API HEAT TRANSFER

PERFORMANCE IS EVERYTHING

CONTENTS

This package of information about API Heat Transfer products and solutions was made especially for you based on your unique heat transfer needs. **If there's anything you'd like to add, visit apiheattransfer.com or call your API Heat Transfer contact today.**

CONTENTS

AOC Series

Thermal Transfer Products Copper Tube and Fin Mobile Hydraulic Oil Coolers

API Heat Transfer's full line of Thermal Transfer Products standard mobile oil coolers is proven to stand-up in some of the toughest off-road environments. Our oil coolers are available with a wide variety of standard options to best suit each application and offer maximum performance.

Copper Tube and Fin Product Highlights

Aluminum or Steel fins available

Up to +100 HP of heat removal from hydraulic oil

Cost effective, industry proven designs

Large range of standard sizes

Standard Product Options

12 or 24 volt DC fans

Hydraulic fan motor drive

Built-in pressure bypass (30 or 60 psi for cold start-up)

Heresite coating for offshore or corrosive environment operation

Customer Focused and Driven

All catalog product is available with short lead-times

Expert application engineers available to select and size the right product for your application

Custom designs are available

Industry Applications

Our oil coolers are used in a wide variety of mobile applications across the globe.

Commercial duty lawnmowers

Municipal street cleaners

Hydrostatic drives

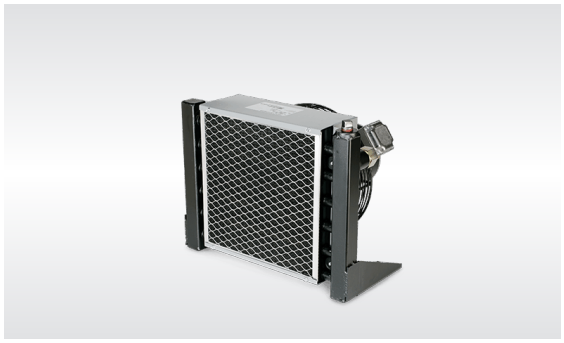
Tow-behind compressor lube cooling

Construction equipment

Underground mining

Engine oil cooling

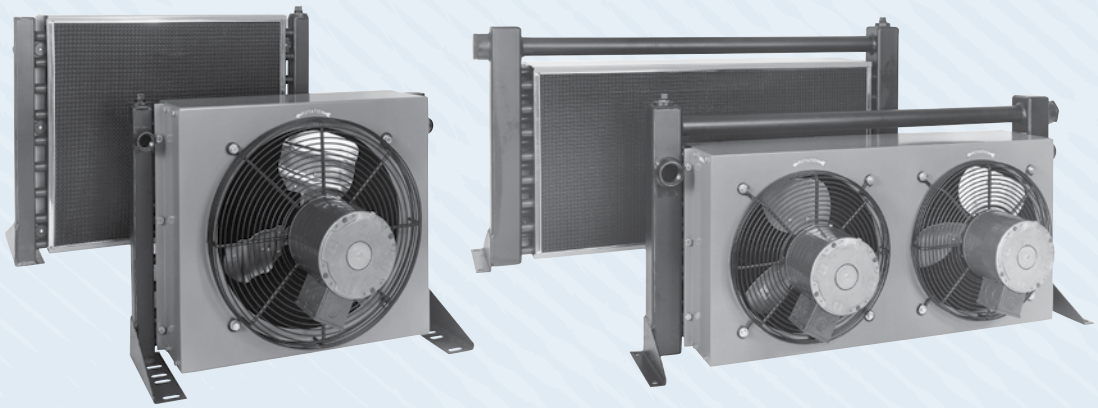
For application help and quoting, visit our Full TTP site or contact ttpsales@apiheattransfer.com.



FEATURES

- **AC Motors**
- **Core Filter**
- **3/4" Tubes**
- **Low Cost**
- **Industrial Duty**
- **Quiet Operation**
- For Low Flow Rates
- Oil Flows to 150 GPM
- Mounting Brackets Included
- SAE Connections
- Single or Three-Phase 60/50 Hz Motors
- Filter Standard

OPTIONS
Built-in Serviceable Bypass Valve;
NPT or BSPP Oil Connections



Ratings

Operating Pressure - 300 psi

Test Pressure - 300 psi

Operating Temperature - 350° F

Materials

Tubes Copper

Fins Aluminum

Turbulators Aluminum

Fan Blade Aluminum with steel hub

Fan Guard Steel with black baked enamel finish

Cabinet Steel with baked enamel finish

Manifolds Copper: Model AOC-08
Steel: Models AOC-19 – AOC-70

Connections Brass: Model AOC-08
Steel: Models AOC-19 – AOC-70

Nameplate Aluminum

Filter Stainless frame with washable media

Relief Bypass Valve Option

MODEL	DESCRIPTION
AOC-08	Available in one pass (30 and 60 psi), two pass (60 psi), designs only. Valves are built into tubes and do not affect external dimensions. All steel valves. Non-serviceable.
AOC-19 thru AOC-33	Available in 30 psi or 60 psi settings. 3/4", external, all steel valve. May be removed for servicing.
AOC-37 Thru AOC-70	Available in 30 psi or 60 psi settings. 1-1/2", external, all steel valve. May be removed for servicing.

How to Order (AOC-08 models only)

AOC	–	0	8	–			–		–	
Model Series		Model Size Selected			Number of Passes	Connection Type		Relief Bypass*		Specify Motor Required

Model Series
AOC - Standard

Model Size Selected

Number of Passes
1 - One Pass
2 - Two Pass
4 - Four Pass

Connection Type
1 - NPT
2 - SAE
3 - BSPP

Relief Bypass*
Blank - No Bypass
30 - 30 psi
60 - 60 psi

Specify Motor Required
115/230V Single Phase
No Motor

*Bypass not available in Four Pass

How to Order (Models AOC-19 through AOC-70)

AOC	–			–		–		–	
Model Series		Model Size Selected			Connection Type		Relief Bypass		Specify Motor Required

Model Series
AOC - Standard

Model Size Selected

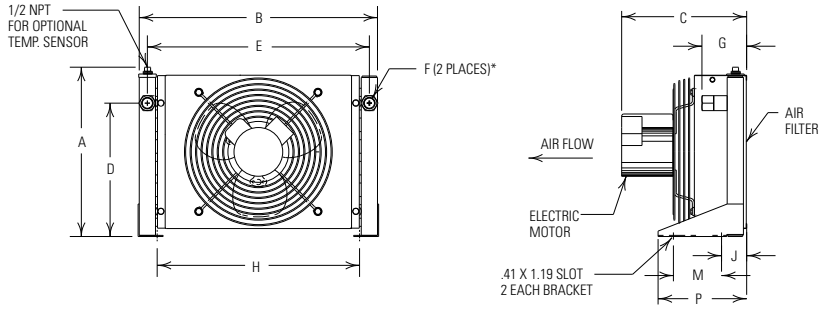
Connection Type
1 - NPT
2 - SAE
3 - BSPP

Relief Bypass
Blank - No Bypass
30 - 30 psi
60 - 60 psi

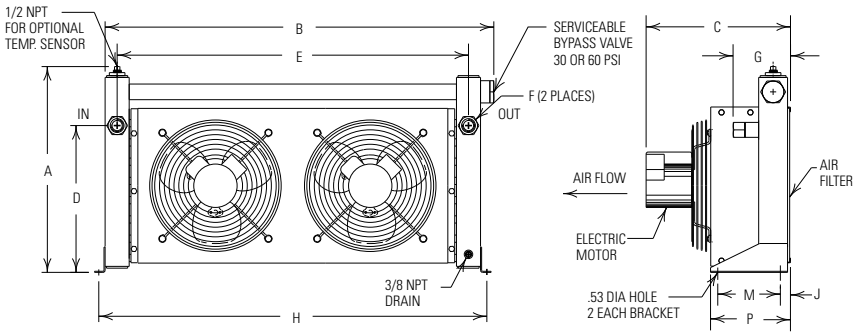
Specify Motor Required
115/230V Single Phase
208-230/460V Three Phase
575 Volt
No Motor

Dimensions

Models AOC-19 Through AOC-33



Models AOC-37 Through AOC-70



Model	A		B		C	D	E	F		G		H	J	M	P	LBS	60 Hz CFM
	No Bypass	Bypass	No Bypass	Bypass				SAE	NPT & BSPP	SAE	NPT & BSPP						
AOC-19	13.62	16.00	16.50	18.16	13.08	10.31	15.00	#12	.75	3.05	4.12	13.96	2.61	5.00	8.18	19	750
AOC-22	15.62	18.00	22.00	23.66	12.19	12.31	20.50					19.46				33	1150
AOC-24	19.62	22.00	24.75	26.41	13.19	16.31	23.25					22.21				46	1900
AOC-33	25.62	28.00	30.25	31.91		22.31	28.75	#16	1.00		4.34	27.71				65	2150
AOC-37	18.50	21.38	39.00	40.38	15.66	15.25	36.50	#20	1.25	4.62	5.97	40.50	1.06	6.50	8.31	95	2150
AOC-50	22.50	25.38	41.00	42.38	15.62	19.25	38.50			4.68	6.03	42.50	1.12		8.37	120	3200
AOC-54	30.50	33.28	42.00	43.38	17.09	27.25	39.50	#24	1.50	4.89	6.30	43.76	1.87	9.00	12.37	154	3800
AOC-57	36.50	39.38	48.00	49.38	16.72	32.75	45.50	#32	2.00	6.68	8.15	49.76				190	4200
AOC-70	38.38	41.25	51.00	52.38	22.62	34.00	48.50			8.44	9.91	52.75	1.62		12.12	322	7500

NOTE: All dimensions in inches. We reserve the right to make reasonable design changes without notice.
**Inlet and outlet oil ports reversible if relief bypass option is not used.*

Specifications

Electric Motor Data

MODEL	MOTOR POWER	# OF MOTORS	FRAME SIZE	SINGLE PHASE	THREE PHASE	575 VOLT	RPM	TYPE	B-BALL S-SLEEVE	THERMAL OVERLOAD	dB(A) 3 FT.
AOC-19 thru AOC-33	1/4	1	Custom	115/230V/60/50Hz 3.2/1.6 Amps Full Load 60 Hz 2.8/1.4 Amps Full Load 50 Hz	208-230/460V/60 Hz 190/380-415V/50 Hz 1.3/.65 Amps Full Load 60 Hz 1.1/.55 Amps Full Load 50 Hz	575/500V/60/50Hz .65 Amps Full Load 60 Hz .60 Amps Full Load 50 Hz	1700 (60 Hz) 1350 (50 Hz)	TEAO	B	YES	80
AOC-37 thru AOC-57		2									84
AOC-70	1		56C	115/208-230V/60 Hz 12.8/6.4 Amps Full Load	208-230/460V/60 Hz 190/380-415V/50 Hz 3.4/1.7 Amps Full Load 60 Hz 3.6/1.9 Amps Full Load 50 Hz	575/500V/60/50Hz 1.5 Amps Full Load 60 Hz 1.4 Amps Full Load 50 Hz	1725 (60 Hz) 1425 (50 Hz)	TEFC	B	NO	90

NOTE: Amp ratings are per motor.

Selection Procedure

Performance Curves are based on 50SSU oil leaving the cooler 40°F higher than the ambient air temperature used for cooling.This is also referred to as a 40°F approach temperature.

STEP 1 **Determine the Heat Load.**This will vary with different systems, but typically coolers are sized to remove 25 to 50% of the input nameplate horsepower.
(Example: 100 HP Power Unit x .33 = 33 HP Heat load.)
If BTU/Hr. is known: $HP = \frac{BTU/Hr}{2545}$

STEP 2 **Determine Approach Temperature.** Desired oil leaving cooler °F – Ambient air temp. °F = Actual Approach

STEP 3 **Determine Curve Horsepower Heat Load.** Enter the information from above:
Horsepower heat load x $\frac{40 \times Cv}{\text{Actual Approach}}$ = Curve Horsepower

STEP 4 **Enter curves** at oil flow through cooler and curve horsepower. Any curve above the intersecting point will work.

STEP 5 **Determine Oil Pressure Drop from Curves:**
● = 5 PSI; ■ = 10 PSI; ▲ = 20 PSI; ✛ = 40 PSI. Multiply pressure drop from curve by correction factor found in oil △P correction curve.

Desired Reservoir Temperature

Return Line Cooling: Desired temperature is the oil temperature leaving the cooler. This will be the same temperature that will be found in the reservoir.

Off-Line Recirculation Cooling Loop: Desired temperature is the oil temperature entering the cooler. In this case, the oil temperature change must be determined so that the actual oil leaving temperature can be found. Calculate the oil temperature change (oil △T) with this formula:
Oil △T = (BTU's/Hr.) / (GPM Oil Flow x 210).
To calculate the oil leaving temperature from the cooler, use this formula:
Oil Leaving Temp. = Oil Entering Temp – Oil △T.
This formula may also be used in any application where the only temperature available is the entering oil temperature.

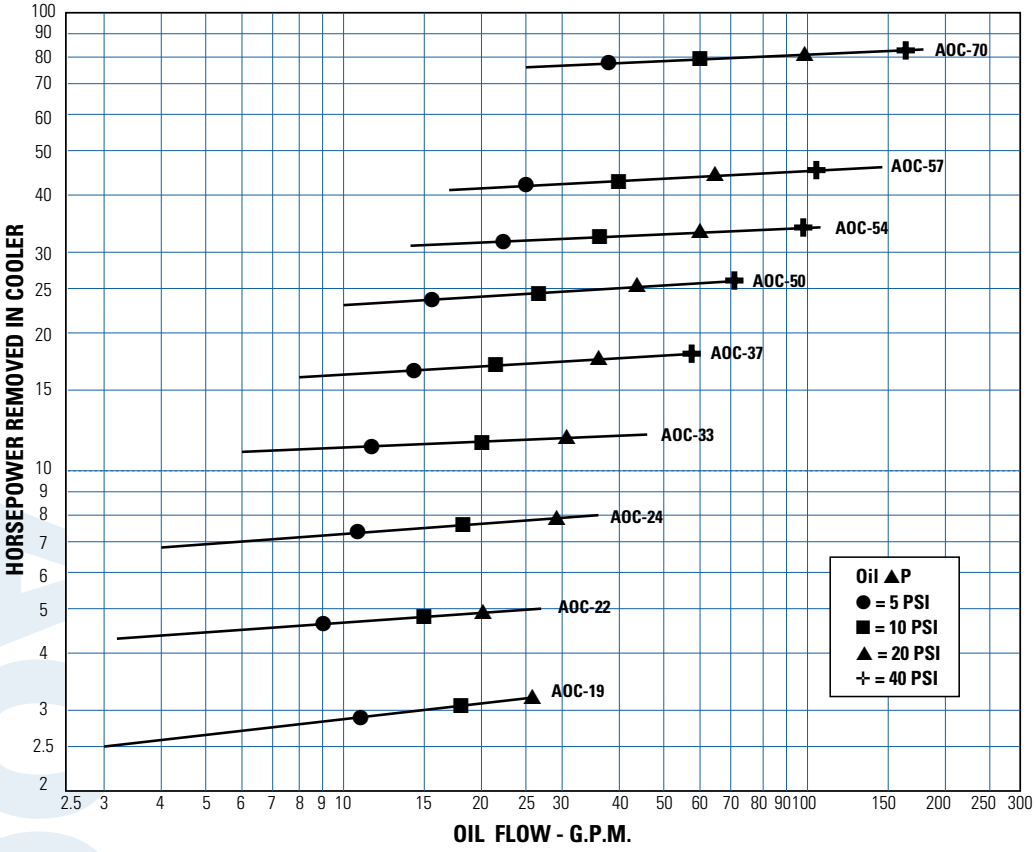
Oil Pressure Drop: Most systems can tolerate a pressure drop through the heat exchanger of 20 to 30 PSI. Excessive pressure drop should be avoided. Care should be taken to limit pressure drop to 5 PSI or less for case drain applications where high back pressure may damage the pump shaft seals.

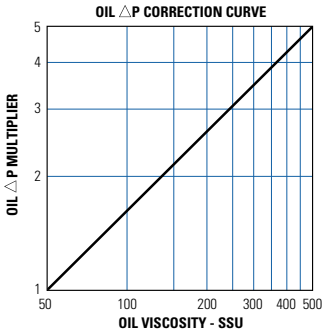
Oil Temperature

Typical operating temperature ranges are:

Hydraulic Motor Oil	110° - 130°F
Hydrostatic Drive Oil	130° - 180°F
Bearing Lube Oil	120° - 160°F
Lube Oil Circuits	110° - 130°F

Performance Curves





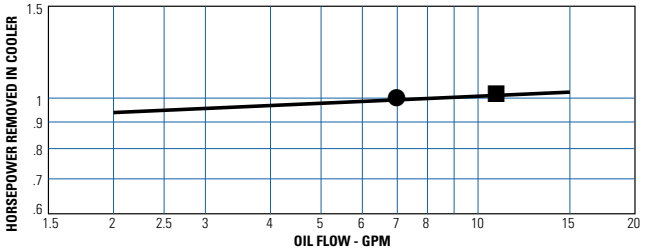
De-rate cooler performance by 10% when used in 50Hz service.

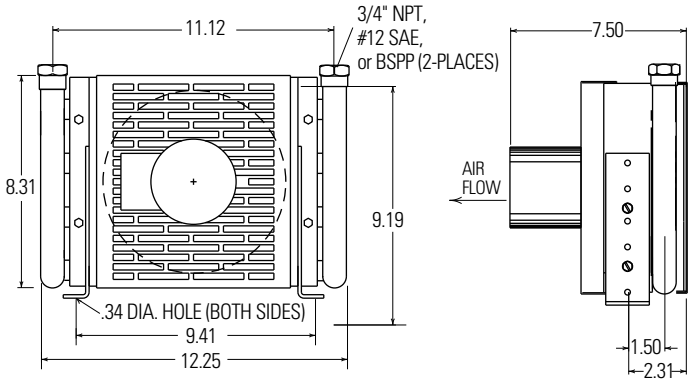
C_V Viscosity Correction

Average Oil Temp °F	OIL SAE 5 110 SSU at 100°F 40 SSU at 210°F	SAE 10 150 SSU at 100°F 43 SSU at 210°F	SAE 20 275 SSU at 100°F 50 SSU at 210°F	SAE 30 500 SSU at 100°F 65 SSU at 210°F	SAE 40 750 SSU at 100°F 75 SSU at 210°F
100	1.14	1.22	1.35	1.58	1.77
150	1.01	1.05	1.11	1.21	1.31
200	.99	1.00	1.01	1.08	1.10
250	.95	.98	.99	1.00	1.00

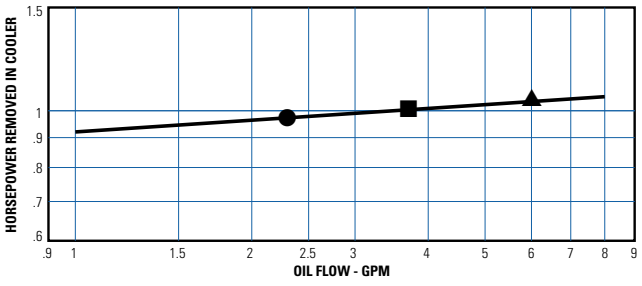
AOC-08 Model Only

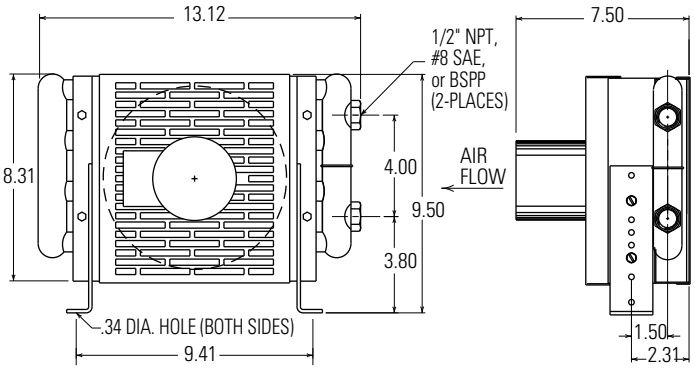
One Pass



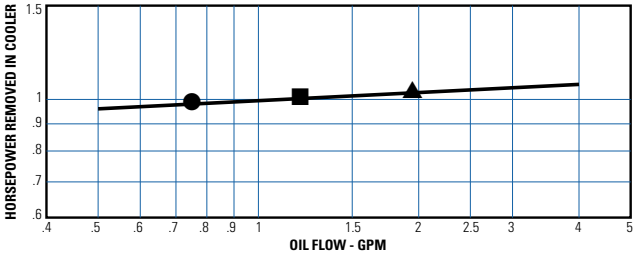


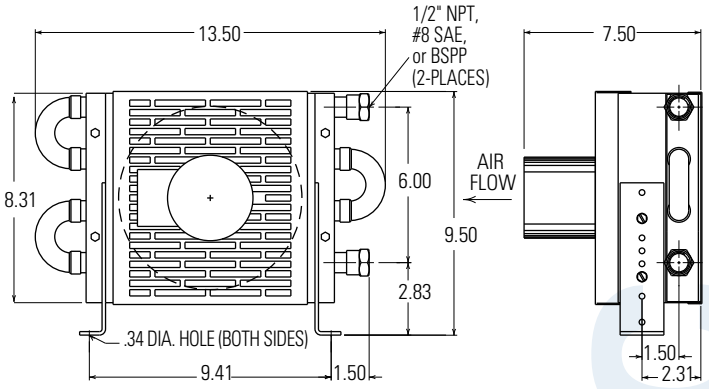
Two Pass





Four Pass





Specifications

Electric Motor Data

Model	MOTOR POWER	115/230 VOLT	50/60 Hz	TYPE	RPM	BEARINGS B-BALL S-SLEEVE	THERMAL OVERLOAD	SHIPPING WEIGHT (lbs.)	dB(A) 3 FT.	CFM
AOC-08	1/30	115 VOLT 230 VOLT	1.1 Amps Full Load .7 Amps Full Load	TEAO	3000	S	YES	12	70	208

BP/BPS/BPCH Series

TTP Industrial Hydraulic Oil Coolers

Our full line of standard catalog industrial hydraulic oil coolers are offered by TTP, an API Heat Transfer company.

For application help and quoting, **visit our full TTP website** or contact **ttpsales@apiheattransfer.com**.

Air to Oil Cooling

Up to +500 HP of heat removal from hydraulic oil

Round tube copper, brass or steel

Brazed aluminum plate & bar (P-BAR™)

Extruded aluminum tube (T-BAR™)

Aluminum/steel fin construction

All aluminum brazed

Water to Oil Cooling

Steel, copper, copper/nickel, or stainless steel construction

Brazed plate construction

Internal fins

Diameters up to 10 inches

Lengths up to 12 feet

Product Options

Brass construction

Steel construction

Internal finned construction

Brazed plate construction

Internal bypass

Seawater service

Applications

Hydraulic presses

Plastic injection molding

Lube oil coolers

Extrusion machinery

Gear boxes

Hydraulic power units

And more.

Thermal Transfer Products

An API Heat Transfer Company

2014

Brazed Plate Heat Exchangers for Fluid Power Applications

BPSeries

We COOL what you POWER

thermaltransfer.com ttpsales@apiheattransfer.com

BP Series

Our BP Series heat exchangers are rugged, compact, cost-effective and reliable over long periods of time with minimal maintenance – an optimal heat transfer solution for compact industrial applications.

316 stainless steel construction and standard SAE connections are features of this highly efficient technology. The compact design and multiple mounting options lead to optimization of heat transfer when space is limited. High plate channel turbulence means effective performance even with close approach temperatures. Our wide offering of standard models ensures fast delivery worldwide. Custom applications always welcome!

Standard **BPSW** Series:
full featured with short lead time

Made to Order **BPW** Series:
customized solutions

A BP Series heat exchanger is one of the most efficient ways to transfer heat today.

SIZE
Design options for heat transfer applications sensitive to weight and space claim can now include the BP Series.

REDUCED HEAT EXCHANGER FLUID VOLUMES
BP Series units hold a minimal volume of fluids. This feature favorably affects material content and overall system footprint.

MATERIAL BENEFIT
BP Series units are gasket-free allowing approximately 95% of the heat exchanger surface to be in effective contact with fluids

PERFORMANCE
High flow turbulence in plate channels brings the benefit of efficient heat transfer even when hot / cold fluid temperature difference is minimal (close approach temperature).

STANDARD MODELS AND CUSTOMIZED SOLUTIONS
A wide offering of standard BPSW models means short lead times and fast delivery worldwide. Our BPW Series offers customized solutions for your specific applications.

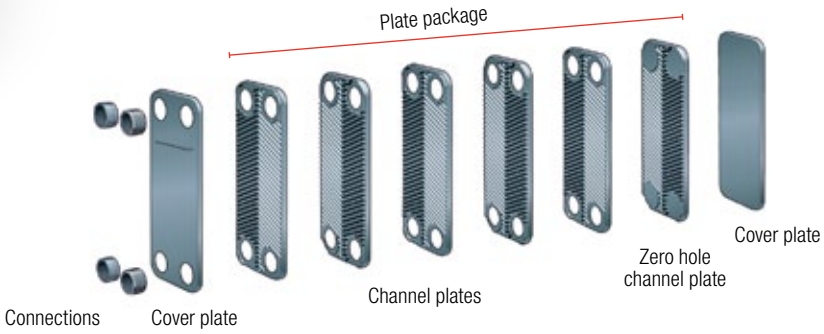
EFFICIENCY ON A GLOBAL SCALE
BP Series units have global applications in demanding, compact applications. Efficient performance is the product of focused research and development activities. 40+ years of engineering experience stands behind all solutions offered by Thermal Transfer Products.

APPROVALS
TTP BP Series heat exchangers are approved by leading independent third-party international bodies:

- **Canada:** Canadian Standard Association (CSA)
- **Japan:** The High Pressure Gas Safety Institute of Japan (KHK)
- **USA:** Underwriters Laboratories (UL)
- **Europe:** Pressure Equipment Directive (PED)

Brazed Plate Heat Exchangers Explained

A brazed plate heat exchanger is constructed as a series of corrugated channel plates stacked between front and rear cover plates. The cover plates can be configured with sealing plates or with blind rings. Connections are mounted on the cover plates and can be customized to meet specific market and application requirements. During the vacuum brazing process, a brazed joint is formed at every contact point between the base and the filler material. This design creates a heat exchanger with two separate channels or circuits.



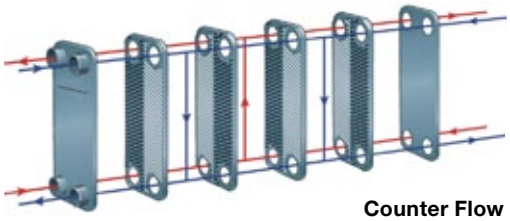
Sealing plates are used to seal off the space between the cover plate and the first and last channel plates. The number of cover plates varies with the type and size of the exchanger and pressure rating. Some brazed plate heat exchangers have a blind ring to seal off the space between the channel plate and the cover plate. In others, the blind rings are integrated in the cover plate and first/last channel plates.

Plates and Channel Types

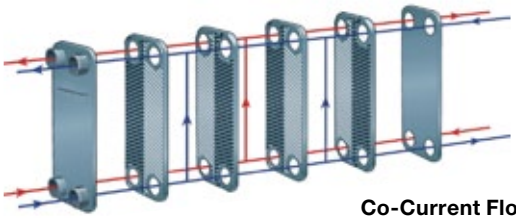
Brazed plate heat exchangers are also available with optional variation in channel plate corrugation within one unit. This feature can bring benefits to hydraulic and thermal performance. As an example, one heat exchanger can have equal pressure drop for both channels even with different flow rates in each.

Fluids can pass through the heat exchanger in different ways. Flow configurations are either:

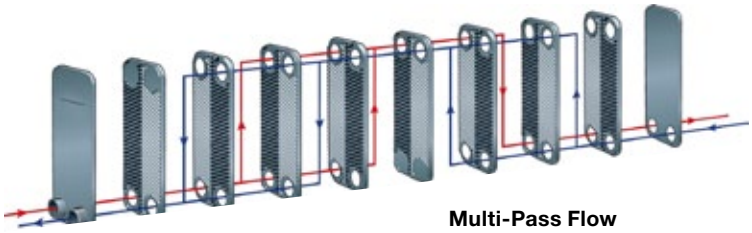
- **Counter Flow** - standard plumbing method for typical opposing flow paths
- **Co-Current Flow** - configurable by plumbing for same direction flow paths
- **Multi-Pass Flow** - BPW only, custom plate configuration to allow oil to flow multiple passes in cooler, Ideal for low flow applications



Counter Flow



Co-Current Flow



Multi-Pass Flow

BPSW Series - Standard Model

STAINLESS STEEL CONSTRUCTION

Features

- **Short Lead Time**
- **Stacked Plate**
- **Stainless Steel**
- **Copper Brazed**
- **Oil to Water Applications**
- **High Performance**
- **Compact Design**
- **SAE Connections**
- Corrosion Resistant Type 316 Stainless Steel Plates
- Mounting Studs Standard (except 8x3 plates)
- SAE Oil Connections, NPT Water Connections
- Optional Foot Mounting Bracket (except 8x3 plates) SEE PAGE 13

Ratings

Maximum Working Pressure 450 psi

Test Pressure 650 psi

Minimum Working Temperature -320ºF

Maximum Working Temperature 437ºF

Materials

Plate Material - Fluid Contact
316 Stainless Steel

Braze Material Copper

Connectors 316 Stainless Steel

Stud Bolts 304 Stainless Steel

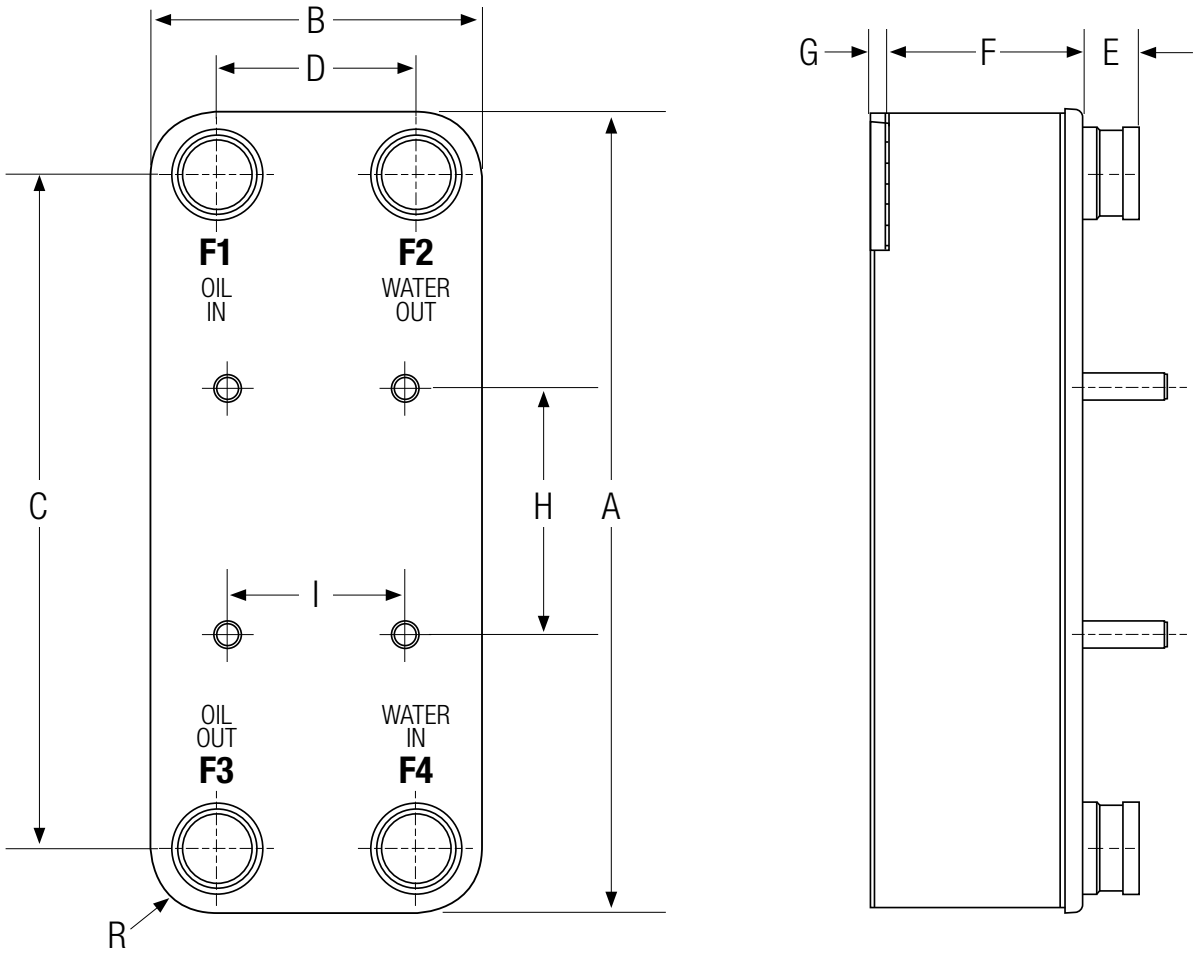
Foot Mounting Bracket Carbon Steel

How to Order

BPSW	–		–	
Model Series BPSW		**Number of Plates**		**Plate Size**

Option
Foot Mounting Brackets
(ordered as a separate item)

Part No.	Plate Size
56839	12x5
56840	20x5
56841	15x5
56842	15x10
56843	20x10
56844	28x10

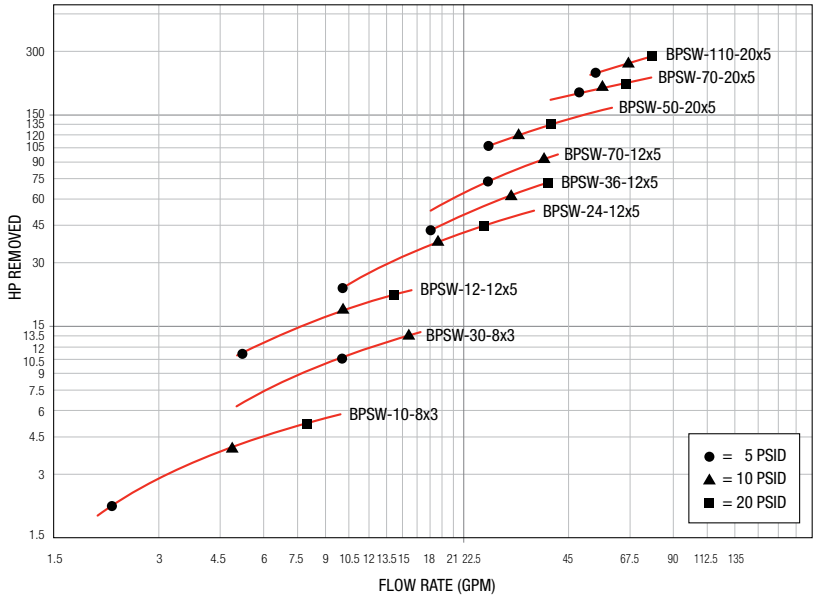


Model	A	B	C	D	E	F	G	F3, F1	F2, F4	H	I	Stud Bolt Thread	Stud Bolt Length	R	Net Weight (lbs)
BPSW-10-8x3	7.6	2.98	6.06	1.57	0.79	1.04	0.28	#10 SAE	¾" NPT	NA	NA	NA	NA	0.70	2.05
BPSW-30-8x3	7.6	2.98	6.06	1.57	0.79	2.80	0.28	#10 SAE	¾" NPT	NA	NA	NA	NA	0.70	3.99
BPSW-12-12x5	11.4	4.69	9.57	2.83	1.78	1.21	0.24	#12 SAE	¾" NPT	5.51	2.36	M8	0.76	0.90	5.60
BPSW-24-12x5	11.4	4.69	9.57	2.83	1.78	2.27	0.24	#12 SAE	¾" NPT	5.51	2.36	M8	0.76	0.90	8.14
BPSW-36-12x5	11.4	4.69	9.57	2.83	1.78	3.33	0.24	#20 SAE	1¼" NPT	5.51	2.36	M8	0.76	0.90	10.68
BPSW-70-12x5	11.4	4.69	9.57	2.83	1.78	6.32	0.24	#20 SAE	1¼" NPT	5.51	2.36	M8	0.76	0.90	17.87
BPSW-50-20x5	20.7	4.69	18.5	2.48	1.07	4.56	0.24	#20 SAE	1¼" NPT	8.86	2.36	M8	1.19	0.90	23.04
BPSW-70-20x5	20.7	4.69	18.5	2.48	1.07	6.32	0.24	#20 SAE	1¼" NPT	8.86	2.36	M8	1.19	0.90	30.28
BPSW-110-20x5	20.7	4.69	18.5	2.48	1.07	9.84	0.24	#20 SAE	1¼" NPT	8.86	2.36	M8	1.19	0.90	44.74
BPSW-50-15x5	14.8	4.69	12.6	2.48	1.07	4.56	0.24	#20 SAE	1¼" NPT	8.86	2.36	M8	0.79	0.90	17.04
BPSW-90-15x5	14.8	4.69	12.6	2.48	1.07	8.08	0.24	#20 SAE	1¼" NPT	8.86	2.36	M8	0.79	0.90	27.62
BPSW-130-15x10	15.5	9.57	12.76	6.85	1.07	12.28	0.12	#24 SAE	1½" NPT	5.51	3.94	M12	0.75	1.38	112.85
BPSW-200-15x10	15.5	9.57	12.76	6.85	1.07	18.72	0.12	#24 SAE	1½" NPT	5.51	3.94	M12	0.75	1.38	165.32
BPSW-24-20x10	20.7	9.57	17.95	6.85	1.07	2.55	0.16	#24 SAE	1½" NPT	5.51	3.94	M12	1.53	1.38	44.02
BPSW-50-20x10	20.7	9.57	17.95	6.85	1.07	4.89	0.16	#24 SAE	1½" NPT	5.51	3.94	M12	1.53	1.38	67.17
BPSW-80-20x10	20.7	9.57	17.95	6.85	1.07	7.59	0.16	#24 SAE	1½" NPT	5.51	3.94	M12	1.53	1.38	93.89
BPSW-90-28x10	27.3	9.57	23.62	5.83	2.13	8.73	0.04	2½" SAE Flg	2½" NPT	12.13	3.94	M12	1.53	1.89	148.24
BPSW-130-28x10	27.3	9.57	23.62	5.83	2.13	13.11	0.04	2½" SAE Flg	2½" NPT	12.13	3.94	M12	1.53	1.89	198.24

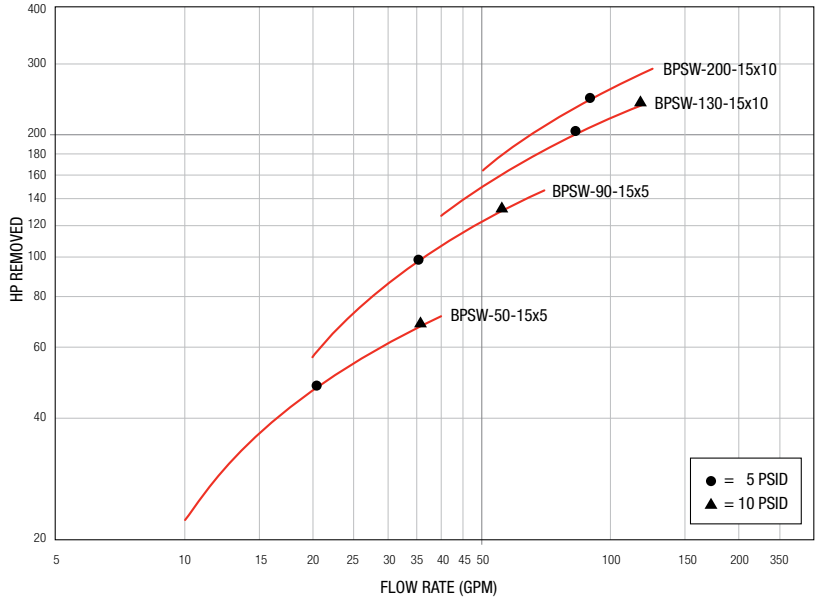
All dimensions are inches, unless noted otherwise.
Note: We reserve the right to make reasonable design changes without notice.

Performance Curves

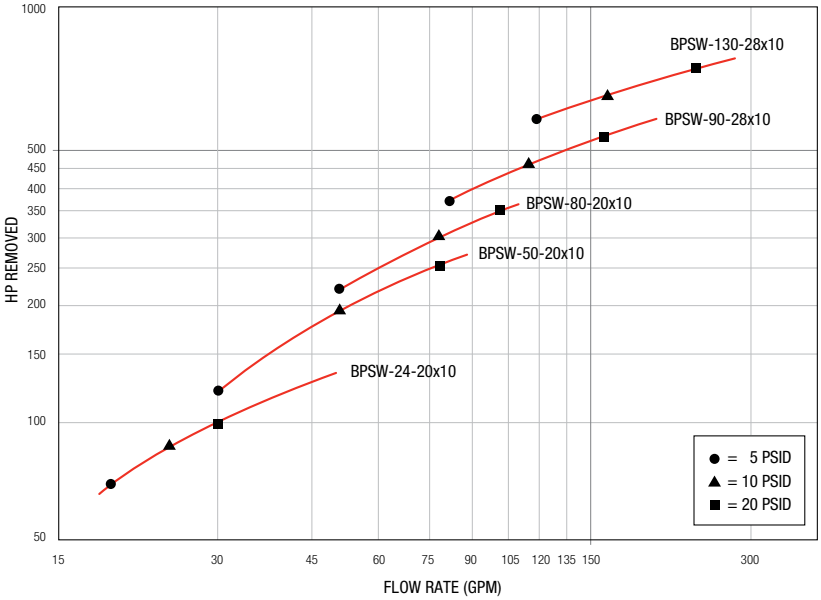
Low Flow



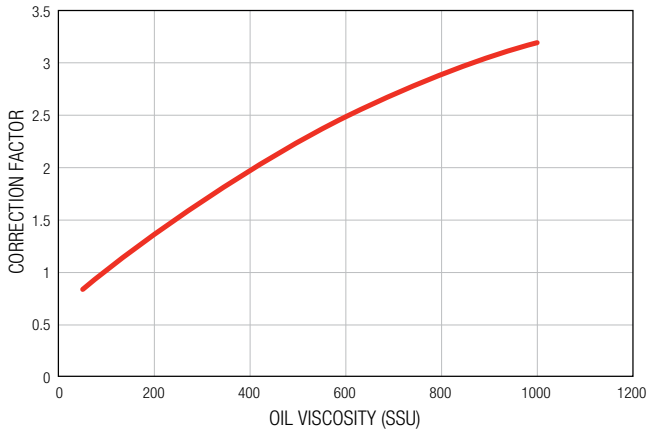
Medium Flow



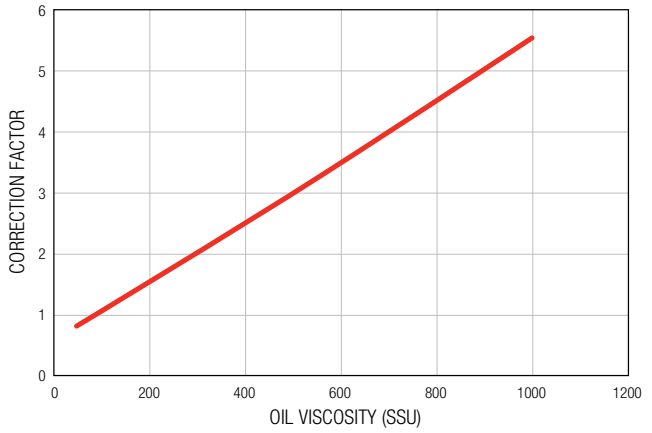
High Flow



Performance Correction



Pressure Drop Correction



	Model	Oil Conn (Female)	Water Conn (Female)
SMALL FLOW	BPSW-10-8x3	#10 SAE	¾" NPT
	BPSW-30-8x3	#10 SAE	¾" NPT
	BPSW-12-12x5	# 12 SAE	¾" NPT
	BPSW-24-12x5	# 12 SAE	¾" NPT
	BPSW-36-12x5	#20 SAE	1¼" NPT
	BPSW-70-12x5	#20 SAE	1¼" NPT
	BPSW-50-20x5	#20 SAE	1¼" NPT
	BPSW-70-20x5	#20 SAE	1¼" NPT
	BPSW-110-20x5	#20 SAE	1¼" NPT
MEDIUM FLOW	BPSW-50-15x5	#20 SAE	1¼" NPT
	BPSW-90-15x5	#20 SAE	1¼" NPT
	BPSW-130-15x10	#24 SAE	1½" NPT
	BPSW-200-15x10	#24 SAE	1½" NPT
LARGE FLOW	BPSW-24-20x10	#24 SAE	1½" NPT
	BPSW-50-20x10	#24 SAE	1½" NPT
	BPSW-80-20x10	#24 SAE	1½" NPT
	BPSW-90-28x10	2½" SAE FLG	2½" NPT
	BPSW-130-28x10	2½" SAE FLG	2½" NPT

Performance Curves are based on 100SSU oil at 40°F approach temperature (125°F oil leaving cooler, 85°F water entering cooler), 2:1 oil: water ratio (1 GPM water flow for each 2 GPM oil flow).

Step 1 **Determine Curve Horsepower Heat to be Removed.**

$$\text{Horsepower heat load} \times \frac{40}{\text{Oil leaving cooler °F minus water entering cooler °F}} \times \text{Performance correction multiplier} = \text{Curve horsepower heat to be removed}$$

Step 2 **Determine Actual Oil Pressure Drop.** Pressure drop shown on curve x Pressure drop correction multiplier = Actual pressure drop.

Oil Temperature

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

Typical operating temperature ranges are:

Hydraulic Motor Oil	110°F - 130°F
Hydrostatic Drive Oil	130°F - 180°F
Lube Oil Circuits	110°F - 130°F
Automatic Transmission Fluid	200°F - 300°F

Desired Reservoir Temperature

Return Line Cooling: Desired temperature is the oil temperature leaving the cooler. This will be the same temperature that will be found in the reservoir.

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

Oil △T=(BTU's/Hr.)/GPM Oil Flow x 210).

To calculate the oil leaving temperature from the cooler, use this formula:

Oil Leaving Temperature = Oil Entering Temperature - Oil △T.

This formula may also be used in any application where the only temperature available is the entering oil temperature.

Oil Pressure Drop: Most systems can tolerate a pressure drop through the heat exchanger of 20 to 30 PSI. Excessive pressure drop should be avoided. Care should be taken to limit pressure drop to 5 PSI or less for case drain applications where high back pressure may damage the pump shaft seals.

BPW Series - Made to Order Model

STAINLESS STEEL CONSTRUCTION

Features

- **Customizable sizes and options**
- **Stacked Plate**
- **Stainless Steel**
- **Copper Brazed**
- **High Performance**
- **Compact Design**
- Corrosion Resistant Type 316 Stainless Steel Plates
- Mounting Studs Standard (except 8x3 plates)
- Optional Foot Mounting Bracket (except 8x3 plates) SEE PAGE 13

Ratings

Maximum Working Pressure 450 psi

Test Pressure 650 psi

Minimum Working Temperature -320ºF

Maximum Working Temperature 437ºF at 450 psi

Pressure rating is for copper brazed only. Consult factory for alternatives.

Materials

Plate Material - Fluid Contact 316 Stainless Steel

Braze Material Copper
Nickel Optional

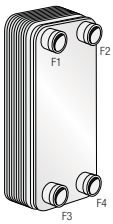
Connectors 316 Stainless Steel

Stud Bolts 304 Stainless Steel

Foot Mounting Bracket Carbon Steel

How to Order

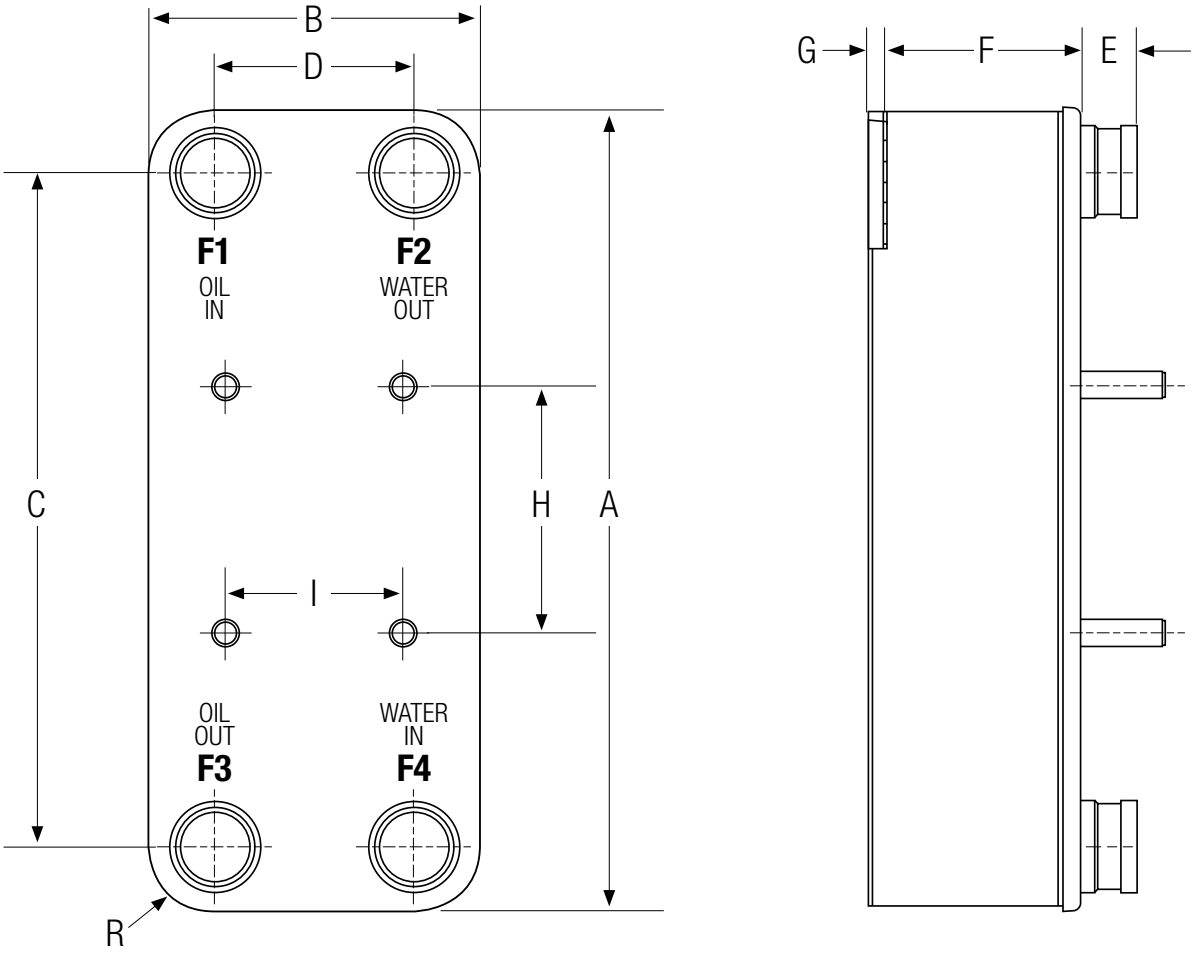
BPW	-		-		-		-		-		-			
Model Series BPW		**Number of Plates**		**Model Size Selected** 8x3 12x5 20x5 15x5 15x10 20x10 28x10		**Connection F3**		**Connection F1**		**Connection F2**		**Connection F4**		**Option** Foot Mounting Brackets *(ordered as a separate item)*



Please see pages 8-9 for all possible connection sizes and types.

