



# FPL

## Dedicated Off-line Filter Panel

A dedicated contamination solution for bulk oil handling, fluid transfer and reservoir or gearbox conditioning.

Enhance cleanliness by adding the FPL to an existing hydraulic system and extend the life of in-line filters.

## Ready when you are.

From the pump to the seals, every FPL arrives fully assembled and ready for installation so you can get straight to cleaning your fluids and improving the efficiency of your equipment.



## The first stage of success.

Staged filtration allows a range of media selections for particulate and water removal to deliver ISO Codes right on target. Choose between dual MF110 cartridge or up to four Spin-On elements to tackle the most viscous fluids and achieve unimaginably low ISO Codes in a single pass.



## Media matters.

DFE rated filter elements stay true to efficiency ratings and ensure the highest level of particulate capture and retention capabilities. And with media options down to  $\beta_{3,C} \geq 4000$ , you can be sure contamination stays exactly where you want it: out of your system.



## Setting the new standard.

Sample ports in the right locations arm you with access to consistently accurate system conditions which is why every FPL comes standard with upstream and downstream sample ports in their proper positions.

## Engineered for industrial use.

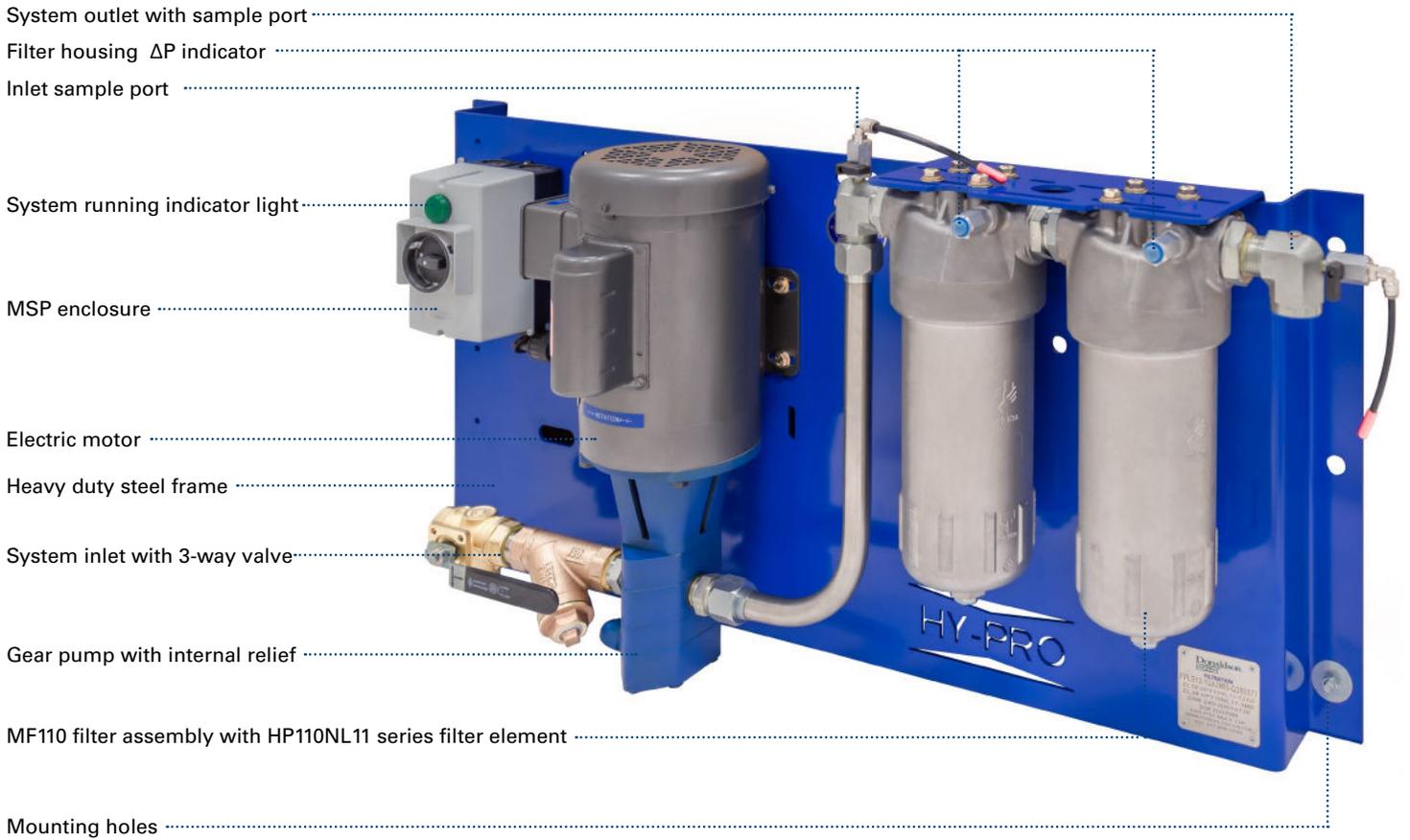
Precision engineered and built from heavy gauge steel, the FPL is designed to be a powerhouse addition to your equipment. To top it off, the cast iron gear pump with internal relief gives you the durability you want with the safety you need.



