TFR

In-Tank Filter Assemblies

Hy-Pro TFR in-tank filter assemblies are ideal for particulate contamination removal in hydraulic power unit return line and mobile hydraulic OEM installations.

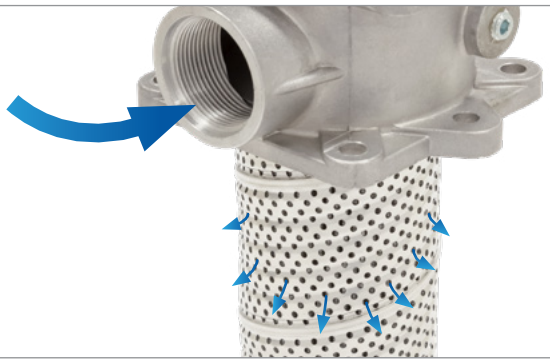
Max Operating Pressure: 150 psi (10 bar)

HY-PRO

hyprofiltration.com/TFR

Elements that go beyond industry standard.

Advanced DFE rated filter elements deliver lower operating ISO Codes with high efficiency particulate removal and retention efficiency. With a range of media options down to $\beta 2.5_{[c]} > 1000$ + water absorbing options, you get the perfect element for your application, every time.



Inside to out flow.

The dirtiest fluid in you system can be found before the filter element in the filter housing. Here, contaminants collect in the filter media and unless disposed of properly, can wreak havoc on your system after element service. That's why when you service the TFR element, which utilizes inside-to-outside flow, you remove all the dirt and contaminated fluid with the element.

Integral element bypass.

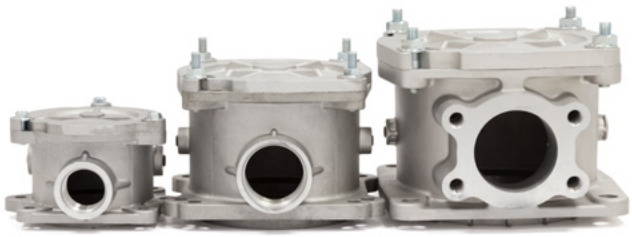
TFR elements include an integral, zero-leak bypass valve. Every time an element is changed a new bypass is installed eliminating bypass valve fatigue and leakage over time.

Minimize the mess.

With most of the assembly inside the reservoir, the top loading TFR housing provides easy and clean access during element service – no slippery spin-ons to handle. With the keyway cover and bolt arrangement lost parts during element service become a thing of the past.

Compact and sized for your system.

With three head sizes, multiple connection sizes, filter element lengths and diffuser options to choose from, TFR assemblies smoothly deliver clean fluids back to tank with a design that keeps things compact.

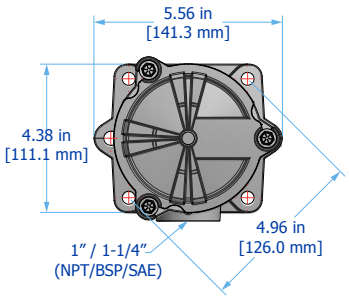


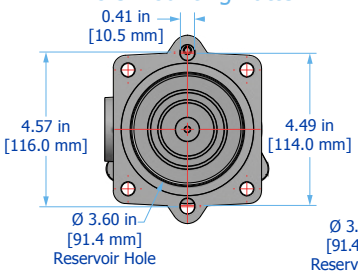
Eliminate aeration.

Smaller reservoirs with higher turnover and less settling time typically lead to aeration as fluids are churned and recirculated. The unique TFR element design minimizes turbulence and integral diffuser tube prevents aeration in compact hydraulic and high velocity return line applications by maintaining a column of fluid outside the filter element and above the fluid line to ensure your fluids are returned clean and without aeration.