Note: Connections on the cooler must all be the same height. Cannot use connections of different heights.

Part No.	Plate Size
56839	12x5
56840	20x5
56841	15x5
56842	15x10
56843	20x10
56844	28x10



Model	A	B	C	D	E	F	G	H	I	Stud Bolt Thread	Stud Bolt Length	R	Approximate Weight (lbs)
BPW-NoP-8x3	7.6	2.98	6.06	1.57	See Connection Tables	0.157 + 0.088 x NoP	0.28	NA	NA	NA	NA	0.70	1.082 + 0.097 x NoP
BPW-NoP-12x5	11.4	4.69	9.57	2.83		0.157 + 0.088 x NoP	0.24	5.51	2.36	M8	0.79	0.90	3.058 + 0.21 x NoP
BPW-NoP-20x5	20.7	4.69	18.50	2.48		0.157 + 0.088 x NoP	0.24	8.86	2.36	M8	1.19	0.90	4.967 + 0.362 x NoP
BPW-NoP-15x5	14.8	4.69	12.60	2.48		0.157 + 0.088 x NoP	0.24	8.86	2.36	M8	0.79	0.90	3.814 + 0.265 x NoP
BPW-NoP-15x10	15.5	9.57	12.76	6.85		0.315 + 0.092 x NoP	0.12	5.51	3.94	M12	0.75	1.38	15.41 + 0.75 x NoP
BPW-NoP-20x10	20.7	9.57	17.95	6.85		0.394 + 0.090 x NoP	0.16	5.51	3.94	M12	1.53	1.38	22.641 + 0.891 x NoP
BPW-NoP-28x10	27.3	9.57	23.54	5.83		0.630 + 0.096 x NoP	0.04	12.13	3.94	M12	1.53	1.89	35.741 + 1.25 x NoP

NoP = Number of Plates
All dimensions are inches, unless noted otherwise.
Note: We reserve the right to make reasonable design changes without notice.

Connection Options

Model	Connection Types	Size	Height (E)
BPW-NoP-8x3	SAE	5/8" O-Ring	0.79
	Solder	8.2	0.79
		12.2	0.79
		10	0.79
		15.9	0.79
		12.8	0.79
		16	0.79
		22	0.79
	ISO-G	1/2"	0.79
		3/4"	0.79
		3/8"	0.79
	ISO-G INT Hex	1/2"	0.79
		3/4"	0.79
	UNF	5/8"	0.79
		3/4"	0.79
	NPT	1/2" INT	0.79
		3/8" INT	0.79
		3/4" INT	0.79
		1/2" (M)	0.79
		3/4" (M)	0.79
		3/4" & 16 (Combo M)	0.79
		1" (M)	0.79
BPW-NoP-12x5	SAE	1" O-Ring	1.06
		1¼" O-Ring (Setting Up)	1.06
	Solder	12.8	0.79
		16	0.79
		22U	0.79
		28U	0.79
		35.1	0.79
	UNF	3/4"	0.79
		5/8"	0.79
	NPT	1" INT	1.06
		1" (M)	1.77
		1/2" INT	0.79
		3/4" (M)	0.79
BPW-NoP-15x5	SAE	1/4" O-Ring	1.06
	Solder	6.5	1.06
		35.1	1.77
		42U	1.06
		28U	1.06
		12.8	1.06
		16	1.06
	ISO-G	1¼" INT	1.77
		1¼" INT HEX	1.06
		1/2" (M)	1.06
		1¼" (M)	1.77
		1" (M)	1.06
		1½"	1.06
	NPT	1/2" INT	1.06
		1¼" (M)	1.06
		1¼" INT (F)	1.77

Model	Connection Types	Size	Height (E)
BPW-NoP-20x5	SAE	1¼" O-Ring	1.06
	Solder	6.5	1.06
		35.1	1.77
		42U	1.06
		12.8	1.06
		28U	1.06
		22U	1.06
		16	1.06
	ISO-G	1¼" INT	1.77
		1¼" INT HEX	1.06
		1/2"	1.06
		1¼" (M)	1.77
		1"	1.06
		1½" (M)	1.77
		1" INT HEX	1.06
	NPT	1/2" INT	1.06
		1¼" (M)	1.06
		1¼" INT (F)	1.77
		1" INT (F)	1.77
	Victaulic	1¼" INT (F)	1.77
		1¼" (M)	1.77
		1½"	1.06
		1¼" (M)	1.06
		1 1/2"	1.77
BPW-NoP-15x10	SAE	1½" O-Ring	1.06
	Solder	16	1.06
		54.3	1.06
		12.8	1.06
		22U	1.06
		28U	1.06
		35.1	1.06
		42U	1.06
	ISO-G	1½"	1.06
	NPT	2" (M)	1.06
		1½" (M)	1.06
		1½" INT (F)	1.06
		3/4" INT (F)	1.06
	Victaulic	1½"	1.06
		2"	1.06
		2"	2.13
		2½"	2.13

All dimensions are in inches, unless noted otherwise.

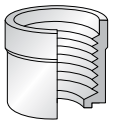
Note: Connections on the cooler must all be the same height. Cannot use connections of different heights.

Model	Connection Types	Size	Height (E)
BPW-NoP-20x10	SAE	1½" O-Ring	1.06
	Solder	16	1.06
		54.3	1.06
		12.8	1.06
		22U	1.06
		28U	1.06
		35.1	1.06
	ISO-G	1½"	1.77
	NPT	1½" (M)	1.06
		1½" INT (F)	1.06
		2" (M)	1.06
	Victaulic	1½"	1.06
		2"	1.06
		2"	2.13
		2½"	2.13
BPW-NoP-28x10	SAE	Flange connection is set up	2.13
	Solder	54.3	2.13
		70U	2.13
		42U	2.13
		66.85	2.13
		35.1	2.13
		76U	2.13
	ISO-G	2"	2.13
		2½"	2.13
		3"	2.13
	NPT	2½" (M)	2.13
		2½" INT (F) is setup	2.13
	SAE Flange	2½"	1.18
		3"	1.18
		1½" Round	1.18
		2" Round	1.18
	DIN Compact Flange	DN65C cs	2.13
		DN80C cd	2.13

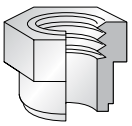
All dimensions are in inches, unless noted otherwise.

Note: Connections on the cooler must all be the same height. Cannot use connections of different heights.

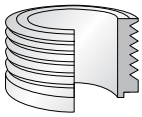
Optional Connection Types



Internally threaded (female)

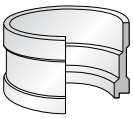


Internally threaded (female) with Hexagonal exterior

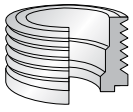


Externally threaded (male)

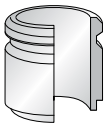
Victualic



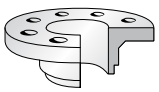
Solder



Combo



Welding



Flanges of DIN/DNC Type

Plate Limits

Model	Number of Plates	HP Removed	Max Oil Flow GPM
BPW-NoP-8x3	10	2	2
	20	4	4
	30	8	6
	40	11	8
	50	16	12
	60	22	16
	70	26	18
	80	27	18.5
BPW-NoP-12x5	10	8	4
	20	20	10
	30	29	14
	40	38	18
	50	52	22
	60	59	24
	70	64	26
	80	72	30
	90	84	34
	100	95	38
	110	106	40
	120	112	42
	130	120	42
	140	125	42
BPW-NoP-15x5	10	7	3
	20	11	6
	30	22	9
	40	33	14
	50	46	18
	60	57	22
	70	65	28
	80	73	34
	90	88	38
	100	98	42
	110	106	46
	120	122	56
	130	150	66
	140	177	78
BPW-NoP-20x5	10	11	3
	20	24	6
	30	38	9
	40	54	13
	50	71	17
	60	87	21
	70	103	25
	80	120	29
	90	163	40
	100	190	46
	110	218	52
	120	245	58
	130	259	64
	140	299	80

Model	Number of Plates	HP Removed	Max Oil Flow GPM
BPW-NoP-15x10	10	14	8
	20	30	16
	30	46	26
	40	63	34
	50	76	40
	60	90	46
	70	106	54
	80	122	64
	90	150	74
	100	163	80
	110	177	90
	140	204	100
	170	231	110
	200	259	120
	230	299	130
	250	327	130
BPW-NoP-20x10	10	19	4
	20	41	8
	30	68	12
	40	90	16
	50	112	20
	60	141	26
	70	171	34
	80	212	44
	90	245	54
	100	286	60
	110	313	66
	140	381	80
	170	449	90
	200	517	95
	230	571	105
	250	612	110
BPW-NoP-28x10	20	54	10
	40	109	20
	60	177	30
	80	231	40
	100	313	60
	120	408	80
	140	490	100
	160	585	120
	180	694	150
	200	789	180
	220	898	220
	240	966	220
	260	1088	260
	280	1361	310
	280	1497	350

Based on 100 SSU Oil, 40°F Approach Temperature, 2:1 Oil-Water Flow Ratio

NoP = Number of Plates

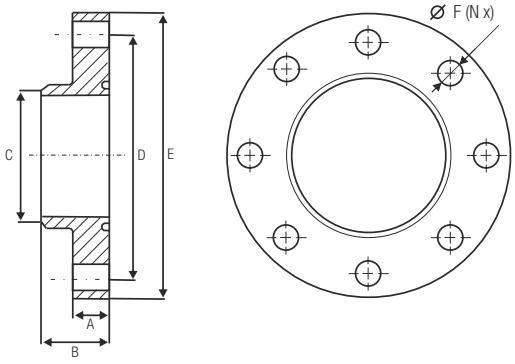
Accessories

All dimensions are inches unless noted otherwise.

BP Series accessories meet the same high standards as our BP Series line of heat exchangers. The high-quality materials are carefully chosen for compatibility, while the accurate dimensions save you time and money on installation. With TTP accessories you have the assurance that everything will fit – and perform – the way the design engineers intended.

Counter Flanges

To increase the flexibility for units with standard threaded connections, TTP offers a range of compact flanges. The threaded part is easily assembled to the connections and the counter flange welded to your pipe.



Dimensions

Part No.	Size	A	B	C	D	E	F
56811	DN20C	.39	.79	1.06	2.09	2.80	.43
56812	DN25C	.39	.79	1.33	2.48	3.31	.51
56813	DN50C	.47	.94	2.37	3.58	4.41	.51
56814	DN65C	.47	.94	3.00	4.17	4.91	.51
56815	DN80C	.59	1.18	3.50	4.65	5.55	.51
56816	DN100C	.59	1.18	4.50	5.67	6.50	.51
56817	DN150C	.87	1.73	6.63	8.54	9.84	.51

Ratings *(according properties of gasket)*

Maximum Working Pressure	580 psi
Minimum Working Temperature	5ºF
Maximum Working Temperature	392ºF

Materials

Stainless Steel

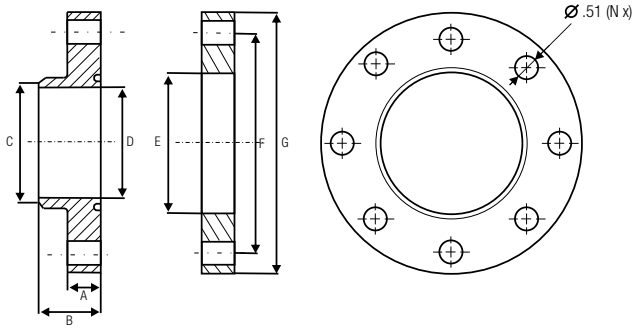
Carbon Steel flanges available. Consult factory for additional information.

Standard Connections

TTP counter flanges are used to connect your pipe to our compact flanges on the BPHE unit.

Flange Kits

To increase the flexibility for units with standard threaded connections, TTP offers a range of compact flange kits. The threaded part is easily assembled to the connections and the counter flange welded to your pipe.



Dimensions

Part No.	Size	A	B	C	D	E	F	G	N
56818	2"	.47	1.46	DN50	1.54	G2"	3.58	4.41	.31
56819	2½"	.47	1.46	DN65	2.36	G2½"	4.17	4.92	.31

Ratings *(according properties of gasket)*

Maximum Working Pressure	580 psi
Minimum Working Temperature	5ºF
Maximum Working Temperature	392ºF

Materials

Stainless Steel

Carbon Steel flanges available. Consult factory for additional information.

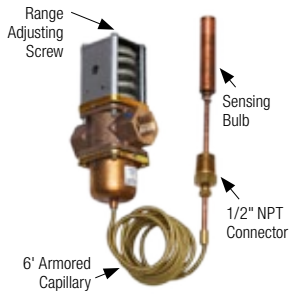
Standard Connections

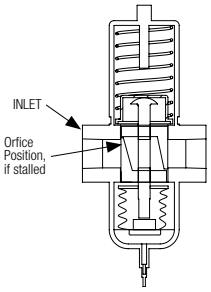
Screw-on flanges are used to convert our ISO-G connections to weld neck compact flanges.

Modulating Water Valves and Bulb Wells

These modulating valves regulate the flow of water to the heat exchanger to maintain a desired exiting oil temperature. They open automatically when temperature increases at the sensing bulb. **No** external power source is required to actuate the valve. **Not** to be used for salt water service.

Bulb Wells are used in conjunction with Remote Bulb Temperature Controls where bulb insertion into a vessel or container to sense temperature is required. Standard and custom bulb well lengths available.





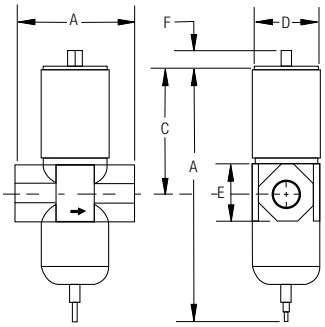
Part No.	Pipe Size (NPT)	Range (Opening Point)	Sensing Bulb Size Diameter x Length	Maximum Water Flow (GPM)	Bulb Well Recommended Size
65293	½"	115°F - 180°F	11/16" x 3¼"	25	L-65140
65127	¾"	115°F - 180°F	11/16" x 3¼"	40	L-65140
65128	1"	115°F - 180°F	11/16" x 6"	55	L-65141
65146	1¼"	115°F - 180°F	11/16" x 6"	75	L-65141
65511	½"	75°F - 135°F	11/16" x 10"	25	L-65280
65253	¾"	75°F - 135°F	11/16" x 10"	40	L-65280
65254	1"	75°F - 135°F	11/16" x 16¼"	55	L-67438
65255	1¼"	75°F - 135°F	11/16" x 16¼"	75	L-67438
66100	1½" ASME	75°F - 115°F	11/16" x 16¼"	90	L-67438
67173	2" ASME	75°F - 115°F	11/16" x 43"	150	L-67808

*Working pressure to 150 PSI Maximum. *For additional protection of the bulb well stem, use the next longer bulb well.*

ADJUSTMENT: ½" to 1¼" valves can be adjusted with a screwdriver, 1½" and 2" have a ½" square shaft. Turn the adjusting screw clockwise to **decrease** opening temperature; and counterclockwise to **increase** opening temperature. Valves are not calibrated, so final desired temperature setting must be established experimentally. Valve is fully open 36°F above opening point.

Water Valve Specifications

Part No.	By-Pass Orifice Diameter	Maximum Bulb Temperature	Opening Temperature (Factory Setting)
65293	.062"	200°F	135°F
65127	.062"	200°F	135°F
65128	.093"	200°F	135°F
65146	.093"	200°F	135°F
65511	.062"	155°F	103°F
65253	.062"	200°F	135°F
65254	.062"	200°F	135°F
65255	.093"	200°F	135°F
66100	.093"	200°F	135°F
67173	.062"	155°F	103°F



Standard temperature elements are furnished with 6' capillary. Longer capillary lengths not available. Valve Disc: Buna N in brass disc retainer.

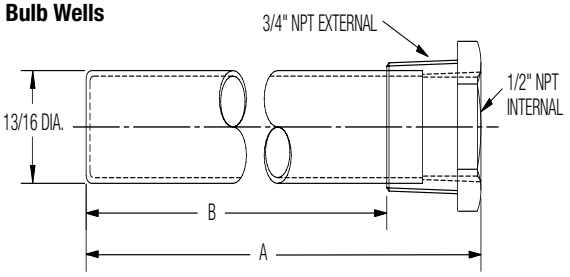
Water Valve Dimensions

Valve Size	A	B	C	D	E	F
½"	3¼	7	3⅜	1 27/32	1½	12/32
¾"	3 9/16	7 29/64	3 51/64	2 1/32	1¾	12/32
1"	4 27/32	10 13/16	5 31/64	2⅝	2	½
1¼"	4 55/64	10 37/64	5 43/64	2⅝	2⅜	½
1½"	5 5/16	10 37/64	5 43/64	2⅝	See flange specs	½
2"	6⅝	12 33/64	6 15/32	3½		½

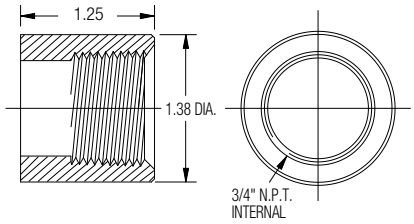
Flange Specifications

Valve Size	# of Bolt Holes	Bolt Hole Size	Bolt Circle	Flange Diameter
½"	4	5/8	3⅞	5
2"	4	¾	4¾	6

Bulb Wells



65187 Half Coupling - Mount to Reservoir. For use with all bulb wells shown above.



Bulb Well Dimensions

Part No.	A	B
65140	4 15/32	3 15/32
65141	7 7/32	6 7/32
65280	11 7/32	10 7/32
67438	17 15/32	16 15/32
67808	44⅜	43⅜

Custom Bulb Well lengths available. Consult factory for additional information.

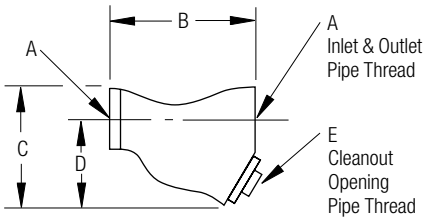
Materials

Tube	Copper
Fitting	Brass

Accessories

All dimensions are inches unless noted otherwise.

Water Strainers



Dimensions

Part No.	A NPT	B	C	D	E
65294	⅜	3.08	2.52	1.88	¼
65295	½	3.08	2.52	1.88	¼
65296	¾	3.87	3.07	2.32	¼
65297	1	4.44	3.77	2.81	⅜
65301	1¼	5.25	4.32	3.18	⅜
65302	1½	6.25	5.10	3.77	½
65303	2	7.63	6.25	4.65	½

Rating

Maximum Working Pressure 300 psi

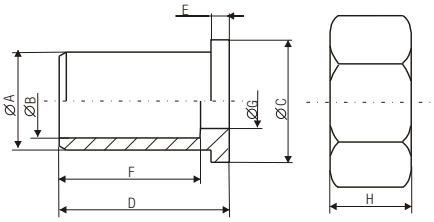
Materials

Housing Bronze

Screen 20 Mesh, 304 Stainless Steel Wire

COSD Connection for Soldering

For standard thread-connections of TTP BPHE, the welding sleeve with union nut can be used to connect pipes with the connection of the heat exchanger. According to the quality of the used medium, the welding sleeve can be chosen in carbon or stainless steel. The soldering connection consists of a union nut, a gasket and a soldering sleeve. COSD connections are suitable for refrigerant applications.



Dimensions

Part No.	Nominal diameter	A	B	C	D	E	F	G	H	Opening of the spanner
56831	¾"	.86	.71	.94	.67	.12	.57	.59	.63	1.18
56832	1"	1.02	.87	1.18	.75	.12	.59	.75	.67	1.42
56833	1¼"	1.38	1.10	1.52	.98	.12	.79	.98	.71	1.81
56834	2"	1.90	1.65	2.20	1.26	.16	1.02	1.54	.94	2.56
56835	2½"	2.36	1.13	2.83	1.46	.19	1.22	2.00	1.02	3.35

The used gasket has a thickness of .079" (2mm)

Materials

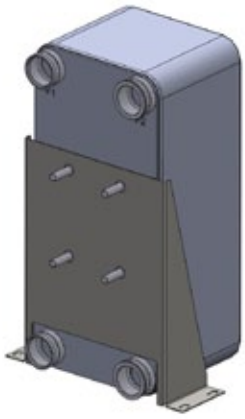
Union nut MS58

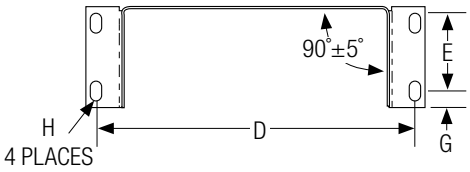
Soldering sleeve Rg5

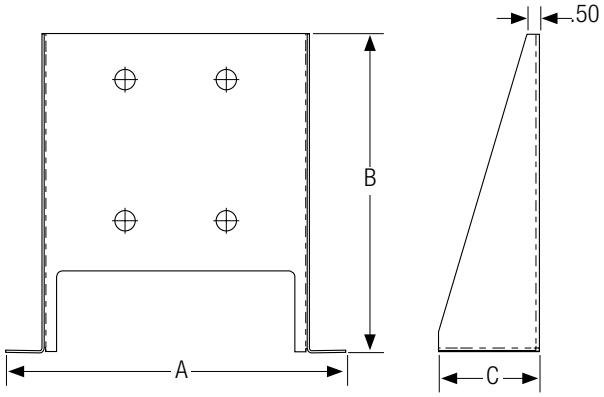
Gasket Hecker-Centellen WS 3820

Mounting Bracket

Optional Foot Mounting Bracket (except 8x3 plates). Constructed of Carbon Steel.







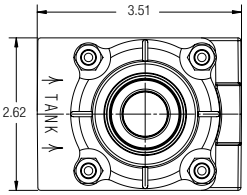
Part No.	Plate Size	A	B	C	D	E	G	H
56839	12x5	7.99	9.35	3.15	7.17	1.77	0.69	.40 x .59
56840	20x5	7.99	15.65	3.15	7.17	1.77	0.69	.40 x .59
56841	15x5	7.99	12.74	3.15	7.17	1.77	0.69	.40 x .59
56842	15x10	13.20	12.40	3.94	12.40	2.64	0.65	.40 x .75
56843	20x10	13.51	14.37	3.94	12.72	2.64	0.65	.40 x .75
56844	28x10	13.20	21.30	3.94	12.40	2.64	0.65	.40 x .75

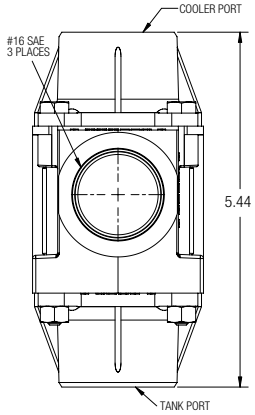
All dimensions are in inches, unless noted otherwise.

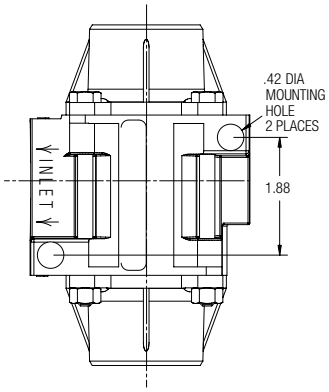
Mounting bracket for location purposes only. Bracket is not designed to support entire weight of the cooler. Customer to add extra support if necessary.

Thermal Bypass Assembly

This thermal bypass valve is ideally suited for hydrostatic drive circuits which require fast warm-up, controlled fluid temperature, and low return line back pressure. When installed in the return line of a hydraulic circuit that employs an oil cooler, this device will modulate fluid temperature by either shifting return line flow through the cooler, or bypassing directly to the reservoir. In addition, a built-in pressure relief function automatically relieves excess pressure to the reservoir should the cooler become restricted and resultant pressure drop become too high for the cooler circuit.







Standard Shift Temperatures
100°F (38°C) 120°F (49°C) 140°F (60°C) 160°F (71°C)

Full Shift (Cooler Port Open) Temperatures
Shift temperature plus 25°F (14°C)

Relief Valve Setting 65 psi (4.5 bar) *Consult factory for other pressure settings.*

Maximum Operating Pressure 250 psi (17 bar)

Proof Pressure 300 psi (21 bar)

Minimum Burst Pressure
Up to the full shift temperature: 325 psi (22 bar).
Above the full shift temperature: 600 psi (41 bar).

Minimum Operating Temperature -30°F (-34°C)

Maximum Operating Temperature Shift temperature plus 75°F (24°C)

Maximum Flow Rating 60 gpm (227 l/m)

Leakage @ 250 psi (17 bar) and 60 gpm (227 l/m) Inlet Flow
Cooler Port:
- 0.5 gpm (2 l/m) maximum up to 5°F (3°C) before shift temp.
- 1.0 gpm (4 l/m) maximum from 5°F (3°C) before shift to shift.

Tank Port: 0.10 gpm (0.4 l/m) maximum

Operating Fluid Mineral base hydraulic fluids

Construction Aluminum die-cast housing

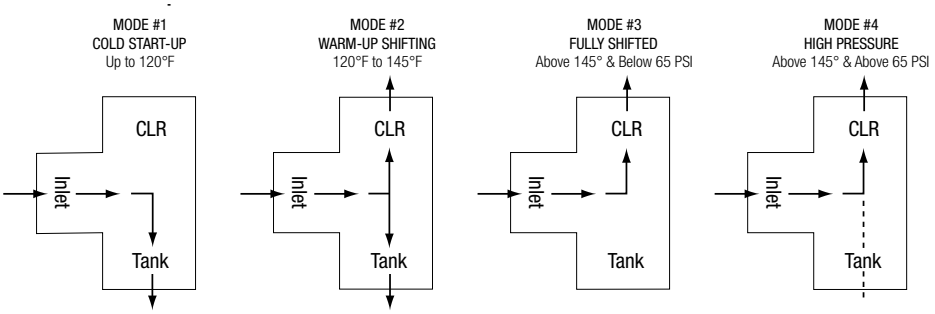
Part No.	A
65654	100°F (38°C)
65655	120°F (49°C)
65655	140°F (60°C)
65655	160°F (71°C)

Operating Characteristics
- Mode 1: At temperatures below the shift temperature oil flows from inlet to tank port.
- Mode 2: At temperatures between the start of shift and full shift the flow from the inlet port is divided between the cooler and tank ports.
- Mode 3: At temperatures above the full shift temperature inlet flow is through the cooler port.
- Mode 4: At temperatures above the full shift temperature the excess pressure is relieved through the tank port.

For 120°F Shift Temperature

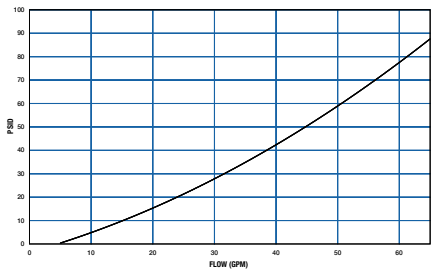
→ Oil Flow
- - - Excess pressurized oil

NOTE: If the temperature drops below 145°F the valve will shift back to modes 2 or 1.

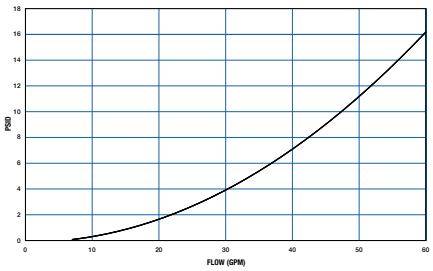


Pressure Drop (Mobile DTE 26 OIL)

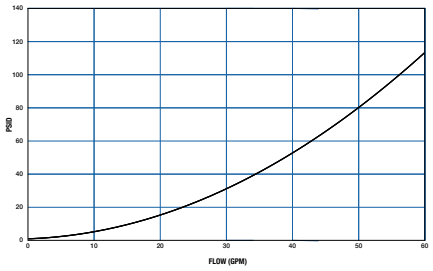
Inlet Port Thru Tank Port @ 100°F (300 SUS)



Inlet Port Thru Cooler Port @ 145°F (110 SUS)



Inlet Port Over Integral Relief Valve @ 170°F (78 SUS)



NOTE: Pressure drop shown is added to relief valve crack pressure for total pressure drop.

Three-Way Thermostatic Valves

TTP thermostatic valves use the principle of expanding wax. A self-contained power element activates a stainless steel sliding valve that provides a positive three-way valve action. All temperature settings are factory set. Elements are field replaceable to obtain the same, or a new bypass temperature setting. Valves may be installed for either mixing or diverting modes of operation at the preference of the user. They may be mounted in any plane. Valves are acceptable for oil or water service.

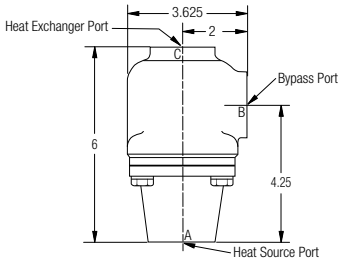
Rating

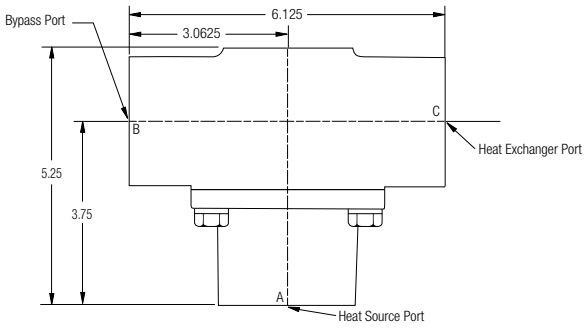
Maximum Operating Pressure 125 psi

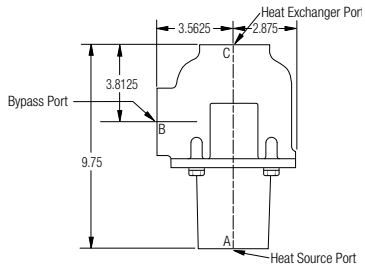
Materials

Housing Grey Iron *(Steel or Bronze optional)*

O-Ring Seals Viton *(Buna N optional)*







Part No.	Port Size
66037-110°F	1/2" NPT
66037-140°F	1/2" NPT
66038-110°F	3/4" NPT
66038-140°F	3/4" NPT
66039-110°F	1" NPT
66039-140°F	1" NPT
67365-110°F	#16 SAE
67365-140°F	#16 SAE
66040-110°F	1-1/2" NPT
66040-140°F	1-1/2" NPT
67760-110°F	#24 SAE
66041-105°F	2" NPT
66041-140°F	2" NPT

NOTE: All three ports on any one valve have the same thread size.

Special Temperature Ranges

½"-¾"-1" NPT Part No.	1½" NPT Part No.	2" NPT Part No.
65974	65977	65978
65975	66040	66041
65976	67760	
66037	(#24 SAE)	
66038		
66039		
67365		
(#16 SAE)		

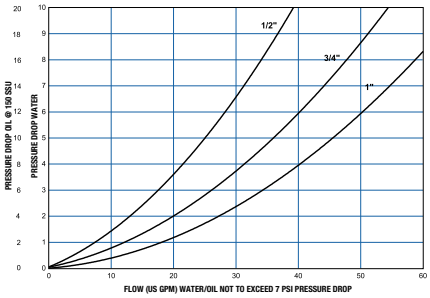
NOTE: All three ports on any one valve have the same thread size.

½"-¾"-1" NPT		1½" NPT		2" NPT	
Nominal	Temp. Range	Nominal	Temp. Range	Nominal	Temp. Range
80	77-88	80	70-88	75	70-85
90	80-100	90	80-100	90	85-105
110	100-120	110	100-120	105	100-116
120	110-130	120	110-130	120	110-130
130	120-140	130	120-140	130	124-140
140	130-150	140	130-150	140	135-150
150	140-160	150	140-160	150	145-160
160	150-170	160	150-170	155	150-165
170	163-180	170	163-180	160	155-172
185	175-190	175	170-185	165	160-175
195	185-200	180	175-190	170	165-180
200	190-210	190	185-200	180	175-190
		200	190-210	195	188-208
				210	200-215

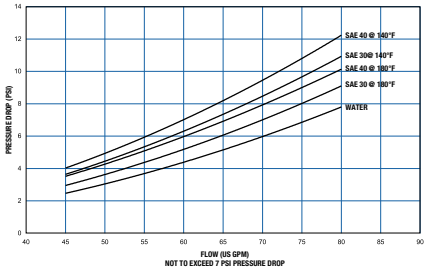
EXAMPLE: 1" NPT, Part Number 66039-90 indicates the 1" NPT valve with a nominal shift temperature of 90°F. The actual operating temperature range in this example is 80-100°F. The valve begins to open at 80°F, and is fully open at 100°F.

Pressure Drop Curves

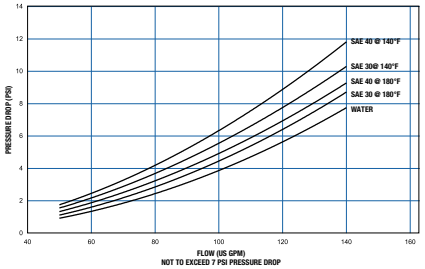
½" - ¾" - 1"



1½"



2"

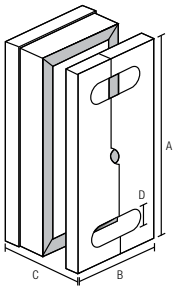


Accessories

All dimensions are inches unless noted otherwise.

Insulation

Insulation boxes for heating applications.



Dimensions

Part No.	A	B	C* (Approx.)	D	Thickness
56820	9.33	4.72	1.26 + .09 x NoP	1.18	.79
56821	13.11	6.38	2.00 + .09 x NoP	1.97	.79
56822	16.61	6.46	2.13 + .09 x NoP	1.97	.79
56823	16.61	6.46	2.17 + .09 x NoP	1.97	.79
56825	17.28	11.34	2.17 + .10 x NoP	3.54	.79
56826	22.52	11.34	2.68 + .09 x NoP	3.54	.79
56827	22.52	11.34	2.17 +. 10 x NoP	3.54	.79

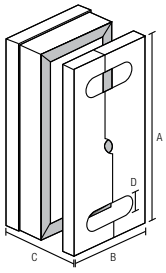
**Only available in selected 20th NoP (20, 40, 60, etc). NoP = Number of Plates.*

Rating

Maximum Working Temperature	302°F
Thermal Conductivity	0.013 BTU/HrFtF°
Fire Properties	B2 in accordance with DIN 4102
Color	Silver

Materials

Insulation	Polyurethane rigid foam
Insulation Cover	Aluminum



Dimensions

Part No.	A	B	C* (Approx.)	D	Thickness
56828	26.78	18.11	9.13 + .09 x NoP	3.15	1.97
56829	37.80	17.32	9.84 + .10 x NoP	3.35	1.97
56830	27.95	18.90	10.24 + .09 x NoP	3.74	1.97

**Only available in selected 20th NoP (20, 40, 60, etc). NoP = Number of Plates.*

Rating

Maximum Working Temperature	302°F
Thermal Conductivity	0.014 BTU/HrFtF°
Fire Properties	B2 in accordance with DIN 4102
Color	Silver

Materials

Insulation	Rigid expanded polyurethane
Insulation Cover	Aluminum

Installation & Maintenance

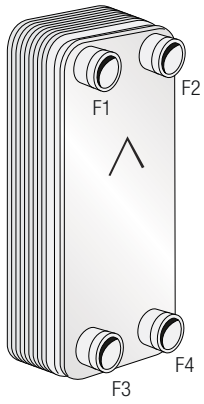
Please read carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. Retain instruction for future reference.

GENERAL INFORMATION

Depending on material combinations, pressure ratings and functions, there are several different types of compact Brazed Plate Heat Exchangers (BPHEs). The standard materials are stainless steel, vacuum-brazed with a pure copper or nickel-based filler.

The basic materials of construction indicate the type of fluids that TTP's BPHEs can be used with. Typical examples are: synthetic or mineral oil, organic solvents, water (not seawater), glycol mixtures (ethylene and propylene glycol).

The front plate of TTP's BPHE is marked with an arrow. The purpose of this marker is to indicate the front side of the BPHE and the location of the inner and outer circuits/channels. With the arrow pointing up, the left side (Port F1, F3) is the inner circuit and the right side (Port F2, F4) is the outer circuit. For TTP asymmetric products one circuit is narrow while the other is wide, which makes it additionally important to correctly combine flow and circuit to reach design performance.



Ports F1/F2/F3/F4 are situated on the front of the heat exchanger.

DESIGN CONDITIONS

The standard pressure rating used for TTP BPHEs, i.e. for standard operating pressure, is maximum 450 psi (3.1 MPa). TTP offers a wide range of pressure ratings based on applications, from low pressures (116 psi) up to high pressures (2030 psi). TTP's standard maximum operating temperature is 437°F for copper-brazed BPHEs, and 660°F for Nickel brazed BPHEs. However, as temperature and pressure are closely coupled, there is a possibility to increase the pressure if the temperature is reduced. For details, please check the label and other technical documentation.

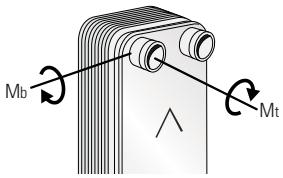
MOUNTING

Never expose the unit to pulsations or excessive cyclic pressure or temperature changes. It is also important that no vibrations are transferred to the heat exchanger. If there is a risk of this, install vibration absorbers. For large connection diameters, we advise you to use an expanding device in the pipeline. It is also suggested that e.g. a rubber mounting strip should be used as a buffer between the BPHE and the mounting clamp.

In single-phase applications, e.g. water-to-water or water-to-oil, the mounting direction has little or no effect on the performance of the heat exchanger.

CONNECTIONS

Allowable Connection Loads for Pipe Assembly Conditions



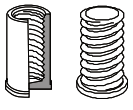
The maximum allowable connection loads given below are valid for low cycle fatigue. If high cycle fatigue is involved special analysis should be made.

Allowable connection loads for different pipe assembly conditions

Pipe Size	Shear Force, F_s (lbf)	Tension Force, F_t (lbf)	Bending Moment, Mb (lbf* in)	Torque, Mt (lbf* in)
½"	787	562	177	310
¾"	2698	562	177	1018
1"	2518	899	398	1372
1¼"	3260	1461	774	2345
1½"	3709	2136	1372	3098
2"	4833	3035	2257	5310
2½"	10004	4047	3452	12834
3"	12447	4136	5089	21773

Allowable Loads for Stud Bolt Assembly Conditions

Mounting stud bolts, in different versions and locations, are available on the BPHEs as an option. These stud bolts are welded to the unit. The maximum allowable load on the stud bolts during assembly are stated below.

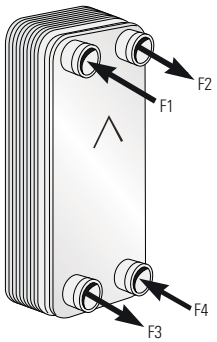


Allowable loads for different stud bolt assembly conditions:

Stud Bolt	Stress Area A_s (in^2)	Tension Force F_t (lbf)	Torque M_t (lbfin)
M6	0.032	315	27
M8	0.053	585	71
M12	0.144	1349	239

INSTALLATION OF BPHEs IN DIFFERENT APPLICATIONS

Single-Phase Applications



Normally, the circuit with the highest temperature and/or pressure should be connected on the left side of the heat exchanger when the arrow is pointing upwards. For example, in a typical water-to-water application, the two fluids are connected in a counter-current flow, i.e. the hot water inlet in connection F1, outlet F3, cold water inlet F4, outlet F2. This is because the right-hand side of the heat exchanger contains one channel more than the left-hand side, and the hot medium is thus surrounded by the cold medium to prevent heat loss.

WATER STRAINER

A water strainer should be installed in the water inlet to protect the unit from particulate matter. 16-20 mesh minimum (20-40 mesh best choice).

PIPING

Piping must be properly supported to prevent excess strain on the heat exchanger ports. Stainless steel is typically not satisfactory for salt water service.

CLEANING

In some applications, the fouling tendency could be very high; for example when using extremely hard water. It is always possible to clean the exchanger by circulating a cleaning liquid. Use a tank with a weak acid. 5% phosphoric acid, or if the exchanger is frequently cleaned, 5% oxalic acid. Pump the cleaning liquid through the exchanger. For optimum cleaning, the cleaning solution flow rate should be a minimum of 1.5 times normal flow rate, preferably in a backflush mode. Afterwards rinse with large amounts of fresh water in order to get rid of all the acid before starting up the system again. Clean at regular intervals.

STORAGE

BPHEs are to be stored dry. The temperature should not be below 34°F and not over 122°F for long term storage (more than 2 weeks).

DISCLAIMER

TTP's BPHE performance is based on installation, maintenance and operating conditions done in conformance with these instructions. TTP cannot assume any liability for BPHEs that do not meet these criteria.

The heat exchanger is not type-approved for fatigue loading.

Thermal Transfer Products

An **API Heat Transfer** Company

We **COOL** what you **POWER**

ttpsales@apiheattransfer.com
www.thermaltransfer.com

Thermal Transfer Products
5215 21st Street
Racine, Wisconsin 53406-5096 USA
+1.262.554.8330

API Heat Transfer

PERFORMANCE IS EVERYTHING

API Heat Transfer Inc. is a global leader in the design and manufacture of a wide range of specialty heat exchangers and heat transfer solutions. Customers benefit from the industry's broadest specialty heat-exchanger portfolio, best-in-class product development and testing capabilities, and an unmatched global sales and manufacturing infrastructure. **For more information visit www.apiheattransfer.com.**

- Global headquarters in Buffalo, NY
- Trusted partner to customers and provider of standard and custom-engineered heat transfer solutions for over 130 years
- Network of 1,800 employees with sales offices around the world
- Twelve modern manufacturing facilities worldwide
- Six business units providing premium brands and the broadest product portfolio available in today's market

See how our performance can improve yours.

USA

Arcade Facility
91 North Street
Arcade, NY 14009, USA
+1.585.496.5755

Buffalo Facility
2777 Walden Avenue
Buffalo, NY 14225, USA
+1.716.684.6700

Franklin Facility
4700 Ironwood Drive
Franklin, WI 53132, USA
+1.414.761.4500

Iron Ridge Facility
1025 Industrial Road
Iron Ridge, WI 53035, USA
+1.920.387.4200

Montgomery Facility
2760 Gunter Park Dr. West
Montgomery, AL 36109, USA
+1.334.277.1810

Racine Facility
5215 21st Street
Racine, WI 53406, USA
+1.262.554.8330

UK

Birmingham Facility
Seeleys Industrial Park
Seeleys Road, Birmingham
B11 2QY, United Kingdom
+44 (0) 121.766.1350

Coventry Facility
Sir Henry Parkes Road
Canley, Coventry
CV5 6BN, United Kingdom
+44 (0) 24.7667.5544

GERMANY

Bretten Facility
Langenmorgen 4
75015 Bretten, Germany
+49.7252.53.0

Dortmund Facility
Breisenbachstrasse 87
44 357 Dortmund, Germany
+49.231.9920.0

CHINA

Suzhou Facilities
156 Qingqiu Street, 3rd District
Suzhou Industrial Park
Suzhou, Jiangsu 215126, China
+86.512.8816.8000

126 Qingqiu Street, 3rd District
Suzhou Industrial Park
Suzhou, Jiangsu 215126, China
+86.512.8816.8000

Airtech | Basco | Covrad GT | Schmidt-Bretten | Thermal Transfer Products | ThermaSys Tubing

STAINLESS STEEL CONSTRUCTION

Features

- **Stacked Plate**
- **Stainless Steel**
- **Copper Brazed**
- **Oil to Water Applications**
- **High Performance**
- **Compact Design**
- **SAE Connections**
- Corrosion Resistant Type 316 Stainless Steel Plates
- Mounting Studs Standard
- SAE Oil Connections, NPT Water Connections
- Optional Mounting Bracket
- Optional Nickel/Chrome Brazed Construction

ADDITIONAL MODELS AVAILABLE – please consult factory for more information

Ratings

Maximum Working Temperature 350° F at 450 psi*

Maximum Working Pressure 450 psi**

Test Pressure 600 psi

*Maximum working temperature can increase with derating of working pressure.

**Maximum working pressure can increase with a derating of working temperature.

Pressure rating is for copper brazed only.

Materials

Plate Material 316L Stainless Steel

Braze Material Copper – Standard
Nickel/Chrome – Optional

Stud Bolts 304 Stainless Steel

Front and Back Pressure Plates 304 Stainless Steel

Connectors 304 Stainless Steel

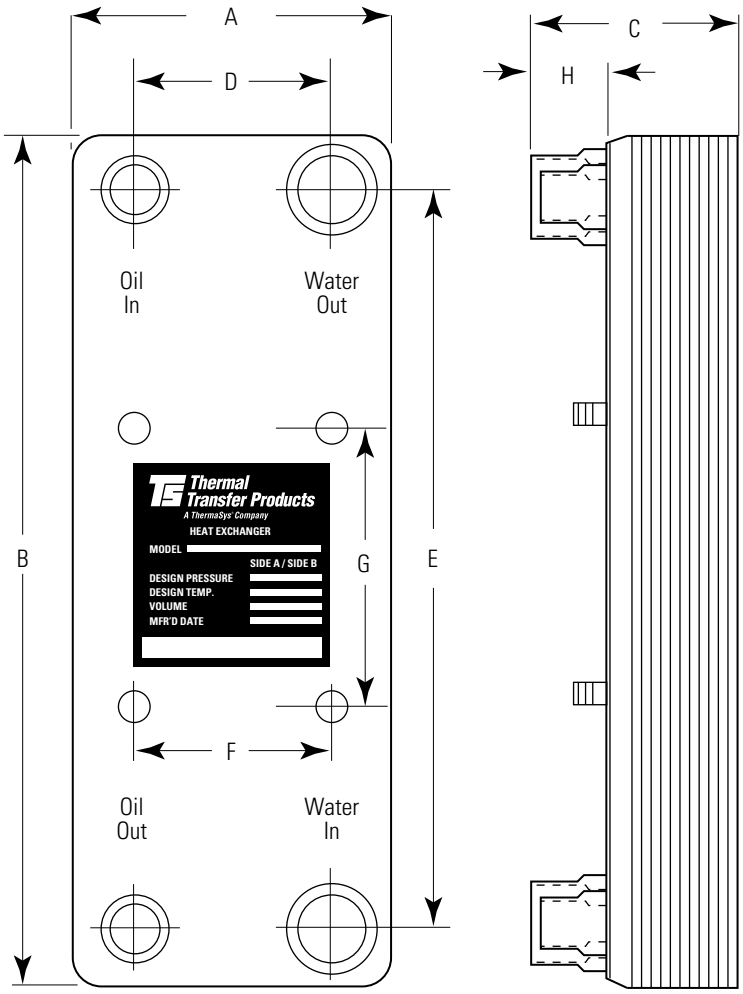
Foot Mounting Brackets 304 Stainless Steel

How to Order

BPS	–		–		–	
Model Series		**Number of Plates**		**Model Size Selected** 12 x 5 20 x 10		**Options** FB - Foot Mounting Brackets

BPS - SAE Oil Connections, NPT Water

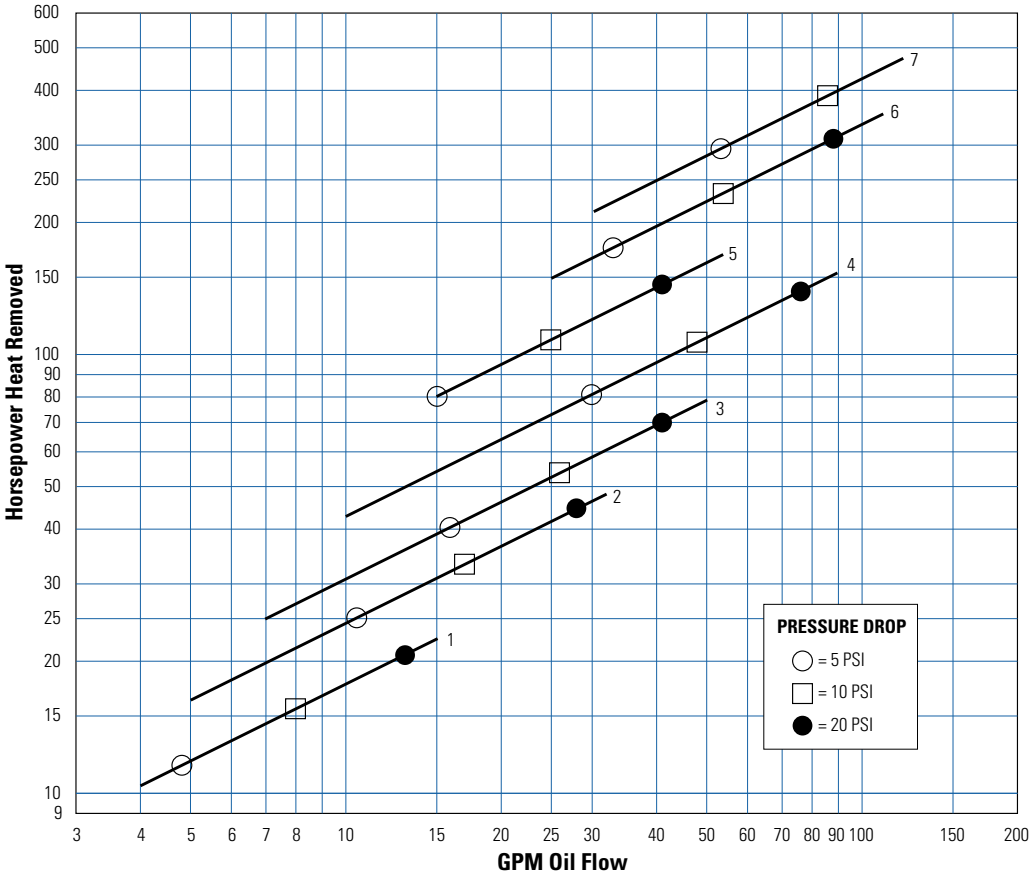
Dimensions



Model	A	B	C	D	E	F	G	H		Oil SAE	Water NPT	Net Wt. lbs.
								SAE	NPT			
BPS-12-12x5	4.9	12.2	2.61	2.7	9.9	2.5	3.5	1.25	1.12	#12	3/4	8
BPS-24-12x5			3.75									12
BPS-36-12x5			5.00					1.50	1.25	#20	1-1/4	16
BPS-70-12x5			8.19									27
BPS-24-20x10	9.8	20.3	3.99	6.5	17.0	4.0	5.5	1.75	1.38	#24	1-1/2	39
BPS-50-20x10			6.44									68
BPS-80-20x10			9.25									100

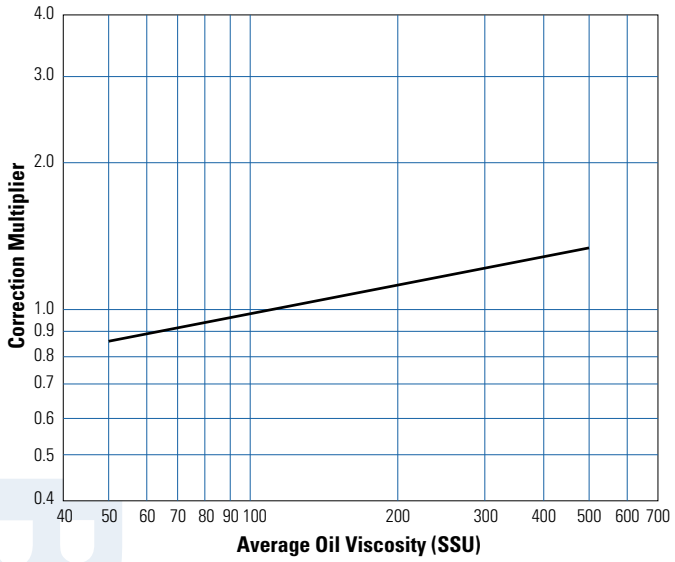
NOTE: We reserve the right to make reasonable design changes without notice. Dimensions are in inches.
SAE Connection Thread Forms: #12 SAE = 1-1/16 - 12UN-2B #20 SAE = 1-5/8 - 12UN-2B #24 SAE = 1-7/8 - 12UN-2B
NPT Connections are internal threads (female).

