirSep Corporation recommends the connection of the oxygen generator's terminal block to a circuit that cannot be accidentally turned off. An accidental shutdown causes the oxygen generator to stop cycling randomly and results in initially lower concentration oxygen during the subsequent start-up. If electrical power is off while the application uses oxygen, the oxygen receiver depressurizes.

- Connect the unit to electrical power that continuously meets the specifications in the Appendix of this instruction manual.
- 2. Place the oxygen generator in an upright position on a level surface.
- 3. Connect the oxygen outlet to the inlet of the application.

If using tubing at the inlet to the application, connect to the oxygen outlet the barb and fastener provided in the plastic bag shipped with the unit. Insert the barb into the tubing connected to the application, and clamp the tubing securely to the barb.

5.4 WALL MOUNTING PROCEDURE

This unit is capable of being mounted on the wall or other vertical surface. In order to do so safely, please follow the prescribed procedure:



Before installation or servicing, make sure the oxygen generator has been disconnected from its power source.



In order to avoid the risk of bodily harm, AirSep recommends that TWO or more people be employed whenever it is necessary to lift or move the oxygen generator.



AirSep recommends that the oxygen generator be installed on a flat surface rather than wall mounting. This wall mounting procedure is given as a reference. If mounting the oxygen generator on a wall or vertical surface, the operator assumes all risks.

1. If the generator is to be mounted to the wall, use two heavy-duty shelf brackets. AirSep recommends using the Stanley® Extra Heavy 795 Series of shelf brackets or a comparable bracket. Follow the instructions supplied with the brackets to make sure that they are mounted properly.



Make sure that the brackets are mounted into the studs on the wall or vertical surface. For the purposes of this procedure, the studs should be 16" on centers. If this is not the case, additional supports may be needed.

2. Set the oxygen generator on the shelf brackets.
3. The back of the oxygen generator has two keyholes that are to be used for mounting. Measure and mark holes on the wall corresponding to the locations of the two keyholes.
4. Install two anchors suitable for a wall type rated to support at least 40 lbs. each. Follow the instructions for the anchors to mount properly. Keep in mind that the shelf brackets will support the actual weight of the unit; these bolts are merely used to keep the unit mounted to the wall.
5. Lift the unit and position it such that the two bolts are locked into the keyholes. The unit should be fully resting on the shelf brackets. Ensure that the shelf brackets are supporting the weight of the generator.



Figure 5.4: Example of Wall Mounting

6.0 Operation

When installation is complete as described in the previous section, the oxygen generator is ready for easy start-up and operation. This section of this instruction manual provides the procedures for start-up and shutdown of the oxygen generator. Before starting the oxygen generator, read and thoroughly understand any literature or instruction manuals for components not provided by AirSep Corporation

 WARNING	Oxygen vigorously accelerates the burning of combustible materials. In an 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 a 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 allow smoking, open flame, or usage of electronic devices that may generate sparks (e.g., cellular telephones) near the oxygen generator or oxygen receiver (if supplied). Post “NO SMOKING OR OPEN FLAMES” signs in the area where the oxygen generator and optional auxiliary oxygen receiver are located. AirSep STRONGLY recommends that only individuals trained and experienced in the safe handling of oxygen operate this generator.
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6.1 INITIAL START-UP

 WARNING	While venting oxygen, do not allow smoking or open flame. Do not allow venting oxygen to come in contact with clothing or hydrocarbon-based materials.
 CAUTION	Increasing the flow of the product oxygen above the flow specified in the Appendix of this instruction manual results in reduced concentration of the product oxygen, potential damage to the molecular sieve and the warranty will be voided.
 NOTE	If the power is turned off unexpectedly, the unit will stop cycling. If the application is using oxygen when the power is off, the oxygen pressure will decrease.



Use an oxygen analyzer (if available) to sample the oxygen concentration to verify it is within specification.

1. Set the I/O power switch to the I (ON) position and wait five minutes to allow the product oxygen to attain the concentration specified in the Appendix of this instruction manual.
2. Rotate the flowmeter knob counterclockwise to increase flow or clockwise to decrease flow as required for the application. The flowmeter must never indicate a setting higher than that specified in the Appendix for the particular model.
3. The flowmeter must be set at the specified flow rate. Refer to the Appendix for the specified flow rates. At the appropriate flowrate setting, top of the ball of the flowmeter will be at the level mark.
4. If the application differs from the pressure specified in the Appendix of this instruction manual, contact the AirSep Service Department.

Oxygen Monitor (Optional)

The oxygen monitor LED will always illuminate when it is first started up.

It will then switch off for few seconds and then light back up again until the oxygen concentration is above $90\pm3\%$. If during operation oxygen concentration goes below $85\pm3\%$, the oxygen monitor LED will light again.

6.2 OPERATION

The oxygen generator operates automatically after start-up. Monitor the performance of the oxygen generator at regular intervals to make sure the product oxygen remains within the specifications (Refer to the Appendix of this instruction manual).

6.3 SHUTDOWN



Do not turn off power to the oxygen generator unless certain that the facility does not require any oxygen, or there is a sufficient alternative/backup source of supplemental oxygen.

1. To stop oxygen delivery, rotate the flowmeter knob clockwise until the flowmeter registers zero.
2. Set the I/O power switch to the O (OFF) position.

6.4 START-UP AFTER AN EXTENDED SHUTDOWN

After an extended shutdown or an unexpected shutdown, such as a loss of electrical power, it is important to purge the oxygen receiver of any low concentration oxygen before the oxygen generator can supply oxygen within concentration specifications.

6.5 OXYGEN CONCENTRATION TEST



Use an oxygen analyzer (if available) to sample the oxygen concentration to verify it is within specification.

1. Disconnect the application from the oxygen outlet.
2. Set the unit's ON/OFF power switch to the ON position. (It takes approximately five minutes for the oxygen concentration to stabilize.)
3. Verify that the product flow rate delivered by the unit matches the flow capacity of the unit as specified in the "Start-Up" section and does not exceed the capacity of the unit.
4. Connect a calibrated oxygen analyzer to the oxygen outlet.
5. Take oxygen concentration readings every 60 seconds until the analyzer shows the same result for two consecutive readings.
6. Disconnect the oxygen analyzer and reconnect the application.

7.0 Maintenance

The oxygen generator requires little maintenance. Use the following chart as a guide to perform preventive maintenance on a regular schedule.

	Clean unit with a dry cloth only. Do not apply liquid directly to the enclosure or use any petroleum-based solvents or cleaning agents.
	If replacement is necessary, both sieve beds must be replaced at the same time.

Time Period	Action
Bi-Weekly	Clean gross particle filter. (Refer to section "Cleaning the Gross Particle Filter.")
Monthly	Make sure product oxygen remains within specifications in the Appendix of this instruction manual.* Clean enclosure. (Refer to section "Cleaning the Enclosure") Check performance of solenoid valves. Rebuild or replace, as necessary.
*If product oxygen does not meet specifications, refer to section "Troubleshooting."	

Table 7.1: Maintenance Chart

	A cycle of the oxygen generator consists of the time taken by a particular step (for example: pressurization of Bed A) to repeat itself.
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7.1 CLEANING THE GROSS PARTICLE FILTER

Clean the gross particle filter on the right side of the oxygen generator enclosure (See Figure 4.1) every two weeks, or more frequently if site conditions warrant. A clean filter allows the unit to cool properly.

Use the following procedure to clean the gross particle filter:

1. Shutdown the oxygen generator as described in Section "Shutdown."
2. Disconnect the power cord from the electrical outlet.

	Do not operate the unit without the gross particle filter in place.
	AirSep selects filters based on their ability to perform in severe conditions. The use of generic brands can void the warranty other than the original filter. To prevent damage, only order replacement parts from AirSep.
	Failure to maintain the air and compressor intake filters can allow foreign air particles to enter the oxygen generator and could cause damage not covered under the AirSep Product Warranty.

3. Remove the filter, and insert the second filter provided with unit.
4. Connect the power cord to the electrical outlet.
5. Restart the unit as described in Section “Start-up.”
6. Wash the filter removed from the unit in a solution of soap and warm water.
7. Rinse the filter thoroughly and remove excess water with a soft, absorbent towel.
8. Allow the filter to dry, and then store it in a clean location. Alternate the clean filter with the filter on the unit each time this procedure is performed.

7.2 CLEANING THE ENCLOSURE

	Only trained personnel should remove the enclosure, if applicable. To prevent electrical shock, shutdown the oxygen generator and disconnect the main power supply before servicing or cleaning the enclosure. Refer to the “Troubleshooting” section in the manual before servicing the oxygen generator.
	To prevent electrical shock, make sure the main power supply is disconnected prior to removing the enclosure (if applicable), inspect the internal components, and installing the oxygen generator and auxiliary oxygen receiver (if supplied).



The front cover of the enclosure protects the components of the unit from damage and dirt. The cover should remain on the enclosure at all times and should only be removed for maintenance or servicing as described in this section.

Use the following procedure to clean the enclosure:

1. Shutdown the oxygen generator as described in Section “Shutdown.”
2. Disconnect the power cord from the electrical outlet.
3. Use a dry, lint-free cloth on the enclosure, taking care to wipe the enclosure clean.



Clean unit with a dry cloth only. Do not apply liquid directly to the enclosure or use any petroleum-based solvents or cleaning agents.

7.3 SOLENOID VALVES



If all of the solenoid valves receive the proper voltage but a solenoid valve still malfunctions, proceed to rebuild the valve. Refer to the troubleshooting chart for further information.



Leaks can be so small in air loss that concentration is not affected immediately. The sieve material can become contaminated gradually. Careful leak testing is important.



Use an oxygen compatible leak-detecting solution to leak test the brass fittings and the air hose to ensure that no air leaks are present.



Take note of spring orientation. Correct direction of spring is required for proper valve function.

Check the performance of solenoid valves once every month. Rebuild or replace the solenoid valves as necessary (Refer to Section “Troubleshooting” for some possible faulty valve scenarios). The typical preventive maintenance interval for the solenoid valves is 30,000 hours. Please refer to the table “Rebuild Kits for Solenoid Valves” to order the correct rebuild kit for the valves:

Model	Item	Rebuild Kit Part Number
Topaz	Feed & Waste Valves	VA034-1
	Equalization Valve	VA450-1
Topaz Ultra	Feed & Waste Valves	VA034-1
	Equalization Valve	VA048-1

Table 7.2: Rebuild Kits for Solenoid Valves

7.4 AIR COMPRESSOR

The typical preventive maintenance interval for the air compressor is 15,000 hours. Rebuild the air compressor, if applicable, after 15,000 hours. If the air compressor for the unit purchased does not come with a rebuild kit, replace the air compressor if the maximum cycle pressure starts to go below 179 kPa (26 psig).



Take note of the assembly of the spring mounts. These components will need to be reinstalled when the new compressor is assembled.

7.5 DECOMMISSIONING AND DISPOSAL

Introduction:

Oxygen generator must be assessed for its redundancy and thereby managed according to the owner’s existing policies for proper decommissioning and disposal. In situations where policies are not well defined, this guideline may be used to decommission and dispose the oxygen generator.

This guideline describes typical process to ensure effective decommissioning and disposal of the oxygen generator.

Definitions:

Decommission - Process of removing oxygen generator from service.

Reuse – Using the oxygen generator at a different location after decommissioning it from its current location.

Scrapping – Disposing the oxygen generator following all local governing ordinances and recycling plans.

Procedure:

1. Identify the status of the redundant oxygen generator, i.e.
 - Fully Functional
 - Partially Functional/Repairable
 - Damaged/Non-repairable
2. Decommission

Decommissioning of the oxygen generator shall be performed in accordance to the owner's quality assurance procedures. A typical decommissioning includes the following:

 - Updating the equipment database
 - Removal of maintenance contracts and/or service schedules
 - If the oxygen generator is fully functional or can be repaired for reuse, an assessment should be done for the current value. An assessment report on type and cost of repairs (if required) should also be prepared. Also, probable future owners should be identified and advised of the availability of the device
 - Redundant oxygen generator should be assessed for contamination with chemical, biological or radiological substances. Contaminated device or its components must be accompanied by a signed risk assessment and may only be disposed following the local governing ordinances to an authorized recipient
3. Reuse

If the oxygen generator can be reused (For example: by a different department, by selling it to a new owner), all the necessary instructions for safe and efficient operation shall be transferred to the new user.
4. Scrapping

Oxygen generator that cannot be reused shall be scrapped to a scrap metal recycling center following all the governing ordinances and recycling plans.

8.0 Troubleshooting

8.1 TECHNICAL SUPPORT

For assistance in troubleshooting or repairing the unit, or to order replacement parts, contact the AirSep Service Department by telephone. In the USA or Canada, call 1-800-874-0202. Outside the USA or Canada, call (716) 691-0202. Address written inquiries to:

AirSep Corporation
 260 Creekside Drive
 Buffalo, NY 14228-2075
 USA
 Attention: AirSep Service Department
 E-mail: cpd@caireinc.com

Visit www.airsep.com to know about our complete range of standard Oxygen Generators.

8.2 TROUBLESHOOTING CHART

Use the following chart as a guide to troubleshoot the oxygen generator.

 CAUTION	Only trained personnel should remove the enclosure, if applicable. To prevent electrical shock, shutdown the oxygen generator and disconnect the main power supply before servicing or cleaning the enclosure. Refer to the "Troubleshooting" section in the manual before servicing the oxygen generator.
 CAUTION	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.
 NOTE	Do not expose molecular sieve (contents of bed) to air for an extended period of time. Prolonged exposure of molecular sieve to the moisture in room air results in contamination and permanent damage to the sieve material. Keep all openings to the sieve adsorbers (beds) sealed.

Problem	Probable Cause	Solution
Unit does not operate.	No electrical power to unit.	Make sure 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.
	Blown fuse	Replace the fuse provided in 240 VAC units.
	Faulty electrical connections.	Disconnect main power supply, remove enclosure, and make sure all electrical connections, connect securely.
	Defective I/O power switch.	Replace I/O power switch.
Unit stops unexpectedly.	No electrical power to unit.	Make sure power cord connects to electrical outlet and that electrical outlet receives power.
	Circuit breaker on I/O power switch tripped.	Reset the circuit breakers and set I/O power switch to I to restart unit. If circuit breaker immediately trips again, check the wiring for any short circuit. Also, check I/O power switch, circuit board, capacitor, and air compressor. Replace all defective components.
Air compressor stops unexpectedly or does not operate when cooling fan operates.	Restricted air flow to air 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.	Make sure power meets specifications in the Appendix of this instruction manual.
	Defective capacitor.	Replace capacitor.
	Defective air compressor.	Rebuild or replace air compressor (as applicable).

Problem	Probable Cause	Solution
Unit operates, but air does not circulate into unit.	Faulty electrical connections to cooling fan.	Disconnect main power supply, remove enclosure, and make sure all electrical connections, including cooling fan leads, connect securely.
	Defective cooling fan.	Replace cooling fan.
Concentration of product oxygen does not remain within specification in the Appendix of this instruction manual.	Leak in unit.	Pressurize unit, set I/O power switch to O, and disconnect power supply. Remove enclosure and make sure tubing remains connected to fittings. Use an oxygen-compatible leak-detecting solution 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.
	Obstructed exhaust muffler.	Replace exhaust muffler.
	Defective solenoid valve(s).	Repair or replace solenoid valve(s).
	Excess temperature inside enclosure due to inadequate ventilation outside enclosure, high ambient temperature, dirty gross particle filter, blocked air intake, or defective cooling fan.	Provide proper ventilation, make sure ambient temperature does not exceed specification in the Appendix of this instruction manual, clean filter, remove obstruction, or replace cooling fan.
	Defective or worn air compressor.	If maximum cycle pressure is below 179 kPa (26 psig), replace air compressor.
	Defective circuit board.	Replace circuit board.
	Defective oxygen board.	Replace oxygen board.
	Contaminated adsorbers.	Replace adsorbers.

Problem	Probable Cause	Solution
Flowmeter fluctuates or flow rate of product oxygen changes unexpectedly.	Leak in unit.	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.
	Improperly set or defective pressure regulator.	Check regulator setting or replace defective regulator.
	Defective solenoid valve(s).	Repair or replace solenoid valve(s).
	Defective air compressor.	Replace air compressor.
	Defective circuit board.	Replace circuit board.
Unit operates, but I/O power switch does not illuminate.	Defective I/O power switch.	Replace I/O power switch.
Pressure of product oxygen changes unexpectedly.	Leak in unit.	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.
	Improperly set or defective pressure regulator.	Check regulator setting or replace defective regulator.
	Relief valves release.	Refer to “Popping” sound indicates release of relief valves” problem in troubleshooting chart.
	Defective air compressor.	Rebuild or replace air compressor (as applicable).

Problem	Probable Cause	Solution
“Popping” sound indicates release of relief valves.	Obstructed exhaust muffler.	Replace exhaust muffler.
	Improperly set or defective pressure regulator.	Check regulator setting or replace defective regulator.
	Defective solenoid valve(s).	Repair or replace solenoid valve(s).
	Defective circuit board.	Replace circuit board.
	Contaminated adsorbers.	Replace adsorbers.
Chattering or buzzing noise from solenoid valve(s).	Low voltage to valve(s).	Make sure electrical power remains within specification in the Appendix of this manual. If power at inlet to unit is correct but is low at valve(s), contact AirSep.
	Defective or worn solenoid valve(s).	Repair or replace solenoid valve(s).
Oxygen monitor LED not illuminating.	Concentration above $90\pm3\%$.	No action required.
Oxygen monitor LED not illuminating. Concentration below $85\pm3\%$.	Loose wiring.	Check wiring to the LED.
	Defective LED.	Replace LED light.
	Defective oxygen board.	Change oxygen board.

A. Appendix Technical Data

A.1 SPECIFICATIONS

Data in this section refer to Topaz Series Oxygen Generators. This data may vary as per the customer's requirements. Consult a sales representative to determine whether the oxygen generator requires modifications for the application.

 CAUTION	Provide proper voltage from a grounded outlet to the oxygen generator. Improper voltage causes damage not covered under the AirSep Corporation Product Warranty.
 NOTE	Operation at a flow rate or delivery pressure outside standard specifications requires system modification(s). Please contact AirSep for further assistance.

Topaz	
Product Flow	12 SCFH* 0.31 Nm ³ /hr* 6 SLPM*
Product Pressure	9 psig 62 kPa 0.62 barg
Product Concentration	Up to 95%
Product Dew Point	-100°F (-73°C)
Dimensions (W x D x H) (Nominal)	19 x 10 x 27 in (48 x 25 x 68 cm)
Weight	53 lb (24 kg) for 120 V ~ units 57 lb (26 kg) for 220 V ~ units [Add 20 lb (9 kg) for Stainless]
Sound Level	65 dBA at 1 meter (open field cond.)
Physical Connections** Product Gas Outlet	B size oxygen adapter
Ambient Operating Conditions	Locate the oxygen generator in a well-ventilated area that is protected from weather elements and remains between 40°F (4°C) and 112°F (44°C)
Control Power Requirements (Single Phase)	120V ~ ±10%, 60 Hz, 5.0 A 220V ~ ±10%, 50 Hz, 2.5 A 220V ~ ±10%, 60 Hz, 2.3 A
Pollution Degree	2
Installation Category	II
Maximum altitude above sea level:	2,000 m (6,562 ft)
Certifications and Approvals	CAN/CSA-C22.2 No. 61010-1-12, UL 61010-1 (2nd Edition) (120 V configurations only)

*SCF (Standard cubic foot) gas measured at 1 atmosphere and 70°F / Nm³ (Normal cubic meter) gas measured at 1 atmosphere and 0°C / SLPM (Standard liters per minute) gas measured at 1 atmosphere and 21°C.

**Check the label on the control panel for appropriate power supply.

***Data may vary as per the customer's requirements.

Table A.1: Topaz Specifications



Topaz Ultra	
Product Flow	21 SCFH* 0.55 Nm ³ /hr* 10 SLPM*
Product Pressure	20 psig 138 kPa 1.37 barg
Product Concentration	Up to 95%
Product Dew Point	-100°F (-73°C)
Dimensions (W x D x H) (Nominal)	19 x 10 x 27 in (48 x 25 x 68 cm)
Weight	58 lb (26 kg) for 120 V ~ units 62 lb (28 kg) for 220 V ~ units [Add 20 lb (9 kg) for Stainless]
Sound Level	65 dBA at 1 meter (open field cond.)
Physical Connections** Product Gas Outlet	B size oxygen adapter
Ambient Operating Conditions	Locate the oxygen generator in a well-ventilated area that is protected from weather elements and remains between 40°F (4°C) and 112°F (44°C)
Control Power Requirements (Single Phase)	120V ~ ±10%, 60 Hz, 6.0 A 220V ~ ±10%, 50 Hz, 3.0 A
Pollution Degree	2
Installation Category	II
Maximum altitude above sea level:	2,000 m (6,562 ft)
Certifications and Approvals	CAN/CSA-C22.2 No. 61010-1-12, UL 61010-1 (2nd Edition) (120 V configurations only)

*SCF (Standard cubic foot) gas measured at 1 atmosphere and 70°F / Nm³ (Normal cubic meter) gas measured at 1 atmosphere and 0°C / SLPM (Standard liters per minute) gas measured at 1 atmosphere and 21°C.

**Check the label on the control panel for appropriate power supply.

***Data may vary as per the customer's requirements.

Table A.2: Topaz Ultra Specifications

A.2 DRAWINGS

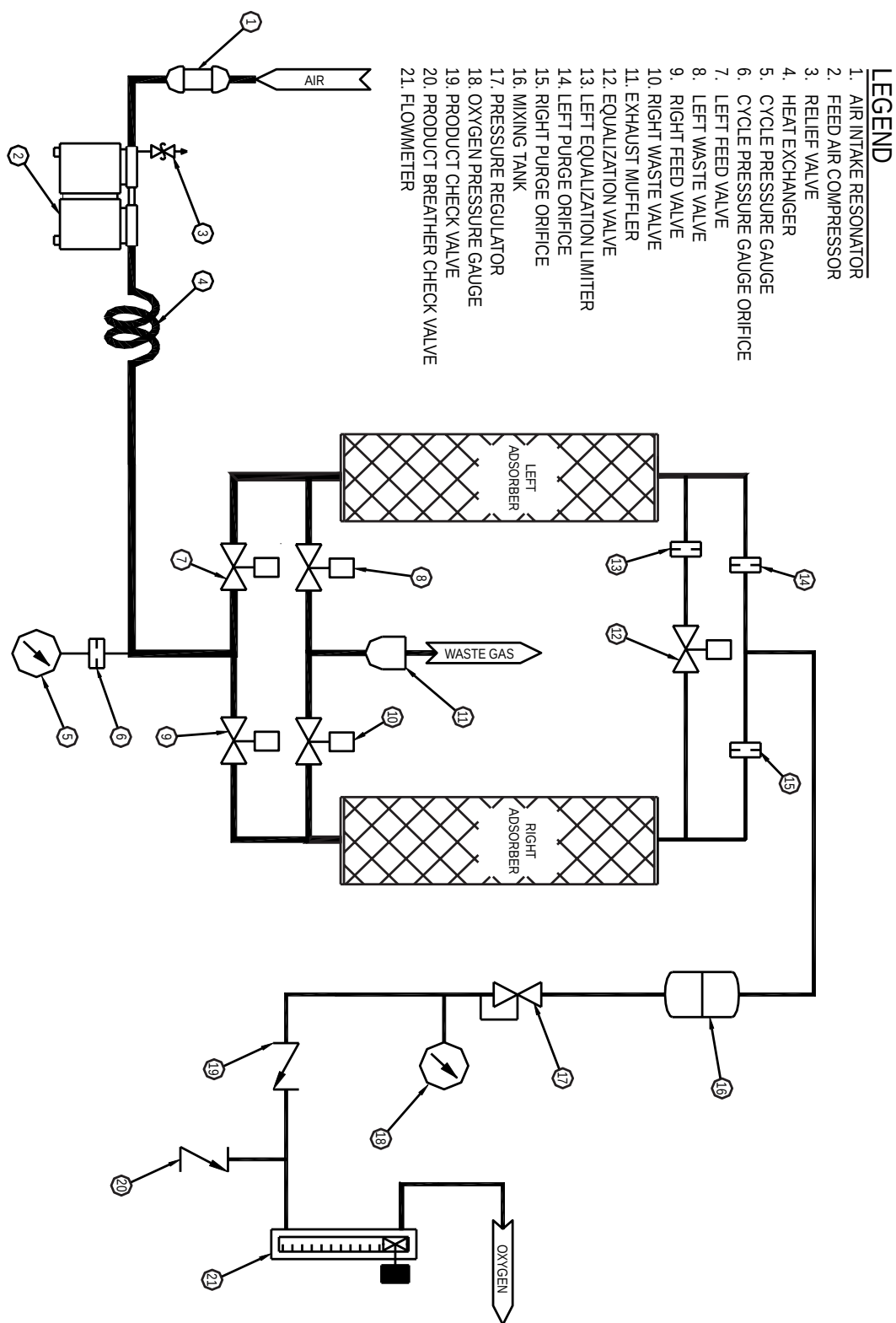


Figure A.1: Flow Schematic - Topaz

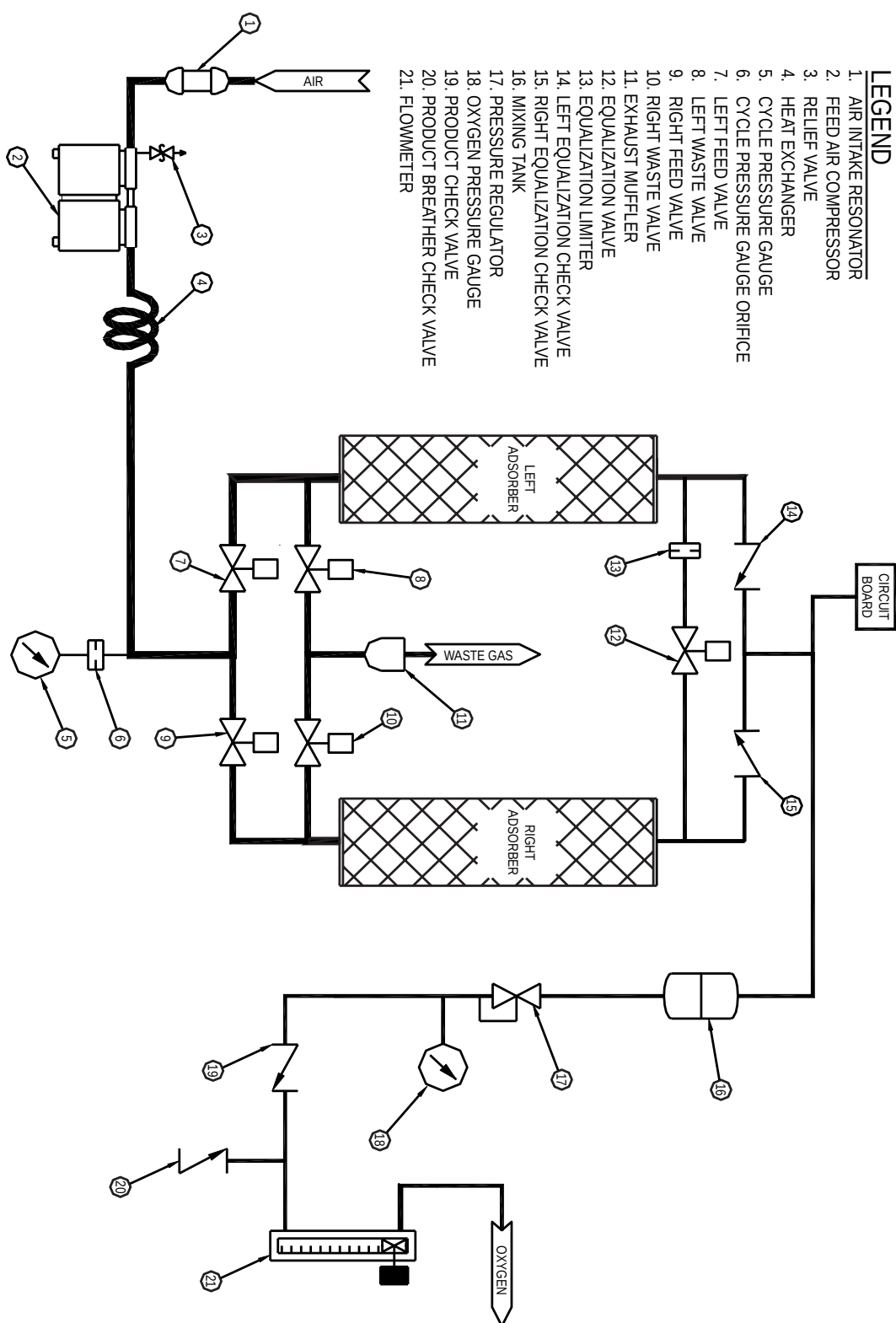


Figure A.2: Flow Schematic – Topaz Ultra

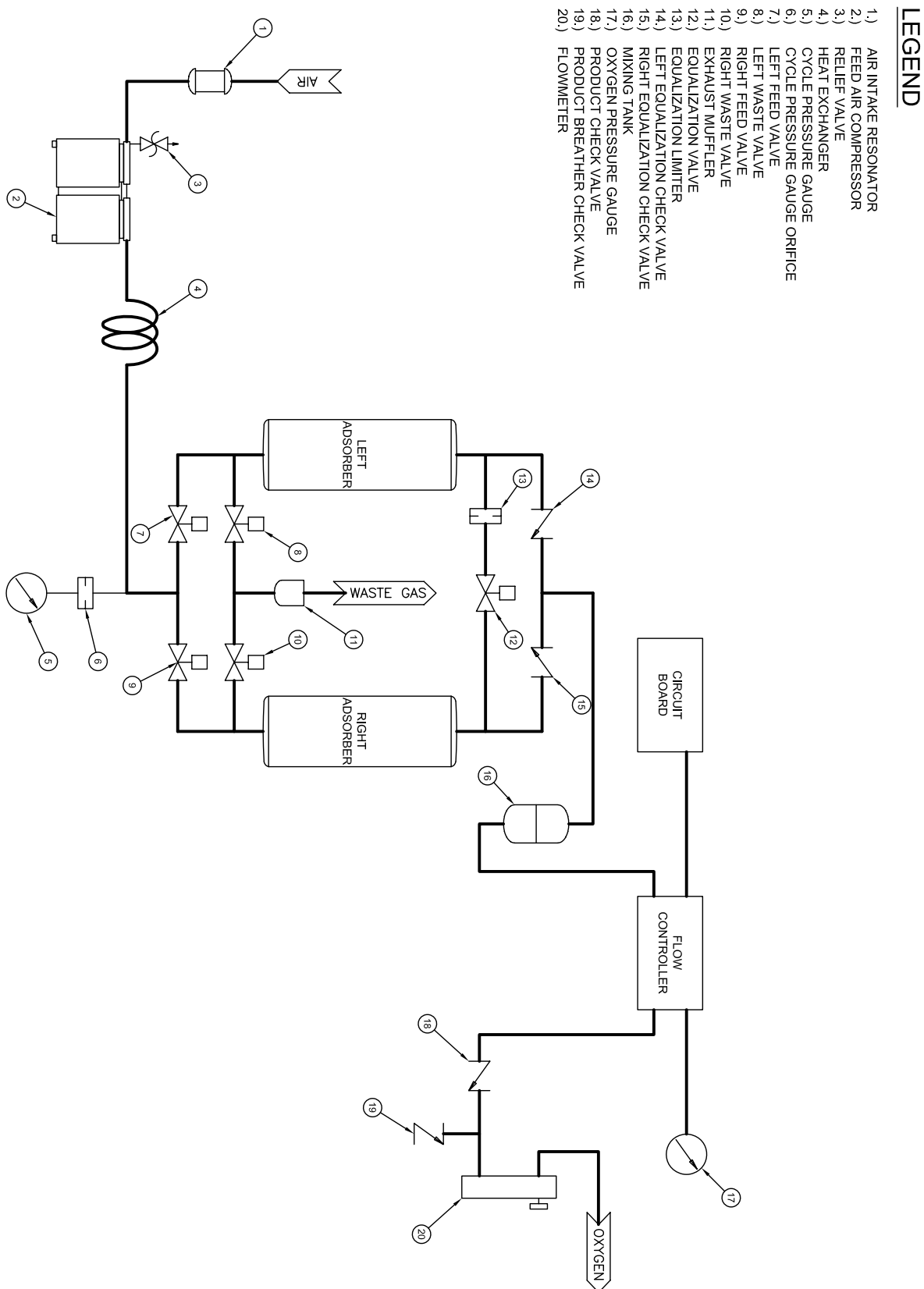


Figure A.3: Flow Schematic – Topaz Ultra (with optional flow controller)

53



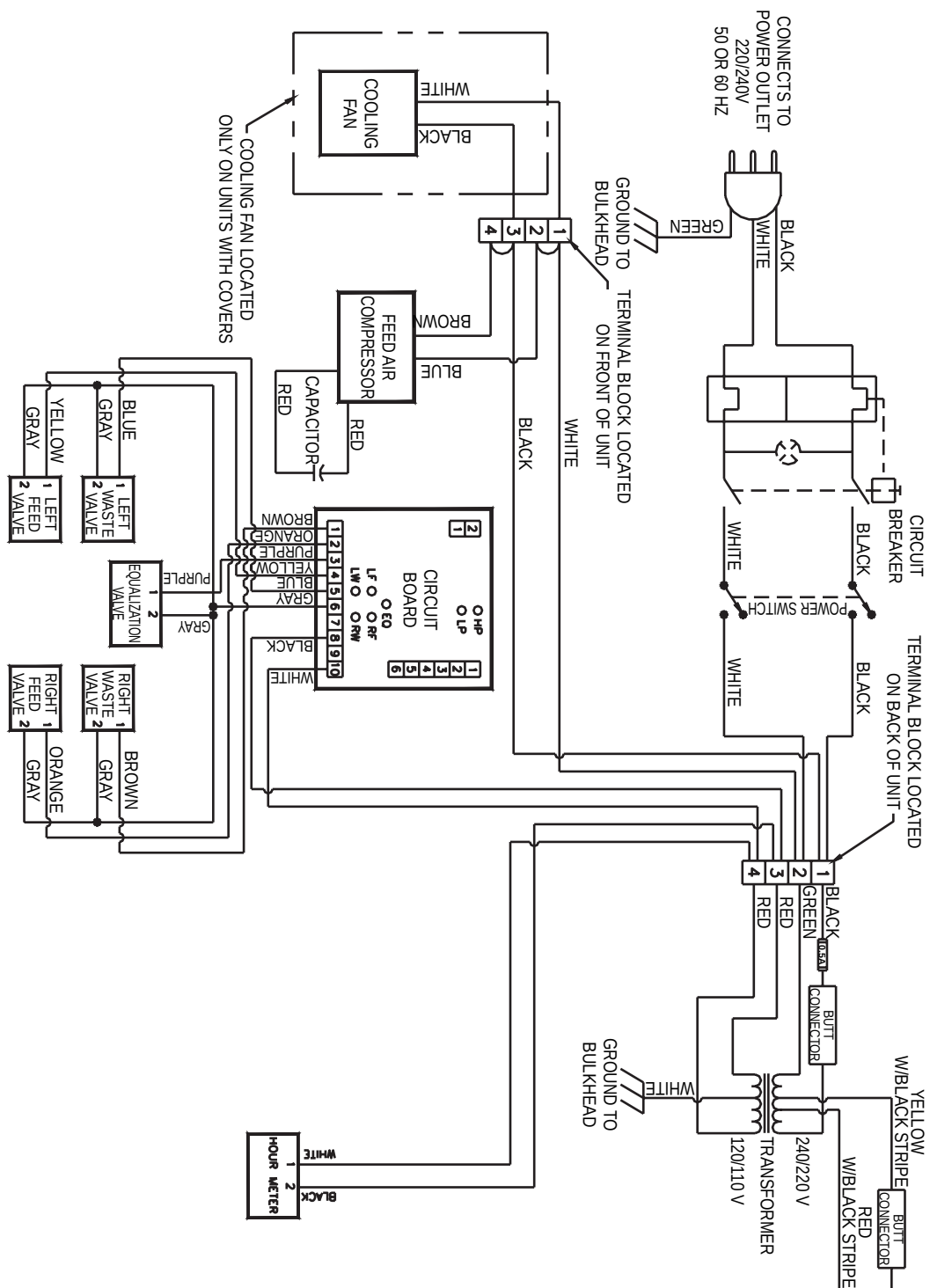


Figure A.5: 240 V, 50 or 60 Hz Electrical Schematic

B. Appendix Warranty/Returns

B.1 PRODUCT WARRANTY

AirSep Corporation (“AirSep”) warrants to the party purchasing from AirSep (the “original purchaser”) the PSA Oxygen Generator to be free from defect in parts and workmanship for one year from the date of start-up, not to exceed eighteen (18) months from the date of shipment to the original purchaser, under normal use, maintenance and operation*. TO THE EXTENT PERMITTED UNDER APPLICABLE LAW, ALL WARRANTIES WITH RESPECT TO SUCH UNIT SHALL ONLY EXTEND TO AND BE FOR THE BENEFIT OF THE ORIGINAL PURCHASER AND SHALL NOT BE ASSIGNABLE TO, EXTEND TO OR BE FOR THE BENEFIT OF ANY OTHER PARTY. AirSep’s obligations under this warranty are limited, at AirSep’s option, to the repair, replacement or refunding the purchase price of any such unit of equipment (or part thereof) found by AirSep to be defective in parts or workmanship; provided, however, that AirSep shall have no obligation hereunder with respect to a defective part unless it receives written notice of such defect prior to the expiration of the applicable warranty period as referenced above.

Each unit of equipment for which a warranty claim is asserted shall, at the request of AirSep, be returned on a prepaid basis with proof of purchase date to the AirSep factory specified by AirSep at the expense of the original purchaser. Replacement parts shall be warranted as stated above for the unexpired portion of the original warranty. This warranty does not extend to any unit or part subjected to misuse (at AirSep’s sole determination), accident, improper maintenance or application, or which has been repaired or altered outside of the AirSep factory without the express prior written authorization of AirSep.

Notwithstanding anything to the contrary contained herein, during the applicable warranty period, as specified above, AirSep will pay the cost of return freight charges to the original purchaser, provided an authorized AirSep representative approved return of the unit or parts, for any equipment found by AirSep to be defective. For warranty repairs performed during the first 90 days from the date of invoice, AirSep will pay freight both ways. After the applicable parts warranty period has expired, the original purchaser is responsible for freight both ways.

* Please refer to the appropriate product documentation for applicable installation and operating requirements.

B.2 LIMITS OF LIABILITY

THE FOREGOING WARRANTY IS THE ONLY WARRANTY MADE BY AIRSEP WITH RESPECT TO THE EQUIPMENT (OR ANY PART THEREOF) AND IS IN LIEU OF ANY OTHER WARRANTY, EXPRESSED OR IMPLIED, IN FACT OR IN LAW, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. IT IS EXPRESSLY UNDERSTOOD THAT THE SOLE AND EXCLUSIVE REMEDY FOR ANY DEFECT IN PARTS OR WORKMANSHIP IS LIMITED TO ENFORCEMENT OF AIRSEP'S OBLIGATIONS AS SET FORTH ABOVE, AND AIRSEP SHALL NOT BE LIABLE TO ORIGINAL PURCHASER OR ANY OTHER PARTY FOR LOSS OF USE OF THE EQUIPMENT, LOST PROFITS OR FOR ANY OTHER SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES (EVEN IF AIRSEP HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES).



AirSep oxygen generators are sold for use in commercial applications only, unless otherwise specified. Contact AirSep for equipment intended for medical use.

B.3 SERVICE RETURNS

If the oxygen generator or a defective part requires service, contact a distributor. If it was instructed by a distributor to contact AirSep Corporation, follow the procedure below to return the oxygen generator or a component for service or credit.

1. Obtain a Return Material Authorization (RMA) number from the AirSep Commercial Products Service Department. Refer to the "Troubleshooting" section for information about contacting AirSep Corporation. Before calling for service assistance, have the following information readily available (noted on the ownership data page in the front of this instruction manual):

- Oxygen Generator Model
- Serial Number
- Hours of Use (see hour meter inside enclosure)
- Invoice Date



AirSep Corporation issues no credit for any warranted item until the model number, serial number, and invoice date of the oxygen generator are presented and the defective part is returned to AirSep Corporation.

2. Write the RMA number clearly on the outside of the shipping container.



AirSep Corporation accepts no item(s) for service or credit unless prior written authorization was issued by AirSep Corporation.

3. Return item(s) in their original packaging material. Pack merchandise for a safe return. AirSep Corporation assumes no responsibility for damage that occurs in transit. Any damage to the oxygen generator or a component because of failure to follow this procedure is the sole responsibility of the customer.

C. Appendix Component Literature

C.1 COMPRESSORS

- Thomas Industries
2660 Series, Compressors
CE32, CG32, CHI37, CE50, CHI56
Compressor Service Kit
Disassembly
Reassembly
Parts List
-

MODEL SK2660

COMPRESSOR SERVICE KIT

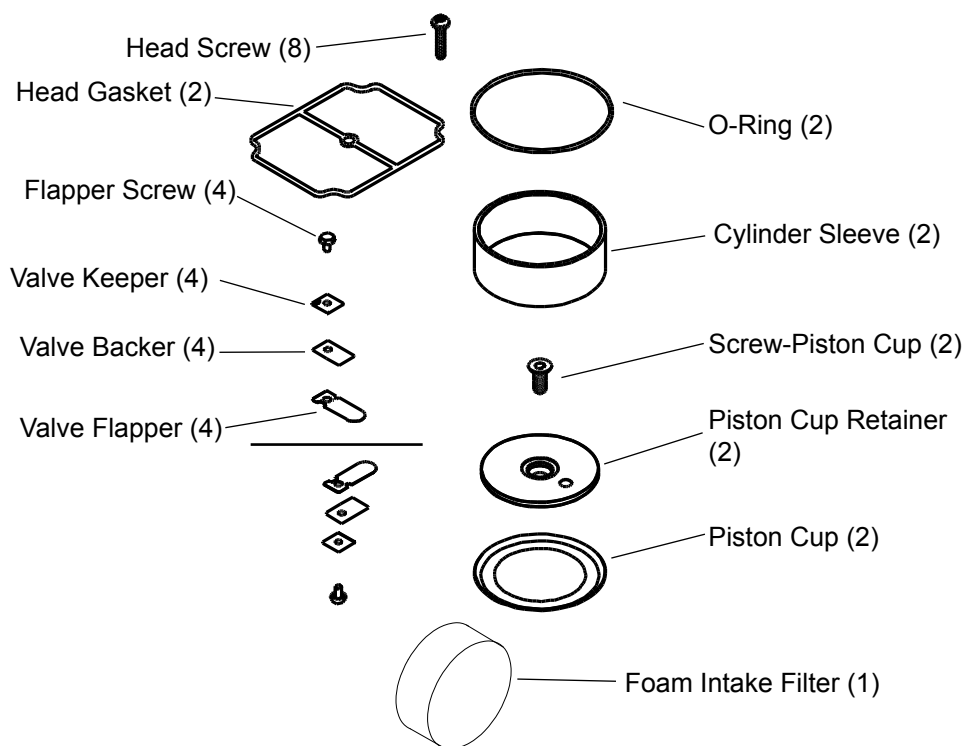
For use on 2660 and 2680 Model Compressors

 **WARNING:** Unplug the compressor before beginning disassembly.

 **CAUTION:** Improper assembly or use of damaged parts may lead to premature failure. To avoid frequent repairs follow the recommended assembly procedures.

This kit includes the following parts:

NOTE: All parts in kit may not apply to your specific model.



NOTE: Before you begin, read these instructions thoroughly and assemble the necessary tools. You will need:

- 1/4" Hex Socket attachment for torque wrench
- Torx T-27 attachment for torque wrench (for retainer screws)
- Torx T-25 attachment for torque wrench (for head screws)
- 5/32" Hex wrench for torque wrench (eccentric screw)
- Flat Screwdriver (2)
- Clean Cloths

Part No.642648B

DISASSEMBLY

NOTE: To avoid confusion, service one end of the compressor at a time.

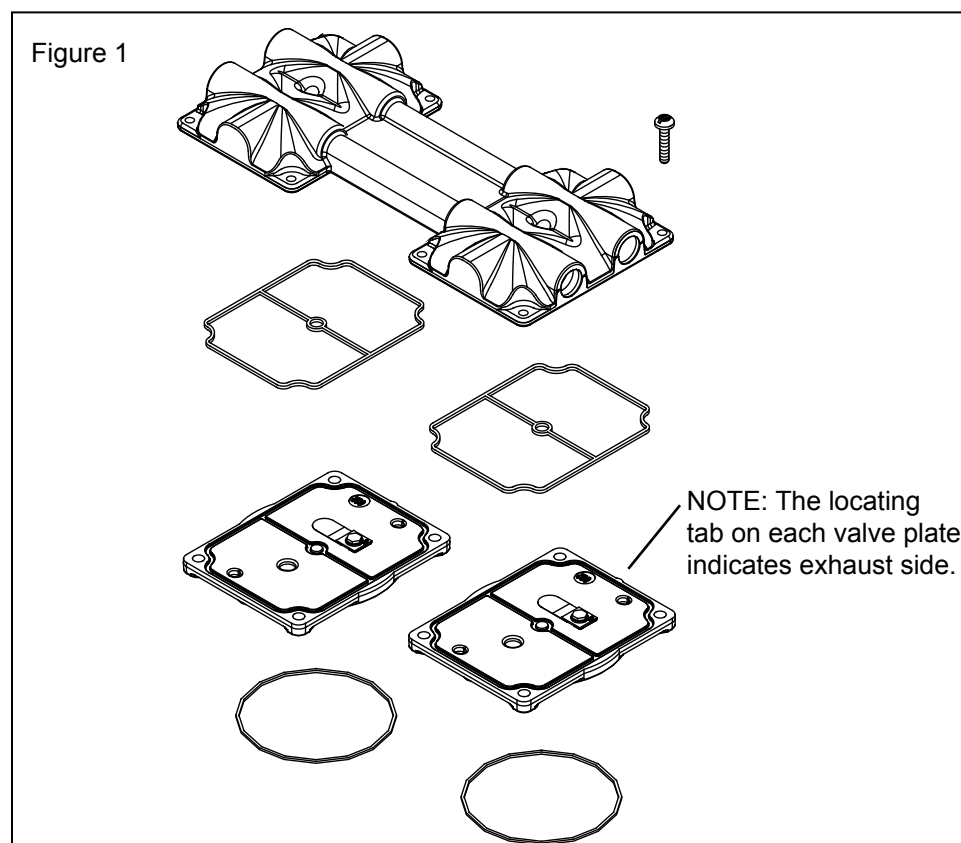
STEP 1. Clean loose dirt from the outside of the compressor.

STEP 2. Loosen the 8 head screws (1) and remove the compressor head (2). Note orientation of head and valve plates for reassembly (very important). Discard head screws.

⚠ Caution: Place capacitor off to side leaving it connected to lead wires.

STEP 3. Carefully remove the valve plates (4) from the bottom of the head, or cylinder sleeves.

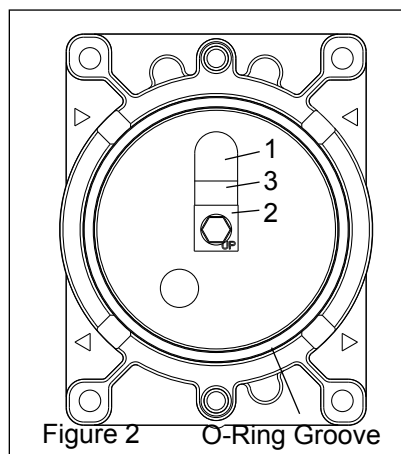
STEP 4. Remove the head gasket O-rings (3) and discard them. Turn the valve plates over. Remove the valve plate O-rings (5) and discard them. Note orientation for reassembly.



STEP 5. Remove the intake valve flapper (1), keeper (2), restraint (3) if assembled, and screw from the bottom of the valve plate and discard. Clean the bottom of the plate with a clean, soft cloth. Install the new intake valve flapper, restraint, if one was removed, and keeper. The valve keeper should be placed on top of the flapper so that the word "UP" is visible (See Fig. #2).

NOTE: Pay close attention to valve assembly. Some parts in kit may not be for your model.

NOTE: Torque new flapper screw to 18 inlbs.

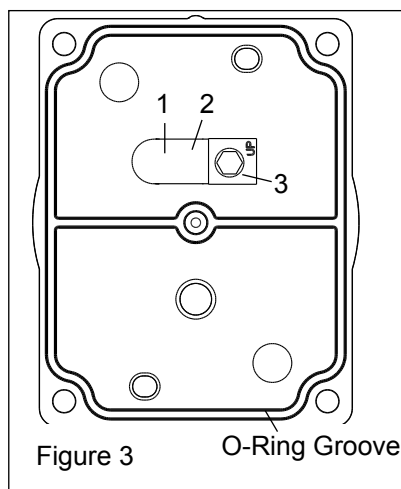


STEP 6. Install the new O-ring, seating it firmly into the groove with your finger or blunt object (See Fig. #2).

STEP 7. Remove the exhaust valve flapper (1), restraint (2) and valve keeper (3) from the top of the valve plate and discard them. Clean the top of the plate with a clean, soft cloth. Install the new exhaust valve flapper, restraint and keeper. The valve keeper should be placed on top of the flapper so that the word "UP" is visible (See Fig. #3).

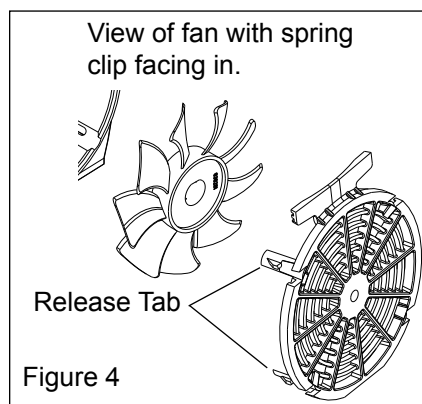
NOTE: Torque flapper screw to 18 inlbs.

STEP 8. Install the new head gasket, seating it firmly into the groove with your finger or blunt object (See Fig. #3). Set aside. Repeat steps 5 thru 8 to service other end of compressor.



STEP 9. Remove the fan guard by depressing the 4 tabs on the side of the housing.

STEP 10. Remove the fan by using two flat blade screwdrivers to pry off, making sure screwdriver contact is made with hub back, and not the fan blades. Note fan orientation for reassembly.



STEP 11. Insert the 5/32" Hex wrench into the access hole in the compressor housing. Loosen the set screw 1/4 turn. Rotate connecting rod to top dead center (180°) and slide the connecting rod/eccentric assembly off the shaft and through the opening in the housing.

STEP 12. Secure the rod assembly in a fixture. Remove the sleeve (1 - discard) from the connecting rod. Remove the screw (2 - discard) from the cup retainer (3 - retain for reassembly). Remove the piston cup (4 - discard) and wipe debris from the top of the connecting rod and retainer with a clean damp cloth.

STEP 13. Carefully place new sleeve (1) over connecting rod top. Place new cup (4) in center of connecting rod top. Do not damage the cup. Place retainer (3) on top of cup (counterbore up), making sure that the cup inside diameter is seated properly over retaining boss. Note that the retainer has a locating boss that must insert into rod top pilot. Drive new retainer screw to 100 inlbs. Carefully push sleeve up forming the cup. Stop pushing the cylinder sleeve up when the piston cup is positioned midway inside the sleeve.

