FSL

FSL Filter Unit

Flow rate up to 22 gpm (82 lpm)

Dedicated filtration skids for gearbox and side-loop reservoir conditioning.

Ideal for high viscosity Lube and hydraulic oils (ISOVG22~ISOVG460)

Filter new fluids during transfer and replenishment (top-off)

Remove particulate and water contamination.

Large element yields extended life.

Materials of Construction

Assembly Frame: Painted Steel
Drip Pan: Painted Steel
Filter Assembly: Epoxy coated steel
25 or 50 psid bypass available
True differential pressure indicator

Operating Temperature

Nitrile (Buna)	-40f to 150f
	-40c to 66c
Fluorocarbon (Viton)*	-15f to 200f
	-26c to 93c

*High temperature / phosphate ester design

Fluid Compatibility

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

Weight

FSL1 (36 length): 260 Lbs (117 kg) approximate
FSL2 (36 length): 273 Lbs (124 kg) approximate
FSL3 (36 length): 292 Lbs (133 kg) approximate

Explosion Proof Option

Class 1, Div 2, Group C/D explosion optional.

Electrical Service

115VAC 60Hz 1P standard
(see options table for other selections)

Electric Motor Specifications

TEFC or ODP, 56C frame
FSL1: 1 HP, 115VAC, 60Hz, 1P, 1750 RPM
FSL2: 1 1/2 HP, 230VAC, 60Hz, 1P, 1750 RPM
or 440VAC, 60Hz, 3P, 1750 RPM
FSL3: 3HP, 230VAC, 60Hz, 1P, 1750 RPM
or 440VAC, 60Hz, 3P, 1750 RPM

Recommended Viscosity Range*

FSL1*: 28 SSU ~ 6000 SSU, 6 cSt ~ 1200 cSt
FSL2*: 28 SSU ~ 5000 SSU, 6 cSt ~ 1000 cSt
FSL3*: 28 SSU ~ 3000 SSU, 6 cSt ~ 600 cSt

*Please check maximum viscosity of oil in coldest condition and normal operating condition for sizing and selection. Do not rely solely on ISO VG viscosity rating of the fluid.

Pump Specifications

Gear pump
Internal relief full flow @ 100 psi standard.

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FSL1, FSL2, FSL3 FILTER CART APPLICATION INFO

Cleaner Fluid, Greater Reliability

When establishing a target ISO cleanliness code first identify the most sensitive component. New oil added should be cleaner than the target ISO code for the system.

Figure 1 details the improvements in component life as the ISO cleanliness is improved for roller contact bearings. Improving and stabilizing fluid cleanliness codes can increase hydraulic component and bearing life exponentially.

Lab and field tests prove time and again that Hy-Pro filters deliver lower ISO cleanliness codes, and do it with greater consistency.

Figure 1

Current ISO Code	Target ISO Code	Target ISO Code	Target ISO Code	Target ISO Code
Start	**2 x Life**	**3 x Life**	**4 x Life**	**5 x Life**
28/26/23	25/22/19	22/20/17	20/18/15	19/17/14
27/25/22	23/21/18	21/19/16	19/17/14	18/16/13
26/24/21	22/20/17	20/18/15	19/17/14	17/15/12
25/23/20	21/19/16	19/17/14	17/15/12	16/14/11
25/22/19	20/18/15	18/16/13	16/14/11	15/13/10
23/21/18	19/17/14	17/15/12	15/13/10	14/12/9
22/20/17	18/16/13	16/14/11	15/13/10	13/11/8
21/19/16	17/15/12	15/13/10	13/11/8	-
20/18/15	16/14/11	14/12/9	-	-
19/17/14	15/13/10	13/11/8	-	-
18/16/13	14/12/9	-	-	-

Coreless Filter Element Technology

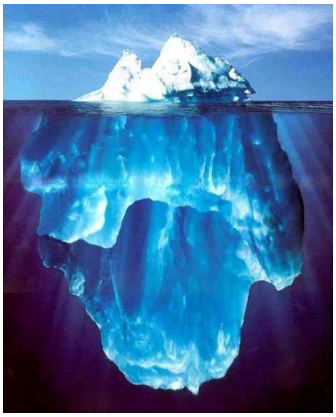
Hy-Pro coreless elements are featured in the FSL series (see figure 4). The elements are oversized to yield extended element life and handle a wide variety of high viscosity oils. Hy-Pro coreless elements utilize wire mesh pleat support which ensures that the pleats won't collapse or lose Integrity.