Performance Curves

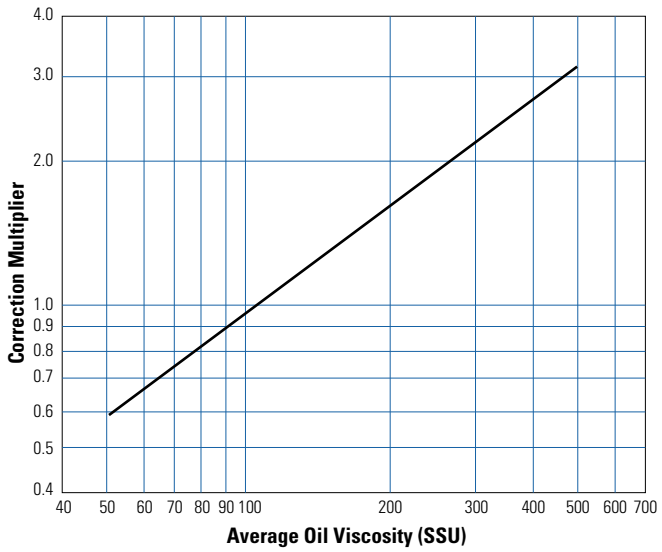


Model
1. BPS-12-12X5
2. BPS-24-12X5
3. BPS-36-12X5
4. BPS-70-12X5
5. BPS-24-20X10
6. BPS-50-20X10
7. BPS-80-20X10

Performance Correction



Pressure Drop Correction



Selection Procedure

Performance Curves are based on 100SSU oil at 40°F approach temperature (125°F oil leaving cooler, 85°F water entering cooler), 2:1 oil: water ratio (1 GPM water flow for each 2 GPM oil flow).

Step 1 **Determine Curve Horsepower Heat to be Removed.**

$$\text{Horsepower heat load} \times \frac{40}{\text{Oil leaving cooler °F Minus water entering cooler °F}} \times \text{Performance Correction Multiplier} = \text{Curve Horsepower Heat to be Removed}$$

Step 2 **Determine Actual Oil Pressure Drop.** Pressure drop shown on curve x Pressure drop correction multiplier = Actual pressure drop.

Oil Temperature

Oil coolers can be selected by using entering or leaving oil tempertures.

Typical operating temperature ranges are:

Hydraulic Motor Oil	110°F - 130°F
Hydrostatic Drive Oil	130°F - 180°F
Lube Oil Circuits	110°F - 130°F
Automatic Transmission Fluid	200°F - 300°F

Desired Reservoir Temperature

Return Line Cooling: Desired temperature is the oil temperature leaving the cooler. This will be the same temperature that will be found in the reservoir.

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

Oil △T=(BTU's/Hr.)/GPM Oil Flow x 210).

To calculate the oil leaving temperature from the cooler, use this formula:

Oil Leaving Temperature = Oil Entering Temperature - Oil △T.

This formula may also be used in any application where the only temperature available is the entering oil temperature.

Oil Pressure Drop: Most systems can tolerate a pressure drop through the heat exchanger of 20 to 30 PSI. Excessive pressure drop should be avoided. Care should be taken to limit pressure drop to 5 PSI or less for case drain applications where high back pressure may damage the pump shaft seals.

STAINLESS STEEL CONSTRUCTION

Features

- **Stacked Plate**
- **Stainless Steel**
- **Copper Brazed**
- **Oil to Water Applications**
- **High Performance**
- **Compact Design**
- **Water Chilling**
- **Lower Refrigerant Charge**
- Specifically Designed for DX Water Chilling Applications from 1 to 40 Tons
- Unique DX Distribution Tube Assures Proper Gas Distribution and Peak Performance
- Type 316 Stainless Steel Plates
- Copper Brazed (Optional Nickel Brazing Compound)
- Optional Foot Mounting Bracket
- Optional Nickel/Chrome Brazed Construction

Ratings

Maximum Working Temperature 350° F at 450 psi*

Maximum Working Pressure 450 psi**

Test Pressure 600 psi

*Maximum working temperature can increase with derating of working pressure.

**Maximum working pressure can increase with a derating of working temperature.

Pressure rating is for copper brazed only.

Materials

Plate Material 316L Stainless Steel

Braze Material Copper – Standard
Nickel/Chrome – Optional

Stud Bolts 304 Stainless Steel

Front and Back Pressure Plates 304 Stainless Steel

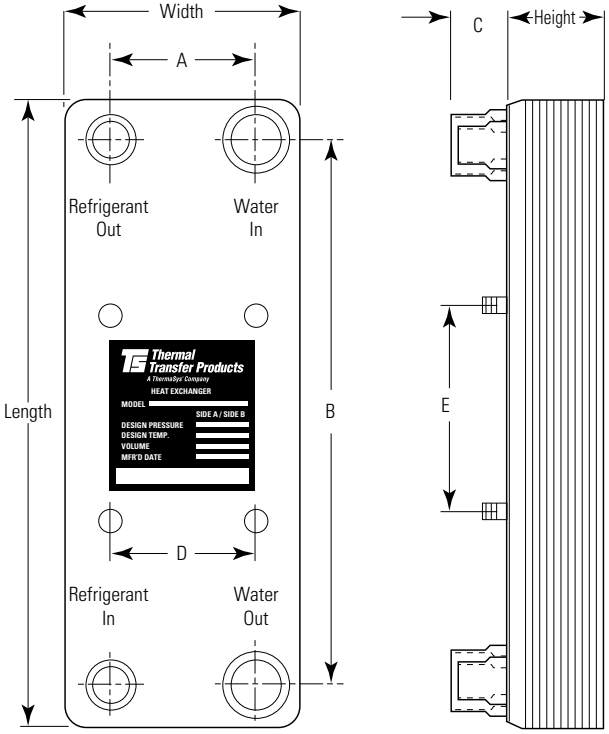
Connectors 304 Stainless Steel

Foot Mounting Brackets 304 Stainless Steel

How to Order

BPCH	–		–		–		–		–		–		–	
Model Series		**Number of Plates**		**Model Size Selected** 12 x 5 20 x 5 20 x 10		**Side A "In"**		**Side A "Out"**		**Side B "In"**		**Side B "Out"**		**Options** **FB** - Foot Mounting Brackets

Dimensions



Model	D	E
12 x 5	2.5"	3.5"
20 x 5	2.5"	5.5"
20 x 10	4.0"	5.5"

Model	Stud Bolts
12 x 5	Optional 3/8 - 16 x 7/8"L
	Optional 2 - 5 Tons
20 x 5	Standard 7.5 - 15 Tons
	3/8 - 24 x 7/8"L
20 x 10	Standard 1/2 - 13 x 7/8"L

Connection Type	C Dimension
1/2, 5/8, 7/8 ID Sweat & 3/4" NPT	1.125"
1-1/8 ID Sweat & 1" NPT	1.250"
1-3/8 ID Sweat & 1-1/4" NPT	1.375"
1-5/8 ID Sweat & 1-1/2" NPT	1.500"
2-1/8 ID Sweat & 2" NPT	1.750"
2-5/8 ID Sweat & 2-1/2" NPT	2.000"

Waterside Pressure Drop

Model	2 GPM/ton	2.4 GPM/ton	3 GPM/ton
BPCH 1A thru BPCH 5A	.8 PSI	1.6 PSI	1.9 PSI
BPCH 2 thru BPCH 5	2.7 PSI	3.8 PSI	5.6 PSI
BPCH 7-1/2 thru BPCH 15B	2.7 PSI	3.9 PSI	5.7 PSI
BPCH 10 thru BPCH 40	2.6 PSI	3.8 PSI	5.9 PSI

12" x 5" Models

Model	Tons	Width	Length	Height	A	B	Refrig Out	Refrig In	Water	Wt (lbs)
BPCH 1A	1	4.9	12.2	1.3	2.7	9.9	5/8 ID - 7/8 ID	5/8 ID - 7/8 ID	7/8 ID	5
BPCH 1-1/2A	1.5			1.5						6
BPCH 2A	2			1.9						8
BPCH 3A	3			2.6						10
BPCH 4A	4			3.2			7/8 ID			12
BPCH 5A	5			4.2						14

20" x 5" Models

Model	Tons	Width	Length	Height	A	B	Refrig Out	Refrig In	Water	Wt (lbs)
BPCH 1-1/2	2	5.0	20.3	1.1	2.8	18.1	5/8 ID - 7/8 ID	5/8 ID - 7/8 ID	7/8 ID	8
BPCH 2	3			1.3						9
BPCH 2-1/2	2.5			1.5						10
BPCH 3	3			1.7						12
BPCH 3-1/2	3.5			1.9						13
BPCH 4	4			2.3			7/8 ID		1-1/8 ID	14
BPCH 5	5			2.6						16
BPCH 7-1/2	7.5			3.8			1-1/8 ID	7/8 ID		22
BPCH 10B	10			5.1			1-3/8 ID		1-3/8 ID	28
BPCH 12B	12.5			6.0						34
BPCH 15B	15			7.0						40

20" x 10" Models

Model	Tons	Width	Length	Height	A	B	Refrig Out	Refrig In	Water	Wt (lbs)
BPCH 10	10	9.8	20.3	2.6	6.5	17.0	1-3/8 ID	7/8 ID	1-5/8 ID	34
BPCH 12	12.5			3.2						40
BPCH 15	15			3.7				7/8 ID*		45
BPCH 20	20			5.1			1-5/8 ID			57
BPCH 25	25			6.0				1-1/8 ID*	2-1/8 ID	68
BPCH 30	30			7.0			2-1/8 ID			81
BPCH 35	35			8.8					2-5/8 ID	92
BPCH 40	40			9.8						104

*Notes: Nominal tons – 12,000 BTUH per ton, 54°F EWT, 44°F LWT, 35°F Evap. Temp., 10°F Superheat, 2.4 gpm per ton, R-22. For Glycol, special fluids or design conditions other than listed above, please contact the factory for special computer selection. *Add .75" to height of refrigerant in connection.*

OCA Series - Process Cooling

Thermal Transfer Products Process Coolers

Our Thermal Transfer Products brand offers a full line of process cooling heat exchangers.

Water-Cooled

Fixed bundle shell and tube

U-Tube Removable Bundle

Stainless Steel brazed plate

Large range of standard sizes

Air-Cooled

Copper-tube and fin

Brazed aluminum

Large range of standard sizes

Standard Product Options

Thermal Transfer process coolers are available with a wide variety of standard options to best suit each application.

Water-Cooled

Copper, copper-nickel, or stainless steel tubing

Nickel-braze plate coolers

Air-Cooled

AC, hydraulic, or air-motor fan drives

Copper tube aluminum fin

Brazed aluminum (P-BAR)

Heresite coating for offshore or corrosive environment operation

Customer Focused and Driven

All catalog product is available with short lead-times

Expert application engineers available to select and size the right product for your application

Custom designs are available

For application help and quoting, visit our Full TTP site or contact ttpsales@apiheattransfer.com.

BRAZED ALUMINUM CONSTRUCTION

HYDRAULIC OR COMPRESSOR OIL COOLING

Features

- **Large Oil Flow**
- **High Performance**
- **Industrial Duty**
- **Brazed Aluminum Bar and Plate Core**
- Compact all aluminum core assembly
- Ideal for converting water cooled equipment to air cooled
- Eliminates high water and sewer costs
- Eliminates corrosion problems associated with water cooled units
- Vertical air flow works well for heat recovery
- State-of-the-art heat transfer technology
- Hydraulic motors available
- Optional SAE Ports
- Marine corrosion control coatings available
- High performance air side fin design
- Detachable legs

Ratings

Maximum Operating Pressure
250 psi (17 BAR)

Maximum Operating Temperature
300° F (150° C)

Materials

Legs Steel with baked enamel finish

Shroud Steel

Standard Core Brazed Aluminum Bar and Plate
- Tanks – 5052 Aluminum
- Nose Bar & Little Bar – 3003-H Aluminum
- Air Fin, Plate, Turbulator & End Plate – 3003-O Aluminum

Fan Aluminum Hub, Plastic Blades

Motor TEFC

Fluid Compatability

Petroleum/mineral oils

Oil/water emulsion

Water/ethylene glycol

How to Order

AOL	–		–		–		–	

Model Series
AOL - Standard

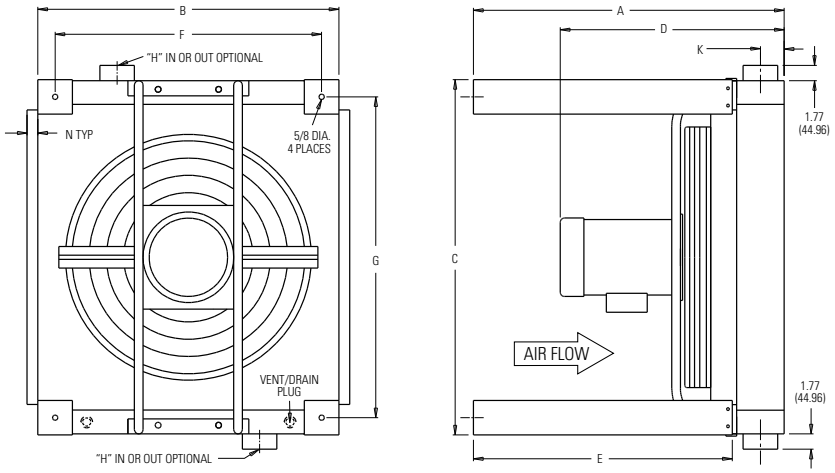
Model Size Selected
400
725
950
1200
1600
2000
2500
3000
3500

Connection Type
Blank - NPT
S - SAE

Specify Motor Required
0 - No Motor
2 - Single Phase
3 - Three Phase
6 - 575 Volt
9 - Hydraulic
18 - IEC Three Phase

Noise Level
Blank - Standard Noise Level
LN - Low Noise Level

Dimensions



Model	A	B	C	D Approx.	E	F	G	H NPT	H SAE	J	K	L	Net Weight Lbs.	Shipping Weight Lbs.
AOL-400	34.20 (868.68)	17.96 (456.18)	22.69 (576.33)	20.86 (529.84)	30.00 (762.00)	13.96 (354.58)	18.69 (474.73)	2.00	#32 SAE 2-1/2-12 UN-2B	5.93 (150.62)	1.85 (46.99)	1.25 (31.75)	109 (49.44)	148 (67.13)
AOL-725	34.20 (868.68)	22.37 (568.20)	30.57 (776.48)	20.86 (529.84)	30.00 (762.00)	18.37 (466.60)	26.57 (674.88)	2.00		5.88 (149.35)	1.85 (46.99)	1.25 (31.75)	151 (68.49)	170 (77.11)
AOL-950	36.01 (914.65)	26.78 (680.21)	37.25 (946.15)	23.62 (599.95)	30.00 (762.00)	22.78 (578.61)	33.25 (844.55)	2.00		6.82 (173.23)	2.76 (70.10)	1.25 (31.75)	221 (100.24)	300 (136.08)
AOL-1200	36.01 (914.65)	26.78 (680.21)	41.20 (1046.48)	25.51 (647.95)	30.00 (762.00)	22.78 (578.61)	37.20 (944.88)	2.00		6.00 (152.40)	2.76 (70.10)	1.25 (31.75)	296 (134.26)	430 (195.04)
AOL-1600	36.01 (914.65)	34.89 (886.21)	41.20 (1046.48)	27.51 (698.75)	30.00 (762.00)	30.89 (784.61)	37.20 (944.88)	2.50	2-1/2 SAE 4 Bolt FLG	8.00 (203.20)	2.76 (70.10)	1.25 (31.75)	355 (161.03)	515 (233.60)
AOL-2000	36.01 (914.65)	37.88 (962.15)	51.05 (1296.67)	26.25 (666.75)	30.00 (762.00)	33.88 (860.55)	47.05 (1195.07)	2.50		8.00 (203.20)	2.76 (70.10)	1.25 (31.75)	482 (218.63)	582 (263.99)
AOL-2500	36.01 (914.65)	43.70 (1109.98)	49.08 (1246.63)	28.51 (724.15)	30.00 (762.00)	39.70 (1008.38)	45.08 (1145.03)	3.00	3" SAE 4 Bolt FLG.	8.00 (203.20)	2.76 (70.10)	1.25 (31.75)	555 (251.74)	655 (297.10)
AOL-3000	36.01 (914.65)	52.52 (1334.01)	51.05 (1296.95)	30.51 (774.95)	30.00 (762.00)	48.52 (1232.41)	47.05 (1206.50)	3.00		8.00 (203.20)	2.76 (70.10)	1.25 (31.75)	724 (328.40)	825 (374.21)
AOL-3500	36.01 (914.65)	56.30 (1430.02)	51.05 (1296.95)	30.51 (774.95)	30.00 (762.00)	52.30 (13328.42	47.05 (1206.50)	3.00		8.00 (203.20)	2.76 (70.10)	1.25 (31.75)	760 (344.73)	860 (390.09)

Note: We reserve the right to make reasonable design changes without notice. All dimensions are in inches and (millimeters).

Selection Procedure

Performance Curves based on 100°F (55.56°C) E.T.D. or Entering Temperature Difference (E.T.D = Entering oil temperature minus ambient air temperature). SAE #10 oil @ 200°F (93.33°C).

Oil pressure drop coding:

- **X** = 5 PSI (.345 BAR)
- ● = 10 PSI (.689 BAR)
- ◆ = 15 PSI (1.03 BAR)
- ▲ = 20 PSI (1.38 BAR)
- ■ = 30 PSI (2.10 BAR)

E.T.D. temperature correction formula:

ENGLISH Version

$$HP_{Curve} = HP_{To\ Be\ Removed} \times \frac{100}{Desired\ E.T.D}$$

METRIC Version

$$\frac{KW}{°C} = \frac{Heatload\ (KW)}{Desired\ E.T.D.\ (°C)}$$

Conversion

$$Hp = \frac{KW}{°C} = X\ .745\ X\ E.T.D.\ (°F)$$

Notes

1. A three-way thermostatic valve is recommended to bypass the cold oil around the heat exchanger during start up.
2. Support piping as needed. Flexible connectors must be properly installed to validate warranty.
3. Coolers should not operate in ambient temperatures below 35°F (1°C). Consult factory for recommendations.
4. The fan cannot be cycled.
5. AOL coolers operated outdoors must be protected from weather. Consult factory for recommendations.
6. If duct work or additional static resistance is added to the cooler airstream, an auxiliary air mover may be required.
7. Can be mounted for horizontal air flow, with oil in at bottom port.

Maintenance

Periodic cleaning of the fins with compressed air is needed to remove the accumulation of dirt and dust. If the inside of the tubes need to be cleaned of oil and carbon, use a chlorinated solvent. Do not use strong solvents. Do not use acids or caustic cleaners.

Specifications

Electric Motor & Fan Data[1] (60 Hz Nema Frame)

Model	Fan CMM	Fan CFM	Motor H.P.	Voltage	Phase	Full Load Amps 230V	Frequency (Hz)	RPM	Nema Frame	Thermal Overload	Sound dB(A) at 3 ft.
AOL-400	62.30	2200	1.0	115/208-230	1	6.0	60[2]	3450	56C	No	97
	51.68/62.30	1825/2200	1.0	208-230/460[3]	3	3.6/3.2	50/60	2850/3450	56C	No	97
AOL-725	101.94	3600	1.5	115/208-230	1	8.5	60[2]	3450	56C	No	100
	84.95/102.94	3000/3600	1.5	208-230/460[4]	3	4.8/4.2	50/60	2850/3450	56C	No	100
AOL-950	133.09	4700	1.5	115/208-230	1	8.6	60[2]	1740	145TC	No	92
	133.09	4700	1.5	208-230/460	3	4.6	60[2]	1740	145TC	No	92
AOL-1200	198.22	7000	5.0	230	1	23.00	60[2]	1740	184TC	No	94
	198.22	7000	3.0	208-230/460	3	8.8	60[2]	1740	182TC	No	96
AOL-1600	223.70	7900	5.0	208-230/460	3	13.4	60[2]	1740	184TC	No	98
AOL-2000	311.49	14000	7.5	230/460	3	19.6	60[2]	1740	213TC	No	98
AOL-2500	396.44	14000	7.5	230/460	3	19.6	60[2]	1740	213TC	No	98
AOL-3000	495.54	17500	10.0	230/460	3	24.8	60[2]	1740	215TC	No	102
AOL-3500	495.54	17500	10.0	230/460	3	24.8	60[2]	1740	215TC	No	102

[1] Published electrical ratings are approximate, and may vary because of motor brand. Actual ratings are on motor nameplate.
[2] May also be operated at 50 hz. Consult factory for details.
[3] 50 Hz voltage: 190-200-208-220/380-400-415-440
[4] 50 Hz voltage: 190-208/380-415
All motors shown are TEFC—Other motor options available upon request.

Electric Motor Information (50 Hz IEC Frame)

Model	CMM	CFM	KW	Voltage	Phase	Frequency	RPM	Frame	Sound dB(A) at 1 meter
AOL-400	52.4	1850	.75	230/400/415	3	50 Hz	3000	80	81
AOL-725	85.0	3001	1.10	230/400/415	3	50 Hz	3000	80	80
AOL-950	108.2	3821	1.50	230/400/415	3	50 Hz	1500	90	78
AOL-1200	165.1	5834	2.20	230/400/415	3	50 Hz	1500	100	83
AOL-1600	186.4	6584	3.00	230/400/415	3	50 Hz	1500	100	85
AOL-2000	331.3	11700	4.00	230/400/415	3	50 Hz	1500	112	88
AOL-2500	331.3	11700	4.00	230/400/415	3	50 Hz	1500	112	88
AOL-3000	410.6	14500	7.50	230/400/415	3	50 Hz	1500	132	90
AOL-3500	410.6	14500	7.50	230/400/415	3	50 Hz	1500	132	90

All IEC frame motors have CE mark.
IEC motor voltages have +/- 10% tolerance.

Electric Motor Information (AOL-Low Noise)

Model	HP	Nema Frame	LN RPM	LN CFM	LN CMM	Voltage	Frequency (Hz)	Sound dB(A) at 3 ft.
AOL-400-1PH-LN	1	56C	1725	1100	31.15	115/230	60	72
AOL-400-3PH-LN	1	56C	1725	1100	31.15	230/460	60	72
AOL-725-1PH-LN	1.50	56C	1725	1780	50.40	115/230	60	82
AOL-725-3PH-LN	1.50	56C	1725	1780	50.40	230/460	60	82
AOL-950-3PH-LN	1.50	145TC	1160	3150	89.20	230/460	60	76
AOL-1200-3PH-LN	1.50	182TC	1160	4690	132.81	230/460	60	75
AOL-1600-3PH-LN	2	184TC	1160	6510	184.34	230/460	60	78
AOL-2000-3PH-LN	5	213TC	1160	8700	246.36	230/460	60	85
AOL-2500-3PH-LN	5	213TC	1160	11700	331.31	230/460	60	85
AOL-3000-3PH-LN	5	215TC	1160	13500	382.28	230/460	60	93
AOL-3500-3PH-LN*	10	256TCZ	1160	16200	458.73	230/460	60	91

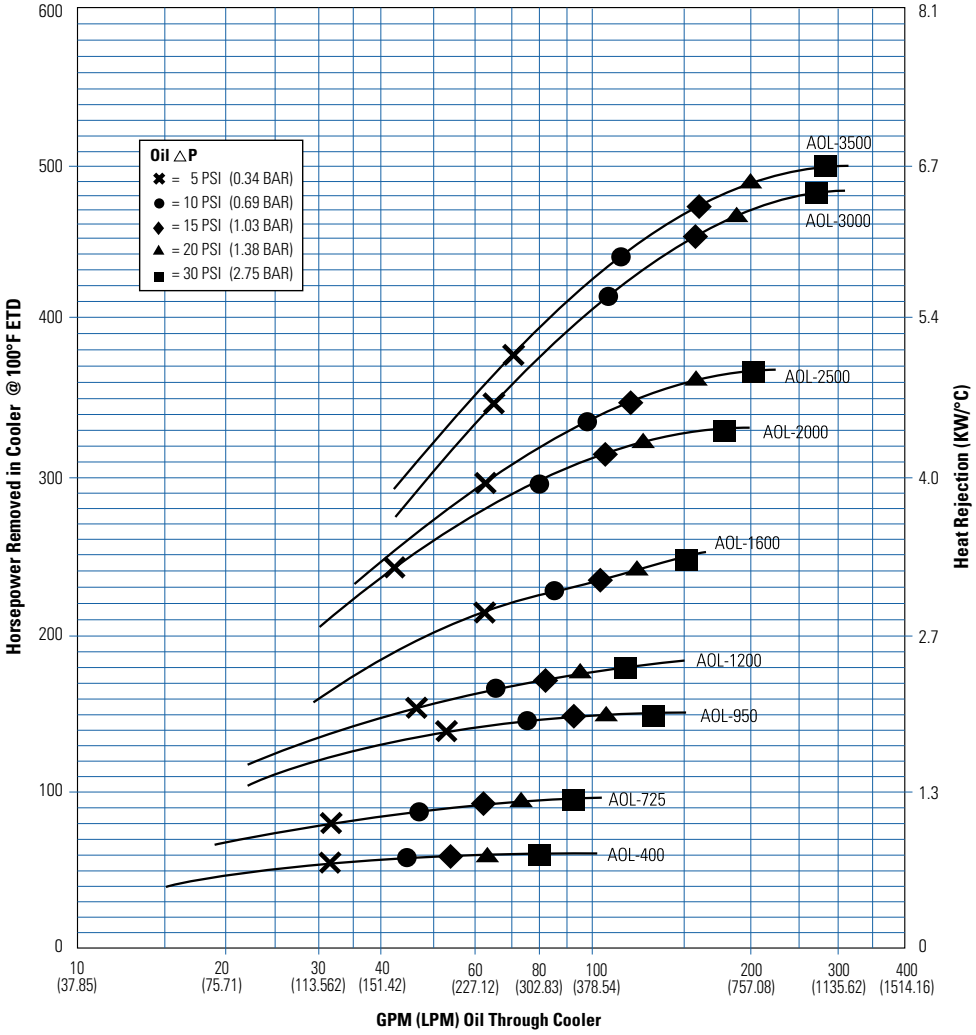
Available in 60 Hz Nema Frame only.

Hydraulic Motor Information

Model	Oil Flow Required GPM (LPM)	Min. Pressure Required PSI (BAR)	Motor IN^3/REV (CM^3/REV) Displacement	Sound dB(A) at 3 ft.
AOL-400	3.3 (12.49)	425 (29.31)	0.22 (3.6)	97
AOL-725	3.3 (12.49)	675 (46.54)	0.22 (3.6)	100
AOL-950	10.1 (38.23)	300 (20.68)	1.4 (22.94)	92
AOL-1200	10.1 (38.23)	725 (50.00)	1.4 (22.94)	94
AOL-1600	10.1 (38.23)	1100 (75.84)	1.4 (22.94)	98
AOL-2000	10.1 (38.23)	1650 (113.76)	1.4 (22.94)	98
AOL-2500	10.1 (38.23)	1650 (113.76)	1.4 (22.94)	98
AOL-3000	10.1 (38.23)	2000 (137.90)	1.4 (22.94)	102
AOL-3500	10.1 (38.23)	2000 (137.90)	1.4 (22.94)	102

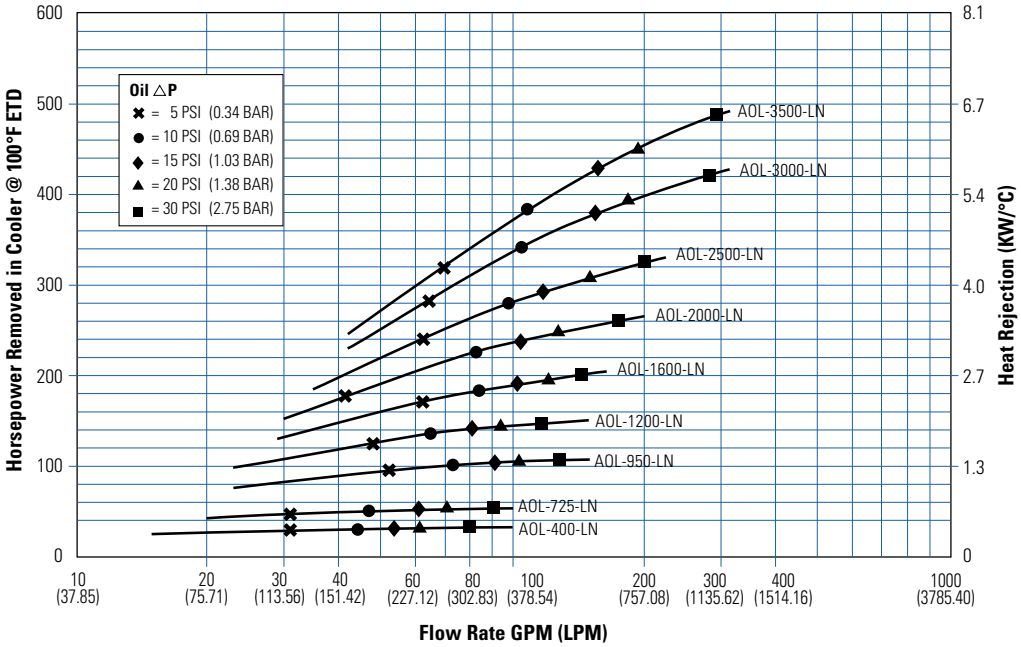
Notes: Maximum Pressure is 2000 psi. Stated Minimum Operating Pressure is at Inlet Port of Motor. 1000 psi Allowable Back Pressure.

Performance Curves



Note: Derate heat rejection values 15% if using 50Hz motors.

Low Noise Option

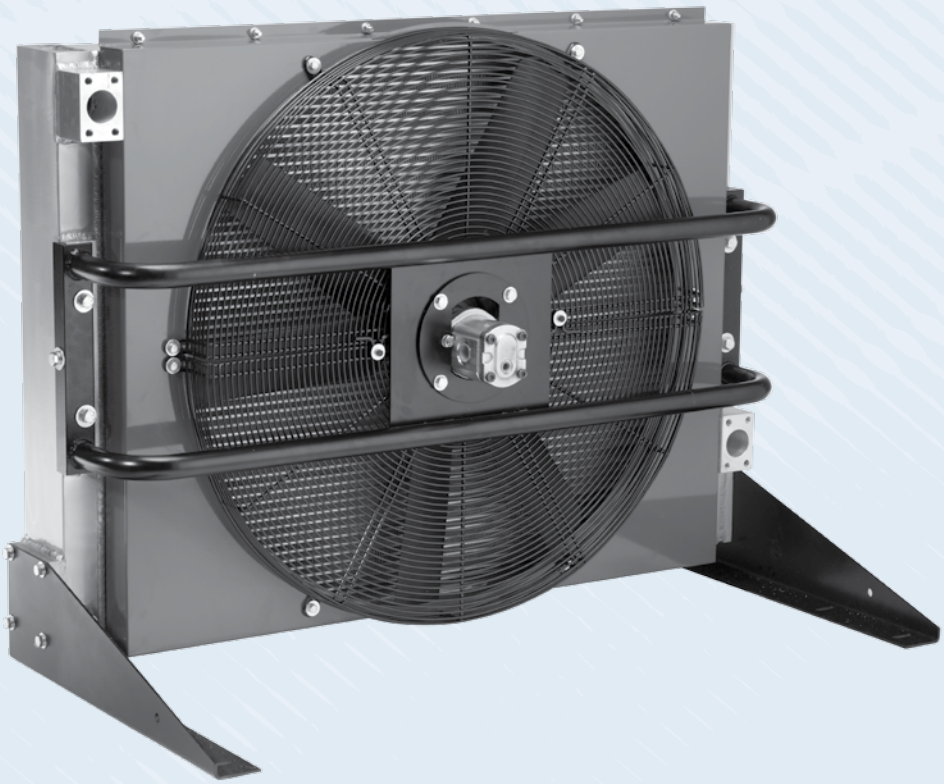


Available in 60 Hz Nema Frame only.

BRAZED ALUMINUM CONSTRUCTION

Features

- **Bar and Plate Brazed Aluminum Core**
- **Rugged, lightweight, and compact**
- **Provides the best heat transfer per given envelope size while minimizing pressure drop**
- **Air-side fin design minimizes fouling and static pressure ensuring long-term, reliable performance**
- **Welded fittings/ports and manifolds ensure structural integrity**
- **Standard SAE ports – NPT and BSPP ports available**
- **Customized units are available to meet your specific performance requirements**
- T-BAR core optional for high viscosity oils or other highly fouling fluids. *See T-Bar Performance Curve
- Low Noise Option Available



Ratings

Maximum Operating Pressure
250 psi (17 BAR)

Maximum Operating Temperature
300° F (150° C)

Materials

Mounting Feet Steel

Standard Core Brazed Aluminum Bar and Plate
- Tanks – 5052 Aluminum
- Nose Bar & Little Bar – 3003-H Aluminum
- Air Fin, Plate, Turbulator & End Plate – 3003-O Aluminum

Fanguard Steel

Connectors Aluminum

Fan Aluminum Hub, Plastic Blades

Shroud Steel

Motor TEFC & IEC

Fluid Compatability

Petroleum/mineral oils

Oil/water emulsion

Water/ethylene glycol

How to Order

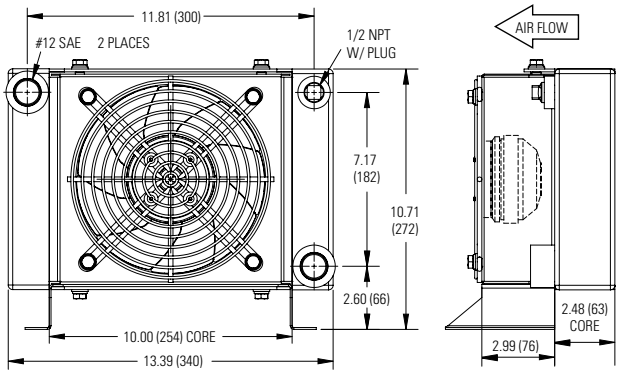
Model Series	**Model Size Selected**	**Connection Type***	**Specify Motor Required**	**Core**	**Noise Level**
BOL	**4** **8** **16** **30** **400** **725** **950** **1200** **1600** **2000**	**1** - NPT **2** - SAE **3** - BSPP	**2** - Single Phase **3** - Three Phase **6** - 575 Volt **9** - Hydraulic **18** - IEC Three Phase	**Blank** - Standard Bar & Plate **TB** - T-BAR Core*	**Blank** - Standard Noise Level **LN** - Low Noise Level

*T-BAR Core option provides a T-BAR core in BOL 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.

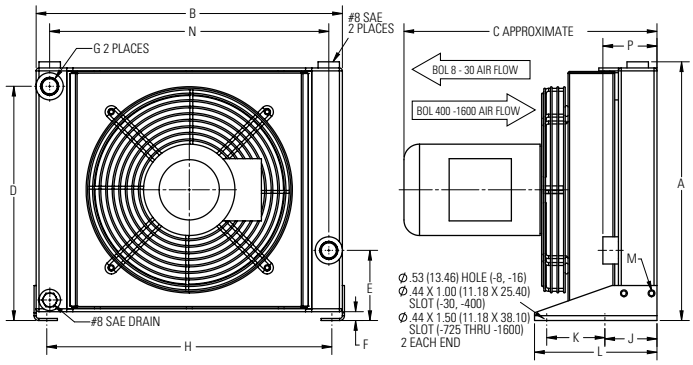
OPTIONAL T-BAR CORE SECTION CUTAWAY

Dimensions

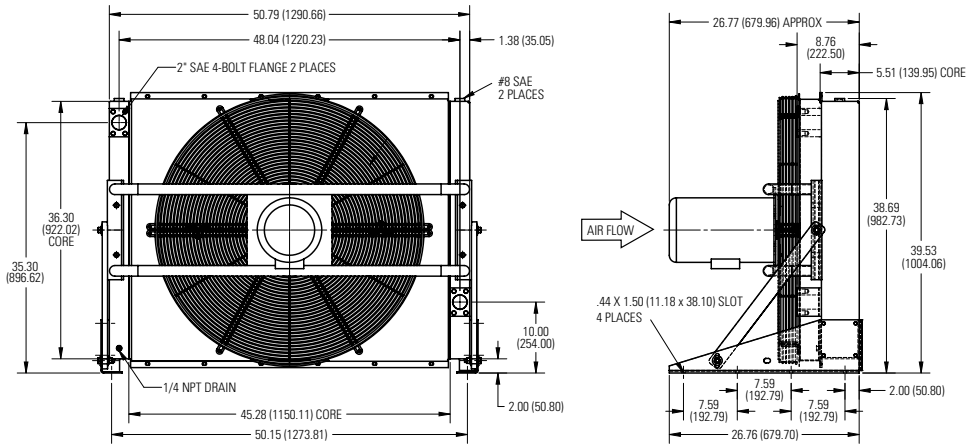
BOL-4



BOL-8 through BOL-1600



BOL-2000



Model	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Approx. Ship Wt. lbs (Kg)
BOL-4	See diagram above			—	—	—	—	—	—	—	—	—	—	—	18 (8.16)
BOL-8	12.93 (328.42)	15.75 (400.05)	14.72 (373.89)	11.30 (287.62)	3.27 (83.06)	.55 (13.97)	#12 SAE	14.53 (369.06)	3.07 (77.98)	3.75 (88.90)	7.36 (186.94)	M8 Bolt (2PL)	14.01 (355.85)	3.48 (88.40)	45 (20.4)
BOL-16	16.63 (422.40)	19.69 (500.13)	16.16 (410.46)	15.06 (382.52)	4.51 (114.56)	.57 (14.48)	#12 SAE	18.30 (464.82)	3.35 (85.09)	3.74 (95.00)	7.87 (199.90)	M8 Bolt (2PL)	17.95 (455.93)	3.46 (87.88)	55 (24.94)
BOL-30	21.09 (535.68)	26.38 (670.06)	18.23 (463.04)	19.49 (495.05)	5.26 (133.60)	1.32 (33.53)	#20 SAE	24.74 (628.40)	4.25 (107.95)	5.00 (127.00)	10.00 (254.00)	M10 Bolt (4PL)	24.34 (618.24)	5.28 (134.11)	125 (56.70)
BOL-400	19.20 (487.68)	22.45 (570.23)	18.80 (477.52)	17.31 (439.67)	6.50 (165.10)	2.00 (50.80)	#20 SAE	22.30 (566.42)	4.25 (107.95)	5.00 (127.00)	10.00 (254.00)	M10 Bolt (4PL)	20.08 (510.03)	5.20 (132.08)	148 (67.13)
BOL-725	23.49 (596.65)	30.32 (770.13)	18.60 (472.44)	21.60 (548.64)	6.50 (165.10)	2.00 (50.80)	#20 SAE	30.17 (766.32)	4.25 (107.95)	5.00 (127.00)	10.00 (254.00)	M10 Bolt (4PL)	27.95 (709.93)	5.20 (132.08)	170 (77.11)
BOL-950	27.94 (709.68)	37.03 (940.56)	22.69 (576.33)	24.55 (623.57)	9.50 (241.30)	2.00 (50.80)	2" SAE 4-Bolt Flange	35.89 (911.61)	6.05 (153.67)	9.20 (233.68)	16.00 (406.40)	M10 Bolt (4PL)	34.26 (870.20)	7.01 (178.05)	300 (136.08)
BOL-1200	27.94 (709.68)	40.96 (1040.38)	24.07 (611.38)	24.55 (623.57)	5.50 (139.70)	2.00 (50.80)		40.31 (1023.87)	6.05 (153.67)	9.20 (233.68)	16.00 (406.40)	M10 Bolt (4PL)	38.19 (970.03)	7.01 (178.05)	430 (195.04)
BOL-1600	36.01 (914.65)	40.96 (1040.38)	25.45 (646.43)	32.62 (828.55)	9.50 (241.30)	2.00 (50.80)		40.31 (1023.87)	6.05 (153.67)	9.20 (233.68)	16.00 (406.40)	M10 Bolt (4PL)	38.19 (970.03)	7.01 (178.05)	515 (233.60)
BOL-2000	See diagram above			—	—	—	—	—	—	—	—	—	—	—	582 (264.00)

Note: We reserve the right to make reasonable design changes without notice. All dimensions are in inches and (millimeters).

Specifications

Electric Motor Information (60 Hz Nema Frame)

Model	CMM	CFM	Motor HP	Voltage	Phase	Full Load Amps 230V	Frequency	RPM	Frame	Thermal Overload	Sound dB(A) at 3ft
BOL-4	31.14	1203	1/4	230	1	—	60 Hz	2850	—	—	73
BOL-8	22.65	800	1/3	115/230	1	3.0	60 Hz	3450	48C	No	80
BOL-8	22.65	800	1/3	208-230/460	3	1.4	60 Hz	3450	48C	No	80
BOL-16	40.35	1425	1/2	115/230	1	3.7	60 Hz	3450	48C	No	85
BOL-16	40.35	1425	1/2	208-230/460	3	2.2	60 Hz	3450	48C	No	85
BOL-30	62.29	2200	1/2	115/230	1	3.7	60 Hz	1725	56C	No	85
BOL-30	62.29	2200	1/2	208-230/460	3	2.0	60 Hz	1725	56C	No	85
BOL-400	62.29	2200	1	115/230	1	6.0	60 Hz	3450	56C	No	97
BOL-400	62.29	2200	1	208-230/460	3	3.2	60 Hz	3450	56C	No	97
BOL-725	101.94	3600	1-1/2	115/230	1	8.5	60 Hz	3450	56C	No	100
BOL-725	101.94	3600	1-1/2	208-230/460	3	4.8	60 Hz	3450	56C	No	100
BOL-950	133.10	4700	1-1/2	115/230	1	8.6	60 Hz	1725	145TC	No	92
BOL-950	133.10	4700	1-1/2	208-230/460	3	4.6	60 Hz	1725	145TC	No	92
BOL-1200	198.22	7000	3	208-230/460	3	8.8	60 Hz	1725	182TC	No	94
BOL-1600	223.75	7900	5	208-230/460	3	13.4	60 Hz	1725	184TC	No	96
BOL-2000	396.44	14000	7.5	230/460	3	24.8	60 Hz	1725	213TC	No	98

Electric Motor Information (50 Hz IEC Frame)

Model	CMM	CFM	KW	Voltage	Phase	Frequency	RPM	Frame	Sound dB(A) at 3ft
BOL-4	28.4	1003	.20	230	1	50 Hz	3000	—	73
BOL-8	18.9	667	.25	230/400/415	3	50 Hz	3000	63	71
BOL-16	33.7	1188	.37	230/400/415	3	50 Hz	3000	71	77
BOL-30	52.4	1850	.37	230/400/415	3	50 Hz	1500	71	73
BOL-400	52.4	1850	.75	230/400/415	3	50 Hz	3000	80	81
BOL-725	85.0	3000	1.10	230/400/415	3	50 Hz	3000	80	80
BOL-950	108.2	3821	1.50	230/400/415	3	50 Hz	1500	90	78
BOL-1200	165.1	5834	2.20	230/400/415	3	50 Hz	1500	100	83
BOL-1600	186.4	6584	3.00	230/400/415	3	50 Hz	1500	100	85
BOL-2000	331.3	11700	4.00	230/400/415	3	50 Hz	1500	112	88

All IEC frame motors have CE mark.
IEC motor voltages have +/- 10% tolerance.

Hydraulic Motor Information

Model	Oil Flow Required GPM (LPM)	Min. Pressure Required PSI (BAR)	Motor IN^3/REV (CM^3/REV) Displacement	Sound dB(A) at 3 ft.
BOL-4	3.3 (12.49)	400 (27.58)	0.22 (3.6)	80
BOL-8	3.3 (12.49)	400 (27.58)	0.22 (3.6)	80
BOL-16	3.3 (12.49)	500 (34.47)	0.22 (3.6)	85
BOL-30	3.4 (12.87)	500 (34.47)	0.45 (7.3)	85
BOL-400	3.3 (12.49)	425 (29.30)	0.22 (3.6)	97

Model	Oil Flow Required GPM (LPM)	Min. Pressure Required PSI (BAR)	Motor IN^3/REV (CM^3/REV) Displacement	Sound dB(A) at 3 ft.
BOL-725	3.3 (12.49)	675 (46.50)	0.22 (3.6)	100
BOL-950	10.1 (38.23)	300 (20.70)	1.4 (22.9)	92
BOL-1200	10.1 (38.23)	725 (50.00)	1.4 (22.9)	94
BOL-1600	10.1 (38.23)	1100 (75.80)	1.4 (22.9)	96
BOL-2000	10.1 (38.23)	1650 (113.76)	1.4 (22.9)	98

Notes: Maximum Pressure is 2000 psi. Stated Minimum Operating Pressure is at Inlet Port of Motor. 1000 psi Allowable Back Pressure.

Selection Procedure

Step 1 **Determine Heat Load.** Typical Rule of Thumb, -size cooler for 1/3 of the input horsepower. Heat load may be expressed as either Horsepower or BTU/Hr or KW/°C.

HP=BTU/HR ÷ 2545

BTU/HR=HP x 2545

$$\text{BTU/HR} = \frac{\text{KW}}{\text{°C}} \times 1894.61 \times \text{E.T.D.(°F)}$$

Step 2 **Determine Entering Temperature Difference.** (Actual E.T.D.)

$$\text{E.T.D.} = \text{Entering oil temperature} - \text{Entering Ambient air temperature}$$

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 **Determine the Corrected Heat Dissipation to use the Curves**

ENGLISH Version

$$\text{Corrected Heat Rejection} = \text{(BTU/Hr) Heat Load} \times \frac{100°\text{F}}{\text{Desired E.T.D.}}$$

(BTU/HR) to use with selection chart

METRIC Version

$$\text{Corrected Heat Rejection} \quad \frac{\text{KW}}{\text{°C}} = \frac{\text{Heatload (kw)}}{\text{Desired E.T.D. (°C)}}$$

Step 4 **Select Model From Curves** Enter the Performance Curves at the bottom with the GPM 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.

Step 5 **Calculate Oil Pressure Drop** Find the oil pressure drop correction factor and multiply it by the Oil Pressure Drop found on performance curve.

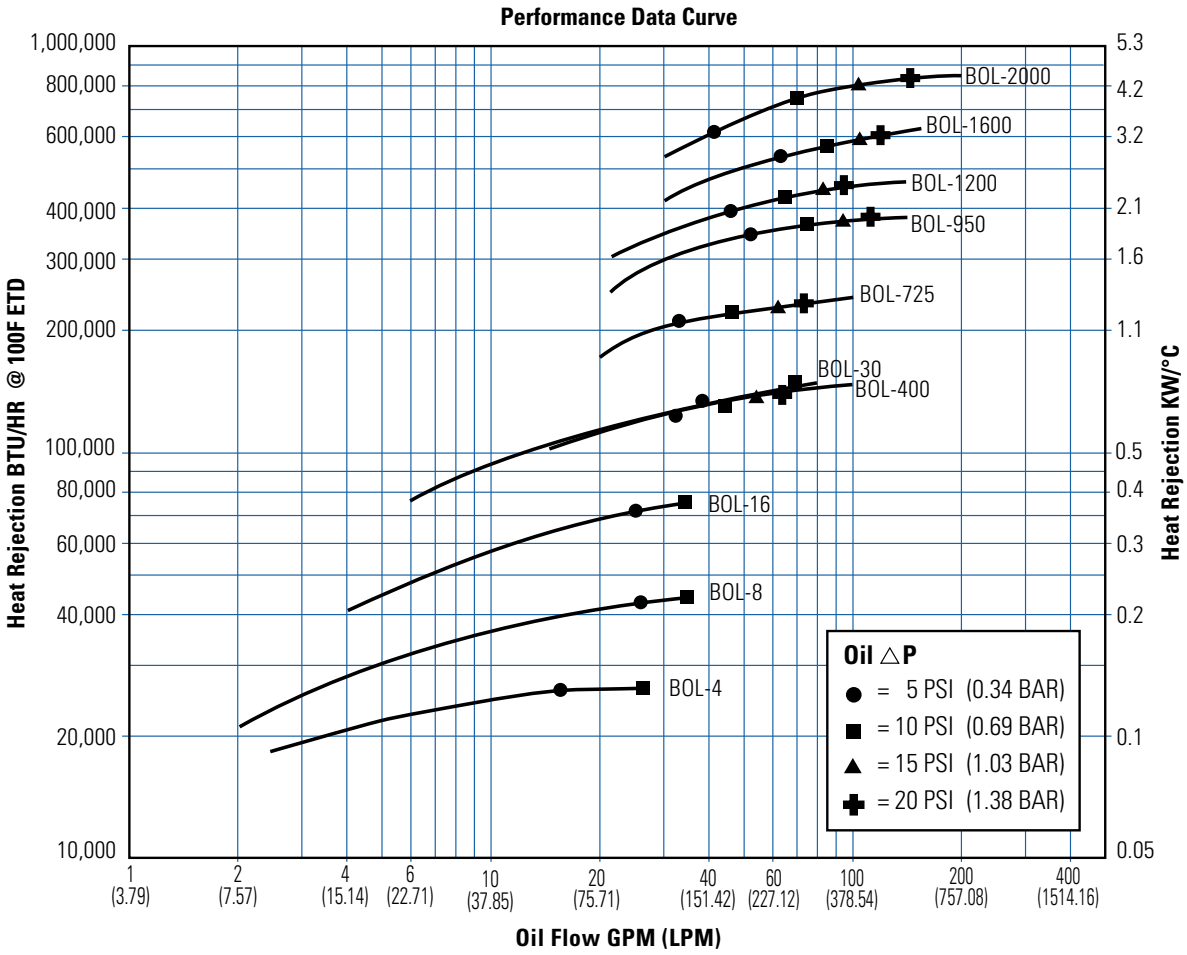
Listed Performance Curves are based on:

- 50 SSU (11 cSt) oil
- 100° F (55.56° C) Entering Temperature Difference (E.T.D.)

If your application conditions are different, then continue with the selection procedure.