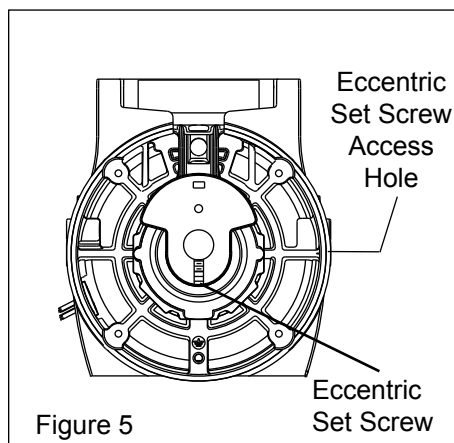


Figure 5

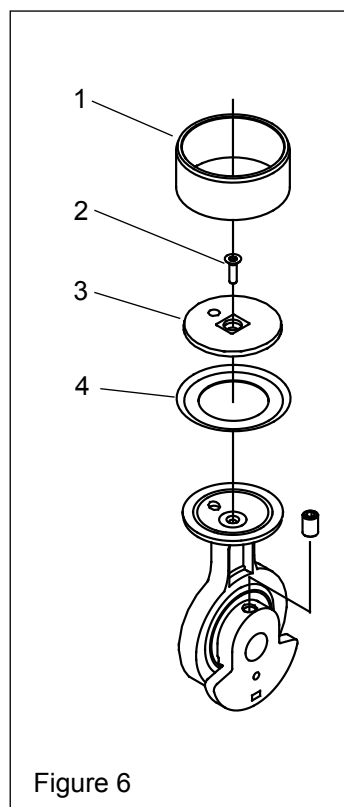


Figure 6

STEP 14. Rotate the rotor shaft so that flat faces up (12:00). Position piston cup at bottom dead center of cylinder sleeve.

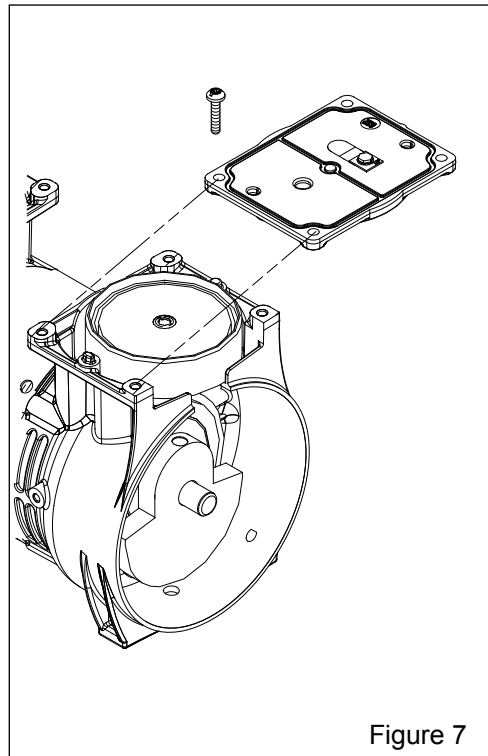
STEP 15. Slide the connecting rod assembly onto the shaft until the eccentric face positively stops against the bearing. Align the eccentric setscrew with the flat of the shaft. Rotate the eccentric and shaft 90 degrees so the set screw is visible through the access hole in the housing, and tighten set screw to 125 inlbs.

STEP 16. Align the flat on the fan with the flat on the motor shaft and slide the fan back onto the motor shaft, making sure you position the fan clip in the same orientation as it was before you removed it. Incorrect orientation of the fan will not provide adequate cooling of the compressor.

CHECK OPERATION

Hold the sleeve down against the housing with one hand, and slowly rotate the fan with the other hand to ensure all components are lined up properly. As the piston travels up and down it will also rock from side to side. This is a feature of the WOB-L Piston.

Repeat steps 9-16 on the other side of compressor.



REASSEMBLY

STEP 1. With the sleeves firmly seated on the housing, replace the valve plates in same manner as they were (See Fig. #8). Make sure the top edge of the sleeve locates in the O-ring groove in the bottom of the valve plate.

⚠ CAUTION: Make sure gasket is not twisted when seated in groove.

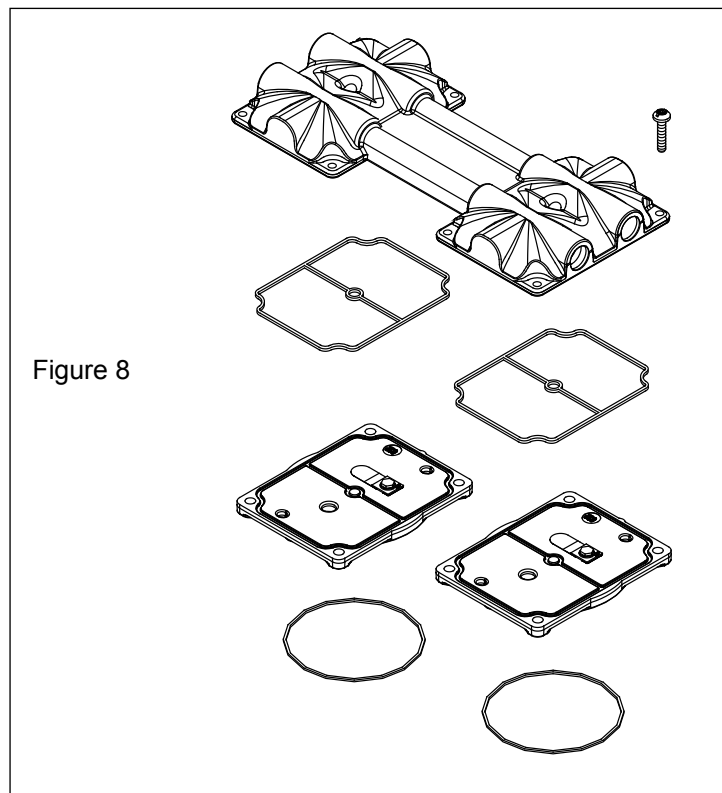


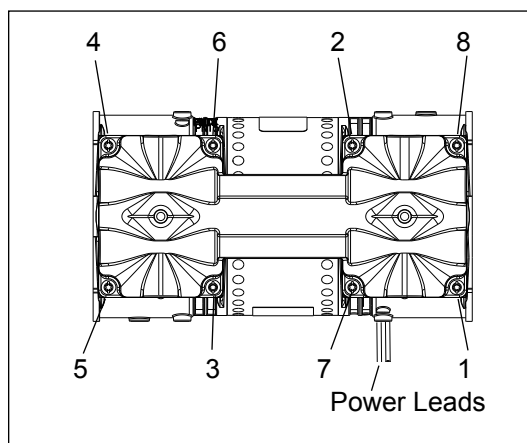
Figure 8

STEP 2. Place head on the valve plates, making sure that the same letter orientation is as was before disassembly. Torque the head screws to 55 inlbs. in a crisscross pattern.

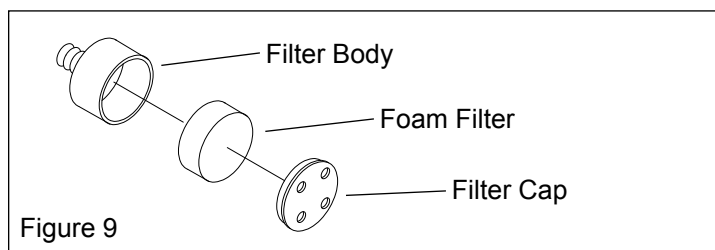
⚠ Caution: To avoid property damage or personal injury, always try rotating the fan by HAND prior to connecting the unit to the power source. Check for suction at the air inlet port by placing your finger over the port as you turn the fan. You should feel a slight suction with each rotation of the fan. If you don't feel suction, or if you feel or hear a thump as you turn the fan, DO NOT CONNECT THE UNIT TO A POWER SOURCE; review the assembly procedure for possible error.

STEP 3. Push the fan guards into the housing until the release tabs "pop" into the mounting holes in the compressor housing.

Numbers indicate tightening sequence Head Assembly



STEP 4. Remove the filter cap from the filter body by prying it with a flat screwdriver. Remove the old foam filter and discard. Replace with the new filter and snap filter cap back into place.



CE32, CG32, CHI37 Parts List		
Part Number	Description	Quantity
TBD	Cylinder Sleeve	2
	O-Ring	2
	Piston Cup	2
	Screw	8
	Retainer-Cup	2
	Gasket O-Ring-Head	2
	Screw-Piston Cup Retainer	2
	Valve Keeper Strip	4
	Valve Flapper	4
	Backer-Dynamic Valve	4
	Screw-Valve Flapper	4
638281	Fan-Gray	1
638282	Fan-Black	1
638701	Valve-Pressure Relief	1

CE50, CHI56 Parts List		
Part Number	Description	Quantity
TBD	Cylinder Sleeve	2
	O-Ring	2
	Piston Cup	2
	Screw	8
	Retainer-Cup	2
	Gasket O-Ring-Head	2
	Screw-Piston Cup Retainer	2
	Valve Keeper Strip	4
	Valve Flapper	4
	Backer-Dynamic Valve	4
	Screw-Valve Flapper	4
638423	Fan-Gray	1
638424	Fan-Black	1
638701	Valve-Pressure Relief	1

C.2 REGULATOR

- Norgren
 - R07 Regulator
 - General Purpose Regulators
 - Installation and Adjustment Instructions
-



R07

Installation & Maintenance Instructions

Regulator
R07 - ★★ - ★★ - ★★

Port	Option	Option	Diaphragm	Gauge	Spring (Outlet Pressure Range) *	Thread Form
11/8"	0Not applicable	0Standard	R....Relieving	G....With	A....0,1 to 0,7 bar (1 to 10 psig)	A....PTF
21/4"		2Low flow seat	N....Non relieving	N....Without	E....0,3 to 3,5 bar (5 to 50 psig)	B....ISO Rc taper
					K....0,3 to 7 bar (5 to 100 psig)	G....ISO G parallel

* Outlet pressure can be adjusted to pressures in excess of, and less than, those specified. Do not use these units to control pressures outside of the specified ranges.

TECHNICAL DATA

Fluid: Compressed air

Maximum pressure: 20 bar (300 psig)

Operating temperature*: -34° to +65°C (-30° to +150°F)

* Air supply must be dry enough to avoid ice formation at temperatures below +2°C (+35°F).

Typical flow with 10 bar (150 psig) inlet pressure, 6,3 bar (90 psig) set pressure and 1 bar (15 psig) droop from set:

1/8" Ports: 6,5 dm³/s (14 scfm)

1/4" Ports: 7 dm³/s (15 scfm)

Gauge ports:

1/8 PTF with PTF main ports

Rc1/8 with ISO Rc main ports

Rc1/8 with ISO G main ports

Materials:

Body: Zinc

Bonnet : Acetal

Valve: Brass/nitrile

Valve seat: Acetal

Elastomers: Nitrile

REPLACEMENT ITEMS

Service kit (includes items circled on exploded view)

Relieving.....3407-02

Non-relieving.....3407-01

Tamper resistant knob18-001-092

PANEL MOUNTING DIMENSIONS

Panel mounting hole diameter: 30 mm (1.19")

Panel thickness: 2 to 6 mm (0.06" to 0.25")

INSTALLATION

- Shut off air pressure. Install regulator in air line -
 - with air flow in direction of arrow on body,
 - upstream of lubricators and cycling valves,
 - as close as possible to the device being serviced,
 - at any angle.
- Connect piping to proper ports using pipe thread sealant on male threads only. Do not allow sealant to enter interior of regulator.
- Install a pressure gauge or plug the gauge ports. Gauge ports can also be used as additional outlets for regulated air.
- Install a Norgren general purpose filter upstream of the regulator.

ADJUSTMENT

- Before applying inlet pressure to regulator, turn adjustment (2 or 5A) counterclockwise to remove all force on regulating spring (6).
- Apply inlet pressure, then turn adjustment clockwise to increase and counterclockwise to decrease pressure setting.
- Always approach the desired pressure from a lower pressure. When reducing from a higher to a lower setting, first reduce to some pressure less than that desired, then bring up to the desired pressure.

NOTE

With non-relieving regulators, make pressure reductions with some air flow in the system. If made under no flow (dead-end) conditions, the regulator will trap the over-pressure in the downstream line.

- Push adjusting knob down to lock pressure setting; pull up to release. Install tamper resistant knob (see **Replacement Items**) to make setting tamper resistant.

DISASSEMBLY

- Regulator can be disassembled without removal from air line.
- Shut off inlet pressure. Reduce pressure in inlet and outlet lines to zero.
- Turn adjustment (2 or 5A) fully counterclockwise to remove all force on regulating spring (6).
- Disassemble in general accordance with the item numbers on exploded view.

CLEANING

- Clean parts with warm water and soap.
- Rinse and dry parts. Blow out internal passages in body with clean, dry compressed air.
- Inspect parts. Replace those found to be damaged.

ASSEMBLY

- Lubricate seals and o-rings with o-ring grease.
- Assemble the unit as shown on the exploded view.
- Torque Table

ITEM	TORQUE NM (INCH-POUNDS)
2, 5A (Bonnet)	7,34 to 8,47 (65 to 75)
9 (Early valve seat)	0,45 to 0,68 (4 to 6)†
11 (Current valve seat)	0,34 to 0,56 (3 to 5)†

† Diaphragm pin (8) must slide freely thru valve seat after torquing.

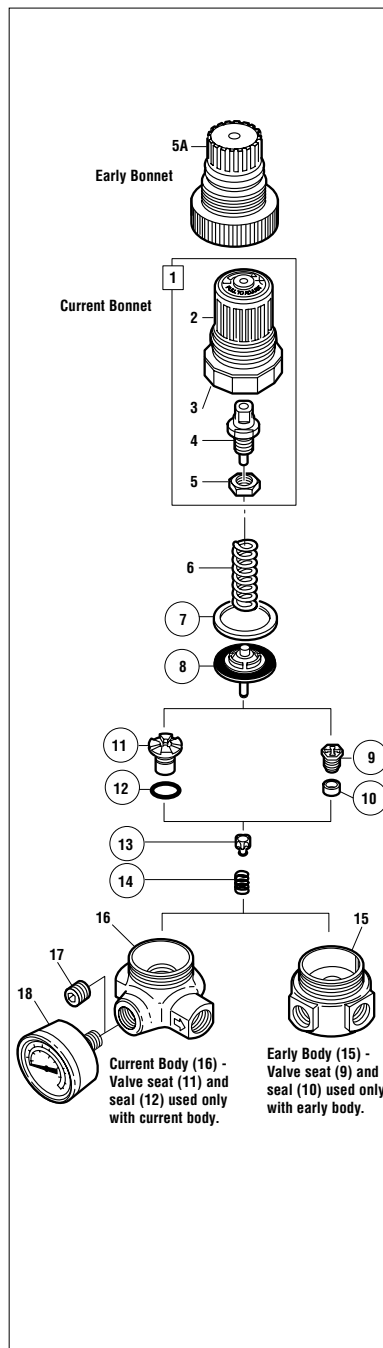
WARNING

These products are intended for use in industrial compressed air systems only. Do not use these products where pressures and temperatures can exceed those listed under **Technical Data**.

If outlet pressure in excess of the regulator pressure setting could cause downstream equipment to rupture or malfunction, install a pressure relief device downstream of the regulator. The relief pressure and flow capacity of the relief device must satisfy system requirements.

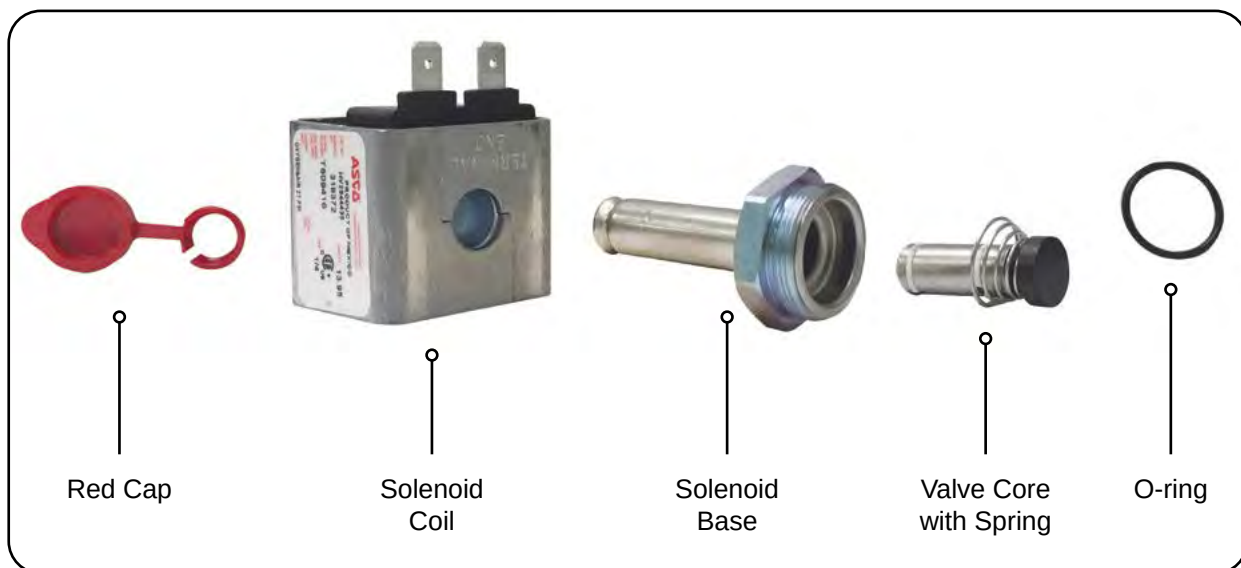
The accuracy of the indication of pressure gauges can change, both during shipment (despite care in packaging) and during the service life. If a pressure gauge is to be used with these products and if inaccurate indications may be hazardous to personnel or property, the gauge should be calibrated before initial installation and at regular intervals during use.

Before using these products with fluids other than air, for non industrial applications, or for life-support systems consult Norgren.



C.3 VALVES

- ASCO Valve Inc.
Solenoid Valve Assembly Diagram



- ASCO Valve Inc.
U8016 & US8016
Open-Frame Solenoids
Installation and Maintenance Instructions
-

Installation & Maintenance Instructions

OPEN-FRAME SOLENOIDS

SERIES
U8016
US8016

NOTICE: See separate valve installation and maintenance instructions for information on: Operation, Positioning, Mounting, Piping, Strainer or Filter Requirements, Flow Controls, Cleaning, Preventive Maintenance, Causes of Improper Operation, Disassembly and Reassembly of Basic Valve.

DESCRIPTION

Series U8016 are open-frame, pull type solenoid operators. When installed just as a solenoid and not as part of an ASCO valve, the core has a 0.250–28 UNF–2B tapped hole with 0.38 minimum full thread.

Series US8016 open-frame solenoid operators are the same as Series U8016 except they are provided with spade terminal coils.

OPERATION

When the solenoid is energized, the core is drawn into the solenoid base sub-assembly.

IMPORTANT: When the solenoid is de-energized, the initial return force for the core, whether developed by spring, pressure or weight, must exert a minimum force to overcome residual magnetism created by the solenoid. Minimum return force for AC construction is 11 ounces; 5 ounces for DC construction.

INSTALLATION

Check nameplate for correct catalog number, voltage, frequency, wattage and service.

CAUTION: To protect the solenoid valve or operator, install a strainer or filter, suitable for the service involved in the inlet side as close to the valve or operator as possible. Clean periodically depending on service conditions. See ASCO Series 8600 and 8601 for strainers.

WARNING: To prevent the possibility of electrical shock from the accessibility of live parts, install the open-frame solenoid in an enclosure.

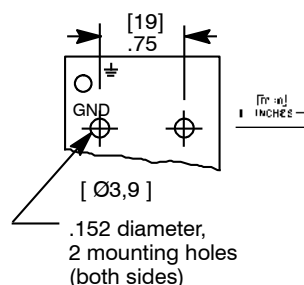
Positioning

This solenoid is designed to perform properly when mounted in any position. However, for optimum life and performance, the solenoid should be mounted vertically and upright to reduce the possibility of foreign matter accumulating in the solenoid base sub-assembly area.

If open-frame solenoid is supplied on an ASCO valve, check basic valve instructions for positioning.

Mounting

Refer to Figure 1 (below) for mounting.



CAUTION: Be sure mounting screws do not penetrate yoke far enough to damage coil.

Figure 1. Yoke mounting dimension (partial view).

Wiring

Wiring must comply with local codes and the National Electrical Code. Coils are provided with lead wires or 1/4" spade terminals. The solenoid yoke is provided with a hole for a grounding screw, see Figure 2. Grounding screw not supplied with solenoid. To facilitate wiring, the solenoid may be rotated 360° by removing the retaining cap, clip or hi-shock clip.

CAUTION: When metal retaining clip disengages, it will spring upward.

Rotate solenoid enclosure to desired position. Then replace retaining cap, clip or hi-shock clip before operating. Be sure hi-shock retaining clip seats in the circular groove around side wall of solenoid base sub-assembly. Tighten retaining clip securely so that the retaining clip ends meet.

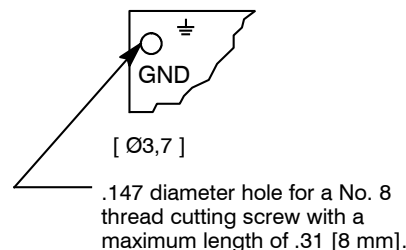


Figure 2. Hole for grounding screw (partial view).

ASCO Valves®

E21903-12/11

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I&M No. V 6917 R2

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Page 1 of 4

Note: Alternating current (AC) and direct current (DC) solenoids are built differently. To convert from one to the other, it is necessary to change the complete solenoid including the core and solenoid base sub-assembly, not just the coil. Consult ASCO.

Solenoid Enclosure Assembly

Catalog Numbers U80161, U80162, US80161 and US80162 open-frame solenoids may be assembled as a complete unit. Tightening is accomplished by means of a hex flange at the base of the solenoid.

⚠ CAUTION: Care must be taken not to mar the upper core surface, when installing core or positioning solenoid.

Solenoid Temperature

Standard solenoids are supplied with coils designed for continuous duty service. When the solenoid is energized for a long period, the solenoid yoke becomes hot. This is a safe operating temperature. Any excessive heating will be indicated by the smoke and odor of burning coil insulation.

MAINTENANCE

⚠ WARNING: To prevent the possibility of death, serious injury or property damage, turn off electrical power, depressurize solenoid operator or valve, and vent fluid to a safe area before servicing.

Cleaning

All solenoid operators and valves should be cleaned periodically. The time between cleanings will vary depending on the medium and service conditions. In general, if the voltage to the coil is correct, sluggish valve operation, excessive noise or leakage will indicate that cleaning is required. In the extreme case, faulty operation will occur and the solenoid operator or valve may fail to shift. Clean strainer or filter when cleaning the operator or valve.

Preventive Maintenance

- Keep the medium flowing through the solenoid operator or valve as free from dirt and foreign material as possible.
- While in service, the solenoid operator or valve should be operated at least once a month to insure proper opening and closing.
- Depending on the medium and service conditions, periodic inspection of internal valve parts for damage or excessive wear is recommended. Thoroughly clean all parts. Replace any worn or damaged parts.

Causes of Improper Operation

- **Faulty Control Circuit:** Check the electrical system by energizing the solenoid. A metallic *click* signifies that the solenoid is operating. Absence of the *click* indicates loss of power supply. Check for loose or blown fuses, open-circuited or grounded solenoid, broken lead wires or splice connections.
- **Burned-Out Coil:** Check for open-circuited coil. Replace if necessary. Check supply voltage; it must be

the same as specified on nameplate and marked on the coil. Check ambient temperature and check the core is not jammed.

- **Low Voltage:** Check voltage across the coil leads. Voltage must be at least 85% of rated voltage.

Coil Replacement/Solenoid Disassembly

1. Disassemble solenoid in an orderly fashion using exploded views for identification and placement of parts.
2. Disconnect coil lead wires from power supply and grounding wire from yoke.
3. Remove retaining cap, clip or hi-shock clip and spacer (if present) from top of solenoid.

⚠ CAUTION: When metal retaining clip disengages, it will spring upward.

4. Slip yoke containing coil, sleeves and insulating washers off the solenoid base sub-assembly. Insulating washers are omitted when a molded coil is used.
5. Remove coil, sleeves (2) and insulating washers (if present) from yoke.

Note: for panel mount (Figure 6) or hi-shock (Figure 5) construction remove additional parts as required.

6. For additional disassembly, unscrew solenoid base sub-assembly or bonnet. The bonnet requires a special wrench adapter which is supplied in ASCO Rebuild Kits. For wrench adapter only, order Wrench Kit No. K218948.
7. Refer to basic valve instructions for further disassembly.

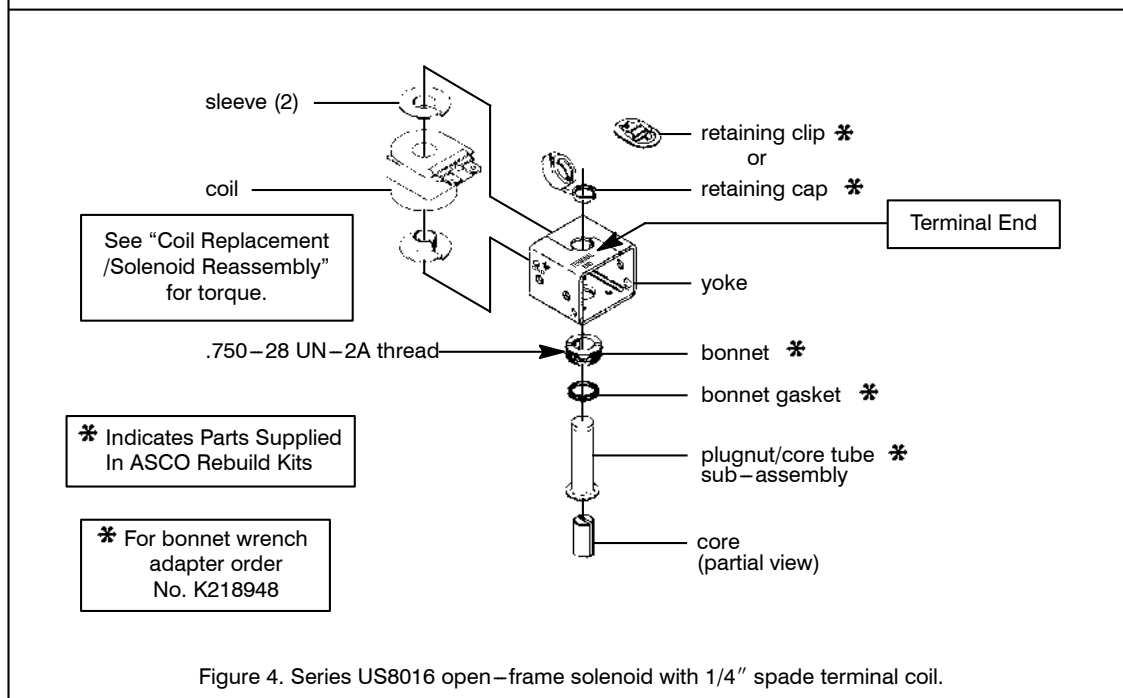
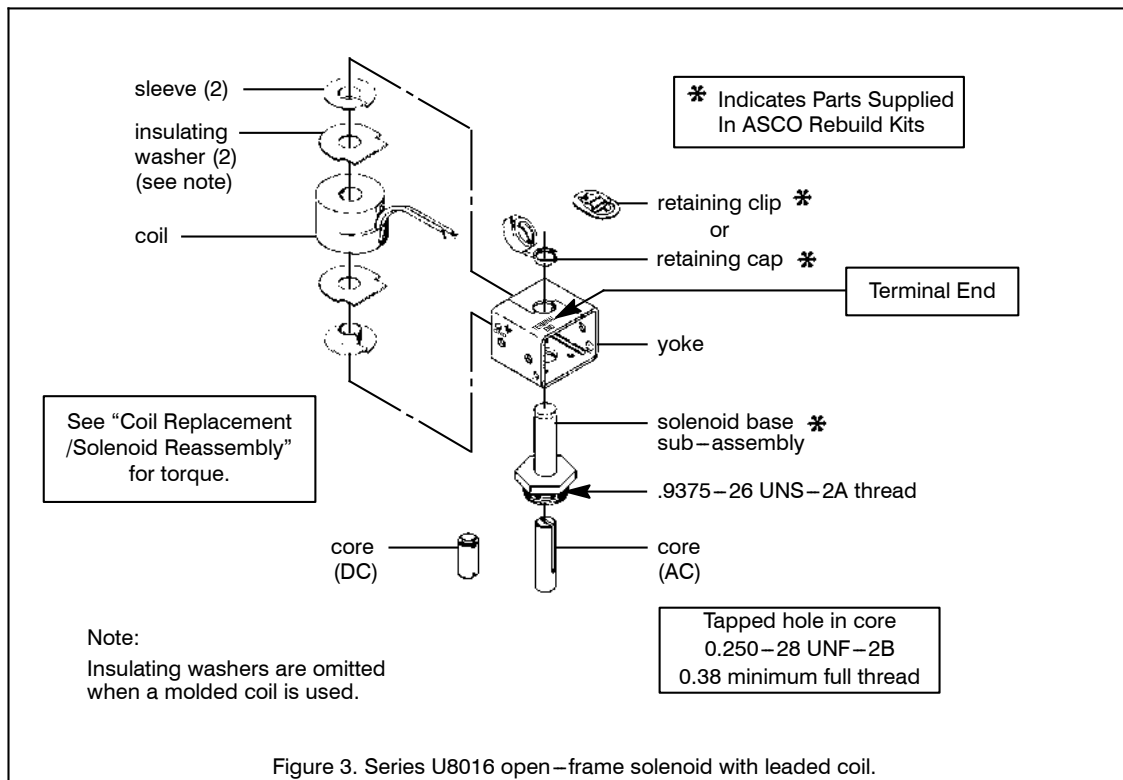
Coil Replacement/Solenoid Reassembly

1. Install solenoid base sub-assembly or plugnut/core tube sub-assembly with bonnet gasket and bonnet. Torque solenoid base sub-assembly to 175 ± 25 in-lbs [$19,8 \pm 2,8$ Nm]. Torque valve bonnet to 90 ± 10 in-lbs [$10,2 \pm 1,1$ Nm].
2. Reassemble open-frame solenoid following exploded views.
3. For solenoid using a hi-shock retaining clip be sure retaining clip seats in circular groove around side wall of solenoid base sub-assembly. Then tighten retaining clip securely so that the retaining clip ends meet.
4. Make electrical connections to solenoid, see **Wiring** section.

⚠ CAUTION: Solenoid must be fully reassembled because the yoke and internal parts complete the magnetic circuit. Be sure to replace insulating washer at each end of non-molded coil.

ORDERING INFORMATION FOR SOLENOID OPERATORS OR COILS

When Ordering Solenoid Operators or Coils, specify Catalog Number, Serial Number, Voltage and Frequency. For Coils, specify number stamped on coil (if visible).



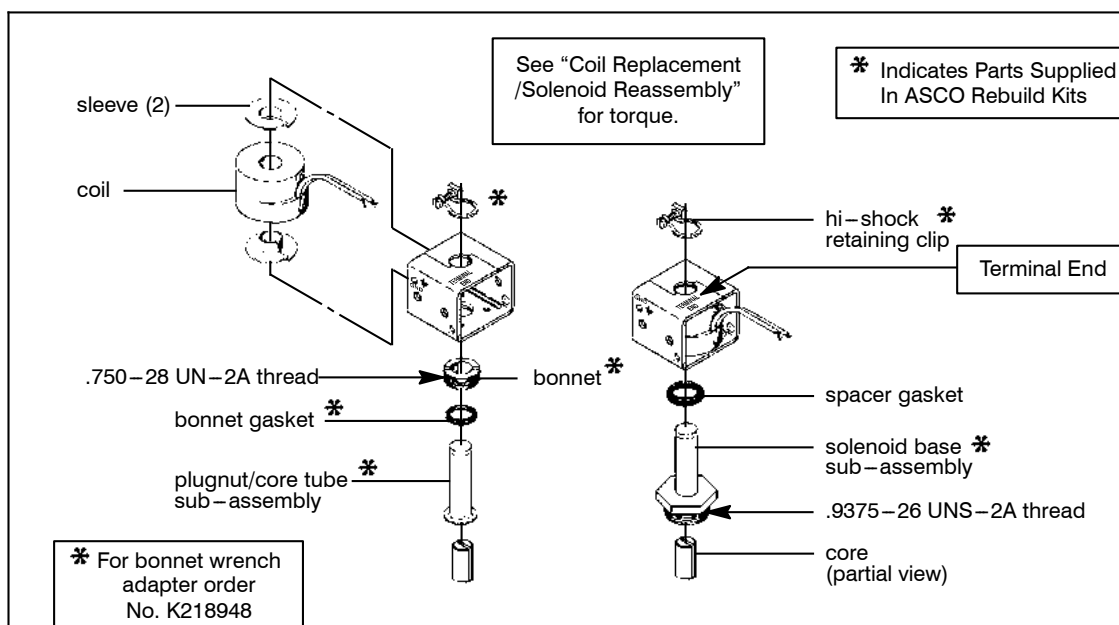


Figure 5. Series U8016 hi-shock clip construction – open-frame solenoid with leaded coil.

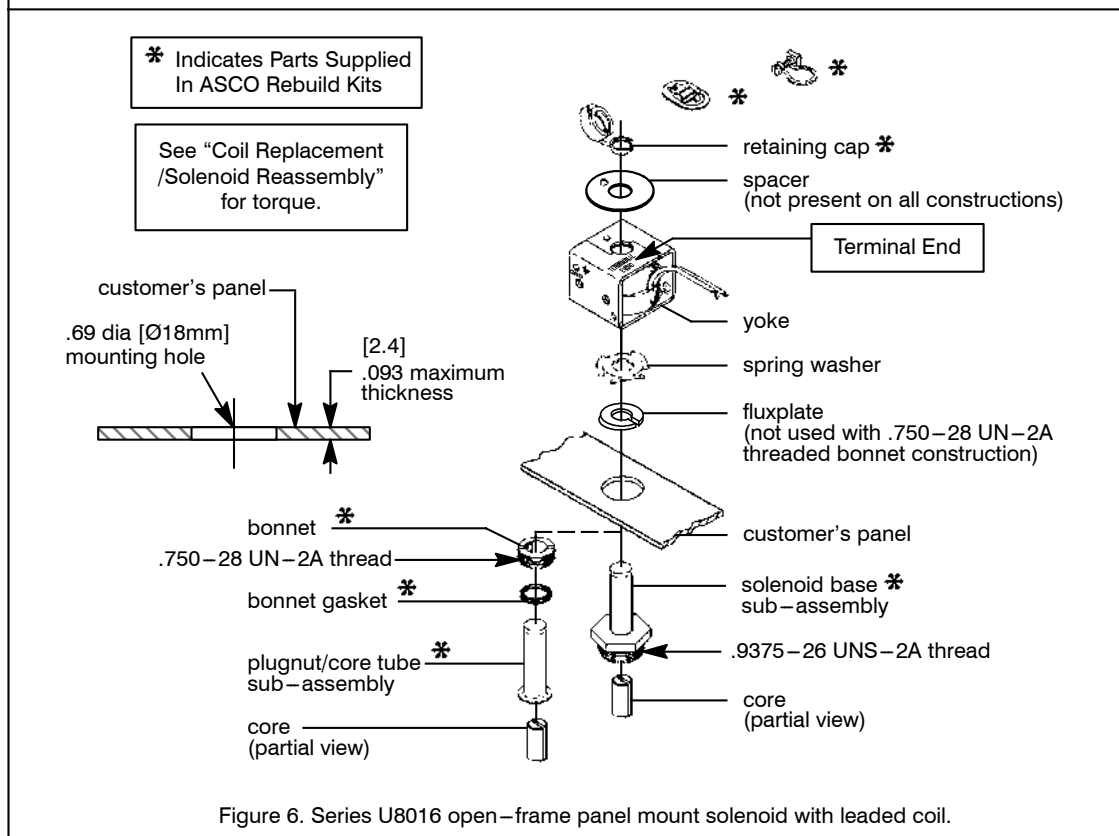


Figure 6. Series U8016 open-frame panel mount solenoid with leaded coil.

- ASCO Valve Inc.
HV238915
Solenoid Valves
General Installation and Maintenance Instructions
-

General Installation & Maintenance Instructions

DESCRIPTION

This sheet is specifically designed to provide general installation and maintenance instructions for specially designed valves. Not all paragraphs on this sheet are applicable to each design. You must review this sheet and select the paragraphs which apply to the valves you have. This sheet is designed to cover a wide range of valve designs, for example: solenoid operated valves, air operated valves, manual operated valves, special designs for special applications and conditions. Refer to the offset assembly drawing which is packaged with your valve for information on size, type, material, and operation.

NOTICE: Brass valves are not certified as lead-free under the Safe Water Drinking Act SWDA 1417 and are not intended for use on drinking water systems. They are intended for control of water in industrial applications. Consult ASCO for valves rated for use in potable water applications.

OPERATION

Refer to assembly drawing for flow diagrams and general instructions on operation.

INSTALLATION

Check nameplate for correct catalog number, pressure, voltage, service and valve for any other special instruction tags or labels. Never apply incompatible fluids or exceed pressure rating of the valve. Installation and valve maintenance to be performed by qualified personnel.

FOR VALVES WITH LEVER TYPE OPERATING MOVEMENTS

⚠ WARNING: Do not obstruct movement of lever. Lever must be free to move or valve will not shift position.

Future Service Considerations

Provision should be made for performing seat leakage, external leakage, and operational tests on the valve with a nonhazardous, noncombustible fluid after disassembly and reassembly.

Temperature Limitations

Refer to assembly drawing for ambient and fluid temperature limitations.

Positioning

Refer to assembly drawing for positioning.

Piping

Connect piping to valve according to markings on valve body (consult flow diagrams on assembly drawings). Apply pipe compound sparingly to male pipe threads only. If applied to valve threads the compound may enter the valve and cause operational difficulty. Avoid pipe strain by properly supporting and aligning piping. When tightening the pipe, do not use valve or solenoid as a lever. Locate wrenches applied to valve body or piping as close as possible to connection point.

⚠ CAUTION: To avoid damage to the valve body, DO NOT OVERTIGHTEN PIPE CONNECTIONS. If PTFE tape, paste, spray or similar lubricant is used, use extra care when tightening due to reduced friction. This applies mainly to valves with aluminum or zinc bodies.

⚠ CAUTION: For the protection of the solenoid valve (all valves in general) install a strainer or filter suitable for the service involved in the inlet side as close to the valve as possible. Periodic cleaning is required depending on service conditions. See Series 8600 and 8601 for strainers.

Minimum Operating Pressure Differential

For all valves requiring a minimum operating pressure differential, the pressure and exhaust lines must be full size without restriction. Minimum operating pressure differential as stamped on the nameplate must be maintained for dependable operation. For 3 and 4-way valves minimum operating pressure differential must be maintained between pressure and exhaust at the moment of

changeover. Hydraulic pumps or air reservoirs must have adequate capacity to maintain the minimum pressure during changeover. To check pressure during changeover, install a pressure gauge in the pressure connection as close as possible to the valve.

MAINTENANCE

⚠ WARNING: To prevent the possibility of death, serious injury or property damage, turn off electrical power and depressurize valve. If the valve handles combustible fluid, extinguish all open flames and avoid any type of sparking or ignition. Vent fluid to a safe area before servicing the valve.

NOTE: For most valves it is not necessary to remove valve from pipeline for repairs. For air operated valves the auxiliary pressure line must be disconnected.

Cleaning

All solenoid valves should be cleaned periodically. The time between cleanings will vary depending on the medium and service conditions. In general, if the voltage to the coil is correct, sluggish valve operation, excessive noise or leakage will indicate that cleaning is required. In the extreme case, faulty valve operation will occur and the valve may fail to shift. Clean strainer or filter when cleaning the valve.

Preventive Maintenance

- Keep medium flowing through valve as free from dirt and foreign material as possible.
- Periodic exercise of the valve should be considered if ambient or fluid conditions are such that corrosion, elastomer degradation, fluid contamination build up, or other conditions that could impede solenoid valve shifting are possible. The actual frequency of exercise necessary will depend on specific operating conditions. A successful operating history is the best indication of a proper interval between exercise cycles.
- Depending on the medium and service conditions, periodic inspection of internal valve parts for damage or excessive wear is recommended. Thoroughly clean all parts. If parts are worn or damaged, install a complete rebuild kit.
- For special designs where an operating movement is utilized, periodic inspection of the movement should be carried out. Operating movement should be kept clean and free from paint, foreign matter, corrosion, freezing and icing conditions.

Causes Of Improper Operation

- **Faulty Control Circuits:** Check the electrical system by energizing the solenoid. Ultramicroscopes that the solenoid is operating. Absence of the click indicates loss of power supply. Check for loose or blown fuses, open circuited or grounded coil, broken lead wires, or splice connections.
- **Burned-Out Coil:** Check for open-circuited coil. Replace coil as necessary. Check supply voltage; it must be the same as specified on nameplate and as marked on the coil.
- **Low Voltage:** Check coil voltage across coil leads. Voltage must be at least 85% of nameplate rating.
- **Incorrect Pressure:** Check valve pressure. Pressure to valve must be within range specified on nameplate.
- **Air Operator:** Check line pressure to air operator.
- **Excessive Leakage:** Disassemble valve and clean all parts. Replace worn or damaged parts with a complete ASCO Rebuild Kit for best results.

ORDERING INFORMATION FOR ASCO REBUILD KITS AND COILS

Parts marked with an asterisk (*) on the assembly drawing are supplied in Rebuild Kits. When Ordering Rebuild Kits for ASCO valves, order the Rebuild Kit number stamped on the valve nameplate. When Ordering Coils for ASCO valves, order the number stamped on your coil. If the number of the kit or the coil is not visible, order by indicating the number of kits required, and the Catalog Number and Serial Number of the valve(s) for which they are intended.

- ASCO Valve Inc.
8262 & 8263 Series
2-way, Direct Acting, Solenoid Valves
Installation and Maintenance Instructions
-

I&M No. V 5256 R11

Installation & Maintenance Instructions

**2-WAY DIRECT-ACTING SOLENOID VALVES
NORMALLY OPEN OR NORMALLY CLOSED OPERATION
BRASS OR STAINLESS STEEL CONSTRUCTION - 1/8", 1/4", OR 3/8" NPT**

SERIES**8262****8263**

IMPORTANT: See separate solenoid installation and maintenance instructions for information on: Wiring, Solenoid Temperature, Causes of Improper Operation, and Coil or Solenoid Replacement.

DESCRIPTION

Series 8262 and 8263 valves are 2-way direct-acting general service solenoid valves. Valve bodies are of rugged brass or stainless steel. Series 8262 or 8263 valves may be provided with a general purpose or explosionproof solenoid enclosure. Series 8262 and 8263 valves with suffix "P" in the catalog number are designed for dry inert gas and non-lubricated air service.

Notice: Brass valves are not certified as lead-free under the Safe Water Drinking Act SWDA 1417 and are not intended for use on drinking water systems. They are intended for control of water in industrial applications. Consult ASCO for valves rated for use in potable water applications.

OPERATION

Normally Open: Valve is open when solenoid is de-energized; closed when is energized.

Normally Closed: Valve is closed when solenoid is de-energized; open when energized.

IMPORTANT: No minimum operating pressure required.

Manual Operation

Manual operator allows manual operation when desired or during an electrical power outage. Depending upon basic valve construction, three types of manual operators are available:

Push Type Manual Operator

To engage push type manual operator, push stem at base of valve body upward as far as possible. Valve will now be in the same position as when the solenoid is energized. To disengage manual operator, release stem. Manual operator will return to original position.

Screw Type Manual Operator

To engage screw type manual operator, rotate stem at base of the valve body clockwise until it hits a stop. Valve will now be in the same position as when the solenoid is energized. To disengage, rotate stem counterclockwise until it hits a stop.

⚠ CAUTION: For valve to operate electrically, manual operator stem must be fully rotated counterclockwise.

Stem/Lever Type Manual Operator

To engage manual operator, turn stem/lever clockwise until it hits a stop. Valve will now be in the same position as when the solenoid is energized. To disengage manual operator, turn stem/lever counterclockwise until it hits a stop.

⚠ CAUTION: For valve to operate electrically, manual operator stem/lever must be fully rotated counterclockwise.

Flow Metering Devices

Valves with suffix "M" in catalog number are provided with a metering device for flow control. Turn stem to right to reduce flow; left to increase flow.

INSTALLATION

Check nameplate for correct catalog number, pressure, voltage, frequency, and service. Never apply incompatible fluids or exceed pressure rating of the valve. Installation and valve maintenance to be performed by qualified personnel.

Note: Inlet port will either be marked "I" or "IN". Outlet port will be marked "O" or "OUT".

Future Service Considerations

Provision should be made for performing seat leakage, external leakage, and operational tests on the valve with a nonhazardous, non-combustible fluid after disassembly and reassembly.

Temperature Limitations

For maximum valve ambient and fluid temperatures, refer to charts below. Check catalog number, coil prefix, suffix, and watt rating on nameplate to determine the maximum temperatures.

Wattage	Catalog Number Coil Prefix	Coil Class	Max. Ambient Temp. °F	Max. Fluid Temp. °F
6, 10.5, 12.4	none, DA or S	A	77	180
6, 10.5, 12.4	DF, FT or SF	F	125	180
6, 10.5, 12.4	HT	H	140	180
9, 10.7	none, DP or SP	F	77	180
9.7	none, FT or HT	A, For H	77	120
11.2	none, FT or HT	A, For H	77	150
16.7	none, DP or SP	F	77	200
17.1	none, KP SP or SD	F	125	180
17.1	HB, KB SS or SV	H	140	180

Catalog Nos. 8262B200 and 8262 C200 AC construction only and Catalog Nos. 8262B214 and 8262 D200 AC and DC construction are limited to 140°F fluid temperature.

Valves with Suffix V or W that are designed for AC service and normally closed operation are for use with No. 2 and 4 fuel oil service. These valves have the same maximum temperatures per the above table except Suffix W valves are limited to a maximum fluid temperature of 140°F.

Listed below are valves with Suffix V in the catalog number that are acceptable for higher temperatures.

Catalog Number Coil Prefix	Max. Ambient Temp. °F	Max. Fluid Temp. °F
FT8262, HB8262 FT8263, HB8263 8262G, 8263G	125	250*
HT or HB 8262G HT or HB 8263G	140	250

*The only exception is the 8262G and 8263G series (Class F coil) at 50 Hertz rated 11.1 and 17.1 watts are limited to 210°F fluid temperature.

Positioning

This valve is designed to perform properly when mounted in any position. However, for optimum life and performance, the solenoid should be mounted vertically and upright to reduce the possibility of foreign matter accumulating in the solenoid base sub-assembly area. Valves with suffix "P" in the catalog number must be mounted with the solenoid vertical and upright.

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E244580 - 4/14

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I&M No. V 5256 R11

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Mounting

Refer to Figure 2 for mounting dimensions.

Piping

Connect piping or tubing to valve according to markings on valve body. Inlet port will either be marked "I" or "IN". Outlet port will be marked "2" or "OUT". Wipe the pipe threads clean of cutting oils. Apply pipe compound sparingly to male pipe threads only. If applied to valve threads, the compound may enter the valve and cause operational difficulty. Avoid pipe strain by properly supporting and aligning piping. When tightening the pipe, do not use valve or solenoid as a lever. Locate wrenches applied to valve body or piping as close as possible to connection point.

IMPORTANT: To protect the solenoid valve, install a strainer or filter suitable for the service involved, in the inlet side as close to the valve as possible. Clean periodically depending on service conditions. See ASCO Series 8600 and 8601 for strainers.

MAINTENANCE

⚠ WARNING: To prevent the possibility of death, serious injury or property damage, turnoff electrical power, depressurize valve, and vent fluid to a safe area before servicing the valve.

NOTE: It is not necessary to remove the valve from the pipeline for repairs.

Cleaning

All solenoid valves should be cleaned periodically. The time between cleanings will vary depending on the medium and service conditions. In general, if the voltage to the coil is correct, sluggish valve operation, excessive noise or leakage will indicate that cleaning is required. In the extreme case, faulty valve operation will occur and the valve may fail to open or close. Clean strainer or filter when cleaning the valve.

Preventive Maintenance

- Keep the medium flowing through the valve as free from dirt and foreign material as possible.
- While in service, the valve should be operated at least once a month to insure proper opening and closing.
- Depending on the medium and service conditions, periodic inspection of internal valve parts for damage or excessive wear is recommended. Thoroughly clean all parts. If parts are worn or damaged, install a complete ASCO Rebuild Kit.

Causes of Improper Operation

- **Incorrect Pressure:** Check valve pressure. Pressure to valve must be within range specified on nameplate.
- **Excessive Leakage:** Disassemble valve (see Maintenance) and clean all parts. If parts are worn or damaged, install a complete ASCO Rebuild Kit.

Valve Disassembly

1. Disassemble valve using exploded views for identification of parts.
2. Remove solenoid, see separate instructions.
3. Unscrew solenoid base sub-assembly or valve bonnet with special wrench adapter supplied in ASCO Rebuild Kit. For wrench adapter only, order No. K218948. Remove core assembly, core spring, and solenoid base gasket from valve body. For normal maintenance on Series 8263 valves it is not necessary to remove valve seat. See Figure 1 for metering or manual operator constructions.
4. For normally open construction (Figure 3) remove end cap, or manual operator, (not shown) end cap gasket, disc holder spring, and disc holder assembly.
5. All parts are now accessible to clean or replace. If parts are worn or damaged, install a complete ASCO Rebuild Kit.

Valve Reassembly

1. Use exploded views for identification, orientation and placement of parts.
2. Lubricate all gaskets with DOW CORNING®111 Compound lubricant or an equivalent high-grade silicone grease.
3. For normally open construction (Figure 3), install disc holder assembly, disc holder spring, end cap gasket and end cap or manual operator. For valves with 1/8" NPT, torque end cap or manual operator to 90±10 in-lbs [10,2±1,1 Nm]. For all other valves torque end cap or manual operator to 175±25 in-lbs [19,8±2,8 Nm].
4. For Series 8263 apply a small amount of LOCTITE®PSTr pipe sealant to threads of valve seat (if removed). Follow manufacturers instructions for application of pipe sealant. Then install valve seat and torque to 75±10 in-lbs [8,5±1,1 Nm].
5. Replace solenoid base gasket, core assembly with core spring and solenoid base sub-assembly or plugnut/core tube sub-assembly and valve bonnet. Note: For core assemblies with internal type core springs, install wide end of core spring in core assembly first, closed end of core spring protrudes from top of core assembly.
6. For 1/8" NPT valve constructions, Torque valve bonnet to 90±10 in-lbs [10,2±1,1 Nm]. Torque solenoid base sub-assembly to 175±25 in-lbs [19,8±2,8 Nm].
7. Install solenoid, see separate solenoid instructions. Then make electrical hookup to solenoid.

⚠ WARNING: To prevent the possibility of death, serious injury or property damage, check valve for proper operation before returning to service. Also perform internal seat and external leakage tests with a nonhazardous, noncombustible fluid.

8. Restore line pressure and electrical power supply to valve.
9. After maintenance is completed, operate the valve a few times to be sure of proper operation. A metallic click signifies the solenoid is operating.

ORDERING INFORMATION FOR ASCO REBUILD KITS

Parts marked with an asterisk (*) in the exploded view are supplied in Rebuild Kits. When Ordering Rebuild Kits for ASCO valves, order the Rebuild Kit number stamped on the valve nameplate. If the number of the kit is not visible, order by indicating the number of kits required, and the Catalog Number and Serial Number of the valve(s) for which they are intended.

