HARLEX

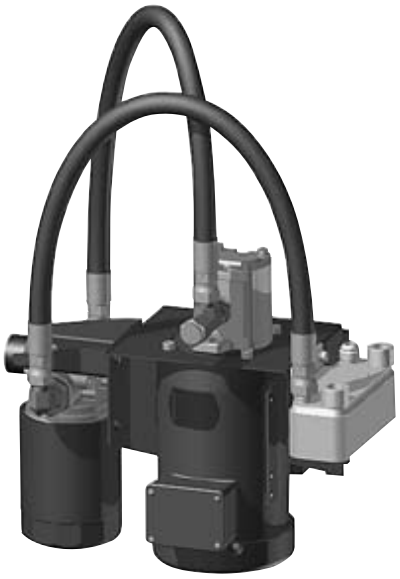
Filter/Cooler Module

Model MFC3, MFN3, MNC3

4–19 Horsepower Removal
Pump Flows 3–13 GPM Motor
Speed 1500/1800 RPM

Advantages:

- Standard units available from stock
- Off line does not interrupt production
- Versatile / Simple Modular design concept
- Space saving vertical designs
- Durable common base construction
- Multiple mounting and configurations
- Multiple pump, and filter element selections
- Dual frequency motor windings standard
- Stainless Steel, plate style heat exchangers
- Single supply source
- Extensive international distribution and service



Pre-assembled Filter/Cooling Modules

The MFC3 is a compact off-line filtration/ cooling package, which provides numerous mounting and configuration options. The design allows for multiple selections of AC motors, pumps, filter elements, and auxiliary components. The modular design concept permits field upgrades concerning oil flow, filtration, or configuration with minimal labor and cost.

Mounting /Configuration Options

The symmetrical fabrication design allows the mounting of the assembly to be either vertical or horizontal. The same fabrication supports both right and left hand configurations of the heat exchanger and filter.

Size/Range

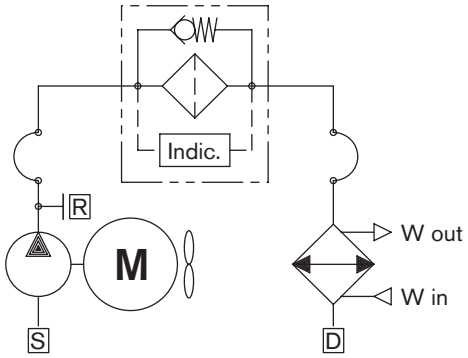
The drive horsepower ranges from 1 to 2 HP using 1500/1800 rpm AC motors with multi voltage, 3 phase and 50/60Hz frequency windings as standard. Pump flow ranges from 3 to 13 gpm, a single heat exchanger with HP removal of 4 to 19 horsepower. A range of filter elements are offered with 3 or 10 micron standard.

Configurations

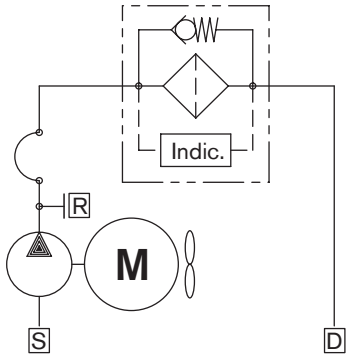
Configurations of three basic assemblies are offered, with and without filter or cooler. (H.E.)

Note: By-pass port “R” is provided on all units, if cool starting conditions are possible a pressure limiting valve should be added from port “R” directly to tank