Performance Curves

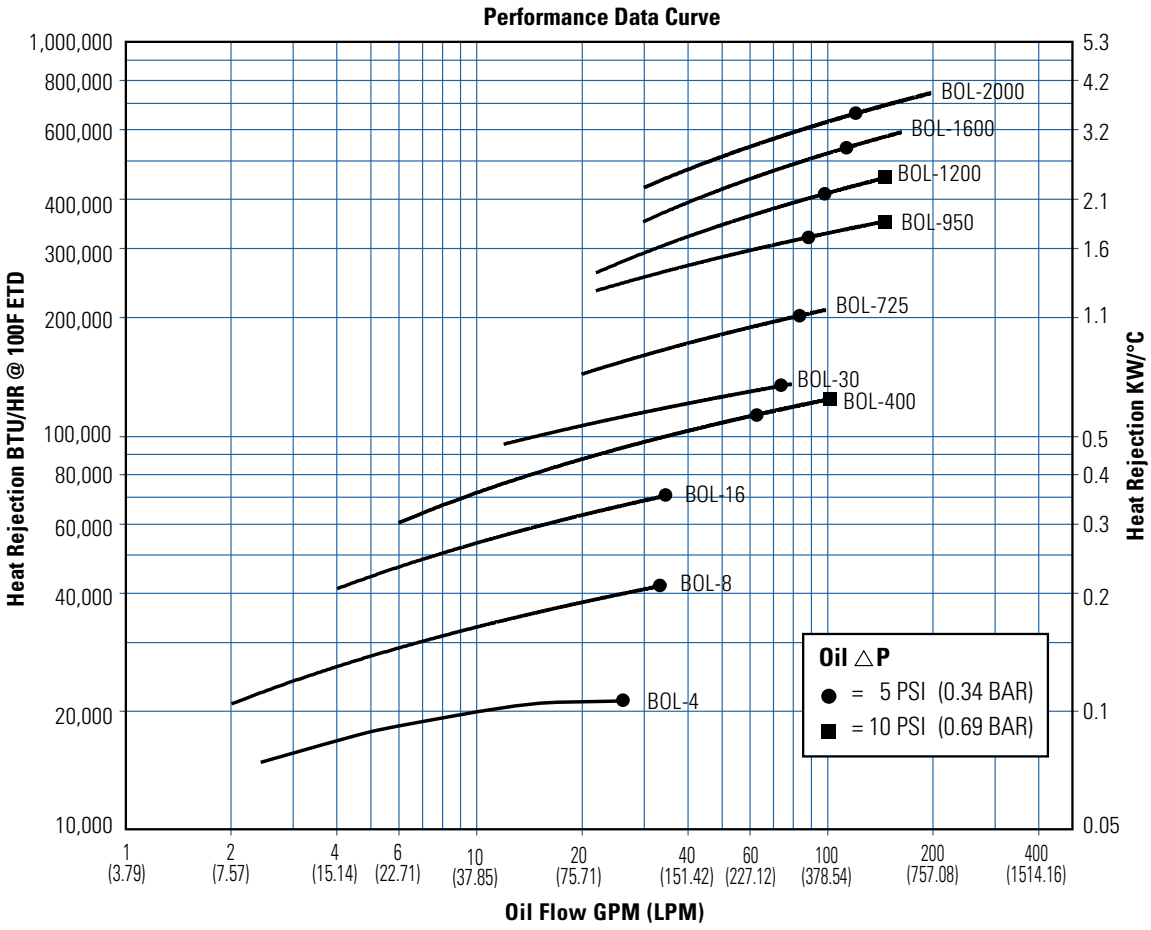
BOL Models with Standard P-BAR Core



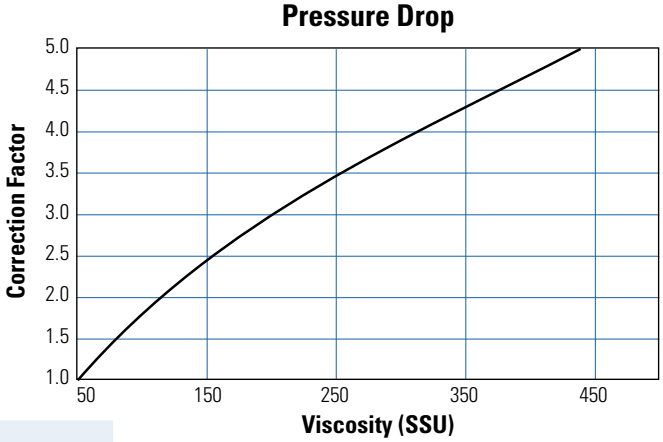
Note: Derate heat rejection values 15% if using 50Hz motors.

Performance Curves

BOL Models with Optional T-BAR Core



Note: Derate heat rejection values 15% if using 50Hz motors.



Oil Temperature

Typical operating temperature ranges are:

Hydraulic Motor Oil	120°F - 180°F (49°C - 82.2°C)
Hydrostatic Drive Oil	160°F - 180°F (71°C - 82.2°C)
Engine Lube Oil	180°F - 200°F (82.2°C - 93.3°C)
Automatic Transmission Fluid	200°F - 300°F (93.3°C - 149°C)

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 = (BTU's/Hr.) / (GPM Oil Flow x 210).

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

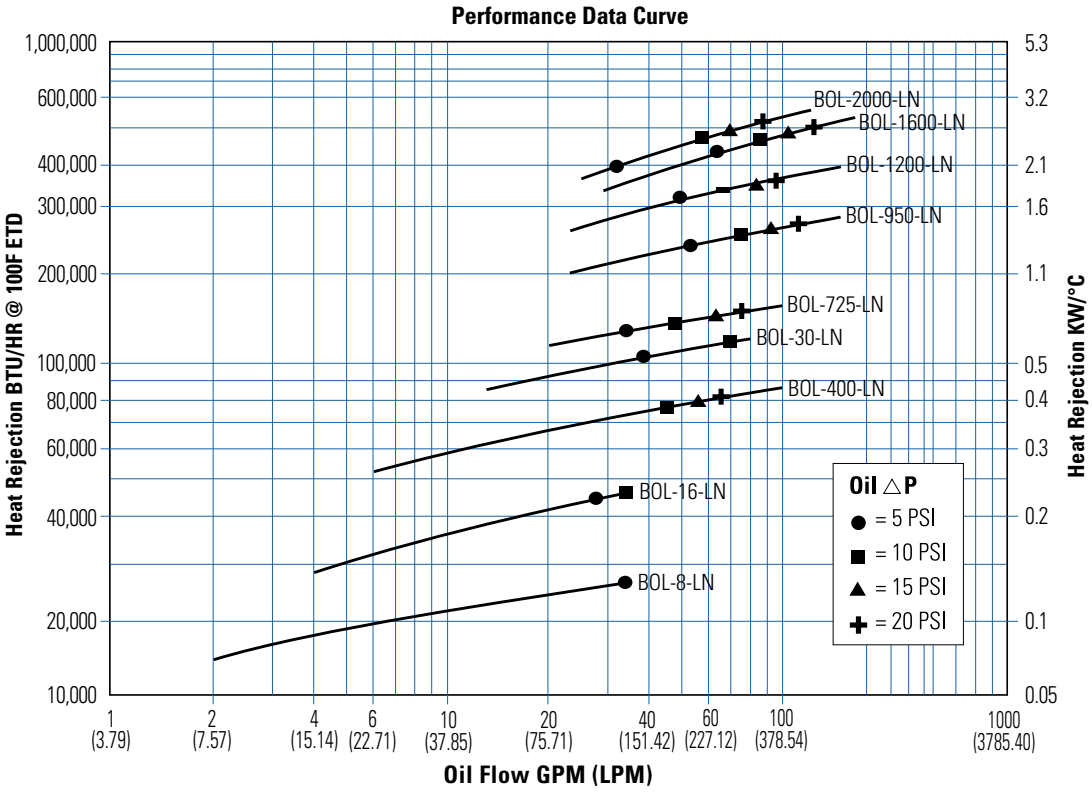
Oil Entering Temp. = Oil Leaving Temp + Oil △T.

Oil Pressure Drop: Most systems can tolerate a pressure drop through the heat exchanger of 20 to 30 PSI. Excessive pressure drop should be avoided. Care should be taken to limit pressure drop to 5 PSI or less for case drain applications where high back pressure may damage the pump shaft seals.

Performance Curves

BOL Models with Low-Noise Option

The low noise option offers the BOL models with a reduced motor speed.
This allows a lower sound level output for noise-sensitive applications.



Available on 60 Hz Nema frame only.

Electric Motor Information

Model	HP	Frame	Low Noise RPM	Low Noise CFM	Low Noise CMM	Voltage	Frequency (HZ)
8-1PH	0.33	48	1725	400	11.33	115/230	60
8-3PH	0.33	48	1725	400	11.33	208-230/460	60
16-1PH	0.50	48	1725	704	19.93	115/230	60
16-3PH	0.50	48	1725	704	19.93	208-230/460	60
30-1PH	0.50	56C	1160	1470	41.62	115/230	60
30-3PH	0.50	56C	1160	1470	41.62	208-230/460	60
400-1PH	1.00	56C	1725	1100	31.19	115/230	60
400-3PH	1.00	56C	1725	1100	31.19	208-230/460	60
725-1PH	1.50	56C	1725	1780	50.40	115/230	60
725-3PH	1.50	56C	1725	1780	50.40	208-230/460	60
950-1PH	1.50	145TC	1160	3150	89.19	115/230	60
950-3PH	1.50	145TC	1160	3150	89.19	208-230/460	60
1200-3PH	1.50	182TC	1160	4690	132.81	208-230/460	60
1600-3PH	2.00	184TC	1160	6510	184.34	208-230/460	60
2000-3PH	5.00	213TC	1160	8700	000.00	230/460	60

Sound Data

Model	DBA at 3 ft
BOL-8-LN	62
BOL-16-LN	69
BOL-30-LN	67
BOL-400-LN	72
BOL-725-LN	82
BOL-950-LN	76
BOL-1200-LN	75
BOL-1600-LN	78
BOL-2000-LN	85

BRAZED ALUMINUM CONSTRUCTION

Features

- **Bar and Plate Brazed Aluminum Core**
- **Rugged, lightweight, and compact**
- **Provides the best heat transfer per given envelope size while minimizing pressure drop**
- **Air-side fin design minimizes fouling and static pressure ensuring long-term, reliable performance**
- **Fan motor assembly has an IP68 with AMP-#180908 connection**
- **Welded aluminum fittings/ports and manifolds ensure structural integrity**
- **Standard SAE ports – NPT and BSPP ports available**
- **Customized units are available to meet your specific performance requirements**
- Additional capabilities for radiators, charge-air-coolers, condensers, and multi-circuit units
- Optional temperature sensors *(see pg. 171)*

30/60 psi Bypass available

Ratings

Maximum Operating Pressure
250 psi (17 BAR)

Maximum Operating Temperature
300° F (150° C)

Fluid Compatability

Petroleum/mineral oils

Oil/water emulsion

Water/ethylene glycol

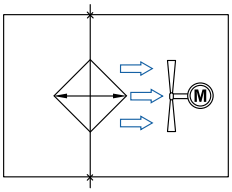
Materials

Core Brazed Aluminum Bar and Plate

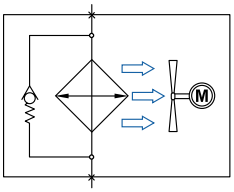
- Tanks – 5052 Aluminum
- Nose Bar & Little Bar – 3003-H Aluminum
- Air Fin, Plate, Turbulator & End Plate – 3003-O Aluminum

Connections Aluminum

Core Mounting Brackets Brazed Aluminum



Without Bypass



With Bypass

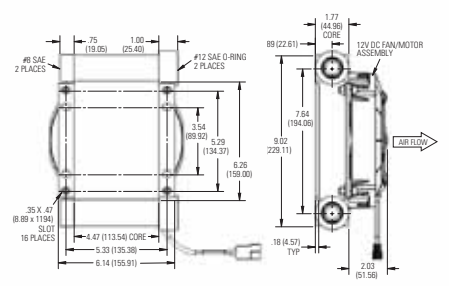
How to Order

Model Series	**Model Size Selected**	**Connection Type***	**Bypass***	**Specify Motor Required**
MA	**3**	**1** - NPT	**30** - 30 PSI	**4A** - 12 VDC
(MAR)	**3.5**	**2** - SAE	**60** - 60 PSI	**4B** - 24 VDC
	4	**3** - BSPP		
	12			
	18			
	32			
	48			
	232			
	248			

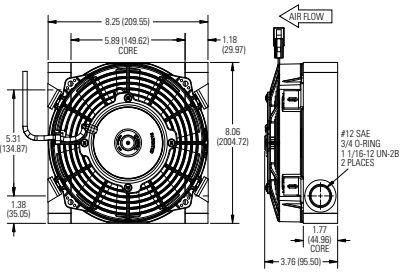
*Bypass available on MA-12, MA-18, MA-32, MA-48, MA-232, MA-248 only. (MAR)
MA-8, MA-14, MA-20, MA-66, MA-32 do not have fan option.
MA 3.5 available with fan only.

Dimensions - Fan/Core

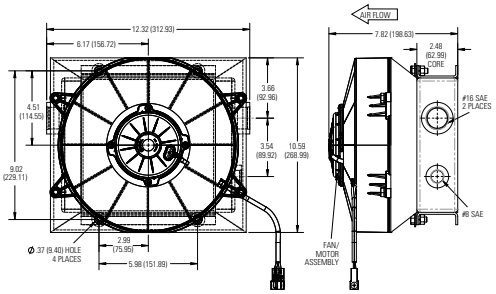
MA-3



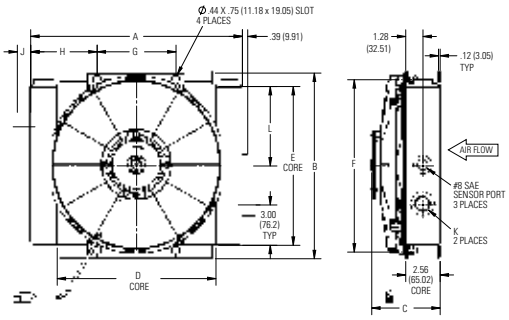
MA-3.5



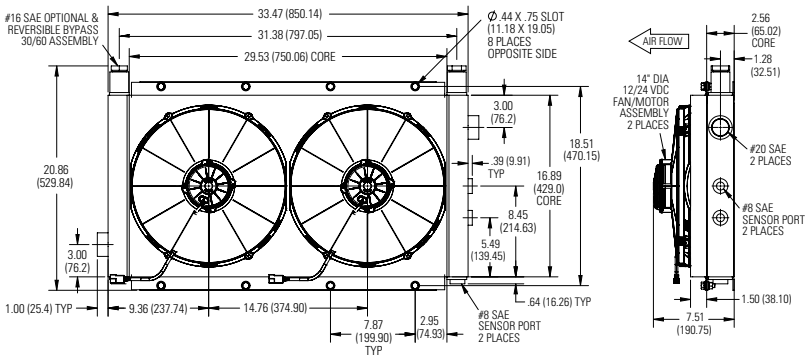
MA-4



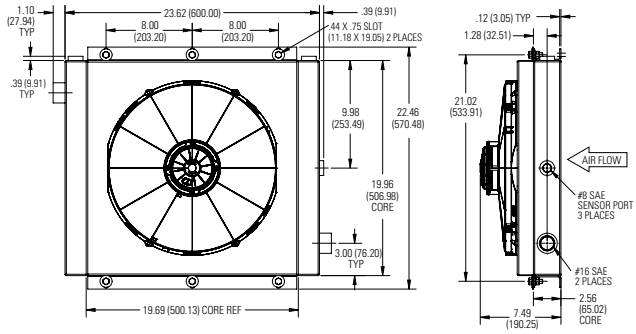
MA-12, MA-18, MA-32



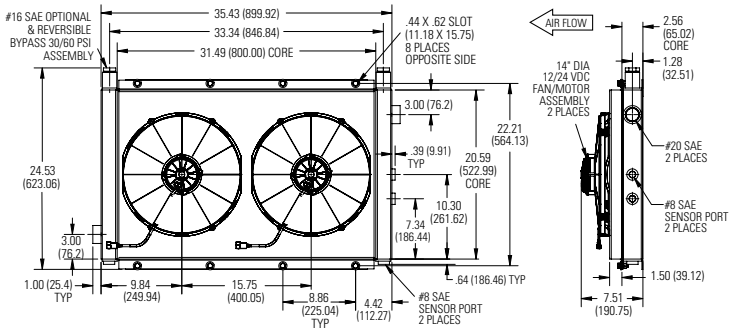
MA-232



MA-48



MA-248

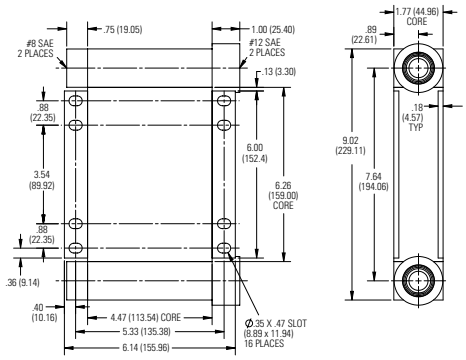


Model	A	B	C	D	E	F	G	H	J	K	L	DC Amp Draw 12V	DC Amp Draw 24V	CFM (CMM)	Approx. Ship Wt. lbs (Kg)
MA-3	See diagram above			—	—	—	—	—	—	—	—	5.7	3.6	300 (8.50)	6 (2.72)
MA-3.5	See diagram above			—	—	—	—	—	—	—	—	12.5	6.3	370 (10.48)	9 (4.08)
MA-4	See diagram above			—	—	—	—	—	—	—	—	12.5	6.3	363 (10.28)	16 (7.26)
MA-12	13.78 (350.01)	11.81 (299.97)	6.26 (159.00)	9.84 (249.94)	9.96 (252.98)	10.87 (276.10)	5.71 (145.00)	4.41 (112.01)	1.00 (25.40)	#12 SAE	4.98 (126.49)	12.5	6.3	521 (14.75)	19 (8.62)
MA-18	15.75 (400.05)	13.81 (350.77)	5.04 128.02)	11.81 (299.97)	11.81 (299.97)	12.80 (325.12)	5.87 (149.10)	4.96 (125.98)	1.00 (25.40)	#12 SAE	5.91 (150.11)	10.6	5.3	783 (22.17)	23 (10.43)
MA-32	19.69 (500.15)	18.54 (470.92)	5.95 (151.13)	15.75 (400.05)	16.14 (409.96)	17.32 (439.93)	12.00 (304.8)	3.86 (98.04)	1.14 (28.96)	#16 SAE	8.07 (204.98)	22.2	11.1	1368 (38.74)	28 (12.70)
MA-48	See diagram above			—	—	—	—	—	—	—	—	22.2	11.1	1637 (46.40)	45 (20.40)
MA-232	See diagram above			—	—	—	—	—	—	—	—	19.3*	9.7*	2234 (63.26)	65 (29.48)
MA-248	See diagram above			—	—	—	—	—	—	—	—	19.3*	9.7*	2904 (82.24)	90 (40.80)

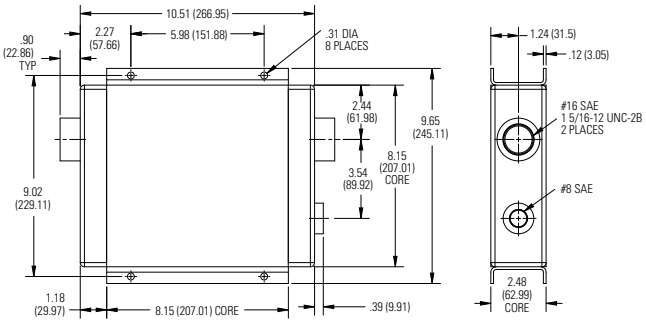
Note: We reserve the right to make reasonable design changes without notice. Dimensions are in inches and (millimeters).
**AMP draw listed as per FAN.*

Dimensions - Core Only

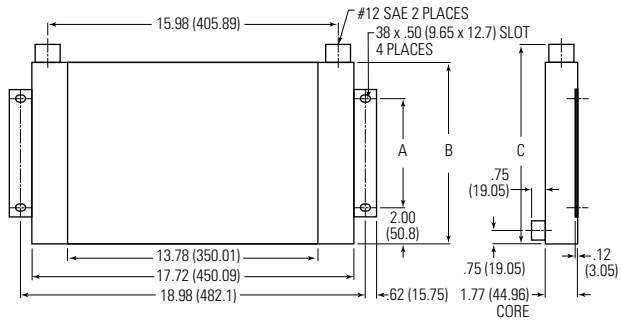
MA-3



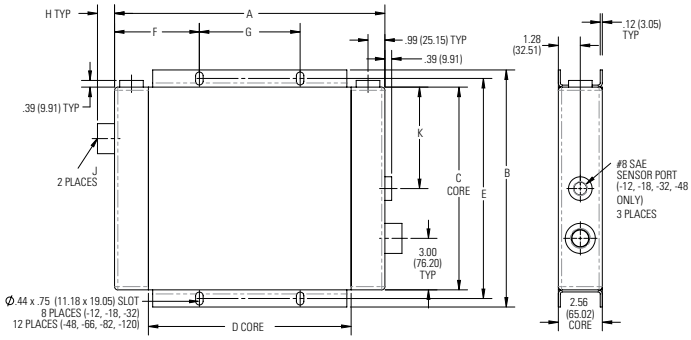
MA-4



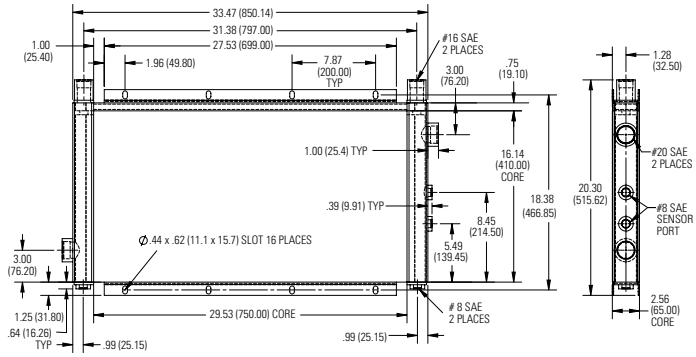
MA-8, MA-14, MA-20



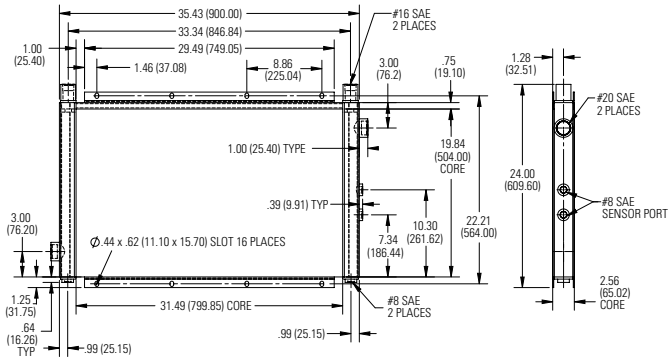
MA-12 thru MA-120



MA-232



MA-248



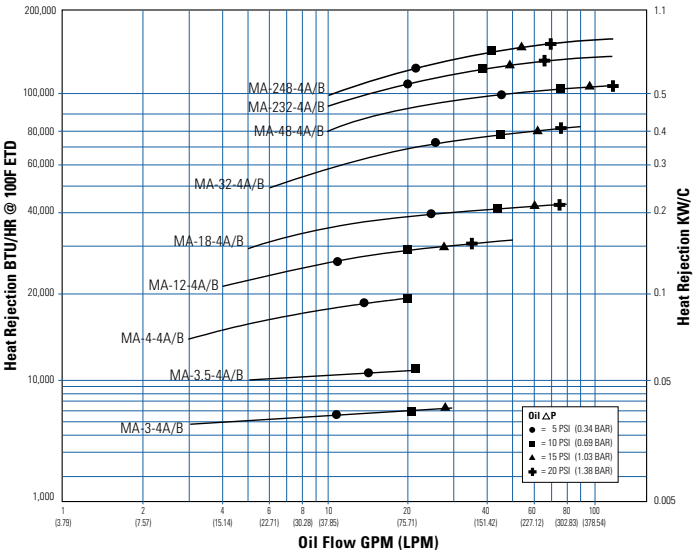
Model	A	B	C	D	E	F	G	H	J	K	Approx. Ship Wt. lbs (Kg)
MA-3	See diagram above			–	–	–	–	–	–	–	4 (1.81)
MA-4	See diagram above			–	–	–	–	–	–	–	7 (3.18)
MA-8	3.00 (76.2)	5.67 (144.02)	6.65 (168.9)	–	–	–	–	–	–	–	10 (4.54)
MA-12	13.78 (350.01)	11.81 (299.97)	9.96 (252.98)	9.84 (294.94)	10.98 (278.89)	4.04 (102.62)	5.71 (145.03)	1.00 (25.4)	#12 SAE	4.98 (126.49)	15 (6.8)
MA-14	6.00 (152.4)	10.00 (254.0)	10.98 (278.89)	–	–	–	–	–	–	–	14 (6.35)
MA-18	15.75 (400.05)	13.81 (350.77)	11.81 (299.97)	11.81 (299.97)	12.82 (325.63)	4.94 (125.48)	5.87 (149.10)	1.00 (25.4)	#12 SAE	5.91 (150.11)	18 (8.16)
MA-20	10.00 (254.0)	14.33 (363.98)	15.31 (388.87)	–	–	–	–	–	–	–	18 (8.16)
MA-32	19.69 (500.13)	18.54 (470.92)	16.14 (409.96)	15.75 (400.05)	17.32 (439.93)	3.85 (97.79)	12.00 (304.8)	1.10 (27.94)	#16 SAE	8.07 (204.98)	28 (12.7)
MA-48	23.62 (599.95)	22.13 (562.10)	19.96 (506.98)	19.69 (500.13)	21.02 (533.91)	3.81 (96.77)	8.00 (203.2)	1.10 (27.94)	#16 SAE	9.98 (253.49)	41 (18.60)
MA-66	27.56 (700.02)	25.83 (656.08)	23.54 (597.92)	23.62 (599.95)	24.72 (627.89)	3.78 (96.01)	10.00 (254.0)	1.58 (40.13)	#20 SAE	–	50 (22.68)
MA-82	31.50 (800.1)	27.68 (703.07)	25.39 (644.91)	27.56 (700.02)	26.57 (674.8)8	5.75 (146.05)	10.00 (254.0)	1.58 (40.13)	#24 SAE	–	65 (29.48)
MA-120	31.50 (800.1)	39.49 (1003.05)	37.20 (944.88)	27.56 (700.02)	38.39 (975.11)	5.75 (146.05)	10.00 (254.0)	1.58 (40.13)	#24 SAE	–	88 (39.92)
MA-232	See diagram above			–	–	–	–	–	–	–	55 (24.95)
MA-248	See diagram above			–	–	–	–	–	–	–	80 (36.29)

Note: We reserve the right to make reasonable design changes without notice. All dimensions are in inches and (millimeters).

Performance Curves

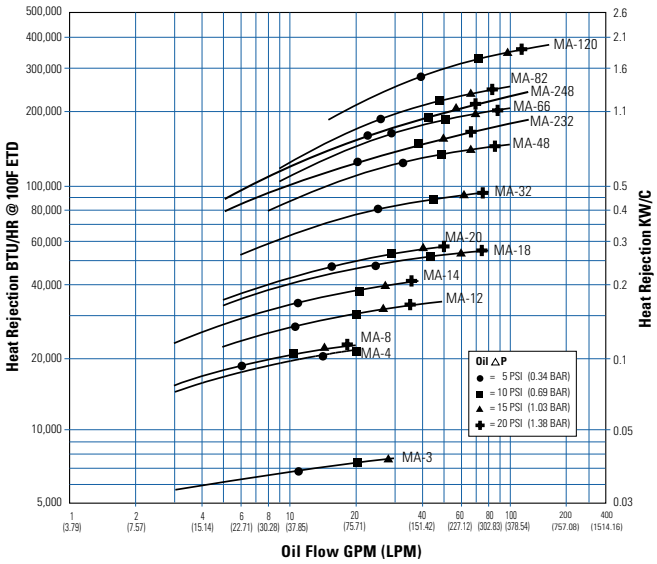
MA Models with DC Fan Assemblies

Performance Data Curve

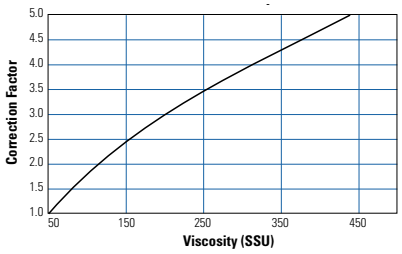


MA Models (No Fan, Core Only)

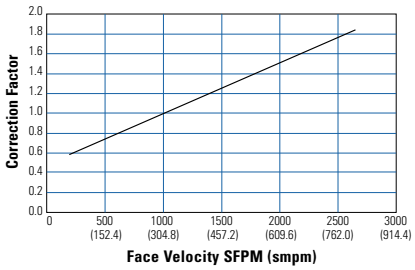
Performance Data Curve



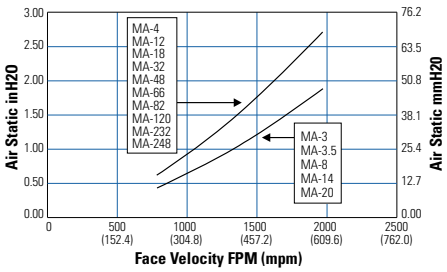
Oil Pressure Drop Correction



Air Static Correction



Air Static Pressure Drop



Selection Procedure

Step 1 **Determine Heat Load.** Typical Rule of Thumb, - size cooler for 1/3 of the input horsepower. Heat load may be expressed as either Horsepower or BTU/HR or KW/°C.

HP = BTU/HR ÷ 2545

BTU/HR = HP x 2545

$$BTU/HR = \frac{KW}{°C} \times 1895 \times E.T.D.(°F)$$

Step 2 **Determine Entering Temperature Difference.** (Actual E.T.D.)
(E.T.D.= Entering oil temperature – Entering Ambient air temperature)

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, plus – add any pre-heating of the air prior to its entering the cooler. Pay special attention if air is drawn from the engine compartment for cooling.

Step 3 **Find Air Velocity Correction Factor**
(Skip to Step 4 if using our DC Fan Assembly)

Calculate actual SFPM Air Velocity or SCFM (Standard Cubit Feet per Minute) for selection using the Face Area from the table.

$$SFPM\ Air\ Velocity^{*} = \frac{SCFM\ Air\ Flow}{Square\ Feet\ Cooler\ Face\ Area}$$

$$SMPM = \frac{SCMM}{Square\ Meter\ Cooler\ Face\ Area}$$

(SCFM Air Flow= SFPM Air Velocity x Square Feet Cooler Face Area)

*If the Air Velocity calculated is different than the value in Step 4, then recheck Corrected oil Pressure drop.

Step 4 **Determine the Corrected Heat Dissipation to use the Curves**

ENGLISH Version

$$\text{Corrected Heat Rejection} = \frac{\text{(BTU/Hr) Heat Load}}{\left[\frac{\text{Desired E.T.D}}{100°F} \times \text{Air Velocity Correction Factor}\right]}$$

(BTU/HR) to use with selection chart

(Air Factor value not needed if using provided DC Fan assembly; Omit in formula)

METRIC Version

$$\text{Corrected Heat Rejection}\left[\frac{KW}{°C}\right] = \frac{\text{Heatload (kw)}}{\text{Desired E.T.D (°C)} \times \text{Air Velocity Correction Factor}}$$

Step 5 **Select Model From Curves** Enter the Performance Curves at the bottom with the GPM oil flow and proceed upward to the adjusted Heat Rejection from Step 4. Any Model or Curve on or above this point will meet these conditions.

Step 6 **Calculate Oil Pressure Drop** Find the oil pressure drop correction factor and multiply it by the Oil Pressure Drop found on performance curve.

Listed Performance Curves are based on:

- 50 SSU (11 cSt) oil
- 1000 Standard Feet per Minute (SPFM) (304.8 MPM) Air Velocity
- 100° F (55.56° C) Entering Temperature Difference (E.T.D.)

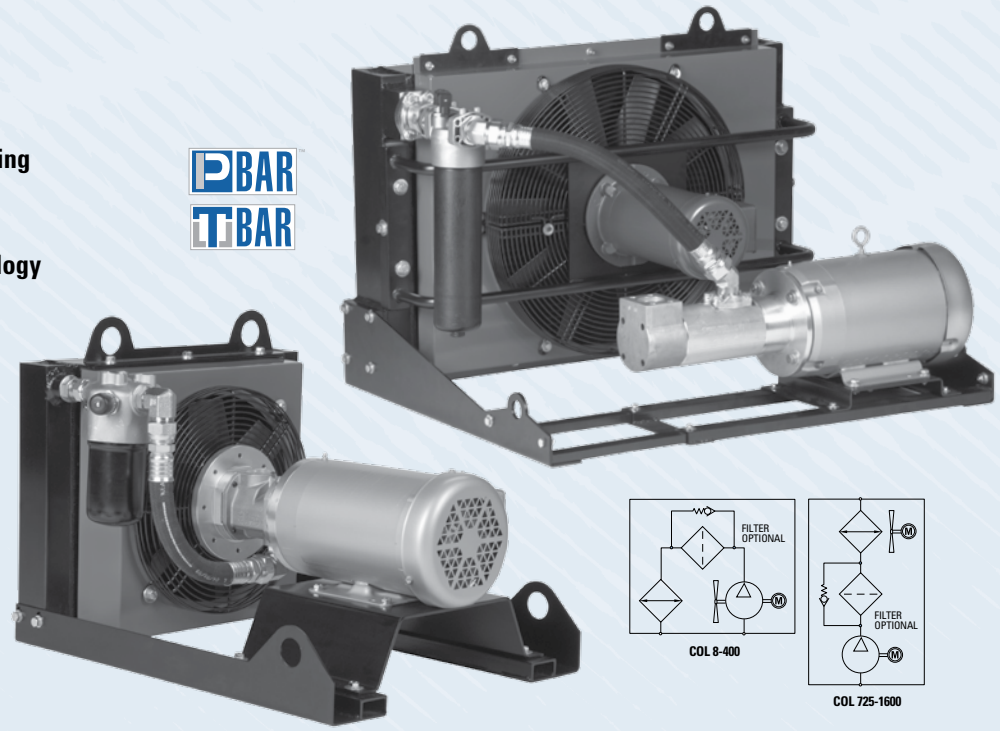
If your application conditions are different, then continue with the selection procedure.

BRAZED ALUMINUM CONSTRUCTION

Features

- **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**
- **Best heat transfer per given envelope size while minimizing pressure drop**
- **Standard SAE ports - NPT and BSPP port adapters available**
- Optional cartridge-style filters with both visual and electrical bypass indicator options
- Optional temperature sensors *(see pgs. 169 & 170)*

P-BAR
T-BAR



COL 8-400

COL 725-1600

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*

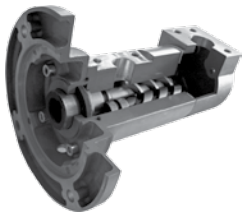
**Standard pump seals are not compatible with phosphate ester. Special pumps with EPDM seals are required. Consult factory for details.*

Micron Filtration

Utilize a modern in-line filter housing and cartridge
- Utilizes a 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

offering 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.

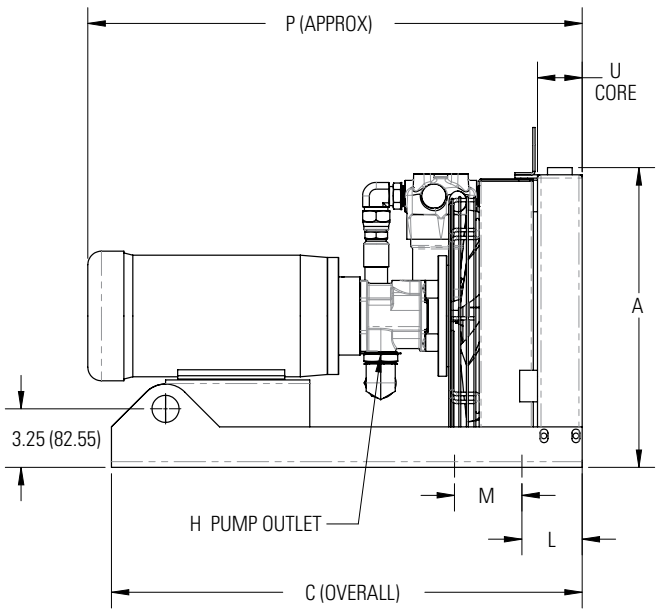
Oil Temperature

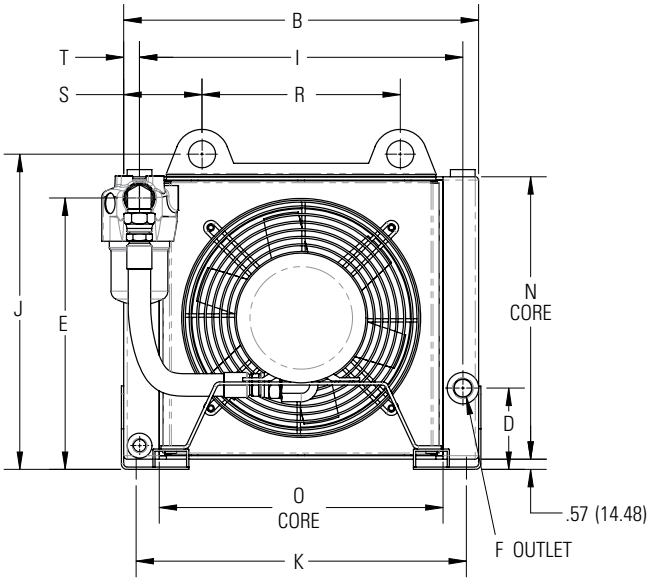
Typical operating temperature ranges are:

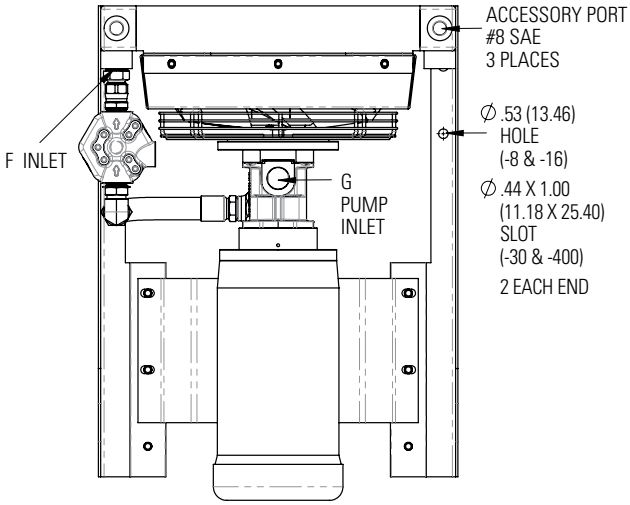
Hydraulic Motor Oil	120 - 180°F (49 - 82°C)
Hydrostatic Drive Oil	160 - 180°F (71 - 82°C)
Engine Lube Oil	180 - 199°F (82 - 93°C)
Automatic Transmission Fluid	199 - 300°F (93 - 149°C)

Dimensions

COL-8 through COL-400





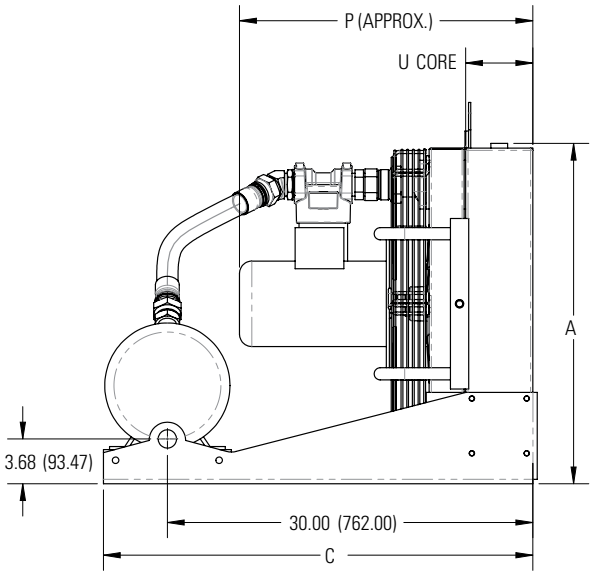


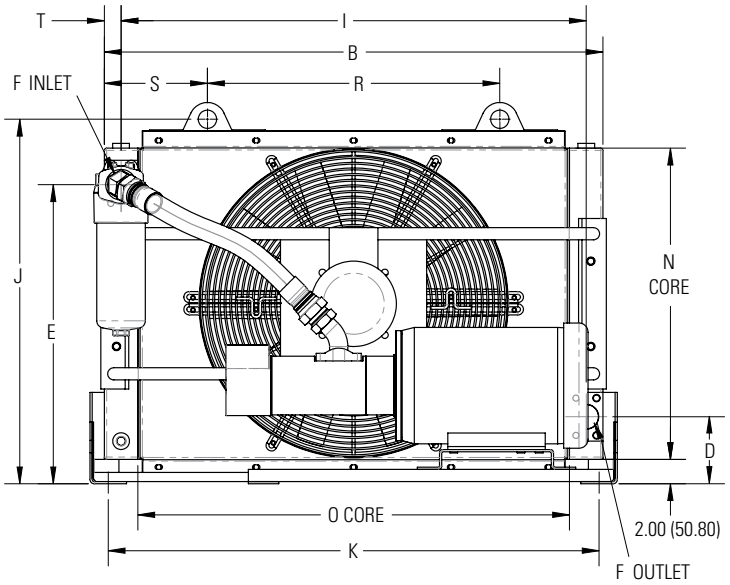
Model	A	B	C	D	E	F	G (Pump Intlet)	H (Pump Outlet)	I	J	K	L	M	N	O	P	R	S	T	U
COL-8-20	12.93 (328)	15.75 (400)	26.13 (664)	4.51 (115)	11.34 (288)	#12 SAE	#12 SAE	#16 SAE	13.99 (355)	13.79 (350)	14.39 (366)	3.35 (85)	3.74 (95)	11.97 (304)	11.81 (300)	27.09 (688)	6.50 (165)	3.75 (95)	0.88 (22)	2.48 (63)
COL-8-40	12.93 (328)	15.75 (400)	26.13 (664)	4.51 (115)	11.34 (288)	#12 SAE	#20 SAE	#24 SAE	13.99 (355)	13.79 (350)	14.39 (366)	3.35 (85)	3.74 (95)	11.97 (304)	11.81 (300)	29.71 (755)	6.50 (165)	3.75 (95)	0.88 (22)	2.48 (63)
COL-16-20	16.63 (422)	19.69 (500)	26.13 (664)	4.51 (115)	15.06 (383)	#12 SAE	#12 SAE	#16 SAE	17.95 (456)	17.49 (444)	18.33 (466)	3.35 (85)	3.74 (95)	15.67 (398)	15.75 (400)	27.44 (697)	11.00 (279)	4.35 (110)	0.87 (22)	2.48 (63)
COL-16-40	16.63 (422)	19.69 (500)	26.13 (664)	4.51 (115)	15.06 (383)	#12 SAE	#20 SAE	#24 SAE	17.95 (456)	17.49 (444)	18.33 (466)	3.35 (85)	3.74 (95)	15.67 (398)	15.75 (400)	30.05 (763)	11.00 (279)	4.35 (110)	0.87 (22)	2.48 (63)
COL-30-20	21.09 (536)	26.38 (670)	26.86 (682)	5.27 (134)	19.50 (495)	#20 SAE	#12 SAE	#16 SAE	24.34 (618)	22.07 (561)	24.74 (628)	4.25 (108)	5.00 (127)	19.37 (492)	21.65 (550)	28.35 (720)	17.00 (432)	4.69 (119)	1.02 (26)	3.70 (94)
COL-30-40	21.09 (536)	26.38 (670)	26.86 (682)	5.27 (134)	19.50 (495)	#20 SAE	#20 SAE	#24 SAE	24.34 (618)	22.07 (561)	24.74 (628)	4.25 (108)	5.00 (127)	19.37 (492)	21.65 (550)	30.96 (786)	17.00 (432)	4.69 (119)	1.02 (26)	3.70 (94)
COL-400-20	19.20 (488)	22.45 (570)	26.86 (682)	6.50 (165)	17.31 (440)	#20 SAE	#12 SAE	#16 SAE	20.08 (510)	20.69 (526)	22.31 (567)	4.25 (108)	5.00 (127)	16.81 (427)	17.72 (450)	28.47 (723)	11.00 (279)	5.73 (146)	1.19 (30)	3.70 (94)
COL-400-40	19.20 (488)	22.45 (570)	26.86 (682)	6.50 (165)	17.31 (440)	#20 SAE	#20 SAE	#24 SAE	20.08 (510)	20.69 (526)	22.31 (567)	4.25 (108)	5.00 (127)	16.81 (427)	17.72 (450)	31.09 (790)	11.00 (279)	5.73 (146)	1.19 (30)	3.70 (94)

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

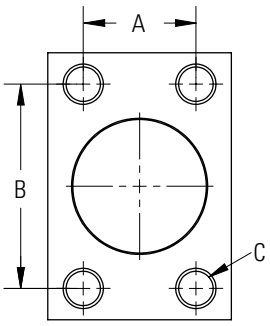
Dimensions

COL-725 through COL-1600

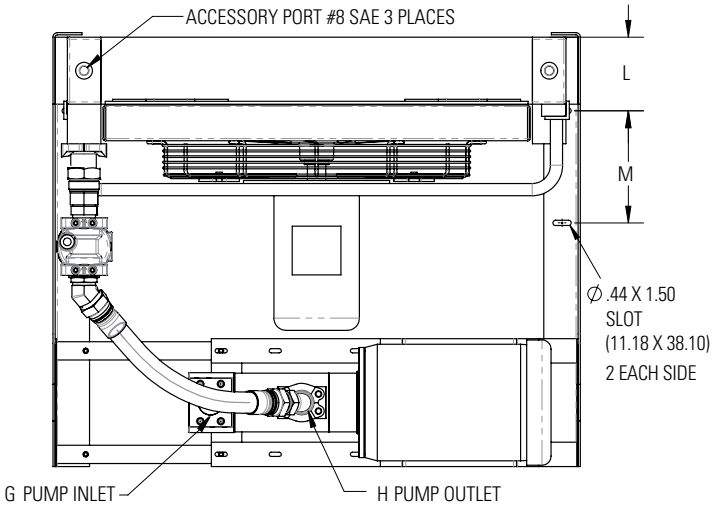




SAE Flange



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

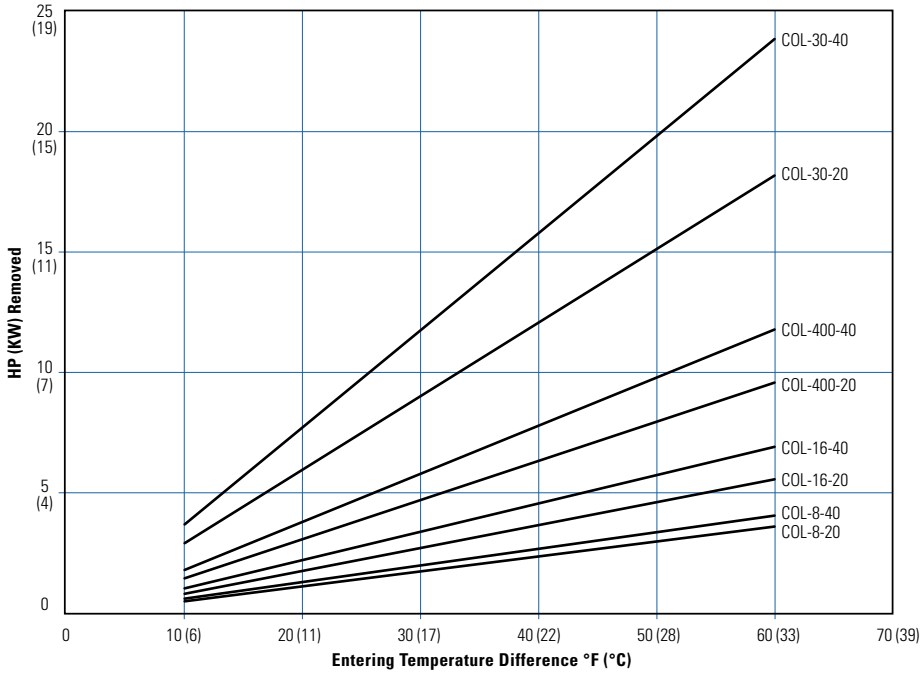


Model	A	B	C	D	E	F	G (Pump Intlet)	H (Pump Outlet)	I	J	K	L	M	N	O	P	R	S	T	U
COL-725-80	23.49 (597)	30.32 (770)	35.00 (889)	6.50 (165)	21.60 (549)	#20 SAE	2" SAE Flange	1½" SAE Flange	27.95 (710)	25.48 (647)	30.18 (767)	4.25 (108)	5.00 (127)	21.10 (536)	25.59 (650)	24.07 (611)	11.98 (304)	9.16 (233)	1.19 (30)	3.70 (94)
COL-725-100	23.49 (597)	30.32 (770)	35.00 (889)	6.50 (165)	21.60 (549)	#20 SAE	2½" SAE Flange	2" SAE Flange	27.95 (710)	25.48 (647)	30.18 (767)	4.25 (108)	5.00 (127)	21.10 (536)	25.59 (650)	24.07 (611)	11.98 (304)	9.16 (233)	0.19 (5)	3.70 (94)
COL-950-80	27.94 (710)	37.01 (940)	35.25 (895)	9.50 (241)	24.55 (624)	2" SAE Flange	2" SAE Flange	1½" SAE Flange	34.26 (870)	29.93 (760)	35.87 (911)	6.05 (154)	9.20 (234)	25.55 (649)	31.50 (800)	22.69 (576)	18.00 (457)	9.51 (242)	1.38 (35)	5.51 (140)
COL-950-100	27.94 (710)	37.01 (940)	35.25 (895)	9.50 (241)	24.55 (624)	2" SAE Flange	2½" 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)	22.69 (576)	18.00 (457)	9.51 (242)	1.38 (35)	5.51 (140)
COL-1200-80	27.94 (710)	40.94 (1040)	35.25 (895)	5.50 (140)	24.55 (624)	2" SAE Flange	2" SAE Flange	1½" SAE Flange	38.19 (970)	29.93 (760)	40.30 (1024)	6.05 (154)	9.20 (234)	25.55 (649)	35.43 (900)	26.05 (662)	24.00 (610)	8.47 (215)	1.38 (35)	5.51 (140)
COL-1200-100	27.94 (710)	40.94 (1040)	35.25 (895)	5.50 (140)	24.55 (624)	2" SAE Flange	2½" SAE Flange	2" SAE Flange	38.19 (970)	29.93 (760)	40.30 (1024)	6.05 (154)	9.20 (234)	25.55 (649)	35.43 (900)	26.05 (662)	24.00 (610)	8.47 (215)	1.38 (35)	5.51 (140)
COL-1600-80	36.01 (915)	40.94 (1040)	35.25 (895)	9.50 (241)	32.62 (829)	2" SAE Flange	2" SAE Flange	1½" SAE Flange	38.19 (970)	37.88 (962)	40.30 (1024)	6.05 (154)	9.20 (234)	33.62 (854)	35.43 (900)	25.45 (646)	24.00 (610)	8.47 (215)	1.38 (35)	5.51 (140)
COL-1600-100	36.01 (915)	40.94 (1040)	35.25 (895)	9.50 (241)	32.62 (829)	2" SAE Flange	2½" SAE Flange	2" SAE Flange	38.19 (970)	37.88 (962)	40.30 (1024)	6.05 (154)	9.20 (234)	33.62 (854)	35.43 (900)	25.45 (646)	24.00 (610)	8.47 (215)	1.38 (35)	5.51 (140)

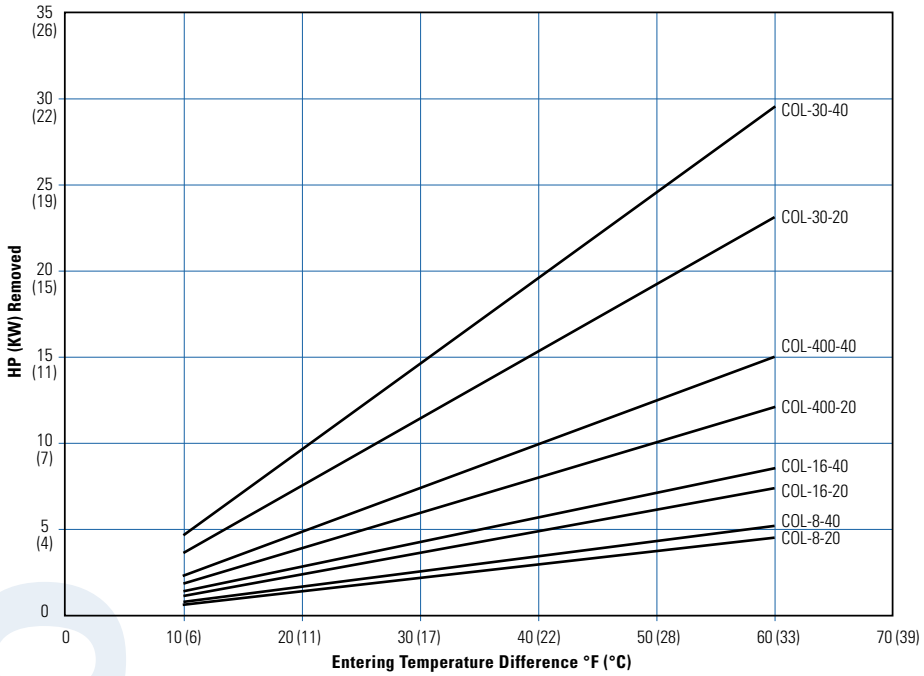
Note: We reserve the right to make reasonable design changes without notice. ***All dimensions in inches (millimeters), unless noted otherwise.***

Performance Curves

Single Motor 50hz/1500 RPM



Single Motor 60hz/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 E.T.D.)

