Off-line Filtration

Types, Uses & Contamination Prevention

Our mission is to make our customers as efficient as possible, and we achieve that with the highest quality filtration products and total system cleanliness strategies to maximize uptime, productivity and prevent costly fluid contamination related failures. We often achieve that by simply upgrading our customers to Hy-Pro DFE rated filter elements and Hy-Dry breathers. But too many systems have insufficient filtration, or worse yet no filtration, creating the need for a range of off-line particulate filtration solutions.

An Off-line system (aka kidney loop) is connected to the reservoir of a hydraulic, lube or storage system that operates independently of the operation of that system meaning that it can be stopped for an element change without interrupting operations. It allows the flexibility to use ultra-high efficiency media to remove particulate and insolubles to reach low ISO Codes that might otherwise be unattainable. Conditioning off-line extends the life of critical on-board pump discharge, servo pilot and return line filters that can only be changed when the system is not running. Maintaining cleanliness in the reservoir protects critical pump inlet, eliminating the need for suction strainers that can cause pump cavitation.

Dedicated

A properly sized off-line filtration system can turn over the entire volume of a reservoir several times a day (we recommend 8 turns), maintaining ISO fluid cleanliness codes well below the upper limit. Whether you're using low viscosity hydraulic or high viscosity lube oil, implementing dedicated off-line filtration will yield longer bearing and hydraulic component life and longer useful fluid life. When dealing with high viscosity gearbox and rolling mill lubricants, it's most effective to filter off-line so that the flow rate and filter can be sized for optimal pressure drop and element life without sacrificing efficiency. That means you can pump thick fluid through an oversized filter at a low flow rate and get it super clean, even when it's cold outside. And when the filter element has removed kilograms of dirt you don't have to stop your operation to change it; just turn off the kidney loop, change elements, and get right back to filtering your fluids. With a dedicated system, you know that your fluids are always clean and your system is always protected.

Mobile

Portable filtration systems are a valuable tool in the battle against contamination and are ideal for fluid transfer and in field service work. The Hy-Pro range of portable filtration systems includes compact units for small gearboxes, filter carts optimized for hydraulic applications and units with generously sized filters for high viscosity or highly contaminated fluids commonly found in fluid reclamation. Staged filtration, two filters in series, allows for combined water removal and particulate filtration in one pass to get you on to the next job more quickly. Hy-Pro mobile filtration systems are designed for industrial, outdoor use with high quality components including cast iron gear pumps and non-shredding wheels that get your filtration exactly where you need it.

Integrated versatility

Implementing off-line filtration is the best way to ensure your hydraulic and lube oils are clean and your systems are operating efficiently. Whereas applications that consume fluids (diesel, etc) must filter fluids in a single pass, off-line filter systems for hydraulic and lube oils allow for recirculating the reservoir to remove more dirt with every pass. A dedicated off-line system has the added benefit of being used as a 3-way valve to top off the reservoir, turning your filter system into a fluid transfer solution that removes any dirt from oil that is added and prevents contamination from ever entering your system.

Off-line Systems

More than just filtration.

With a Hy-Pro dedicated filtration system, fluid contamination related failures and premature fluid replacement are a thing of the past. Every off-line solution includes sample ports before and after filters, providing accurate reservoir condition and filter performance validation. Some great options include on-board particle monitors, cooling for hot gearboxes, ultra high viscosity, dragline-optimized skids, automatic isolation valves, hazardous environment, custom enclosures and more. As with all Hy-Pro systems, your off-line system can be completely customized to provide the best solution for your application.

CFU

Compact Filter Unit

Bigger isn't always better. The Compact Filter Unit provides you with the best filtration at a size you can take anywhere. Tried and true, the CFU is the ultimate filtration system in power and mobility. And with easy to change Spin-On elements or heavy duty MF3s, you can rest easy knowing your filtration will always exceed your expectations.

HY-PRO

hyprofiltration.com/CFU

Small size, huge results.

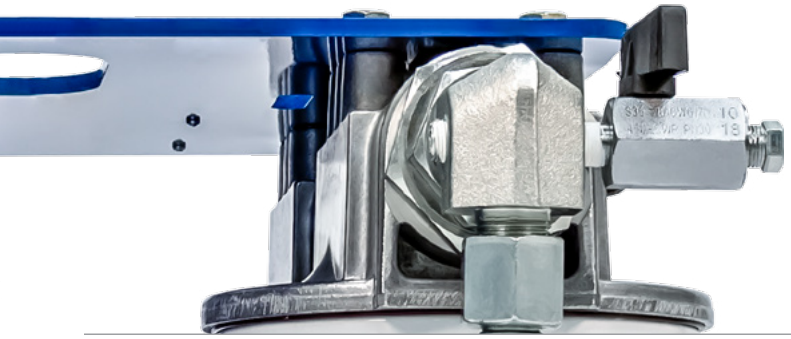
Designed specifically for limited space operations, the CFU maximizes power in a minimal package. Use the ergonomic handle to hoist the CFU to provide filtration directly within turbine nacelles or filter straight from the barrel to take out contaminants before they can ever reach your equipment.

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 from six element configurations to get the perfect CFU for your toughest contamination problems.

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 $\beta 2.5_{[C]} \geq 1000$ you can be sure contamination stays exactly where you want it: out of your fluid.



Redefines standard filtration.

Knowledge of your system is the ultimate tool in the fight against contamination. With upstream and downstream sample ports located on every machine, the standard CFUs are anything but standard.

Different by design.

Built from lightweight aluminum and engineered for portability, the CFU is perfectly designed to filter new fluids during transfer and top-off bulk oil before use. For fluids already in service, use the CFU to flush them through the high efficiency elements for unparalleled levels of fluid cleanliness.

Completely customizable.

Every CFU can be specifically tailored to the job at hand so you get the perfect solution to suit your needs. With a variety of flow rates and power options, even the ability to color coordinate each CFU to your existing safety standards, the possibilities are endless for what you can do with the CFU.

CFU Specifications

Dimensions[1]

Height	Length	Width	Weight
21" (54 cm)	21" (54 cm)	12" (31 cm)	47 lbs (21 kg)

Connections

Inlet	Outlet	Hoses
¾" male JIC with 37° flare	½" male JIC with 37° flare	¾" x 8 ft (2.4 m) suction female JIC or BSPP swivel ½" x 8 ft (2.4 m) discharge female JIC or BSPP swivel

Operating Temperature

Fluid Temperature	Ambient Temperature
30°F to 225°F (0°C to 105°C)	-4°F to 104°F (-20C to 40C)

ΔP Indicator Trigger

22 psi (1.5 bar). Consult factory for other options.

Filter Assembly Bypass

25 psid (1.7 bard). Consult factory for other options.

Materials of Construction

Frame	Filter Assembly	Hoses	Wands	Element Bypass Valve
Powder coated aluminum	Aluminum head	Reinforced synthetic	Stainless steel	Nylon

Electric Motor

TEFC, 56C frame
½ hp, 1450-1750 RPM

Electric Connection

15' (4.6 m) cord included installed on machine.[2]

Pump

Positive displacement gear pump with relief valve. Maximum pressure on pump inlet 15 psi (1 bar). Consult factory for higher pressures.

Pneumatic Option Air Consumption

~15 cfm @ 60 psi[3]

Media Description

M	A	W
G8 Dualglass, our latest generation of DFE rated, high performance glass media for all hydraulic & lubrication fluids. $\beta x_{[C]} \geq 1000$ ($\beta x \geq 200$)	G8 Dualglass high performance media combined with water removal scrim. $\beta x_{[C]} \geq 1000$ ($\beta x \geq 200$)	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 equipment part number:

Model	Filter Element Part Number	Example
CFUD	HP75L8 – [Media Selection Code] [Seal Code]	HP75L8–12MB
CFUH	HP75L8 – [Media Selection Code] [Seal Code]	HP75L8–3ME-WS
CFUL	HP409L9 – [Media Selection Code] [Seal Code]	HP409L9–40WV
CFUM	HP60L8 – [Media Selection Code] [Seal Code]	HP60L8–16MB
CFUN	HP60L8 – [Media Selection Code] [Seal Code]	HP60L8–6AV
CFUS	HP75L8 – [Media Selection Code] [Seal Code]	HP75L8–25MV

Viscosity

Max viscosity rated for 200 cSt.[4]

Fluid Compatibility

Petroleum and mineral based fluids (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.

Filter Sizing Guidelines

See pages for selected options filter sizing guidelines:
MF3: 190
S75-76: 182
S409: 186

[1]Dimensions are approximations taken from base model and will vary according to options chosen.
[2]Selecting pneumatic power option removes electric cord.
[3]Air consumption values are estimated maximums and will vary with regulator setting.
[4]When sized and installed appropriately. Contact factory for applications above 200 cSt for sizing requirements.

CFU Part Number Builder

CFU [ ] [ ] [ ] [ ] - [ ] - [ ] [ ] [ ]

Model | Flow Rate | Power Options | Hose Connection | Special Options | Media 1 | Media 2 | Seal

Model

Filter Assemblies

D	1 x S75D Spin-On filter assembly
H[1]	1 x S75 Spin-On filter assembly
L	2 x S409 Spin-On filter assemblies
M[1]	1 x MF3 cartridge housing
N	2 x MF3 cartridge housings
S	2 x S75 Spin-On filter assemblies

Filter Elements

2 x HP75L8-*** filter elements in parallel flow
1 x HP75L8-*** filter element
2 x HP409L9-*** filter elements in series flow
1 x HP60L8-*** filter element
2 x HP60L8-*** filter elements in series flow
2 x HP75L8-*** filter elements in series flow

Flow Rate[2]

05	0.5 gpm (1.7 lpm)
1	1 gpm (3.7 lpm)
2	2 gpm (7.5 lpm)
5	5 gpm (18.9 lpm)

Power Options

Contact factory for options not listed

60 Hz, 1750 RPM

12	120 V ac, 1P
22	208-230 V ac, 1P

50 Hz, 1450 RPM

11	110 V ac, 1P
21	220 V ac, 1P

Pneumatic

00 Pneumatically driven air motor & PD pump. FRL & flow meter included.

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

X__[3] Add X prefix to power option listed above. Not available with (00) Pneumatic Option.

Hose Connection

G	Female BSPP swivel hose ends, no wands
S	Female JIC swivel hose ends, no wands
W	Female JIC swivel hose ends, with wands

Special Options

B	Complete filter bypass line
C	CE marked for machinery safety directive 2006/42/EC
G[3]	Spill retention pan with fork guides (industrial coated steel)
J	Add pressure gauge between pump & filter assembly
M	Total system flow meter (120 cSt max)
N	PM-1 ready (plumbing only)
O[3]	On-board PM-1 particle monitor & clean oil indicator light
P9[4]	Phosphate ester fluid compatibility modification
S9[5]	Skydrol fluid compatibility modification
Z	On site start-up training

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	$\beta 7_{[C]} \geq 1000$, $\beta 6 \geq 200$
12M[6]	$\beta 12_{[C]} \geq 1000$, $\beta 12 \geq 200$
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	$\beta 7_{[C]} \geq 1000$, $\beta 6 \geq 200$
12A[6]	$\beta 12_{[C]} \geq 1000$, $\beta 12 \geq 200$
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[7]	EPR seals + stainless steel support mesh

[1]When selected, omit Media 2 option from part number builder.
[2]Nominal flow rates at 60 Hz motor speeds.
[3]Significant size/weight increase when selected. Contact factory for specifications.
[4]When selected, must be paired with Seal option "V." Contact factory for more information or assistance in fluid compatibility.
[5]When selected, must be paired with Seal option "E-WS." Contact factory for more information or assistance in fluid compatibility.
[6]When Model "L" selected, use 10M or 10A for respective media code in place of 12M or 12A.
[7]Only available in 3M media for HP75L8 series elements.

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.

HY-PRO

hyprofiltration.com/FPL

Ready when you are.

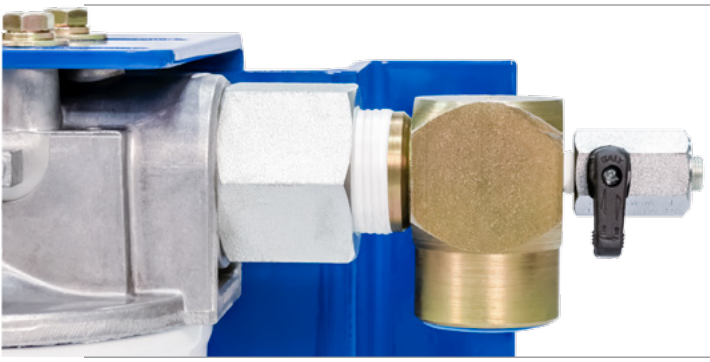
From the pump to the seals, every FPL arrives fully assembled and ready for installation so you can get straight to cleaning your fluids and improving the efficiency of your equipment.

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 MF3 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 $\beta 2.5_{[C]} \geq 1000$, 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 Specifications

Dimensions[1]	**Height** 22" (58 cm)	**Length** 42" (107 cm)	**Depth** 12" (31 cm)	**Weight** 138 lbs (63 kg)
Connections	**Inlet with 3-way valve** 1" FNPT		**Outlet** 1" 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)	
ΔP Indicator Trigger	**Standard MF3 Assemblies** 22 psi (1.5 bar)	**Special Options D1 + S1 (S75/D)** 22 psi (1.5 bar)	**Special Option D2 (DFN)** 32 psid (2.2 bard)	**Special Option P1 (PFH)** 73 psid (5 bard)
Filter Assembly Bypass	**Standard MF3 Assemblies** 25 psid (1.7 bard)	**Special Options D1 + S1 (S75/D)** 25 psid (1.7 bard)	**Special Option D2 (DFN)** 50 psid (3.4 bard)	**Special Option P1 (PFH)** 102 psid (7 bard)
Materials of Construction	**Frame** Carbon steel with industrial coating			
Electric Motor	TEFC, 56-145 frame 1 hp, 1450-1750 RPM			
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. $\beta x_{[C]} \geq 1000$ ($\beta x \geq 200$)	**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 equipment part number:

Model	Filter Element Part Number	Example
Standard FPL (2x MF3 13" bowls)	HP60L13 – [Media Selection Code] [Seal Code]	HP60L13-12MV
Special Option D1	HP75L8 – [Media Selection Code] [Seal Code]	HP75L8-25MB
Special Option D2	HP39NL15 – [Media Selection Code] [Seal Code]	HP39NL15-10AB
Special Option P1	HP419L13 – [Media Selection Code] [Seal Code]	HP419NL13-10MV
Special Option S1	HP75L8 – [Media Selection Code] [Seal Code]	HP75L8-3AB

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 will be included.

Filter Sizing Guidelines

See pages for selected options filter sizing guidelines:
MF3 (Standard): 190
S75-76: 182
PFH: 203
DFN: 218

[1]Dimensions are approximations taken from base model and will vary according to options chosen.
[2]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.
[3]Air consumption values are estimated maximums and will vary with regulator setting.
[4]When sized and installed appropriately. Contact factory for applications above 800 cSt for sizing requirements.

FPL Part Number Builder

FPL [ ] [ ] - [ ] - [ ] [ ] [ ]

Flow Rate | Power Options | Special Options | Media 1 | Media 2 | Seal

Flow Rate[1]

05	0.5 gpm (1.7 lpm)
1	1 gpm (3.7 lpm)
2	2 gpm (7.5 lpm)
5	5 gpm (18.9 lpm)
10	10 gpm (37.9 lpm)

Power Options

Contact factory for options not listed

60 Hz, 1750 RPM

12	120 V ac, 1P
22	208-230 V ac, 1P
23	208-230 V ac, 3P
46	460-480 V ac, 3P
57	575 V ac, 3P

50 Hz, 1450 RPM

11	110 V ac, 1P
21	220 V ac, 1P
40	380-440 V ac, 3P
52	525 V ac, 3P

Pneumatic

00	Pneumatically driven air motor & PD pump. FRL & flow meter included.

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

B	Complete filter bypass line
C	CE marked for machinery safety directive 2006/42/EC
D1[2]	2 x S75DL8 filter assemblies in series
D2[2,3]	1 x DFN39NL15 duplex filter assembly
D3	True differential pressure gauge, visual green to red
E	100 mesh cast iron basket strainer
J	Add pressure gauge between pump & filter assembly
K	HP75L8-149W Spin-On suction strainer
L2	Liquid cooled heat exchanger
M	Total system flow meter (120 cSt max)
N	PM-1 ready (plumbing only)
O	On-board PM-1 particle monitor & clean oil indicator light
P1[2,3]	1 x PFH419NL13 filter assembly
P9[4]	Phosphate ester fluid compatibility modification
S1[2]	2 x S75L8 Spin-On filter assemblies in series
S9[5]	Skydrol fluid compatibility modification
U	CUL and/or CSA marked starter enclosure for Canada
Y	VFD variable speed motor frequency control
Z	On site start-up training

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	$\beta 7_{[C]} \geq 1000, \beta 6 \geq 200$
12M[6]	$\beta 12_{[C]} \geq 1000, \beta 12 \geq 200$
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	$\beta 7_{[C]} \geq 1000, \beta 6 \geq 200$
12A[6]	$\beta 12_{[C]} \geq 1000, \beta 12 \geq 200$
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[7]	EPR seals + stainless steel support mesh

[1]Nominal flow rates at 60 Hz motor speeds.
[2]Replaces standard MF3 housings.
[3]When selected, omit Media 2 option from part number builder.
[4]When selected, must be paired with Seal option "V." Contact factory for more information or assistance in fluid compatibility.
[5]When selected, must be paired with Seal option "E-WS." Contact factory for more information or assistance in fluid compatibility.
[6]When Special Options "D2" or "P1" selected, use 10M or 10A for respective media code in place of 12M or 12A.
[7]Only available in 3M media for HP75L8 series elements.

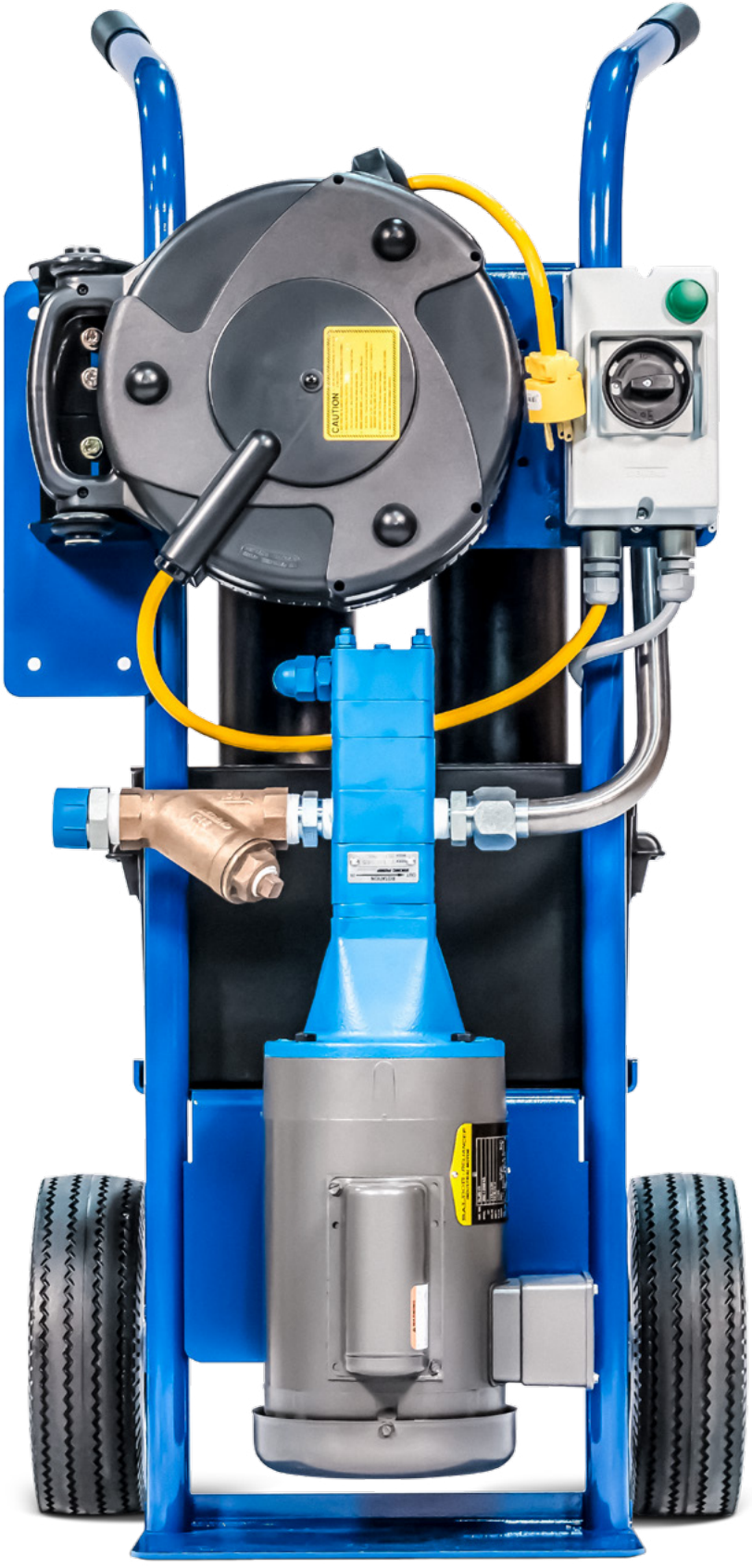
FC
Filter Cart

A fully self-contained mobile solution for bulk oil handling, fluid transfer and reservoir or gearbox conditioning.

Ideal for lower viscosity hydraulic oil, lube oil and diesel fuel.

HY-PRO

hyprofiltration.com/FC



Engineered for industrial use.

Rugged construction and attention to the smallest of details come together remarkably so that nothing holds you or your equipment back. The easy to maneuver hand-truck style design with never-flat pneumatic tires and cast iron gear pump with internal relief mean you get powerful filtration exactly when and where you need it.

Set the stage for your success.

Staged filtration allows a range of media selections for particulate and water removal to deliver ISO Codes right on target. Choose between dual MF3 cartridge (standard) 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.

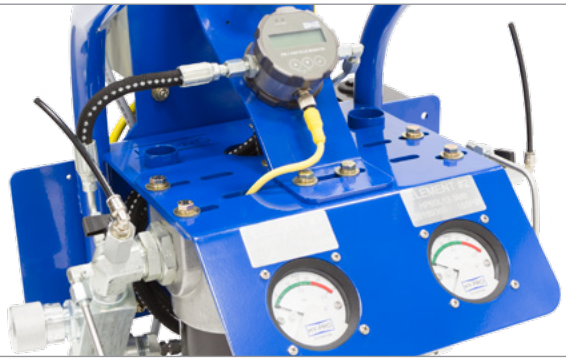
DFE rated filter elements stay true to efficiency ratings and ensure the highest level of particulate capture and retention capabilities. And with media options down to $\beta 2.5_{[C]} \geq 1000$, you can be sure contamination stays exactly where you want it: out of your systems.

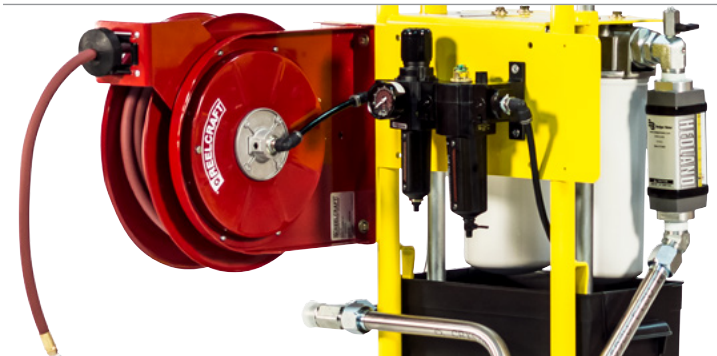
Your standard Filter Cart, reimagined.

Sample ports in the right locations arm you with access to consistently accurate system conditions which is why every FC comes standard with up- and downstream sample ports in their proper positions. And with the 35’ (11m) retractable cord reel or 35’ air hose for pneumatic models, it’s easy to see why the standard FC isn’t so standard after all.

With options to make your job easier.

With the optional filter bypass line, cold starts, gearbox pump-outs, and even element change outs become easier than ever. Add the optional PM-1 particle monitor for real time cleanliness data and know exactly how your filtration is performing without the need for a bottle.





Completely customizable.

The FC comes in a variety of flow rates and with electric options that range from 120 to 575 V ac, single or three phase. Or choose the pneumatic and explosion proof models to take your filtration into hazardous zones like you never thought possible. Even color coordinate each FC to your existing safety standards. With thousands of combinations to choose from, the possibilities are endless for what you can do with the FC.

FC Specifications

Dimensions[1]	**Height** 45" (114 cm)	**Width** 20" (50 cm)	**Depth** 23" (58 cm)	**Weight** 125 lbs (57 kg)
Connections	**Inlet** FC05-FC5: 1" male JIC (37° flare) FC10: 1.25" male JIC (37° flare) FC20: 1.5" male JIC (37° flare)	**Outlet** FC05-FC10 1" male JIC (37° flare) FC20: 1.25" male JIC (37° flare)	**Hoses** FC05-FC5: 1" x 10 ft (2.4 m) FC10: 1.25" x 10 ft (2.4 m) suction 1" x 10 ft (2.4 m) discharge FC20- 1.5" x 10 ft (2.4 m) suction FC30: 1.25" x 10 ft (2.4 m) discharge	
Operating Temperature	**Fluid Temperature** 30°F to 225°F (0°C to 105°C)	**Ambient Temperature** -4°F to 104°F (-20C to 40C)		
ΔP Indicator Trigger	22 psi (1.5 bar). Consult factory for other options.			
Filter Assembly Bypass	25 psid (1.7 bard). Consult factory for other options.			
Materials of Construction	**Frame** Industrial coated steel	**Filter Assembly** Aluminum head & canister	**Hoses** Reinforced synthetic	**Wands** Stainless Steel	**Element Bypass Valve** Nylon
Electric Motor	TEFC, 56-215 frame 0.5-3 hp, 1450-1750 RPM				
Motor Starter	MSP (motor starter/protector) in an IP65, aluminum enclosure with short circuit and overload protection.				
Electric Connection	Voltages 230 V ac and under, single phase: 35' (11 m) retractable cord reel included. NEMA 5-15 plug installed on Power Option 12. Voltages over 230 V ac: 35' (11 m) power cord included.				
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] 35' (11 m) retractable air hose included when pneumatic option selected (replaces electric cord reel).				
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 equipment part number:			
	Model Standard FC (2x MF3 13" bowls) Special Option D1 Special Option S1	**Filter Element Part Number** HP60L13 – [Media Selection Code] [Seal Code] HP75L8 – [Media Selection Code] [Seal Code] HP75L8 – [Media Selection Code] [Seal Code]	**Example** HP60L13-12MV HP75L8-25MB HP75L8-3AB	
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 will be included.			
Filter Sizing Guidelines	See pages for selected options filter sizing guidelines: MF3 (Standard): 190 S75-76: 182			

[1]Dimensions are approximations taken from base model and will vary according to options chosen.
[2]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 lifeand/or cause premature pump failure.
[3]Air consumption values are estimated maximums and will vary with regulator setting.
[4]When sized and installed appropriately. Contact factory for applications above 800 cSt for sizing requirements.

