Fluid Cooling Industrial COL Series

BRAZED ALUMINUM CONSTRUCTION

Performance Notes

- Ideal for independent cooling and filtering of system oils
- Low to medium pressure applications utilizing low noise screw pump technology
- Pump flows ranging 9.5 GPM to 45 GPM
- Bar and plate brazed aluminum P-BAR core with optional T-BAR core
- Standard SAE ports - NPT and BSPP port adapters available
- Direct mount; no coupler or bell housing

Options
Cartridge-style filters
Plugged filter indicators
T-BAR core
Temperature sensors

Ratings

Maximum Operating Pressure
250 PSI (17 BAR)

Maximum Operating Temperature
300°F (150°C) without filter
230°F (110°C) with filter

Maximum Viscosity
P-BAR 150 cst
T-BAR 320 cst

Materials

Mounting Feet Steel

Standard Core Brazed aluminum plate and bar (T-BAR is optional)

- Tanks 5052 Aluminum
- Nose Bar and Little Bar 3003-H Aluminum
- Air Fin, Plate, Turbulator and End Plate 3003-O Aluminum

Fanguard and Shroud Steel

Connectors Aluminum

Fan Aluminum Hub, Plastic Blades

Motor NEMA

Fluid Compatability

Petroleum
Water/ethylene glycol
Cutting oils (contact TTP)
Water-oil emulsions
Water-Ethylene Glycol emulsions
Mineral oil HLP and HLVP
Ecologic fluids HETG-HEPG-HEE
Lubrication high viscosity oils
MIL-H, SKYDROL/HFDR phosphate ester*

**Standard pump seals are not compatible with phosphate ester. Special pumps with EPDM seals are required. Consult factory for details.*

Micron Filtration

Utilizes a modern in-line filter housing and cartridge

- Standard cartridge element
- Filter Options:
  - 10 micron fiberglass, standard
  - 3, 6, and 25 micron fiberglass, optional
  - Consult factory for high viscosity fluids
- ß 1000 filtration efficiency
- Filtration indicator
  Visual, visual/electrical or electrical

Screw Pump Technology

Offers significant maintenance and performance advantages.

Screw pumps meet the need of having a silent hydraulic component, unique pump design offers the characteristics of a gear pump and the silence of a screw pump.

- Reliable, high performance, low noise
- Run without pulsation, providing long life to your application
- Positive displacement rotary pump with axial flow design
- Only three moving parts
- Rolling action eliminates noise and vibration

How to Order

Model Series	**Model Size Selected**	**Ports**	**Pump***	**Motor**	**Filter**	**Indicator**	**Core**	**Heresite**
COL	**8** • **16** • **30** **400** • **725** • **950** **1200** • **1600**	**1** - NPT **2** - SAE **3** - BSPP	**20** - 20cc **40** - 40cc **80** - 80cc **100** - 100cc	**0** - No Motor **3** - 3ph	**Blank** - None **3** - 3µ **6** - 6µ **10** - 10µ **25** - 25µ	**Blank** - None **V** - Visual **E** - Electrical **EV** - Electrical/ Visual	**Blank** - Standard **TB**** - T-BAR Optional	**Blank** - Standard Paint **HC** - Heresite

*20cc & 40cc – Sizes 8, 16, 30, and 400 only. 80cc & 100cc – Sizes 725, 950, 1200, and 1600 only.
**T-BAR Core option provides a T-BAR core in COL frame. Used for high fouling or high viscosity fluids. Performance is typically 15-25% less than the bar and plate core. Consult factory for details.

Specifications

Pump/Fan Motor Data (COL-8 – COL-400)

Model	Actual Displacement CUIN (CC)	GPM (LPM) Flow	Operating Pressure PSI (BAR)	Motor HP	RPM	Voltage	PH/HZ	Full Load Amps 208-230/460	Frame Size	Fan CFM (CMM) Air Flow	Overall Sound dB(A) at 3 FT (1 M)
COL-8	1.22 (20)	9.5 (36)	130 (9)	1.5	1800	208-230/460	3/60	4.5-4.4/2.2	145TC	418 (11.83)	67
	2.44 (40)	21 (79)	130 (9)	3	1800	208-230/460	3/60	9-8.4/4.2	182TC	418 (11.83)	67
COL-16	1.22 (20)	9.5 (36)	130 (9)	1.5	1800	208-230/460	3/60	4.5-4.4/2.2	145TC	745 (21.09)	73
	2.44 (40)	21 (79)	130 (9)	3	1800	208-230/460	3/60	9-8.4/4.2	182TC	745 (21.09)	73
COL-30	1.22 (20)	9.5 (36)	130 (9)	1.5	1800	208-230/460	3/60	4.5-4.4/2.2	145TC	2200 (62.29)	85
	2.44 (40)	21 (79)	130 (9)	3	1800	208-230/460	3/60	9-8.4/4.2	182TC	2200 (62.29)	85
COL-400	1.22 (20)	9.5 (36)	130 (9)	1.5	1800	208-230/460	3/60	4.5-4.4/2.2	145TC	1149 (32.53)	77
	2.44 (40)	21 (79)	130 (9)	3	1800	208-230/460	3/60	9-8.4/4.2	182TC	1149 (32.53)	77

Performance based upon 46 cSt oil, 60 HZ

Pump Motor Data (COL-725 – COL-1600)

Model	Actual Displacement CUIN (CC)	GPM (LPM) Flow	Operating Pressure PSI (BAR)	Motor HP	RPM	Voltage	PH/HZ	Full Load Amps 208-230/460	Frame Size	Overall Sound dB(A) at 3 FT (1 M)
COL-725	4.52 (74)	35 (133)	218 (15)	7.5	1800	208-230/460	3/60	21-18.8/9.4	213TC	100
	5.68 (93)	45 (169)	203 (14)	7.5	1800	208-230/460	3/60	21-18.8-9.4	213TC	100
COL-950	4.52 (74)	35 (133)	218 (15)	7.5	1800	208-230/460	3/60	21-18.8/9.4	213TC	92
	5.68 (93)	45 (169)	203 (14)	7.5	1800	208-230/460	3/60	21-18.8-9.4	213TC	92
COL-1200	4.52 (74)	35 (133)	218 (15)	7.5	1800	208-230/460	3/60	21-18.8/9.4	213TC	94
	5.68 (93)	45 (169)	203 (14)	7.5	1800	208-230/460	3/60	21-18.8-9.4	213TC	94
COL-1600	4.52 (74)	35 (133)	218 (15)	7.5	1800	208-230/460	3/60	21-18.8/9.4	213TC	96
	5.68 (93)	45 (169)	203 (14)	7.5	1800	208-230/460	3/60	21-18.8-9.4	213TC	96

Performance based upon 46 cSt oil, 60 HZ

Fan Motor Data (COL-725 – COL-1600)

Model	Motor HP	RPM	Voltage	PH/HZ	Full Load Amps 208-230/460	Frame Size	Fan CFM (CMM) Air Flow
COL-725	1.5	3450	208-230/460	3/60	4.9-4.6/2.3	56C	3600 (101.94)
COL-950	1.5	1750	208-230/460	3/60	5.1-4.8/2.4	145TC	4700 (133.10)
COL-1200	3	1750	208-230/460	3/60	9.1-8.4/4.2	182TC	7000 (198.22)
COL-1600	5	1750	208-230/460	3/60	14.2-13.6/6.8	184TC	7900 (223.75)

Performance based upon 46 cSt oil, 60 HZ

Desired Reservoir Temperature

Oil Temperature: Oil coolers can be selected using entering or leaving oil temperatures.