E.T.D. = 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.

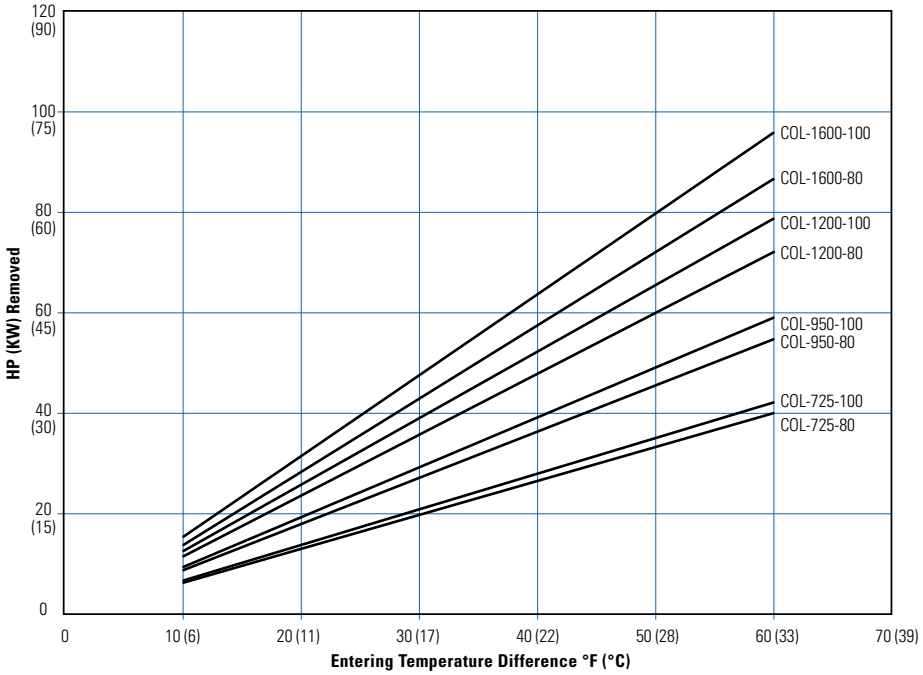
Listed Performance Curves are based on 46 cSt oil.

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

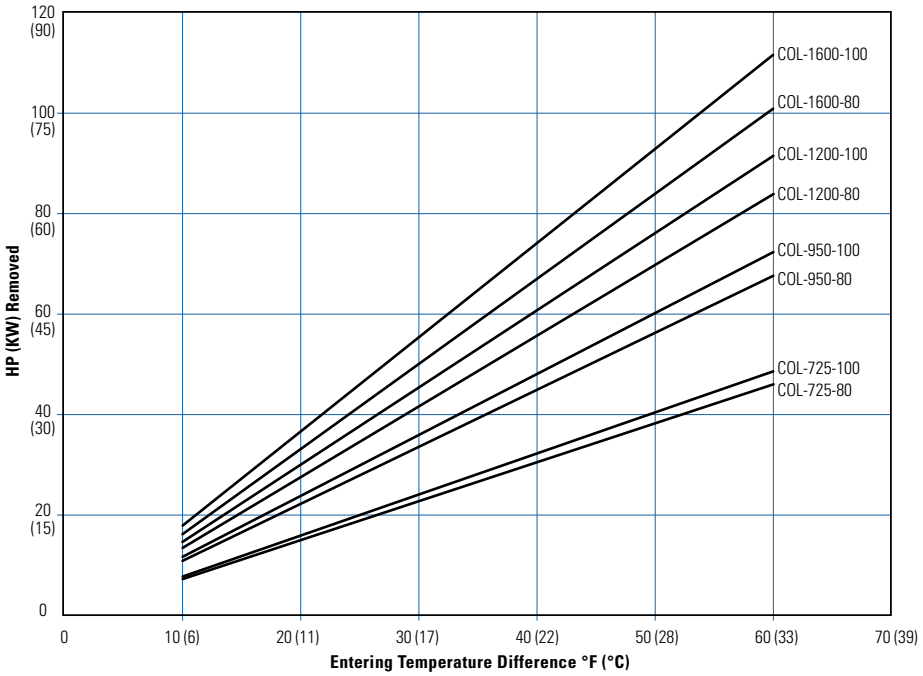
Model	50 Hz Flow Rate GPM (LPM)	60 Hz Flow Rate GPM (LPM)
COL-8-20	8 (30)	9.5 (36)
COL-8-40	16 (60)	21 (79)
COL-16-20	8 (30)	9.5 (36)
COL-16-40	16 (60)	21 (79)
COL-30-20	8 (30)	9.5 (36)
COL-30-40	16 (60)	21 (79)
COL-400-20	8 (30)	9.5 (36)
COL-400-40	16 (60)	21 (79)

Performance Curves / Selection Procedure

Dual Motor 50hz/1500 RPM



Dual Motor 60hz/1800 RPM

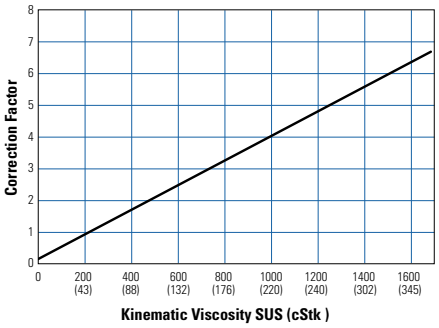


System Pressure Drop

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.

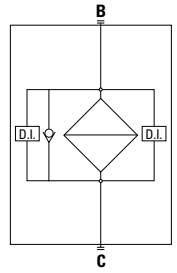
Oil Pressure Drop Correction

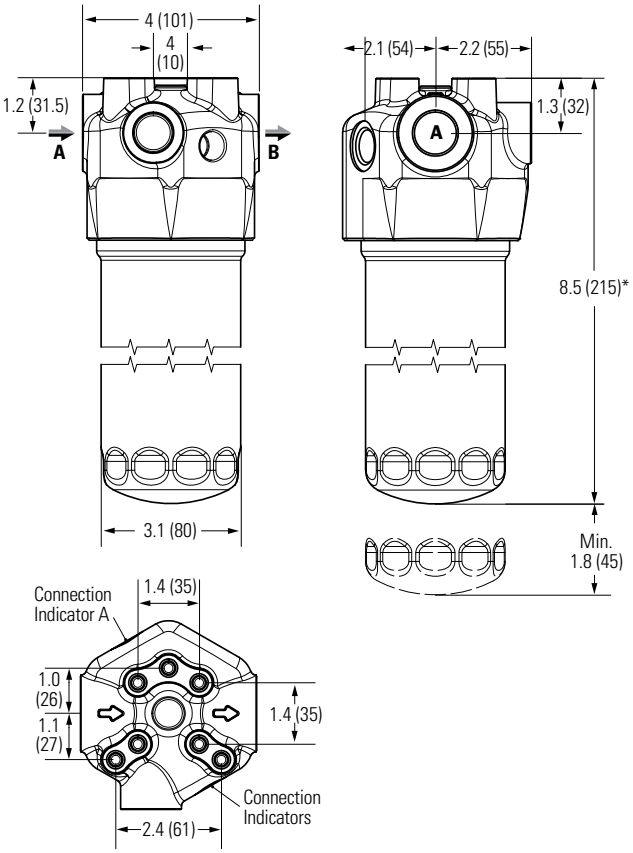


Model	50 Hz Flow Rate GPM (LPM)	60 Hz Flow Rate GPM (LPM)
COL-725-80	29.5 (112)	35 (133)
COL-725-100	37 (140)	45 (169)
COL-950-80	29.5 (112)	35 (133)
COL-950-100	37 (140)	45 (169)
COL-1200-80	29.5 (112)	35 (133)
COL-1200-100	37 (140)	45 (169)
COL-1600-80	29.5 (112)	35 (133)
COL-1600-100	37 (140)	45 (169)

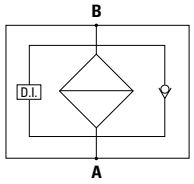
Micron Filter Specifications

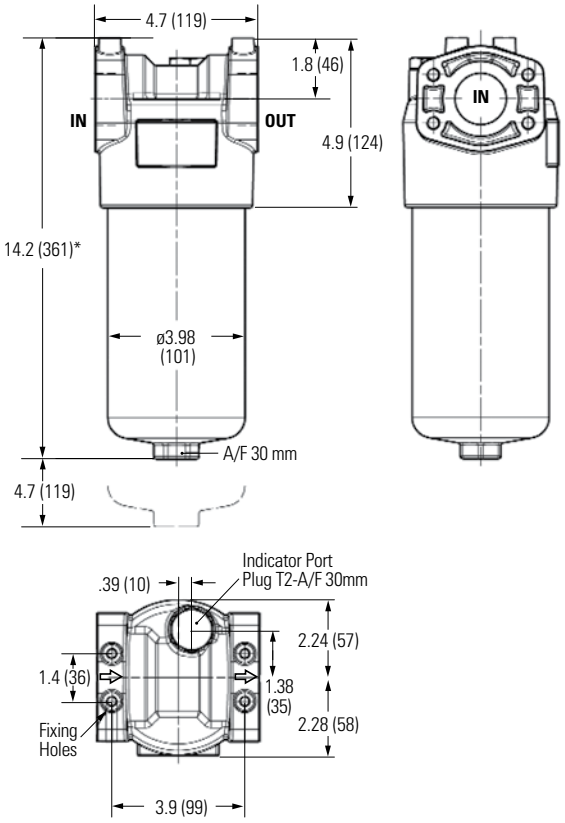
COL-8 – COL-400





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
- Bypass valve – Brass/Aluminum

Maximum Temperature
- 230°F (110°C)

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
- Bypass valve – Nylon

Maximum Temperature
- 230°F (110°C)

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

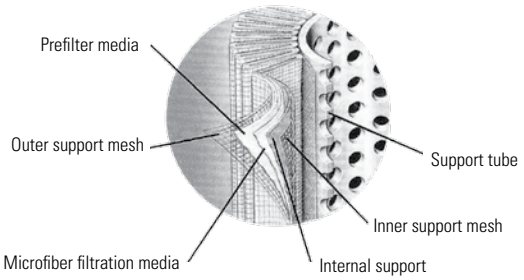
Seals, standard in NBR compatible with:

- 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*

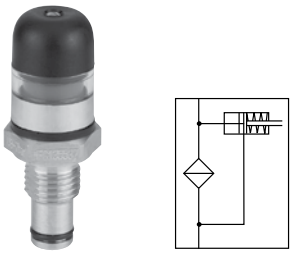
International Standards for Fluid Contamination Control

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

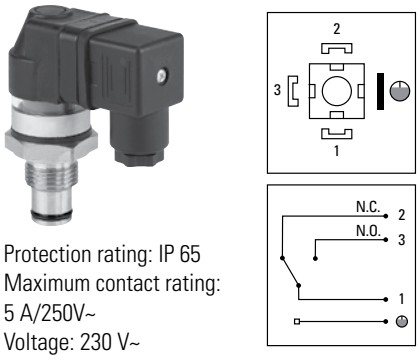
Visual "V"



- 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"

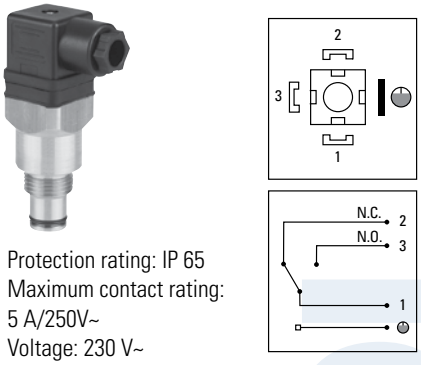
Connector EN 175301-803 A/ISO4400



- 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"

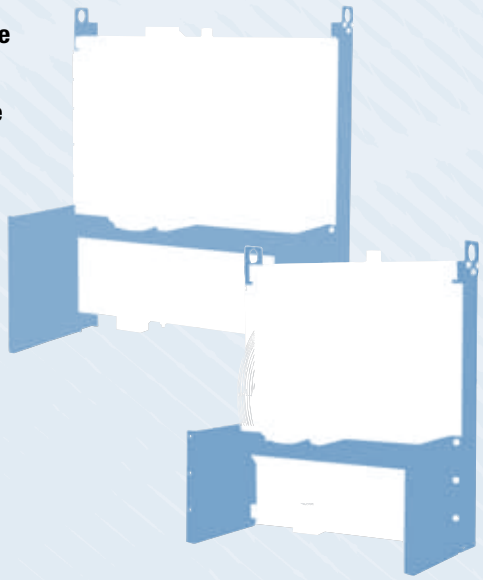
Connector EN 175301-803 A/ISO4400

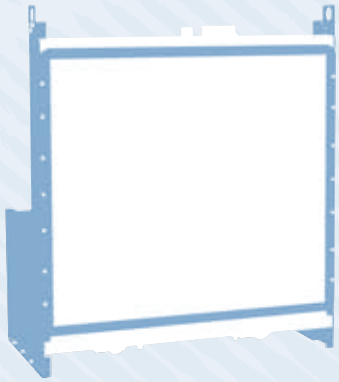


- Protection rating: IP 65
- Maximum contact rating: 5 A/250V~
- Voltage: 230 V~
- Connector: DIN 43650 Microswitch contact
- Cable gland: PG 9
- Weight: 6.5 oz (184 g)
- Tightening torque: 48 ft-lbs (65 Nm)

FEATURES

- **Young Radiator – OCS Model Interchange (approximate)**
- **American Industrial – AOCS Interchange (approximate)**
- **Hydraulic Circuits**
- **Machine Tool Cooling**
- **Gear Oil Cooling**
- **Lube Oil Cooling**
- **Process Cooling**
- **Torque Converters**
- **Marine Transmissions**
- Aerodynamically Designed Fan
- Brazed Aluminum Core
- Enclosed Fan Cooled Standard – TEFC





T-BAR™ • CORE INSIDE •

This Line Features

- High efficient, light weight, low fouling extruded core design
- Rugged construction with a patented T-Bar brazed aluminum core captured in steel framing
- Both mobile and industrial applications
- High flow capacity; with a flow range from 20-500 GPM
- Ability to handle high viscosity fluids i.e. gear oil cooling
- Available in 7 sizes with electric or hydraulic motor options
- Standard sizes available with short, lean lead time

Materials

Fan Blade Composite with cast aluminum hub

Cabinet Steel with baked enamel finish

Connections Aluminum – Female SAE

Motor Support Steel

Shroud Steel

Core Brazed Aluminum

Motor TEFC & Hydraulic motor

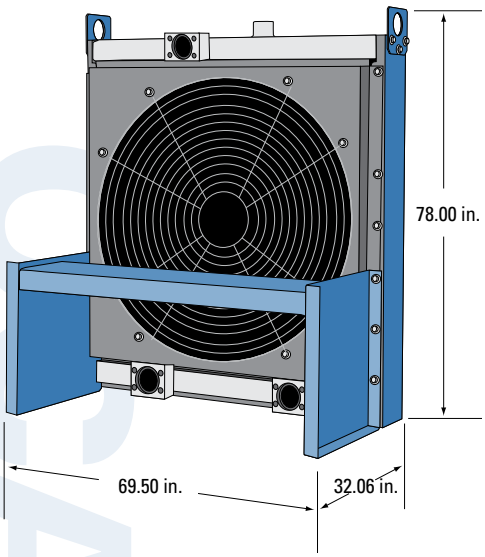
Ratings

Max Operating Pressure - 250 psi

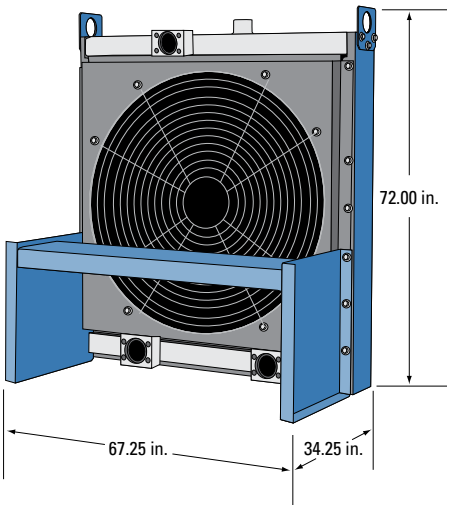
Max Operating Temperature - 350° F

Dimension Range

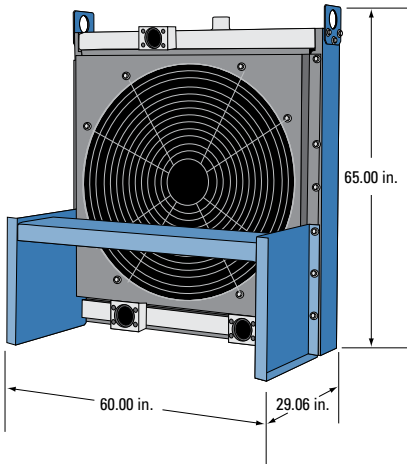
OCA-3100



OCA-2500



OCA-2000



How to Order

OCA	–		–		–		–		–	

Model Series
OCA - Standard

Model Size Selected

Connection Type
2 - SAE

[1] External Relief Bypass Kit
BLANK- NO BYPASS
30-30 PSI
60-60 PSI

Specify Motor Required
0 -NO-MOTOR
3 -THREE PHASE
6 -575 VOLT
9 -HYDRAULIC MOTOR
11 - THREE PH EXPLOSION PROOF
18 - THREE PH IEC

[2] Material Options
HC - HERESITE COATING (CORE)
G - GALVANIZED STEEL (CABINET)
SFG - STAINLESS STEEL (FAN GUARD)

Connection Conversion Kits - *order as separate line item*

	Part Number						
	OCA-450	OCA-600	OCA-1000	OCA-1500	OCA-2000	OCA-2500	OCA3100
2 Pass SAE (Flange Cover)	12076	12011	12012	12012	12012	12013	12013
1 Pass NPT	51166	51168	51170	51172	51174	51175	5178
2 Pass NPT[3]	51167	51169	51171	51173	51175	51177	51179
1 Pass BSPP	Consult Factory						
2 Pass BSPP[3]	Consult Factory						
Fill Plug (#20 SAE)[4]	50732						

[1] Available for 2 Pass unit only. Pressure tolerance is (+5 PSI/-0 PSI). Consult factory for details.

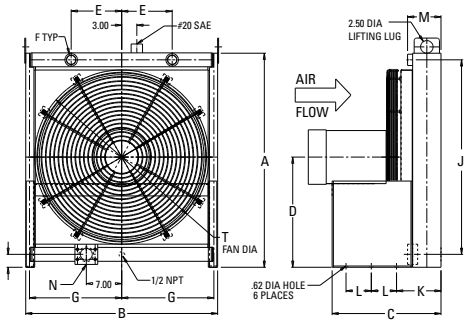
[2] Use HC-G-SFG if all three add-ons are desired.

[3] Two Pass adapter kits already include cover plate.

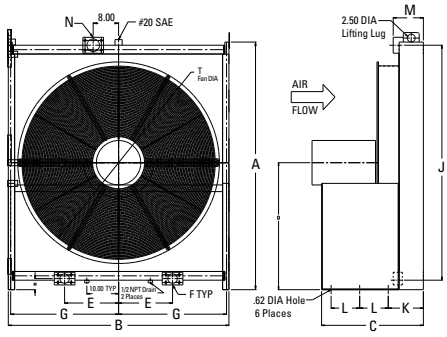
[4] Ports do not come plugged unless specified at time of order.

Dimensions

OCA-450 & 600

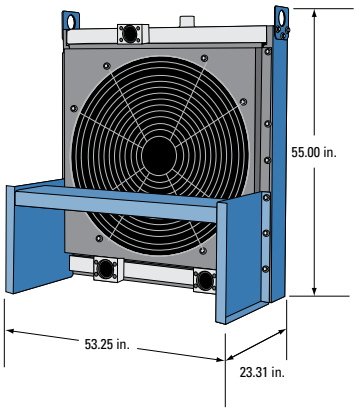


OCA-1000 Through OCA-3100

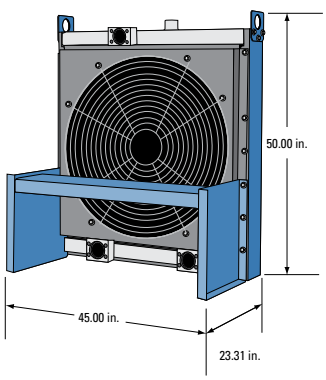


MODEL	A	B	C	D	E	F	G	H	J	K	L	M	N	T	Shipping WT (lbs)	DBA at 3 ft
OCA-450	36.38	33.00	21.56	18.50	8.00	#24	15.75	4.12	28.75	8.81	5.00	6.62	2.00	24.00	400	81
OCA-600	42.38	38.00	21.56	21.81	10.00	#24	18.25	2.56	35.50	8.81	5.00	6.62	2.50	32.00	497	84
OCA-1000	50.00	45.00	24.56	26.25	10.50	2.00	21.75	4.19	45.50	7.81	7.50	7.50	3.00	36.00	690	88
OCA-1500	55.00	53.25	23.31	28.50	12.50	2.00	25.75	4.31	49.75	7.79	7.00	8.50	3.00	42.00	832	92
OCA-2000	65.00	60.00	29.06	33.00	15.00	3.00	29.00	4.00	58.00	11.06	7.50	8.56	3.00	48.00	1223	96
OCA-2500	72.00	67.25	34.25	37.00	17.00	3.00	32.88	3.25	67.50	11.06	7.50	9.50	4.00	54.00	1723	96
OCA-3100	78.00	69.50	32.06	40.00	17.00	3.00	34.00	3.00	74.00	11.06	9.00	9.50	4.00	60.00	1806	96

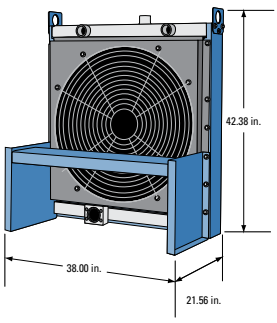
OCA-1500



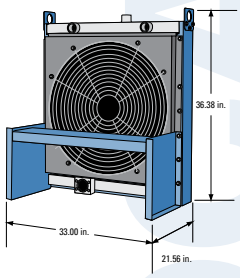
OCA-1000



OCA-600

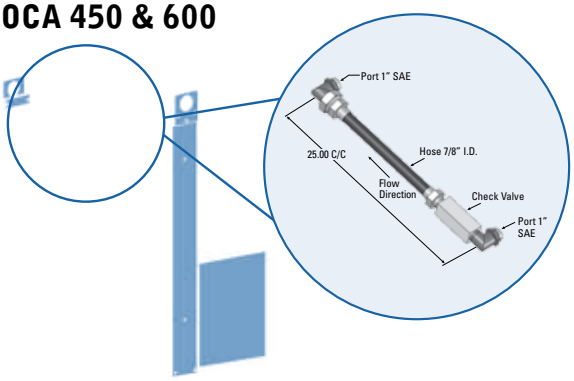


OCA-450

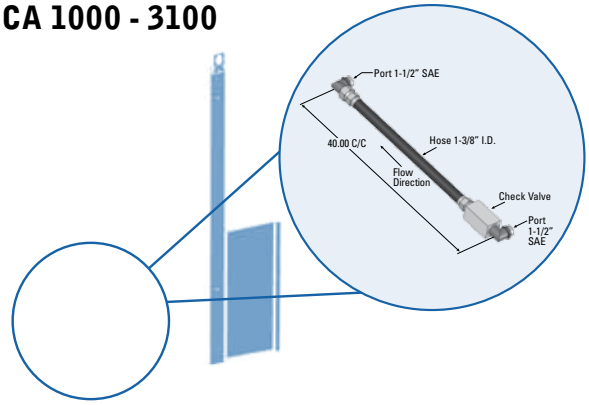


External Bypass Option (Extra port is removed for bypass options)

OCA 450 & 600

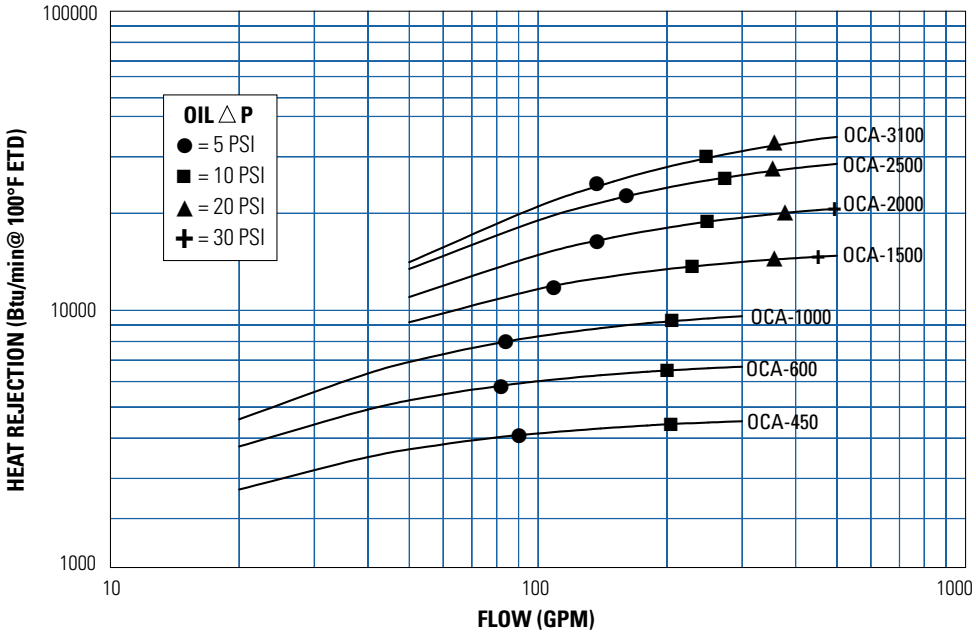


OCA 1000 - 3100

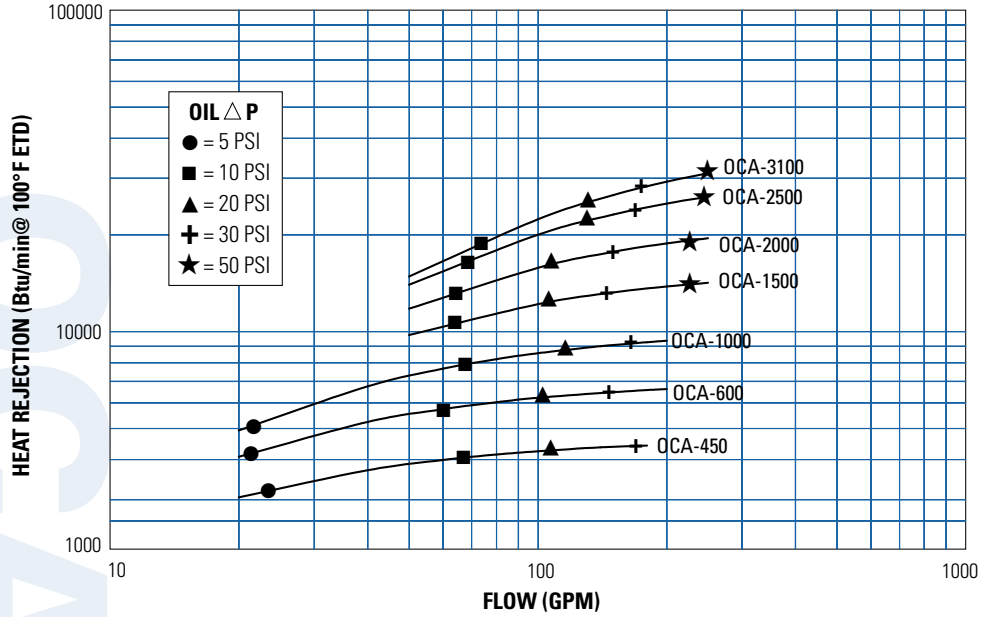


Performance Curves

One Pass Oil

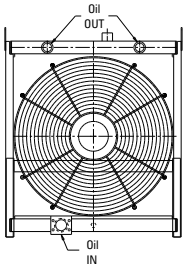


Two Pass Oil

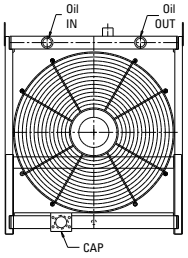


Oil Piping Diagram

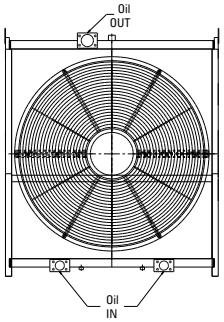
OCA 450 & 600 One Pass



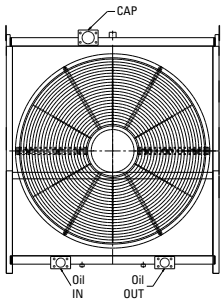
OCA 450 & 600 Two Pass



1000 - 3100 One Pass



1000 - 3100 Two Pass



Selection Procedure

Performance Curves are based on 50SSU oil entering the cooler 100°F higher than the ambient air temperature used for cooling. This is also referred to as a 100°F Entering Temperature Difference (ETD).

STEP 1 **Determine the Heat Load.** This will vary with different systems, but typically coolers are sized to remove 25 to 50% of the input nameplate horsepower.
(Example: 100 HP Power Unit x .33 = 33 HP Heat load.)
Convert HP to BTU/MIN: HP x 42.41 = BTU/MIN

STEP 2 **Determine Entering Temperature Difference (ETD).**
Desired oil entering cooler °F – Ambient air temp. °F = Actual ETD

STEP 3 **Determine Curve Horsepower Heat Load.**
Enter the information from above:
E.T.D. Temperature Correction Factor:

$$\text{Btu/Min}_{\text{corrected}} = \text{Input Btu/Min} \times \frac{100 \times Cv}{\text{Desired E.T.D.}}$$

Enter curves at oil flow through cooler and curve horsepower. Any curve above the intersecting point will work.

STEP 5 **Determine Oil Pressure Drop from Curves:**
● = 5 PSI; ■ = 10 PSI; ▲ = 20 PSI; ✢ = 30 PSI; ★ = 50 PSI.
Multiply pressure drop from curve by correction factor found in oil △P correction curve.

Example

FLUID = SAE 20 OIL
SYSTEM ELECTRIC NAMEPLATE HORSEPOWER = 300HP
ENTERING TEMPERATURE = 200°F
AMBIENT TEMPERATURE = 75°F
FLOW RATE = 200GPM

- Determine heat load.
  Generally, about 25% to 33% of the system horsepower is removed.

  300hp x 0.33 = 99hp
- Since the graphs have the heat load in terms of BTU/min, the units must be converted.

  99hp x 42.4167 = 4,199 BTU/min
- Calculate the entering temperature difference (E.T.D.). The E.T.D. is the inlet oil temperature minus the entering air temperature.

  ETD=200-75 =125
- Calculate the corrected curve heat load.
  Corrected curve heat load = actual heat load x (100/ETD) x Cv (viscosity correction factor obtained from the Cv table).

  4,199 BTU/min x (100/125) x 1.02= 3,426 BTU/min
- Find the intersection point between the corrected heat load and flow rate on the performance curves. Any curve above this point will work for this application. Usually the smallest cooler is most desired. In this case the intersecting point on the single pass graph indicates that the OCA-450 will suffice.
- The pressure drop should be found next. Find the point on the curve that is directly above the intersecting point. This point on the curve indicates the pressure drop.

  △P ≈ 6psi
- These curves are made for SAE 10 oil entering at 200°F. Therefore, the pressure drop needs to be corrected. The 1.24 is the pressure drop correction factor obtained in the Cp table.
- $P_{CORRECTED}$ = 6 x 1.24= 7.44 psi

C_V VISCOSITY CORRECTION FACTORS

Entering Liquid Temp	SAE 5	SAE 10	SAE 20	SAE 30	SAE 40	ISO 22	ISO 32	ISO 46	ISO 68	ISO 100	ISO 150	ISO 220	ISO 320	MIL-L 7808	Ester Polyglycol	Phosphate	50%EG
100	1.12	1.16	1.26	1.39	1.46	1.09	1.15	1.19	1.27	1.38	1.44	1.57	1.85	1.20	0.93	0.84	0.86
110	1.10	1.13	1.21	1.33	1.41	1.07	1.14	1.17	1.26	1.32	1.40	1.49	1.68	1.15	0.90	0.81	0.85
120	1.07	1.11	1.18	1.28	1.36	1.05	1.12	1.15	1.21	1.28	1.36	1.41	1.54	1.10	0.89	0.80	0.85
130	1.05	1.09	1.14	1.25	1.30	1.04	1.10	1.14	1.18	1.25	1.31	1.35	1.45	1.06	0.86	0.78	0.84
140	1.04	1.06	1.12	1.20	1.26	1.03	1.09	1.11	1.17	1.21	1.27	1.31	1.40	1.04	0.85	0.77	0.83
150	1.02	1.05	1.10	1.17	1.23	1.03	1.07	1.10	1.14	1.18	1.23	1.28	1.34	1.02	0.84	0.75	0.83
200	0.99	1.00	1.02	1.05	1.08	0.99	1.00	1.01	1.02	1.03	1.09	1.10	1.15	0.99	0.80	0.72	0.81
250	0.96	0.97	0.98	0.99	1.00	0.96	0.97	0.97	0.97	0.98	1.00	1.02	1.03	0.98	0.77	0.70	0.80

C_P PRESSURE DROP CORRECTION FACTORS

Entering Liquid Temp	SAE 5	SAE 10	SAE 20	SAE 30	SAE 40	ISO 22	ISO 32	ISO 46	ISO 68	ISO 100	ISO 150	ISO 220	ISO 320	MIL-L 7808	Ester Polyglycol	Phosphate	50%EG
100	2.04	2.44	4.44	6.44	8.84	1.11	1.57	1.86	2.58	4.23	6.48	9.42	13.60	1.30	3.04	3.54	0.770
110	1.74	2.14	3.64	5.14	6.74	1.08	1.49	1.76	2.39	3.77	5.74	8.37	11.67	1.24	2.44	2.94	0.760
120	1.54	1.84	3.04	4.24	5.64	1.06	1.42	1.64	2.19	3.30	5.95	7.27	9.77	1.18	2.14	2.54	0.749
130	1.44	1.64	2.64	3.44	4.54	1.03	1.34	1.53	1.98	2.84	4.18	6.23	7.84	1.12	1.94	2.24	0.738
140	1.34	1.54	2.27	2.94	3.74	1.01	1.27	1.42	1.79	2.42	3.51	5.24	6.15	1.07	1.94	2.04	0.726
150	1.24	1.34	1.94	2.54	3.14	0.99	1.21	1.34	1.65	2.08	2.94	4.39	4.81	1.02	1.74	1.94	0.716
200	0.97	1.00	1.24	1.44	1.64	0.93	1.03	1.12	1.22	1.37	2.63	1.78	1.99	0.94	1.24	1.34	0.675
250	0.85	0.86	0.96	1.01	1.09	0.89	0.97	1.00	1.07	1.15	1.25	1.26	1.27	0.87	1.04	1.09	0.596

Specifications

Electric Motor Data

(3 Phase TEFC)

Model	Motor HP	Phase	HZ	Voltage	RPM	Nema Frame	Full Load Amps	Net Weight
OCA-450	3	3	60	208-230/460	1725	182T	9.5-8.6/4.3	68
OCA-600	3	3	60	230/460	1160	213T	10/5	125
OCA-1000	5	3	60	230/460	1160	215T	16/8	138
OCA-1500	5	3	60	230/460	1160	215T	16/8	138
OCA-2000	10	3	60	230/460	1175	256T	28.8/14.4	269
OCA-2500	15	3	60	230/460	1175	284T	39.4/19.7	361
OCA-3100	20	3	60	230/460	1175	286T	52/26	368

(3 Phase Explosion Proof Class I Group D & Class II Group F&G)

Model	Motor HP	Phase	HZ	Voltage	RPM	Nema Frame	Full Load Amps	Net Weight
OCA-450	3	3	60	230/460	1750	182T	9.6/4.8	134
OCA-600	3	3	60	230/460	1160	213T	9.6/4.8	147
OCA-1000	5	3	60	230/460	1160	215T	16.2/8.1	161
OCA-1500	5	3	60	230/460	1160	215T	16.2/8.1	161
OCA-2000	10	3	60	230/460	1175	256T	28.8/14.4	357
OCA-2500	15	3	60	230/460	1170	284T	39/19.5	436
OCA-3100	20	3	60	230/460	1175	286T	51/25.5	522

(3 Phase 575V TEFC)

Model	Motor HP	Phase	HZ	Voltage	RPM	Nema Frame	Full Load Amps	Net Weight
OCA-450	3	3	60	575	1750	182T	3.4	68
OCA-600	3	3	60	575	1160	213T	4.1	111
OCA-1000	5	3	60	575	1160	215T	6.0	122
OCA-1500	5	3	60	575	1160	215T	6.0	122
OCA-2000	10	3	60	575	1180	256T	11.5	286
OCA-2500	15	3	60	575	1180	284T	15.0	425
OCA-3100	20	3	60	575	1175	286T	20.0	452

(3 Phase Metric/IEC)

Model	Motor KW/HP	Phase	HZ	Voltage	RPM	IEC Frame	Full Load Amps	Net Weight
OCA-450	2.2/3	3	60	208-230/460	1750	100	8.5-8.2/4.1	68
OCA-600	2.2/3	3	60	230/460	1160	132	9.6/4	110
OCA-1000	3.7/5	3	60	230/460	1160	132	17.6/8.8	123
OCA-1500	3.7/5	3	60	230/460	1160	132	17.6/8.8	123
OCA-2000	7.5/10	3	60	230/460	1180	160	28.4/14.2	247
OCA-2500	11/15	3	60	230/460	1180	180	42/21	361
OCA-3100	15/20	3	60	230/460	1175	180	52/26	368

Hydraulic Motor Data

Hydraulic Motors

Model	HP	Pressure (PSI)	Flow (GPM)	RPM	Displacement (CUIN/REV)
OCA-450	3	870	11.1	1750	1.37
OCA-600	3	1305	8.0	1160	1.37
OCA-1000	5	2030	8.0	1160	1.37
OCA-1500	5	2030	8.0	1160	1.37
OCA-2000	10	2090	8.2	1175	1.37
OCA-2500	15	2900	8.2	1175	1.71
OCA-3100	20	2320	13.3	1175	2.2

T-BAR™
• CORE INSIDE •

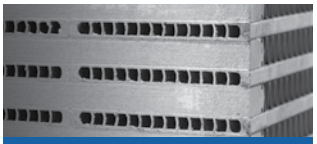
Advantages

T-BAR provides advantages and value far beyond typical aluminum core designs.

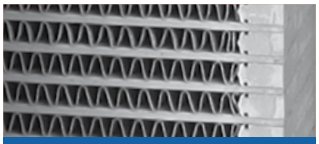
- **Extruded tubes for a leak free design**
- **Flows high viscosity fluids**
- **Low pressure drop due to absence of internal turbulator**
- **Resistance to fouling—transfer fluids without plugging**
- **Great for cooling cutting fluids or gear lube**
- **Resistant to salt spray and salt air**
- **Standard Zinc infused/coated core & fins for up to 10 times protection in salt conditions**
- **Domestic built**
- **Optional core for BOL model**

T-BAR is a flexible design, high performing, and a cost-effective aluminum solution.

Tubular Micro Channel Extrusion (T-BAR™)
T-BAR is manufactured with Alloy 1100 aluminum micro channel and bars, **with Zinc flame-sprayed extruded tubes and zinc alloy coated fins**, in our patented in-house tube-to-bar brazing process using a Nocolok CAB (Controlled Atmosphere Brazing) brazing technology furnace. Because our tubes are a solid extrusion, T-BAR is very robust — with no tube seams to fail and leak.



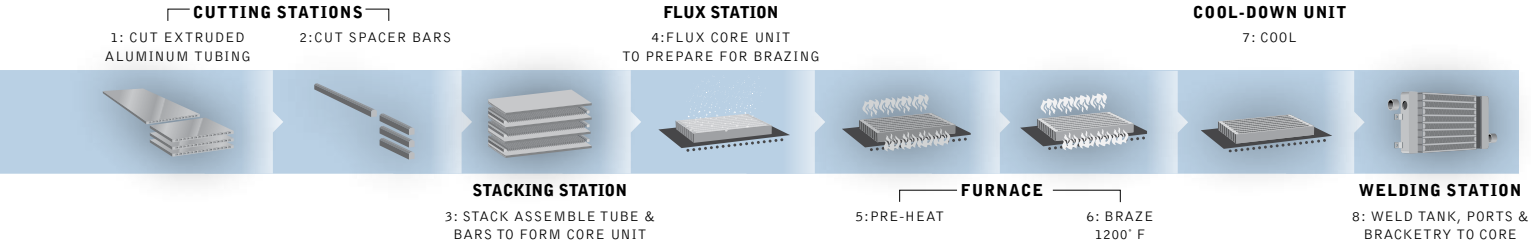
HIGH-PERFORMANCE



LOW-CLOGGING

T-BAR CORE IN OCA ASSEMBLY

T-Bar Manufacturing Process



DF DC/MF DC Fan Drive

Thermal Transfer Products Copper Tube and Fin Mobile Hydraulic Oil Coolers

API Heat Transfer's full line of Thermal Transfer Products standard mobile oil coolers is proven to stand-up in some of the toughest off-road environments. Our oil coolers are available with a wide variety of standard options to best suit each application and offer maximum performance.

Copper Tube and Fin Product Highlights

Aluminum or Steel fins available

Up to +100 HP of heat removal from hydraulic oil

Cost effective, industry proven designs

Large range of standard sizes

Standard Product Options

12 or 24 volt DC fans

Hydraulic fan motor drive

Built-in pressure bypass (30 or 60 psi for cold start-up)

Heresite coating for offshore or corrosive environment operation

Customer Focused and Driven

All catalog product is available with short lead-times

Expert application engineers available to select and size the right product for your application

Custom designs are available

Industry Applications

Our oil coolers are used in a wide variety of mobile applications across the globe.

Commercial duty lawnmowers

Municipal street cleaners

Hydrostatic drives

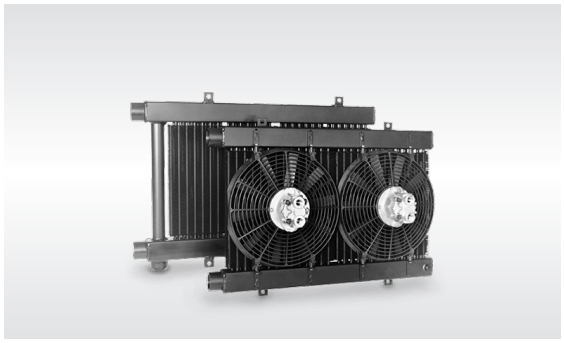
Tow-behind compressor lube cooling

Construction equipment

Underground mining

Engine oil cooling

For application help and quoting, visit our Full TTP site or contact ttpsales@apiheattransfer.com.



AB Series - Compressed Air

Thermal Transfer Products Compressed Air Aftercoolers

API Heat Transfer's line of Thermal Transfer Products compressed air aftercoolers is a complete series of standard catalog air-to-air and water-to-air aftercoolers for compressed air and lube oil cooling. All Thermal Transfer Products aftercoolers are available with a wide variety of standard options to best suit each application.

Water-Cooled

In-Line shell and tube

Up to 5000-cfm capacity

Large range of standard sizes

Low approach temperatures

Copper, copper-nickel, or stainless steel tubing

Air-Cooled

Belt Guard or fan-cooled units

Up to 5000-cfm capacity

Large range of standard sizes

AC, hydraulic, or air-motor fan drives

Copper tube aluminum fin

Brazed aluminum (P-BAR)

Heresite coating for offshore or corrosive environment operation

Customer Focused and Driven

All catalog products are available with short lead-times

Expert application engineers available to select and size the right product for your application

Custom designs are available

For application help and quoting, visit our Full TTP site or contact ttpsales@apiheattransfer.com.

AOL Series - Compressed Air

Thermal Transfer Products Compressed Air Aftercoolers

API Heat Transfer's line of Thermal Transfer Products compressed air aftercoolers is a complete series of standard catalog air-to-air and water-to-air aftercoolers for compressed air and lube oil cooling. All Thermal Transfer Products aftercoolers are available with a wide variety of standard options to best suit each application.

Water-Cooled

In-Line shell and tube

Up to 5000-cfm capacity

Large range of standard sizes

Low approach temperatures

Copper, copper-nickel, or stainless steel tubing

Air-Cooled

Belt Guard or fan-cooled units

Up to 5000-cfm capacity

Large range of standard sizes

AC, hydraulic, or air-motor fan drives

Copper tube aluminum fin

Brazed aluminum (P-BAR)

Heresite coating for offshore or corrosive environment operation

Customer Focused and Driven

All catalog products are available with short lead-times

Expert application engineers available to select and size the right product for your application

Custom designs are available

For application help and quoting, visit our Full TTP site or contact ttpsales@apiheattransfer.com.

Belt Guard Series

Thermal Transfer Products Compressed Air Aftercoolers

API Heat Transfer's line of Thermal Transfer Products compressed air aftercoolers is a complete series of standard catalog air-to-air and water-to-air aftercoolers for compressed air and lube oil cooling. All Thermal Transfer Products aftercoolers are available with a wide variety of standard options to best suit each application.

Water-Cooled

In-Line shell and tube

Up to 5000-cfm capacity

Large range of standard sizes

Low approach temperatures

Copper, copper-nickel, or stainless steel tubing

Air-Cooled

Belt Guard or fan-cooled units

Up to 5000-cfm capacity

Large range of standard sizes

AC, hydraulic, or air-motor fan drives

Copper tube aluminum fin

Brazed aluminum (P-BAR)

Heresite coating for offshore or corrosive environment operation

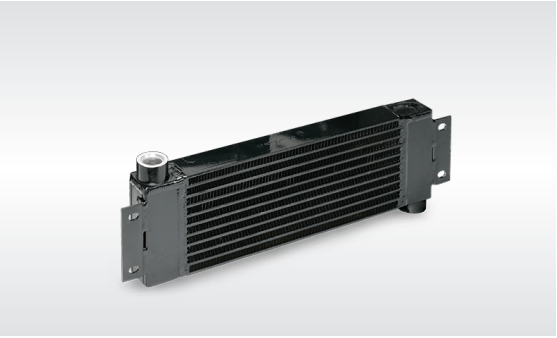
Customer Focused and Driven

All catalog products are available with short lead-times

Expert application engineers available to select and size the right product for your application

Custom designs are available

For application help and quoting, visit our Full TTP site or contact ttpsales@apiheattransfer.com.



AHP Series

Thermal Transfer Products Compressed Air Aftercoolers

API Heat Transfer's line of Thermal Transfer Products compressed air aftercoolers is a complete series of standard catalog air-to-air and water-to-air aftercoolers for compressed air and lube oil cooling. All Thermal Transfer Products aftercoolers are available with a wide variety of standard options to best suit each application.

Water-Cooled

In-Line shell and tube

Up to 5000-cfm capacity

Large range of standard sizes

Low approach temperatures

Copper, copper-nickel, or stainless steel tubing

Air-Cooled

Belt Guard or fan-cooled units

Up to 5000-cfm capacity

Large range of standard sizes

AC, hydraulic, or air-motor fan drives

Copper tube aluminum fin

Brazed aluminum (P-BAR)

Heresite coating for offshore or corrosive environment operation

Customer Focused and Driven

All catalog products are available with short lead-times

Expert application engineers available to select and size the right product for your application

Custom designs are available

For application help and quoting, visit our Full TTP site or contact ttpsales@apiheattransfer.com.

AHPV Series

Thermal Transfer Products Compressed Air Aftercoolers

API Heat Transfer's line of Thermal Transfer Products compressed air aftercoolers is a complete series of standard catalog air-to-air and water-to-air aftercoolers for compressed air and lube oil cooling. All Thermal Transfer Products aftercoolers are available with a wide variety of standard options to best suit each application.

Water-Cooled

In-Line shell and tube

Up to 5000-cfm capacity

Large range of standard sizes

Low approach temperatures

Copper, copper-nickel, or stainless steel tubing

Air-Cooled

Belt Guard or fan-cooled units

Up to 5000-cfm capacity

Large range of standard sizes

AC, hydraulic, or air-motor fan drives

Copper tube aluminum fin

Brazed aluminum (P-BAR)

Heresite coating for offshore or corrosive environment operation

Customer Focused and Driven

All catalog products are available with short lead-times

Expert application engineers available to select and size the right product for your application

Custom designs are available

For application help and quoting, visit our Full TTP site or contact ttpsales@apiheattransfer.com.

AA Series

Thermal Transfer Products Compressed Air Aftercoolers

API Heat Transfer's line of Thermal Transfer Products compressed air aftercoolers is a complete series of standard catalog air-to-air and water-to-air aftercoolers for compressed air and lube oil cooling. All Thermal Transfer Products aftercoolers are available with a wide variety of standard options to best suit each application.

Water-Cooled

In-Line shell and tube

Up to 5000-cfm capacity

Large range of standard sizes

Low approach temperatures

Copper, copper-nickel, or stainless steel tubing

Air-Cooled

Belt Guard or fan-cooled units

Up to 5000-cfm capacity

Large range of standard sizes

AC, hydraulic, or air-motor fan drives

Copper tube aluminum fin

Brazed aluminum (P-BAR)

Heresite coating for offshore or corrosive environment operation

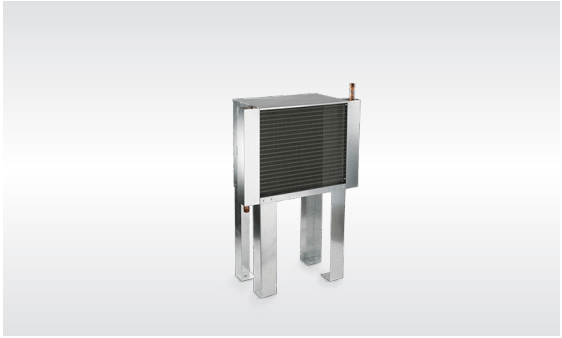
Customer Focused and Driven

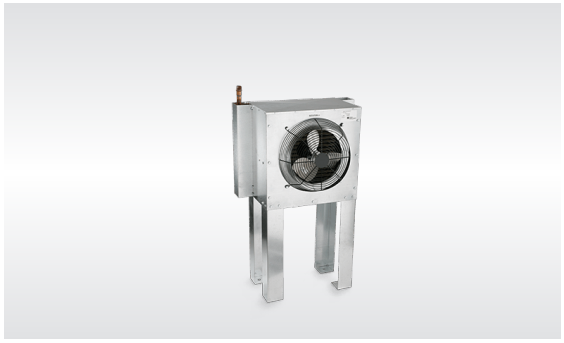
All catalog products are available with short lead-times

Expert application engineers available to select and size the right product for your application

Custom designs are available

For application help and quoting, visit our Full TTP site or contact ttpsales@apiheattransfer.com.





