

# 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.



[hyprofiltration.com/](http://hyprofiltration.com/)



## 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.

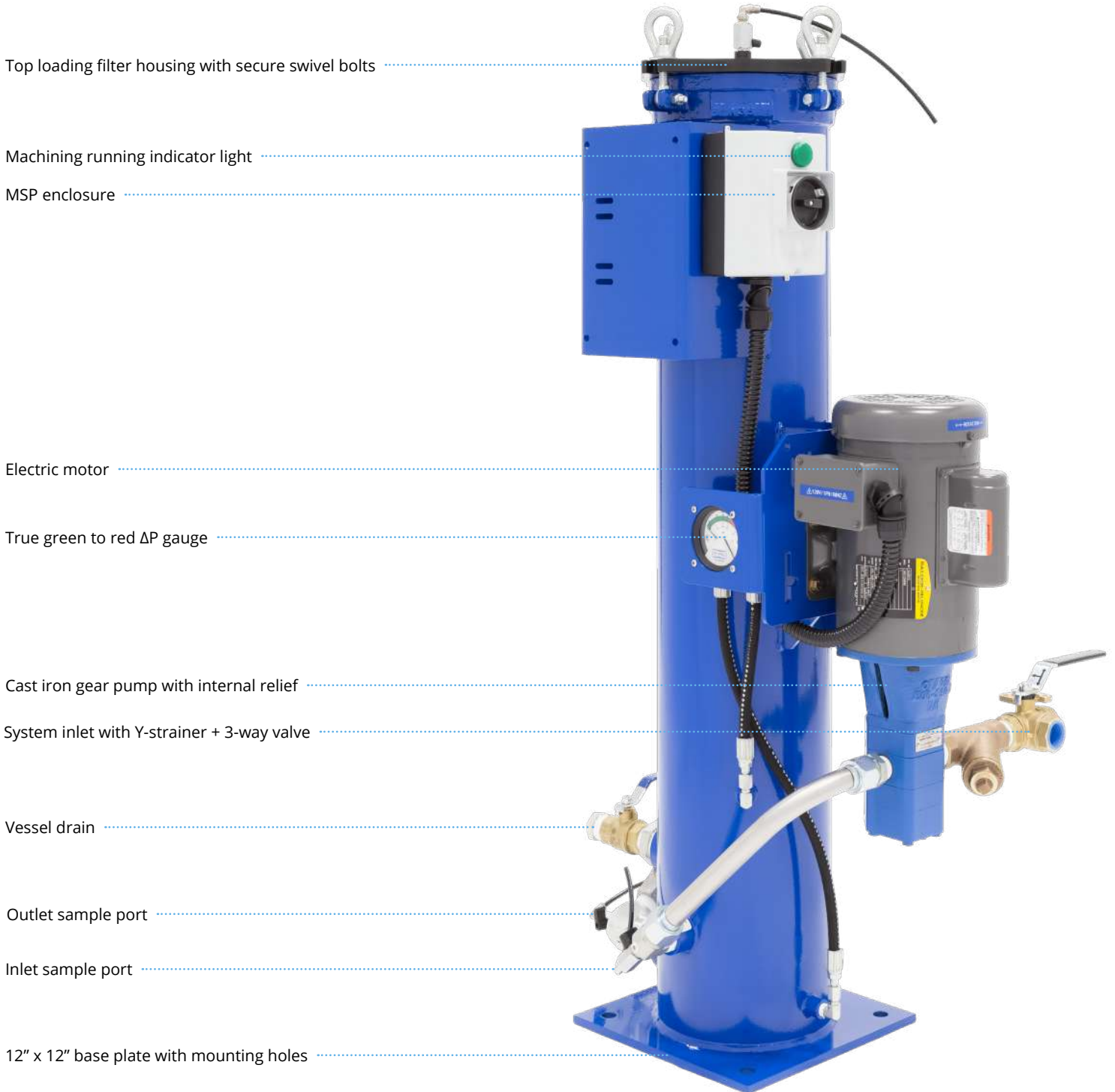


## Completely customizable.

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  $\Delta P$  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  $\Delta P$  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  $\Delta P$  calculation should be repeated for start-up conditions if cold starts are frequent.
- Actual assembly clean  $\Delta P$  should not exceed 10% of bypass  $\Delta P$  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  $\Delta P$  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

$\Delta P$ Factors <sup>1</sup>	Length	Units	Media	05M	1M	3M	6M	10M	16M	25M	**W
			VTM								
16/18		psid/gpm	0.063	0.047	0.046	0.039	0.030	0.027	0.027	0.026	0.005
		bard/lpm	0.001	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.000
36/39		psid/gpm	0.044	0.033	0.032	0.027	0.021	0.019	0.019	0.018	0.003
		bard/lpm	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	0.051	0.043	0.034	0.030	0.030	0.028
	bard/lpm	0.001	0.001	0.001	0.001	0.001	0.001
36/39	psid/gpm	0.036	0.030	0.024	0.021	0.021	0.020
	bard/lpm	0.001	0.001	0.000	0.000	0.000	0.000

