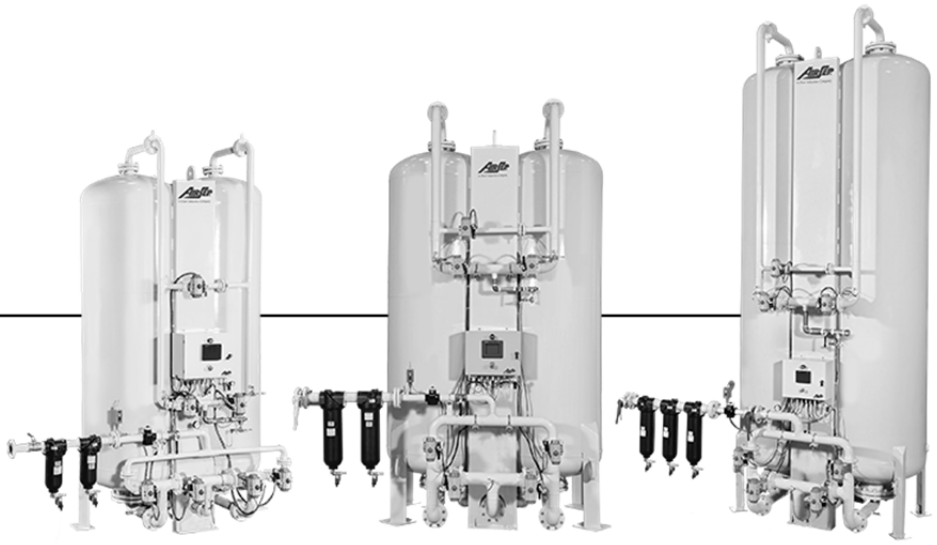
AirSep®
A Chart Industries Company

AS-Q – AS-Z

PSA Oxygen Generators



INSTRUCTION MANUAL

ALPHA SERIES

Ownership Data

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

PSA Oxygen Generator

Model Number:

Serial Number:

Invoice Date:

Start-up Date:

AirSep Representative

Company:

Contact:

Address:

City/Town: State: Zip:

Country: Fax:

Phone: Telex:

! WARNING	Before you attempt 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.

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1.0 Introduction

1.1 General

This instruction manual provides a description of the AirSep Corporation PSA Oxygen Generator Models AS-Q, AS-R, AS-W and AS-Z, as well as instructions for their installation, operation, and maintenance. The Appendix of this instruction manual also includes pertinent drawings and component literature.

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

As you read 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.

Cautions against the risk of electric shock.

Provides information important enough to emphasize or repeat.

1.3 References to Controls and Indicators with Tags or Labels

This instruction manual uses uppercase characters (e.g., ON/OFF switch) to refer to controls and indicators identified by tags or labels. Numbers inside parentheses (e.g., V-2) identify manually operated flow controls (e.g., manual valves). Refer to Chapter 4 for description of the oxygen generator components for each mode.

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 your safety, thoroughly read and familiarize yourself with the entire section of this instruction manual. In addition, AirSep Corporation strongly recommends that you review this section periodically.

2.2 Potential Hazards

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 reduce the risk of fire or explosion, keep gasoline, kerosene, oil, grease, cotton fibers, wood, paint, and other combustible material away from all parts 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.

Post "NO SMOKING OR OPEN FLAMES" signs conspicuously near the location of the oxygen generator.

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 product oxygen. Check all oxygen fittings for leaks with an oxygen-compatible, leak-detecting solution.

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

Before attempting to install, operate, or repair the oxygen generator, read and thoroughly understand this instruction manual and the component manuals located in the Appendix D of this instruction manual. Improper installation, operation, or repairs can result in severe bodily injury, damage to the oxygen generator, or poor performance.

The interior of the oxygen generator control cabinet contains electrical parts that can produce an electrical shock hazard if not handled properly. To prevent electrical shock, read and thoroughly understand Section 8 — Troubleshooting in this instruction manual before servicing the oxygen generator.

AirSep oxygen generators are sold for use in commercial applications only. Contact AirSep Corporation, or an authorized AirSep representative, before using this unit for any medical application.

Disconnect power before servicing oxygen generator.

Do not disconnect protective earth

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:

- "Installation of Bulk Oxygen Systems at Consumer Sites;" NFPA No. 50; National Fire Protection Association; 1 Batterymarch Park; P. O. Box 9101; Quincy, Massachusetts 02269-9101 USA.
- "Oxygen;" Pamphlet G-4; Compressed Gas Association; 1725 Jefferson Davis Highway; Arlington, Virginia 22202-4102 USA.
- "Cleaning Equipment For Oxygen Service," Pamphlet G-4.1; Compressed Gas Association; 1725 Jefferson Davis Highway; Arlington, Virginia 22202-4102 USA.

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 your application.

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

This instruction manual serves as the guidelines for the standard AS-Q thru AS-Z models. Refer to the illustrations, located in the Appendix A, 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 drawings in this section illustrate the location of the main components of the various oxygen generator models. All models include similar components unless noted otherwise; however, the location and size of these components varies among the different models. Refer to the Appendix for general layout drawings and specifications for all the oxygen generator models referenced in this instruction manual. In addition, the oxygen generator requires use of an oxygen receiver to provide stable flow and concentration for short-term surges of feed oxygen above the rated capacity of the oxygen generator.

4.1 External Components

Figure 4.1 below illustrates the external components viewed from the front of the oxygen generator.

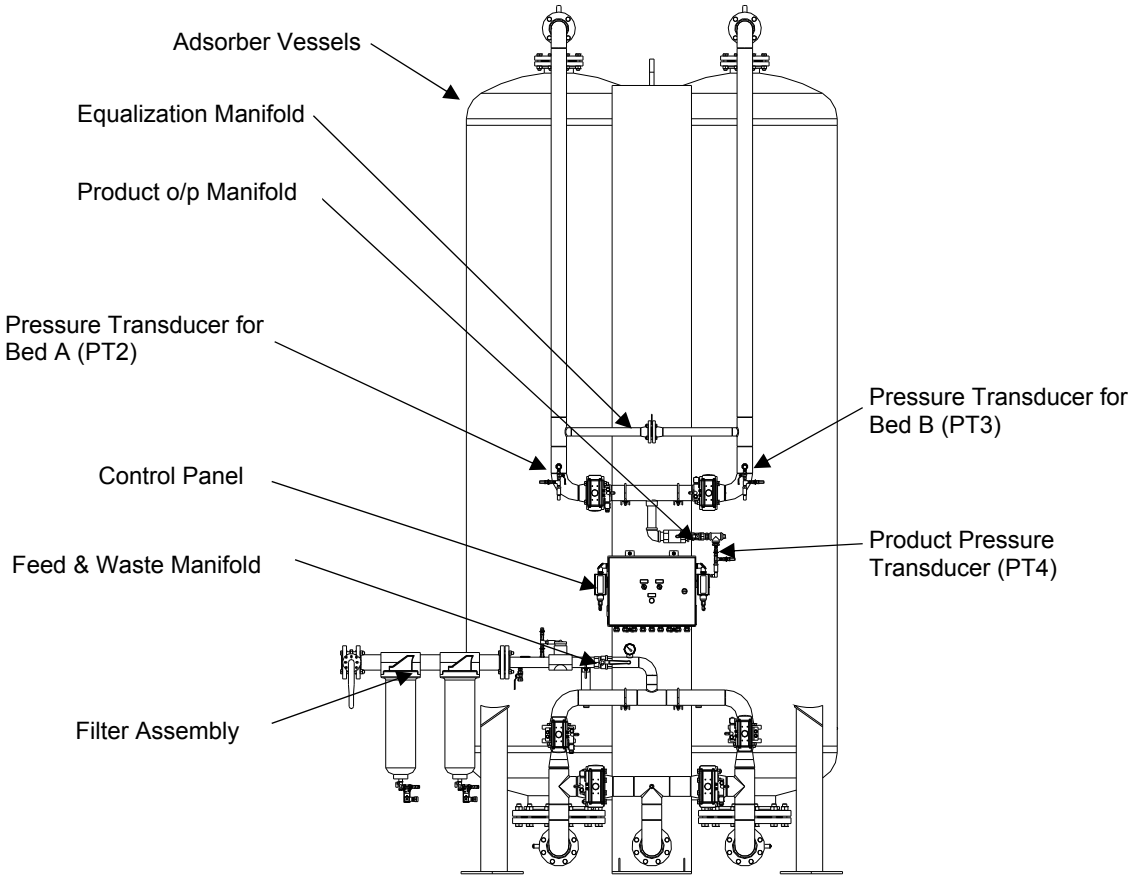


Figure 4.1: External Components — Front View

4.2 Adsorbers

The adsorbers, or beds, are vessels that contain the molecular sieve used to adsorb (attract) nitrogen from compressed air and allow oxygen to pass through as the product gas.

4.3 Filter Assembly

The filter assembly consists of two filters. The particulate filter, or pre-filter, removes particulates from the feed air before the air enters the coalescing filter and the coalescing filter removes condensed water, oil vapor, and other contaminants from the feed air before the air enters the adsorbers.

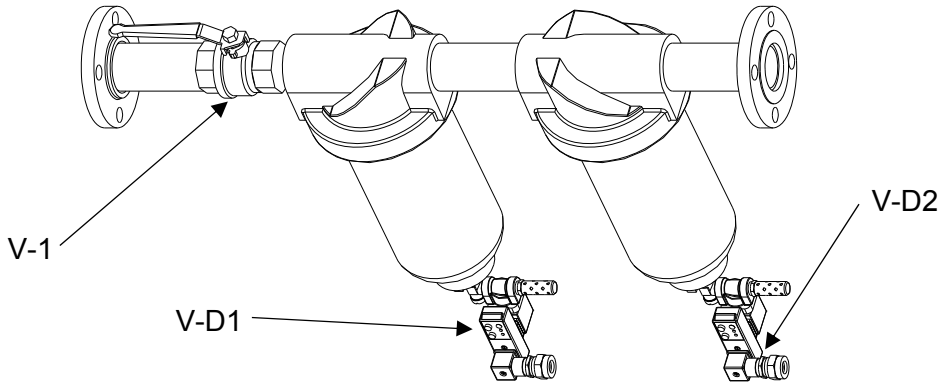


Figure 4.2: Typical Filter Assembly

Particulate Filter Drain (V-D1)

This automatic valve removes moisture from the particulate filter.

Coalescing Filter Drain (V-D2)

This automatic valve removes moisture from the coalescing filter.

Manual Feed #1 Valve (V-1)

This manual valve (if available) controls the flow of feed air from the air compressor to the filter assembly.

4.4 Pressure Switch Sub-assembly

The assembly is located before the inlet ball valve (V-2) of the feed and waste manifold (Section 4.6). It solves the purpose of monitoring the feed air pressure. The assembly also regulates the flow of air through all the automatic valves.

Manual Valve to Pressure Switch

This manual valve controls the flow of air to the pressure switch on the oxygen generator. The valve should not be closed at any circumstance while the unit is running.

4.5 Product Output Sub-assembly

The product output sub-assembly directs the oxygen flow to the oxygen receiver and the pressure transducer (PT4).

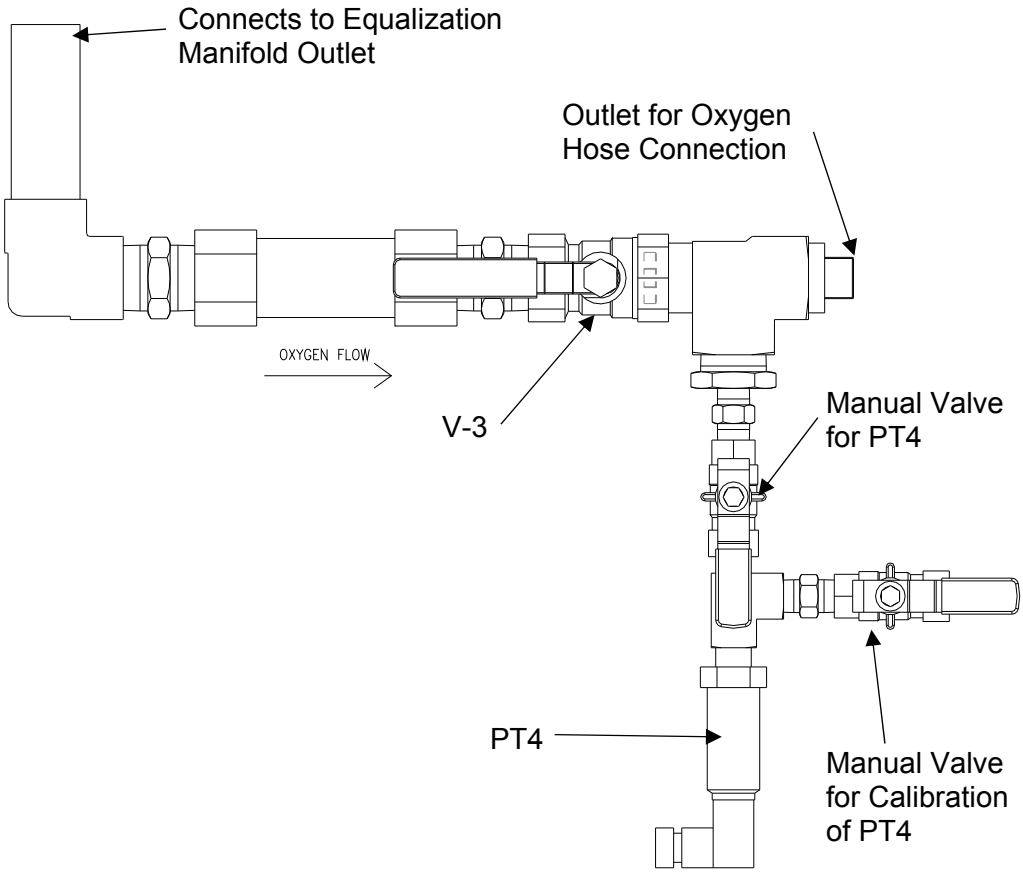


Figure 4.3: Typical Product Output Sub-assembly

Manual Product Valve (V-3)

This manual valve controls the flow of oxygen from the product manifold to the oxygen receiver.

Manual Valve to Pressure Transducer (PT4)

This manual valve controls the flow of oxygen to the pressure transducer (PT4) on the oxygen generator. The valve should not be closed at any circumstance while the unit is running except for the purpose of calibration.

4.6 Feed and Waste Manifold Assembly

The feed and waste manifold includes all the process valves: feed air through valves V-FA, V-FB, and waste gas from the valves V-WA, V-WB.

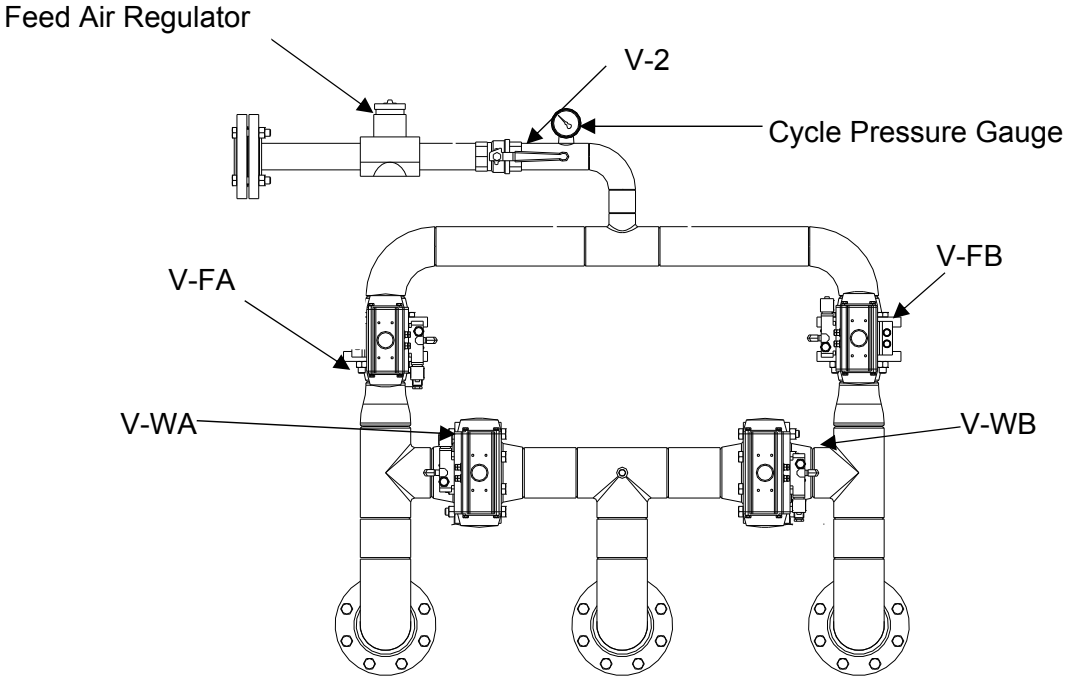


Figure 4.4: Typical Feed & Waste Manifold Assembly

Manual Feed #2 Valve (V-2)

This manual valve controls the flow of feed air from the air compressor, through the filter assembly, to the feed and waste manifold.

Vent Silencers

The vent silencers muffle the sound of the waste gas as it exits the adsorbers.

Cycle Pressure Gauge

The cycle pressure gauge indicates the pressure of the feed air before the air enters the adsorbers.

Feed Air Regulator

The feed air regulator is set at the AirSep Corporation factory. It controls the maximum oxygen generator cycle pressure. The setting of the regulator is customized as per the demand of oxygen for your application. Please ensure that the feed air regulator setting is not changed before consulting AirSep Corporation.

NOTE

Setting the feed air regulator to a value such that the maximum oxygen generator cycle/bed pressure is 80 psig or more can cause severe damage to the molecular sieve in the adsorbers which will not be covered under AirSep's warranty.

4.7 Equalization and Purge Manifold Assembly

The manifold includes all the process valves (V-EA, V-EB and V-PU) that direct the flow of oxygen from the adsorbers.

4.8 Control Panel: Internal Components

Programmable Logic Controller (PLC)

The oxygen generator uses a programmable logic controller to control and monitor all valves, interfaces and switches on the oxygen generator.

Transformer

The transformer provides the proper voltage for the electrical components of the oxygen generator.

Terminal Block (TB1)

The terminal block provides the connection point for electrical wiring that supplies electrical power to the oxygen generator.

EMI Filter (EMI1)

The EMI filter eliminates electrical line interference from the incoming power source.

Circuit Breakers

The circuit breakers protect the electrical components of the oxygen generator from any damaging electrical current if an overload occurs.

Fuses

The fuses protect the electrical components of the oxygen generator from any damaging electrical current if an overload occurs.

4.9 Control Panel: External Components

Schneider Electric Touch Screen

The touch screen on the oxygen generator control panel uses a series of screen pages to perform the following functions:

- Provides a normal start-up system
- Monitors and controls the operation of the process valves
- Monitors signals coming from pressure transducers
- Provides an alarm system to indicate malfunctions in the PSA Oxygen Generating System
- Provides a fail-safe shutdown in the event of loss in product concentration

The main Human/Machine Interface (HMI) consists of the Schneider Electric Magelis Touch screen. The Magelis has a 5.7" screen, which is touch-sensitive.

In order to make the software simple to use, the various screens follow a consistent template design. Each screen consists of two components: the title bar and the information display.

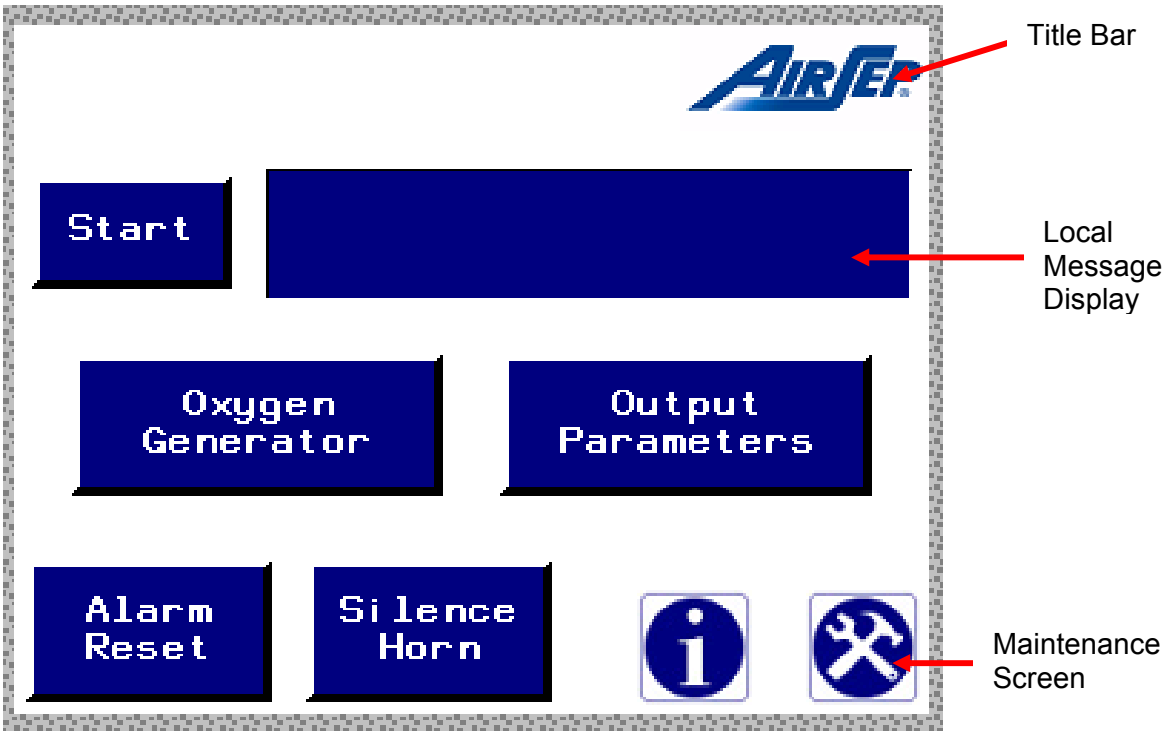


Figure 4.5: Typical Main System Control Screen

The title bar serves two purposes. It identifies the screen that is currently being displayed. It also acts as the main navigational tool.
No matter which screen is being currently displayed, touching the AirSep logo will display the Main System Control screen.

The “Information Display” changes depending on the screen currently displayed. However, they all share three basic components: Monitoring Devices, Message Displays, and Interface Mechanisms. Monitoring Devices are components that are used to relay real-time information about the system, like pressure graphs. Message Displays are used to relay information pertaining to the system in a text format. These displays are also used to present help pages that can be used to better understand the unit. Interface Mechanisms are screen items that can be used to interface directly with the system. These are in the form of buttons, switches, or icons.

The Main System Control Screen is the primary source for information on the whole unit. In the top left corner of the information display are the buttons that will start and stop the oxygen generator.

Every time an alarm or shutdown condition is displayed on the ‘Local Message Display’ (Refer to Figure 4.3), rectify the cause and press the ‘Alarm Reset’ icon to bring the system into normal mode before starting.

The ‘Local Message Display’ icon displays the different status of the generator namely Stopped, Running, Standby, and Alarm. This display will also show the recent alarms if you push and hold.

This window will populate with the most recent, highest priority message of the system. The priorities are listed here, from highest to lowest:

Priority List

I. **Runtime Power Loss**
II. **Emergency Stop**
III. **Stopped**
IV. **Shutdown: High Bed Pressure**
V. **Shutdown: Low Instrument Air**
VI. **Shutdown: Low Oxygen**
VII. **Standby**
VIII. **Stop Sequence Activated**
IX. **Alarm: High Bed Pressure**
X. **Alarm: Low Oxygen Concentration**
XI. **Running**

The icons ‘Oxygen Generator’ and ‘Output Parameters’ take the user to dedicated screens described later in this section. Lastly, by touching ‘Screen Cleaning’ icon at the bottom right corner of the information display, a blank screen for cleaning purpose is displayed and the ‘Maintenance’ icon will display a screen that provides guidelines for the general maintenance of the unit. The ‘Silence Horn’ icon bypasses the horn for 10 minutes during an alarm or shutdown condition.

Figure 4.6 below shows the layout of all the screens in HMI for easy navigation.

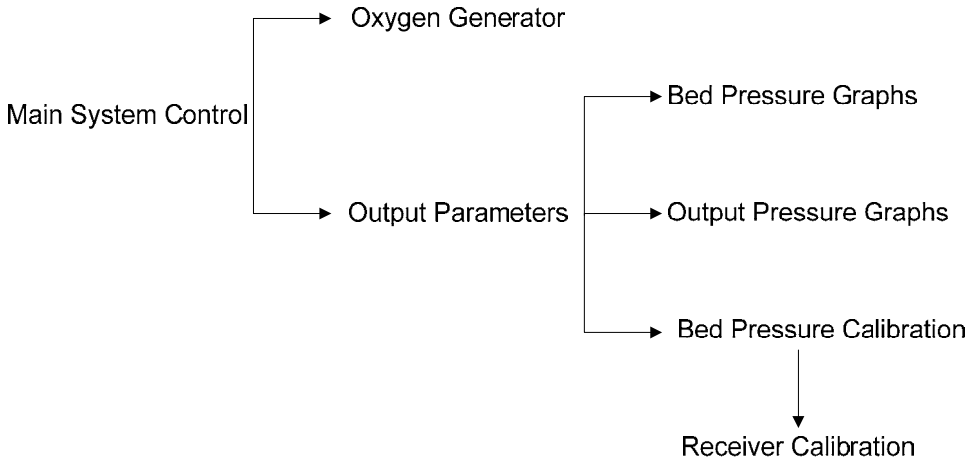


Figure 4.6: HMI Navigation Layout

The 'Oxygen Generator' Screen (Figure 4.7) is the primary source of information pertaining to the actual oxygen generation process. The adsorber vessels (also called beds – Bed A is the bed on your left while facing the control panel and Bed B is on your right while facing the control panel) are shown in the center of the screen and the oxygen receiver vessel is shown on the right hand side of the screen. The receiver has a numeric pressure display. Additionally, the diagram shown will animate to indicate which valves are currently being actuated. The 'AUTO/MAN' icon selects the operating mode for the oxygen generator. In the AUTO position, the oxygen generator cycles on and off to meet oxygen demand.

When the pressure in the product output manifold increases to approximately the maximum pressure specified in the Appendix A, the oxygen generator stops oxygen production after a timed delay and enters standby mode. To prevent short cycling and maintain concentration, the oxygen generator continues to operate for five additional cycles after increased pressure in the product output manifold. This five-cycle delay to shutdown functions only in the AUTO mode.

When the pressure in the product output manifold decreases to approximately the minimum pressure specified in the Appendix A, the oxygen production begins.

In the MANUAL position, the oxygen generator cycles continuously. The symbol 'A' at the right side of the 'AUTO/MAN' switch appears only when the oxygen generator is in AUTO mode.

The 'MANUAL DRAIN' icon activates the drain valve when pressed.

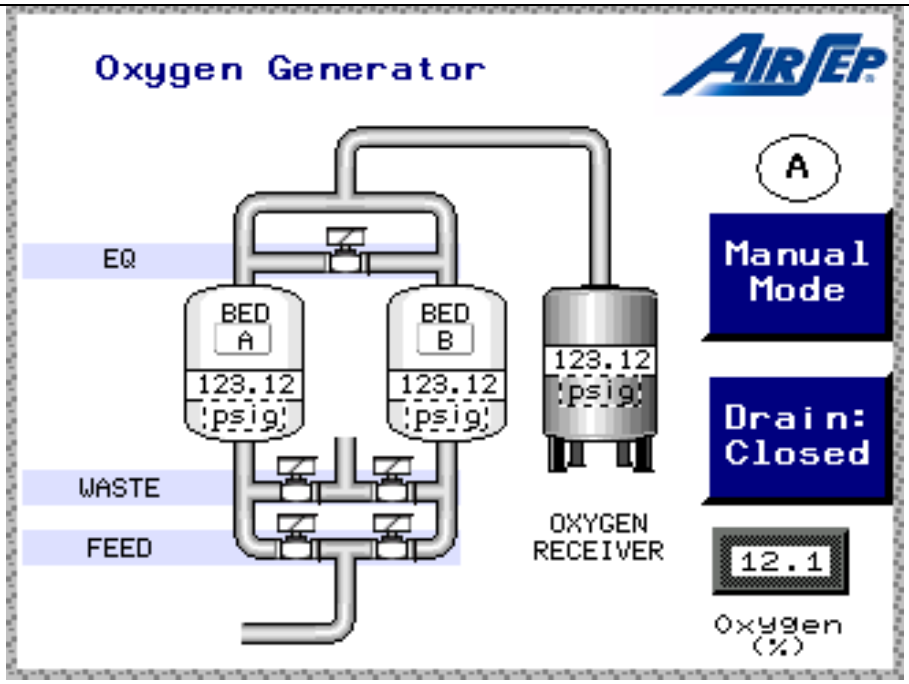


Figure 4.7: Typical Oxygen Generator Screen

The 'Parameters and Output' Screen (Figure 4.8) is the main location to observe the several parameters of the oxygen generator. The bed pressures, oxygen receiver pressure, oxygen concentration, and the number of working hours are all displayed here via Message Displays.

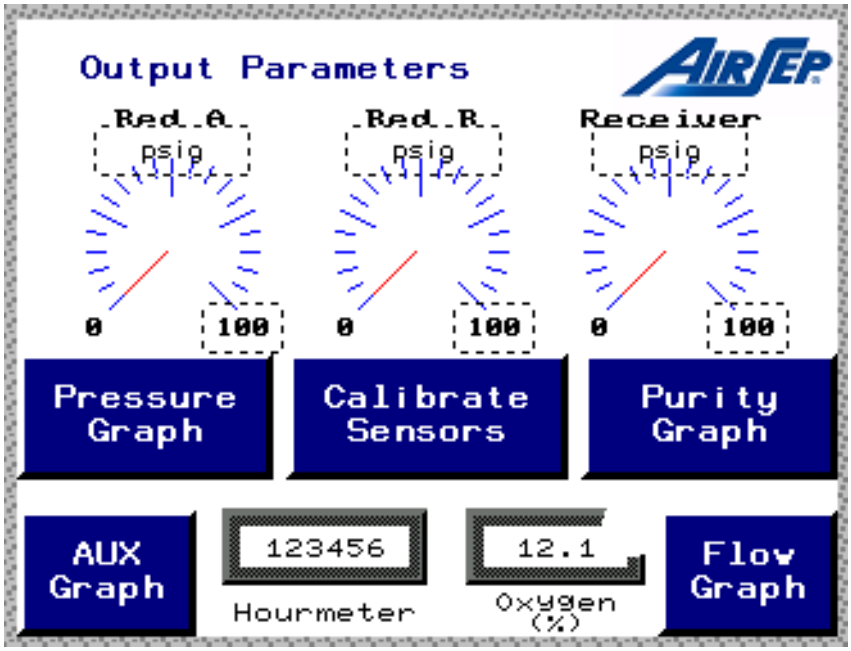


Figure 4.8: Typical Parameters and Output Screen

The ‘Bed Pressure Graphs’ icon takes to the Bed Pressure Graphs Screen as shown.

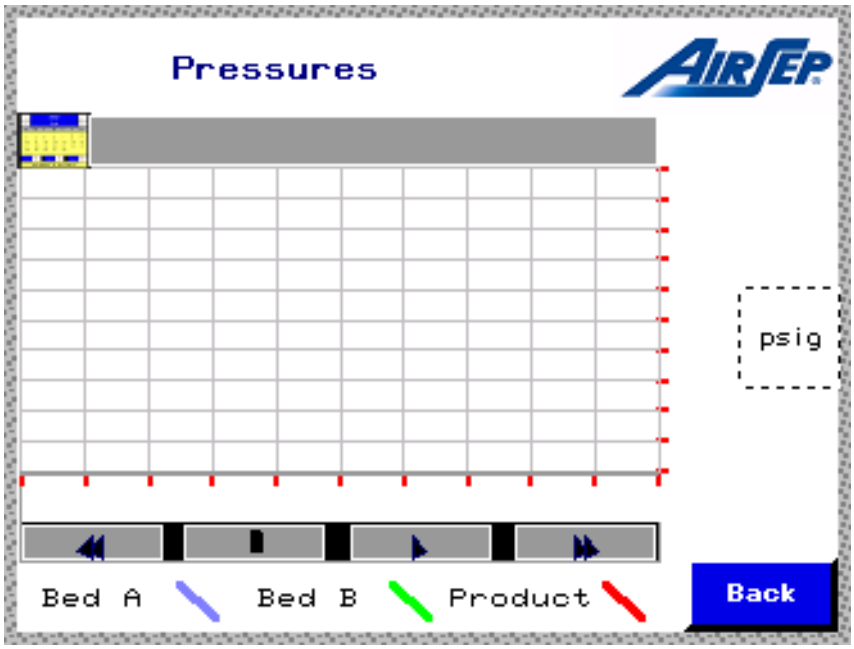


Figure 4.9: Typical Bed Pressure Graphs Screen

The ‘Output Parameter Graphs’ icon takes to the screen that displays the graphs between oxygen pressure Vs time and the oxygen concentration Vs time. The ‘Next Pen’ icon changes the scale of the ordinate to suit the respective displayed pressure.

The ‘Calibrate Pressure Transducers’ icon displays a screen dedicated to the pressure transducers calibration and settings as shown below.

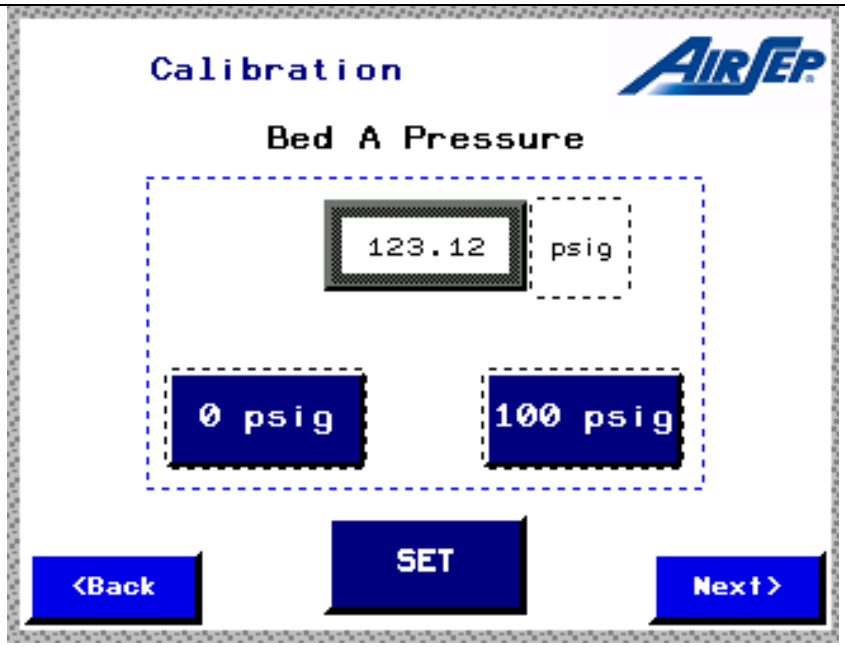


Figure 4.10: Typical Bed Pressure Calibration Screen

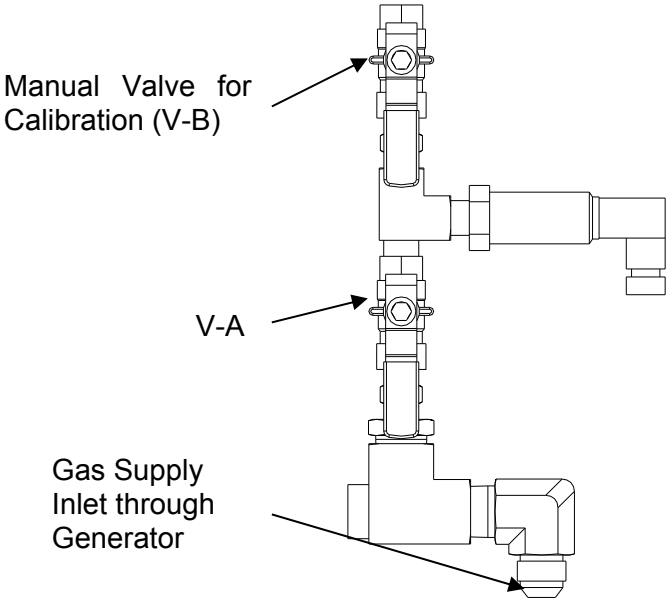


Figure 4.11: Feed Air Pressure Transducer Assembly

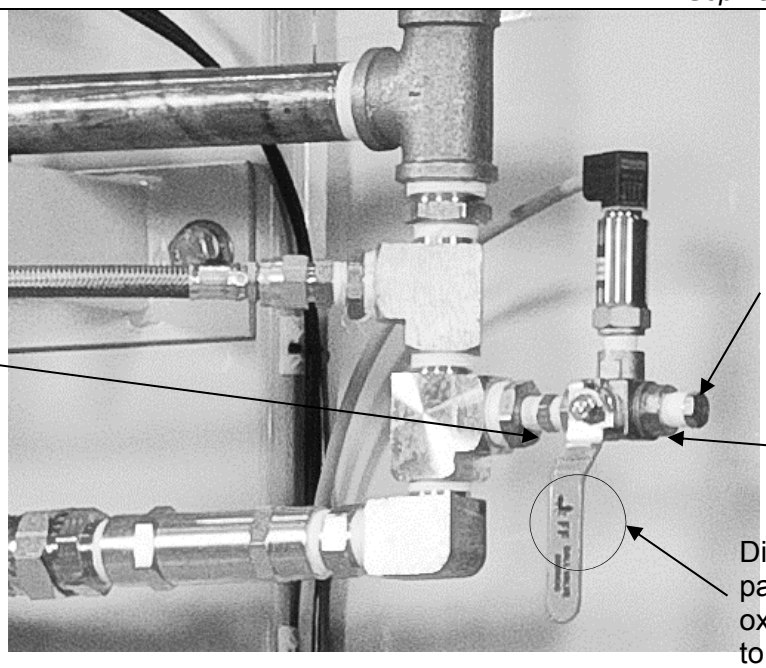


Figure 4.12: Bed Pressure Transducer Assembly

The pressure transducers for the beds and the product oxygen pressure are factory calibrated and should not require any calibration for a long period. However, if the need arises, follow the procedure below for calibration.

