

MCS-500 ANSI Installation, Operation & Maintenance

Description 1
 Specifications 1
 Service Requirements 1
 Materials of Construction 1
 Connections 1
 Elastomers 1
 Design Pressures 1
 Design Temperature 1
 Filter Volume 1
 Airborne Noise Emissions 1
 Installation 1
 Transportation 2
 Securing to Foundation 2
 Connecting to Process Piping 2
 Checklist 2
 Commissioning Procedure 2
 Operation 2
 Operational Modes 2
 Straining 2
 Screen Cleaning 2
 Purging 2
 Inspection, Disassembly & Reassembly 3
 Cleaning Disc 3
 Element 5
 Bearing 5
 Maintenance 6
 Maintenance Schedule 6
 Weekly 6
 Monthly 6
 Troubleshooting 6
 Symptoms 6
 Possible Faults 6

Description

Each filter station of a High Flow MCS strainer system consists of a cylindrical stainless steel filter screen sealed within a stainless steel strainer vessel. Unfiltered process fluid enters the strainer vessel through the upper port. The process fluid enters the inside of the strainer screen from above and the filtrate flows through the screen, exiting the filter vessel through the lower port. Contaminants are trapped on the inside of the screen. The contaminants are periodically scraped from the surface of the screen by a cleaning disc which travels across the surface of the screen. These contaminants are deposited in a collection chamber at the bottom of the strainer vessel where they are periodically purged out of the bottom port of the filter vessel.



WARNING: This filter is a pressure vessel designed to operate under specific pressure, temperature, and other engineering parameters. There is a risk of explosion, process fluid leakage or electrical shock if the requirements set forth in this Manual are not

followed during either installation, operation, inspection or servicing of this equipment. Equipment should be shut down and isolated from energy sources and other equipment before any inspection or servicing to prevent risk of shock or process fluid leakage. Appropriate PPE required. **FAILURE TO FOLLOW THIS WARNING COULD LEAD TO DEATH, SEVERE INJURY OR PROPERTY DAMAGE.**

Specifications

The general specifications for a typical MCS-500 strainer system are:

Service Requirements

Electrical: 115 V AC or 230 V AC 50/60 Hz
 Air: Minimum 60 PSIG (4 bar), Maximum 116 PSIG (8 bar) at 5.0 cfm (141.5 L·min) clean, dry, non-lubricated air.

Materials of Construction

All welded and wetted materials are type 316/316L stainless steel. *The material selection for this vessel is specified by the customer. It is the customer's responsibility to ensure material compatibility with process and environment conditions. SPECIFICATION OF INCOMPATIBLE MATERIALS MAY LEAD TO PRODUCT FAILURE, LEAKAGE, DEATH, SEVERE INJURY OR PROPERTY DAMAGE.*

Connections

Process inlet & outlet: 6" 150# ANSI raised face flange (standard)
 Purge: 1½" NPTI

Elastomers

EPT/EPDM (Nordel™), and Viton® are available.

Design Concentration

Process stream should contain less than 200 PPM of strainable solids.

Design Pressures

Service: 150 PSIG (1035 kPa) maximum, 30 PSIG (207 kPa) minimum.
 Differential: Maximum differential pressure for slotted media is 110 PSID (496 kPa).

Design Temperature

Temperature limits vary based on process liquid, magnetically coupled actuator, elastomers and cleaning disc materials. Normally this temperature is limited to 180 °F (82 °C).

- Magnetically coupled actuator: 180 °F (82 °C) maximum.
- Process Liquid: above freezing point and below atmospheric boiling point temperatures. **DANGER:: To prevent BLEVE (Boiling Liquid Expanding Vapor Explosion) do not filter pressurized liquids above their atmospheric boiling point temperature.**
- Maximum temperature elastomers and cleaning disc: Viton®, EPT and Delrin all exceed 180 °F (82 °C)

Filter Volume

Strainer vessel: 18.7 US Gallons (70.8 L)
 Purge chamber: 0.56 US Gallons (2.1 L)

Airborne Noise Emissions

<70 dB(A) During normal operation

Installation

This document applies to the installation of the strainer vessel. See additional instructions for the installation of any strainer unit controls.