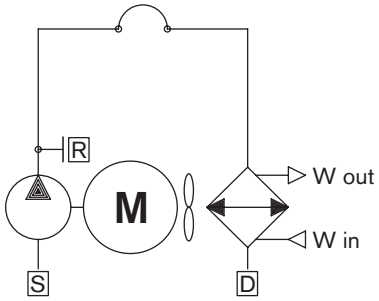
MFC3
Filter and Cooler



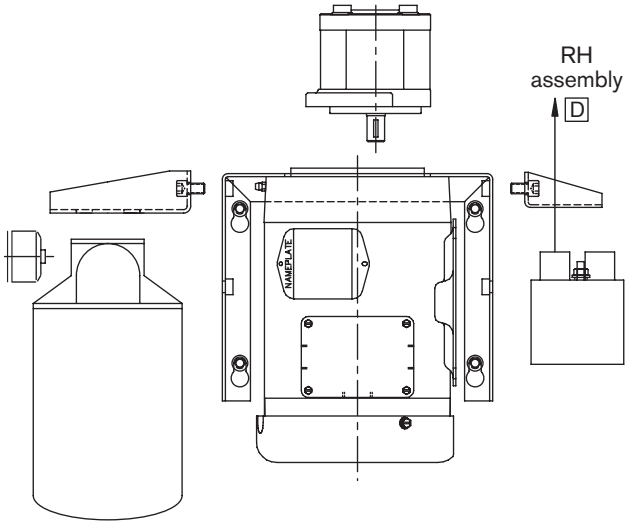
MFN3
Filter only



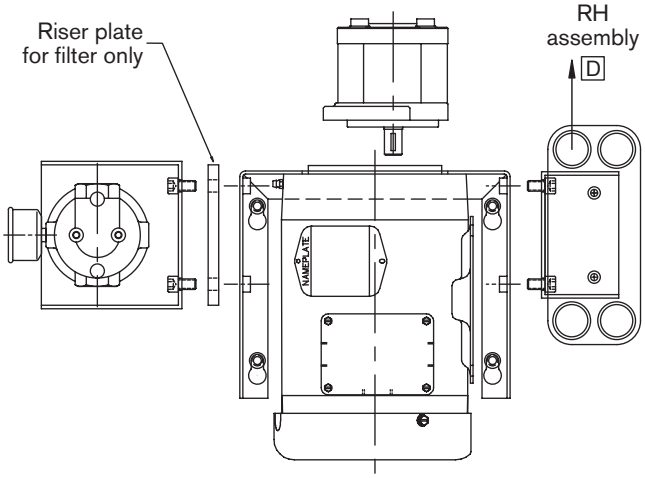
MNC3
Cooler only



Vertical Base Mounting
(Wall mount)
Front View



Horizontal Base Mounting
(Floor mount)
Top View



Vertical or horizontal unit mounting is accomplished by a common base design. The symmetrical design of the base allows the heat exchanger and/or filter brackets to be rotated 90-degrees to accommodate for either of the mounting positions.

Right or left-hand assemblies are also provided by the symmetrical base design, allowing the heat exchanger and/or filter bracket to be mounted on either side of the base. The oil return port “D” determines the assembly configuration in reference to the drawings above.

Regardless of the pump’s mounting orientation (vertical or horizontal), the minimum and maximum allowable suction head values need to be observed. The pump suction line size should never be downsized and the suction line length and number of bends should be minimal.

Pump Type	Min. Pump Suction Inlet Pressure, Absolute	Max. Pump Suction Inlet Pressures, Absolute
AF	Pabs Min. = 10.3 PSIA (0.7 bar)	Pabs Max. = 43.5 PSIA (3.0 bar)

Ordering code: MFC, MFN, OR MNC units (**Bold** selections are standard)

Module Filter/Cooler

MFC3	V	R	B	XXXH	4/D	EO	F	AF/XXX	030	S / 090	XX	X	J	XXXXX

Configuration:
MFC3 – Filter/Cooler
MFN3 – Filter only
MNC3 – Cooler only

Base Mounting:
V – Vertical (wall mounting)
H – Horizontal (floor mounting)

Assembly:
R – Right hand
L – Left hand

Horsepower X.XH

1.0H	2.0H
3.9–7.7 GPM	9.0–13.2 GPM

No. of Poles/Hertz

# of Poles/	D 50/60 Hz
4	1500/1800 rpm

Voltage:
E – 208–230/460V/60Hz
O – 190/380, 200/400, 208/416V/50Hz

Enclosure:
F – TEFC

Pump Type / Displacement cc:

Gear Pump AZPF:	Displacement cc							
AF/	008	**011**	014	**016**	019	**022**	025	**028**
GPM @1800 RPM	3.9	5.2	6.6	7.7	9.0	10.6	11.7	13.2

Cooler Size, # of Plates:
030 (Omit for MFN units with filter only option)

Filter Model, Size, Micron, Indicator:

Model	Size	μm	Indicator Type
S=SL Spin On 7 bar	**090**	**03** 06 **10** 20	0 – None **A – Pressure Gauge** **J – Pressure SW**
(Omit for MNC units without filter option)			

Fittings:
J – 37 deg JIC

Internal Reference Number:

Configuration guide – MFC3, MFN3 or MNC3 units, 150 SSU Fluids (**Bold** selections are standard)

# of Poles	Pump Type	Motor HP 50/60 Hz	Max. Pump Flow 50Hz GPM (LPM)	Max. Pumps Flow 60HZ GPM (LPM)	Heat Exchanger Selection	Filter Type / Size / Micron Rating Selection	Recomended Reservoir Volume Gallons
4 – Pole 1500/1800 rpm 50/60 Hz	AF-08	1.0 HP	3.3 (12.3)	3.9 (14.8)	30 Plates	S/90/3,6,10,20	50 / 60
	AF-11	**1.0 HP**	4.3 (16.4)	5.2 (19.7)	30 Plates	S/90/3,6,10,20	65 / 80
	AF-14	1.0 HP	5.5 (20.8)	6.6 (25.0)	30 Plates	S/90/3,6,10,20	80 / 100
	AF-16	**1.0 HP**	6.4 (24.3)	7.7 (29.1)	30 Plates	S/90/3,6,10,20	100 / 115
	AF-19	2.0 HP	7.5 (28.4)	9.0 (34.1)	30 Plates	S/90/3,6,10,20	115 / 135
	AF-22	**2.0 HP**	8.8 (33.4)	10.6 (40.1)	30 Plates	S/90/3,6,10,20	130 / 160
	AF-25	2.0 HP	9.8 (36.9)	11.7 (44.3)	30 Plates	S/90/3,6,10,20	150 / 175
	AF-28	**2.0 HP**	11.0 (41.7)	13.2 (50.0)	30 Plates	S/90/3,6,10,20	165 / 200

M style filters sized for < 6 psid with 3uM element, 150 SSU fluid.
F style filters sized for < 10 psid with 3uM element, 150 SSU fluid
Recommended reservoir size allows total fluid exchange 3-5 times / hour.
Recommended maximum reservoir (gallons) = Pump Flow (gpm) x 15

Unit sizing of cooler and filter:

1) Determine the reservoir volume in gallons.
   Calculate Pump flow (gpm) = [Reservoir volume in gallons x fluid exchange /hour] ÷ 60 min/hour.
   - Recommended fluid exchange rate is (3 to 5) times the reservoir volume /hour.