True Differential Pressure Gauges & Switches

Differential pressure gauges with green to red display ensures proper monitoring of filter element condition. DIN connector switch can be added to any pressure gauge (see figure 5).

Cost of Contamination Control - The Tip of the Iceberg

Filtration as a visible cost is less than 3% of the total costs associated with contamination and contamination related failures. Poorly managed fluid contamination can result in the following costly situations:



- **Lost production (downtime)**
- **Component repair, replacement**
- **Higher maintenance labor costs**
- **Unreliable machine performance**
- **Reduced fluid life**
- **Wasted time and energy**

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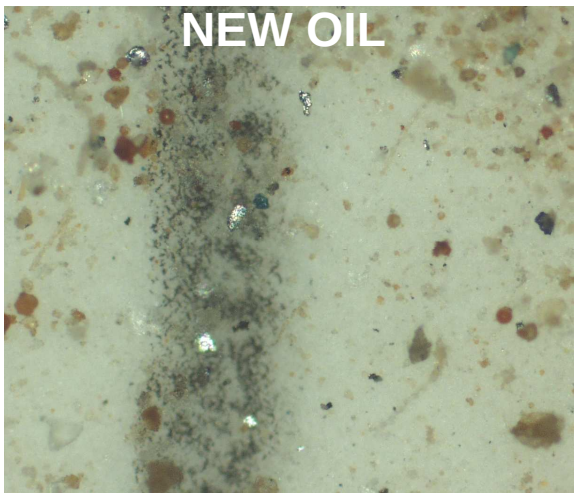
FSL1, FSL2, FSL3 FILTER CART APPLICATION INFO

Filtering New Oil - Remove Particulate and Water

New oil is typically not clean oil, and not suitable for use in hydraulic and lube systems. During the production and transportation process new oil collects high levels of solid contaminant and water. A common ISO code for new oil is 24/22/19. New oil is one of the worst sources of particulate contaminant system ingression.



The FSL features a three-way valve on the inlet and may be used to draw new oil from a tote and pre-filter the new oil. Hy-Pro High efficiency media is your last line of defense against harmful particulate and water contamination. Free and dissolved water in hydraulic and lube systems leads to accelerated abrasive wear, corrosion of metal surfaces, increased electrical conductivity, viscosity variance, loss of lubricity, fluid additive breakdown, bearing fatigue, and more. The FSL features a wide range of options to tackle any challenge whether you are removing solid particles only or water and particles. The “A” media adsorbs water while controlling particles with absolute efficiency (beta ratio of $\beta X_{[c]} > 1000$).

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FSL FILTRATION UNIT SELECTION AND SIZING GUIDELINES

Effective filter sizing requires consideration of flow rate, viscosity (operating and cold start), fluid type, 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 150 SSU (32Cts) viscosity and 0.86 fluid specific gravity. Use the following steps to identify the correct high pressure filter assembly.

1. Calculate Δp coefficient at both operating and cold start viscosity:

$$\Delta p \text{ Coefficient} = \frac{\text{Actual Operating Viscosity (SSU)}}{150} \times \frac{\text{Actual S.G.}}{0.86}$$

2. Calculate actual clean filter assembly Δp at both operating and cold start viscosity:

Actual assembly clean Δp = Flow rate x Δp Coefficient x Assembly Δp factor (from sizing table)

3. 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 5 psid 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.
- High viscosity fluid (ie gear lube ISO 220) will typically display very high viscosity as the temperature drops below 100f. For such applications avoiding bypass during start-up might not be possible.

FSL Filter Assembly (housing + element) Differential Pressure Factors

Media code	Length code	Δp factor* (psid/gpm)	Δp factor* (bar/lpm)	Length code	Δp factor* (psid/gpm)	Δp factor* (bar/lpm)
1M	16,18	0.059	0.00113	36,39	0.047	0.0009
3M		0.05	0.00096		0.042	0.00081
6M		0.048	0.00092		0.041	0.00079
10M		0.046	0.00087		0.04	0.00077
16M		0.043	0.00082		0.038	0.00073
25M		0.04	0.00077		0.037	0.00071
**W		0.037	0.00071		0.035	0.00067

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FSL FILTER CART PART NUMBER GUIDE

	table 1		table 2	table 3		table 4	table 5		table 6	table 7	table 8	
FSL	Flow Rate	-	Element Type	Media Selection	-	Seals	Length	-	Δp Indictr	Power Option	Extra Option	Hy-Pro mfg code