Off-Line Recirculation Cooling Loop: Desired reservoir temperature is the oil temperature entering the cooler.

Return Line Cooling: Desired reservoir temperature is the oil temperature leaving the cooler. In this case, the oil temperature change must be determined so that the actual oil entering temperature can be found. Calculate the oil temperature change (oil △T) with this formula:

Oil △T °F (°C) = (BTU/HR ÷ [GPM oil flow x 210])
[KW ÷ (LPM Oil Flow x .029)]

To calculate the oil entering temperature to the cooler, use this formula:

Oil Entering Temp. = Oil Leaving Temp + Oil △T.

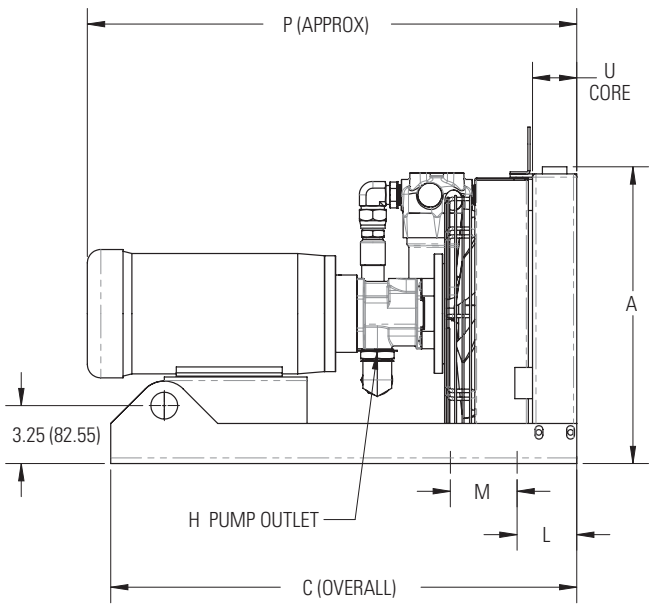
Oil Pressure Drop: Most systems can tolerate a pressure drop through the heat exchanger of 19 to 30 PSI (1.3 to 2.1 BAR). Excessive pressure drop should be avoided. Care should be taken to limit pressure drop to 5 PSI (.35 BAR) or less for case drain applications where high back pressure may damage the pump shaft seals.

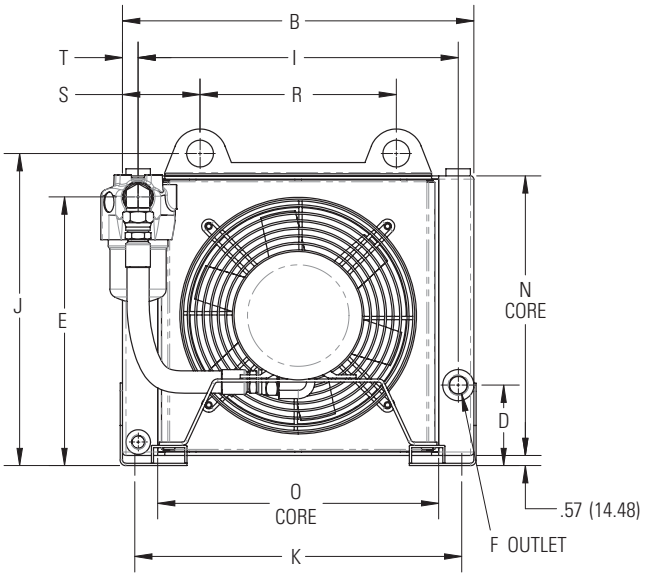
Typical operating temperature ranges are:

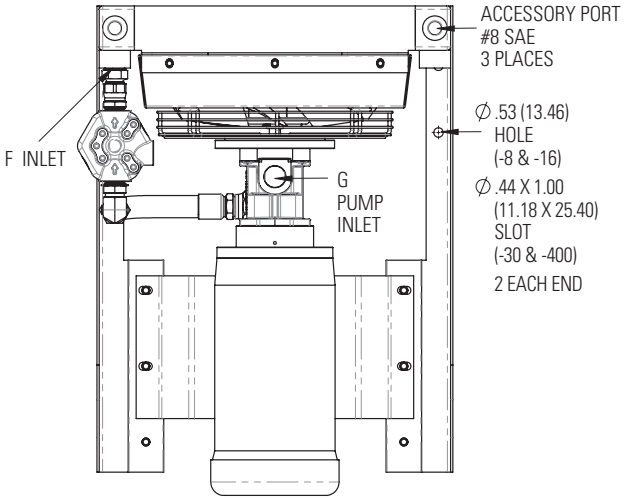
Hydraulic Motor Oil	120 - 180°F (49 - 82°C)
Hydrostatic Drive Oil	160 - 180°F (71 - 82°C)
Engine Lube Oil	180 - 199°F (82 - 93°C)
Automatic Transmission Fluid	199 - 300°F (93 - 149°C)