FC Part Number Builder

FC [ ] [ ] [ ] - [ ] - [ ] [ ] [ ]

Flow Rate | Power Options | Hose Connection | Special Options | Media 1 | Media 2 | Seal

Flow Rate[1]

05	0.5 gpm (1.7 lpm)
1	1 gpm (3.7 lpm)
2	2 gpm (7.5 lpm)
5	5 gpm (18.9 lpm)
10	10 gpm (37.9 lpm)
20[2]	20 gpm (75.7 lpm)

Power Options

Contact factory for options not listed

60 Hz, 1750 RPM

12	120 V ac, 1P
22	208-230 V ac, 1P
23	208-230 V ac, 3P
46	460-480 V ac, 3P
57	575 V ac, 3P

50 Hz, 1450 RPM

11	110 V ac, 1P
21	220 V ac, 1P
40	380-440 V ac, 3P
52	525 V ac, 3P

Pneumatic

00	Pneumatically driven air motor & PD pump. FRL & flow meter included.

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

Hose Connection

G	Female BSPP swivel hose ends, no wands
S	Female JIC swivel hose ends, no wands
W	Female JIC swivel hose ends, with wands

Special Options

B	Complete filter bypass line
C	CE marked for machinery safety directive 2006/42/EC
D1[3]	2 x S75DL8 filter assemblies in series
D3	True differential pressure gauge, visual green to red
E	100 mesh cast iron basket strainer
H1	10' (3 m) return line hose extension
H2	20' (6 m) return line hose extension
J	Add pressure gauge between pump & filter assembly
K	HP75L8-149W Spin-On suction strainer
M	Total system flow meter (120 cSt max)
N	PM-1 ready (plumbing only)
O	On-board PM-1 particle monitor & clean oil indicator light
P9[4]	Phosphate ester fluid compatibility modification
S1[3]	2 x S75 Spin-On filter assemblies in series
S9[5]	Skydrol fluid compatibility modification
U	CUL and/or CSA marked starter enclosure for Canada
Z	On site start-up training

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	$\beta 7_{[C]} \geq 1000$, $\beta 6 \geq 200$
12M	$\beta 12_{[C]} \geq 1000$, $\beta 12 \geq 200$
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	$\beta 7_{[C]} \geq 1000$, $\beta 6 \geq 200$
12A	$\beta 12_{[C]} \geq 1000$, $\beta 12 \geq 200$
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[6]	EPR seals + stainless steel support mesh

[1]Nominal flow rates at 60 Hz motor speeds.
[2]Contact factory for sizing assistance on all viscosities.
[3]Replaces standard MF3 housings.
[4]When selected, must be paired with Seal option "V." Contact factory for more information or assistance in fluid compatibility.
[5]When selected, must be paired with Seal option "E-WS." Contact factory for more information or assistance in fluid compatibility.
[6]Only available in 3M media for HP75L8 series elements.

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.

HY-PRO

hyprofiltration.com/FSL

Filtration starts with the filter.

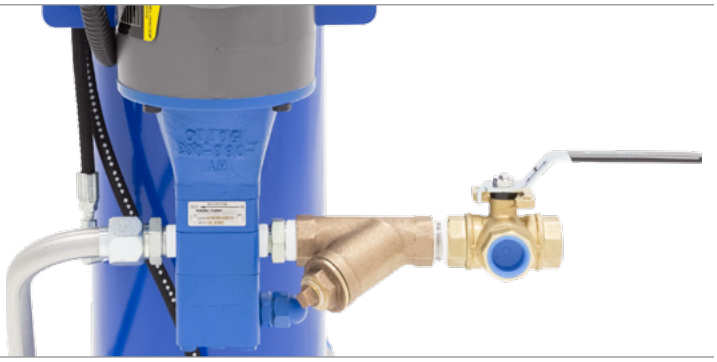
The oversized coreless filter element in every FSL delivers lower ISO Codes over a long element lifespan to ensure low disposal impact, simultaneously reducing your environmental footprint and your bottom line. To top it off, select elements come standard with an integral zero-leak bypass so with every 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 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. $\beta x_{[C]} \geq 1000$ ($\beta x \geq 200$)	**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 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.
Filter Sizing Guidelines	See page 170 for LF filter sizing guidelines

[1]Dimensions are approximations taken from base model and will vary according to options chosen.
[2]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.
[3]Air consumption values are estimated maximums and will vary with regulator setting.
[4]When sized and installed appropriately. Contact factory for applications above 800 cSt for sizing requirements.

FSL Part Number Builder

FSL [ ] [ ] [ ] [ ] [ ] - [ ] - [ ] [ ]

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

Flow Rate[1]

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

18[2]	L18 single length filter housing and coreless element	**16**[2]	L16 single length filter housing and coreless element
36[2]	L36 single length filter housing and coreless element	**39**[2]	L39 single length filter housing and coreless element

ΔP Indicator

D	22 psid visual gauge + electric switch	**H**	65 psid visual gauge + electric switch
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 gages (industrial liquid filled)
G	45 psid visual gauge		

Power Options

Contact factory for options not listed

60 Hz, 1750 RPM

12	120 V ac, 1P
22	208-230 V ac, 1P
23	208-230 V ac, 3P
46	460-480 V ac, 3P
57	575 V ac, 3P

50 Hz, 1450 RPM

11	110 V ac, 1P
21	220 V ac, 1P
40	380-440 V ac, 3P
52	525 V ac, 3P

Pneumatic

00	Pneumatically driven air motor & PD pump. FRL & flow meter included.

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

Media Selection

G8 Dualglass

05M	$\beta 0.9_{[C]} \geq 1000, \beta 1 \geq 200$
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[6]	$\beta 12_{[C]} \geq 1000, \beta 12 \geq 200$
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[6]	$\beta 12_{[C]} \geq 1000, \beta 12 \geq 200$
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

VTM

VTM710[7]	$\beta 0.9_{[C]} \geq 1000$ particulate, insoluble oxidation by-product and water removal media

Seals

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

[1]Nominal flow rates at 60 Hz motor speeds.
[2]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.
[3]When selected, must be paired with Seal option "V." Contact factory for more information or assistance in fluid compatibility.
[4]With exception to cast iron gear pump.
[5]When selected, must be paired with Seal option "E-WS." Contact factory for more information or assistance in fluid compatibility.
[6]For elements HP8314, use 12M or 12A for respective media code in place of 10M or 10A.
[7]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.

FSLD

High Viscosity Dual Filter Skids

A dedicated contamination solution for off-line conditioning and bulk oil handling. Dual housings allow flexibility in using staged element ratings to achieve remarkably clean fluids and hit target ISO Codes in fewer passes, all while extending filter element and oil life.

Ideal for conditioning reclaimed fluids or fluids with high dirt load.

HY-PRO

hyprofiltration.com/FSLD

Dynamic duo.

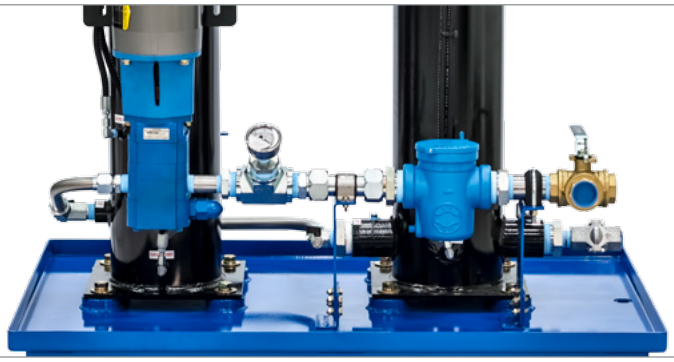
Combine a number of media options in the dual FSL filter housings to maximize single pass efficiency and achieve lower ISO Codes even faster than you thought possible.

Filtration starts with the filter(s).

The FSLD's dual oversized coreless filter elements deliver 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, giving you time back from unnecessary gearbox rebuilds and letting you focus on what really matters.

Engineered for Industrial use.

Rugged construction and attention to the smallest of details come together remarkably so that nothing holds you or your equipment back. The standard spill retention pan and cast iron pump with internal relief mean you get the power and durability you want with the safety you have to have.

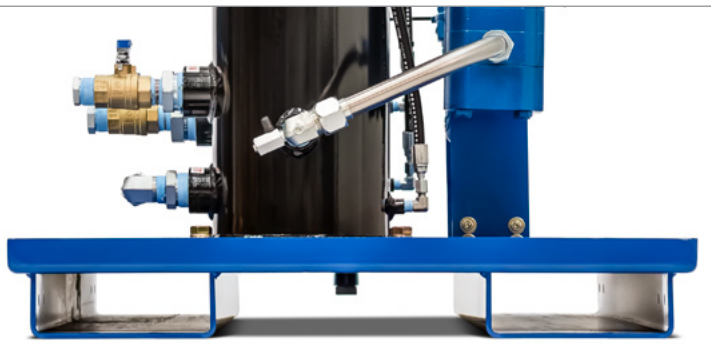


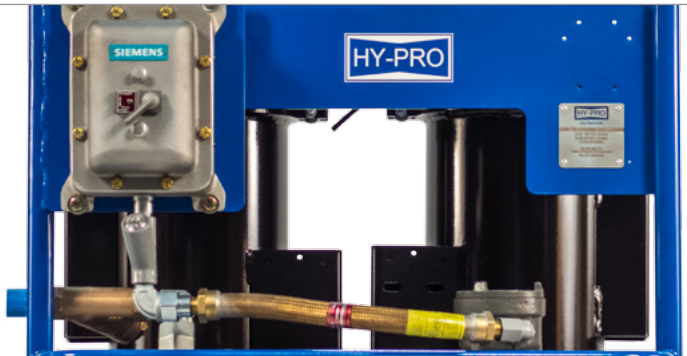
Make your filtration count.

With the optional filter bypass line, cold starts and element change outs become easier than ever. Add to that the PM-1 Particle Monitor for real time cleanliness data and watch your ISO Codes drop like you'd never believe.

Setting the new standard.

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





Completely customizable.

Every FSLD can be tailored specifically to your application whether you're dealing with high viscosities, cold weather, or temperature sensitive components so you get the perfect solution to your contamination problems.

FSLD Specifications

Dimensions[1]

Height	Length	Width	Weight
55" (139 cm)	48" (121 cm)	32" (81 cm)	484 lbs (219 kg)

Connections

Inlet with 3-Way Valve
FSLD05-FSLD10: 1" FNPT
FSLD20-FSLD30: 1.5" FNPT

Outlet
FSLD05-FSLD10: 1" FNPT
FSLD20-FSLD30: 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

Housings
Carbon steel with industrial coating

Tray
Carbon steel with industrial coating

Electric Motor

TEFC, 56-215 frame
1-5 hp, 1450-1750 RPM

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. $\beta x_{[C]} \geq 1000$ ($\beta x \geq 200$)

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 $\beta x_{[C]} \geq 2$ ($\beta x \geq 2$)

VTM
$\beta 0.9_{[C]} \geq 1000$ particulate, insoluble oxidation by-product and water removal media

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.

Filter Sizing Guidelines

See page 170 for LF filter sizing guidelines.

[1]Dimensions are approximations taken from base model and will vary according to options chosen.
[2]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.
[3]Air consumption values are estimated maximums and will vary with regulator setting.
[4]When sized and installed appropriately. Contact factory for applications above 800 cSt for sizing requirements.

FSLD Part Number Builder

FSLD [ ] [ ] [ ] [ ] [ ] [ ] - [ ] - [ ] [ ] [ ]

Flow Rate | Flow Type | Element Type | Element Length | Indicator | Power Options | Special Options | Media 1 | Media 2 | Seal

Flow Rate[1]

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

Flow Type

D[2]	Duplex
P[2]	Parallel
S	Series

Element Type

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

Element Length

18[3]	L18 single length filter housing and coreless element
36[3]	L36 single length filter housing and coreless element
16[3]	L16 single length filter housing and coreless element
39[3]	L39 single length filter housing and coreless element

ΔP Indicator

D	22 psid visual gages + electric switches
E	22 psid visual gages
F	45 psid visual gages + electric switches
G	45 psid visual gages
H	65 psid visual gages + electric switches
J	65 psid visual gages (elements 5 or 8X only)
P	2 pressure gages (industrial liquid filled)
X	None (ports plugged)

Power Options

Contact factory for options not listed

60 Hz, 1750 RPM

12[4]	120 V ac, 1P
22	208-230 V ac, 1P
23	208-230 V ac, 3P
46	460-480 V ac, 3P
57	575 V ac, 3P

50 Hz, 1450 RPM

11[4]	110 V ac, 1P
21	220 V ac, 1P
40	380-440 V ac, 3P
52	525 V ac, 3P

Pneumatic

00	Pneumatically driven air motor & PD pump. FRL & flow meter included.

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)
B	Complete filter bypass line
C	CE marked for machinery safety directive 2006/42/EC
D	High filter ΔP auto shutdown
E	100 mesh cast iron basket strainer
F	Filter element ΔP gauge with tattle tale follower needle
J	Add pressure gauge between pump & filter assembly
K	HP75L8-149W Spin-On suction strainer
L	High filter element ΔP indicator light
M	Total system flow meter (120 cSt max)
N	PM-1 ready (plumbing only)
O	On-board PM-1 particle monitor & clean oil indicator light
P9[5]	Phosphate ester fluid compatibility modification
R	Spill retention pan with wheels (industrial coated steel)
S[6]	All wetted components 304 or higher stainless steel
S9[7]	Skydrol fluid compatibility modification
U	CUL and/or CSA marked starter enclosure for Canada
V	Lifting eye kit
W	Automatic air bleed valve
Y	VFD variable speed motor frequency control
Z	On site start-up training

Media Selection

G8 Dualglass

05M	$\beta 0.9_{[C]} \geq 1000$, $\beta 1 \geq 200$
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[8]	$\beta 12_{[C]} \geq 1000$, $\beta 12 \geq 200$
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[8]	$\beta 12_{[C]} \geq 1000$, $\beta 12 \geq 200$
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

VTM

VTM710[9] $\beta 0.9_{[C]} \geq 1000$ particulate, insoluble oxidation by-product and water removal media

Bag filter

BAG[10] #2 size bag housing 25µ nominal

Seals

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

[1] Nominal flow rates at 60 Hz motor speeds.
[2] When selected, omit Media 2 option from part number builder. Element chosen will be supplied for both filter housings.
[3] Compatibility will be based on Element Type selection. For elements HP105, HP106, and HP107, use Length code 36. Length code 39 only compatible with HP8314.
[4] High amp draw on 10 GPM models. Estimated FLA 18. See Appendix for details.
[5] When selected, must be paired with Seal option "V." Contact factory for more information or assistance in fluid compatibility.
[6] With exception to cast iron gear pump.
[7] When selected, must be paired with Seal option "E-WS." Contact factory for more information or assistance in fluid compatibility.
[8] For elements HP8314, use 12M or 12A for respective media code in place of 10M or 10A.
[9] 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.
[10] Available in series 1 housing only. Replaces Element Type in series 1 housing.

FSW

Wall Mounted Filtration Systems

A compact, dedicated off-line contamination solution ideal for small reservoirs, gearboxes and diesel engine crankcase conditioning. Element media options for every application including particulate removal, water absorption, varnish and acid removal.

Compact and compatible, the FSW is the perfect off-line filtration system for removing contamination from your systems and making sure they remain in peak operating condition.

HY-PRO

hyprofiltration.com/FSW

User friendly on a whole new scale.

With everything you need together in one tiny little package, FSW service and operation couldn't be easier. From the top loading housing to sample ports, the FSW is built to match powerful filtration with your convenience. And with the no-tools-required swing bolt enclosure, worrying about lost parts during service becomes a thing of the past.

Elements that go beyond industry standard.

DFE rated advanced media technologies provide the highest level of particulate capture and retention capabilities so your equipment operates unimpeded by contamination. With media options down to $\beta 0.9_{[C]} > 1000$ + water absorption and integral element bypass valves, you get the perfect element for your application, every time.

ICB Advanced Resin Technologies.

ICB canisters treat your oil on a molecular level removing acids, soluble oxidation by-products (varnish), dissolved metals, and extending useful fluid life by protecting AO additives or improving FRF resistivity. Let us help you pick the right ICB media for your turbine & compressor lube oil varnish challenges or to help you achieve trouble free phosphate ester maintenance.

AW oils, say goodbye to varnish.

FSW fitted with VTM media removes insoluble varnish and water while delivering incredibly low ISO Codes. Ideal for plastic injection molding and steel mill hydraulics with sensitive servo controls that fall victim to high temperature related insoluble varnish issues.

Dedicated to your success.

The FSW provides dedicated off-line filtration to help you stay in control of total system cleanliness and prolong the life of your critical components. And with standard sample ports in their proper positions, you'll be able to see just how good it can be running your equipment with clean oil.

Small size, huge results.

FSW provides world class filtration in all the tight spaces where you need it most with a compact wall mount arrangement. Combine FSW with a second LFW modular housing for multiple filtration passes, or to combine ICB and particulate removal technologies in series for the perfect comprehensive filtration system.

FSW Specifications

Dimensions[1]	**Height** 22" (56 cm)	**Width** 22" (56 cm)	**Depth** 13" (33 cm)	**Weight** 138 lbs (63 kg)
Mounting & Clearance	Contact factory for detailed system and mounting dimensions.			
Connections	**Inlet** ¾" male JIC 37° flare		**Outlet** ¾" male JIC 37° flare	
Operating Temperature	**Dualglass, Stainless wire mesh, VTM** 30°F to 225°F (0°C to 105°C)	**ICB** 86°F to 176°F (30°C to 80°C)	**Ambient Temperature** -4°F to 104°F (-20C to 40C)	
Materials of Construction	**Vessel** Carbon steel with industrial coating			
Electric Motor	TEFC, 56 frame ½-1 hp, 1450-1750 RPM			
Motor Starter	Motor starter with 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)			
Pneumatic Option Air Consumption	~15 cfm @ 60 psi[2]			
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 $\beta x_{[C]} \geq 2$ ($\beta x \geq 2$)	
	VTM $\beta 0.9_{[C]} \geq 1000$ particulate, insoluble oxidation by-product and water removal media	**ICB** Ion charge bonding resin media for molecular removal of acids, varnish deposits, soluble oxidation by-products and dissolved metal ions. Contact factory for fluid specification.		

Replacement Elements

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

Element Type Code	Filter Element Part Number	Example
4	ICB – 601946 – [ICB Media Selection Code]	ICB-601946-J
6	HP106L10 – [Media Selection Code] [Seal Code]	HP106L10-10AB
7	HP107L10 – [Media Selection Code] [Seal Code]	HP107L10-3MV

Viscosity	10-5000 cSt[3]
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.
Filter Sizing Guidelines	See page 174 for LFW filter sizing guidelines.

[1] Dimensions are approximations taken from base model and will vary according to options chosen.
[2] Air consumption values are estimated maximums and will vary with regulator setting.
[3] When sized and installed appropriately. Contact factory for applications above 800 cSt for sizing requirements.

FSW Part Number Builder

FSW [ ] [ ] [ ] [ ] [ ] - [ ] - [ ] [ ]

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

Flow Rate[1]

02	0.2 gpm (0.75 lpm)
05	0.5 gpm (1.7 lpm)
1	1 gpm (3.7 lpm)
2	2 gpm (7.5 lpm)
5	5 gpm (18.9 lpm)

Element Type

4[2]	ICB-601946
6	HP106 coreless element, 25 psid (1.7 bard) integral element bypass
7	HP107 coreless element, 50 psid (3.4 bard) integral element bypass

Element Length

10	L10 single length filter housing and element

ΔP Indicator

D	22 psid visual gauge + electric switch
E	22 psid visual gauge
F	45 psid visual gauge + electric switch
G	45 psid visual gauge
P[3]	2 pressure gages (industrial liquid filled)

Power Options

Contact factory for options not listed

60 Hz, 1750 RPM

12	120 V ac, 1P
22	208-230 V ac, 1P
23	208-230 V ac, 3P
46	460-480 V ac, 3P
57	575 V ac, 3P

50 Hz, 1450 RPM

11	110 V ac, 1P
21	220 V ac, 1P
40	380-440 V ac, 3P
52	525 V ac, 3P

Pneumatic

00	Pneumatically driven air motor & PD pump. FRL & flow meter included.

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

B	Complete filter bypass line
C	CE marked for machinery safety directive 2006/42/EC
F	Filter element ΔP gauge with tattle tale follower needle
J	Add pressure gauge between pump & filter assembly
N	PM-1 ready (plumbing only)
O	On-board PM-1 particle monitor & clean oil indicator light
P9[4]	Phosphate ester fluid compatibility modification
S2	51" (130 cm) Mounting stand – ships fully assembled
S9[5]	Skydrol fluid compatibility modification
U	CUL and/or CSA marked starter enclosure for Canada
V	Lifting eye kit
W	Automatic air bleed valve
Y	VFD variable speed motor frequency control
Z	On site start-up training

Media Selection

G8 Dualglass

05M	$\beta 0.9_{[C]} \geq 1000, \beta 1 \geq 200$
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

1A	$\beta 2.5_{[C]} \geq 1000, \beta 1 \geq 200$
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

VTM

VTM710[6]	$\beta 0.9_{[C]} \geq 1000$ particulate, insoluble oxidation by-product and water removal media

ICB – max reservoir size

ICBA[7]	Phosphate ester – 150 gal (567 liters)
ICBJ[7]	Jet lube aeroderivative – 100 gal (376 liters)
ICBT[7]	Specified fluids – 600 gal (2271 liters)
ICBV[7]	Mineral based R&O turbine/compressor lube oil – 400 gal (1514 liters)

Seals

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

[1]Nominal flow rates at 60 Hz motor speeds.
[2]Compatible only with Flow Rate "02" and ICB Media Selection.
[3]Required when selected with ICB media from Element Type.
[4]When selected, must be paired with Seal option "V." Contact factory for more information or assistance in fluid compatibility.
[5]When selected, must be paired with Seal option "E-WS." Contact factory for more information or assistance in fluid compatibility.
[6]Only available on HP107 series elements. Flow rate should not exceed 4 gpm (15 lpm) for HP107L10-VTM710* elements.
[7]Compatible only with Flow Rate "02" and Element Type "4"

HY-PRO

FCL

High Viscosity Filter Cart

A self contained solution for high viscosity bulk oil handling, fluid transfer and reservoir or gearbox conditioning.

Ideal for higher viscosity lube oil and highly contaminated fuel and hydraulic oil.

HY-PRO

hyprofiltration.com/FCL

Built in versatility.

From cold weather to cold starts, the FCL is engineered to easily handle almost any job you can throw at it. Rugged construction including the heavy duty, oversized filter housing and cast iron gear pump with internal relief all come together so that you can be sure the FCL will tackle your application with ease.

Filtration starts with the filter.

The oversized coreless filter element in every FCL 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.

Unmatched on the move.

Non-shredding wheels, optional off-road, heavy duty tires, and easy to maneuver cart design with ergonomic handle mean you get powerful filtration exactly when and where you need it.

Setting the new standard.

Sampling is no longer an option, it's a necessity. That's why every FCL comes standard with upstream and downstream sample ports located in the proper positions for best practice oil sampling. You'll get consistently accurate readings and a first hand view at just how well your FCL is working.

With options to make your job easier.

Use the FCL to pump out your gearbox or to ease cold starts and get your system up to temperature faster with the optional complete filter bypass line. Add on the PM-1 Particle Monitor to see real time ISO Codes of your fluid and you'll be amazed to watch how effective your FCL will be.

Completely customizable.

Tailor your FCL specifically to your application with options including pneumatic or explosion proof models, CE and CUL marks, and stainless steel construction for safety and compatibility with your existing systems. And if you're nice, we'll even let you trick it out with a custom paint job.

FCL Specifications

Dimensions[1]

Height	Width	Depth	Weight
57" (144 cm)	30" (77 cm)	30" (77 cm)	351 lbs (159 kg)

Connections

Inlet
FCL05-FCL5: 1" male JIC (37° flare)
FCL10: 1.25" male JIC (37° flare)
FCL20-FCL30: 1.5" male JIC (37° flare)

Outlet
FCL05-FCL10: 1" male JIC (37° flare)
FCL20-FCL30: 1.25" male JIC (37° flare)

Hoses
FCL05-FCL5: 1" x 10 ft (2.4 m)
FCL10: 1.25" x 10 ft (2.4 m) suction
1" x 10 ft (2.4 m) discharge
FCL20-FCL30: 1.5" x 10 ft (2.4 m) suction
1.25" x 10 ft (2.4 m) discharge

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

Housing
Carbon steel with industrial coating

Hoses
Reinforced synthetic

Wands
Stainless steel

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.

Electric Connection

Voltages 230 V ac and under, single phase: 35' (11 m) retractable cord reel included. NEMA 5-15 plug installed on Power Option 12.
Voltages over 230 V ac: 35' (11 m) loose cord included.

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]
35' (11 m) retractable air hose included when pneumatic option selected. Replaces 35' (11m) electric cord reel.

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 $\beta x_{[c]} \geq 2$ ($\beta x \geq 2$)

VTM
$\beta 0.9_{[c]} \geq 1000$ particulate, insoluble oxidation by-product and water removal media

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.

Filter Sizing Guidelines

See page 170 for LF filter sizing guidelines

[1]Dimensions are approximations taken from base model and will vary according to options chosen.
[2]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.
[3]Air consumption values are estimated maximums and will vary with regulator setting.
[4]When sized and installed appropriately. Contact factory for applications above 800 cSt for sizing requirements.

FCL Part Number Builder

FCL [ ] [ ] [ ] [ ] [ ] [ ] - [ ] - [ ] [ ]

Flow Rate | Element Type | Element Length | Indicator | Power Options | Hose Connection | Special Options | Media | Seal

Flow Rate[1]

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

18[2]	L18 single length filter housing and coreless element	**16**[2]	L16 single length filter housing and coreless element
36[2]	L36 single length filter housing and coreless element	**39**[2]	L39 single length filter housing and coreless element

ΔP Indicator

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

Power Options

Contact factory for options not listed

60 Hz, 1750 RPM

12	120 V ac, 1P
22	208-230 V ac, 1P
23	208-230 V ac, 3P
46	460-480 V ac, 3P
57	575 V ac, 3P

50 Hz, 1450 RPM

11	110 V ac, 1P
21	220 V ac, 1P
40	380-440 V ac, 3P
52	525 V ac, 3P

Pneumatic

00	Pneumatically driven air motor & PD pump. FRL & flow meter included.

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.