UPA Series

Thermal Transfer Products Compressed Air Aftercoolers

API Heat Transfer's line of Thermal Transfer Products compressed air aftercoolers is a complete series of standard catalog air-to-air and water-to-air aftercoolers for compressed air and lube oil cooling. All Thermal Transfer Products aftercoolers are available with a wide variety of standard options to best suit each application.

Water-Cooled

In-Line shell and tube

Up to 5000-cfm capacity

Large range of standard sizes

Low approach temperatures

Copper, copper-nickel, or stainless steel tubing

Air-Cooled

Belt Guard or fan-cooled units

Up to 5000-cfm capacity

Large range of standard sizes

AC, hydraulic, or air-motor fan drives

Copper tube aluminum fin

Brazed aluminum (P-BAR)

Heresite coating for offshore or corrosive environment operation

Customer Focused and Driven

All catalog products are available with short lead-times

Expert application engineers available to select and size the right product for your application

Custom designs are available

For application help and quoting, visit our Full TTP site or contact ttpsales@apiheattransfer.com.

MA Series

Thermal Transfer Products Brazed Aluminum Mobile Hydraulic Oil Coolers

Made with 100% brazed aluminum bar and plate construction, API Heat Transfer's full line of Thermal Transfer Products standard mobile oil coolers is proven to stand-up in some of the toughest off-road environments. Our oil coolers are available with a wide variety of standard options to best suit each application and offer maximum performance.

Brazed Aluminum (P-BAR) Highlights

100% rugged bar and plate construction

Up to +400 HP of heat removal from hydraulic oil

Highest performing internal turbulator for maximum performance

Low-clogging / easy maintenance air side cooling fins

Standard Product Options

12 or 24 volt DC fans

Hydraulic fan motor drive

Built-in pressure bypass (30 or 60 psi for cold start-up)

Heresite coating for offshore or corrosive environment operation

Customer Focused and Driven

All catalog product is available with short lead-times

Expert application engineers available to select and size the right product for your application

Custom designs are available

Industry Applications

Our oil coolers are used in a wide variety of mobile applications across the globe.

Commercial duty lawnmowers

Municipal street cleaners

Hydrostatic drives

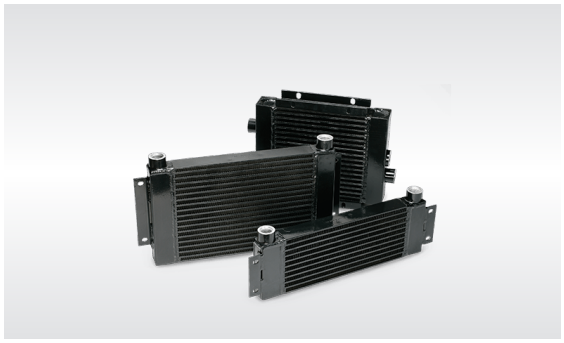
Tow-behind compressor lube cooling

Construction equipment

Underground mining

Engine oil cooling

For application help and quoting, visit our Full TTP site or contact ttpsales@apiheattransfer.com.



BRAZED ALUMINUM CONSTRUCTION

Features

- **Bar and Plate Brazed Aluminum Core**
- **Rugged, lightweight, and compact**
- **Provides the best heat transfer per given envelope size while minimizing pressure drop**
- **Air-side fin design minimizes fouling and static pressure ensuring long-term, reliable performance**
- **Fan motor assembly has an IP68 with AMP-#180908 connection**
- **Welded aluminum fittings/ports and manifolds ensure structural integrity**
- **Standard SAE ports – NPT and BSPP ports available**
- **Customized units are available to meet your specific performance requirements**
- Additional capabilities for radiators, charge-air-coolers, condensers, and multi-circuit units
- Optional temperature sensors *(see pg. 171)*

30/60 psi Bypass available

Ratings

Maximum Operating Pressure
250 psi (17 BAR)

Maximum Operating Temperature
300° F (150° C)

Fluid Compatability

Petroleum/mineral oils

Oil/water emulsion

Water/ethylene glycol

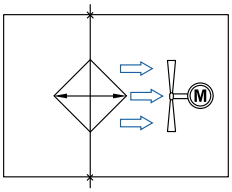
Materials

Core Brazed Aluminum Bar and Plate

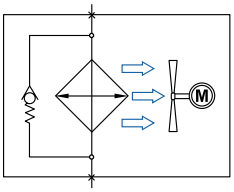
- Tanks – 5052 Aluminum
- Nose Bar & Little Bar – 3003-H Aluminum
- Air Fin, Plate, Turbulator & End Plate – 3003-O Aluminum

Connections Aluminum

Core Mounting Brackets Brazed Aluminum



Without Bypass



With Bypass

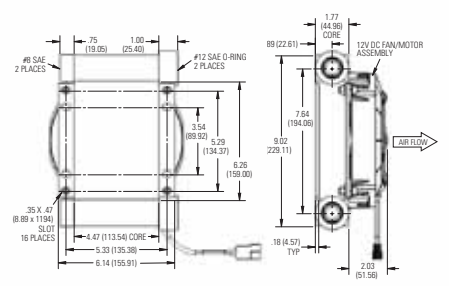
How to Order

Model Series	**Model Size Selected**	**Connection Type***	**Bypass***	**Specify Motor Required**
MA	**3**	**1** - NPT	**30** - 30 PSI	**4A** - 12 VDC
(MAR)	**3.5**	**2** - SAE	**60** - 60 PSI	**4B** - 24 VDC
	4	**3** - BSPP		
	12			
	18			
	32			
	48			
	232			
	248			

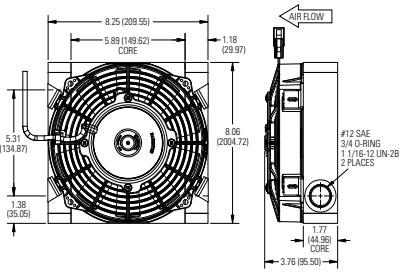
*Bypass available on MA-12, MA-18, MA-32, MA-48, MA-232, MA-248 only. (MAR)
MA-8, MA-14, MA-20, MA-66, MA-32 do not have fan option.
MA 3.5 available with fan only.

Dimensions - Fan/Core

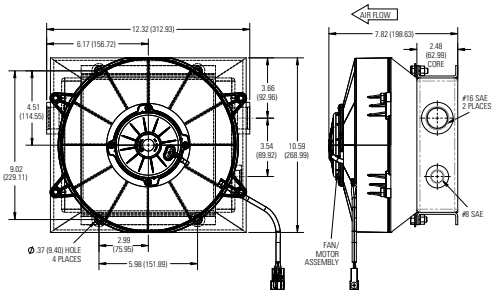
MA-3



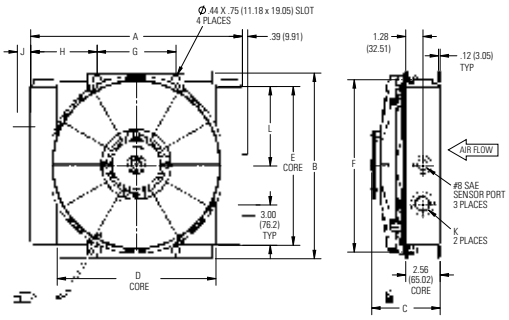
MA-3.5



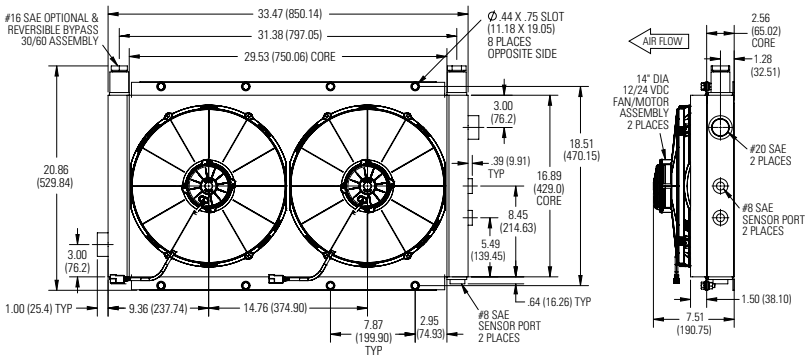
MA-4



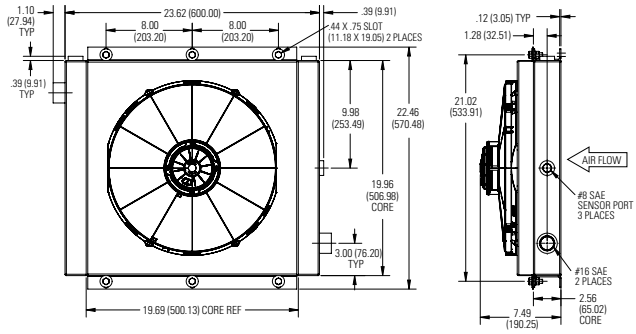
MA-12, MA-18, MA-32



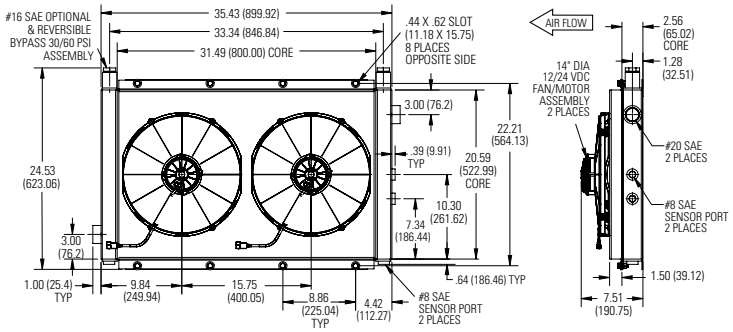
MA-232



MA-48



MA-248

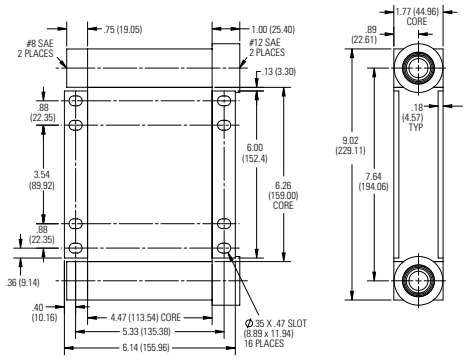


Model	A	B	C	D	E	F	G	H	J	K	L	DC Amp Draw 12V	DC Amp Draw 24V	CFM (CMM)	Approx. Ship Wt. lbs (Kg)
MA-3	See diagram above			—	—	—	—	—	—	—	—	5.7	3.6	300 (8.50)	6 (2.72)
MA-3.5	See diagram above			—	—	—	—	—	—	—	—	12.5	6.3	370 (10.48)	9 (4.08)
MA-4	See diagram above			—	—	—	—	—	—	—	—	12.5	6.3	363 (10.28)	16 (7.26)
MA-12	13.78 (350.01)	11.81 (299.97)	6.26 (159.00)	9.84 (249.94)	9.96 (252.98)	10.87 (276.10)	5.71 (145.00)	4.41 (112.01)	1.00 (25.40)	#12 SAE	4.98 (126.49)	12.5	6.3	521 (14.75)	19 (8.62)
MA-18	15.75 (400.05)	13.81 (350.77)	5.04 128.02)	11.81 (299.97)	11.81 (299.97)	12.80 (325.12)	5.87 (149.10)	4.96 (125.98)	1.00 (25.40)	#12 SAE	5.91 (150.11)	10.6	5.3	783 (22.17)	23 (10.43)
MA-32	19.69 (500.15)	18.54 (470.92)	5.95 (151.13)	15.75 (400.05)	16.14 (409.96)	17.32 (439.93)	12.00 (304.8)	3.86 (98.04)	1.14 (28.96)	#16 SAE	8.07 (204.98)	22.2	11.1	1368 (38.74)	28 (12.70)
MA-48	See diagram above			—	—	—	—	—	—	—	—	22.2	11.1	1637 (46.40)	45 (20.40)
MA-232	See diagram above			—	—	—	—	—	—	—	—	19.3*	9.7*	2234 (63.26)	65 (29.48)
MA-248	See diagram above			—	—	—	—	—	—	—	—	19.3*	9.7*	2904 (82.24)	90 (40.80)

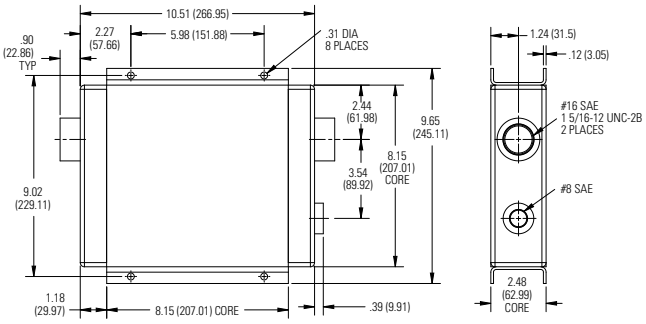
Note: We reserve the right to make reasonable design changes without notice. Dimensions are in inches and (millimeters).
**AMP draw listed as per FAN.*

Dimensions - Core Only

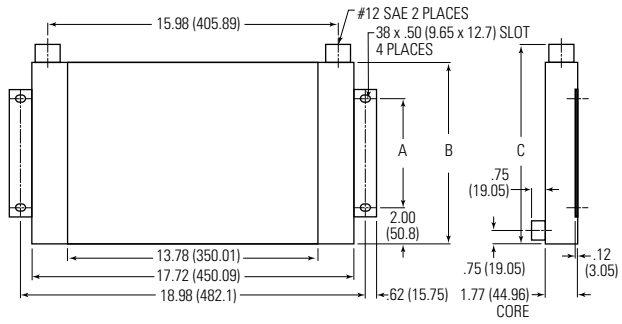
MA-3



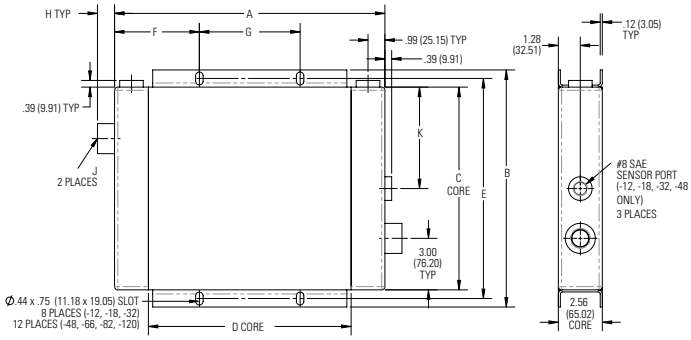
MA-4



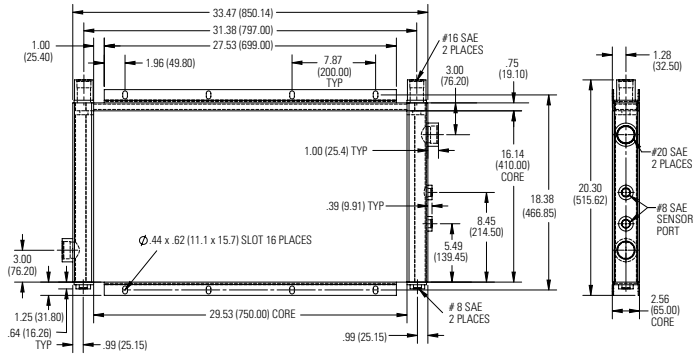
MA-8, MA-14, MA-20



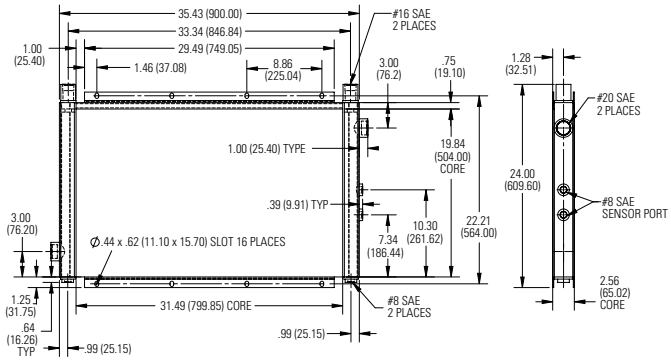
MA-12 thru MA-120



MA-232



MA-248



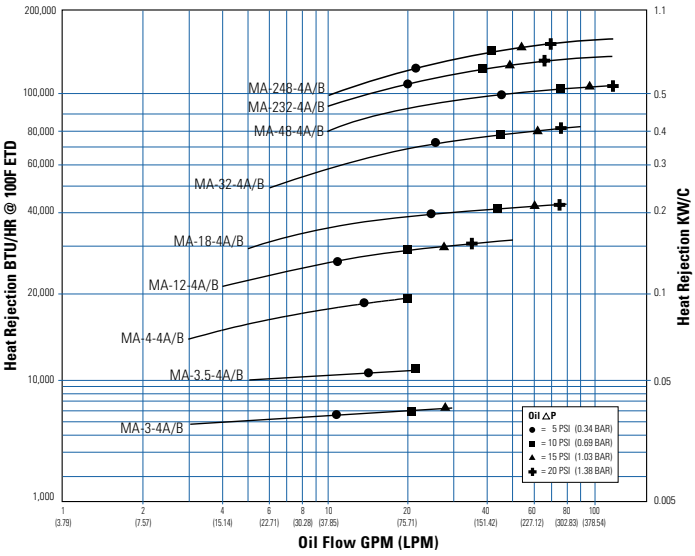
Model	A	B	C	D	E	F	G	H	J	K	Approx. Ship Wt. lbs (Kg)
MA-3	See diagram above			–	–	–	–	–	–	–	4 (1.81)
MA-4	See diagram above			–	–	–	–	–	–	–	7 (3.18)
MA-8	3.00 (76.2)	5.67 (144.02)	6.65 (168.9)	–	–	–	–	–	–	–	10 (4.54)
MA-12	13.78 (350.01)	11.81 (299.97)	9.96 (252.98)	9.84 (294.94)	10.98 (278.89)	4.04 (102.62)	5.71 (145.03)	1.00 (25.4)	#12 SAE	4.98 (126.49)	15 (6.8)
MA-14	6.00 (152.4)	10.00 (254.0)	10.98 (278.89)	–	–	–	–	–	–	–	14 (6.35)
MA-18	15.75 (400.05)	13.81 (350.77)	11.81 (299.97)	11.81 (299.97)	12.82 (325.63)	4.94 (125.48)	5.87 (149.10)	1.00 (25.4)	#12 SAE	5.91 (150.11)	18 (8.16)
MA-20	10.00 (254.0)	14.33 (363.98)	15.31 (388.87)	–	–	–	–	–	–	–	18 (8.16)
MA-32	19.69 (500.13)	18.54 (470.92)	16.14 (409.96)	15.75 (400.05)	17.32 (439.93)	3.85 (97.79)	12.00 (304.8)	1.10 (27.94)	#16 SAE	8.07 (204.98)	28 (12.7)
MA-48	23.62 (599.95)	22.13 (562.10)	19.96 (506.98)	19.69 (500.13)	21.02 (533.91)	3.81 (96.77)	8.00 (203.2)	1.10 (27.94)	#16 SAE	9.98 (253.49)	41 (18.60)
MA-66	27.56 (700.02)	25.83 (656.08)	23.54 (597.92)	23.62 (599.95)	24.72 (627.89)	3.78 (96.01)	10.00 (254.0)	1.58 (40.13)	#20 SAE	–	50 (22.68)
MA-82	31.50 (800.1)	27.68 (703.07)	25.39 (644.91)	27.56 (700.02)	26.57 (674.8)8	5.75 (146.05)	10.00 (254.0)	1.58 (40.13)	#24 SAE	–	65 (29.48)
MA-120	31.50 (800.1)	39.49 (1003.05)	37.20 (944.88)	27.56 (700.02)	38.39 (975.11)	5.75 (146.05)	10.00 (254.0)	1.58 (40.13)	#24 SAE	–	88 (39.92)
MA-232	See diagram above			–	–	–	–	–	–	–	55 (24.95)
MA-248	See diagram above			–	–	–	–	–	–	–	80 (36.29)

Note: We reserve the right to make reasonable design changes without notice. All dimensions are in inches and (millimeters).

Performance Curves

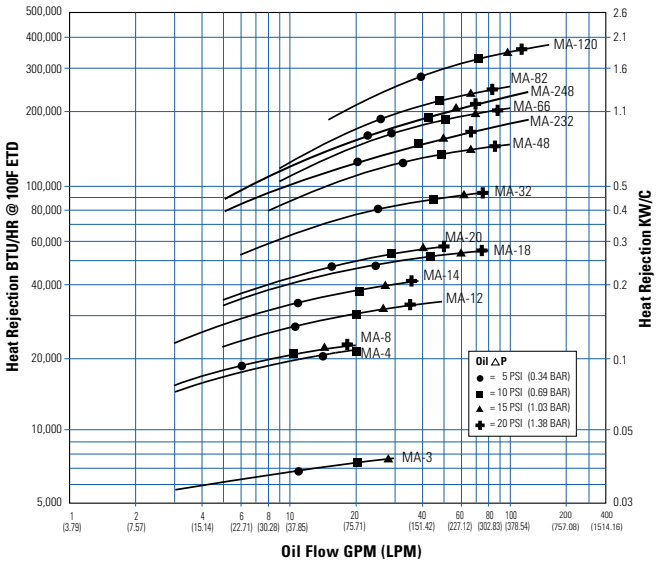
MA Models with DC Fan Assemblies

Performance Data Curve

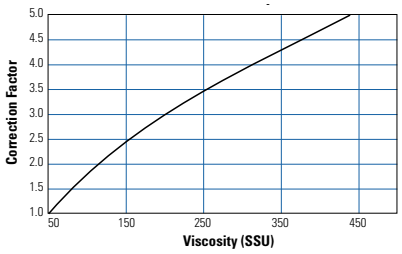


MA Models (No Fan, Core Only)

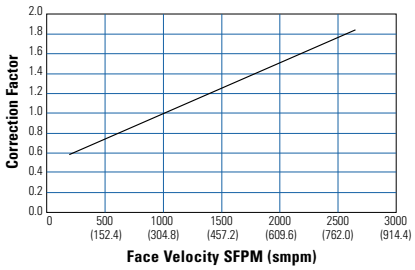
Performance Data Curve



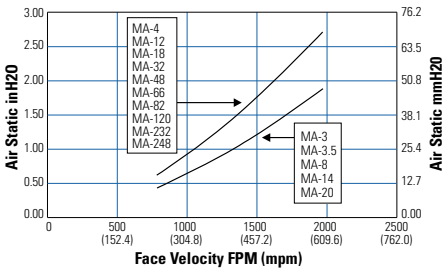
Oil Pressure Drop Correction



Air Static Correction



Air Static Pressure Drop



Selection Procedure

Step 1 **Determine Heat Load.** Typical Rule of Thumb, - size cooler for 1/3 of the input horsepower. Heat load may be expressed as either Horsepower or BTU/HR or KW/°C.

HP = BTU/HR ÷ 2545

BTU/HR = HP x 2545

$$BTU/HR = \frac{KW}{°C} \times 1895 \times E.T.D.(°F)$$

Step 2 **Determine Entering Temperature Difference.** (Actual E.T.D.)
(E.T.D.= Entering oil temperature – Entering Ambient air temperature)

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, plus – add any pre-heating of the air prior to its entering the cooler. Pay special attention if air is drawn from the engine compartment for cooling.

Step 3 **Find Air Velocity Correction Factor**
(Skip to Step 4 if using our DC Fan Assembly)

Calculate actual SFPM Air Velocity or SCFM (Standard Cubit Feet per Minute) for selection using the Face Area from the table.

$$SFPM\ Air\ Velocity^{*} = \frac{SCFM\ Air\ Flow}{Square\ Feet\ Cooler\ Face\ Area}$$

$$SMPM = \frac{SCMM}{Square\ Meter\ Cooler\ Face\ Area}$$

(SCFM Air Flow= SFPM Air Velocity x Square Feet Cooler Face Area)

*If the Air Velocity calculated is different than the value in Step 4, then recheck Corrected oil Pressure drop.

Step 4 **Determine the Corrected Heat Dissipation to use the Curves**

ENGLISH Version

$$\text{Corrected Heat Rejection} = \frac{\text{(BTU/Hr) Heat Load}}{\left[\frac{\text{Desired E.T.D}}{100°F} \times \text{Air Velocity Correction Factor}\right]}$$

(BTU/HR) to use with selection chart

(Air Factor value not needed if using provided DC Fan assembly; Omit in formula)

METRIC Version

$$\text{Corrected Heat Rejection}\left[\frac{KW}{°C}\right] = \frac{\text{Heatload (kw)}}{\text{Desired E.T.D (°C)} \times \text{Air Velocity Correction Factor}}$$

Step 5 **Select Model From Curves** Enter the Performance Curves at the bottom with the GPM oil flow and proceed upward to the adjusted Heat Rejection from Step 4. Any Model or Curve on or above this point will meet these conditions.

Step 6 **Calculate Oil Pressure Drop** Find the oil pressure drop correction factor and multiply it by the Oil Pressure Drop found on performance curve.

Listed Performance Curves are based on:

- 50 SSU (11 cSt) oil
- 1000 Standard Feet per Minute (SPFM) (304.8 MPM) Air Velocity
- 100° F (55.56° C) Entering Temperature Difference (E.T.D.)

If your application conditions are different, then continue with the selection procedure.

BOL Series - Mobile

Thermal Transfer Products Brazed Aluminum Mobile Hydraulic Oil Coolers

Made with 100% brazed aluminum bar and plate construction, API Heat Transfer's full line of Thermal Transfer Products standard mobile oil coolers is proven to stand-up in some of the toughest off-road environments. Our oil coolers are available with a wide variety of standard options to best suit each application and offer maximum performance.

Brazed Aluminum (P-BAR) Highlights

100% rugged bar and plate construction

Up to +400 HP of heat removal from hydraulic oil

Highest performing internal turbulator for maximum performance

Low-clogging / easy maintenance air side cooling fins

Standard Product Options

12 or 24 volt DC fans

Hydraulic fan motor drive

Built-in pressure bypass (30 or 60 psi for cold start-up)

Heresite coating for offshore or corrosive environment operation

Customer Focused and Driven

All catalog product is available with short lead-times

Expert application engineers available to select and size the right product for your application

Custom designs are available

Industry Applications

Our oil coolers are used in a wide variety of mobile applications across the globe.

Commercial duty lawnmowers

Municipal street cleaners

Hydrostatic drives

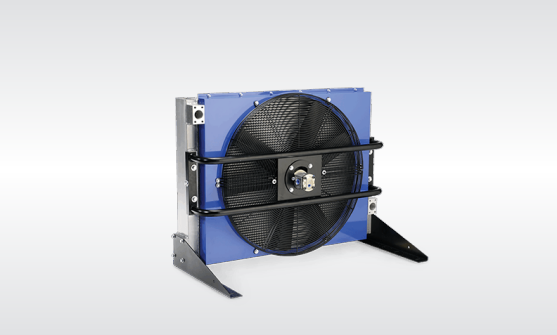
Tow-behind compressor lube cooling

Construction equipment

Underground mining

Engine oil cooling

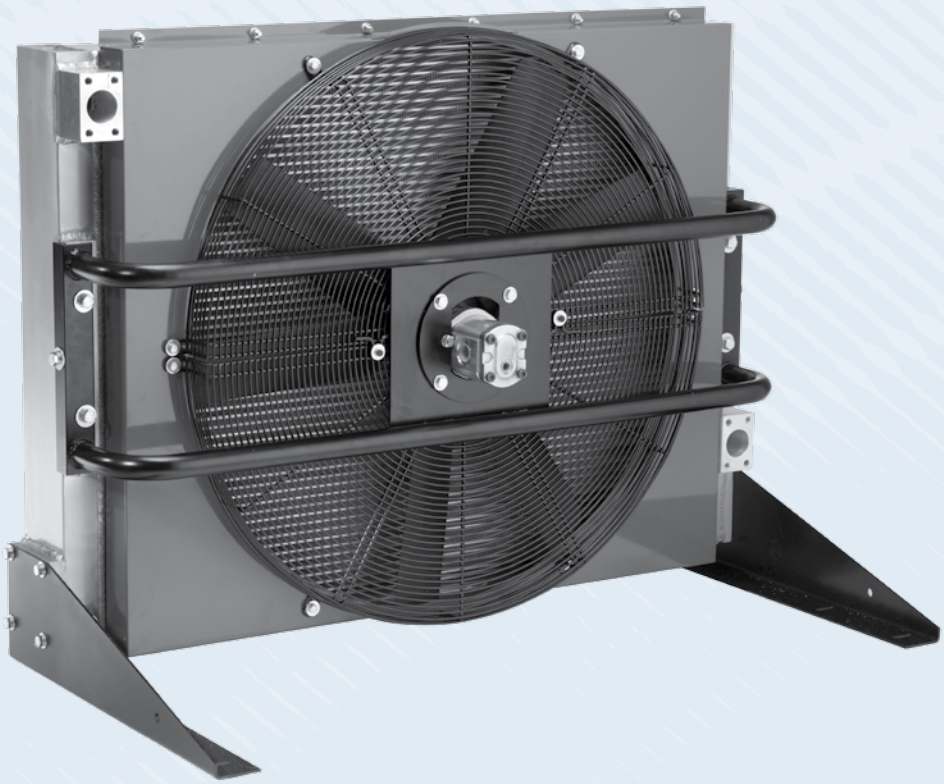
For application help and quoting, visit our Full TTP site or contact ttpsales@apiheattransfer.com.



BRAZED ALUMINUM CONSTRUCTION

Features

- **Bar and Plate Brazed Aluminum Core**
- **Rugged, lightweight, and compact**
- **Provides the best heat transfer per given envelope size while minimizing pressure drop**
- **Air-side fin design minimizes fouling and static pressure ensuring long-term, reliable performance**
- **Welded fittings/ports and manifolds ensure structural integrity**
- **Standard SAE ports – NPT and BSPP ports available**
- **Customized units are available to meet your specific performance requirements**
- T-BAR core optional for high viscosity oils or other highly fouling fluids. *See T-Bar Performance Curve
- Low Noise Option Available



Ratings

Maximum Operating Pressure
250 psi (17 BAR)

Maximum Operating Temperature
300° F (150° C)

Materials

Mounting Feet Steel

Standard Core Brazed Aluminum Bar and Plate
- Tanks – 5052 Aluminum
- Nose Bar & Little Bar – 3003-H Aluminum
- Air Fin, Plate, Turbulator & End Plate – 3003-O Aluminum

Fanguard Steel

Connectors Aluminum

Fan Aluminum Hub, Plastic Blades

Shroud Steel

Motor TEFC & IEC

Fluid Compatability

Petroleum/mineral oils

Oil/water emulsion

Water/ethylene glycol

How to Order

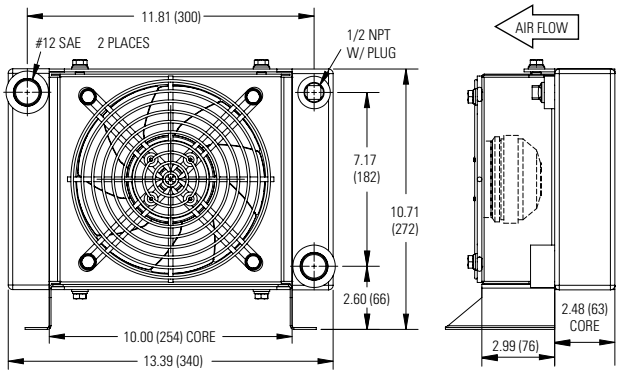
Model Series	**Model Size Selected**	**Connection Type***	**Specify Motor Required**	**Core**	**Noise Level**
BOL	**4** **8** **16** **30** **400** **725** **950** **1200** **1600** **2000**	**1** - NPT **2** - SAE **3** - BSPP	**2** - Single Phase **3** - Three Phase **6** - 575 Volt **9** - Hydraulic **18** - IEC Three Phase	**Blank** - Standard Bar & Plate **TB** - T-BAR Core*	**Blank** - Standard Noise Level **LN** - Low Noise Level

*T-BAR Core option provides a T-BAR core in BOL 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.

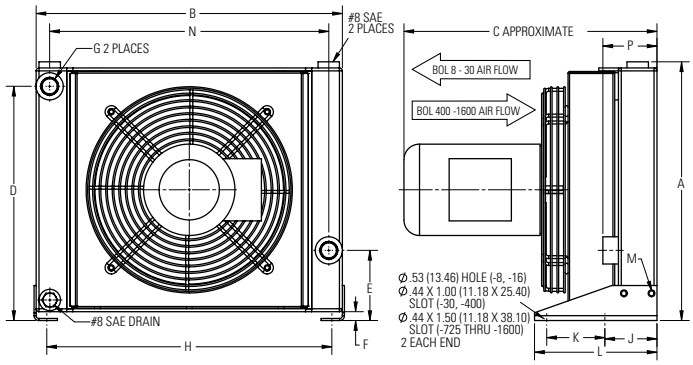
OPTIONAL T-BAR CORE SECTION CUTAWAY

Dimensions

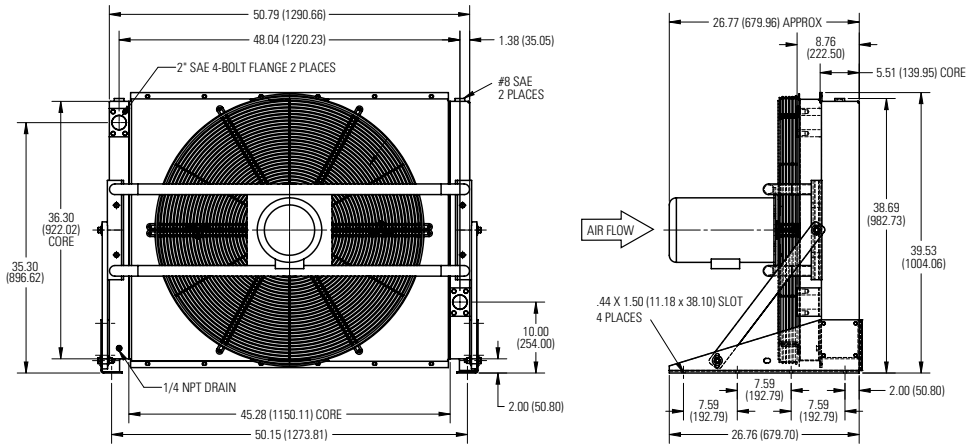
BOL-4



BOL-8 through BOL-1600



BOL-2000



Model	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Approx. Ship Wt. lbs (Kg)
BOL-4	See diagram above			—	—	—	—	—	—	—	—	—	—	—	18 (8.16)
BOL-8	12.93 (328.42)	15.75 (400.05)	14.72 (373.89)	11.30 (287.62)	3.27 (83.06)	.55 (13.97)	#12 SAE	14.53 (369.06)	3.07 (77.98)	3.75 (88.90)	7.36 (186.94)	M8 Bolt (2PL)	14.01 (355.85)	3.48 (88.40)	45 (20.4)
BOL-16	16.63 (422.40)	19.69 (500.13)	16.16 (410.46)	15.06 (382.52)	4.51 (114.56)	.57 (14.48)	#12 SAE	18.30 (464.82)	3.35 (85.09)	3.74 (95.00)	7.87 (199.90)	M8 Bolt (2PL)	17.95 (455.93)	3.46 (87.88)	55 (24.94)
BOL-30	21.09 (535.68)	26.38 (670.06)	18.23 (463.04)	19.49 (495.05)	5.26 (133.60)	1.32 (33.53)	#20 SAE	24.74 (628.40)	4.25 (107.95)	5.00 (127.00)	10.00 (254.00)	M10 Bolt (4PL)	24.34 (618.24)	5.28 (134.11)	125 (56.70)
BOL-400	19.20 (487.68)	22.45 (570.23)	18.80 (477.52)	17.31 (439.67)	6.50 (165.10)	2.00 (50.80)	#20 SAE	22.30 (566.42)	4.25 (107.95)	5.00 (127.00)	10.00 (254.00)	M10 Bolt (4PL)	20.08 (510.03)	5.20 (132.08)	148 (67.13)
BOL-725	23.49 (596.65)	30.32 (770.13)	18.60 (472.44)	21.60 (548.64)	6.50 (165.10)	2.00 (50.80)	#20 SAE	30.17 (766.32)	4.25 (107.95)	5.00 (127.00)	10.00 (254.00)	M10 Bolt (4PL)	27.95 (709.93)	5.20 (132.08)	170 (77.11)
BOL-950	27.94 (709.68)	37.03 (940.56)	22.69 (576.33)	24.55 (623.57)	9.50 (241.30)	2.00 (50.80)	2" SAE 4-Bolt Flange	35.89 (911.61)	6.05 (153.67)	9.20 (233.68)	16.00 (406.40)	M10 Bolt (4PL)	34.26 (870.20)	7.01 (178.05)	300 (136.08)
BOL-1200	27.94 (709.68)	40.96 (1040.38)	24.07 (611.38)	24.55 (623.57)	5.50 (139.70)	2.00 (50.80)		40.31 (1023.87)	6.05 (153.67)	9.20 (233.68)	16.00 (406.40)	M10 Bolt (4PL)	38.19 (970.03)	7.01 (178.05)	430 (195.04)
BOL-1600	36.01 (914.65)	40.96 (1040.38)	25.45 (646.43)	32.62 (828.55)	9.50 (241.30)	2.00 (50.80)		40.31 (1023.87)	6.05 (153.67)	9.20 (233.68)	16.00 (406.40)	M10 Bolt (4PL)	38.19 (970.03)	7.01 (178.05)	515 (233.60)
BOL-2000	See diagram above			—	—	—	—	—	—	—	—	—	—	—	582 (264.00)

Note: We reserve the right to make reasonable design changes without notice. All dimensions are in inches and (millimeters).

Specifications

Electric Motor Information (60 Hz Nema Frame)

Model	CMM	CFM	Motor HP	Voltage	Phase	Full Load Amps 230V	Frequency	RPM	Frame	Thermal Overload	Sound dB(A) at 3ft
BOL-4	31.14	1203	1/4	230	1	—	60 Hz	2850	—	—	73
BOL-8	22.65	800	1/3	115/230	1	3.0	60 Hz	3450	48C	No	80
BOL-8	22.65	800	1/3	208-230/460	3	1.4	60 Hz	3450	48C	No	80
BOL-16	40.35	1425	1/2	115/230	1	3.7	60 Hz	3450	48C	No	85
BOL-16	40.35	1425	1/2	208-230/460	3	2.2	60 Hz	3450	48C	No	85
BOL-30	62.29	2200	1/2	115/230	1	3.7	60 Hz	1725	56C	No	85
BOL-30	62.29	2200	1/2	208-230/460	3	2.0	60 Hz	1725	56C	No	85
BOL-400	62.29	2200	1	115/230	1	6.0	60 Hz	3450	56C	No	97
BOL-400	62.29	2200	1	208-230/460	3	3.2	60 Hz	3450	56C	No	97
BOL-725	101.94	3600	1-1/2	115/230	1	8.5	60 Hz	3450	56C	No	100
BOL-725	101.94	3600	1-1/2	208-230/460	3	4.8	60 Hz	3450	56C	No	100
BOL-950	133.10	4700	1-1/2	115/230	1	8.6	60 Hz	1725	145TC	No	92
BOL-950	133.10	4700	1-1/2	208-230/460	3	4.6	60 Hz	1725	145TC	No	92
BOL-1200	198.22	7000	3	208-230/460	3	8.8	60 Hz	1725	182TC	No	94
BOL-1600	223.75	7900	5	208-230/460	3	13.4	60 Hz	1725	184TC	No	96
BOL-2000	396.44	14000	7.5	230/460	3	24.8	60 Hz	1725	213TC	No	98

Electric Motor Information (50 Hz IEC Frame)

Model	CMM	CFM	KW	Voltage	Phase	Frequency	RPM	Frame	Sound dB(A) at 3ft
BOL-4	28.4	1003	.20	230	1	50 Hz	3000	—	73
BOL-8	18.9	667	.25	230/400/415	3	50 Hz	3000	63	71
BOL-16	33.7	1188	.37	230/400/415	3	50 Hz	3000	71	77
BOL-30	52.4	1850	.37	230/400/415	3	50 Hz	1500	71	73
BOL-400	52.4	1850	.75	230/400/415	3	50 Hz	3000	80	81
BOL-725	85.0	3000	1.10	230/400/415	3	50 Hz	3000	80	80
BOL-950	108.2	3821	1.50	230/400/415	3	50 Hz	1500	90	78
BOL-1200	165.1	5834	2.20	230/400/415	3	50 Hz	1500	100	83
BOL-1600	186.4	6584	3.00	230/400/415	3	50 Hz	1500	100	85
BOL-2000	331.3	11700	4.00	230/400/415	3	50 Hz	1500	112	88

All IEC frame motors have CE mark.
IEC motor voltages have +/- 10% tolerance.

Hydraulic Motor Information

Model	Oil Flow Required GPM (LPM)	Min. Pressure Required PSI (BAR)	Motor IN^3/REV (CM^3/REV) Displacement	Sound dB(A) at 3 ft.
BOL-4	3.3 (12.49)	400 (27.58)	0.22 (3.6)	80
BOL-8	3.3 (12.49)	400 (27.58)	0.22 (3.6)	80
BOL-16	3.3 (12.49)	500 (34.47)	0.22 (3.6)	85
BOL-30	3.4 (12.87)	500 (34.47)	0.45 (7.3)	85
BOL-400	3.3 (12.49)	425 (29.30)	0.22 (3.6)	97

Model	Oil Flow Required GPM (LPM)	Min. Pressure Required PSI (BAR)	Motor IN^3/REV (CM^3/REV) Displacement	Sound dB(A) at 3 ft.
BOL-725	3.3 (12.49)	675 (46.50)	0.22 (3.6)	100
BOL-950	10.1 (38.23)	300 (20.70)	1.4 (22.9)	92
BOL-1200	10.1 (38.23)	725 (50.00)	1.4 (22.9)	94
BOL-1600	10.1 (38.23)	1100 (75.80)	1.4 (22.9)	96
BOL-2000	10.1 (38.23)	1650 (113.76)	1.4 (22.9)	98

Notes: Maximum Pressure is 2000 psi. Stated Minimum Operating Pressure is at Inlet Port of Motor. 1000 psi Allowable Back Pressure.

Selection Procedure

Step 1 **Determine Heat Load.** Typical Rule of Thumb, -size cooler for 1/3 of the input horsepower. Heat load may be expressed as either Horsepower or BTU/Hr or KW/°C.

HP=BTU/HR ÷ 2545

BTU/HR=HP x 2545

$$\text{BTU/HR} = \frac{\text{KW}}{\text{°C}} \times 1894.61 \times \text{E.T.D.(°F)}$$

Step 2 **Determine Entering Temperature Difference.** (Actual E.T.D.)

$$\text{E.T.D.} = \text{Entering oil temperature} - \text{Entering Ambient air temperature}$$

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 **Determine the Corrected Heat Dissipation to use the Curves**

ENGLISH Version

$$\text{Corrected Heat Rejection} = \text{(BTU/Hr) Heat Load} \times \frac{100°\text{F}}{\text{Desired E.T.D.}}$$

(BTU/HR) to use with selection chart

METRIC Version

$$\text{Corrected Heat Rejection} \quad \frac{\text{KW}}{\text{°C}} = \frac{\text{Heatload (kw)}}{\text{Desired E.T.D. (°C)}}$$

Step 4 **Select Model From Curves** Enter the Performance Curves at the bottom with the GPM 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.

Step 5 **Calculate Oil Pressure Drop** Find the oil pressure drop correction factor and multiply it by the Oil Pressure Drop found on performance curve.

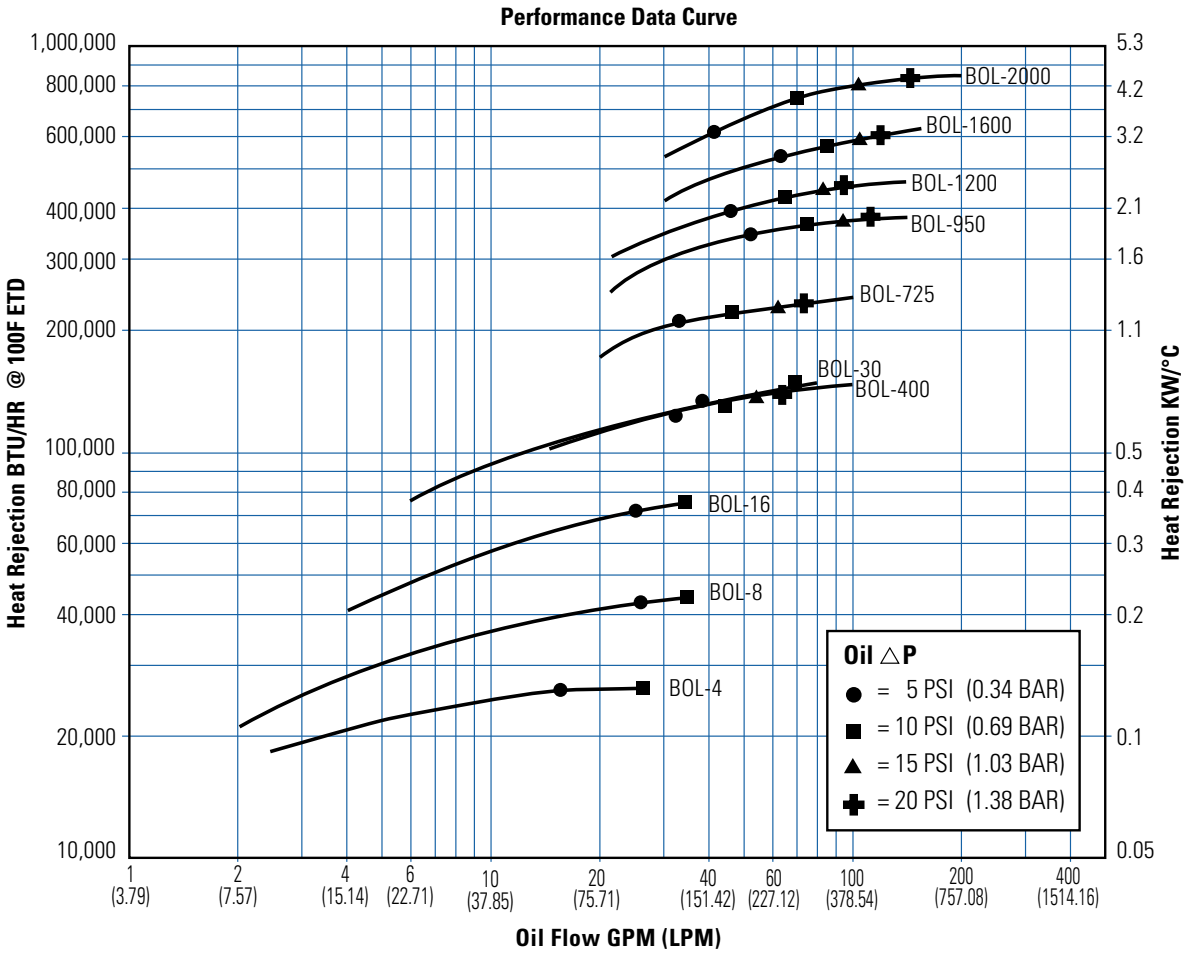
Listed Performance Curves are based on:

- 50 SSU (11 cSt) oil
- 100° F (55.56° C) Entering Temperature Difference (E.T.D.)

If your application conditions are different, then continue with the selection procedure.

Performance Curves

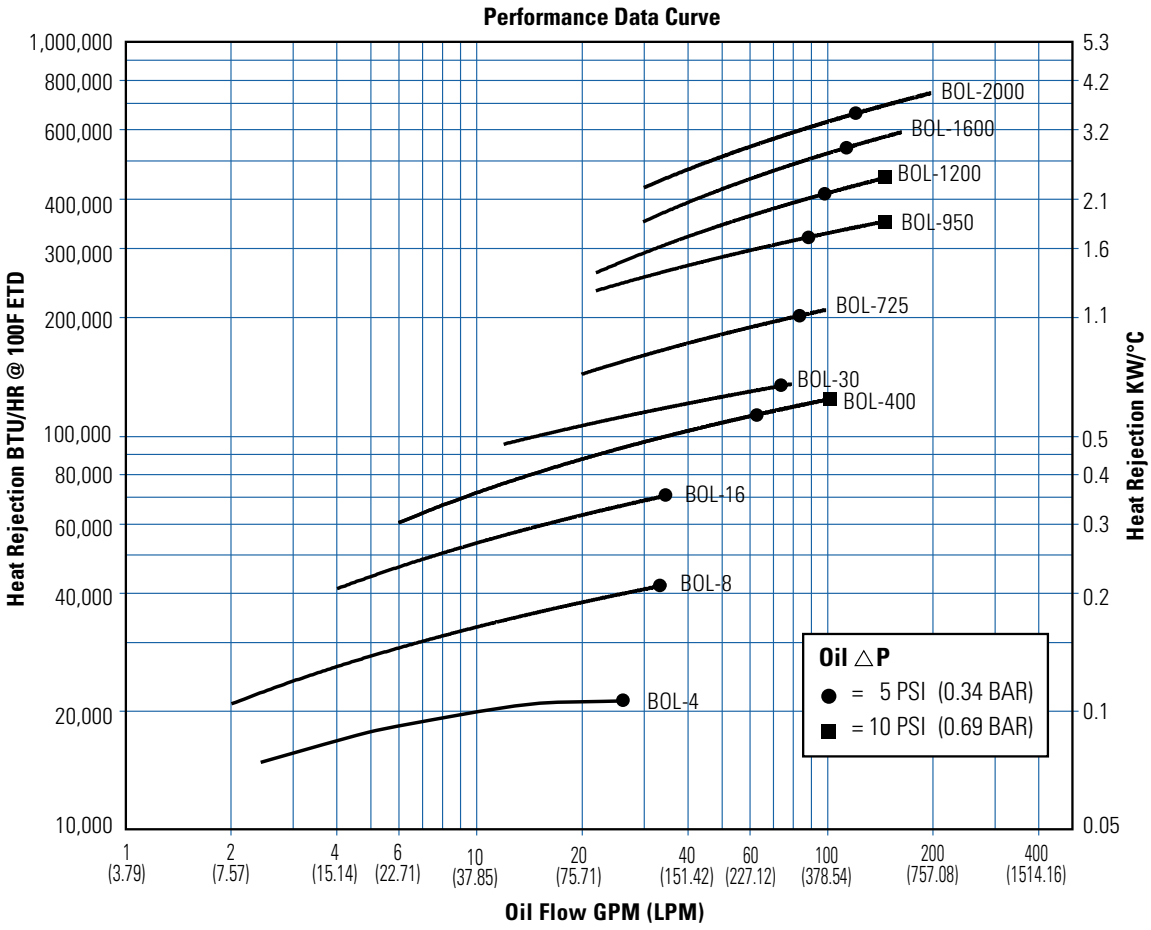
BOL Models with Standard P-BAR Core



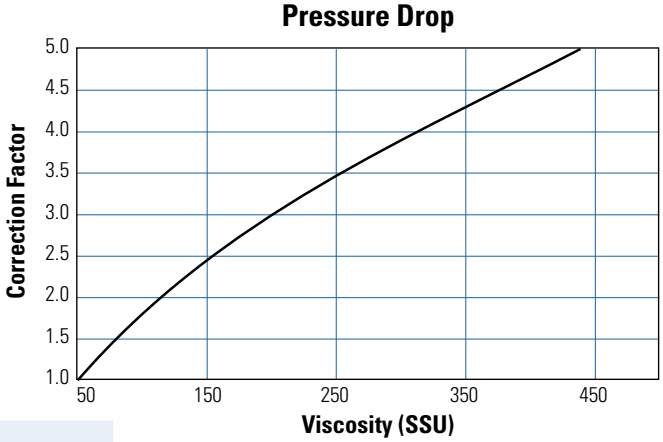
Note: Derate heat rejection values 15% if using 50Hz motors.