Dimensions

COL-8 through COL-400





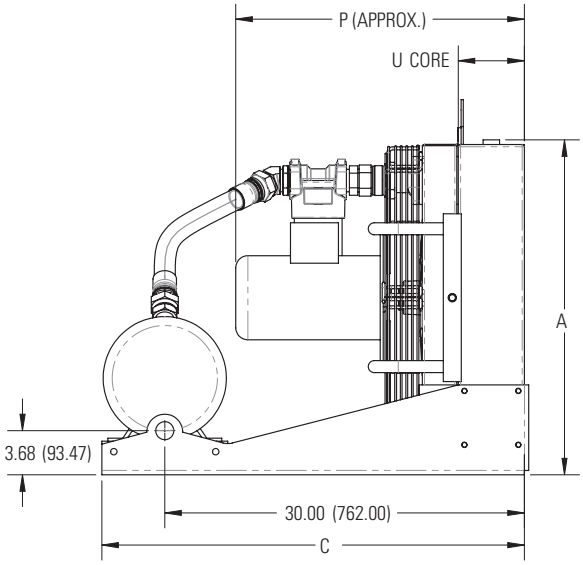


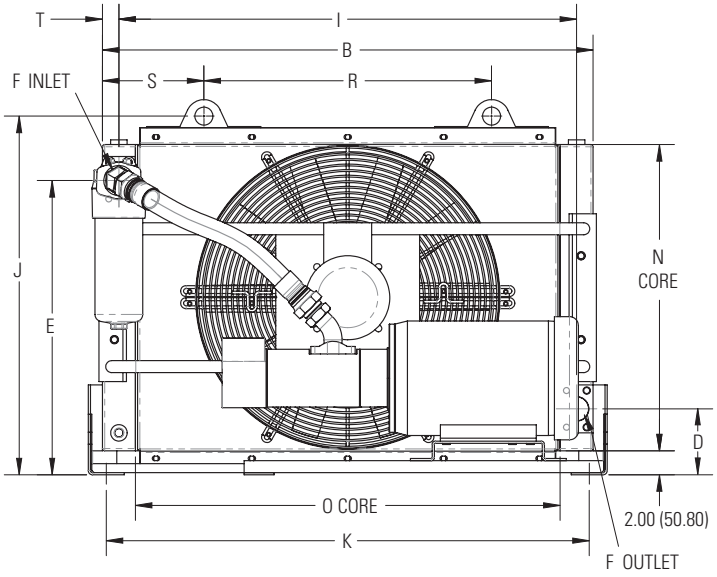
Model	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	R	S	T	U
COL-8-20	13.13 (334)	15.81 (402)	26.13 (664)	4.51 (115)	11.34 (288)	#12 SAE	#16 SAE	#12 SAE	13.99 (355)	13.99 (355)	14.45 (367)	3.35 (85)	3.74 (95)	12.17 (309)	11.87 (302)	27.25 (692)	6.50 (165)	4.63 (117)	.91 (23)	2.64 (67)
COL-8-40	13.13 (334)	15.81 (402)	26.13 (664)	4.51 (115)	11.34 (288)	#12 SAE	#24 SAE	#20 SAE	13.99 (355)	13.99 (355)	14.45 (367)	3.35 (85)	3.74 (95)	12.17 (309)	11.87 (302)	29.87 (759)	6.50 (165)	4.63 (117)	.91 (23)	2.64 (67)
COL-16-20	16.91 (429)	19.69 (500)	26.13 (664)	4.51 (115)	15.06 (382)	#12 SAE	#16 SAE	#12 SAE	17.95 (456)	17.76 (451)	18.32 (465)	3.35 (85)	3.74 (95)	15.94 (405)	15.75 (400)	27.59 (701)	11.00 (279)	4.34 (1110)	.87 (22)	2.64 (67)
COL-16-40	16.91 (429)	19.69 (500)	26.13 (664)	4.51 (115)	15.06 (382)	#12 SAE	#24 SAE	#20 SAE	17.95 (456)	17.76 (451)	18.32 (465)	3.35 (85)	3.74 (95)	15.94 (405)	15.75 (400)	30.21 (767)	11.00 (279)	4.34 (1110)	.87 (22)	2.64 (67)
COL-30-20	21.46 (545)	26.38 (670)	26.86 (682)	5.27 (134)	19.50 (495)	#20 SAE	#16 SAE	#12 SAE	24.34 (618)	22.44 (570)	24.73 (628)	4.25 (108)	5.00 (127)	19.74 (501)	21.88 (556)	27.99 (711)	17.00 (432)	4.69 (119)	1.02 (26)	3.50 (89)
COL-30-40	21.46 (545)	26.38 (670)	26.86 (682)	5.27 (134)	19.50 (495)	#20 SAE	#24 SAE	#20 SAE	24.34 (618)	22.44 (570)	24.73 (628)	4.25 (108)	5.00 (127)	19.74 (501)	21.88 (556)	30.61 (778)	17.00 (432)	4.69 (119)	1.02 (26)	3.50 (89)
COL-400-20	19.28 (490)	22.38 (568)	26.86 (682)	6.50 (165)	17.31 (440)	#20 SAE	#16 SAE	#12 SAE	20.07 (510)	20.77 (527)	22.23 (565)	4.25 (108)	5.00 (127)	16.89 (429)	17.72 (450)	28.27 (718)	11.00 (279)	5.69 (144)	1.16 (29)	3.50 (89)
COL-400-40	19.28 (490)	22.38 (568)	26.86 (682)	6.50 (165)	17.31 (440)	#20 SAE	#24 SAE	#20 SAE	20.07 (510)	20.77 (527)	22.23 (565)	4.25 (108)	5.00 (127)	16.89 (429)	17.72 (450)	30.89 (785)	11.00 (279)	5.69 (144)	1.16 (29)	3.50 (89)

Note: We reserve the right to make reasonable design changes without notice. All dimensions in inches (millimeters), unless noted otherwise.

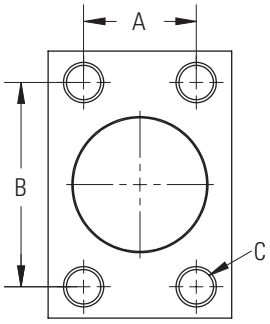
Dimensions

COL-725 through COL-1600

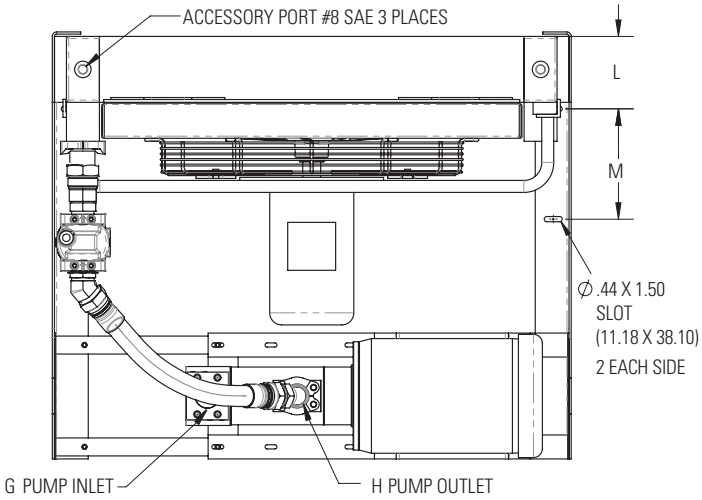




SAE Flange



SAE Flange Size	A INCHES (MM)	B INCHES (MM)	C
1½"	1.41 (36)	2.75 (70)	1½ - 13 UNC
2"	1.69 (43)	3.06 (78)	1½ - 13 UNC
2½"	2.00 (51)	3.50 (89)	1½ - 13 UNC