Hose Connection

G	Female BSPP swivel hose ends, no wands
S	Female JIC swivel hose ends, no wands
W	Female JIC swivel hose ends, with wands

Special Options

B	Complete filter bypass line	**N**	PM-1 ready (plumbing only)
C	CE marked for machinery safety directive 2006/42/EC	**O**	On-board PM-1 particle monitor & clean oil indicator light
D	High filter ΔP auto shutdown	**P9**[3]	Phosphate ester fluid compatibility modification
E	100 mesh cast iron basket strainer	**R**	Spill retention pan with wheels (industrial coated steel)
F	Filter element ΔP gauge with tattle tale follower needle	**S**[4]	All wetted components 304 or higher stainless steel
G	Spill retention pan with fork guides (industrial coated steel)	**S9**[5]	Skydrol fluid compatibility modification
H1	10' (3 m) return line hose extension	**T**[6]	Foam filled off-road tires for rugged environment
H2	20' (6 m) return line hose extension	**U**	CUL and/or CSA marked starter enclosure for Canada
J	Add pressure gauge between pump & filter assembly	**W**	Automatic air bleed valve
K	HP75L8-149W Spin-On suction strainer	**Y**	VFD variable speed motor frequency control
L	High filter element ΔP indicator light	**Z**	On site start-up training
M	Total system flow meter (120 cSt max)		

Media Selection

G8 Dualglass

05M	$\beta 0.9_{[C]} \geq 1000$, $\beta 1 \geq 200$
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[7]	$\beta 12_{[C]} \geq 1000$, $\beta 12 \geq 200$
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[7]	$\beta 12_{[C]} \geq 1000$, $\beta 12 \geq 200$
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

VTM

VTM710[8]	$\beta 0.9_{[C]} \geq 1000$ particulate, insoluble oxidation by-product and water removal media

Seals

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

[1]Nominal flow rates at 60 Hz motor speeds.
[2]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.
[3]When selected, must be paired with Seal option "V." Contact factory for more information or assistance in fluid compatibility.
[4]With exception to cast iron gear pump.
[5]When selected, must be paired with Seal option "E-WS." Contact factory for more information or assistance in fluid compatibility.
[6]When selected, front casters of unit will be replaced with stationary feet.
[7]For elements HP8314, use 12M or 12A for respective media code in place of 10M or 10A.
[8]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.

HS
Heater Skids

Designed to achieve target ISO Codes and safely heat hydraulic and lube oils, the HS is a fully self-contained heating and filtration solution ideal for service applications, mass fluid transfers, and preheating systems before they come online.

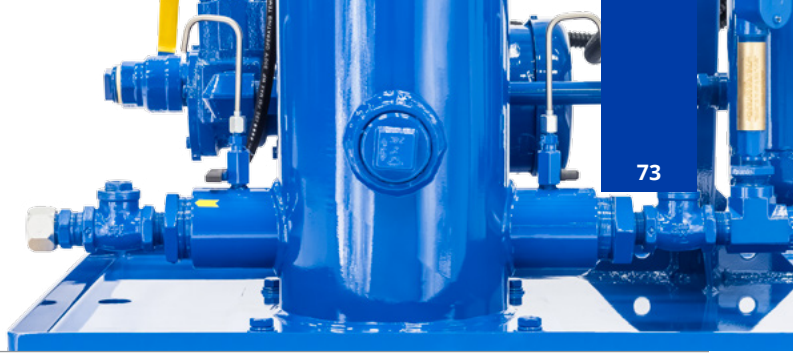
Completely customizable for hydraulic fluids and high viscosity lubrication oils up to ISO VG 680.

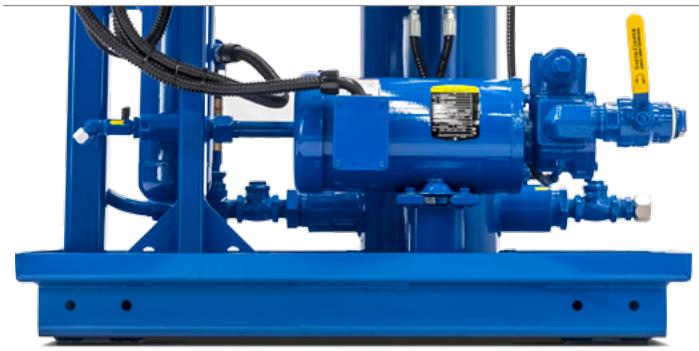
HY-PRO

hyprofiltration.com/HS

More than your standard heater skid.

Whether you're performing a high velocity flush or preheating your system before it comes online, knowing your fluids are clean is the first step in extending your system and components' lifespans. HS heater skids come standard with properly positioned sample ports both up and downstream of the filter so you get consistently accurate readings and the knowledge that your system is operating as efficiently as possible.





Rock solid from the ground up.

Standard carbon steel spill retention pans with fork guides provide a sturdy base to contain everything you need together in a single package. Add the 6" caster option for increased mobility or even select options for CE or CUL markings to meet required safety standards.

You can't beat the heat.

With no direct contact with the heating element, your fluid will safely and quickly get up to temperature without the risk of burning. The programmable temperature control and integral no-flow switch prevent oil damage and allow you to heat your fluids at your own pace. And what's more: all this comes standard on every HS.

Take control of your systems.

Smart relay enabled controls make the HS series heater skids easy to operate with just the push of a button. Take it one step further and select the optional PLC touch screen and make accessing real time data as easy as using that smartphone of yours.

Filtration starts with the filter.

Within the housing on every HS is a powerful tool to help you get the most of your system and protect your critical components from particulate erosion. Media options down to $\beta 2.5_{[c]} \geq 1000$ on the oversized filter element deliver lower ISO Codes over longer periods of time, letting you clean your new or in use oil to ensure long gear and bearing life.

Fits like a glove.

Designed and built specifically to meet your system's needs, HS heater skids can be completely customized so you get the powerful heating and filtration you need for that mass fluid transfer along with all the options you want to make the job easier than ever.

HS Specifications

Dimensions

Consult factory with model number for dimensions and connection sizes.

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

Housing	Tray	Plumbing	Heater
Carbon steel with industrial coating	Carbon steel with industrial coating	Carbon steel with industrial coating	Aluminum low watt density fin tube

Electric Motor

TEFC with overload protection

Pump

Cast iron, positive displacement gear pump with internal relief. Maximum pressure on pump inlet 15 psi (1 bar).

Pump Relief Setting

85 psi (5.86 bar)

Media Description

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

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 equipment part number:

Element Type Code	Filter Element Part Number	Example
LF7	HP107L[Length Code] – [Media Selection Code][Seal Code]	HP107L36–25MV
LF8	HP8314L[Length Code] – [Media Selection Code][Seal Code]	HP8314L16–12MB

Fluid Compatibility

Petroleum and mineral based fluids (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.

Filter Sizing Guidelines

See page 170 for LF filter sizing guidelines

HS Part Number Builder

HS [ ] - [ ] [ ] [ ] [ ] - [ ] - [ ]

Flow Rate | Power Option | Element Type | Media Selection | Seals | Heat Capacity | Special Options

Flow Rate[1]

3	3 gpm (11.4 lpm)
5	5 gpm (18.9 lpm)
10	10 gpm (37.9 lpm)
15	15 gpm (56.8 lpm)
20	20 gpm (75.7 lpm)
30	30 gpm (114 lpm)
45	45 gpm (170 lpm)
60	60 gpm (225 lpm)

Power Options

60 Hz

E3	230 V ac, 1P[2]
23	230 V ac, 3P
46	460-480 V ac, 3P
57	575 V ac, 3P

50 Hz

E2	220 V ac, 1P[2]
22	220 V ac, 3P
38	380 V ac, 3P
41	415 V ac, 3P

Element Type

LF7	LF housing with HP107L36 filter coreless element with integral element 50 psid (3.4 bard) bypass
LF8	LF housing with HP8314L39 filter coreless element with integral post 50 psid (3.4 bard) bypass
X	No filter housing

Seals

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

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[3]	$\beta 12_{[C]} \geq 1000$, $\beta 12 \geq 200$
16M	$\beta 17_{[C]} \geq 1000$, $\beta 17 \geq 200$
25M	$\beta 22_{[C]} \geq 1000$, $\beta 25 \geq 200$

Stainless wire mesh

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

Heat Capacity

4	1 x 4.5 kw heater
9	1 x 9 kw heater
12	1 x 12 kw heater
24	2 x 12 kw heaters
36	3 x 12 kw heaters
48	4 x 12 kw heaters
64	4 x 16 kw heaters

Special Options

6	6" (15 cm) casters
B	Basket strainer
C	CE marked for machinery safety directive 2006/42/EC
D	High filter element ΔP indicator light
J	Individual heater selector switch
M	Discharge line visual flow meter
O	On-board PM-1 particle monitor
P9[4]	Phosphate ester fluid compatibility modification
S	304 stainless steel filter vessels
S9[5]	Skydrol fluid compatibility modification
T	Hose kit (suction/return hoses & wands)
U	50' (13 m) electrical cord (no plug)
V	Inlet control valve N/C solenoid
Y	VFD variable speed motor frequency control

[1]Nominal flow rates at 60 Hz motor speeds.
[2]Option only available when coupled with 4 kw heater option and 3 or 5 gpm max flow rate unit.
[3]For elements HP8314, use 12M for media code in place of 10M.
[4]When selected, must be paired with Seal option "V." Contact factory for more information or assistance in fluid compatibility.
[5]When selected, must be paired with Seal option "E-WS." Contact factory for more information or assistance in fluid compatibility.

Diesel Contamination

Types, Removal & Prevention

There are three main types of contamination related to Diesel fuels which can be introduced at any and all stages of the supply chain. To protect your systems and components, these contaminants must be removed prior to introduction into your system or you risk exposing your fuel injectors, fuel pumps, and every part of your system to catastrophic wear and premature failure.

When today's high pressure combustion engines fail, contamination is typically to blame. Hard particles, water and microbial growth are the primary contamination culprits that must be removed from diesel fuel to prevent fuel injector and pump failure and achieve trouble free operation.

Dirt & Particulate

Ultra fine particles at higher pressures in today's diesel engines can be a major source of fuel injector and pump failures, component wear, and loss of efficiency across entire systems. When particles get jammed inside a metal surface, it cuts a groove as it passes in a process known as scoring. Scoring can be a source of internally generated contamination and cause ISO Codes to increase, leading to the further degradation of system components.

Water

While all diesels contain water to some degree, it is crucial to prevent free water from reaching modern fuel systems as recommended by manufacturers and to prevent both direct and indirect damage caused by water. Water contamination in USLD diesel fuels leads to accelerated microbial growth (more on that below) and contributes to combustion engine failure and fuel efficiency loss. It can also cause the formation of rust, component corrosion and abrasion, etching, cavitation, and can even freeze in cold temperatures.

Microbial

With free water present in diesel fuels, microbial organisms can flourish to form slimes and sludge (soft solids) that clog fuel delivery systems and filters. If microbial growth is prevalent enough, it can even lead to high acidity which corrodes fuel systems and storage tanks, further exacerbating fuel degradation and increasing the likelihood of fuel oxidation. By removing water from diesel fuels, you alter the environment to discourage microbial growths and keep your system operating at peak efficiencies.

Diesel Contamination Solutions

Prioritize Diesel Filtration

The first priority when it comes to fuel filtration is to remove the dirt. Expose your engine to dirty fuel and you risk your on-board particulate filter and fuel/water separators becoming clogged, giving you equipment alarms, damage, failures, and a massive headache. All that productivity you've had the last quarter? Kiss that goodbye.

The most effective and efficient way to clean up diesel is to filter remove particulate with high efficiency media filter elements then come in after to remove the water. With effective particulate contamination upstream, coalesce technology, which is featured in all of the systems listed below, removes all free and emulsified water down to saturation point in a single pass. Lucky for you, our diesel systems combine unmatched particulate filtration and water removal into one system to let you focus on the job at hand and leave worrying about contamination behind.

Whereas hydraulic and lube systems are able to constantly recirc fluids using off-line kidney loops, diesel fuel applications consume fluids – meaning the best option is to condition the fuel is in transit to and from storage tanks, day tanks, service trucks, or as it is dispensed from a service truck or to a fuel rail. Those transition points are the optimal time in which contamination can enter diesel fuels. Ideally, implementing filtration at each step of the way and preventing possible sources of ingression will help rid your fuels of contamination and leave your equipment running to at the highest efficiencies.

COD
Diesel Conditioning Systems

78 CODs offer complete diesel conditioning to remove particulate, water, and bacterial contamination from your diesel. Available in both off-line (kidney loop) and on-line (CODX) systems, CODs utilize high capacity DFE rated filter elements to remove particulate with incredible efficiency upstream of the Coalesce housing, giving you clean, dry fuels and protecting your injectors. Standard models can be sized up to 600 gpm (2271 lpm) to work with diesel powered turbines or down to as few as 5 gpm (19 lpm) for the smallest of diesel reservoirs.

FSLCOD
Compact Diesel Conditioning Systems

82 A smaller and more compact alternative to full size COD systems, FSLCODs utilize a condensed design perfect for marine and any applications requiring size restrictions.

FCLCOD
Diesel Conditioning Filter Cart

86 For those applications requiring filtration on the go, FCLCOD Diesel Conditioning Filter Carts provide the same unmatched filtration capabilities as the COD and FSLCOD in a mobile platform perfect for facilities and tank farms with multiple diesel storage sites.

CSD
Diesel Coalescing In-Line Filter Assembly

90 Ideal for construction fueling depots, tank farms and common fuel rail applications with particulate filtration already in place, CSD Diesel Coalescing systems provide in-line single pass water removal efficiency down to 50 ppm. Matched to your existing system flow, CSDs give you incredible flexibility for installation and allow you to filter the fuels that pass through.

COD

Diesel Conditioning Systems

Remove water and particulate to extend fuel injector life and increase combustion engine fuel efficiency.

Ideal for large mining and construction fueling depots, diesel fueled turbines, backup generators, and smaller day tank dispensing or on-board fueling truck applications. With options for adding non-powered units to existing fuel dispensing lines, there's a perfect COD for all of your diesel applications.

HY-PRO

hyprofiltration.com/COD

Filtration starts with the filter(s).

COD combines high efficiency single pass particulate and water removal to ensure that your fuel is always in spec, eliminating wear related injector failures. Achieve cleanliness below the 18/16/13 ISO Code limit required by engine manufacturers with $\beta 5_{[c]} > 1000$ media elements and extend the life of on-board fuel filters that plug and cause replacement downtime that can shut down your entire mining group.

Redefining standard filtration.

For high pressure injectors, water is one of the worst forms of contamination. The solution for your water contamination lies in COD's 100% synthetic coalesce/separator elements that remove all free and emulsified water down to 50 ppm. Your fuel rail and high pressure injectors will be protected and running more efficiently than ever.

Increase fuel efficiency, lower emissions.

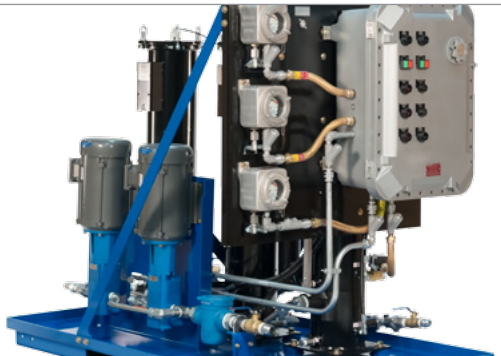
Cleaner fuel runs more efficiently and with lower emissions, yielding better injector performance and life and can even lead to lower fuel usage – which translates to bottom line profitability and a drastically lower environmental footprint. Monitor your fuel's condition with properly positioned sample ports before the pre-filter and after the coalesce stage and always know how your filtration is performing.

Take control of your systems.

Smart relay and auto water drain make COD a 24/7 unattended, easy-to-operate solution that functions as an in-line contamination barrier for every drop of fuel that goes into your engines. Optional PLC touchscreen enables custom programming so your COD can purify backup fuel tanks on your schedule and even data log ISO Codes and saturation levels so you know your fuel is clean and reliable when you're on and off the clock.

Integrated results.

For fuel delivery systems already in place, the CODX non-powered skids are the perfect addition for seamless integration and contain all the contamination removal technology of powered COD units. Ideal for fueling depots, bulk fuel deliveries, upgrading common fuel rails, on-board engine and marine applications.



Built to exceed your expectations.

Flexible dimension and process arrangement are available with every COD so you get the perfect contamination solution for your fuel delivery system. Even choose from explosion proof models and color coordinate to fit perfectly with your existing safety standards for the ultimate system in diesel conditioning.

COD Specifications

Model	COD5-10-30	COD60-100	COD200	COD300-400	COD500-600
Height[1]	72" (183 cm)	80" (203 cm)	90" (229 cm)	90" (229 cm)	90" (229 cm)
Length[1]	48" (122 cm)	72" (183 cm)	84" (213 cm)	84" (213 cm)	96" (244 cm)
Width[1]	42" (107 cm)	36" (92 cm)	48" (122 cm)	60" (152 cm)	60" (152 cm)
Weight[1]	1200 lbs (454 kg)	2000 lbs (907 kg)	2400 lbs (1089 kg)	3500 lbs (1588 kg)	4200 lbs (1905 kg)
Inlet[2]	COD5-10: 1" (2.5 cm) COD30: 1½" (3.8 cm)	2" (5.1 cm)	3" (7.6 cm)	4" (10.2 cm)	5" (12.7 cm) 6" (15.2 cm)
Outlet[2]	COD5-10: 1" (2.5 cm) COD30: 1½" (3.8 cm)	1½" (3.8 cm) 2" (5.1 cm)	3" (7.6 cm)	4" (10.2 cm)	5" (12.7 cm) 6" (15.2 cm)
Motor Size	1-5 hp	7.5-10 hp	20 hp	30 hp	40 hp
Pre-Filter Elements	1	1	3	4	4
Coalesce Elements	1 x HP538L38-CSV[3]	2 x HP731L39-CB	3 x HP731L39-CB	6 x HP731L39-CB	8 x HP731L39-CB
Separator/ Polish Elements	(combination element)	1 x HP582L30-S25MB	2 x HP582L30-S25MB	3 x HP582L30-S25MB	5 x HP582L30-S25MB

Operating Temperature	**Fluid Temperature** 30°F to 225°F (0°C to 105°C)	**Ambient Temperature** 40°F to 104°F (4°C to 40°C)	
Materials of Construction	**Housings** Carbon steel with industrial coating	**Frame** Carbon steel with industrial coating	**Tray** Carbon steel with industrial coating
Electric Motor	TEFC motors with 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 Relief	85-100 psi adjustable		
Media Description	**M** G8 Dualglass, our latest generation of DFE rated, high performance glass media for all hydraulic & lubrication fluids. $\beta x_{[c]} \geq 1000$ ($\beta x \geq 200$)	**Coalesce** 100% synthetic fiber media	**Separator** TEFLON® coated screen (water barrier)
Fluid Compatibility	Petroleum based fuels, #2 Diesel (standard) and jet fuel. For other fuel options contact factory.		
Hazardous Environment Options	Select special option X for explosion proof unit. Consult factory for exact standards requirements such as Class, Division, and Zone.		

[1]Dimensions are approximations taken from base model and will vary according to options chosen.
[2]Female pipe port.
[3]HP538L38-CSV element combines coalesce and separator element functions into a single element.
TEFLON® is a registered trademark of DuPont.

COD Part Number Builder

COD [ ] [ ] - [ ] - [ ]

Flow Rate | Power Options | Seal | Special Options

Flow Rate[1]

5	5 gpm (18.9 lpm)
10	10 gpm (37.9 lpm)
30	30 gpm (114 lpm)
60	60 gpm (225 lpm)
100	100 gpm (379 lpm)
200	200 gpm (757 lpm)
300	300 gpm (1135 lpm)
400	400 gpm (1514 lpm)
500	500 gpm (1892 lpm)
600	600 gpm (2271 lpm)

Power Options

60 Hz

12	120 V ac, 1P
E2	230 V ac, 1P
46	460 V ac, 3P
57	575 V ac, 3P

50 Hz

E1	120 V ac, 1P
E3	230 V ac, 1P
32	320 V ac, 3P
38	380 V ac, 3P
41	415 V ac, 3P
52	525 V ac, 3P

Non-Powered

X[2]	Non-powered COD: No pump-motor combination or electrical controls.

Seals

B	Nitrile (Buna)
V	Fluorocarbon

Special Options

8	8” (20 cm) solid wheel upgrade
A[3]	Auto water drain (manual drain included)
B[4]	Adjustable coalesce vessel bypass loop
C	CE marked for machinery safety directive 2006/42/EC
H	Manual reset hour meter (in addition to non-reset meter)
K	Sight flow indicator (wheel type)
L	Lifting eye kit
M	Water discharge totalizing meter
O	On-board PM-1 particle monitor & clean oil indicator light
P	PLC touch screen control (does not include VFD)
Q[5]	Maintenance spares and repair kit
T[3]	Hose kit (suction & return hoses + wands)
U	50’ (15 m) electrical cord with no plug
X	Explosion proof - must specify standards required
Y	VFD variable speed motor frequency control
Z[3]	On site start-up training

[1]Nominal flow rates at 60 Hz motor speeds.
[2]Suitable for adding to existing fuel delivery system with existing pressure and flow. Auto water drain option is mechanical.
[3]Recommended option.
[4]Standard option.
[5]Includes fuses, common relay, panel bulb, replacement element set for coalesce chamber & particulate housing.

FSLCOD

Marine and Industrial Diesel Filtration Systems

Remove water and particulate to extend fuel injector life and increase combustion engine fuel efficiency.

Ideal for permanent installation on-board sea vessels and diesel applications requiring compact size restrictions.

HY-PRO

hyprofiltration.com/FSLCOD

Remove contaminants, protect equipment.

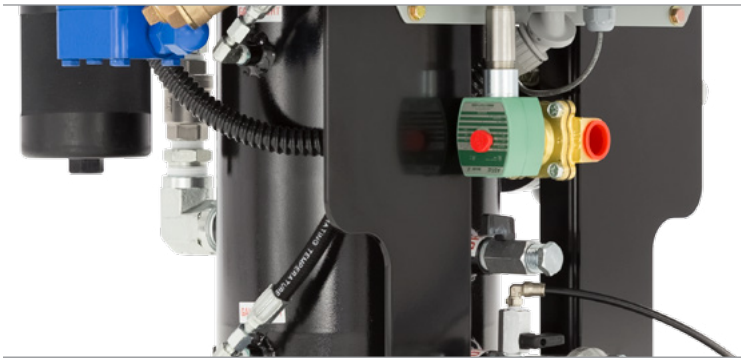
FSLCOD combines high efficiency single pass particulate and water removal to ensure that your fuel is always in spec, eliminating premature injector failures and downtime.

Elements that go beyond industry standard.

With DFE rated particulate filters and 100% synthetic coalesce/ separator elements that remove all free and emulsified water down to 50 ppm, your fuel rail and high pressure injectors will be protected and running more efficiently than ever.

Small has never been bigger.

Coming in at only 1 ft^2 (30 cm^2) of floor space and 34" (86 cm) tall, the FSLCOD is engineered to provide maximum efficiency in minimal space.



Smarter filtration.

Designed for 24/7 unattended operation, FSLCODs with auto water drain technologies, available electrically or mechanically powered, provide you with the safety and security to know your diesel is clean and dry even when you're off the clock.

Increase fuel efficiency, lower emissions.

Cleaner fuel runs more efficiently and with lower emissions, yielding better injector performance and life and leading to lower fuel usage, translating to bottom line profitability and a drastically lower environmental footprint. Monitor your fuels' condition with properly positioned sample ports before the pre-filter and after the coalesce stage and always know how your filtration is performing.

No detail overlooked.

From the cast iron gear pump with internal relief to the space saving design, every component of the FSLCOD is designed to provide you with the highest quality filtration and integrate seamlessly into your systems. So whether you've got a single vessel or an entire fleet, you can rest assured that your diesel is clean and dry.

FSLCOD Specifications

Dimensions[1]	**Height** 34" (86 cm)	**Width** 30" (76 cm)	**Depth** 25" (64 cm)	**Weight** 285 lbs (129 kg)
Connections	**Inlet** FSLCOD5-10: 1" male JIC (37° flare) FSLCOD20: 1¼" male JIC (37° flare)		**Outlet** 1" male JIC (37° flare)	
Element Configuration	**Pre-filter** HP60L13-3MV		**Main Filter** FSLCOD5-10: HP538L18-CSV FSLCOD20: HP538L38-CSV	
Seals	Fluorocarbon			
Operating Temperature	**Fluid Temperature** 30°F to 225°F (0°C to 105°C)		**Ambient Temperature** 40°F to 104°F (4°C to 40°C)	
Materials of Construction	**Housings** Carbon steel with industrial coating			
Electric Motor	TEFC, 56-184 frame 0.5-2 hp, 1450-1750 RPM			
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. $\beta x_{[c]} \geq 1000$ ($\beta x \geq 200$)	**Coalesce** 100% synthetic fiber media	**Separator** TEFLON® coated screen (water barrier)	
Fluid Compatibility	Petroleum based fuels, #2 Diesel (standard). For other fuel options contact factory.			
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.			

[1]Dimensions are approximations taken from base model and will vary according to options chosen.
[2]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.
[3]Air consumption values are estimated maximums and will vary with regulator setting.
TEFLON® is a registered trademark of DuPont

FSLCOD Part Number Builder

FSLCOD [Flow Rate] [Indicator] [Power Options] - [Special Options]

Flow Rate[1]

5	5 gpm (18.9 lpm)
10	10 gpm (37.9 lpm)
20[2]	20 gpm (75.7 lpm)

ΔP Indicator[3]

D	22 psid visual gauge + electric switch
E	22 psid visual gauge

Power Options

Contact factory for options not listed

60 Hz, 1750 RPM

12	120 V ac, 1P
22	208-230 V ac, 1P
23	208-230 V ac, 3P
46	460-480 V ac, 3P
57	575 V ac, 3P

50 Hz, 1450 RPM

11	110 V ac, 1P
21	220 V ac, 1P
40	380-440 V ac, 3P
52	525 V ac, 3P

Pneumatic

00	Pneumatically driven air motor & PD pump. FRL & flow meter included.

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

A1[4]	Electrically powered automatic water drain
B	Complete filter bypass line
C	CE marked for machinery safety directive 2006/42/EC
D	High filter ΔP auto shutdown
E	100 mesh cast iron basket strainer
F	Filter element ΔP gauge with tattle tale follower needle
G	Spill retention pan with fork guides (industrial coated steel)
J	Add pressure gauge between pump & filter assembly
K	HP75L8-149W Spin-On suction strainer
L	High filter element ΔP indicator light
M	Total system flow meter (120 cSt max)
N	PM-1 ready (plumbing only)
O[5]	On-board PM-1 particle monitor & clean oil indicator light
S[6]	All wetted components 303 or higher stainless steel
U	CUL and/or CSA marked starter enclosure for Canada
W	Automatic air bleed valve
Z	On site start-up training

[1]Nominal flow rates at 60 Hz motor speeds.
[2]20 gpm machine utilizes 36" vessel.
[3]Coalesce filter only. Particulate filter housing is equipped with pop-up differential indicator.
[4]Requires Electric Power Option.
[5]PM-1 will not function properly in the presence of free or emulsified water at or above saturation point. If selected, PM-1 is installed downstream of the filtration.
[6]With exception to cast iron gear pump.