REPLACEMENT FILTER ELEMENT PART NUMBER GUIDE

	table 2	table 5		table 3	table 4
HP10		*L___	-		

*Use L16 or L39 length code for HP8314 single and double element lengths.

table 1 code	**flow rate gpm (lpm)**
1	5 gpm (18,7 lpm)
2	10 gpm (37,5 lpm)
3	22 gpm (82 lpm)

table 4 code	**seal material**
B	Nitrile (Buna)
V	Specified synthetics or High Temperature (>150F). Viton seals

table 2 code	**Element Configuration**
5	HP105 coreless series, positive o-ring seals, **NO BYPASS,** max change-out 60 psid (4,2 bar)
6	HP106 element with bypass, 25 psid (1,8 bar) bypass, orings change-out 22 psid (1,5 bar)
7	HP107 element with bypass 50 psid (3,5 bar) bypass, orings change-out 45 psid (3,2 bar)
8	USE HP8314 for element P/N Interchanges with Pall HC8314, **NO BYPASS,** oring seals, max change-out 45 psid (3,2 bar)

table 3 code	**filtration rating**	media type
1M	$\beta 2.5_{[c]}$ = 1000 (β1 = 200)	G7 Dualglass
3M	$\beta 5_{[c]}$ = 1000 (β3 = 200)	G7 Dualglass
6M	$\beta 7_{[c]}$ = 1000 (β6 = 200)	G7 Dualglass
10A	$\beta 12[_{c]}$ = 1000 (β12 = 200)	Water removal
10M	$\beta 12_{[c]}$ = 1000 (β12 = 200)	G7 Dualglass
16A	$\beta 16_{[c]}$ = 1000 (β17 = 200)	Water removal
16M	$\beta 16_{[c]}$ = 1000 (β17 = 200)	G7 Dualglass
25A	$\beta 22_{[c]}$ = 1000 (β25 = 200)	Water removal G7
25M	$\beta 22_{[c]}$ = 1000 (β25 = 200)	Dualglass
25W	25u nominal	wire mesh
40W	40u nominal	wire mesh
74W	74u nominal	wire mesh
149W	149u nominal	wire mesh

table 5 code	**element length**
18	Single - 18" nominal (FSL1, FSL2 only)
36	Double - 36" nominal (FSL1, FSL2, FSL3)

table 6 code	**differential pressure indicator**
X	None (ported, plugged)
D	22 psid visual Δp gage, + electric alarm (120V AC)
E	22 psid visual Δp gage
F	45 psid visual Δp gage, + electric alarm (120V AC)
G	45 psid visual Δp gage
H	65 psid visual Δp gage, + electric alarm (120V AC, non-bypass element options 5 & 8 only)
J	65 psid visual Δp gage (non-bypass element options 5 & 8 only)
P	Two pressure gages (industrial liquid filled)

table 7 code	**power options**
Omit (standard)	115 VAC, 60Hz, 1P (1750 RPM motor)
E1	120 VAC, 50Hz, 1P (1450 RPM motor)
E2	230 VAC, 60Hz, 1P (1750 RPM motor)
E3	230 VAC, 50Hz, 1P (1450 RPM motor)
E4	24 VDC (Consult factory for application)
E5	440-480 VAC, 60 Hz, 3P (1750 RPM motor)
E6	380-420 VAC, 50Hz, 3P (1450 RPM motor)

*3 phase electrical option carts are supplied with terminated electrical cord only. Customer may provide a plug to be installed by Hy-Pro.

table 8 code	**special options**
C1	Explosion proof electrical (Class 1,Div 2, Grp C/D)
P	On-board particle monitor (call factory for info)
S	Stainless steel vessel, plumbing, element support
T	Drip Tray with for spill retention

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FILTER MEDIA . . . THE HEART OF A FILTER

Dynamic Filter Efficiency (DFE) Testing

Revolutionary test methods assure that DFE rated elements perform true to rating even under demanding variable flow and vibration conditions. Today's industrial and mobile hydraulic circuits require elements that deliver specified cleanliness under ALL circumstances. Wire mesh supports the media to ensure against cyclical flow fatigue, temperature, and chemical resistance failures possible in filters with synthetic support mesh. Contact your distributor or Hy-Pro for more information and published articles on DFE testing.

