Filter Selection Considerations

Filter Location

Pressure filtration: Pressure filters usually produce the lowest system contamination levels to assure clean fluid for sensitive high-pressure components and provide protection of downstream components in the event of catastrophic failures. Systems with high intermittent return line flows may need only be sized to match the output of the pump, where the return line may require a much larger filter for the higher intermittent flows. See Figure 6(a).

Return line filtration: Return line filters are often considered when initial cost is a major concern. A special concern in applying return line filters is sizing for flow. Large rod cylinders and other components can cause return line flows to be much greater than pump output. Return lines can have substantial pressure surges, which need to be taken into consideration when selecting filters and their locations. See Figure 6(b).

Re-circulating filtration: While usually not recommended as a system's primary filtration (due to the high cost of obtaining adequate flow rates) re-circulating, or off-line, filtration is often used to supplement on-line filters when adequate turnover cannot be obtained with the latter. It is also often an ideal location in which to use a water removal filter. Off-line re-circulating filters normally do not provide adequate turnover flow rates to handle the high contamination loading occasioned by component failures and/or inefficient maintenance practices. See Figure 6(c).

Suction filtration: Micronic suction filters are not recommended for open-loop circuits. The cavitation these filters can cause far outweighs any advantage obtained by attempting to clean the fluid in this part of the system. SKB magnetic suction separators are recommended, as they will protect the pump from large and ferrous particles, without the risks of cavitation.

Breather filtration: Efficient filter breathers are required for effective contamination control on nonpressurized reservoirs and should complement the liquid filtration component.

Multiple filtration: For systems incorporating large total fluid volumes, it may be necessary to employ filters in more than one location. Multiple pressure filters, pressure and return line filters, and recirculating filters are examples of multiple filtration applications.

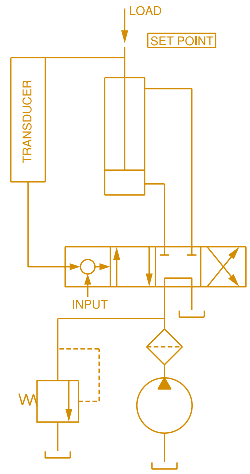


Figure 6(a). Pressure Filtration Circuit

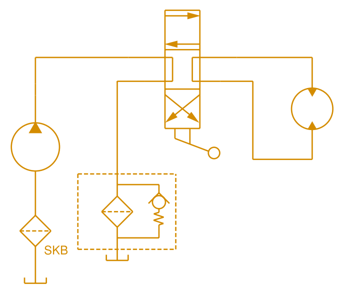


Figure 6(b). Return Line Filtration Circuit

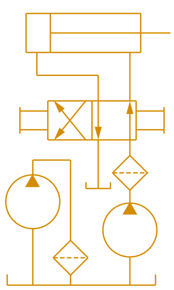
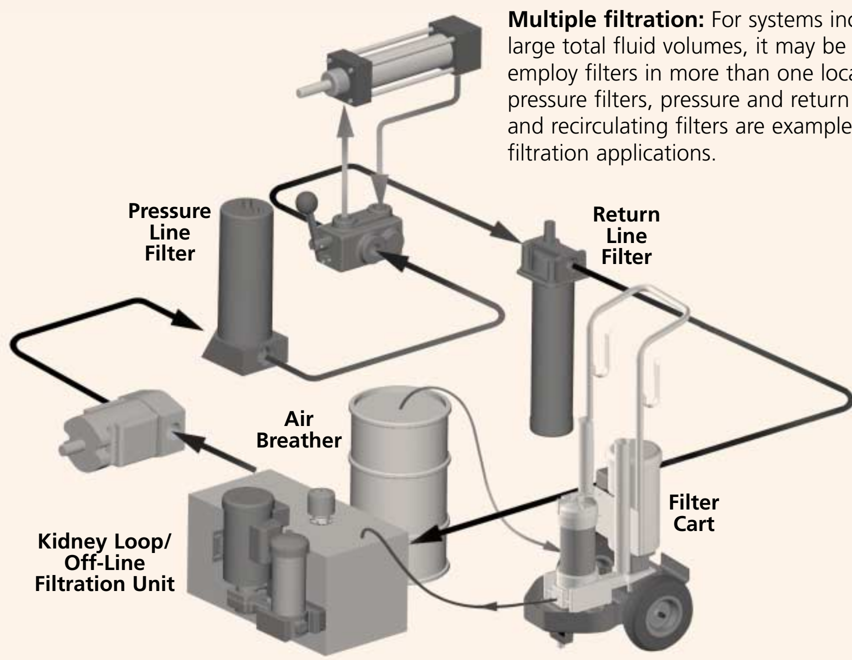


