

FSL

High Viscosity Filtration Systems

A dedicated contamination solution for bulk oil handling and fluid transfer. Designed to excel in filtering particulate from heavily contaminated oil, the FSL keeps gearbox lubricant clean and equipment running efficiently.

Ideal for high viscosity gearbox or lube applications and highly contaminated fuel applications.



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Filtration starts with the filter.

The oversized coreless filter element in every FSL delivers lower ISO Codes over a long element lifespan to ensure low disposal impact, simultaneously reducing your environmental footprint and your bottom line. To top it off, select elements come standard with an integral zero-leak bypass so with every filter change you get a new bypass along with peace of mind.



Weather any condition.

From cold weather to cold starts, the FSL is engineered to easily handle almost any job. Designed to combine incredible capacity and low maintenance, the oversized housing with secure swivel bolts allow for effortless element changes with all the parts kept right where they need to be.



Cleaner fluid + greater reliability.

DFE rated advanced media technologies provide the highest level of particulate capture and retention capabilities so your equipment operates unimpeded by contamination. And with the cast iron gear pump with internal relief, you get the durability you want with the safety you need, all conveniently in one square foot of floor space.



Options to make your job easier.

By selecting the optional filter bypass line, cold starts and element change-outs become easier than ever. Choose the pneumatic powered model or explosion proof option to match your application and even add the optional PM-1 particle monitor for real time cleanliness data without the need for a bottle.

Setting the new standard.

Every FSL comes standard with sample ports in the right locations to arm you with access to consistently accurate system conditions. And with true differential pressure gages, you'll know exactly how well your filtration is performing.



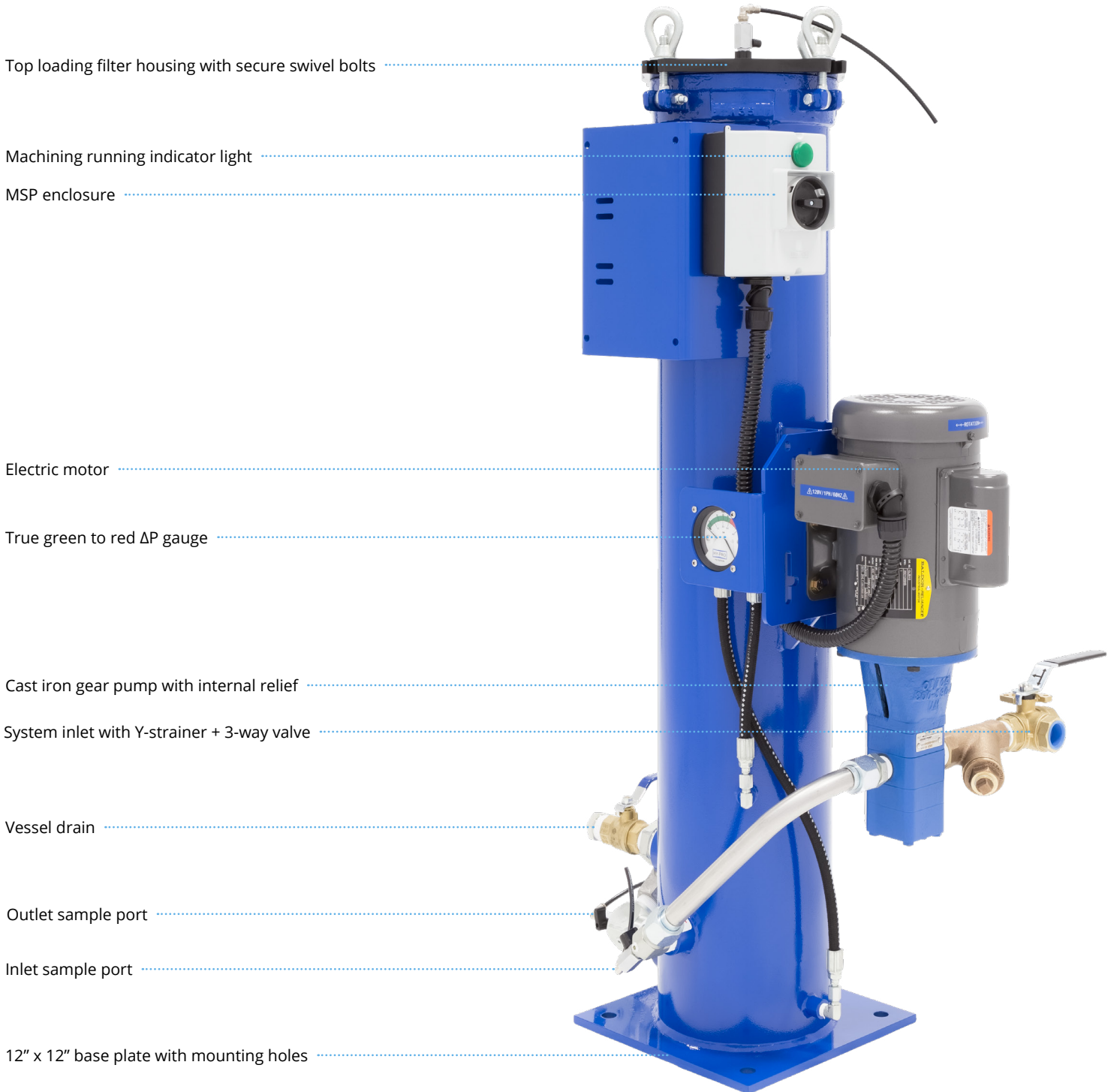
Completely customizable.