To calibrate the feed air pressure transducer:

1. Close the manual valve (V-A) as shown in the Figure 4.11.
2. Take out the plug at the inlet of the manual valve (V-B) and attach a manual air pump having an accurate pressure gauge.
3. Open the manual valve (V-B).
4. Press the 'Calibrate 0 psig' icon when the gauge on the manual air pump reads 0 psig.
5. Manually pump the air so that the pressure reading on the gauge is 100 psig.
6. At this point, press the 'Calibrate 100 psig' icon on the calibration screen to finish the calibration procedure.
7. Once the 0 psig and 100 psig point are calibrated press and hold the 'SET' button until it pops back out.
8. Close the manual valve (V-B) and take out the compressed air supply.
9. Open the manual valve (V-A) and resume the normal operation.

Press the 'NEXT' icon to navigate the calibration screen for the next pressure transducer.

To calibrate the product and bed pressure transducers:

1. The three-way valve (V-A) (Figure 4.12) handle shows the direction of flow path. In Figure 4.12, direction of flow path is from oxygen generator to pressure transducer. Close this manual three-way valve (V-A), so that the flow path is from the atmosphere to the pressure transducer.

2. Take out the plug, if any, from the port A (Figure 4.12) and attach a manual air pump having an accurate pressure gauge.

3. Press the 'Calibrate 0 psig' icon when the gauge on the manual air pump reads 0 psig.
4. Manually pump the air so that the pressure reading on the gauge is 100 psig.
5. At this point, press the 'Calibrate 100 psig' icon on the calibration screen to finish the calibration procedure.
6. Press and hold the "SET" button until it pops back out. This will save the calibration.
7. Release pressure and check a few points in the range and ensure the reading is close. If it is off, return to step 3.

8. Disconnect the manual air pump from the port A and put the plug, if any, back to the port A.
9. Open the manual three-way valve (V-A), so that the flow path is from the oxygen generator to the pressure transducer as shown in Figure 4.12.

Press the 'NEXT' icon to navigate the calibration screen for Bed B and the oxygen receiver pressure transducer.

4.10 Control Panel: Internal Components

The internal layout of the control panel mainly consists of programmable logic controller (PLC), oxygen concentration board (optional), HMI, circuit breakers, transformers, and an alarm horn.

Programmable Logic Controller

The programmable logic controller (PLC) contains the logic for the oxygen generator operation.

Oxygen Concentration Monitoring Board

This board monitors the concentration of the product oxygen. A sample of product oxygen flows from the oxygen receiver to this board through a regulator. Ensure that the regulator is set for ~1 psig for accurate readings. Refer to Figure 4.1 for the location of the regulator.

Human Machine Interface (HMI)

The HMI acts as an interface between the operator and the oxygen generator.

5.0 Installation

5.1 Handling and Unpacking

AirSep Corporation ships the oxygen generator on a wooden skid along with the filter assembly. In the AS-Z series models, vent silencer assembly is also shipped apart from the oxygen generator and filter assembly. The oxygen receiver, if supplied, is also shipped on a separate skid.

Follow these unpacking guidelines carefully to protect yourself against loss from any damage that occurred during shipment.

1) Thoroughly inspect the exterior of the oxygen generator, filter assembly, vent silencer assembly and oxygen receiver, if supplied, for any damage that occurred during shipment. Pay special attention to the control cabinet on the oxygen generator. Open the control cabinet door, and inspect the interior for damage. If you observe any damage, note it on the freight bill or the express receipt before you sign it.

Failure to note any exterior damage on the freight bill or the express receipt at the time of delivery can result in the refusal of a damage claim by the carrier.

2) Carefully cut and remove any banding straps from the oxygen generator, filter assembly, vent silencer assembly and oxygen receiver, if supplied.

Remove all packing material very carefully. Retain the packing material for use if any additional shipping is required.

Use extreme caution when you lift the oxygen generator from the pallet. Lift only by the two lifting lugs at the top of the unit.

3) Carefully stand the oxygen generator on its legs.

Use extreme care when you handle any part of the oxygen generator to prevent damage.

4) Carefully stand the oxygen receiver, if supplied, on its base.

5) Although the oxygen generator, the filter assembly, the vent silencer assembly and the oxygen receiver are carefully inspected, tested, and packed, they can be damaged during shipment due to improper handling. If you find any concealed damage (loss or damage not found until you unpack the oxygen generator, filter assembly, vent silencer assembly and oxygen receiver), immediately call the delivery carrier and file a concealed-damage claim. Retain ALL container materials and interior packing for the carrier's inspection.

You must make a concealed damage claim within 24 hours of delivery. Only the consignee can file this claim.

5.2 Pre-installation Guidelines

Before you install the oxygen generator and the oxygen receiver, if supplied, refer to the Specifications section in the Appendix of this instruction manual to determine the applicable floor space, feed air, and the power requirements for your particular model.

The oxygen generator may use feed air at specifications outside those shown in the Appendix of this instruction manual; however, use of such feed air may require modification of the oxygen generator at the AirSep Corporation factory to ensure the product oxygen meets the specifications. Consult your sales representative to determine whether your oxygen generator requires modifications for your application.

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.

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

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 as well as to allow safe operation and maintenance.

AirSep oxygen generators are sold for use in industrial applications only. Contact AirSep Corporation, or an authorized AirSep representative, before you use this unit for any medical application.

Do not disconnect protective earth:

5.3 Installation Instructions

The section illustrates the standard installation arrangement.

Do not connect the filter assembly outlet directly to the feed air inlet on the oxygen generator. The feed air piping on the oxygen generator does not provide adequate support for the weight of the filter assembly.

Feed air at a temperature above 50°C (122°F) can cause damage to the oxygen generator not covered under the AirSep Corporation Product Warranty.

AirSep Corporation recommends installation of a shut-off valve on your air receiver. The shut-off valve enables safe depressurization of the feed air piping and air receiver to perform maintenance or repairs.

Airsep oxygen generators are intended to be secured to the floor. Failure to do so can result in the unit tipping over. An example of securing to the floor would be bolting the unit down.

1) Stand up the oxygen generator and secure to the floor. Tanks that are included and any compressor should also be secured as well to prevent tipping over.

2) On the AS-Z models, connect the vent silencer assembly to the oxygen generator (Refer to Appendix A of this instruction manual for general layout drawings of the AS-Z models which show the vent silencer):

   a) Install the bracket provided to the rear of the oxygen generator.
   b) Connect the oxygen generator exhaust outlet to the flanged pipe provided with the vent silencer assembly.
   c) Remove the flange covers, if any, from the flange at the base of the vent silencer assembly and the flange at the base of the rear of the oxygen generator.
   d) Connect the flanges at the base of the vent silencer assembly and rear of the oxygen generator. Take care not to damage the gasket between the flanges during installation.
   e) Connect the mufflers provided for the silencer assembly.

3) Remove the flange cover from the filter assembly inlet and outlet flange.

4) Connect the filter assembly to the oxygen generator after providing support to the filter assembly.

5) Connect the filter assembly inlet flange to the piping from your source of feed air. Provide clean piping with enough length to provide support for the weight of the filter assembly. Take care not to damage the gasket between the flanges during installation.

6) Install your oxygen receiver supplied by AirSep Corporation. If AirSep Corporation supplied the oxygen receiver, install a relief valve and oxygen outlet manifold to complete its assembly. AirSep Corporation recommends, if not supplied, the oxygen outlet manifold contain a manual ball valve, a vent valve with muffler, a pressure gauge, and a pressure regulator. If your application includes an oxygen analyzer or monitor, install an outlet with a manual ball valve on the oxygen outlet manifold to provide an oxygen sample.

WARNING

Take extreme care to keep all oxygen piping, hoses, and vessels clean. To avoid fire or explosion, oxygen clean all surfaces that can come in contact with the product oxygen.

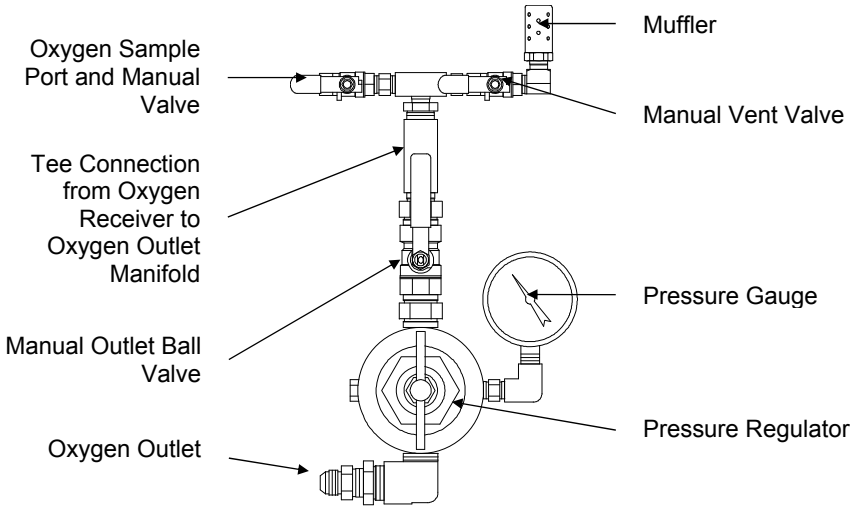


Figure 5.1: Typical Oxygen Outlet Manifold on Oxygen Receiver

7) Install the oxygen regulator assembly on the oxygen receiver.

8) Connect the #4 oxygen concentration sample line to the oxygen receiver and the control panel.

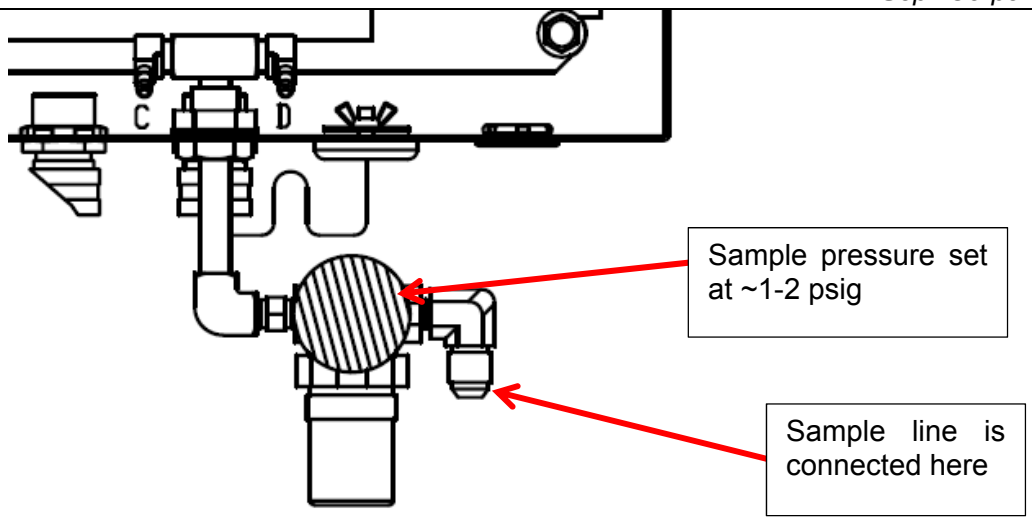


Figure 5:2: Oxygen Sample Control Panel Connection

9) Connect the respective electrical wires to the automatic drain valves of the filter assembly. Refer to the Appendix A of the instruction manual for the electrical schematics pertinent to the oxygen generator model.

10) Remove the plug from the oxygen outlet on the oxygen generator. Take care to prevent contamination from dust, oil, grease, etc. of the oxygen outlet and oxygen hose or piping.

11) Connect the oxygen outlet to the oxygen hose or piping to the oxygen receiver. Use Teflon™ tape to seal threaded connections.

12) Connect electrical wiring to the appropriate power supply.

! CAUTION	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 your application uses oxygen, the oxygen receiver depressurizes.

! CAUTION	Provide proper voltage to the oxygen generator. Improper voltage causes damage not covered under the AirSep Corporation Product Warranty.

6.0 Operation

6.1 General

This section of the instruction manual provides the procedures for start-up and shutdown of the oxygen generator. Review the component literature provided in the Appendix D of this instruction manual before you attempt to start the oxygen generator. Also read and thoroughly understand any literature or instruction manuals for components not provided by the AirSep Corporation.

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.

Do not allow smoking, open flame, or electronic devices that may generate sparks (e.g., cellular telephones) near the oxygen generator.

Post “NO SMOKING OR OPEN FLAMES” signs conspicuously near the location of the oxygen generator.

6.2 Initial Start-up

To start the oxygen generator for the first time, or after an extended or unexpected shutdown, follow the steps below:

Supply electrical power to the oxygen generator.

Refer to Figure 4.1 for the location of the pressure transducers (PT2, PT3 and PT4). Refer to the following chart to set the position of the manual valves on the oxygen generator prior to the initial start-up. Make sure each valve is fully open or fully closed, as indicated in the chart.

Valve Description	Valve No.	Initial Start-Up Position	Normal Operating Position
MANUAL FEED #1 valve (if applicable)	V-1	Open*	Open*
MANUAL FEED #2 valve	V-2	Closed	Open
MANUAL PRODUCT valve	V-3	Open	Open
Manual valve for Pressure Switch	---	Open	Open
Manual valve for PT2	---	Open	Open
Manual valve for calibration of PT2	---	Closed	Closed
Manual valve for PT3	---	Open	Open
Manual valve for calibration of PT3	---	Closed	Closed
Manual valve for PT4	---	Open	Open
Manual valve for calibration of PT4	---	Closed	Closed

Manual inlet valve of receiver	---	Open	Open
Manual valve to gauge on receiver	---	Open	Open
Manual sample valve	---	Closed	Open
Manual vent valve	---	Closed	Closed
Manual outlet valve of receiver	---	Closed	Open
Manual outlet valve to application	---	Closed	Open

* Also open all manual valves prior to MANUAL FEED #1 valve

Table 6.1 – Manual Valve Position Chart

Supply the compressed air.

Make sure the feed air supplied is within the feed air pressure range specified in this instruction manual.

Press the 'AUTO/MAN' icon on the Oxygen Generator Control Screen so that the oxygen generator is in *MANUAL* mode.

Press the 'ALARM RESET' icon on the Oxygen Generator Control Screen (if visible). The generator will only start if there is no shutdown condition existing. However, during start-up, a low concentration alarm may exist. If a shutdown condition exists, pressing the 'ALARM RESET' will not reset the system. The 'ALARM RESET' icon disappears once all the alarm and shutdown conditions have been rectified.

Please note that during initial start-up or start-up after a long period, the oxygen concentration can be lower than the low concentration alarm and/or shutdown setpoint and a 'low concentration' alarm may exist. However, the oxygen generator ignores the oxygen concentration shutdown setpoint for the first 60 minutes after start-up. If the oxygen concentration after 60 minutes of operation is still below the low concentration shutdown setpoint, the oxygen generator shuts down.

NOTE

The FEED PRESSURE must be above the feed air low pressure shutdown level specified in this instruction manual for the oxygen generator to run.

Make sure the POWER lights on the automatic drain valves at the base of the filter bowls illuminate. Press the manual override buttons on the PARTICULATE FILTER DRAIN valve and the COALESCING FILTER DRAIN valve, and make sure air discharges from the drain outlets.

NOTE

Make sure the exhaust contains no liquid. If liquid discharges, press the manual override buttons on the drain valves until the exhaust no longer contains liquid.

NOTE

The automatic drains on the oxygen generator exhaust periodically during operation to remove condensate from the filter bowls.

Adjust the automatic drain timer so that the exhaust contains no liquid without overdrawing the feed air. The typical timing for the drain valve operation is 5 sec every 10 min.

Press the 'START' icon on the Oxygen Generator Control Screen. You may press the 'Silence Horn' icon on the main screen to silence the alarm due to low oxygen concentration. The 'Silence Horn' icon bypasses the horn for 10 minutes.

Open the MANUAL FEED #2 valve (V-2) slightly. The valve should be open no more than 20-25%. Allow the unit to run this way until the bed pressures reach a maximum of 55-60 psig each cycle. This will take approximately 5 minutes. Once this pressure is reached, open the valve so that it is no more than 50% open. Allow the unit to run this way until the bed pressures reach a maximum of 60-65 psig each cycle. This will take approximately an additional 5 minutes. Lastly, open the valve so that it is no more than 75% open. Allow the unit to run this way until the bed pressures reach a maximum of 70-75 psig each cycle. This will take approximately an additional 5 minutes.

NOTE

When initially starting the unit, the adsorber vessels and oxygen receiver will be completely empty. If the feed valve is fully open when the unit begins to run, all of the air from the feed compressor, feed air tank, and feed piping will rush into the empty generator. This will cause the pressure to drop below the low instrument air shutdown setpoint. By slowly throttling the feed valve, it allows the empty generator to be gradually filled to the point at which the feed valve can be fully opened to its normal operating condition.

To purge oxygen at less than design concentration from the oxygen receiver, while the oxygen generator is running, open the manual vent valve on the oxygen receiver to vent gas. (This is the manual valve that vents low concentration oxygen to the atmosphere to increase oxygen concentration in the oxygen receiver to the level required for your application. Ensure that vent is sized such that the oxygen generator is never overdrawn.)

NOTE

During initial start-up, while the feed air oxygen generator piping and hoses, oxygen lines, and oxygen receiver pressurize, apply soapy water to all feed air piping and connections, oxygen piping or hoses and connections, and oxygen receiver connections to check for leaks. Repair or replace the leaking item(s).

Open the product sample valve to the oxygen analyzer assembly (if used) to monitor the concentration of the oxygen. If an oxygen analyzer board is provided, ensure that the pressure regulator to the oxygen analyzer board is set at 5 psig.

When the oxygen analyzer indicates the concentration of the oxygen in the oxygen receiver that exceeds the minimum concentration specified in this instruction manual, close the manual vent valve.

Fully open the manual outlet valves that control the flow of oxygen from the oxygen receiver to your application, and set the pressure regulator on the oxygen receiver outlet manifold to the pressure required for your application.

Press the 'AUTO/MAN' icon on the Oxygen Generator Screen so that the oxygen generator comes in *AUTO* mode.

6.3 Operation

The oxygen generator can be operated in AUTO or MANUAL mode depending on the requirements of your application. To use product oxygen that meets the specifications for your model listed in the Appendix A of this instruction manual, set the AUTO/MANUAL icon on the 'Oxygen Generator Screen' to AUTO to produce oxygen only during times of the oxygen demand.

6.4 Shutdown

1) Stop the flow of product oxygen from the oxygen receiver to your application by fully closing all manual valves between the outlet of the oxygen receiver and the inlet to your application.

2) Make sure the AUTO/MANUAL icon on the HMI is set to AUTO.

3) Allow the oxygen receiver to repressurize fully. When the oxygen receiver repressurizes, after a time delay of five cycles (approx. 15 min.), the oxygen generator stops cycling and enters the standby mode.

Allow the oxygen generator to enter standby during shutdown to ensure that the oxygen receiver contains oxygen at design concentration during the subsequent restart and also ensure that the unit shuts down at the proper point in the cycle. Failure to wait until the oxygen generator enters standby results in temporarily reduced concentration oxygen during the subsequent restart.

4) Press the STOP icon on the 'Main System Control Screen' or switch off the remote on/off switch depending on the mode of the oxygen generator to stop it.

5) Close the manual valve for the oxygen sample to the oxygen concentration monitoring board.

6.5 Normal Start-Up

To perform a normal start-up, the oxygen generator first requires a shutdown as described in 6.4 — Shutdown. If the oxygen generator shuts down due to a power loss or inadequate feed air pressure, follow the procedure in Section 6.2 — Initial Start-Up to restart the oxygen generator.

Start the supply of compressed air.

Make sure the MANUAL FEED #1 (V-1) and #2 (V-2) valves are fully open.

Make sure the INSTRUMENT AIR valve is fully open.

Make sure the 'AUTO/MAN' icon on the oxygen generator control panel is in the *AUTO* mode.

When the feed air pressure exceeds the minimum feed air pressure specified in this instruction manual, press the 'START' icon on the Main System Control Screen.

Fully open the MANUAL PRODUCT valve (V-3) and the product sample valve.

The oxygen generator will not produce oxygen during a normal start-up until the OXYGEN RECEIVER PRESSURE gauge registers pressure less than the minimum pressure specified in this instruction manual.

Start the flow of oxygen from the oxygen receiver to your application.

6.6 Extended Shutdown

To shut down the oxygen generator for 24 hours or longer, complete all the steps in Section 6.4 — Shutdown. In addition, perform the following steps:

1) Fully close all manual valves on the oxygen receiver to isolate the oxygen in the oxygen receiver, to prevent the loss of pressure in the oxygen receiver and enable a normal start-up.

2) Disconnect the power supply.

6.7 Start-up after an Extended Shutdown

After an extended shutdown or an unexpected shutdown, such as a loss of electrical power, you must purge the oxygen receiver of any low concentration oxygen before the oxygen generator can supply oxygen within concentration specifications. To purge the oxygen receiver, follow all the steps in Section 6.2 — Initial Start-Up.

Using the oxygen generator at flows higher than 15% above those specified in Appendix A of this manual, will result in the likely contamination of the molecular sieve beds. This damage is not covered under the standard warranty.

7.0 Maintenance

7.1 General

The most important maintenance you can perform on the oxygen generator is to make sure the automatic drain valve for the filters functions properly. Routinely monitor the operation of this drain valve to ensure the long life of the oxygen generator. Follow the procedures described in this section of the instruction manual for daily, semi-annual, and annual maintenance. It should be noted that a few procedural steps in the sub-sections may apply to a specific model.

Use the following chart as a guide to perform maintenance on a regular schedule:

Time Period	Action
Daily	Make sure automatic drain functions properly.
Monthly	Inspect filters and bowls. Clean bowls or replace filters as necessary.
Six Months	Replace particulate filter element.
Annually	Replace coalescing filter element.
	Check performance of automatic valves and actuators.
	Clean and lubricate feed air regulator.

Table 7.1 Maintenance Chart

7.2 Daily Maintenance

1) Observe the operation of the automatic drain valves at the bottom of both filters. Make sure the condensate outlets for the drain valves are not obstructed.

2) The automatic drain valves can be set to operate at the desired intervals. Generally, it is set at the intervals such that the condensate could be removed completely without over draining the feed air supply.

3) If condensate does not discharge from an outlet, fully close the manual inlet isolation valve on the automatic drain valve at the outlet, remove the screw-on type plug from the base of the inlet, remove the strainer inside the inlet, clean the strainer, replace the strainer and plug, and fully open the manual inlet isolation valve.

4) Press the manual override buttons on the automatic drain valves on both filters to test the operation of the drain valves. Air or condensate should discharge from the outlets on the drain valves.

5) Observe the discharge from the automatic drain valves during normal operation. The discharge from the drain valves should not contain condensate at the end of each drain cycle. If condensate remains in the discharge at the end of the drain cycle, adjust the timers on the drain

valves to either increase the length of time for the drain cycle or decrease the interval between drain cycles until the discharge at the end of the drain cycle is free of condensate.

To adjust the time for the drain cycle, use the lower knob on the timer on the drain valve. Rotate the knob counterclockwise to decrease the time or clockwise to increase the time.

To adjust the interval between drain cycles, use the upper knob on the timer. Rotate the knob counterclockwise to decrease the interval or clockwise to increase the interval.

Excess operation of the automatic drain valves may decrease the quantity of feed air enough to impair the performance of the oxygen generator. Set the timers to allow the drain valves to operate long enough to drain all the condensate from the discharge but not long enough to allow air-only discharge for more than a few seconds.

7.3 Semi-Annual Maintenance

Perform the semi-annual maintenance procedure only with the oxygen generator shut down.

Do not attempt to remove the filter bowls until the filter assembly fully depressurizes.

7.3.1 Particulate Filter Replacement

The particulate filter removes rust, pipe scale, and other foreign particles from the feed air. It also separates most of the condensed water and oil from the air. Use the following procedure to replace the particulate filter element(s) at least every six months or as required:

The expected life of the particulate filter is approximately six months. Its purpose is to protect and extend the life of the coalescing filter. The life of the particulate filter depends on air and piping quality. The particulate filter has a rating of 5 microns.

Follow all steps in Section 6.6 — Extended Shutdown.

Follow all steps in Section 6.2 — Initial Start-Up.

7.4 Annual Maintenance

Perform the annual maintenance procedure only with the oxygen generator shut down.

Do not attempt to remove the filter bowls until the filter assembly fully depressurizes.

7.4.1 Maintenance of Automatic Valves

If possible, the functioning of the valves should be checked daily.

1) Check all moving parts on the oxygen generator (automatic valves and pneumatic actuators) for any indication of wear. Replace all worn parts.
2) Make sure all automatic valves operate properly. Make sure all connections remain tight and that each valve opens and closes properly.
3) If a valve operates slowly (two seconds or more), repair or rebuild the solenoid valve or valve actuator. Refer to the valve manufacturer's literature in Appendix D of this instruction manual for more information.
4) Check all automatic valves and pneumatic actuators for leaks. Use soapy water to check leaks at the valve stems. If the valves or actuators leak, tighten or replace the packing.

Do not over-tighten packing bolts on air operated valves.

7.4.2 Coalescing Filter Replacement

The coalescing filter causes oil "fog" particles and water vapor that pass through the particulate filter to collide (coalesce) and form larger droplets, which fall to the bottom of the filter bowl. Replace the coalescing filter element(s) annually.

The expected life of the coalescing filter is approximately one year with proper maintenance of the particulate filter. The coalescing filter has a rating of 0.01 microns.

1) Follow all steps in Section 6.6 — Extended Shutdown.

2) Make sure that manual valves on either side of the filter assembly are closed.

3) Press the manual override button on the automatic drains of the filters to depressurize the filter assembly.

4) Disconnect, tag, and lockout electrical power to the drain valve.

5) Remove the timer and conduit from the drain valve on the bottom of the filter bowl. The timer attaches to the valve body with one screw.

6) Slowly loosen, but do not remove, all eight socket head cap screws that hold the bowl to the filter body to make sure the bowl fully depressurizes before removal.

7) Remove the eight socket head cap screws that hold the bowl to the filter body to disconnect the bowl.

   An empty filter bowl indicates proper drain system operation.

The old coalescing filter element(s) cannot be cleaned. You must replace it (them) with (a) new element(s).

8) To remove the coalescing filter element(s), disconnect the retainer nut from under the element(s).

9) Place the new element(s) where the old one(s) was (were) located, and reconnect the retainer nut.

10) Wash the bowl in warm, soapy water, and rinse.

11) Reconnect the filter bowl.

12) Reconnect the timer and conduit assembly to the drain valve body.

13) Remove the lockout and tag, and provide electrical power to the oxygen generator.

14) Make sure the MANUAL FEED #2 valve (V-2) remains fully closed.

15) Fully open the MANUAL FEED #1 valve (V-1) to pressurize the particulate filter.

16) Apply soapy water to check for leaks on all fittings loosened during the replacement procedure.

17) Press the manual override button on the automatic drain valve on the coalescing filter and make sure the exhaust contains no liquid.

18) Follow all steps in Section 6.2 — Initial Start-Up.

8.0 Troubleshooting

8.1 General

The oxygen generator contains electrical parts that can produce an electrical shock hazard if not handled properly. To prevent electrical shock, use extreme care when you service the oxygen generator. Only trained personnel may open the oxygen generator.

The AirSep PSA Oxygen Generator is pressurized during normal operation. You must depressurize the oxygen generator before you attempt any repairs.

8.2 Technical Support

For assistance in troubleshooting or repairing the unit, or to order replacement parts, contact the AirSep Commercial Products Service Department by telephone Monday through Friday between 7:30 a.m. and 4:30 p.m. Eastern Time. In the USA or Canada, call **1-800-320-0303 press option 3 then select option 1**. Outside the USA or Canada, call **(716) 691-0202 ext 7325**. Send fax inquiries anytime to **(716) 564-2717**. Address written inquiries to:

AirSep Corporation
260 Creekside Drive
Buffalo, NY 14228-2075 USA
Attention: Commercial Products Service Department

E-mail: cpdservice@chartindustries.com

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

8.3 Troubleshooting Chart

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

Problem	Probable Cause	Solution
Oxygen generator does not cycle.	No electrical power to control cabinet.	Make sure unit is plugged into wall outlet and that wall outlet receives power.
	Circuit breaker tripped.	Reset the breaker.
	Fuse blown	Replace fuse.
	Generator is not switched on	Switch on the oxygen generator
	Oxygen Generator is in Standby mode.	The oxygen generator will start running once the pressure in the oxygen receiver goes below the low setpoint for standby mode.
Oxygen generator operates continuously. Pressure of oxygen at specified concentration is lower than the specified pressure.	Inadequate feed air pressure.	Make sure feed air valves remain fully open and lines are not obstructed.
	Inadequate cycle pressure.	Adjust or replace feed air regulator.
	Oxygen demand exceeds oxygen generator capacity.	Check oxygen usage or check unit and oxygen hoses and piping for leaks.
Oxygen concentration below specified concentration (50–70%).	Oxygen Sample flow line obstructed	Ensure that all the valves on the oxygen sample line to the concentration monitoring board are open.
		Ensure that the oxygen regulator on the oxygen sample line is set at ~6 psig.
	Low concentration oxygen during initial start-up.	Start unit as described in Chapter 6.
	Unit shut down for extended period—no pressure in oxygen system.	Start unit as described in Chapter 6.
	Momentary power loss.	Vent low concentration oxygen from system as described in Chapter 6.
	Inadequate feed air.	Check air lines for obstructions or adjust or replace feed air regulator.
	Valves not cycling properly.	Replace or rebuild the valves as necessary.

	Oxygen concentration monitoring board defective	Replace the oxygen concentration monitoring board
	Improperly wired PLC.	Check the wiring or replace PLC.
	Solenoid valve not functioning properly. Check for the following causes:	
	Defective coil.	Replace coil.
	Loose or defective wire to valve.	Repair or replace wire.
	Defective PLC. (No power output to valve.)	Replace PLC.
	Valve remains energized and open.	Check the valve or the PLC output LED.
	Defective valve.	Rebuild valve.
	Worn internal parts on valve.	Rebuild valve.
Valve makes loud “chattering” noise.	Low voltage.	Check power supply.
	Low voltage PLC output.	Replace PLC.
	Dirty valve.	Clean or rebuild valve.
	Worn valve core.	Rebuild valve.
	Defective EMI filter.	Replace EMI filter.
Very low concentration oxygen output (21–50%).	Oxygen Sample flow line obstructed	Ensure that all the valves on the oxygen sample line to the concentration monitoring board are open.
		Ensure that the oxygen regulator on the oxygen sample line is set at ~6 psig.
	Leaking check valves.	Clean or replace check valves.
	Plugged muffler.	Replace muffler.
	Oxygen concentration monitoring board defective.	Replace the oxygen concentration monitoring board.
Oxygen generator outputs particulates (dusting).	Feed air regulator set improperly set.	Adjust feed air regulator.
	Contaminated molecular sieve in adsorbers.	Contaminated molecular sieve in adsorbers.
	System not cycling properly.	Check and repair or replace faulty wiring and/or PLC.
Feed air regulator leaks out bleed orifice.	Stuck feed air regulator main valve assembly.	Clean and lubricate main regulator valve assembly.

	Defective main valve assembly seat.	Rebuild or replace regulator.
Oxygen generator relief valves open.	Cycle pressure exceeds the maximum pressure specified.	Adjust feed air regulator.
	Stuck feed air regulator main valve assembly.	Rebuild or replace regulator.
	Defective relief valve.	Replace relief valve.
Filter drain valve remains open. (Valve not energized.)	Valve obstructed.	Clean or replace valve.
Filter drain valve does not energize.	Loose or defective wire to valve.	Repair or replace wire.
	Defective valve coil.	Replace valve.
	Valve core stuck in closed position.	Replace valve.
	Defective PLC. (No power output to valve.)	Replace PLC.
Filter drain valve energizes with unit pressurized, but no air exhausts.	Drain valve obstructed or stuck in closed position.	Clean or replace valve.
	Drain tubing obstructed or pinched.	Clean or replace tubing.

A Appendix Technical Data

Specifications

Data in this section refer to standard AS-Q through AS-Z model oxygen generators. The oxygen generators may use feed air at specifications outside those shown; however, use of such feed air may require modification of the oxygen generators at the AirSep Corporation factory to ensure the product oxygen meets the design specifications. Consult your sales representative to determine whether your oxygen generator requires modifications for your application.

AS-Q	
Product Flow	2,500 – 2,800 SCFH* 65.72 – 73.61 Nm^3/hr* 1,179 – 1,321 LPM*
Product Pressure	45 – 65 psig* 310 – 448 kPa* 3.0 – 4.4 barg*
Product Concentration	Up to 95%
Product Dew Point	-100°F (-73°C)
Dimensions (W x D x H) (Nominal)	112 x 61 x 140 in (284 x 155 x 356 cm)
Weight	8,025 lb (3,640 kg)
Physical Connections** **Compressed Air Inlet** **Product Gas Outlet**	 2” 150# ANSI Flange 1” NPT
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 104°F (40°C)
Feed Air Requirements	
Pressure (minimum)	90 psig 621 kPa 6.2 barg
Temperature (maximum)	122°F (50°C)
Feed Air Regulator Setting***	70 – 75 psig 483 – 517 kPa 4.8 – 5.1 barg
Control Power Requirements (Single Phase)	120 V ~ ±10%, 50/60 Hz, 3.0 A 220 V ~±10%, 50/60 Hz, 1.0 A
Pressure Switch Setting***	
(minimum)	65 – 70 psig 448 – 483 kPa 4.4 – 4.8 barg
(maximum)	72 – 75 psig 496 – 517 kPa 4.9 – 5.1 barg
Other Specifications **Pollution Degree** **Installation Category** **Altitude**	 2 II 2000 m

*SCF (Standard cubic foot) gas measured at 1 atmosphere and 70°F / Nm^3 (Normal cubic meter) gas measured at 1 atmosphere and 0°C **/** LPM (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.

AS-R	
Product Flow	3,000 – 3,700 SCFH* 78.86 – 97.27 Nm^3/hr* 1,415 – 1,746 LPM*
Product Pressure	45 – 65 psig* 310 – 448 kPa* 3.0 – 4.4 barg*
Product Concentration	Up to 95%
Product Dew Point	-100°F (-73°C)
Dimensions (W x D x H) (Nominal)	114 x 73 x 157 in (290 x 185 x 399 cm)
Weight	12,906 lb (5,854 kg)
Physical Connections** **Compressed Air Inlet** **Product Gas Outlet**	 3” 150# ANSI Flange 1” NPT
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 104°F (40°C)
Feed Air Requirements	
Pressure (minimum)	90 psig 621 kPa 6.2 barg
Temperature (maximum)	122°F (50°C)
Feed Air Regulator Setting***	70 – 75 psig 483 – 517 kPa 4.8 – 5.1 barg
Control Power Requirements (Single Phase)	120 V ~ ±10%, 50/60 Hz, 3.0 A 220 V ~ ±10%, 50/60 Hz, 1.0 A
Pressure Switch Setting***	
(minimum)	65 – 70 psig 448 – 483 kPa 4.4 – 4.8 barg
(maximum)	72 – 75 psig 496 – 517 kPa 4.9 – 5.1 barg
Other Specifications **Pollution Degree** **Installation Category** **Altitude**	 2 II 2000 m

*SCF (Standard cubic foot) gas measured at 1 atmosphere and 70°F / Nm^3 (Normal cubic meter) gas measured at 1 atmosphere and 0°C **/** LPM (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.

AS-W	
Product Flow	4,000 – 4,600 SCFH* 105.15 – 120.93 Nm^3/hr* 1,887 – 2,170 LPM*
Product Pressure	45 – 65 psig* 310 – 448 kPa* 3.0 – 4.4 barg*
Product Concentration	Up to 95%
Product Dew Point	-100°F (-73°C)
Dimensions (W x D x H) (Nominal)	122 x 87 x 196 in (310 x 221 x 498 cm)
Weight	17,012 lb (7,717 kg)
Physical Connections** **Compressed Air Inlet** **Product Gas Outlet**	 3” 150# ANSI Flange 1” NPT
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 104°F (40°C)
Feed Air Requirements	
Pressure (minimum)	90 psig 621 kPa 6.2 barg
Temperature (maximum)	122°F (50°C)
Feed Air Regulator Setting***	70 – 75 psig 483 – 517 kPa 4.8 – 5.1 barg
Control Power Requirements (Single Phase)	120 V ~ ±10%, 50/60 Hz, 3.0 A 220 V ~ ±10%, 50/60 Hz, 1.0 A
Pressure Switch Setting***	
(minimum)	65 – 70 psig 448 – 483 kPa 4.4 – 4.8 barg
(maximum)	72 – 75 psig 496 – 517 kPa 4.9 – 5.1 barg
Other Specifications **Pollution Degree** **Installation Category** **Altitude**	 2 II 2000 m

*SCF (Standard cubic foot) gas measured at 1 atmosphere and 70°F / Nm^3 (Normal cubic meter) gas measured at 1 atmosphere and 0°C **/** LPM (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.

AS-Z	
Product Flow	5,000 – 5,500 SCFH* 131.44 – 144.59 Nm^3/hr* 2,359 – 2,595 LPM*
Product Pressure	45 – 65 psig* 310 – 448 kPa* 3.0 – 4.4 barg*
Product Concentration	Up to 95%
Product Dew Point	-100°F (-73°C)
Dimensions (W x D x H) (Nominal)	114 x 88 x 197 in (290 x 224 x 500 cm)
Weight	20,002 lb (9,073 kg)
Physical Connections **Compressed Air Inlet** **Product Gas Outlet**	 3” 150# ANSI Flange 1½” 150# ANSI Flange
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 104°F (40°C)
Feed Air Requirements	
Pressure (minimum)	90 psig 621 kPa 6.2 barg
Temperature (maximum)	122°F (50°C)
Feed Air Regulator Setting* **	70 – 75 psig 483 – 517 kPa 4.8 – 5.1 barg
Control Power Requirements (Single Phase)	120 V ~ ±10%, 50/60 Hz, 3.0 A 220 V ~ ±10%, 50/60 Hz, 1.0 A
Pressure Switch Setting* **	
(minimum)	65 – 70 psig 448 – 483 kPa 4.4 – 4.8 barg
(maximum)	72 – 75 psig 496 – 517 kPa 4.9 – 5.1 barg
Other Specifications **Pollution Degree** **Installation Category** **Altitude**	 2 II 2000 m

*SCF (Standard cubic foot) gas measured at 1 atmosphere and 70°F / Nm^3 (Normal cubic meter) gas measured at 1 atmosphere and 0°C **/** LPM (Liters per minute) gas measured at 1 atmosphere and 21°C.

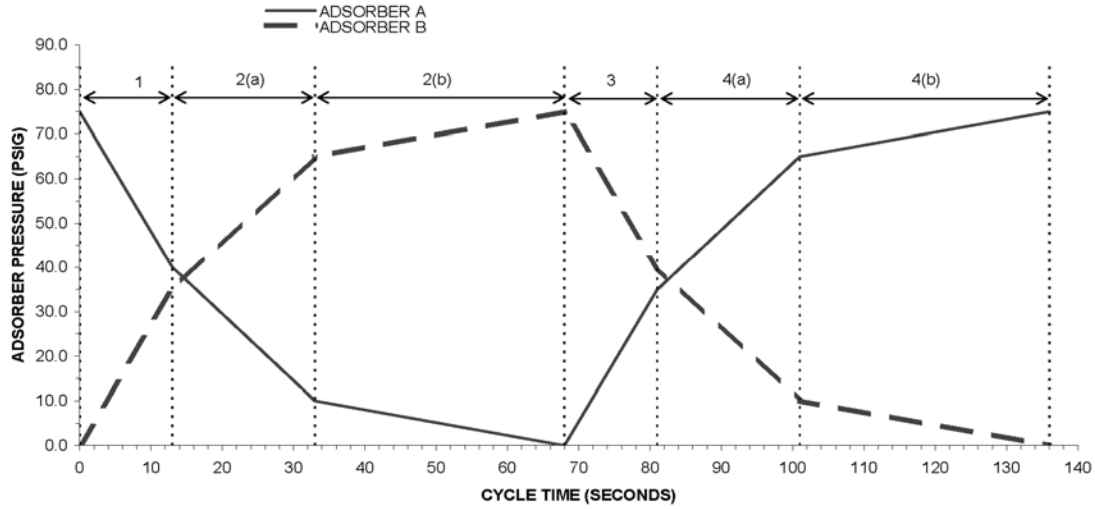
**Check the label on the control panel for appropriate power supply.

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

High bed pressure alarm	83 psig
High bed pressure shutdown	85 psig
Low oxygen concentration alarm	89%
Low oxygen concentration shutdown setpoint	87%
Time delay for concentration shutdown at start-up	1 hour
Cycle pressure/feed air regulator setting	70 – 75 psig
Oxygen sample line pressure regulator setting	1 psig

Table A.1: Typical System Set points

Drawings and Schematics



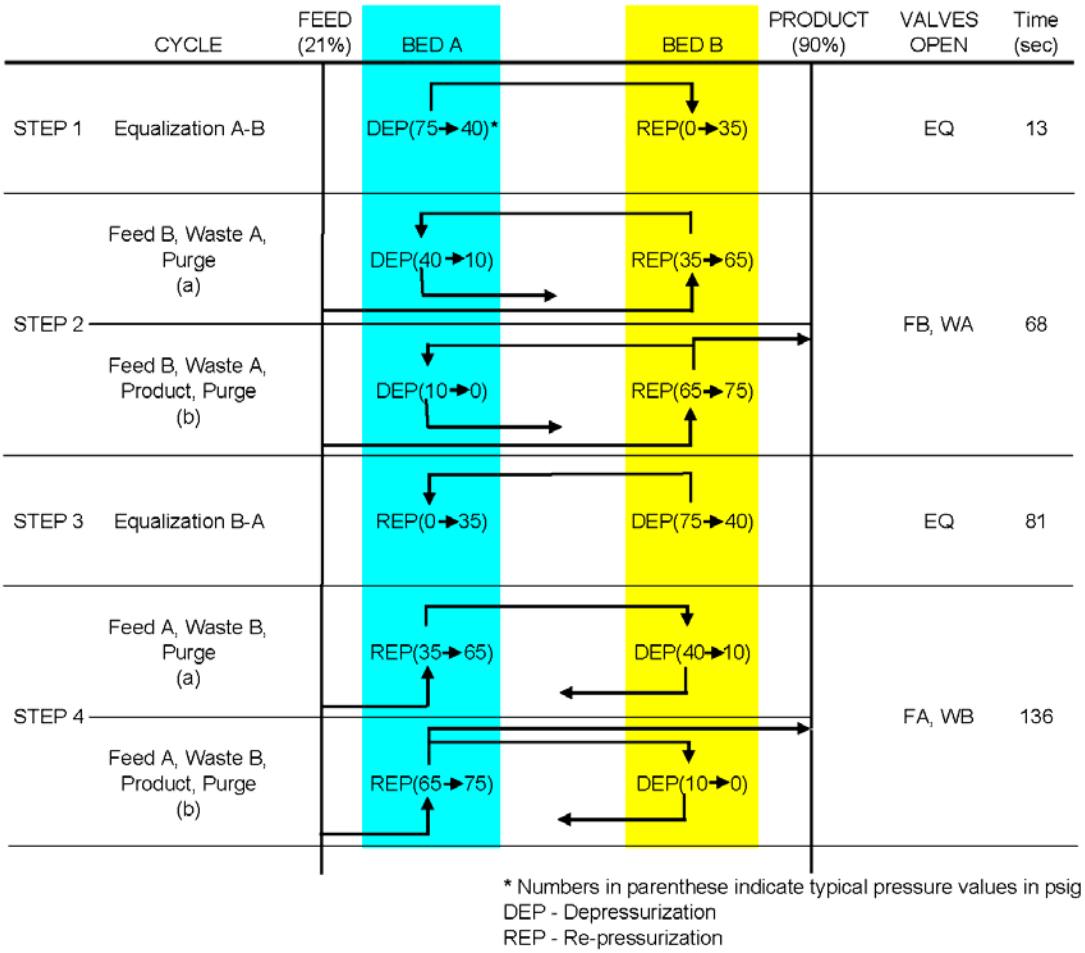


Figure A.1: Typical Pressure Profile and Valves Cycle Sequence

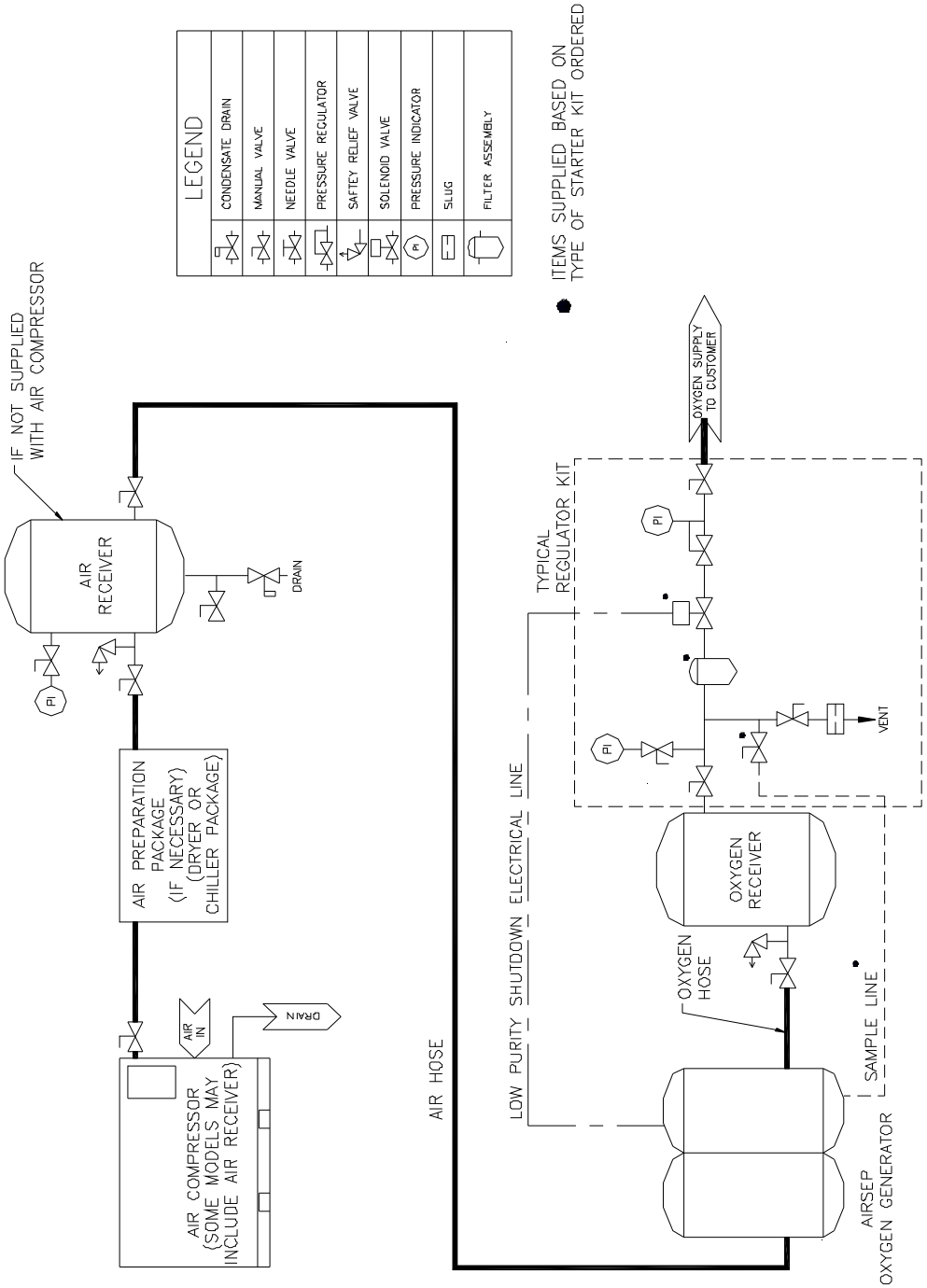


Figure A.2: Typical Installation Arrangement

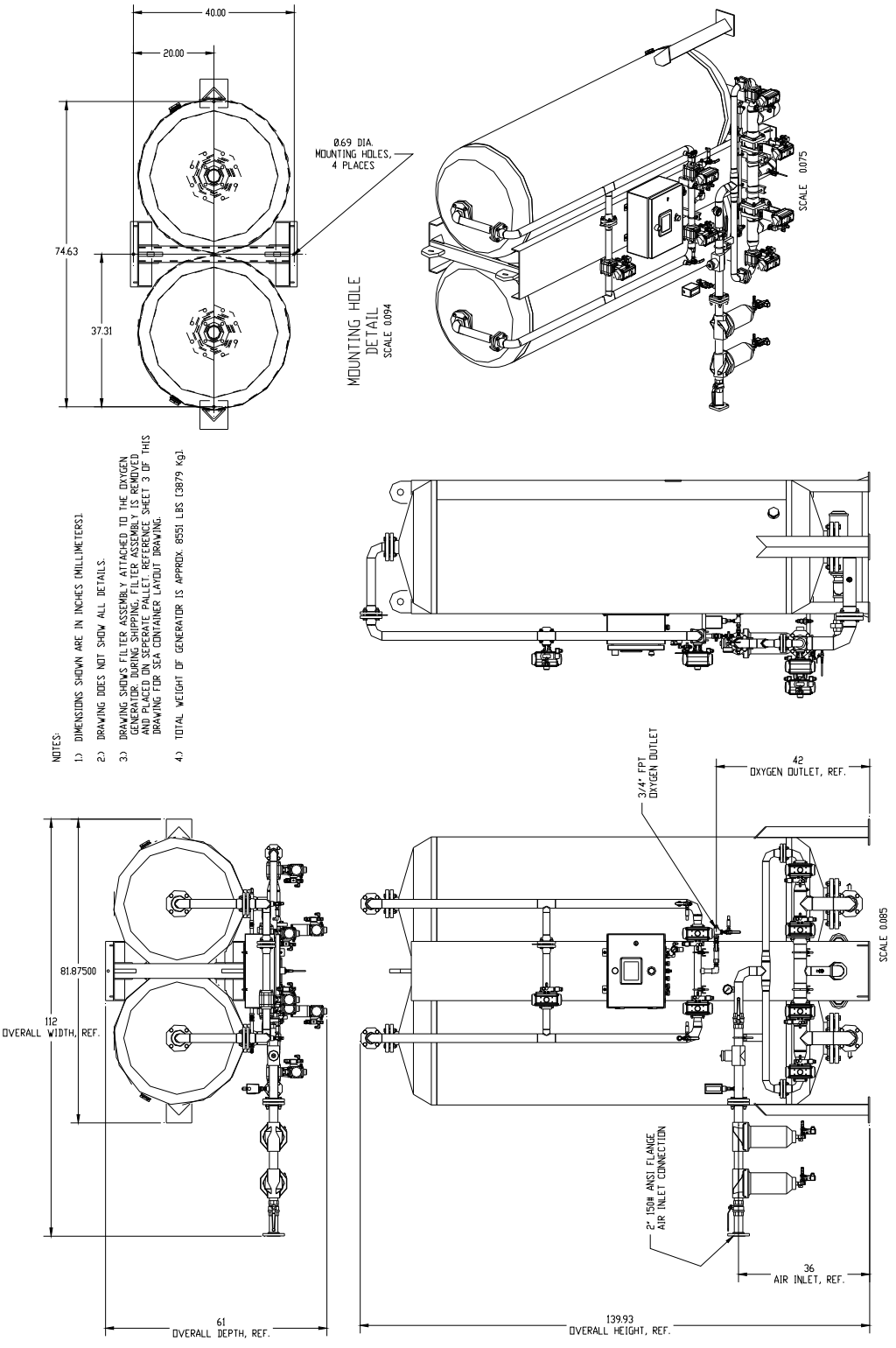


Figure A.3: General Arrangement Drawing – AS-Q

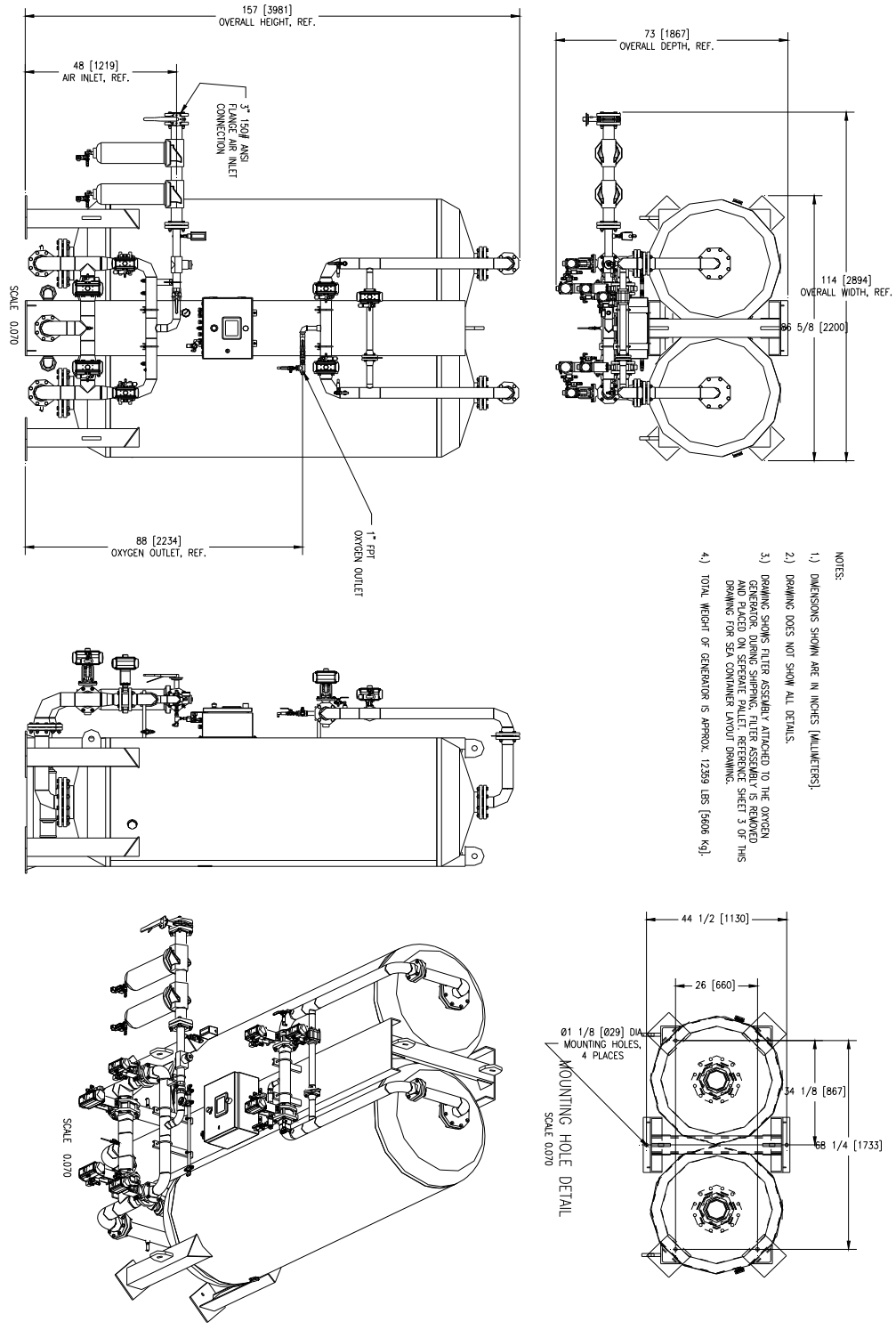


Figure A.4: General Arrangement Drawing – AS-R

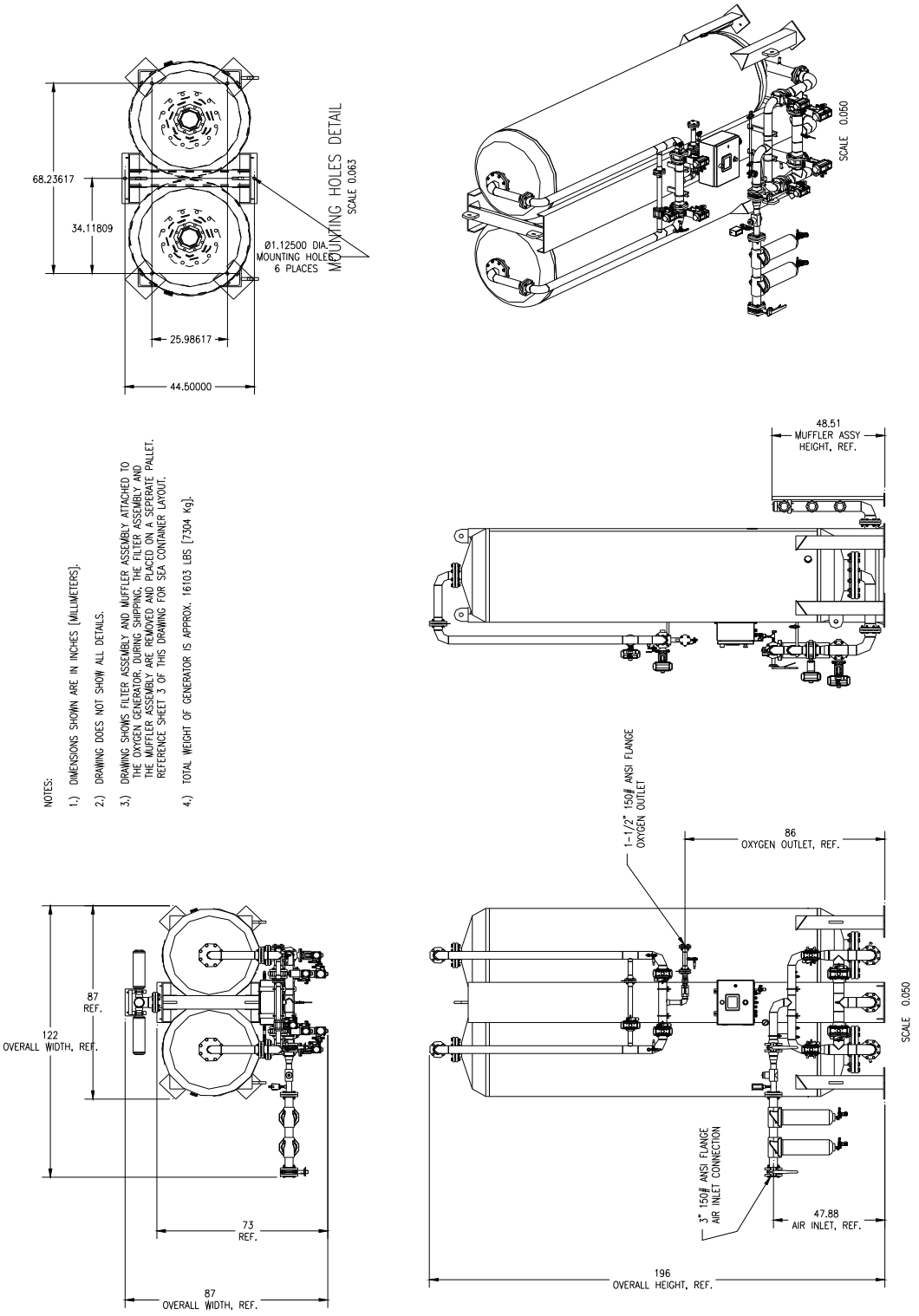


Figure A.5: General Arrangement Drawing – AS-W

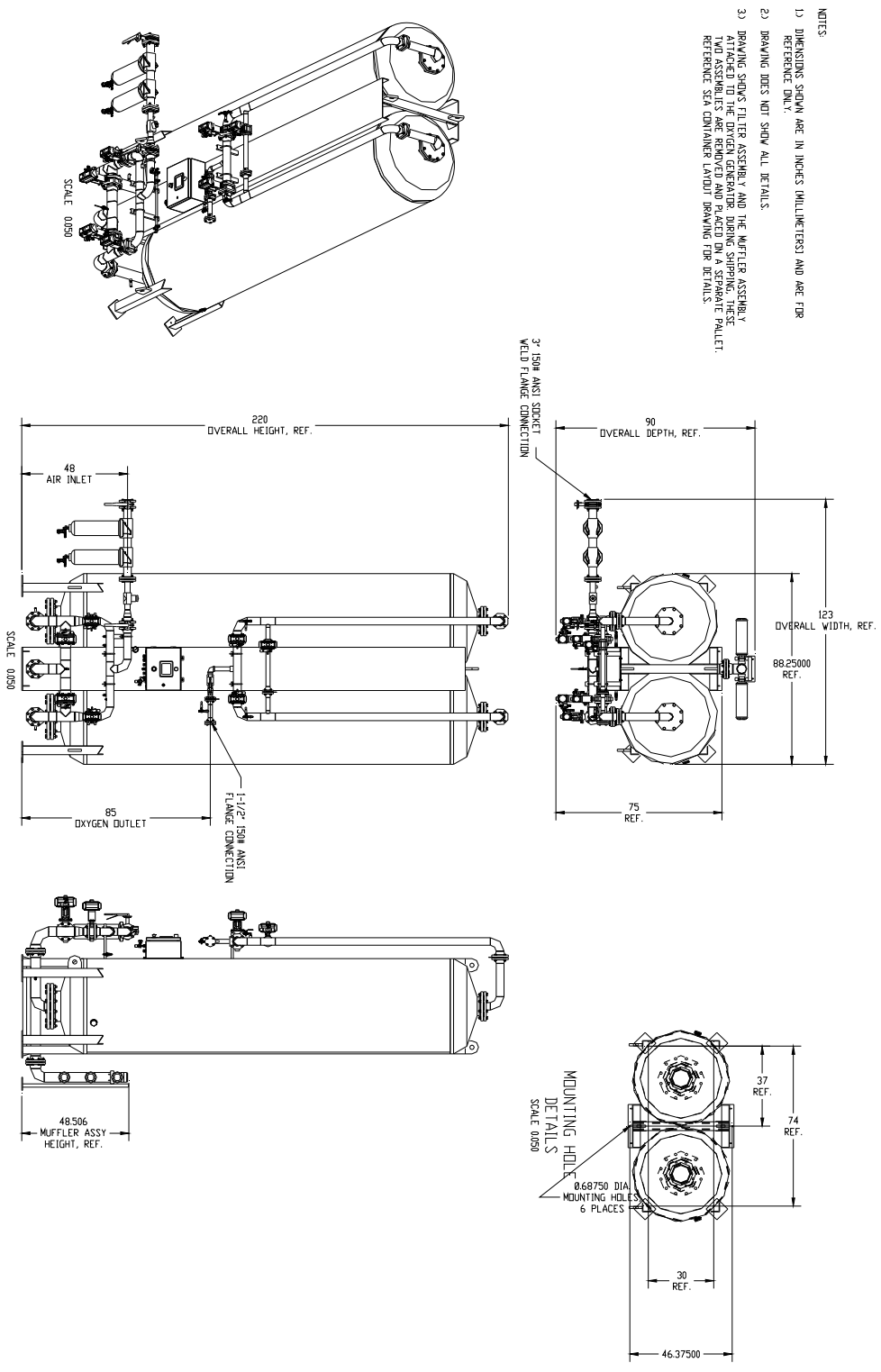


Figure A.6: General Arrangement Drawing – AS-Z

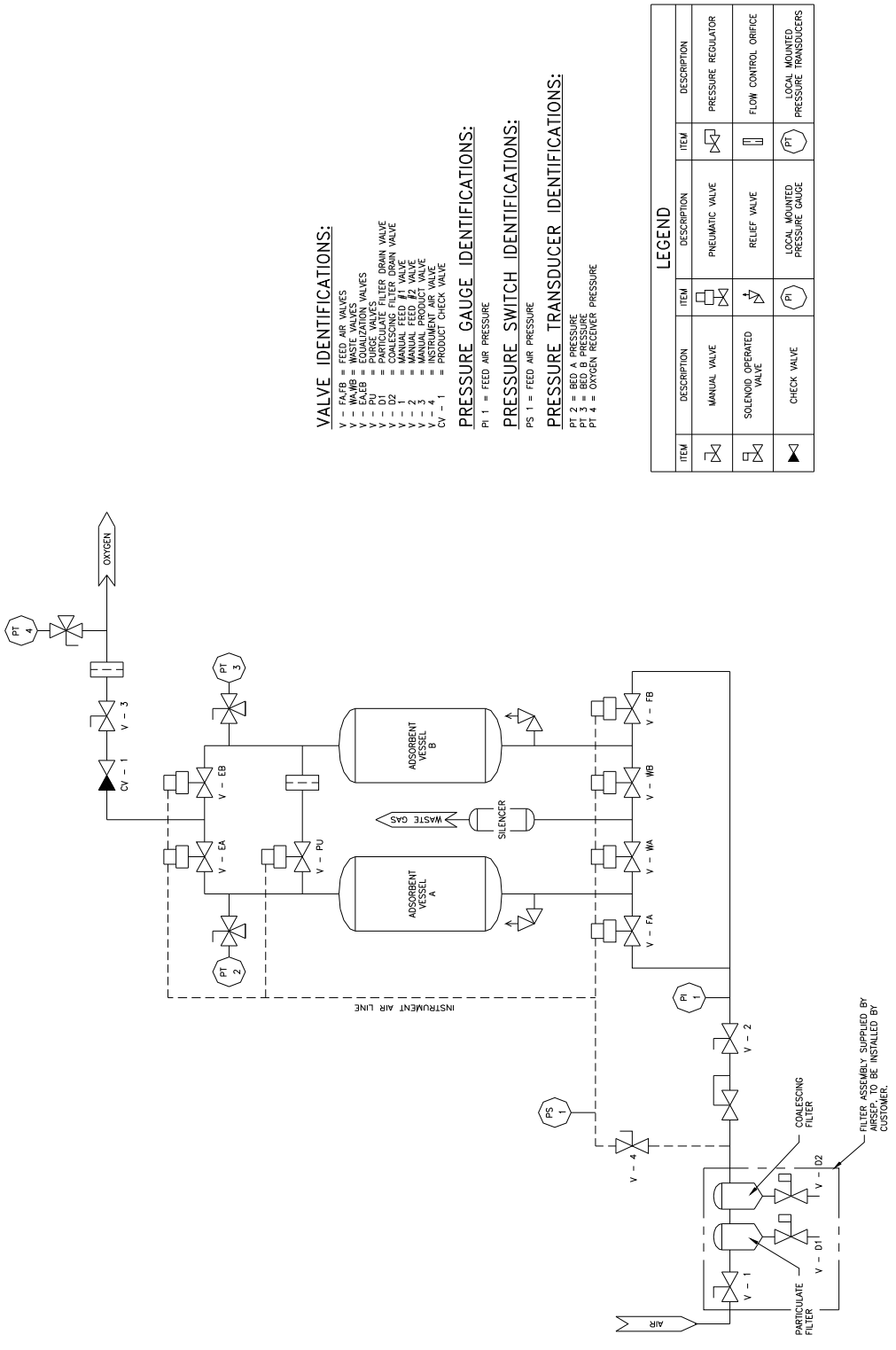


Figure A.7: P&ID Drawing – AS-Q, AS-R, AS-W and AS-Z

Electrical Schematics – AS-Q – AS-Z

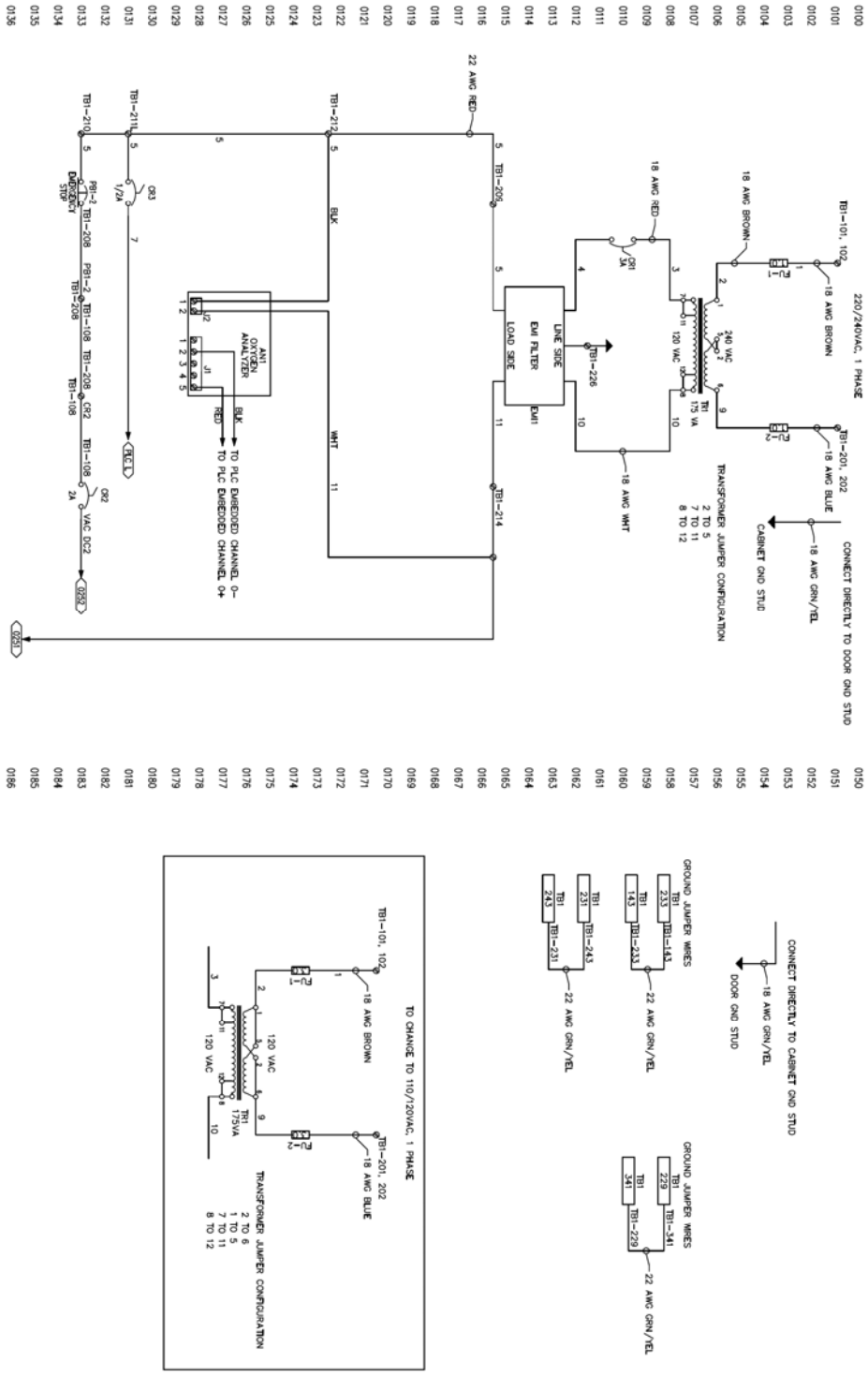


Figure A.8: Electrical Schematic – Sheet 1

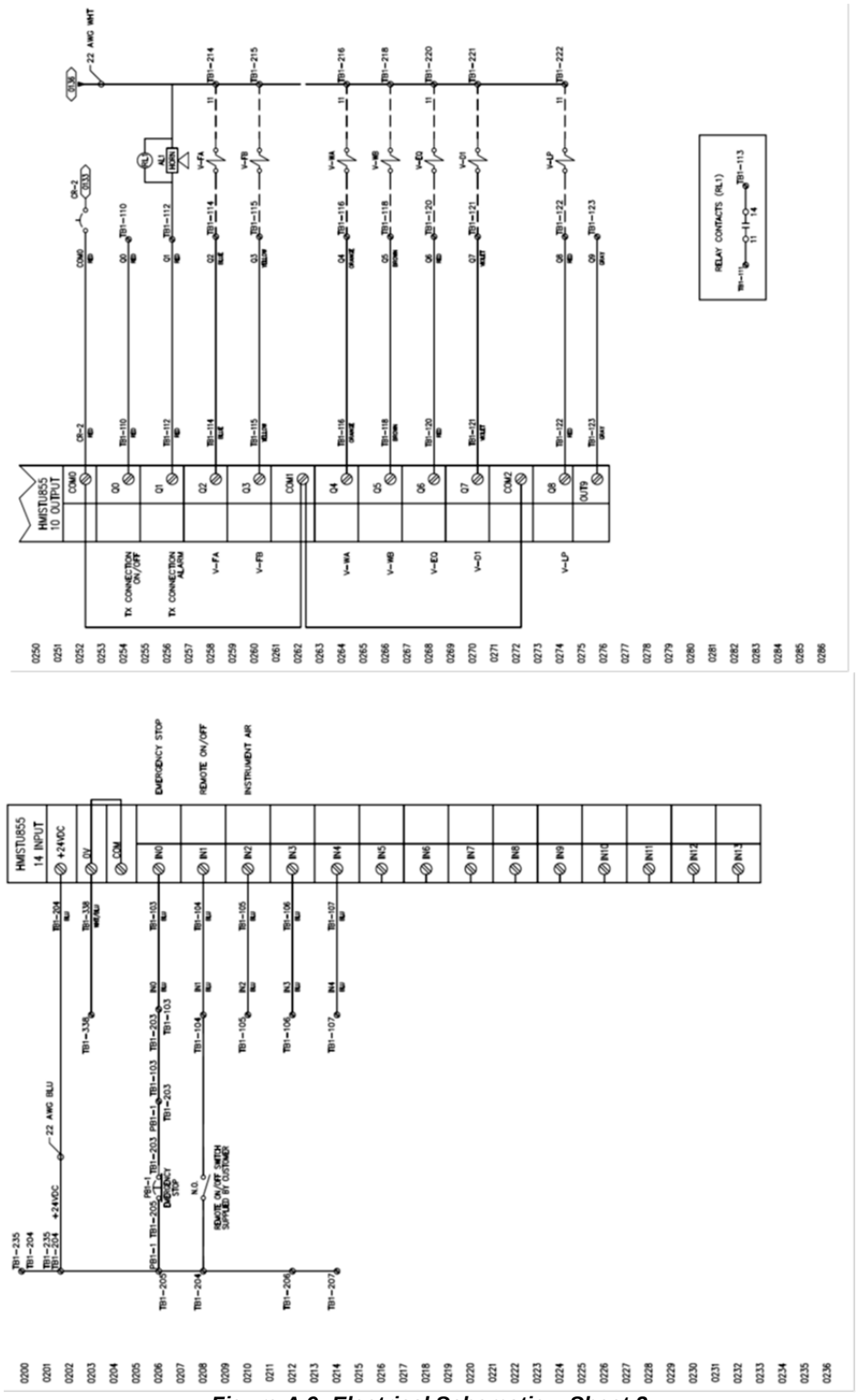


Figure A.9: Electrical Schematic – Sheet 2

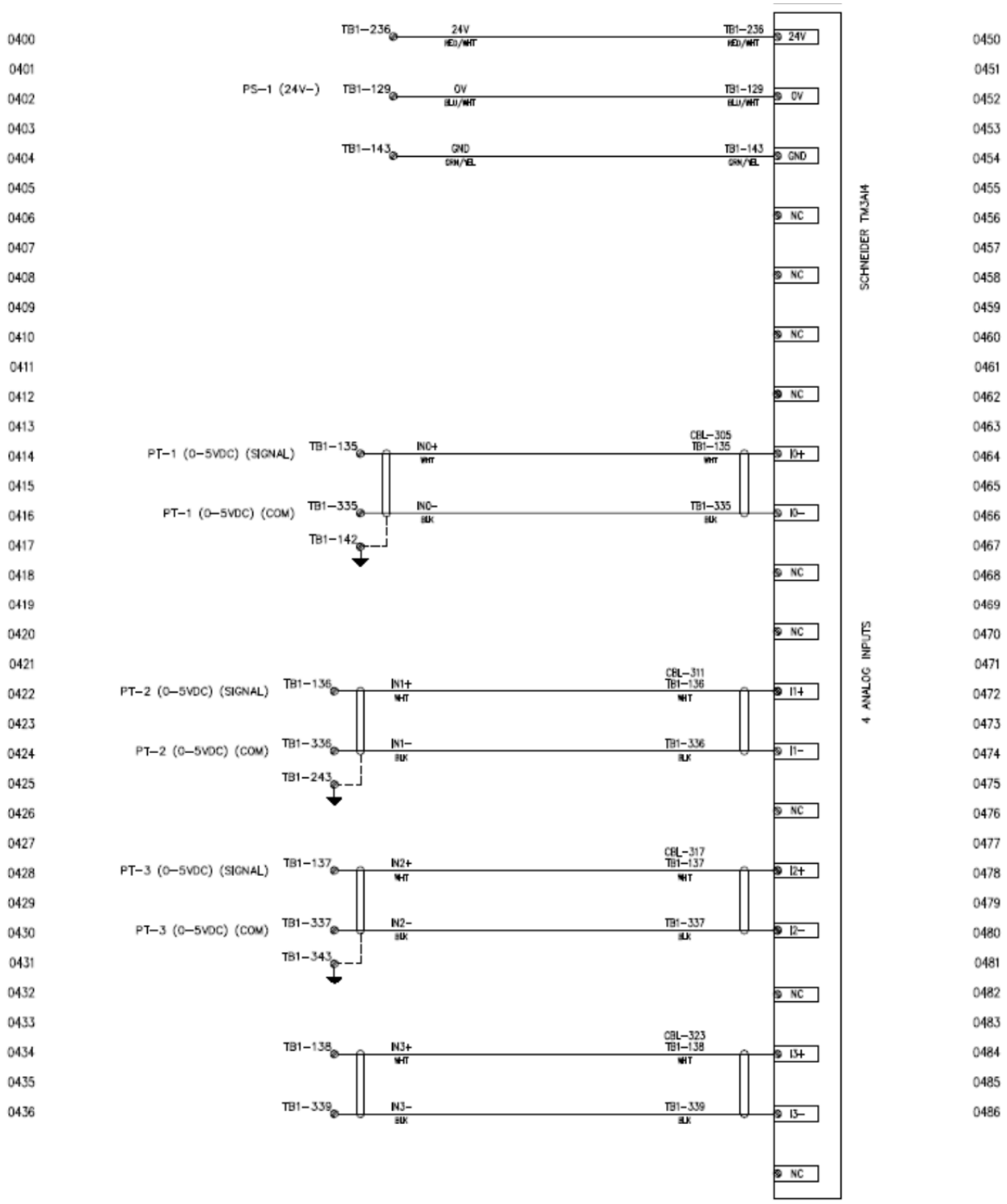


Figure A.10: Electrical Schematic – Sheet 3

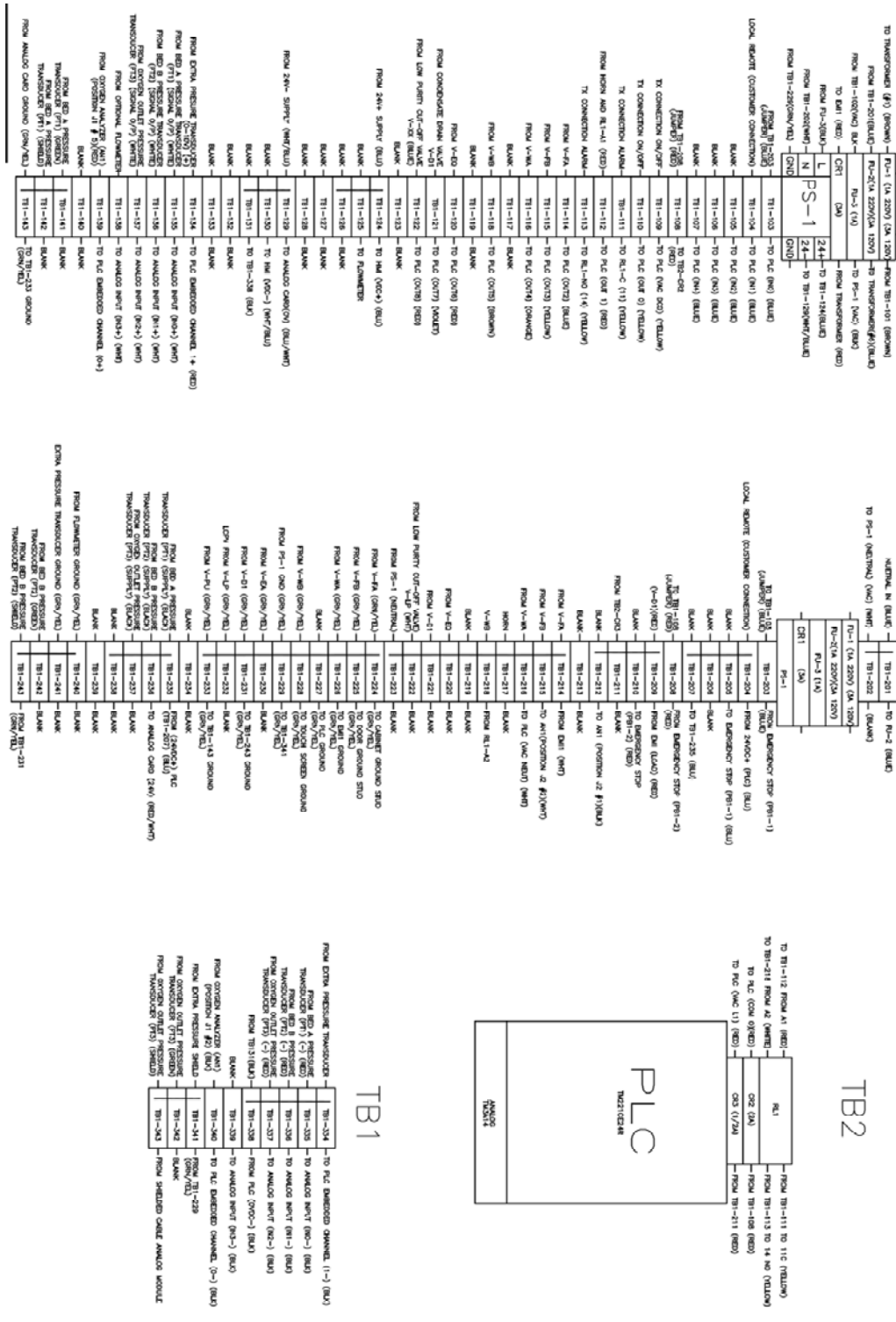


Figure A.11: Electrical Schematic – Sheet 4

B Appendix Warranty/Returns

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

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. Contact AirSep Corporation or an authorized AirSep Corporation representative before you use this unit for any medical application.

Returning the Oxygen Generator or a Component for Service

If the oxygen generator or a defective part requires service, contact your distributor. If instructed by your 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 Goods Authorization (RGA) number from the AirSep Commercial Products Service Department. (Refer to Chapter 8, Troubleshooting for information about contacting AirSep Corporation.) Before you call for service assistance, have the following information readily available:
    - Oxygen Generator Model
    - Serial Number
    - Hours of Use
    - Invoice Date

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

2) Write the RGA 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.

Return item(s) on a freight prepaid basis only.

C Appendix Parts Lists

Use the following lists to order parts for the oxygen generator. To order, please contact your distributor. If instructed by your distributor to contact AirSep Corporation, contact the AirSep Commercial Products Service Department as described in Chapter 8, Troubleshooting. If the list does not contain the part you require, please provide a precise description of the part when you call.

AS-Q Parts

Spare Parts

Item	Qty	Part #
8,000 Hour Kit/1 Year		
Prefilter Element FRP-95-115 1/4000 hrs	2	FI029-1
Microalescer Element MTP-95-549 1/8000 hrs	1	FI020-1
16,000 Hour Kit/2 Year		
Prefilter Element FRP-95-115 1/4000 hrs	4	FI029-1
Microalescer Element MTP-95-549 1/8000 hrs	2	FI020-1
⅜" Feed Valve Rebuild Kit 302272	2	VA096-1
⅜" Waste Valve Rebuild Kit 302272	2	VA096-1
⅜" Equalization Valve Rebuild Kit	1	VA432-1
⅛" Drain Valve	1	VA495-2
40,000 Hour Kit/5 Year		
Prefilter Element FRP-95-115 1/4000 hrs	10	FI029-1
Microalescer Element MTP-95-549 1/8000 hrs	5	FI020-1
⅜" Feed Valve Rebuild Kit 302272	4	VA096-1
⅜" Waste Valve Rebuild Kit 302272	4	VA096-1
⅜" Equalization Valve Rebuild Kit	4	VA432-1
⅛" Drain Valve	2	VA495-2
Emergency spares		
⅜" Feed, Waste, Equalization Valve Coil 2184103		VA112-1
Sol. Valve for EQ		VA430-1
MagnaLube		PS211-1
Fuse 1A (220/240V)		FU040-1
Fuse 3A (110/120V)		FU040-3

AS-R Parts

Spare Parts

Item	Qty	Part #
8,000 Hour Kit/1 Year		
Prefilter Element FRP-95-115 1/4000 hrs	2	FI029-1
Microalescer Element MTP-95-549 1/8000 hrs	1	FI020-1
16,000 Hour Kit/2 Year		
Prefilter Element FRP-95-115 1/4000 hrs	4	FI029-1
Microalescer Element MTP-95-549 1/8000 hrs	2	FI020-1
½" Feed Valve Rebuild Kit 302272	2	VA096-1
¾" Waste Valve Rebuild Kit 302276	2	VA101-1
½" Equalization Valve Rebuild Kit C131204	1	VA432-1
⅛" Drain Valve SC8225B003V	1	VA495-2
40,000 Hour Kit/5 Year		
Prefilter Element FRP-95-115 1/4000 hrs	10	FI029-1
Microalescer Element MTP-95-549 1/8000 hrs	5	FI020-1
½" Feed Valve Rebuild Kit 302272	4	VA096-1
¾" Waste Valve Rebuild Kit 302276	4	VA101-1
½" Equalization Valve Rebuild Kit C131204	2	VA432-1
⅛" Drain Valve SC8225B003V	2	VA495-2
Emergency spares		
Muffler Element 1"		MU055-1
½" EQ Valve & Operator		VA426-1
SOL Valve for Operator		VA430-1
⅜" Check Valve		VA027-1
Feed, Waste Valve Coil 238612032		VA389-1
MagnaLube		PS211-1
Fuse 1A (220/240V)		FU040-1
Fuse 3A (110/120V)		FU040-3

AS-W Parts

Spare Parts

Item	Qty	Part #
8,000 Hour Kit/1 Year		
Prefilter Element FRP-95-209 1/4000 hrs	2	FI030-1
Microalescer Element MTP-95-551 1/8000 hrs	1	FI016-1
16,000 Hour Kit/2 Year		
Prefilter Element FRP-95-209 1/4000 hrs	4	FI030-1
Microalescer Element MTP-95-551 1/8000 hrs	2	FI016-1
¾" Feed Valve Rebuild Kit 302276	2	VA101-1
1" Waste Valve Rebuild Kit 302283	2	VA103-1
¾"" Equalization Valve Rebuild Kit C131205	1	VA433-1
⅛" Drain Valve SC8225B003V	1	VA495-2
40,000 Hour Kit/5 Year		
Prefilter Element FRP-95-209 1/4000 hrs	10	FI030-1
Microalescer Element MTP-95-551 1/8000 hrs	5	FI016-1
¾" Feed Valve Rebuild Kit 302276	4	VA101-1
1" Waste Valve Rebuild Kit 302283	4	VA103-1
¾" Equalization Valve Rebuild Kit C131205	2	VA433-1
⅛" Drain Valve SC8225B003V	2	VA495-2
Emergency spares		
Muffler Element 1 ½"		MU056-1
¾" EQ Valve & Operator		VA427-1
SOL Valve for Operator		VA430-1
⅜" Check Valve		VA027-1
¾" Feed Valve Coil 238612032		VA389-1
1" Waste Valve Coil 272612032		VA360-1
MagnaLube		PS211-1
Fuse 1A (220/240V)		FU040-1
Fuse 3A (110/120V)		FU040-3

AS-Z Parts

Spare Parts

Item	Qty	Part #
8,000 Hour Kit/1 Year		
Prefilter Element FRP-95-209 1/4000 hrs	2	FI030-1
Microalescer Element MTP-95-551 1/8000 hrs	1	FI016-1
16,000 Hour Kit/2 Year		
Prefilter Element FRP-95-209 1/4000 hrs	4	FI030-1
Microalescer Element MTP-95-551 1/8000 hrs	2	FI016-1
1" Feed Valve Rebuild Kit 302283	2	VA103-1
1½" Waste Valve Rebuild Kit 302286N	2	VA104-1
1" Equalization Valve Rebuild Kit C131206	1	VA434-1
⅛" Drain Valve SC8225B003V	1	VA495-2
40,000 Hour Kit/5 Year		
Prefilter Element FRP-95-209 1/4000 hrs	10	FI030-1
Microalescer Element MTP-95-551 1/8000 hrs	5	FI016-1
1" Feed Valve Rebuild Kit 302283	4	VA103-1
1½" Waste Valve Rebuild Kit 302286N	4	VA104-1
1" Equalization Valve Rebuild Kit C131206	2	VA434-1
⅛" Drain Valve SC8225B003V	2	VA495-2
Emergency spares		
Muffler Element 2"		MU057-1
1" EQ VALVE & OPERATOR		VA428-1
SOL FOR OPERATOR		VA430-1
⅜" Check Valve		VA027-1
Feed, Waste Valve Coil 272612032		VA360-1
MagnaLube		PS211-1
Fuse 1A (220/240V)		FU040-1
Fuse 3A (110/120V)		FU040-3

D Appendix Component Literature

Programmable Logic Controller

- Schneider Modicon M221
  Data Sheets

Touchscreen

- Schneider Electric Magelis HMISTU855

  Data sheets

Filters

- Wilkerson
  Filter Models F35, F36, and F37
  Installation and Maintenance Sheet
- Wilkerson
  Filter Models M35, M36, and M37
  Installation and Maintenance Sheet
- Wilkerson
  Filter Model F43
  Installation and Maintenance Sheet
- Wilkerson
  Filter Models M43 & M45
  Installation and Maintenance Sheet

Pressure Transducer

- Measurement Specialties, Inc. – MSI
  MSP-300 Stainless Steel Isolated Pressure Transducer
- Measurement Specialties, Inc. – MSI
  MSP-300-150-P-4-N-X-XXX Pressure Transducer Drawing

Valves and Actuators

- Neles-Jamesbury
  IMO 308
  Model C Wafer-Sphere® Butterfly Valves
  Installation, Maintenance and Operating Instructions

- Motivair
  Automatic Condensate Removal Valve
  EDM 20-1 Electronic Timer-Solenoid
  Technical Data

- ASCO
  4-Way 2 Position Single Solenoid Valves — ¼ NPT Pressure
  Series 8551
  Installation and Maintenance Instructions

- Jamesbury
  Double-opposed Piston Actuators
  IMO-528
  Installation, Maintenance and Operating Instructions

Pressure Switch

- Allen-Bradley
  Bulletin 836
  Style C
  Instruction Sheet

Miscellaneous

- Gasket Material for Oxygen Service
  Durabla Manufacturing Company
  Durabla Black Compressed Gasket Material
  Material Safety Data Sheets

Product data sheet
Characteristics

TM221CE24R
controller M221 24 IO relay Ethernet

Main

Range of product	Modicon M221
Product or component type	Logic controller
[Us] rated supply voltage	100...240 V AC
Discrete input number	14 discrete input conforming to IEC 61131-2 Type 1 including 4 fast input
Analogue input number	2 at input range: 0...10 V
Discrete output type	Relay normally open
Discrete output number	10 relay
Discrete output voltage	5...250 V AC 5...125 V DC
Discrete output current	2 A

Complementary

Discrete I/O number	24
Number of I/O expansion module	<= 7 with <= 32 discrete output(s) for relay output <= 7 with <= 144 discrete output(s) for transistor output
Supply voltage limits	85...264 V
Network frequency	50/60 Hz
Inrush current	<= 40 A
Power consumption in VA	<= 35 VA at 100...240 V without I/O expansion module <= 58 VA at 100...240 V with max number of I/O expansion module
Discrete input logic	Sink or source (positive/negative)
Discrete input voltage	24 V
Discrete input voltage type	DC
Analogue input resolution	10 bits
LSB value	10 mV
Conversion time	1 ms per channel + 1 controller cycle time for analog input
Permitted overload on inputs	+/- 15 V DC for analog input permanent +/- 30 V DC for analog input with 5 min maximum
Voltage state1 guaranteed	>= 15 V for input
Current state 1 guaranteed	>= 2.5 mA for input
Voltage state 0 guaranteed	<= 5 V for input
Current state 0 guaranteed	<= 1 mA for input
Discrete input current	7 mA for input
Input impedance	100 kOhm for analog input 3.4 kOhm for discrete input
Response time	10 ms turn-off operation for output 10 ms turn-on operation for output 5 µs turn-off operation for fast input 5 µs turn-on operation for fast input 100 µs turn-off operation for input; I8...I15 terminal 100 µs turn-on operation for input; I8...I15 terminal 35 µs turn-off operation for input; I2...I5 terminal 35 µs turn-on operation for input; I2...I5 terminal
Configurable filtering time	12 ms for input 3 ms for input 0 ms for input
Output voltage limits	277 V AC 125 V DC

The information provided in this documentation contains general descriptions and/or technical characteristics of the performance of the products contained herein.
This documentation is not intended as a substitute for and is not to be used for determining suitability or reliability of these products for specific user applications.
It is the duty of any such user or integrator to perform the appropriate and complete risk analysis, evaluation and testing of the products with respect to the relevant specific application or use thereof.
Neither Schneider Electric Industries SAS nor any of its affiliates or subsidiaries shall be responsible or liable for misuse of the information contained herein.

Current per output common	4 A at COM 2 terminal 8 A at COM 1 terminal 8 A at COM 0 terminal
Absolute accuracy error	+/- 1 % of full scale for analog input
Electrical durability	Inductive (L/R = 7 ms) DC-13, 24 V / 7.2 W : 300000 cycles Inductive (L/R = 7 ms) DC-13, 24 V / 24 W : 100000 cycles Resistive DC-12, 24 V / 16 W : 300000 cycles Resistive DC-12, 24 V / 48 W : 100000 cycles Inductive AC-14, (cos phi = 0.7) 240 V / 72 VA : 300000 cycles Inductive AC-14, (cos phi = 0.7) 120 V / 36 VA : 300000 cycles Inductive AC-14, (cos phi = 0.7) 240 V / 240 VA : 100000 cycles Inductive AC-14, (cos phi = 0.7) 120 V / 120 VA : 100000 cycles Inductive AC-15, (cos phi = 0.35) 240 V / 36 VA : 300000 cycles Inductive AC-15, (cos phi = 0.35) 120 V / 18 VA : 300000 cycles Inductive AC-15, (cos phi = 0.35) 240 V / 120 VA : 100000 cycles Inductive AC-15, (cos phi = 0.35) 120 V / 60 VA : 100000 cycles Resistive AC-12, 240 V / 160 VA : 300000 cycles Resistive AC-12, 120 V / 80 VA : 300000 cycles Resistive AC-12, 240 V / 480 VA : 100000 cycles Resistive AC-12, 120 V / 240 VA : 100000 cycles
Switching frequency	20 switching operations/minute with maximum load
Mechanical durability	>= 20000000 cycles for relay output
Minimum load	10 mA at 5 V DC for relay output
Reset time	1 s
Memory capacity	256 kB for program with 10000 instructions
Data backed up	256 kB built-in flash memory for backup of programs
Data storage equipment	2 GB SD card optional
Battery type	BR2032 lithium non-rechargeable, battery life: 4 yr
Backup time	1 year at 25 °C by interruption of power supply
Execution time for 1 KInstruction	0.3 ms for event and periodic task
Execution time per instruction	0.2 µs Boolean
Exct time for event task	60 µs response time
Clock drift	<= 30 s/month at 25 °C
Regulation loop	Adjustable PID regulator up to 14 simultaneous loops
Control signal type	Single phase signal at 100 kHz for fast input (HSC mode) Pulse/Direction signal at 100 kHz for fast input (HSC mode) A/B signal at 50 kHz for fast input (HSC mode)
Counting input number	4 fast input (HSC mode) (counting frequency: 100 kHz), counting capacity: 32 bits
Integrated connection type	Ethernet with connector RJ45 Non isolated serial link "serial 1" with connector RJ45 and interface RS232/ RS485 USB port with connector mini B USB 2.0
Supply	Serial serial link supply at 5 V 200 mA
Transmission rate	480 Mbit/s - communication protocol: USB 1.2...115.2 kbit/s (115.2 kbit/s by default) for bus length of 3 m - communication protocol: RS232 1.2... 115.2 kbit/s (115.2 kbit/s by default) for bus length of 15 m - communication protocol: RS485
Communication port protocol	Non isolated serial link : Modbus protocol master/slave - RTU/ASCII or SoMachine-Network USB port : USB protocol - SoMachine-Network
Port Ethernet	10BASE-T/100BASE-TX 1 port with 100 m copper cable
Communication service	DHCP client Modbus TCP server Modbus TCP client Modbus TCP slave device
Local signalling	Ethernet network link yellow for Link (Link Status) Ethernet network activity green for ACT 1 LED green for SL 1 LED per channel green for I/O state 1 LED red for BAT 1 LED green for SD card access (SD) 1 LED red for module error (ERR) 1 LED green for RUN 1 LED green for PWR

Electrical connection	Mini B USB 2.0 connector for a programming terminal Connector, 4 terminal(s) for analogue inputs Terminal block, 3 terminal(s) for connecting the 24 V DC power supply Removable screw terminal block for outputs Removable screw terminal block for inputs
Cable length	<= 30 m unshielded cable for output <= 10 m shielded cable for fast input <= 30 m unshielded cable for input
Insulation	Non-insulated between analogue inputs Non-insulated between analogue input and internal logic 500 V AC between output groups 500 V AC between output and internal logic Non-insulated between inputs 500 V AC between fast input and internal logic 500 V AC between input and internal logic
Marking	CE
Sensor power supply	24 V DC at 250 mA supplied by the controller
Mounting support	Plate or panel with fixing kit Top hat type TH35-7.5 rail conforming to IEC 60715 Top hat type TH35-15 rail conforming to IEC 60715
Height	70 mm
Depth	70 mm
Width	110 mm
Product weight	0.395 kg

Environment

Standards	EN/IEC 61131-2 EN/IEC 61010-2-201
Product certifications	CSA CULus IACS E10 RCM
Resistance to electrostatic discharge	4 kV on contact conforming to EN/IEC 61000-4-2 8 kV in air conforming to EN/IEC 61000-4-2
Resistance to electromagnetic fields	1 V/m (2 GHz...3 GHz) conforming to EN/IEC 61000-4-3 3 V/m (1.4 GHz...2 GHz) conforming to EN/IEC 61000-4-3 10 V/m (80 MHz...1 GHz) conforming to EN/IEC 61000-4-3
Resistance to magnetic fields	30 A/m at 50...60 Hz conforming to EN/IEC 61000-4-8
Resistance to fast transients	1 kV for serial link conforming to EN/IEC 61000-4-4 1 kV for Ethernet line conforming to EN/IEC 61000-4-4 1 kV for I/O conforming to EN/IEC 61000-4-4 2 kV for relay output conforming to EN/IEC 61000-4-4 2 kV for power lines conforming to EN/IEC 61000-4-4
Surge withstand	1 kV for relay output in differential mode conforming to EN/IEC 61000-4-5 1 kV for power lines (AC) in differential mode conforming to EN/IEC 61000-4-5 0.5 kV for power lines (DC) in differential mode conforming to EN/IEC 61000-4-5 1 kV for shielded cable in common mode conforming to EN/IEC 61000-4-5 1 kV for I/O in common mode conforming to EN/IEC 61000-4-5 2 kV for relay output in common mode conforming to EN/IEC 61000-4-5 2 kV for power lines (AC) in common mode conforming to EN/IEC 61000-4-5 1 kV for power lines (DC) in common mode conforming to EN/IEC 61000-4-5
Resistance to conducted disturbances, induced by radio frequency fields	10 Vrms (spot frequency (2, 3, 4, 6.2, 8.2, 12.6, 16.5, 18.8, 22, 25 MHz)) conforming to Marine specification (LR, ABS, DNV, GL) 3 Vrms (0.1...80 MHz) conforming to Marine specification (LR, ABS, DNV, GL) 10 Vrms (0.15...80 MHz) conforming to EN/IEC 61000-4-6
Electromagnetic emission	Radiated emissions conforming to EN/IEC 55011 class A 10 m, 230 MHz...1 GHz : 47 dBµV/m QP Radiated emissions conforming to EN/IEC 55011 class A 10 m, 30...230 MHz : 40 dBµV/m QP Conducted emissions conforming to EN/IEC 55011 power lines, 1.5...30 MHz : 63 dBµV/m QP Conducted emissions conforming to EN/IEC 55011 power lines, 150 kHz...1.5 MHz : 79...63 dBµV/m QP Conducted emissions conforming to EN/IEC 55011 power lines, 10...150 kHz : 120...69 dBµV/m QP Conducted emissions conforming to EN/IEC 55011 power lines (AC), 0.5...300 MHz : 73 dBµV/m QP/60 dBµV/m AV Conducted emissions conforming to EN/IEC 55011 power lines (AC), 0.15...0.5 MHz : 79 dBµV/m QP/66 dBµV/m AV
Immunity to microbreaks	10 ms

Product data sheet
Characteristics

HMISTU855
touch panel screen 5"7 Color

Main

Range of product	Magelis STO & STU
Product or component type	Touch panel screen
Software designation	Vijeo Designer
Operating system	Magelis
Processor name	CPU ARM9

Complementary

Display size	5.7 inch
Display type	QVGA TFT colour touchscreen
Display colour	65536 colours
Pixel resolution	320 x 240 pixels
Touch panel	Analogue
Backlight lifespan	50000 hours
Brightness	16 levels
Character font	ASCII Chinese (simplified Chinese) Japanese (ANK, Kanji) Korean Taiwanese (traditional Chinese)
[Us] rated supply voltage	24 V DC
Supply	External source
Supply voltage limits	20.4...28.8 V
Inrush current	<= 30 A
Power consumption	6.8 W
Number of pages	Limited by internal memory capacity
Processor frequency	333 MHz
Memory description	Back up of data, 64 kB Application memory, 16 MB
Integrated connection type	Power supply removable screw terminal block COM1 serial link female RJ45, transmission rate <= 115.2 kbits/s (RS232C/ RS485) 1 USB (V2.0) port USB type A 1 USB (V2.0) port mini B USB
Realtime clock	Access to the PLC real-time clock
Downloadable protocols	Modbus Modbus TCP/IP Third party protocols Uni-TE
Fixing mode	Ø 22 mm hole
Enclosure material	PC/PBT and PAA
Marking	CE
Height	129.15 mm
Width	163 mm
Depth	56.5 mm

The information provided in this documentation contains general descriptions and/or technical characteristics of the performance of the products contained herein.
This documentation is not intended as a substitute for and is not to be used for determining suitability or reliability of these products for specific user applications.
It is the duty of any such user or integrator to perform the appropriate and complete risk analysis, evaluation and testing of the products with respect to the relevant specific application or use thereof.
Neither Schneider Electric Industries SAS nor any of its affiliates or subsidiaries shall be responsible or liable for misuse of the information contained herein.

Environment

Immunity to microbreaks	<= 7 ms
Standards	EN 61131-2 FCC Class A IEC 61000-6-2 UL 1604 UL 508
Product certifications	C-Tick CULus UL class 1 Div2 T4A ou T5 Marine
Ambient air temperature for operation	0...50 °C
Ambient air temperature for storage	-20...60 °C
Relative humidity	0...85 % without condensation
Operating altitude	<= 2000 m
IP degree of protection	IP65 (front panel) conforming to IEC 60529 IP20 (rear panel) conforming to IEC 60529
NEMA degree of protection	NEMA 4X front panel (indoor use)
Shock resistance	15 gn for 11 ms conforming to IEC 60068-2-27
Vibration resistance	1 gn (f = 9...150 Hz) conforming to IEC 60068-2-6 +/- 3,5 mm (f = 5...9 Hz) conforming to IEC 60068-2-6
Resistance to electromagnetic fields	10 V/m conforming to IEC 61000-4-3

WILKERSON®
OPERATIONS

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INSTALLATION AND MAINTENANCE SHEET

Filter Models F35, F36 and F37 with Variations and Accessories

⚠ WARNING ⚠

EXCEPT as otherwise specified by the manufacturer, this product is specifically designed for compressed air service, and use with any other fluid (liquid or gas) is a misapplication. For example, use with or injection of certain hazardous liquids or gases in the system (such as alcohol or liquid petroleum gas) could be harmful to the unit or result in a combustible condition or hazardous external leakage. Manufacturer's warranties are void in the event of misapplication, and manufacturer assumes no responsibility for any resulting loss. Before using with fluids other than compressed air, or for nonindustrial applications, or for life support systems consult manufacturer for written approval.

ATTENTION: Make sure bowl is fully inserted into body, and then fully turned to lock bowl in place before applying air pressure to unit. When bowl is properly installed, the alignment markings on the bowl/bowlguard assembly and the marks on the body will line up, indicating proper assembly. Failure to do so may cause air pressure to blow bowl off of unit, resulting in serious personal injury or death.

INSTALLATION

1. Purge downstream air line of oil.
2. Install the unit with the air flowing in the direction indicated by the arrow on the body and/or the DP2 Differential Pressure Indicator.
3. The drain line connection is dependent on the type of drain that is selected.
4. Maximum inlet pressure and operating temperature ratings are: units with DP2 150 psig (10,3 bar) 150°F (66°C); units without DP2: 300 psig (20 bar) 150°F (66°C).

NOTE: CONTAMINATES REMOVED FROM THE COMPRESSED AIR SYSTEM MUST BE DISPOSED OF IN ACCORDANCE WITH LOCAL, STATE AND FEDERAL STANDARDS.

MAINTENANCE

1. TO CLEAN OR REPLACE FILTER ELEMENT: Shut off air supply and reduce pressure in the unit to zero, remove the 8 screws from the filter housing, unscrew the filter support and remove filter element.

a. IF THE UNIT HAS A RIGID FILTER ELEMENT: remove and clean periodically by tapping on a hard surface, and blowing off with air gun. Torque element support to 8 ± 1 ft. lb. when replacing element. Element should be cleaned/replaced when the DP2 differential pressure indicator is completely red.

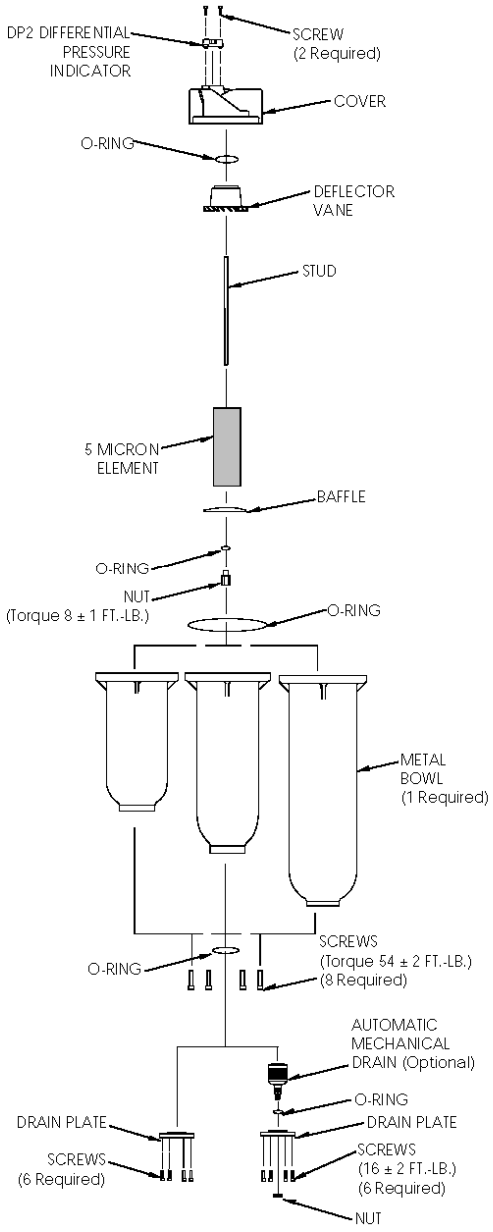
2. IF THE UNIT HAS A MANUAL DRAIN, DRAIN THE UNIT ONCE EVERY 8 HOURS MINIMUM. To do so, rotate the drain knob to the left one or two turns.* If the unit is equipped with an automatic drain, clean the screen around the drain. Clean screen by blowing off with air gun.
3. When the bowl becomes dirty, clean with a dry clean cloth.
4. **Before placing the unit in service, make sure that the bowl is properly reinstalled, and securely bolted in place.**

***NOTE: In the event the drain knob is over-rotated, it may become disengaged from the drain stem. In such a case, pull down on both the knob and the stem while rotating to the right to re-engage.**

REPAIR KITS AND REPLACEMENT PARTS

Filter Element Kit (F35)
(includes filter element and o-rings) **FRP-95-505**
Filter Element Kit Type (F36)
(includes filter element and o-rings) **FRP-95-506**
Filter Element Kit Type (F37)
(includes filter element, o-ring) **FRP-95-507**
Drain Plate Kits
Drain Plate (For use with internal Automatic Mechanical float drain No. GRP-95-981 or GRP-96-300) **GRP-95-391**
Drain Plate (¼ NPT) **GRP-95-392**
Drain Plate Rc ¼ **GRP-95-394**
Drain Plate (⅛ NPT) **GRP-95-393**
Drain Plate Rc ½ **GRP-95-395**
Differential Pressure Indicator (Standard) **DP2-01-001**
Differential Pressure Removal Cap Kit **GRP-95-022**
Bowl O-ring Kit **GRP-95-291**
Drains:
Internal Drains:
Automatic Mechanical Drain (Fluorocarbon seals w/⅛ NPT stem) **GRP-95-981**
Automatic Mechanical Drain (Fluorocarbon seals w/R ⅛ stem) **GRP-96-300**
Manual Override for Auto Drain (GRP-95-981 ⅛ NPT) **GRP-96-000**
(GRP-96-300 R ⅛) **GRP-96-100**
External Drains:
External Automatic Mechanical Drain **X01-04-000**
External Automatic Mechanical Drain **X02-04-F00**
External Automatic Mechanical Drain **XB3-04-000**

(See reverse side for Repair and Replacement Parts cont.)



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REPAIR KITS AND REPLACEMENT PARTS Cont.

Automatic Electric Drain Valve

MODEL NUMBER KIT	PORT SIZE	ORIFICE SIZE	ELECTRICAL	OPERATING PRESS MIN.	MAX.
X20-02-ED00	1/4" NPT	7/64"	115 VAC/1Ph/50-60Hz	2 psig	300 psig
X20-02-EE00	1/4" NPT	7/64"	230 VAC/1PH/50-60Hz	2 psig	300 psig
X20-02-EC00	1/4" NPT	7/64"	24 VDC	5 psig	300 psig
X20-04-ED00	1/2" NPT	7/64"	115 VAC/1Ph/50-60Hz	2 psig	300 psig
X20-04-EE00	1/2" NPT	7/64"	230 VAC/1PH/50-60Hz	2 psig	300 psig
X20-04-EC00	1/2" NPT	7/64"	24 VDC	5 psig	300 psig

WILKERSON.
OPERATIONS

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INSTALLATION AND MAINTENANCE SHEET

Filter Models M35, M36 and M37 with Variations and Accessories

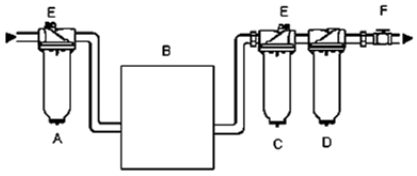
WARNING

EXCEPT as otherwise specified by manufacturer, this product is specifically designed for compressed air service only, and use with any other fluids (liquid or gas) is a misapplication. For example, use with or injection of certain hazardous liquids or gases in the system (such as alcohol or liquid petroleum gas) could be harmful to the unit or result in a combustible condition or hazardous external leakage. Manufacturer's warranties are void in the event of misapplication, and manufacturer assumes no responsibility for any resulting loss. Before using with fluids other than air, or for non-industrial applications, consult manufacturer for written approval.

INSTALLATION

1. Purge downstream air line of oil.
2. Install the unit with the air flowing in the direction indicated by the arrow on the body and/or the DP2 Differential Pressure Indicator.
3. The drain line connection is dependent on the type of drain that is selected.
4. Maximum inlet pressure and operating temperature ratings: units with DP2, 150 psig (10,3 bar) and 150°F (66°C);units without DP2: 300 psig (20,7 bar) 150°F (66°C).

TYPICAL INSTALLATION (not to scale)

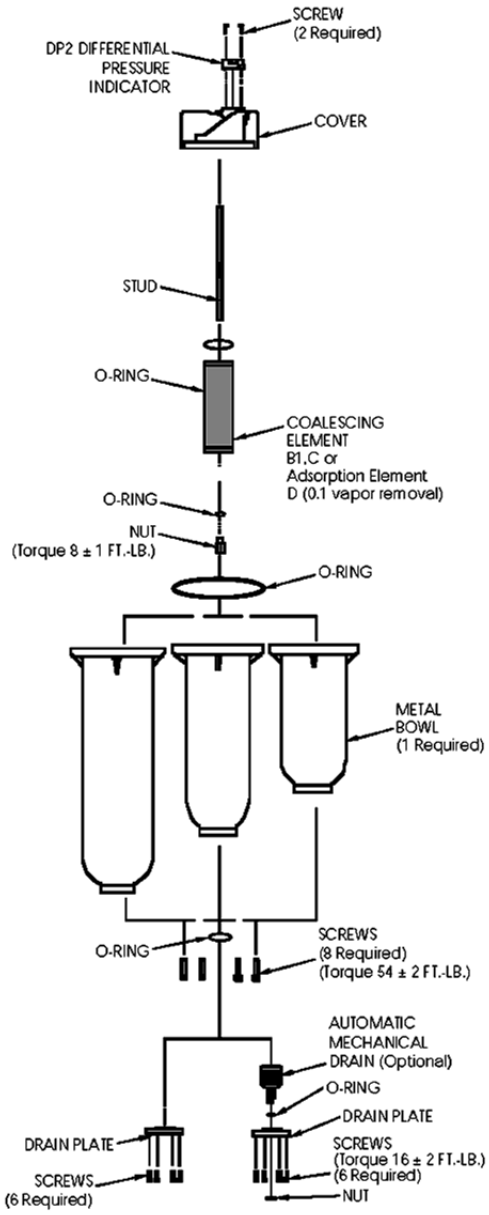


A. PREFILTER - It is recommended that a Wilkerson "B1" Element coalescing prefilter (particle removal down to 1.0 micron; maximum downstream remaining oil content is 0.5 ppm/wt.) is installed to protect the dryer from contaminants and extend the element life in the high efficiency coalescing filter (filter "C").
B. AIR DRYER - (Refrigerated or Desiccant). An air dryer is recommended if water vapor condensation is a problem.
C. HIGH EFFICIENCY COALESCER FILTER - It is recommended that a Wilkerson "C" element coalescer (particle removal down to 0.01 micron; maximum downstream remaining oil content 0.01 ppm/wt) be installed to protect the compressed air system from oil and particulate contamination.
D. OIL VAPOR FILTER - The Type D element filter (maximum downstream remaining oil content 0.003 ppm/wt) is an adsorption type for removing oil vapors, oil-associated odors, whether petroleum base or synthetic base and nearly 100% of any remaining solid contaminants.
E. DIFFERENTIAL PRESSURE INDICATOR/GAUGE - Maximum recommended pressure drop across coalescer filters is 7 psi (0,5 bar). This can be monitored by installing a Wilkerson DP2 differential pressure indicator.
F. VALVE - Do not use a valve or shutoff device in conjunction with a coalescer filter that will allow a momentary or surge pressure drop greater than 50 psid (3,4 bar). To avoid high surges which can either ruin the element or momentarily allow downstream contamination, use a slow-opening type valve.

MAINTENANCE

1. The element operates effectively when it is saturated. The element's useful life will end only when the DP2 differential pressure indicator is completely red. The element cannot be cleaned or reused and must be replaced at the end of its useful life.
2. IF THE UNIT HAS A MANUAL DRAIN, DRAIN THE UNIT ONCE EVERY 8 HOURS MINIMUM. If the unit is equipped with an automatic drain clean the screen around the drain. Clean screen by blowing off with air gun.
3. When bowl becomes dirty, clean with a dry clean cloth.
4. Before placing the unit in service, make sure that the bowl is properly reinstalled, and securely bolted in place per noted torque specification.

(See reverse side for Repair and Replacement Kits)



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REPAIR KITS AND REPLACEMENT PARTS

Filter Element Kit (kit includes filter element, element o-ring and retainer o-ring)

	Element Types		
Model	Type B1 (1 micron)	Type C (0.01 micron)	Type D (oil vapor, adsorption)
M35	**MSP-95-502**	**MTP-95-502**	**MXP-95-502**
M36	**MSP-95-503**	**MTP-95-503**	**MXP-95-503**
M37	**MSP-95-504**	**MTP-95-504**	**MXP-95-504**

Drain Plate Kit
- Drain Plate (Use with internal automatic mechanical float drain no. GRP-95-981 or GRP-96-300)...**GRP-95-391**
- Drain Plate (¼ NPT)...**GRP-95-392**
- Drain Plate (Rc ¼)...**GRP-95-394**
- Drain Plate (⅜ NPT)...**GRP-95-393**
- Drain Plate (Rc ½)...**GRP-95-395**

Bowl O-ring Kit...**GRP-95-291**
Differential Pressure Indicator (Standard)...**DP2-01-001**
DP2 Removal Cap Kit (for 300 psig appl.)...**GRP-95-022**
Internal Drains:
- Automatic Mechanical Drain (Fluorocarbon seals w/⅛ NPT stem)...**GRP-95-981**
- Automatic Mechanical Drain (Fluorocarbon seals w/R ⅛ stem)...**GRP-96-300**
- Manual Override for Auto Drain (GRP-95-981 ⅛ NPT)...**GRP-96-000**
  (GRP-96-300 R ⅛)...**GRP-96-100**

External Drains
- External Automatic Mechanical Drain ...**X01-04-000**
- External Automatic Mechanical Drain...**X02-04-F00**
- External Automatic Mechanical Drain...**XB3-04-000**

Automatic Electric Drain Valve

MODEL NUMBER KIT	PORT SIZE	ORIFICE SIZE	ELECTRICAL	OPERATING PRESS MIN.	OPERATING PRESS MAX.
X20-02-EE00	¼" NPT	7/64"	115 VAC/1Ph/50-60Hz	2 psig	300 psig
X20-02-ED00	¼" NPT	7/64"	230 VAC/1PH/50-60Hz	2 psig	300 psig
X20-02-EC00	¼" NPT	7/64"	24 VDC	5 psig	300 psig
X20-04-EE00	½" NPT	7/64"	115 VAC/1Ph/50-60Hz	2 psig	300 psig
X20-04-ED00	½" NPT	7/64"	230 VAC/1PH/50-60Hz	2 psig	300 psig
X20-04-EC00	½" NPT	7/64"	24 VDC	5 psig	300 psig

WILKERSON
OPERATIONS

INSTALLATION AND MAINTENANCE SHEET

Filter Models F43 with Variations and Accessories

WARNING

EXCEPT as otherwise specified by manufacturer, this product is specifically designed for compressed air service only, and use with any other fluids (liquid or gas) is a misapplication. For example, use with or injection of certain hazardous liquids or gases in the system (such as alcohol or liquid petroleum gas) could be harmful to the unit or result in a combustible condition or hazardous external leakage. Manufacturer's warranties are void in the event of misapplication, and manufacturer assumes no responsibility for any resulting loss. Before using with fluids other than air, or for non-industrial applications, consult manufacturer for written approval.

INSTALLATION

1. Purge downstream air line of oil.
2. Install the unit with the air flowing in the direction indicated by the arrow on the body and/or the DP2 indicator.
3. The drain line connection is dependent on the type of drain that is selected. The internal auto float drain has a ⅛" NPT or (BSP) male connection. The external drains require the ½" NPT or (BSP) drain plate and a ½" NPT or (BSP) pipe nipple to connect the drain to the filter. The X01, X02 and XB3 series of drains have a ⅛" NPT (BSP) female port to connect a drain line to pipe away contaminants.
4. Maximum inlet pressure and operating temperature ratings are: units with DP2 150 psig (10,3 bar) 150°F (66°C); units without DP2: 300 psig (20 bar) 150°F (66°C).

MAINTENANCE

1. TO CLEAN OR REPLACE FILTER ELEMENT: Shut off air supply and reduce pressure in the unit to zero, remove the 8 screws from the filter housing, unscrew the filter support and remove filter element.

a. IF THE UNIT HAS A RIGID FILTER ELEMENT: remove and clean periodically by tapping on a hard surface, and blowing off with air blow gun. Torque element support to 8 ± 1 FT.-LB. when replacing element. Element should be cleaned/replaced when the DP2 pressure indicator is completely red or when the DP3 reads 7 psi (0,5 bar).

2. IF THE UNIT HAS A MANUAL DRAIN, DRAIN THE UNIT ONCE EVERY 8 HOURS MINIMUM. If the unit is equipped with an external automatic drain clean the screen on top of the drain. Clean screen by blowing it off with an air blow gun.
3. When the bowl becomes dirty, clean by wiping with dry, clean cloth.
4. Before placing the unit in service, make sure that the bowl is properly reinstalled, and securely bolted in place using the noted torque specifications.

REPAIR KITS AND REPLACEMENT PARTS

Filter Element Kit (F43) (includes filter element, o-ring/gasket)	**FRP-95-508**
Drain Plate Kits	
Drain Plate 9/16 diameter (use with internal automatic (mechanical float drain no. GRP-95-981 or GRP-96-300	**GRP-95-391**
Drain Plate (¼ NPT)	**GRP-95-392**
Drain Plate (¼ BSP)	**GRP-95-394**
Drain Plate (½ NPT)	**GRP-95-393**
Drain Plate (½ BSP)	**GRP-95-395**
Bowl O-ring Kit	**GRP-95-290**
Differential Pressure Indicator (Standard)	**DP2-01-001**
Differential Pressure Removal Cap Kit	**GRP-95-022**
Internal Drains:	
Automatic Mechanical Drain (Fluorocarbon seals w/NPT stem)	**GRP-95-981**
Automatic Mechanical Drain (Fluorocarbon seals w/BSP stem)	**GRP-96-300**
Manual Override for Auto Drain (GRP-95-981)	**GRP-96-000**
(GRP-96-300)	**GRP-96-100**
External Drain	
External Automatic Mechanical Drain	**X01-04-000**
External Automatic Mechanical Drain	**X02-04-F00**
External Automatic Mechanical Drain	**XB3-04-000**

(See reverse side for Repair and Replacement cont.)

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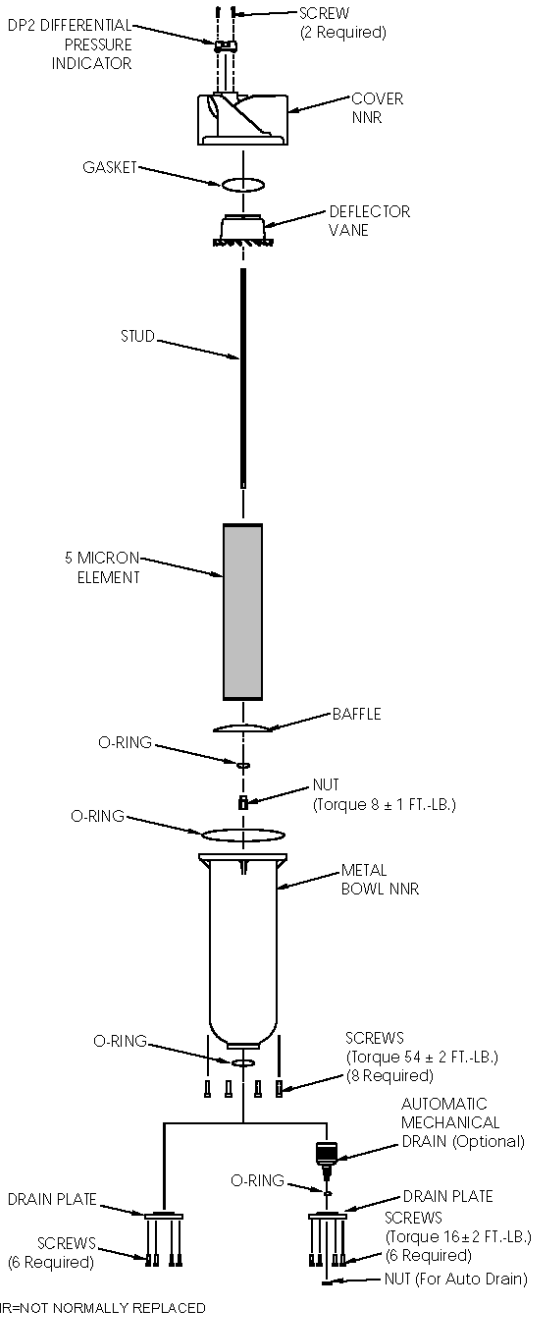

NNR=NOT NORMALLY REPLACED

REPAIR KITS AND REPLACEMENT PARTS Cont.

Automatic Electric Drain Valve

MODEL NUMBER KIT	PORT SIZE	ORIFICE SIZE	ELECTRICAL	OPERATING PRESS MIN.	MAX.
X20-02-EE00	1/4" NPT	7/16"	115 VAC/1Ph/50-60Hz	2 psig	300 psig
X20-02-ED00	1/4" NPT	7/16"	230 VAC/1PH/50-60Hz	2 psig	300 psig
X20-02-EC00	1/4" NPT	7/16"	24 VDC	5 psig	300 psig
X20-04-EE00	1/2" NPT	7/16"	115 VAC/1Ph/50-60Hz	2 psig	300 psig
X20-04-ED00	1/2" NPT	7/16"	230 VAC/1PH/50-60Hz	2 psig	300 psig
X20-04-EC00	1/2" NPT	7/16"	24 VDC	5 psig	300 psig

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WILKERSON®

INSTALLATION AND MAINTENANCE SHEET

Filter Models M43 and M45 with Variations and Accessories

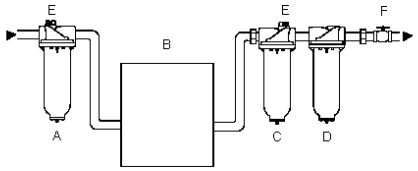
WARNING

EXCEPT as otherwise specified by manufacturer, this product is specifically designed for compressed air service only, and use with any other fluids (liquid or gas) is a misapplication. For example, use with or injection of certain hazardous liquids or gases in the system (such as alcohol or liquid petroleum gas) could be harmful to the unit or result in a combustible condition or hazardous external leakage. Manufacturer's warranties are void in the event of misapplication, and manufacturer assumes no responsibility for any resulting loss. Before using with fluids other than air, or for non-industrial applications, consult manufacturer for written approval.

INSTALLATION

1. Purge downstream air line of oil.
2. Install the unit with the air flowing in the direction indicated by the arrow on the body and/or the Differential Pressure Indicator.
3. The drain line connection is dependent on the type of drain that is selected.
4. Maximum inlet pressure and operating temperature ratings are: units with Differential Pressure Indicator, 150 psig (10,3 bar) and 150°F (66°C); units without DP2 Differential Pressure Indicator: 300 psig (20.7 bar) 150°F (66°C).

TYPICAL INSTALLATION (not to scale)



A. PREFILTER - It is recommended that a "B1" Element coalescing prefilter (particle removal down to 1.0 micron; maximum downstream remaining oil content is 0.5 ppm/wt.) is installed to protect the dryer from contaminants and extend the element life in the high efficiency coalescing filter (filter "C").

B. AIR DRYER - (Refrigerated or Desiccant). An air dryer is recommended if water vapor condensation is a problem.

C. HIGH EFFICIENCY COALESCER FILTER - It is recommended that a Wilkerson "C" element coalescer (particle removal down to 0.01 micron; maximum downstream remaining oil content 0.01 ppm/wt) be installed to protect the compressed air system from oil and particulate contamination.

D. OIL VAPOR FILTER - The Type D element filter (maximum downstream remaining oil content 0.003 ppm/wt) is an adsorption type for removing oil vapors, oil-associated odors, whether petroleum base or synthetic base and nearly 100% of any remaining solid contaminants.

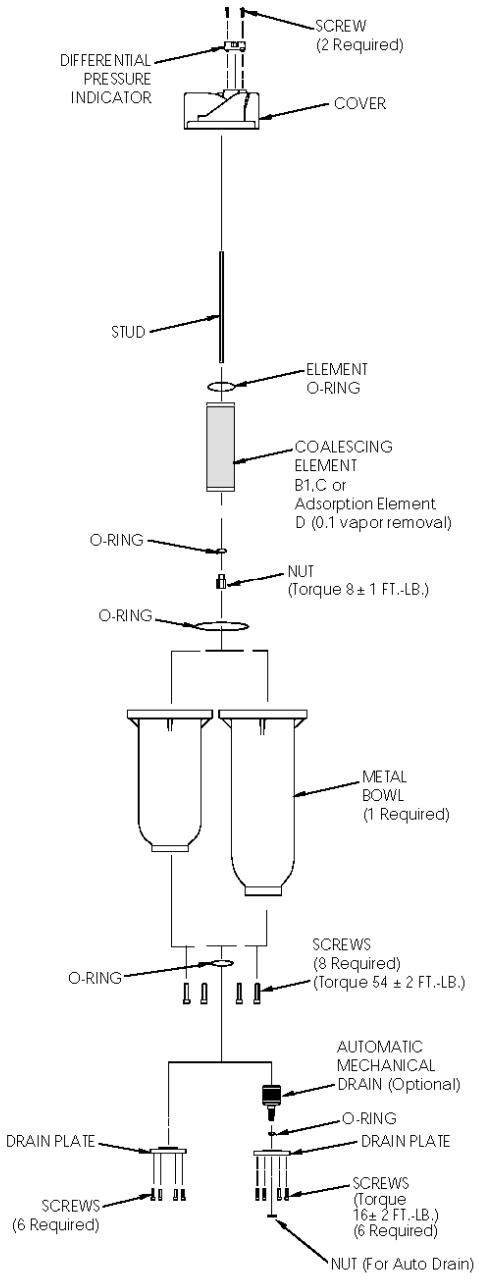
E. DIFFERENTIAL PRESSURE INDICATOR/GAUGE - Maximum recommended pressure drop across coalescer filters is 7 psi (0,5 bar). This can be monitored by installing a Wilkerson DP2 differential pressure indicator.

F. VALVE - Do not use a valve or shutoff device in conjunction with a coalescer filter that will allow a momentary or surge pressure drop greater than 50 psid (3,4 bar). To avoid high surges which can either ruin the element or momentarily allow downstream contamination, use a slow-opening type valve.

MAINTENANCE

1. The element operates effectively when it is saturated. The element's useful life will end only when the Differential Pressure Indicator is completely red. The element cannot be cleaned or reused and must be replaced at the end of its useful life.
2. IF THE UNIT HAS A MANUAL DRAIN, DRAIN THE UNIT ONCE EVERY 8 HOURS MINIMUM. If the unit is equipped with an automatic drain clean the screen around the drain. Clean screen by blowing off with air gun.
3. When bowl becomes dirty, replace the bowl or clean by wiping with a clean, dry cloth.
4. Before placing the unit in service, make sure that the bowl is securely bolted in place per noted torque specification.

(See reverse side for Repair and Replacement Kits)



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REPAIR KITS AND REPLACEMENT PARTS

Filter Element Kit (kit includes filter element, element o-ring, and retainer o-ring)

	Element Types		
	Type B1 (1 micron)	Type C (0.01 micron)	Type D (oil vapor, adsorption)
M43	**MSP-95-876**	**MTP-95-562**	**MXP-95-565**
M45	**MSP-95-500**	**MTP-95-500**	**MXP-95-500**

Drain Plate Kit
- Drain Plate 9/16 diameter (Use with internal automatic mechanical float drain no. GRP-95-981 or GRP-96-300)... **GRP-95-391**
- Drain Plate (1/4 NPT)... **GRP-95-392**
- Drain Plate (Rc1/4)... **GRP-95-394**
- Drain Plate (1/2 NPT)... **GRP-95-393**
- Drain Plate (Rc1/2)... **GRP-95-395**

Bowl O-ring Kit... **GRP-95-290**
Differential Pressure Indicator (Standard)... **DP2-01-001**
Differential Pressure Indicator Removal Cap Kit (for 300 psig appl.)... **GRP-95-022**
Internal Drains:
- Automatic Mechanical Drain (Fluorocarbon 1/8 NPT seals w/ stem)... **GRP-95-981**
- Automatic Mechanical Drain (Fluorocarbon R1/8 seals w/ stem)... **GRP-96-300**
- Manual Override for Auto Drain (GRP-95-981)... **GRP-96-000**
  (GRP-96-300)... **GRP-96-100**

External Drains
- External Automatic Mechanical Drain... **X01-04-000**
- External Automatic Mechanical Drain... **X02-04-F00**
- External Automatic Mechanical Drain... **XB3-04-000**

MODEL NUMBER KIT	PORT SIZE	ORIFICE SIZE	ELECTRICAL	OPERATING PRESS MIN.	OPERATING PRESS MAX.
X20-02-EE00	1/4" NPT	7/16"	115 VAC/1Ph/50-60Hz	2 psig	300 psig
X20-02-ED00	1/4" NPT	7/16"	230 VAC/1PH/50-60Hz	2 psig	300 psig
X20-02-EC00	1/4" NPT	7/16"	24 VDC	5 psig	300 psig
X20-04-EE00	1/2" NPT	7/16"	115 VAC/1Ph/50-60Hz	2 psig	300 psig
X20-04-ED00	1/2" NPT	7/16"	230 VAC/1PH/50-60Hz	2 psig	300 psig
X20-04-EC00	1/2" NPT	7/16"	24 VDC	5 psig	300 psig

PROVISIONAL

REVISIONS					
ECN	REV	DESCRIPTION	DATE	DRWN BY	CHKD BY
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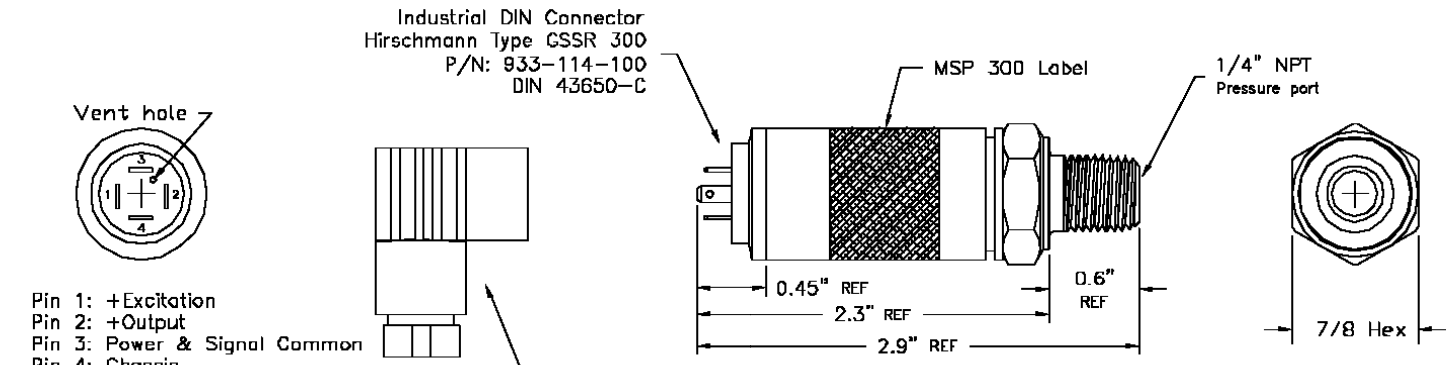

TRANSDUCER SPECIFICATIONS:

1. Pressure range: 0–150 psi
2. Minimum resistance between transducer body & any wire – 50M Ohms @ 250 Vdc
3. Accuracy (combined linearity, hysteresis, & repeatability) <1% of FS BSFL.
4. Pressure cycles: 10^8 minimum full pressure cycles.
5. Pressure overload: 2x rated pressure.
6. Burst pressure: 5x rated pressure or 20,000 psig.
7. Long term stability (1 year): ±0.25% of FS, typical.
8. Supply Voltage: 10–30 Vdc
9. Supply Current: <10mA
10. Output: 1 to 5V
11. Zero offset: ±2% of FS.
12. Span tolerance: ±2% of FS.
13. Operating temperature range: –20° to 85°C.
14. Compensation temperature range: 0° to 55°C.
15. Zero thermal error: <±2% of FS.
16. Span thermal error: <±2% of FS.
17. Load impedance greater than 5K Ohms for quoted performance.
18. Pressure port material: 17–4 PH
19. Sensor type: gauge pressure

REFERENCE COPY
DO NOT USE FOR MANUFACTURE

CUSTOMER APPROVAL: _____

DATE: _____

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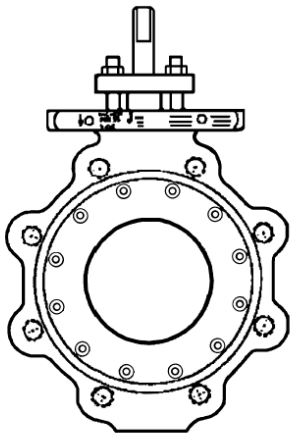

IMO - 308

Issue Date: 12/02

INSTALLATION, MAINTENANCE, AND OPERATING INSTRUCTIONS

MODEL C
WAFER-SPHERE®

Read entire instructions carefully before installation or servicing

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1 GENERAL

This instruction manual contains important information regarding the installation, maintenance, and operation of Jamesbury Model C *Wafer-Sphere*. Please read the instructions carefully and save them for future reference.

The Jamesbury *Wafer-Sphere* Valve is a high performance butterfly valve design. Maximum shutoff pressure rating depends on the materials chosen.

1.1 WARNING

SAFETY FIRST! FOR YOUR SAFETY, ASK THE FOLLOWING QUESTIONS BEFORE REMOVING THE VALVE FROM THE LINE, AND BEFORE ANY DISASSEMBLY:

1. **WHAT'S IN THE LINE?**

   BE SURE YOU KNOW WHAT FLUID IS IN THE LINE. IF THERE IS ANY DOUBT, DOUBLE-CHECK WITH THE PROPER SUPERVISOR.

2. **ARE YOU PROTECTED?**

   WEAR ANY PROTECTIVE CLOTHING AND EQUIPMENT NORMALLY REQUIRED TO AVOID INJURY FROM THE PARTICULAR FLUID IN THE LINE.

3. **IS THE LINE DEPRESSURIZED?**

   DEPRESSURIZE THE LINE AND DRAIN THE SYSTEM FLUID. THE *WAFER-SPHERE* BUTTERFLY'S OFFSET SHAFT CREATES GREATER DISC AREA ON ONE SIDE OF THE SHAFT. THIS MEANS THAT A *WAFER-SPHERE* VALVE TENDS TO OPEN WHEN PRESSURIZED ON THE INSERT SIDE WITHOUT A HANDLE OR AN ACTUATOR ON THE VALVE.

4. **IS THE VALVE CLOSED?**

   BEFORE YOU INSTALL A *WAFER-SPHERE* VALVE IN, OR REMOVE IT FROM THE LINE, FULLY CLOSE THE VALVE. THE *WAFER-SPHERE* BUTTERFLY VALVE MUST BE REMOVED FROM THE LINE IN THE CLOSED POSITION. THIS WILL PREVENT MECHANICAL DAMAGE TO THE DISC SEALING EDGE. THE BLADE DRIVE FLATS OR LINE ON TOP OF THE SHAFT WILL INDICATE THE POSITION OF THE DISC. **(SEE FIGURES 1 AND 2)**

1.2 Description

Refer to the tag attached to each valve for this rating. Do not use a valve at service conditions that exceed the rating on the name plate.

Offset Shaft Design

One of the design features of the *Wafer-Sphere* valve that is responsible for its superior performance is the valve's offset shaft design. The shaft is offset in two planes: (1) away from the valve disc centerline and (2) behind the disc sealing plane **(See Figure 3)**. Offset shaft design makes the rotating disc "cam" back and away from the seat, completely eliminating the usual wear points at the top and bottom of the seat. Because the disc rotates off the seat in an eccentric arc, it operates in one quadrant only **(See Figure 3)**.

***WAFER-SPHERE* BUTTERFLY VALVES**
WAFER DESIGN

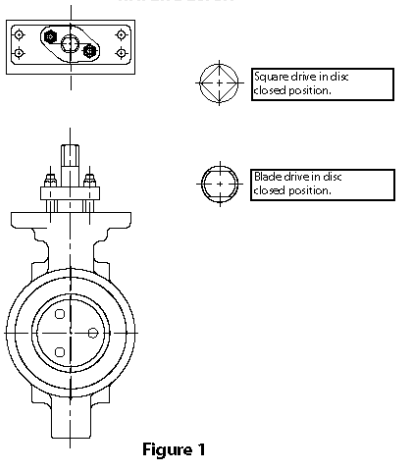


Figure 1

***WAFER-SPHERE* BUTTERFLY VALVES**
SINGLE FLANGE LUGGED DESIGN

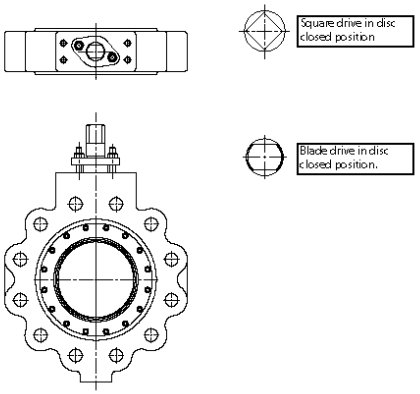


Figure 2

Positive Stop Feature

To prevent seat damage from over-travel of the disc beyond the closed position (usually during field mounting of a handle or actuator), a "positive stop" feature has been designed into the *Wafer-sphere* butterfly valve. The "positive stop" feature also makes it possible to adjust the actuator travel stops in-line. The location of this feature is shown in **(Figure 3)**.

Actuation

High line pressure may create high enough forces to pull a manual handle out of an operator's hand. With Types 815W, 815L, 830W, and 830L valves, either a manual gear

operator, a pneumatic or an electric actuator should be used in place of a detent handle on 2-1/2," 3" and 4" (DN 65, 80 and 100) valves when differential pressure exceeds 300 psi (20.7 bar), on 5", 6" and 8" (DN 125, 150 and 200) valves when differential pressure exceeds 150 psi (10.35 bar), and on 10" and 12" (DN 250 and 300) valves when differential pressure exceeds 50 psi (3.45 bar).

Wafer Body Design

Some wafer designs **(See Figure 1)** contain flange bolt holes or slots in the body to hold the valve and assist with correct alignment during installation in the line.The centering holes or slots in wafer bodies alone are not suitable, or intended for containing line pressure, and are only for use in conjunction with a fully bolted pipeline flange.

2 INSTALLATION

For lowest torque, *Wafer-sphere* butterfly valves should be installed with the body insert toward the higher pressure, (shaft downstream).

1. Read the **WARNING** Section on Page 2 carefully.

2. **IMPORTANT:** Only operating handle stops or actuator stop set screws must be used to stop the disc in position. DO NOT use the "positive stop" by itself to limit travel.

3. Visually check the position of the disc when the valve is in the closed position and the insert is fully compressed. The disc should be parallel to the flanges within 1/32 " (.79 mm).

4. Before installing a closed valve in the pipeline, be sure that the handle or actuator is attached so that a counter-clockwise rotation, viewed from above, opens the valve **(See Figure 3)**. Fully close the valve again before installing it in the pipeline.

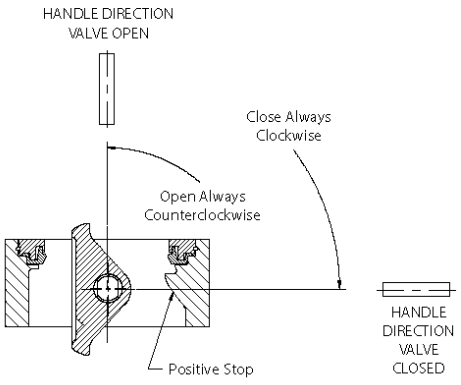


Figure 3

5. **THE PIPELINE:** The *Wafer-sphere* butterfly valve must be centered between flanges to avoid disc-pipe contact which could damage the disc and shaft. Any flange or pipeline welding should be done prior to installation of the valves. If this is impossible, protective covering or shields must be placed in the pipeline between the valve and the area being welded prior to welding. Not only must the valve be protected against weld slag, but also against any excessive heat, which could cause seat damage. It is essential that all weld slag, rods, debris, tools, etc., be removed from the pipeline before valves are installed or cycled.

6. Secure the valve between flanges. Compress the flange gasket **EVENLY** by tightening the fasteners in an alternating sequence.

IMPORTANT: The valve should be tightened between flanges using appropriate gaskets and fasteners for the service, in compliance with applicable piping codes and standards. Recommended fastener lengths are listed in Bulletin T104-1.

7. If there is seapage past the shaft seal upon installation, the valve may have been subject to wide temperature variations in shipment. Leak tight performance will be restored by a simple packing adjustment described in the **MAINTENANCE** Section.

TABLE 1

Insert Screw Torque Table (lb - ft Unless Otherwise Specified)

Screw Size	Torque Carbon Steel FT•LBS (N•m)	Torque Stainless Steel FT•LBS (N•m)
#10	50 IN•LBS (6)	23 IN•LBS (3)
1/4"	14 (19)	6 (8)
5/16"	30 (41)	11 (15)
3/8"	50 (68)	20 (27)
7/16"	80 (109)	30 (41)
1/2"	120 (163)	40 (55)

TABLE 2

Cover Plate Screw Torque Table

Screw size	Torque – FT•LBS (N•m)
3/8"	35 (48)
1/2"	80 (109)
9/16"	110 (149)
5/8"	180 (244)
3/4"	270 (366)

3 MAINTENANCE

3.1 General

Routine maintenance consists of periodically tightening down the compression plate to compensate for shaft seal wear. The compression plate, however, should not be tightened down too tight, since this will shorten the life of the seals. More extensive maintenance such as seat, seal and bearing replacement is described below.

3.2 Valve Removal

1. Read the **WARNING** Section on Page 2 carefully.
2. Valve must be fully closed before removing it from the pipeline.
3. **CAUTION:** Valves equipped with spring-to-open (air-to-close) actuators must be disconnected from the actuators and then closed. Valves must be closed while removing them from the pipeline.

3.3 Seat Replacement Standard Valves

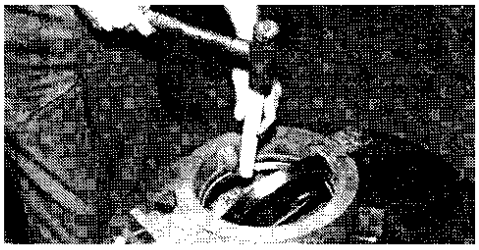
Numbers in ( ) refer to items shown in **(Figure 5)**.

1. After removing the valve from the line, place it on a bench. Take care not to damage the sealing edge of the valve disc.
2. Insert Styles:

   A. Bolted Insert:
   Remove the insert screws (21) and the insert (2). If the insert does not lift out easily, tap it out from the shaft side using a wooden or plastic rod and a hammer. Do not strike the valve directly with a hammer.

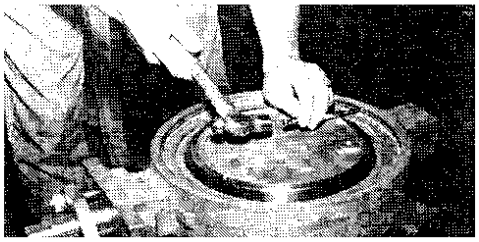
   B. Snap-In Insert (See Figure 4):
   Using a wooden or plastic rod and hammer, drive the insert out of the body from the shaft side. The rod should be placed on either side of the positive stop in the body. Do not strike the valve directly with a hammer. (**NOTE:** Removal of the insert often results in damage to the seat being replaced.)

3. Remove the seat (5) and discard it.
4. Remove the body seal (40) when applicable, (2-1/2", 3" and 4" [DN 65, 80 and 100] Series 815L and 830L valves).
5. Clean the valve, and deburr the insert.
6. Carefully clean and polish the disc sealing surface. It should be free of all grooves and scratches.

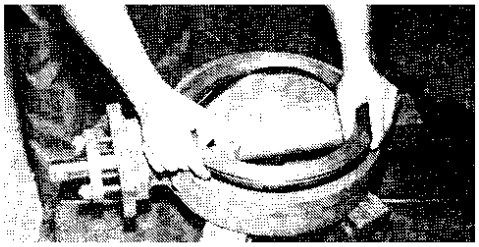


Removing Insert

Placing Spring Into Groove



Tapping End Of Spring Into Body

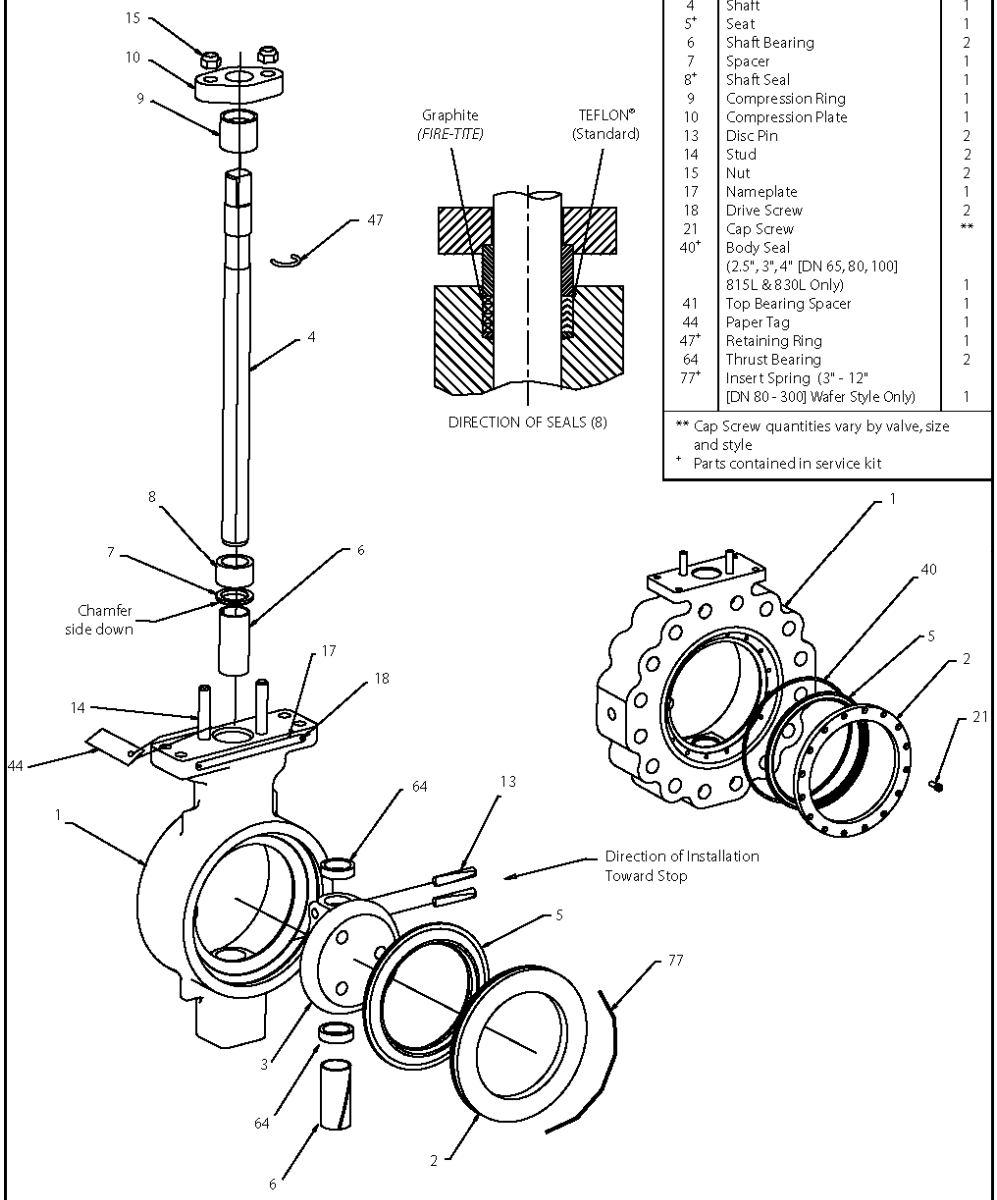


Installing Seat And Insert Assembly Into Body. Angled As To Engage Insert Spring

Tapping Insert Assembly Into Body

Figure 4

EXPLODED VIEW
Valves Without Cover Plates



PARTS LIST

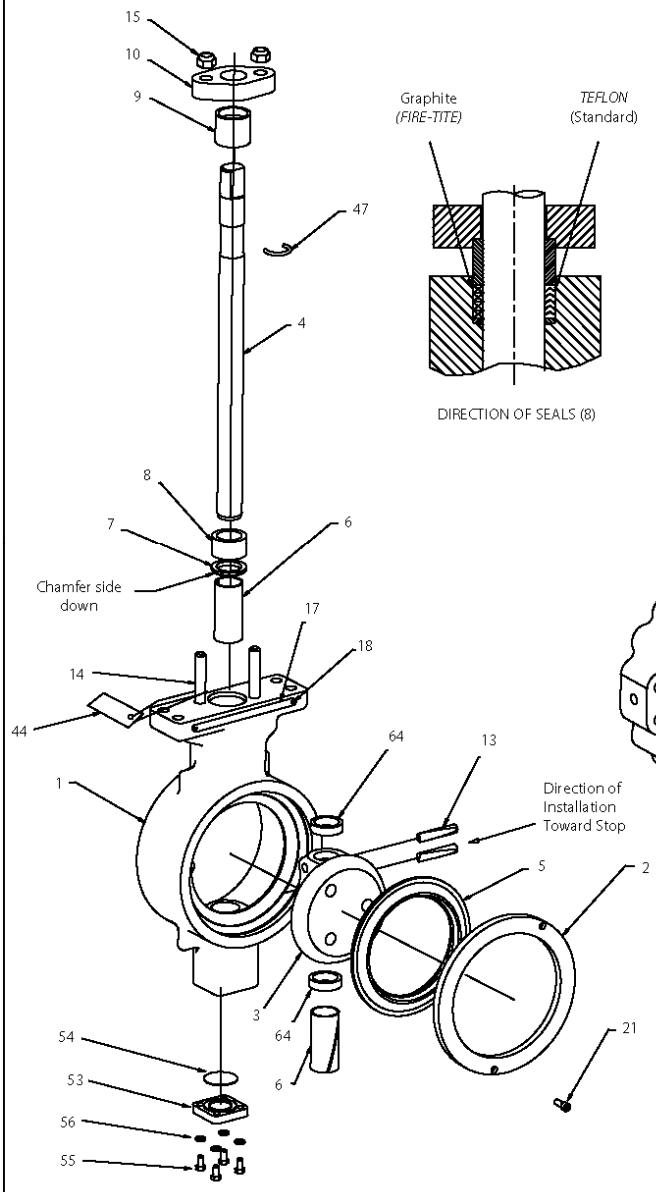
ITEM	PART NAME	QTY
1	Body	1
2	Insert	1
3	Disc	1
4	Shaft	1
5+	Seat	1
6	Shaft Bearing	2
7	Spacer	1
8+	Shaft Seal	1
9	Compression Ring	1
10	Compression Plate	1
13	Disc Pin	2
14	Stud	2
15	Nut	2
17	Nameplate	1
18	Drive Screw	2
21	Cap Screw	**
40+	Body Seal (2.5", 3", 4" [DN 65, 80, 100] 815L & 830L Only)	1
41	Top Bearing Spacer	1
44	Paper Tag	1
47+	Retaining Ring	1
64	Thrust Bearing	2
77+	Insert Spring (3" - 12" [DN 80 - 300] Wafer Style Only)	1

** Cap Screw quantities vary by valve, size and style

+ Parts contained in service kit

Figure 5

EXPLODED VIEW
Valves With Cover Plates



PARTS LIST

ITEM	PART NAME	QTY
1	Body	1
2	Insert	1
3	Disc	1
4	Shaft	1
5+	Seat	1
6	Shaft Bearing	2
7	Spacer	1
8+	Shaft Seal	1
9	Compression Ring	1
10	Compression Plate	1
13	Disc Pin	#
14	Stud	2
15	Nut	2
17	Nameplate	1
18	Drive Screw	2
21	Cap Screw	**
29	Indicator Pointer (Sqare Drives Only)	1
41	Top Bearing Spacer	1
44	Paper Tag	1
47+	Retaining Ring	1
53	Cover Plate	1
54	Gasket	1
55	Hex Head Cap Screw	#
56	Lockwasher	#
64	Thrust Bearing	2

** Cap Screw quantities vary by valve, size and style
+ Parts contained in service kit
# Quantities vary by valve size

Figure 5A

7. If the disc is slightly damaged, it may be possible to smooth the sealing surface with crocus cloth, a fine stone, or the equivalent. If deep scratches are present, replace disc or return the valve to the factory for service.

8. Place the new body seal (40) into the groove in the body (when applicable).

9. Install the seat (5) into the insert (2).

10. Insert Styles:

    A. Bolted Insert:
    With the valve in the closed position, replace the insert and seat together, using the insert screws. Tighten the screws uniformly. Torque valves are given in **(Table 1)**. Open the valve and retorque the insert screws per **(Table 1)**. Take care not to damage the sealing edge of the disc. Close the valve.

    B. Snap-In Insert:
    Place the insert spring (77) into the groove in the body, opposite the positive stop **(See Figure 5)**. Lightly tap one end of the spring into the body groove. Be sure the spring is positioned snugly into the groove. Lightly tap the other end of the spring into the groove. Make sure that the ends of the spring are embedded into the body groove to prevent spring movement. With the seat assembled into the insert and the disc slightly open, install the assembly into the body such that it is angled into the body to engage the insert spring. Once the insert spring is engaged, "pop" the opposite side of the insert into the body by lightly tapping the insert with a block of wood and a hammer. Close the valve.

11. Set the handle or actuator stops as described in the **SETTING HANDLE STOP** Section or **ACTUATOR MOUNTING INSTRUCTION** Section. **NOTE:** After installation of a new seat, torque will be higher for a few cycles.

3.4 Seat Replacement *FIRE-TITE* Valves

Numbers in ( ) refer to items shown in **(Figure 6)**.

1. After removing the valve from the pipeline, place it on a bench and cycle it open. Take care not to damage the sealing edge of the valve disc.

2. Insert Styles:

    A. Bolted Insert:
    Remove the insert screws (21) and the insert (2). If the insert does not lift out easily, tap it out from the shaft side using a wooden or plastic rod and a hammer. Do not strike the valve directly with a hammer.

    B. Snap-In Insert:
    Using a wooden or plastic rod and hammer, drive the insert out of the body from the shaft side. The rod should be placed on either side of the positive stop in the body. Do not strike the valve directly with a hammer. **(NOTE:** Removal of the insert often results in damage to the seat being replaced.)

3. Remove the seat (5) and discard. Remove the body seal (40) from the insert and body.

4. Carefully clean the gasketing surfaces with a suitable solvent. They should be free of all grooves and scratches. If deep scratches are present, polish or repair is required.

5. Clean the valve and deburr the insert.

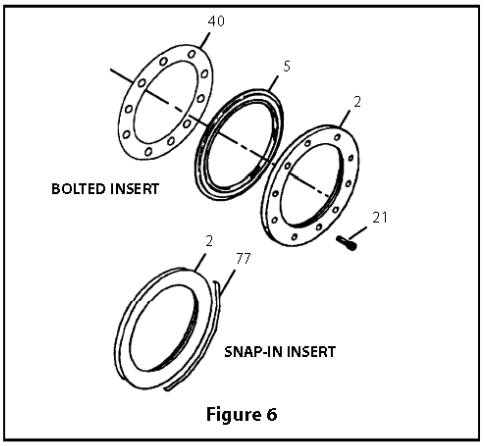


Figure 6

6. Carefully clean and polish the disc. It should be free from all grooves and scratches.

7. If the disc is slightly damaged, it may be possible to smooth the sealing surface with crocus cloth, a fine stone, or the equivalent. If deep scratches are present, replace disc or return the valve to the factory for service.

8. Cycle the valve closed.

9. A body seal (40) is required between the seat tail and body as shown in **(Figure 7)**. The valve uses a graphite type gasket. This is installed in accordance with the following steps:

    a. **IMPORTANT:** Exercise care at all times not to damage the gasket. A break may cause the gasket to leak.

    b. The bottom surface of the insert is to be free of all foreign particles. Clean thoroughly with suitable solvent.

    c. Apply the gasket to the body, and if a lug style, take care to align the holes in the gasket with the insert screw holes.

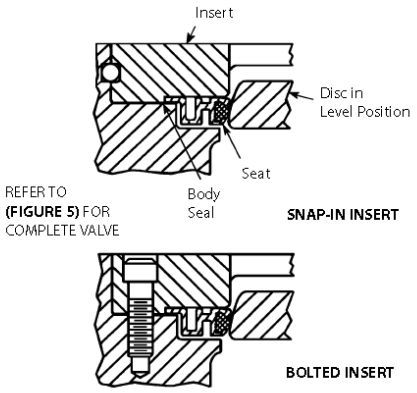


Figure 7

10. Verify that the disc is in the level position. Install new seat and insert. **(See Figure 6 & 7.)** For bolted inserts, install the insert screws, and tighten them uniformly. Torque values are given in **(Table 1)**. Whenever possible, open the valve and retorque the insert screws per **(Table 1)**. Take care not to damage the sealing edge of the disc. Close the valve. For snap-in inserts, place the retaining spring into the groove in the body, opposite the positive stop. **(See Figure 4.)** The tips of the spring should be toward the insert side of the valve. Lightly tap one end of the spring into the body groove. Be sure the spring is positioned snugly into the groove. Lightly tap the other end of the spring into the groove. Make sure the tips of the spring are embedded into the body groove to prevent spring movement. With the seat assembled into the insert, and the disc slightly open, install the assembly into the body, such that it is angled into the body to engage the retaining spring. Once the retaining spring is engaged, "pop" the opposite side of the insert into the body by lightly tapping the insert with a block of wood and a hammer.

11. Set the actuator stops as described in the **ACTUATOR MOUNTING INSTRUCTIONS** Section. Do not install and tighten flanges on a newly reseated valve until the actuator stops are properly set and the valve is fully closed. Incorrect disc positioning may cause damage to a new seat when the valve is compressed between flanges for the first time. **NOTE:** After installation of a new seat, torque will be higher for a few cycles.

3.5 Shaft Seal Replacement

Numbers in ( ) refer to items shown in **(Figure 5)**.

See IMO-317 for live loaded shaft seals.

CAUTION: Read the **WARNING** Section (Page 2) before continuing.

1. Remove the handle or actuator coupling.

2. Remove the nuts (15) from above the compression plate (10). Remove the compression plate (10). The studs (14) do not have to be removed.

3. Remove C-shaped retainer ring (47) from the shaft.

4. Remove the compression ring (9).

5. Remove the old shaft seal (8) segments. Do not score the shaft or body bore!

6. The spacer (7) need not be removed for shaft seal replacement.

7. Replace the old shaft seal with a new shaft seal.
   NOTE: If the seal is of the PTFE V-ring type, keep the seal rings stacked in the same order as removed from kit. Note the orientation in **(Figure 5)**.This orientation is preferred for all applications, including vacuum.

8. Reinstall the compression ring (9), the retainer ring (47), the compression plate (10), the nuts (15).

*If the compression ring initially sits too high to install the retainer ring it may be necessary to precompress the shaft seals somewhat.In that case, install the compression plate and tighten the nuts enough to accomplish the precompression. Remove the compression plate to install the retainer ring and then complete the reassembly.

9. Close the valve.

10. With the valve closed, tighten the nuts (15) on the compression plate evenly until the packing is adequately compressed to prevent leakage. This should require tightening the nuts approximately 1-1/2 to 2 full turns after they have both come into contact with the compression plate.

3.6 Valve Disassembly

Numbers in ( ) refer to items shown in **(Figure 5 & 5A)**.

NOTE: If complete disassembly becomes necessary, replacement of seats and all seals is recommended.

1. Place the valve on a bench or other suitable working space.

2. If the seat is to be replaced or removed, follow Steps 2, 3, 4 and 5 in the **SEAT REPLACEMENT** Section.
   NOTE: It is good practice to replace the seat, shaft and body seals and bearings any time a valve is disassembled.

3. Remove the shaft seal compression hardware as detailed in Steps 1-4 in the **SHAFT SEAL REPLACEMENT** Section. The seal material itself can be more easily removed after the shaft has been removed from the valve.

4. Remove the disc pin welds by grinding or machining off the welds. Drive out the pins opposite the installation direction shown in (**Figure 5**).

5. Remove screws (55) and cover plate (53), and remove gasket (54).

6. Remove the shaft (4). **NOTE:** When removing the shaft and freeing the disc, be careful not to scratch the sealing surface of the disc.

7. Remove the disc (3) and upper and lower thrust bearings (64).

8. Remove the top bearing (6) either through the top of the valve or the waterway.

9. Remove the bottom bearing (6).

3.7 Valve Assembly

Numbers in ( ) refer to items shown in (**Figure 5**).

1. Clean all valve components.

2. Inspect all components for damage before assembling the valve. Look for damage to the sealing areas on the disc, shaft, and body, and for wear in the bearing areas.

3. Carefully clean and polish the disc sealing surface. It should be free from all grooves and scratches.

4. If the disc is slightly damaged, it may be possible to smooth the sealing surface with crocus cloth, a fine stone, or the equivalent. If deep scratches are present, replace the disc or return the valve to the factory for service.

5. Install the bearings (6) into the body bores.

6. To ease assembly of the shaft into the disc, it may be necessary to coat the shaft and the disc bore lightly with a lubricant compatible with the media to be handled by the valve.

7. Slide the shaft through the top bearing and engage the top thrust bearing (64). With the two pin holes toward the bonnet, place the disc in the waterway and slide the shaft through the shaft bore in the disc. Place the lower thrust bearing (64) below the disc, slide the shaft through and into the lower shaft bearing (6). Use caution to prevent damage to the shaft bearings and disc sealing surface.

8. Insert the disc pins (13), as shown in (**Figure 5**), and drive them into place. The pins must be driven so that both pins are the same depth within 1/16" (1.56 mm). When they are correctly installed the drive shaft will be as shown in (**Figures 1 and 2**). Weld both ends of the pins, small end first, grounding the shaft only (body on blocks of wood). After the disc cools, clean the welds with a wire brush. **CAUTION:** Use care to keep contamination out of the valve.

9. Install the upper bearing spacer (41) when applicable, the spacer (7) with chamfered side toward disc, the shaft seal (8), the compression ring (9) and the retainer ring (47). If the shaft seal is of the PTFE V-ring type, be certain that it is installed in the orientation shown in (**Figure 5**).

10. If the studs (14) have been removed from the valve, reinstall them in the holes shown in (**Figure 5**), using Loctite® or other locking compound to prevent vibration loosening. Stud protrusion should be 2" (50.8 mm) for the 3", 4", 6" and 8" (DN 80, 100, 150 and 200) valves and 2-1/4" (57.15 mm) for the 10" and 12" (DN 250 and 300) valves.

11. Install new gasket (54), and secure cover plate to valve body using screws (55). To ensure even gasket loading tighten screws, in an alternating sequence to torque in (**Table 2**).

12. If the handle ratchet plate has been removed from the valve, reinstall it in the orientation shown in (**Figure 6**). Install lock washers and screws in the two bonnet holes. Do not tighten the screws until the stops are set. (See **SETTING HANDLE STOP** Section or **ACTUATOR MOUNTING INSTRUCTIONS** Section.)

13. Place the compression plate (10) over the shaft (4) and studs (14). Install the nuts (15), but do not tighten.

14. Cycle the valve fully closed. Install new unused seat and body seal. See the **SEAT REPLACEMENT** Section for details.

15. With the valve still closed, tighten the nuts (15) on the compression plate evenly until the shaft seals are adequately compressed to prevent leakage. This should require tightening the nuts approximately 1-1/2 to 2 full turns after they have both come into contact with the compression plate.

16. Set the handle or actuator stops as described in the **SETTING HANDLE STOP** Section or **ACTUATOR MOUNTING INSTRUCTIONS** Section. Tighten the screws holding the ratchet plate.

4 VALVE TESTING PROCEDURE

Should it become necessary to perform a leak test of the valve prior to its installation in the pipeline, follow the procedure outlined below.

1. In the following test, suitable gaskets are required between the faces of the valve and the test hardware.

2. Before pressurizing the valve be sure all actuator linkage fasteners are tight, and that the power or pressure is applied to the actuator to maintain the valve in the closed position. The offset design on the valve may cause it to rotate when the test pressure is applied to one side of the disc.

3. The valve should be installed between flanges or in a testing apparatus. If flanges are used, refer to **INSTALLATION** Section, part 6. If a testing device other than flanges is used, the clamping force of the device must be comparable with flange bolt loads on the valve.

4. Slightly open the valve. Verify that you do not have a seal between the seat and the disc. Exercise caution when cycling a valve in the test apparatus to avoid possible disc damage from the disc striking the test fixture.

5. Cap the downstream vent and apply 100 psi (6.9 bar) to the valve. Check the shaft seals, and flange gaskets for leakage. This can be done by applying a liquid mixture of soap and water at all seal joints and watching for bubbles.

IMPORTANT: If leakage is detected between the valve and flanges **STOP IMMEDIATELY.** Mark the area of leakage. Vent the valve, and when it has returned to 0 psi (0 bar), retighten the flange bolts in the area. Repressurize the valve checking the gasket again. If leakage persists, disassemble and inspect for damage.

6. If leakage is detected at the shaft seals, tighten the bonnet nuts only enough to stop the leak.

7. Vent the valve, and when it has returned to 0 psi (0 bar), cycle the valve closed.

8. Attach a small tube or hose to the downstream flange (shaft side of the valve).

9. Be sure power/pressure is still applied to the actuator. Pressurize the upstream flange (insert side of valve) to 100 psi (6.9 bar). Check for leakage passing through the free end of the tube/hose.

10. If leakage is detected, vent the valve and make an actuator close-stop adjustment as described in the appropriate Jamesbury actuator IMO, listed on Page 11.

11. Repressurize the valve and check the leakage. If valve still leaks, repeat step 10. If leakage cannot be stopped, adjust the actuator stop so that leakage is minimized.

12. Rebuilt valves may have some minor leakage due to damage to the disc. With the valve still pressurized, insert the free end of the tube/hose into a beaker of water and check for bubbles. In the absence of other test standards, observe leakage after it has reached a stable condition. Because of the volume of air that must be exhausted from a cycled valve, it may be necessary to wait several minutes for the leakage to stabilize or stop. One bubble per inch (25.4 mm) of valve diameter per minute may be considered acceptable for rebuilt soft seated or *Fire-Tite* valves.

5 MANUAL HANDLES

5.1 Handle adjustment

1. Depressurize the line.

2. 2-1/2″ thru 6″ (DN 65 thru 150) Valves - To ensure proper handle/shaft engagement, the handle must be mounted on the shaft such that it rests on the bottom of the shaft blade. **(See Figure 8.)**

HANDLE SUBASSEMBLY

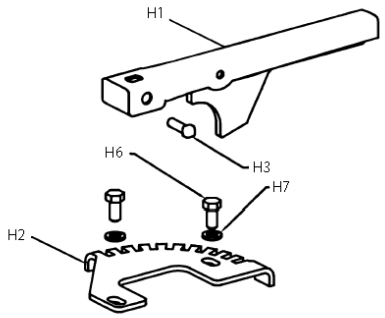


Figure 8

3. 8″, 10″ and 12″ (DN 200, 250, and 300) Valves - Handles for these valves are of solid cast construction. Adjusting these handles along the blade to assure proper ratchet plate engagement is permitted.

NOTE: Handles not available on square drives.

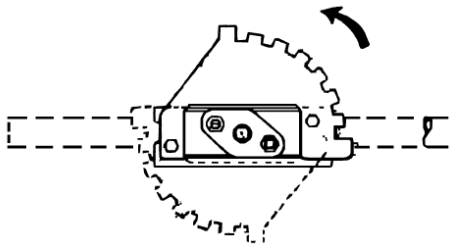


Figure 8-1

5.2 Change of Handle Quadrant

If it is necessary to remount the handle 180 degrees from its standard direction (**Figure 8-1**).

1. Depressurize the line. Remove the handle, hex head cap screws (H6) and lockwashers (H7). Do not remove the studs (14), nuts (15), or compression plate (10).
2. Lift the ratchet plate up and rotate it 180 degrees. Do not turn it upside down.
3. Reinstall all the components which were just removed. Do not tighten the ratchet plate fasteners until the plate has been properly adjusted as described below in the **SETTING HANDLE STOP** Section. If the valve is not installed in the line, do not install it until the ratchet plate is properly adjusted.

5.3 Setting Handle Stop

1. It is recommended that the valve be out of the pipeline for proper adjustment. If this is not possible, valve must be depressurized before adjustment is made.
2. Loosen the two hex head cap screws (H6) clamping the ratchet plate to the valve.
3. Close the valve until the disc is parallel with the flange faces within 1/32" (.79 mm). Do not over close the valve, so that the disc is in contact with the positive stop in the body.
4. If the handle (**H1 in Figure 8-1**) has been removed from the valve, reinstall it on the shaft drive blade and tighten. Cast handles use a screw (H3) and nut (H5). Fabricated handles use only a set screw (H3). With the handle locking tab in the last (closed) notch of the ratchet plate, rotate the ratchet plate clockwise (when viewed from above the handle) until it is stopped by the locking tab. The disc/handle assembly is now trapped between the disc stop in the body and the ratchet plate.
5. Tighten the two screws (H6) holding the ratchet plate.

TABLE 4	
Actuator	**IMO**
QUADRA-POWR	IMO-31, 32
ST-50	IMO-22
ST-60, 90, 115, 175MS	IMO-23
ST-200/400	IMO-26
ST-600/1200	IMO-24, 38
ST-160, 240, 290, 440MS	IMO-27, 39
ST-1800	IMO-506
Manual Gears	IMO-63
SP	IMO-512
BC, B1C	5 BC 70-A
BJ, B1J	5 BJ 70-A
EU Series	IMO-515
ER Series	IMO-516

6 ACTUATOR MOUNTING

6.1 WARNING

BEFORE INSTALLING THE VALVE AND ACTUATOR, BE SURE THAT THE INDICATOR POINTER ON TOP OF THE ACTUATOR IS CORRECTLY INDICATING THE VALVE POSITION. FAILURE TO ASSEMBLE THESE PRODUCTS TO INDICATE CORRECT VALVE POSITION COULD RESULT IN PERSONAL INJURY.

CAUTION: WHEN INSTALLING A LINKAGE OR SERVICING A VALVE/ACTUATOR ASSEMBLY, THE BEST PRACTICE IS TO REMOVE THE ENTIRE ASSEMBLY FROM SERVICE.

CAUTION: AN ACTUATOR SHOULD BE REMOUNTED ON THE VALVE FROM WHICH IT WAS REMOVED. THE ACTUATOR MUST BE READJUSTED FOR PROPER OPEN AND CLOSE POSITION EACH TIME IT IS REMOUNTED.

CAUTION: THE LINKAGE HAS BEEN DESIGNED TO SUPPORT THE WEIGHT OF THE Jamesbury ACTUATORS AND RECOMMENDED ACCESSORIES. USE OF THIS LINKAGE TO SUPPORT ADDITIONAL EQUIPMENT SUCH AS PEOPLE, LADDERS, ETC. MAY RESULT IN THE FAILURE OF THE LINKAGE, VALVE OR ACTUATOR AND MAY CAUSE PERSONAL INJURY.

WARNING: WHEN MOUNTING THE ACTUATOR MAKE SURE THAT THE VALVE AND ACTUATOR ARE BOTH IN THE SAME POSITION. MOUNTING AN OPEN ACTUATOR TO A CLOSED VALVE MAY RESULT IN VALVE STEM DAMAGE.

NOTE: WHEN A SINGLE-ACTING STMS PNEUMATIC SPRING-RETURN ACTUATOR IS MOUNTED TO A *WAFER-SPHERE* VALVE, IT CAN BE MOUNTED ONLY IN THE SPRING-TO-CLOSE MODE (AIR-TO-OPEN).

6.2 Actuator Mounting Instructions

1. When a spring-return actuator is being mounted, the valve should be in the closed position for spring-to-close operation or in the open position for the spring-to-open operation. When an electric or double-acting pneumatic actuator is being mounted, the valve position should correspond to the indicated actuator position.

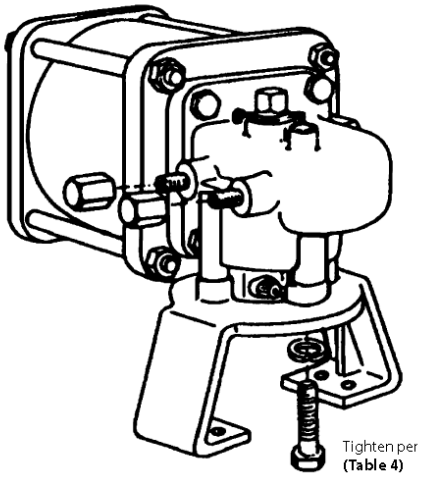


Figure 9-1

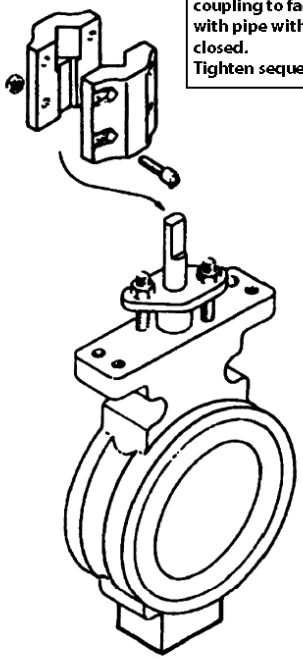


Figure 9-2

2. Assemble bracket to actuator as shown in **(Figure 9-1)**. Tighten to torque listed in **(Table 4)**.

3. Place the coupling onto the valve stem. If the valve has a two-piece "no-play" bolted coupling, assemble the coupling loosely on the valve stem. Use socket head cap screws and lock nuts. **(See Figure 9-2.)**

4. Lower actuator and bracket onto valve while engaging actuator stem driver into coupling. Tighten screws just enough to firmly mate bracket to valve. This should allow bracket to shift, allowing the coupling to align the valve and actuator shafts. **(See Figure 9-3, Step 3A.)**

5. Tighten the no-play coupling screws to torques shown in **(Figure 9-3, Step 3B)**. Use alternating sequence shown.

6. Cycle actuator. See actuator instructions.

7. Fully tighten the screws holding the bracket to the valve, as shown in **(Figure 9-3, Step 3C)**.

8. Recheck no-play coupling screw torques, using the torques in **(Figure 9-3, Step 3B)**. Use alternating sequence shown.

9. Adjust the actuator travel stops as described in the actuator instructions to these proper valve open and closed positions:

   Valve Open: Disc face (or shaft blade) perpendicular with the flange face.

   Valve Closed: Disc face parallel to flange face within 1/32" (.79 mm).

6.3 Direct Drive Mounting

Follow instructions per Paragraph 6.2 except for coupling assembly. **(See Figure 9-4.)**

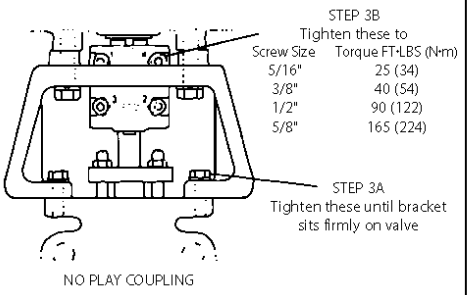


Figure 9-3

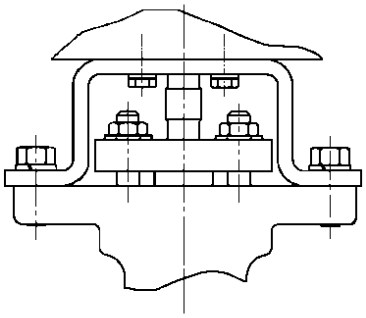


Figure 9-4

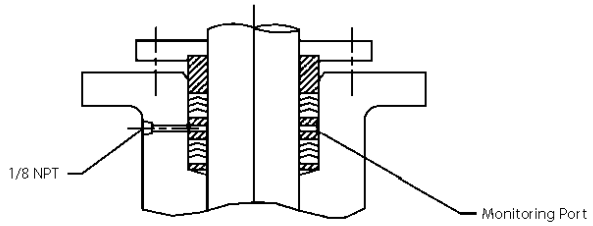


Figure 10

7 REPAIR KITS/SPARE PARTS

Service kits include one seat (seat assembly for *Fire-Tite* valves), and a set of shaft seals. When ordering service kits, seat and shaft seal materials must be specified. For example, a kit for a 10″ (DN 250) type 815L valve with filled PTFE(M) seat and PTFE(T) seals is ordered as RKW-362MT. Wafer style valves will also include insert springs. 2-1/2″, 3″, and 4″ (DN 65, 80 and 100) lug style **only** will also include body seals.

For further information on spare parts and service or assistance visit our web-site at **www.jamesbury.com**.

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TABLE 4 Bracket Bolting Torques for GR.5 Hex Cap Screws				
	Torque to Aluminum Body Actuators		Torque to Cast/Ductile Body Actuators	
Bolt Size	No Lubrication to Screws			
inches	FT•LBS	N•m	FT•LBS	N•m
1/4	6	—	8	—
5/16	12	—	16	—
3/8	20	—	27	—
7/16	30	—	45	—
1/2	50	—	67	—
9/16	70	—	100	—
5/8	90	—	135	—
3/4	160	—	225	—
7/8	250	—	335	—
1	360	—	520	—
1-1/8	520	—	700	—
1-1/4	700	—	990	—
M6	—	6.8	—	9.5
M8	—	14.9	—	19.0
M10	—	30	—	38
M12	—	52	—	65
M16	—	122	—	156
M20	—	230	—	305
M30	—	773	—	1062
M36	—	1288	—	1826

***WAFER-SPHERE* REPAIR KITS**				
MODEL C				
Size	**Soft Seat**		***FIRE-TITE***	
	Wafer	Lug	Wafer	Lug
2-1/2" (DN 65) 815 2-1/2" (DN 65) 830	RKW-470 RKW-470	RKW-471 RKW-471	O/A O/A	O/A O/A
3" (DN 80) 815 3" (DN 80) 830	RKW-352 RKW-352	RKW-358 RKW-358	RKW-364 RKW-364	RKW-370 RKW-370
4" (DN 100) 815 4" (DN 100) 830	RKW-353 RKW-353	RKW-359 RKW-359	RKW-365 RKW-365	RKW-371 RKW-371
5" (DN 125) 815	RKW-468	RKW-469	RKW-472	RKW-473
6" (DN 150) 815 6" (DN 150) 830	RKW-354 RKW-405	RKW-360 RKW-409	RKW-366 RKW-413	RKW-372 RKW-417
8" (DN 200) 815 8" (DN 200) 830	RKW-355 RKW-406	RKW-361 RKW-410	RKW-367 RKW-414	RKW-373 RKW-418
10" (DN 250) 815 10" (DN 250) 830	RKW-356 RKW-407	RKW-362 RKW-411	RKW-368 RKW-415	RKW-374 RKW-419
12" (DN 300) 815 12" (DN 300) 830	RKW-357 RKW-408	RKW-363 RKW-412	RKW-369 RKW-416	RKW-375 RKW-420
14" (DN 350) 815 14" (DN 350) 830	RKW-678 RKW-673	RKW-678 RKW-673	RKW-663 RKW-668	RKW-663 RKW-668
16" (DN 400) 815 16" (DN 400) 830	RKW-660 RKW-674	RKW-660 RKW-674	RKW-664 RKW-669	RKW-664 RKW-669
18" (DN 450) 815 18" (DN 450) 830	RKW-661 RKW-675	RKW-661 RKW-675	RKW-665 RKW-670	RKW-665 RKW-670
20" (DN 500) 815 20" (DN 500) 830	RKW-662 RKW-676	RKW-662 RKW-676	RKW-666 RKW-671	RKW-666 RKW-671
24" (DN 600) 815 24" (DN 600) 830	RKW-334 RKW-676	RKW-334 RKW-676	RKW-667 RKW-672	RKW-667 RKW-672

OA = ON APPLICATION

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DRAIN VALVE

Model
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Electronic Drain Valve

Adjustable 1 to 15 seconds
On Time

Adjustable 1 to 45 minutes
Off Time

24, 120, or 230 volt AC
Voltage

Timer Data	
On Time:	Adjustable 1 to 15 seconds
Off Time:	Adjustable 1 to 45 minutes
Voltage:	24, 120, or 230 volt AC
Indicators:	LED
Override:	Manual
Enclosure:	Nema 4
DIN Connectors:	Power cord or conduit connector

Valve Data	
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Max. Operating Pressure:	300 psi
Orifice Size:	7/16"
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Installation & Maintenance Instructions

3–WAY OR 4–WAY, 2 POSITION SINGLE OR DUAL SOLENOID VALVES FOR NAMUR ACTUATORS – 1/4 NPT PRESSURE & 1/8 NPT EXHAUST CONNECTIONS AIR OR INERT GAS SERVICE – ANODIZED ALUMINUM CONSTRUCTION

SERIES 8551

Form No.V7418

Service Notice

Except for coil replacement, the Series 8551 are not repairable. When any performance problems are detected during routine inspection, replace valve immediately.

For catalog numbers prefixed WT or EF, see separate solenoid installation and maintenance instructions for information on: Wiring, Solenoid Temperature, Cause of Improper Operation and Coil Replacement.

DESCRIPTION

Series 8551 valves are 3–way or 4–way, 5 ported 2 position piloted spool type single or dual solenoid valves designed for air or inert gas service. Valves are made of rugged anodized aluminum. A built–in manual operator allows manual operation when desired or during an electrical power outage. Each valve may be used for 3–way (normally closed) or 4–way operation by using the appropriate flow plate provided. Flow plates are marked (3/2) for 3 Ports, 2 Positions (3–way operation) or (5/2) for 5 Ports, 2 Positions (4–way operation). These valves are supplied with all necessary hardware for a NAMUR direct mount installation i.e. flow plates, gaskets, mounting screws and a locating set screw. ***See Flow Selection And Mounting section.***

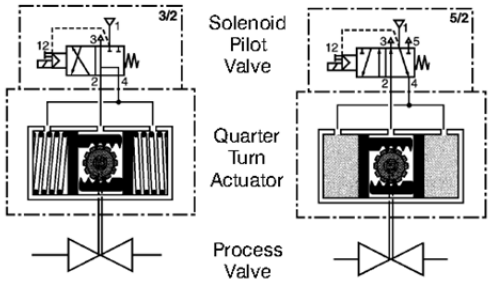
Valves catalog numbers prefixed SC are supplied with an open–frame spade plug connection coil (3x DIN 46244). A DIN Plug Connector Kit No. K226061–001, is available from ASCO.

APPLICATIONS

Typically, the 3–way (3/2) normally closed mode is used for a single acting (spring return) actuator; 4–way (5/2) mode for a double acting actuator.

Single–acting actuator solenoid spool-valve control adapted for 3/2 operation

Double–acting actuator solenoid spool-valve control adapted for 5/2 operation



Port Markings: 1 = Pressure, 2 & 4 = Cylinder 3 & 5 = Exhaust

OPERATION

IMPORTANT: Minimum operating pressure differential 30 psi; maximum 150 psi.

Breather Function 3–way (3/2) mode only: Allows for spring side of a spring return actuator to vent at all times through valve exhaust port 3.

Single Solenoid: This type of operation is used where automatic return of the valve on electrical power failure or loss of main line pressure is required.

3–Way NC Single Solenoid Operation

Solenoid De–energized: Flow is from port 2 to port 3. Port 4 is open to exhaust port 3 (breather function); pressure port 1 is closed Slight pilot exhaust is also apparent. Port 5 is not used.

Solenoid Energized: Flow is from pressure port 1 to port 2. Port 4 is open to exhaust port 3 (breather function); pilot exhaust is closed.

3–Way Single Solenoid (3/2)

Solenoid De–energized	Solenoid Energized
Pilot Exh. 2 4 / 3 1 5	Pilot Exh. 2 4 / 3 1 5

4–Way Single Solenoid Operation

Solenoid De–energized: Flow is from pressure port 1 to port 4 and from port 2 to port 3. Port 5 is closed. Slight pilot exhaust is also apparent.

Solenoid Energized: Flow is from pressure port 1 to port 2 and from port 4 to port 5. Port 3 and pilot exhaust are closed.

4–Way Single Solenoid (5/2)

Solenoid De–energized	Solenoid Energized
Pilot Exh. 2 4 / 3 1 5	Pilot Exh. 2 4 / 3 1 5

Dual Solenoids: Solenoid may be energized momentarily or continuously depending upon application. Dual solenoid valves are used where equipment must not change position when electrical power fails. Valve operates when one solenoid is energized and returns when the other solenoid is energized.

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ASCO Valves Automatic Switch Co. 50–60 Hanover Road, Florham Park, New Jersey 07932 www.ascovalve.com

⚠ **CAUTION: Do not energize solenoids A and B simultaneously, as this will cause valve to malfunction.**

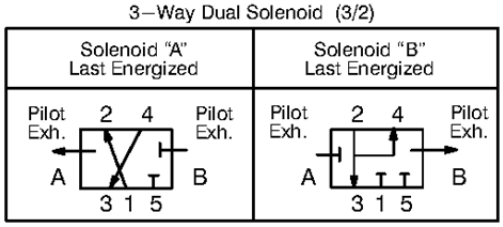
IMPORTANT: Minimum *on time* for each solenoid is 0.3 seconds.

3–Way NC Dual Solenoid Operation

Solenoid A Last Energized: Flow is from pressure port 1 to port 2. Port 4 is open to exhaust port 3 (breather function). Slight pilot exhaust is apparent when solenoid A is de–energized. Port 5 is not used.

Solenoid B Last Energized: Flow is from pressure 2 to port 3. Port 4 is open to exhaust 3 (breather function); pressure port 1 is closed. Slight pilot exhaust is apparent when solenoid B is de–energized.

3–Way Dual Solenoid (3/2)

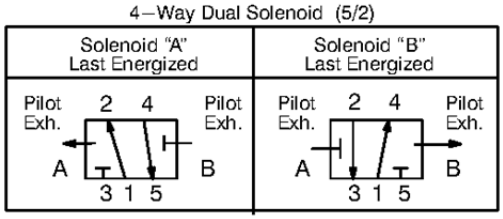


4–Way Dual Solenoid Operation

Solenoid A Last Energized: Flow is from pressure port 1 to port 2 and from port 4 to port 5. Port 3 is closed. Slight pilot exhaust apparent when solenoid A is de–energized.

Solenoid B Last Energized: Flow is from pressure port 1 to port 4 and from port 2 to port 3. Port 5 is closed. Slight pilot exhaust apparent when solenoid B is de–energized.

4–Way Dual Solenoid (5/2)



Manual Operator

Manual operator provides manual operation when desired or during an electrical power outage. To engage manual operator, rotate screw clockwise as far as possible to "1". Valve will now be in the same position as when the solenoid is energized. To disengage manual operator, rotate screw counterclockwise as far as possible to "0".

⚠ **CAUTION: To prevent malfunction be sure to turn screw counterclockwise to "0" before operating valve electrically.**

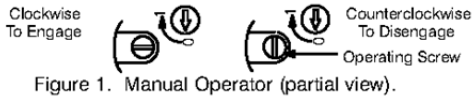


Figure 1. Manual Operator (partial view).

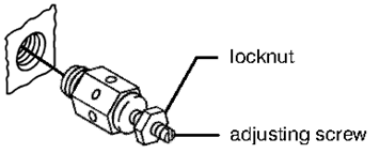
Metering Device with Filter for 1/8 NPT Connections (Optional Feature)

These metering devices can be used to vary the operating speed of the actuator/cylinder this valve is piloting. Install metering devices in 1/8 NPT exhaust connection and tighten securely. Install a metering device in port 3 and port 5 of 4–way (5/2) valves only. Because of the breather function, the use of a metering device is not recommended for the 3–way (3/2) mode.

Metering Device Adjustment:

A. Loosen Locknut on adjusting screw.
B. Turn adjusting screw clockwise (to reduce flow) as far as possible.
C. Turn adjusting screw counterclockwise (to increase flow) no more than two turns.
D. Tighten locknut using 13 mm wrench.

IMPORTANT: The steps above provide only a rough adjustment of the metering device. Final adjustments must be made with valve fully pressurized in the line of final application.



Turn clockwise to reduce flow and speed of actuatory/cylinder this valve is piloting; counterclockwise to increase flow and speed.

Figure 2. Metering Device (partial view).

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.

⚠ **WARNING: To prevent the possibility of electrical shock from the accessibility of live parts, install the open–frame solenoid in a suitable enclosure.**

Future Service Considerations

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

Temperature Limitations

For valve ambient and fluid temperature ranges, refer to chart following. Check catalog number prefix and watt rating on nameplate.

ASCO Valves Automatic Switch Co. 50–60 Hanover Road, Florham Park, New Jersey 07932 www.ascovalve.com

Watt Rating AC/DC	Catalog Number Prefix	Ambient And Fluid Temperature Range
2.5 & 3 AC & DC	SC	5°F to 140°F (−15°C to 60°C)
6.3 AC	WT	5°F to 140°F (−15°C to 60°C)
	EF	5°F to 104°F (−15°C to 40°C)
6.9 DC	WT or EF	5°F to 77°F (−15°C to 25°C)

NOTE: For temperatures below 32°F (0°C) moisture−free air must be used.

Positioning

Valve may be mounted in any position.

Flow Selection and Mounting (Refer to Figure 3)

Two flow plates are provided with each valve. Flow plates are marked (3/2) for 3−way or (5/2) for 4−way. For proper orientation of the flow plate, the marking (3/2) or (5/2) must be opposite series number 8551 flow diagram label on valve body or facing solenoid "B" for dual solenoid construction. See Figure 3. for proper orientation of flow plate, gaskets, mounting screws and locating set screw. Then proceed as follows:

1. If required, install locating set screw using a 2 mm hex key wrench.
2. Install Port 2 and Port 4 gaskets and flow gasket on flow plate.
3. Position flow plate and solenoid valve on actuator. Then install two socket head cap screws in offset center holes on either side. Hand thread screws a few turns into actuator. Then tighten screws evenly using a 4 mm hex key wrench.

NOTE: Three sets of mounting screws are provided, sizes:M5, .190−24 UNC−2A and .190−32 UNF−2A.

Piping

There is pilot exhaust from the top of the solenoid when the solenoid is de−energized. The pilot exhaust may be connected to the main exhaust if the air or inert gas cannot be exhausted directly to the atmosphere. An exhaust protector is provided in the top of the plugnut/core tube assembly to prevent debris from entering pilot exhaust.

Connect piping or tubing to valve according to markings on valve body. Refer to flow diagrams in ***OPERATION*** section. 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 TEFLON* tape, paste, spray or similar lubricant is used, use extra care when tightening due to reduced friction.

*DuPont's Registered Trademark

NOTE: The exhaust and/or pressure lines may be restricted to control cylinder speed on 4−way (5/2) mode only.

⚠ 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 Series 8600, 8601, and 8602 for strainers.

Wiring

Wiring must comply with local codes and the National Electrical Code. The open−frame solenoid may be rotated 360°. The open−frame solenoid is provided with 1/4″ spade terminals and a grounding spade terminal connection.

NOTE: Valves can be converted from alternating current (AC) to direct current (DC), or vice−versa, by changing the coil.

Solenoid Temperature

Series 8551 valves are supplied with coils designed for continuous duty service. When the solenoid is energized for a long period, the solenoid coil becomes hot and can be touched with the hand only for an instant. 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 valve, and vent fluid to a safe area before inspecting or servicing the valve.

Preventive Maintenance

- Prepare and follow a routine inspection schedule based on the media, environment, and frequency of use.
- Keep the medium flowing through the valve as free from dirt and foreign material as possible. Depending on medium and service conditions, clean valve strainer or filter as required to keep the valve free of contamination. In the extreme case, contamination will cause faulty valve operation and the valve may fail to shift.
- While in service, the valve should be operated at least once a month to ensure proper operation.

Causes of Improper Operation

- **Incorrect Pressure:** Check valve pressure. Pressure to valve must be within range specified on nameplate.
- **Faulty Control Circuits:** 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 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.
- **Low Voltage:** Check voltage across the coil terminals. Voltage must be at least 85% of nameplate rating

Coil Replacement

1. Disconnect grounding and supply wires from coil.
2. Remove retaining clip and slip coil off the plugnut/core tube assembly.
3. Install new coil and replace retaining clip.
4. Make electrical hookup to coil.

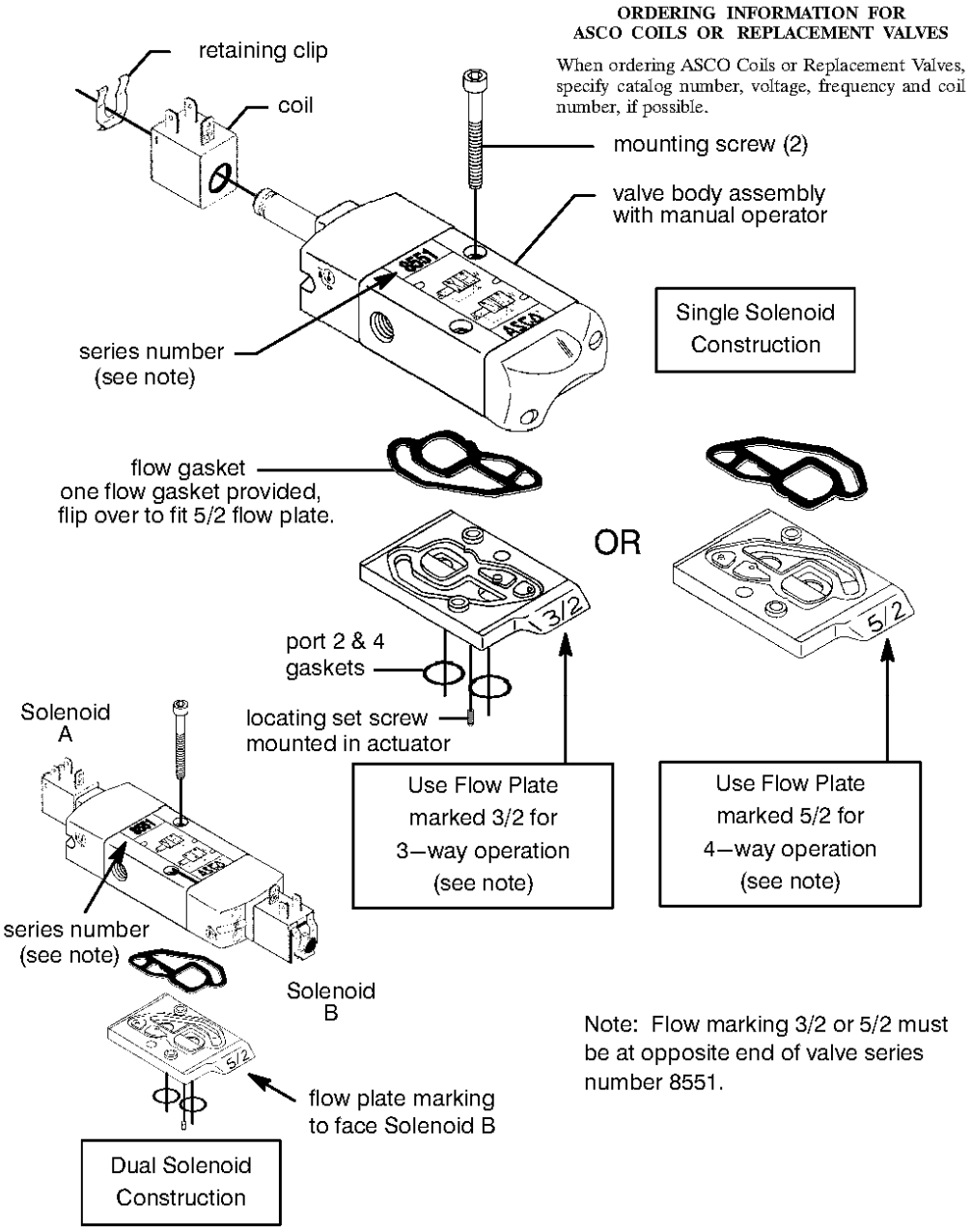


Figure 3. Series 8551 shown with prefix SC coil.

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metso automation

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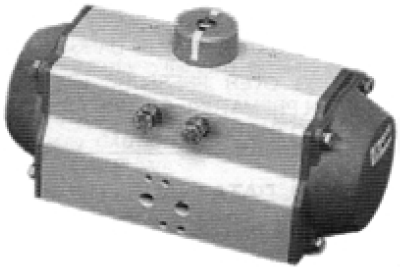
Issue Date: 10/02

INSTALLATION, MAINTENANCE, AND OPERATING INSTRUCTIONS



VALV-POWR® VPVL MOD B VALUE-LINE® DOUBLE-OPPOSED PISTON ACTUATORS

Read entire instructions carefully before installation or servicing

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1 GENERAL

This instruction manual contains important information regarding the installation, operation, and troubleshooting of the Jamesbury *VALV-POWR* VPVL Mod B *VALUE-LINE* Double-Opposed Piston Actuators. Please read these instructions carefully and save them for further reference.

1.1 WARNING

1. KEEP HANDS AND CLOTHING AWAY FROM THE VALVE PORTS AND ACTUATOR PINION AT ALL TIMES.
2. DO NOT ATTEMPT TO DISASSEMBLE INDIVIDUAL SPRING CARTRIDGES. DISASSEMBLY OF THE CARTRIDGE MAY RESULT IN SERIOUS PERSONAL INJURY. IF MAINTENANCE OF THE CARTRIDGE IS NECESSARY, IT MUST BE RETURNED TO METSO AUTOMATION.
3. SHUT OFF AND BLEED ALL SUPPLY LINES BEFORE INSTALLATION OR SERVICING. DO NOT REMOVE END CAPS WHILE THE ACTUATOR IS PRESSURIZED.
4. BEFORE INSTALLING THE VALVE AND ACTUATOR, BE SURE THAT THE INDICATOR ON TOP OF THE ACTUATOR CORRECTLY SHOWS THE VALVE POSITION. FAILURE TO ASSEMBLE THESE PRODUCTS TO INDICATE THE CORRECT VALVE POSITION COULD RESULT IN PERSONAL INJURY.
5. AN ACTUATOR MUST BE SIZED ACCURATELY FOR PROPER OPERATION. REFER TO INFORMATION ON ACTUATOR OUTPUT TORQUES IN THIS BULLETIN AND VALVE TORQUE REQUIREMENTS IN THE APPROPRIATE VALVE BULLETIN.
6. OPERATING THE ACTUATOR OVER TEMPERATURE LIMITS MAY DAMAGE INTERNAL AND EXTERNAL COMPONENTS (DISASSEMBLY OF SPRING RETURN ACTUATORS MAY BE DANGEROUS).
7. OPERATING OVER PRESSURE LIMITS MAY RESULT IN PREMATURE FAILURE AS WELL AS DAMAGE TO THE HOUSING.

2 TECHNICAL DATA

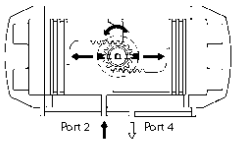
1. **Operating Media:** Dry or lubricated air, non-corrosive and inert gas, or light hydraulic oil.
2. **Air Supply:** 116 psi (8 bar) Maximum.
3. **Temperature:**

   Standard; -4˚ to 175˚F (-20˚ to 80˚C)

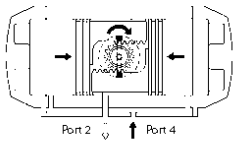
   Viton O-rings: -4˚ to 300˚F (-20˚ to 150˚C)

   Silicon O-rings: -40˚ to 175˚ F (-40˚ to 80˚C)
4. **Lubrication:** Factory lubricated for the life of the actuator under normal operating conditions.
5. **Construction:** Suitable for indoor and outdoor use.
6. **External Travel Stops:** ±4 degree adjustment on 90 degree stroke.

Double-Acting (Top View)



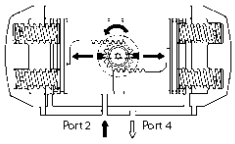
Air supplied to **Port 2** forces pistons apart and toward end positions with exhaust air exiting at **Port 4** (a counterclockwise rotation is obtained).



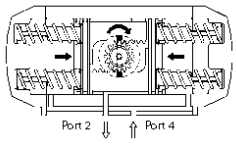
Air supplied to **Port 4** forces pistons toward center with exhaust air exiting at **Port 2** (a clockwise rotation is obtained).

Figure 1

Spring-Return (Top View) Spring-to-Close



Air supplied to **Port 2** forces pistons apart and toward end position, compressing springs. Exhaust air exits at **Port 4** (a counterclockwise rotation is obtained).



Loss of air pressure allows springs to force pistons toward center position with exhaust air exiting at **Port 2** (a clockwise rotation is obtained).

Figure 2

3 INSTALLATION

3.1 General

1. Check to see that the desired failure mode is correct **(Figures 1 & 2)**.In the spring-to-close mode, the actuator will cycle clockwise to close upon loss of pressure. If the spring-return actuator is not set up in the configuration desired, follow the disassembly procedure section 4.2. Reverse the orientation of the pistons, then reassemble following the assembly procedure, section 4.3.

2. Mount the actuator to the valve, following the direction in the linkage AMI or valve IMO.

3. Connect a regulated air supply to the NPT fitting in the actuator housing. **CAUTION: The maximum operating pressure is 116 psi (8 bar).**

4. Adjust the stop screws following assembly section 4.3.5. Stops can be adjusted by up to ±4 degrees.

3.2 Operation

1. The actuator series, size, operating pressure, output torque, spring directions, and drive type is determined by the actuator designation.

2. The label lists the actuator series, size, operating pressure, maximum pressure, and serial number. Actuator designation example, VPVL300 SR6 B F07-N-L-19, is a spring-return series, VPVL300 double-opposed piston actuator that has 80-psi (5.5-bar) springs, a Teflon® - coated anodized housing (protection B), an end-of-stroke output torque of 41.1 FT•LBS (55.7 N•m), mounts via an F07 pattern, and uses a 19-mm female parallel square to drive the valve.

4 MAINTENANCE

4.1 General

NOTE: All VPVL actuator fasteners are metric. Under normal operating conditions the actuator requires only periodic observation to ensure proper adjustment. Service kits are available to replace seals and bearings (soft parts). These parts are identified in **(Figure 20)** and listed in **(Table 3)**. Table 1 below lists kit part numbers.

TABLE 1

Actuator	Service Kit	Actuator	Service Kit
VPVL01/011	RKP-152	VPVL-450	RKP-160
VPVL050/051	RKP-153	VPVL-500	RKP-161
VPVL100	RKP-154	VPVL-550	RKP-162
VPVL200	RKP-155	VPVL-600	RPK-163
VPVL250	RKP-156	VPVL-650	RPK-164
VPVL300	RKP-157	VPVL-700	RPK-165
VPVL350	RKP-158	VPVL-800	RPK-166
VPVL400	RKP-159		

4.2 Disassembly

When disassembly of the actuator is required for maintenance, remove the actuator from the valve. Ensure proper lifting procedures are followed when moving or carrying actuators. **(Table 4)** lists the approximate weights of the VPVL actuators and provides outline dimensions for the double acting and spring return actuators. **CAUTION: Do not use the M5 VDE/ VDI mounting holes or the M6 hole in the pinion for lifting the actuator.**

When disassembling VPVL actuators, use caution and be certain that the actuator is free from accessories and the air supply is disconnected. When the actuator is a spring-return unit, make sure that the actuator is in the failed position before disassembling.

1. Removal of Position Indicator (19,20), (Figure 3):

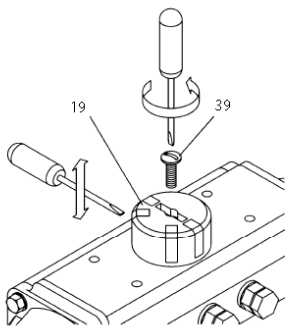


Figure 3

A. Remove cap screw if fitted (39).

B. Lift position indicator (19) off shaft; it may be necessary to pry gently with a screwdriver.

2. Removal of Stop Cap Screws (02), (Figure 4):

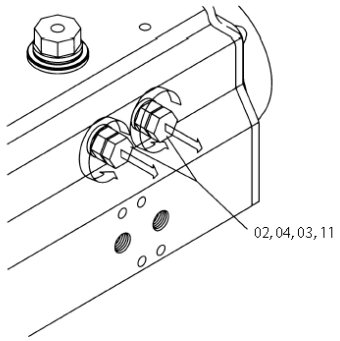


Figure 4

A. Remove both stop cap screws (02) together with nut (04) and washer (03).

B. Remove stop screw o-rings (11) and discard if replacing all soft parts.

3. End Cap (30, 31) Disassembly, (Figure 5):

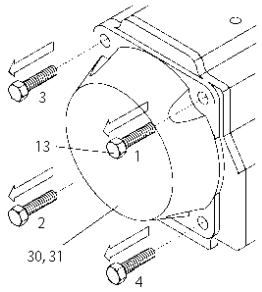


Figure 5

A. Remove the end cap bolts (13) in the sequence shown in **(Figure 5).** **CAUTION: When disassembling a spring return actuator, the end cap (30, 31) should be loose after unscrewing end cap bolts (13) 4-5 turns. If there is still force on the end cap (30, 31) after 4-5 turns of the end cap bolt (13), this may indicate a damaged spring cartridge and any further disassembly should be discontinued. Further disassembly of the end-caps may result in serious personal injury. Return actuator to Metso Automation for further maintenance.**

B. For spring return actuators, remove spring cartridges (17).

C. Remove end-cap o-rings (14) and discard if replacing all soft parts.

4. Piston (40) Disassembly, (Figure 6):

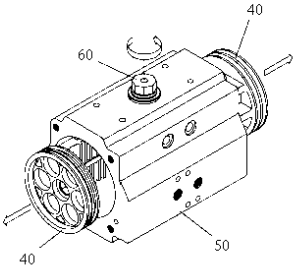


Figure 6

A. Holding the body (50) in a vice (or similar device), rotate the drive shaft (60) until the pistons (40) are released. **CAUTION: Air Pressure should not be used to remove the pistons from the body.** Clean and inspect the piston teeth for signs of wear. Replace piston if wear seems excessive.

B. Remove piston o-ring seal (16) using a screwdriver. Remove the piston head (15) and piston back (5) bearings. Discard bearings if replacing all soft parts.

5. Drive Shaft (60) and Bearing (6, 7) Disassembly, (Figure 7):

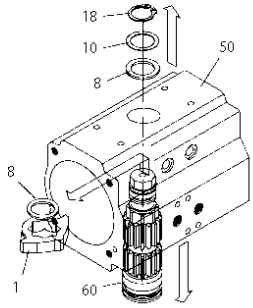


Figure 7

A. Remove spring clip (18) carefully, using snap-ring pliers. Remove external thrust bearing (8) and thrust washer (10).

B. Apply downward force to top of drive shaft (60) until it is partially out of the bottom of the body (50) and the octi-cam (1) and internal thrust bearing (8) can be removed. Remove the octi-cam (1) and internal thrust bearing (8). Push the drive shaft (60) completely out of the bottom of the body (50). If the shaft (60) does not move freely, gently tap with a plastic mallet.

C. Remove the top and bottom shaft bearings (6, 7) and top and bottom shaft o-rings (21, 22). Discard if replacing all soft parts.

6. Cleaning and Inspection.

A. When all components are disassembled, those not being replaced should be properly cleaned and inspected for wear prior to re-assembly.

4.3 Assembly

Prior to assembly, ensure that all components are clean and undamaged.

NOTE: **(Table 2)** lists the recommended *VALV-POWR* lubricants.

TABLE 2	
Recommended VPVL Lubricants	
General Use	Kluber UniGear LA 02 Grease
	Esso (Exxon) Beacon EP2
	Fina Marson EP L2
	Shell Alvania EP2
	Mobilux EP2
	Dyrdene Pyroplex EP2
	Oilsum Multiplex
O-Ring Areas	Dow-Corning Silicone 111

1. Drive Shaft (60) Assembly, (Figures 8 & 9):

A. Install the top and bottom shaft bearings (6, 7) and o-rings (21, 22) onto the shaft (60).

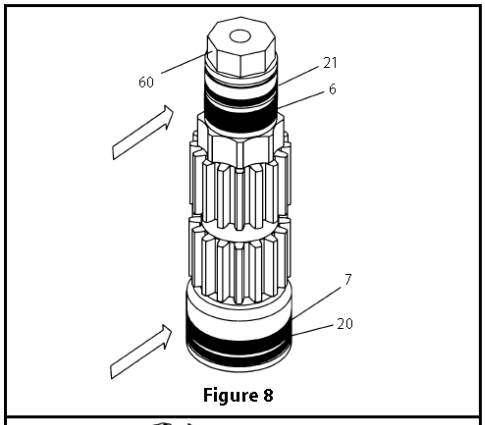


Figure 8

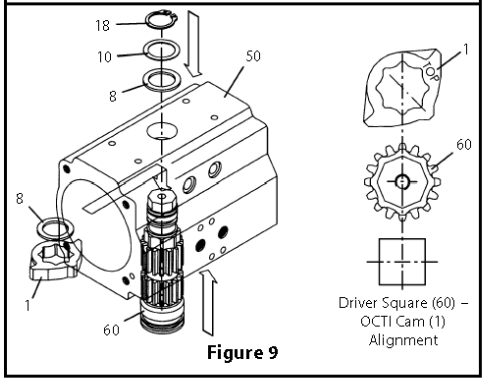


Figure 9

B. Apply grease to the shaft bearings (6, 7), using a general purpose grease listed in **(Table 2)**. Apply silicone grease to the shaft o-rings (21,22) using the recommended o-ring-area grease listed in **(Table 2)**.

C. Partially Insert the shaft (60) into the body (50). Install the octi-cam (1) onto the shaft in the orientation shown in **(Figure 9)**. The edges of the octi-cam (1) should align with the edges of the square in the bottom of the shaft (60). Insert the internal thrust bearing (8) over the octi-cam (1). Fully insert the shaft into the body (50).

D. Install the external thrust bearing (8), thrust washer (10), and the spring clip (18).

2. Piston (40) Assembly, (Figures 10 through 13):

A. Install the piston o-ring seal (16) and the piston head (15) and piston back (5) bearings.

B. Apply silicone grease to the internal bore of the body (50) using a recommended o-ring area grease listed in **(Table 2)**. Apply grease to the piston (40) rack teeth using a recommended general-purpose grease listed in **(Table 2)**.

C. Hold the body (50) in a horizontal position by inserting the top of the shaft in a vice, or inserting the bottom of the shaft connection into a male drive fitted into a vice as shown by **(Figure 10)**.

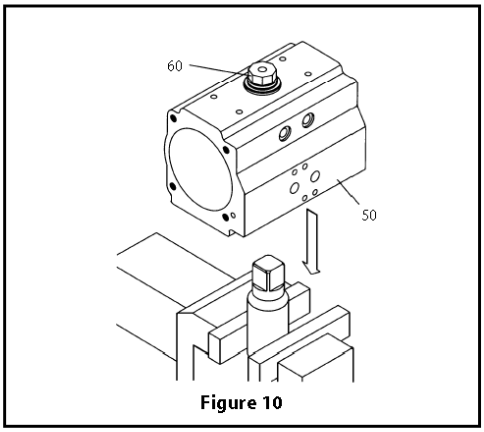


Figure 10

D. Ensure that the octi-cam (1) is in the correct position as shown by **(Figure 11)**.

E. For standard-rotation assembly (clockwise to close) rotate the body (50) 40-45˚ counterclockwise (if viewing the bottom of the actuator), or clockwise (if viewing the top of the actuator) as shown in **(Figure 12)**.

F. Press the two pistons (40) simultaneously into the body (50) until the piston racks are engaged and rotate the body clockwise (if viewing the bottom of the actuator), or counter-clockwise (if viewing the top of the actuator), until the stroke is completed.

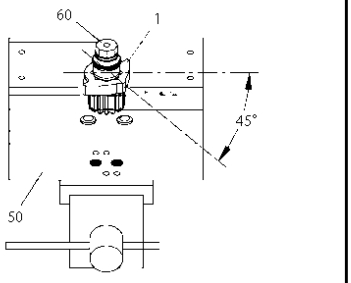


Figure 11

G. To ensure that the piston (40) teeth are evenly engaged, fully compress both pistons (40) inward and measure the distance from the edge of the body to the piston (40) face on each side, shown as dimension "A" in **(Figure 12)**. If a different value is obtained on each side, remove the pistons and repeat from step 2d.

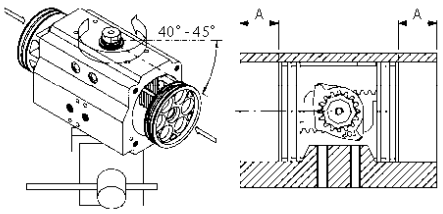


Figure 12

H. Temporarily install the position indicator (19) onto the shaft (60) to determine whether the correct stroke is obtained, Verify that the slot in the top of the position indicator (19) will rotate a minimum of 4° beyond the 90° vertical centerline of the actuator body (50) and a minimum of 4° beyond the 0° horizontal centerline of the actuator body as shown in **(Figure 13)**. If the proper stroke is not obtained, remove the pistons and repeat from step 2d. Once the proper stroke is verified, remove the position indicator (19).

3. End Cap (30, 31) and Spring Cartridge (17) Assembly, (Figures 14 through 16):

NOTE: In Models VPVP550 through 800 the end caps are symmetrical and use two item (30)s.

A. For spring-return actuators, insert the proper quantity of spring cartridges (17) according to the pattern shown in **(Figure 14)** (referring to the total number of springs). Insert spring cartridges (17) as shown in **(Figure 15)**.

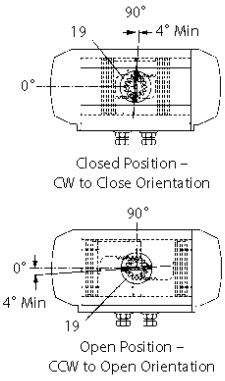


Figure 13

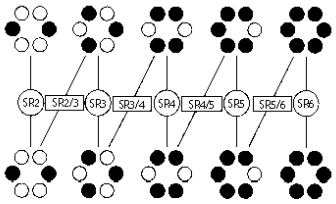


Figure 14

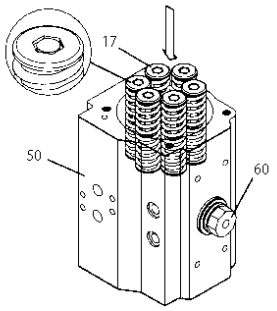


Figure 15

B. Apply silicone grease to the end-cap o-ring seals, using the recommended o-ring-area grease listed in **(Table 2)**. Fit the end-cap o-ring seals (14) into the groove in each end cap (30, 31).

C. Fit the end caps (30, 31) onto the body (50), verifying that the o-ring seals (14) remain in the grooves.

D. Insert all end-cap screws (13) and hand tighten. Complete tightening by following the sequence indicated in **(Figure 16)**.

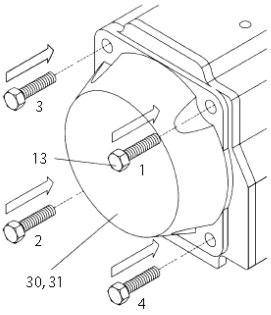


Figure 16

4. Assembly of Stop Screws (2) and Stroke Adjustment. (Figure 17):

A. Insert the nut (4), washer (3), and o-ring (11) onto the stop screws (2).

B. Screw the stop screws (2) into the body (50).

5. External Travel Stop Adjustment, (Figure 17):

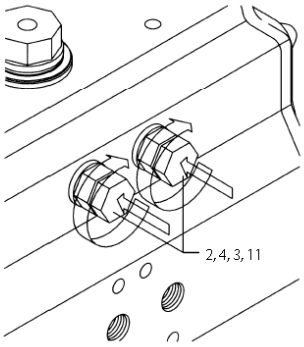


Figure 17

The stop adjustment screw (2) to the right controls the clockwise end of travel. The stop adjustment screw (2) to the left controls the counter-clockwise end of travel.

A. Cycle the actuator/valve to the clockwise end of travel and measure to determine if the valve is in the proper position. (In most applications this will be fully closed.)

B. If the valve is not in the correct clockwise position, turn the right stop adjustment screw (2) IN to reduce actuator travel, or OUT to increase actuator travel.

C. When the correct clockwise position is obtained, hold the adjusting screw (2) stationary while tightening the lock nut (4).

D. Cycle the actuator/valve to the counter-clockwise end of travel and measure to determine if the valve is in the proper position. (In most applications this will be fully opened.)

E. If the valve is not in the correct counter-clockwise position, turn the left stop adjustment screw (2) IN to reduce actuator travel, or OUT to increase actuator travel.

F. When the correct counter-clockwise position is obtained, hold the adjusting screw (2) stationary while tightening the lock nut (4).

6. Position Indicator (19, 39) Assembly. (Figure 18):

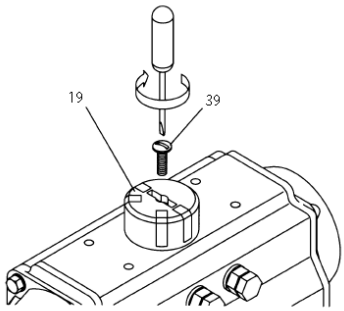


Figure 18

A. Fit position indicator (19) on the shaft (60), verifying that it indicates the correct actuator position.

B. Tighten cap screw (39) to secure the position indicator.

7. Setting 100% Adjustable Stop (If applicable). (Figure 19):

To limit the rotation on the stroke beyond the standard ±4˚ of a VPVL actuator, a stainless steel 100% adjustable travel stop option can be added. The stops, located in the end caps, allow the valve position to be set anywhere between full closed and full open. This option limits travel of only the couter-clockwise stroke for standard double-acting and spring-closed units.

Follow the proceeding steps in order to set the 100% adjustable travel stops.

Double Acting Actuators:

A. Back off one travel stop screw, leaving it partially threaded in the end cap. Entirely remove the other stop screw from the other end cap.

B. Open valve using air pressure. **NOTE:** actuator will leak due to removed travel stop.

C. Use the indicator pointer on top of actuator to determine if valve is open to desired position. If

not, repeat steps 1-3, backing off or screwing in stop screw to attain proper open position of valve.

D. Make sure O-ring is in proper position in countersunk area on end cap and the washer is in place. Tighten down nut to set stop position.

E. Thread in the other travel stop, making sure the O-ring and washer are in the correct place. When the travel stop will not thread any further, tighten nut to set stop position.

F. The previous steps set the open travel stop. See section 4.5 for instructions on setting the close position stop.

Spring Return Actuators:

A. Back off one travel stop screw, leaving it partially threaded in the end cap. Entirely remove the other stop screw from the other end cap.

B. Open valve using air pressure. Note actuator will leak due to removed travel stop.

C. Keeping air pressure applied to actuator, use the indicator pointer on top of actuator to determine if valve is open to desired position. If not, remove air pressure and repeat steps 1-3, backing off or screwing in stop screw to attain proper open position of valve.

D. Make sure O-ring is in proper position in countersunk area on end cap and the washer is in place. Tighten down nut to set stop position.

E. Thread in the other travel stop, making sure the O-ring and washer are in the correct place. When the travel stop will not thread any further, tighten nut to set stop position.

F. The previous steps set the open travel stop. See section 4.5 for instructions on setting the close position stop.

5 ACTUATOR STORAGE

If the actuators are not for immediate use, the following precautions must be taken for storage:

A. Store in a dry environment

B. It is recommended that the actuator be stored in its original box.

C. Do not remove the plastic plugs on the air supply ports.

6 REPAIR KITS/SPARE PARTS

For further information on spare parts and service or assistance visit our web-site at **www.Jamesbury.com.**

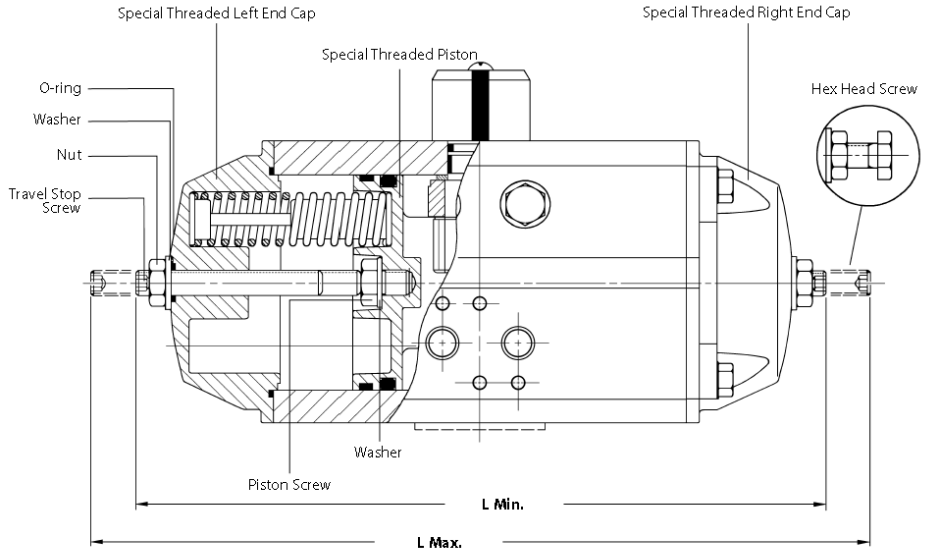


Figure 19

7 EXPLODED VIEW

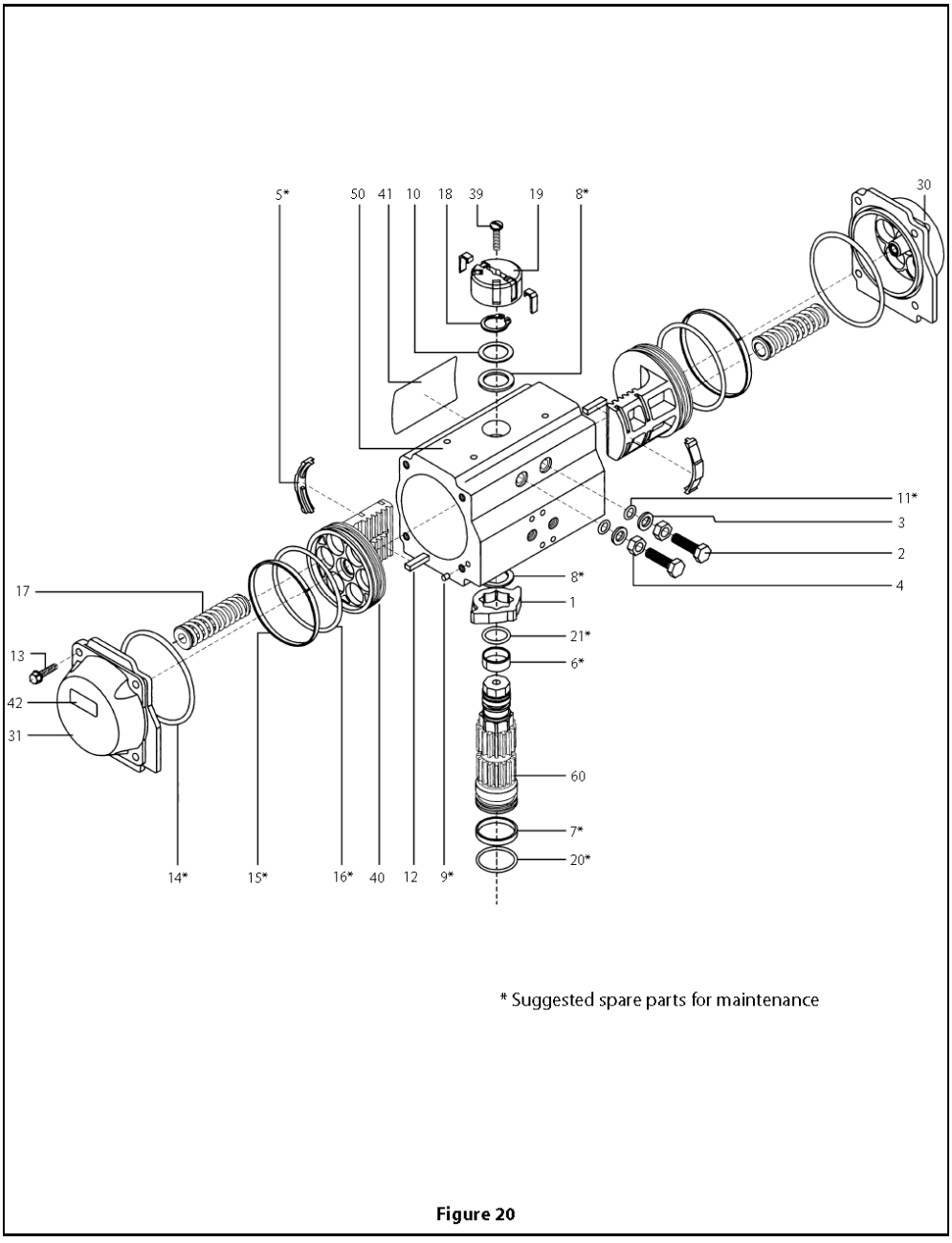


Figure 20

TABLE 3

PARTS LIST FOR (FIGURE 20)

Number	Quantity	Description	Material	Specificacions	Corrosion Protection
1	1	Octi-Cam (Stop Arrangement)	1.4021/GS400-15[1]	EN 10088-3/ISO 1083[1]	
2	2	Stop Cap Screw	B8 Cl.2	ASTM A193	
3	2	Washer (Stop Cap Screw)	A2	ISO 3506	
4	2	Nut (Stop Cap Screw)	A2-70	ISO 3506	
5*	2	Bearing (Piston Back)	PPA	Amodel ET1001HS	
6*	1	Bearing (Pinion Top)	PA46	Stanyl TW300	
7*	1	Bearing (Pinion Bottom)	PA46	Stanyl TW300	
8*	2	Thrust Bearing (Pinion)	PPA	Amodel ET1001HS	
9*	2	Plug (Tansfer Port)	NBR	NBR 70 Shore A	
10	1	Thrust Washer (Pinion)	1.4301	EN 10088-3	
11*	2	O-Ring (Stop Cap Screw Seal)	NBR	NBR 70 Shore A	
12	2	Piston Guide	PPA+45%GF	Amodel AS1145	
13	8/12/[2]	Cap Screw (End Cap)	A2-70	ISO 3506	
14*	2	O-Ring (End Cap)	NBR	NBR 70Shore A	
15*	2	Bearing (Piston Head)	PPA	Amodel ET1001HS	
16*	2	O-Ring (Piston)	NBR	NBR 70Shore A	
17	min. 4/ max. 12	Spring (Cartridge)	SiCr Spring Alloy Steel	DIN 1223 Part 2	Epoxy Coated
18	1	Spring Clip (Pinion)	C75	DIN 17222	ENP
19	1	Position Indicator	PP+30%GF	Hostalen PPN VP7790 GV 2/30	
20*	1	O-Ring (Pinion Bottom)	NBR	NBR 70Shore A	
21*	1	O-Ring (Pinion Top)	NBR	NBR 70Shore A	
30	1[3]	Right End Cap	GD-AlSi8.5Cu3.5FE	UNI 5075	Polyester
31	1[3]	Left End Cap	GD-AlSi8.5Cu3.5FE	UNI 5075	Coated
39	1	Cap Screw (Indicator)	A2-70	ISO 3506	
40	2	Pistons	GD-AlSi8.5Cu3.5FE	UNI 5075	Anodized
41	1	Actuator Identification Label	Polyester Aluminum		
42	2	End Cap Label	Polyester Aluminum		
50	1	Body	Alloy 6063	ASTM B221	Anodized PTFE Coated
60	1	Drive Shaft	A105	ASTM A105	ENP

* Suggested spare parts for maintenance

(1) AISI420 for models VPVL-050 through 300
GS400-15 for models VPVL-350 through 800

(2) Quantity - 8 pieces for models VPVL-050 through 600
Quantity - 12 pieces for models VPVL-700 through 800

(3) Only for models VPVL-500 through 800; right and left end-caps are symmetric

8 OUTLINE AND DIMENSIONS

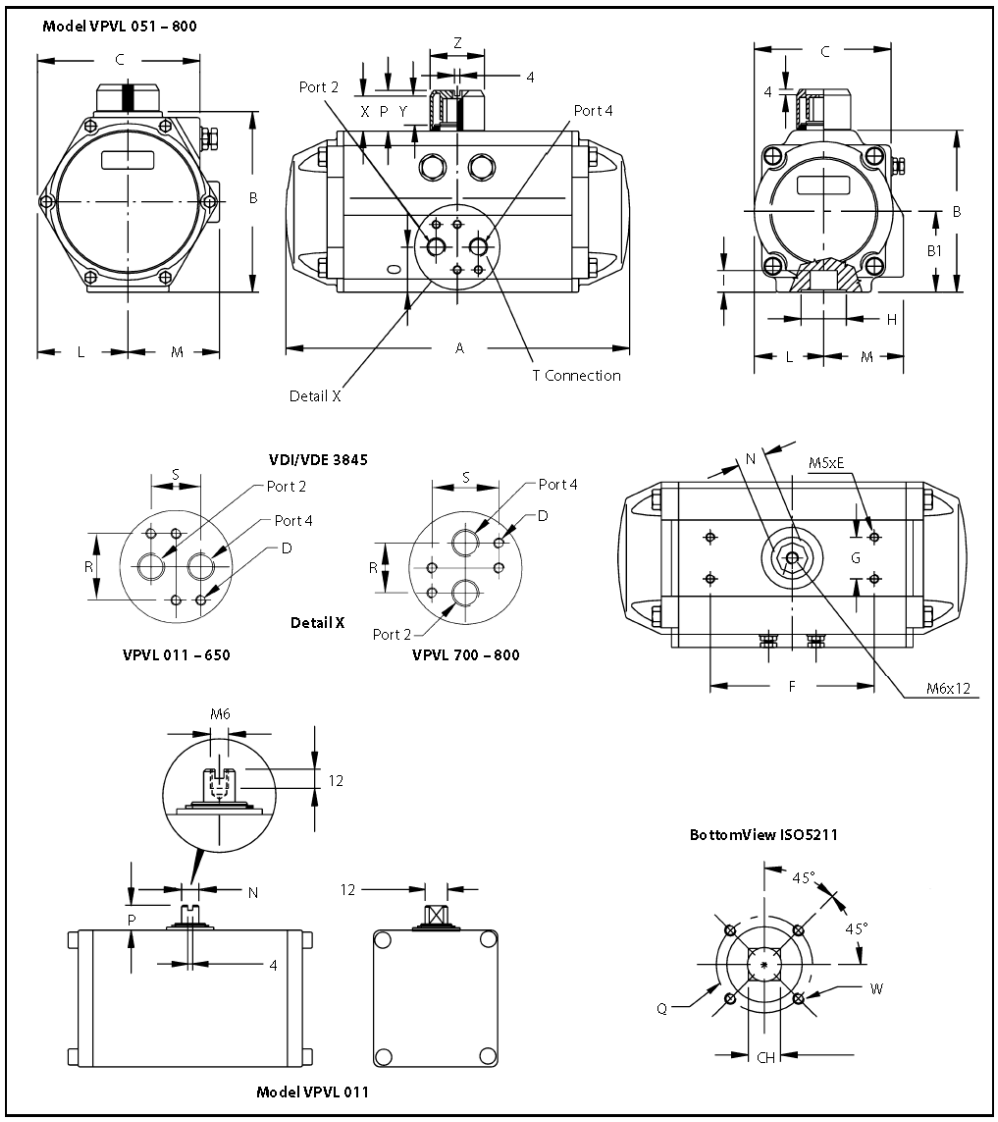
Dimensions- inches / lb.

Size	A	B	B1	C	D	E	F	G	H	I	L	M	N	O	P	Q	R	S	W	X	Y	T NPT	ISO Flange	CH	Z	Weight DA	Weight SR
011	4.50	1.70	0.00	1.70	M5x4	0.30	1.90	0.90	0.79	0.39	0.80	0.80	0.30	-	0.70	1.40	1.26	0.94	M5	—	—	1/8	F03	0.35	—	1.0	—
051	5.53	2.72	1.36	2.32	M5x8	0.16	3.15	1.18	0.98	0.47	1.14	1.63	0.43	1.04	0.79	1.40	1.26	0.94	M5	0.57	0.31	1/8	F03	0.43	1.57	2.1	2.3
100	6.24	3.35	1.67	2.83	M5x8	0.31	3.15	1.18	1.38	0.63	1.42	1.85	0.43	1.18	0.79	1.97	1.26	0.94	M6	0.57	0.31	1/8	F05	0.55	1.57	3.3	3.8
200	8.29	4.02	2.01	3.33	M5x8	0.31	3.15	1.18	1.38	0.63	1.67	2.05	0.75	1.20	0.79	1.97	1.26	0.94	M6	0.57	0.31	1/8	F05	0.55	1.57	5.9	7.0
250	9.74	4.53	2.26	3.84	M5x8	0.31	3.15	1.18	2.17	0.83	1.95	2.24	0.75	1.28	0.79	2.76	1.26	0.94	M8	0.57	0.31	1/8	F07	0.75	1.57	8.4	9.7
300	10.57	5.00	2.50	4.37	M5x8	0.31	3.15	1.18	2.17	0.83	2.20	2.64	0.75	1.48	0.79	2.76	1.26	0.94	M8	0.57	0.31	1/4	F07	0.75	1.57	11.9	14.3
350	12.40	5.71	2.85	5.00	M5x8	0.31	3.15	1.18	2.76	0.94	2.52	3.03	1.06	1.67	1.18	4.02	1.26	0.94	M10	0.96	0.57	1/4	F10	0.87	2.20	18.5	21.7
400	13.58	6.18	3.09	5.35	M5x8	0.31	3.15	1.18	2.76	0.94	2.74	3.23	1.06	1.77	1.18	4.02	1.26	0.94	M10	0.96	0.57	1/4	F10	0.87	2.20	22.5	27.8
450	16.08	6.97	3.88	6.16	M5x8	0.31	3.15	1.18	3.35	1.38	3.15	3.60	1.06	1.85	1.18	4.92	1.26	0.94	M12	0.96	0.57	1/4	F12	1.06	2.56	32	40
500	17.22	7.72	3.86	6.65	M5x8	0.31	3.15	1.18	3.35	1.38	3.46	3.90	1.06	2.05	1.18	4.92	1.26	0.94	M12	0.96	0.57	1/4	F12	1.06	2.56	44	53
550	19.17	8.68	4.39	7.51	M5x8	0.31	5.12	1.18	3.94	1.57	3.90	4.13	1.65	2.28	1.97	5.51	1.26	0.94	M16	1.75	0.79	1/4	F14	1.42	3.15	55	70
600	21.38	9.65	4.80	8.39	M5x8	0.31	5.12	1.18	3.94	1.57	4.33	4.41	1.65	2.44	1.97	5.51	1.26	0.94	M16	1.75	0.79	1/4	F14	1.42	3.15	78	99
650	24.45	11.75	5.93	9.88	M6x10	0.31	5.12	1.18	5.12	1.89	5.16	5.16	1.65	3.09	1.97	6.50	1.77	1.57	M20	1.75	0.79	3/8	F16	1.81	3.15	115	139
700	26.93	12.99	6.50	11.75	M6x10	0.31	5.12	1.18	5.12	1.97	6.44	6.54	1.65	6.50	1.97	6.50	1.77	1.57	M20	1.75	0.79	1/2	F16	1.81	3.15	183	225
800	34.39	16.14	6.50	15.08	M6x10	0.31	5.12	1.18	7.87	2.24	8.03	8.43	1.65	7.28	1.97	10.00	1.57	1.77	M16	1.75	0.79	1/2	F25	2.17	3.15	295	373

Dimensions- mm / kg

Size	A	B	B1	C	D	E	F	G	H	I	L	M	N	O	P	Q	R	S	W	X	Y	T NPT	ISO Flange	CH	Z	Weight DA	Weight SR
011	114	43	0.0	43	M5x4	8	48	23	20	10	20	20	8	-	18	36	32	24	M5	—	—	1/8	F03	9	—	0.45	—
051	140	69	34.5	59	M5x8	4	80	30	25	12	29	41	11	26	20	36	32	24	M5	14.5	8.0	1/8	F03	11	40	0.95	1.04
100	158	85	42.5	72	M5x8	8	80	30	35	16	36	47	11	30	20	50	32	24	M6	14.5	8.0	1/8	F05	14	40	1.5	1.7
200	211	102	51.0	85	M5x8	8	80	30	35	16	42	52	19	30	20	50	32	24	M6	14.5	8.0	1/8	F05	14	40	2.7	3.2
250	247	115	57.5	98	M5x8	8	80	30	55	21	50	57	19	33	20	70	32	24	M8	14.5	8.0	1/8	F07	19	40	3.8	4.4
300	268	127	63.5	111	M5x8	8	80	30	55	21	56	67	19	38	20	70	32	24	M8	14.5	8.0	1/4	F07	19	40	5.4	6.5
350	315	145	72.5	127	M5x8	8	80	30	70	24	64	77	27	42	30	102	32	24	M10	24.5	14.5	1/4	F10	22	56	8.4	9.8
400	345	157	78.5	136	M5x8	9	80	30	70	24	70	82	27	45	30	102	32	24	M10	24.5	14.5	1/4	F10	22	56	10	13
450	408	177	98.5	156	M5x8	8	80	30	85	35	80	91	27	47	30	125	32	24	M12	24.5	14.5	1/4	F12	27	65	15	18
500	437	196	98.0	169	M5x8	8	80	30	85	35	88	99	27	52	30	125	32	24	M12	24.5	14.5	1/4	F12	27	65	20	24
550	487	220	111.5	191	M5x8	8	130	30	100	40	99	105	42	58	50	140	32	24	M16	44.5	20.0	1/4	F14	36	80	25	32
600	543	245	122.0	213	M5x8	8	130	30	100	40	110	112	42	62	50	140	32	24	M16	44.5	20.0	1/4	F14	36	80	35	45
650	621	298	150.5	251	M6x10	8	130	30	130	48	131	131	42	78	50	165	45	40	M20	44.5	20.0	3/8	F16	46	80	53	64
700	684	330	165.0	298	M6x10	8	130	30	130	50	164	166	42	165	50	165	45	40	M20	44.5	20.0	1/2	F16	46	80	83	102
800	876	410	165.0	383	M6x10	8	130	30	200	57	204	214	42	185	50	254	40	45	M16	44.5	20.0	1/2	F25	55	80	134	169

12



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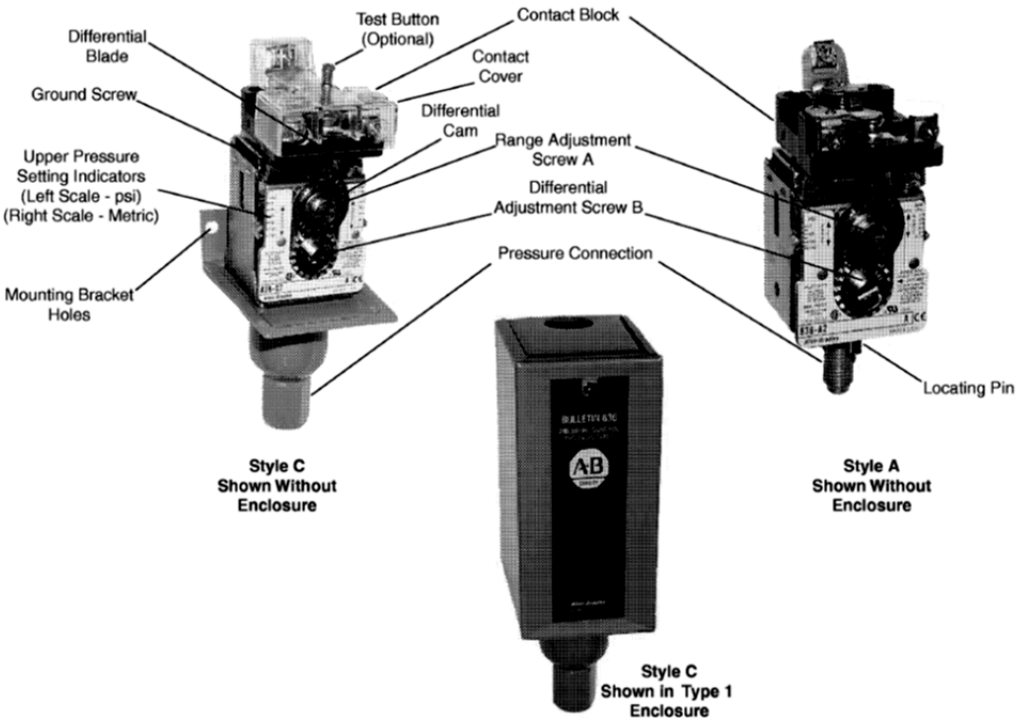
BULLETIN 836
INSTRUCTIONS

Pressure Controls



Style C Shown Without Enclosure

Style A Shown Without Enclosure

Style C Shown in Type 1 Enclosure

DESCRIPTION - Bulletin 836 Pressure Controls are designed for use with air, water, oil and other noncorrosive liquids, vapors, and gasses. (Type 316 stainless steel bellows are available for more corrosive liquids or gasses in pressure ranges to 375 psi.)

Bulletin 836 Controls are available in Type 1, 4 & 13, 4X, 7 & 9, 4 &13 combination enclosures in addition to open type. The operating range pressure and differential are adjustable. Fixed differential versions are also available. Pressure ranges available from 30 in. Hg vacuum to 900 psi.

The standard contact block is single pole, double throw and can be wired to open or close on increasing or decreasing pressure.

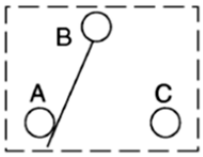
CONTACT RATINGS

Non-Inductive Ratings	Control Circuit Ratings
5 Amperes, 250 Volts	AC-125 VA 24 to 600 Volts
3 Amperes, 600 Volts	DC-57.5 VA 115 to 230 Volts

Manual reset, horsepower rated and other contact block modifications are also available on devices manufactured at the factory.

OPERATION - A low friction, straight in-line mechanism operates a snap action switch at a predetermined pressure setting. An increase in pressure causes the normally closed circuit A-B to open and normally open circuit B-C to close. This is known as the "Trip" pressure. When the pressure returns to a lower predetermined setting, the circuit A-B will close and circuit B-C will open. This is known as the "Reset" pressure. The difference between the "Trip" and "Reset" pressure is the differential.

For controls which operate in a vacuum, the following sequence occurs: 1) an increase in vacuum (lower pressure toward 30 in Hg) causes circuit A-B to close and B-C to open. This is the "Trip" setting. 2) when the pressure returns to a predetermined lower vacuum (higher pressure toward 0 psi.), circuit A-B will open and B-C will close. This is the "Reset" point. The difference between the "Trip" and "Reset" setting is the differential.



Standard Contact Arrangement For Positive Pressure

40060-217-01 (5)
Printed in U.S.A.

ADJUSTMENT - Generally, unless otherwise specified, controls shipped from the factory are set at the maximum operating range pressure and minimum differential.

The following procedure should be used to set the control to a particular requirement:

OPERATING RANGE ADJUSTMENT: Turn range adjustment Screw "A" counterclockwise to lower the upper and lower pressure settings. To increase the upper and lower settings, turn Screw "A" clockwise. The approximate upper pressure setting is shown by indicators on the outer edges of the nameplate.

DIFFERENTIAL ADJUSTMENT: When the differential blade is at the low point of the differential cam the control will function at minimum differential. To increase the differential, turn adjustment Screw "B" counterclockwise. This will decrease the lower pressure setting only. To decrease the differential, turn differential adjustment Screw "B" clockwise. This will raise the lower setting only.

Condensed instructions are supplied with open style controls and are on the inside of the cover of enclosed devices.

NOTE: The use of a pressure gauge is desirable when setting the control.

CAUTION: The range adjustment Screw "A" should not be adjusted beyond the pressure indicated on the pressure scale as this may cause the control to malfunction.

It is recommended that a periodic inspection of gauge pressure be made and the pressure control adjusted to compensate for application variables.

BELLOWS LIFE: The pressure applied to a bellows in a normal cycle of operation should not exceed the maximum rated Range Pressure. The bellows will withstand the rated Maximum Line Pressure but should not be cycled at this pressure. The control is designed to operate within published rated Range Pressure. For general applications a control used within 30% to 80% of Range Pressure will provide optimum bellows life and repeatability.

IMPORTANT: Bulletin 836 Style A pressure controls are normally supplied with a built in pulsation snubber. Bulletin 836 Style C devices are supplied with a removable snubber. The snubber can be removed for inspection, cleaning, or when using the control with high viscosity fluids. The snubber can be removed with a 1/4 inch nut wrench, or equivalent.

The pulsation snubber is designed to help reduce pressure transients. Transients can vary in amplitude, frequency, and duration and if not controlled with a snubber can reduce bellows life.

Pressure systems and lines must be maintained and kept free of foreign particles in air lines and sludge in fluid lines. A restricted or clogged pulsation snubber can cause the pressure control to become inoperative.

MOUNTING: The pressure control should be mounted securely to a firm base using two mounting screws. The mounting holes are provided either in the base of the enclosure or in a convenient mounting bracket which is provided as part of the open Style C control. Mounting brackets are available for the open type Style A control.

CAUTION: The control should not be supported by the electrical and pressure connections only. A support wrench should be used when tightening the electrical hub and pressure connections. The enclosed device or open type control using a mounting bracket is not intended to support connecting equipment. This equipment must be secured to support weight and to reduce vibration.

CAUTION: If a liquid thread sealant is used on the pressure connection, care must be taken to avoid excess sealant from getting into bellows orifice.

PILOT LIGHT OPTION - A high intensity neon glow pilot light is available for 120 volt, 60 hertz applications. A 24 volt DC LED pilot light is also available. The pilot light is factory wired across the N.C. contacts, circuit A-B and can easily be converted to the N.O. contacts, circuit B-C, on the standard contact block .

Unless a third wire is made available, the pilot light is connected across the load contacts which can be either the N.O. or N.C. contacts. The pilot light is on until the load is energized.

Current rating:
120 VAC high intensity neon glow . . . . . 4 mA
24 VDC high intensity LED . . . . . 22 mA

ATTENTION - To prevent electrical shock, disconnect from power source before installing or servicing.

CAUTION - For 24 VDC LED pilot lights, polarity must be observed. Red (+) lead of pilot light should always be connected to rear terminal (B)

To order pilot light version add X9 (120VAC), X15 (24VDC) or X18 (24VDC) to catalog number of the selected control.

REPAIRS - Due to the integral construction of the Bulletin 836 Pressure Control, only limited repairs can be made in the field. If returned to the factory for repairs, the condition of the control will be evaluated to determine economic feasibility. When practical, the control will be repaired, factory adjustments made for optimum performance and tested to specifications.

CONTACT BLOCK REPLACEMENT - To order the Bulletin 836 Contact Block replacement Kit, specify Catalog Number 836-N2.

Rockwell Automation

MATERIAL SAFETY DATA SHEET

I. PRODUCT IDENTIFICATION

Trade name (as labeled) DURABLA BLACK (Compressed Gasket Material)

MANUFACTURER'S NAME DURABLA MANUFACTURING COMPANY

Address (complete mailing address): 140 Sheree Blvd., P. O. Box 700, Lionville, PA 19341

Phone number for additional information: 610-363-8900

Date prepared or revised 9/15/94 (REV) Name of preparer*

II. HAZARDOUS INGREDIENTS

Chemical Names	CAS Numbers	Percent*	Exposure Limits in Air (give units)		
			ACGIH TLV	OSHA PEL	Other (specify)
Chrysotile Asbestos	1332-21-4	Approx. 80%	0.2 f/cc	0.2 f/cc	

III. PHYSICAL PROPERTIES

Vapor density (air=1) N/A
Specific gravity 1.9
Solubility in water Insoluble
Vapor pressure, mmHg at 20 °C N/A
Melting point or range, °F N/A
Boiling point or range °F N/A
Evaporation rate (butyl acetate = 1) N/A
Appearance and odor: Asbestos is white and odorless, but is contained in a Styrene-butadiene or Nitrile (NBR) rubber binder which may be black or slate gray.

HOW TO DETECT THIS SUBSTANCE* (warning properties of substance as a gas, vapor, dust or mist)

*Not a required category

Note: All required categories should be addressed. If any item is not applicable, or no information is available, the space must be marked to indicate that.

The information contained herein is based on data provided from suppliers of the materials used and not on the mixture itself, and is believed to be correct. However, no warranty is expressed or implied regarding the accuracy of the data. Since the information contained herein may be applied under conditions beyond our control, the persons receiving it shall make their own determination of the suitability of the product for their particular purposes.

IV. FIRE AND EXPLOSION

Flash Point, °F (give method) N/A

Auto ignition temperature, °F N/A

Flammable limits in air, volume %: N/A lower (LEL) N/A upper (UEL) N/A

Fire extinguishing materials:

X water spray X carbon dioxide ____ other:

X foam X dry chemical

Special firefighting procedures: Non-combustible material. Type of fire will determine extinguishing material to be used.

Unusual fire and explosion hazards: Direct flame may ignite. Material contains rubber, which will burn slowly, emitting thick smoke. Self-contained breathing apparatus should be worn.

V. HEALTH HAZARD INFORMATION

SYMPTOMS OF OVEREXPOSURE for each potential route of exposure

Inhaled: Early symptom of asbestos overexposure may be reduced breathing capacity.

Contact with skin or eyes: Not probable route of overexposure.

Absorbed through skin: Not probable route of overexposure.

Swallowed: Not probable route of overexposure.

HEALTH EFFECTS OR RISKS FROM EXPOSURE. Explain in lay terms. Attach extra page if more space is needed.

Acute: None

Chronic: Exposure to high concentrations of asbestos dust increases risk of developing lung disease. Smokers are at greater risk.

FIRST AID: EMERGENCY PROCEDURES

Eye Contact: N/A

Skin Contact: N/A

Inhaled: N/A

Swallowed: N/A

SUSPECTED CANCER AGENT?

____NO: This product's ingredients are not found in the lists below.

YES: X Federal OSHA X NTP X IARC

California employers using Cal/OSHA - regulated carcinogens must register with Cal/OSHA. The Cal/OSHA and Federal OSHA carcinogen lists are similar.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE

Asbestos may aggravate some medical conditions. For example, workers with emphysema can be affected.

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VI. REACTIVITY DATA

Stability: __X__ Stable _____ Unstable

Conditions to avoid:

Incompatibility (materials to avoid): No known substances that reaction to would constitute a health hazard. Refer to product literature for application related limitations.

Hazardous decomposition products (including combustion products): None

Hazardous polymerization: _____ May occur __X__ Will not occur

Conditions to avoid: None

VII. SPILL, LEAK AND DISPOSAL PROCEDURES

Spill response procedures (include employee protection measures):

During removal, the used gasket should be wetted and its residue placed in impermeable bags for disposal. Small particles should be vacuumed with an approved system.

Preparing wastes for disposal (container types, neutralization, etc.):

Regular methods

NOTE: Dispose of all wastes in accordance with federal, state and local regulations.

VIII. SPECIAL HANDLING INFORMATION

Ventilation and engineering controls: Provide adequate ventilation if PEL/TLV is exceeded.

Respiratory protection (type): Unnecessary under normal use. However, approved (non-disposable) respirators are necessary if permissable exposure levels (PEL/TLV) are exceeded. Refer to 29 CFR 1910.1001 for respirator selection.

Eye protection (type): Unnecessary under normal use.

Gloves (specify material): Normally not required.

Other clothing and equipment: Unnecessary under normal conditions.

Work practices, hygenic practices: The storage, handling or cutting of Durabla Black gasket material with a sharp blade or die, or the installation of a cut gasket, will not emit asbestos fibers in excess of the current OSHA action level limit. In removing a used gasket, we recommend using a gasket removal agent. If the user has reason to believe that asbestos fibers have been released, clean-up should be accomplished by using a vacuum cleaner equipped with a HEPA filter. No smoking, eating or drinking in work areas. Processes using drilling, grinding or sawing must be avoided.

Other handling and storage requirements: Store material in dry, ventilated areas.

Protective measures during maintenance of contaminated equipment:

Do not drill, saw, grind, sand or subject material to any dust-producing process without adequate dust extraction or wetting down. Approved respirators should be worn during operations which will release asbestos fibers in excess of PEL/TLV limits.

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E AppendixDecommissioning/Disposal

Oxygen Generator Decommissioning and Disposal Guideline

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.

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