Figure 6(c). Re-circulating Filtration Circuit



Seven Steps to Selecting a Filter

It is important to keep in mind that all system components have some tolerance for contamination. The key to cost effective contamination control is to maintain the system's cleanliness level at the tolerance level of the most sensitive component. To filter more stringently just adds unnecessary cost. Little, if any, increase in component life or reliability is obtained by further reducing the contamination level. Once the desired cleanliness level (ISO code) is determined, selecting a cost effective filtration system can be readily accomplished.

1. Determining desired cleanliness level

Step 1. Determine the most sensitive component in the system. Then, determine the desired cleanliness level (ISO code) by using Tables 4 and 5 (Page 15) or by contacting the manufacturer directly.

Operating pressure levels also have a bearing on cleanliness requirements.

2. Selecting correct medium

Step 2. Using Tables 9 and 10 (Pages 18 and 23, respectively), identify the proper Schroeder filter media to employ.

3. Where to filter

Step 3. Determine where to locate the filters, using the information on the previous page, "Filter Location."

4. Selecting filter housing

Step 4. Refer to the Filter Product Index in the Table of Contents, pages 2-3 and the individual filter catalog pages to select the specific filter housing that will meet the requirements set forth in Steps 2 and 3 above, as well as the pressure and flow parameters at the particular filter's location.

Consideration should also be given to installation convenience for your particular application. Use the selection charts shown on the catalog page to determine the specific filter model number for the desired media at the required flow rate.

5. Selecting filter breather

Step 5. For nonpressurized reservoirs, refer to Section 6, pages 180-181 to select the appropriate filter breather.

6. Contamination control practices

Step 6. Implement the appropriate manufacturing, assembly, and maintenance contamination control procedures. Effective contamination control is achieved through the conscientious use of sound manufacturing and maintenance practices. Some examples are: filtering make-up oil; controlling contamination ingestion during manufacturing, assembly, maintenance, and repair processes; and properly maintaining cylinder wiper seals.

7. Verifying results

Step 7. Check all filtration systems to determine if the results expected are obtained and maintained during system operation, as operating conditions and maintenance practices may not remain constant. Schroeder distributors and field representatives have access to contamination monitoring equipment that can determine the exact cleanliness level (ISO code) of your system on the spot. **Contact your Schroeder distributor or phone us for complete details.**

Parameters: A piston pump and servo system with 20 gpm (76 L/min) pump flow, 30 gpm (114 L/min) return flow, 4000 psi (275 bar) system pressure, and total system volume of 60 gallons (227 liters), with a nonpressurized reservoir.

Step 1 example. The servo valve is the system's most sensitive component. Referring to Tables 4 and 5 (page 15), you can see that a cleanliness level (ISO Code) of 16/14/11 or better is recommended for a high pressure system containing a servo valve.

Step 2 example. Table 10 recommends the Schroeder Z5 element media or finer to achieve a cleanliness level of 16/14/11.

Table 10. Schroeder Element Media Recommendations

Desired Cleanliness Levels (ISO Code)	Schroeder Media
20/18/15-19/17/14	Z25
19/17/14-18/16/13	Z10
18/16/13-15/13/10	Z5
15/13/10-14/12/9	Z3
14/12/9-13/11/8	Z1

Step 3 example. A combination of a pressure filter upstream of the servo valve and a return line filter would provide cost effective contamination control for servo systems.

Step 4 example. Filter model EF60, shown on page 53, is selected as the appropriate pressure filter because of its 30 gpm and 6,000 psi capacities. A look at the Element Selection Chart for the EF60 located on page 53 verifies that the 7EZ5 element will handle 20 gpm, and the appropriate model number is EF60-7EZ5.

The ZT in-tank return line filter is selected for the 30 gpm return flow and the Z5 media. As shown in the model selection chart for the ZT on page 91, the proper model number to meet the specifications is ZT-8ZZ5.