## From concept to creation.

Whether for plastic injection molding hydraulics with varnish issues or a wind turbine gearbox with small size restrictions, the FPL can be custom designed and built to meet the exact needs to solve your contamination problems.

# FPL Reference Guide



# 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.

# FPL Filter Sizing Guidelines

MF90-MF110 Options $\Delta P$ Factors <sup>1</sup>	Series	Length	Units	Media						
				1M	3M	6M	10M	16M	25M	**W
MF90	L9		psid/gpm	0.270	0.228	0.177	0.159	0.155	0.149	0.027
			bard/lpm	0.005	0.004	0.003	0.003	0.003	0.003	0.000
MF110	L8		psid/gpm	0.250	0.211	0.164	0.147	0.144	0.138	0.025
			bard/lpm	0.005	0.004	0.003	0.003	0.003	0.003	0.000
	L11		psid/gpm	0.176	0.149	0.115	0.103	0.101	0.097	0.018
			bard/lpm	0.003	0.003	0.002	0.002	0.002	0.002	0.000

S75D Options $\Delta P$ Factors <sup>1</sup>	Series	Length	Units	Media						
				1M	3M	6M	12M	16M	25M	**W
S75D	L8		psid/gpm	0.092	0.077	0.060	0.054	0.053	0.051	0.009
			bard/lpm	0.002	0.001	0.001	0.001	0.001	0.001	0.000
	Series	Length	Units	Media						
S75D	L8			3A	6A	12A	25A	3C	10C	25C
			psid/gpm	0.086	0.067	0.060	0.056	0.124	0.081	0.078
			bard/lpm	0.002	0.001	0.001	0.001	0.002	0.001	0.001

DFN39 Option $\Delta P$ Factors <sup>1</sup>	Series	Length	Units	Media						
				1M	3M	6M	12M	16M	25M	**W
DFN39N	L15		psid/gpm	0.463	0.391	0.301	0.266	0.218	0.210	0.117
			bard/lpm	0.008	0.007	0.005	0.005	0.004	0.004	0.002

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

# FPL Specifications

Dimensions <sup>1</sup>	<b>Height</b> 22" (58 cm)	<b>Length</b> 42" (107 cm)	<b>Depth</b> 12" (31 cm)	<b>Weight</b> 138 lbs (63 kg)
Connections	<b>Inlet with 3-way valve</b> 1" FNPT		<b>Outlet</b> 1" 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)	
ΔP Indicator Trigger	<b>Standard MF110 Assemblies</b> 18 psi (1.2 bar)	<b>Special Options D1</b> 22 psi (1.5 bar)		
Filter Assembly Bypass	<b>Standard MF110 Assemblies</b> 25 psid (1.7 bard)	<b>Special Options D1</b> 25 psid (1.7 bard)		
Materials of Construction	<b>Frame</b> Carbon steel with industrial coating			
Electric Motor	TEFC, 56-185 frame 0.5 - 7.5 hp, 900 - 1750 RPM			
Motor Starter	MSP (motor starter/protector) in an IP55, 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. $\beta_{x(c)} \geq 4000$ ( $\beta_x \geq 200$ )	<b>A</b> G8 Dualglass high performance media combined with water removal scrim. $\beta_{x(c)} \geq 4000$ ( $\beta_x \geq 200$ )	<b>W</b> Stainless steel wire mesh media $\beta_{x(c)} \geq 2$ ( $\beta_x \geq 2$ )	
Replacement Elements	<b>To determine replacement elements, use corresponding codes from your equipment part number:</b>			
	<b>Model</b> Standard FPL (2x MF110 11" bowls) Special Option D1	<b>Filter Element Part Number</b> HP110NL11 – [Media Selection Code] [Seal Code] HP75L8 – [Media Selection Code] [Seal Code]	<b>Example</b> HP110NL11-12MV HP75L8-25MB	
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 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.