Performance Curves

BOL Models with Optional T-BAR Core



Note: Derate heat rejection values 15% if using 50Hz motors.



Oil Temperature

Typical operating temperature ranges are:

Hydraulic Motor Oil	120°F - 180°F (49°C - 82.2°C)
Hydrostatic Drive Oil	160°F - 180°F (71°C - 82.2°C)
Engine Lube Oil	180°F - 200°F (82.2°C - 93.3°C)
Automatic Transmission Fluid	200°F - 300°F (93.3°C - 149°C)

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 = (BTU's/Hr.) / (GPM Oil Flow x 210).

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

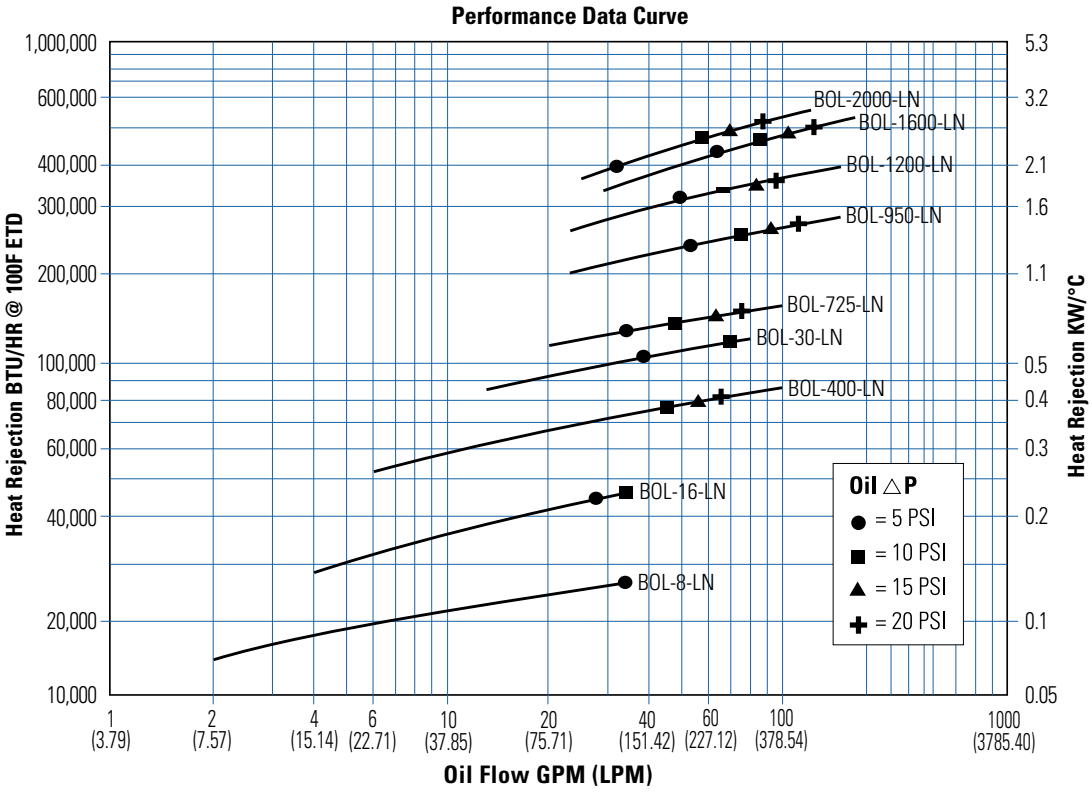
Oil Entering Temp. = Oil Leaving Temp + Oil △T.

Oil Pressure Drop: Most systems can tolerate a pressure drop through the heat exchanger of 20 to 30 PSI. Excessive pressure drop should be avoided. Care should be taken to limit pressure drop to 5 PSI or less for case drain applications where high back pressure may damage the pump shaft seals.

Performance Curves

BOL Models with Low-Noise Option

The low noise option offers the BOL models with a reduced motor speed.
This allows a lower sound level output for noise-sensitive applications.



Available on 60 Hz Nema frame only.

Electric Motor Information

Model	HP	Frame	Low Noise RPM	Low Noise CFM	Low Noise CMM	Voltage	Frequency (HZ)
8-1PH	0.33	48	1725	400	11.33	115/230	60
8-3PH	0.33	48	1725	400	11.33	208-230/460	60
16-1PH	0.50	48	1725	704	19.93	115/230	60
16-3PH	0.50	48	1725	704	19.93	208-230/460	60
30-1PH	0.50	56C	1160	1470	41.62	115/230	60
30-3PH	0.50	56C	1160	1470	41.62	208-230/460	60
400-1PH	1.00	56C	1725	1100	31.19	115/230	60
400-3PH	1.00	56C	1725	1100	31.19	208-230/460	60
725-1PH	1.50	56C	1725	1780	50.40	115/230	60
725-3PH	1.50	56C	1725	1780	50.40	208-230/460	60
950-1PH	1.50	145TC	1160	3150	89.19	115/230	60
950-3PH	1.50	145TC	1160	3150	89.19	208-230/460	60
1200-3PH	1.50	182TC	1160	4690	132.81	208-230/460	60
1600-3PH	2.00	184TC	1160	6510	184.34	208-230/460	60
2000-3PH	5.00	213TC	1160	8700	000.00	230/460	60

Sound Data

Model	DBA at 3 ft
BOL-8-LN	62
BOL-16-LN	69
BOL-30-LN	67
BOL-400-LN	72
BOL-725-LN	82
BOL-950-LN	76
BOL-1200-LN	75
BOL-1600-LN	78
BOL-2000-LN	85

DH Series

Thermal Transfer Products Copper Tube and Fin Mobile Hydraulic Oil Coolers

API Heat Transfer's full line of Thermal Transfer Products standard mobile oil coolers is proven to stand-up in some of the toughest off-road environments. Our oil coolers are available with a wide variety of standard options to best suit each application and offer maximum performance.

Copper Tube and Fin Product Highlights

Aluminum or Steel fins available

Up to +100 HP of heat removal from hydraulic oil

Cost effective, industry proven designs

Large range of standard sizes

Standard Product Options

12 or 24 volt DC fans

Hydraulic fan motor drive

Built-in pressure bypass (30 or 60 psi for cold start-up)

Heresite coating for offshore or corrosive environment operation

Customer Focused and Driven

All catalog product is available with short lead-times

Expert application engineers available to select and size the right product for your application

Custom designs are available

Industry Applications

Our oil coolers are used in a wide variety of mobile applications across the globe.

Commercial duty lawnmowers

Municipal street cleaners

Hydrostatic drives

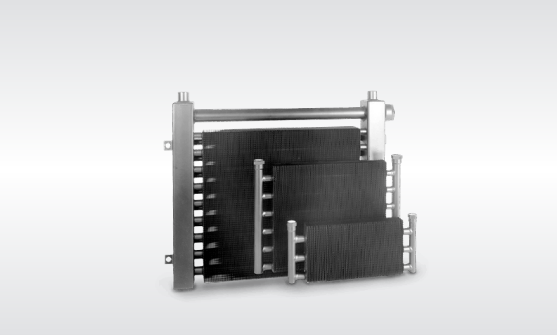
Tow-behind compressor lube cooling

Construction equipment

Underground mining

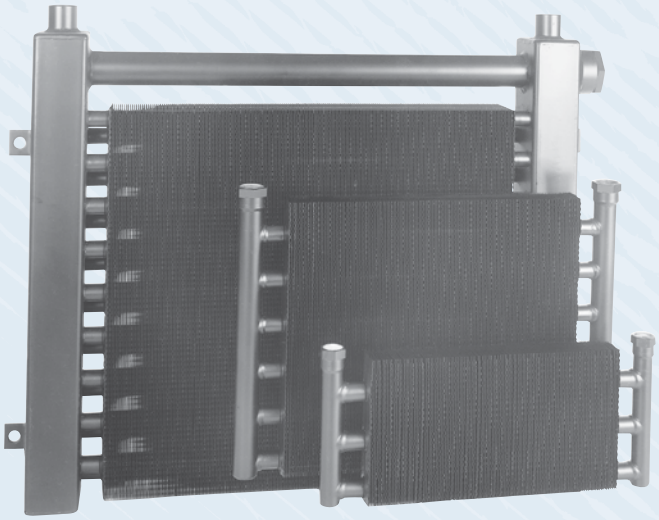
Engine oil cooling

For application help and quoting, visit our Full TTP site or contact ttpsales@apiheattransfer.com.



Features

- **Hayden Interchange**
- **Excellent for Radiator Face Mount Cooling**
- **3/4" Tube Size**
- **Steel or Aluminum Fin**
- **Copper Manifolds – One Row**
- **Steel Manifolds – Two Row**
- High Performance Oil Turbulators
- Rugged Off-Highway Steel Designs Available
- Oil Flows to 150 GPM, Heat Removal to 175,000 BTU/HR
- Oil Cooler
- Transmission Cooler
- Fuel Cooler



OPTIONS

- Built-in Relief Bypass
- Steel Components
- Custom Sizes/ Mounting Brackets
- Connection Sizes/ Locations
- Corrosion Resistant Marine Coating

Ratings

Operating Pressure 300 psi

Test Pressure 300 psi

Operating Temperature 350° F

Materials

Tubes Copper

Fins Aluminum or Steel

Turbulators Aluminum

Manifolds Copper: Models DH-051 – DH-447
Steel: Models DH-513 – DH-670

Connections Brass: Models DH-051 – DH-447
Steel: Models DH-513 – DH-670

Relief Bypass Valve Option

MODEL	DESCRIPTION
DH-051 thru DH-447	Available in either 30 psi or 60 psi settings. Bypass valve is built into tubes and does not effect external dimensions. All steel valves. Not serviceable.
DH-513	Available in either 30 psi or 60 psi settings. 3/4", external all steel valve. May be removed for servicing.
DH-524 thru DH-670	Available in either 30 psi or 60 psi settings. 1-1/2", external, all steel valve. May be removed for servicing.

How to Order

[ ] – [ ][ ][ ] – [ ] – [ ] – [ ]

Model Series
DH
DHR - Relief Bypass Included

Model Size Selected

Connection Type*
1 - NPT
2 - SAE

Fin Material
1 - Aluminum
2 - Steel

Relief Bypass
Blank - No Bypass
30 - 30 psi
60 - 60 psi

ADD FOR DHR MODELS ONLY

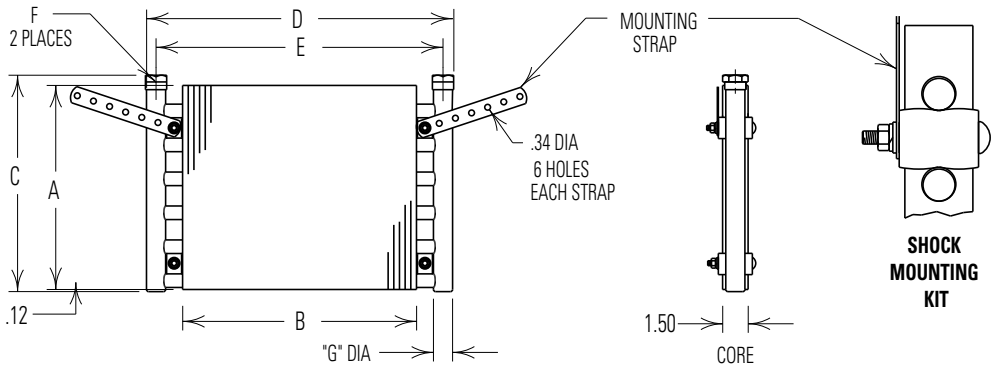
Examples: DH-051-1-1 or DHR-062-2-2-30

Note: All positions must be filled. Mounting Kits (where needed) must be ordered separately, by part number.

*Other connection types available. Please consult factory for assistance.

Dimensions & Weights

DH-051 thru DH-447



Mounting Kits

Optional Mounting Kits are available with or without straps.

	Part Number
With strap	L-84741
Without strap	L-84740

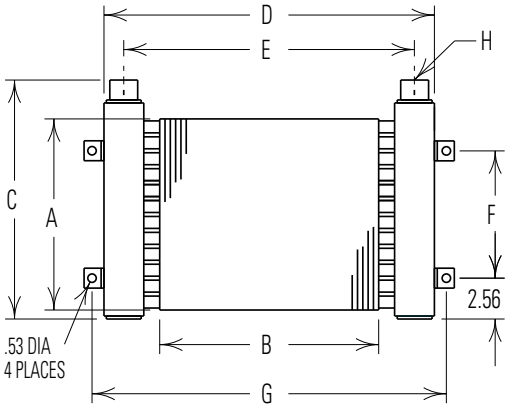
MODEL	A	B	C	D	E	F NPT	F SAE	G DIA	QTY MTG KITS	FACE AREA SQ FT	WEIGHT LBS.
DH-051	4.00	11.25	4.50	15.00	14.12				2	0.31	2
DH-062				15.00	14.12					0.47	3
DH-073	6.00	14.25	6.50	18.00	17.12					0.60	3
DH-084		20.25		24.00	23.12	0.50	#10	0.88		0.84	4
DH-095		14.25		18.00	17.12					0.79	4
DH-106	8.00	17.25	8.50	21.00	20.12				4	0.96	5
DH-117		20.25		24.00	23.12					1.12	5
DH-194		13.75		18.00	16.88					1.15	6
DH-205	12.00	16.75	12.73	21.00	19.88					1.40	7
DH-216		19.75		24.00	22.88	0.75	#12	1.12		1.64	8
DH-227	14.00		14.73	24.00	22.88					1.92	9
DH-249	18.00		18.73	24.00	22.88				6	2.47	12
DH-326	24.00	19.25	25.00	24.00	22.62					3.21	16
DH-337		25.25		30.00	28.62					4.21	20
DH-348		19.25		24.00	22.62	1.00	#16	1.38		4.00	19
DH-359	30.00	25.25	31.00	30.00	28.62				8	5.26	24
DH-370		31.25		36.00	34.62					6.51	28
DH-425	36.00	24.75	37.41	30.00	28.38	1.25	#20	1.62		6.19	32
DH-447	40.00	36.75	41.41	42.00	40.38					10.21	43

All dimensions in inches. Weights are for aluminum fins.
After making your base model selection with the connection of your choice, please refer to the How to Order section.
Note: We reserve the right to make reasonable design changes without notice.

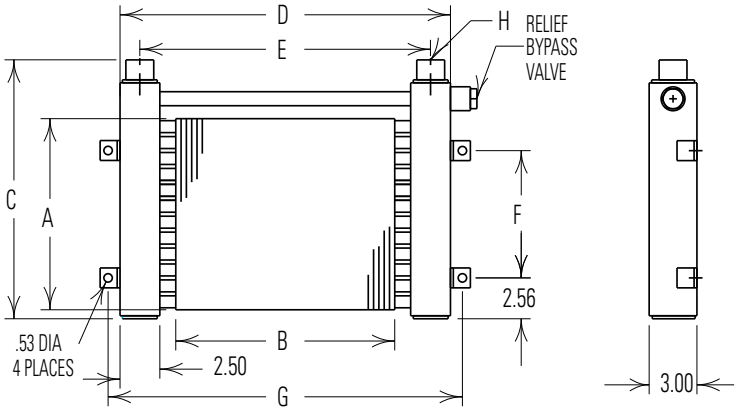
Dimensions & Weights

DH-513 thru DH-670

DH Series



DHR Series



MODEL	A	B	C		D		E	F	G	H		FACE AREA SQ FT	WEIGHT LBS
			DH	DHR	DH	DHR				NPT	SAE		
DH-513	12.00	13.75	15.00	16.25	20.75	22.41	18.25	8.00	22.25	0.75	#12	1.15	16
DH-524	18.00	19.75	21.00	23.25	26.75	28.13	24.25	14.00	28.25			2.47	27
DH-535	24.00	19.25	27.00	29.25	26.75	27.63	23.75	20.00	27.75	1.00	#16	3.21	53
DH-626	36.00	22.75	39.03	41.20	29.75	31.13	27.25	32.00	31.25	2.00	#32	5.69	60
DH-670	40.00	34.75	43.03	45.28	41.75	43.13	39.25	36.00	43.25			9.65	115

All dimensions in inches. Weights are for aluminum fins.
After making your base model selection with the connection of your choice, please refer to the How to Order section.

Desired Reservoir Temperature

Return Line Cooling: Desired temperature is the oil temperature leaving the cooler. This will be the same temperature that will be found in the reservoir.

Off-Line Recirculation Cooling Loop: Desired temperature is the oil temperature entering the cooler. In this case, the oil temperature change must be determined so that the actual oil leaving temperature can be found. Calculate the oil temperature change (oil △T) with this formula:
Oil △T = (BTU's/Hr.) / (GPM Oil Flow x 210).
To calculate the oil leaving temperature from the cooler, use this formula:
Oil Leaving Temp. = Oil Entering Temp – Oil △T.
This formula may also be used in any application where the only temperature available is the entering oil temperature.

Oil Pressure Drop: Most systems can tolerate a pressure drop through the heat exchanger of 20 to 30 PSI. Excessive pressure drop should be avoided. Care should be taken to limit pressure drop to 5 PSI or less for case drain applications where high back pressure may damage the pump shaft seals.

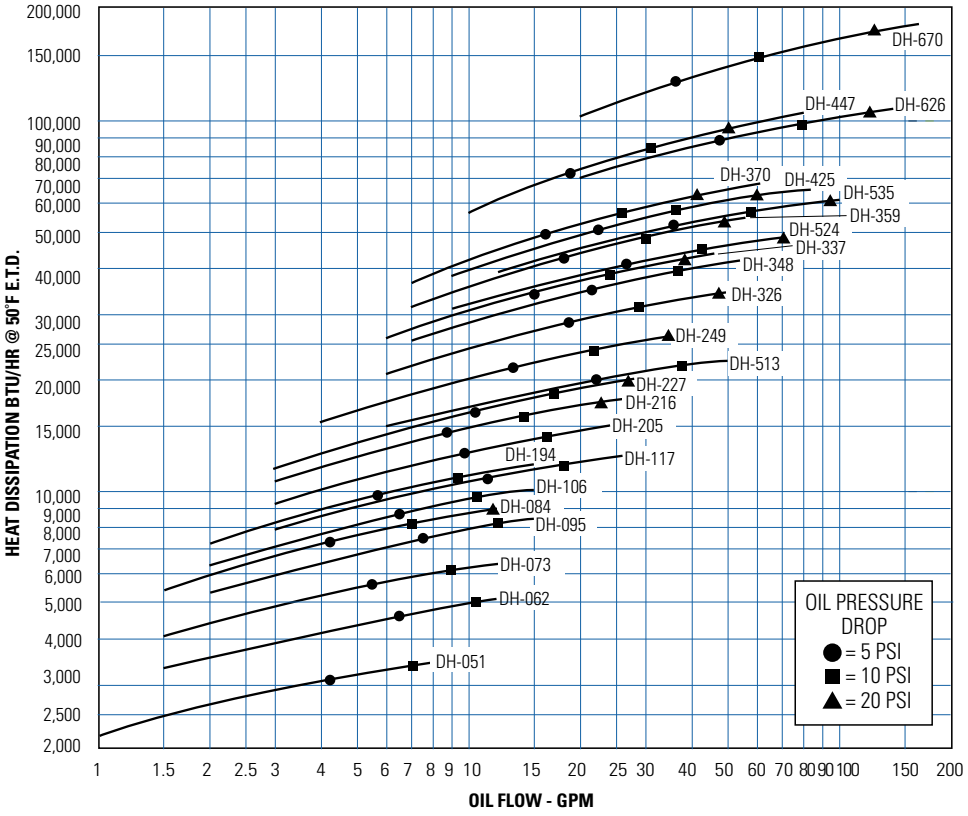
Oil Temperature

Typical operating temperature ranges are:

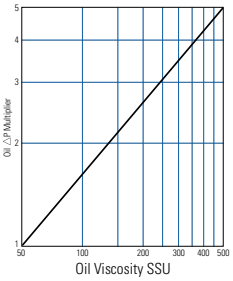
Hydraulic Motor Oil	110° - 130°F
Hydrostatic Drive Oil	130° - 180°F
Bearing Lube Oil	120° - 160°F
Lube Oil Circuits	110° - 130°F

Oil Temp °F	TYPICAL OIL VISCOSITY, SSU				
	SAE 5	SAE 10	SAE 20	SAE 30	SAE 40
100	110	150	275	500	750
150	60	70	100	135	190
210	40	43	50	65	75

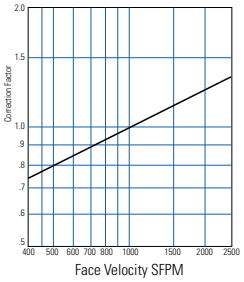
Performance Curves



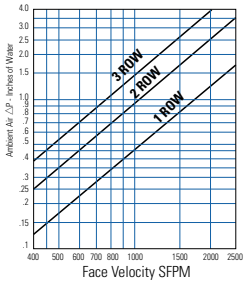
Oil △P Correction Curve



Air Velocity Correction Curve



Air Static Pressure Drop



Selection Procedure

Performance Curves are based on 50 SSU oil, 1000 Standard Feet per Minute (SFPM) Air Velocity, and a 50°F Entering Temperature Difference (E.T.D.)
E.T.D. = Entering oil temperature - Ambient air temperature

Step 1 **Determine Heat Load:** Heat load may be expressed as either Horsepower or BTU/Hr. BTU/Hr. = Horsepower x 2545

Step 2 **Determine entering temperature difference:** The entering oil temperature is generally the maximum desired system temperature. E.T.D. = Entering oil temperature - Ambient air temperature.

Step 3 **Determine the corrected heat dissipation to use the curves:**

$$\text{Corrected Heat Dissipation} = \text{BTU/Hr. (Heat Load)} \times \left[\frac{50°\text{F} \times \text{Cv}}{\text{Desired E.T.D.} \times \text{Air Velocity Correction Factor}} \right]$$

Step 4 **Enter the Performance Curves** at the bottom with the GPM oil flow and proceed upward to the adjusted heat load from Step 3. Any curve on or above this point will meet these conditions.

Step 5 **Calculate actual SFPM Air Velocity or SCFM** (Standard Cubic Feet Per Minute) using the Face Area from the table.

A. SFPM Air Velocity* $= \dfrac{\text{SCFM Air Flow}}{\text{Square Feet Face Area}}$

B. SCFM Air Flow = SFPM Air Velocity x Square Feet Face Area

*If the Air Velocity calculated is different than the value in Step 3, recheck Corrected oil Pressure Drop.

Step 6 **Multiply Oil Pressure Drop** from curve by correction factor found in Oil △ P Correction Curve.

*Note: If air velocity is unknown assume 750 SFPM.

C_V Viscosity Correction

	OIL				
Average Oil Temp °F	**SAE 5** 110 SSU at 100°F 40 SSU at 210°F	**SAE 10** 150 SSU at 100°F 43 SSU at 210°F	**SAE 20** 275 SSU at 100°F 50 SSU at 210°F	**SAE 30** 500 SSU at 100°F 65 SSU at 210°F	**SAE 40** 750 SSU at 100°F 75 SSU at 210°F
100	1.14	1.22	1.35	1.58	1.77
150	1.01	1.05	1.11	1.21	1.31
200	.99	1.00	1.01	1.08	1.10
250	.95	.98	.99	1.00	1.00

AOHM/AOVHM Hydraulic Motor Drive

Thermal Transfer Products Copper Tube and Fin Mobile Hydraulic Oil Coolers

API Heat Transfer's full line of Thermal Transfer Products standard mobile oil coolers is proven to stand-up in some of the toughest off-road environments. Our oil coolers are available with a wide variety of standard options to best suit each application and offer maximum performance.

Copper Tube and Fin Product Highlights

Aluminum or Steel fins available

Up to +100 HP of heat removal from hydraulic oil

Cost effective, industry proven designs

Large range of standard sizes

Standard Product Options

12 or 24 volt DC fans

Hydraulic fan motor drive

Built-in pressure bypass (30 or 60 psi for cold start-up)

Heresite coating for offshore or corrosive environment operation

Customer Focused and Driven

All catalog product is available with short lead-times

Expert application engineers available to select and size the right product for your application

Custom designs are available

Industry Applications

Our oil coolers are used in a wide variety of mobile applications across the globe.

Commercial duty lawnmowers

Municipal street cleaners

Hydrostatic drives

Tow-behind compressor lube cooling

Construction equipment

Underground mining

Engine oil cooling

For application help and quoting, visit our Full TTP site or contact ttpsales@apiheattransfer.com.

Features

- **AO/AOVH Series with Hydraulic Motor**
- **High Heat Removal**
- **Heavy Duty Construction**
- **Wide Flow Range**
- Heat Removal up to 210,000 BTU/Hr.
- Long Life Hydraulic Motor
- NPT Connections

OPTIONS
Built-in Relief Bypass Valve
SAE or BSPP Connections
Corrosion Resistant Coating

Ratings

Operating Pressure 300 psi
Test Pressure 300 psi
Operating Temperature 400° F

Materials

Tubes Copper
Fins Aluminum
Turbulators Steel
Manifolds Steel
Connections Steel
Cabinet Steel with Baked Enamel Finish
Fan Blade Aluminum with Steel Hub
Fan Guard Zinc Plated Steel
Fan Adapter Steel

How to Order

[ ] – [ ][ ] – [ ] – [ ] – [ ] – [ ] – [ ]

Model Series
AOHM
AOHMR
AOVHM
AOVHMR

Model Size Selected

Number of Passes**
Blank - No Bypass
1 - One Pass*
2 - Two Pass

Connection Type*
Blank - NPT
S - SAE

Relief Bypass**
Blank - No Bypass
30 - 30 psi
60 - 60 psi

Foot Mounting Brackets
Blank - No Brackets
FB - Foot Brackets

ADD FOR AOHM & AOHMR MODELS ONLY

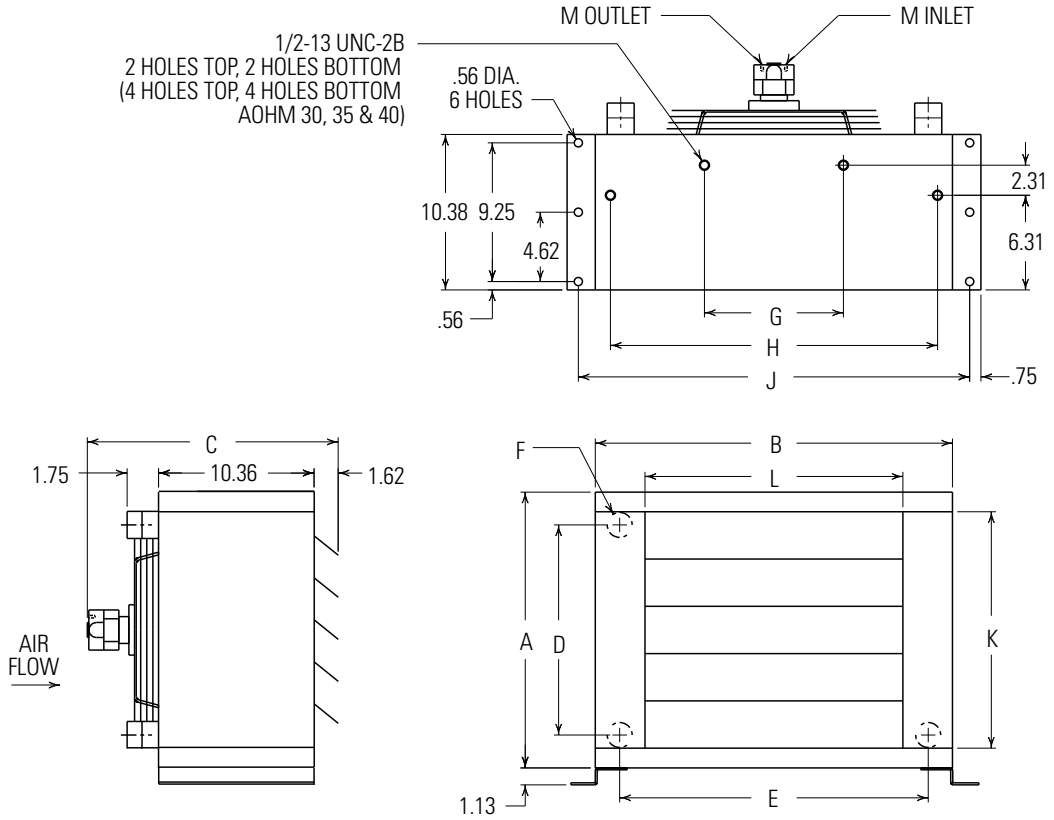
AOHMR - Relief Bypass Included
AOVHMR - Relief Bypass Included (available in 2 pass only)

*Other connection types available. Please consult factory for assistance.

****ADD FOR AOHMR & AOVHMR MODELS ONLY**

Dimensions

Fan Rotating Clockwise/Facing Motor Shaft



Foot Brackets:
Optional for AOHM
Standard with AOVHM

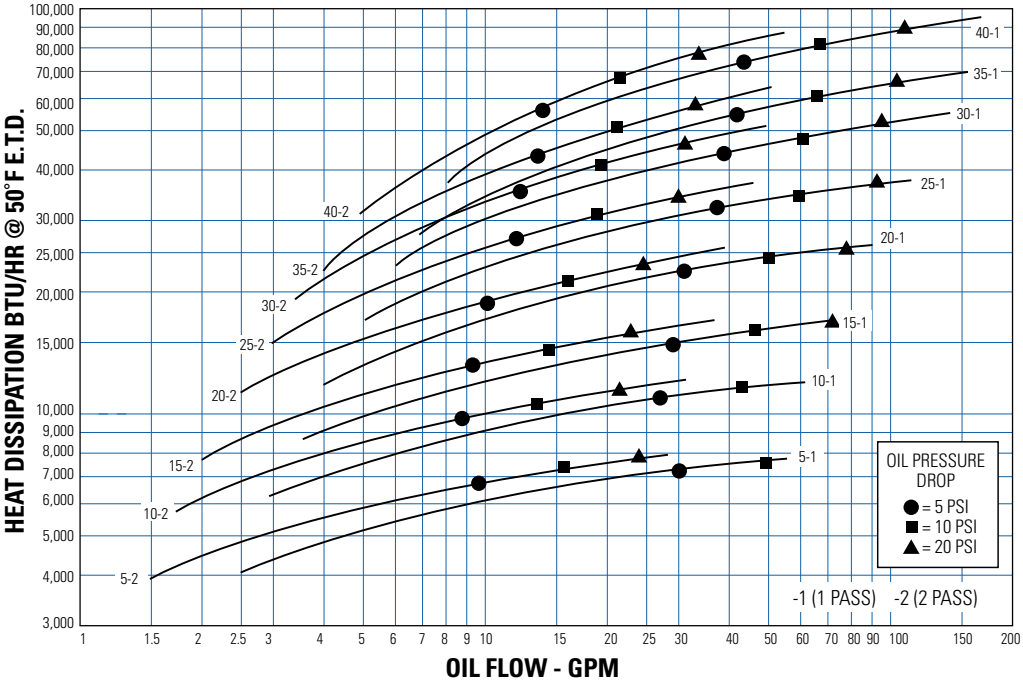
See dimensional chart for external NPT or optional internal SAE connection size.

MODEL	A	B	C	D	E	F		G	H	J	K	L	M (SAE)	NET WT (LBS)
						NPT	SAE							
AOHM-5	11.81	14.81	16.70	7.69	11.69	1"	#16	–	12.94	16.81	9.19	8.31	#8	35
AOVHM-5						1 1/2"	#24							59
AOHM-10	13.12	19.00		8.88	15.88	1"	#16		17.12	21.00	10.50	12.50		50
AOVHM-10						1 1/2"	#24							76
AOHM-15	15.75	20.38	17.09	11.50	17.25	1"	#16		18.50	22.38	13.12	13.88		60
AOVHM-15						1 1/2"	#24							89
AOHM-20	18.38	23.81		14.00	20.56	1 1/4"	#20		21.81	25.81	15.75	17.19		75
AOVHM-20						2"	#32							108
AOHM-25	23.62	26.68		19.25	23.56	1 1/4"	#20		24.81	28.68	21.00	20.1[9]		110
AOVHM-25			17.25			2"	#32							143
AOHM-30	27.56	31.62	16.70	23.19	28.50	1 1/4"	#20	11.00	29.75	33.62	24.94	25.12		120
AOVHM-30			16.95			2"	#32							178
AOHM-35	30.19	33.81	16.70	25.81	30.69	1 1/4"	#20	11.00	31.94	35.81	27.56	27.31		135
AOVHM-35			17.22			2"	#32						#10	220
AOHM-40	36.75	41.62	16.70	32.38	38.50	1 1/4"	#20	13.25	39.75	43.62	34.12	35.12	#8	160
AOVHM-40			17.22			2"	#32						#10	286

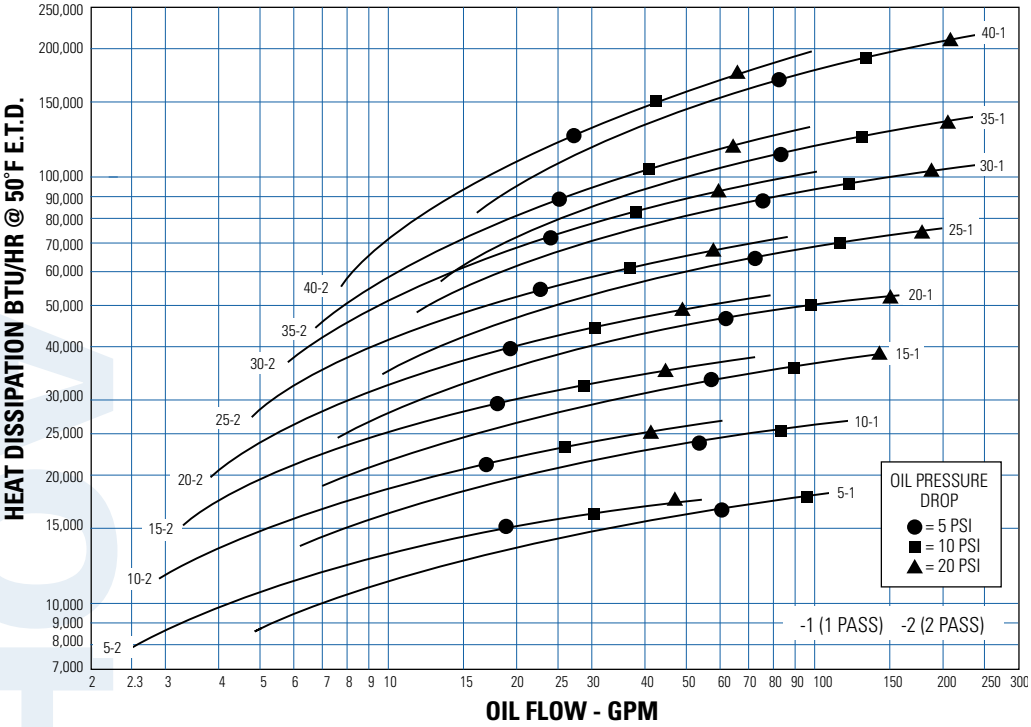
NOTE: We reserve the right to make reasonable design changes without notice. All dimensions are in inches.

Performance Curves

AOHM Series



AOVHM Series



Selection Procedure

Performance Curves are based on 50 SSU oil entering the cooler 50°F higher than the ambient air temperature used for cooling. This is referred to as a 50°F E.T.D.

Step 1 **Determine the Heat Load.** Heat load may be expressed as either horsepower or BTU/Hr. To convert horsepower to BTU/Hr.:
BTU/HR = Horsepower x 2545

Step 2 **Determine Entering Temperature Difference.** The entering oil temperature is generally the maximum desired oil temperature.
Entering oil temperature – Ambient air temperature = E.T.D.

Step 3 **Determine the Corrected Heat Dissipation to use the curves.**
Corrected Heat Dissipation =
BTU/HR heat load x $\frac{50°F}{E.T.D.}$ x viscosity correction A.

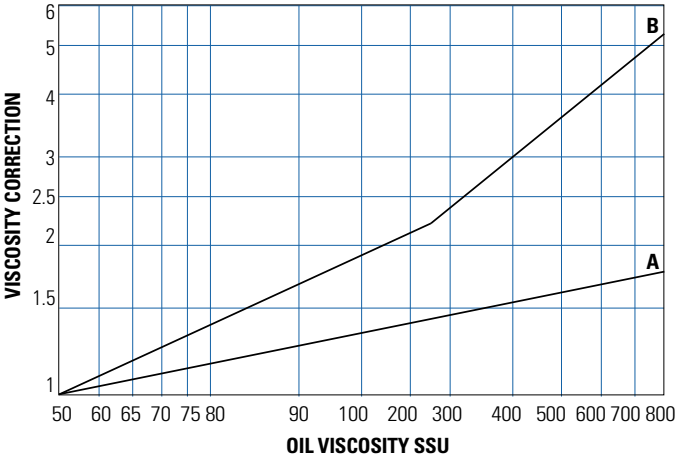
Step 4 **Enter curves** at oil flow through cooler and curve heat dissipation. Any curve above the intersecting point will work.

NOTE: *Performance curves shown are for 1 and 2 pass configuration.*

EXAMPLE: *35 - 2 is AOHM or AOVHM - 35*

Step 5 **Determine Oil Pressure Drop from Curves:**
● = 5 PSI; ■ = 10 PSI; ▲ = 20 PSI. Multiply pressure drop from curve by correction factor B found in oil viscosity correction curve.

OIL VISCOSITY CORRECTION MULTIPLIERS



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 = (BTU's/Hr.) / (GPM Oil Flow x 210).

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 20 to 30 PSI. Excessive pressure drop should be avoided. Care should be taken to limit pressure drop to 5 PSI or less for case drain applications where high back pressure may damage the pump shaft seals.

Oil Temperature

Typical operating temperature ranges are:

Hydraulic Motor Oil	120°F - 180°F
Hydrostatic Drive Oil	160°F - 180°F
Engine Lube Oil	180°F - 200°F
Automatic Transmission Fluid	200°F - 300°F

Hydraulic Motor

MODEL SIZE	MAXIMUM FAN SPEED (RPM)		OIL FLOW REQUIRED (GPM)		MIN. OPERATING PRESSURE (PSI)		SOUND dB(A)*		MOTOR (in³/rev.) DISPLACEMENT		CFM	
	AOHM	AOVHM	AOHM	AOVHM	AOHM	AOVHM	AOHM	AOVHM	AOHM	AOVHM	AOHM	AOVHM
5	1725	3450	1.6	3.3	300	300	68	85	.22	.22	465	780
10							68	85			669	1110
15							69	91			956	1590
20							70	91			1460	2168
25	1140	1725	1.1	3.4	400	500	72	81		.45	2160	3000
30							75	84			2990	4095
35				5.2	900	1000	76	89		.70	4370	5921
40							78	91			5450	9609

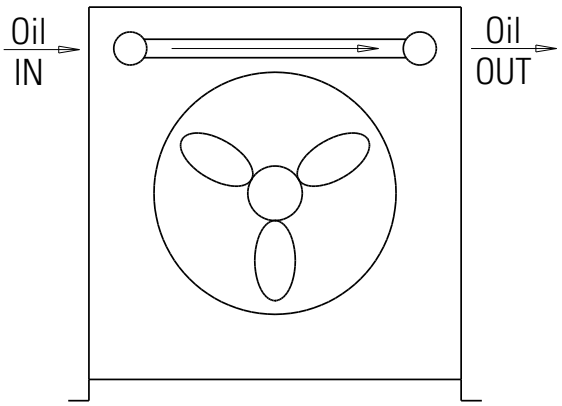
Notes: Maximum pressure is 2000 psi. Stated minimum operating pressure is at inlet port of motor. 1000 psi allowable back pressure.
**Catalog db(A) sound levels are at seven (7) feet. dB(A) sound levels increase by six (6) dB(A) for halving this distance and decrease by (6) dB(A) for doubling this distance.*

Built-In Relief Bypass

AOHMR Series

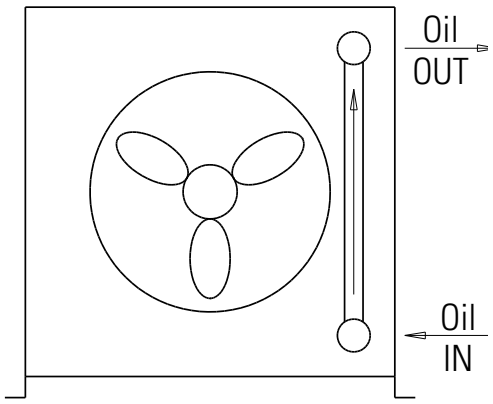
One Pass (Medium to High Oil Flows)

Model Number	Flow Range GPM (USA)
AOHMR - 5-1	2 - 80
AOHMR - 10-1	3 - 80
AOHMR - 15-1	4 - 80
AOHMR - 20-1	5 - 80
AOHMR - 25-1	6 - 100
AOHMR - 30-1	7 - 100
AOHMR - 35-1	8 - 112
AOHMR - 40-1	9 - 118



Two Pass (Low to Medium Oil Flows)

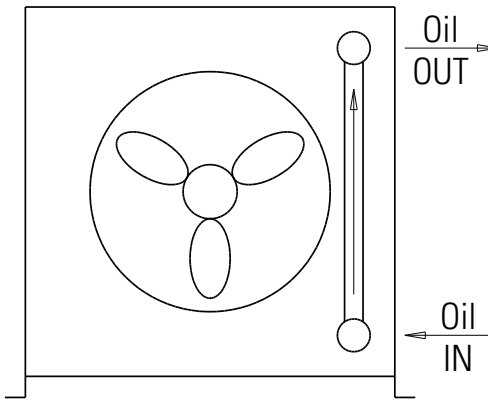
Model Number	Flow Range GPM (USA)
AOHMR - 5-2	2 - 25
AOHMR - 10-2	2 - 30
AOHMR - 15-2	2 - 40
AOHMR - 20-2	2 - 30
AOHMR - 25-2	2 - 40
AOHMR - 30-2	2 - 40
AOHMR - 35-2	3 - 40
AOHMR - 40-2	4 - 40



AOVHMR Series

Two Pass (Low to Medium Oil Flows)

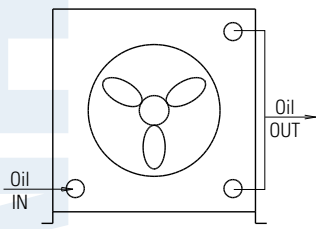
Model Number	Flow Range GPM (USA)
AOVHMR - 5-2	4 - 50
AOVHMR - 10-2	4 - 60
AOVHMR - 15-2	4 - 60
AOVHMR - 20-2	4 - 80
AOVHMR - 25-2	4 - 80
AOVHMR - 30-2	4 - 80
AOVHMR - 35-2	6 - 80
AOVHMR - 40-2	8 - 80



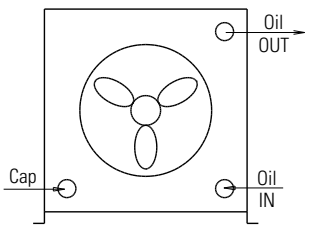
Bypass valve is available for 2 pass AOVHMR models only.

Installation Piping Diagrams

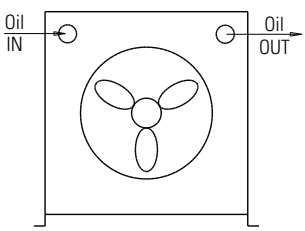
One Oil Pass



Two Oil Passes



One Oil Pass w/Bypass



BP Series

Thermal Transfer Products Process Coolers

Our Thermal Transfer Products brand offers a full line of process cooling heat exchangers.

Water-Cooled

Fixed bundle shell and tube

U-Tube Removable Bundle

Stainless Steel brazed plate

Large range of standard sizes

Air-Cooled

Copper-tube and fin

Brazed aluminum

Large range of standard sizes

Standard Product Options

Thermal Transfer process coolers are available with a wide variety of standard options to best suit each application.

Water-Cooled

Copper, copper-nickel, or stainless steel tubing

Nickel-braze plate coolers

Air-Cooled

AC, hydraulic, or air-motor fan drives

Copper tube aluminum fin

Brazed aluminum (P-BAR)

Heresite coating for offshore or corrosive environment operation

Customer Focused and Driven

All catalog product is available with short lead-times

Expert application engineers available to select and size the right product for your application

Custom designs are available

For application help and quoting, visit our Full TTP site or contact ttpsales@apiheattransfer.com.

UC Series - Process Cooling

Thermal Transfer Products Process Coolers

Our Thermal Transfer Products brand offers a full line of process cooling heat exchangers.

Water-Cooled

Fixed bundle shell and tube

U-Tube Removable Bundle

Stainless Steel brazed plate

Large range of standard sizes

Air-Cooled

Copper-tube and fin

Brazed aluminum

Large range of standard sizes

Standard Product Options

Thermal Transfer process coolers are available with a wide variety of standard options to best suit each application.

Water-Cooled

Copper, copper-nickel, or stainless steel tubing

Nickel-braze plate coolers

Air-Cooled

AC, hydraulic, or air-motor fan drives

Copper tube aluminum fin

Brazed aluminum (P-BAR)

Heresite coating for offshore or corrosive environment operation

Customer Focused and Driven

All catalog product is available with short lead-times

Expert application engineers available to select and size the right product for your application

Custom designs are available

For application help and quoting, visit our Full TTP site or contact ttpsales@apiheattransfer.com.