Example: [100 gallons x 4 exchange /hour] ÷ 60 min/hour = 6.67 GPM, use 7.33 GPM std. flow rate.

2) Determine heat exchanger removal rate from the calculated pump flow. See page 5.
   - It is important that fluid viscosity be considered during cold start-up and normal oil temperature operation. These variables have large effects on the total pressure drop of the heat exchanger and of the total system.
   - If necessary the pump flow can be increased to achieve a larger HP removal rate. When this is necessary, step 1 should be reconsidered with the increased pump flow.

Example: A flow of 7.33 GPM with 1:1 oil/water ratio allows 9.5 HP removal rate and produces 2.7 psid pressure drop when using 150 SSU oil at 125 °F. The fluid viscosity of a cold start temperature of 75 °F can be estimated by [Actual Viscosity/ 150 SSU] x [Actual SG/0.86} = cold oil SSU. Use the oil pressure drop correction factor graph to determine the multiplier, the cold oil pressure drop = CF x 2.7 PSID.

3) Determine filter and element pressure drop from the calculated pump flow. See pages 6-7.
   - It is important that fluid viscosity and SG be considered during cold start-up and normal oil temperature operation. These variables have large effects on the total pressure drop of the filter and the total system pressure drop.

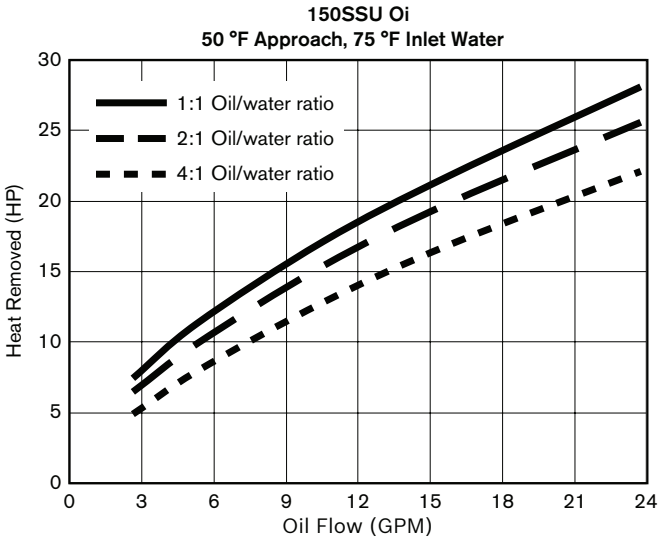
Example: A flow of 6.6 gpm through an SL45 filter with a 10 μm element has 3.6 PSID when using 150 SSU oil at 125 °F. The total filter pressure drop of a cold start oil temperature of 75 °F can be estimated by [Actual Viscosity/150 SSU] x [Actual SG/0.86] x 3.60 PSID.

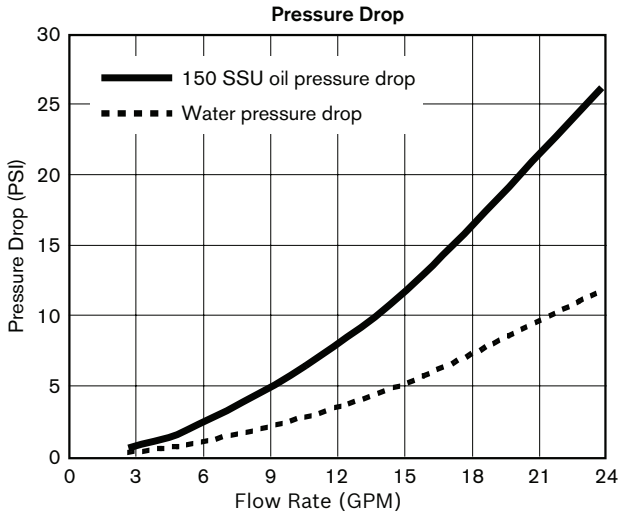
4) Determine the total estimated system pressure drop = [ΔP heat exchange + ΔP filter] x 1.2
   - The total system pressure drop of cold start must be below the filter pressure rating.
   - The total system pressure drop of normal oil temperature operation must be below the filter bypass rating.