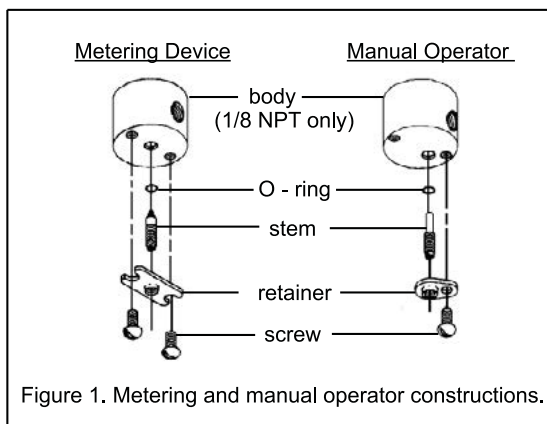
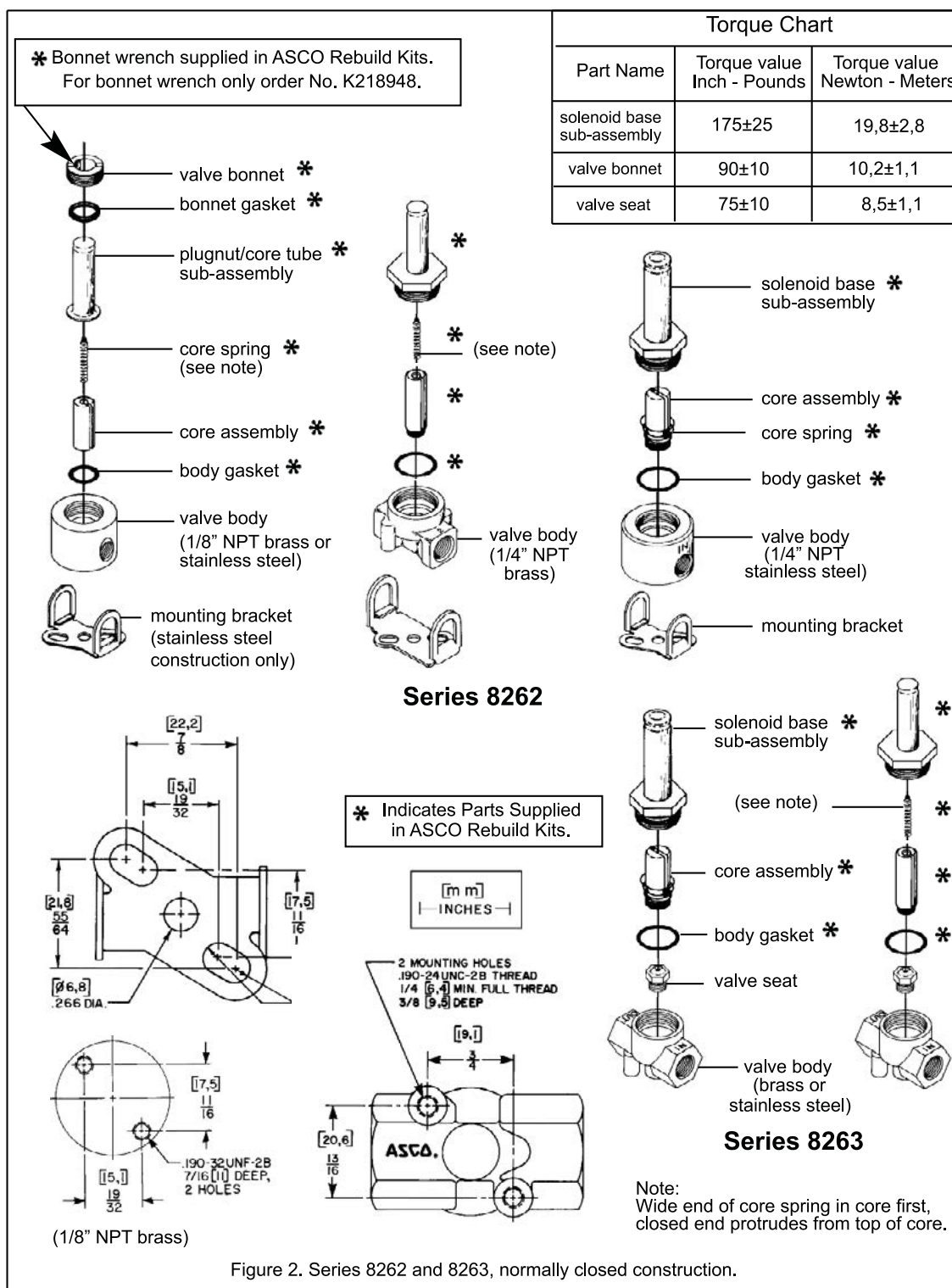


Figure 1. Metering and manual operator constructions.



Disassembly and Reassembly of Stem /Lever Type Manual Operator (Refer to Figure 3)

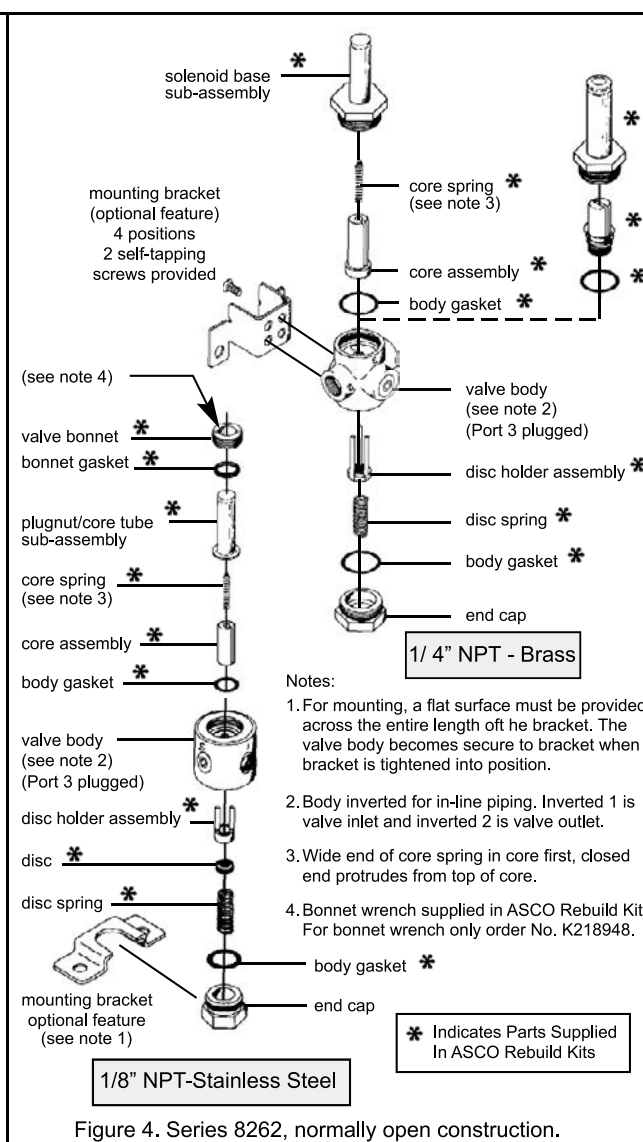
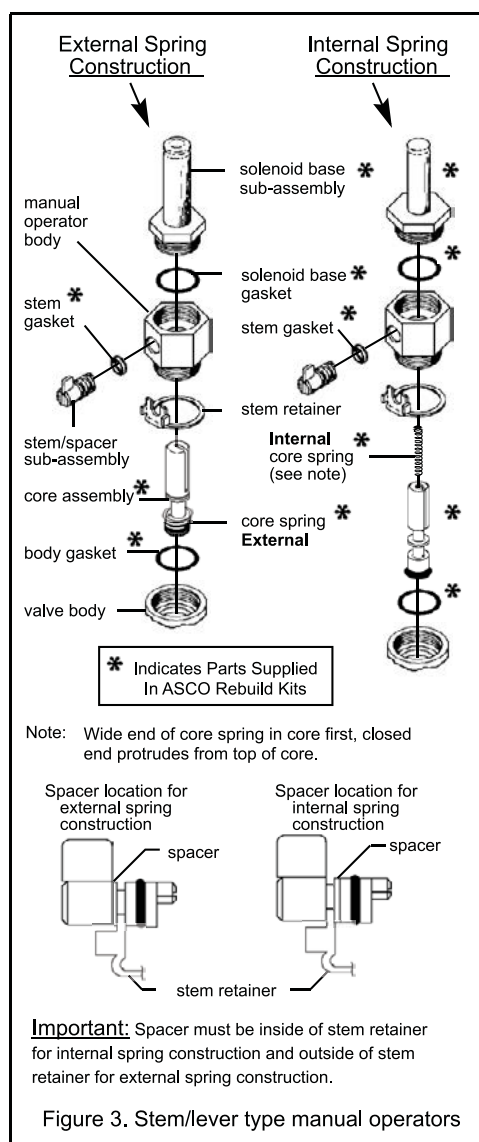
NOTE: There are two stem/lever manual operator constructions. They are identified by the location of the core spring as *internal* or *external* spring construction.

1. Unscrew solenoid base sub-assembly from manual operator body.
2. Unscrew manual operator body from valve body. Then remove body gasket and stem retainer.
3. Slip stem/spacer sub-assembly with stem gasket from manual operator body. Remove core assembly with core spring from center of manual operator body.
4. All parts are now accessible for cleaning or replacement. Lubricate gaskets per *Valve Reassembly* step 2.

5. Position core assembly with core spring into base of manual operator body. Then install stem/spacer sub-assembly into manual operator body to engage with core assembly.
6. Reinstall stem retainer on body and stem/spacer sub-assembly.

IMPORTANT: The spacer on the stem/spacer sub-assembly must be inside of the stem retainer for internal spring construction and outside the stem retainer for external spring construction.

7. Replace body gasket and install manual operator assembly in valve body. Torque manual operator body to 175 ± 25 in-lbs [$19,8 \pm 2,8$ Nm].
8. Replace solenoid base gasket and solenoid base sub-assembly. Torque solenoid base sub-assembly to 175 ± 25 in-lbs [$19,8 \pm 2,8$ Nm].
9. Check manual operator for proper operation. Turn stem clockwise and counterclockwise; stem should turn freely without binding.



- ASCO Valve Inc.
8225 Series
2-way, Direct Acting, Solenoid Valves
Installation and Maintenance Instructions
-

INSTALLATION & MAINTENANCE INSTRUCTIONS

2-WAY DIRECT-ACTING SOLENOID VALVES
SUB-MINIATURE - NORMALLY CLOSED OPERATION
BRASS OR STAINLESS STEEL CONSTRUCTION - 1/8 NPT

V6332R3



SERIES
8225

DESCRIPTION

Series 8225 valves are 2-way normally closed, direct-acting solenoid valves made of rugged brass or stainless steel. Valves are sub-miniature in size and are provided with an open-frame solenoid.

OPTIONAL FEATURES

Mounting Bracket Kit No. 224-736: This kit provides mounting of valves for ease of installation, removal and adjustment to piping (See Figure 2).

Plug Connector Kit No. 226-061: The open-frame solenoid with spade terminal connections may be used with the plug connector kit providing a 2-pole with grounding contact Type 3 x DIN 46244 construction (See Figure 4).

Conduit Connector Kit No. 224-735: The open-frame solenoid with lead wires may be converted to gasketed threaded conduit hub enclosure for watertight or general purpose construction (See Figure 5).

OPERATION

Normally Closed: Valve is closed when solenoid is de-energized. Valve is open when solenoid is energized.

IMPORTANT: No minimum operating pressure required.

INSTALLATION

Check nameplate for correct catalog number, pressure, voltage frequency and service. Never apply incompatible fluids or exceed pressure rating of the valve. Installation and valve maintenance to be performed by qualified personnel.

FUTURE SERVICE CONSIDERATIONS

Provisions should be made for performing seat leakage, external leakage and operational tests on the valve with a nonhazardous, noncombustible fluid after disassembly and reassembly.

POSITIONING

This valve is designed to perform properly when mounted in any position. However, for optimum life and performance, the solenoid should be mounted vertically and upright to reduce the possibility of foreign matter accumulating in the plugnut/core tube sub-assembly area.

MOUNTING

For valve body mounting dimensions refer to Figure 1. For dimensions of mounting bracket supplied in Mounting Bracket Kit No. 224-736, refer to Figure 2.

PIPING

Connect piping to valve according to markings on valve body. Inlet port is marked "1" and outlet port is marked "2". Apply pipe compound sparingly to male pipe threads only. If applied to valve threads the compound may enter the valve and cause operational difficulty. Avoid pipe strain by properly supporting and aligning piping. When tightening the pipe, do not use valve or solenoid as a lever! Locate wrenches applied to valve body or piping as close as possible to connection point.

CAUTION: To protect the solenoid valve, install a strainer or filter, suitable for the service involved, in the inlet side as close to the valve as possible. Clean periodically depending on service conditions. See ASCO Bulletins 8600, 8601 and 8602 for strainers.

WIRING

Wiring must comply with local codes and the National Electrical Code.

NOTE: To convert from Alternating Current (A-C) to Direct Current (D-C) or vice versa, it is necessary to change only the coil. However, the valve pressure rating will change. Consult ASCO Catalog.

SOLENOID TEMPERATURE

Coils for Bulletin 8225 valves are designed for continuous duty. When solenoid is energized for a long period, the solenoid enclosure becomes hot and can be touched by hand only for an instant. This is a safe operating temperature. Any excessive heating will be indicated by the smoke and odour of burning coil insulation.

MAINTENANCE

NOTE: It is not necessary to remove the valve from the pipeline for inspecting, cleaning or coil replacement.

WARNING: To prevent the possibility of personal injury or property damage, turn off electrical power, depressurize valve and vent fluid to a safe area before servicing the valve.

CLEANING

All solenoid valves should be cleaned periodically. The time between cleanings will vary depending on the medium and service conditions. In general, if the voltage to the coil is correct, sluggish valve operation, excessive noise or leakage will indicate that cleaning is required. In the extreme case faulty valve operation will occur and the valve may fail to open or close. Clean valve strainer or filter when cleaning the valve.

PREVENTIVE MAINTENANCE

1. Keep the medium flowing through the valve as free from dirt and foreign material as possible.
2. While in service, the valve should be operated at least once a month to insure proper opening and closing

CAUSES OF IMPROPER OPERATION

1. **Faulty Control Circuit:** Check the electrical system by energizing the coil. A metallic "click" signifies that the solenoid is operating. Absence of the "click" indicates loss of power supply. Check for loose or blown fuses, open-circuited or grounded coil, broken lead wires or splice connections.
2. **Burned-Out Coil:** Check for open-circuited coil. Replace coil if necessary. Check supply voltage; it must be the same as specified on nameplate.
3. **Low Voltage:** Check voltage across the coil leads. Voltage must be at least 85% of nameplate rating.
4. **Incorrect Pressure:** Check valve pressure. Pressure to valve must be within range specified on nameplate.
5. **Excessive Leakage:** Disassemble valve (see MAINTENANCE) and clean all parts. If parts are worn or damaged, replace valve. See Ordering Information.

COIL REPLACEMENT (Refer to Figure 3)

WARNING: Turn-off electrical power supply and depressurize valve. Then proceed as follows:

1. Disconnect coil lead wires
2. Remove clip
3. Slip coil off plugnut/core tube sub-assembly
4. Install new coil and replace clip
5. Make electrical hook-up and restore electrical power

VALVE DISASSEMBLY FOR INSPECTING AND CLEANING

(Refer to Figure 3)

WARNING: Turn -off electrical power supply and depressurize valve. Then proceed as follows:

1. Disassemble valve in an orderly fashion. Use exploded view for identification and placement of parts.
2. Disconnect coil lead wires
3. Remove clip
4. Slip coil off plugnut/core tube sub-assembly
5. Remove mounting screws, cover, plugnut/core tube sub-assembly, gasket and core assembly with core spring
6. All parts are now accessible for cleaning

VALVE REASSEMBLY

1. Reassemble in reverse order of disassembly. Use exploded view for identification and placement of parts.
2. Lubricate gasket with DOW CORNING® 111 Compound lubricant or an equivalent high-grade silicone grease.
NOTE: If core spring has been removed from core assembly, be sure to install small diameter end of core spring on core assembly first. The core spring should snap in place and remain engaged.
3. Replace core assembly, core spring, gasket, plugnut/core tube sub-assembly, cover and mounting screws. Torque mounting screws in a crisscross manner to 9 ± 2 inch-pounds (1.0 ± 0.2 newton-meters).
4. Replace coil and retaining spring. Make electrical hook-up and restore electrical power and line pressure.
5. After maintenance is completed, operate the valve a few times to be sure of proper operation.



AJN:123-626-332

⚠ WARNING: To prevent the possibility of personal injury or property damage, check valve for proper operation before returning to service. Also perform internal seat and external leakage tests with a nonhazardous, noncombustible fluid.

INSTALLATION OF PLUG CONNECTOR KIT NO. 226-061

(Refer to Figure 4)

1. Remove center screw from plug connector. Using a small screwdriver pry terminal block from connector housing.
2. Use stranded copper wire rated at 90°C or greater for connections. Maximum wire size is Number 18 AWG. Strip wire leads back approximately 1/4-inch for installation in socket terminals. The use of wire-end sleeves is also recommended for these socket terminals. Maximum length of wire-end sleeves to be approximately 1/4-inch. Tinning of the ends of the lead wires is not recommended.
3. Thread wire through gland nut, gland gasket, washer and connector housing. NOTE: Connector housing may be rotated 180° from position shown in Figure 4 for alternate positioning of cable entry.

4. Make electrical hook-up to terminal block. Snap terminal block into connector housing and replace center screw.
5. Position gasket on coil and install plug connector. Torque center screw to 5 ± 2 inch-pounds [$0,6 \pm 0,2$ newton-meters].

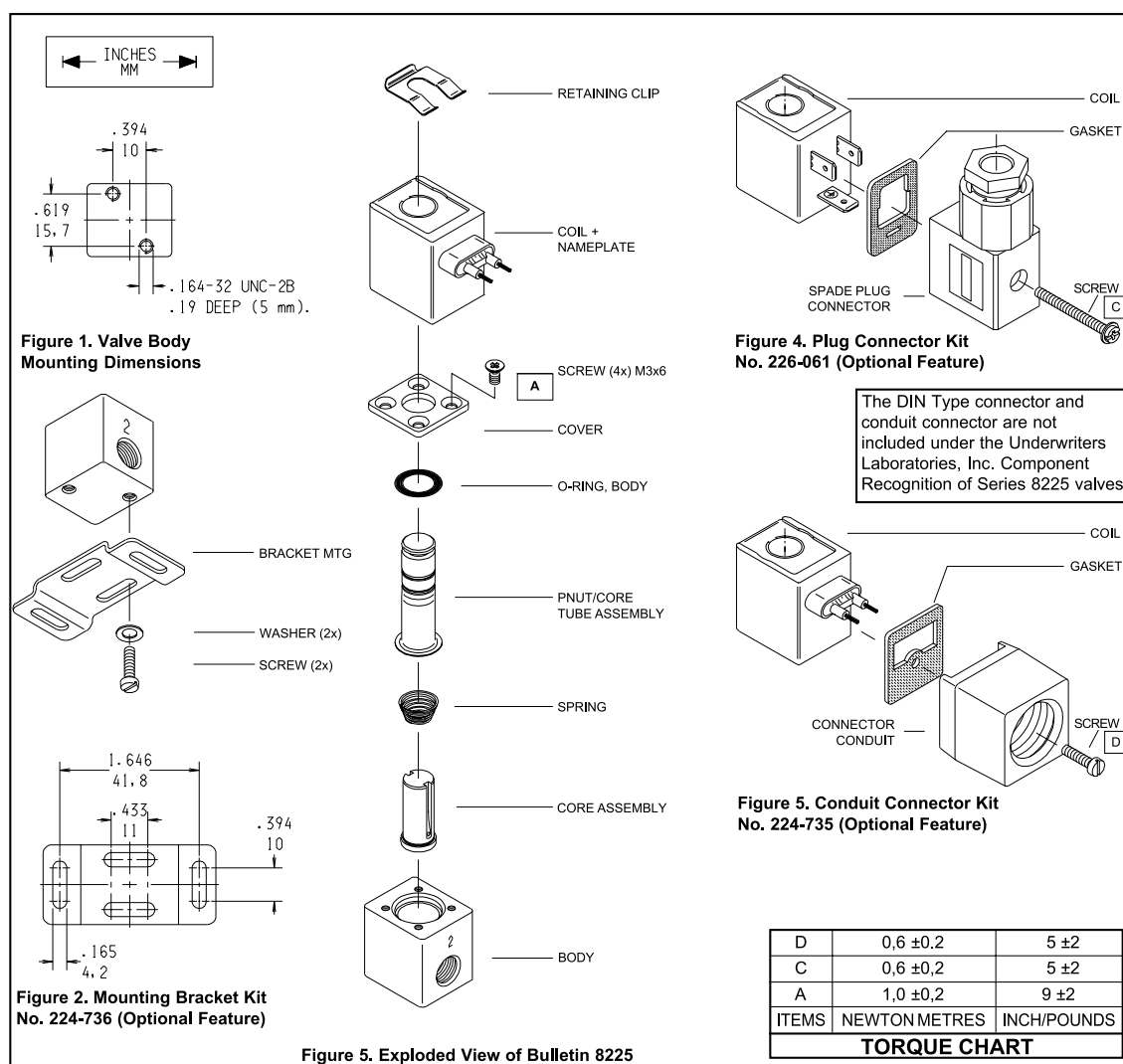
INSTALLATION OF CONDUIT CONNECTOR KIT NO. 224-735

(Refer to Figure 5)

1. Thread coil lead wires through connector gasket and conduit connector.
2. Position gasket and conduit connector against coil and install center screw. Torque center screw to 5 ± 2 inch-pounds [$0,6 \pm 0,2$ newton-meters].

ORDERING INFORMATION FOR NEW COILS OR VALVES

When ordering specify coil number or valve catalog number, serial number, voltage and frequency.



ASCO®



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12 February 2021 MN012-2 D



ABSOLUTE OZONE®



ATLAS®/TITAN®/MAGNUM® OPERATOR'S MANUAL



ABSOLUTE OZONE®

OPERATOR'S MANUAL

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General Information

IMPORTANT SAFETY INSTRUCTIONS. PLEASE READ AND FOLLOW ALL INSTRUCTIONS.

Read this manual completely before operation of
ATLAS/TITAN MAGNUM Ozone Generator Equipment.

Warning - High Voltage is present inside the enclosure

USE EXTREME CAUTION

- Operate the ATLAS/TITAN/MAGNUM 30-200 with safe access to electrical power.
- Connect to a GFCI type receptacle.
- Follow all applicable electrical codes.
- Do not bury cord.

WARNING: To reduce the risk of electrical shock, replace damaged cord immediately.

ELECTRICAL SHOCK HAZARD: Turn OFF all power switches and disconnect power cord from power source receptacle before performing any service work. Failure to do so could result in serious injury or death.



ABSOLUTE OZONE®

OPERATOR'S MANUAL

Section 1

1A. Description

The ATLAS/TITAN/MAGNUM 30-200 are Ozone Generators that produce from 1 to 200 grams of ozone per hour respectively, with ozone concentration up to 22% by weight or as specified in attached test report.

The ATLAS/TITAN/MAGNUM 30-200 are designed to produce ozone for variety of applications.

Atlas 30



1B. Specifications

Model	ATLAS®	TITAN®	MAGNUM®
Ozone Production (g/h)	30 g/h - 100g/h	30g/h - 100 g/h	160 g/h - 200 g/h
Nominal Working Pressure (psig)	20psig	20psig	40psig
Concentration (% by weight O ₃)	5%-22%	5%-12%	6-12%
Power Requirements	120 V ~ ±3%, 50/60 Hz, Single Phase, 5.0-9.0 A 220 V ~ ±3%, 50/60 Hz, Single Phase, 3.5-7.0 A Maximum Power Consumption: 350-650W	120 V ~ ±3%, 50/60 Hz, Single Phase, 5.0-9.0 A 220 V ~ ±3%, 50/60 Hz, Single Phase, 3.5-7.0 A Maximum Power Consumption: 350-650W	208/210/220/230 VAC ~ ±3%, 50/60 Hz, Three Phase, 8.0-10.0 A Maximum Power Consumption: 1600-1700 W



ABSOLUTE OZONE®

OPERATOR'S MANUAL

Section 1

1C. Accessories

The ATLAS/TITAN/MAGNUM 30-200 could be used with several accessories and safety devices to assure long service life of the Generator.

1C.i Ozone Generation

- Air Compressor: air compressor pumps ambient air into the oxygen concentrator
- Oxygen Concentrator separates oxygen from Nitrogen and supplies it to ozone generating cell.
- Ozone Generating Cell design is based on proprietary Microfluidic Platform Technology, constructed from ozone resistant materials and offers extremely high performance and reliability. Ozone Cell is designed to be absolutely maintenance and service free. Anticipated service life 15-20 years.

1C.ii Required Equipment and Accessories

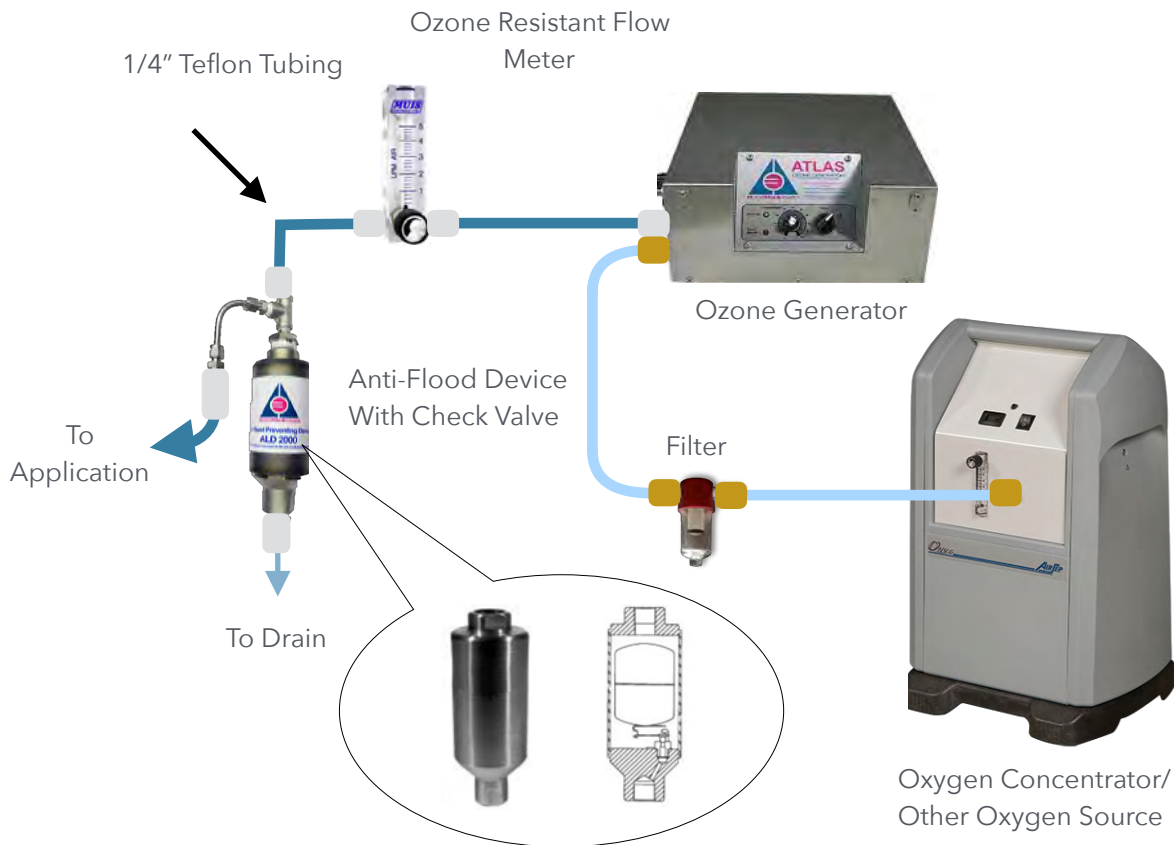
- Oxygen Concentrator: The oxygen concentrator uses a PSA (pressure swing adsorption) molecular sieve to remove dirt, moisture, nitrogen and other trace gases, producing oxygen at greater than 90% purity and less than -60°C dew-point. The air compressor pumps ambient air into the oxygen concentrator. Concentrated oxygen feed-gas enables ozone concentration up to 14% by weight. In our experience, Oxygen Concentrators made by AirSep work well with all Absolute Ozone generators.
- To protect Absolute Ozone Generator from sieve particles in case of oxygen concentrator failure we recommend installing Oxygen Filter Upstream from the generator.
- Ozone Flow Control Valve: Downstream from ozone generator to maintain working pressure across ozone cell as specified 20-120 PSIG for the unit.
- Automatic Ozone Compatible ALD2000 Water Drain system to prevent Ozone Generator flooding. Please note – **Non return valves (check valves) do not provide 100% protection to ozone generator!**
- We do not recommend installing ozone generator, without this device.



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Section 1



- Ozone Injector for Water Treatment Applications: Inlet water flows through the pump and through the ozone injector, creating vacuum that pulls ozone gas from the ozone generation module and injects the ozone into the water flow. The injector should be sized to dissolve a minimum of 90% of the ozone gas into the water flow continuously.
- Ozone Degas Chamber: Ozone-enriched water from the ozone injector flows into the degas chamber where the counter-current design forces any undissolved ozone gas through the float valve-protected top vent to the Ozone Destructor.
- Ozone Destructor: Undissolved ozone gas passes through the heated catalytic ozone destructor that is made of non-consumable manganese dioxide (heat protected from moisture fouling). The manganese dioxide and heat offer redundant ozone destruct capabilities.

For more information about this product visit our website at, <http://www.absoluteozone.com>



ABSOLUTE OZONE®

OPERATOR'S MANUAL

Installation

2A. Location

The ATLAS/TITAN/MAGNUM 30-200 Ozone Generators are designed to be installed on the wall, on the rack or stack up system in convenient location mobile cart or skied. Allow for access to protected electrical power and required gas connections and cooling air to the Ozone Generator. **Do not obstruct cooling air vents of the Generator!**

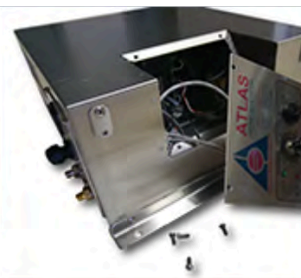
Unit could be installed indoors & outdoors if protected from weather element. Ambient working temperature from -10°C to $+30^{\circ}\text{C}$.

Reversible Universal Control Panel

We had to strive for efficiency in every detail, right down to how it connects and mounts. So we contributed to a new reversible universal control panel. Designed to efficiently accommodate installing the ATLAS in an upright or downright position



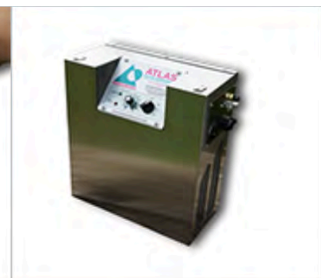
Control Panel In Upright Position



Remove 4 screws and reverse the control panel in the downright position



Tighten Screws



Now the ATLAS/Magnum can be installed in this position

Stackable Without a Rack

Every Absolute Ozone® ozone generator comes equipped with attachment tabs that can be reversed to provide you with the liberty to install the ATLAS one on top of another in a rack mount formation but without requiring a rack.



Reversible tabs in original position



Loosen screws and swing the tab into the upright position



Tighten Screws



Now the ATLAS/Magnum can be installed in this position

For more information about this product visit our website at, <http://www.absoluteozone.com>



ABSOLUTE OZONE®

OPERATOR'S MANUAL

Section 2

2B. Electrical

Main Power Supply Circuit: The ATLAS/TITAN/MAGNUM 30-200 are supplied with 3-5 feet power cord. Connect the power cord to a standard grounded 15 Amp (10 Amp International) power source, according to a local electrical code only.

2C. Plumbing

When injecting Ozone in to water all measures should be taking to protect the Generator Cell from water exposure, which may cause internal cell damage. A small tank with/or an automatic water drain system is recommended.

2D. Gas Connections

The Ozone Generator should be connected by tubing made from material appropriate for ozone and oxygen applications. Connect the Ozone Generator according to indications on input and output bulkheads. All efforts should be made to protect the generator from exposure to excessive pressure fluctuations, which may lead to the damage of electronic circuitry and Ozone Cell. For applications where pressure fluctuations are possible we strongly recommend installation of a buffer tank with an appropriate hi-low pressure switch. It is **VERY IMPORTANT** to protect the Generator from any possible contamination from the Oxygen Concentrator or from water injection device, by installing oxygen monitor and filter upstream from the Generator and automatic water drain device in combination with check valve. Concentration of feed oxygen should not be below 90%.

2E. Remote Control

All Absolute Ozone Generators are equipped with standard "On/Off" remote control terminals to enabling operator, ambient ozone monitor or PLC to remotely switch the Ozone Generator On or Off.

This contacts have to be connected to dry contact only (not connected to the ground on any kind or to any voltage source AC or DC)



ABSOLUTE OZONE®

OPERATOR'S MANUAL

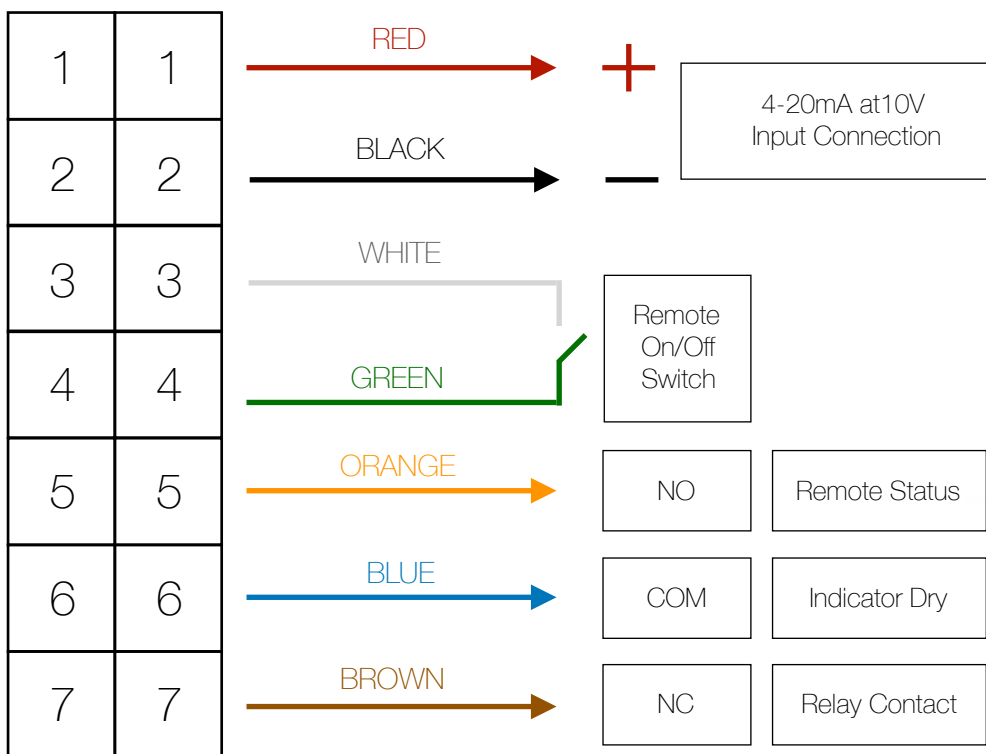
Section 2

2E. 4-20mA On/Off Power Remote Control

Description and Schematic of remote control features:

- Remote control of ozone production level by 4-20mA at 10 V signal, no special switching for both of these signals required
- Remote On/Off. Remote Switch must be normally open for the generator to be "On" and closed to stop the Ozone production.
- That switch has to be connected to dry contacts only (not connected to the ground on any kind or to any voltage source AC or DC)
- Remote Ozone Generator status indicator.
 - a. During Normal Ozone generator operation pin 5 –normally open, pin 6– common, pin 7 –normally closed.
 - b. If Remote Control Switch is off or safety shutoff is activated the circuit will be closed between pins 5 & 6.

Standard Remote Control Schematic



Use Shielded Cable Only!
Ground Shield Only on One Side!



Status Indicator Relay
1A,
120-240VAC/
24VDC

Remote Control Cables of required length are available as a special order option

For more information about this product visit our website at, <http://www.absoluteozone.com>



ABSOLUTE OZONE®

OPERATOR'S MANUAL

Control Panel

3A. LCD Control Panel Overview

Here is a general description of the controller and features it offers:

All Atlas Absolute Ozone® come with 4-20mA remote power control as a standard feature that allows to select power going to the ozone cell that is later automatically monitored and maintained by a control system, regardless of minor voltage or pressure deviations. It is standard for all Atlas & Magnum ozone generators.

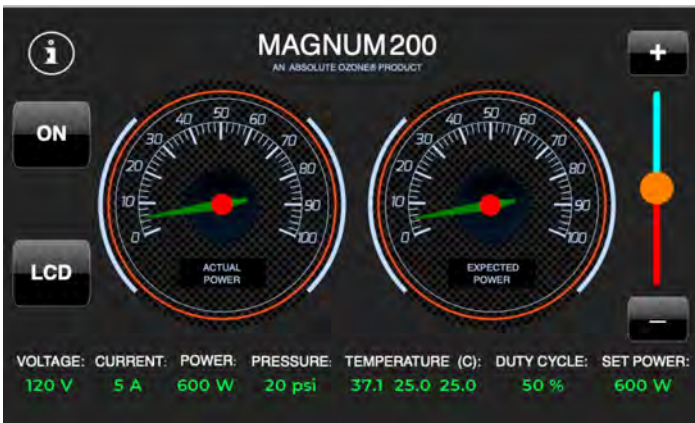
On top of it new generation controller protects the generator from damage caused by:

- connecting to incorrect power source,
- incorrect wiring or voltage applied to the remote control terminals,
- incorrect operating pressure,
- ozone cell contamination by water or similar,
- overheating or failure of the cooling system, etc.

In addition all Atlas ozone generators have:

- Status indicator that has No/Nc contacts that will change the status every time the generator is not producing any ozone regardless of the reason.
- On/Off contacts that are "NO" normally open. If the contacts are closed by external dry contact relay, the generator will move in to a standby mode. Once the contacts are open, the generator will start producing ozone again.

Photos of typical LCD 5" control touch screen:



The LCD screen shows the following parameters:

- Selected or Expected power setting %, so you will be able to see on the screen power selected by the remote control or slider.
- Actual power % & Watt going to an ozone cell.
- The cell voltage V
- Current Amp going to the ozone cell,
- Gas pressure inside the ozone cell
- Temperature inside the ozone cell.
- The LCD screen will allow by touch to switch the generator on and off and to adjust desire power by moving slider on the screen with your finger.

For more information about this product visit our website at, <http://www.absoluteozone.com>

- In a case when incorrect operating parameters are applied to an ozone generator the unit is switched off by the control system and LCD screen will indicate which of parameters caused the generator shutdown.
- In a safety shutdown mode the generator will be constantly monitoring operating parameters and the moment they are corrected the generator will restart automatically, without any assistance.
- I.e. if there is a power spike or if there is a pressure drop caused by temporary power failure and interruption of oxygen supply, the moment the pressure is normal again or voltage supplied is within the operating range, the generator will restart and will produce ozone again.

3B. System Startup

1. Make sure the Ozone Generator enclosure is securely attached to an appropriate frame or wall Ozone Generators Stack.
2. Make sure all connections to the generator, power and gas are made according to local codes and regulations.
3. Purge the generator with 90% or higher concentration oxygen and assure free flow of oxygen through the system and removal of contaminants. Conduct system leak test applying working pressure +/- 10% using oxygen only. Adjust gas pressure across the cell according to specifications using downstream Control Valve (on flow meter) and pressure gage (supplied by the installer).
4. Plug the system into a specified receptacle.
5. Flip the Power Switch in to "ON" position.
6. Slide red dot on the power control slider upwards to adjust to desired power from 0-100% according to supplied "Ozone Generator Performance Test" chart. Now the generator is in optimum production mode, and ozone should be flowing through the system.

3C. System Shutdown

1. Slide red dot on the power control slider downwards to adjust power from to 0%. (No ozone is produced at this time.)
2. Switch the power switch (located on the side panel) to OFF position.
3. Unplug the system from the power source if required.
4. Close down the downstream Control Valve (located on the flow meter -supplied by installer) to protect unit from accidental flooding.
5. Turn the oxygen source off.



ABSOLUTE OZONE®

OPERATOR'S MANUAL

Section 3

3D. Standard Operating Procedures

NOTE: To assure a long trouble-free service life of the ATLAS/TITAN/MAGNUM 30-200 Ozone Generators, provide following operating conditions:

- Make sure that the oxygen concentrator is maintained properly and is producing oxygen at greater than 90% purity and less than -60°C dew point. Check sieve conditions and replace it as often as recommended by manufacturer
- Install oxygen filter and oxygen dryer between oxygen concentrator and the Ozone Generator, check condition and replace a cartridge as to protect Ozone Generator from sieve particles in case of oxygen generator failure and moisture.
- Make sure to maintain working pressure across ozone cell as specified for the generator protection and most efficient ozone production.
- When injecting ozone in to water make sure to protect the generator from flooding by installing ALD 2000 Flood Prevention device (can be supplied) capable of preventing water backup. Check valves usually start leaking after few days of operation in ozone and cause serious damage to the ozone cell. We recommend using devices, which could automatically drain water out of ozone line and stop it from entering the ozone cell.
- Protect internal components of the Ozone Generator from water, snow, excessive dust, dirt, humidity, vibration, and/or mechanical shock; make sure that there is a sufficient amount of clean air available for the unit cooling air **and inlet and outlet are not obstructed by other equipment or elements.**
- Check that electrical power fluctuations are within +/- 10% of the specified AC Voltage and install power-conditioning devices if necessary.



ABSOLUTE OZONE®

OPERATOR'S MANUAL

Maintenance and Service

4A. Preventative Maintenance

Generally the ATLAS/TITAN/MAGNUM 30-200 are maintenance-free although it is useful to check the Ozone Generator for proper operation:

- a. Verify on the LCD display panel that parameters indicated are consistent with your

On a monthly basis:

1. Make sure that all system equipment (oxygen concentrator, air compressor, etc.) is maintained according to the manufacturer recommendations.
2. Remove and replace or clean filter cartridges and other devices if installed and required.
3. Perform general cleaning of cabinet exterior after disconnecting the equipment from electrical source.
4. Using clean/dry compressed air, blow out the interior of cabinet, taking special care around electronic components and wiring.



ABSOLUTE OZONE®

OPERATOR'S MANUAL

Section 4

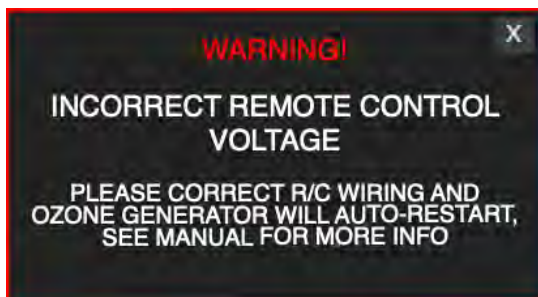
4B. Troubleshooting

Knowledge of electrical applications is required for troubleshooting. Contact a certified electrician if you are unsure of your ability to service the equipment. If

any problem persists, please call 780-486-3761. We will have one of our system engineers discuss your situation with you over the phone.

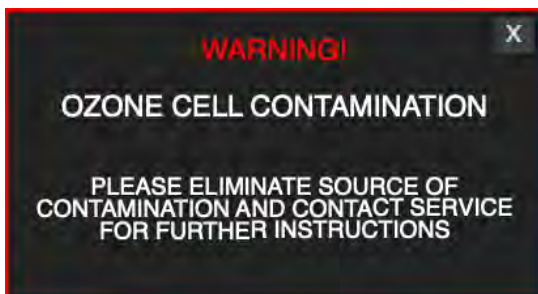
Symptom (Warning Message): INCORRECT REMOTE CONTROL VOLTAGE

PLEASE MAKE SURE THE VOLTAGE YOU HAVE SUPPLIED TO THE REMOTE CONTROL (4-20MA SIGNAL) IS NOT HIGHER THAN 10V.



Symptom (Warning Message): OZONE CELL CONTAMINATION

THE OZONE SENSOR DETECTED OZONE CELL CONTAMINATION BY WATER OR POSSIBLY SOME OTHER CONDUCTIVE LIQUIDS. PLEASE SWITCH THE OZONE GENERATOR OFF, LOCATE AND ELIMINATE THE SOURCE OF THE CONTAMINATION, WHILE HAVING POWER OFF. RUN OXYGEN THROUGH THE OZONE CELL FOR SEVERAL DAYS TO DRY THE LIQUID AND/OR OTHER CONTAMINANTS OUT AND THEN TRY TO RESTART THE OZONE GENERATOR. IF THE PROBLEM PERSISTS PLEASE CONTACT ABSOLUTE OZONE TECHNICAL SUPPORT.





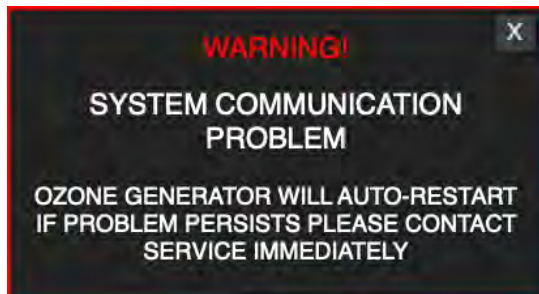
ABSOLUTE OZONE®

OPERATOR'S MANUAL

Section 4

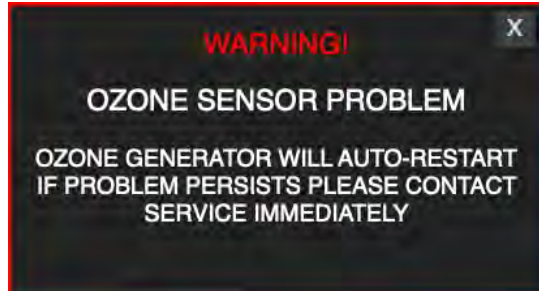
Symptom (Warning Message): SYSTEM COMMUNICATION PROBLEM

IF AFTER SEVERAL ATTEMPTS DOES NOT RESTART, PLEASE CONTACT US TECHNICAL SUPPORT



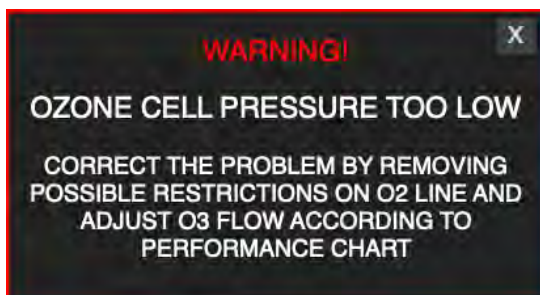
Symptom (Warning Message): OZONE SENSOR PROBLEM

AFTER SEVERAL ATTEMPTS DOES NOT RESTART, PLEASE CONTACT US TECHNICAL SUPPORT



Symptom (Warning Message): OZONE CELL PRESSURE TOO LOW

PLEASE MAKE SURE THERE ARE NO RESTRICTIONS ON THE OXYGEN LINE COMING TO THE OZONE GENERATOR AND THAT THE FLOW IS ONLY ADJUSTED ON THE OZONE LINE AFTER THE OZONE GENERATOR TO MAINTAIN CORRECT WORKING PRESSURE, IF THE PRESSURE IS TOO LOW DUE TO INCORRECTLY SET PRESSURE REGULATOR OR FAILURE OF OXYGEN GENERATORS, PLEASE RECTIFY THE PROBLEM AND THE OZONE GENERATOR WILL CONTINUE OPERATION.





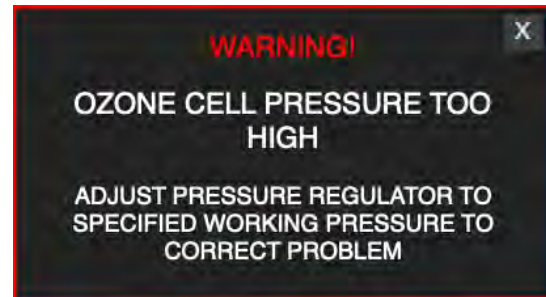
ABSOLUTE OZONE®

OPERATOR'S MANUAL

Section 4

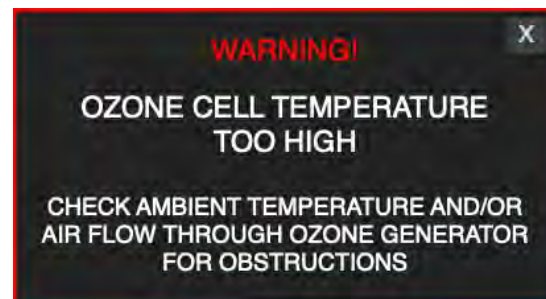
Symptom (Warning Message): OZONE CELL PRESSURE TOO HIGH

PLEASE ADJUST OXYGEN PRESSURE REGULATOR TO SPECIFIED PRESSURE AND THAT WILL RECTIFY THIS PROBLEM AND WARNING MESSAGE.



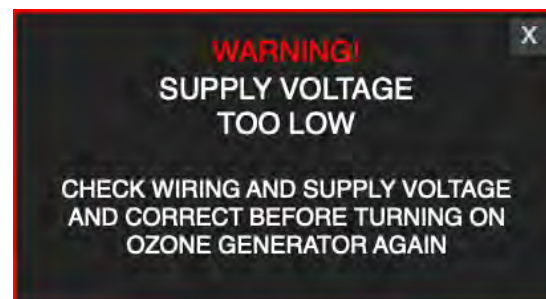
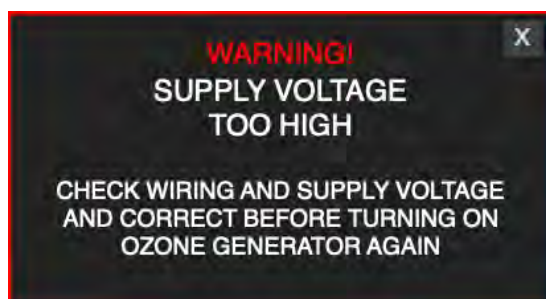
Symptom (Warning Message): OZONE CELL TEMPERATURE TOO HIGH

MAKE SURE THAT THE AMBIENT TEMPERATURE IN THE INSTALLATION ROOM IS BELOW 25 C, CHECK THAT THERE IS GOOD UNRESTRICTED COOLING AIRFLOW THROUGH THE OZONE GENERATOR (NOT OBSTRUCTED ON EITHER SIDE OF COOLING GRILLS). PLEASE MAKE SURE THAT THE COOLING FAN IS WORKING PROPERLY. IN CASE OF THE COOLING FAN FAILURE, PLEASE CONTACT TECHNICAL SUPPORT FOR FURTHER INSTRUCTIONS



Symptom (Warning Message): SUPPLY VOLTAGE TOO HIGH OR TOO LOW

PLEASE MAKE SURE THAT THE VOLTAGE SUPPLIED TO THE OZONE GENERATOR AS SPECIFIED +/- 5% IN ORDER TO CORRECT THE PROBLEM. IF VOLTAGE SUPPLIED IS AS SPECIFIED AND THE PROBLEM PERSISTS, PLEASE CONTACT OUR SERVICE DEPARTMENT





ABSOLUTE OZONE®

OPERATOR'S MANUAL

Safety Procedures and Ozone Overview

5A. Ozone Use and Technology Overview

5A.i Relative Strength of Ozone

The following compares the strengths of several common oxidizing reagents (EOP vs. Cl₂)

- Elemental Fluorine (2.25)
- Hydroxyl Radical (2.05)
- Ozone (1.52)
- Hydrogen Peroxide (1.30)
- Hypochlorite (1.10)
- Chlorine (1.00)
- Chlorine Dioxide (0.93)
- Bromine (0.57)

5A.ii Micro-Flocculation and Oxidation

Ozone oxidizes the following metals (known as micro-flocculation), enabling their removal via filtration:

- Iron
- Copper
- Manganese
- Zinc
- Arsenic

Ozone neutralizes "nuisance" compounds - most commonly, hydrogen sulfide.

5B. General Safety Information

5B.i Ozone Properties

- Colorless to blue gas (greater than -169°F)
- Characteristic odor often associated with electrical sparks or lightning in concentrations of less than 0.02 ppm
- Highly chemically reactive
- Non-flammable, non-carcinogenic
- Hazardous polymerization can occur in some rear materials
- Spontaneously decomposes to oxygen gas

For more information about this product visit our website at, <http://www.absoluteozone.com>



ABSOLUTE OZONE®

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5B.ii Ozone Uses

- Chemical Oxidation
- Organic Oxidation

5C. Hazards

5C.i Health Hazards – Detection Levels

Gaseous ozone can be detected in air by its distinctive odor at concentrations of about 0.02 ppm. Although each nose varies, olfactory fatigue occurs quickly. Initial small exposure may reduce cell sensitivity and/or increase mucous thickness producing a resistance to low gaseous ozone levels.