Transportation

Move the strainer system as close as possible to the installation site before it is removed from the crate or skid. Position the filter frame on a prepared, level foundation. Level the strainer frame before it is anchored to the foundation.

Securing to Foundation

Anchor the strainer frame to the foundation using the three, 3/4" [19mm] diameter anchor holes located at the base of the frame. Connect the stand grounding tab to a suitable earth ground point.

WARNING: Do not remove vessel from included frame assembly. The unit is not intended to self-support by the process connections.

Connecting to Process Piping

1. Attach the inlet and outlet connections to the interconnecting piping (customer supplied). Take care to avoid excessive nozzle loading at the filter connections. Consult your pump manufacturers' installation guide for minimum pipe run length between the pump outlet and the inlet of the filter unit.



Notice: Isolation/block valves (supplied by others) are required on all process connections on the strainer unit. These valves allow the strainer to be isolated from the process liquid in the event that service is required. Pressure gauges are also recommended on all process connections.

2. Connect the drain line (customer supplied) to the strainer unit purge valve. To avoid restricting purge flow, the drain line should be the same size as the purge valve or larger, as short as possible and on a lower grade than the purge valve.

Checklist

- Verify that all process connections are secure and free of leaks.
- Check the condition of the strainer element. It should be clean and free of damage.
- Confirm that the top and bottom element seals are installed properly.
- Confirm that the element hold-down bar and 3/8-16 socket head cap screws are installed properly.
- Verify that the cleaning disc can be activated manually and automatically if so equipped.
- Verify that the o-ring sealing the lid to the strainer vessel is in good condition and properly installed.
- Verify that all lid bolts are tight. The lid bolt torque spec is 45 ft/lbs. Do not over tighten. Damage may occur to the lid o-ring and flange surfaces if overtightened.
- Verify that the purge valve is closed.
- Check that the purge discharge line is directed in a suitable fashion to accept waste when purged.

Commissioning Procedure

1. Inspect the piping connections to the strainer. Verify that the inlet connection on the strainer is connected to the pipe containing the incoming process fluid. Repeat this procedure for the outlet and purge connections.
2. All isolation valves to the strainer should be closed. If there is a bypass loop around the strainer, that loop should be closed to prevent back flushing dirty process fluid into the strainer.
3. Open the isolation valve for the outlet piping.
4. If this strainer is supplied with a control package, turn on the power to the strainer system controls.

5. Open the inlet isolation valve to allow approximately 25% of the flow to reach the strainer.



Notice: Opening the inlet valve to the fully open position without proper ramping may cause particles to become wedged into the strainer screen. If this happens, the screen will have to be removed and cleaned manually.

6. Over the next ½ hour, slowly introduce more of the flow until you reach 100%. You may want to manually initiate a purge during this time to ensure that piping debris is cleaned from the unit.

Operation



Notice: Do not exceed 180 °F (82 °C) normal operating temperature. Magnetic actuator decoupling may occur at temperatures in excess of 180 °F (82 °C).

1. The unit self-cleaning controls should be on whenever flow is occurring through the strainer. The controls should be off when there is no flow.
2. The cleaning disc should stroke the strainer element clean to keep the differential pressure between the inlet and outlet of the filter below 5 PSID (34 kPa). Stroking too frequently will shorten the life of all wear components.
3. The strainer unit is supplied with a valve used to purge the contaminants from the vessel. This valve should be cycled before the collected contaminants exceed the purge chamber volume and cause a differential pressure increase.
4. If the strainer element is removed from the unit, avoid high pressure washing from the inside of the element. This may force contaminants into the filter media and cause permanent blockage and/or element damage.
5. Always pressurize the unit slowly on start up and watch for leaks.
6. The unit is equipped with a 3/4" port in the lid for placement of overpressure vent, for use as an air release and/or connection for fluid filling of vessel.
7. Monitoring of the differential pressure between the inlet and outlet pressures should be used to determine stroking and purging rates. Normal operation should exhibit low differential pressure of 3-5 psi that is maintained continuously.