FCLCOD

Diesel Conditioning Filter Cart

Remove water and particulate to extend fuel injector life and increase combustion engine fuel efficiency.

Ideal for service oriented stand by diesel tanks and marine applications.

HY-PRO

hyprofiltration.com/FCLCOD

Take control of your systems.

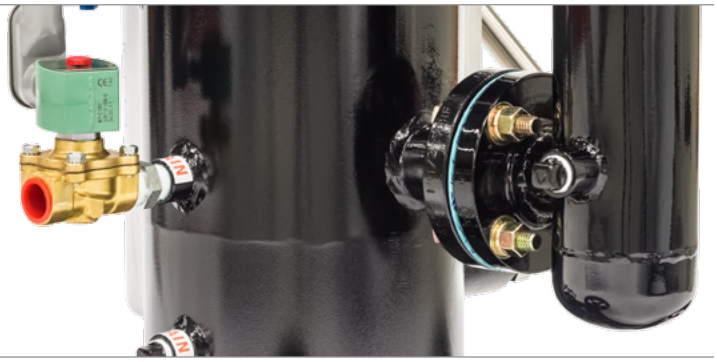
FCLCOD filter carts are constructed to be powerful, dependable, and easy to use. Whether you've got multiple diesel reservoirs or simply need your filtration on the move, conditioning your fuels has never been easier. Add automatic water drain and your FCLCOD becomes a powerhouse that does the work for you.

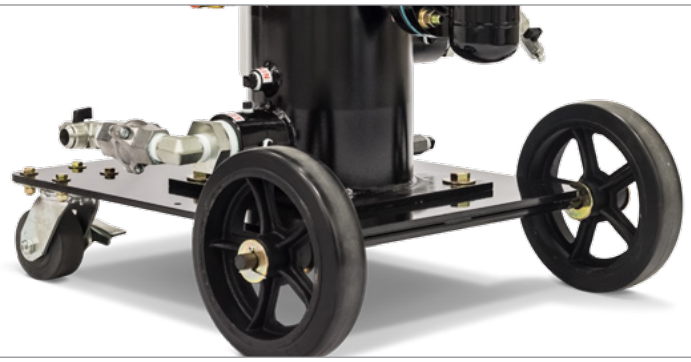
Filtration starts with the filter(s).

FCLCOD combines high efficiency single pass particulate and water removal to ensure that your fuel is always in spec, eliminating premature injector failures and downtime. With DFE rated particulate filters and 100% synthetic coalesce/ separator elements that remove all free and emulsified water down to 50 ppm, your fuel rail and high pressure injectors will be protected and running more efficiently than ever.

Never stops working.

Designed for 24/7 unattended operation, FCLCODs with auto water drain technologies, available electrically or mechanically powered, provide you with the safety and security to know your diesel is clean and dry even when you're off the clock.





Unmatched on the move.

Non-shredding wheels, optional off-road heavy duty tires and easy to maneuver cart design with ergonomic handle mean you get powerful filtration exactly when and where you need it.

Increase fuel efficiency, lower emissions.

Cleaner fuel runs more efficiently and with lower emissions, yielding better injector performance and life and can even lead to lower fuel usage which translates to bottom line profitability and a drastically lower environmental footprint. Monitor your fuel's condition with properly positioned sample ports before the pre-filter and after the coalesce stage and always know how your filtration is performing.

Completely customizable.

Flexible dimension and process arrangement are available with every FCLCOD so you get the perfect contamination solution for your fuel delivery system. Even choose from explosion proof models and color coordinate to fit perfectly with your existing safety standards for the ultimate mobile system in diesel conditioning.

FCLCOD Specifications

Dimensions[1]	**Height** 62" (158 cm)	**Width** 30.5"	**Depth** 29" (74 cm)	**Weight** 379 lbs (172 kg)
Connections	**Inlet** FCLCOD5-FCLCOD10: 1" male JIC (37° flare) FCLCOD20: 1¼" male JIC (37° flare)	**Outlet** FCLCOD5-FCLCOD10: 1" male JIC (37° flare) FCLCOD20: 1¼" male JIC (37° flare)	**Hoses** FCLCOD5-FCLCOD10: 1" x 10 ft (2.4 m) FCLCOD20: 1¼" x 10 ft (2.4 m)	
Element Configuration	**Pre-filter** HP75L8-3MV	**Main Filter** HP538L38-CSV		
Seals	Fluorocarbon			
Operating Temperature	**Fluid Temperature** 30°F to 225°F (0°C to 105°C)	**Ambient Temperature** 40°F to 104°F (4°C to 40°C)		
Materials of Construction	**Housings** Carbon steel with industrial coating	**Hoses** Reinforced synthetic	**Wands** Stainless steel	
Electric Motor	TEFC, 56-145 frame 0.5-2 hp, 1450-1750 RPM			
Motor Starter	MSP (motor starter/protector) in an IP65, aluminum enclosure with short circuit and overload protection.			
Electric Connection	Voltages 230 V ac and under, single phase: 35' (11 m) retractable cord reel included. NEMA 5-15 plug installed on Power Option 12. Voltages over 230 V ac: 35' (11 m) loose cord included.			
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] 35' (11 m) retractable air hose included when pneumatic option selected. Replaces 35' (11m) electric cord reel.			
Media Description	**M** G8 Dualglass, our latest generation of DFE rated, high performance glass media for all hydraulic & lubrication fluids. $\beta x_{[c]} \geq 1000$ ($\beta x \geq 200$)	**Coalesce** 100% synthetic fiber media	**Separator** TEFLON® coated screen (water barrier)	
Fluid Compatibility	Petroleum based fuels, #2 Diesel (standard). For other fuel options contact factory.			
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.			

[1]Dimensions are approximations taken from base model and will vary according to options chosen.
[2]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.
[3]Air consumption values are estimated maximums and will vary with regulator setting.
TEFLON® is a registered trademark of DuPont.

FCLCOD Part Number Builder

FCLCOD [ ] [ ] [ ] [ ] - [ ]

Flow Rate | Indicator | Power Options | Hose Connection | Special Options

Flow Rate[1]

5	5 gpm (18.9 lpm)
10	10 gpm (37.9 lpm)
20	20 gpm (75.7 lpm)

ΔP Indicator[2]

D	22 psid visual gauge + electric switch
E	22 psid visual gauge

Power Options

Contact factory for options not listed

60 Hz, 1750 RPM

12	120 V ac, 1P
22	208-230 V ac, 1P
23	208-230 V ac, 3P
46	460-480 V ac, 3P
57	575 V ac, 3P

50 Hz, 1450 RPM

11	110 V ac, 1P
21	220 V ac, 1P
40	380-440 V ac, 3P
52	525 V ac, 3P

Pneumatic

00	Pneumatically driven air motor & PD pump. FRL & flow meter included.

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.

Hose Connection

G	Female BSPP swivel hose ends, no wands
S	Female JIC swivel hose ends, no wands
W	Female JIC swivel hose ends, with wands

Special Options

A1	Electrically powered automatic water drain
B	Complete filter bypass line
C	CE marked for machinery safety directive 2006/42/EC
D	High filter ΔP auto shutdown
E	100 mesh cast iron basket strainer
F	Filter element ΔP gauge with tattle tale follower needle
G	Spill retention pan with fork guides (industrial coated steel)
H1	10' (3 m) return line hose extension
H2	20' (6 m) return line hose extension
J	Add pressure gauge between pump & filter assembly
K	HP75L8-149W Spin-On suction strainer
L	High filter element ΔP indicator light
M	Total system flow meter (120 cSt max)
N	PM-1 ready (plumbing only)
O[3]	On-board PM-1 particle monitor & clean oil indicator light
R	Spill retention pan with wheels (industrial coated steel)
S[4]	All wetted components 303 or higher stainless steel
T	Foam filled off-road tires for rugged environment
U	CUL and/or CSA marked starter enclosure for Canada
W	Automatic air bleed valve
Z	On site start-up training

[1]Nominal flow rates at 60 Hz motor speeds.
[2]Coalesce filter only. Particulate filter housing is equipped with sliding differential indicator.
[3]PM-1 will not function properly in the presence of free or emulsified water at or above saturation point. If selected, PM-1 is installed downstream of the filtration.
[4]With exception to cast iron gear pump.

CSD

Diesel Coalesce Non-Powered Filtration System

Remove water to extend fuel injector life and increase combustion fuel efficiency. The CSD is designed for direct integration into fuel delivery systems with pump flow and pressure already in place for easy, streamlined water removal through your existing system. Using high efficiency coalesce and separating media, the CSD will keep diesel free from water contamination down to 50 ppm in a single pass.

Ideal for construction fueling depots, tank farms and common fuel rail applications.

HY-PRO

hyprofiltration.com/CSD

Protect your uptime.

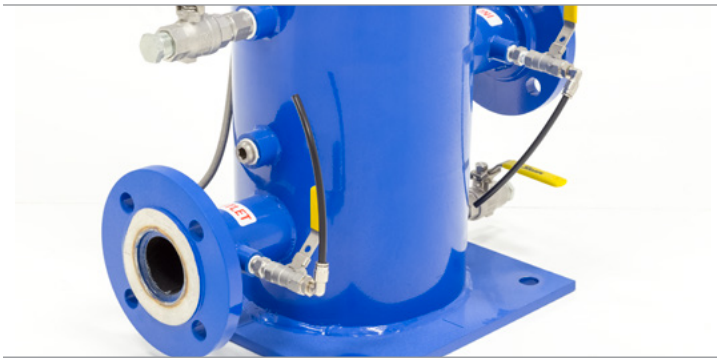
By removing water from your diesel systems, you're providing the best environment for your equipment to operate efficiently and helping to prevent breakdowns and damage, saving you time and effort. CSD systems rapidly remove water down to saturation point, protecting your systems and letting you focus on the job at hand.

Media matters.

Cellulose media is known to break down under high water content, resulting in media migration and loss of coalescence efficiency. CSD's 100% synthetic coalesce and separator elements contain no cellulose and feature a pleated synthetic configuration to maximize surface area and ensure your fuel rail and high pressure injectors will be protected and running more efficiently than ever.

Don't quit your day job.

Designed for 24/7 unattended operation, CSDs with auto water drain technologies, available mechanically or electrically powered, provide you with the safety and security to know your diesel is clean and dry so you can forget worrying about your filtration and focus on the job at hand.



Setting the new standard.

Sampling and preventative maintenance are no longer optional, they're a necessity. Knowing your diesel is clean is the first step in prolonging the life of your fuel injectors and critical components. CSD series housings come standard with easy-to-access sample ports in their proper positions so you can always know you're putting clean, dry diesel into your systems.

Combined filtration, double the power.

A properly sized Hy-Pro CSD plus Hy-Pro high efficiency particulate filtration will deliver diesel fuel cleanliness codes of 15/13/10 and better while maintaining water levels at 50 ppm. Pair your CSD with an LF housing in-line on your system and rest assured knowing your fuel injectors are protected.

Integrated results.

Installing CSDs in-line on your current system means you get powerful filtration exactly where you need it – directly upstream of your critical components. With standard models ranging up to 600 gpm, your diesel will be dry and components protected whether you're on a small diesel tank farm or a massive diesel fired turbine.

CSD Specifications

Model	CSD30	CSD120	CSD200	CSD400	CSD600
Max Flow Rate	30 gpm (114 lpm)	120 gpm (454 lpm)	200 gpm (757 lpm)	400 gpm (1514 lpm)	600 gpm (2271 lpm)
Weight[1]	164 lbs (74 kg)	319 lbs (177 kg)	546 lbs (248 kg)	1097 lbs (498 kg)	1155 lbs (524 kg)
Height[1]	62" (158 cm)	74" (188 cm)	82" (209 cm)	82" (209 cm)	82" (209 cm)
Width[1]	22" (56 cm)	32" (82 cm)	36" (92 cm)	48" (122 cm)	48" (122 cm)
Length[1]	22" (56 cm)	27" (69 cm)	32" (82 cm)	40" (102 cm)	40" (102 cm)
Coalesce Elements	1 x HP538L38-CSV[2]	2 x HP731L39-CB	3 x HP731L39-CB	6 x HP731L39-CB	8 x HP731L39-CB
Separator/ Polish Elements	(combination element)	1 x HP582L30-S25MB	2 x HP582L30-S25MB	3 x HP582L30-S25MB	5 x HP582L30-S25MB

Materials of Construction

Housing
Industrial coated steel

Tray
Industrial coated steel

Hoses
Reinforced synthetic

Media Description

Coalesce
100% synthetic fiber media

Separator
TEFLON® coated screen (water barrier)

Fluid Compatibility

Petroleum based fuels, #2 Diesel (standard). For other fuel options contact factory.

[1]Weights and dimensions are approximations taken from base model and will vary according to options chosen.
[2]HP538L38-CSV element combines coalesce and separator element functions into a single element.
TEFLON® is a registered trademark of DuPont.

CSD Part Number Builder

CSD [ ] [ ] - [ ] - [ ]

Flow Rate | Port Connection | Seals | Special Options

Flow Rate[1]

30	30 gpm (114 lpm)
120	120 gpm (454 lpm)
200	200 gpm (757 lpm)
400	400 gpm (1514 lpm)
600	600 gpm (2271 lpm)

Port Connections

	Connection Type	CSD Series Availability
B2	2" BSPP	30-120
C2	2" SAE Code 61 flange	30-120
C3	3" SAE Code 61 flange	30-120
D2	DN50 DIN flange	30-120
D3	DN65 DIN flange	30-120
D4	DN100 DIN flange	200-400
D5	DN125 DIN flange	200-400
D6	DN150 DIN flange	200-400
D8	DN200 DIN flange	200-600
D10	DN250 DIN flange	200-600
F2	2" ANSI flange	30-120
F3	3" ANSI flange	30-120
F4	4" ANSI flange	200-400
F6	6" ANSI flange	200-600
F8	8" ANSI flange	200-600
F10	10" ANSI flange	200-600
F12	12" ANSI flange	200-600
N2	2" NPT	30-120

Seals

B	Nitrile (Buna)[1]
V	Fluorocarbon

Special Options

AX	Auto water drain - mechanical (no electrical)[2]
AE	Auto water drain - electrically operated solenoid valve (120 V ac, 1P, 60Hz[3])
AE1	Auto water drain - electrically operated solenoid valve (110 V ac, 1P, 50Hz[3])
AE2	Auto water drain - electrically operated solenoid valve (230 V ac, 1P, 60Hz[3])
AE3	Auto water drain - electrically operated solenoid valve (220 V ac, 1P, 50Hz[3])
B	Auto air bleed valve[4]
M	Water discharge totalizing meter
T	Optional drip tray + fork life guides

[1]Not suitable for bio diesel.
[2]Suitable for adding to existing fuel delivery system with existing pressure and flow. Auto water drain option is mechanical.
[3]Requires power supply.
[4]Recommended options.

What is Varnish?

Varnish formation

Lubricant varnish is defined per ASTM D02.C01 WK27308 as a thin, hard, lustrous, oil-insoluble deposit, composed primarily of organic residue, and most readily definable by color intensity. It is not easily removed by wiping with a clean, dry, soft, lint-free wiping material and is resistant to saturated (light hydrocarbon) solvents. Its color may vary, but it usually appears in gray, brown, or amber hues. Varnish begins its life as a soluble degradation product before converting to an insoluble particulate form. The process responsible for the deposition of particulate varnish is reversible.

Lubricant solvency

Under normal operating conditions, turbine lubricants are subjected to oxidation, which produces polar molecules, the varnish precursors, from lubricant mineral-oil base stocks. These polar species represent the starting point of the varnish life cycle. As a result, lubricants in service are a complex combination of base stocks, additives, and contaminants.

A lubricant's solvency is defined as its ability to dissolve these distinct components. Everything in the oil has a finite solubility which is affected by numerous variables (molecular polarity, contaminant levels, temperature, etc). When the solubility of a molecule is low, the lubricant cannot dissolve those components which then release from the fluid to form deposits. However, when the solubility of a molecule is high, the lubricant will have a high capacity to dissolve it, avoiding the formation of varnish deposits.

Contaminant levels

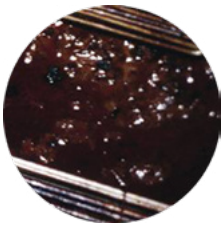
As the oil degrades and oxidation products accumulate, the solvency of the fluid decreases accordingly. Beyond the saturation point, the fluid can no longer dissolve additional varnish precursors formed by continuing oxidation and varnish will begin to precipitate from the solution.

Temperature

Oil temperature directly affects the solubilities of all the species dissolved within it. As temperature decreases, so too does the solubility of varnish and its precursors. Because metals are more polar than the lubricant's base stock, the precipitated polar varnishes prefer to adhere to the metal and form potentially damaging deposits. When the level of varnish precursors in a lubricant is at (or near) the fluid's saturation point, varnishing in cooler regions is very likely to occur.

Types of varnish

The images below depict four different formations of varnish as they can appear in different types and locations throughout a lube system. While this list is not comprehensive, the types listed below are among the most commonly seen.



Varnish can be soft and gooey (Sludge)

Varnish can be hard and brittle (Lacquer)

Varnish on reservoir ceiling (Stalactites)

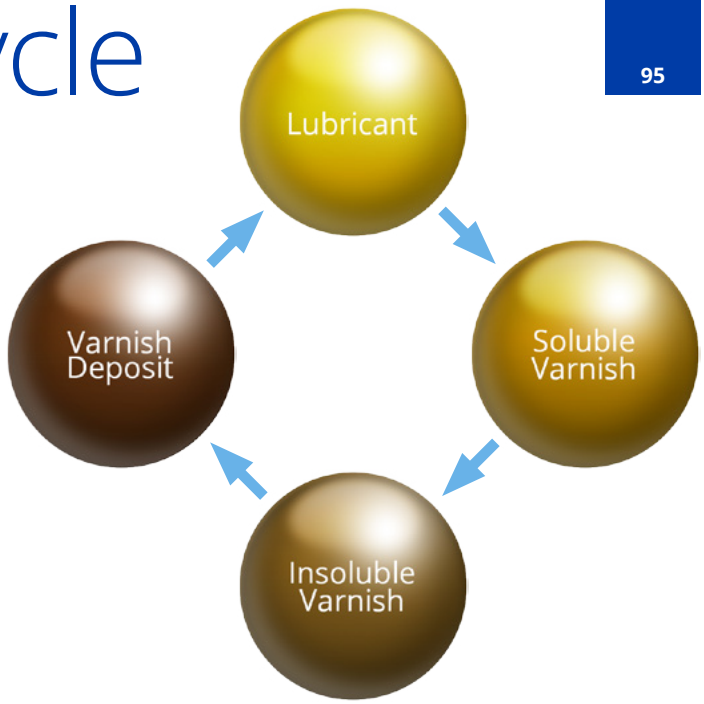
Varnish deposits on reservoir floor (Plated)

Testing for varnish

Varnishing can cause costly turbine downtime. An easy solution to combat this is to determine the lubricant's potential for varnish formation. Two of the most widely adopted techniques are QSA® (quantitative spectrophotometric analysis) and the standardized MPC (membrane patch colorimetry, ASTM 7843).

Both methods can produce results which vary significantly depending upon the length of time during which the oil sample was "aged." Indeed, longer sample aging periods produce higher MPC values, suggesting that degradation of lubricants continues in the sample bottle. For this reason, the ASTM MPC method suggests all samples be incubated at room temperature for 72 hours after being heated to 140°F (60°C) for 24 hours. This well-defined and standardized aging time has provided inter-laboratory consistency and improved testing repeatability.

The Varnish Cycle



It all starts with oxidation.

Oxidation is an unavoidable chemical reaction between the lubricant base stock and oxygen present in the air surrounding it. Oxidation increases as the operating temperature rises, but the by-products remain dissolved.

When oil moves from hotter regions within the system to cooler ones, the fluid temperature decreases and these precursors begin a physical change to precipitate from solution in the form of soft particulates.

Once formed, varnish particles agglomerate and form deposits which preferentially coat metal surfaces within the reservoir and on components like valves. These deposits are often the cause of unit trips and fail-to-start conditions.

In most cases, however, once varnish deposits form, they can be reabsorbed into the fluid and broken down if the solvency of the lubricant increases.

The table below breaks down the stages in the process of varnish formation along with the approximate fluid color corresponding to each stage.

Oxidation	**Oxidation** is the root cause of the problem. It creates free radicals resulting in acids, alcohols, esters and lactones. Anti-oxidant (A0) additives are designed to neutralize the products of oxidation. As oxidation occurs, the phenol and amine additives are depleted. The products of oxidation become the building blocks of varnish.
Polymerization	**Polymerization** occurs as the by-products of oxidation and additive reactions combine to create longer chain molecules with higher molecular weight. These molecules have lower solubility and are polarized. The rate of molecular polymerization is a function of temperature (as a catalyst) and the concentration of oxidation by-products (free radicals).
Solvency	**Solvency** describes fluid's capacity to hold the varnish producing molecules in solution (dissolved). Solubility is directly affected by temperature. As more oxidation by-products are generated, the fluid approaches its solubility saturation point beyond which no additional polymerized molecules can be held in solution.
Precipitation	**Precipitation** occurs once the solubility threshold (saturation point) has been crossed or if there is a drop in temperature which reduces the solubility of the fluid. As additional oxidation by-products (free radicals) are generated, they become insoluble and precipitate out and are free to form varnish deposits.
Agglomeration	**Agglomeration** begins as insoluble sub-micron soft particles (~0.08 micron) that have precipitated out of solution bond to form large particles (1.0 micron). These agglomerated soft particles remain insoluble, remain polarized, and maintain a higher molecular weight than the fluid itself.
Varnish Formation	**Varnish forms** as the polarized oxidation by-products come out of solution, agglomerate and collect on metal surfaces. The surfaces where varnish typically forms include cool zones, low flow and low clearance areas. Why? This is where solubility diminishes, precipitation starts and agglomeration goes on undisturbed. Deposit formation also occurs locally in the reservoir and on components where hot spots in the fluid or sparking lead to varnish, such as on reservoir walls and filter elements.

Typical Fluid Condition

Strategies to Combat Varnishing

There are two main types of varnish removal systems: those based upon the removal of suspended (insoluble) particles and those based upon the removal of soluble varnish and its precursors.

Anti-oxidant packages, generally consisting of phenols and amines, are usually added to the lubricant as a built-in varnish mitigation strategy. Anti-oxidants limit the rate of oxidative degradation and, therefore, delay varnishing. But these AO packages fail in that they cannot prevent it indefinitely. Although both phenols and amines have anti-oxidant activity on their own, they function more efficiently in concert with one another. While the specific identities and amounts of the anti-oxidants employed varies with different lubricant formulations, the mechanism by which they enhance fluid lifetime remains the same. AO levels deplete continuously which means the fluid needs to be replaced once all AO additives have been consumed.

Insoluble Varnish Removal

Charge agglomeration, electrostatic oil cleaning, or combinations of these techniques are advanced forms of particulate removal. These techniques remove fine particulates that are suspended within the fluid including insoluble varnish particles. However, these technologies are only helpful once the insoluble particles form. Soluble varnish and soluble varnish precursors are able to return to the turbine and become varnish deposits as seen on the components to the right.

Soluble Varnish Removal

Soluble Varnish Removal (SVR™) systems use specialized Ion Charge Bonding (ICB™) resins that contain billions of polar sites capable of adsorbing soluble varnish and its precursors. This adsorption relies on a preferential molecular interaction between the polar varnish molecules and the polar sites present within the resin. Just as insoluble by-products prefer metal surfaces to being suspended in the fluid, soluble by-products prefer ICB resin than to remain dissolved within the fluid.

Conventional ion-exchange resins function by exchanging one chemical for another. ICB resins are engineered to adsorb the entire contaminant without returning any others to the fluid. A key benefit of the ICB adsorption principle is that harmful oxidation products can be removed at any operating temperature, meaning that SVR systems can be used continuously. The continuous removal of soluble varnish and its precursors ensures that degradation products do not accumulate in the lubricant, eliminating the risk of varnish formation during normal turbine shut down cycles. Moreover, the continuous removal of soluble varnish produces a lubricant with extremely high solvency.

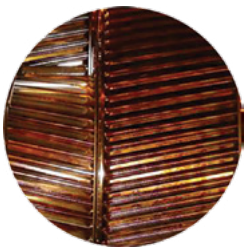
Since the physical changes that resulted in the formation of insoluble varnish particles and deposits are reversible, the high solvency of the SVR treated lubricant forces insoluble varnish already present on turbine surfaces back into the soluble varnish form where they can be adsorbed and removed. With all the remaining oxidation by-products removed, the varnish formation cycle is completely stopped.

Varnish particles and deposits are created from reversible physical changes that begin with soluble oxidation products and end with insoluble deposits. For these changes to be reversible, the chemistry of the deposits has to be similar to the chemistry of the lubricant from which the deposits originated. Normally, once fluid solvency has been increased (by removing soluble varnish at normal operating temperature), deposits will simply dissolve back into the fluid and be removed.

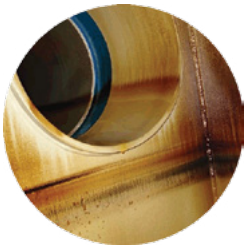
Varnish deposits on filter element (GE Frame 6B)

IGV valves and fuel control valves are typically the first problem components

Varnish on load gear (Frame 6)



Lube oil reservoir coated (Varnish Deposits)



Filter element cross section (Lacquer Varnish Deposits, Support Tube)

Varnish & Acid Scavenging Systems

SVR
Soluble Varnish Removal Systems

98

Ideal for large frame turbines where mineral based lube oil and specified synthetics are used. Prevent unit trip and fail-to-start conditions where a common reservoir is used for lube and hydraulic control circuits. ICB media technology treats oil on a molecular level, reversing the chemical process of varnish deposit formation, improving servo valve response time, protecting lube oil anti-oxidant additive packages, removing acids to improve oxidative stability, and improving oil demulsibility. High efficiency post filter removes particles to deliver low ISO Codes while extending the life of main bearing lube, pump discharge and servo pilot filters.

FSTO
Turbine Oil Varnish Removal Systems

104

A total solution for varnish deposit removal and prevention in mineral based and specified synthetic compressor and small frame turbine lube oil applications subject to varnish deposits in bearings, heat exchangers and control valves. ICB media technology treats lube oil on a molecular level, reversing the chemical process of varnish deposit formation, improving servo valve response time, protecting lube oil anti-oxidant additive package, removing acids to improve oxidative stability, and improving oil demulsibility. VTM post-filter media removes insoluble (suspended) oxidation by-products, water, and hard contamination to achieve incredibly low ISO Codes and clean lube oil.