DO NOT RELY ON ODOR AS A WARNING OF HIGH OZONE

CONCENTRATIONS. The Permissible Exposure Level (PEL) or time-weighted concentration for gaseous ozone to which workers may be exposed is 0.1 ppm averaged over 8 hours, 5 days a week (OSHA). The short-term exposure limit is 0.3 ppm averaged over 15 minutes. The concentration of 5.0 ppm ozone in air is generally accepted as Immediately Dangerous to Life or Health (IDLH).



ABSOLUTE OZONE®

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5C.ii Health Hazards – Effects on Humans

Gaseous ozone acts as a primary irritant, affecting mainly the eyes, upper respiratory tract and the lungs. Inhalation produces various degrees of respiratory effects from irritation to pulmonary edema (fluid in lungs). Short exposure to 1-2 ppm concentrations causes headache as well as irritation to the respiratory system but symptoms subside when exposure ends. High concentrations of ozone produce severe irritation to the eyes and respiratory system. Exposure above the ACGIH/OSHA limits may produce nausea, chest pain, coughing, fatigue, reduced visual acuity and pulmonary edema. Symptoms of edema from excessive exposure can be delayed one or more hours. There is no threshold limit and so no exposure (regardless of how small) is theoretically without effect from ozone's strong oxidative ability.

TOXIC EFFECTS OF GASEOUS OZONE

OZONE CONCENTRATION (PPM)	EFFECT
0.01 - 0.10	Range of Odor Threshold
0.1	Permissible concentration (8 hour work day)*
0.3	Permitted short-term exposure (15min.)*
0.01 - 0.1	Headaches, irritation to respiratory tract, severe irritation to eyes
1.0 - 10.0	Nausea, chest pain, coughing, fatigue, reduced visual acuity, pulmonary edema
5.0	Immediately Dangerous to Life or Health (I.D.L.H)*
>20.0	Can be fatal after 1 hour
>50.0	Can be fatal after 30 minutes

*Regulatory Levels

For more information about this product visit our website at, <http://www.absoluteozone.com>



ABSOLUTE OZONE®

OPERATOR'S MANUAL

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5C.iii Electrical Hazards

Turn OFF all power switches and disconnect power cord from power source receptacle before performing service work. Failure to do so could result in serious injury or death. Operate the ATLAS/TITAN/MAGNUM 30-200 with safe access to electrical power. Connect the ATLAS/TITAN/MAGNUM 30-200 to a G.F.C.I. type receptacle or as required by local electrical code & regulations. Do not bury the electrical cord. To reduce risk of electrical shock, replace damaged cord immediately.

5C.iv Fire Hazards

Ozone is nonflammable. Decomposition of ozone into oxygen gas (O₂) can increase strength of fire. Ozone is unstable at room temperature and spontaneously decomposes to oxygen gas. Avoid ignition sources such as heat, sparks, and open flame. Keep away from strong combustible materials such as grease, oils, and fats.

5C.v Chemical Action

Ozone is chemically incompatible with all oxidizable materials, both organic and inorganic.

5D. Precautions for Safe Handling and Use

5D.i Ozone Monitors

Ambient ozone monitoring equipment should be installed in the areas where ozone is being generated or applied. (See Monitoring section 6F.) Self-adhesive ozone monitor badges, such as the Chromair® System by K&M Environmental (Virginia Beach, VA, www.kandmenvironmental.com), may be used for personal or area monitoring for exposure times ranging from 5 minutes to 10 hours.

5D.ii Ventilation

It is mandatory that general and local exhaust ventilation be provided to dilute and disperse small amounts of ozone into the outside atmosphere. Federal, state, and local regulations must be followed.



ABSOLUTE OZONE®

OPERATOR'S MANUAL

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5D.iii Emergency Procedure

Due to the short life of ozone, evacuation and ventilation is all that is generally required in the event of a high ambient ozone alarm. All ozone generating and delivery equipment should be shut down (manually or automatically by alarm) and a high-speed fan activated to dilute and disperse ozone in to the atmosphere. Personnel should leave the affected area until levels are returned to below 0.1ppm.

5D.iv Respiratory Protection

A disposable respirator (3M #N95 8214/8514 - Minneapolis, MN, www.3m.com) is recommended for relief against ozone levels up to 10 times the OSHA PEL or applicable government occupational exposure limits, whichever is lower.

5D.v Education and Training

The education and training of workers is the responsibility of the employer. An effective training program must be practical, based on written work procedures and be specific to both the job-site and the tasks to be performed. Training shall also include the responsibilities and responses of workers in an emergency. The employer shall ensure through the education and training program that all workers are able to work without risk to themselves or others around them.

All workers must clearly understand their responsibilities with regard to not only specific work procedures, but also the need to report all hazards, accidents or incidents and injuries. Management and employees shall review all routine work and emergency procedures jointly at least once annually.



ABSOLUTE OZONE®

OPERATOR'S MANUAL

Section 5

5E. System Operation and Maintenance

5E.i Safety Precautions and Equipment

Repair and maintenance of the ozone system shall be done under the direction of qualified personnel. Qualification shall consist of instruction and training by the equipment supplier in the safeguards and procedures necessary for safe performance of the work. A certificate of completion of such training shall be provided. Repair of Ozone Generator could be performed only at Absolute Ozone facilities unless authorized and instructed otherwise by Absolute Ozone personnel.

All equipment in an ozone plant (ozone generator, piping, pumps, tanks...) coming in contact with gases containing ozone must be maintained free of oil and grease. Monitoring equipment and alarm system shall be tested and serviced according to the manufacturer's instructions. The planned maintenance of all safety equipment is essential to worker safety.

5E.ii Maintenance Requirements

It is the joint responsibility of the manufacturer, supplier and installer of the Ozone Generating and handling equipment to determine whether or not the system is working properly. The operation and maintenance manual provided with the equipment outlines the operating procedures and maintenance requirements.

5F. Monitoring

5F.i Location of Monitors

Ambient ozone detection monitors shall be located to monitor ozone room air and production/plant room air for indoor applications.



ABSOLUTE OZONE®

OPERATOR'S MANUAL

Section 5

5F.ii Monitoring Equipment

Proper Ozone Monitoring equipment should be use to protect personnel from dangerous levels of ozone exposure. Absolute Ozone could provide suitable ozone monitoring at customer request.

5G. First Aid Procedures

5G.i General Information

1. DO NOT PANIC. If exposure to gaseous ozone causes headaches or shortness of breath, immediately remove the worker to a fresh-air environment.
2. Ensure there is no more danger to yourself or the worker.
3. Workers who have been exposed to low concentrations of ozone should be given oxygen to breathe while under the observation of trained personnel.
4. If exposure is severe, send for medical assistance immediately.

5G.ii Inhalation

1. Assess worker's breathing.
2. All unconscious workers must be placed in the drainage position (on their sides); so that fluids can drain from the airways once breathing has been restored.
3. Check pulse.
4. If breathing has ceased, start artificial respiration (rescue breathing is the most effective method) until breathing has been restored.
5. Send for medical assistance immediately.
6. If absent, begin cardiopulmonary resuscitation (CPR).

5G.iii Eye Contact

1. Effective irrigation should start immediately. Eyes should be irritated for 30 minutes by the clock with running tap water or preferably normal saline.
2. Effective irrigation must be continued while en-route to hospital.



ABSOLUTE OZONE®

OPERATOR'S MANUAL

Section 5

5G.iv Precautions

Workers with a previous cardiopulmonary (heart and lung) condition must consult their physician prior to working in an area in which they may be exposed to ozone. Significant alterations in cardiopulmonary functions have been documented when such workers have been exposed to low concentrations of ozone.

5G.v Emergency Information Form

An emergency information form (see below) should be filled out prior to operating the Ozone Generator.

EMERGENCY INFORMATION	
FILL IN ALL INFORMATION NOW. IF YOU DO NOT KNOW, FIND OUT BEFORE AN EMERGENCY OCCURS.	
Person responsible for control/evacuation:	
Phone #:	
Alternate:	
Phone#:	
Emergency response team:	
Phone #:	
Fire Department:	
Phone#:	
Doctor/First Aid:	
Phone #:	
Hospital:	
Phone#:	
Ozone Manufacturer:	
Phone #:	
Ozone Leak Location:	
Locations to notify in emergency situations:	
Name:	Phone:

For more information about this product visit our website at, <http://www.absoluteozone.com>



ABSOLUTE OZONE®

OPERATOR'S MANUAL

Warranty

Absolute Ozone Five Years Limited Warranty

The limited warranty set forth below applies to products manufactured by Absolute Ozone 10712 - 181 Street, Edmonton, AB., T5S 1K8, Canada, and sold by Absolute Ozone and its authorized dealers. This limited warranty is given only to the first retail purchaser of such products and is not transferable to any subsequent owners or purchasers of such products.

Absolute Ozone warrants that Absolute Ozone will repair or replace, at Absolute Ozone's option, any part of such products proven to be defective in materials or workmanship within Five (5) years from date of original purchase. Parts are covered under the Five (5) year warranty when and only when required operating conditions and procedures as described in this manual are performed and provided. This Warranty specifically excludes any components not manufactured by Absolute Ozone that are external to the products covered, such as pumps, air compressors, monitors, tanks, or related components. Absolute Ozone will assist with warranty claims for such components purchased through Absolute Ozone; limited to the extent of the manufacturer's standard warranty. ANY REPAIR OR REPLACEMENT WILL BE WARRANTED ONLY FOR THE BALANCE OF THE ORIGINAL FIVE (5) YEAR WARRANTY PERIOD.

THIS LIMITED WARRANTY DOES NOT INCLUDE ANY OF THE FOLLOWING:

- (a) Any labor charges for troubleshooting, removal, or installation of such parts;
- (b) Any repair or replacement of such parts necessitated by faulty installation, or improper operating procedures and conditions, misuse, abuse, negligence, accident, fire, flood, repair materials, and/or unauthorized accessories;
- (c) Any such products installed without regard to required local codes and accepted trade practices;
- (d) Damage caused by water passing through unit;
- (e) Damage caused by operating below or above specified working pressure;
- (f) ANY IMPLIED WARRANTY OF MERCHANTABILITY OR IMPLIED WARRANTY OF FITNESS FOR PARTICULAR PURPOSE, AND SUCH WARRANTIES ARE HEREBY DISCLAIMED; AND
- (g) ABSOLUTE OZONE SHALL NOT BE LIABLE UNDER ANY CIRCUMSTANCES FOR LOSS OF USE OF SUCH PRODUCTS, LOST PROFITS, DIRECT DAMAGES, INDIRECT DAMAGES, CONSEQUENTIAL DAMAGES AND/OR INCIDENTAL DAMAGES.



ABSOLUTE OZONE®

OPERATOR'S MANUAL

Warranty

NOTE: ANY WORK PERFORMED ON ABSOLUTE OZONE PRODUCTS WITHOUT PRIOR AUTHORIZATION FROM ABSOLUTE OZONE WILL AUTOMATICALLY VOID THIS WARRANTY. ANY ABSOLUTE OZONE PRODUCT MUST BE RETURNED TO ABSOLUTE OZONE PREPAID, FOR WARRANTY EVALUATION.

THE OZONE CELL CONTAINS TAMPER PROOF DEVICE. ANY ATTEMPT TO OPEN THE CELL WILL NOT ONLY VOID THE WARRANTY, BUT WILL VOID A POSSIBILITY OF OBTAINING ANY SERVICE BY ABSOLUTE OZONE.

TO OBTAIN WARRANTY SERVICE:

Please provide the following information:

1. Project, contact name, mailing address and telephone
2. Installer/Mechanical Contractor
3. Serial # and date of purchase
4. The date of failure
5. A description of the failure
6. **All shipping documents should clearly state “Warranty Repair” and indicated RMA number.** Absolute Ozone is not responsible for double taxes or duties resulted from improper shipping documentation.

Absolute Ozone
10712 – 181 Street,
Edmonton, Alberta,
T5S 1K8, Canada

Customer Service: 780-486-3761
Web: www.absoluteozone.com
Email: info@absoluteozone.com

For more information about this product visit our website at, <http://www.absoluteozone.com>



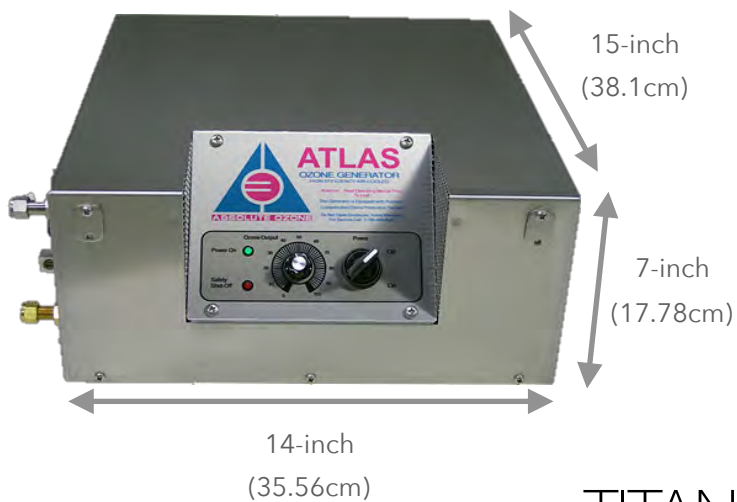
ABSOLUTE OZONE®

OPERATOR'S MANUAL

Dimensions

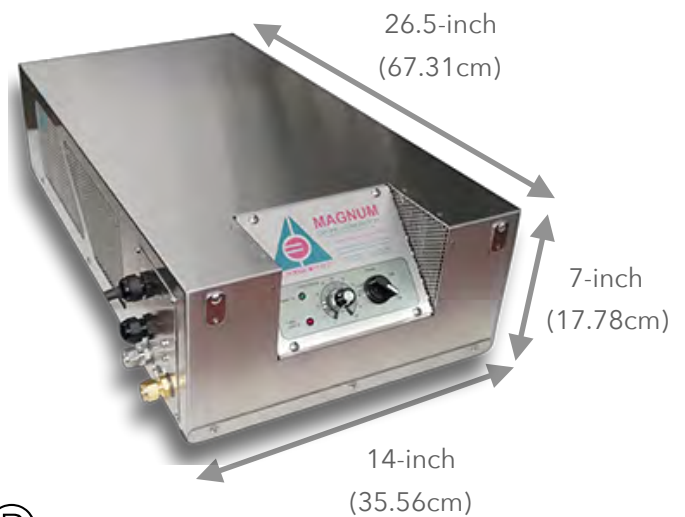
ATLAS®

Weight:
26lbs. - 32lbs.
(11.79 kg) - (14.52kg)



MAGNUM®

Weight:
53lbs.
(24.04kg)



TITAN®

Weight:
26lbs. - 32lbs.
(11.79 kg) - (14.52kg)



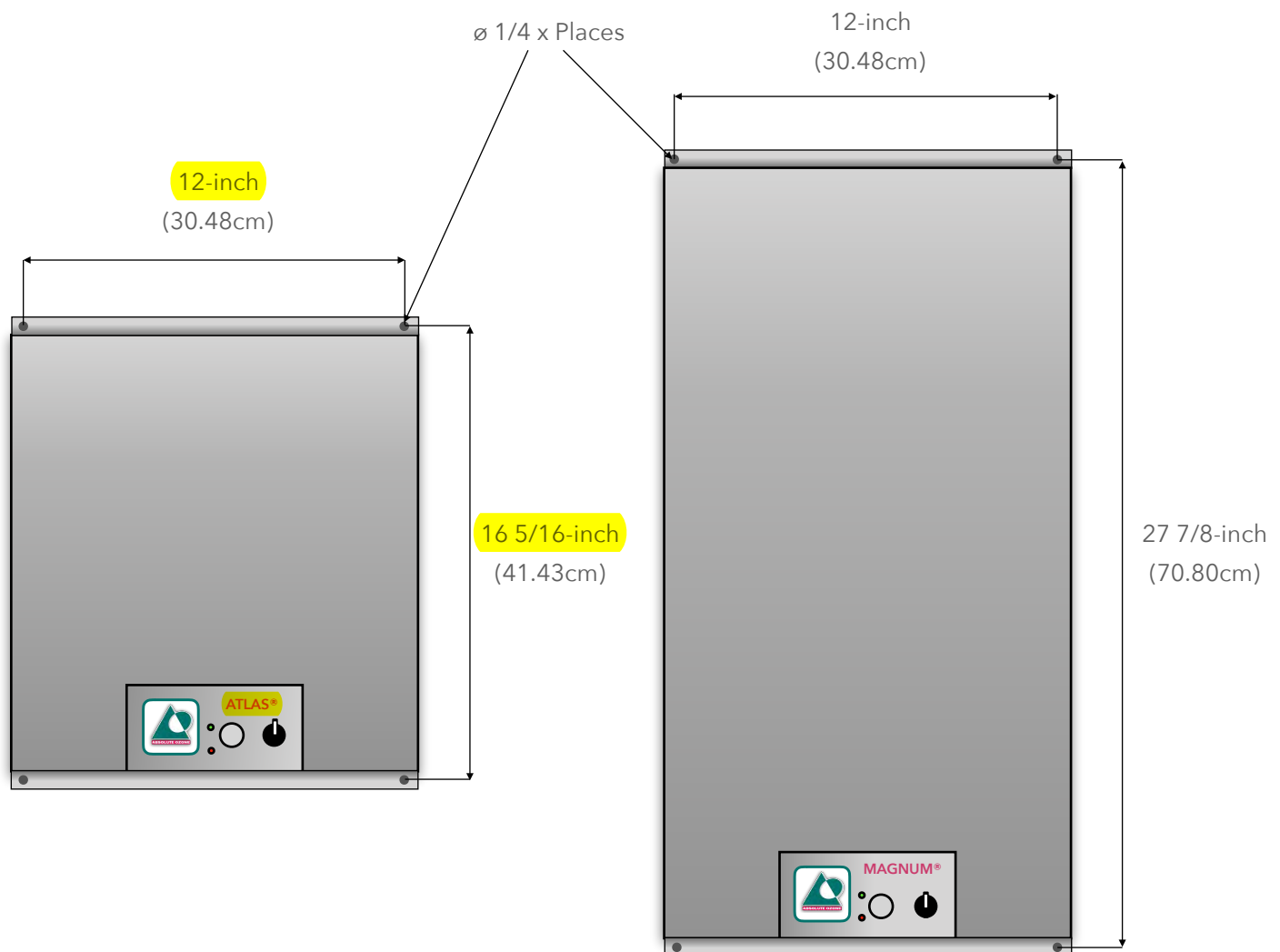
For more information about this product visit our website at, <http://www.absoluteozone.com>



ABSOLUTE OZONE®

OPERATOR'S MANUAL

Dimensions

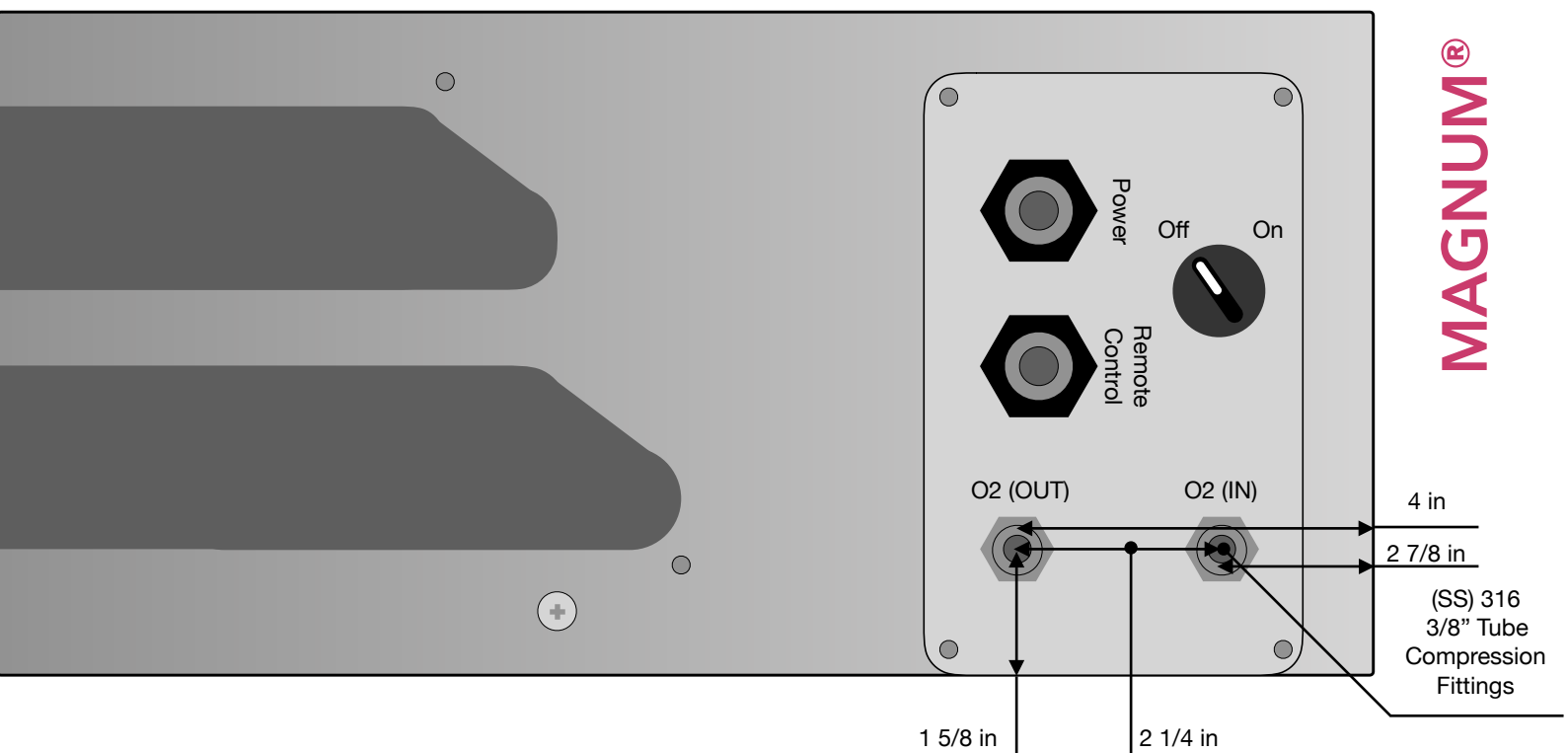
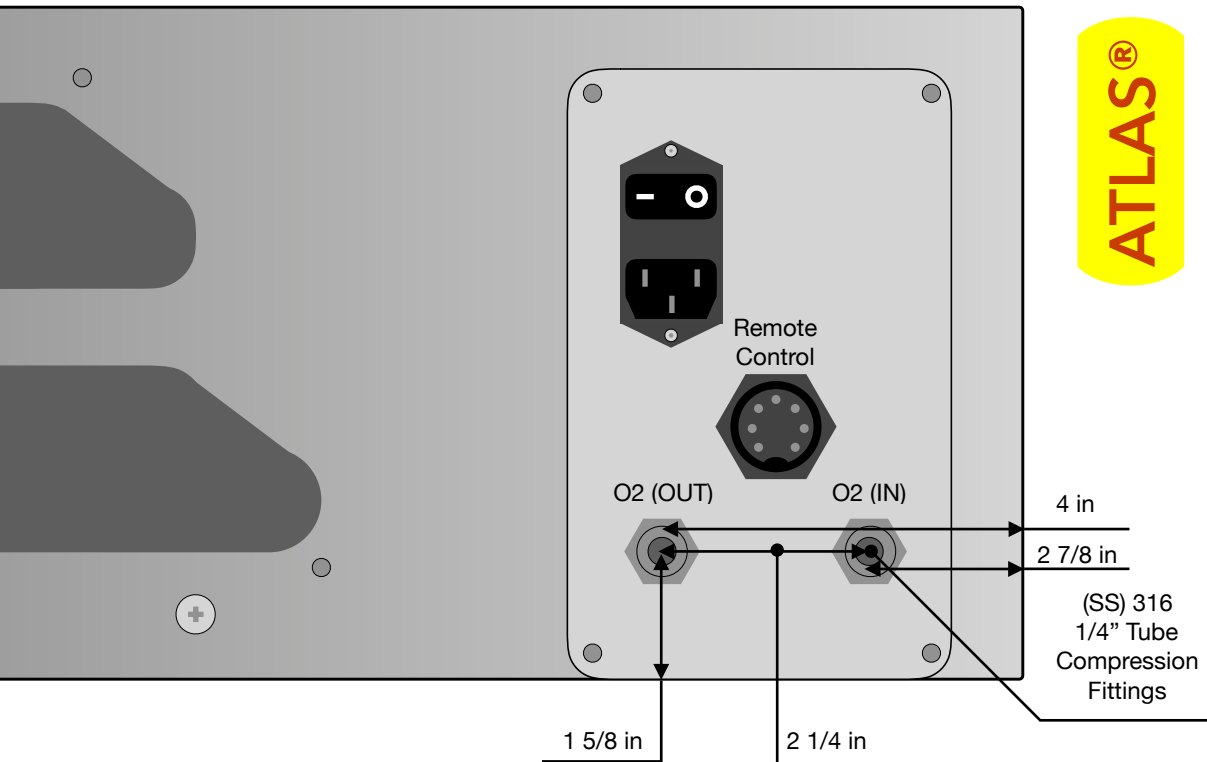


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ABSOLUTE OZONE®

Dimensions

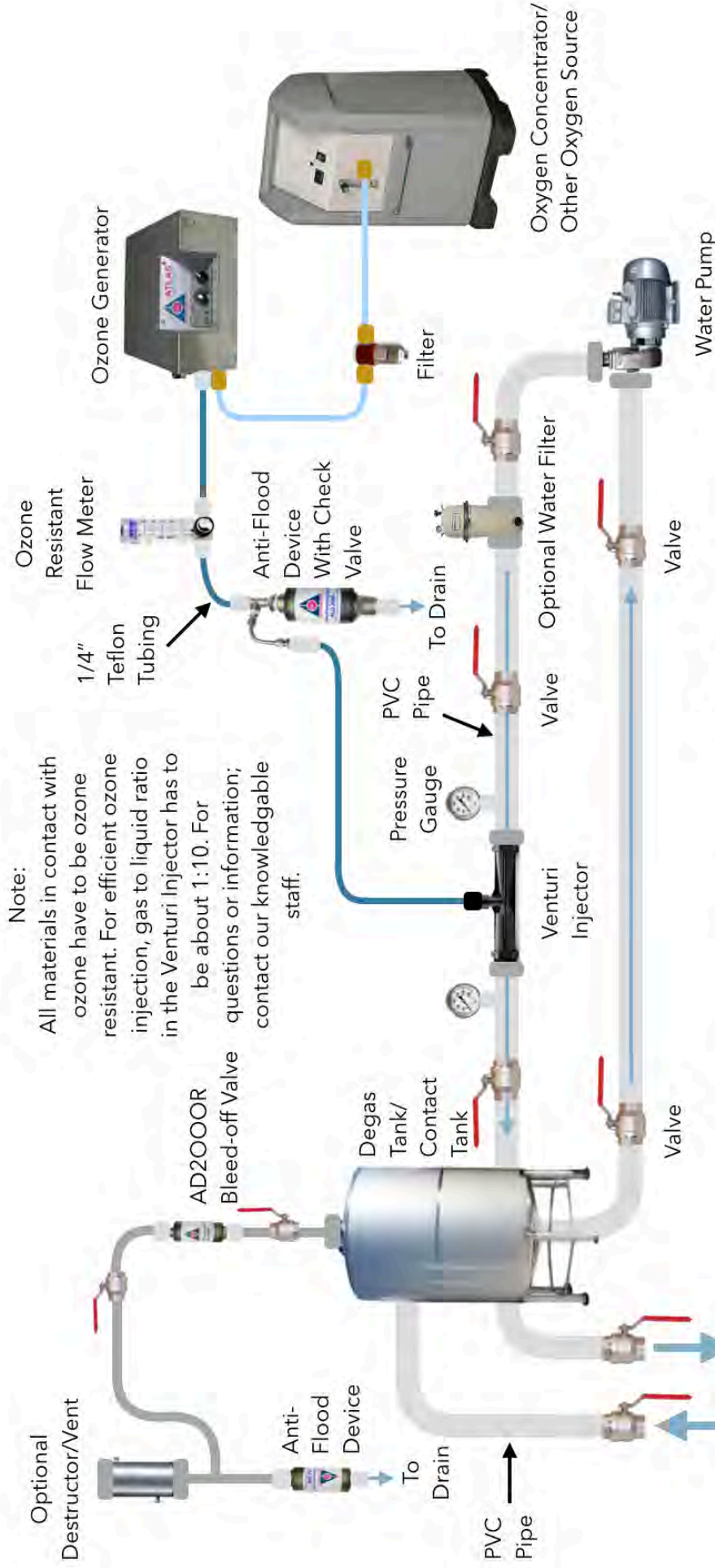




ABSOLUTE OZONE®

Conceptual Ozone Injection System

OPERATOR'S MANUAL



ATTENTION

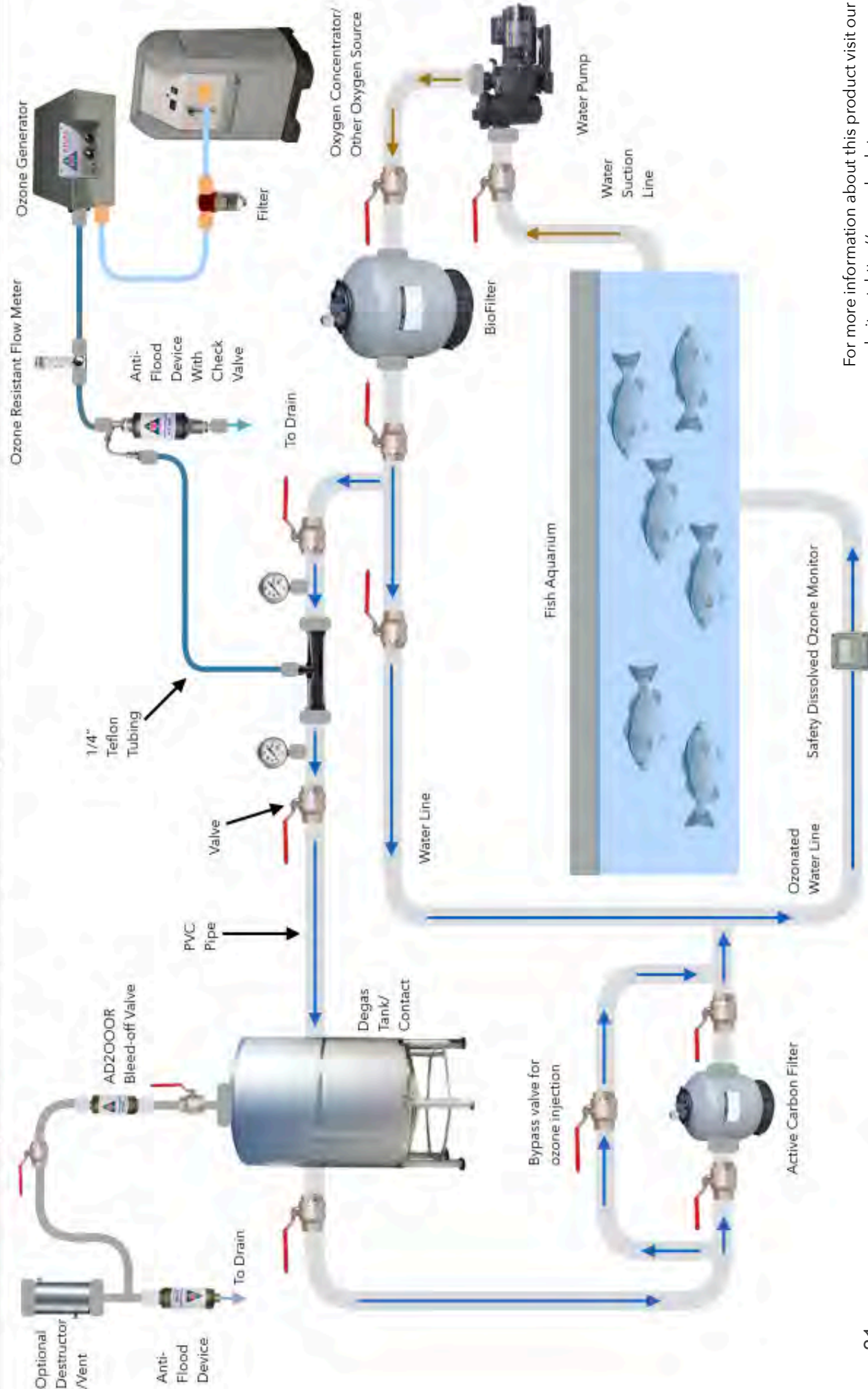
All Absolute Ozone® generators are designed to work without service, any maintenance, or spare parts, for the first 15 years of use if they are installed correctly. Therefore, it is important to maintain correct working pressure across the ozone generator, good feed gas quality, and protect the generator from flooding or external contamination. For good ozone generator performance, it is important to place generator in a well ventilated, dust free environment, and maintain ambient temperature at 20-22°C.

For more information about this product visit our website at, <http://www.absoluteozone.com>



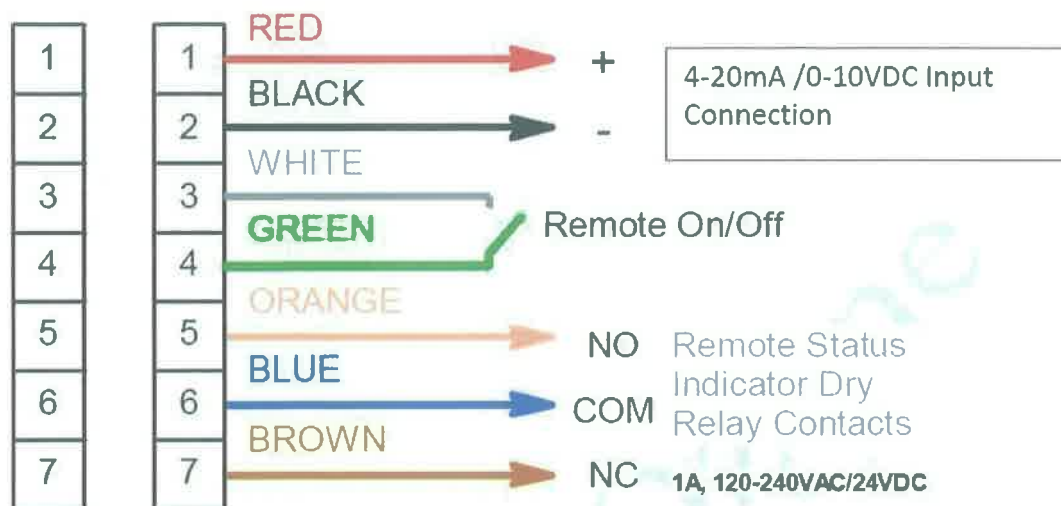
ABSOLUTE OZONE®

AquaCulture Ozone Injection Diagram



For more information about this product visit our website at, <http://www.absoluteozone.com>

Full Remote Control Connection Schematic



Use Shielded Cable Only!
Ground Shield Only on
One Side!



Absolute Ozone® Five Year Limited Warranty

The limited warranty set forth below applies to products manufactured by Absolute Ozone 10712 - 181 Street, Edmonton, AB, T5S 1K8, Canada, and sold by Absolute Ozone and its authorized dealers. This limited warranty is given only to the first retail purchaser of such products and is not transferable to any subsequent owners or purchasers of such products. Absolute Ozone warrants that Absolute Ozone or Absolute Ozone authorized dealers will repair or replace, at Absolute Ozone's option, any part of such products proven to be defective in materials or workmanship within five (5) years from date of original purchase. Parts are covered under the five (5) year warranty when and only when required operating conditions and procedures as described in this manual are performed and provided.

This Warranty specifically excludes any components not manufactured by Absolute Ozone that are external to the products covered, such as pumps, air compressors, monitors, tanks, or related components. Absolute Ozone will assist with warranty claims for such components purchased through Absolute Ozone; limited to the extent of the manufacturer's standard warranty.

ANY REPAIR OR REPLACEMENT WILL BE WARRANTED ONLY FOR THE BALANCE OF THE ORIGINAL FIVE (5) YEAR WARRANTY PERIOD.

NOTE: ANY WORK PERFORMED ON ABSOLUTE OZONE PRODUCTS WITHOUT PRIOR AUTHORIZATION FROM ABSOLUTE OZONE WILL AUTOMATICALLY VOID THIS WARRANTY. ANY ABSOLUTE OZONE PRODUCT MUST BE RETURNED TO

ABSOLUTE OZONE PREPAID, FOR WARRANTY EVALUATION. THE OZONE CELL CONTAINS TAMPER PROOF DEVICE. ANY ATTEMPT TO OPEN THE CELL WILL NOT VOID THE WARRANTY, BUT WILL VOID A POSSIBILITY OF OBTAINING ANY SERVICE BY ABSOLUTE OZONE.

THIS LIMITED WARRANTY DOES NOT INCLUDE ANY OF THE FOLLOWING:

- (a) Any labor charges for troubleshooting, removal, or installation of such parts;
- (b) Any repair or replacement of such parts necessitated by faulty installation, or improper operating procedures and conditions, misuse, abuse, negligence, accident, fire, flood, repair materials, and/or unauthorized accessories;
- (c) Any such products installed without regard to required local codes and accepted trade practices;
- (d) Damage caused by water passing through unit;
- (e) Damage caused by operating below or above specified working pressure;
- (f) **ANY IMPLIED WARRANTY OF MERCHANTABILITY OR IMPLIED WARRANTY OF FITNESS FOR PARTICULAR PURPOSE, AND SUCH WARRANTIES ARE HEREBY DISCLAIMED; AND**

(g) ABSOLUTE OZONE SHALL NOT BE LIABLE UNDER ANY CIRCUMSTANCES FOR LOSS OF USE OF SUCH PRODUCTS, LOST PROFITS, DIRECT DAMAGES, INDIRECT DAMAGES, CONSEQUENTIAL DAMAGES AND/OR INCIDENTAL DAMAGES.

TO OBTAIN WARRANTY SERVICE:

Absolute Ozone
10712 - 181 Street, Edmonton, Alberta, T5S 1K8, Canada
Customer Service: 780-486-3761
Fax: 780-486-3763
Web: www.absoluteozone.com
Email: Office@absoluteozone.com

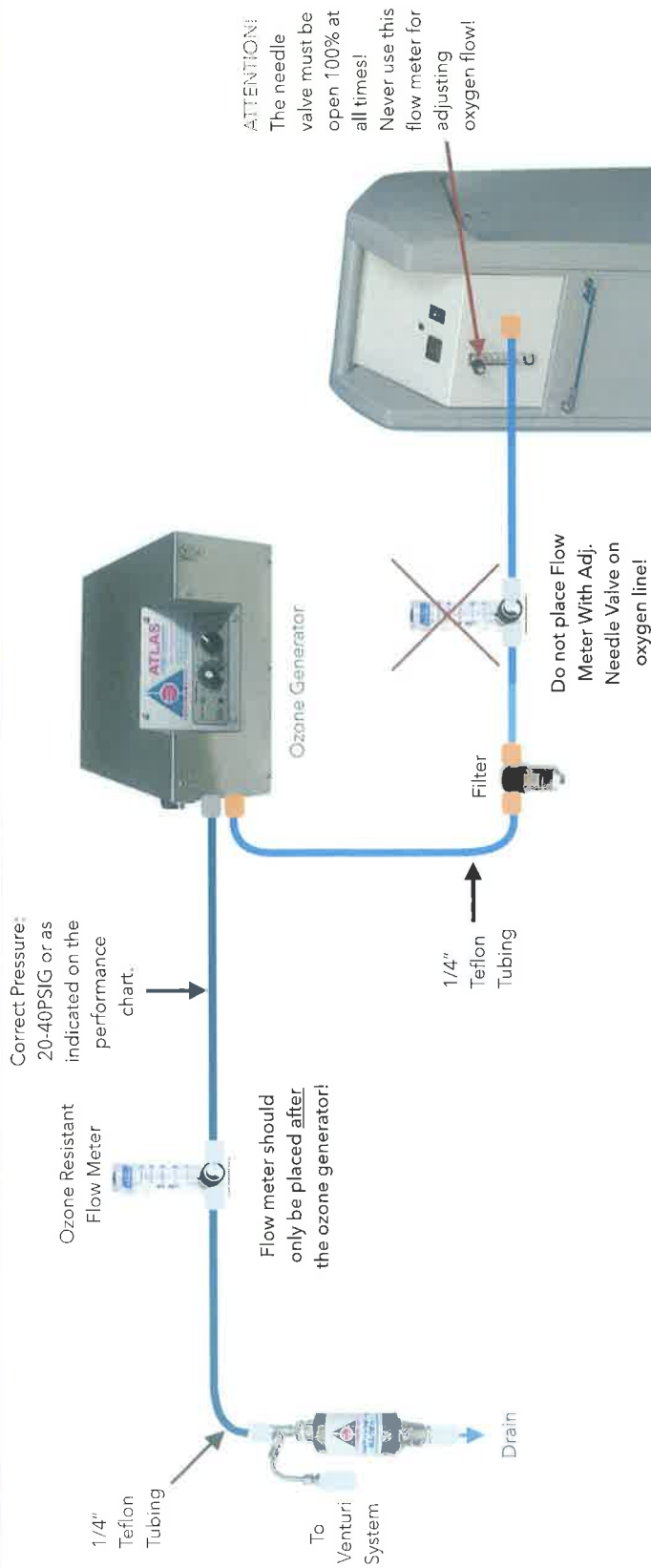
Please provide the following information:

1. Project, contact name, mailing address and telephone
2. Installer/Mechanical Contractor
3. Serial # and date of purchase
4. The date of failure
5. A description of the failure
6. All shipping documents should clearly state "Warranty Repair" and indicated RMA number. Absolute Ozone is not responsible for double taxes or duties resulted from improper shipping documentation.



ABSOLUTE OZONE®

ATLAS® Installation Diagram



ATTENTION!

All Absolute Ozone® generators are designed to work without service, any maintenance, or spare parts, for the first 15 years of use if they are installed correctly. Therefore, it is important to maintain correct working pressure across the ozone generator, good feed gas quality, and protect the generator from flooding or external contamination. For good ozone generator performance, it is important to place generator in a well ventilated, dust free environment, and maintain ambient temperature at 20-22°C.

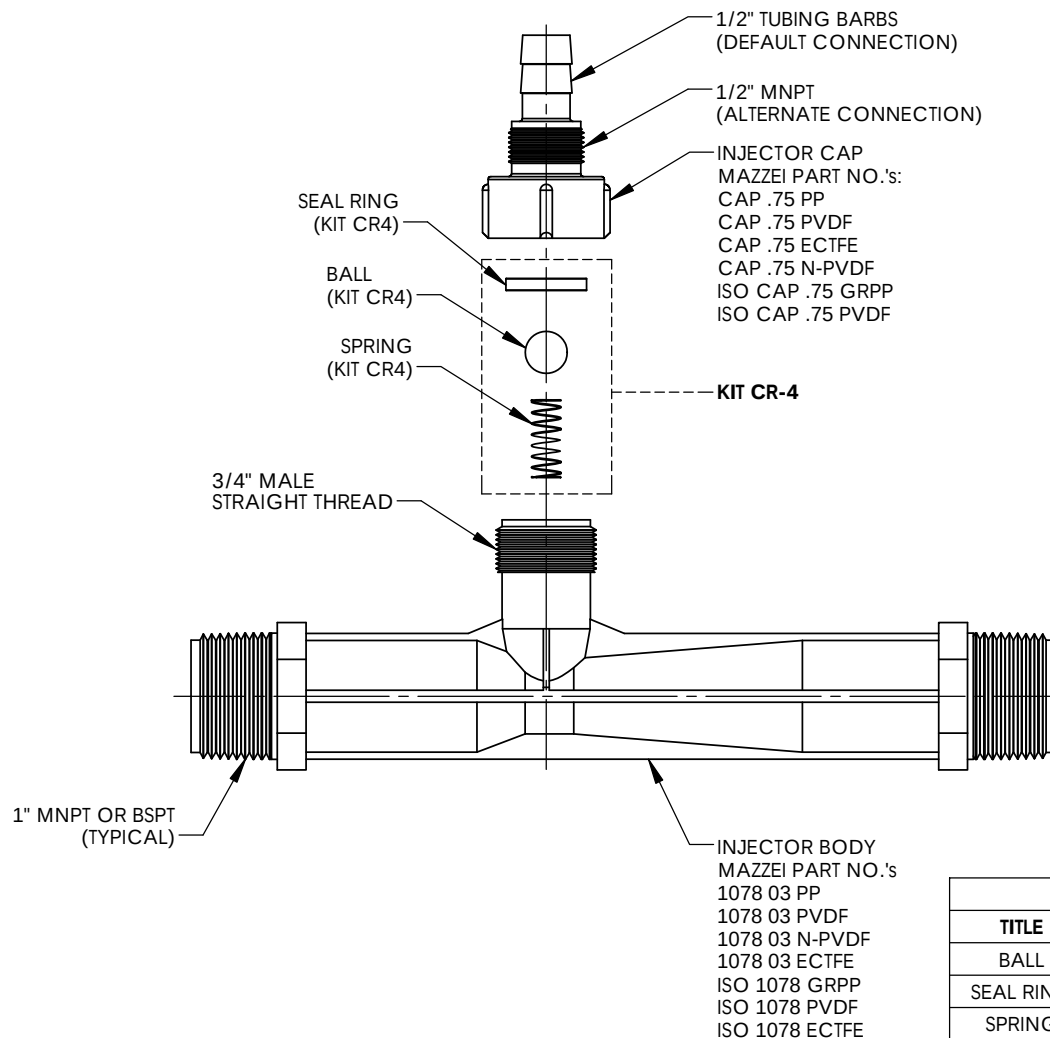
Oxygen Concentrator/
Other Oxygen Source

NOTES:

1. MADE IN THE U.S.A.
2. U.S. PATENT No. 5,863,128
3. U.S. No. 3,852,076 AND INTERNATIONAL REGISTERED TRADEMARKS
4. MATERIAL: GLASS FILLED POLYPROPYLENE (PP) OR POLYVINYLIDENE FLOURIDE (PVDF) OR ETHYLENE CHLOROTRIFLUOROETHYLENE (ECTFE)
5. INLET/OUTLET CONNECTION:
1" MNPT OR BSPT
6. SUCTION PORT CONNECTION:

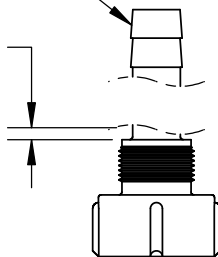
DEFAULT - 1/2" I.D. TUBING BARB WITH INTEGRATED CHECK VALVE

ALTERNATE - 1/2" MNPT - SEE ALTERNATE CAP MODIFICATION DETAIL
7. FOR INSTALLATION RECOMMENDATIONS REFER TO MAZZEI TECHNICAL BULLETINS No. 4, No. 5, No. 6, No. 10 AND No. 11, WHICH CAN BE FOUND IN THE "KNOWLEDGE CENTER" AT WWW.MAZZEI.NET.
8. MAZZEI INJECTOR CO., LLC.
500 ROOSTER DR.
BAKERSFIELD, CA 93307
TEL: 661.363.6500
WEB: WWW.MAZZEI.NET



REMOVE HOSE BARBS
FROM CAP AND DISCARD

[3mm]
.13in MAXIMUM
STICKOUT

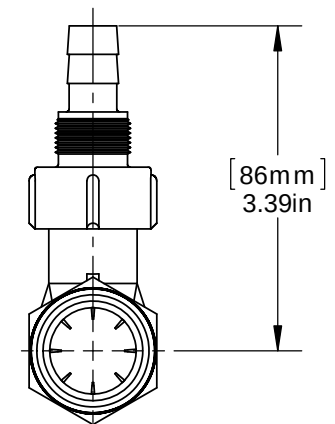
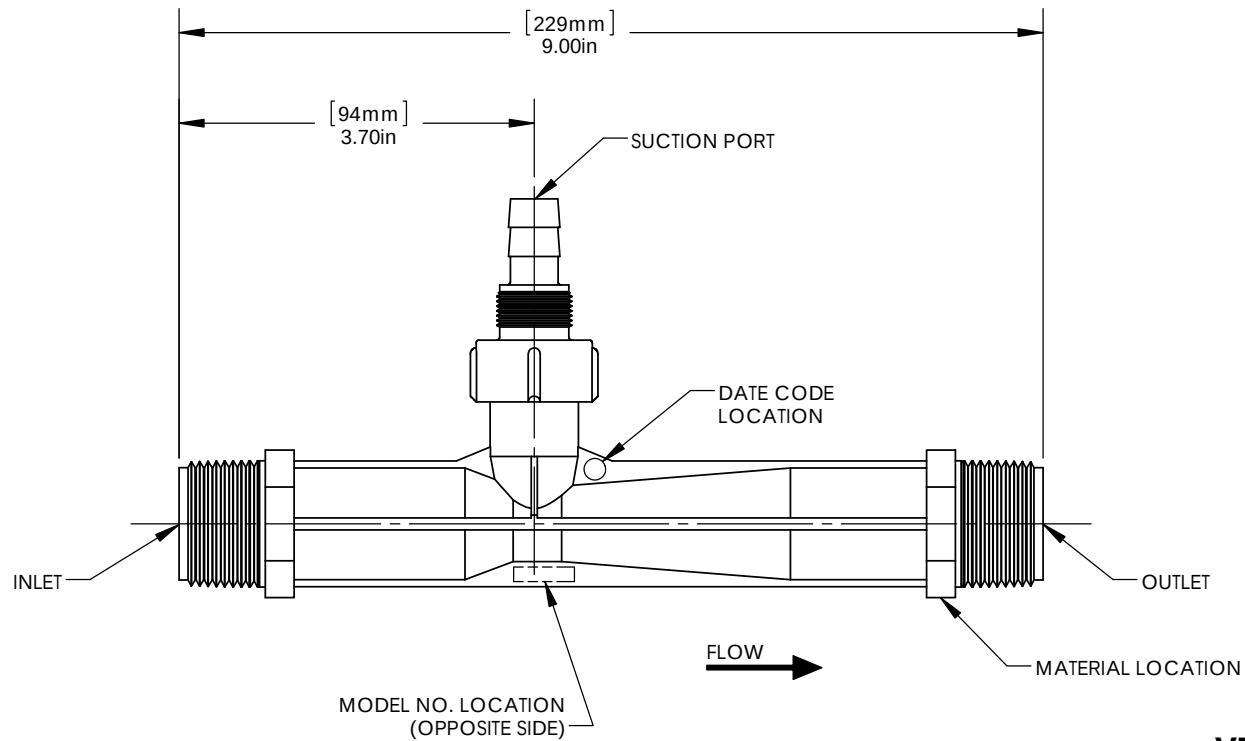
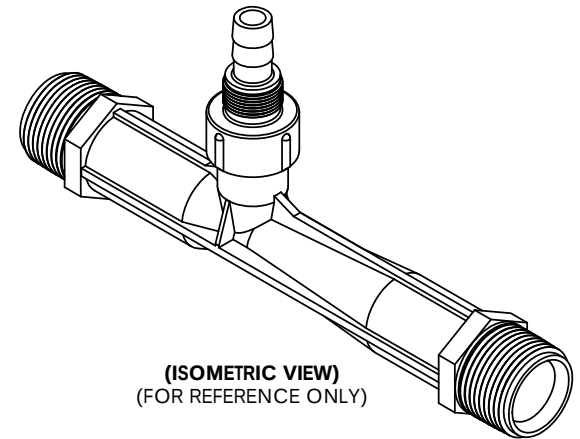


"CAP MODIFICATION DETAIL"
(ALTERNATE)