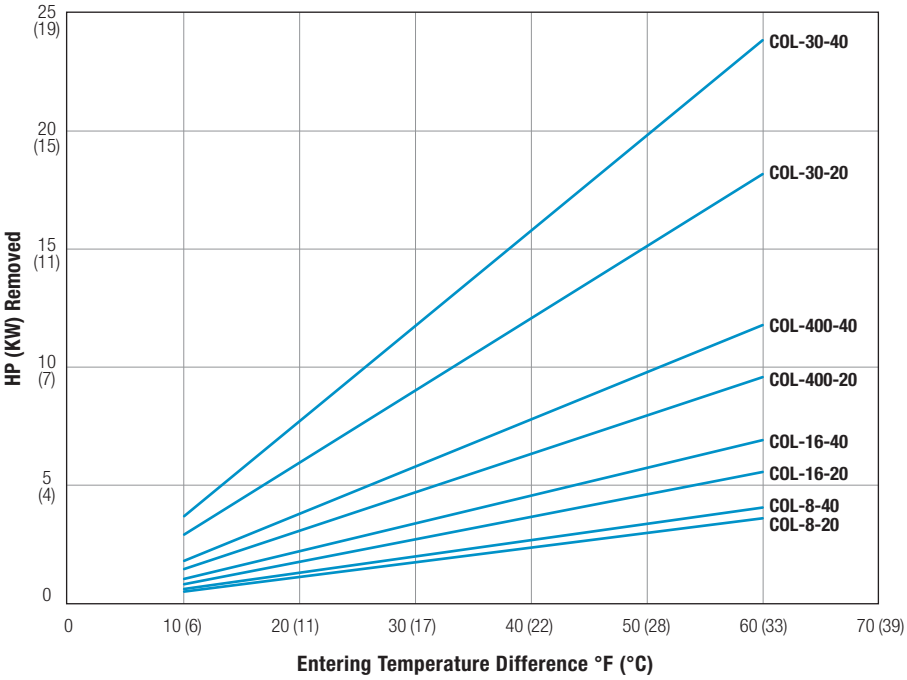


Model	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	R	S	T	U
COL-725-80	23.61 (600)	30.25 (768)	35.00 (889)	6.50 (165)	21.62 (549)	#20 SAE	2" SAE FLANGE	1.5" SAE FLANGE	27.95 (710)	25.60 (650)	30.11 (765)	4.15 (105)	5.00 (127)	21.22 (539)	25.75 (654)	17.43 (443)	12.00 (305)	9.13 (232)	1.15 (29)	3.50 (89)
COL-725-100	23.61 (600)	30.25 (768)	35.00 (889)	6.50 (165)	21.62 (549)	#20 SAE	2.5" SAE FLANGE	2" SAE FLANGE	27.95 (710)	25.60 (650)	30.11 (765)	4.15 (105)	5.00 (127)	21.22 (539)	25.75 (654)	17.43 (443)	12.00 (305)	9.13 (232)	1.15 (29)	3.50 (89)
COL-950-80	27.94 (710)	37.01 (940)	35.25 (895)	9.50 (241)	24.55 (624)	2" SAE FLANGE	2" SAE FLANGE	1.5" SAE FLANGE	34.26 (870)	29.93 (760)	35.87 (911)	6.05 (154)	9.20 (234)	25.55 (649)	31.50 (800)	22.81 (579)	18.00 (457)	9.51 (241)	1.38 (35)	5.50 (140)
COL-950-100	27.94 (710)	37.01 (940)	35.25 (895)	9.50 (241)	24.55 (624)	2" SAE FLANGE	2.5" SAE FLANGE	2" SAE FLANGE	34.26 (870)	29.93 (760)	35.87 (911)	6.05 (154)	9.20 (234)	25.55 (649)	31.50 (800)	22.81 (579)	18.00 (457)	9.51 (241)	1.38 (35)	5.50 (140)
COL-1200-80	27.94 (710)	40.98 (1041)	35.25 (895)	5.50 (140)	24.55 (624)	2" SAE FLANGE	2" SAE FLANGE	1.5" SAE FLANGE	38.18 (970)	29.93 (760)	40.31 (1024)	6.05 (154)	9.20 (234)	25.55 (649)	35.51 (902)	24.05 (611)	24.00 (610)	8.49 (216)	1.40 (36)	5.51 (140)
COL-1200-100	27.94 (710)	40.98 (1041)	35.25 (895)	5.50 (140)	24.55 (624)	2" SAE FLANGE	2.5" SAE FLANGE	2" SAE FLANGE	38.18 (970)	29.93 (760)	40.31 (1024)	6.05 (154)	9.20 (234)	25.55 (649)	35.51 (902)	24.05 (611)	24.00 (610)	8.49 (216)	1.40 (36)	5.51 (140)
COL-1600-80	36.06 (916)	40.96 (1040)	35.25 (895)	9.50 (241)	32.80 (833)	2" SAE FLANGE	2" SAE FLANGE	1.5" SAE FLANGE	38.18 (970)	38.04 (966)	40.31 (1024)	6.05 (154)	9.20 (234)	33.66 (855)	35.51 (902)	25.43 (646)	24.00 (610)	8.53 (217)	1.38 (35)	5.51 (140)
COL-1600-100	36.06 (916)	40.96 (1040)	35.25 (895)	9.50 (241)	32.80 (833)	2" SAE FLANGE	2.5" SAE FLANGE	2" SAE FLANGE	38.18 (970)	38.04 (966)	40.31 (1024)	6.05 (154)	9.20 (234)	33.66 (855)	35.51 (902)	25.43 (646)	24.00 (610)	8.53 (217)	1.38 (35)	5.51 (140)

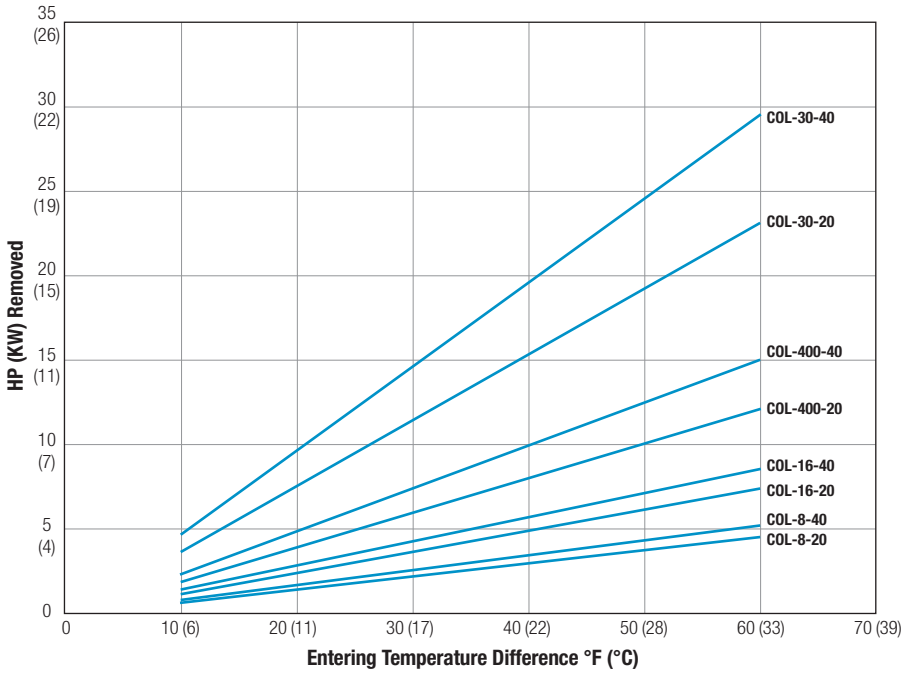
Note: We reserve the right to make reasonable design changes without notice. All dimensions in inches (millimeters), unless noted otherwise.

Performance Curves

Single Motor 50 HZ/1500 RPM



Single Motor 60 HZ/1800 RPM



Note: T-BAR cores derate performance 15-25%. Consult factory for sizing information.

Selection Procedure

STEP 1 **Determine Heat Load.** Most applications can have a cooler sized for 1/3 of the input HP (KW).

STEP 2 **Determine Entering Temperature Difference.** (Actual ETD)

ETD = Entering oil temperature °F (°C) – Entering ambient air temperature °F (°C)

The entering oil temperature is generally the maximum desired system oil temperature.

Entering air temperature is the highest ambient air temperature the application will see.

STEP 3 **Select Model From Curves.** Enter the Performance Curves at the bottom with the GPM (LPM) oil flow and proceed upward to the adjusted Heat Rejection from Step 3. Any Model or Curve on or above this point will meet these conditions.

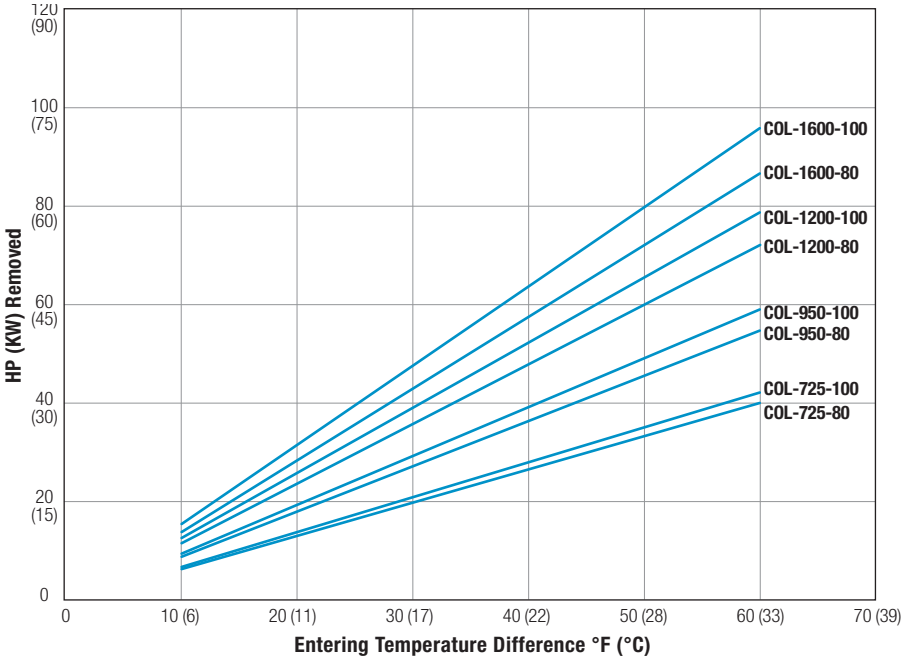
Listed Performance Curves are based on 46 cSt oil.

If your application conditions are different, consult factory for assistance.

Model	50 HZ Flow Rate GPM (LPM)	60 HZ Flow Rate GPM (LPM)
COL-8-20	8 (30)	9.5 (36)
COL-8-40	16 (60)	21 (79)
COL-16-20	8 (30)	9.5 (36)
COL-16-40	16 (60)	21 (79)
COL-30-20	8 (30)	9.5 (36)
COL-30-40	16 (60)	21 (79)
COL-400-20	8 (30)	9.5 (36)
COL-400-40	16 (60)	21 (79)

Performance Curves

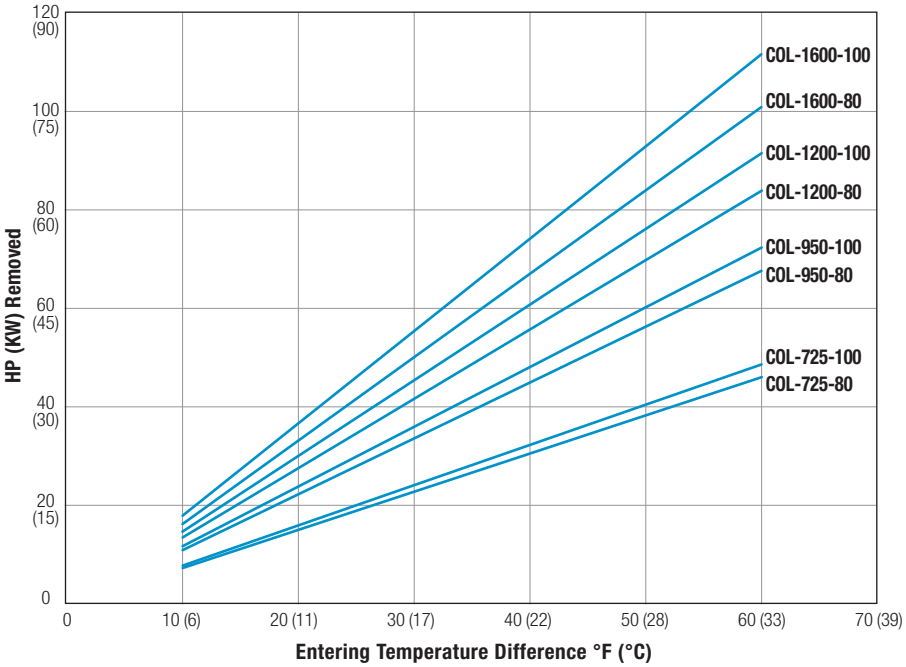
Dual Motor 50 HZ/1500 RPM



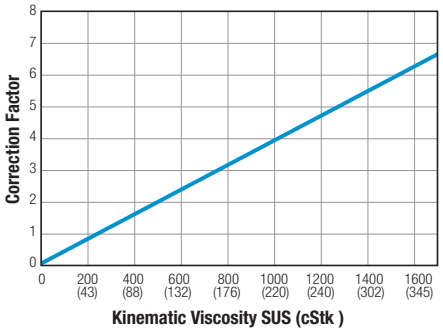
Model	Oil Flow Rate GPM (LPM)	Estimated Pressure Drop with Filter PSI (BAR)	Estimated Pressure Drop without Filter PSI (BAR)
COL-8-20	9.5 (36)	14 (1.0)	5 (0.3)
COL-8-40	21.0 (79)	28 (2.0)	17 (1.2)
COL-16-20	9.5 (36)	14 (1.0)	5 (0.3)
COL-16-40	21.0 (79)	27 (1.9)	16 (1.1)
COL-30-20	9.5 (36)	12 (0.8)	3 (0.2)
COL-30-40	21.0 (79)	23 (1.6)	12 (0.8)
COL-400-20	9.5 (36)	13 (0.9)	3 (0.2)
COL-400-40	21.0 (79)	24 (1.7)	13 (0.9)
COL-725-80	35.0 (133)	25 (1.7)	16 (1.1)
COL-725-100	45.0 (169)	33 (2.3)	19 (1.3)
COL-950-80	35.0 (133)	19 (1.3)	11 (0.8)
COL-960-100	45.0 (169)	25 (1.7)	12 (0.8)
COL-1200-80	35.0 (133)	20 (1.4)	12 (0.8)
COL-1200-100	45.0 (169)	27 (1.9)	13 (0.9)
COL-1600-80	35.0 (133)	17 (1.2)	9 (0.6)
COL-1600-100	45.0 (169)	24 (1.7)	10 (0.7)

Total pressure drop is estimated using 46 cStk oil. 10 micron mesh filter is used in calculating filter pressure drop.

Dual Motor 60 HZ/1800 RPM



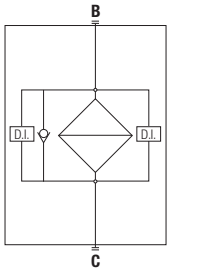
Oil Pressure Drop Correction

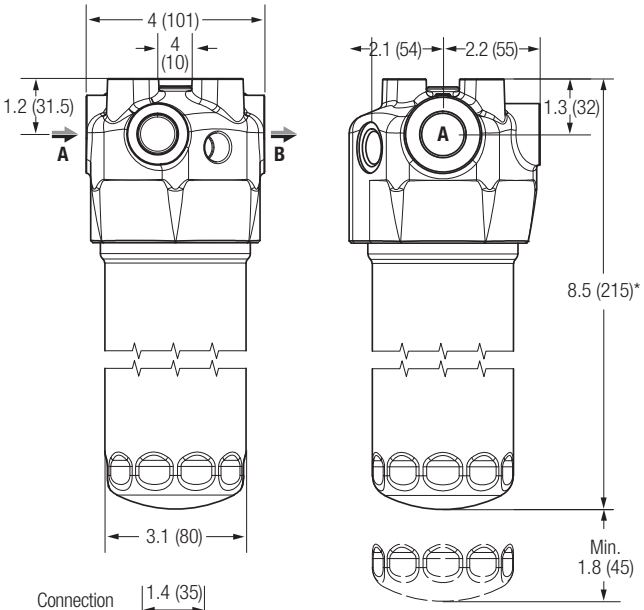


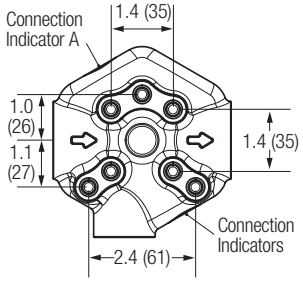
Model	50 HZ Flow Rate GPM (LPM)	60 HZ Flow Rate GPM (LPM)
COL-725-80	29.5 (112)	35 (133)
COL-725-100	37 (140)	45 (169)
COL-950-80	29.5 (112)	35 (133)
COL-950-100	37 (140)	45 (169)
COL-1200-80	29.5 (112)	35 (133)
COL-1200-100	37 (140)	45 (169)
COL-1600-80	29.5 (112)	35 (133)
COL-1600-100	37 (140)	45 (169)

Micron Filter Specifications

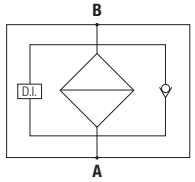
COL-8 – COL-400

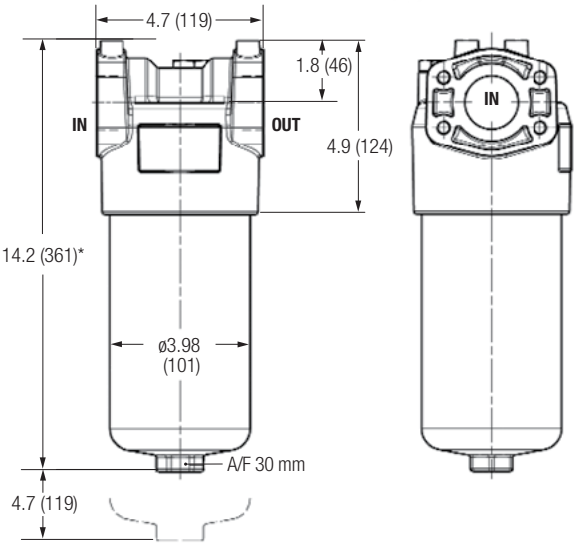


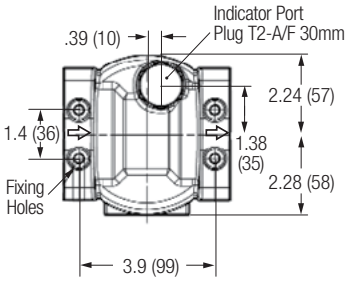




COL-725 – COL-1600







**Other bowl lengths available. Consult factory for details.*
All dimensions in inches (millimeters), unless noted otherwise.

Filter Housing Materials
- Head – Aluminum
- Housing – Phosphated Steel
- Pressure bypass valve – Brass/Aluminum

Maximum Temperature
- 230°F (110°C)

Pressure Bypass Valve
- Opening pressure – 51 PSI (3.5 BAR) ±10%
- Other opening pressures on request

Connection In/Out
- #12 SAE

Seals
- Standard NBR
- Optional FPM

Weight
- 4.0 LBS (1.8 KG)

Volume
- 0.21 gallons (0.81 liters)

Filter Housing Materials
- Head – Anodized Aluminum
- Housing – Anodized Aluminum
- Pressure bypass valve – Nylon

Maximum Temperature
- 230°F (110°C)

Pressure Bypass Valve
- Opening pressure – 51 PSI (3.5 BAR) ±10%
- Other opening pressures on request

Connection In/Out
- #24 SAE

Seals
- Standard NBR
- Optional FPM

Weight
- 7.7 LBS (3.5 KG)

Volume
- 0.40 gallons (1.5 liters)

Micron Filter Specifications

Filtration Media Composition

- Internal support mesh
- Filter media support
- Filtration media
- Prefilter media
- External support mesh

Compatibility with Fluids

The filter elements are compatible with:

- Mineral oils to ISO 2943-4
- Aqueous emulsions
- Synthetic fluids, water glycol

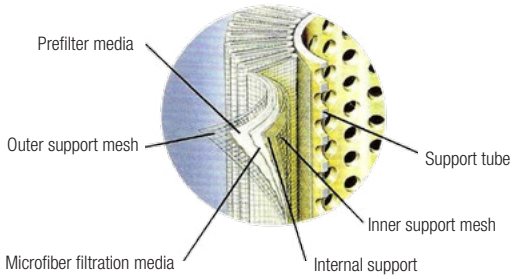
Seals, standard in NBR compatible with:

- Mineral oils to ISO 2943-4
- Aqueous emulsions
- Synthetic fluids, water glycol

FPM seals compatible with:

- Synthetic fluids type HS-HFDR-HFDS-HFDU to ISO 6743-4

Inorganic Microfiber



Multipass Test

In compliance with new ISO 16889 Standard
Contaminant ISO MTD

Value ß	2	10	75	100	200	1000*
Filtration efficiency	50%	90%	98.70%	99%	99.50%	99.90%

**TTP Standard*

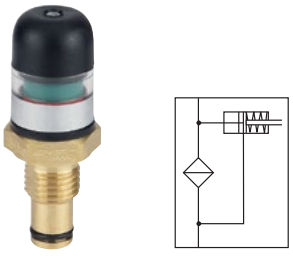
International Standards for Fluid Contamination Control