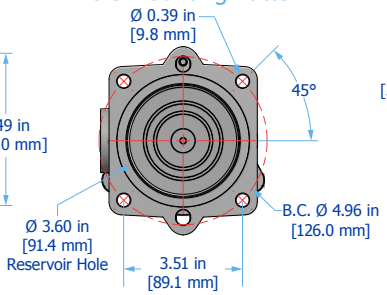
TFR Installation Drawings

TFR1 Installation Drawing

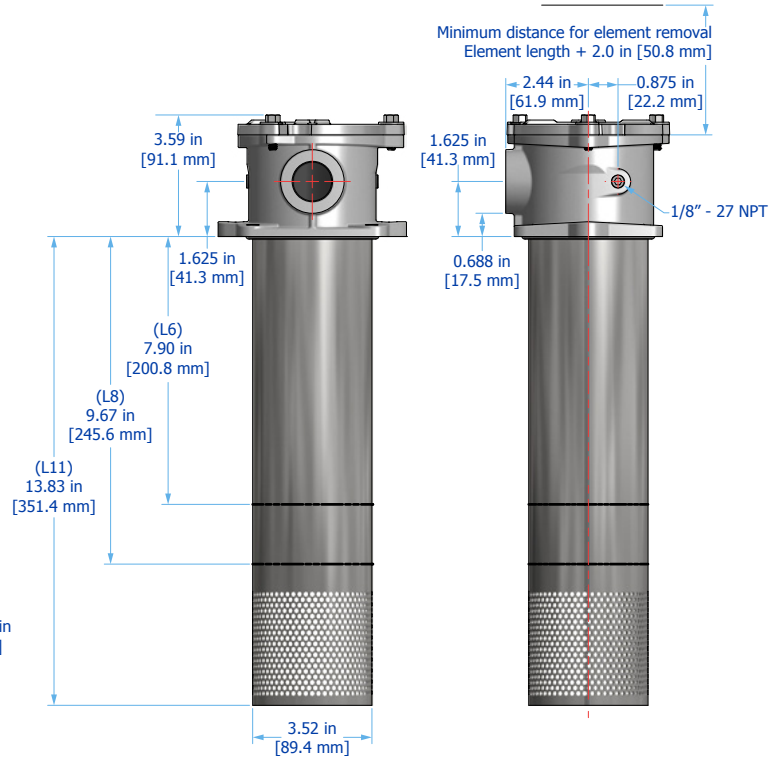




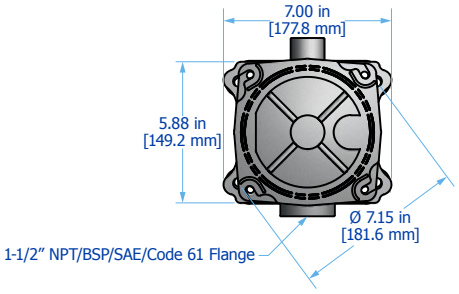
2-Hole Mounting Pattern

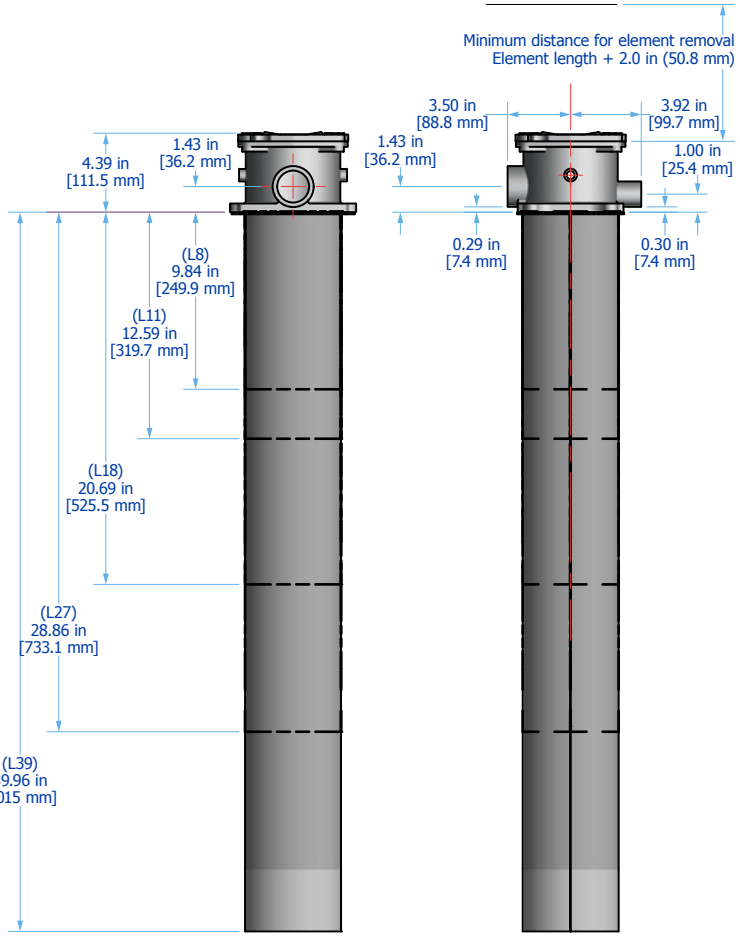


4-Hole Mounting Pattern

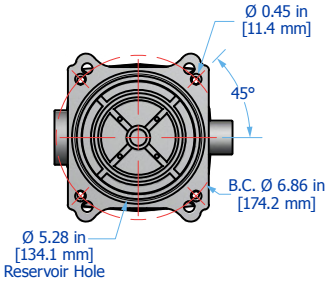


TFR2 Installation Drawing

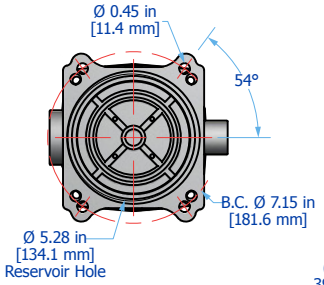




4-Hole Mounting Pattern

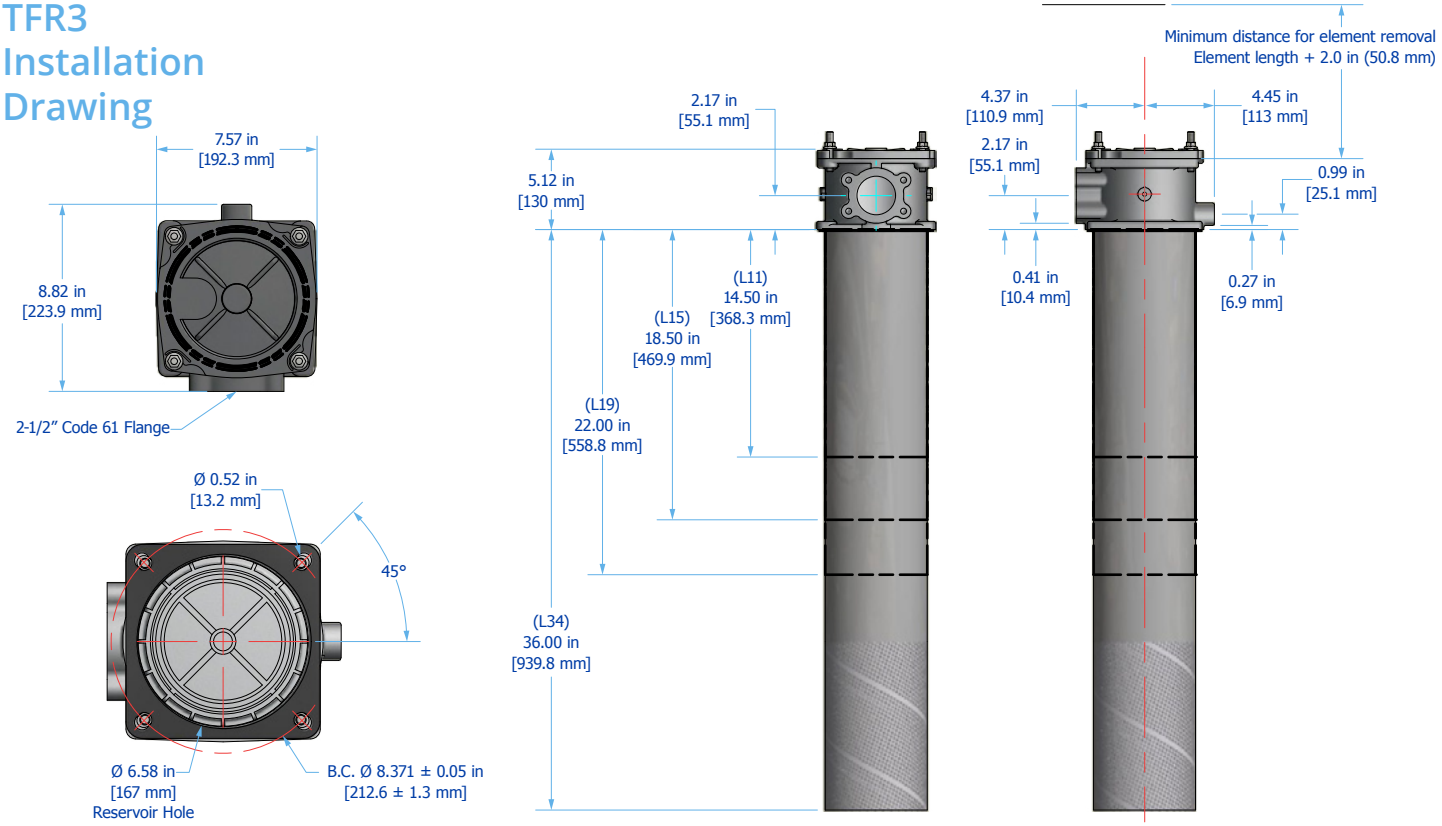


2-Hole Mounting Pattern

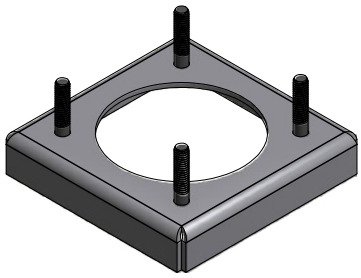


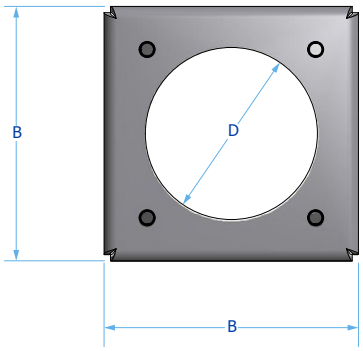
TFR Installation Drawings

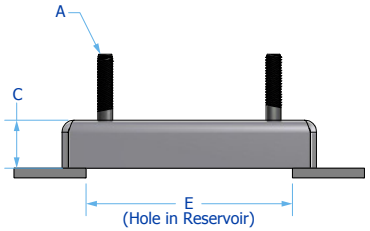
TFR3 Installation Drawing



TFR Weld Flange Installation Drawing







Series	TFR1	TFR2	TFR3
A	5/16" - 18 UNC-2A	3/8" - 16 UNC-2A	3/8" - 16 UNC-2A
B	5.33" (135.4 mm)	7.09" (18.0 mm)	8.31" (21.1 mm)
C	1.00" (25.4 mm)	1.00" (25.4 mm)	1.00" (25.4 mm)
D	3.59" (91.2 mm)	5.30" (134.6 mm)	6.67" (169.4 mm)
E	3.8-4.5" (96.5-114.3 mm)	5.5-6.25" (139.7-158.75 mm)	6.75-7.25" (171.5-184.2 mm)

Filter Assembly Sizing

Filter Assembly Sizing Guidelines

Effective filter sizing requires consideration of flow rate, viscosity (operating and cold start), fluid type and degree of filtration. When properly sized, bypass during cold start can be avoided/minimized and optimum element efficiency and life achieved. The filter assembly differential pressure values provided for sizing differ for each media code, and assume 32 cSt (150 SUS) viscosity and 0.86 fluid specific gravity. Use the following steps to calculate clean element assembly pressure drop.

Sizing recommendations to optimize performance and permit future flexibility

- To avoid or minimize bypass during cold start the actual assembly clean ΔP calculation should be repeated for start-up conditions if cold starts are frequent.
- Actual assembly clean ΔP should not exceed 10% of bypass ΔP gauge/indicator set point at normal operating viscosity.
- If suitable assembly size is approaching the upper limit of the recommended flow rate at the desired degree of filtration consider increasing the assembly to the next larger size if a finer degree of filtration might be preferred in the future. This practice allows the future flexibility to enhance fluid cleanliness without compromising clean ΔP or filter element life.
- Once a suitable filter assembly size is determined consider increasing the assembly to the next larger size to optimize filter element life and avoid bypass during cold start.
- When using water glycol or other specified synthetics, we recommend increasing the filter assembly by 1~2 sizes.

Step 1: Calculate ΔP coefficient for actual viscosity

Using Saybolt Universal Seconds (SUS)

$$\text{ΔP Coefficient} = \frac{\text{Actual Operating Viscosity1 (SUS)}}{150} \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Using Centistokes (cSt)

$$\text{ΔP Coefficient} = \frac{\text{Actual Operating Viscosity}^{1}\text{ (cSt)}}{32} \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Step 2: Calculate actual clean filter assembly ΔP at both operating and cold start viscosity

$$\text{Actual Assembly Clean ΔP} = \text{Flow Rate} \times \text{ΔP Coefficient (from Step 1)} \times \text{Assembly ΔP Factor (from sizing table)}$$

Filter Assembly Sizing

Filter assembly clean element ΔP after actual viscosity correction should not exceed 10% of filter assembly bypass setting. See above for viscosity correction formula. For applications with extreme cold start condition contact Hy-Pro for sizing recommendations.

ΔP Factors[1]

Model	Length	Units	Media 1M	3M	6M	10M	16M	25M	**W
TFR1	L6	psid/gpm	0.5640	0.4759	0.3688	0.3308	0.3236	0.3117	0.0571
		bard/lpm	0.0103	0.0087	0.0067	0.0060	0.0059	0.0057	0.0010
	L8	psid/gpm	0.4846	0.4090	0.3170	0.2842	0.2781	0.2679	0.0491
		bard/lpm	0.0088	0.0074	0.0058	0.0052	0.0051	0.0049	0.0009
	L11	psid/gpm	0.3379	0.2852	0.2210	0.1982	0.1939	0.1868	0.0342
		bard/lpm	0.0062	0.0052	0.0040	0.0036	0.0035	0.0034	0.0006
TFR2	L8	psid/gpm	0.2370	0.2000	0.1550	0.1390	0.1360	0.1310	0.0240
		bard/lpm	0.0043	0.0036	0.0028	0.0025	0.0025	0.0024	0.0004
	L11	psid/gpm	0.1774	0.1497	0.1160	0.1041	0.1018	0.0981	0.0180
		bard/lpm	0.0032	0.0027	0.0021	0.0019	0.0019	0.0018	0.0003
	L18	psid/gpm	0.1009	0.0852	0.0660	0.0592	0.0579	0.0558	0.0102
		bard/lpm	0.0018	0.0016	0.0012	0.0011	0.0011	0.0010	0.0002
TFR3	L11	psid/gpm	0.1102	0.0930	0.0721	0.0646	0.0632	0.0609	0.0112
		bard/lpm	0.0020	0.0017	0.0013	0.0012	0.0012	0.0011	0.0002
	L15	psid/gpm	0.0834	0.0704	0.0545	0.0489	0.0479	0.0461	0.0084
		bard/lpm	0.0015	0.0013	0.0010	0.0009	0.0009	0.0008	0.0002
	L19	psid/gpm	0.0688	0.0580	0.0450	0.0403	0.0395	0.0380	0.0070
		bard/lpm	0.0013	0.0011	0.0008	0.0007	0.0007	0.0007	0.0001
	L34	psid/gpm	0.0398	0.0336	0.0260	0.0234	0.0228	0.0220	0.0040
		bard/lpm	0.0007	0.0006	0.0005	0.0004	0.0004	0.0004	0.0001

[1]Max flow rates and ΔP factors assume υ = 150 SUS, 32 cSt. See filter assembly sizing guideline for viscosity conversion formula for viscosity change.

TFR Specifications

Dimensions

See Installation Drawings on pages 3-4 for model specific dimensions.

Operating Temperature

Fluid Temperature
30°F to 225°F
(0°C to 105°C)

Ambient Temperature
-4°F to 140°F
(-20C to 60C)

Operating Pressure

150 psi (10 bar) maximum

Pressure Switch Trigger

22 psi (1.5 bar)
45 psi (3.1 bar)

Visual Gauge

0-22 psi (0-1.5 bar), green to red
0-45 psi (0-3.1 bar), green to red

Element Collapse Rating

100 psid (6.9 bard)

Integral Bypass Setting

25 psid (1.7 bard) standard. For 50 psid (3.4 bard) option, select Bypass Option "3" in Assembly Part Number Builder and add "-50" to the end of Replacement Element part number.

Materials of Construction

Head
Cast aluminum

Diffuser
Powder coated or plated steel

Element Bypass Valve
Plated steel

Media Description

M
G8 Dualglass, our latest generation of DFE rated, high performance glass media for all hydraulic & lubrication fluids. $\beta x_{[C]} \geq 1000$ ($\beta x \geq 200$)

A
G8 Dualglass high performance media combined with water removal scrim. $\beta x_{[C]} \geq 1000$ ($\beta x \geq 200$)

W
Stainless steel wire mesh media $\beta x_{[C]} \geq 2$ ($\beta x \geq 2$)

Replacement Elements

To determine replacement elements, use corresponding codes from your assembly part number:

Series Code	Bypass Code	Filter Element Part Number	Example
1	2	HPTFR1L[Element Length Code] – [Media Selection Code][Seal Code]	HPTFR1L6–6MV
	3	HPTFR1L[Element Length Code] – [Media Selection Code][Seal Code] – 50	HPTFR1L6–6MV–50
2	2	HPTFR2L[Element Length Code] – [Media Selection Code][Seal Code]	HPTFR2L27–10AB
	3	HPTFR2L[Element Length Code] – [Media Selection Code][Seal Code] – 50	HPTFR2L27–10AB–50
3	2	HPTFR3L[Element Length Code] – [Media Selection Code][Seal Code]	HPTFRL19–3ME-WS
	3	HPTFR3L[Element Length Code] – [Media Selection Code][Seal Code] – 50	HPTFRL19–3ME-WS–50

Fluid Compatibility

Petroleum and mineral based fluids (standard). For polyol ester, phosphate ester, and other specified synthetic fluids use fluorocarbon seal option or contact factory.

TFR Part Number Builder

TFR [ ] [ ] [ ] [ ] [ ] - [ ] - [ ] [ ]

Series | Connection | Length | Bypass | Indicator | Special Options | Media | Seal

Series

Series

1	1.25" maximum inlet
2	1.5" maximum inlet
3	2.5" maximum inlet

Max Flow Rate

40 gpm (151 lpm)[1]
60 gpm (227 lpm)[1]
150 gpm (568 lpm)[1]

Connection

TFR1

G16	1" G thread (BSPP)
G20	1.25" G thread (BSPP)
N16	1" NPT
S16	1" SAE
S20	1.25" SAE

TFR2

F24	1.5" Code 61 flange
G24	1.5" G thread (BSPP)
N24	1.5" NPT
S24	1.5" SAE

TFR3

F40	2.5" Code 61 flange

Element Length[2]