KIT CR-4	
TITLE	MATERIAL
BALL	TEFLON ® (PTFE)
SEAL RING	KEL-F ® (PCTFE)
SPRING	HASTELLOY C-22

VENDOR ITEM CONTROL DRAWING

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES		 Mazzei [®]		TITLE: 1" INJECTOR; MODEL 1078 03			
DRAWN:	T.JOHNS			DRAWING NO.: 107803-PP/PVDF/ECTFE			
DATE:	07/19/13						
APPROVED:	P. BANKOWSKI	SIZE: A	WEIGHT: N/A	SCALE: 1:2	REV.: NC	SHEET: 1 OF 2	



VENDOR ITEM CONTROL DRAWING

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES			TITLE: 1" INJECTOR; MODEL 1078 03		
DRAWN:	T.JOHNS		DRAWING NO.: 107803-PP/PVDF/ECTFE		
DATE:	07/19/13	SIZE:	WEIGHT:	SCALE:	REV.:
APPROVED:	P. BANKOWSKI	A	N/A	1:2	NC
				SHEET:	2 OF 2

Mazzei Injector Company, LLC- Injector Performance Table							
Injector Model				1078			
Operating Pressure PSIG		Water Suction		Operating Pressure PSIG		Water Suction	
Injector Inlet	Injector Outlet	Motive Flow GPM	Water Suction GPH	Injector Inlet	Injector Outlet	Motive Flow GPM	Water Suction GPH
5	0	5.5	1015	60	0	19.0	92.7
	1		46.4		5		92.7
	2		22.2		10		92.7
	3		2.7		15		92.7
	4				20		92.7
10	0	7.7	1058		30		93.1
	2		75.7		35		91.7
	5		41.8		40		77.1
	7		19.2		45		44.4
	8		4.4	70	0	20.5	93.4
15	0	9.5	1013		5		93.4
	5		79.9		10		93.4
	7		64.7		15		93.4
	10		34.3		20		93.4
	12		17.0		30		93.5
20	0	11.0	98.2		40		92.3
	5		95.4		45		81.9
	10		70.0		50		54.5
	12		51.5		55		28.8
	15		30.3	80	0	21.9	93.9
25	0	12.2	96.0		5		93.9
	5		96.7		10		93.9
	10		89.4		15		93.9
	15		68.2		20		93.9
	20		31.9		30		93.9
30	0	13.4	94.4		40		94.8
	5		94.5		50		91.5
	10		94.5		60		52.9
	15		82.1		65		33.0
	20		55.4	90	0	23.2	94.5
35	0	14.5	94.0		5		94.5
	5		94.0		10		94.5
	10		94.0		20		94.5
	15		91.9		30		94.5
	20		74.1		40		95.6
40	0	15.5	93.2		50		94.4
	5		93.2		60		84.7
	10		93.2		70		39.6
	15		93.2		75		20.6
	20		91.9	100	0	24.5	94.2
45	0	16.4	92.8		5		94.2
	5		92.8		10		94.2
	10		92.8		20		94.2
	15		92.8		30		94.2
	20		93.9		40		94.2
50	0	17.3	92.4		50		94.0
	5		92.4		60		94.9
	10		92.4		70		81.4
	15		92.4		80		30.6
	20		92.4	120	0	26.8	94.5
	25		92.4		5		94.5
	30		86.4		10		94.5
	35		64.3		20		94.5
	40		35.0		30		94.5
					40		94.5
					50		94.5
					60		95.2
					70		94.5
					80		90.8
					90		61.2
					100		22.3

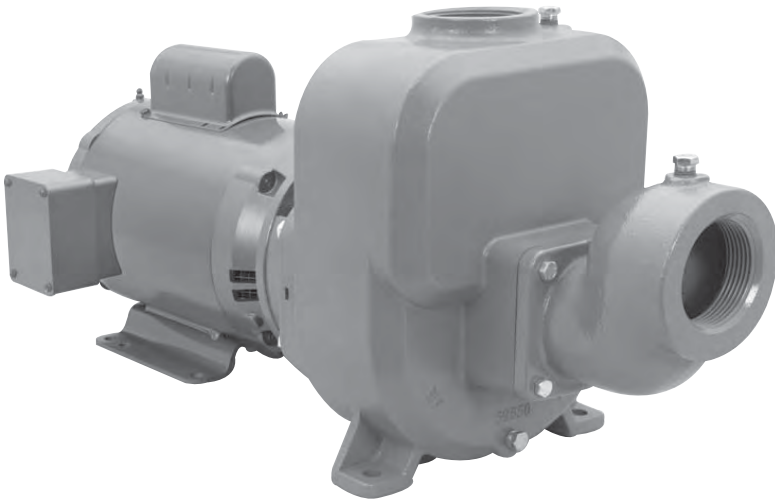
Mazzei Injector Company, LLC- Injector Performance Table							
Injector Model				1078			
Operating Pressure kg/cm2		Water Suction		Operating Pressure kg/cm2		Water Suction	
Injector Inlet	Injector Outlet	Motive Flow l/min	Water Suction LPH	Injector Inlet	Injector Outlet	Motive Flow l/min	Water Suction LPH
0.35	0.00	20.7	3843	4.22	0.00	71.8	350.9
	0.07		1757		0.35		350.9
	0.14		839		0.70		350.9
	0.21		103		1.05		350.9
	0.28				1.41		350.9
0.70	0.00	29.3	4004	4.92	2.11	77.5	352.3
	0.14		2865		2.46		347.2
	0.35		1582		2.81		292.0
	0.49		726		3.16		168.1
	0.56		167		0.00		353.4
1.05	0.00	35.9	3836	5.62	0.35	82.9	353.4
	0.35		3025		0.70		353.4
	0.49		2447		1.05		353.4
	0.70		1298		1.41		353.4
	0.84		643		2.11		353.8
1.41	0.00	41.5	3718		2.81	87.9	349.5
	0.35		3613		3.16		309.8
	0.70		2649		3.52		206.4
	0.84		1950		3.87		109.0
	1.05		1148		0.00		355.4
1.76	0.00	46.3	3632	7.03	0.35	92.7	355.4
	0.35		3659		0.70		355.4
	0.70		3385		1.05		355.4
	1.05		2581		1.41		355.4
	1.41		1206		2.11		355.4
2.11	0.00	50.8	3571	8.44	2.81	101.5	358.7
	0.35		3576		3.52		346.5
	0.70		3576		4.22		200.1
	1.05		3106		4.57		125.0
	1.41		2098		0.00		357.6
2.46	0.00	54.8	678	7.03	0.35	92.7	357.6
	0.35		3557		0.70		357.6
	0.70		3557		1.41		357.6
	1.05		3478		2.11		357.6
	1.41		2806		2.81		362.0
2.81	0.00	58.6	1789	7.03	3.52	92.7	357.1
	0.35		3527		4.22		320.6
	0.70		3527		4.92		149.9
	1.05		3527		5.27		77.9
	1.41		3477		0.00		356.5
3.16	0.00	62.2	2733	7.03	0.35	92.7	356.5
	0.35		1614		0.70		356.5
	0.70		3513		1.41		356.5
	1.05		3513		2.11		356.5
	1.41		3554		2.81		356.5
3.52	0.00	65.5	3291	8.44	3.52	101.5	355.7
	0.35		2505		4.22		359.3
	0.70		1390		4.92		308.0
	1.05		3499		5.62		115.8
	1.41		3499		0.00		357.5
3.52	0.00	65.5	3499	8.44	0.35	101.5	357.5
	0.35		3499		0.70		357.5
	0.70		3499		1.41		357.5
	1.05		3499		2.11		357.5
	1.41		3499		2.81		357.5
3.52	0.00	65.5	3497	8.44	3.52	101.5	357.5
	0.35		3270		4.22		360.4
	0.70		2434		4.92		357.5
	1.05		1326		5.62		343.8
	1.41				6.33		231.7
3.52	0.00	65.5		8.44	7.03	101.5	84.5
	0.35						
	0.70						
	1.05						
	1.41						

Mazzei Injector Company, LLC- Injector Performance Table							
Injector Model				1078			
Operating Pressure PSIG		Air Suction		Operating Pressure PSIG		Air Suction	
Injector Inlet	Injector Outlet	Motive Flow GPM	Air Suction SCFH	Injector Inlet	Injector Outlet	Motive Flow GPM	Air Suction SCFH
5	0	5.2	24.3	60	0	18.2	91.5
	1		6.4		5		76.3
	2		2.7		10		57.6
	3		1.5		15		34.5
	4				20		24.4
10	0	7.4	40.1		30		14.0
	2		16.2		35		10.4
	5		4.1		40		7.3
	7		1.6		45		4.5
	8			70	0	19.6	100.5
15	0	9.1	48.6		5		81.8
	5		13.1		10		67.5
	7		7.9		15		46.3
	10		3.4		20		31.8
	12		2.2		30		19.7
20	0	10.5	55.0		40		12.5
	5		22.2		45		8.8
	10		8.6		50		7.0
	12		5.6		55		4.5
	15		3.2	80	0	21.0	105.6
25	0	11.7	60.9		5		89.6
	5		33.3		10		74.9
	10		14.3		15		57.8
	15		7.5		20		39.5
	20		3.4		30		24.7
30	0	12.9	70.6		40		17.0
	5		46.4		50		10.2
	10		20.5		60		6.3
	15		11.2		65		4.6
	20		6.1	90	0	22.3	112.7
35	0	13.9	74.0		5		96.3
	5		52.9		10		81.7
	10		24.7		20		48.9
	15		13.7		30		29.4
	20		9.1		40		20.8
40	0	14.8	79.9		50		14.9
	5		57.9		60		9.2
	10		31.4		70		5.9
	15		18.9		75		4.3
	20		13.1	100	0	23.5	116.7
45	0	15.7	85.9		5		103.1
	5		62.8		10		87.8
	10		38.4		20		62.9
	15		23.3		30		37.2
	20		15.8		40		25.8
50	0	16.6	87.7		50		18.1
	5		66.5		60		12.6
	10		42.4		70		8.4
	15		25.7		80		5.6
	20		16.2	120	0	25.7	124.7
	25		12.8		5		110.9
	30		8.7		10		97.9
	35		5.3		20		77.8
	40		3.1		30		47.0
	0				40		33.6
	5				50		25.0
	10				60		19.2
	15				70		14.2
	20				80		10.3
	0				90		6.7
	5				100		5.2
	10						
	15						
	20						

Mazzei Injector Company, LLC- Injector Performance Table							
Injector Model				1078			
Operating Pressure kg/cm2		Air Suction		Operating Pressure kg/cm2		Air Suction	
Injector Inlet	Injector Outlet	Motive Flow l/min	Air Suction l/min	Injector Inlet	Injector Outlet	Motive Flow l/min	Air Suction l/min
0.35	0.00	19.9	11.5	4.22	0.00	68.8	43.2
	0.07		3.0		0.35		36.0
	0.14		1.3		0.70		27.2
	0.21		0.7		1.05		16.3
	0.28				1.41		11.5
0.70	0.00	28.1	18.9	4.92	2.11	74.3	6.6
	0.14		7.6		2.46		4.9
	0.35		2.0		2.81		3.5
	0.49		0.7		3.16		2.1
	0.56						
1.05	0.00	34.4	22.9	5.62	0.00	79.5	47.4
	0.35		6.2		0.35		38.6
	0.49		3.7		0.70		31.9
	0.70		1.6		1.05		21.9
	0.84		1.0		1.41		15.0
1.41	0.00	39.7	26.0		2.11		9.3
	0.35		10.5		2.81		5.9
	0.70		4.0		3.16		4.1
	0.84		2.7		3.52		3.3
	1.05		1.5		3.87		2.1
1.76	0.00	44.4	28.8	6.33	0.00	84.3	49.9
	0.35		15.7		0.35		42.3
	0.70		6.8		0.70		35.3
	1.05		3.6		1.05		27.3
	1.41		1.6		1.41		18.6
2.11	0.00	48.7	33.3		2.11		11.7
	0.35		21.9		2.81		8.0
	0.70		9.7		3.52		4.8
	1.05		5.3		4.22		3.0
	1.41		2.9		4.57		2.1
2.46	0.00	52.6	34.9	7.03	0.00	88.8	53.2
	0.35		25.0		0.35		45.5
	0.70		11.7		0.70		38.6
	1.05		6.5		1.41		23.1
	1.41		4.3		2.11		13.9
2.81	0.00	56.2	37.7		2.81		9.8
	0.35		27.3		3.52		7.0
	0.70		14.8		4.22		4.3
	1.05		8.9		4.92		2.8
	1.41		6.2		5.27		2.0
3.16	0.00	59.6	40.6	8.44	0.00	97.3	55.1
	0.35		29.7		0.35		48.6
	0.70		18.1		0.70		41.4
	1.05		11.0		1.41		29.7
	1.41		7.5		2.11		17.5
3.52	0.00	62.8	41.4		2.81		12.2
	0.35		31.4		3.52		8.5
	0.70		20.0		4.22		6.0
	1.05		12.1		4.92		4.0
	1.41		7.6		5.62		2.6
	1.76		6.0		0.00		58.9
	2.11		4.1		0.35		52.4
	2.46		2.5		0.70		46.2
	2.81		1.5		1.41		36.7
					2.11		22.2
					2.81		15.9
					3.52		11.8
					4.22		9.1
					4.92		6.7
					5.62		4.9
					6.33		3.2
					7.03		2.4

TECHNICAL BROCHURE

BSPMSPH R3



SOLD SEPARATELY
OR BUILT IN

PrimeLine[®] SP

SPM & SPH SERIES



FEATURES

Self Priming Design: Features a replaceable check valve which acts to retain sufficient liquid in the casing to assure fast, reliable priming and repriming capabilities. Once initially primed the pump will reprime automatically.

Impeller and Wear Ring: Silicon Bronze construction, replaceable wear rings extend pump life, designed for maximum efficiency and repriming capabilities. Impeller is enclosed type, balanced for smooth operation, keyed to motor shaft.

Casing and Diffuser: Cast iron construction, featuring a back pull out design with tapped connections provided for casing fill and drain to simplify pump start up and removal at the end of the season. Top accessible pump feet for easy access to hold-down bolts. Casing o-ring sealing simplifies maintenance.

Shaft Sleeve: 300 series stainless steel replaceable sleeve provides motor shaft protection.

Mechanical Seal: Carbon/Ceramic faces, BUNA elastomers, 300 series stainless steel metal parts.

APPLICATIONS

- Lawn irrigation
- Dewatering
- Liquid transfer
- Plot irrigation
- Livestock watering

SPECIFICATIONS

Pump

- Flows to 240 GPM
- Heads to 165 feet
- Reprime capabilities to 25'
- 2" through 3" suction
- 1½" through 2½" discharge
- Maximum temperature 160°F

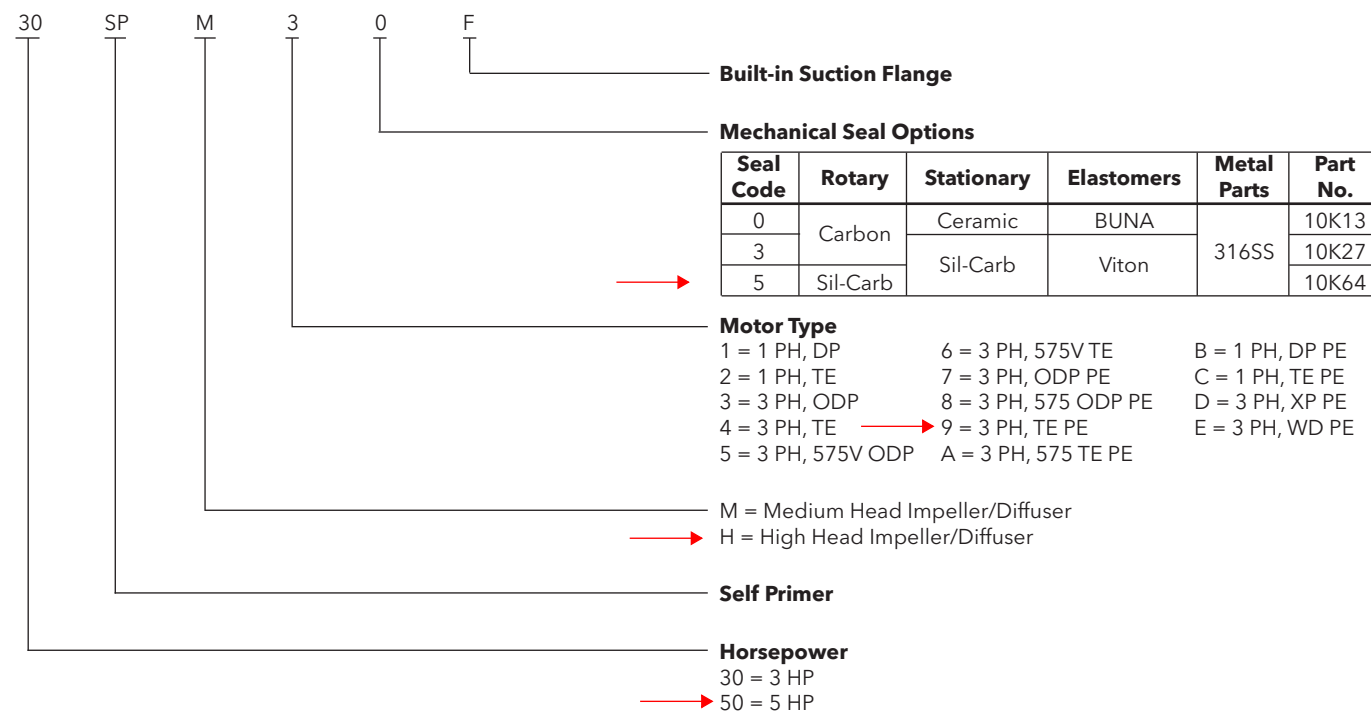
Motor

- NEMA standard, JM shaft, Open Drip Proof* or Totally Enclosed Fan Cooled*.
- Single phase: 3 HP, 115/230 V; 5 HP, 230 V.
- Three phase: 3 and 5 HP, 208-230/460 V or 575 V.
- **Note:** Pump is not rated for 50 Hz service.

* Premium efficiency where required by Department of Energy regulations.

50SPH95

ORDERING INFORMATION



Medium Head

Order Number	HP	PH	Enclosure	Voltage	Suction Flange
30SPM10	3	1	ODP*	115 / 230	SPF25
30SPM20		1	TEFC*	208-230	
30SPM30		3	ODP*	208-230/460	
30SPM40		3	TEFC*	208-230/460	
50SPM10	5	1	ODP*	230	SPF30
50SPM20		1	TEFC*	208-230	
50SPM30		3	ODP*	208-230/460	
50SPM40		3	TEFC*	208-230/460	

High Head

Order Number	HP	PH	Enclosure	Voltage	Suction Flange
30SPH10	3	1	ODP*	115 / 230	SPF20
30SPH20		1	TEFC*	208-230	
30SPH30		3	ODP*	208-230/460	
30SPH40		3	TEFC*	208-230/460	
50SPH10	5	1	ODP*	230	SPF25
50SPH20		1	TEFC*	208-230	
50SPH30		3	ODP*	208-230/460	
50SPH40		3	TEFC*	208-230/460	

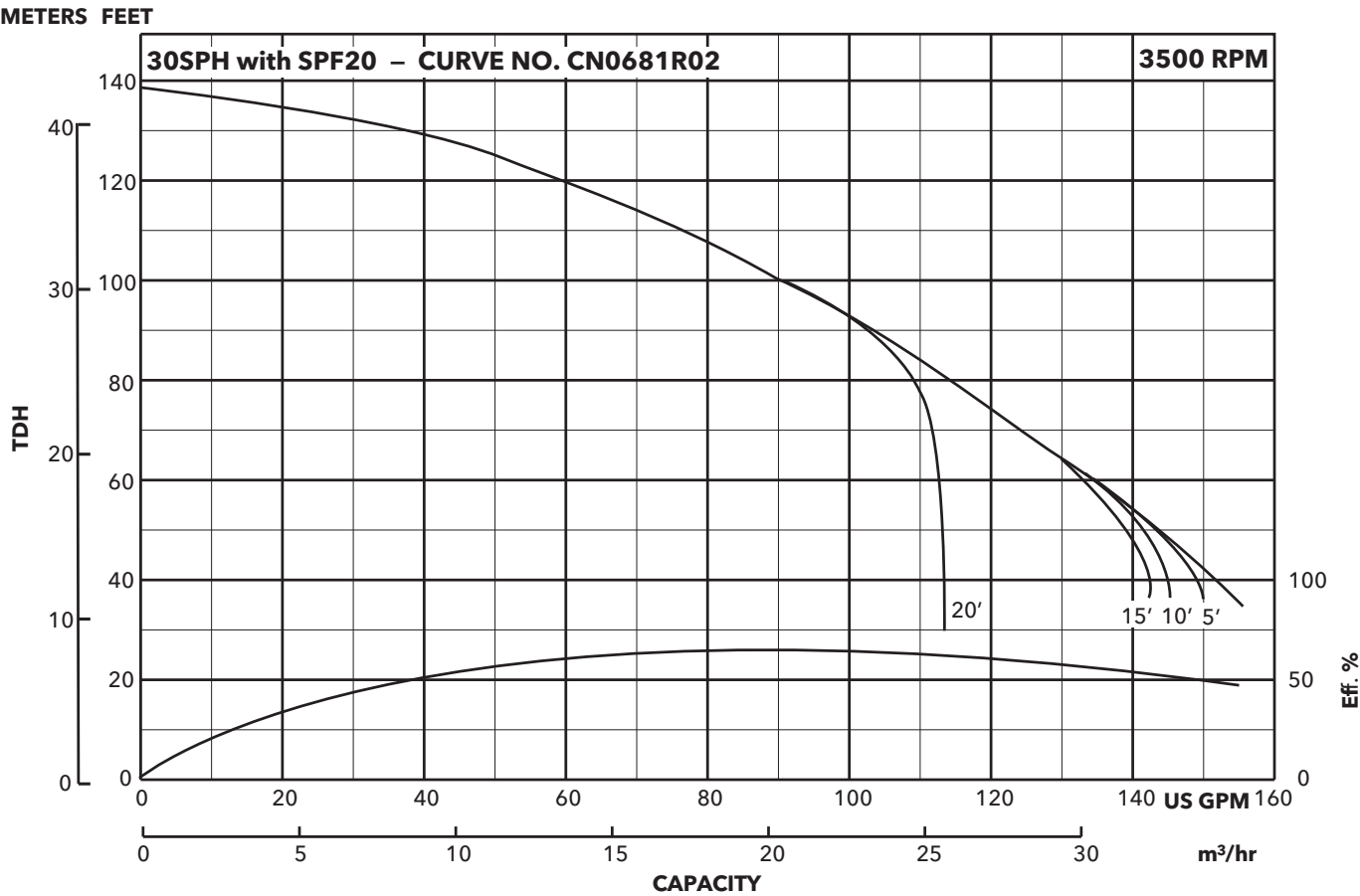
Use standard Order No. for pump only or suction flange.
Add an F suffix to Order No. to order a pump with suction flange.

* Premium efficiency where required by Department of Energy regulations.

PUMP PERFORMANCE (capacity in GPM)

3 HP High Head Model						
Model	PSI	Feet	5'	10'	15'	20'
30SPH1 30SPH3	20	46.2	138	136	130	*
	30	69.3	120	114	108	101
	40	92.4	91	88	80	69
	50	115.5	57	47	32	20

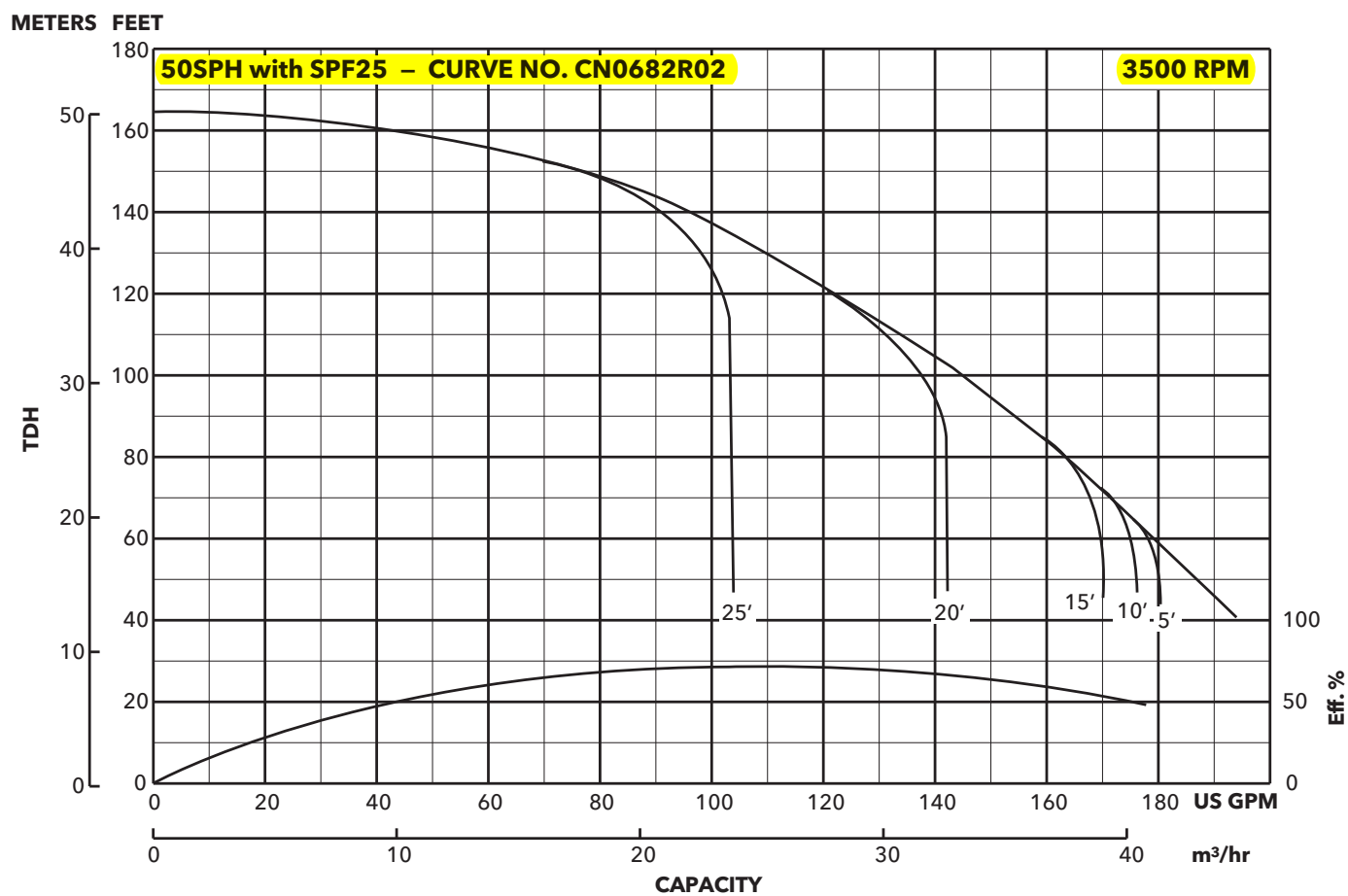
* Operation not recommended at this point.



PUMP PERFORMANCE (capacity in GPM)

5 HP High Head Model							
Model	PSI	Feet	5'	10'	15'	20'	25'
50SPH1 50SPH3	20	46.2	182	176	*	*	*
	30	69.3	168	164	158	*	*
	40	92.4	147	144	139	134	*
	50	115.5	120	118	114	108	96
	60	138.6	88	86	78	64	55

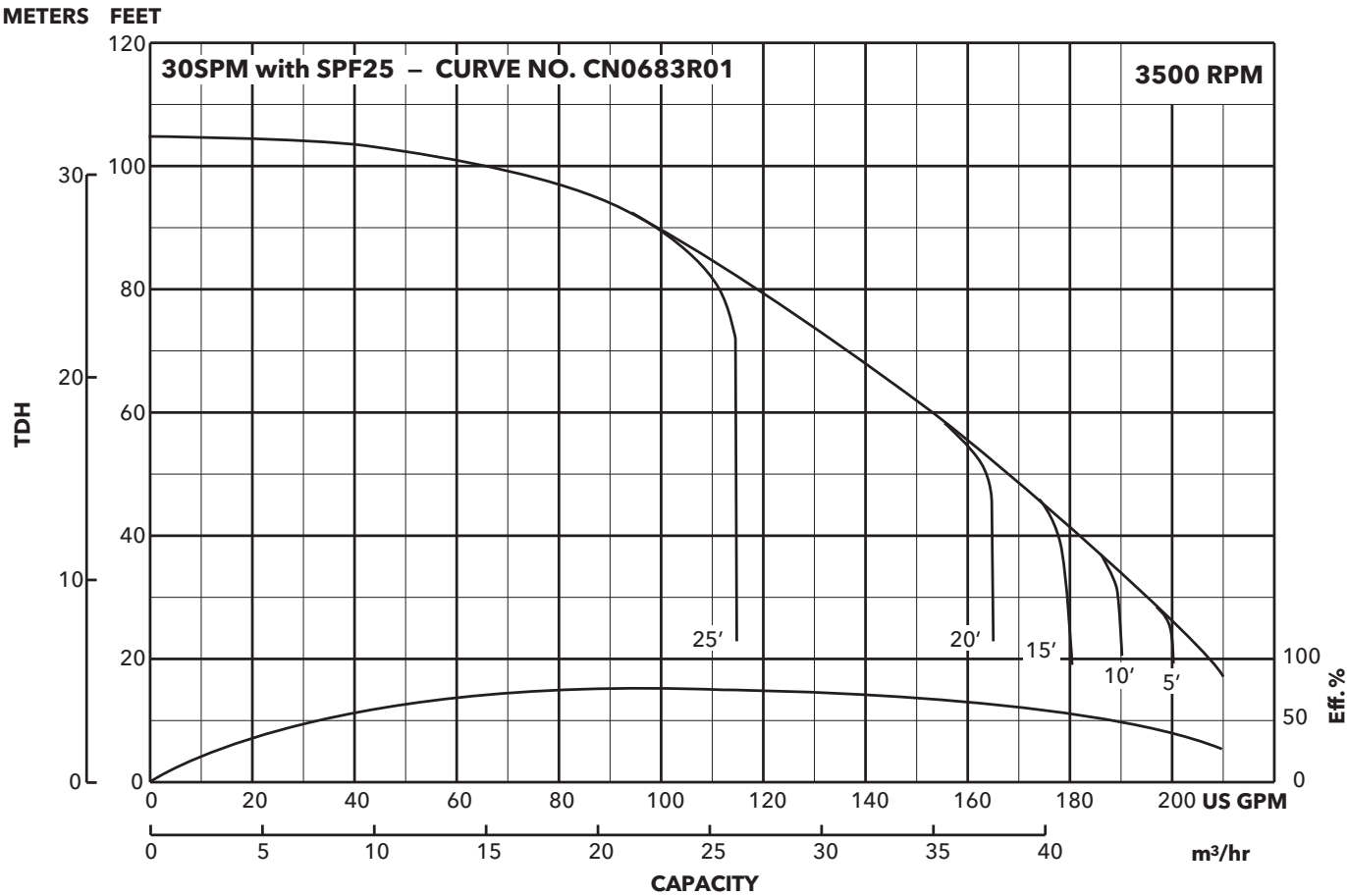
* Operation not recommended at this point.



PUMP PERFORMANCE (capacity in GPM)

3 HP Medium Head Model							
Model	PSI	Feet	5'	10'	15'	20'	25'
30SPM1	20	46.2	163	155	147	138	114
	30	69.3	127	117	107	95	84
30SPM3	40	92.4	77	47	*	*	*

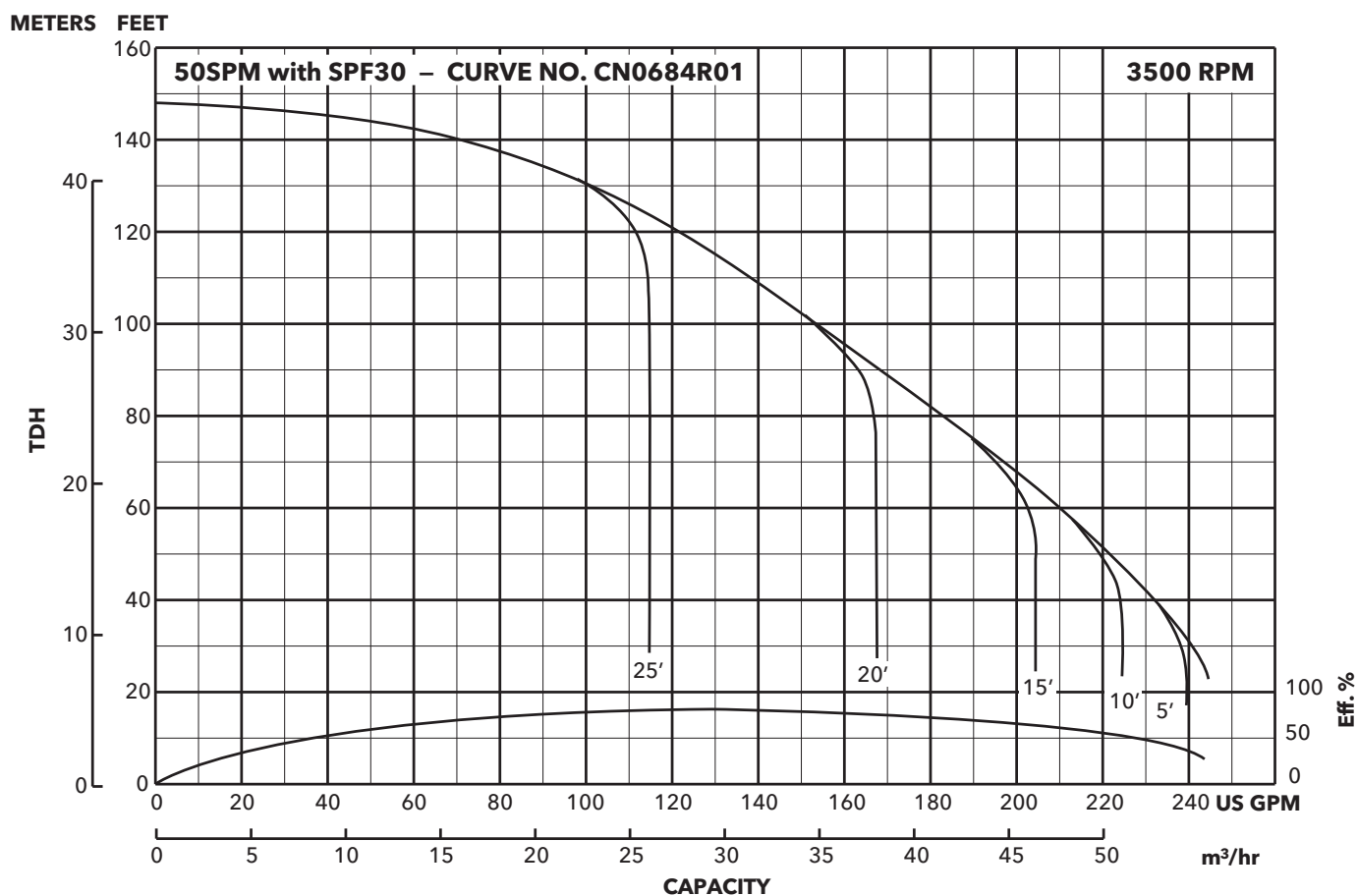
* Operation not recommended at this point.



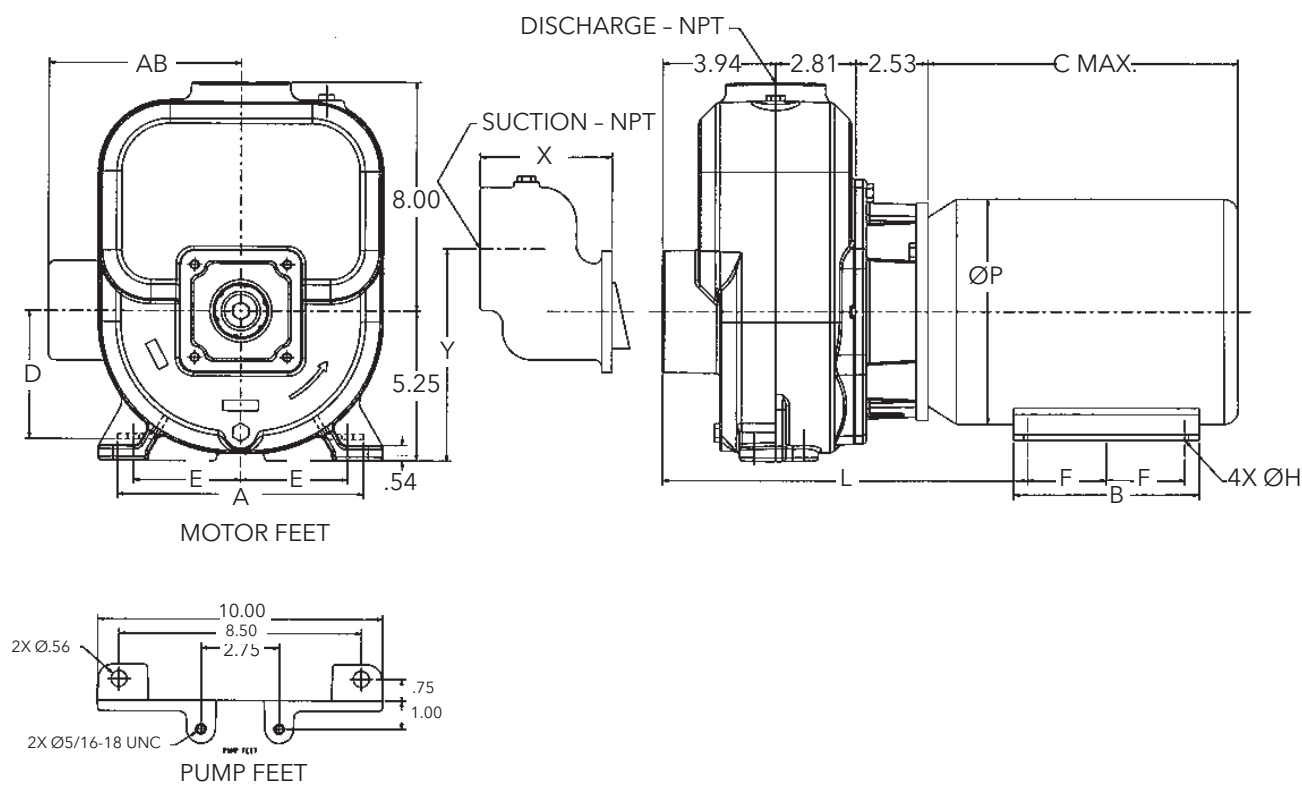
PUMP PERFORMANCE (capacity in GPM)

5 HP Medium Head Model							
Model	PSI	Feet	5'	10'	15'	20'	25'
50SPM1	20	46.2	218	211	202	167	*
	30	69.3	187	182	172	164	*
50SPM3	40	92.4	155	148	138	133	111
	50	115.5	119	107	96	90	65

* Operation not recommended at this point.



DIMENSIONS AND WEIGHTS



Pump Model	HP	PH	Suction	Disch.	A	AB	B	C MAX.	D	E	F	ØH	L	ØP	X	Y	Wt. (lbs.)					
30SPH1	3	1	2	1½	8.63	6.87	6.50	12.56	4.50	3.75	2.75	0.41	12.78	7.88	3.58	6.50	135					
30SPH3		3			6.50	5.61	5.94		3.50	2.75	2.50	0.34	12.16	6.62			115					
30SPM1		1	2½	2	8.63	6.87	6.50		4.50	3.75	2.75	0.41	12.78	7.88			135					
30SPM3		3				5.73								6.62			115					
50SPH1	5	1	2½	6.75		6.50	13.80	4.50						3.75	2.75	0.41	12.78	7.88	155			
50SPH3		3		5.85															135			
50SPM1		1	3	2½															6.87	4.62	7.44	155
50SPM3		3																				135

NOTES: Dimensions are approximate, not for construction purposes.



Xylem Inc.
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Phone: (800) 453-6777
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SPS83 Suction Strainer



INTRODUCING SPS83

SPS83 Suction Strainer is specifically designed for water reclaim and vehicle washing use. Made of a rugged cast iron body and a stainless steel basket, this product pairs with our Prime Line® SP pumps to offer a complete pump and suction strainer option for you. This is designed to fit all Prime Line SP models, as well as other self-priming pumps, and will filter out large particulates from entering the pump, enabling you to ensure your water needs are met.

APPLICATIONS

Vehicle Washing • Water Reclaim



LET'S SOLVE YOUR WATER NEEDS!

SPS83 STRAINER FEATURES

- Rugged cast iron body
- Stainless steel basket
- 3" NPT Connection
- 2"/3" FNPT Suction Flange options
- Compatible with self-priming pumps
- Repair parts available for order (see RSPMSPH)



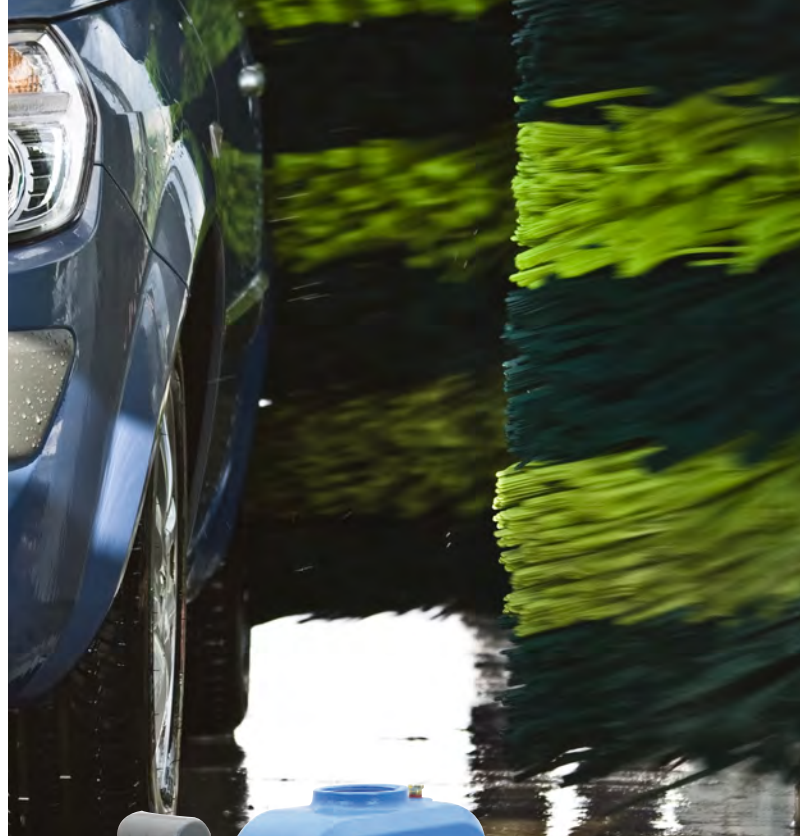
STRAINER BASKET

Order Number	Item
SPS83	Strainer Basket Only
SPF40	2" FNPT Flange Kit
SPF45	3" FNPT Flange Kit



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Phone: (800) 453-6777 • Fax: (888) 322-5877
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PRIME LINE® SP PUMP FEATURES

The SPS83 was designed to pair with our Prime Line SP pump, offering you complete pump and suction strainer capabilities. Available for a variety of uses, the Prime Line SP with the SPS83 is also great for vehicle washing and water reclaim applications. Learn more about the Prime Line SP online at www.gouldswatertechnology.com/products.

- 3 and 5 HP medium and high head self-priming pumps
- Matches industry performance, efficiency and priming characteristics
- Pairs perfectly with the SPS83 suction strainer

Section 3
**Frame and Piping
Design**

ENGINEERING NOTES:

- 1. INPUT POWER REQUIREMENTS: 480V/120V
- 2. PUMP DESIGN OUTPUT: 150 GPM @ 41 PSI
- 3. RECLAIM FLOW: 134 GPM
- 4. TREATED FLOW: 16 GPM
- 5. OZONE OUTPUT: 0-30 g/h

BILL OF MATERIAL NOTES:

- 1. ALL ITEMS ARE LISTED WITH McMASTER-CARR CATALOG NUMBERS UNLESS OTHERWISE SPECIFIED.
- 2. BULK AND COMMODITY ITEMS WITH McMSTER-CARR CATALOG NUMBERS MAY BE PURCHASED AS LISTED OR EQUAL.

FABRICATION NOTES:

- 1. CYCLONE OUTLET (22) MACHINED FROM UNUSED COLLECTION VESSEL INCLUDED WITH CYCLONE.
- 2. CYCLONE NOZZLE FLANGES (6) REQUIRE MATCH DRILLING TO MATE WITH STANDARD 2" FLANGE BOLT CRICLE.
- 3. CYCLONE CLAMPS (21) REQUIRE ALTERATION. CLAMPS SHORTENED AND GRIP TEETH RECUT.

ASSEMBLY NOTES:

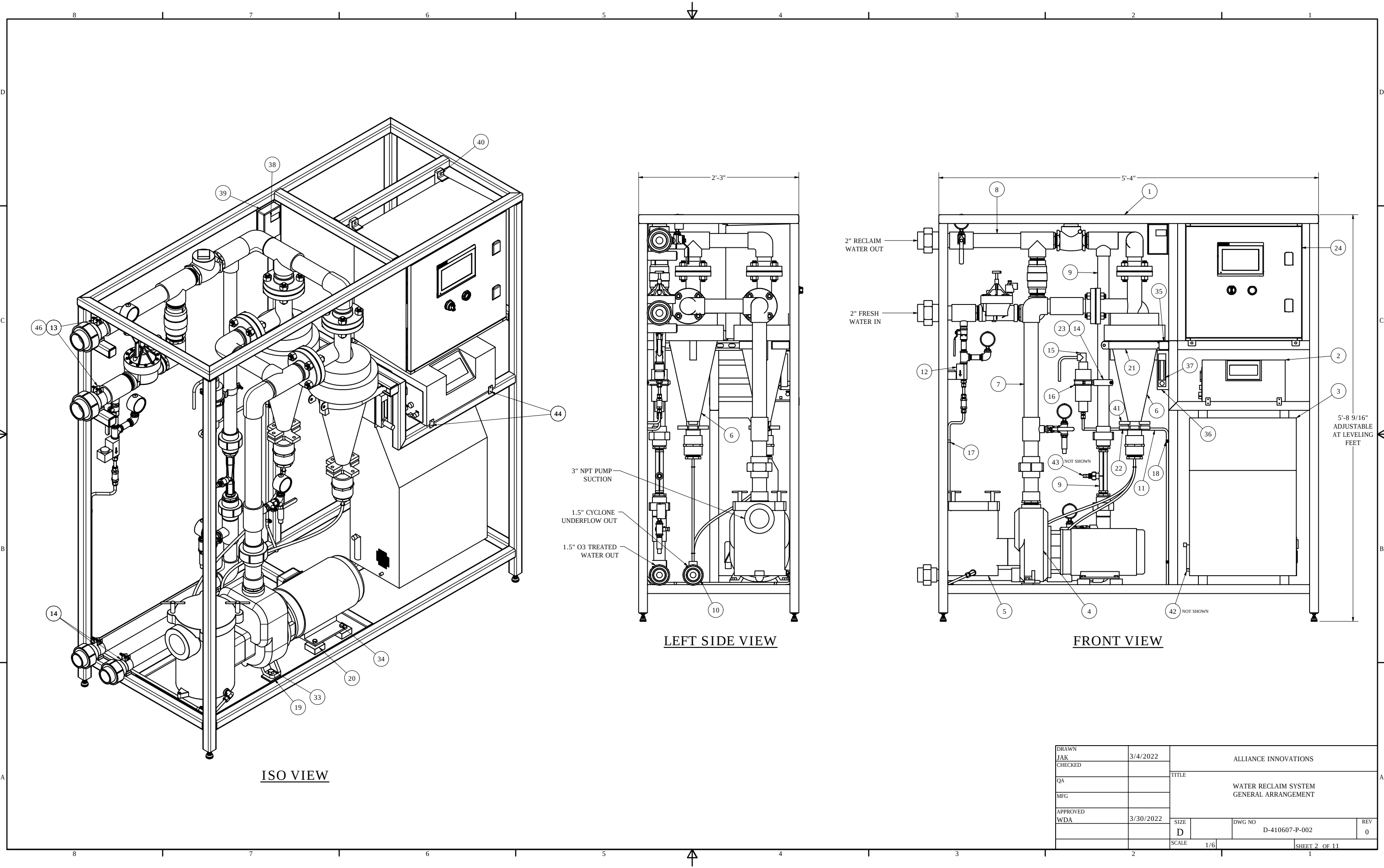
- 1. PVC MANUFACTURER RECOMMENDS THREADED CONNECTIONS ASSEMBLED FINGER TIGHT PLUS TWO TURNS.
- 2. DO NOT USE TEFLON TAPE OR PTFE PIPE DOPE ON 1/2" PVC THREADED CONNECTIONS.
- 3. DO USE A NON-HARDENING, NON-PTFE THREAD SEALANT ON 1/2" PVC THREADED CONNECTIONS. TEFLON TAPE AND / OR A NON-HARDENING THREAD SEALANT MAY BE USED ON 2" THREADED CONNECTIONS WHEN FOLLOWING MFR INSTRUCTIONS IN NOTE 1.
- 4. 1/2" PVC THREADED CONNECTIONS WILL BE OVER STRESSED AT FINGER TIGHT PLUS 3 TURNS PER MFR, AND MAY BE OVER STRESSED IN LESS THAN 3 TURNS IF TEFLON TAPE IS USED.