Components	Recommended Filtration								
Servo valves			●	●	●				
Proportional valves				●	●	●			
Variable displacement pumps					●	●	●		
Cartridge valves						●	●	●	
Piston pumps						●	●	●	
Vane pumps							●	●	●
Pressure/flow rate control valves							●	●	●
Solenoid valves							●	●	●
ISO code	12/10/7	13/11/8	14/12/9	15/13/10	16/14/11	17/15/12	18/16/13	19/17/14	20/18/15
NAS code	1	2	3	4	5	6	7	8	9
Absolute filtration recommended	3 micron				6 micron		10 micron*		>10 micron

**TTP Standard*

Filtration Indicators

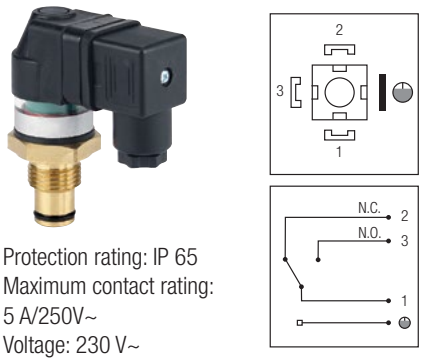
Visual "V"



- Cover and lens: nylon
- Visual indicator green: cartridge clean
- Visual indicator red: cartridge clogged
- Weight: 4.8 oz (136 g)
- Tightening torque: 70 FT-LBS (95 Nm)

Electrical/Visual "EV"

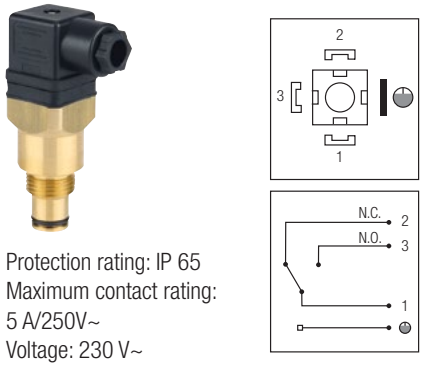
Connector EN 175301-803 A/ISO4400



- Protection rating: IP 65
- Maximum contact rating: 5 A/250V~
- Voltage: 230 V~
- Connector: DIN 43650 Microswitch contact
- Cable gland: PG 9
- Cover and lens: nylon
- Visual indicator green: cartridge clean
- Visual indicator red: cartridge clogged
- Weight: 6.6 oz (187 g)
- Tightening torque: 70 FT-LBS (95 Nm)

Electric "E"

Connector EN 175301-803 A/ISO4400



- Protection rating: IP 65
- Maximum contact rating: 5 A/250V~
- Voltage: 230 V~
- Connector: DIN 43650 Microswitch contact
- Cable gland: PG 9
- Weight: 6.5 oz (184 g)
- Tightening torque: 48 FT-LBS (65 Nm)

COL Series

CORE ASSEMBLY/ MOTOR

General Information

1. COL oil coolers are built for operation with maximum oil pressure of 250 PSIG (17.2 BAR) and temperatures of 300°F (148°C) without filter / 230°F (110°C) with filter. Maximum oil viscosity for P-BAR core is 150 cSt without filter / 95 cSt with filter. Maximum oil viscosity for T-BAR core is 320 cSt without filter / 95 cSt with filter.
2. The motors furnished are built for fan duty. Consideration should be given to the installation location so motors are not subjected to extreme temperatures or additional static pressure restrictions above that of the core.
3. Oil coolers are not to be operated in ambient temperatures below 35°F (1°C).
4. The fan cannot be cycled.
5. Coolers operated outdoors must be protected from weather. Consult factory for recommendations.
6. If the unit is to be stored for longer than 6 months, the unit should be oil flushed and all openings sealed with plastic plugs.

Installation

1. Air cooled oil coolers should not be located in corrosive atmospheres as rapid deterioration of fan shroud, cooling coil, fan and motor may take place.
2. The cooler should be mounted securely with its designed mounts.
3. Piping should be sized based on oil flow and pressure drop requirements, not on the oil cooler's supply and return connection sizes.
4. A filter located ahead of the oil cooler should be installed to trap dirt or sludge that may be present in piping and equipment, or that may accumulate with use.
5. A temperature controlled bypass valve is recommended for cold start-up. The bypass valve should be plumbed at the oil inlet to the unit in-order to function properly. Failure to plumb the bypass valve correctly could result in damage or failure of the unit.
6. Flexible connectors should be installed to prevent the stressing of manifolds. (Must be properly installed to validate warranty)
7. For proper air flow, a minimum of 12" (305mm) should be allowed between the oil cooler fan and any walls or obstructions. Sufficient ventilation is required in closed areas.

Electrical

1. Use CAUTION to prevent possible electrical shock, it is important to make sure this unit is properly grounded.
2. Connect motor only to a power supply of the same characteristics as shown on the motor nameplate. Be sure to provide proper fusing to prevent possible motor burnout. Before starting motor, follow manufacturer's recommendations. Turn fan manually to eliminate possible motor burnout in the event the fan has been damaged in shipment. Observe operation after motor is started for the first time.

Maintenance

Inspect the unit regularly for loose bolts and connections, rust and corrosion, and dirty or clogged heat transfer surfaces (cooling coil).

Heat Transfer Surface

Dirt and dust should be removed by brushing the fins and tubes and blowing loose dirt off with an air hose. Should the surface be greasy, the motor should be removed and the fins and tubes brushed or sprayed with a non-flammable degreasing fluid. Follow with a hot water rinse and dry thoroughly. A steam hose may also be used effectively.

Do not clean with caustic cleaners. Only cleaners compatible for use with aluminum are to be used.

Fan Shroud, Fan and Motor

Dirt and grease should be removed from these parts. Rusty or corroded surfaces should be sanded clean and repainted.

Internal Cleaning

Once a year piping should be disconnected and a degreasing agent or flushing oil circulated through the unit to remove sludge from turbulators and internal tube surfaces to return the unit to full capacity. **Do not clean with caustic cleaners.** Only cleaners compatible for use with aluminum are to be used. A thorough cleaning of the entire system in the same manner is preferable to avoid carry-over from uncleaned piping, pump and accessories. The strainer of any filtering devices should be removed and serviced following this cleaning operation.

Motor

Keep outside surface free of dirt and grease so motor will cool properly. All motors use sealed shaft bearings. As a result, they do not require greasing.

Repair or Replacement of Parts

When ordering replacement parts or making inquiry regarding service, mention model number, serial number and the original purchase order number. Any reference to the motor must carry full nameplate data.

FILTER

Installation

- Check that the pressure value of the selected filter is higher than the system's maximum operating pressure (the maximum pressure value is shown on the data plate).
- Check that the filter body contains the filter cartridge.
- Check that the operating fluid is compatible with the material of the body, cartridge, and seals.
- Secure the filter using the relevant threaded holes, to rigid brackets. Rigid installation makes it possible to unscrew the housing without introducing flexing of the hydraulic fittings, limiting any points of stress transfer. Install the filter in an accessible position for correct and trouble-free maintenance and visibility.
- Start the machine and check for the absence of oil leaks from the filter and relative fittings.
- Repeat the visual inspection when the system arrives at the operating temperature of the oil.