# FPL Part Number Builder



Flow Rate <sup>1</sup>		
<b>05</b>	0.5 gpm (1.7 lpm)	900 RPM (50Hz) / 1200 RPM (60Hz)
<b>1</b>	1 gpm (3.7 lpm)	1450 RPM (50Hz) / 1750 RPM (60Hz)
<b>2</b>	2 gpm (7.5 lpm)	1450 RPM (50Hz) / 1750 RPM (60Hz)
<b>5</b>	5 gpm (18.9 lpm)	1450 RPM (50Hz) / 1750 RPM (60Hz)
<b>10<sup>2</sup></b>	10 gpm (37.9 lpm)	1450 RPM (50Hz) / 1750 RPM (60Hz)

Power Options	60 Hz	50 Hz	Pneumatic
<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	
<b>57</b>	575 V ac, 3P		

## Explosion proof - Class 1, Division 1, Group 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		
<b>B</b>	Complete filter bypass line	<b>O<sup>4</sup></b> On-board PM-1 particle monitor & clean oil indicator light
<b>C</b>	CE marked for machinery safety directive 2006/42/EC	<b>P<sup>5</sup></b> Phosphate ester fluid compatibility modification
<b>D1<sup>3</sup></b>	2 x S75DL8 filter assemblies in series	<b>S<sup>9</sup></b> Skydrol fluid compatibility modification
<b>D3</b>	True differential pressure gauge, visual green to red	<b>U</b> CUL and/or CSA marked starter enclosure for Canada
<b>E</b>	100 mesh cast iron basket strainer	<b>Y</b> VFD variable speed motor frequency control
<b>J</b>	Add pressure gauge between pump & filter assembly	<b>Z</b> On site start-up training
<b>K</b>	HP75L8-149W Spin-On suction strainer	<b>S2</b> 51" (130 cm) Mounting Stand - Ships Fully Assembled
<b>M</b>	Total system flow meter (120 cSt max)	

Media Selection	G8 Dualglass	G8 Dualglass + water removal	Stainless wire mesh
<b>1M</b>	$\beta_{3(c)} \geq 4000$	<b>3A</b> $\beta_{4(c)} \geq 4000$	<b>25W</b> 25 $\mu$ nominal
<b>3M</b>	$\beta_{4(c)} \geq 4000$	<b>6A</b> $\beta_{6(c)} \geq 4000$	<b>40W</b> 40 $\mu$ nominal
<b>6M</b>	$\beta_{6(c)} \geq 4000$	<b>10A</b> $\beta_{11(c)} \geq 4000$	<b>74W</b> 74 $\mu$ nominal
<b>10M</b>	$\beta_{11(c)} \geq 4000$	<b>25A</b> $\beta_{22(c)} \geq 4000$	<b>149W</b> 149 $\mu$ nominal
<b>16M</b>	$\beta_{16(c)} \geq 4000$		
<b>25M</b>	$\beta_{22(c)} \geq 4000$		

Seals	
<b>B</b>	Nitrile (Buna)
<b>V</b>	Fluorocarbon
<b>E-WS<sup>7</sup></b>	EPR seals + stainless steel support mesh

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

<sup>2</sup>Has a max viscosity 200cSt limitation with 1P electrical option, and not available with "O" special option.

<sup>3</sup>Replaces standard MF110 housings.

<sup>4</sup>"O" option not available with "X\_\_" or "Y" options.

<sup>5</sup>When selected, must be paired with Seal option "V". Contact factory for more information or assistance in fluid compatibility.

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

<sup>7</sup>Only available in 3M media for HP75L8 series 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**

Donaldson 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 Donaldson 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 Donaldson Hy-Pro filter elements is the first step to clean oil and improved efficiency.

**Advanced Media Options** DFE glass media maintaining efficiency to  $\beta_{3[\text{e}]}$  > 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, Donaldson 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 Donaldson Hy-Pro filter elements means you not only get the best filters, you also get the unrivaled support, training, knowledge and expertise of the Donaldson 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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