ASSEMBLY PACKAGE DRAWING LIST:

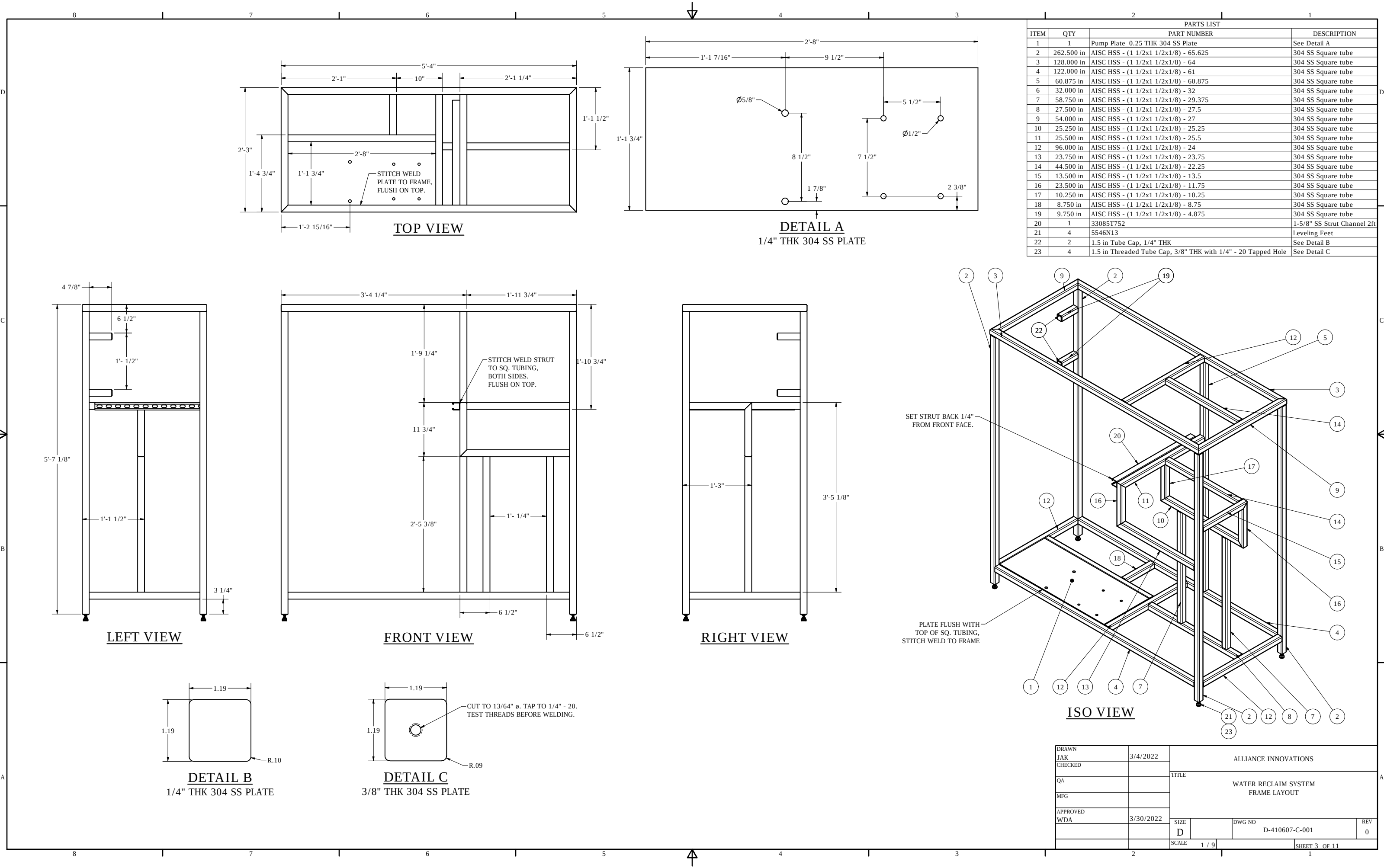
SHEET#	DRAWING NO.	DESCRIPTION
1	D-410607-P-001	GENERAL BILL OF MATERIALS
2	D-410607-P-002	GENERAL ARRANGEMENT
3	D-410607-C-001	FRAME LAYOUT
4	D-410607-P-003	PUMP OUTLET PIPING
5	D-410607-P-004	CYCLONE OUTLET PIPING
6	D-410607-P-005	TREATED WATER OUTLET
7	D-410607-P-006	CYCLONE UNDERFLOW PIPING
8	D-410607-P-007	FLOOD PREVENTION OVERFLOW TUBING
9	D-410607-P-008	PUMP PRIME TUBING
10	D-410607-C-002	FLOW METER BRACKET
11	D-410607-C-003	OZONE MONITOR BRACKET

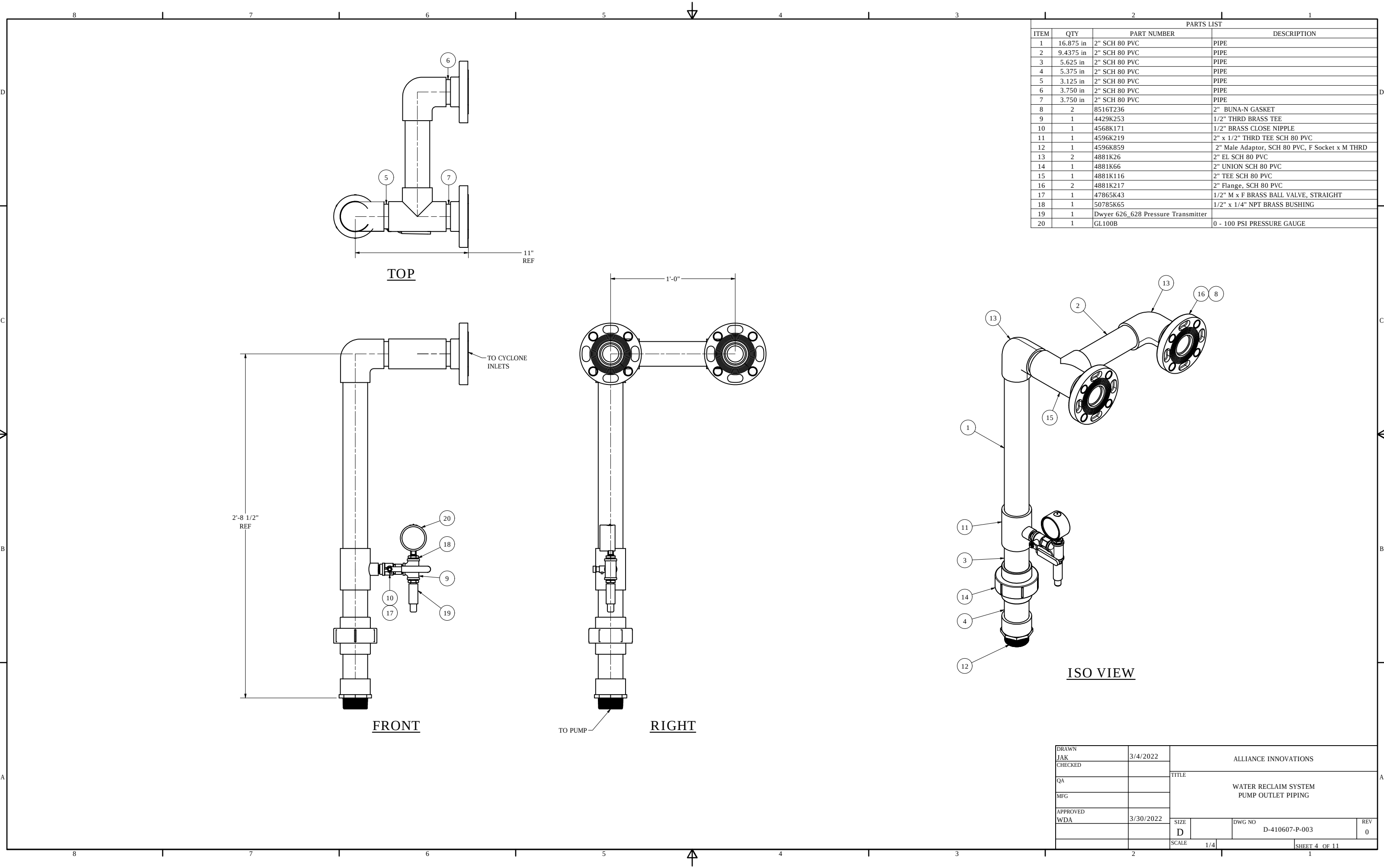
		PARTS LIST	
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	410607 Stainless Steel Frame	SEE PAGE 3
2	1	ATLAS 30	Ozone Generator
3	1	AS123-10	Oxygen Concentrator
4	1	Goulds 50SPH	5HP SELF PRIMING PUMP
5	1	SPS83	PUMP STRAINER
6	2	RKHC225	2" Flanged Hydrocyclone
7	1	410607 Assembly.Pump Outlet Piping	SEE PAGE 4
8	1	410607 Assembly.Cyclone Outlet Piping	SEE PAGE 5
9	1	410607 Assembly.Treated Out Piping	SEE PAGE 6
10	1	410607 Assembly.Underflow Out Piping	SEE PAGE 7
11	1	410607 Assembly.Flood Prevention Drain Tubing	SEE PAGE 8
12	1	410607 Assembly.Pump Prime Tubing	SEE PAGE 9
13	2	3006T94	2 in SS Pipe Support
14	5	3006T68	1.5 in SS Pipe Support
15	1	ALD-200	Flood Prevention Device
16	1	2615T21	Threaded-Rod-Mount Clamping Hanger
17	4	8863T66	0.375" SS Loop Clamp
18	2	8863T65	0.25" SS Loup Clamp
19	2	9306K42	Unthreaded Bumper_0.25 THK
20	4	9306K44	Unthreaded Bumper_0.94 THK
21	2	3115T66	Cyclone Strut Clamp, Alteration Required
22	2	Cyclone Underflow Connector	Machined Part
23	1	92949A450	18-8 Stainless Steel Button Head Screw, 3/8"-16 X 3/8" Long
24	1	Control Panel w/HMI	SEE PANEL DRAWING D-410607-E-100_1
25	20	90420A460	No 10 SS Drilling Screws 1 in Long
26	16	5/8"-18 x 3" Long Stud with 2 Heavy Hex Nuts	Zinc Coated
27	2	1/2" Washer	Stainless Steel
28	6	3/8" Washer	Stainless Steel
29	6	3/8" Lock Washer	Stainless Steel
30	2	1/2" Lock Washer	Stainless Steel
31	6	3/8 - 16 Hex Nut	Stainless Steel
32	2	1/2 - 13 Hex Nut	Stainless Steel
33	2	1/2-13 x 2", Hex Bolt	Stainless Steel
34	6	3/8-16 x 2.25", Hex Bolt	Stainless Steel
35	2	3312T84	304 Stainless Steel End Plug for 1-5 8 Strut Channel
36	1	Flow Meter Bracket	SEE PAGE 10
37	1	PMR1	Flow Meter
38	1	AOM3000	O3 Monitor
39	1	O3 Monitor Bracket	SEE PAGE 11
40	4	8MM X 75MM Bolt w / Nut, Lock Washer and Washer	Stainless Steel
41	4	5/16 - 18 x 1.75" Bolt w/ Nut and 2 Washers	Zinc Plated
42	1	SS-400-2-2	Swagelok Stainless Steel Male Elbow, 1/4" Tube x 1/8" Male NPT
43	1	SS-400-2-4	Swagelok Stainless Steel Male Elbow, 1/4" Tube x 1/4" Male NPT
44	4	#8-32 x 5/8" Machine Screw	SS, Ozone Generator Hold Down
45	3	3177T5	1/4" ID Cushioned Loop Clamp, Stainless Steel
46	2	1/4" - 20 x 2" Bolt w/ Nut	Stainless Steel

DRAWN	3/4/2022	ALLIANCE INNOVATIONS			
JAK					
CHECKED		TITLE			
QA					
MFG					
APPROVED					
WDA	3/30/2022	WATER RECLAIM SYSTEM GENERAL ARRANGEMENT BILL OF MATERIALS			
		SIZE		DWG NO	REV
		D		D-410607-P-001	0
		SCALE		SHEET 1 OF 11	

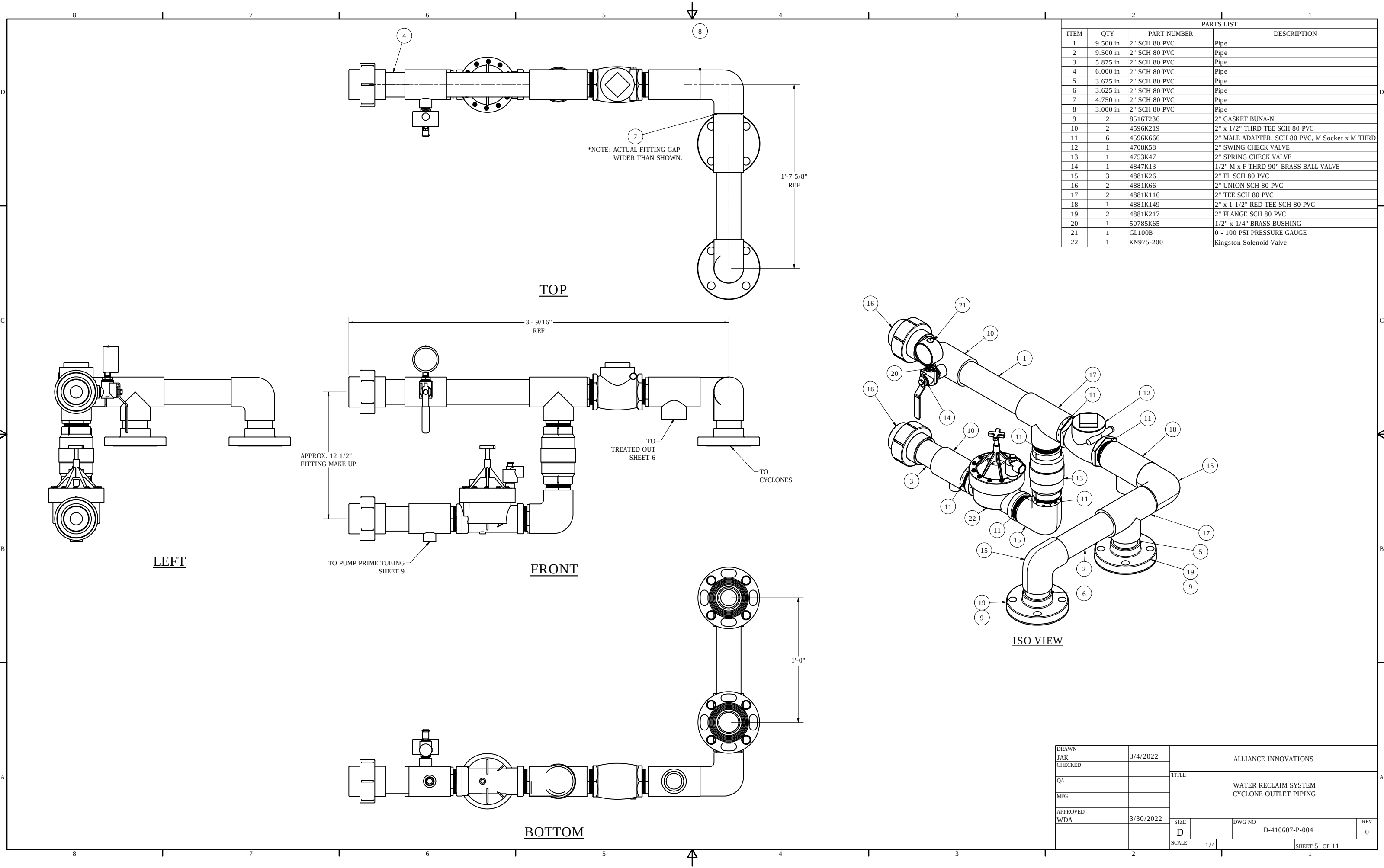


DRAWN	JAK	3/4/2022	ALLIANCE INNOVATIONS			
CHECKED			TITLE WATER RECLAIM SYSTEM GENERAL ARRANGEMENT			
QA						
MFG						
APPROVED	WDA	3/30/2022	SIZE D	DWG NO D-410607-P-002	REV 0	
			SCALE 1/6"	SHEET 2 OF 11		

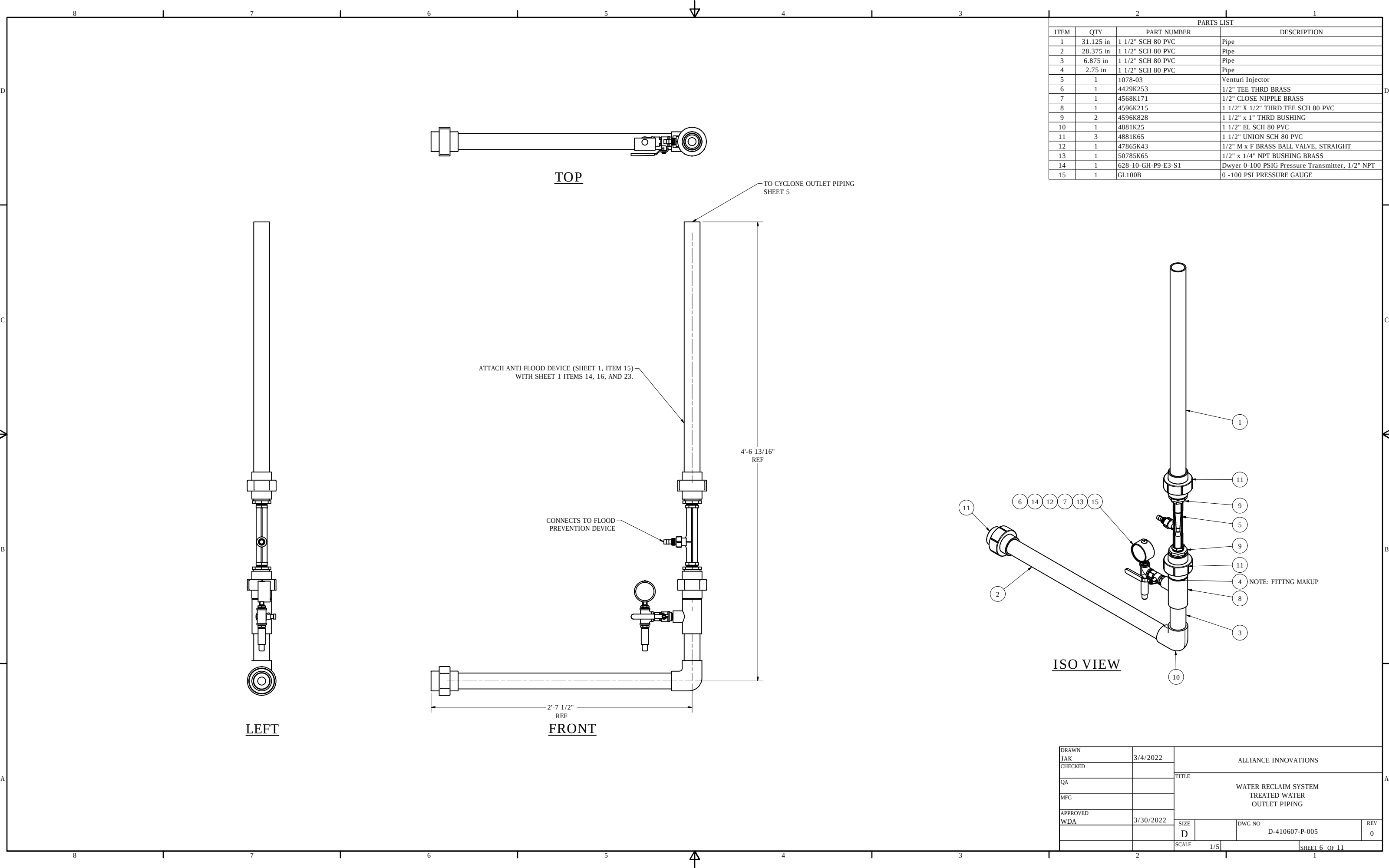




DRAWN	JAK	3/4/2022	ALLIANCE INNOVATIONS			
CHECKED			TITLE			
QA			WATER RECLAIM SYSTEM			
MFG			PUMP OUTLET PIPING			
APPROVED	WDA	3/30/2022	SIZE	D	DWG NO	REV
			SCALE	1/4"	D-410607-P-003	0
			SHEET 4 OF 11			

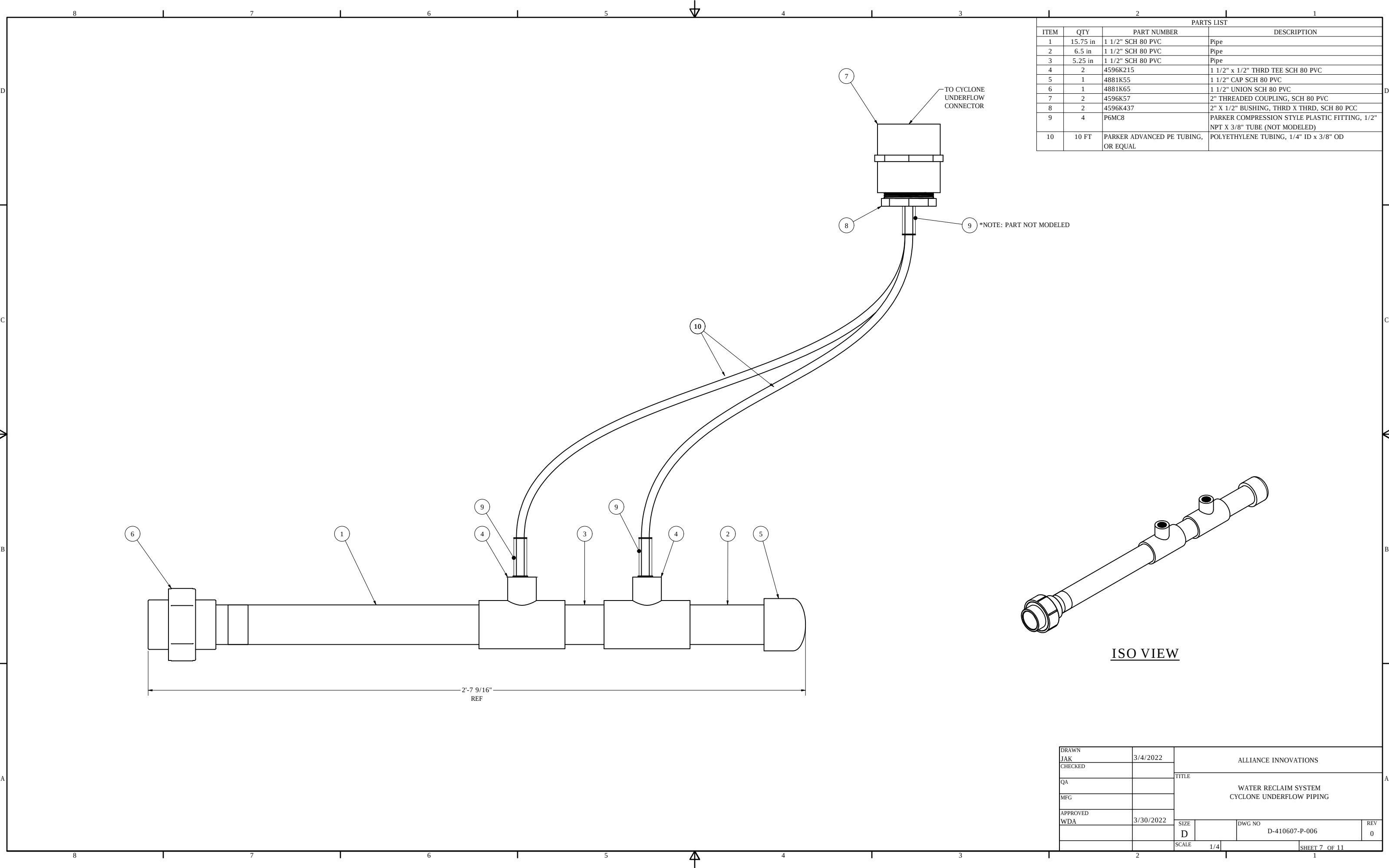


DRAWN	JAK	3/4/2022	ALLIANCE INNOVATIONS			
CHECKED			TITLE WATER RECLAIM SYSTEM CYCLONE OUTLET PIPING			
QA						
MFG						
APPROVED	WDA	3/30/2022	SIZE D	DWG NO D-410607-P-004	REV 0	
		SCALE 1/4"	SHEET 5 OF 11			



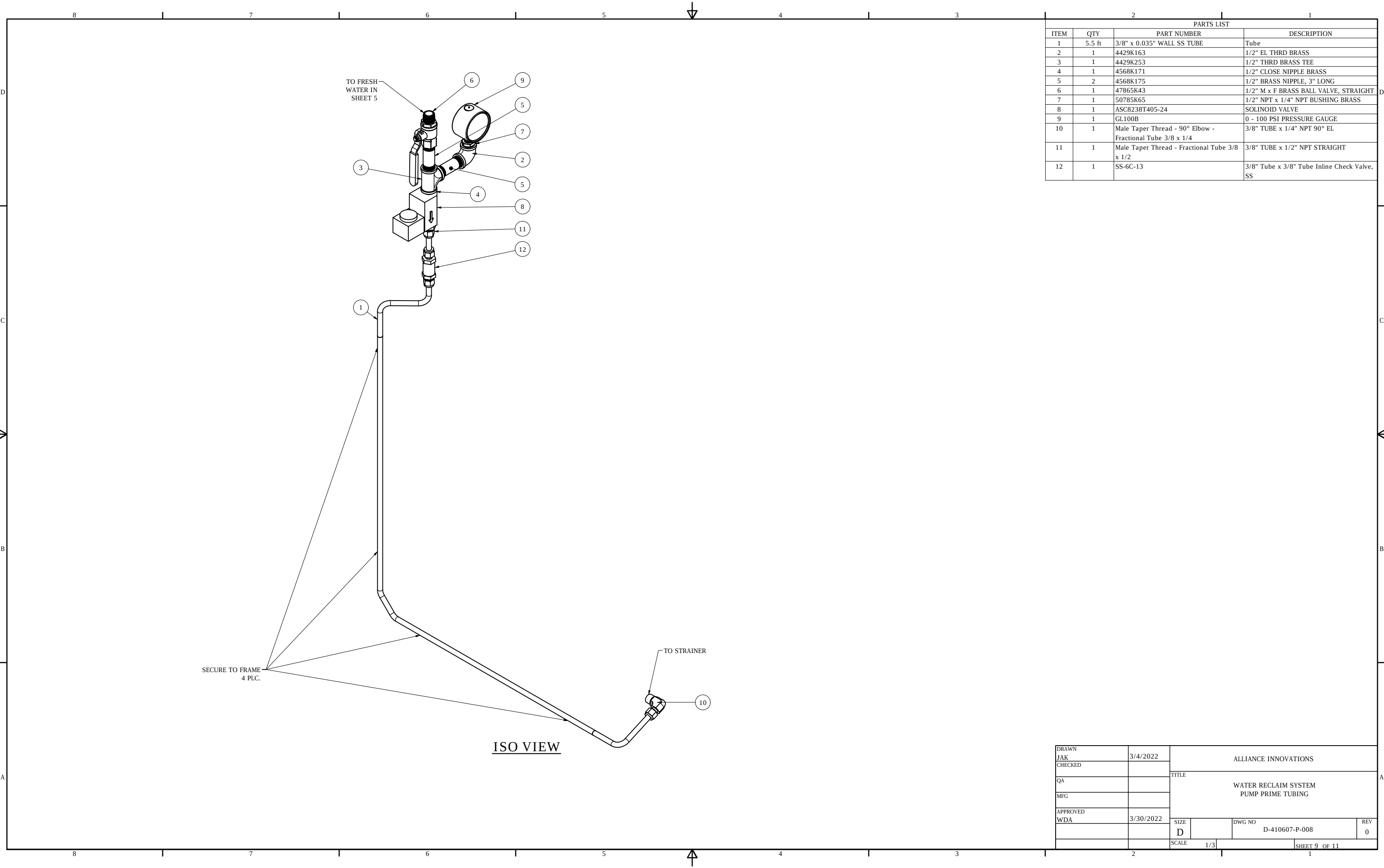
PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	31.125 in	1 1/2" SCH 80 PVC	Pipe
2	28.375 in	1 1/2" SCH 80 PVC	Pipe
3	6.875 in	1 1/2" SCH 80 PVC	Pipe
4	2.75 in	1 1/2" SCH 80 PVC	Pipe
5	1	1078-03	Venturi Injector
6	1	4429K253	1/2" TEE THRD BRASS
7	1	4568K171	1/2" CLOSE NIPPLE BRASS
8	1	4596K215	1 1/2" X 1/2" THRD TEE SCH 80 PVC
9	2	4596K828	1 1/2" x 1" THRD BUSHING
10	1	4881K25	1 1/2" EL SCH 80 PVC
11	3	4881K65	1 1/2" UNION SCH 80 PVC
12	1	47865K43	1/2" M x F BRASS BALL VALVE, STRAIGHT
13	1	50785K65	1/2" x 1/4" NPT BUSHING BRASS
14	1	628-10-GH-P9-E3-S1	Dwyer 0-100 PSIG Pressure Transmitter, 1/2" NPT
15	1	GL100B	0 -100 PSI PRESSURE GAUGE

DRAWN JAK	3/4/2022	ALLIANCE INNOVATIONS		
CHECKED				
QA		TITLE WATER RECLAIM SYSTEM TREATED WATER OUTLET PIPING		
MFG				
APPROVED WDA	3/30/2022			
		SIZE D	DWG NO D-410607-P-005	REV 0
		SCALE 1/5	SHEET 6 OF 11	



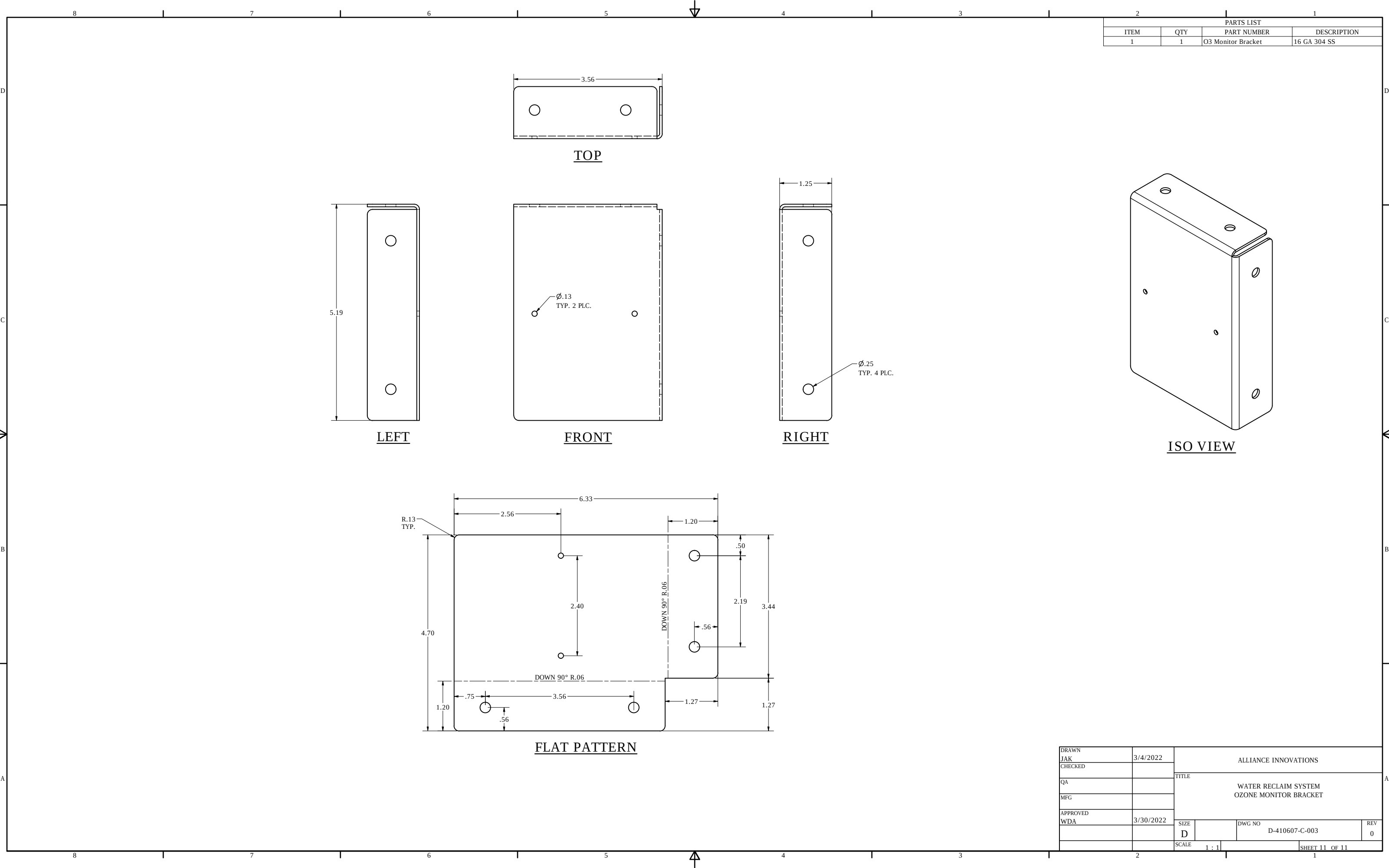
PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	15.75 in	1 1/2" SCH 80 PVC	Pipe
2	6.5 in	1 1/2" SCH 80 PVC	Pipe
3	5.25 in	1 1/2" SCH 80 PVC	Pipe
4	2	4596K215	1 1/2" x 1/2" THRD TEE SCH 80 PVC
5	1	4881K55	1 1/2" CAP SCH 80 PVC
6	1	4881K65	1 1/2" UNION SCH 80 PVC
7	2	4596K57	2" THREADED COUPLING, SCH 80 PVC
8	2	4596K437	2" X 1/2" BUSHING, THRD X THRD, SCH 80 PCC
9	4	P6MC8	PARKER COMPRESSION STYLE PLASTIC FITTING, 1/2" NPT X 3/8" TUBE (NOT MODELED)
10	10 FT	PARKER ADVANCED PE TUBING, OR EQUAL	POLYETHYLENE TUBING, 1/4" ID x 3/8" OD

DRAWN JAK	3/4/2022	ALLIANCE INNOVATIONS			
CHECKED		TITLE WATER RECLAIM SYSTEM CYCLONE UNDERFLOW PIPING			
QA					
MFG					
APPROVED WDA	3/30/2022	SIZE D	DWG NO D-410607-P-006		REV 0
		SCALE 1/4"	SHEET 7 OF 11		



PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	5.5 ft	3/8" x 0.035" WALL SS TUBE	Tube
2	1	4429K163	1/2" EL THRD BRASS
3	1	4429K253	1/2" THRD BRASS TEE
4	1	4568K171	1/2" CLOSE NIPPLE BRASS
5	2	4568K175	1/2" BRASS NIPPLE, 3" LONG
6	1	47865K43	1/2" M x F BRASS BALL VALVE, STRAIGHT
7	1	50785K65	1/2" NPT x 1/4" NPT BUSHING BRASS
8	1	ASC8238T405-24	SOLINOID VALVE
9	1	GL100B	0 - 100 PSI PRESSURE GAUGE
10	1	Male Taper Thread - 90° Elbow - Fractional Tube 3/8 x 1/4	3/8" TUBE x 1/4" NPT 90° EL
11	1	Male Taper Thread - Fractional Tube 3/8 x 1/2	3/8" TUBE x 1/2" NPT STRAIGHT
12	1	SS-6C-13	3/8" Tube x 3/8" Tube Inline Check Valve, SS

DRAWN JAK	3/4/2022	ALLIANCE INNOVATIONS			
CHECKED		WATER RECLAIM SYSTEM PUMP PRIME TUBING			
QA					
MFG					
APPROVED WDA	3/30/2022				
		SIZE D		DWG NO D-410607-P-008	REV 0
		SCALE 1/3	SHEET 9 OF 11		



Section 4

Instrument Data

GENERAL DESCRIPTION

Model T flow meters incorporate the principles of traditional variable area flow technology.

These rugged PTFE-Glass flow meters offer solutions to low to medium flow range measurements of highly corrosive or ultra-pure liquids and gases.

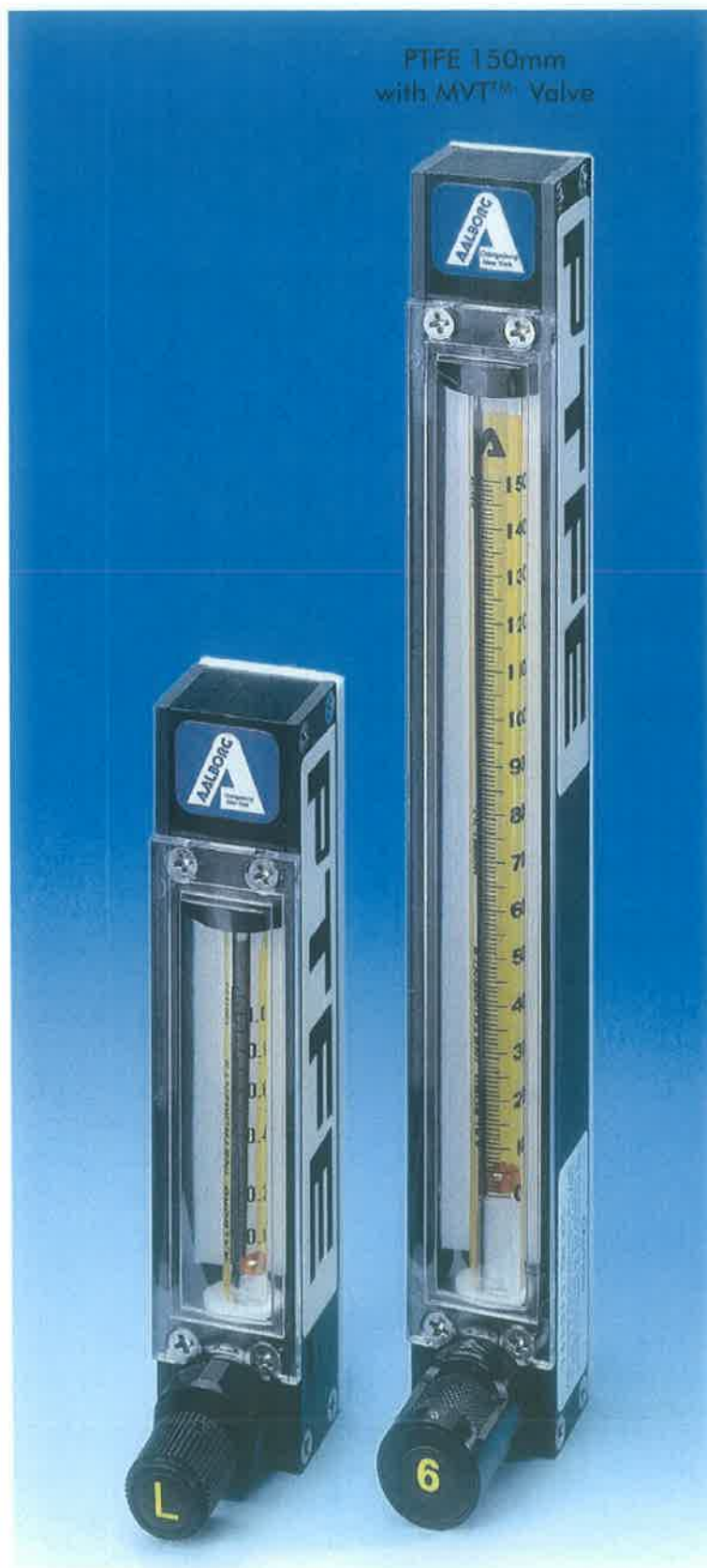
Wetted inert components are surrounded by structurally rigid anodized aluminum. The resultant design represents a unique combination of a rugged mechanically rigid frame and chemically inert wetted parts.

For additional protection of personnel each meter is supplied with a thick protective magnifying safety shield.

*Glass and Sapphire floats are recommended.

design features

- ✓ Constructed of inert materials: Borosilicate Glass, PTFE and PCTFE.
- ✓ Chemically inert wetted parts within mechanically rigid frame.
- ✓ Rib-guided or fluted metering tubes facilitate stable, accurate readings.
- ✓ Magnifier lens in front shield to enhance reading resolution.
- ✓ OPTIGRAD™ scales minimize parallax and eye fatigue.
- ✓ Simple means of panel mounting.
- ✓ Interchangeability of flow tubes and floats.
- ✓ Conveniently overlapping flow ranges available in both standard millimeter and "direct reading" scales.



PTFE 65mm
with CVT™ Valve

T

PTFE-SINGLE GLASS FLOW METERS

LEAK INTEGRITY

Flow meters are individually tested on a Mass Spectrometer Leak Detector and certified to a leak integrity rating of 1×10^{-7} sccs Helium or better.

BUILT-IN VALVES

Meters are available with built-in needle valves (CVT™), high precision metering valves (MVT™) with "non-rising stems", or with no valves. The higher cost of MVT™ valves is justified whenever high sensitivity control and resolution are desirable particularly in conjunction with metering tubes of very low flow rates.

When meters with valves are ordered the valve cartridges are installed at the inlet. For vacuum service it is recommended that meters are ordered with valves at the outlet.

Assorted flow tubes may be used in conjunction with a single mounting frame, an apparent benefit in many laboratory applications.

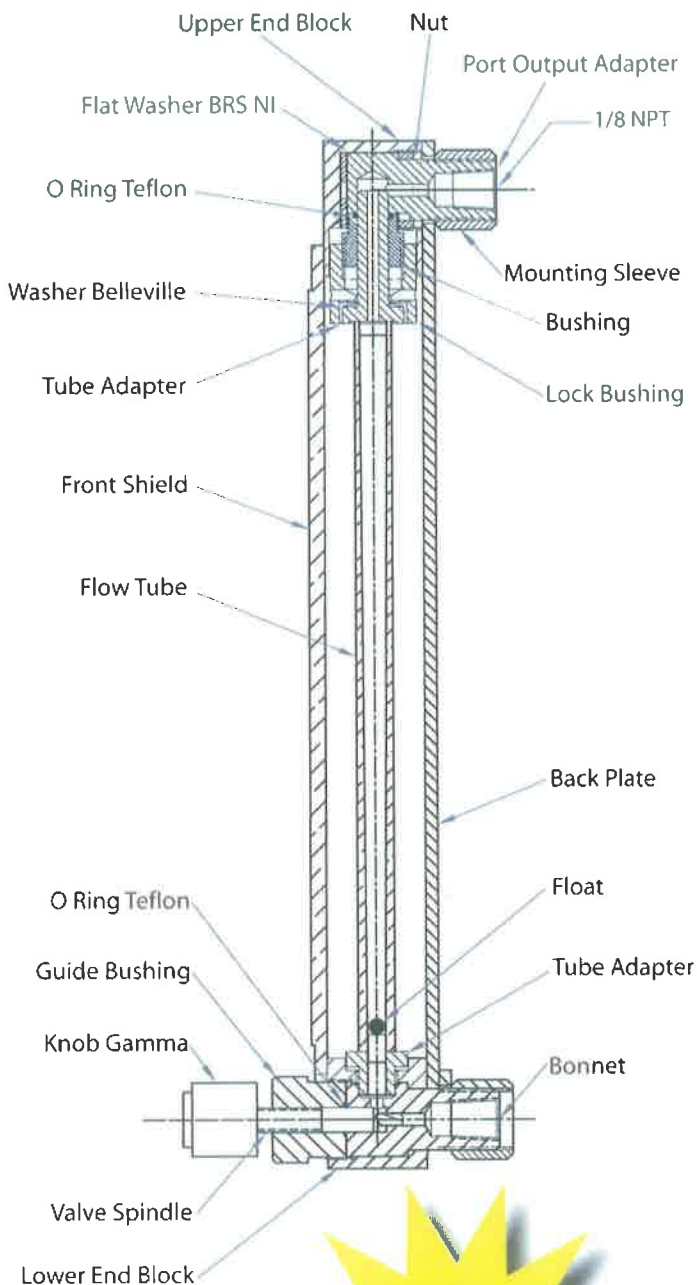
SPECIFICATIONS

STANDARD ACCURACY	±2% FS mm scales except 042 and 032 flow tubes. ±5% FS direct reading scales 042 and 032 flow tubes.
REPEATABILITY	± 0.25%.
USEFUL FLOW RANGES	10:1 minimum with one float.
MAXIMUM OPERATING PRESSURE	100 psig/6.7 bars.
MAXIMUM OPERATING TEMPERATURE	150 °F/ 65 °C.
LEAK INTEGRITY	Individually pressure and leak tested and certified to a rating of 1×10^{-7} sccs Helium.

**MATERIALS OF CONSTRUCTION

FLOW TUBES	Heavy walled borosilicate glass. (Sapphire or glass floats recommended).
FITTINGS IN CONTACT WITH FLUIDS	Virgin PTFE PCTFE.
SIDE PLATES	Aluminum, black anodized.
FRONT SHIELD AND BACK PLATE	1/8" thick clear polycarbonate and white acrylics.
O-RINGS	PTFE.
CONNECTIONS	1/8" NPT female inlet and outlet connections.
OPTIONAL	glass hose nipples or compression fittings.

**The selection of materials of construction, is the responsibility of the customer. The company accepts no liability.

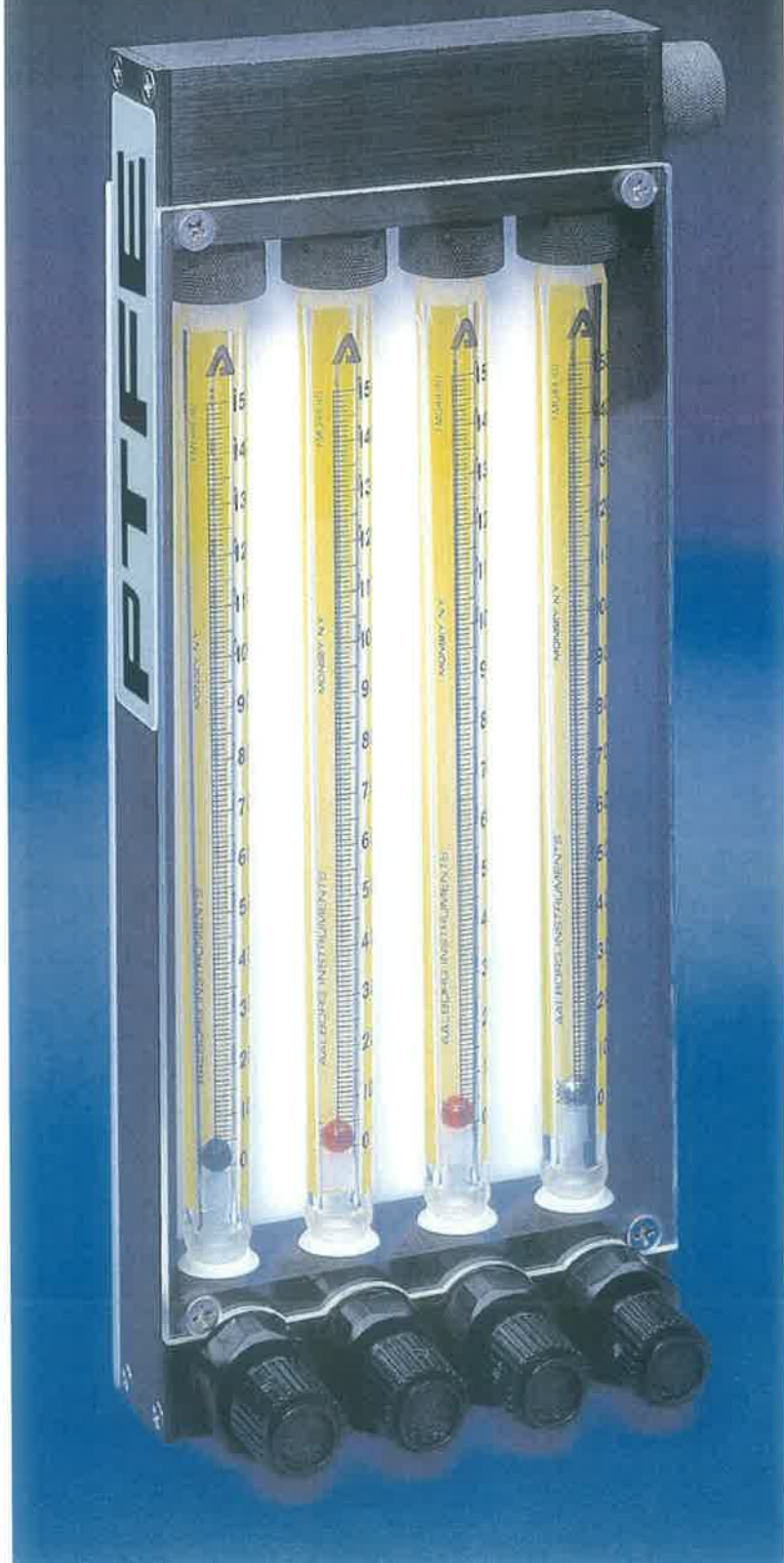


**FOR
OPTICAL SENSOR
SWITCH
SEE PAGE 30**

Panel mounting is convertible to bench mounting through the use of an optional acrylic tripod base with spirit leveler (catalog No. TP1)

**Ordering information see page 26.
Dimensional information see page 25.**

Four Tube PTFE meter shown with CVT™ valves



Model Tx Multiple Tube PTFE-Glass Flow meters combine the convenience of multiple tube meters with the unique design features of single tube PTFE-Glass flow meters. These meters are available with the same interchangeable 65mm or 150mm glass flow tubes used in single tube designs and they are available with or without built-in PTFE needle valves.

Wetted inert components are surrounded by structurally rigid anodized aluminum. The resultant design represents a unique combination of a rugged mechanically rigid frame and chemically inert wetted parts.

They are ideal for applications where several streams of corrosive gases or liquids are to be metered in individual channels or as a controlled mixer in manifolded models.

design features

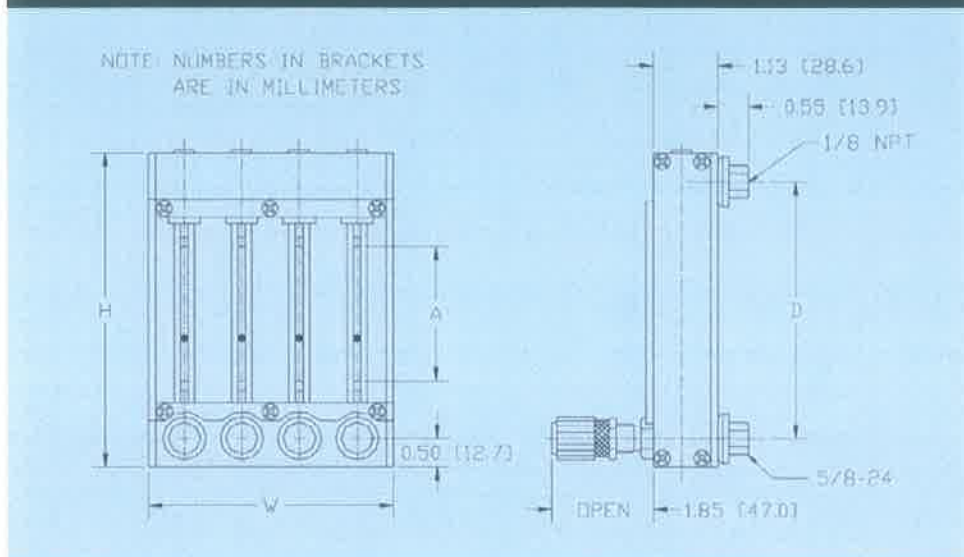
- ✓ Constructed of inert materials: Borosilicate Glass, PTFE and PCTFE.
- ✓ Chemical inert wetted parts within mechanically rigid frame.
- ✓ Rib-guided or fluted metering tubes facilitate: stable, accurate readings.
- ✓ OPTIGRAD™ scales minimize parallax and eye fatigue.
- ✓ Simple means of panel mounting.
- ✓ Interchangeability of flow tubes and floats.
- ✓ Conveniently overlapping flow ranges available in both standard millimeter and direct reading scales.

BUILT-IN VALVES

Meters are available with built-in needle valves (CVT™), high precision metering valves (MVT™) with non-rising stems, or with no valves. The higher cost of MVT™ valves is justified whenever high sensitivity control and resolution are desirable particularly in conjunction with metering tubes of very low flow rates.

For vacuum service it is recommended that meters are ordered with valves at the outlet.

DIMENSIONS



LEAK INTEGRITY

Flow meters are individually tested on a Mass Spectrometer Leak Detector and certified to a leak integrity rating of 1×10^{-7} sccs Helium or better.

Note: To obtain millimeters multiply inch dimensions by 2.54.

SPECIFICATIONS

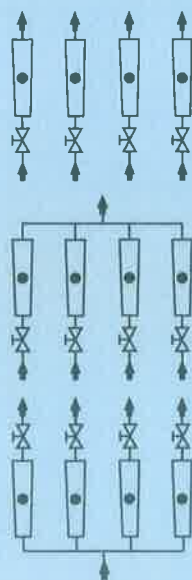
STANDARD ACCURACY	±2% FS mm scales except 042 and 032 flow tubes. ±5% FS direct reading scales and 042 and 032 flow tubes.
REPEATABILITY	± 0.25%.
USEFUL FLOW RANGES	10:1 minimum with one float.
MAXIMUM OPERATING PRESSURE	100 psig/6.7 bars.
MAXIMUM OPERATING TEMPERATURE	150 °F/ 65 °C.
LEAK INTEGRITY	Individually pressure and leak tested and certified to a rating of 1×10^{-7} sccs Helium.

**MATERIALS OF CONSTRUCTION

FLOW TUBES	Heavy walled borosilicate glass. (Sapphire or glass floats recommended).
FITTINGS IN CONTACT WITH FLUIDS	Virgin PTFE PCTFE.
SIDE PLATES	Aluminum, black anodized.
FRONT SHIELD AND BACK PLATE	1/8" thick clear polycarbonate and white acrylics.
O-RINGS	PTFE.
CONNECTIONS	1/8" NPT female inlet and outlet connections.
OPTIONAL	glass hose nipples or compression fittings.

**The selection of materials of construction, is the responsibility of the customer. The company accepts no liability.

FLOW PATTERNS AVAILABLE



1. Parallel isolated channels

2. Parallel channels mixed in manifold

3. Single fluid entering exhausted separately

When meters with valves are ordered the valve cartridges are installed at the inlet.