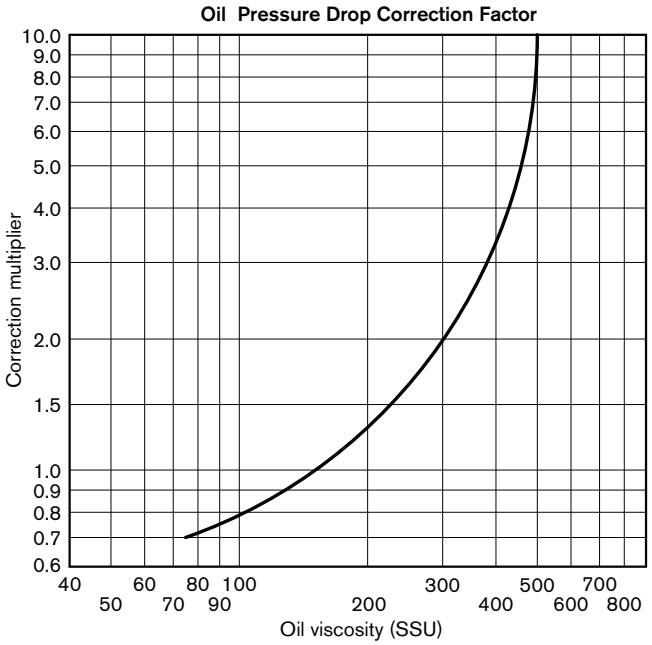
Example: The [heat exchange PSID + total filter PSID] x 1.2 = [2.7 PSID + 5.625 PSID] x 1.2 = 9.99 PSID. The total system pressure drop of a cold start oil temperature of 75 °F can be estimated by [Actual Viscosity/150 SSU] x [Actual SG/0.86] x 9.99 PSID.

5) Determine unit mounting and water cooling options as required, these options are purchased as separate items. See page 12.

Heat Exchanger Performance

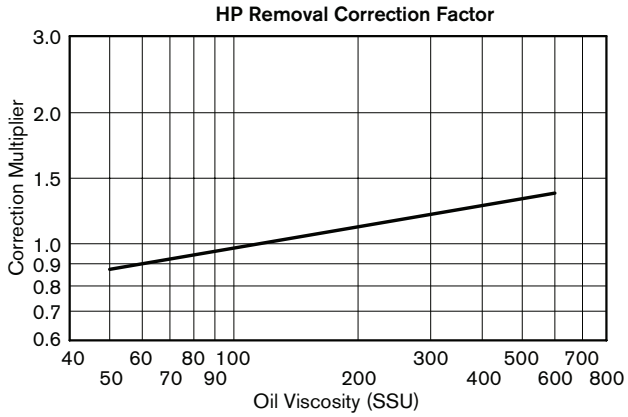






Specifications

- Plate material 316L stainless steel
- Braze material copper
- Max. operating temperature – 435 °F
- Max. operating pressure – 435 PSI
- Oil ports –12 JIC flare
- Water ports – 3/4" FNPT



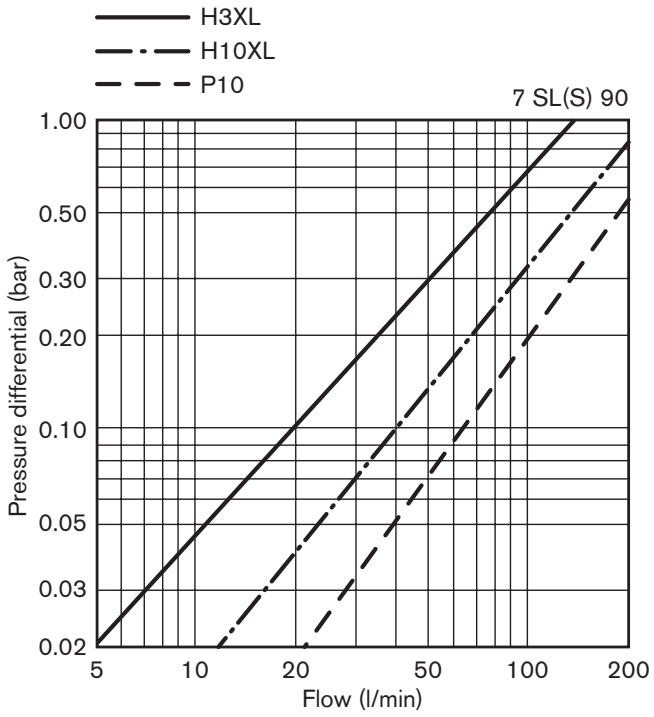
To calculate curve horsepower heat removal:

$$\text{Horsepower Heat Load} \times \frac{\text{Oil leaving cooler °F} - \text{Water entering cooler °F}}{50} \times \text{HP removal}$$

To calculate oil the pressure drop at a viscosity other than 150 SSU:

Find the oil pressure drop on the graph and multiply by the correction factor (150 SSU pressure drop x oil pressure drop correction factor).

“S” spin on type filter (determine water pressure drop from graph using the dashed lines)



Specifications:

- Operating Pressure 100 PSI (7 bar) max.
- Fluid Operating Temperature:
  14 °F to 212 °F (–10 °C to 100 °C)
- Aluminum Die Cast Head
- Nitrile Seals
- Differential Pressure Sensing Indication
- Micro glass filter elements

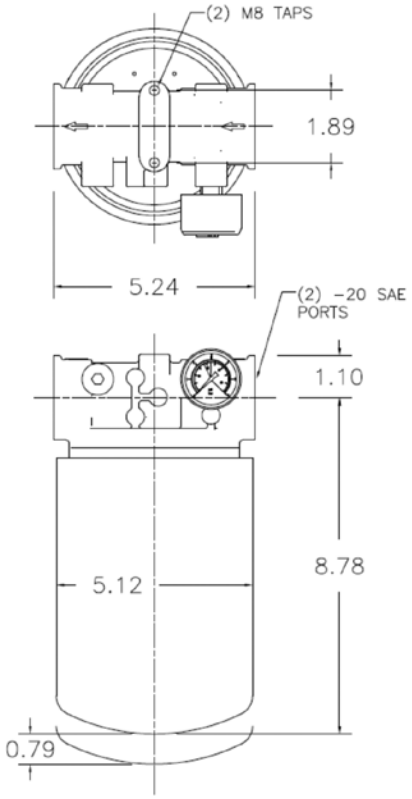
Sizing:

Find delta pressure on housing from graph.
Adjust for oil viscosity and S.G. difference:

Total delta pressure =

$$\text{Sum of delta pressure} \times \frac{\text{Actual Viscosity}}{150} \times \frac{\text{Actual Specific Gravity}}{0.86}$$

1 Gallon = 3.8 liters
1 bar = 14.5 PSI

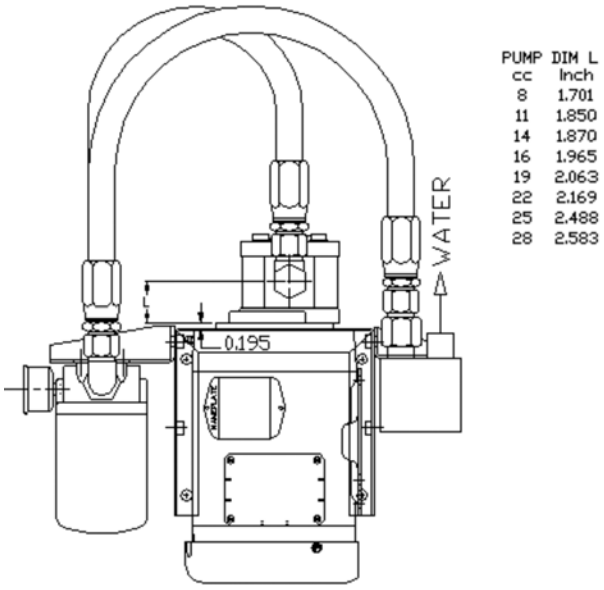


Standard vertical configuration and part numbers

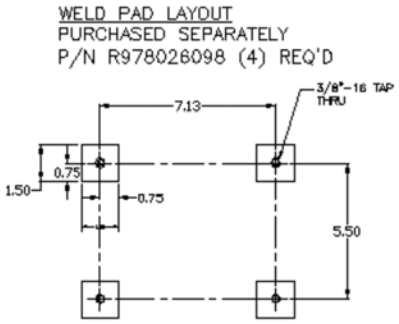
Filter Cooler Module, Vertical RH Unit		Filter Cooler Module, Vertical LH Unit	
3 Micron Filter Element		3 Micron Filter Element	
	Model Code Description		Model Code Description
	MFC3VRB1.0H4/DEOFAF/011030S/09003AJ		MFC3VLB1.0H4/DEOFAF/011030S/09003AJ
	MFC3VRB1.0H4/DEOFAF/011030S/09003JJ		MFC3VLB1.0H4/DEOFAF/011030S/09003JJ
	MFC3VRB1.0H4/DEOFAF/016030S/09003AJ		MFC3VLB1.0H4/DEOFAF/016030S/09003AJ
	MFC3VRB1.0H4/DEOFAF/016030S/09003JJ		MFC3VLB1.0H4/DEOFAF/016030S/09003JJ
	MFC3VRB2.0H4/DEOFAF/022030S/09003AJ		MFC3VLB2.0H4/DEOFAF/022030S/09003AJ
	MFC3VRB2.0H4/DEOFAF/022030S/09003JJ		MFC3VLB2.0H4/DEOFAF/022030S/09003JJ
	MFC3VRB2.0H4/DEOFAF/028030S/09003AJ		MFC3VLB2.0H4/DEOFAF/028030S/09003AJ
	MFC3VRB2.0H4/DEOFAF/028030S/09003JJ		MFC3VLB2.0H4/DEOFAF/028030S/09003JJ
10 Micron Filter Element		10 Micron Filter Element	
	Model Code Description		Model Code Description
	MFC3VRB1.0H4/DEOFAF/011030S/09010AJ		MFC3VLB1.0H4/DEOFAF/011030S/09010AJ
	MFC3VRB1.0H4/DEOFAF/011030S/09010JJ		MFC3VLB1.0H4/DEOFAF/011030S/09010JJ
	MFC3VRB1.0H4/DEOFAF/016030S/09010AJ		MFC3VLB1.0H4/DEOFAF/016030S/09010AJ
	MFC3VRB1.0H4/DEOFAF/016030S/09010JJ		MFC3VLB1.0H4/DEOFAF/016030S/09010JJ
	MFC3VRB2.0H4/DEOFAF/022030S/09010AJ		MFC3VLB2.0H4/DEOFAF/022030S/09010AJ
	MFC3VRB2.0H4/DEOFAF/022030S/09010JJ		MFC3VLB2.0H4/DEOFAF/022030S/09010JJ
	MFC3VRB2.0H4/DEOFAF/028030S/09010AJ		MFC3VLB2.0H4/DEOFAF/028030S/09010AJ
	MFC3VRB2.0H4/DEOFAF/028030S/09010JJ		MFC3VLB2.0H4/DEOFAF/028030S/09010JJ

Contact for info about filter or cooler only modules and non-standard configurations.

Actual pump (L) dimension will vary with pump size, determine (L) dimension from the pump displacement (cc).

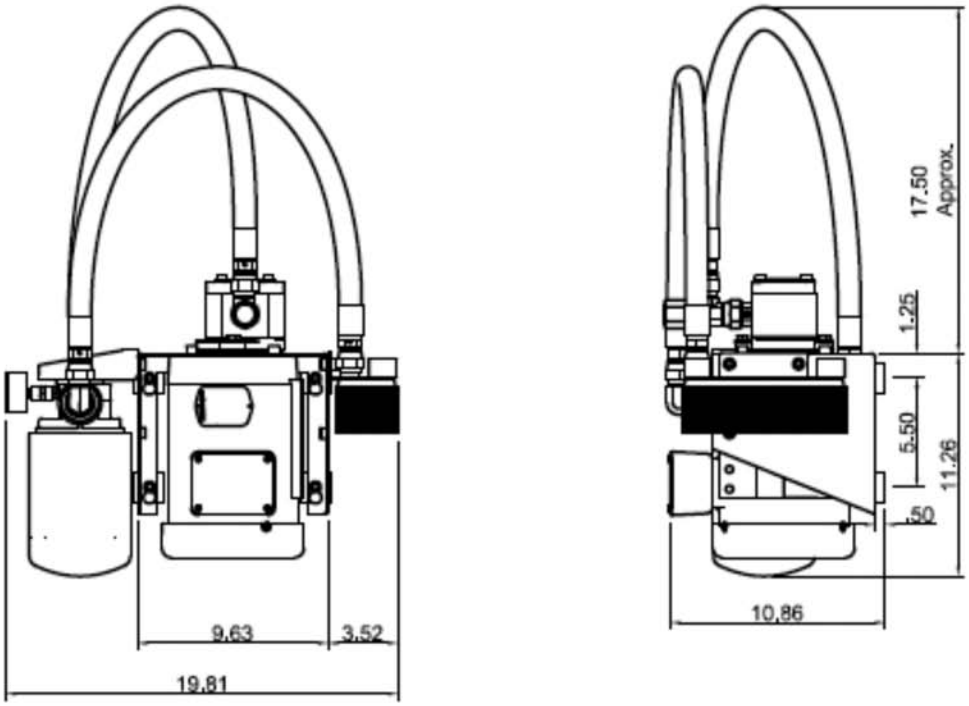


PUMP DIM L	
cc	Inch
8	1.701
11	1.850
14	1.870
16	1.965
19	2.063
22	2.169
25	2.488
28	2.583

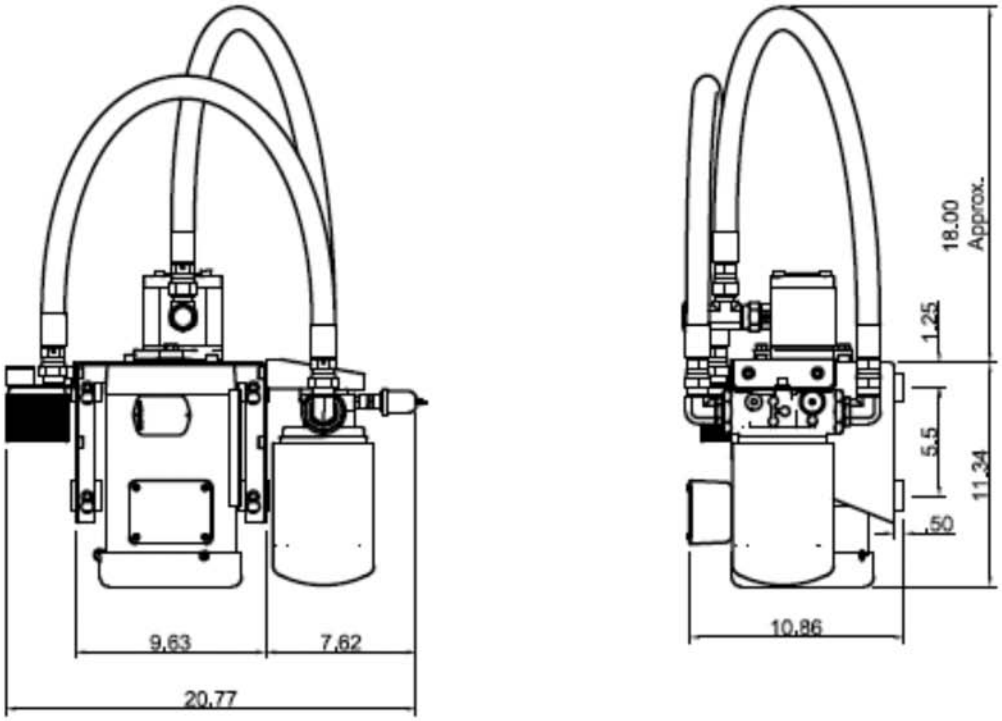


Vertical dimensions (approximate)

MFC3VR…AF/011…AJ



MFC3VL…AF/22…JJ



Standard horizontal configuration and part numbers

Filter Cooler Module, Horizontal RH Unit		Filter Cooler Module, Horizontal LH Unit	
3 Micron Filter Element		3 Micron Filter Element	
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	MFC3HRB1.0H4/DEOFAF/011030S/09003AJ		MFC3HLB1.0H4/DEOFAF/011030S/09003AJ
	MFC3HRB1.0H4/DEOFAF/011030S/09003JJ		MFC3HLB1.0H4/DEOFAF/011030S/09003JJ
	MFC3HRB1.0H4/DEOFAF/016030S/09003AJ		MFC3HLB1.0H4/DEOFAF/016030S/09003AJ
	MFC3HRB1.0H4/DEOFAF/016030S/09003JJ		MFC3HLB1.0H4/DEOFAF/016030S/09003JJ
	MFC3HRB2.0H4/DEOFAF/022030S/09003AJ		MFC3HLB2.0H4/DEOFAF/022030S/09003AJ
	MFC3HRB2.0H4/DEOFAF/022030S/09003JJ		MFC3HLB2.0H4/DEOFAF/022030S/09003JJ
	MFC3HRB2.0H4/DEOFAF/028030S/09003AJ		MFC3HLB2.0H4/DEOFAF/028030S/09003AJ
	MFC3HRB2.0H4/DEOFAF/028030S/09003JJ		MFC3HLB2.0H4/DEOFAF/028030S/09003JJ
10 Micron Filter Element		10 Micron Filter Element	
	Model Code Description		Model Code Description
	MFC3HRB1.0H4/DEOFAF/011030S/09010AJ		MFC3HLB1.0H4/DEOFAF/011030S/09010AJ
	MFC3HRB1.0H4/DEOFAF/011030S/09010JJ		MFC3HLB1.0H4/DEOFAF/011030S/09010JJ
	MFC3HRB1.0H4/DEOFAF/016030S/09010AJ		MFC3HLB1.0H4/DEOFAF/016030S/09010AJ
	MFC3HRB1.0H4/DEOFAF/016030S/09010JJ		MFC3HLB1.0H4/DEOFAF/016030S/09010JJ
	MFC3HRB2.0H4/DEOFAF/022030S/09010AJ		MFC3HLB2.0H4/DEOFAF/022030S/09010AJ
	MFC3HRB2.0H4/DEOFAF/022030S/09010JJ		MFC3HLB2.0H4/DEOFAF/022030S/09010JJ
	MFC3HRB2.0H4/DEOFAF/028030S/09010AJ		MFC3HLB2.0H4/DEOFAF/028030S/09010AJ
	MFC3HRB2.0H4/DEOFAF/028030S/09010JJ		MFC3HLB2.0H4/DEOFAF/028030S/09010JJ

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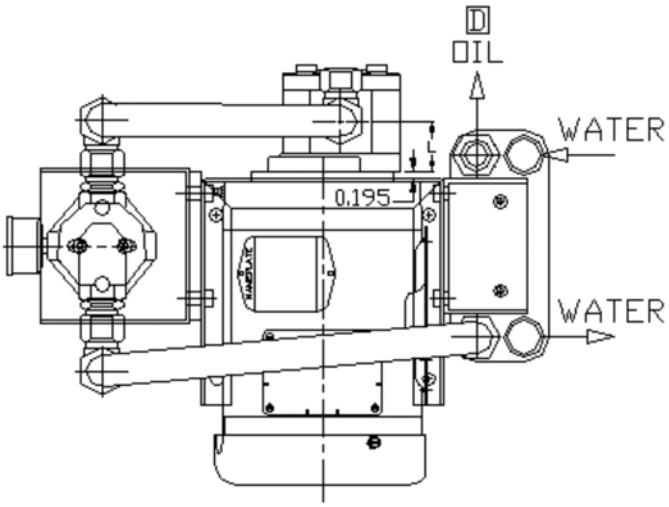

PUMP cc	DIM L Inch
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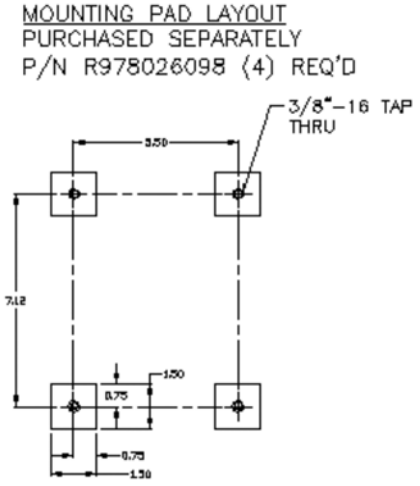
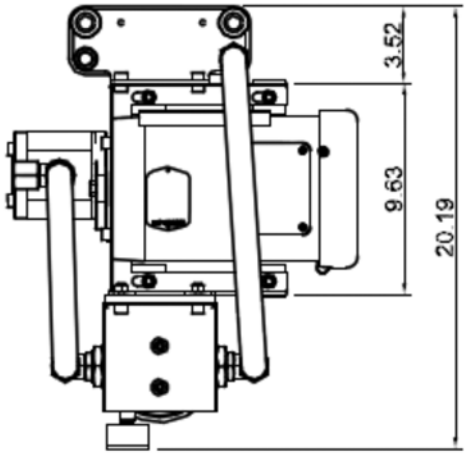
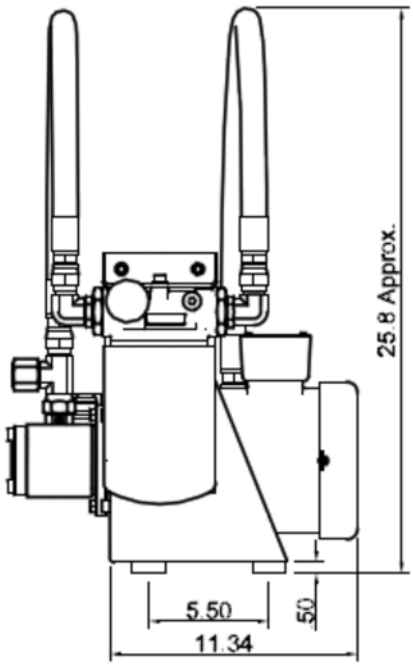


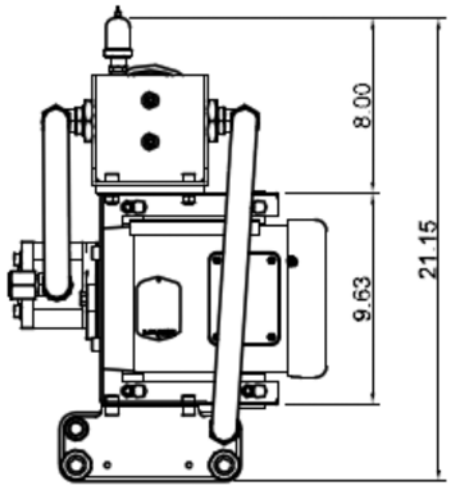
Horizontal dimensions (approximate)

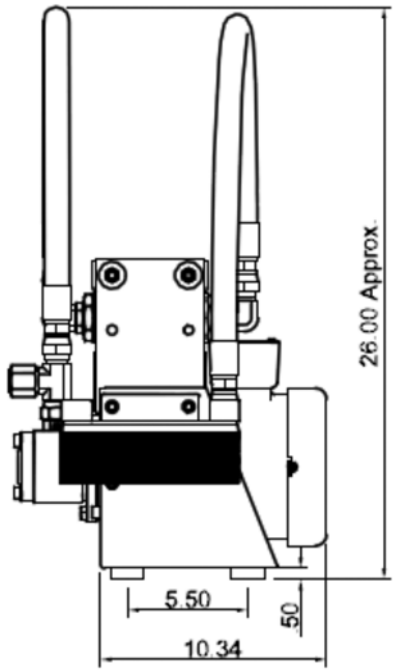
MFC3HR…AF/011…AJ





MFC3HL…AF/011…JJ





Replacement components and water control options (**Bold** selections are standard)

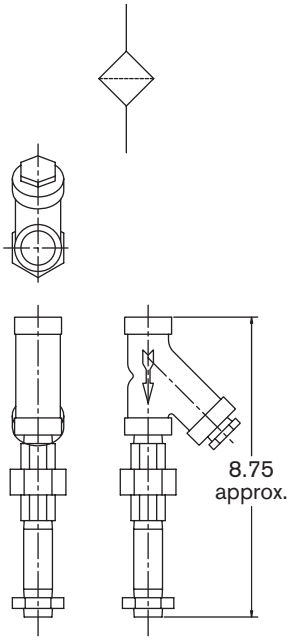
Replacement Filter Elements				
Filter Type	**03 µm**	**05 µm**	**10 µm**	**20 µm**
SL90				

Replacement Filter Indicators				
Filter Type	**A** Pressure Gauge	**J** Pressure Switch (AC/DC)		
SL90				

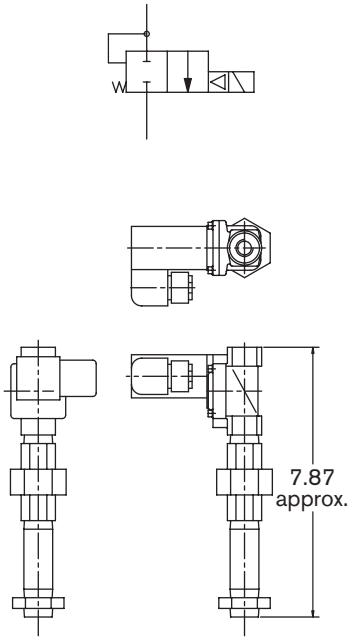
Replacement Water Control Options	
	Description
	“Y” Strainer
	Solenoid Valve 120 VAC
	Solenoid Valve 24 VDC
	Water Regulator

Water Control Options		
	Function	**Assembly Contents**
	‘Y’ Strainer, 1/2" FNPT	Includes 1/2" galvanized pipe and union, 3/4"-1/2" reducer to H.E. inlet port. Water regulator includes 6 ft. capilary tube & bulbwell.
	Solenoid Valve 24 VAC, 1/2" FNPT	
	Solenoid Valve 120 VDC, 1/2" FNPT	
	Water Regulator, 1/2" FNPT	

'Y' Strainer



Sol Valve



Water Regulator