Every FSL can be tailored to meet any application and even to fit your existing safety standards. With the power to filter fluids greater than ISO VG 1500, contamination doesn't stand a chance.



FSL Reference Guide

FSL10 model shown (L36 element length)



Filter Sizing Guidelines

Filter Sizing Guidelines and Viscosity Conversion

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.

Calculate ΔP coefficient for actual viscosity

Using Saybolt Universal Seconds (SUS)

$$\Delta P \text{ Coefficient} = \frac{\text{Actual Operating Viscosity}^1 \text{ (SUS)}}{150} \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Using Centistokes (cSt)

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

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

$$\text{Actual Assembly Clean } \Delta P = \text{Flow Rate} \times \frac{\Delta P \text{ Coefficient (from calculation above)}}{\text{Assembly } \Delta P \text{ Factor (from sizing table)}}$$

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.



FSL Filter Sizing Guidelines

ΔP Factors ¹	Length	Units	Media	05M	1M	3M	6M	10M	16M	25M	**W
			VTM								
16/18		psid/gpm bard/lpm	0.063	0.047	0.046	0.039	0.030	0.027	0.027	0.026	0.005
			0.001	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.000
36/39		psid/gpm bard/lpm	0.044	0.033	0.032	0.027	0.021	0.019	0.019	0.018	0.003
			0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000

Length	Units	Media	3A	6A	10A	16A	25A	
		1A						
16/18		psid/gpm bard/lpm	0.051	0.043	0.034	0.030	0.030	0.028
			0.001	0.001	0.001	0.001	0.001	0.001
36/39		psid/gpm bard/lpm	0.036	0.030	0.024	0.021	0.021	0.020
			0.001	0.001	0.000	0.000	0.000	0.000

Max flow rates and ΔP factors assume $\mu = 150$ SUS, 32 cSt. See filter assembly sizing guideline for viscosity conversion formula.