DIMENSIONS FOR T STYLE METERS

SCALE LENGTH (A)	ALL METERS		WIDTH (W)			
	HEIGHT (H)	CENTER TO CENTER (D)	TUBE 1	TUBE 2	TUBE 3	TUBE 4
65mm	6.156	5.156	1.250	2.250	3.250	4.250
150mm	10.46	9.469	1.250	2.250	3.250	4.250

ORDERING INFORMATION MODEL T METERS



Configure and Order Online: [Model T Single Flow Tube PTFE Meters](#)

[Model Tx Multi Flow Tube PTFE Meters](#)

T	T STYLE METERS
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CODE	NUMBER OF CHANNELS
1	SINGLE CHANNEL (ONE TUBE)
2	TWO CHANNEL METER (TWO TUBES)
3	THREE CHANNEL METER (THREE TUBES)
4	FOUR CHANNEL METER (FOUR TUBES)

CODE	SIZE
6	65 mm
1	150 mm

CODE	MATERIAL
T	PTFE

CODE	VALVE POSITION
1	MFV (HIGH PRECISION) INLET
3	NO VALVE
4	CV (STANDARD CARTRIDGE) INLET
5	MFV (HIGH PRECISION) OUTLET
6	CV (STANDARD CARTRIDGE) OUTLET

CODE	SEALS
T	PTFE

CODE	FITTINGS
A	1/8" FNPT (STANDARD)
F	1/4" COMPRESSION
G	0.390 O.D. GLASS HOSE NIPPLE

CODE	MANIFOLD
0	NONE (STANDARD FOR SINGLE CHANNEL)
1	BOTTOM
2	TOP

T 1 1 T 3 — T F 0 — *TUBE

EXAMPLE: T11T3-TF0

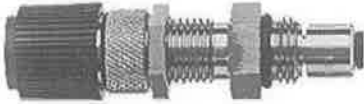
T-Style Meter, Single Channel, 150mm, PTFE, No Valve, PTFE Seals, 1/4" compression fittings, No Manifold.

Optional Accessories

- TP1**-Tripod for single channel meter.
- TP2**-Tripod for 2 and 4 isolated channels or manifolding at top.
- TP3**-Tripod for 3 isolated channels or manifolding at bottom.
- TP5**-Tripod for 3 single tube meters.

*Tube selection:

- Millimeter tubes:** Tables 6 thru 9
- Direct Reading tubes:** Tables 11 thru 22.



FLOW CAPACITIES Spare valve cartridges P, Px and S meters

TABLE 1 - MFV™ VALVE FLOW CAPACITIES 10 psig (0.7 kPa gauge) INLET PRESSURE, ATMOSPHERIC EXHAUST

SIZE	AIR		HELIUM		WATER	
	[mL/min]	[scfh]	[mL/min]	[scfh]	[mL/min]	[gph]
1	200	0.42	400	0.85	6	0.095
2	400	0.85	850	1.80	12	0.190
3	1020	2.15	2100	4.45	28	0.444
4	2600	5.50	6050	12.80	85	1.347
5	8900	18.85	20800	44.05	270	4.279
6	35000	74.15	84500	179.10	1070	16.960
7	63000	133.50	156000	330.50	1930	30.590



TABLE 2 - CV™ VALVE FLOW CAPACITIES 10 psig (0.7 kPa gauge) INLET PRESSURE, ATMOSPHERIC EXHAUST

SIZE	AIR		HELIUM		WATER	
	[mL/min]	[scfh]	[mL/min]	[scfh]	[mL/min]	[gph]
L	5050	10.70	11500	24.35	360	5.70
M	30000	63.55	71500	151.50	1760	27.90
H	76000	161.05	180000	381.40	4500	71.33



FLOW CAPACITIES Spare valve cartridges T and Tx meters

TABLE 1a - MVT™ VALVE FLOW CAPACITIES 10 psig (0.7 kPa gauge) INLET PRESSURE, ATMOSPHERIC EXHAUST

SIZE	AIR		HELIUM		WATER	
	[mL/min]	[scfh]	[mL/min]	[scfh]	[mL/min]	[gph]
1	600	1.25	1250	2.65	36	0.57
3	3000	6.35	6900	14.60	180	2.85
6	30000	63.55	71500	151.50	1800	28.53



TABLE 2a - CVT™ VALVE FLOW CAPACITIES 10 psig (0.7 kPa gauge) INLET PRESSURE, ATMOSPHERIC EXHAUST

SIZE	AIR		HELIUM		WATER	
	[mL/min]	[scfh]	[mL/min]	[scfh]	[mL/min]	[gph]
L	2400	5.10	5300	11.23	130	2.05
H	55000	116.55	135000	286.05	2800	44.40

METER SIZING FOR P, PX, T, TX AND S METERS

Flow capacity tables 6, 7, 8, 9 and 10 (pages 61 to 64) are based on calibrations at standard conditions, meaning 14.7 psia (1 atm) pressure and 70 °F (21.1 °C).

Tables list maximum flow rates of flow tubes. The usable range of meters is at least 10:1, often more. Thus, as a rule of thumb, to estimate the minimum metering limit divide the flow rates listed, by ten.

For gases or liquids with fluid properties not greatly different from the calibration media, tables apply directly, when working pressure and temperature are also approximately standard.

Where the above conditions do not apply the maximum flow rates of the metered fluids are converted to equivalent standard flow rates of air or water.

To do this calculate "K" as shown in charts, multiply the maximum flow rate with this factor, and select the appropriate flow tube size from the Flow Capacity tables 6, 7, 8, 9 and 10 (pages 61 to 64).

gas flow

$$Q_{air} = K_{gas} \times Q_{gas}$$

$$K_{gas} = \sqrt{G \times \frac{T_{act}}{T_o} \times \frac{P_o}{P_{act}}}$$

where:

- Q_{air} = equivalent air flow capacity at Standard Conditions (SPT).
- Q_{gas} = maximum flow of metered gas.
- G = specific gravity of metered gas (from table 5).
- T_{act} = absolute temperature at flow condition, deg R or deg K.
- T_o = absolute temperature at Standard Conditions.
(STP) deg R (530) or deg K (294).
- P_{act} = pressure at flow conditions, psia.
- P_o = pressure at Standard Conditions (STP), (14.7 psia).

liquid flow

$$Q_{water} = K_{liq} \times Q_{liq}$$

$$K_{liq} = \sqrt{\frac{(d_F - d_W)}{(d_F - d_L)} \times \frac{d_L}{d_W}}$$

where:

- Q_{water} = equivalent water flow capacity at Standard Conditions (STP).
- Q_{liq} = maximum flow of metered liquid.
- d_F = density of float selected, (see table 3), (g/ml).
- d_L = density of metered liquid, (g/ml).
- d_W = density of water at Standard Conditions (STP) (1.0 g/ml).

CALCULATION VS. CALIBRATION FOR P, PX, S, T AND TX METERS

In case of liquid flows at each major point along the scale, sample volumes are collected in a buret of a volumetric flask during measured time intervals. Volumes are interpolated to a unit of time such as for example [mL/min] or [cu. ft/hr] etc. A table or a graph is then constructed to establish a complete set of calibration data. In case of gas flows, calibration data can be similarly developed, except that collection of sample volumes is accomplished by means of gas sampling devices, the simplest of which is a "soap bubble" meter.

It is very important that the correction factors as calculated from the accompanying equations are used for sizing only. These relationships are greatly simplified and will not provide precise predictable flow corrections. It is always best practice to calibrate meters for non-standard conditions on site, by using reliable means of calibration.

TECHNICAL INFORMATION

TABLE 3 - FLOAT DENSITIES

MATERIAL	DENSITY [g/ml]
GLASS	2.53
SAPPHIRE	3.98
STAINLESS STEEL	8.04
CARBOLOY	14.98
TANTALUM	16.58

TABLE 4 - CONVERSION FACTORS

MULTIPLY	BY	TO OBTAIN
atm	14.70	lbs/sq. in.
atm	1.0333	kg/sq. cm.
lbs/square inch	0.07031	kg/sq. cm.
ml/min	0.001	liters/min.
ml/min	3.531×10^{-5}	cu. ft/min.
ml/min	1.585×10^{-2}	gal/hr.
cubic ft/hr	472	ml/min.
gal/min	3785	ml/min.
g/ml	62.43	lbs/cu. ft.
g/ml	0.03613	lbs/cu. in.
cc/min	1	ml/min.
cfm (ft ³ /min)	28.31	L/min.
cfm (ft ³ /min)	1.699	m ³ /hr.
oz/min	29.57	mL/min.

PRESSURE

MULTIPLY	BY	TO OBTAIN
PSI	27.71	in. H ₂ O
PSI	2.036	in. Hg
PSI	703.1	mm/H ₂ O
PSI	51.75	mm/Hg
PSI	.0703	kg/cm ²
PSI	.0689	bar
PSI	68.95	mbar
PSI	6895	Pa
PSI	6.895	kPa

TEMPERATURE

$$^{\circ}\text{F} = (1.8 \times ^{\circ}\text{C}) + 32$$

$$^{\circ}\text{C} = (^{\circ}\text{F} - 32) \times 0.555$$

$$^{\circ}\text{Kelvin} = ^{\circ}\text{C} + 273.2$$

LENGTH

MULTIPLY	BY	TO OBTAIN
Multiply	2.54	cm
Inch	12	inch
Ft.	0.305	meter
Yard	1.094	meter
Angstrom	10^{10}	meter

TABLE 5- DENSITY, VISCOSITY & SPECIFIC GRAVITY OF GASES

GAS	DENSITY [g/ml]	VISCOSITY [centipols]	SPECIFIC GRAVITY G [air=1.0]
Acetylene	0.001090	0.00988	0.9073
Air	0.001200	0.01812	1.0000
Ammonia	0.000716	0.00994	0.5963
Argon	0.001660	0.02220	1.3796
Butane	0.002484	0.00848	2.0854
Carbon Dioxide	0.001835	0.01470	1.5290
Carbon Monoxide	0.001163	0.01750	0.9671
Chlorine	0.002983	0.01330	2.4860
Ethane	0.001260	0.00901	1.0493
Ethylene	0.001170	0.00994	0.9749
Helium	0.0001656	0.01980	0.13804
Hydrogen	0.0000834	0.00885	0.06952
Hydrogen Chloride	0.001512	0.01560	1.2678
Methane	0.0006653	0.01099	0.5544
Nitrogen	0.001160	0.01756	0.96724
Nitrous Oxide	0.001833	0.01453	1.5297
Oxygen	0.001326	0.02030	1.10527
Propane	0.001874	0.00805	1.5620
Sulfur Dioxide	0.002717	0.01270	2.2638

TABLES OF STANDARD FLOW CAPACITIES P, PX, T, TX AND S METERS

TABLE 6

150mm Flow tubes (See Table 8 for Gas Flow Capacities)

FLOW TUBE MAXIMUM FLOW RATES

FLOW TUBE NUMBER	AIR		WATER	
	[smL/min]	[scfh]	[smL/min]	[gph]
042-15-GL	18.3	0.040	0.18	0.002
042-15-SA	29.1	0.070	0.37	0.005
042-15-ST	58.7	0.130	0.91	0.014
042-15-CA	103.4	0.234	1.84	0.029
042-15-TA	118	0.220	2.06	0.032
032-41-GL	46.6	0.098	0.50	0.007
032-41-SA	73.1	0.154	0.99	0.015
032-41-ST	138.3	0.293	2.36	0.037
032-41-CA	239.1	0.506	4.60	0.072
032-41-TA	258.7	0.548	5.10	0.080
062-01-GL	91.6	0.194	1.13	0.020
062-01-SA	144.3	0.306	2.19	0.035
062-01-ST	262.2	0.556	4.97	0.079
062-01-CA	431.7	0.915	9.23	0.146
062-01-TA	467.1	0.990	10.15	0.161
112-02-GL	370.6	0.784	5.71	0.090
112-02-SA	513.3	1.087	10.00	0.158
112-02-ST	816.0	1.729	19.2	0.301
112-02-CA	1216.9	2.579	31.6	0.500
112-02-TA	1291.7	2.738	34.1	0.540
082-03-GL	817	1.731	15.2	0.240
082-03-SA	1093	2.316	24.9	0.394
082-03-ST	1665	3.528	44.3	0.702
082-03-CA	2405	5.096	69.0	1.094
082-03-TA	2558	5.420	74.1	1.175
092-04-GL	2214	4.690	49.9	0.792
092-04-SA	2975	6.300	77.7	1.234
092-04-ST	4494	9.520	132.5	2.092
092-04-CA	6467	13.70	203.2	3.218
092-04-TA	6979	14.79	219	3.471
102-05-GL	3780	8.00	89	1.411
102-05-SA	4942	10.47	134	2.124
102-05-ST	7467	15.82	226	3.582
102-05-CA	10780	22.84	343	5.437
102-05-TA	11287	23.92	361	5.722
034-39-GL	8555	18.12	200	3.170
034-39-SA	11140	23.60	301	4.771
034-39-ST	16493	34.94	498	7.893
034-39-CA	23001	48.73	736	11.67
034-39-TA	24540	51.99	784	12.43
044-40-GL	23105	48.95	579	9.177
044-40-SA	29410	62.30	833	13.2
044-40-ST	42860	90.80	1339	21.22
044-40-CA	60212	127.5	1972	31.26
044-40-TA	65625	139.0	2144	33.98

*SUFFIX REFERS TO FLOAT MATERIALS;

GL = Black Glass
SA = Sapphire (red)
ST = 316 Stainless Steel
CA = Carboloy®
TA = Tantalum

TABLE 7

65mm Flow tubes (See Table 9 for Gas Flow Capacities)

FLOW TUBE MAXIMUM FLOW RATES

FLOW TUBE NUMBER	AIR		WATER	
	[smL/min]	[scfh]	[smL/min]	[gph]
042-07-GL	6	0.013	0.07	0.001
042-07-SA	9	0.017	0.08	0.001
042-07-ST	19	0.036	0.28	0.004
042-07-CA	33	0.070	0.62	0.009
042-07-TA	36	0.072	0.66	0.010
032-15-GL	49	0.104	0.55	0.009
032-15-SA	74	0.153	0.98	0.016
032-15-ST	145	0.307	2.38	0.038
032-15-CA	246	0.528	4.60	0.073
032-15-TA	271	0.578	5.25	0.084
022-13-GL	104	0.22	1.24	0.019
022-13-SA	160	0.33	2.47	0.039
022-13-ST	296	0.62	5.75	0.091
022-13-CA	484	1.02	10.58	0.160
022-13-TA	523	1.10	11.61	0.180
012-10-GL	204	0.43	2.8	0.045
012-10-SA	303	0.64	5.3	0.079
012-10-ST	518	1.09	11.2	0.170
012-10-CA	809	1.71	19.5	0.302
012-10-TA	851	1.80	20.7	0.320
052-01-GL	1056	2.23	20.8	0.329
052-01-SA	1399	2.96	33.3	0.527
052-01-ST	2125	4.50	58.7	0.930
052-01-CA	3059	6.48	90.0	1.426
052-01-TA	3245	6.87	94.0	1.537
023-92-GL	1249	2.65	25	0.396
023-92-SA	1623	3.44	36.7	0.581
023-92-ST	2520	5.34	70.7	1.121
023-92-CA	3680	7.80	103.5	1.641
013-88-GL	2006	4.25	39.5	0.61
013-88-SA	2680	5.67	63.2	0.99
013-88-ST	4060	8.6	111.7	1.75
013-88-CA	5798	12.28	172	2.72
365-02-GL	2522	5.35	54.7	0.86
365-02-ST	4917	10.42	143	2.26
014-96-GL	6318	13.4	147	2.33
014-96-SA	8145	17.3	217	3.44
014-96-ST	12058	25.5	364	5.77
014-96-CA	16943	35.8	540	8.56
014-96-TA	18213	38.6	568	9.00
054-17-GL	12860	27.2	307	4.86
054-17-SA	16617	35.2	449	7.11
054-17-ST	24452	51.8	723	11.46
054-17-CA	34507	73.1	1049	16.63
054-17-TA	36466	77.2	1111	17.61
064-63-GL	21969	46.5	550	8.71
064-63-SA	28518	60.4	811	12.85
064-63-ST	41289	87.4	1297	20.56
064-63-CA	58348	123.6	1895	30.04
064-63-TA	61299	129.9	2000	31.70

TABLE OF STANDARD FLOW CAPACITIES P, PX, T, TX AND S METERS

TABLE 8 - 150mm FLOW TUBES, GAS FLOW CAPACITIES OF ROUTINE GASES

FLOW TUBE MAXIMUM FLOW RATES												
FLOW TUBE NUMBER	ARGON		CARBON DIOXIDE		HELIUM		HYDROGEN		NITROGEN		OXYGEN	
	[smL/min]	[scfh]	[smL/min]	[scfh]	[smL/min]	[scfh]	[smL/min]	[scfh]	[smL/min]	[scfh]	[smL/min]	[scfh]
042-15-GL	14.9	0.032	22.8	0.049	15.5	0.033	35.8	0.076	18.9	0.040	16.3	0.035
042-15-SA	23.7	0.051	35.7	0.076	24.8	0.053	57.4	0.122	30	0.064	25.9	0.055
042-15-ST	48	0.102	70	0.149	51.3	0.109	118.8	0.252	60.6	0.129	52.5	0.112
042-15-CA	84.7	0.180	115.3	0.245	97.9	0.208	224.3	0.476	106.5	0.226	92.8	0.197
042-15-TA	96	0.204	135	0.286	108	0.229	248	0.526	121	0.257	106	0.225
032-41-GL	38.1	0.080	55.1	0.116	41.1	0.087	95	0.201	48	0.101	42	0.088
032-41-SA	59.1	0.125	83	0.175	66	0.139	151	0.319	74	0.156	65	0.137
032-41-ST	114	0.241	153	0.324	136	0.288	304	0.644	142	0.300	125	0.264
032-41-CA	197	0.417	255	0.540	254	0.538	553	1.171	246	0.521	217	0.459
032-41-TA	215	0.455	276	0.584	281	0.595	609	1.29	268	0.567	237	0.502
062-01-GL	79.2	0.168	112.8	0.239	94	0.200	211	0.447	93	0.197	87	0.185
062-01-SA	119	0.253	156	0.331	149	0.316	327	0.693	148	0.314	131	0.278
062-01-ST	217	0.460	272	0.577	288	0.611	632	1.339	269	0.570	239	0.507
062-01-CA	368	0.780	431	0.914	518	1.098	1100	2.331	443	0.939	396	0.839
062-01-TA	388.3	0.823	464.1	0.983	571.9	1.212	1200.3	2.543	478.8	1.015	429	0.909
112-02-GL	307	0.650	358.3	0.758	453	0.959	981	2.079	378	0.800	340	0.012
112-02-SA	429	0.909	485	1.028	708	1.500	1420	3.009	525	1.112	478	1.013
112-02-ST	682	1.445	740	1.568	1352	2.865	2366	5.013	832	1.763	756	1.621
112-02-CA	1022	2.165	1080	2.288	2228	4.721	3688	7.814	1243	2.634	1141	2.418
112-02-TA	1090	2.310	1140.9	2.418	2404.6	5.096	4257	9.020	1321.4	2.799	1211	2.566
082-03-GL	685	1.451	705	1.494	1488	3.153	2459	5.210	834	1.767	761	1.612
082-03-SA	919	1.947	950	2.013	2105	4.460	3546	7.514	1117	2.367	1022	2.165
082-03-ST	1403	2.973	1362	2.886	3443	7.295	5359	11.36	1699	3.600	1573	3.333
082-03-CA	2029	4.299	2076	4.399	5197	11.01	7967	16.88	2452	5.195	2275	4.820
082-03-TA	2159	4.575	2182	4.623	5530	11.72	8511	18.03	2608	5.526	2406	5.098
092-04-GL	1896	4.01	1976	4.18	4727	10.02	7557	16.01	2288	4.84	2113	4.47
092-04-SA	2516	5.33	2610	5.53	6310	13.37	10202	21.62	3032	6.42	2806	5.94
092-04-ST	3805	8.06	3887	8.23	9728	20.61	15754	33.38	4578	9.70	4247	8.99
092-04-CA	5525	11.71	5599	11.86	14158	30.00	23232	49.23	6640	14.07	6170	13.07
092-04-TA	5914	12.53	5954	12.62	15227	32.26	24927	52.82	7103	15.05	6604	13.99
102-05-GL	3148	6.67	3266	6.92	8526	18.07	13164	27.89	3824	8.10	3549	7.52
102-05-SA	4185	8.86	4314	9.14	10384	22.00	17434	36.94	5033	10.66	4672	9.89
102-05-ST	6329	13.41	6288	13.32	15906	33.70	26770	56.72	7603	16.11	7069	14.98
102-05-CA	9082	19.24	8976	19.02	23416	49.62	39080	82.81	10974	23.25	10185	21.58
102-05-TA	9573	20.28	9351	19.81	24794	52.54	40968	86.81	11490	24.35	10697	22.67
034-39-GL	7266	15.39	7304	15.47	19040	40.33	29795	63.12	8695	18.42	8091	17.14
034-39-SA	9373	19.85	9406	19.92	24810	52.56	39101	82.84	11270	23.87	10535	22.31
034-39-ST	13977	29.61	13728	29.08	39280	83.22	58968	124.9	16794	35.58	15610	33.07
034-39-CA	19580	41.48	19296	40.88	54965	116.4	84023	178.0	23444	49.66	22000	46.61
034-39-TA	20938	44.36	20543	43.52	60207	127.5	89109	188.7	25084	53.14	23500	49.78
044-40-GL	19472	41.25	19220	40.72	53552	113.4	83730	177.3	23432	49.64	21832	46.25
044-40-SA	24878	52.70	24263	51.40	71100	150.6	106992	226.6	29798	63.13	27937	59.26
044-40-ST	36564	77.46	35541	75.29	106151	224.8	157719	334.1	43607	92.38	41076	87.02
044-40-CA	51689	109.5	50243	106.4	161232	341.5	224353	475.3	61653	130.6	57480	121.7
044-40-TA	55248	117.0	53771	113.9	171090	362.4	243016	514.8	66954	141.8	61892	131.1

*Suffix refers to float materials: G = black glass, S = sapphire (red), ST = 316 stainless steel, C = Carboloy® , T = tantalum.

Flow capacities shown in Tables 4, 5, 6 and 7 are based on calibrations at standard (STP) conditions (70 °F / 21.1 °C and 14.7psia/1 atm abs). For fluids other than air or water at STP conditions see paragraph on METER SIZING on page 59. For special OEM requirements call toll free 1-800-866-3837.

for direct reading (engineering units) scale flow tubes contact the company or visit us at www.aalborg.com

TABLE OF STANDARD FLOW CAPACITIES P, PX, T, TX AND S METERS

TABLE 9 - 65mm FLOW TUBES, GAS FLOW CAPACITIES OF ROUTINE GASES

FLOW TUBE MAXIMUM FLOW RATES

FLOW TUBE NUMBER	ARGON [smL/min] [scfh]		CARBON DIOXIDE [smL/min] [scfh]		HELIUM [smL/min] [scfh]		HYDROGEN [smL/min] [scfh]		NITROGEN [smL/min] [scfh]		OXYGEN [smL/min] [scfh]	
042-07-GL	4	0.01	6.5	0.01	5.5	0.01	9.6	0.02	5.6	0.01	5	0.01
042-07-SA	7.7	0.02	10	0.02	8	0.02	15.3	0.03	8.5	0.02	7	0.01
042-07-ST	14	0.03	20	0.04	16	0.03	32.3	0.07	18	0.04	15	0.03
042-07-CA	28	0.06	39	0.08	30	0.06	53.6	0.11	34	0.07	29	0.06
042-07-TA	29	0.06	40	0.08	32	0.07	64.8	0.14	34	0.07	30	0.06
032-15-GL	38	0.08	59	0.13	47	0.10	100	0.21	51	0.11	46	0.10
032-15-SA	63	0.13	90	0.19	71	0.15	150	0.32	78	0.17	72	0.15
032-15-ST	122	0.26	160	0.34	146	0.31	314	0.67	149	0.32	132	0.28
032-15-CA	214	0.45	263	0.56	274	0.58	593	1.26	264	0.56	239	0.51
032-15-TA	224	0.47	279	0.59	294	0.62	654	1.39	276	0.58	248	0.53
022-13-GL	86	0.19	121	0.26	103	0.22	230	0.49	107	0.23	94	0.20
022-13-SA	132	0.28	176	0.38	164	0.35	367	0.78	164	0.35	145	0.31
022-13-ST	246	0.53	307	0.65	312	0.67	728	1.55	304	0.65	271	0.58
022-13-CA	403	0.86	478	1.02	562	1.19	1257	2.67	496	1.05	445	0.95
022-13-TA	435.2	0.93	513.4	1.09	616.5	1.31	1370	2.91	535.7	1.14	481.1	1.02
012-10-GL	169	0.35	218	0.46	207	0.43	496	1.05	210	0.44	187	0.39
012-10-SA	251	0.53	305	0.64	331	0.70	768	1.62	310	0.65	277	0.58
012-10-ST	432	0.91	501	1.06	665	1.40	1399	2.96	531	1.12	478	1.01
012-10-CA	677	1.43	729	1.54	1194	2.52	2298	4.86	828	1.75	751	1.59
012-10-TA	712	1.50	771	1.63	1273	2.69	2426	5.13	870	1.84	789	1.67
052-01-GL	886	1.87	939	1.98	2070	4.38	3294	6.98	1086	2.30	1003	2.12
052-01-SA	1185	2.51	1227	2.59	2852	6.04	4477	9.49	1419	3.00	1344	2.84
052-01-ST	1794	3.80	1838	3.89	4573	9.68	7061	14.96	2164	4.58	2022	4.28
052-01-CA	2573	5.45	2629	5.56	6762	14.32	10394	21.93	3105	6.57	2912	6.16
052-01-TA	2742	5.80	2774	5.87	7190	15.23	11056	23.43	3293	6.97	3094	6.55
023-92-GL	1030	2.19	1114	2.36	1934	4.10	3590	7.61	1251	2.65	1150	2.44
023-92-SA	1399	2.97	1494	3.17	2878	6.10	5022	10.64	1702	3.61	1568	3.33
023-92-ST	2141	4.54	2224	4.72	4886	10.36	8251	17.48	2576	5.46	2381	5.05
023-92-CA	3103	6.58	3194	6.77	7580	16.06	12517	26.52	3767	7.98	3480	7.38
013-88-GL	1687	3.57	1787	3.78	3344	7.08	6255	13.25	2048	4.33	1876	3.97
013-88-SA	2240	4.74	2338	4.95	4966	10.52	8506	18.02	2737	5.79	2493	5.28
013-88-ST	3426	7.25	3508	7.43	8258	17.49	13435	28.46	4112	8.71	3817	8.08
013-88-CA	4928	10.44	4957	10.50	12672	26.84	19783	41.91	5943	12.59	5494	11.63
365-02-GL	2106	4.47	2188	4.64	4748	10.06	7770	16.47	2563	5.43	2373	5.03
365-02-ST	4141	8.78	4106	8.70	10903	23.10	16980	35.98	5034	10.67	4657	9.87
014-96-GL	5290	11.21	5379	11.4	13639	28.9	21327	45.2	6380	13.52	5880	124.5
014-96-SA	6900	14.62	6980	14.79	18500	39.19	28211	59.77	8280	17.54	7690	16.29
014-96-ST	10175	21.56	10150	21.50	27300	57.84	41889	88.76	12058	25.55	11250	23.83
014-96-CA	14293	30.28	14200	30.08	40036	84.84	58498	123.9	17253	36.55	16031	33.97
014-96-TA	15168	32.14	15088	36.55	42396	89.84	63885	135.4	18250	38.67	16939	35.89
054-17-GL	10895	23.09	10811	22.91	29355	62.20	47100	99.8	13096	27.75	12166	25.78
054-17-SA	14085	29.85	14000	29.67	38325	81.20	61715	130.7	16919	35.85	15733	33.34
054-17-ST	20740	43.94	20307	43.03	57120	121.0	90323	191.3	24891	52.74	23174	49.10
054-17-CA	29280	62.04	28420	60.22	81800	173.3	130805	277.1	35122	74.42	32724	69.33
054-17-TA	30944	65.56	30570	64.77	87573	185.5	139224	294.9	37115	78.64	34585	73.28
064-63-GL	18625	39.46	18159	38.48	50441	106.87	79680	168.82	22501	47.68	20812	44.10
064-63-SA	24193	51.26	23513	49.82	66312	140.50	104110	220.58	29027	61.50	27038	57.29
064-63-ST	35263	74.71	34151	72.36	104993	222.45	152772	323.67	41985	88.96	39416	83.51
064-63-CA	49534	104.95	47860	101.40	143606	304.25	215595	456.77	59377	125.80	55375	117.32
064-63-TA	52041	110.26	50268	106.50	156768	332.14	226636	480.17	62380	132.17	57772	122.40

TABLE OF FLOW CAPACITIES AT 50 PSIG FOR GAS PROPORTIONERS

TABLE 10 - 150mm FLOW TUBES, GAS FLOW CAPACITIES FOR GAS PROPORTIONERS at 50 PSIG

FLOW TUBE MAXIMUM FLOW RATES

FLOW TUBE NUMBER	AIR [smL/min]	ARGON [smL/min]	CARBON DIOXIDE [smL/min]	HELIUM [smL/min]	HYDROGEN [smL/min]	NITROGEN [smL/min]	OXYGEN [smL/min]
042-15-GL	83	67	97	73	169	85	74
042-15-SA	127	104	146	117	267	131	114
042-15-ST	242	200	265	241	535	249	218
042-15-CA	415	343	437	450	967	426	376
032-41-GL	191	161	203	195	399	197	166
032-41-SA	270	229	279	302	662	283	246
032-41-ST	460	383	478	573	1185	471	442
032-41-CA	743	625	702	1094	2013	771	719
062-01-GL	324	270	346	333	844	331	294
062-01-SA	505	412	494	569	1209	467	460
062-01-ST	825	687	771	1089	2432	833	764
062-01-CA	1275	1062	1132	1972	3732	1303	1175
112-02-GL	1086	855	934	1779	3110	1016	930
112-02-SA	1324	1115	1168	2468	4289	1340	1228
112-02-ST	2024	1717	1724	4083	6740	2034	1905
112-02-CA	2912	2472	2521	6927	9979	2997	2703
082-03-GL	2008	1697	1747	4214	6711	2039	1865
082-03-SA	2590	2186	2264	5656	8995	2643	2503
082-03-ST	3903	3274	3343	8669	14490	3731	3685
082-03-CA	5547	4697	4691	12717	19993	6169	5210
092-04-GL	5528	4794	4954	12540	18862	5801	5381
092-04-SA	7240	6163	6217	15703	25235	7415	6826
092-04-ST	10813	9077	9178	24629	38556	11044	10335
092-04-CA	15322	12904	12879	34709	55936	15433	14451
102-05-GL	9294	7705	7888	19830	30900	9419	8749
102-05-SA	11647	9969	10042	26008	45263	11955	11137
102-05-ST	17311	14489	14420	40831	60300	17525	16353
102-05-CA	24065	20744	20099	59702	86369	24549	22905
034-39-GL	19767	17978	17936	48193	73500	21676	19931
034-39-SA	27514	23001	54010	63240	97000	27449	25800
034-39-ST	38995	33778	33087	98676	142000	40086	36821
034-39-CA	55293	47151	45745	139847	200500	55930	52494
044-40-GL	49374	41899	40520	125617	182239	50258	46851
044-40-SA	62480	53038	51220	159976	231239	63595	59304
044-40-ST	89880	76322	73584	231946	333775	91478	85341
044-40-CA	123846	105182	101303	321265	460942	126041	117615

DIRECT READING SCALES FOR P, PX, T, TX AND S METERS

TABLE 11 - FLOW TUBES FOR AIR

65mm				150mm			
FLOW TUBE	QMAX	[UNITS]	PRESSURE	FLOW TUBE	QMAX	[UNITS]	PRESSURE
042-10-GL	7.00	mL/min	14.70 psia	042-12-SA	25.00	mL/min	14.70 psia
032-01-ST	50.00	mL/min	14.70 psia	032-06-SA	52.00	mL/min	14.70 psia
062-04-ST	75.00	mL/min	14.70 psia	042-06-CA	75.00	mL/min	14.70 psia
022-14-GL	100.00	mL/min	14.70 psia	032-10-ST	100.00	mL/min	14.70 psia
032-11-ST	130.00	mL/min	14.70 psia	042-75-CA	100.00	mL/min	14.70 psia
032-03-CA	250.00	mL/min	14.70 psia	032-21-ST	150.00	mL/min	14.70 psia
022-05-CA	500.00	mL/min	14.70 psia	062-03-ST	200.00	mL/min	14.70 psia
052-12-GL	1000.00	mL/min	14.70 psia	112-10-GL	300.00	mL/min	14.70 psia
052-04-GL	1.00	L/min	14.70 psia	112-08-SA	500.00	mL/min	14.70 psia
023-03-GL	1.15	L/min	14.70 psia	082-02-GL	800.00	mL/min	14.70 psia
052-07-ST	2.00	L/min	14.70 psia	112-19-CA	1.25	L/min	14.70 psia
013-89-ST	4.00	L/min	14.70 psia	082-12-ST	1.80	L/min	14.70 psia
014-03-GL	5.00	L/min	14.70 psia	092-25-GL	2.50	L/min	14.70 psia
014-02-ST	10.00	L/min	14.70 psia	102-07-GL	4.00	L/min	14.70 psia
044-11-ST	16.00	L/min	14.70 psia	102-03-SA	4.50	L/min	14.70 psia
054-01-ST	25.00	L/min	14.70 psia	092-14-ST	4.80	L/min	14.70 psia
064-03-ST	40.00	L/min	14.70 psia	102-01-SA	5.00	L/min	14.70 psia
052-05-GL	2.20	scfh	14.70 psia	102-16-CA	10.00	L/min	14.70 psia
365-18-GL	6.00	scfh	14.70 psia	034-13-ST	17.00	L/min	14.70 psia
365-19-ST	10.00	scfh	14.70 psia	044-14-GL	23.00	L/min	14.70 psia
034-61-ST	18.00	scfh	14.70 psia	044-41-ST	42.00	L/min	14.70 psia
014-17-ST	25.00	scfh	14.70 psia	044-16-CA	60.00	L/min	14.70 psia
054-02-ST	50.00	scfh	14.70 psia	112-01-CA	2.50	scfh	14.70 psia
064-62-ST	90.00	scfh	14.70 psia	092-09-GL	5.00	scfh	14.70 psia
074-02-CA	150.00	scfh	14.70 psia	102-06-GL	8.25	scfh	14.70 psia
014-01-CA	0.60	scfm	14.70 psia	092-10-ST	10.00	scfh	14.70 psia
				102-08-ST	16.50	scfh	14.70 psia
				102-09-CA	23.00	scfh	14.70 psia
				044-05-GL	55.00	scfh	14.70 psia
				044-18-ST	90.00	scfh	14.70 psia
				044-07-ST	94.00	scfh	14.70 psia
				044-23-SA	1.00	scfm	14.70 psia
				044-43-ST	1.50	scfm	14.70 psia

TABLE 12 - FLOW TUBES FOR WATER

65mm				150mm			
FLOW TUBE	QMAX	[UNITS]	PRESSURE	FLOW TUBE	QMAX	[UNITS]	PRESSURE
032-04-GL	0.50	mL/min	14.70 psia	032-05-SA	1.00	mL/min	14.70 psia
022-08-ST	6.00	mL/min	14.70 psia	112-12-SA	10.00	mL/min	14.70 psia
052-09-GL	25.00	mL/min	14.70 psia	112-05-ST	20.00	mL/min	14.70 psia
052-08-ST	60.00	mL/min	14.70 psia	092-02-GL	50.00	mL/min	14.70 psia
013-02-ST	115.00	mL/min	14.70 psia	092-08-GL	60.00	mL/min	14.70 psia
365-01-ST	150.00	mL/min	14.70 psia	102-11-GL	100.00	mL/min	14.70 psia
044-09-GL	250.00	mL/min	14.70 psia	092-06-CA	200.00	mL/min	14.70 psia
064-05-GL	500.00	mL/min	14.70 psia	044-15-ST	1.20	L/min	14.70 psia
054-03-ST	750.00	mL/min	14.70 psia	044-01-TA	2.00	L/min	14.70 psia
064-04-SA	1.00	L/min	14.70 psia	044-12-SA	0.22	gpm	14.70 psia
064-06-ST	1.20	L/min	14.70 psia	044-42-CA	0.45	gpm	14.70 psia
052-16-ST	3.00	L/hr	14.70 psia	044-10-CA	29.00	gph	14.70 psia
034-74-ST	2.7	gph	14.70 psia				
064-12-GL	10.00	gph	14.70 psia				
064-09-CA	24.00	gph	14.70 psia				
064-11-TA	32.00	gph	14.70 psia				

TECHNICAL INFORMATION

DIRECT READING SCALES FOR P, PX, T, TX AND S METERS

TABLE 13 - FLOW TUBES FOR ARGON

65mm				150mm			
FLOW TUBE	QMAX	[UNITS]	PRESSURE	FLOW TUBE	QMAX	[UNITS]	PRESSURE
052-15-SA	1000.00	mL/min	14.70 psia	062-10-CA	325.00	mL/min	14.70 psia
013-09-CA	4.5	L/min	14.70 psia	032-18-GL	33.00	mL/min	14.70 psia
064-14-SA	26.00	L/min	14.70 psia	082-11-CA	2.00	L/min	14.70 psia
023-05-GL	2.50	scfh	14.70 psia	034-07-ST	15.00	L/min	14.70 psia
365-17-ST	10.00	scfh	14.70 psia	044-22-SA	25.00	L/min	14.70 psia
014-14-ST	22.00	scfh	14.70 psia				
064-01-GL	50.00	scfh	14.70 psia				

TABLE 14 - FLOW TUBES FOR CARBON DIOXIDE

65mm				150mm			
FLOW TUBE	QMAX	[UNITS]	PRESSURE	FLOW TUBE	QMAX	[UNITS]	PRESSURE
042-20-SA	10.00	mL/min	14.70 psia	062-09-GL	100.00	mL/min	14.70 psia
042-09-ST	20.00	mL/min	14.70 psia	032-32-ST	150.00	mL/min	14.70 psia
032-20-GL	55.00	mL/min	14.70 psia	062-14-ST	300.00	mL/min	14.70 psia
022-24-SA	220.00	mL/min	14.70 psia	092-18-SA	2.5	L/min	14.70 psia
052-14-GL	1.00	L/min	14.70 psia	034-18-SA	10.00	L/min	14.70 psia
023-07-ST	2.00	L/min	14.70 psia				
014-18-GL	6.00	L/min	14.70 psia				
014-19-ST	10.00	L/min	14.70 psia				
064-08-ST	35.00	L/min	14.70 psia				

TABLE 15 - DIRECT READING FLOW TUBES FOR FUEL OIL

150mm			
FLOW TUBE	QMAX	[UNITS]	PRESSURE
034-60-GL	3.00	gph	14.70 psia

TABLE 16 - DIRECT READING FLOW TUBES FOR HELIUM

65mm				150mm			
FLOW TUBE	QMAX	[UNITS]	PRESSURE	FLOW TUBE	QMAX	[UNITS]	PRESSURE
032-07-SA	65.00	mL/min	14.70 psia	062-13-GL	100.00	mL/min	14.70 psia
022-02-GL	120.00	mL/min	14.70 psia	062-07-CA	500.00	mL/min	14.70 psia
014-04-GL	30.00	scfh	14.70 psia	082-05-GL	1500.00	mL/min	14.70 psia
				082-07-CA	5.00	L/min	14.70 psia
				034-09-ST	40.00	L/min	14.70 psia
				112-03-SA	1.25	scfh	14.70 psia

TABLE 17 - DIRECT READING FLOW TUBES FOR HYDROGEN

65mm				150mm			
FLOW TUBE	QMAX	[UNITS]	PRESSURE	FLOW TUBE	QMAX	[UNITS]	PRESSURE
032-13-GL	35.00	mL/min	14.70 psia	032-12-GL	100.00	mL/min	14.70 psia
042-01-CA	100.00	mL/min	14.70 psia	092-15-SA	20.00	scfh	14.70 psia
032-02-SA	150.00	mL/min	14.70 psia	044-20-SA	225.00	scfh	14.70 psia
012-01-GL	600.00	mL/min	14.70 psia				
022-01-CA	1.50	L/min	14.70 psia				
023-01-GL	3.50	L/min	14.70 psia				
013-01-GL	6.00	L/min	14.70 psia				
014-15-ST	42.00	L/min	14.70 psia				
013-08-ST	30.00	scfh	14.70 psia				

DIRECT READING SCALES FOR P, PX, T, TX AND S METERS

TABLE 18- DIRECT READING FLOW TUBES FOR METHANE

65mm			
FLOW TUBE	QMAX	[UNITS]	PRESSURE
042-03-ST	40.00	mL/min	14.70 psia

TABLE 19- DIRECT READING FLOW TUBES FOR NITROUS OXIDE

150mm			
FLOW TUBE	QMAX	[UNITS]	PRESSURE
112-11-SA	500.00	mL/min	14.70 psia

TABLE 20 - DIRECT READING FLOW TUBES FOR NITROGEN

65mm				150mm			
FLOW TUBE	QMAX	[UNITS]	PRESSURE	FLOW TUBE	QMAX	[UNITS]	PRESSURE
042-08-GL	6.00	mL/min	14.70 psia	062-12-GL	100.00	mL/min	14.70 psia
032-16-ST	50.00	mL/min	14.70 psia	032-22-CA	200.00	mL/min	14.70 psia
032-08-SA	60.00	mL/min	14.70 psia	062-30-CA	300.00	mL/min	14.70 psia
022-15-GL	120.00	mL/min	14.70 psia	112-06-SA	500.00	mL/min	14.70 psia
022-06-SA	200.00	mL/min	14.70 psia	032-31-GL	50.00	mL/min	14.70 psia
014-16-ST	12.00	L/min	14.70 psia	092-05-GL	2.00	L/min	14.70 psia
064-13-GL	20.00	L/min	14.70 psia	102-21-ST	7.00	L/min	14.70 psia
				034-24-ST	14.00	L/min	14.70 psia
				044-25-CA	50.00	L/min	14.70 psia
				044-24-TA	66.00	L/min	14.70 psia
				044-06-ST	1.60	scfm	14.70 psia

TABLE 21 - DIRECT READING FLOW TUBES FOR OXYGEN

65mm				150mm			
FLOW TUBE	QMAX	[UNITS]	PRESSURE	FLOW TUBE	QMAX	[UNITS]	PRESSURE
042-21-ST	10.00	mL/min	14.70 psia	032-33-ST	150.00	mL/min	14.70 psia
032-09-GL	35.00	mL/min	14.70 psia	062-02-ST	250.00	mL/min	14.70 psia
032-19-GL	50.00	mL/min	14.70 psia	112-04-SA	400.00	mL/min	14.70 psia
022-07-ST	300.00	mL/min	14.70 psia	062-16-CA	600.00	mL/min	14.70 psia
012-02-ST	500.00	mL/min	14.70 psia	082-08-SA	1.00	L/min	14.70 psia
052-02-GL	1.00	L/min	14.70 psia	102-12-SA	5.00	L/min	14.70 psia
013-25-ST	4.00	L/min	14.70 psia	102-17-CA	10.00	L/min	14.70 psia
034-08-ST	8.00	L/min	14.70 psia	034-15-ST	16.50	L/min	14.70 psia
044-04-ST	15.00	L/min	14.70 psia	044-19-CA	58.00	L/min	14.70 psia

TABLE 22 - DIRECT READING FLOW TUBES FOR PROPANE

150mm			
FLOW TUBE	QMAX	[UNITS]	PRESSURE
092-01-ST	4.20	L/min	14.70 psia
102-02-CA	10.00	L/min	14.70 psia
044-02-ST	38.00	L/min	14.70 psia

COMMON EQUIVALENTS AND CONVERSIONS

Approximate Common Equivalents

1 inch	= 25 millimeter
1 foot	= 0.3 meter
1 yard	= 0.9 meter
1 mile	= 1.6 kilometers
1 square inch	= 6.5 sq centimeters
1 square foot	= 0.09 square meter
1 square yard	= 0.8 square meter
1 acre	= 0.4 hectare +
1 cubic inch	= 16 cu centimeters
1 cubic foot	= 0.03 cubic meter
1 cubic yard	= 0.8 cubic meter
1 quart (lq)	= 1 liter +
1 gallon	= 0.004 cubic meter
1 ounce (avdp)	= 28 grams
1 pound (avdp)	= 0.45 kilogram
1 horsepower	= 0.75 kilowatt
1 millimeter	= 0.04 inch
1 meter	= 3.3 feet
1 meter	= 1.1 yards
1 kilometer	= 0.6 mile
1 square centimeter	= 0.16 square inch
1 square meter	= 11 square feet
1 square meter	= 1.2 square yards
1 hectare +	= 2.5 acres
1 cubic centimeter	= 0.06 cubic feet
1 cubic meter	= 35 cubic feet
1 cubic meter	= 1.3 cubic yards
1 liter +	= 1 quart
1 cubic meter	= 250 gallons
1 gram	= 0.035 ounces (avdp)
1 kilogram	= 2.2 pounds (avdp)
1 kilowatt	= 1.3 horsepower

Conversions Accurate to Parts Per Million

inches X 25.4*	= millimeters
feet X 0.3048*	= meters
yards X 0.9144*	= meters
miles X 1.603 34	= kilometers
square inches X 6.4516*	= square centimeters
square feet X 0.92 903 0	= square meters
square yards X 0.836 127	= square meters
acres X 0.404 686	= hectares
cubic inches X 16.3871	= cubic centimeters
cubic feet X 0.028 316.8	= cubic meters
cubic yards X 0.764 555	= cubic meters
quarts (lq) X 0.946 353	= liters
gallons X 0.003 785 41	= cubic meters
ounces (avdp) X 28.3495	= grams
pounds (avdp) X 0.453 592	= kilograms
horsepower X 0.745 700	= kilowatts
millimeters X 0.039 370 1	= inches
meters X 3.280 84	= feet
meters X 1.093 61	= yards
kilometers X 0.621 371	= miles
sq centimeters X 0.155 000	= square inches
square meters X 10.7639	= square feet
square meters X 1.195 99	= square yards
hectares X 2.471 05	= acres
cu centimeters X 0.061 623 7	= cubic inches
cubic meters X 35.3147	= cubic feet
cubic meters X 1.307 95	= cubic yards
liters X 1.056 69	= quarts (lq)
cubic meters X 264.172	= gallons
grams 0.035 274 0	= ounces (avdp)
kilograms X 2.204 62	= pounds (avdp)
kilowatts 1.341 02	= horsepower

THESE PREFIXES MAY BE APPLIED TO ALL SI UNITS

Multiples and Submultiples

1 000 000 000 000	= 10 ¹²
1 000 000 000	= 10 ⁹
1 000 000	= 10 ⁶
1000	= 10 ³
100	= 10 ²
10	= 10
0.1	= 10 ⁻¹
0.01	= 10 ⁻²
0.001	= 10 ⁻³
0.000 001	= 10 ⁻⁶
0.000 000 001	= 10 ⁻⁹
0.000 000 000 001	= 10 ⁻¹²
0.000 000 000 000 001	= 10 ⁻¹⁵
0.000 000 000 000 000 001	= 10 ⁻¹⁸

Prefixes

Symbols

tara (ter'a)	T
giga (ji ga)	G
mega (meg'a)	Ma
kilo (kil o)	k*
hecto (hek'to)	h
deka (dek'a)	da
deci (des'i)	d
centi (sen'ti)	c*
milli (mil'i)	m*
micro (mil' kro)	u*
nano (nan'o)	n
pico (pe'ko)	p
femto (ferm'to)	f
atto (at'to)	a

+ common term not used in SI

* exact

Source: NBS Special Pub. 304.

ABSOLUTE OZONE® AOM3000

Ozone + Temperature +Humidity Monitor and Alarm

User Manual

Specification	
Model	ABSOLUTE OZONE® AOM3000
Sensing Element	Electrochemical sensor
Temperature sensor / Humidity sensor	NTC 5K thermistance / HS series capacitive sensor
Power Supply	24VAC/VDC (A 24VAC/VDC power adaptor could also be used on the power socket at the side of unit)
Consumption	2.8 W
Warm up Time	<60 seconds
Temperature Measurement Range	5℃~60℃ (41℉~140℉)
Humidity Measurement Range	0~80%RH
Ozone Measuring Range	0~5000ppb (0-5ppm)(0~9.81mg/m ³)
Display Resolution	1ppb (0.001ppm) (0.01mg/ m ³)
LCD Backlight	Green—ozone level <1500ppb Yellow—1500ppb< ozone level <3500ppb Red— 3500ppb < ozone level (default)
Sound Alarm	When the LCD backlight is red, the Inner buzzer alarm will be activated
Control output	a. Analog output: 1x 0~10VDC or 4~20mA output The voltage output or current output can be selectable by jumpers b. Relay output: two dry-contact outputs max switching current 3A (220VAC/30VDC), resistance load
Working condition / Storage conditions	5℃~60℃ (41℉~140℉) / 0~ 80% RH
Net Weight	190g
Dimensions	130mm(height)×85mm(width)×36.5mm(D)
Installation standard	65mm×65mm or 2"×4" wire box
Wiring standard	Wire section area<1.5mm ²
Interface Connection (Max)	9 terminals
Quality System	ISO 9001 Certified
Housing	PC/ABS fireproof plastic material, protection class: IP30
Compliance	EMC Directive 89/336/EEC
Version	AOM3000

Important Safety Information

- ◆ Always cut off power before mounting, removing, and cleaning the alarm.
Notice the supply power voltage: 24 VAC/VDC.

Mounting and Wire Connection

- ◆ Do not mount it behind the door, in the corner or near heat source, diffuser or any steam source, in direct sunlight
- ◆ If the monitor uses the power adaptor to supply the 24VAC/VDC power, plug the output end of the adaptor into the power socket at the side face of the alarm. (see figure 1)

Figure1 Adaptor power supply

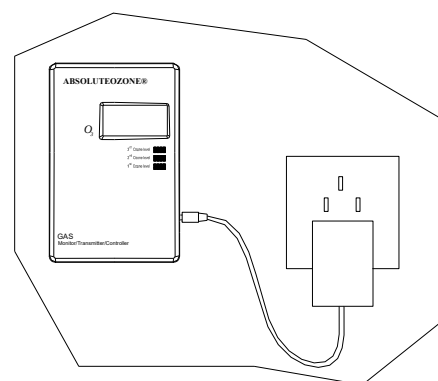
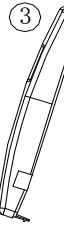


Fig.2

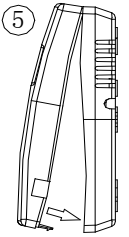
- ◆ For wall mounting
- Follow the step figure 2.
- Cut off power at
- flat head screw
- deep inside of t
- on the bottom c
- alarm housing,
- depress the clip
- Mount the unit c
- Connect wires t
- After finishing th

1

2



4



4

5

Fig.4 wiring connection

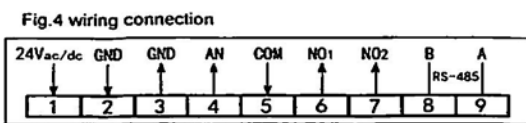
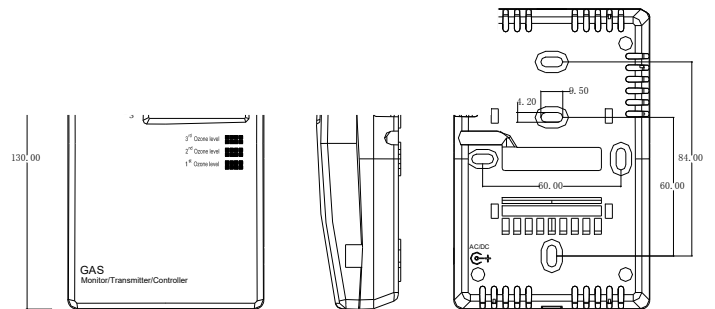
Fig.5
LCD display

Fig.3 wall plate



Operation

- ◆ Turn on the power, a red spotlight at lower position on the cover can be seen, meanwhile the LCD screen activated in green. The measured temperature and the relative humidity displays on the upper line of the LCD and the second line is the ozone level. See the fig.5

Analog output selection

If you want to change the analog output, please follow the below steps:

- Power off and remove the back cover, you can see two jumpers S1 and S2 in the middle of the circuit board. Connect the right two pins of the S1 and S2, the analog output is voltage output; connect the left two pins of S1 and S2, the analog output is current output.
- There is another two jumper J1 and J2 in the upper left of the circuit board. When the J1 is connected the analog output is 2-10VDC or 4-20mA output, when the J1 is disconnected, the analog output is 0-10VDC or 0-20mA output.
- The J1, J2 is just for testing before leaving factory, the default is 4-20mA. Do not change them !