Media Options

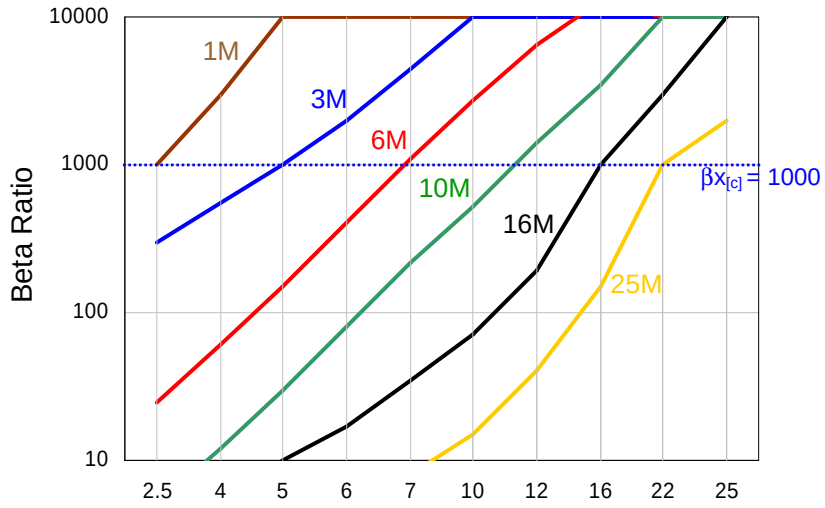
Through extensive testing we have developed media choices to handle any application. Options include G7 Dualglass, G7 Dualglass + Water Removal and Stainless steel wire mesh.

Fluid Compatibility

Petroleum based fluids, water glycol, polyol ester, phosphate ester, High water based fluids, and many other synthetics. Contact us for seal material selection assistance.

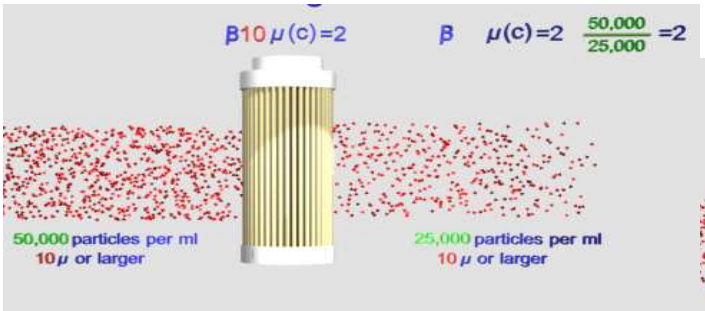
FILTER MEDIA SPECIFICATIONS

Glass Media Code Filtration Efficiency (Beta Ratio) vs Micron Size (per ISO16889 multipass)



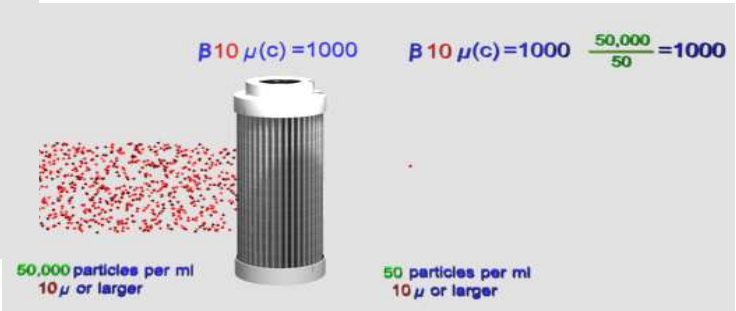
Micron size $\mu m_{[c]}$ (per ISO16889)

media code	media description
A	G7 Dualglass high performance media combined with water removal scrim. $\beta x_{[c]} = 1000$ ($\beta x = 200$)
M	G7 Dualglass our latest generation of DFE rated, high performance glass media for all hydraulic & lubrication fluids. $\beta x_{[c]} = 1000$ ($\beta x = 200$)
W	Stainless steel wire mesh media $\beta x_{[c]} = 2$ ($\beta x = 2$) nominally rated



Typical cellulose media performance

Hy-Pro G7 Dualglass media performance



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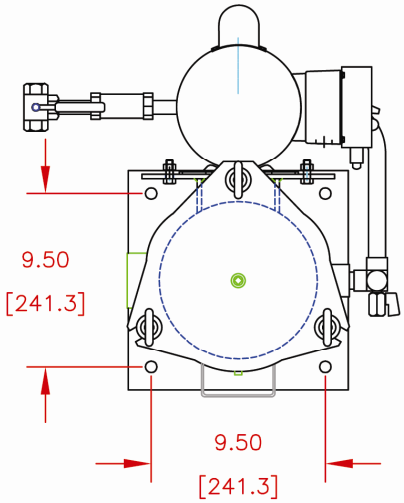
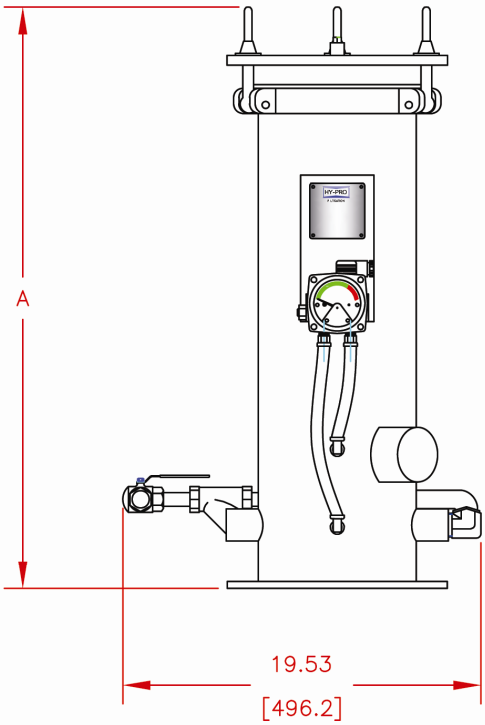
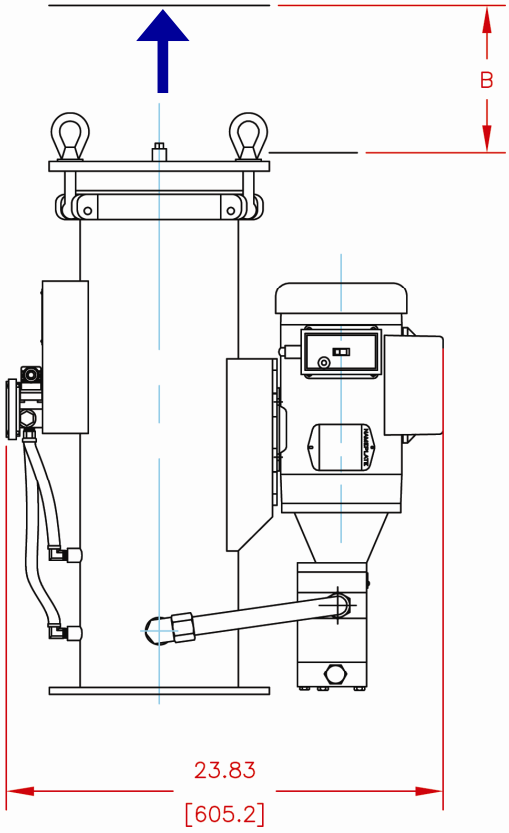
FSL1, FSL2 DIMENSIONS



	Dims IN (mm)	
	L18	**L36**
A	31.81 (808)	49.81 (1265)
B	17.25 (438)	36.25 (921)



Element removal clearance



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SPARE PARTS

Series	Part Number	Description
FSL1, FSL2, FSL3	LFSV	Oil sampling isolation valve
FSL1, FSL2, FSL3	SPLF107	HP106, HP107 Element hold down spring
FSL1, FSL2, FSL3	LFHD105KIT	HP105, HP8314 Element hold down plate with snap ring
FSL1, FSL2, FSL3	GLF	P option- liquid filled pressure gauge
FSL1, FSL2, FSL3	LFIND-D	22 psid green to red visual differential pressure gauge + electric alarm
FSL1, FSL2, FSL3	LFIND-E	22 psid green to red visual differential pressure gauge
FSL1, FSL2, FSL3	LFIND-F	45 psid green to red visual differential pressure gauge + electric alarm
FSL1, FSL2, FSL3	LFIND-G	45 psid green to red visual differential pressure gauge
FSL1, FSL2, FSL3	LFIND-H	65 psid green to red visual differential pressure gauge + electric alarm
FSL1, FSL2, FSL3	LFIND-J	65 psid green to red visual differential pressure gauge
FSL1, FSL2, FSL3	OVLFLID	Filter housing seal VITON
FSL1, FSL2, FSL3	LBLFLID	Filter housing seal BUNA
FSL1, FSL2, FSL3	LFLID	Filter housing cover
FSL1, FSL2, FSL3	LFLIDBLT	Filter housing cover bolts
FSL1, FSL2, FSL3	LFLIDNUT	Filter housing cover eye nuts
FCL1, FCL2, FCL3	LFDRPLUG	2" NPT filter housing drain plug
FSL1, FSL2, FSL3	LFVPLUG	1/4" NPT filter housing cover vent port plug

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