Operational Modes

Straining

Dirty process fluid enters thru the inlet port, passes through the strainer screen where contaminants are removed and clean process fluid exits through the outlet port.

Screen Cleaning

The cleaning process occurs periodically during the straining process. As the dirty process fluid passes thru the strainer screen, contaminants are collected on the inside of the screen. The cleaning disc scrapes the length of the strainer screen and pushes the contaminants into the purge chamber.

Purging

The purging process occurs periodically during the straining process. The purge valve is opened, allowing the flow and pressure in the vessel to push the concentrated contaminants collected in the purge chamber out of the vessel.

Inspection, Disassembly & Reassembly

Cleaning Disc

1. Isolate the unit from process fluids by closing the isolation valves to the unit.
2. Depressurize and drain the vessel by opening the purge and vent valves in that order. When straining air-drying liquids, flush all residual materials from vessel prior to service.
3. Turn off unit controls and disconnect electrical and pneumatic power to the unit while the carrier is at the top of its stroke in accordance with standard lock-out/tag-out and energy isolation procedures.
4. Loosen and remove the eight 3/8-16 lid bolts with a 9/16" wrench.
5. Remove the lid flange.
CAUTION – The lid weighs approximately 30 lbs. Use proper precautions when handling the lid to avoid injury or damage to the equipment. See Figure 1.
6. Inspect the lid o-ring (Figure 3, item 1) for damage and replace if necessary.
7. With the lid removed, wash down the inside of the vessel to remove all remaining process fluid and solids.
8. Remove the two 3/8-16 socket head cap screws with a 5/16" hex key and remove the element hold-down bar.
9. Inspect the cleaning disc blades while inside the unit. If the spacing between the edge of the blade and the inside edge of the plate is approximately 1/8" then the blades need to be replaced. See Figure 2.
10. Blade removal instructions
 - a. Inspect blades while in unit. Blade wear is indicated by pin location. See figure 2. The cleaning blades should be replaced every six months to keep the unit in proper working order.
 - b. Remove retaining pin (item 3) from carrier assembly.
 - c. Rotate cleaning disc assembly 45 degrees, corresponding to carrier, so as to clear the retaining tabs.
 - d. Remove cleaning disc (Figure 2) assembly by pulling it up and clear of the carrier.
 - e. Inspect blades (see Figure 2b). If blades are in good condition, skip to step 12.
 - f. Remove blades by spreading and lifting past the retaining pin on the doctor plate.
 - g. Remove cleaning blade springs (item 2a).
 - h. Clean doctor plate (item 1) of any solids buildup.
11. Install new cleaning blades and springs (item 2).
 - a. Place a new spring over the post on the doctor plate.
 - b. Align blade with spring and slide blade onto plate until it slides over and catches the retaining pin.
 - c. After the four blades have been installed, compress each blade to ensure proper movement.
12. Remove and inspect the filter element for damage. Damage may consist of deformation, dents, holes or blockage.
13. Clean the element from the outside. High pressure washing may damage the filter element.
14. Remove and inspect the element O-rings.
15. Clean and remove any debris from the bottom of the housing. Inspect the purge chamber to ensure it is clean and free of large debris.

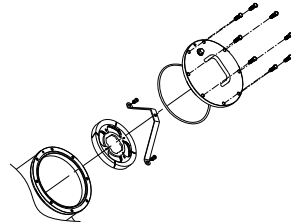


Figure 1

16. Inspect the actuator bearings per figure 8a or 8b, depending on which bearing you have. Skip to step 27 if the bearings are not worn. The bearings should be replaced every 6 months to keep the filter in proper working order.
17. To replace the bearings, the actuator must be removed from the filter.
18. Shut off air supply to unit.
19. Label and mark the position of the air lines on the bottom of the actuator. Disconnect the air lines.
20. Remove the clevis pin from the bottom of the actuator.
21. Pull the actuator out of the filter unit from the top. **If the actuator seems stuck, avoid rocking when trying to remove it. Instead tap the actuator out from the bottom with a soft-faced hammer. DO NOT place the magnetic actuator near ferrous materials.**
22. Slide the carrier to the top of the actuator (opposite the ported end).
23. Using internal snap-ring pliers, remove the snap ring retaining the upper bearing.
24. Thread the supplied screws into the two holes in the bearing and pull the bearing out of the carrier. The bearing holding block may remain inside the carrier. If this happens, inspect and replace if necessary. **DO NOT stack holding blocks. DO NOT over-tighten screws such that they protrude entirely through the bearings. Actuator damage may result if these instructions are not followed.**
25. Insert the new bearing and replace the snap ring.
26. Slide the carrier to the bottom (ported end) of the actuator.
27. Repeat steps 22, 23 and 24.
28. Clean and inspect the O-ring at the bottom of the actuator (Figure 6, item 5) and replace if necessary.
29. Re-install the actuator. Lower the actuator (ported end down) into the filter and through the opening in the bottom cone.
30. Insert the clevis pin at the bottom of the actuator and secure it with the included cotter pin.
31. Re-attach the air lines to the actuator.
32. Re-install the element O-rings (Figure 7, item 1) and lower the element into the filter housing. When the element reaches the bottom, a small amount of force is needed to seat the element into the base.
33. Slide the cleaning disc assembly onto the actuator carrier so that it stops on the lower retaining ring.
34. Inspect the upper retaining ring for cleanliness and wear. Using a pair of internal snap-ring pliers, install the upper retaining ring to secure the cleaning disc in place.
35. Inspect and clean or replace if necessary the 3/8-16 socket head cap screws (Figure 5, item 2) and corresponding threaded holes in the filter vessel element flange.
36. Install the element hold-down bar (Figure 5, item 1) and secure with the 3/8-16 socket head cap screws (Figure 5, item 2). Tighten the 3/8-16 socket head cap screws to 20 ft-lbs. **DO NOT operate strainer without hold-down bar properly installed. Loss of filtrate quality and element damage may result if these instructions are not followed.**
37. Inspect the o-ring groove and lid flange and remove any contaminants found. Install the o-ring in its groove.
38. Inspect the lid face and clean any found contaminants. Orient the lid so that the hole for the flange pin is located at the top. Place the lid, with the vent pointing up, onto the filter housing.
39. Inspect and clean or replace if necessary the eight 1/2-13 lid bolts (Figure 4, item 2) and corresponding threaded holes in the filter vessel lid flange.
40. Secure the lid to the filter housing with the eight 1/2-13 lid bolts. The bolts should be tightened to 45 ft-lbs torque. See Figure 1.

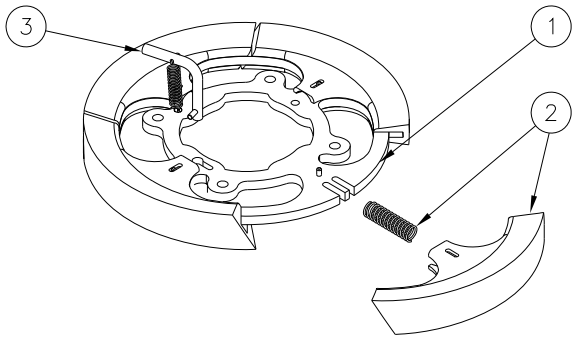


Figure 2

Table for Figure 2

Ref	Part Number	Description
1	40187	PLATE ASSY, MCF DCTR F/NEW PIN
2	40116-DEL	KIT, MCF BLADES, SPRINGS
2a	40111	SPRING, DISC ASSY MCF 4 BLADE
2b	40115-DEL	BLADE, CLN DISC MCF DELRIN
2c	40147-EN	INSTRUCTIONS, MCF BLADE KIT
3	40186	PIN, MCF DCTR RETAINING

Ref	Part Number	Description
1	RPS0000002	O-RING, 2-374 VIT .210 X 9.225
	RPS0000003	O-RING, 2-374 EPDM .210 X 9.225
2	RPR0000002	HHCS 3/8-16 X1-1/4"LG. A193 B8M CL1
3	WEL0000004	MCS-500 LID ASSY W/ HANDLE

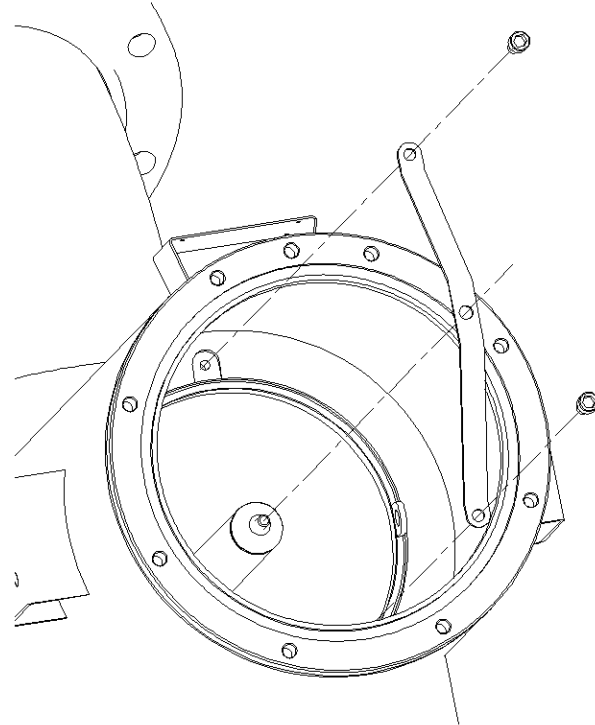


Figure 4

Table for Figure 4 – Actuator and Element Brace

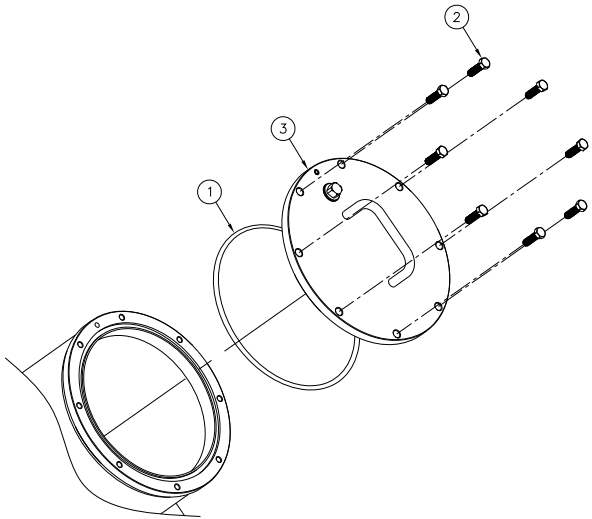


Figure 3

Table for Figure 3 – Lid Closure and Gasket

Ref	Part Number	Description
1	59025	PLATE, ELE HOLD DOWN MCS-500
2	40124	SCREW, 3/8-16 X 3/4 SOCHDCP SS

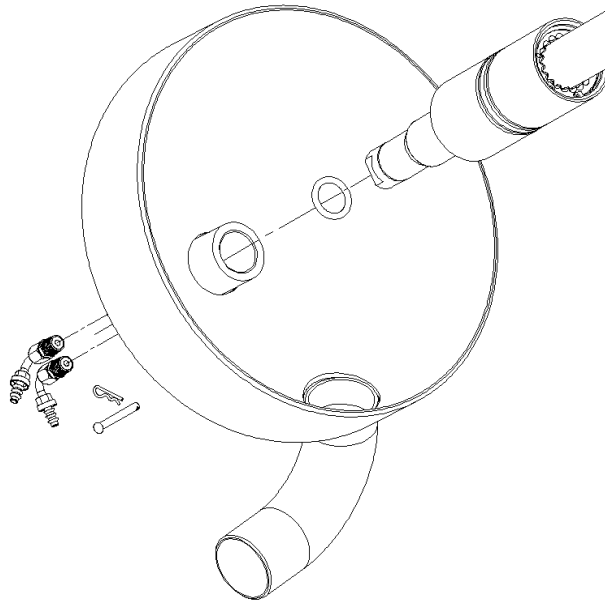


Figure 5

Table for Figure 5 – Actuator Base

Ref	Part Number	Description
1	P-20760-BRZ	ADAPTOR, 1/4 NPT X 45 FLARE
2	40141	FITTING, SWVL TO HOSE 90DEG
3	40144	PIN, CLEVIS AND HAIRPIN MCF
	40106	ACT, 180 MAG VIT ORK HF500
4	40170	ACT, 180 MAG EPT ORK HF500
	40179	ACT, 180 MAG DELRIN AF HF500
	40126-VIT	O-RING, ACT RETAINING MCF VIT
5	40126-EPD	O-RING, ACT RETAINING MCF EPDM
	WEB0000043	BODY ASSY, MCS-500 NONCODE 6" 150# ANSI
6	WEB0000044	BODY ASSY, MCS-500 U-STAMP 6" 150# ANSI
	40172	KIT, MCF WEAR PARTS VIT ACT
	40173	KIT, MCF WEAR PARTS EPT ACT.

Element

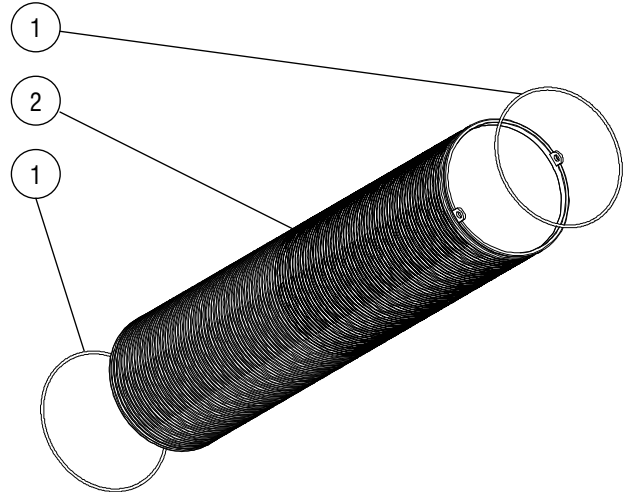


Figure 6

Table for Figure 6

Ref	Part Number	Description
1	P-43517-EPT	O-RING, 2-369 EPDM .210 X 7.975
	P-43517-VIT	O-RING, 2-369 VIT .210 X 7.775
2	Varies	Element, Slotted

Bearing

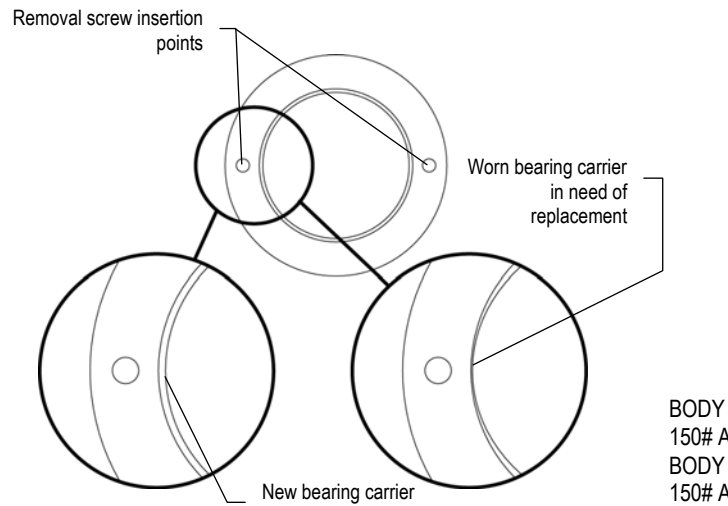
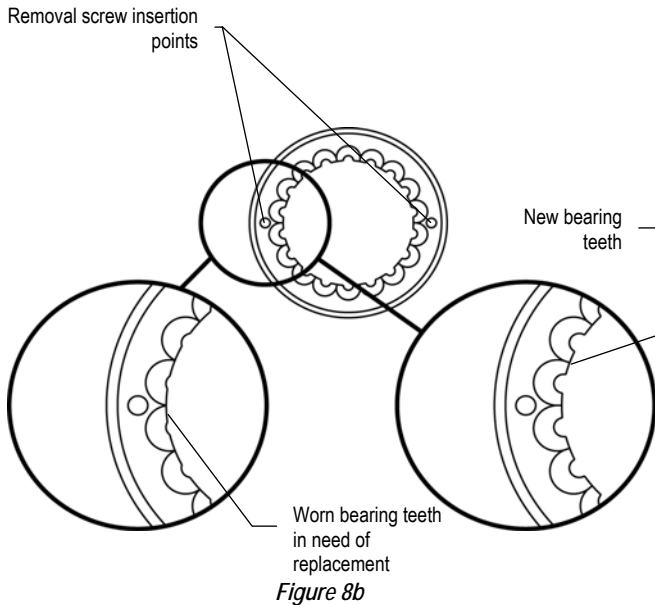


Figure 7a



Maintenance

To service the MCS-500 strainer unit, isolate it from the process air and electrical supply using proper lockout/tagout plant procedures. Depressurize and de-energize all sources of power. Utilize proper application of PPE for the process conditions.

Maintenance Schedule

Frequency of inspection is at the discretion of the customer and may need to be increased or decreased accordingly. The wear of certain items depends on how often the filter is used and the abrasiveness of the product being filtered.

Weekly

- Check for actuator bearing wear. Replace if necessary.
- Inspect the cleaning disc for excessive wear. Remove the cleaning disc and inspect.

Monthly

- Inspect the inside of the filter element for excessive wear. Remove the cleaning assembly and inspect the inside of the filter element. The lid seal should be replaced to maintain a proper seal. If the element is removed from the housing, the seals should be replaced to maintain a proper seal. Over time, gaskets will take on a permanent "set".
- Inspect the actuator assembly. When the actuator begins to fail, the differential pressure will rise. This occurs because the actuator cannot sufficiently drive the cleaning disc assembly.

Troubleshooting

Symptoms

- A Actuator doesn't operate properly
- B Purge valve will not operate properly
- C Leakage at lid seal
- D Reduction in flow rate or high differential pressure
- E Drop in filtrate quality

Possible Faults

- A Actuator doesn't operate properly
 - 1 No power
 - a Check to see if the filter system is receiving adequate power.
 - b Check to see if the filter system is set to the proper voltage.
 - c Check all wiring connections.
 - 2 No air
 - a Check to see if the filter system is receiving adequate air.
 - b Check for air leaks.
 - c Check to see if the air bleed valve is closed and the air block valve is open.
 - d Check to see if the air lines are connected to the correct ports.
 - 3 Actuator seals have worn out
 - a Check the air filter and water separator for operation.
 - b Replace the actuator
 - 4 Actuator installed improperly
 - a Confirm the element hold-down bar is properly installed and is securing the actuator.

- 5 Faulty solenoid valve
 - a* Check to see whether the manual override button on the solenoid valve actuates the cylinder.
- 6 Actuator cleaning disc carrier is magnetically decoupled
 - a* Recouple magnetic actuator (call Eaton Tech Support).
- 7 Actuator cleaning disc carrier is seized.
 - a* Actuator tube is damaged – replace actuator.
 - b* Inspect and clean actuator assembly of built-up solids.
 - c* Remove magnetic solids and use magnetic separator if necessary to prevent buildup.
- 8 Cleaning disc not cleaning the filter screen
 - a* Confirm the installation of the cleaning disc assembly.
 - b* Inspect and clean the filter screen.
 - c* Inspect and replace the cleaning disc.
- B Purge valve will not operate properly**
 - 1 No power
 - a* Check to see if the filter system is receiving adequate power.
 - b* Check to see if the filter system is set to the proper voltage.
 - c* Check all wiring connections.
 - 2 No air
 - a* Check to see if the filter system is receiving adequate air.
 - b* Check for air leaks.
 - c* Check to see if the air bleed valve is closed and the air block valve is open.
 - d* Check to see if the air lines are connected to the correct ports.
 - 3 Actuator seals have been destroyed
 - a* Order a factory repair kit and replace the seals.
 - 4 Faulty solenoid valve
 - a* Check to see whether the manual override button on the solenoid valve actuates the cylinder
 - 5 Damaged purge valve
 - a* Replace or rebuild purge valve
 - 6 Debris caught in purge valve
 - a* Remove debris from purge valve
- C Leakage at lid seal**
 - 1 Loose lid nuts/bolts
 - a* Tighten lid/nut bolts.
 - 2 Dirty lid sealing surfaces
 - a* Clean lid sealing surfaces
 - 3 Damaged sealing surfaces
 - a* Repair or replace filter station
 - 4 Damaged lid o-ring
 - a* Remove and replace with factory lid o-ring
- D Reduction in flow rate or high differential pressure**
 - 1 Cleaning interval set too long
 - a* Decrease cleaning timer setting
 - 2 Purge interval set too long
 - a* Decrease purge timer setting
 - 3 Purge valve not functioning
 - a* Inspect and replace purge valve
 - 4 Dirty or damaged filter screen
 - a* Inspect and clean or replace filter screen
 - 5 Flow, viscosity or solids increase
 - a* Consult factory
 - 6 Cleaning disc not properly cleaning element
 - a* Inspect cleaning disc for wear and replace if necessary
- E Drop in filtrate quality**
 - 1 High differential pressure
 - a* Refer to reduction in flow rate or high differential pressure above
 - 2 Improper Assembly
 - a* Confirm the Element Hold-Down Bar is properly installed
 - 3 Damaged filter screen O-rings
 - a* Remove and replace with factory strainer screen O-rings
 - 4 Damaged filter screen
 - a* Remove and replace with factory strainer screen
 - 5 Filter screen too coarse
 - a* Consult factory for ability of filter system to accept a finer screen retention. Remove and replace with factory strainer screen.

WARRANTY

All products manufactured by Seller are warranted against defects in material and workmanship under normal use and service for which such products were designed for a period of eighteen (18) months after shipment from our factory or twelve (12) months after start up, whichever comes first. OUR SOLE OBLIGATION UNDER THIS WARRANTY IS TO REPAIR OR REPLACE, AT OUR OPTION, ANY PRODUCT OR ANY PARTS OR PARTS THEREOF FOUND TO BE DEFECTIVE. SELLER MAKES NO OTHER REPRESENTATION OR WARRANTY, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. WE SHALL NOT BE LIABLE FOR CARTAGE, LABOR, CONSEQUENTIAL DAMAGES OR CONTINGENT LIABILITIES. OUR MAXIMUM LIABILITY SHALL NOT IN ANY EVENT EXCEED THE CONTRACT PRICE FOR THE PRODUCT.

If you are interested in ordering spare parts or having service performed on your filter, please contact Customer Service at +1 800 525 4214 (U.S.) or +1 269 323 1313 (Worldwide).

EATON Filtration, LLC
70 Wood Avenue, South
Iselin, New Jersey 08830 USA
Phone (Worldwide) +1 732 767 4200
Phone (U.S.) +1 800 525 4214
Fax +1 269 323 2403
Email us at filtrationinfo@eaton.com
www.filtration.eaton.com

Eaton Filtration, LLC reserves the right to change specifications, dimensions and model designations without prior notice.