FSAPE
Phosphate Ester Varnish Removal Systems

108

A dedicated solution for phosphate ester based fluids on turbine control, steel mill hydraulics and other high heat applications. ICB media removes acids formed in phosphate ester (hydrolysis) and dissolved metals leeched into the fluid from Fuller's earth, D-earth and Selexsorb acid remediation technologies which lead to gels, deposits and poor air release in FRFs. ICB also restores fluid resistivity and removes gels and deposits in control valves to improve servo valve response time. VTM mechanical filter element media reduces ISO Codes and extends pump discharge, servo pilot and last chance filter element life. $TMRN_2$ manages water to 300 ppm and prevents contamination from air ingression. Use FSAPE to avoid unit trip, expensive premature fluid replacement, flushes or bleed and feed routines.

FSJL
Aeroderivative Jet Lube Varnish Removal Systems

112

Aeroderivative turbines suffer from contamination related variable geometry failures, bearing deposits and premature fluid replacement, all of which can be caused by varnish. ICB media technology removes acids, molecular by-products, and varnish deposits that form during jet lube fluid degradation. $TMRN_2$ manages water to 300 ppm and prevents contamination from air ingression. VTM mechanical filter element media reduces ISO Codes and extends pump discharge, servo pilot and last chance filter element life. FSL is a total fluid management solution for aeroderivative turbine jet lube applications.

ECR
Electrostatic Contamination Removal Systems

116

The primary application for the ECR is the removal of sub-micron carbon particles that form as a result of micro dieseling in turbine EHC (electrohydraulic control) systems using phosphate ester based fluids. The presence of sub-micron carbon particles is evident by a general darkening of the fluid from its original amber color or by black patch color when patch weight analysis is performed. ISO fluid cleanliness codes might show very clean fluid when sub-micron carbon is present as it is below the threshold particle counting per ISO 11171. Sub-micron carbon can lead to deposits, low resistivity and poor air release properties. ECR is the most effective way to remove the sub-micron carbon particles.

ICB
Ionic Charged Bonding Filter Elements

118

Ionic Charged Bonding (ICB) media is used to treat a range of fluids at the molecular level by removing contaminant molecules that form as a by-product of oxidation and fluid degradation. The heavy weight molecules to be removed are polar oxides, acids and other free radicals that result in deposit formation (varnish) and are detrimental to fluid performance. ICB media is designed to selectively remove the contaminant without removing fluid additives. The use of ICB results in fluids that perform better, last longer and yield trouble-free operation for those who are responsible for maintaining them. We apply fluid specific ICB media that remove acids, dissolved metals and varnish while improving important fluid characteristics such as solubility, resistivity and demulsibility.

VTM
Particulate, Water, and Oxidation By-product Removal Media

VTM media configuration is a combination of technologies that mechanically removes insoluble (suspended) oxidation by-products that form varnish deposits in additized AW hydraulic oils and EP gear lubricants. VTM adsorbs water and some polar molecules while removing particulate contamination to $\beta 0.9_{[C]} > 1000$. Ideal for high heat hydraulic and gearbox lube applications such as plastic injection molding, wind turbine, or coal mill applications. VTM is available in FSW, FSL, and FCL dedicated and portable off-line systems and is used in tandem with ICB media on FSTO, FSA, FSJL, and SVR solutions.

SVR™

Soluble Varnish Removal

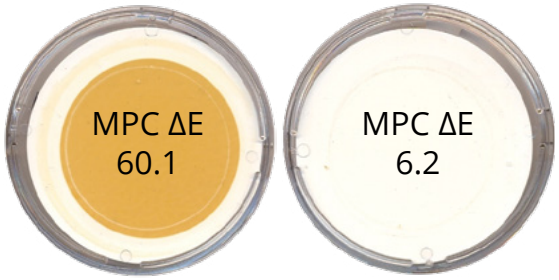
A complete recovery and maintenance solution for mineral-oil based turbine lubricants. SVR targets and removes the dissolved varnish pre-cursors which are the cause of varnish. By removing these waste oxidation by-products, you restore the oils original solvency properties which forces any solid varnish deposits to be dissolved back into the oil where they are removed permanently.

HY-PRO EPT

hyprofiltration.com/SVR

Stop varnish related fail-to-starts and unit trips.

SVR attacks the source of the problem on a molecular level, removing the oxidation by-products that form varnish deposits. SVR reverses the chemical process of varnish deposit formation by restoring oil health removing varnish throughout the system and in critical components so your servo valves operate more efficiently than ever.



Advanced media technologies.

Ion Charge Bonding (ICB) removes soluble oxidation by-products and restores demulsibility during normal turbine operation without damaging additive chemistry. With the most advanced media, SVR has 4x more capacity than competing varnish removal systems.

Remove acid.

Acid in turbine oil is by-product of oxidation, a leading pre-cursor to varnish formation. SVR removes acid improving oxidative stability, slowing oxidation rate and dramatically reducing a source of varnish production.

Attack the problem, not the symptoms.

Turbine oil is condemned when anti-oxidant (AO) additive levels deplete to 20% of new. A dedicated SVR performs in parallel with AO additives to slow depletion to drastically extend the life of your oil. On top of being the ultimate varnish deposit recovery system, SVR restores and protects oil health and actively prevents new varnish from forming. Once varnish is under control the benefit of longer oil life can be fully realized.

Work with the experts.

With SVR, you'll work alongside industry experts and receive comprehensive oil analysis and results interpretation to provide the best solution to extend your fluid life and make varnish vanish, for good.

Endless applications.

In addition to a range of options including the PM-1 Particle Monitor, explosion proof models, a range of power options, even stainless steel vessels, SVR can be completely customized to provide the perfect solution for your application.

Elements that go beyond industry standard.

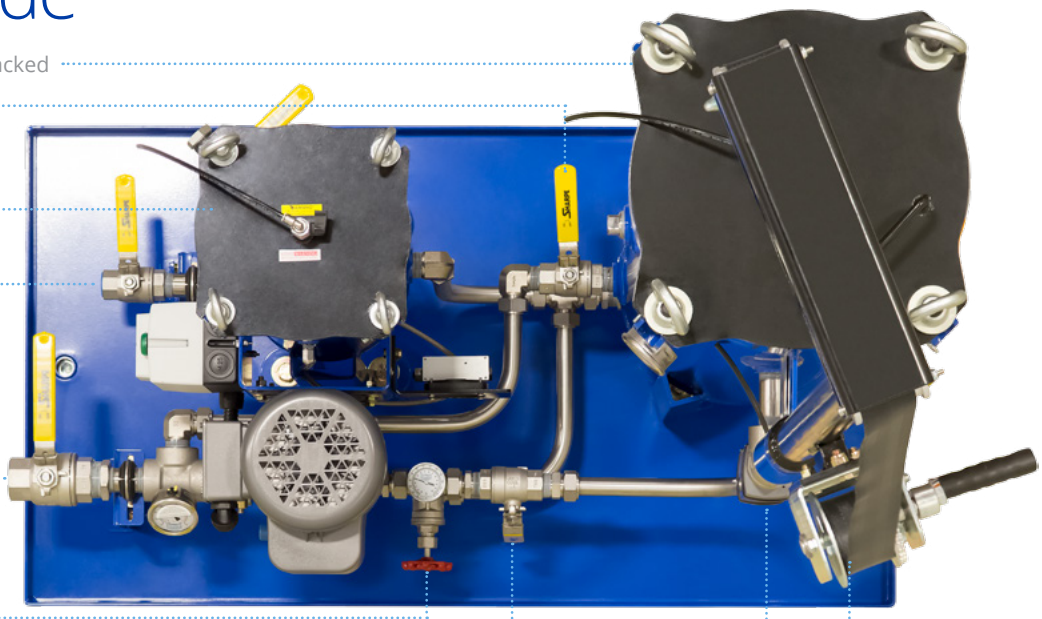
ICB Advanced Resin Technology.

Turbine oil varnish deposits form when oil becomes saturated with oxidation by-products from fluid breakdown. ICB goes where other technologies can't to remove polar oxides on a molecular level. When varnish deposits are affecting servo valve response time, that means the oil is saturated. SVR addresses this by removing dissolved oxidation by-products and restoring the oil's solubility. The restored oil dissolves deposits back into solution which can then be removed by the SVR. The process repeats during recovery until the entire system and the oil are varnish free. That's when you see a white patch. Once the varnish is gone, SVR continues to work by removing by-products as they form to prevent future deposits. ICB also slows anti-oxidant additive depletion to boost oil life. ICB is the only technology that treats the dissolved varnish during normal turbine operation to prevent varnish from forming.

HP107 for ISO Code Management.

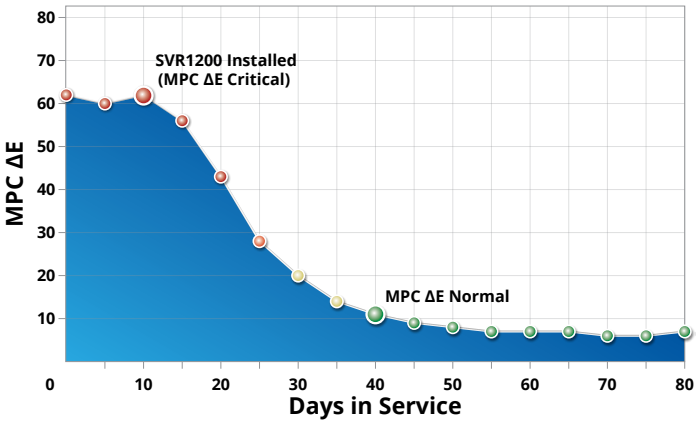
DFE rated advanced media technologies provide the highest level of particulate capture and retention so your equipment operates unimpeded by contamination. The coreless filter element in every SVR delivers remarkably low ISO Codes, taking the dirt load off of critical system lube and hydraulic control filter elements (IGV, pump discharge). In addition to particulate control, the HP107 with VTM media also removes the insoluble oxidation by-products that are suspended in the oil, working hand-in-hand with the ICB media to rapidly reduce varnish potential and restore the health of your oil. The element is oversized to perform over a long element lifespan and to ensure low environmental and bottom line impact. To top it off, the HP107 element comes standard with an integral zero leak bypass so with every filter change, you get a new bypass along with peace of mind.

SVR Quick Guide

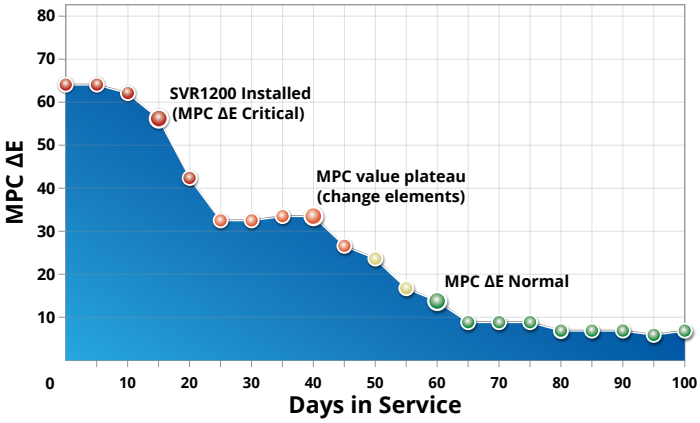


The Proven Varnish Solution

Varnish Potential (MPC) Trend After SVR Installation



Varnish Potential (MPC) Trend After SVR Installation



MPC ΔE Condition Scale

Normal	Monitor	Abnormal	Critical
<15	16-25	26-35	>36

Figure 1 depicts SVR1200 on a 7FA gas turbine with critically high varnish potential (MPC ΔE) experiencing slow servo valve response time and sticking. SVR had an immediate impact on the 6,200 gallon / 24,000 liter lube reservoir. Within 45 days MPC values were reduced to condition normal.

Starting RULER was 5 meaning only 5% AO remained in the oil, below condemning level. By installing SVR before a fluid change, all varnish deposits were removed before the oil change which allowed new oil to be added to a clean reservoir. If not for the deposit removal, AO in the new oil could have immediately depleted to as low as 65%.

Figure 2 is the restoration of a combustion turbine with heavy varnish deposits where MPC varnish potential dropped to 35 after SVR installation. 40 days into service, the ICB elements were changed as they were fully loaded with oxidation by-product. Once changed, MPC dropped to single digits. In the case of a heavily varnished turbine, 2 to 3 sets of ICB elements might be required to achieve condition normal. Once MPC drops to single digits, the ICB elements would normally be replaced annually to maintain the lubricant in optimal condition.

Note: Graph lines have been smoothed to demonstrate long term performance and MPC values will fluctuate as varnish is drawn from the system back into solution and subsequently removed from the system by the SVR

VTK Varnish Test Kits

Colorimetric analysis per ASTM D02.C0.01 WK13070 is used to determine varnish potential in turbine lube oil. A mixture of the sample oil and petroleum ether is used to make the soluble by-products available for collection on a patch. The patch is analyzed with a spectrometer measuring ΔE reported as the MPC ΔE value. See page 236 for more details.

SVR Specifications

Dimensions[1]	**Height** 58" (147 cm) 98" (249 cm) with crane	**Length**[2] 48" (122 cm)	**Width**[2] 26" (66 cm)	**Weight** 700 lbs (318 kg)
Connections	**Inlet** 1.5" FNPT with locking ball valve		**Outlet** 1" FNPT with locking ball valve	
Max Reservoir Size	**SVR1200 + SVR1200X** 8,000 gal (30,000 liter) reservoir		**SVR2400** Max 16,000 gal (60,000 liter) reservoir	
Element Configuration	**Particulate filter** SVR1200: HP107L18-VTM710V SVR2400: HP107L18-VTM710V SVR1200X: no particulate filter included		**Main Filter** SVR1200: ICB600524-V x 2 SVR2400: ICB600524-V x 4 SVR1200X: ICB600524-V x 2	
Seals	Fluorocarbon + silicone			
Operating Temperature	**Fluid Temperature** 86°F to 176°F (30°C to 80°C)		**Ambient Temperature** -4°F to 104°F (-20C to 40C)	
Materials of Construction	**Housings** Carbon steel with industrial coating ASME U Code optional	**Tray** Carbon steel with industrial coating	**Fittings** Swagelok® stainless	
Electric Motor	TEFC, 56-145 frame 1-1.5 hp, 1150-1750 RPM			
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 90 psi (6.2 bar)			
Total System Flow[3]	**SVR1200** 7-11 gpm	**SVR2400** 14-16 gpm		
ICB Canister Flow Rates[4]	**SVR1200 + SVR1200X** 5 gpm (18.9 lpm) max	**SVR2400** 10 gpm (37.9 lpm) max		
Pneumatic Option Air Consumption[5]	~40 cfm @ 80 psi			
Media Description	**VTM** $\beta 0.9_{[C]}$ = 1000 particulate, insoluble oxidation by-product and water removal media		**ICB** Ion charge bonding resin media for molecular removal of acids, varnish deposits, soluble oxidation by-products and dissolved metal ions from mineral based turbine oil.	
Fluid Compatibility	Petroleum and mineral based fluids only (standard). For phosphate ester and other specified synthetic fluids, see FSA (page 108) or contact factory.			
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.			

[1]Dimensions are approximations taken from base model and will vary according to options chosen.
[2]Spill retention pan standard size. Contact factory for custom pan sizing.
[3]Controlled via flow control valve + flow meter (included standard).
[4]Maximum system flow dependent on and will vary with motor selection.
[5]Air consumption values are estimated maximums and will vary with regulator setting.

SVR Part Number Builder

SVR [ ] [ ] [ ] [ ] - [ ]

Model | Turbine Type | Indicator | Power Options | Special Options

Model

Particulate Filter	ICB	Recommended Reservoir Size
1200 HP107L18-VTM710V	ICB600524-V x 2	Max 8,000 gal (30,000 liter) reservoir
2400 HP107L18-VTM710V	ICB600524-V x 4	Max 16,000 gal (60,000 liter) reservoir
1200X none (omit ΔP indicator and power options)	ICB600524-V x 2	Max 8,000 gal (30,000 liter) reservoir

Turbine Type

CT Combustion turbine - mineral based oil
ST Steam turbine - mineral based oil

ΔP Indicator[1]

D 22 psid visual gauge + electric switch
E 22 psid visual gauge

Power Options

Contact factory for options not listed

60 Hz, 1150-1750 RPM

12 120 V ac, 1P
22 208-230 V ac, 1P
23 208-230 V ac, 3P
46 460-480 V ac, 3P
57 575 V ac, 3P

50 Hz, 1450 RPM

11 110 V ac, 1P
21 220 V ac, 1P
40 380-440 V ac, 3P
52 525 V ac, 3P

Pneumatic

00 Pneumatically driven air motor & PD pump. FRL & flow meter included.

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)
C CE marked for machinery safety directive 2006/42/EC
D High filter ΔP auto shutdown
E 100 mesh cast iron basket strainer
F Filter element ΔP gauge with tattle tale follower needle
H Automatic high temp shut down (160°F, 71°C)
L High filter element ΔP indicator light (particulate filter only)
M Total system flow meter (120 cSt max)
N PM-1 ready (plumbing only)
O On-board PM-1 particle monitor & clean oil indicator light
S All wetted components 304 or higher stainless steel[2]
U CUL and/or CSA marked starter enclosure for Canada
U1 U Code (ASME U code certified) + CRN
V Lifting eye kit
W Automatic air bleed valve (includes one per vessel)
Y VFD variable speed motor frequency control
Z On site start-up training

[1]Particulate filter only. ICB housing is equipped with 0-100 psi static pressure gauge. Industrial, liquid filled.
[2]With exception to cast iron gear pump.

FSTO

Turbine Oil Varnish Removal Systems

FSTO is the complete oil conditioning solution for turbine and compressor lube oil. FSTO treats both soluble and insoluble forms of oxidation by-products to remove and prevent varnish deposits and deliver guaranteed results.

Utilizing ICB technology, FSTO removes the soluble varnish feedstock, acids and protects the anti-oxidant additive package while VTM high efficiency post filter removes insoluble by-products and will deliver unimaginably low ISO cleanliness codes so you can use your clean, in-service oil longer than ever before.

HY-PRO EPT

hyprofiltration.com/FSTO

Sized just right.

Not every job calls for a Goliath sized solution. When it comes to small turbine lube oil and compressor reservoirs with contamination problems, the FSTO is sized just right. Sizing and flow rate options mean you get the perfect solution tailored specifically to your systems.

Reverse varnish formation.

Even before MPC values climb, trending acid number can be a leading indicator of trouble ahead. By removing oxidation by-products, FSTO restores the solubility of your oil which in turn chemically removes varnish deposits in your system. The continuous process goes even further by removing the acids from your system on a molecular level, meaning you're free and clear of varnish and its underlying causes.

Continuous varnish control.

Combined VTM and ICB technologies continuously remove soluble and insoluble oxidation by-products so that your turbines operate uninhibited by varnish. With the added benefits of increasing the lifespan of AO packages, implementing the FSTO to your filtration regime will make unit trips and unplanned downtime a thing of the past.

ISO Codes: right on target.

The same ultra-high efficiency particulate filter which removes insoluble oxidation by-products doubles up to deliver incredibly low ISO Codes and take the pressure off your on-board bearing lube, pump discharge, and servo filters, giving you an extension on the lifespans of both your oil and your critical components.

Extend your oil life.

FSTO prevents AO additive depletion, removes acids which negatively affect oxidative stability, and can even improve oil demulsibility to greatly extend the useful life of your oil. Every FSTO comes standard with sample ports in the right locations to arm you with access to consistently accurate and best practice samples.

A league of its own.

ICB is used on over 400 turbine and compressor packages achieving over 40 million hours of operating experience. No other product in the market can match track record or experience level. ROI in a Frame 7ea Gas Turbine has been calculated at $170,000 per year on a $8000 average annual investment on lubricant maintenance.

FSTO Specifications

Dimensions[1]	**Height** 72" (183 cm)	**Length**[2] 47.5" (121 cm)	**Width**[2] 31.5" (80 cm)	**Weight** 585 lbs (265 kg)
Connections	**Inlet** 1" FNPT with ball valve		**Outlet** 1" FNPT with ball valve	
Max Reservoir Size	**FSTO05** 600 gal (2,271 liters)	**FSTO1** 1,200 gal (4,542 liters)	**FSTO2** 2,500 gal (9463 liters)	**FSTO4** 5,000 gal (18,927 liters)
Element Configuration	**Pre-filter** HP107L18-VTM710V		**ICB** FSTO05: ICB600504-V FSTO1: ICB600504-V x 2 FSTO2: ICB600524 -V FSTO4: ICB600524-V x 2	
Seals	Fluorocarbon + silicone			
Operating Temperature	**Fluid Temperature** 86°F to 176°F (30°C to 80°C)		**Ambient Temperature** -4°F to 104°F (-20C to 40C)	
Materials of Construction	**Housings** Carbon steel with industrial coating		**Tray** Carbon steel with industrial coating	
Electric Motor	TEFC, 56-145 frame 0.5 hp, 1450-1750 RPM			
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)			
Pneumatic Option Air Consumption	~40 cfm @ 80 psi[3]			
Media Description	**VTM** $\beta 0.9_{[C]} \geq 1000$ particulate, insoluble oxidation by-product and water removal media.		**ICB** Ion charge bonding resin media for molecular removal of acids, varnish deposits, soluble oxidation by-products and dissolved metal ions from mineral based turbine oil.	
Fluid Compatibility	Petroleum and mineral based fluids only (standard). For phosphate ester and other specified synthetic fluids, see FSA (page 108) or contact factory.			
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.			

[1]Dimensions are approximations taken from base model and will vary according to options chosen.
[2]Spill retention pan standard size. Consult factory for custom pan sizing.
[3]Air consumption values are estimated maximums and will vary with regulator setting.

FSTO Part Number Builder

FSTO [ ] [ ] [ ] - [ ]

Flow Rate | Indicator | Power Options | Special Options

Flow Rate[1]

05	0.5 gpm (1.7 lpm)
1	1 gpm (3.7 lpm)
2	2 gpm (7.5 lpm)
4	4 gpm (15.1 lpm)

ΔP Indicator[2]

D	22 psid visual gauge + electric switch
E	22 psid visual gauge

Power Options

Contact factory for options not listed

60 Hz, 1750 RPM

12	120 V ac, 1P
22	208-230 V ac, 1P
23	208-230 V ac, 3P
46	460-480 V ac, 3P
57	575 V ac, 3P

50 Hz, 1450 RPM

11	110 V ac, 1P
21	220 V ac, 1P
40	380-440 V ac, 3P
52	525 V ac, 3P

Pneumatic

00	Pneumatically driven air motor & PD pump. FRL & flow meter included.

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

A	Air cooled heat exchanger (consult factory)
B	Complete filter bypass line
C	CE marked for machinery safety directive 2006/42/EC
D	High filter ΔP auto shutdown
E	100 mesh cast iron basket strainer
F	Filter element ΔP gauge with tattle tale follower needle
H	Automatic high temp shut down (160°F, 71°C)
L	High filter element ΔP indicator light
M	Total system flow meter (120 cSt max)
N	PM-1 ready (plumbing only)
O	On-board PM-1 particle monitor & clean oil indicator light
S	All wetted components 304 or higher stainless steel3
U	CUL and/or CSA marked starter enclosure for Canada
V	Lifting eye kit
W	Automatic air bleed valve
Z	On site start-up training

[1]Nominal flow rates at 60 Hz motor speeds.
[2]Particulate filter only. ICB housing is equipped with 0-100 psi static pressure gauge. Industrial, liquid filled.

FSA

Phosphate Ester Conditioning Systems

A complete solution for trouble-free EHC operation using phosphate ester fluids. Avoid premature fluid replacement, bleed and feed, and eliminate expensive flushes. FSAPE is the new standard for maintenance of water, acid, ISO Code, resistivity, and removal of gels and deposits that cause servo valve failure.

Ideal for steam turbine EHC fire resistant fluid maintenance.

HY-PRO EPT **hyprofiltration**.com/FSA

Resolve servo valve issues.

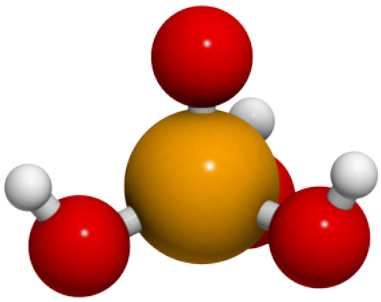
FSA skids featuring ICB™ technology will maintain ideal fluid chemistry and cleanliness. Systems will reduce elevated Acid Number and water, increase resistivity and eliminate the cause of fluid gelling and servo valve sticking.

Clean, dry, healthy oil.

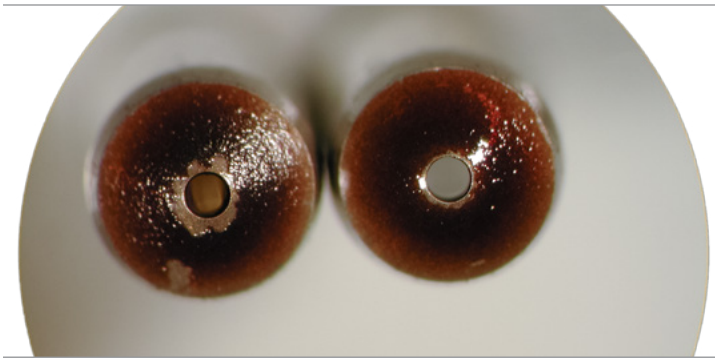
Water and phosphate ester together form strong acid which leads to premature fluid replacement. Integrated TMRN$_2$™ Headspace Dehydrators continuously introduce nitrogen through the headspace to simultaneously remove water, O2, CO, H and other high temperature breakdown gases. Maintaining low water levels and eliminating reservoir contact with O2 will proactively manage the rate of fluid breakdown and minimize acid production.

Minimize acid. Maximize efficiency.

High acid number (AN) in phosphate ester means premature fluid replacement if left unmanaged. Since acid production is autocatalytic, the acid in your system will generate more acid until your fluid becomes unusable. ICB technology can reduce AN to as low as 0.03 with 4-8x the capacity of other acid removal filters.



H_3PO_4
Phosphoric Acid

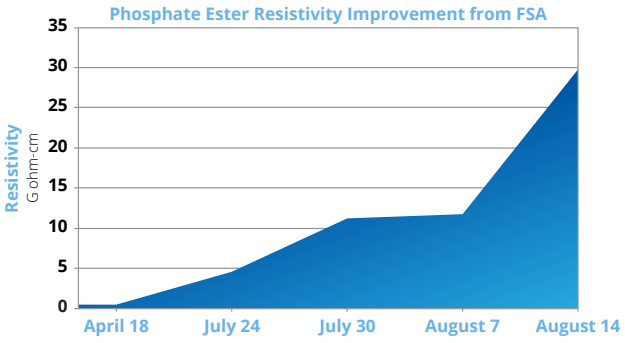


Remove what others left behind.

Dissolved metal ions in phosphate ester form gels and deposits that accumulate on servo valve nozzles & flappers, resulting in slow servo valve response time, unit trips, and reduced fluid resistivity. ICB removes all dissolved metal, reverses gel and deposit formation, prevents unit trip and restores servo valve response time.

Extend your oil life, don't flush it.

Low resistivity in phosphate ester leads to electro-kinetic corrosion between dissimilar metal surfaces and is one of the condemning factors of phosphate ester. In addition to removing acids and dissolved metals, ICB has been shown to significantly increase fluid resistivity to prevent premature fluid replacement, expensive bleed-and-feed routines and unnecessary chemical flushes.



Comprehensive EHC protection.

In addition to FSA we offer these important companion products that eliminate common weak points in EHC fluid maintenance. Dynafuzz stainless steel filters to eliminate the common issues of high pressure filter fiber migration and static discharge, ECR to restore fluid color and to reduce patch weight, and VTM to upgrade existing low pressure filters.

FSA Specifications

Dimensions[1]	**Height** 58" (147 cm)	**Length**[2] 47.5" (121 cm)	**Width**[2] 31.5" (80 cm)	**Weight** 571 lbs (259 kg)
Connections	**Inlet** 1" FNPT with locking ball valve		**Outlet** 1" FNPT with locking ball valve	
Max Reservoir Size	**FSA05** 200 gal (750 liters)	**FSA1** 400 gal (1,500 liters)	**FSA2** 800 gal (3,000 liters)	**FSA4** 1,600 gal (6,050 liters)
Element Configuration	**Particulate filter** HP107L18-VTM710V		**ICB** FSA05: ICB600504-A FSA1: ICB 600504-A x 2 FSA2: ICB600524-A FSA4: ICB600524-A x 2	
Seals	Fluorocarbon + silicone			
Operating Temperature	**Fluid Temperature** 86°F to 176°F (30°C to 80°C)		**Ambient Temperature** -4°F to 104°F (-20C to 40C)	
Materials of Construction	**Housings** Carbon steel with industrial coating		**Tray** Carbon steel with industrial coating	
Electric Motor	TEFC, 56-145 frame 0.5 hp, 1450-1750 RPM			
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)			
Pneumatic Option Air Consumption	~40 cfm @ 80 psi[3]			
TMR-N_2 Air Consumption	**FSA05** < 1.2 SCFM	**FSA1** < 1.2 SCFM	**FSA2** < 2.0 SCFM	**FSA4** < 3.6 SCFM
Media Description	**VTM** $\beta 0.9_{[C]} \geq 1000$ particulate, insoluble oxidation by-product and water removal media.		**ICB** Ion charge bonding resin media for molecular removal of acids, gels and deposits, oxidation by-products and dissolved metal ions from phosphate ester and other synthetic fluids.	
Fluid Compatibility	EHC Fire resistant hydraulic fluids (phosphate ester). For polyol ester and other specified synthetics contact factory.			
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.			

[1]Dimensions are approximations taken from base model and will vary according to options chosen.
[2]Spill retention pan standard size. Consult factory for custom pan sizing.
[3]Air consumption values are estimated maximums and will vary with regulator setting.

FSA Part Number Builder

FSA [ ] [ ] [ ] [ ] - [ ]

Fluid Type | Flow Rate | Indicator | Power Options | Special Options

Fluid Type

PE	Phosphate Ester (not compatible with Skydrol)[1]

Flow Rate[2]

05	0.5 gpm (1.7 lpm)
1	1 gpm (3.7 lpm)
2	2 gpm (7.5 lpm)
4	4 gpm (15.1 lpm)

ΔP Indicator[3]

D	22 psid visual gauge + electric switch
E	22 psid visual gauge

Power Options

Contact factory for options not listed

60 Hz, 1750 RPM

12	120 V ac, 1P
22	208-230 V ac, 1P
23	208-230 V ac, 3P
46	460-480 V ac, 3P
57	575 V ac, 3P

50 Hz, 1450 RPM

11	110 V ac, 1P
21	220 V ac, 1P
40	380-440 V ac, 3P
52	525 V ac, 3P

Pneumatic

00	Pneumatically driven air motor & PD pump. FRL & flow meter included.

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)
C	CE marked for machinery safety directive 2006/42/EC
D	High filter ΔP auto shutdown
E	100 mesh cast iron basket strainer
F	Filter element ΔP gauge with tattle tale follower needle
H	Automatic high temp shut down (160°F, 71°C)
L	High filter element ΔP indicator light
M	Total system flow meter (120 cSt max)
N	PM-1 ready (plumbing only)
O	On-board PM-1 particle monitor & clean oil indicator light
S	All wetted components 304 or higher stainless steel[4]
T3	Remove $TMRN_2$ reservoir headspace dehydrator
U	CUL and/or CSA marked starter enclosure for Canada
V	Lifting eye kit
W	Automatic air bleed valve
Z	On site start-up training

[1]Consult factory for additional fluid type information.
[2]Nominal flow rate at 60 Hz motor speeds.
[3]Particulate filter only. ICB housing is equipped with 0-100 psi static pressure gauge. Industrial, liquid filled.
[4]With exception to cast iron gear pump.

FSJL

Aeroderivative Jet Lube Oil Conditioning Systems

FSJL fluid conditioning skids are a total solution for managing aeroderivative jet lube oils susceptible to high thermal oxidative stress and coke deposit formation. FSJL prevents and reduces coke deposits that lead to variable geometry failures. Extend useful fluid life by removing the catalysts for oxidation; O_2 contact, acid, oxidative coking precursors, dissolved metals, combustible gases, water, and varnish all while maintaining low ISO Codes. Specifically designed for MIL-L-23699 aeroderivative jet lube oils, the FSJL eliminates the contamination that leads to variable geometry failures.

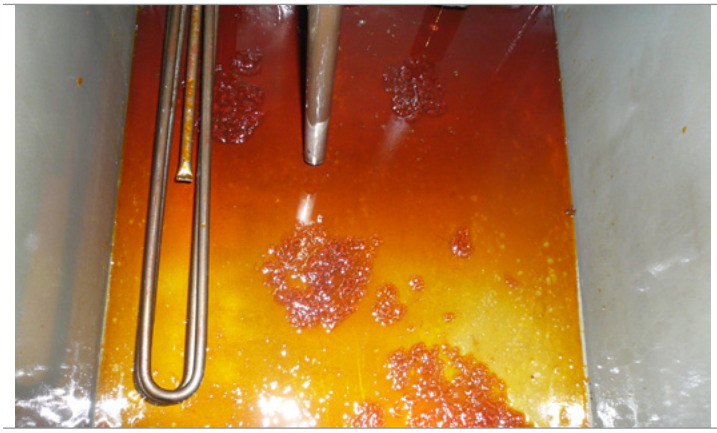
Ideal for maintenance of aeroderivative jet lube oil and hydraulic systems.

HY-PRO EPT

hyprofiltration.com/FSJL

Prevent coking deposits.

Mechanical wear, oil flow restrictions, and increased operating temperature are all caused by coking deposits, the major cause of premature failure in aeroderivative oils. ICB (Ion Charge Bonding) technology removes the oxidation by-products before they can cause additive depletion and coking deposits that form on the turbine rotor, bearings and other wetted surfaces.



Remove acids & dissolved metals.

Aeroderivative turbines often operate at elevated Acid Number (AN) values which attack metal surfaces, adding dissolved metals into the lubricant. ICB technology removes acids and metals, keeping rates of breakdown at a minimum while eliminating the feedstock that leads to coke formation.

High efficiency filtration.

The FSJL high efficiency final filter removes particles and insoluble by-products, delivering unimaginably low ISO Codes to extend the life of your mechanical components and bearings. To top it off, every HP107 filter element comes with an integral bypass valve to give you the safety and security you want with the filtration power you need.

Actively manage oxidation.

Normal lubricant reservoirs are vented to atmosphere, the key ingression pathway for water and oxygen which are two major causes of jet lube breakdown. The integrated TMR-N_2 headspace dehydrator on every FSJL actively blankets the reservoir with dry nitrogen to remove water, oxygen and combustible gases and greatly reduce the rate of oxidation and extend your fluid's useful life.

Full-time (water) extraction.

For applications that require full-time operation of reservoir headspace extraction fans, special option V1 integrates the V1 Compact Vacuum Dehydrator in place of the TMR-N_2 to provide a powerhouse water removal option that complements ICB and high efficiency on-board particulate filtration.

FSJL Specifications

Dimensions[1]	**Height** 58" (147 cm)	**Length**[2] 47.5" (121 cm)	**Width**[2] 31.5" (80 cm)	**Weight** 571 lbs (259 kg)
Connections	**Inlet** 1" FNPT with ball valve		**Outlet** 1" FNPT with ball valve	
Max Reservoir Size	**FSJL05** 150 gal (560 liters)	**FSJL1** 300 gal (1,125 liters)	**FSJL2** 800 gal (3,000 liters)	**FSJL4** 1,600 gal (6,000 liters)
Element Configuration	**Particulate filter** HP107L18-VTM710V		**ICB** FSJL05: ICB600504-J FSJL1: ICB 600504-J x 2 FSJL2: ICB600524-J FSJL4: ICB600524-J x 2	
Seals	Fluorocarbon + silicone			
Operating Temperature	**Fluid Temperature** 86°F to 176°F (30°C to 80°C)		**Ambient Temperature** -4°F to 104°F (-20C to 40C)	
Materials of Construction	**Housings** Carbon steel with industrial coating		**Tray** Carbon steel with industrial coating	
Electric Motor	TEFC, 56-145 frame 0.5 hp, 1450-1750 RPM			
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)			
Pneumatic Option Air Consumption	~40 cfm @ 80 psi[2]			
TMR-N_2 Option Air Consumption	**FSJL05** < 1.2 SCFM	**FSJL1** < 1.2 SCFM	**FSJL2** < 2.0 SCFM	**FSJL4** < 3.6 SCFM
Media Description	**VTM** $\beta 0.9_{[C]} \geq 1000$ particulate, insoluble oxidation by-product and water removal media.		**ICB** Ion charge bonding resin media for molecular removal of acids, gels and deposits, oxidation by-products and dissolved metal ions from polyol ester and other synthetic fluids.	
Fluid Compatibility	Type II, MIL-L-23699, polyol ester base stock, synthetic turbo oils and polyol esters.			
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.			

[1]Dimensions are approximations taken from base model and will vary according to options chosen.
[2]Air consumption values are estimated maximums and will vary with regulator setting.

FSJL Part Number Builder

FS [ ] [ ] [ ] [ ] - [ ]

Fluid Type | Flow Rate | Indicator | Power Options | Special Options

Fluid Type

JL	Aeroderivative jet lubricants

Flow Rate[1]

05	0.5 gpm (1.7 lpm)
1	1 gpm (3.7 lpm)
2	2 gpm (7.5 lpm)
4	4 gpm (15.1 lpm)

ΔP Indicator[2]

D	22 psid visual gauge + electric switch
E	22 psid visual gauge

Power Options

Contact factory for options not listed

60 Hz, 1750 RPM

12	120 V ac, 1P
22	208-230 V ac, 1P
23	208-230 V ac, 3P
46	460-480 V ac, 3P
57	575 V ac, 3P

50 Hz, 1450 RPM

11	110 V ac, 1P
21	220 V ac, 1P
40	380-440 V ac, 3P
52	525 V ac, 3P

Pneumatic

00	Pneumatically driven air motor & PD pump. FRL & flow meter included.

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)
B	Complete filter bypass line
C	CE marked for machinery safety directive 2006/42/EC
D	High filter ΔP auto shutdown
E	100 mesh cast iron basket strainer
F	Filter element ΔP gauge with tattle tale follower needle
H	Automatic high temp shut down (160°F, 71°C)
L	High filter element ΔP indicator light
M	Total system flow meter (120 cSt max)
N	PM-1 ready (plumbing only)
O	On-board PM-1 particle monitor & clean oil indicator light
S	All wetted components 304 or higher stainless steel[3]
T2	Add $TMRN_2$ reservoir headspace dehydrator
U	CUL and/or CSA marked starter enclosure for Canada
V	Lifting eye kit
V1	Add V1 Compact Vacuum Dehydrator
W	Automatic air bleed valve
Z	On site start-up training

[1]Nominal flow rates at 60 Hz motor speeds.
[2]Particulate filter only. ICB housing is equipped with 0-100 psi static pressure gauge. Industrial, liquid filled.
[3]With exception to cast iron gear pump.

ECR™

Electrostatic Contamination Removal

Ideal for sub-micron insoluble contamination removal in phosphate ester fluids in turbine EHC systems.

Remove fine particulates that are below the range of mechanical filters. Standard Electrostatic Oil Cleaner (EOC) systems are ineffective for phosphate ester fluid applications due to fluid conductivity restrictions. The ECR™ is designed specifically to solve this dilemma.

HY-PRO EPT hyprofiltration.com/ECR

Extend your oil life.

ECR™ improves fluid color and drastically reduces solid contamination levels. When used in conjunction with ICB™ for acid and dissolved contamination removal and TMR™-N2 for water removal, comprehensive fluid maintenance is achieved which, when maintained over time, eliminates the need for chemical flushes.

Unique restoration solution.

Pressure induced dieseling and element spark discharge generate sub-micron insoluble carbon based particles that cannot be removed by traditional particulate filtration. The ECR™ combines a high voltage electrostatic field with a proprietary collector element design to remove the sub-micron particles that are the cause of dark EHC fluid and high varnish potential values (MPC).

Comprehensive testing & support.

With typical analysis showing as little as 10% of the contamination present, specialized testing is included to document starting contamination levels and demonstrate results.

ECR™ Specifications

Model	ECR4000	ECR8000
Height	57" (145 cm)	57" (145 cm)
Width	42" (107 cm)	56" (142 cm)
Depth	27" (69 cm)	27" (69 cm)
Weight	426 lbs (193 kg)	567 lbs (257 kg)
Connections	1" MNPT	1" MNPT
Max Flow Rate	4.5 gpm (17 lpm)	9 gpm (34 lpm)
Element Quantity	1 collector element	2 collector element
Seals	Fluorocarbon	Fluorocarbon
Control Panel	Weather resistant NEMA 4 enclosure	Weather resistant NEMA 4 enclosure
High Voltage Capacity	12,000 V	12,000 V
Electric Motor	TEFC, 56-145 frame ¾ hp, 1450-1750 RPM	TEFC, 56-145 frame ¾ hp, 1450-1750 RPM
Dirt Capacity	15 lbs (6.8 kg) per element	15 lbs (6.8 kg) per element
Element Lifespan	Approximately 4,000 service hours	Approximately 4,000 service hours
Max Suction Line Pressure Loss	6 psi (0.41 bar), 12.2 Hg vacuum	6 psi (0.41 bar), 12.2 Hg vacuum
Max Water Level	<500 ppm for maximum efficiency	<500 ppm for maximum efficiency
Fluid Compatibility	Phosphate ester based fire resistant fluids.	Phosphate ester based fire resistant fluids.

ECR™ Part Number Builder

ECR [ ] [ ] - [ ]

Model | Element Type | Power Option

Model

4000	1 collector element
8000	2 collector elements

Element Type

Fluid Resistivity Value		Collector Element
omit	> 8G-OHMS/cm	COL-600990
-LR	< 8G-OHMS/cm	COL-600907

Power Options

60 Hz, 1750 RPM		50 Hz, 1450 RPM	
12	120 V ac, 1P	**11**	110 V ac, 1P
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
57	575 V ac, 3P		

ICB™

Ion Charge Bonding Acid and Varnish Removal Filters

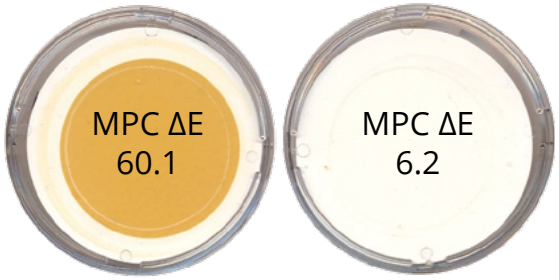
While offering best in class acid and varnish removal, ICB™ filter elements significantly reduce production losses and resolve servo-valve issues by eliminating the contamination responsible for sticking or sluggish valves. Conventional acid filters cannot remove this contamination and are also significant contributors of harmful metals and fine particulate. ICB™ filters eliminate these key issues and direct maintenance to where it matters most.

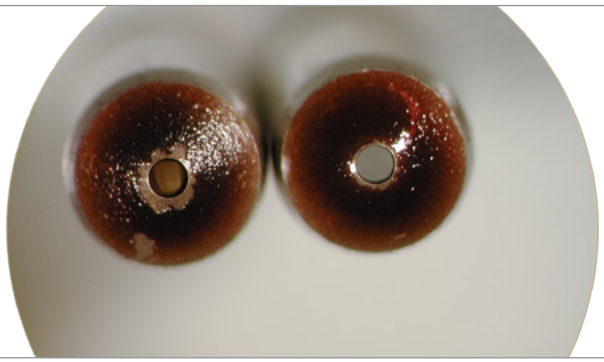
HY-PRO EPT

hyprofiltration.com/ICB

Stop varnish related fail-to-starts and unit trips.

ICB™ attacks the source of the problem on a molecular level, removing the oxidation by-products that form varnish deposits. By reversing the chemical process of varnish deposit formation, ICB™ restores oil health to remove varnish throughout the system and in critical components so your servo valves operate more efficiently than ever.



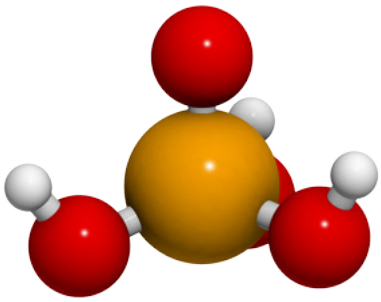


Remove what others left behind.

As dissolved metals accumulate, they act as a catalyst forming depots on servo valves and gels that can cause valve restriction and mask filter elements. ICB™ elements do not contribute metals and will remove dissolved metals from airborne ingress and element leaching to <10 ppm.

Minimize acid. Maximize efficiency.

High acid number (AN) in phosphate ester means premature fluid replacement if left un-managed. Since acid production is autocatalytic, the acid in your system will generate more acid which, left unchecked, can quickly become a serious problem. ICB™ technology removes acid to our target of AN < 0.05 with 4-8 times the capacity of alternate acid removal medias.



H_3PO_4
Phosphoric Acid

Unlike all others.

ICB™ is unlike all other ion exchange resin products. Our 20 years of operating experience and continued research has led to best in class resistivity improving capability with increases >10X having been observed. We use custom engineered resins that have been optimized for the lubricant environment.

Extend your oil life, don't flush it.

For most EHC systems, the primary operating fluid is phosphate ester. This is a very safe fluid with excellent lubricating properties that when properly maintained can provide years of trouble-free operation without the need for a flush during replacement. Unfortunately, many power plants have insufficient or incorrect maintenance which causes wide ranging issues that result in actual or high risk of production loss, and expensive flushes after the fact.

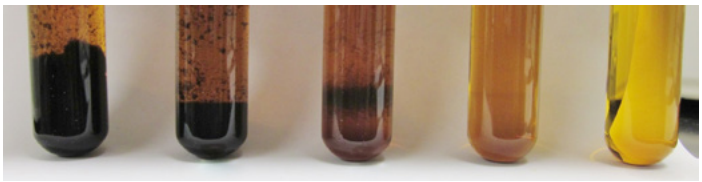
Upgrade your filtration.

ICB™ filters are drop in replacements for many OEM sizes and come in a variety of chemistries for specialized lubricant and fluid applications. When used in conjunction with Hy-Pro Dualglass media filter elements, ISO particle codes will be decreased significantly with document results.

Acid Scavenging Technology Comparison

Selexsorb	Fuller's Earth	ICB™ Ion Charge Bonding
Produces by-products that react with fluid to cause soft gel deposits	Produces hard salts and soap deposits that coat sensitive servo valves	Removes the dissolved break-down products that are responsible for servo valve failures (See Figures 1 and 2)
Can only control acids up to 0.25 mg KOH/g, leading to diminished fluid resistivity	Can only control acids up to 0.25 mg KOH/g, leading to diminished fluid resistivity	Dramatically increases fluid resistivity values which eliminates a common servo-valve failure mode referred to as electro-kinetic-wear or valve erosion
Removes acid but re-contaminates your fluid with sodium, aluminum, silicon	Removes acid but re-contaminates your fluid with magnesium, iron, calcium	Does not contribute fine particulate, or add dissolved metals that normally contribute to increased rates of oxidation
3x less capacity to remove acid than ICB	6-7x less capacity to remove acid than ICB	Highest ratio of resin volume to flow rate for higher single pass removal rate and much lower cost of ownership
Made from purified activated Alumina as a Y-Zeolite	Made from magnesium oxide and hydroxide, processed from attapulgus clay or attpulgite	Complete stainless steel construction, featuring robotic, spiral welding which provides maximum filter integrity, adding a new fail-safe in the EHC fluid conditioning system

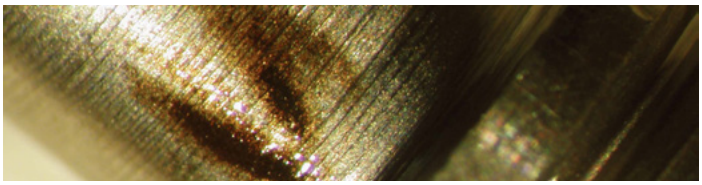
Figure 1 – Deposition Tendency Test



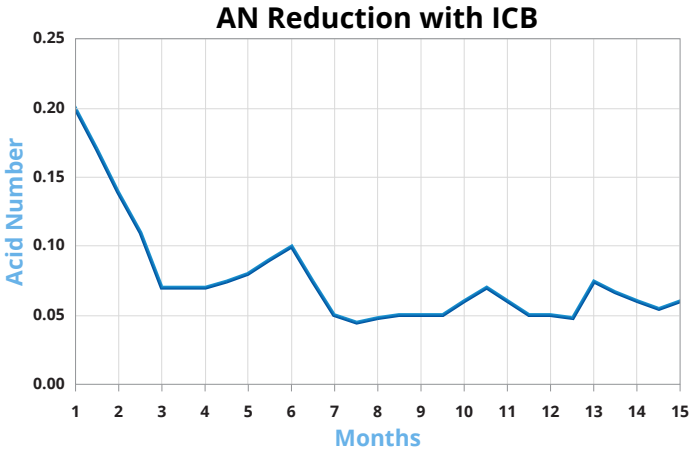
A B C D E

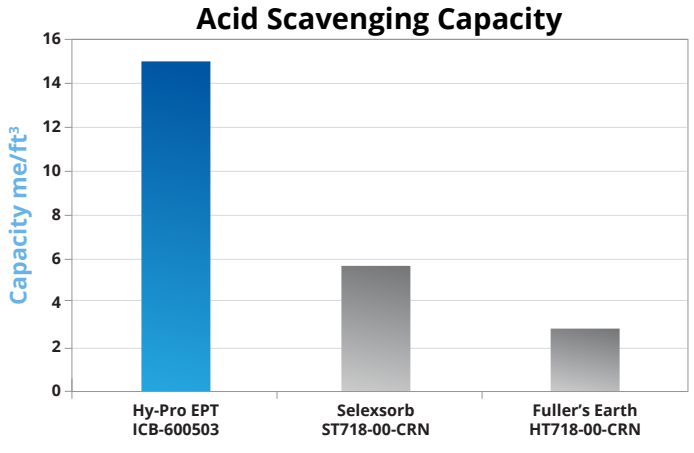
In Step 1 of the Deposition Tendency Test referred to in the EPRI EHC Fluid Maintenance Guide 2002, Page 4-39, EHC fluid is mixed with Hexane which forces out dissolved contamination into solid form. In the first three test tubes (A,B,C), EHC fluid using conventional treatment form visible solids. Servo-valve performance and reliability would be significantly impaired using EHC fluid in this condition. In the last 2 test tubes (D,E) where the EHC fluid was cleaned with ICB™, no deposition or solids of any form are observed. Servo-valve response time and reliability would be maximized operating EHC fluid in this condition.

Figure 2 – Servo Valve Spool with Contamination Deposit



Servo Valve Spool showing signs of fluid contamination deposition. The contamination responsible for these deposits is not routinely measured and in this example the servo-valve would be at abnormal risk level for failure. The Deposition Tendency test as shown in Figure 1, easily identifies if this contamination is present.





ICB™ Specifications

Dimensions

Model	Length	Outer Diameter	Inner Diameter	Dry Weight
ICB-600502	11.030 in (28.016 cm)	4.869 in (12.367 cm)	1.866 in (4.740 cm)	8.5 lbs (3.9 kg)
ICB-600503	18.000 in (45.720 cm)	6.211 in (15.776 cm)	2.250 in (5.715 cm)	13.0 lbs (5.9 kg)
ICB-600504	18.000 in (45.720 cm)	6.211 in (15.776 cm)	2.600 in (6.604 cm)	13.0 lbs (5.9 kg)
ICB-600508	32.072 in (81.463 cm)	6.202 in (15.753 cm)	1.555 in (3.950 cm)	23.0 lbs (10.4 kg)
ICB-600509	17.875 in (45.403 cm)	11.045 in (28.054 cm)	2.375 in (6.033 cm)	35.0 lbs (15.9 kg)
ICB-600510	19.010 in (48.285 cm)	11.045 in (28.054 cm)	2.375 in (6.033 cm)	37.0 lbs (16.8 kg)
ICB-600511	19.473 in (49.461 cm)	11.020 in (27.991 cm)	2.375 in (6.033 cm)	38.0 lbs (17.2 kg)
ICB-600514	20.157 in (51.199 cm)	11.045 in (28.054 cm)	2.375 in (6.033 cm)	40.0 lbs (18.1 kg)
ICB-600524	20.157 in (51.199 cm)	11.045 in (28.054 cm)	2.375 in (6.033 cm)	40.0 lbs (18.1 kg)
ICB-601349	24.563 in (62.390 cm)	10.281 in (26.114 cm)	8.919 in (22.654 cm)	35.0 lbs (15.9 kg)
ICB-601946	9.119 in (23.162 cm)	6.211 in (15.776 cm)	2.600 in (6.604 cm)	6.0 lbs (2.7 kg)

Operating Temperature

86°F to 176°F
(30°C to 80°C)

Operating Pressure

Maximum operating ΔP is <90 psid (<6.2 bard) with normal ΔP <25 psid (<1.8 bard)

Materials of Construction

Shell	Endcaps	Handle	Seals
Stainless steel	Stainless steel	Stainless steel	Silicone[1]

Media Description[2]

A	C	J	T	V
A filter for phosphate ester, fire-resistant lubricants, sold under the brand names: Fyrquel®, Fyrquel® EHC, Fyrquel® EHC Plus, Fyrquel® GT, Reolube® TurboFluid 46XC, Reolube® TurboFluid B, Anvol® 46 XC, Shell Turbo® Fluid DR 46, Mobil Pyrotec® HFD 46, and many others	C filter for polyol ester fluids including QuintoLubric®	J filter for polyol ester lubricants used in aero derivative jet engines including Mobil Jet® II	T filter for mineral oil based hydraulic fluids	V filter for mineral oil based turbine and compressor lubricants

Applications

A	C	J	T	V
Acid + Varnish Scavenging (Acid Numbers <0.5 mg KOH/g)	Aggressive Acid + Varnish Scavenging (Acid Numbers >0.5 mg KOH/g)	Acid + Varnish Scavenging	Varnish Removal	Aggressive Varnish + Moderate Acid Scavenging

Filter Sizing Guidelines

Phosphate ester and EHC applications ideally require 3-4x reservoir exchange per day for normal fluid maintenance. Mineral Oil based turbine and compressor lubricants require 1x reservoir exchange per day for normal lubricant maintenance. For fluid or lubricant restoration higher flow rates may be required. Contact Hy-Pro for application guidelines, selection and sizing assistance.