FSL Specifications

Dimensions ¹	Height 50" (127 cm)	Width 22" (56 cm)	Depth 28" (71 cm)	Weight 222 lbs (101 kg)
Connections	Inlet with 3-way valve FSL05-FSL10: 1" FNPT FSL20-FSL30: 1.5" FNPT		Outlet FSL05-FSL10: 1" FNPT FSL20-FSL30: 1.25" FNPT	
Operating Temperature	Fluid Temperature 30°F to 225°F (0°C to 105°C)		Ambient Temperature -4°F to 104°F (-20C to 40C)	
Materials of Construction	Vessel Carbon steel with industrial coating			
Electric Motor	TEFC, 56-215 frame 0.5-3 hp, 1450-1750 RPM, see Appendix for amp ratings.			
Motor Starter	MSP (motor starter/protector) in an IP65, aluminum enclosure with short circuit and overload protection.			
Pump	Cast iron, positive displacement gear pump with internal relief. Maximum pressure on pump inlet 15 psi (1 bar). Consult factory for higher pressures.			
Pump Bypass	Full bypass at 150 psi (10 bar) ²			
Pneumatic Option Air Consumption	~40 cfm @ 80 psi ³			
Media Description	M G8 Dualglass, our latest generation of DFE rated, high performance glass media for all hydraulic & lubrication fluids. $\beta_{x_{10}}$ \geq 4000	A G8 Dualglass high performance media combined with water removal scrim. $\beta_{x_{10}}$ \geq 4000	W Stainless steel wire mesh media $\beta_{x_{10}}$ \geq 2 ($\beta_x \geq 2$)	
Replacement Elements	To determine replacement elements, use corresponding codes from your equipment part number:			
	Element Type Code	Filter Element Part Number	Example	
	5	HP105L[Length Code] - [Media Selection Code][Seal Code]	HP105L36-6AB	
	6	HP106L[Length Code] - [Media Selection Code][Seal Code]	HP106L18-10MV	
	7	HP107L[Length Code] - [Media Selection Code][Seal Code]	HP107L36-VTM710V	
	8X	HP8314L[Length Code] - [Media Selection Code][Seal Code]	HP8314L39-25WV	
	82	HP8314L[Length Code] - [Media Selection Code][Seal Code]	HP8314L16-12MB	
	85	HP8314L[Length Code] - [Media Selection Code][Seal Code]	HP8314L39-16ME-WS	
Viscosity	2-5000 cSt ⁴			
Fluid Compatibility	Petroleum and mineral based fluids, #2 diesel fuels (standard). For specified synthetics contact factory for compatibility with fluorocarbon seal option. For phosphate ester (P9) or skydrol fluid (S9) compatibility select fluid compatibility from special options.			
Hazardous Environment Options	Select pneumatic powered unit (Power Option 00) or explosion proof NEC Article 501, Class 1, Division 1, Group C+D. Call for IEC, Atex or other requirements. If Explosion Proof option (X--) selected, no electrical cord or cord reel will be included.			

¹Dimensions are approximations taken from base model and will vary according to options chosen.

²10 GPM pump is rated for intermittent duty only at pressures above 100 psi. Continual operation with dual clogged filters resulting in operating pressures over 100 psi will reduce pump life and/or cause premature pump failure.

³Air consumption values are estimated maximums and will vary with regulator setting.

⁴When sized and installed appropriately. Contact factory for applications above 800 cSt for sizing requirements.



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FSL Part Number Builder

FSL - -

Flow Rate Element Type Element Length Indicator Power Options Special Options Media Seal

Flow Rate¹	05	0.5 gpm (1.7 lpm)	10	10 gpm (37.9 lpm)
	1	1 gpm (3.7 lpm)	20	20 gpm (75.7 lpm)
	2	2 gpm (7.5 lpm)	30	30 gpm (114 lpm)
	5	5 gpm (18.9 lpm)		

Element Type	5	HP105 – no bypass	8X	HP8314 – no bypass
	6	HP106 – 25 psid (1.7 bard) integral element bypass	82	HP8314 – 25 psid (1.7 bard) integral housing bypass
	7	HP107 – 50 psid (3.4 bard) integral element bypass	85	HP8314 – 50 psid (3.4 bard) integral housing bypass

Element Length	18²	L18 single length filter housing and coreless element	16²	L16 single length filter housing and coreless element
	36²	L36 single length filter housing and coreless element	39²	L39 single length filter housing and coreless element

ΔP Indicator	D	22 psid visual gauge + electric switch	H	65 psid visual gauge + electric switch (elements 5 or 8X only)
	E	22 psid visual gauge	J	65 psid visual gauge (elements 5 or 8X only)
	F	45 psid visual gauge + electric switch	P	2 pressure gauges (industrial liquid filled)
	G	45 psid visual gauge		

Power Options Contact factory for options not listed	60 Hz, 1750 RPM		50 Hz, 1450 RPM		Pneumatic	
	12	120 V ac, 1P	11	110 V ac, 1P	00 Pneumatically driven air motor & PD pump. FRL & flow meter included.	
	22	208-230 V ac, 1P	21	220 V ac, 1P		
	23	208-230 V ac, 3P	40	380-440 V ac, 3P		
	46	460-480 V ac, 3P	52	525 V ac, 3P		

Explosion proof - Class 1, Division 1, Group C+D per NEC 501 – Ready for outdoor use

X_ Add X prefix to power option listed above. Not available with (00) Pneumatic Option.

Special Options	A	Air cooled heat exchanger (consult factory)	O⁵	On-board PM-1 particle monitor & clean oil indicator light
	B	Complete filter bypass line	P9⁶	Phosphate ester fluid compatibility modification
	C	CE marked for machinery safety directive 2006/42/EC	S⁷	All wetted components 304 or higher stainless steel
	D	High filter ΔP auto shutdown	S9⁸	Skydrol fluid compatibility modification
	E³	100 mesh cast iron basket strainer	U	CUL and/or CSA marked starter enclosure for Canada
	F	Filter element ΔP gauge with tattle tale follower needle	V	Lifting eye kit
	G	Spill retention pan with fork guides (industrial coated steel)	W	Automatic air bleed valve
	J⁴	Add pressure gauge between pump & filter assembly	Y⁹	VFD variable speed motor frequency control
	K³	HP75L8-149W Spin-On suction strainer	Z	On site start-up training
	L	High filter element ΔP indicator light		
	M	Total system flow meter (120 cSt max)		

Media Selection	G8 Dualglass		G8 Dualglass + water removal		Stainless wire mesh	
	05M	β _{0.9} (_{C1}) ≥ 4000	3A	β ₅ (_{C1}) ≥ 4000	25W	25μ nominal
	1M	β ₃ (_{C1}) ≥ 4000	6A	β ₇ (_{C1}) ≥ 4000	40W	40μ nominal
	3M	β ₅ (_{C1}) ≥ 4000	10A¹⁰	β ₁₂ (_{C1}) ≥ 4000	74W	74μ nominal
	6L	β ₇ (_{C1}) ≥ 4000	25A	β ₂₂ (_{C1}) ≥ 4000	149W	149μ nominal
	10M¹⁰	β ₁₂ (_{C1}) ≥ 4000				
	16M	β ₁₇ (_{C1}) ≥ 4000				

VTM

VTM710¹¹ β₃(_{C1}) ≥ 4000 particulate, insoluble oxidation by-product and water removal media

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

¹Nominal flow rates at 60 Hz motor speeds.

²Compatibility will be based on Element Type selection. For elements HP105, HP106, and HP107, use Length code 18 or 36. Length codes 16 and 39 only compatible with HP8314 element.

³"E" and "K" options can't be paired together

⁴"O" Option includes the "J" Option, do not pair

⁵"O" Option Not available with 30 GPM & requires electrical DP gauge with switch

⁶When selected, must be paired with Seal option "V." Contact factory for more information or assistance in fluid compatibility.

⁷With exception to cast iron gear pump.

⁸When selected, must be paired with Seal option "E-WS." Contact factory for more information or assistance in fluid compatibility.

⁹"Y" option not available with "O" option.

¹⁰For elements HP8314, use 12M or 12A for respective media code in place of 10M or 10A.

¹¹Only available on HP107 series elements. Flow rate should not exceed 16 gpm (60 lpm) for HP107L36-VTM710* elements and 8 gpm (30 lpm) for HP107L18-VTM710* elements.

For all up to date option details and compatibilities, please reference our Contamination Solutions Price List or contact customer service.



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 $\beta_{3, \mu} > 4000$, 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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