Step 5 example. Using page 156, select the ABF-3/10-S breather/strainer.

Step 6 example. Implement the appropriate manufacturing, assembly and maintenance contamination control procedures.

Schroeder Industries LLC has taken this practice a step further by developing a program to help customers model element life in their specific hydraulic systems. To learn more about this program, visit the Schroeder web site at www.schroederindustries.com and select the **Roll-Off Cleanliness Program** or refer to Appendix D.

Step 7 example. Check start-up and ongoing system cleanliness (ISO Codes). Schroeder Industries LLC offers oil sampling kits that can be forwarded to a lab for particle counting and determination of cleanliness levels.

Rated Fatigue Pressure

The application of individual filters should take fatigue ratings into consideration when there are flow or pressure variations creating pressure peaks and shock loads.

Typical hydraulic systems that use highly repetitive operations include plastic injection molding machines, die-cast machines, and forging and stamping press systems. In these and other similar applications, rated fatigue pressure should be considered when selecting a filter.

It has been common practice in the fluid power industry to establish component ratings for maximum operating pressure based on the minimum yield pressure, which is usually one third of the minimum yield pressure for higher-pressure components and one fourth of the minimum yield pressure for lower-pressure components. This rating method has proved satisfactory for many years, but it does not directly address the subject of fatigue.

The National Fluid Power Association has introduced a method (NFPA T2.6.1) for verifying the fatigue pressure rating of the pressure-containing envelope of a metal fluid power component. In this method, components are cycled from 0 to test pressure for 1 million cycles (10 million cycles is optional). The rated fatigue pressure (RFP) is verified by testing. We establish the desired RFP from design, then we calculate the cycle testing pressure (CTP), and then conduct tests at CTP per 1,000,000 cycles.

The T2.6.1 Pressure Rating document is available from the National Fluid Power Association, 3333 N. Mayfair Road, Milwaukee, WI 53222-3219. Schroeder Industries LLC and our distributors would also be glad to furnish additional information.

Table 11. Fatigue Pressure Ratings

Model	Rated Fatigue Pressure psi (bar)	Model	Rated Fatigue Pressure psi (bar)
NF30/NFS30	2400 (165)	FOF60	4000 (275)
DF40/CF40 w/Alum. Head	1800 (125)	ZT	90 (6)
CEF40 w/Alum. Head	1800 (125)	RT	90 (6)
DF40/CF40 w/Steel Head	3000 (207)	LRT	90 (6)
CEF40 w/Steel Head	3000 (207)	QT	100 (7)
CFX30	1800 (125)	TF1	270 (19)
EF60	3500 (240)	KF3/WKF3	290 (20)
CF60	4000 (276)	LF1/MLF1	250 (17)
VF60/Esafe VF60	3300 (230)	SRLT/Esafe SRLT	750 (52)
KF30	2500 (170)	RLT/WRLT/Esafe RLT	415 (29)
TF50/TEF50	3500 (240)	KF8	500 (35)
KF50/KC50/KEF50	3500 (240)	K9	750 (52)
KFH50	3500 (240)	QF15	800 (55)
MKF50	3500 (240)	QLF15	800 (55)
KC65	5500 (380)		

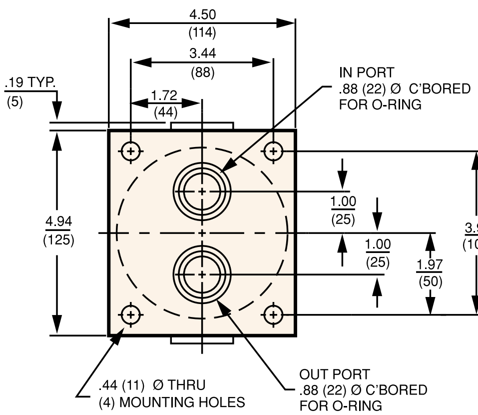
Contact Factory For: EFS50, FOF30, NOF30, MTA, MTB, GT, KT, KFT, BFT, PAF1, MAF1, MF2, RTI, and QFD5 Fatigue Ratings.

Manifold Mounting

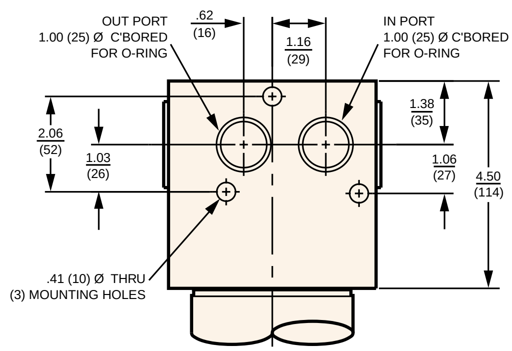
In some filtration applications, it is advantageous to have the inlet and outlet ports mount directly onto a block without any hydraulic hose in between. Schroeder offers several such manifold-mounted filter models.

Shown below for convenience are several examples of manifold mounting. Included are drawings showing the important dimensions and other pertinent information (such as what parts must be supplied by the customer). Manifold porting patterns are shown for both our popular top-ported and our base-ported filter assemblies.

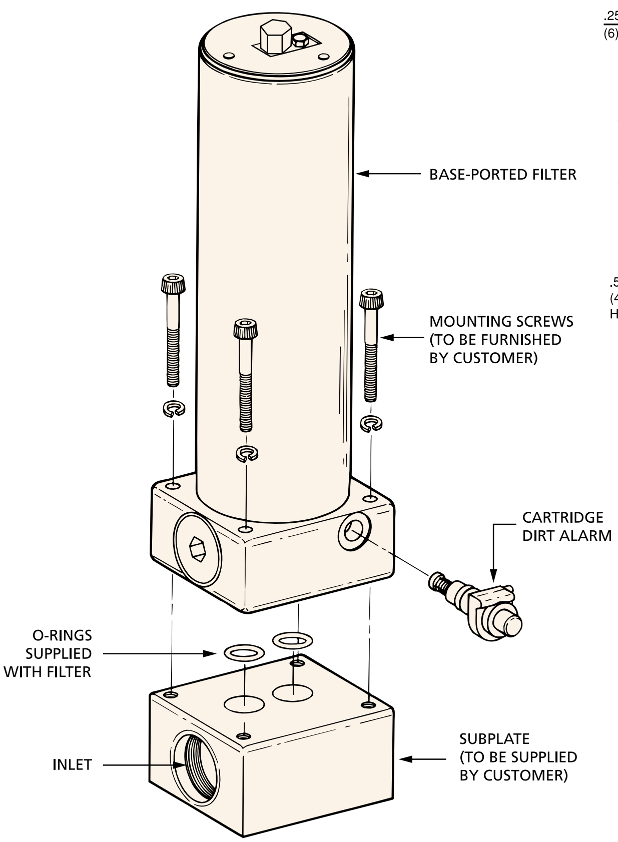
Figure 7. Examples of Manifold Mounted Filters



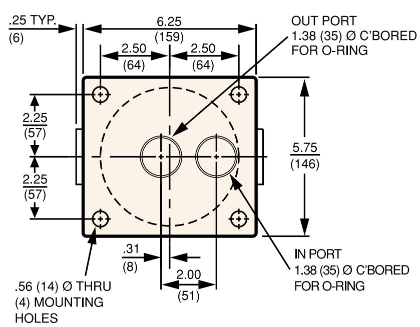
TF50



DF40



KF30/50



KF30/50

Note: Updated cap design is not reflected in this illustration.

No-Element Indicator

The No-Element Indicator is a unique, patented signaling device designed to alert the user if no filter element is present in the housing. This virtually eliminates any possible confusion on the part of the user that the filter contains an element and is functioning in a normal manner.

The tamper proof system utilizes a patented internal valve design. If the element is not installed in the housing, the valve restricts flow, causing a high pressure drop. The high pressure drop, in turn, causes the Schroeder Dirt Alarm® to indicate that the element is not installed in the housing.

The only way to deactivate the indicator is to install the element in the housing.

This feature is available in the following filter models: RT, TF1, KF3, CF40, DF40, CF60, TF50, KF30, KF50, KC50, KC65, and MKF50 that are equipped with a Schroeder Dirt Alarm®.

Figure 8. No-Element Indicator Feature

When an element is not present in the filter (as shown in the cutaway photo), the valve indicated by the arrow is in an upright (or closed) position restricting flow and causing a high pressure drop which triggers a mechanical or electrical Dirt Alarm® to signal the absence of the element.