[1] ICB-600508 utilizes Fluorocarbon gasket standard.
[2] Fyrquel is a registered trademark of ICL, Reolube is a registered trademark of Chemtura, Anvol is a registered trademark of Castrol. Shell Turbo is a trademark of Shell Oil Company. Mobil Pyrotec and Mobil Jet are trademarks of Exxon Mobil Corporation. Quintolubric is a registered trademark of Quaker Chemicals.

Water Contamination

Types, Removal & Prevention

Water is one of the most common and most damaging contaminants found in lube or hydraulic systems. Continuous or periodic high water levels result in damage such as: metal etching (corrosion), abrasive wear in hydraulic components, dielectric strength loss, fluid breakdown, additive precipitation and oil oxidation, reduction in lubricating properties, and many others.

The effects of moisture in your oil systems can drastically reduce on-stream plant availability. Bearing life and critical component life can also be greatly reduced by moisture levels above and within the saturation point. What makes matters worse, the degree of contamination and type of water contamination play a pivotal role in determining the best method for removal. The three types are listed below.

Free and dissolved water in hydraulic and lube systems leads to bearing fatigue, accelerated abrasive wear, corrosion of metal surfaces, increased electrical conductivity, viscosity variance, loss of lubricity, and fluid additive breakdown. Sources include condensation, reservoir leakage, worn actuator seals, heat exchanger leakage, new oil and more.

Dissolved Water

Dissolved water is the state at which individual water molecules (not visible to the naked eye) are dispersed throughout a fluid. Dissolved water accrues below the fluid's saturation point. Fluid with only dissolved water in it will have a bright, clear appearance.

Emulsified Water

Once the dissolved water's concentration has exceeded the saturation point of the fluid, microscopic water droplets will start to form an emulsion which is suspended within the fluid. Fluid samples containing emulsified water will have a cloudy, hazy appearance.

Free Water

Free water is formed once the emulsified water has reached a concentration at which it starts a separation phase and large water droplets begin to fall out of solution. Fluid samples containing free water will have a cloudy, hazy appearance. As the sample settles, the free water will fall out to form a separated layer on the bottom of the sample.

Water Contamination Solutions

VUD
Vac-U-Dry Vacuum Dehydrators

 Vacuum dehydration removes free, emulsified and dissolved water while maintaining low operating ISO Codes with high efficiency particulate filtration. With flow rates up to 100 gpm (379 lpm) and 24x7 unattended operation capabilities, the VUD is ideal for all hydraulic and lube oil fluids up to ISO VG 680.

V1
Compact VUD Vacuum Dehydrators

 Optimized for tight spaces with a salt water edition for marine applications, V1 removes free, emulsified and dissolved water while maintaining low operating ISO Codes with high efficiency particulate filtration. Ideal for all hydraulic and lube oils up to ISO VG 680.

COT
Turbine Oil Conditioning Systems

 A total conditioner for turbine and compressor lube oils, COT rapidly removes gross free and emulsified water by coalesce liquid-liquid separation technology. Ideal for managing steam turbine water ingression during start-up or continuous cooler/steam leaks. COT maintains low operating ISO Codes with high efficiency particulate filtration. Suitable only for R&O lube oils up to ISO VG 68.

FCLCOT
Turbine Oil Conditioning Filter Carts

 A compact, portable solution for boiler feed pump and compressor lube oils, FCLCOT rapidly removes gross free and emulsified water by coalesce liquid-liquid separation technology. Suitable only for R&O lube oils up to ISO VG 68. Maintains low operating ISO Codes with high efficiency particulate filtration.

TMR-N_2
Active Headspace Dehydrator + Nitrogen Generators

 A dedicated active headspace dehydrator and nitrogen generator for hydraulic reservoir and gearbox applications. TMR-N_2 maintains water between 200-500 ppm, prevents airborne water, particulate and metal ion ingression, and removes dissolved combustible gases.

TMR-Air
Active Headspace Dehydrators

 A dedicated active headspace dehydrator for hydraulic reservoir and gearbox applications. TMR-Air maintains water between 200-500 ppm, and prevents airborne water, particulate and metal ion ingression.

VUD

Vac-U-Dry Vacuum Dehydrators

The optimized balance between heat, vacuum, process design and an easy, user friendly operating system for removal of water and particulate from hydraulic and high viscosity lubricating oils. Equipped with generously sized, high efficiency filtration, the VUD is the ultimate oil purifier.

Keeping fluids clean and dry extends component and bearing life, increases productivity, minimizes downtime and extends useful fluid life. The VUD is ideal for removal of all forms of water, including free, emulsified and dissolved water and gas from hydraulic and lubricating oils.

HY-PRO

hyprofiltration.com/VUD

Contamination is complicated. Removing it is easy.

With features including viscosity specific dispersal element designs, fin tube low watt density heaters, oversized particulate filter, adjustable recirculation line, auto phase detection and reversal, programmable thermostat, proprietary vacuum chamber level control, foam sensor and auto-drain, VUD is the ultimate contamination removal system.

Results you can see.

Clear covers on the vacuum chamber and condensate collection tanks let you see what is really happening inside the VUD. You will know when you start removing water or when you are almost below saturation point with just a glance.

Never stops working.

VUD is a workhorse designed for 24/7 unattended operation. With a dual condensate collection tank design, auto water level sensors and automatic drain valves, there is no need to stop to drain water. The oversized condenser and dual condensate collection tanks work together to keep the water out of the vacuum pump.

Integrated intelligence.

The VUD smart relay enabled control panel makes start-up and shut-down safe and operator friendly so that everything is controlled with the simple push of a button. To take it even further, the optional PLC Touch Screen provides operating controls and data right at your fingertips.

Filtration starts with the filter(s).

Particulate media options down to $\beta 2.5_{[C]} \geq 1000$ and viscosity specific dispersal elements provide you with the best filtration and water removal capabilities in the world, period.

Completely, entirely, totally, all inclusive.

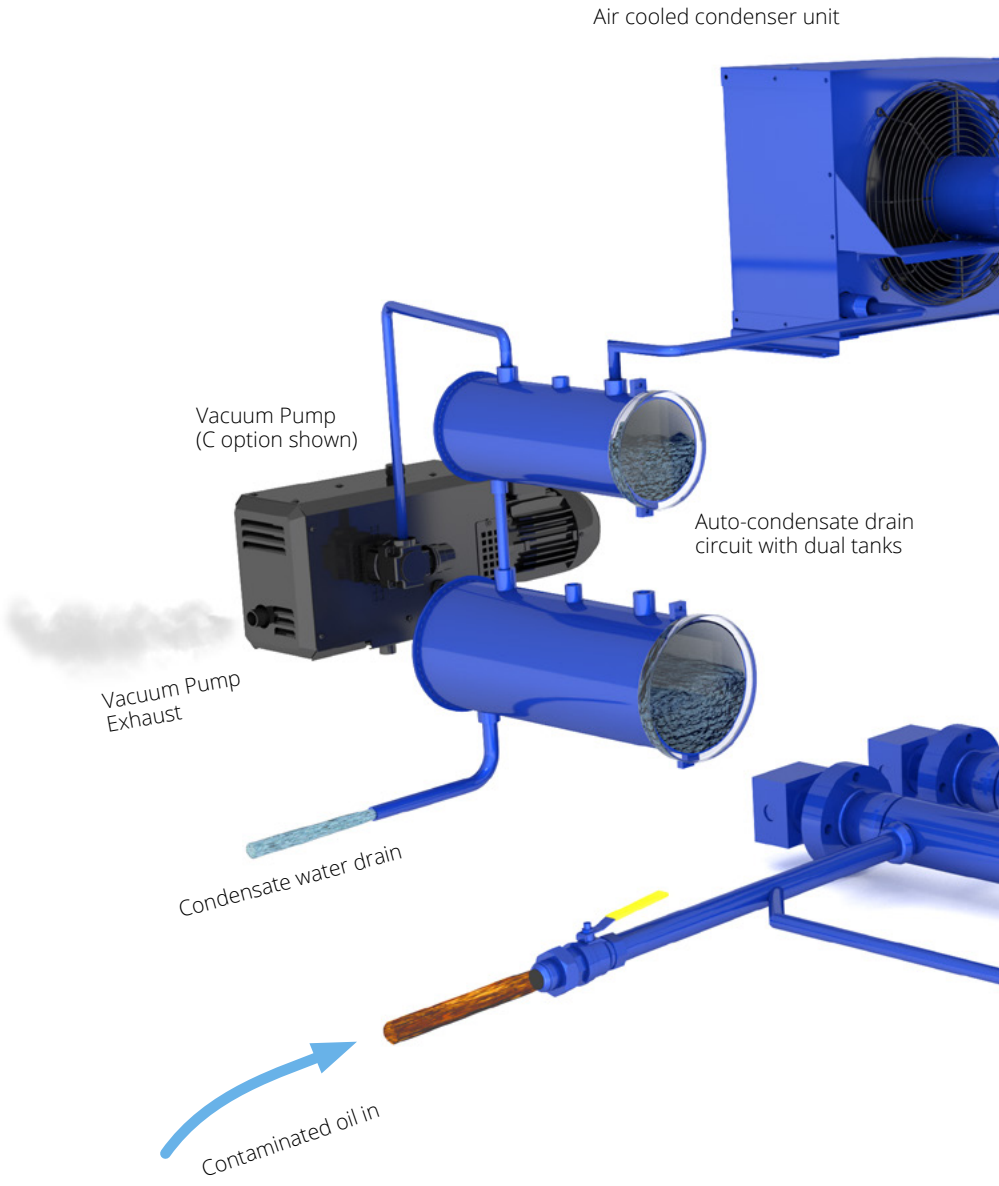
When it comes to comprehensive filtration and water removal, the buck stops here. VUD customization takes on many forms such as unique size requirements, combining VUD with other technologies such as FRF acid or turbine lube oil varnish removal, ATEX electrical standards, all to deliver the perfect oil purification system to meet your exact needs.

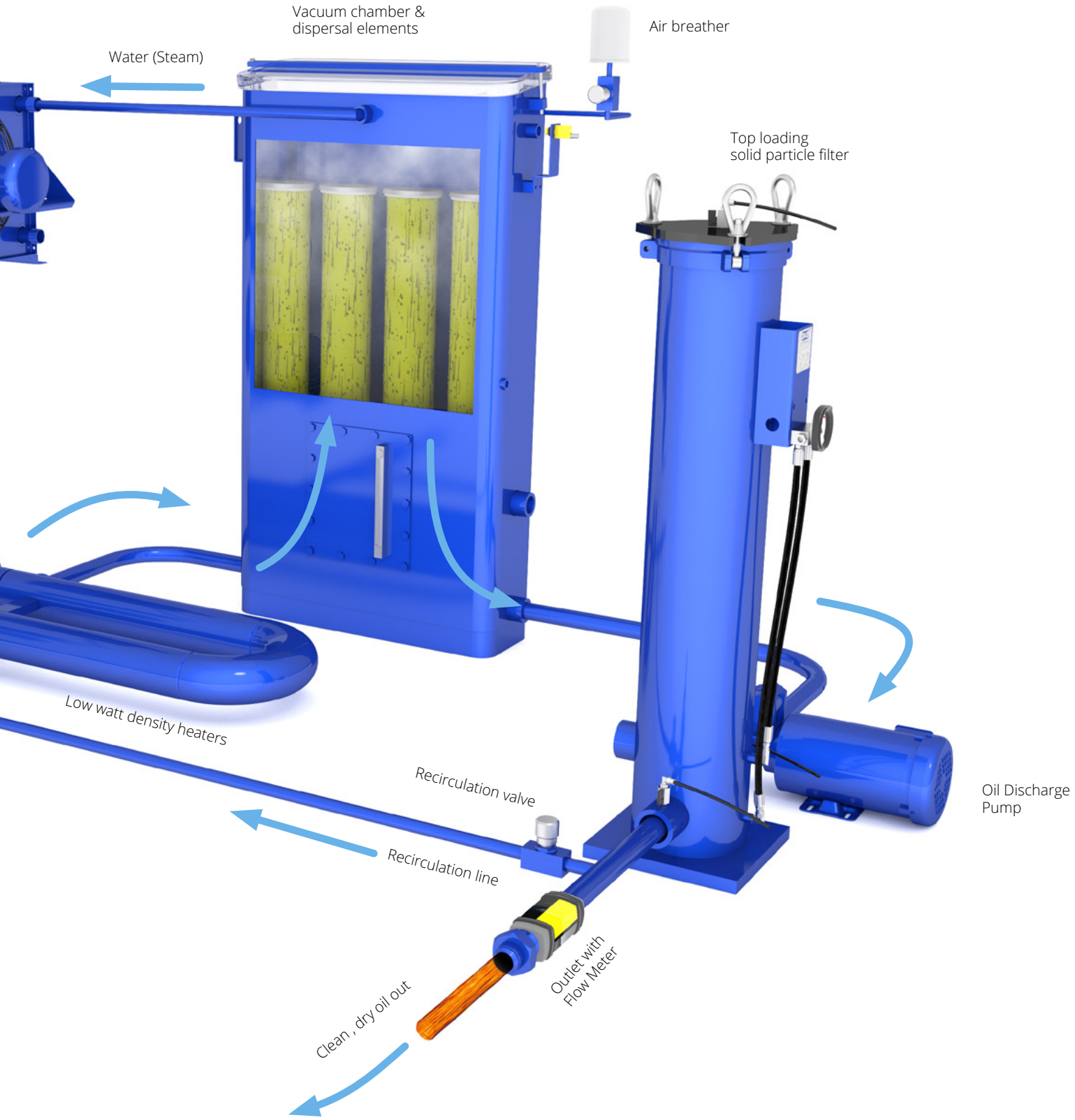
The Unmatched Purification Process

How it works

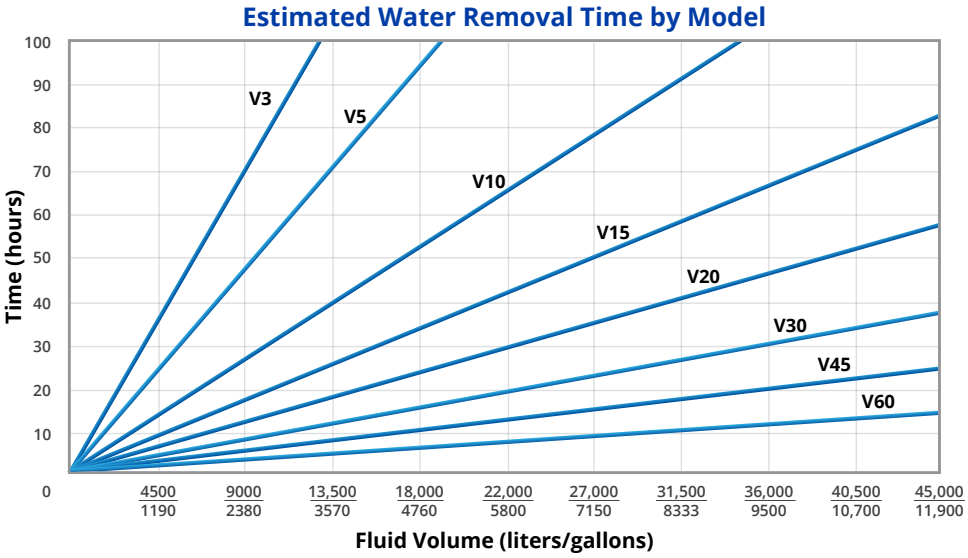
Contaminated oil is drawn into the Vac-U-Dry purifier by a high output vacuum pump. The oil passes through the low watt density heater where heated to optimum temperature for the dehydration process (150°F, 66°C). The oil enters the vacuum chamber passing through specially designed dispersal elements which create a thin film of oil that is exposed to the vacuum. The water is vaporized and then drawn into the condenser where it liquefies and drains into the condensate tank.

The dehydrated oil flows to the bottom of the vacuum chamber and is removed by the discharge pump where it is pumped through the high efficiency particulate filter assembly ($\beta x_{[c]}$ >1000) and returned to the system. The recirculating line helps the Vac-U-Dry reach optimum temperature in cold start situations and can be used to throttle machine inlet and outlet flow. From here, your oil can either be recirculated for additional temperature and contamination control or returned to your reservoir or equipment where it will operate more efficiently than ever.




Vacuum chamber &
dispersal elements
Air breather
Water (Steam)
Top loading
solid particle filter
Low watt density heaters
Recirculation valve
Oil Discharge
Pump
Recirculation line
Outlet with
Flow Meter
Clean , dry oil out

The Proven Performer



No other technology removes water faster or more safely with less chance of foaming than the Hy-Pro VUD. The graph here represents the estimated time required per model to remove water from 5000 ppm (0.5%) down to 150 ppm (0.015%) for increasing reservoir sizes.

Vacuum Pump Options

VUDs come standard with several vacuum pump options to best suit your application needs. Options C and D offer maximum portability to use your VUD in almost any location. Whether you're using your VUD to service multiple systems or for service work, you'll have unmatched filtration everywhere you need it.

C – Dry Seal (Dry Rotary Claw)

Long maintenance interval (10,000 hour synchronizing gear oil change) and great for portability. With excellent corrosion resistance to condensate exposure, this offers our lowest cost of ownership vacuum pump option.

D – Dry Seal (Lubricated Rotary Vane)

500-750 hour maintenance interval (lubricating oil and filter change), excellent for portability, compact size and low weight. The D option vacuum pump offers our lowest initial cost of ownership.

L – Liquid Ring

Ideal for dedicated VUD applications where ambient conditions are hot and humid and portability is not required. Minimum 3 gpm (11 lpm) external process water is required. Maintenance includes maintaining clean process water and balancing compound pressure gauge.

Vacuum power that doesn't suck.

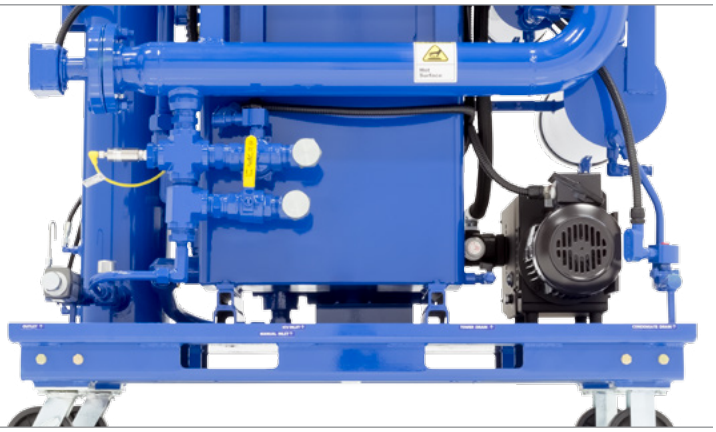
Pulled by the vacuum pump, oil passes through the heater housing and vacuum chamber dispersal elements, providing smooth flow for optimum water removal without foam. The tall vertical vacuum chamber achieves maximum oil film surface area on the dispersal elements, aided by proprietary variable flow level control, to remove water from your oil incredibly fast with unmatched consistency.

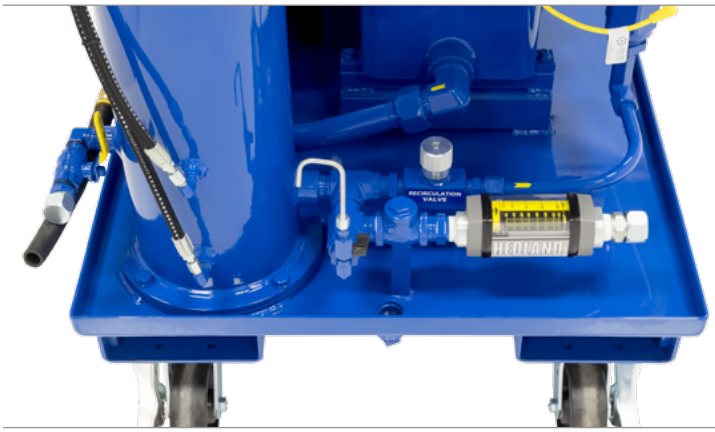
Dispersal elements.

Inside every VUD's vacuum chamber is the secret to its high efficiency water removal success. Viscosity range specific dispersal elements configured properly means faster water removal without the foaming issues that come with a one size fits all dispersal media for hydraulic and lube oils.

Take control of your system, automatically.

The Inlet Control Valve (N/C Solenoid) automatically closes when the VUD is not in operation, preventing the unit from siphoning fluid from a reservoir or flooding from a positive head inlet situation.



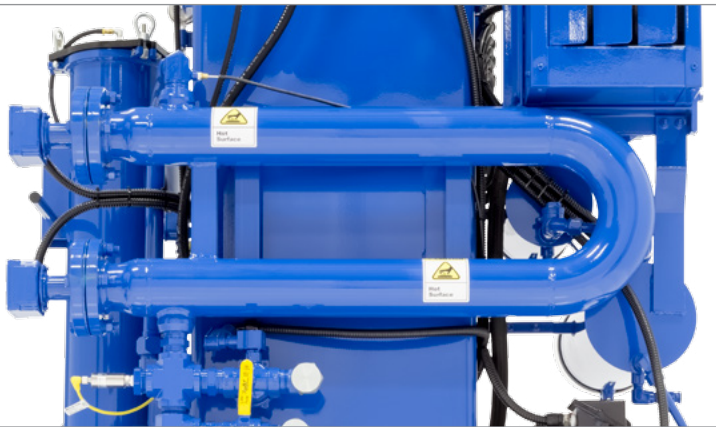


Synced to your system.

Achieve optimum VUD process temperature faster and ease start-up on high viscosity oils, especially when they're cold. Also ideal for adjusting overall VUD return flow down when using VUD on a small reservoir or gearbox. Simple and effective, the recirculation line adds incredible flexibility to fine tune the VUD to your system.

You can't beat the heat.

With no direct contact with the heating element, your turbine oil will safely and quickly get up to temperature without the risk of burning. The programmable temperature control with integral no-flow switch prevents oil damage and allows you to heat your fluids at your own pace. And what's more: all this comes standard on every VUD.



VUD Specifications

Model	V3D	V5C	V10C	V15C	V20C	V30C	V45C	V60C	V100C
Height[1]	60″ (152 cm)	75″ (191 cm)	75″ (191 cm)	75″ (191 cm)	75″ (191 cm)	89″ (226 cm)	75″ (191 cm)	89″ (226 cm)	89″ (226 cm)
Length[1]	48″ (122 cm)	56″ (142 cm)	56″ (142 cm)	56″ (142 cm)	72″ (183 cm)	84″ (213 cm)	84″ (213 cm)	96″ (244 cm)	120″ (305 cm)
Width[1]	32″ (82 cm)	32″ (82 cm)	32″ (82 cm)	32″ (82 cm)	36″ (91 cm)	40″ (102 cm)	48″ (122 cm)	60″ (153 cm)	96″ (244 cm)
Weight[1]	850 lbs (386 kg)	2000 lbs (908 kg)	2400 lbs (1089 kg)	2500 lbs (1134 kg)	2800 lbs (1270 kg)	3100 lbs (1406 kg)	3400 lbs (1542 kg)	3700 lbs (1678 kg)	4600 lbs (2087 kg)
Dispersal Element Quantity	2 x 11″ (28 cm)	2 x 22″ (56 cm)	3 x 22″ (56 cm)	3 x 22″ (56 cm)	4 x 22″ (56 cm)	4 x 36″ (91 cm)	8 x 22″ (56 cm)	8 x 36″ (91 cm)	16 x 36″ (91 cm)

Operating Temperature

Fluid Temperature
30°F to 180°F
(0°C to 82°C)

Ambient Temperature
-4°F to 104°F
(-20C to 40C)

Materials of Construction

Frame
Painted steel & 304 stainless

Filter assembly
Carbon steel

Condensate tanks
Stainless steel

Element bypass valve
Nylon

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 $\beta x_{[C]} \geq 2$ ($\beta x \geq 2$)

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

VUD Part Number Builder

VUD [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] - [ ] - [ ]

Flow Rate | Vacuum Pump | Power Options | Dispersal Element | Media | Seals | Heaters | Condenser | Special Options | Multi Function Unit

Flow Rate[1]

3	3 gpm (11 lpm)
5	5 gpm (18.9 lpm)
10	10 gpm (37.9 lpm)
15	15 gpm (56.8 lpm)
20	20 gpm (75.7 lpm)
30	30 gpm (114 lpm)
45	45 gpm (170 lpm)
60	60 gpm (225 lpm)
100	100 gpm (379 lpm)

Vacuum Pump Type

C	Dry seal (rotary claw)
D	Dry seal (lubricated rotary vane)
L	Liquid ring (external water supply required)

Power Options

60 Hz		50 Hz	
23	208-230 V ac, 3P	**38**	380 V ac, 3P
46	460-480 V ac, 3P	**41**	415 V ac, 3P
57	575 V ac, 3P	**52**	525 V ac, 3P

Dispersal Element

D	Pleated dispersal element - all synthetic media (viscosity ≤ ISO VG 220)
P	Metallic packed dispersal element - not for use in phosphate ester systems (viscosity ≥ ISO VG 460)
W	Pleated stainless steel dispersal element (ISO VG 150-320)

Media Selection

G8 Dualglass		Stainless wire mesh	
1M	$\beta 2.5_{[C]} \geq 1000$, $\beta 1 \geq 200$	**25W**	25µ nominal
3M	$\beta 5_{[C]} \geq 1000$, $\beta 3 \geq 200$	**40W**	40µ nominal
6M	$\beta 7_{[C]} \geq 1000$, $\beta 6 \geq 200$	**74W**	74µ nominal
10M	$\beta 12_{[C]} \geq 1000$, $\beta 12 \geq 200$	**149W**	149µ nominal
16M	$\beta 17_{[C]} \geq 1000$, $\beta 17 \geq 200$		
25M	$\beta 22_{[C]} \geq 1000$, $\beta 25 \geq 200$		

Seals

V	Fluorocarbon
E[2]	EPR seals (for Skydrol use)

Heaters

9	9 kW	**48**	48 kW (4 x 12 kW)
12	12 kW	**64**	64 kW (4 x 16 kW)
24	24 kW (2 x 12 kW)	**80**	80 kW (5 x 16 kW)
36	36 kW (3 x 12 kW)	**96**	96 kW (6 x 16 kW)

Condenser

A	Air cooled
B	Air & liquid cooled
L	Liquid cooled

Special Options

8	8" solid wheel upgrade	**P**	PLC touch screen operation & data
A[3]	Auto condensate drain	**Q**[4,5]	Maintenance spares & repair kit
B	Pre-filter bag filter housing	**P9**[6]	Phosphate ester fluid compatibility modification
C	CE marked + international crating (V5-V60)	**R**[3]	Electrical phase reversal switch
D	Dirty filter indicator alarm light	**S**	Inlet line basket strainer
E	Carbon vacuum pump exhaust filter	**S9**[7]	Skydrol fluid compatibility modification
F	Vacuum chamber foaming sensor	**T**[4]	Hose kit (suction & return hoses + wands)
G	316 stainless condensate wet parts (304 standard)	**U**	50' (15 m) electrical cord without plug
H	Manual reset hour meter (in addition to std. non-reset)	**V**[4]	Inlet control valve (for positive head inlet)
J	Individual heater selector switches	**W**	Water sensor and indicator
K	Sight flow indicator (wheel type)	**X**[8]	Explosion proof - Class 1, Div 2 Group C+D
L	Lifting eye kit	**Y**	VFD variable speed motor frequency control
M	Discharge line flow meter	**Z**	On site start-up training (1 x 10 hour shift)
O	On-board PM-1 particle monitor		

Multi Function Units

omit	Standard VUD capabilities
COT	COT coalesce vessel adder + auto water drain function (sized to handle 100% of VUD flow)
ICBPE[9]	Phosphate ester acid & dissolved metal removal (contact factory for alternate fluids)
SVR1200CT[9]	Varnish removal & prevention side loop (5 gpm continuous element flow up to 8000 gal/30,000 liter reservoir)

[1]Nominal flow rates at 60 Hz motor speeds.
[2]Contact factory for other fluid option compatibility.
[3]Standard supplied options, must be included in part number.
[4]Recommended option.
[5]Repair & spares kit includes common consumable and select critical spares such as flow switches, fuses, and tank lids.
[6]When selected, must be paired with Seal option "V." Contact factory for more information or assistance in fluid compatibility.
[7]When selected, must be paired with Seal option "E." Contact factory for more information or assistance in fluid compatibility.
[8]Consult factory for other explosion proof options.
[9]Varnish and ICB add-on technologies condition a portion of maximum VUD flow. Standard SVR1200CT flow rate ≤ 5 gpm. ICB add-on will be sized to reservoir volume.

HY-PRO

V1

Compact VUD Vacuum Dehydrator

A compact and mobile dehydration and high efficiency filtration solution, the V1 prevent acidity and loss of lubrication properties caused by inefficient dehydration and high ingression.

Ideal for rapidly removing all forms of water including free, emulsified, and dissolved water and gas from hydraulic and lube oils.

HY-PRO

hyprofiltration.com/V1

V1P model shown

V1S model shown

Different by design.

The V1S is optimized for low headspace clearance for use in marine applications and with the S special option, V1S can remove the water without leaving salt behind to cause problems in thruster, steering and propulsion systems.

Size matters.

With small size comes great power. Utilizing single phase power supplies, V1 models provide the same unmatched water and particulate removal as larger VUDs on a smaller scale with the added benefit of incredible mobility. And with the ability to use single phase connections for power, you'll have clean, dry fluids anywhere and everywhere you need them.

Results you can see.

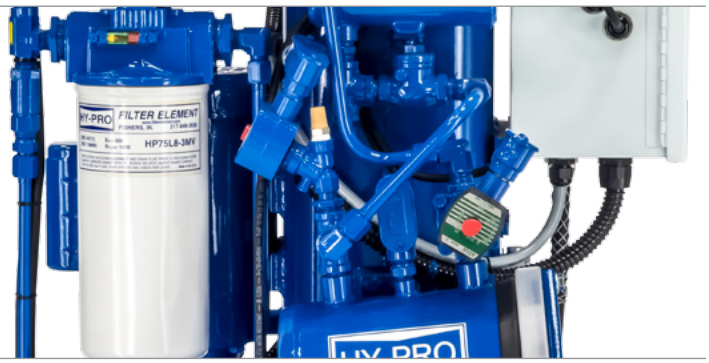
Clear covers on the vacuum chamber and condensate collection tank let you see as the V1 removes the water from your oil and collects it in the condensate tank. From there, you can say goodbye as it's drained and removed from your system, for good.

Integrated intelligence.

The V1 smart relay enabled control panel makes start-up and shut-down operator friendly and safe so that when you press the start button the automatic scripted sequence controls what comes on and when, meaning you don't need three hands to get it going.

Never stops working.

V1 is a workhorse designed for 24/7 unattended operation. With a dual condensate collection tank design, auto water level sensors and automatic acting drain valves, there is no need to stop to drain water.



Completely, entirely, totally, all inclusive.

When it comes to comprehensive filtration and water removal, the buck stops here. V1 customization takes on many forms such as unique size requirements, combining V1 with other technologies (i.e. FRF acid or turbine lube oil varnish removal), or other customer specific needs.

V1 Specifications

Model	V1P	V1S
Height[1]	50" (127 cm)	45" (114 cm)
Width[1]	28" (71 cm)	34" (86 cm)
Depth[1]	28" (71 cm)	24" (61 cm)
Weight[1]	400 lbs (181 kg)	400 lbs (181 kg)
Inlet	¾" male JIC	¾" male JIC
Outlet	½" male JIC	½" male JIC
Electric Motor	TEFC with overload protection	
Pump	Cast iron, positive displacement gear pump with internal relief.	
Vacuum Pump	Dry Rotary Vane	
Operating Temperature	**Fluid Temperature** 32°F to 180°F (0°C to 82°C)	**Ambient Temperature** -4°F to 104°F (-20C to 40C)
Materials of Construction	**Frame** Carbon steel or stainless steel	**Filter assembly** Aluminum and carbon steel
Electric Connection	50' (15 m) power cord supplied with machine.	
Media Description	**M** G8 Dualglass, our latest generation of DFE rated, high performance glass media for all hydraulic & lubrication fluids. $\beta x_{[C]} \geq 1000$ ($\beta x \geq 200$)	**W** Stainless steel wire mesh media $\beta x_{[C]} \geq 2$ ($\beta x \geq 2$)
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 or skydrol fluid compatibility select fluid compatibility from special options.	

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

V1 Part Number Builder

V1 [ ] [ ] [ ] [ ] [ ] [ ] A- [ ]

Model Type | Power Option | Dispersal Element | Media | Seal | Heater | Special Options

Model

P	Hand truck style design for maximum mobility
S	Low profile design optimized for marine low headspace applications

Power Options

60 Hz

12	120 V ac, 1P
23	230 V ac, 1P

50 Hz

22	220 V ac, 1P

Disperser Element

D	Pleated disperser element - all synthetic media (viscosity ≤ ISO VG 220)
P	Metallic packed disperser element (viscosity ≥ ISO VG 460)[1]
W	Pleated stainless steel disperser element (ISO VG 150-320)

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	$\beta 22_{[C]} \geq 1000$, $\beta 25 \geq 200$

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

Heater[1]

1	1 kW (power option 12 only)
2	2.5 kW (power options 22 & 23 only)
4	4.5 kW (power options 22 & 23 only)

Special Options

A	Auto-condensate drain
C	CE marked for machinery safety directive 2006/42/EC
P9[2]	Phosphate ester fluid compatibility modification
S[3]	Stainless components for salt water removal
S9[4]	Skydrol fluid compatibility modification
T	Hose kit (suction & return hoses + wands)
V[5]	Inlet control valve (for positive head inlet)

[1] Heater is dependent on power option
[2] When selected, must be paired with Seal option "V." Contact factory for more information or assistance in fluid compatibility.
[3] Only available on V1S model.
[4] When selected, must be paired with Seal option "E-WS." Contact factory for more information or assistance in fluid compatibility.
[5] Recommended option.

COT

Turbine Oil Conditioning Skids

Remove harmful particulate and water contamination and achieve target ISO Codes faster with the COT.

Ideal for preventing unplanned downtime and premature component failures in turbine lube systems.

HY-PRO

hyprofiltration.com/COT

Size matters.

COT optimizes coalesce and separator flow density to rapidly remove gross free water ingress during steam turbine start-up or in the event of a seal leak. High single pass water removal efficiency that keeps up with ingression so your bearings don't see free or emulsified water.

Filtration starts with the filter(s).

COT combines high efficiency single pass particulate and water removal to ensure that your turbine oil is always in spec, eliminating premature component failures and downtime. With particulate media options down to $\beta 2.5_{[C]} > 1000$ and 100% synthetic coalesce/separator elements that remove all free and emulsified water down to saturation point, your turbines will be protected and running more efficiently than ever.

Setting the new standard.

Sampling and preventative maintenance are no longer optional, they're a necessity. That's why every COT comes standard with properly positioned sample ports to arm you with access to consistently accurate system conditions and letting you know exactly how well your filtration is performing.

Take control of your systems.

Smart relay and auto water drain make COT a 24/7 unattended, easy-to-operate solution that functions as an in-line contamination barrier for every drop of turbine oil that goes into your turbines. Optional PLC touchscreen enables custom programming so your COT can purify reservoirs on your schedule and even data log ISO Codes and water removal rates so you know your lube is clean and reliable when you're on and off the clock.

You can't beat the heat.

With no direct contact with the heating element, your turbine oil will safely and quickly get up to temperature without the risk of burning. The programmable temperature control with integral no-flow switch prevents oil damage and allows you to heat your fluids at your own pace. And what's more: all this comes standard on every COT.

Built to exceed your expectations.

Flexible dimension and process arrangement are available with every COT so you get the perfect contamination solution for your turbine lubrication system. Even choose from explosion proof models and color coordinate to fit perfectly with your existing safety standards for the ultimate system in turbine oil conditioning.

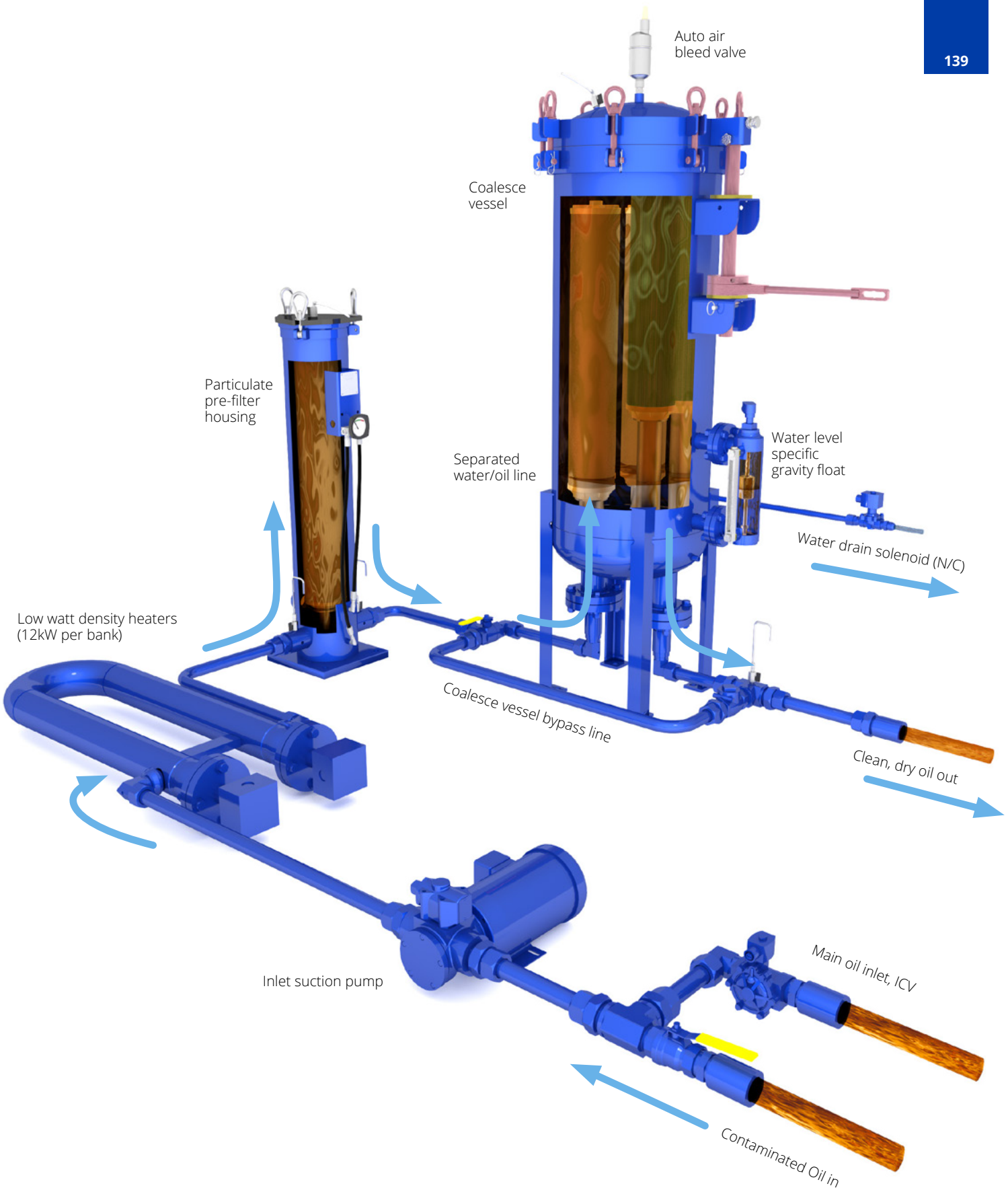
The COT Process

How it works

Oil from the system entering the COT through a positive displacement gear pump passes through low watt density heat to achieve the optimum turbine oil temperature for efficient liquid-liquid separation by coalesce, >100°F (38°C).

The first stage of oil conditioning is particulate removal by $\beta 5_{[c]}$>1000 high efficiency glass media element. Next, the oil enters the two stage coalesce vessel where the oil passes through 100% synthetic media coalesce elements. The free and emulsified water coalesces to form larger droplets that overcome the specific gravity of the oil and drop to the bottom of the vessel. Stage two in the coalesce vessel is the separator/post-filter element that functions as a water barrier for emulsified and small droplets of water that have not reached a size large enough to drop of suspension. After passing through the water barrier, the oil passes through a final stage of particulate removal filtration by $\beta 2.5_{[c]}$>1000 media to achieve even lower operating ISO Codes.

The coalesce vessel will achieve single pass water removal from 5000 ppm to <150 ppm under normal operating conditions and oil health. As water collects in the bottom of the coalesce vessel, a specific gravity float reaches a limit indicator that will open the automatic water drain valve and eject the separated water as it is removed to allow for 24/7 continuous operation. When fitted with a totalizing meter on the water drain line, quantity and timing for water removal can be established.


Auto air
bleed valve
Coalesce
vessel
Particulate
pre-filter
housing
Separated
water/oil line
Water level
specific
gravity float
Water drain solenoid (N/C)
Low watt density heaters
(12kW per bank)
Coalesce vessel bypass line
Clean, dry oil out
Inlet suction pump
Main oil inlet, ICV
Contaminated Oil in

COT Specifications

Model	COT5	COT10	COT30	COT60	COT100
Max Reservoir Size	800 gallons (3000 liters)	1600 gallons (6000 liters)	4000 gallons (15100 liters)	8000 gallons (30300 liters)	13250 gallons (50200 liters)
Height[1]	65″ (165 cm)	83″ (211 cm)	88″ (224 cm)	88″ (224 cm)	100″ (254 cm)
Length[1]	56″ (142 cm)	60″ (153 cm)	84″ (213 cm)	84″ (213 cm)	96″ (244 cm)
Width[1]	32″ (81 cm)	40″ (102 cm)	40″ (102 cm)	60″ (153 cm)	60″ (153 cm)
Weight[1]	1400 lbs (635 kg)	2000 lbs (907 kg)	2700 lbs (1225 kg)	3400 lbs (1542 kg)	4400 lbs (1996 kg)
Inlet[2]	1″ (2.5 cm)	1.5″ (4 cm)	2″ (5 cm)	3″ (7.5 cm)	3″ (7.5 cm)
Outlet[2]	1″ (2.5 cm)	1″ (2.5 cm)	1.5″ (4 cm)	2″ (5 cm)	3″ (7.5 cm)
Motor Size	1 hp	1.5 hp	5 hp	7.5 hp	10 hp
Pre-Filter Elements	1	1	1	2	3
Coalesce Elements	1 x HP538L38-CS3MV[3]	2 x HP731L39-CV	5 x HP731L39-CV	8 x HP731L39-CV	10 x HP731L39-CV
Separator/ Polish Elements	(combination element)	1 x HP582L30-S1MV	3 x HP582L30-S1MV	5 x HP582L30-S1MV	9 x HP582L30-S1MV
Seals	Fluorocarbon				
Operating Temperature	**Fluid Temperature** 32°F to 200°F (0°C to 93°C)		**Ambient Temperature** 40°F to 104°F (4°C to 40°C)		
Materials of Construction	**Housings** Carbon steel with industrial coating		**Frame** Carbon steel with industrial coating		
Media Description	**M** G8 Dualglass, our latest generation of DFE rated, high performance glass media for all hydraulic & lubrication fluids. $\beta x_{[C]} \geq 1000$ ($\beta x \geq 200$)		**Coalesce/Separator** Coalesce: 100% synthetic fiber media Separator: TEFLON® coated screen (water barrier)		
Fluid Compatibility	Mineral based turbine oil, call factory for synthetic. Cannot be used with AW hydraulic oils or phosphate esters. For water removal in AW hydraulic oils and phosphate esters, see VUD (page 136).				

[1]Dimensions are approximations taken from base model and will vary according to options chosen.
[2]Female pipe port.
[3]HP538L38CS-3MV element combines coalesce and separator element functions into a single element.
TEFLON® is a registered trademark of DuPont.

COT Part Number Builder

COT [ ] [ ] - [ ] [ ] - [ ]

Flow Rate | Power Options | Heat Capacity | Seal | Special Options

Flow Rate[1]

5	5 gpm (18.9 lpm)
10	10 gpm (37.9 lpm)
30	30 gpm (114 lpm)
60	60 gpm (225 lpm)
100	100 gpm (379 lpm)

Power Options

60 Hz, 1750 RPM

23[2]	230 V ac, 3P
46	460 V ac, 3P
57	575 V ac, 3P

50 Hz, 1450 RPM

38	380 V ac, 3P
41	415 V ac, 3P
52	525 V ac, 3P

Heat Capacity

12	12 kW
24	24 kW
36[3]	36 kW
48[3]	48 kW
64[3]	64 kW
72[3]	72 kW
84[3]	84 kW
X	No heaters

Seal

V	Fluorocarbon

Special Options

8	8” (20 cm) solid wheel upgrade
A[4]	Auto water drain (manual drain included)
B	Adjustable coalesce vessel bypass loop
C	CE marked for machinery safety directive 2006/42/EC
H	Manual reset hour meter
J[3]	Individual heater selector switches for limited amp circuits
K	Sight flow indicator
L	Lifting eye kit
M	Water discharge totalizing meter
O	On-board PM-1 particle monitor & clean oil indicator light
P	PLC touch screen control (does not include VFD)
Q[4,5]	Maintenance spares & repair kit
S	Oil sensing safety shut-off in water discharge line
T[4]	10’ (3 m) hose kit + wands (JIC female connections)
U	50’ (15 m) electrical cord (no plug supplied)
V	Inlet control valve (for positive head application)
X	Explosion proof - Class 1, Div 2, Group C+D. Consult factory for other explosion proof options.
Y	VFD variable speed motor frequency control
Z[4]	On-site startup training (1 x 10 hour shift)

[1]Nominal flow rates at 60 Hz motor speeds.
[2]Only available with COT5.
[3]Possible high full amp load (consider special option J).
[4]Recommended option.
[5]Q option repair & spares kit includes several items such as fuses, common rely, panel bulb, and replacement element set for coalesce chamber & particulate housing.

FCLCOT

Turbine Oil Conditioning Filter Cart

A mobile solution that maintains turbine lube oil by removing water and particulate contamination that can cause corrosion, fluid breakdown, abrasive wear on components, additive precipitation, reduced lubricity, and dielectric strength loss.

Ideal for turbine lube oil, boiler feed pumps, compressors and others R&O applications.

HY-PRO

hyprofiltration.com/FCLCOT

Filtration starts with the filter(s).

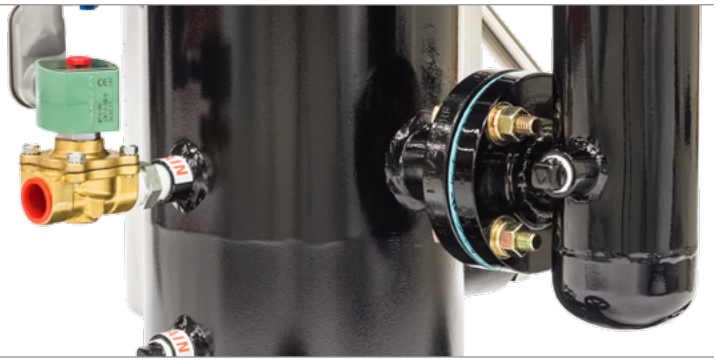
FCLCOT combines high efficiency single pass particulate and water removal to ensure that your turbine oil is always in spec, eliminating premature component failures and downtime. With particulate media options down to $\beta 2.5_{[C]} > 1000$ and 100% synthetic coalesce/separator elements that remove all free and emulsified water down to 50 ppm, your turbines will be protected and running more efficiently than ever.

Cleaner fluids: greater efficiency.

Water and particulate contamination in turbine oils can lead to decreased output efficiency, metal etching, fluid breakdown, and abrasive wear in hydraulic components among many other costly issues. With a single pass through the FCLCOT, you'll not only remove harmful contaminants but increase your uptime and promote the best environment for your turbine to operate efficiently.

Never stops working.

Designed for 24/7 unattended operation, FCLCOTs with auto water drain technologies provide you with the safety and security to know your turbine oil is clean and dry even when you're off the clock.



Unmatched on the move.

Non-shredding, never flat wheels and easy to maneuver cart design with ergonomic handle mean you get powerful filtration exactly when and where you need it.

Setting the new standard.

Sampling and preventative maintenance are no longer optional, they're a necessity. That's why every FCLCOT comes standard with properly positioned sample ports to arm you with access to consistently accurate system conditions and letting you know exactly how well your filtration is performing.

Completely customizable.

Whether you need the heavy duty off-road tires for greater mobility or add one of several inlet strainer options, each and every FCLCOT can be built specifically to suit your needs. And with options for both convenience and tailoring for specific applications, you'll be sure to get the perfect solution for all your contamination problems.

FCLCOT Specifications

Dimensions[1]	**Height** 62" (158 cm)	**Width** 30.5" (77 cm)	**Depth** 29" (74 cm)	**Weight** 379 lbs (172 kg)
Connections	**Inlet** 1" male JIC	**Outlet** 1" male JIC	**Hoses** 1" x 10 ft (2.4 m)	
Element Configuration	**Particulate filter** HP75L8-3MV	**Coalesce/Separator Filter** HP538L38-CS3MV		
Seals	Fluorocarbon			
Operating Temperature	**Fluid Temperature** 80°F to 250°F (27°C to 121°C)	**Ambient Temperature** 40°F to 104°F (4°C to 40°C)		
Materials of Construction	**Housings** Carbon steel with industrial coating	**Hoses** Reinforced synthetic	**Wands** Stainless steel	
Electric Motor	TEFC, 56-145 frame 0.5 hp, 1450-1750 RPM			
Motor Starter	MSP (motor starter/protector) in an IP65, aluminum enclosure with short circuit and overload protection.			
Electric Connection	Voltages 230 V ac and under, single phase: 35' (11 m) retractable cord reel included. Power Option 12 includes NEMA 5-15 plug. Voltages over 230 V ac: 35' (11 m) power cord included.			
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)			
Pneumatic Option Air Consumption	~40 cfm @ 80 psi[2] 35' (11 m) retractable air hose included when pneumatic option selected. Replaces 35' (11m) electric cord reel.			
Media Description	**M** G8 Dualglass, our latest generation of DFE rated, high performance glass media for all hydraulic & lubrication fluids. $\beta x_{[c]} \geq 1000$ ($\beta x \geq 200$)	**Coalesce/Separator** Coalesce: 100% synthetic fiber media Separator: TEFLON® coated screen (water barrier)		
Fluid Compatibility	Mineral based turbine oil, call factory for synthetic. Cannot be used with AW hydraulic oils or phosphate esters. For water removal in AW hydraulic oils and phosphate esters, see VUD (page 124).			
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 Power Option X selected, no electrical cord or cord reel will be included.			

[1]Dimensions are approximations taken from base model and will vary according to options chosen.
[2]Air consumption values are estimated maximums and will vary with regulator setting.
TEFLON® is a registered trademark of DuPont.

FCLCOT Part Number Builder

FCLCOT [ ] [ ] [ ] [ ] - [ ]

Flow Rate | Indicator | Power Options | Hose Connection | Special Options

Flow Rate[1]

05	0.5 gpm (1.7 lpm)
1	1 gpm (3.7 lpm)
2	2 gpm (7.5 lpm)

ΔP Indicator[2]

D	22 psid visual gauge + electric switch
E	22 psid visual gauge

Power Options

Contact factory for options not listed

60 Hz, 1750 RPM

12	120 V ac, 1P
22	208-230 V ac, 1P
23	208-230 V ac, 3P
46	460-480 V ac, 3P
57	575 V ac, 3P

50 Hz, 1450 RPM

11	110 V ac, 1P
21	220 V ac, 1P
40	380-440 V ac, 3P
52	525 V ac, 3P

Pneumatic

00	Pneumatically driven air motor & PD pump. FRL & flow meter included.

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.

Hose Connection

G	Female BSPP swivel hose ends, no wands
S	Female JIC swivel hose ends, no wands
W	Female JIC swivel hose ends, with wands

Special Options

A1	Electrically powered automatic water drain
B	Complete filter bypass line
C	CE marked for machinery safety directive 2006/42/EC
D	High filter ΔP auto shutdown
E	100 mesh cast iron basket strainer
F	Filter element ΔP gauge with tattle tale follower needle
G	Spill retention pan with fork guides (industrial coated steel)
H1	10 ft (3 m) return line hose extension
H2	20 ft (6 m) return line hose extension
J	Add pressure gauge between pump & filter assembly
K	HP75L8-149W Spin-On suction strainer
L	High filter element ΔP indicator light
M	Total system flow meter (120 cSt max)
N	PM-1 ready (plumbing only)
O[3]	On-board PM-1 particle monitor & clean oil indicator light
R	Spill retention pan with wheels (industrial coated steel)
S[4]	All wetted components 304 or higher stainless steel
T	Foam filled off-road tires for rugged environment
U	CUL and/or CSA marked starter enclosure for Canada
W	Automatic air bleed valve
Z	On site start-up training

[1]Nominal flow rates at 60 Hz motor speeds.
[2]Particulate filter only. Coalesce housing is equipped with sliding differential indicator.
[3]PM-1 will not function properly in the presence of free or emulsified water at or above saturation point. If selected, PM-1 is installed downstream of the filtration.
[4]With exception to cast iron gear pump.