TFR1

6	6" (15 cm) nominal
8	8" (20 cm) nominal
11	11" (28 cm) nominal

TFR2

8	8" (20 cm) nominal
11	11" (28 cm) nominal
18	18" (46 cm) nominal
27	27" (69 cm) nominal
39	39" (99 cm) nominal

TFR3

11	11" (28 cm) nominal
15	15" (38 cm) nominal
19	19" (48 cm) nominal)
34	34" (86 cm) nominal

Bypass

2[3]	Integrated bypass - 25 psid (1.7 bar)
3[4]	Integrated bypass - 50 psid (3.4 bar)

Pressure Indicator

DX	Electric pressure switch (DIN connection)
E	Electric switch with flying leads (3-wire connection)
G	Visual pressure gauge
X	No indicator (port plugged)

Special Options

R[5]	Exclude diffuser tube
W	Reservoir weld flange

Media Selection

G8 Dualglass

1M	$\beta 2.5_{[C]} \geq 1000, \beta 1 \geq 200$
3M	$\beta 5_{[C]} \geq 1000, \beta 3 \geq 200$
6M	$\beta 7_{[C]} \geq 1000, \beta 6 \geq 200$
10M	$\beta 12_{[C]} \geq 1000, \beta 12 \geq 200$
16M	$\beta 17_{[C]} \geq 1000, \beta 17 \geq 200$
25M	$\beta 22_{[C]} \geq 1000, \beta 25 \geq 200$

G8 Dualglass + water removal

3A	$\beta 5_{[C]} \geq 1000, \beta 3 \geq 200$
6A	$\beta 7_{[C]} \geq 1000, \beta 6 \geq 200$
10A	$\beta 12_{[C]} \geq 1000, \beta 12 \geq 200$
25A	$\beta 22_{[C]} \geq 1000, \beta 25 \geq 200$

Stainless wire mesh

25W	25µ nominal
40W	40µ nominal
74W	74µ nominal
149W	149µ nominal

Seals

B	Nitrile (Buna)
V	Fluorocarbon
E-WS	EPR seals + stainless steel support mesh

[1]Maximum recommended flow rate based on velocity through port and internal flow path. Consult sizing guidelines or consult factory for sizing based on flow rate, viscosity, temperature, filter media selection.
[2]Improper length selection could result in reservoir foaming. Consider diffuser and element length and anticipated reservoir fluid level when sizing. To protect against foaming, using longer lengths is recommended.
[3]Standard Bypass Rating. Consult Hy-Pro for alternate valve setting.
[4]When selected, add "-50" to end of replacement element part number.
[5]Excluding diffuser tube can result in reservoir foaming in high flow density applications.

HY-PRO

Filtration starts with the filter.

Lower ISO Codes: Lower Total Cost of Ownership Hy-Pro filter elements deliver lower operating ISO Codes so you know your fluids are always clean, meaning lower total cost of ownership and reducing element consumption, downtime, repairs, and efficiency losses.

DFE Rated Filter Elements DFE is Hy-Pro's proprietary testing process which extends ISO 16889 Multi Pass testing to include real world, dynamic conditions and ensures that our filter elements excel in your most demanding hydraulic and lube applications.

Upgrade Your Filtration Keeping fluids clean results in big reliability gains and upgrading to Hy-Pro filter elements is the first step to clean oil and improved efficiency.

Advanced Media Options DFE glass media maintaining efficiency to $\beta 0.7_{[c]} > 1000$, Dualglass + water removal media to remove free and emulsified water, stainless wire mesh for coarse filtration applications, and Dynafuzz stainless fiber media for EHC and aerospace applications.

Delivery in days, not weeks From a massive inventory of ready-to-ship filter elements to flexible manufacturing processes, Hy-Pro is equipped for incredibly fast response time to ensure you get your filter elements and protect your uptime.

More than just filtration Purchasing Hy-Pro filter elements means you not only get the best filters, you also get the unrivaled support, training, knowledge and expertise of the Hy-Pro team working shoulder-to-shoulder with you to eliminate fluid contamination.

Want to find out more? Get in touch.

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