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

# FSL Specifications

Dimensions <sup>1</sup>	<b>Height</b> 50" (127 cm)	<b>Width</b> 22" (56 cm)	<b>Depth</b> 28" (71 cm)	<b>Weight</b> 222 lbs (101 kg)
Connections	<b>Inlet with 3-way valve</b> FSL05-FSL10: 1" FNPT FSL20-FSL30: 1.5" FNPT		<b>Outlet</b> FSL05-FSL10: 1" FNPT FSL20-FSL30: 1.25" FNPT	
Operating Temperature	<b>Fluid Temperature</b> 30°F to 225°F (0°C to 105°C)		<b>Ambient Temperature</b> -4°F to 104°F (-20C to 40C)	
Materials of Construction	<b>Vessel</b> 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) <sup>2</sup>			
Pneumatic Option Air Consumption	~40 cfm @ 80 psi <sup>3</sup>			
Media Description	<b>M</b> G8 Dualglass, our latest generation of DFE rated, high performance glass media for all hydraulic & lubrication fluids. $\beta_{x_{10}}$ $\geq$ 4000	<b>A</b> G8 Dualglass high performance media combined with water removal scrim. $\beta_{x_{10}}$ $\geq$ 4000	<b>W</b> 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:			
	<b>Element Type Code</b>	<b>Filter Element Part Number</b>	<b>Example</b>	
	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 <sup>4</sup>			
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.			

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

<sup>2</sup>10 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.

<sup>3</sup>Air consumption values are estimated maximums and will vary with regulator setting.

<sup>4</sup>When 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

<b>Flow Rate<sup>1</sup></b>	<b>05</b>	0.5 gpm (1.7 lpm)	<b>10</b>	10 gpm (37.9 lpm)
	<b>1</b>	1 gpm (3.7 lpm)	<b>20</b>	20 gpm (75.7 lpm)
	<b>2</b>	2 gpm (7.5 lpm)	<b>30</b>	30 gpm (114 lpm)
	<b>5</b>	5 gpm (18.9 lpm)		

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

<b>Element Length</b>	<b>18<sup>2</sup></b>	L18 single length filter housing and coreless element	<b>16<sup>2</sup></b>	L16 single length filter housing and coreless element
	<b>36<sup>2</sup></b>	L36 single length filter housing and coreless element	<b>39<sup>2</sup></b>	L39 single length filter housing and coreless element

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

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

<b>Special Options</b>	<b>A</b>	Air cooled heat exchanger (consult factory)	<b>O<sup>5</sup></b>	On-board PM-1 particle monitor & clean oil indicator light
	<b>B</b>	Complete filter bypass line	<b>P9<sup>5</sup></b>	Phosphate ester fluid compatibility modification
	<b>C</b>	CE marked for machinery safety directive 2006/42/EC	<b>S<sup>7</sup></b>	All wetted components 304 or higher stainless steel
	<b>D</b>	High filter ΔP auto shutdown	<b>S9<sup>5</sup></b>	Skydrol fluid compatibility modification
	<b>E<sup>3</sup></b>	100 mesh cast iron basket strainer	<b>U</b>	CUL and/or CSA marked starter enclosure for Canada
	<b>F</b>	Filter element ΔP gauge with tattle tale follower needle	<b>V</b>	Lifting eye kit
	<b>G</b>	Spill retention pan with fork guides (industrial coated steel)	<b>W</b>	Automatic air bleed valve
	<b>J<sup>4</sup></b>	Add pressure gauge between pump & filter assembly	<b>Y<sup>9</sup></b>	VFD variable speed motor frequency control
	<b>K<sup>3</sup></b>	HP75L8-149W Spin-On suction strainer	<b>Z</b>	On site start-up training
	<b>L</b>	High filter element ΔP indicator light		
	<b>M</b>	Total system flow meter (120 cSt max)		

<b>Media Selection</b>	<b>G8 Dualglass</b>		<b>G8 Dualglass + water removal</b>		<b>Stainless wire mesh</b>	
	<b>05M</b>	β <sub>0.9</sub> (c) ≥ 4000	<b>3A</b>	β <sub>5</sub> (c) ≥ 4000	<b>25W</b>	25μ nominal
	<b>1M</b>	β <sub>3</sub> (c) ≥ 4000	<b>6A</b>	β <sub>7</sub> (c) ≥ 4000	<b>40W</b>	40μ nominal
	<b>3M</b>	β <sub>5</sub> (c) ≥ 4000	<b>10A<sup>10</sup></b>	β <sub>12</sub> (c) ≥ 4000	<b>74W</b>	74μ nominal
	<b>6L</b>	β <sub>7</sub> (c) ≥ 4000	<b>25A</b>	β <sub>22</sub> (c) ≥ 4000	<b>149W</b>	149μ nominal
	<b>10M<sup>10</sup></b>	β <sub>12</sub> (c) ≥ 4000				
	<b>16M</b>	β <sub>17</sub> (c) ≥ 4000				

## VTM

**VTM710<sup>11</sup>** β<sub>3</sub>(c) ≥ 4000 particulate, insoluble oxidation by-product and water removal media

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

<sup>1</sup>Nominal flow rates at 60 Hz motor speeds.

<sup>2</sup>Compatibility 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.

<sup>3</sup>"E" and "K" options can't be paired together

<sup>4</sup>"O" Option includes the "J" Option, do not pair

<sup>5</sup>"O" Option Not available with 30 GPM & requires electrical DP gauge with switch

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

<sup>7</sup>With exception to cast iron gear pump.

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

<sup>9</sup>"Y" option not available with "O" option.

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

<sup>11</sup>Only 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 filter media maintaining efficiency to  $\beta_{3, \text{eq}} > 4000$ , 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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