Parameter Setup

Cut off power and remove the face cover, there is a set of 4 Dip switches on the upper left corner on the circuit board.

DIP1	OFF – volume concentration	ON- mass concentration	Leaving factory (default): OFF
DIP2	OFF - Celsius	ON-Fahrenheit	Leaving factory: OFF
DIP3	OFF- relay 1 control valid at the first setpoint		Leaving factory: OFF
	ON- relay 1 control valid at the second setpoint		

DIP4 OFF- relay 2 control valid at the first setpoint
ON- relay 2 control valid at the second setpoint

Leaving factory: OFF

Jumpers

J1: connected (short circuit)— analog start-value at 2V/4mA; disconnected— analog start value at 0V/0mA;

J2: connected — test of analog output bottom limit; disconnected— analog output work normally

J3: connected — test of analog output upper limit, relay outputs, backlight& buzzer alarm;
disconnected—all work normally

J4: connected-- zero point calibration

after using the ozone sensor for more than one year, the sensor need to be calibrated again. Put the monitor into the space of zero ozone (make sure the ozone level in the space is zero), connect the jumper first and then disconnect the jumper when the buzzer stops alarming(about 30 seconds), the ozone level at that time will be 0 ppm

J5: connected--single point calibration

connect the jumper first and then disconnect the jumper when the buzzer stops alarming(about 30 seconds), the ozone level at that time will be the value as that shows in parameter -26

Parameter Setup:

1. parameters can be set through RS485

OR

2. connect **J1& J2** at the same, DIP 1 & 2 to ON. parameters can be set through infrared remote controller (▼▲ keys to adjust values,

MODE key to switch items)



LCD Display	Parameter	Setting Range	Default
-01	Temperature differential value	$\pm 3.0^{\circ}\text{C}/\pm 6^{\circ}\text{F}$	0
-02	Manual humidity calibration	5~99%RH	50
-03	Real-time ozone value calibration	0~ upper limit of measuring range e.g. if set this value at 16 through RS485 or remote controller, the sensor will take the present ozone level as 16ppm	0
-04	First setpoint of relay 1	1~ upper limit of measuring range	1000
-05	Second setpoint of relay 1	1~ upper limit of measuring range	2000
-06	First setpoint of relay 2	1~ upper limit of measuring range	3000
-07	Second setpoint of relay 2	1~ upper limit of measuring range	4000
-08	Relay differential value	1~1000	100
-09	Relay control mode	0: to increase ozone concentration 1: to decrease ozone concentration	1
-10	Demarcation point between green backlight and yellow backlight	1~ upper limit of measuring range	1500
-11	Demarcation point between yellow backlight and red backlight	1~ upper limit of measuring range	3500
-12	Buzzer alarm	0: invalid 1: valid	1
-13	Alarm setpoint	1~ upper limit of measuring range	3500
-14	Alarm differential value	1~1000	100
-15	Alarm song album	0: Tick-tick 1: Music-For Elise 2: Music-Mariage d'amour	0
-16	Sensor warm-up time	1~ 600 seconds	120
-17	Display in ppm or ppb	1: ppm 2: ppb	2
-18	RS485 communication address	1~ 255	1

-19	RS485 Baud rate	1: 4800bps 2: 9600bps 3: 14400bps 4: 19200bps 5: 28800bps 6: 38400bps	4
-20	RS485 Parity bits and Stop bits selectable	1: None 1Stop; 2: None 2Stop 3: Odd 1Stop; 4: Even 1Stop	1
-21	Sensor detection upper limit value	1~ upper limit of measuring range	5000
-22	Self calibration	0: invalid 1: valid	1
-23	Manual zero point calibration available	Adjust the setpoint from 0 to 1, the present ozone level is deemed as 0ppm	0
-24	Manual single point calibration available	Adjust the setpoint from 0 to 1, the present ozone level is deemed as the value in -26	0
-25	Manual vernier regulation of detection value (AD value calibration)	-9999~ 9999	--
-26	Sensor calibration, 1 st detection point	0ppb~ upper limit of measuring range	0
-27	Sensor calibration, 1 st AD value	0 ~ 32767	--
-28	Sensor calibration, 2 nd detection point	0ppb~ upper limit of measuring range	2500
-29	Sensor calibration, 2 nd AD value	0 ~ 32767	--
-30	Sensor calibration, 3 rd detection point	0ppb~ upper limit of measuring range	5000
-31	Sensor calibration, 3 rd AD value	0 ~ 32767	--

Notice: Relay 1 activated, **ON** will display on LCD; Relay 1 deactivated, **ON** will not display on LCD

Should you have any questions regarding the AOM 3000 Ozone Safety Monitor, please contact ABSOLUTE OZONE® technical support at the following contact information and we will be more than happy to assist you:

Phone (Toll Free): 1-877-486-3761
Email: Office@AbsoluteOzone.com
Website: www.AbsoluteOzone.com

Absolute Ozone®
10712-181 Street,
Edmonton, Alberta,
Canada, T5S1K8



SERIES 626 & 628 | INDUSTRIAL PRESSURE TRANSMITTER/TRANSDUCER



626/628 pressure transmitters with
general purpose housing (-GH)



626/628 pressure transmitters
with conduit box housing (-CB)
and LCD display

FEATURES/BENEFITS

Standard:

- NEMA 4X rated enclosure
- Robust 316L SS oil filled sensor
- CE approved design
- 626: 0.25% FS
- 628: 1.0% FS

Optional:

- Advanced environmental protection
- C-276 wetted materials
- Digital or analog outputs (I2C)
- Custom range configuration
- Overpressure and/or vacuum protection

APPLICATIONS

- Booster stations
- Pumping systems
- Irrigation equipment
- PTO systems
- Submersible pump control

DESCRIPTION

The **Series 626 & 628 Pressure Transmitters** feature a piezo-resistive sensor contained in a compact, rugged, NEMA 4X (IP66) stainless steel general purpose housing or cast aluminum conduit housing.

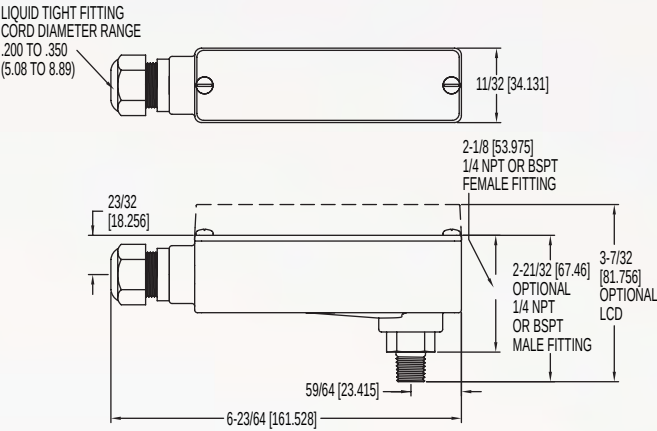
Dwyer offers optional configurations to address multiple common points of failure that have traditionally challenged the use of similar products in extreme conditions. The 626 & 628 are uniquely suited for precision irrigation and additional outdoor power equipment applications. The corrosion resistant 316L stainless steel wetted parts allow the Series 626 & 628 transmitters to measure pressure in a multitude of processes from simple irrigation systems to chemical dosing and injection systems. Optional wetted materials such as C-276 offer chemical compatibility with aggressive media. The 626 & 628 can be configured to provide advanced environmental protection. This includes, but is not limited to, freeze/thaw protection for outdoor cold weather applications, vibration resistance, and/or overpressure protection to protect the sensors against pressure surges or pump cavitation. The Series 626 & 628 are available in absolute and gauge pressure ranges with a variety of optional outputs, process connections, electrical terminations, and select agency approvals to allow you to select the correct transmitter for your application.

Contact Dwyer Instruments today to discuss your specific application needs.

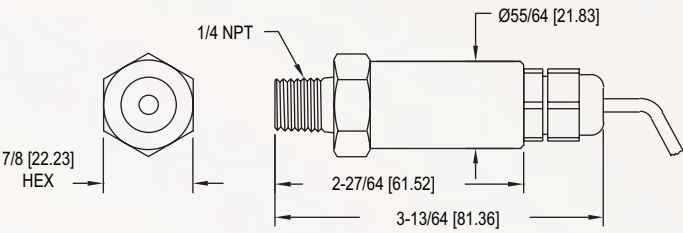
SPECIFICATIONS

Service	Compatible gases and liquids.
Wetted Materials	Type 316L SS. (Consult factory for additional options)
Accuracy	626: 0.25% FS, 0.20% RSS; 628: 1.0% FS, 0.5% RSS; 626 absolute ranges: 0.5% FS, 0.30% RSS. (Includes linearity, hysteresis, and repeatability).
Temperature Limit	0 to 200°F (-18 to 93°C).
Compensated Temperature Range	0 to 175°F (-18 to 79°C).
Thermal Effect	±0.2% FS/°F (includes zero and span).
Pressure Limits	See table on catalog page.
Display	Optional 4-1/2 digit LCD field attachable display. For -CB option.
Power Requirement	10-30 VDC (for 4-20 mA, 0-5, 1-5, VDC outputs); 13-30 VDC (for 0-10 VDC output); 5 VDC ±0.5 VDC (for 0.5-4.5 VDC ratiometric output), 10-35 VDC (for 4-20 mA with -CB option); 13-35 VDC or isolated 16-33 VAC (for selectable output with -CB option).
Output Signal	4-20 mA, 0-5 VDC, 1-5 VDC, 0-10 VDC, or 0.5-4.5 VDC, or selectable 0-5, 1-5, 0-10, 2-10 VDC for -CB option.
Response Time	300 ms.
Loop Resistance	0 to 1000 Ω max. R max = 50 (Vps-10) Ω (4-20 mA output), 0 to 1250 Ω max. Rmax = 50(Vps-10) Ω (4 to 20 mA output with -CB option), 5K Ω (0-5, 1-5, 0-10, 0.5-4.5 VDC output).
Stability	1.0% FS/year (typ).
Current Consumption	38 mA maximum (for 4-20 mA output); 10 mA maximum (for 0-5, 1-5, 0-10, 0.5-4.5 VDC output); 140 mA maximum (for all 626/628/629-CH with optional LED).
Electrical Connections	See model chart.
Process Connections	See model chart.
Enclosure Rating	NEMA 4X (IP66).
Weight	10 oz (283 g).
Agency Approvals	Standard: CE; Optional: NSF/ANSI 61/372, ANSI/UL 218, ANSI/UL 508, NEPA 20.

DIMENSIONS



Conduit housing



General purpose housing

HOW TO ORDER

Use the **bold** characters from the chart below to construct a product code.

	626	-05	-GH	-P3	-E1	-S1	-NIST
SERIES							OPTIONS
626: 0.25% full scale accuracy							-AT: Aluminum tag
628: 1.0% full scale accuracy							-LED: Bright red LED display
							-NIST: NIST traceable calibration certificate
							-NW: NSF/ANSI 61/372 certified
RANGE							SIGNAL OUTPUT
-00: 0 to 15 psia*							-S1: 4-20 mA
-01: 0 to 30 psia*							-S2: 1-5 VDC
-02: 0 to 50 psia*							-S4: 0-5 VDC
-03: 0 to 100 psia*							-S5: 0-10 VDC
-04: 0 to 200 psia*							-S7: 0.5-4.5 VDC
-05: 0 to 300 psia*							-S8: 0-5, 1-5, 0-10, 2-10 VDC
-06: 0 to 5 psi							
-07: 0 to 15 psi							ELECTRICAL CONNECTIONS
-08: 0 to 30 psi							-E1: Cable gland with 3' of prewired cable
-09: 0 to 50 psi							-E3: Cable gland with 9' of prewired cable
-10: 0 to 100 psi							-E4: DIN EN 175801-803-C
-11: 0 to 150 psi							-E5: 1/2" female NPT conduit
-12: 0 to 200 psi							-E6: M-12 4-pin connector UL listed
-13: 0 to 300 psi							-E8: Packard connector
							-E9: M-12 4-pin connector non-UL listed
HOUSING							PROCESS CONNECTIONS
-CB: Conduit box housing							-P1: 1/4" male NPT
-GH: General purpose housing							-P2: 1/4" female NPT
							-P3: 1/4" male BSPT
							-P5: 1/4" female SAE with refrigerant valve depressor
							-P9: 1/2" male NPT

ACCESSORIES

Model	Description
A-164	16.4' (5 m) cable with M-12 4-pin female connector
A-62X-LCD	Field-upgradeable LCD
A-960	3' (1 m) Packard cable
A-961	9' (3 m) Packard cable
A-962	20' (7 m) Packard cable

ORDER ONLINE TODAY!

dwyer-inst.com/Product/Series626-628



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DS-626-628 Rev. 7

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KINGSTON

KN Series Solenoid Valves

KN Series

Internally Piloted Industrial Solenoid Valve

The KN Series internally piloted liquid control valve offers the same dependable performance, quality, and value you've come to expect in a Kingston valve. Superior durability and versatility in a wide range of industrial liquid control applications continues to make Kingston your first choice in industrial valves.

Features

High Performance Flow Characteristics

The Kingston KN Series Solenoid Control Valves produce exceptional flow rate performance. With a low pressure loss profile, its flow characteristics allow for additional capacity to move downstream and increase energy efficiency by easing the stress on system pumps.

Reverse Flow/Fail Closed Feature

Available in both forward (fail open) and reverse (fail closed) flow design allowing designers to build added safety and redundancy.

Pressure Regulation

PRS (Pressure Regulating System) option offers in-valve pressure control capability allowing designers and manufacturers to reduce overall system parts count and increase ease of maintenance,

Diaphragm Reliability

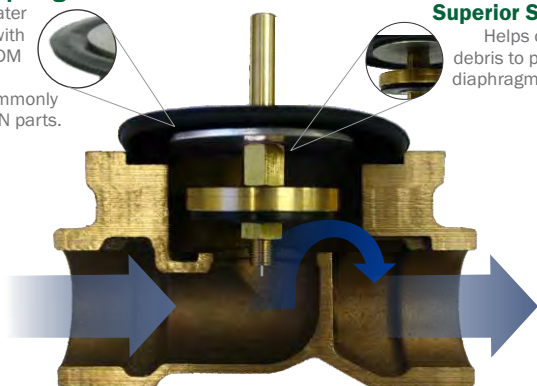
Advanced two-piece internal assembly offers diaphragm protection by shielding diaphragm from flow path.

EPDM Diaphragm

Recycled water protection with durable EPDM diaphragm outlasts commonly used Buna-N parts.

Superior Shield™

Helps deflect debris to prevent diaphragm tears.

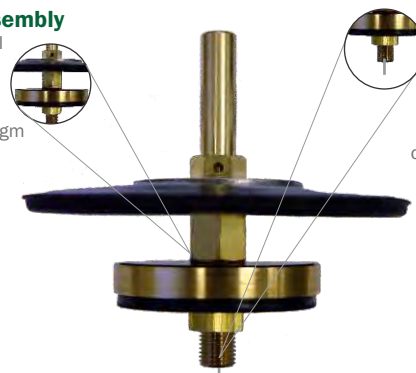


Debris Tolerance

Advanced porting design with self-cleaning metering rod system ensures that only "clean" water enters the diaphragm chamber, protecting the diaphragm for longer life.

Two-Piece Assembly

Two-piece internal assembly offers diaphragm protection by removing diaphragm from flow path.



Cleaning Rod

Self-Cleaning metering rod prevents debris from entering inlet orifice to upper diaphragm chamber.

Stop Water Hammer

Stop hammering in its tracks. Kingston internally piloted diaphragm design creates a buffer that prevents the violent, potentially damaging vibrations often associated with direct acting solenoid valves.

NEMA 4X Solenoid

NEMA 4X rated electrical components add the flexibility to design these multi-function valves into the most demanding industrial environments.

Normally Closed



Standard KN
Electric Diaphragm Valve



DW Series
Electric Diaphragm Valve
w/ Dirty Water Filter



DWIB Series
Electric Diaphragm Valve DW
w/Internal Bleed Features



PRS Series
Electric Diaphragm Valve DWIB
w/ Pressure Reg. System

Reverse Flow



RF Series
Electric Diaphragm Valve
Reverse Flow/Fail Closed Feature
(1 to 2" Only)



PRSRF Series
Electric Diaphragm Valve DWIB
w/ Pressure Reg. System
Reverse Flow/Fail Closed Feature
(1 to 2" Only)

Reclaimed Water



KN1000 Valve
Electric Diaphragm Valve DWIB
w/ HCR™ Premium Diaphragm
Copper Tubing & Purple Cross Handle
(1 to 2" Only)

How To Specify / Order

KN975 100 DWIB

Model	Size	Option	Notes
KN975 120/60 110/50	075 = 3/4" 100 = 1" 125 = 1-1/4" 150 = 1-1/2"	DW = Dirty Water DWIB = Dirty Water w/ Internal Bleed PRS = Pressure Regulating (Includes DW & DWIB Features) RF/PRSRF = Reverse Flow 1" to 2" Only	Reverse Flow Standard RF comes includes DW Option, RF available in PRS Handle Options Purple reclaimed water cross handle available for all dirty water options. KN1000 Valve Premium reclaimed water valve includes DWIB, HCR™ Diaphragm and purple cross handle standard. No options to add.
KN1075 120/60 110/50	200 = 2" 250 = 2-1/2" 300 = 3"		

Solenoid Specifications

110/120 VAC (KN975)

In-rush current: 95 mA (10.5 VA)
Holding current: 0.45 mA (7.2 VA)

Operating Ranges

Flow: 5 to 360 gpm
Pressure: 20 to 150 psi
Temperature: -20 to 200F

Pressure Loss in PSI

GPM	3/4"	1"	1-1/4"	1-1/2"	2"	2-1/2"	3"
5	0.45	0.16					
10	1.75	0.75					
15	4	1.5	0.48				
20	7	2.6	0.85	0.45			
30		5.7	1.9	1			
40		10	3.5	1.7	0.53		
50			5.3	2.65	0.82		
60			7.6	3.8	1.2		
70			10.1	5.1	1.6		
80				6.6	2.05		
90				8.3	2.6		
100				10.9	3.2	2.38	2.38
120					4.6	2.45	2.45
140					6.3	2.5	2.5
160					8	2.9	2.9
200					13.9	4	4
240						6	6
260						8.2	8.2
320						10.7	10.7
360						13.2	13.2

Expert Technical Support

Knowledgeable technical support resource provides quick response times. No-charge customer service is available by calling 1-800-210-2525.



Pilot Operated General Service Solenoid Valves

Brass Body • 3/8" to 2" NPT

2/2
SERIES
8238

The 8238 Series is a 2-way pilot operated valve available in Normally Closed and Normally Open constructions. They are available either AC or DC operated with brass bodies. They come standard with DIN connection coils. Options are limited to flying leads, manual operators, and some alternate elastomers. Dedicated constructions of the 8238 Series are suitable for the following applications:

- General Service (air, inert gas, water, and light oil)

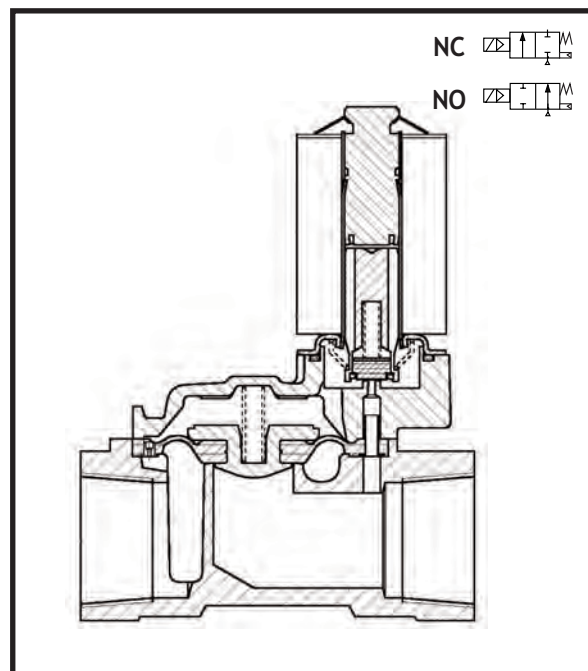
Construction

Valve Parts in Contact with Fluids	
General Service	
Body	Brass
Seals and Discs	See Capabilities Chart
Core Tube	Stainless Steel
Core and Plugnut	Stainless Steel
Springs	Stainless Steel
Shading Coil	Copper



Electrical

Standard Coil Class of Insulation	Watt Rating and Power Consumption				Ambient Temp. °F	DIN Spare Coil Family	DIN Connection Size
	DC Watts	AC				AC/DC	
		Watts	VA Holding	VA Inrush			
A	3.0	-	-	-	15 to 140	Z070A	9.4 mm
F	6.0	6.0	10	16	15 to 140	Z614A	11 mm
F	9.2	9.2	14	23	15 to 140	ZA34A	18 mm
F	13.0	13.0	24	44	15 to 140	Z134A	18 mm
F	17.2	-	-	-	15 to 140	Z914A	18 mm
F	-	21.0	33	65	15 to 140	Z923E	18 mm
Standard Voltages: 24, 120, 240 volts AC, 60 Hz (or 110, 230 volts AC, 50 Hz). 12, 24 volts DC (6 DC for 3 watt version). Must be specified when ordering.							





Specifications

Pipe Size (ins.)	Orifice Dia. (ins.)	Cv Flow	Min.	Operating Pressure Differential (psi)						Max. Fluid Temp. °F	Brass	Const. Ref.	UL ^①	Wattage		Approx. Shipping Weight (lbs.)
				Max. AC			Max. DC							AC	DC	
				Air - Inert Gas	Water	Light Oil	Air - Inert Gas	Water	Light Oil							
General Service - Normally Closed																
3/8	25/64	1.75	0	145	145	145	75	45	45	195	SC8238S401	1	☐	9.2	9.2	2.0
3/8	7/16	1.99	5	175	175	175	175	175	175	195	SC8238S402	2	☐	6	6	1.7
1/2	1/2	2.46	0	145	145	145	45	45	45	195	SC8238S404	4	☐	13	13	2.3
1/2	9/16	4.45	5	230	230	230	230	230	230	195	SC8238S405	5	☐	6	6	2.0
3/4	3/4	5.60	0	3	3	3	-	-	-	190	SC8238S406	6	☐	13	-	2.3
3/4	11/16	5.27	0	145	145	145	45	45	45	195	SC8238S407	7	☐	13	13	2.7
3/4	11/16	5.85	5	175	175	175	175	175	175	195	SC8238S408	8	☐	6	6	2.3
1	3/4	10.53	0	145	145	145	45	45	45	195	SC8238S409	9	-	21	17.2	5.0
1	15/16	12.87	5	175	175	175	175	175	175	195	SC8238S410	10	☐	6	6	3.5
1 1/4	1 1/4	17.50	7	145	145	145	145	145	145	195	SC8238S411	11	☐	9.2	9.2	4.6
1 1/2	1 3/4	31.50	7	145	145	145	145	145	145	195	SC8238S412	12	☐	9.2	9.2	6.7
2	1 3/4	39.66	7	145	145	145	145	145	145	195	SC8238S413	13	☐	9.2	9.2	7.6
General Service - Normally Open																
3/8	7/16	1.99	5	175	175	175	175	175	175	195	SC8238S414	14	☐	6	6	2.0
1/2	7/16	2.46	5	175	175	175	175	175	175	195	SC8238S415	15	☐	6	6	2.3
3/4	11/16	5.85	5	175	175	175	175	175	175	195	SC8238S416	16	☐	6	6	2.5
1	15/16	12.87	5	175	175	175	175	175	175	195	SC8238S417	17	☐	6	6	3.5
1 1/4	1 1/4	17.50	7	145	145	145	145	145	145	195	SC8238S418	18	☐	9.2	9.2	4.6
1 1/2	1 3/4	31.50	7	145	145	145	145	145	145	195	SC8238S419	19	☐	9.2	9.2	6.7
2	1 3/4	39.66	7	145	145	145	145	145	145	195	SC8238S420	20	☐	9.2	9.2	7.6
General Service - Normally Closed - Latching Model																
3/8	7/16	1.99	5	-	-	-	175	175	175	195	SA8238S421	21	-	-	3	1.7
1/2	9/16	4.45	5	-	-	-	175	175	175	195	SA8238S422	22	-	-	3	2.0
3/4	11/16	5.85	5	-	-	-	175	175	175	195	SA8238S423	23	-	-	3	2.3
1	15/16	12.87	5	-	-	-	175	175	175	195	SA8238S424	24	-	-	3	3.5
☐ = Component Solenoid. ① With SU or SC prefix only.																

☐ = Component Solenoid. ① With SU or SC prefix only.

Capabilities Chart

Solenoid Options							Base Catalog Number	Resilient Materials								Other		Standard Rebuild Kit	
NEMA Type 3-9	High Temp. (DIN only)	Wiring Box Screw Terminal	Multipin	DIN	Spade	Open Frame with Leads ②	Brass	NBR	FKM	EPDM	Neoprene	Oxygen Service	PTFE	Urethane	Vacuum	Manual Operator	Mounting Bracket	Brass AC	Brass DC
-	SU	-	-	●	-	OF	SC8238S401	●	V ①	-	-	-	-	-	-	MO	MB	323185	323185
-	SU	-	-	●	-	OF	SC8238S402	●	V ①	-	-	-	-	-	-	MO	MB	322955	322955
-	SU	-	-	●	-	-	SC8238S404	●	V	-	-	-	-	-	-	-	-	322957	322957
-	SU	-	-	●	-	OF	SC8238S405	●	V ①	-	-	-	-	-	-	MO	MB	322959	322959
-	SU	-	-	●	-	-	SC8238S406	●	-	-	-	-	-	-	-	-	-	322961	-
-	SU	-	-	●	-	-	SC8238S407	●	V	-	-	-	-	-	-	-	-	322962	322962
-	SU	-	-	●	-	OF	SC8238S408	●	V ①	-	-	-	-	-	-	MO	-	322964	322964
-	SU	-	-	●	-	-	SC8238S409	●	V	-	-	-	-	-	-	-	-	322966	322966
-	SU	-	-	●	-	OF	SC8238S410	●	V ①	-	-	-	-	-	-	MO	-	322968	322968
-	SU	-	-	●	-	OF	SC8238S411	●	V ①	-	-	-	-	-	-	MO	-	323187	323187
-	SU	-	-	●	-	OF	SC8238S412	●	V ①	-	-	-	-	-	-	MO	-	323189	323189
-	SU	-	-	●	-	OF	SC8238S413	●	V ①	-	-	-	-	-	-	MO	-	323191	323191
-	SU	-	-	●	-	OF	SC8238S414	●	V ①	-	-	-	-	-	-	-	-	322970	322970
-	SU	-	-	●	-	OF	SC8238S415	●	V ①	-	-	-	-	-	-	-	-	322972	322972
-	SU	-	-	●	-	OF	SC8238S416	●	V ①	-	-	-	-	-	-	-	-	322974	322974
-	SU	-	-	●	-	OF	SC8238S417	●	V ①	-	-	-	-	-	-	-	-	322976	322976
-	SU	-	-	●	-	OF	SC8238S418	●	V ①	-	-	-	-	-	-	-	-	323193	323193
-	SU	-	-	●	-	OF	SC8238S419	●	V ①	-	-	-	-	-	-	-	-	323195	323195
-	SU	-	-	●	-	OF	SC8238S420	●	V ①	-	-	-	-	-	-	-	-	323197	323197
-	-	-	-	●	-	-	SA8238S421	●	-	-	-	-	-	-	-	-	-	-	322978
-	-	-	-	●	-	-	SA8238S422	●	-	-	-	-	-	-	-	-	-	-	322979
-	-	-	-	●	-	-	SA8238S423	●	-	-	-	-	-	-	-	-	-	-	322980
-	-	-	-	●	-	-	SA8238S424	●	-	-	-	-	-	-	-	-	-	-	322981

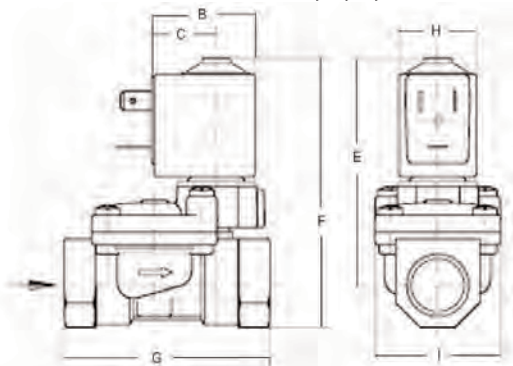
● = Standard. ① Reduces pressure rating by 25%; ② Drop the SC when applying the OF prefix.

● = Standard. ① Reduces pressure rating by 25%; ② Drop the SC when applying the OF prefix.

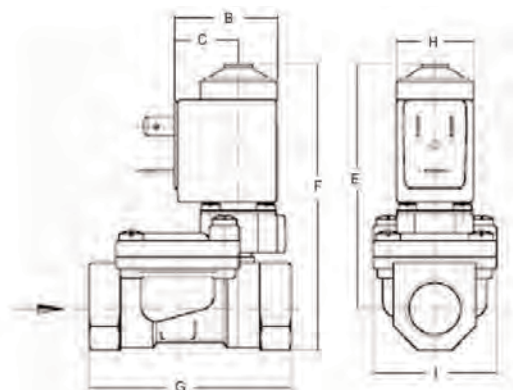
Dimensions: inches

Const. Ref.	A	B	C	D	E	F	G	H	I
1	-	1.63	0.85	-	2.71	3.15	2.36	1.18	1.61
2	-	1.32	0.83	-	2.80	3.23	2.36	0.98	1.57
4	-	1.93	1.10	-	2.93	3.54	2.60	1.65	1.61
5	-	1.32	0.83	-	2.89	3.43	2.60	0.98	1.57
6	-	1.93	1.10	-	3.23	3.88	3.11	1.65	2.01
7	-	1.93	1.10	-	3.19	3.86	3.11	1.65	2.01
8	-	1.32	0.98	-	3.13	3.78	3.11	0.98	1.57
9	-	2.33	1.38	-	3.94	4.76	4.13	1.91	2.80
10	-	1.32	0.83	-	3.66	4.49	4.13	0.98	2.80
11	-	1.69	1.06	-	4.29	5.31	4.45	1.26	3.19
12	-	1.69	1.06	-	4.41	5.59	5.51	1.26	4.33
13	-	1.69	1.06	-	4.61	6.02	6.18	1.26	4.33
14	-	1.32	0.83	-	3.11	3.50	2.36	0.98	1.57
15	-	1.32	0.83	-	3.15	3.68	2.60	0.98	1.57
16	-	1.32	0.83	-	3.39	4.04	3.11	0.98	1.97
17	-	1.32	0.83	-	3.94	4.76	4.13	0.98	2.80
18	-	1.69	1.06	-	4.29	5.31	4.45	1.26	3.19
19	-	1.69	1.06	-	4.41	5.59	5.51	1.26	4.33
20	-	1.69	1.06	-	4.61	6.02	6.18	1.26	4.33
21	-	0.93	0.59	-	2.26	2.76	2.36	0.67	1.57
22	-	0.93	0.59	-	2.36	2.93	2.60	0.67	1.57
23	-	0.93	0.59	-	2.60	3.29	3.11	0.67	1.97
24	-	0.93	0.59	-	3.17	4.02	4.13	0.67	2.80

Const. Ref. 2, 5, 8, 10



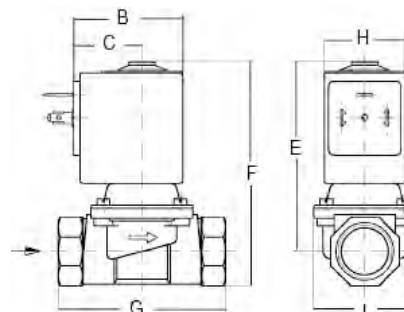
Const. Ref. 14, 15, 16, 17



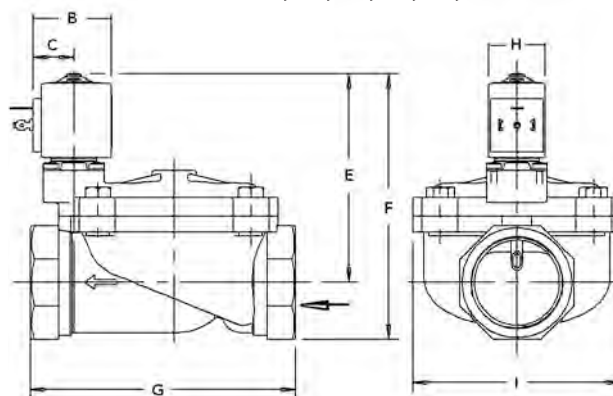
Const. Ref. 1, 4, 7, 9



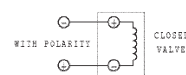
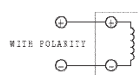
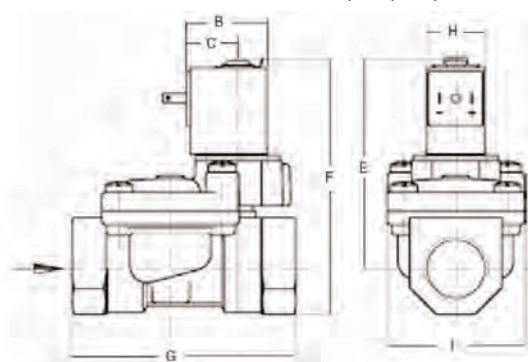
Const. Ref. 6



Const. Ref. 11, 12, 13, 18, 19, 20

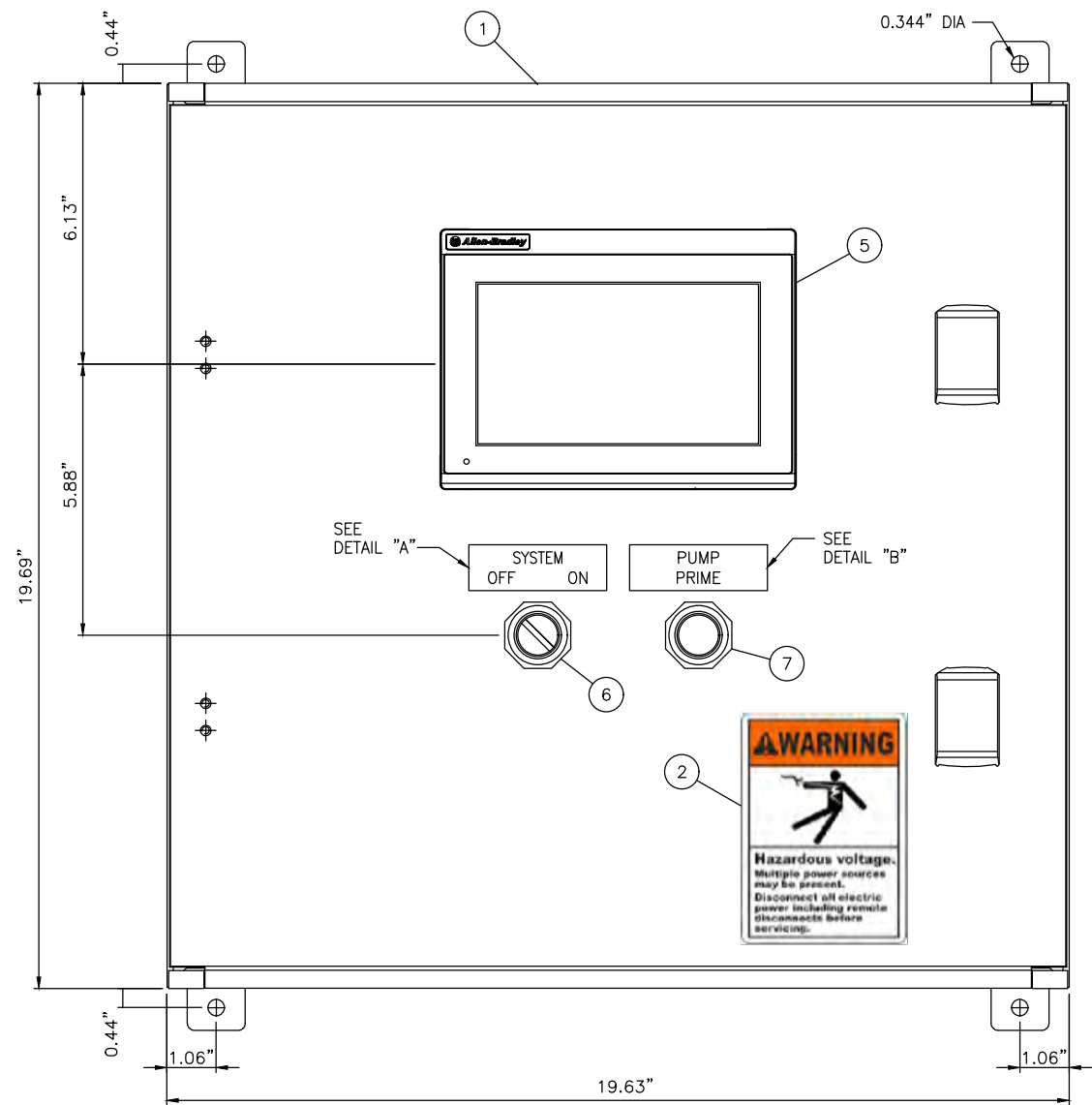


Const. Ref. 21, 22, 23, 24

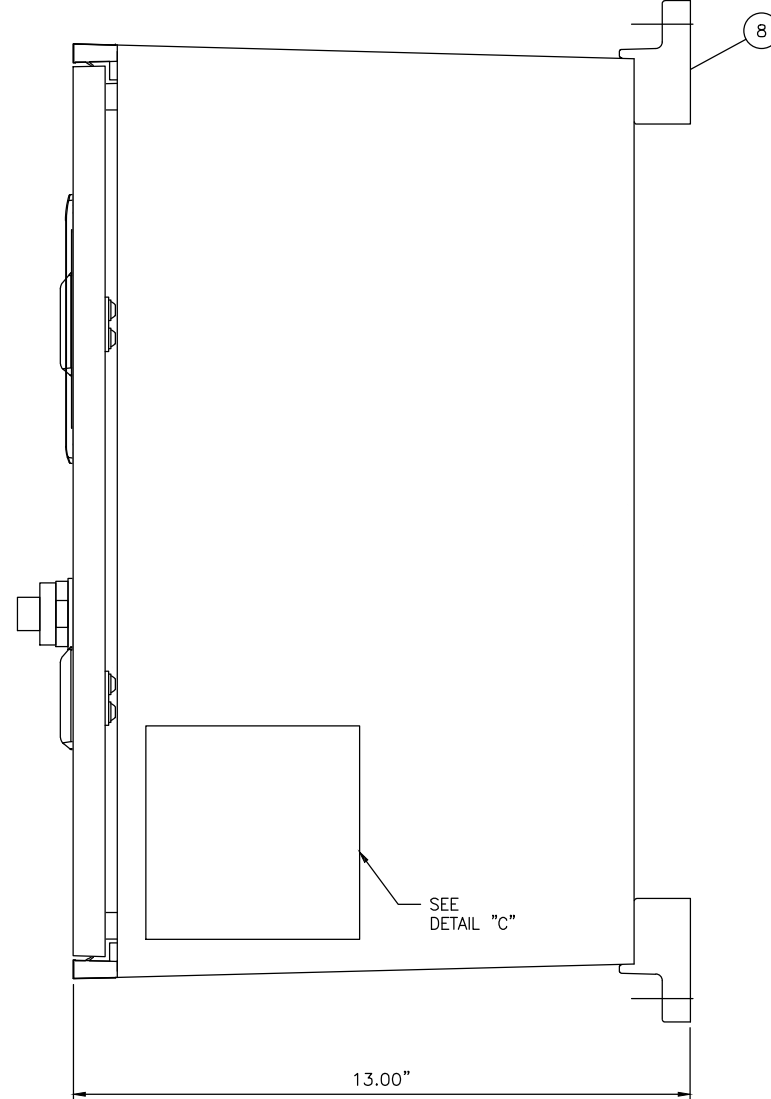


Section 5

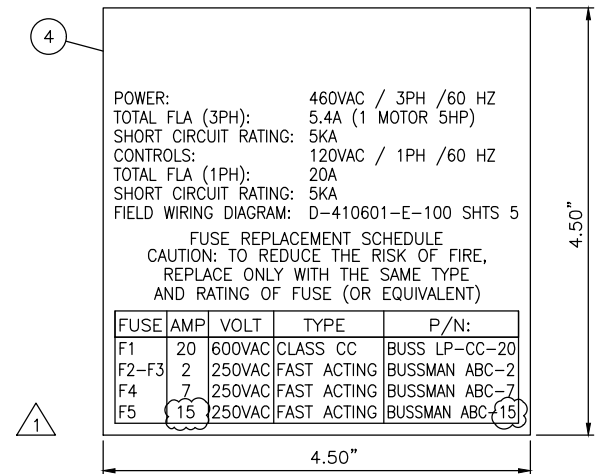
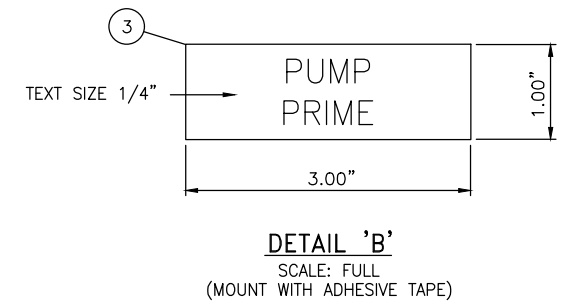
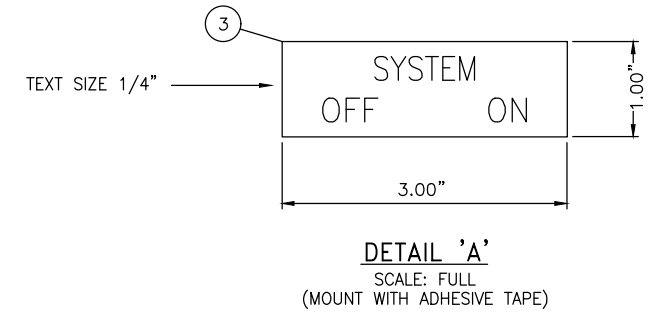
Electrical Information



FRONT VIEW



RIGHT VIEW



NOTES:

GENERAL NOTES:

1. REFER TO TABLE 1 FOR REQUIRED WIRE SPECIFICATIONS UNLESS OTHERWISE NOTED. ALL CONDUCTORS SHALL BE COPPER.
2. ALL FIELD POWER WIRES SHALL BE RATED:

A) 60°C FOR TERMINALS LESS THAN 100 AMPS

B) 75°C FOR TERMINALS 100 AMPS OR MORE.
3. SEE FIGURE 1 FOR ANALOG SHIELDING SYMBOLS TYPICAL FOR 4–20mA, RTD & THERMOCOUPLE
4. ALL INSTALLATIONS SHALL BE SUITABLE FOR A NON–HAZARDOUS AREA CLASSIFICATION AS DEFINED BY LATEST EDITION OF THE NATIONAL ELECTRIC CODE NEC, NFPA 70.
5. ENCLOSURE RATING IS TYPE 4X. ALL CONDUIT HUBS OR FITTINGS INSTALLED IN ENCLOSURE SHALL HAVE THE SAME ENVIRONMENTAL RATING AS THE ENCLOSURE.
6. REF. TABLE 2 FOR TERMINAL BLOCK TIGHTENING TORQUE REQUIREMENTS.
7. ALL CONTROL WIRING CONNECTIONS TO BE MADE WITH PHOENIX FERRULES AND CRIMPED WITH PHOENIX CRIMPFOX 6H CRIMPER.
8. PANEL SHOP TO LABEL FUSE HOLDERS, CONTROL RELAYS, CONTACTORS, CIRCUIT BREAKERS AND FIELD WIRING TERMINALS WITH P–TOUCH LABELS.

VOLTAGE	LOCATION	FUNCTION	CONDUCTOR	INSULATION RATING				COLOR		NOTES
				TYPE	MIN TEMP	VOLTAGE	MIN. AWG	LINE/POS	NEUTRAL/NEG	
460VAC	FIELD	POWER	SINGLE, STRANDED	THHN	90 C	600V	14	BLACK	N/A	
120VAC	PANEL	CONTROL CIRCUITS	SINGLE, STRANDED	THHN	90 C	600V	14	RED	WHITE	
120VAC	FIELD	CONTROL DEVICE	SINGLE, STRANDED	THHN	90 C	600V	14	BLACK	WHITE	
24VDC	PANEL	CONTROL CIRCUITS	SINGLE, STRANDED	TFFN	75 C	600V	18	BLUE	WHT/BLU STRIPE	
4–20mA	PANEL	ANALOG CIRCUITS	SINGLE, STRANDED	TFFN	75 C	600V	18	BLUE	WHT/BLU STRIPE	
4–20mA	FIELD	ANALOG CIRCUITS	1 PAIR	PVC/PVC	90° C	300V	18	BLACK	WHITE	

TABLE 1
WIRE SPECIFICATIONS

MEGR	PART NO.	TYPE	FUNCTION	TIGHTENING TORQUE
ALLEN–BRADLEY	1492–H4		FUSE TERMINAL 120VAC	7.1 LB–IN MAX
ALLEN–BRADLEY	1492–J3		I/O TERMINAL BLOCK	7.1 LB–IN MAX
ALLEN–BRADLEY	1492–JD3		I/O TERMINAL BLOCK	4.5–7.1 LB–IN MAX
ALLEN–BRADLEY	700HN221		RELAY BASE TERMINAL	7.0 LB–IN MAX
ALLEN–BRADLEY	140MT–C3E–B63		MPCB	18–22 LB–IN MAX
ALLEN–BRADLEY	100–C09D300		CONTACTOR	13.3–17.7 LB–IN MAX
BURNDY	KPA4C		GROUND TERMINAL	35 LB–IN MAX

TABLE 2
TERMINAL BLOCK TIGHTENING TORQUE

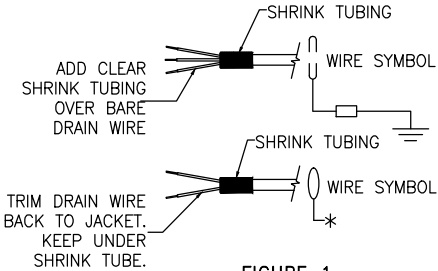


FIGURE 1
SHIELDING SYMBOLS

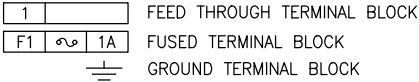
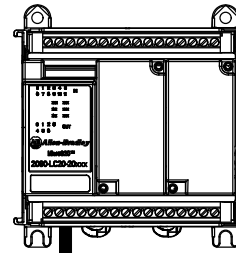


FIGURE 2
TERMINAL BLOCK SYMBOLS

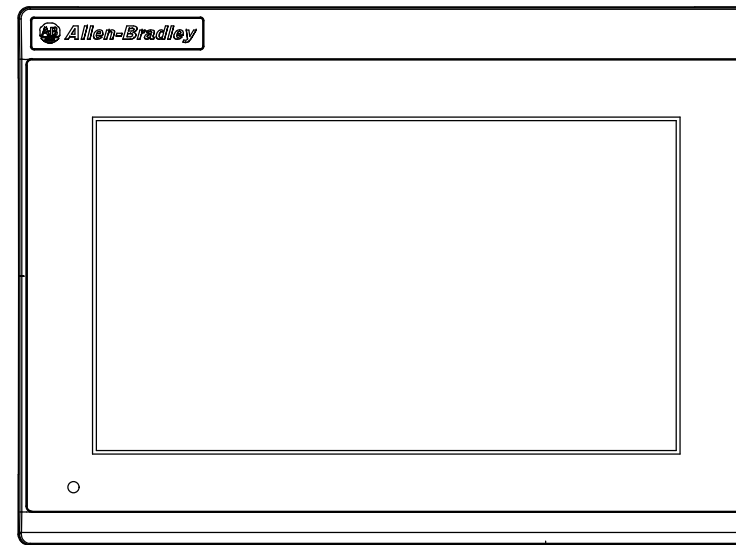
WIRE LEGEND	
—————	INTERNAL PANEL WIRING
- - - - -	FIELD WIRING
- · - · -	SKID (SHOP) WIRING

NOTES:

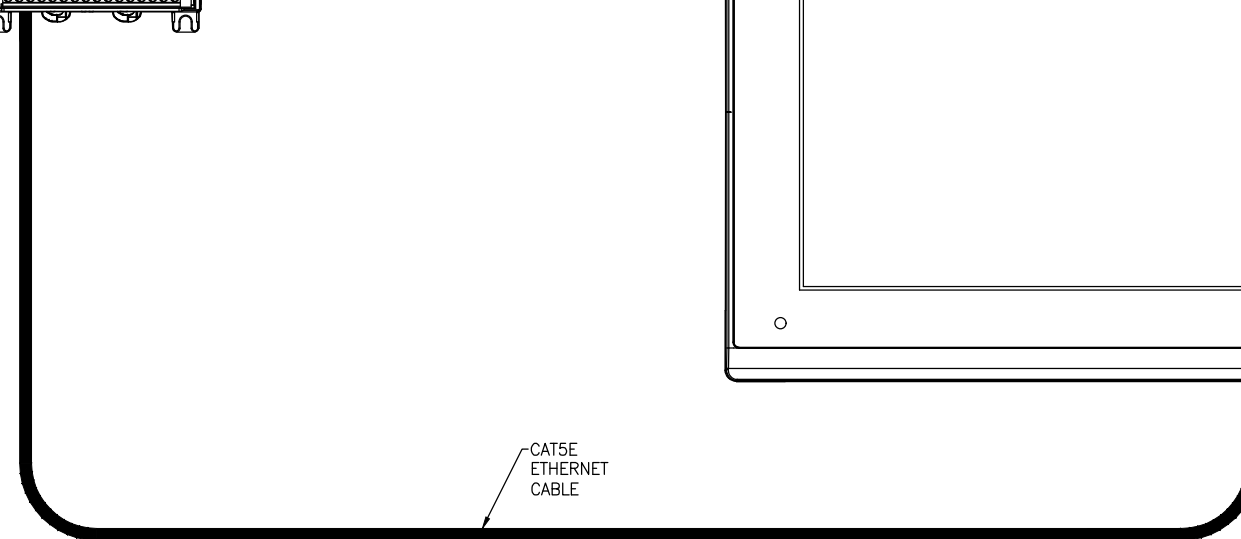
SMART RELAY



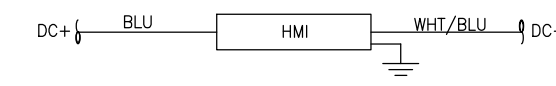
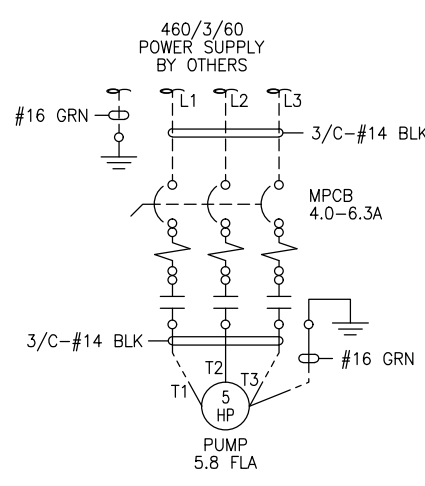
HMI



CAT5E
ETHERNET
CABLE



NOTES:



NOTES: