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**90 SERIES
SELF CLEANING WATER FILTER
OPERATION & MAINTENANCE MANUAL**

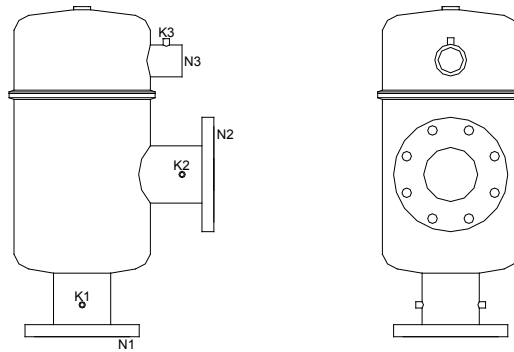
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Filter Basics

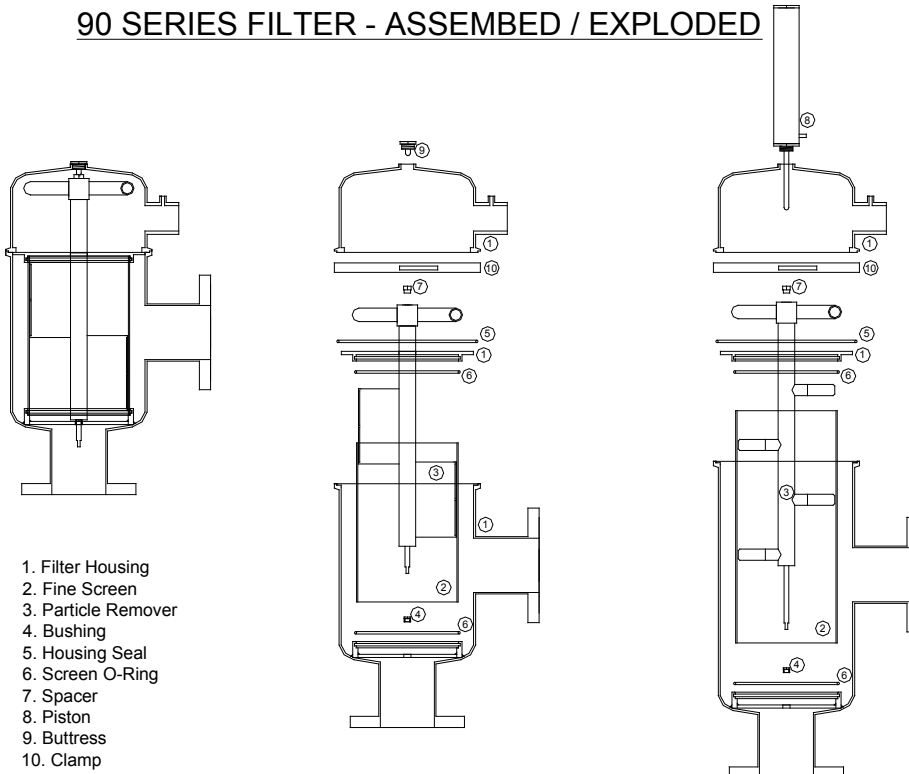
Forsta 90 Series are self cleaning screen water filters. The major components include the Filter Housing (1), Fine Screen filter element (2), Particle Remover (3), Hydraulic Piston (8), and Backwash Valve (12).

90 SERIES FILTER - GENERAL LAYOUT



NOZZLE	DESCRIPTION
N1	INLET
N2	OUTLET
N3	FLUSH OUTLET
K1	HYD CONNECTION
K2	HYD CONNECTION
K3	HYD CONNECTION

90 SERIES FILTER - ASSEMBLED / EXPLODED

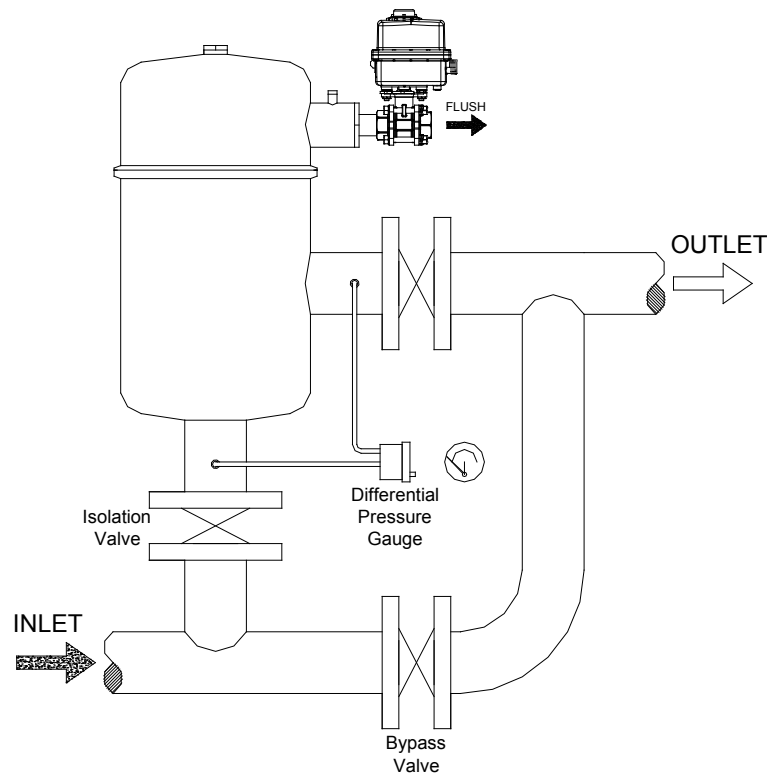


1. Filter Housing
2. Fine Screen
3. Particle Remover
4. Bushing
5. Housing Seal
6. Screen O-Ring
7. Spacer
8. Piston
9. Buttress
10. Clamp

Installation Requirements

90 Series filters may be mounted directly on the inlet (N1) and outlet (N2) flanges, and positioned in any orientation. Isolation valves should be installed at the inlet and outlet, and a bypass valve should be installed between the flanges. This will allow the filter to be taken offline periodically without disruption to water flow.

90 SERIES FILTER - INSTALLATION LAYOUT



There should be adequate clearance around the filter to allow for easy maintenance access. The minimum clearance above the top portion depends on the model. There must be enough room to remove the fine screen periodically.

FLUSH LINE

The piping for the flush valve must have no backpressure. It is strongly recommended to use oversized piping to accommodate this requirement. For example, if the 90 Series filter uses a 1" valve, the recommended pipe is a minimum of 2".

To minimize backpressure on the flush line, it is also important to avoid elevation gain. Even a small elevation gain can reduce the filter's ability to perform an effective backwash cycle. If flush water must be transported to higher elevation, it is recommended to pipe the flush line to a storage tank first, and then pump out to higher elevation.

HYDRAULIC CONNECTIONS

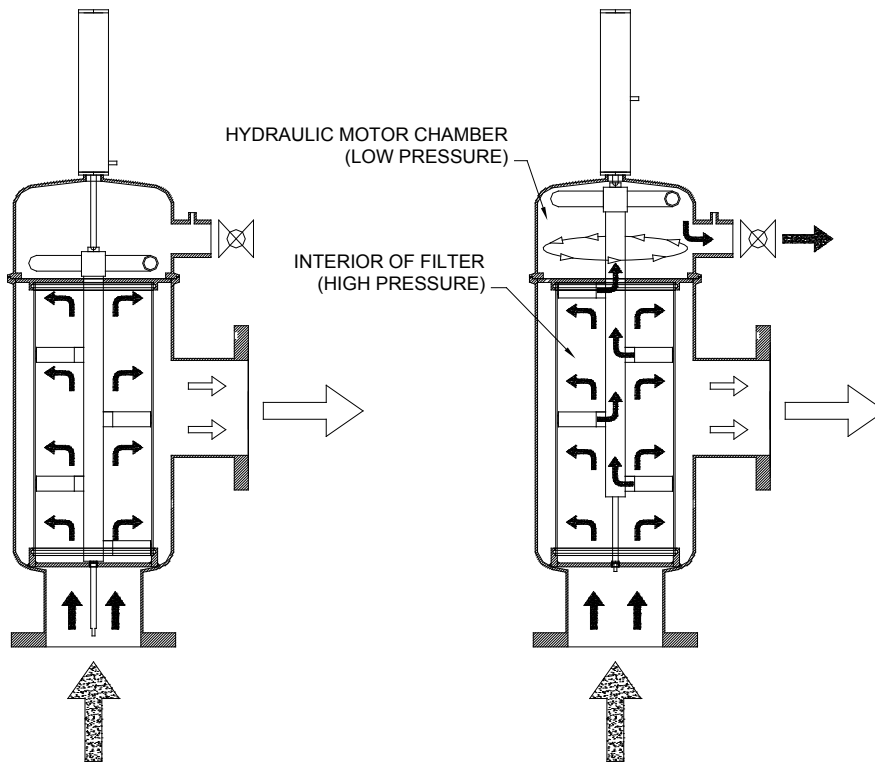
Each flanged connection nozzle (N1) on the 90 Series filter has two 1/4" threaded couplings. One may be used to install a pressure gauge or other sensor equipment. The other 1/4" coupling will be used to connect hydraulic tubing from the differential pressure switch to the filter. The high pressure line is fitted to the inlet, and low pressure fitted to the outlet.

HYDRAULIC PISTON (if applicable)

The piston (8) is mounted on the top section of the filter. 1/4" tubing must be installed from the fitting located on the back of the piston to the hydraulic connection (K3) on the flush outlet (N3). A filter is installed on the hydraulic tubing to protect the piston.

Filter Performance

90 SERIES FILTER - OPERATION



NORMAL OPERATION

Debris is trapped as water passes through the inlet and across the fine screen. Clean water exits through the outlet of the filter.

BACKWASH CYCLE

The flush valve opens and lowers the pressure in the top section. This causes the particle remover to vacuum the inside of the screen, expelling debris through the flush outlet.

NORMAL OPERATION

During normal operation of the filter, dirty water enters through the inlet, travels down the center of the filter and is strained across the fine screen. As water passes from inside the screen to outside, suspended particles are trapped on the fine screen and continue to buildup, eventually creating a drop in pressure at the outlet of the filter.

This drop in outlet pressure is monitored by the differential pressure gauge, which at seven PSID (pounds per square inch differential) sends a signal to the controller to initiate a backwash cycle.

BACKWASH CYCLE

The controller opens the flush valve, which causes a drop in pressure in the hydraulic motor chamber. This creates a low pressure path inside the particle remover, which acts as a vacuum at the end of the suction nozzles, removing the built up debris from the inside of the fine screen.

Water flows through the suction nozzles, down the interior of the particle remover, and out the hydraulic motor. The motor rotates the particle remover, enabling each suction nozzle to cover a radial strip of screen.

If a piston is installed, the pressure difference between the interior of the filter and the hydraulic motor chamber drives the particle remover toward the hydraulic piston. The piston depressurizes during the backwash cycle, and expels the volume of water from its chamber. This acts as a timer, gradually allowing the particle remover to drive the piston rod into the piston, assuring that the suction nozzles cover the entire surface of the fine screen. When the piston reaches the end of its stroke, the backwash cycle is complete, and the flush valve closes. Pressure inside the hydraulic motor chamber normalizes, and the piston pushes the particle remover back to its original position.

After the piston and particle remover move back to their original positions, the filter returns to normal operation. During the entire backwash cycle, the main flow through the filter is never disrupted.

Flow & Pressure Requirements

Forsta 90 Series filters have a minimum pressure requirement of 40 PSI. This includes any pressure loss incurred during the backwash cycle. Therefore the pump performance is a crucial component in determining whether the filter will perform correctly.

Pump manufacturers will provide the performance data in the form of a pump curve. This is a graph that plots pressure vs. flow rate. A pump is considered adequate for an application if it can maintain a minimum of 40 PSI while pumping the normal system flow AND the additional flow required during backwash. The additional flow depends on the filter model and what valve is used.

90 SERIES FILTER - VALVE FLOW RATES

<u>Valve</u>	<u>Flow Rate</u>
1"	40 gpm
1.5"	100 gpm
2"	220 gpm

Maintenance & Spare Parts

STARTUP

When pumping water through the Forsta 90 Series for the first time or after it has been emptied, it is important to follow a correct sequence of valve actuation in order to prevent damage to the filter components.

With both isolation valves closed and the bypass valve open, the correct sequence is:

1. Slowly open the inlet isolation valve letting water flow into the filter. Let the entire filter fill with water before moving to the next step.
2. Close the bypass valve.
3. Open the outlet isolation valve.

If it is not possible to close the bypass valve momentarily before opening the outlet valve, then both may be actuated simultaneously.

SHUTDOWN

To remove the filter from operation, reverse the steps used for startup.

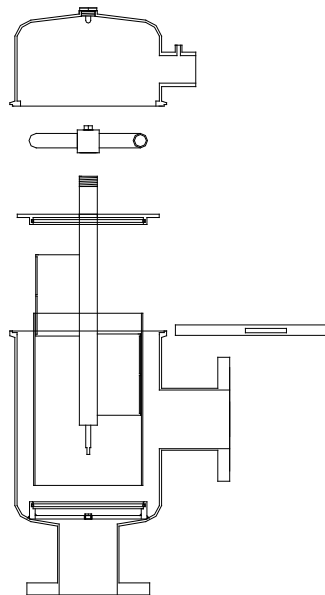
1. Close the outlet valve.
2. Open the bypass valve
3. Close the inlet valve. There will be residual pressure in the tank still, so use caution when draining.

If it is not possible to close the outlet valve momentarily before opening the bypass, then both may be actuated simultaneously.

PERIODIC MAINTENANCE

Every six months to a year, or during scheduled down-time it is recommended to open the filter and inspect the components. Access to the internal components can be gained by removing the clamp and top section. Lift the particle remover and plate straight out of the filter housing and separate the two. Inspect both for wear.

90 SERIES FILTER - INSPECTION



Remove the screen and o-rings. The screen mesh and bushing should be inspected for wear, as well as the particle remover rod and suction nozzles.

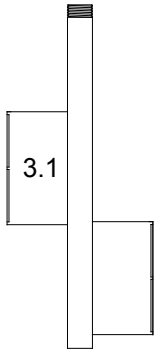
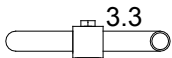
SPARE PARTS

Spare parts for maintenance for two years include:

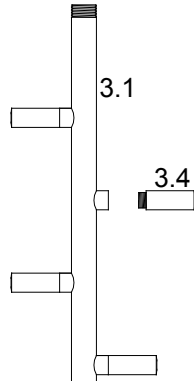
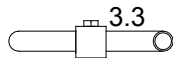
- Screen O-rings (6)
- Cover Seal (5)
- Suction Nozzles (3.5)
- Bushing (4)
- Differential Pressure Gauge (18)
- Piston Seal Kit (8K)
- Mini-Filter (16)
- Valve (12)
- Fine Screen (2)
- Particle Remover (3)
- Spacer (7)

90 SERIES PARTICLE REMOVER - AB & C MODELS

MODELS A&B



MODELS C

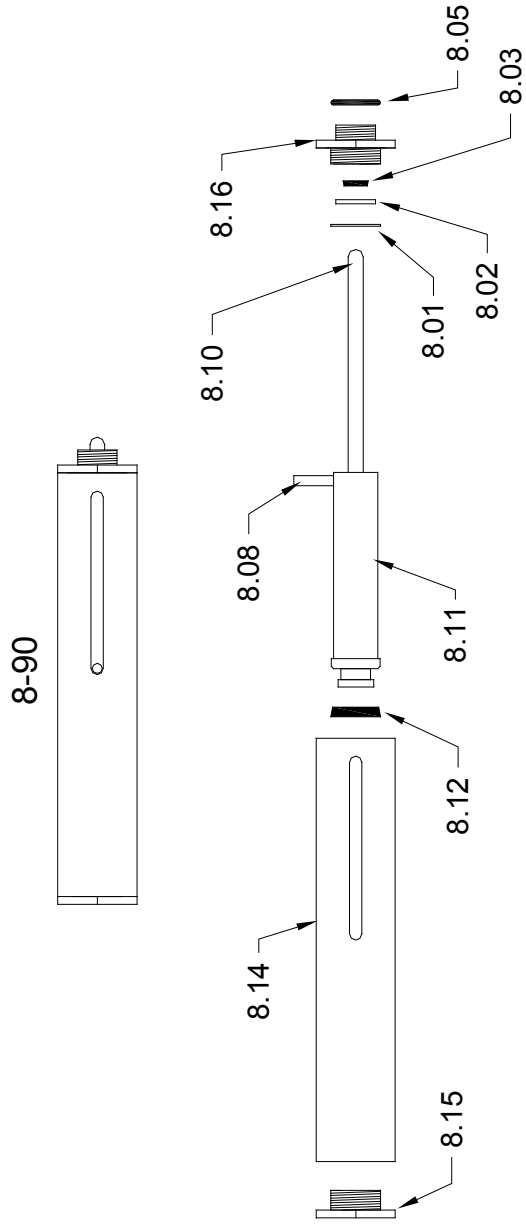


PARTICLE REMOVER - PART LIST

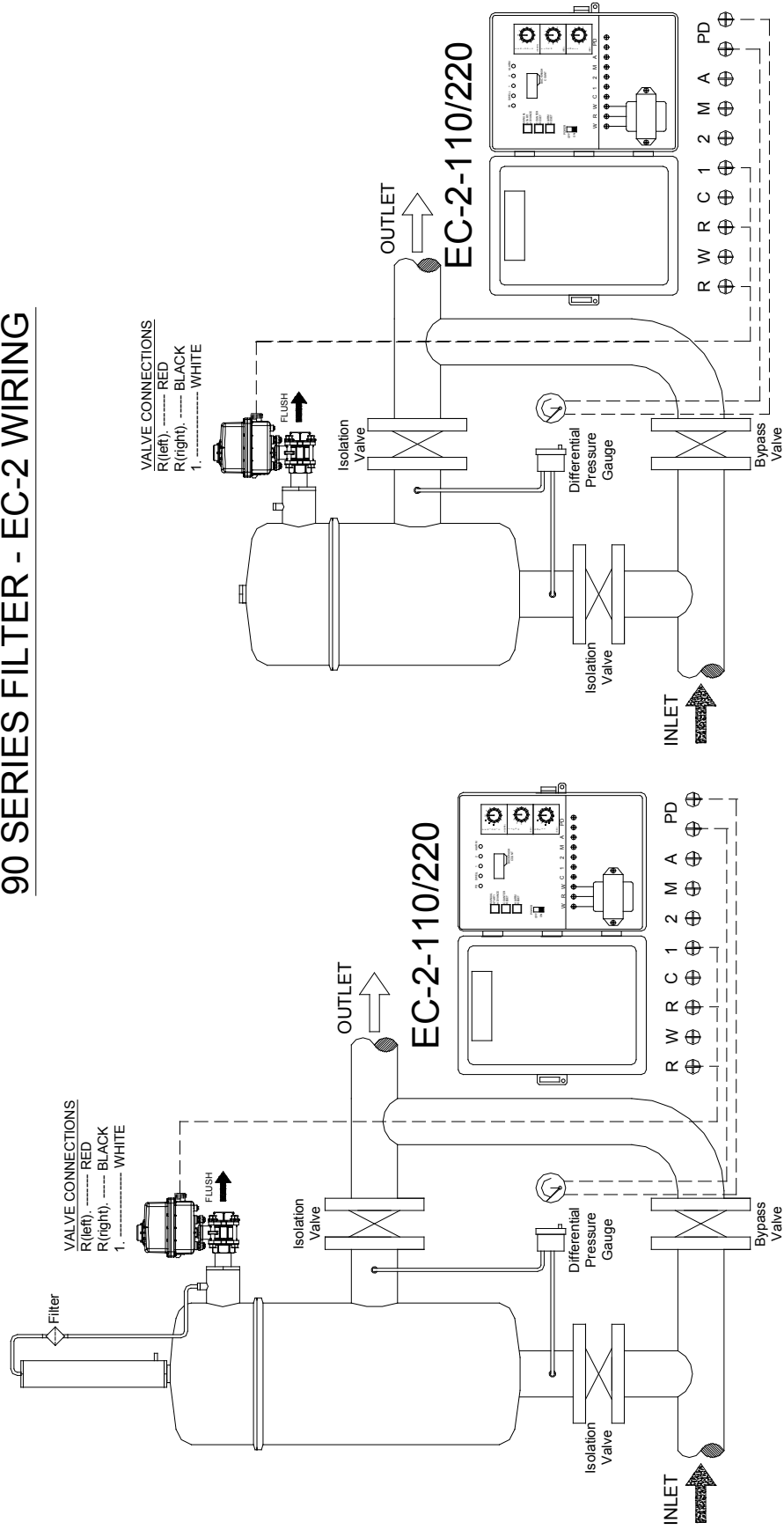
ITEM	PART NUMBER
Particle Remover	3
Housing	3.1
Rod	3.2
Hydraulic Motor	3.3
Suction Nozzle	3.4

90 SERIES PISTON

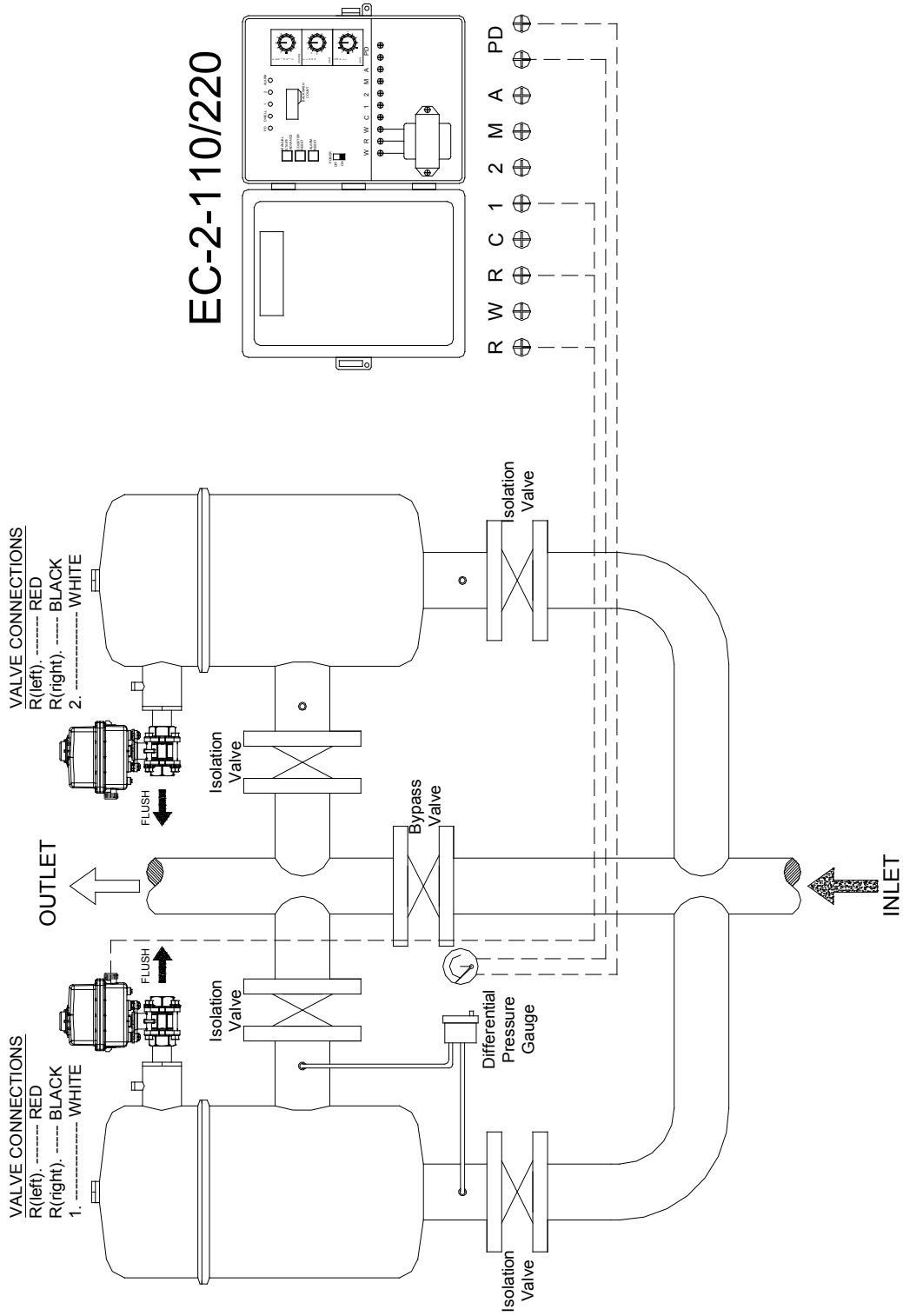
ITEM	PART NUMBER
Hydraulic Piston	8-90
Snap Ring	8.01-90
Head Ring	8.02-90
Shaft U-cup	8.03-90
Head O-ring	8.05-90
Piston Pin	8.08-90
Shaft	8.10-90
U-cup Holder	8.11-90
Casing U-cup	8.12-90
Casing	8.14-90
Casing Cap	8.15-90
Piston Head	8.16-90



90 SERIES FILTER - EC-2 WIRING



2 x 90 SERIES FILTERS - EC-2 WIRING



Warranty

Forsta Filters guarantees all self cleaning water filters, components, and accessories free of defects for one year from the date of installation, or 18 months from the date of original shipment. Forsta will replace any part found defective during the warranty period, provided the equipment in question was handled, installed, and operated in accordance with the operation and maintenance manual and sound engineering practices. Forsta Filters assumes no liability for incidental or consequential damage resulting from the use of its products, services, or data. Liability is limited to replacement or repair of products provide by Forsta Filters, and no agent or sales representative has authority to extend the warranty period without the express written consent of Forsta Filters, Inc. Shipping charges for returned equipment will be at the expense of the purchaser, and all returned equipment must be sent to Forsta Filters.