Maintenance

- All maintenance operations must be performed only by suitably trained personnel.
- The hydraulic system must be depressurized before performing maintenance operations (except in the case of LMD duplex filters)
- Maintenance must be carried out using suitable tools and containers to collect the fluid contained in the filter body. Spent fluids must be disposed of in compliance with statutory legislation.
- Do not use naked flames during maintenance operations.
- Use the utmost caution in relation to the temperature of the fluid. High temperatures can lead to residual pressure with resulting undesirable movements of mechanical parts.

Changing the Filter Element

- The date on which the filter elements are changed must be entered in the machine data sheet.
- Spare parts installed must be in compliance with the specifications given in the machine operating and maintenance manual.
- Filter bodies and tools must be thoroughly cleaned prior to each maintenance operation.

- After having opened the filter to change the filter element, check the condition of the seals and renew them if necessary. Clean thoroughly before reassembling.

Changing the Filter Procedure

- Depressurize the system and clean the filter.
- Unscrew the oil drain plug collecting the fluid in a suitable container. When the operation is terminated, screw the plug by tightening it fully down and check the condition of the seal. Unscrew housing using the appropriate tools and extract the filter element.
- Collect the spent oil and cartridge in a suitable container and dispose of them in compliance with statutory legislation
- ***WARNING!*** To avoid damaging the components, clean seals, surfaces, and threads of the housing and the head.
- Lubricate the filter element seal with the operating fluid. Insert the filter element in the filter housing. Insert the cartridge in the head spigot.
- Check the condition of seals if renewing, lubricate the new seals with the operating fluid before installing.
- Screw the housing onto the head using the correct tool. WARNING: Screw the housing fully home into the head "DO NOT APPLY EXCESSIVE TIGHTENING TORQUE".
- Start the machine and check for the absence of leaks. Repeat the check when the machine has reached its operating temperature.

PUMP

Corrosion

Fretting: To reduce the corrosion due to fretting effect we recommend to grease the motor shaft with dedicated products (samples: lubricants based on MoS2, Loctite® 8008, Molykote® G-n plus, Turmopast® MA2).

Fretting: To reduce the corrosion due to fretting effect, we recommend to check the electric motor ground connection and to check that the shaft residual currents are within the norms.

Leakage Prevention: In case of wear of shaft seal to avoid leakage, all pump flanges with hallow shaft have a threaded ¼" GAS thread that can be used for drainage connection to the tank

Piping/Valves

- Piping connected to pump MUST be independently supported and not allowed to impose strains on pump casing including allowing for expansion and contraction due to pressure and temperature changes.
- To prevent foaming and air entrainment, all return lines in re-circulating systems should end well below liquid surface in reservoir. Bypass liquid from relief pressure and flow control valves should be returned to source (tank, reservoir, etc.), NOT to pump inlet line.
- Shut-off valves should be installed in both the suction and discharge lines so pump can be hydraulically isolated for service or removal. All new piping should be flushed clean before connecting to pump
- **Pipe strain will distort a pump. This could lead to pump and piping malfunction or failure.**
- **Return lines piped back to pump can cause excessive temperature rise at pump which could result in catastrophic pump failure.**
- Use relief valves to protect pumps from overpressure. They need to be connected to pump discharge lines as close to pumps as possible and with no other valves between pumps and relief valves. Relief valve settings should be set as low as practical.
- DO NOT set relief valve higher than maximum pressure rating of pump, including pressure accumulation at 100% bypass. Relief valve return lines should NOT be piped into pump inlet lines because they can produce a loop that will overheat pump. This pump is a positive displacement type. It will deliver (or attempt to deliver) flow regardless of back-pressure on unit. Failure to provide pump overpressure protection can cause pump or driver malfunction and/or rupture of pump and/or piping.

Suction Line/ Suction Strainer/Filter

- The suction line should be designed so pump inlet pressure, measured at pump inlet flange, is greater than or equal to the minimum required pump inlet pressure (also referred to as Net Positive Inlet Pressure Required or (NPIPR). Velocity in suction line should be kept within 1.6-4 ft/s (0,5-1,2 m/s). Suction line length should be as short as possible and equal to or larger than pump's inlet size. All joints in suction line must be tight and sealed. If pump cannot be located below liquid level in reservoir, it necessary either to position the suction or install a foot valve so liquid cannot drain from pump while it is shut down. When pump is mounted vertically with drive shaft upward, or mounted horizontally with inlet port opening other than facing upward, a foot valve or liquid trap should be installed in suction line to prevent draining. The suction line should be filled before pump start-up.
- **DO NOT operate the pump without liquid or under severe cavitation**
- Pump life is related to liquid cleanliness. Suction strainers or filters should be installed in all systems to prevent entry of large contaminants into pump.
- The purpose of a suction strainer or filter is for basic protection of internal pumping elements. It should be installed immediately ahead of inlet port. This location should provide for easy cleaning or replacement of strainer element. Appropriate gages or instrumentation should be provided to monitor pump pressure. Pressure drop across a dirty strainer must not allow inlet pressure to fall below NPIPR. The pressure drop across the strainer should preferably not exceed 1.45 PSIG (0.1 BAR) at maximum flow rate and normal operating viscosity. General guidelines for strainer sizing are as follows:
  - When pumping relatively clean viscous liquids (over 1000 cSt), use 10 to 12 mesh screens or those with about 1/16 inch (1,5mm) openings.
  - When pumping relatively clean light liquids such as distillate fuels, hydraulic oil and light lube oils, use suction strainers of 100 to 200 mesh.
  - When pumping heavy crude oils, use 5 to 6 mesh strainer screens or those with or about 1/8 inch (3mm) openings.
  - When pumping relatively clean distillate fuels in high pressure fuel supply systems, use 25 micron "absolute" filters for three screw pumps and 10 micron "absolute" filters for gear pumps.
  - Make sure size/capacity of strainer or filter is adequate to prevent having to clean or replace elements too frequently.

Gauges

Pressure and temperature gauges are recommended for monitoring the pump's operating conditions. These gauges should be easily readable and placed as close as possible to pump's inlet and outlet flanges

Pumped Liquids

NEVER operate a pump with straight water (water/glycol is okay). The pump is designed for liquids having general characteristics of oil. In closed or re-circulating systems, check liquid level in tank before and after start-up to be sure it is within operating limits. If initial liquid level is low, or if it drops as system fills during start-up or pumping operations, add sufficient clean liquid to tank to bring liquid to its normal operating level. Only use liquid recommended or approved for use with the equipment. Regular checks should be made on the condition of the liquid. In closed systems, follow supplier's recommendations for maintaining liquid and establishing when liquid is to be changed. Be sure temperature is controlled so liquid cannot fall below its minimum allowable viscosity which occurs at its maximum operating temperature. Also, ensure that maximum viscosity at cold start-up does not cause pump inlet pressure to fall below its minimum required value.

NEVER operate a pump without liquid in it!

Operate only on liquids approved for use with pump.