COPPER & STEEL CONSTRUCTION

Features

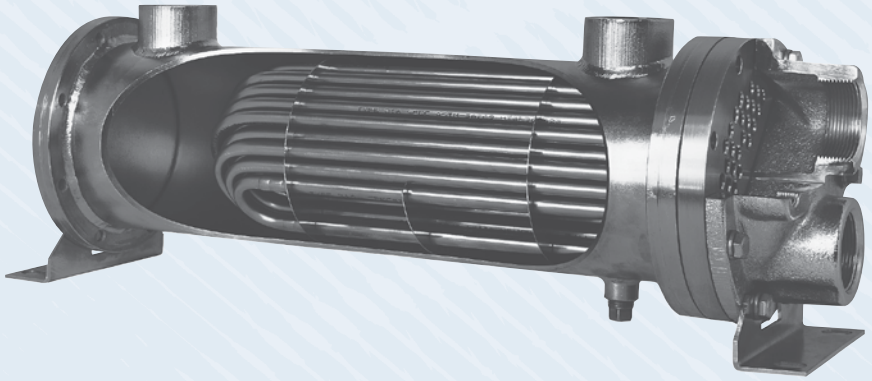
- **Steam & Large Temperature Differentials**
- **Removable Tube Bundle for Servicing**
- **Reduces Thermal Expansion Stresses**
- **3/8" Tubes**
- Built-In Expansion Chamber
- Threaded or Flanged Connections
- Mounting Brackets Included
- Steel Shell Assembly

OPTIONS

Wide Variety of Materials Available

Custom Sizes/Designs

Stainless Steel Hardware and Mounting



Ratings

UC SERIES

Maximum Shell Pressure 250 psi

Maximum Tube Side Pressure 150 psi

Maximum Temperature 400° F

UCV SERIES

Maximum Shell Pressure
600, 800, 1000 250 psi
1200, 1700 150 psi

Maximum Tube Side Pressure 150 psi

Maximum Temperature 400° F

Materials UC/UCV Series

Tubes Copper

Tube Sheets Steel

Shell Steel/316L Stainless Steel (UCV)

Shell Connections Steel

Baffles Stainless Steel

End Bonnets Cast Iron

Mounting Brackets Steel

Gaskets Non-Asbestos Fiber/Nitrile Rubber

Nameplate Aluminum Foil

Materials USSC/USSCV Series

Tubes 316L Stainless Steel

Tube Sheets 316L Stainless Steel

Shell 316L Stainless Steel

Shell Connections 316L Stainless Steel

Baffles 316L Stainless Steel

End Bonnets 316L Stainless Steel

Mounting Brackets Steel

Gaskets Non-Asbestos Fiber/Nitrile Rubber

Nameplate Aluminum Foil

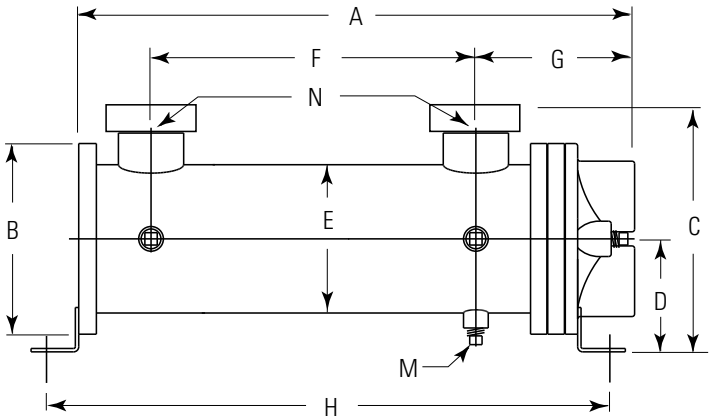
How to Order

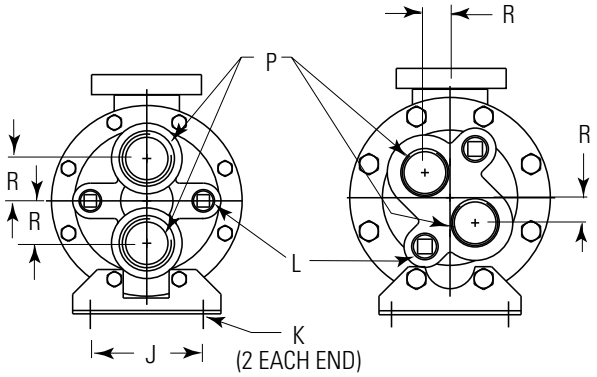
Model Series	Model Size Selected	Baffle Spacing	Tube Diameter	Tubeside Passes	Cooling Tube Material	End Bonnet Material	Tube Sheet Material	Zinc Anodes
UC/USSC **UCA/USSCA** **UCV/USSCV**				**T** - Two Pass **F** - Four Pass	**Blank** - Copper **CN** - CuNi **SS** - Stainless Steel	**Blank** - Cast Iron **B** - Bronze **SB** - Stainless Steel	**Blank** - Steel **W** - CuNi **S** - Stainless Steel	**Blank** - None **Z** - Zinc

UC/USSC = NPT Shell Connections; NPT Tube Connections
UCA/USSCA = ASME/ANSI Flange Shell Connections, NPT Tube Connections
UCV/USSCV = 1000 and Smaller: Inlet and Outlet NPT Shell Connections Rotated 180°, NPT Tube Side Connections
UCV/USSCV = 1200 and Larger: ASME/ANSI Flange Inlet and NPT Outlet Shell Connections Rotated 180°, NPT Tube Side Connections

Dimensions

UC Two Pass





All models except UC-800 & UC-1200 Series

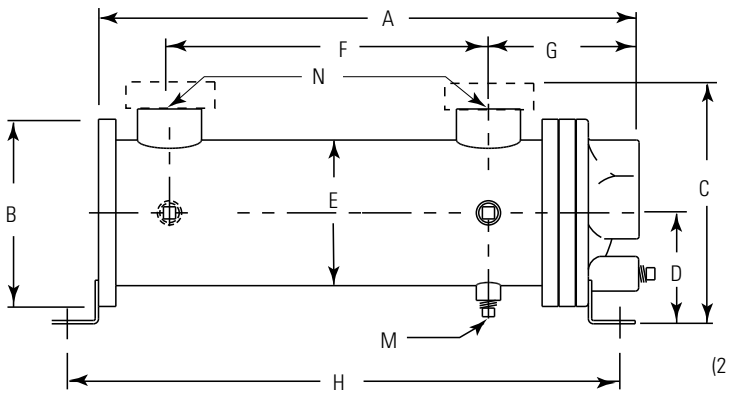
UC-800 & UC-1200 Series

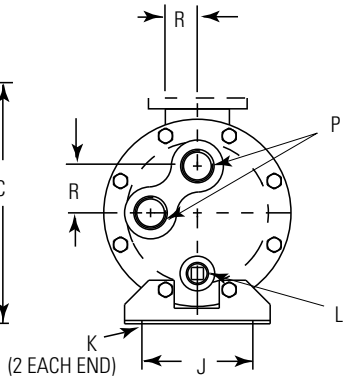
MODEL	A	B DIA	C NPT	C ASME* FLANGE	D	E DIA	F	G	H	J	K	L NPT	M NPT	N NPT	P NPT	R	FT² SURFACE AREA
612	17.22	4.50	5.38	6.75	2.75	3.25	11.25	4.03	17.66	3.25	.44 DIA	(2) .38	(3) .25	1.00	1.00	—	2.4
624	29.22						23.25		29.66							—	4.7
812	19.47	6.00	6.75	8.25	3.50	4.25	12.38	4.97	19.65	3.50	.44 DIA	(2) .38	(3) .25	1.50	1.25	0.75	4.0
824	31.47						24.38		31.65								7.9
836	43.47						36.38		43.65								11.9
1012	19.68	6.75	7.75	9.25	4.00	5.25	11.50	5.62	19.94	4.00	.50 x .75 SLOT	(2) .38	(3) .38	1.50	1.50	1.50	7.4
1024	31.68						23.50		31.94								14.5
1036	43.68						35.50		43.94								21.5
1218	26.22	7.75	8.75	10.38	4.50	6.25	17.38	5.89	26.12	5.00	.50 x .75 SLOT	(2) .50	(3) .38	2.00	2.00	1.10	15.3
1224	32.22						23.38		32.12								21.1
1236	44.22						35.38		44.12								31.3
1248	56.22						47.38		56.12								41.6
1724	34.69	10.50	11.58	13.00	5.75	8.62	23.50	7.81	34.27	7.00	.62 x .88 SLOT	(2) .50	(3) .38	3.00	2.50	2.25	47.7
1736	46.69						35.50		46.27								70.1
1748	58.69						47.50		58.27								92.5
1760	70.69						59.50		70.27								114.8

**150# ASME/ANSI Flange (Optional). NOTE: We reserve the right to make reasonable design changes without notice. Consult factory. All dimensions are inches.*

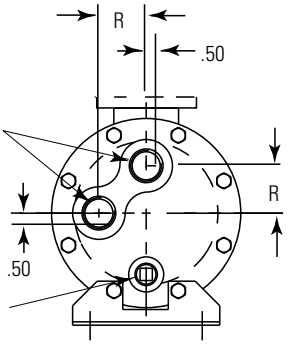
Dimensions

UC Four Pass





All models except UC-1700 Series



UC-1700 Series

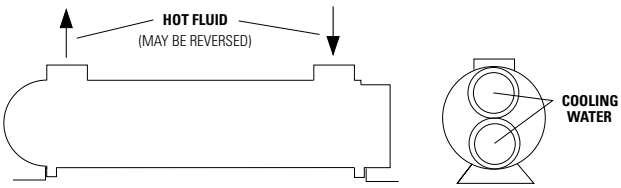
MODEL	A	B DIA	C NPT	C ASME* FLANGE	D	E DIA	F	G	H	J	K	L NPT	M NPT	N NPT	P NPT	R	FT² SURFACE AREA
612	17.20	4.50	5.38	6.75	2.75	3.25	11.25	4.01	17.66	3.25	.44 DIA	—	(3) .25	1.00	.75	1.00	2.4
624	29.20						23.25		29.66			—					4.7
812	19.47	6.00	6.75	8.25	3.50	4.25	12.00	4.97	19.65	3.50	.44 DIA	(2) .38	(3) .25	1.50	.75	1.25	4.0
824	31.47						24.00		31.65								7.9
836	43.47						36.00		43.65								11.9
1012	19.50	6.75	7.75	9.25	4.00	5.25	11.50	5.43	19.95	4.00	.50 x .75 SLOT	(2) .38	(3) .38	1.50	1.00	1.69	7.4
1024	31.50						23.50		31.95								14.5
1036	43.50						35.50		43.95								21.5
1218	26.22	7.75	8.75	10.38	4.50	6.25	17.38	5.89	26.12	5.00	.50 x .75 SLOT	(2) .38	(3) .38	2.00	1.50	2.00	15.3
1224	32.22						23.38		32.12								21.1
1236	44.22						35.38		44.12								31.3
1248	56.22						47.38		56.12								41.6
1724	34.69	10.50	11.58	13.00	5.75	8.62	23.50	7.81	34.27	7.00	.62 x .88 SLOT	(2) .38	(3) .38	3.00	2.00	2.50	47.7
1736	46.69						35.50		46.27								70.1
1748	58.69						47.50		58.27								92.5
1760	70.69						59.50		70.27								114.8

**150# ASME/ANSI Flange (Optional). NOTE: We reserve the right to make reasonable design changes without notice. Consult factory. All dimensions are inches.*

UC Applications

U-Tube Heat Exchangers allow the shell and tube bundle to expand and contract independently with temperature fluctuation. This reduces temperature dependent stresses so they are ideal in applications with large temperature differentials. Some typical examples for **UC** units include quench oil coolers, liquid to liquid heaters, and barrel oil coolers for plastic extrusion machines. The removable bundle design allows for easier cleaning of the shell side cavity when the bundle is removed.

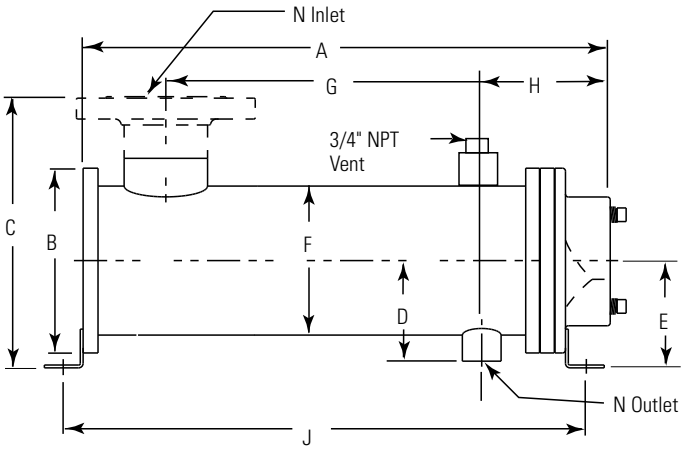
Piping Hook-up

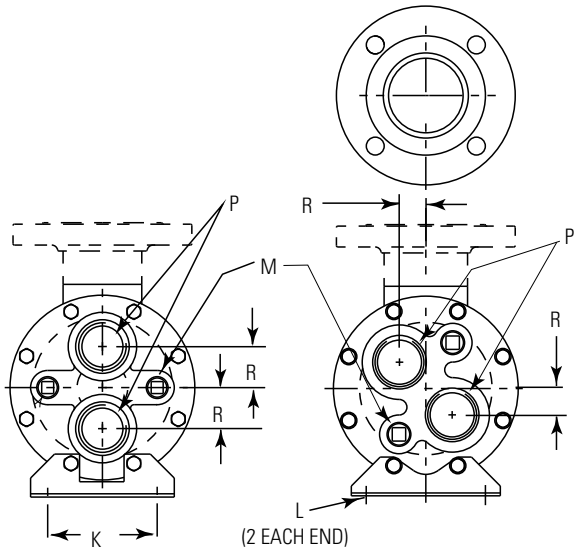


Specific applications may have different piping arrangements. Consult factory for assistance.

Dimensions

UCV Two Pass





All models except UCV-800 & UCV-1200 Series

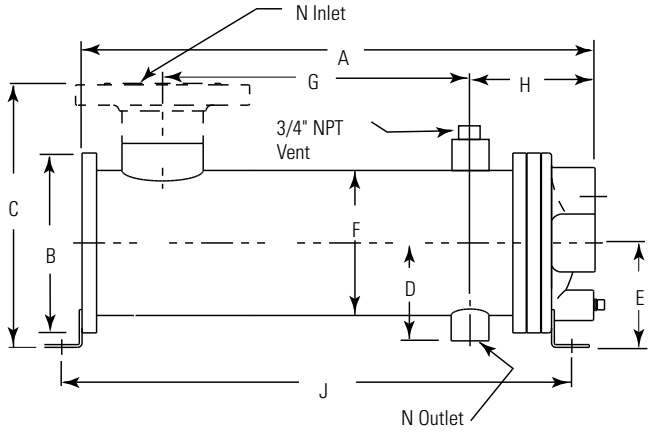
UCV-800 & UC-1200 Series

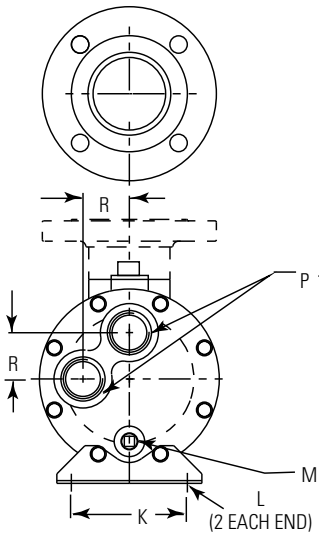
MODEL	A	B DIA	C	D	E	F DIA	G	H	J	K	L	M NPT	N INLET	N OUTLET	P NPT	R	FT^2 SURFACE AREA
612	17.22	4.50	5.25	2.62	2.75	3.25	11.00	4.00	17.66	3.25	.44 DIA	(2) .38	1.25	.75	1.00	—	2.4
624	29.22						23.00		29.66							—	4.7
812	19.47	6.00	6.75	3.15	3.50	4.25	12.00	4.60	19.65	3.50	.44 DIA	(2) .38	1.50	.75	1.25	0.75	4.0
824	31.47						24.00		31.65								7.9
836	43.47						36.00		43.65								11.9
1012	19.68	6.75	7.77	3.70	4.00	5.25	11.50	5.37	19.94	4.00	.50 x .75 SLOT	(2) .38	2.00	1.00	1.50	1.50	7.4
1024	31.68						23.50		31.94								14.5
1036	43.68						35.50		43.94								21.5
1218	26.22	7.75	11.38	4.22	4.50	6.25	17.38	5.38	26.12	5.00	.50 x .75 SLOT	(2) .50	3.00*	1.00	2.00	1.10	15.3
1224	32.22						23.38		32.12								21.1
1236	44.22						35.38		44.12								31.3
1248	56.22						47.38		56.12								41.6
1724	34.69	10.50	14.00	5.58	5.75	8.62	23.00	7.31	34.27	7.00	.62 x .88 SLOT	(2) .50	4.00*	1.50	2.50	2.25	47.7
1736	46.69						35.00		46.27								70.1
1748	58.69						47.00		58.27								92.5
1760	70.69						59.00		70.27								114.8

**150# ASME/ANSI Flange. NOTE: We reserve the right to make reasonable design changes without notice. Consult factory. All dimensions are inches.*

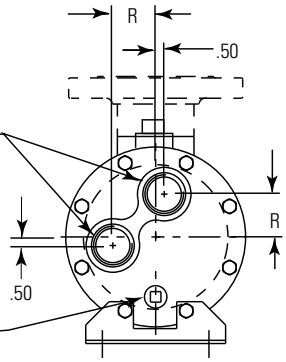
Dimensions

UCV Four Pass





All models except UCV-1700 Series



UCV-1700 Series

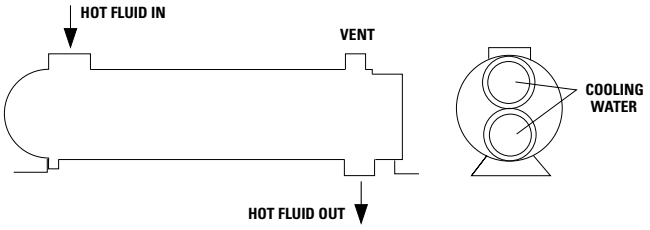
MODEL	A	B DIA	C	D	E	F DIA	G	H	J	K	L	M NPT	N INLET	N OUTLET	P NPT	R	FT² SURFACE AREA
612	17.20	4.50	5.25	2.62	2.75	3.25	11.00	3.98	17.66	3.25	.44 DIA	(2) .38	1.25	.75	.75	1.00	2.4
624	29.20						23.00		29.66								4.7
812	19.47	6.00	6.75	3.15	3.50	4.25	12.38	4.60	19.65	3.50	.44 DIA	(2) .38	1.50	.75	.75	1.25	4.0
824	31.47						24.38		31.65								7.9
836	43.47						36.38		43.65								11.9
1012	19.50	6.75	7.77	3.70	4.00	5.25	11.50	5.18	19.95	4.00	.50 x .75 SLOT	(2) .38	2.00	1.00	1.00	1.69	7.4
1024	31.50						23.50		31.95								14.5
1036	43.50						35.50		43.95								21.5
1218	26.22	7.75	10.38	4.22	4.50	6.25	17.38	5.38	26.12	5.00	.50 x .75 SLOT	(2) .38	3.00*	1.00	1.50	2.00	15.3
1224	32.22						23.38		32.12								21.1
1236	44.22						35.38		44.12								31.3
1248	56.22						47.38		56.12								41.6
1724	34.69	10.50	13.00	5.58	5.75	8.62	23.00	7.31	34.27	7.00	.62 x .88 SLOT	(2) .38	4.00*	1.50	2.00	2.50	47.7
1736	46.69						35.00		46.27								70.1
1748	58.69						47.00		58.27								92.5
1760	70.69						59.00		70.27								114.8

**150# ASME/ANSI Flange. NOTE: We reserve the right to make reasonable design changes without notice. Consult factory. All dimensions are inches.*

UCV Applications

U-Tube Heat Exchangers allow the shell and tube bundle to expand and contract independently with temperature fluctuation. This reduces temperature dependent stresses so they are ideal in applications with large temperature differentials. A typical example for **UCV** units is steam to liquid heaters. The removable bundle design allows for easier cleaning of the shell side cavity when the bundle is removed.

Piping Hook-up



Specific applications may have different piping arrangements. Consult factory for assistance.

CA Series

Industrial Hydraulic Oil Coolers

Thermal Transfer Products offers a full line of standard catalog hydraulic oil coolers for all industrial machine hydraulics for system cooling.

Air to Oil Cooling

Up to +500 HP of heat removal from hydraulic oil

Round tube copper, brass or steel

Brazed aluminum plate & bar (P-BAR™)

Extruded aluminum tube (T-BAR™)

Aluminum/steel fin construction

All aluminum brazed

Water to Oil Cooling

Steel, copper, copper/nickel, or stainless steel construction

Brazed plate construction

Internal fins

Diameters up to 10 inches

Lengths up to 12 feet

Product Options

Thermal Transfer industrial hydraulic oil coolers are available with a host of options to meet the demands of your application.

Brass construction

Steel construction

Internal finned construction

Brazed plate construction

Internal bypass

Seawater service

Applications

Our hydraulic oil coolers are used worldwide in a broad range of industrial applications, including:

Hydraulic presses

Plastic injection molding

Lube oil coolers

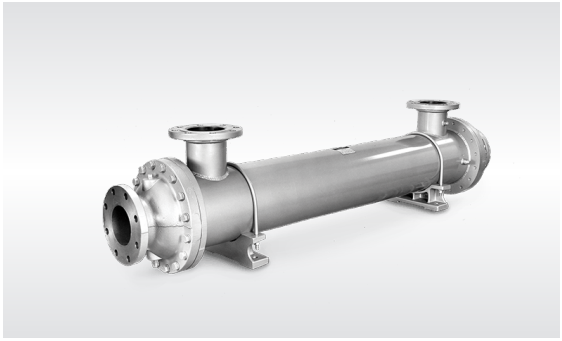
Extrusion machinery

Gear boxes

Hydraulic power units

And more.

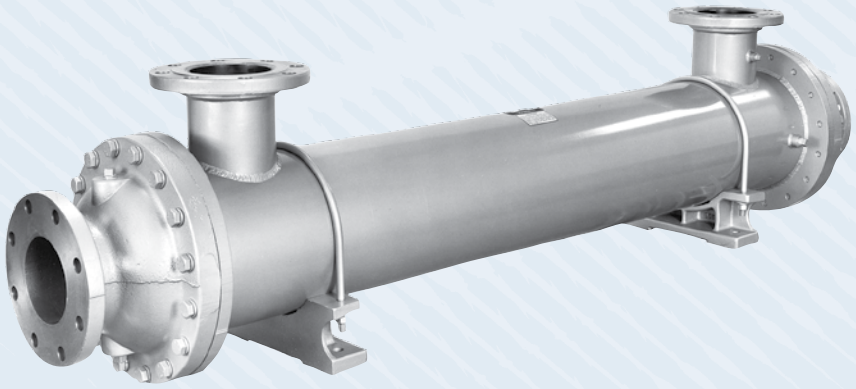
For application help and quoting, visit our Full TTP site or contact ttpsales@apiheattransfer.com.



COPPER & STEEL CONSTRUCTION

Features

- **Super High Flow**
- **Largest Flow Rates & Heat Transfer Available**
- **Rugged Steel Construction**
- **Custom Designs Available**
- **Competitively Priced**
- **3/8" & 5/8" Tubes Available**
- **Max. 10" Diameter, 12' Long**
- **150# ANSI/ASME Flanged Shell Connections (Metric Available)**
- Optional Construction on CA-2000 Series: Tubes, Tubesheets, and End Bonnets
- End Bonnets Removable For Servicing
- Saddle Brackets For Incremental Mounting



Ratings

Maximum Shell Pressure 150 psi
Maximum Tube Side Pressure 150 psi
Maximum Temperature 300° F

Materials

Headers Steel
Shell Steel
Shell Connections Steel
Baffles Brass
End Bonnets Cast Iron
Mounting Brackets Steel/Cast Iron
Gaskets Nitrile Rubber/Cellulose Fiber
Nameplate Aluminum Foil

Maximum Flow Rates

Shell Side (GPM)		Tube Side GPM		
6" Baffle	9" Baffle	One Pass	Two Pass	Four Pass
210	320	652	326	163

How to Order

[ ] – [ ][ ][ ][ ][ ] – [ ] – [ ] – [ ] – [ ] – [ ] – [ ] – [ ] – [ ] – [ ]

Model Series
CA
CAM

Model Size Selected

Baffle Spacing

Tube Diameter Code
6 - 3/8"
10 - 5/8"

Tubeside Passes
0 - One Pass
T - Two Pass
F - Four Pass

Cooling Tube Material
Blank - Copper
CN - CuNi
SS - Stainless Steel
AD - Admiralty Brass

End Bonnet Material
Blank - Cast Iron
NP - Electroless Nickel Plate

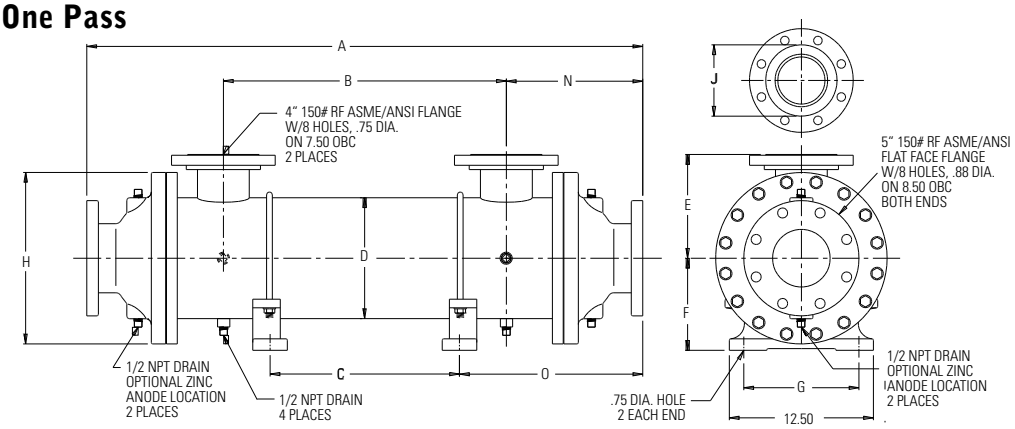
Tubesheet Material
Blank - Cast Iron
W - CuNi
S - Stainless Steel

Zinc Anodes
Blank - None
Z - Zinc

CA = NPT tubeside bottom connections; ASME/ANSI flange shell top connections.
CAM = BSPP shellside connections; BSPP tubeside connections.

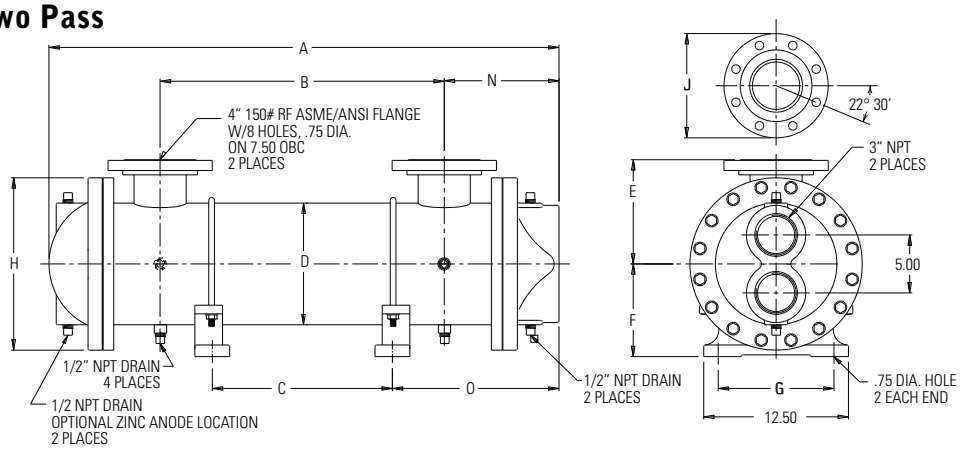
Dimensions

One Pass



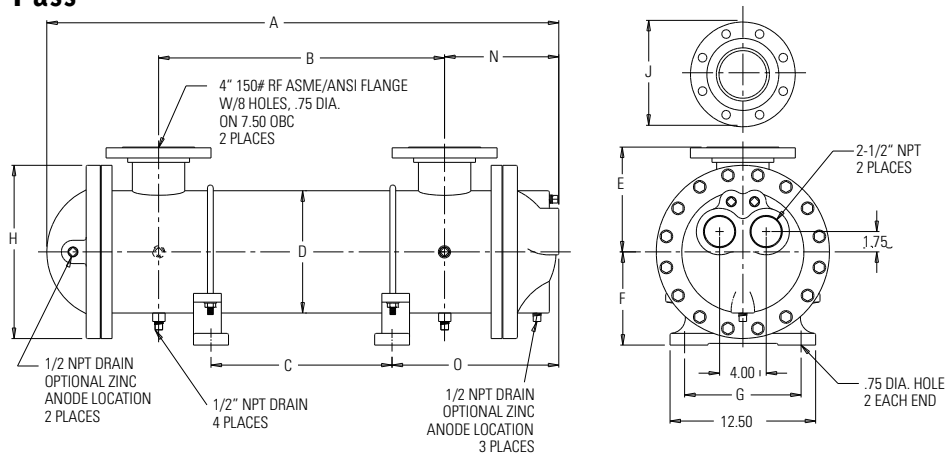
Model	A	N	O
CA-2036	49.64		
CA-2048	61.64		
CA-2060	73.64		
CA-2072	85.64		
CA-2084	97.64	11.82	15.92
CA-2096	109.64		
CA-20108	121.64		
CA-20120	133.64		
CA-20132	145.64		
CA-20144	157.64		

Two Pass



Model	A	N	O
CA-2036	45.55		
CA-2048	57.55		
CA-2060	69.55		
CA-2072	81.55		
CA-2084	93.55	9.90	14.38
CA-2096	105.55		
CA-20108	117.55		
CA-20120	129.55		
CA-20132	141.55		
CA-20144	153.55		

Four Pass



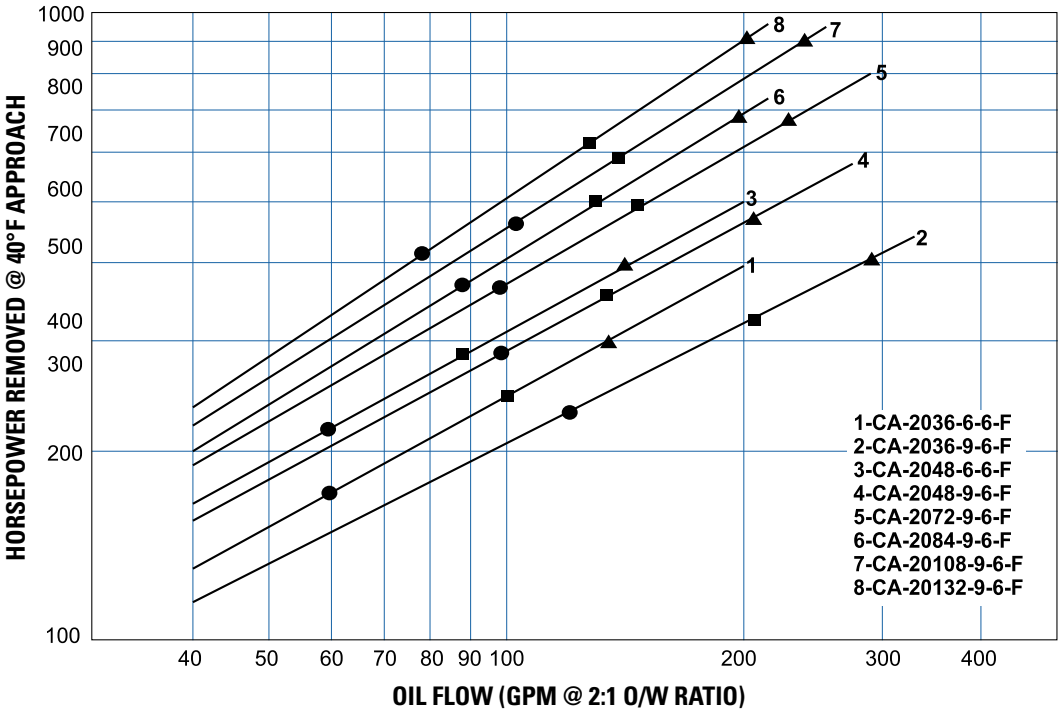
Model	A	N	O
CA-2036	45.34		
CA-2048	57.34		
CA-2060	69.34		
CA-2072	81.34		
CA-2084	93.34	9.78	13.78
CA-2096	105.34		
CA-20108	117.34		
CA-20120	129.34		
CA-20132	141.34		
CA-20144	153.34		

Model	B	C	D	E	F	G	H	J
CA-2036	26	18						
CA-2048	38	30						
CA-2060	50	42						6.19 DIA
CA-2072	62	54						Raised
CA-2084	74	66	10.5 DIA	9	8	10	14.88 DIA	Face
CA-2096	86	78						2 Places
CA-20108	98	90						
CA-20120	110	102						
CA-20132	122	114						
CA-20144	134	126						

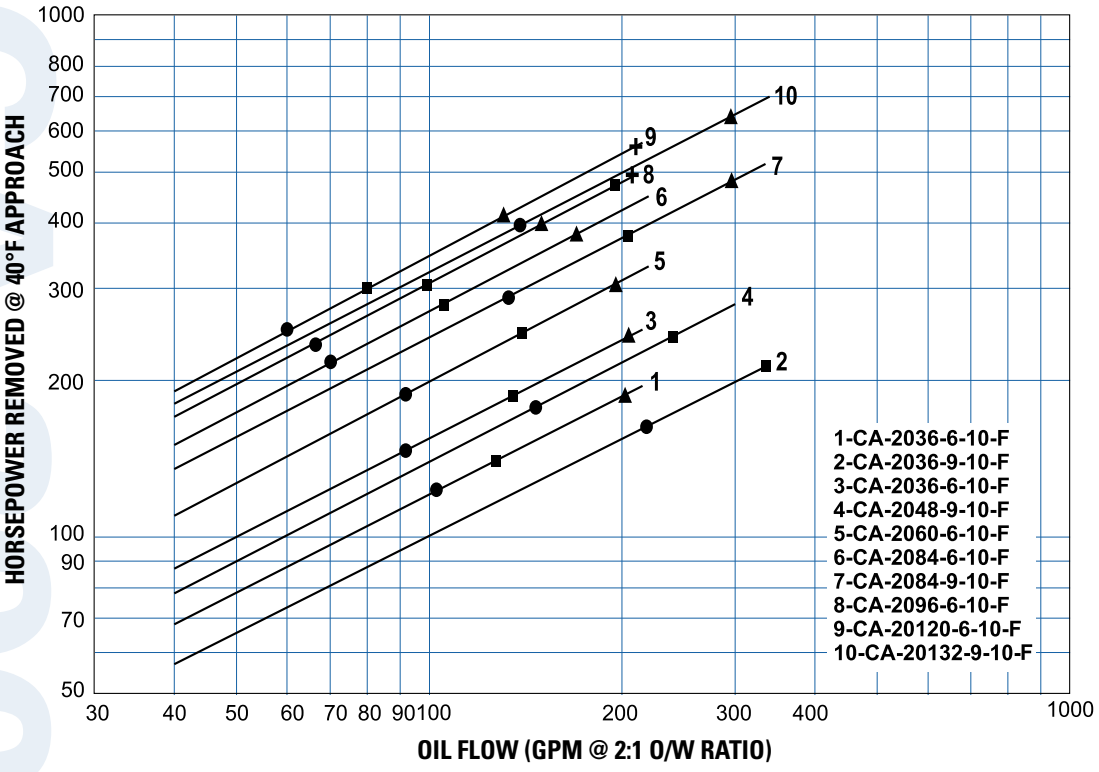
NOTE: We reserve the right to make reasonable design changes without notice. Dimensions are in inches.

Performance Curves

3/8" Tubes



5/8" Tubes



Selection Procedure

Performance Curves are based on 100SSU oil leaving the cooler 40°F higher than the incoming water temperature (40°F approach temperature). Curves are based on a 2:1 oil to water ratio.

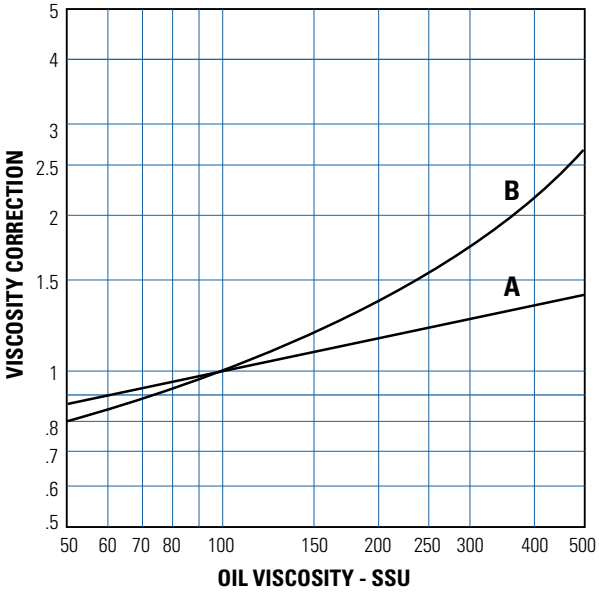
Step 1 **Determine the Heat Load.** This will vary with different systems, but typically coolers are sized to remove 25 to 50% of the input nameplate horsepower. (Example: 100 HP Power Unit x .33 = 33 HP Heat load.)
If BTU/Hr. is known: $HP = \frac{BTU/Hr}{2545}$

Step 2 **Determine Approach Temperature.**
Desired oil leaving cooler °F – Water Inlet temp. °F = Actual Approach

Step 3 **Determine Curve Horsepower Heat Load.** Enter the information from above:
HP heat load x $\frac{40}{\text{Actual Approach}}$ x Viscosity Correction A = Curve Horsepower

Step 4 **Enter curves** at oil flow through cooler and curve horsepower. Any curve above the intersecting point will work.

Step 5 **Determine Oil Pressure Drop from Curves.** Multiply pressure drop from curve by correction factor B found on oil viscosity correction curve.
● = 5 PSI; ■ = 10 PSI; ▲ = 20 PSI; ✚ = 40 PSI.



Oil Temperature

Oil coolers can be selected by using entering or leaving oil tempertures.

Typical operating temperature ranges are:

Hydraulic Motor Oil	110°F - 130°F
Hydrostatic Drive Oil	130°F - 180°F
Lube Oil Circuits	110°F - 130°F
Automatic Transmission Fluid	200°F - 300°F

Desired Reservoir Temperature

Return Line Cooling: Desired temperature is the oil temperature leaving the cooler. This will be the same temperature that will be found in the reservoir.

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

Oil △T=(BTU's/Hr.)/GPM Oil Flow x 210).

To calculate the oil leaving temperature from the cooler, use this formula:

Oil Leaving Temperature = Oil Entering Temperature - Oil △T.

This formula may also be used in any application where the only temperature available is the entering oil temperature.

Oil Pressure Drop: Most systems can tolerate a pressure drop through the heat exchanger of 20 to 30 PSI. Excessive pressure drop should be avoided. Care should be taken to limit pressure drop to 5 PSI or less for case drain applications where high back pressure may damage the pump shaft seals.

A Series

Industrial Hydraulic Oil Coolers

Thermal Transfer Products offers a full line of standard catalog hydraulic oil coolers for all industrial machine hydraulics for system cooling.

Air to Oil Cooling

Up to +500 HP of heat removal from hydraulic oil

Round tube copper, brass or steel

Brazed aluminum plate & bar (P-BAR™)

Extruded aluminum tube (T-BAR™)

Aluminum/steel fin construction

All aluminum brazed

Water to Oil Cooling

Steel, copper, copper/nickel, or stainless steel construction

Brazed plate construction

Internal fins

Diameters up to 10 inches

Lengths up to 12 feet

Product Options

Thermal Transfer industrial hydraulic oil coolers are available with a host of options to meet the demands of your application.

Brass construction

Steel construction

Internal finned construction

Brazed plate construction

Internal bypass

Seawater service

Applications

Our hydraulic oil coolers are used worldwide in a broad range of industrial applications, including:

Hydraulic presses

Plastic injection molding

Lube oil coolers

Extrusion machinery

Gear boxes

Hydraulic power units

And more.

For application help and quoting, visit our Full TTP site or contact ttpsales@apiheattransfer.com.

EC Series

Industrial Hydraulic Oil Coolers

Thermal Transfer Products offers a full line of standard catalog hydraulic oil coolers for all industrial machine hydraulics for system cooling.

Air to Oil Cooling

Up to +500 HP of heat removal from hydraulic oil

Round tube copper, brass or steel

Brazed aluminum plate & bar (P-BAR™)

Extruded aluminum tube (T-BAR™)

Aluminum/steel fin construction

All aluminum brazed

Water to Oil Cooling

Steel, copper, copper/nickel, or stainless steel construction

Brazed plate construction

Internal fins

Diameters up to 10 inches

Lengths up to 12 feet

Product Options

Thermal Transfer industrial hydraulic oil coolers are available with a host of options to meet the demands of your application.

Brass construction

Steel construction

Internal finned construction

Brazed plate construction

Internal bypass

Seawater service

Applications

Our hydraulic oil coolers are used worldwide in a broad range of industrial applications, including:

Hydraulic presses

Plastic injection molding

Lube oil coolers

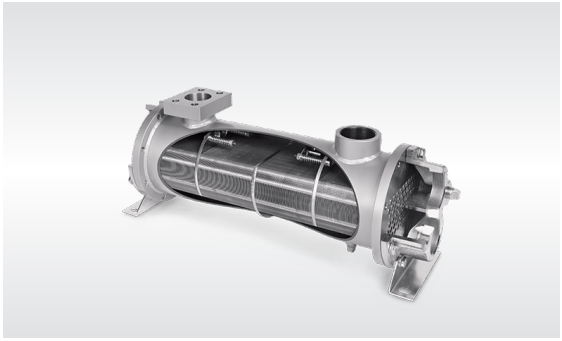
Extrusion machinery

Gear boxes

Hydraulic power units

And more.

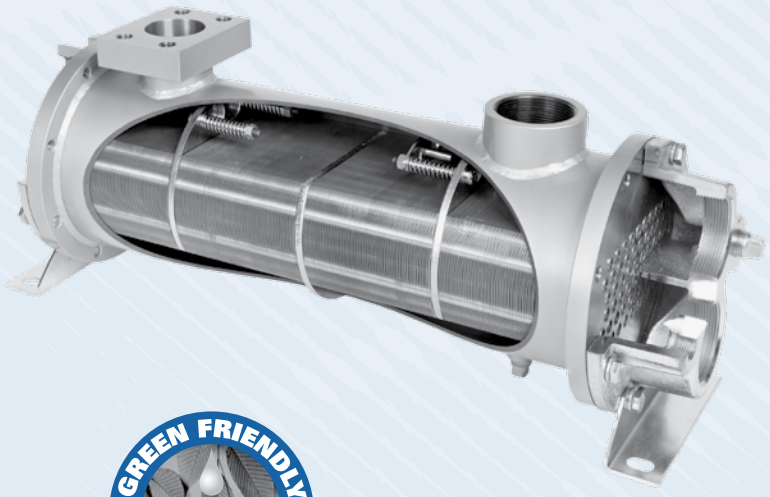
For application help and quoting, visit our Full TTP site or contact ttpsales@apiheattransfer.com.



COPPER & STEEL CONSTRUCTION

Features

- **Rugged Steel Shell Construction**
- **3/8" Tube Size**
- **Larger Shell Diameter than EK, 8.50" Dia Max**
- **High Flow Capacity & Performance**
- **High Efficiency Finned Bundle Design**
- **Optional Patented Built-in Surge-Cushion® Bypass**
- End bonnets removable for easy tube cleaning
- Mounting brackets included – may be rotated for simple installation
- NPT, SAE, BSPP, BSPT or flange connections
- Optional type 316 stainless steel or 90/10 copper-nickel components available



Cutaway view shows high performance copper tube/aluminum fin cooling chamber with patented SURGE-CUSHION® relief bypass valve, and optional flange connections.

Ratings

Operating Pressure 300 psi

Test Pressure 150 psi

Operating Temperature 300° F

Materials

Shell Steel

Tubesheets Steel

Tubes Copper

Baffles Steel

Mounting Brackets Steel

Gaskets Nitrile Rubber/Cellulose Fiber

Nameplate Aluminum Foil

Fins Aluminum

End Caps Grey Iron

Surge-Cushion (Option)

The SURGE-CUSHION® is a protective device (patented) designed to internally bypass a portion of the oil flow during cold start conditions, or when sudden flow surges temporarily exceed the maximum flow allowed for a given cooler. This device may replace an external bypass valve, but it is not intended to bypass the total oil flow.

How to Order

	–			–		–		–		–		–		–		–		–		–	

Model Series
EC
ECS
ECM
ECF
ECFM

Model Size Selected

Baffle Spacing

Tubeside Passes
0 - One Pass
T - 2 Pass
F - 4 Pass

Surge Cushion
Blank - No Valve
R - Value Included

Cooling Tube Material
Blank - Copper
CN - CuNi
SS - 316 Stainless Steel

End Bonnet Material
Blank - Cast Iron
B - Bronze
SB - 316 Stainless Steel

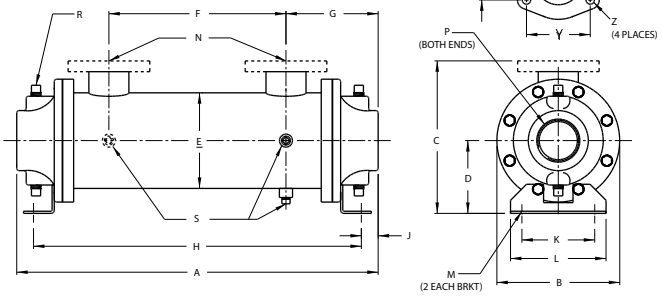
Tubesheet Material
Blank - Steel
W - CuNi
S - 316 Stainless Steel

Zinc Anodes
Blank - None
Z - Zinc Anodes

EC = NPT Oil connections; NPT Water connections.
ECS = SAE O-Ring Oil connections; NPT Water connections.
ECM = BSPP Oil connections; BSPP Water connections.
ECF = SAE 4 Bolt Flange (Tapped SAE) Oil connections; NPT Water connections.
ECFM = SAE 4 Bolt Flange (Tapped Metric) Oil connections; BSPP Water connections.

Dimensions

One Pass

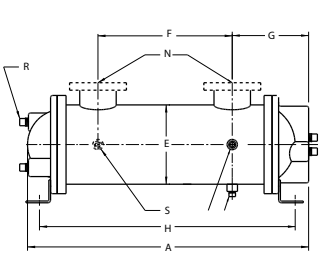


SAE Flange Size	X	Y	Z
1-1/2	1.41	2.75	1/2 - 13
2	1.69	3.06	UNC-2B
3	2.44	4.19	5/8 - 11 UNC 2B

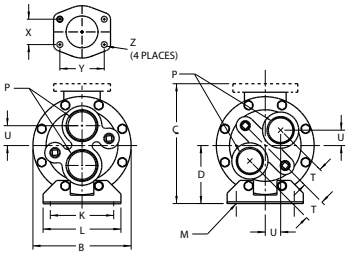
MODEL	A	B	C		D	E	F	G	H	J	K	L	M	N		P	R	S
			NPT / BSPP SAE O-RING	SAE FLANGE										NPT/BSPP FLANGE	SAE O-RING	NPT BSPP	NPT BSPP	NPT BSPP
EC-1014	20.22	6.75 DIA.	7.75	8.00	4.00	5.25 DIA.	10.12	5.05	18.38	.92	4.00	5.25	.50 x .75 SLOT	1-1/2	#24 SAE	2	(4) 3/8	(3) 3/8
EC-1024	30.22						20.12		28.38									
EC-1036	42.22						32.12		40.38									
EC-1054	60.22						50.12		58.32									
EC-1224	30.72	7.75 DIA.	8.75	9.38	4.50	6.25 DIA.	18.97	5.87	27.84	1.43	5.00	6.25		2	#32 SAE	3	(4) 3/8	
EC-1236	42.72						30.97		39.84									
EC-1254	60.72						48.97		57.84									
EC-1272	78.72						66.97		75.84									
EC-1724	32.22	10.50 DIA.	11.50	12.50	5.75	8.50 DIA.	18.75	7.23	29.25	1.99	7.00	8.25	.62 x .88 SLOT	3	N/A	4		
EC-1736	45.22						30.75		41.25									
EC-1754	63.22						48.75		59.25									
EC-1772	81.22						66.75		77.25									
EC-1784	43.22						78.75		89.25									

NOTE: We reserve the right to make reasonable design changes without notice. All dimensions are in inches.

Two Pass



EC-1200



EC-1000 & 1700

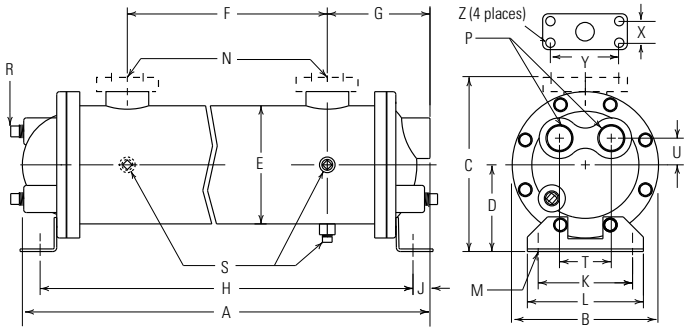
SAE Flange Size	X	Y	Z
1-1/2	1.41	2.75	1/2 - 13
2	1.69	3.06	UNC-2B
3	2.44	4.19	5/8 - 11 UNC 2B

MODEL	A	B	C		D	E	F	G	H	J	K	L	M	N		P	R	S	T	U
			NPT / BSPP SAE O-RING	SAE FLANGE										NPT/BSPP FLANGE	SAE O-RING	NPT BSPP	NPT BSPP	NPT BSPP		
EC-1014	19.75	6.75 DIA.	7.75	8.00	4.00	5.25 DIA.	10.12	5.05	18.38	.92	4.00	5.25	.50 x .75 SLOT	1-1/2	#24 SAE	1-1/2	(4) 3/8	3/8	1.50	1.06
EC-1024	29.75						20.12		28.38											
EC-1036	41.75						32.12		40.38											
EC-1054	59.75						50.12		58.32											
EC-1224	29.75	7.75 DIA.	8.75	9.38	4.50	6.25 DIA.	18.97	5.44	27.84	1.00	5.00	6.25		2	#32 SAE	2	(4) 3/8		—	1.56
EC-1236	41.75						30.97		39.84											
EC-1254	59.75						48.97		57.84											
EC-1272	77.75						66.97		75.84											
EC-1724	32.37	10.50 DIA.	11.50	12.50	5.75	8.50 DIA.	18.75	7.06	29.25	1.81	7.00	8.25	.62 x .88 SLOT	3	N/A				2.25	1.59
EC-1736	44.37						30.75		41.25											
EC-1754	62.37						48.75		59.25											
EC-1772	80.37						66.75		77.25											
EC-1784	92.37						78.75		89.25											

NOTE: We reserve the right to make reasonable design changes without notice. All dimensions are in inches.

Dimensions

Four Pass



SAE Flange Size	X	Y	Z
1-1/2	1.41	2.75	1/2 - 13
2	1.69	3.06	UNC-2B
3	2.44	4.19	5/8 - 11 UNC 2B

MODEL	A	B	C		D	E	F	G	H	J	K	L	M	N		P	R	S	T	U
			NPT BSPP SAE O-RING	SAE FLANGE										NPT BSPP FLANGE	SAE O-RING	NPT BSPP	NPT BSPP	NPT BSPP		
EC-1014	19.87	6.75 DIA.	7.75	8.00	4.00	5.25 DIA.	10.12	4.82	18.38	.75	4.00	5.25	.50 x .75 SLOT	1 1/2	#24 SAE	1	(3) 3/8	(3) 3/8	2.40	1.20
EC-1024	29.87						20.12		28.38											
EC-1036	41.87						32.12		40.38											
EC-1054	59.87						50.12		58.38											
EC-1224	29.78	7.75 DIA.	8.75	9.38	4.50	6.25 DIA.	18.97	5.44	27.84	1.00	5.00	6.25		2	#32 SAE	1 1/2			2.82	1.41
EC-1236	41.78						30.97		39.84											
EC-1254	59.78						48.97		57.84											
EC-1272	77.78						66.97		75.84											
EC-1724	31.61	10.50 DIA.	11.50	12.50	5.75	8.50 DIA.	18.75	7.06	29.25	1.81	7.00	8.25	.62 x .88 SLOT	3	N/A	2			4.25	1.41
EC-1736	43.61						30.75		41.25											
EC-1754	61.61						48.75		59.25											
EC-1772	79.61						66.75		77.25											
EC-1784	91.61						78.75		89.25											

NOTE: We reserve the right to make reasonable design changes without notice. All dimensions are in inches.

Selection Procedure

Performance Curves are based on 100SSU oil leaving the cooler 40°F higher than the incoming water temperature (40°F approach temperature).

Step 1 **Determine the Heat Load.** This will vary with different systems, but typically coolers are sized to remove 25 to 50% of the input nameplate horsepower. (Example: 100 HP Power Unit x .33 = 33 HP Heat load.)
If BTU/Hr. is known: $HP = \frac{BTU/Hr}{2545}$

Step 2 **Determine Approach Temperature.**
Desired oil leaving cooler °F − Water Inlet temp. °F = Actual Approach

Step 3 **Determine Curve Horsepower Heat Load.** Enter the information from above:
HP heat load x $\frac{40}{\text{Actual Approach}}$ x Viscosity Correction A = Curve Horsepower

Step 4 **Enter curves** at oil flow through cooler and curve horsepower. Any curve above the intersecting point will work.

Step 5 **Determine Oil Pressure Drop from Curves.** Multiply pressure drop from curve by correction factor B found on oil viscosity correction curve.
● = 5 PSI; ■ = 10 PSI; ▲ = 20 PSI.

Oil Temperature

Oil coolers can be selected by using entering or leaving oil tempertures.

Typical operating temperature ranges are:

Hydraulic Motor Oil	110°F - 130°F
Hydrostatic Drive Oil	130°F - 180°F
Lube Oil Circuits	110°F - 130°F
Automatic Transmission Fluid	200°F - 300°F

Desired Reservoir Temperature

Return Line Cooling: Desired temperature is the oil temperature leaving the cooler. This will be the same temperature that will be found in the reservoir.

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

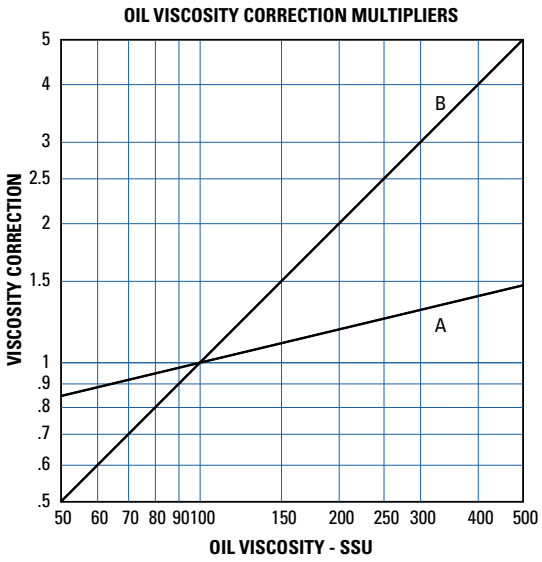
Oil △T=(BTU's/Hr.)/GPM Oil Flow x 210).

To calculate the oil leaving temperature from the cooler, use this formula:

Oil Leaving Temperature = Oil Entering Temperature - Oil △T.

This formula may also be used in any application where the only temperature available is the entering oil temperature.

Oil Pressure Drop: Most systems can tolerate a pressure drop through the heat exchanger of 20 to 30 PSI. Excessive pressure drop should be avoided. Care should be taken to limit pressure drop to 5 PSI or less for case drain applications where high back pressure may damage the pump shaft seals.



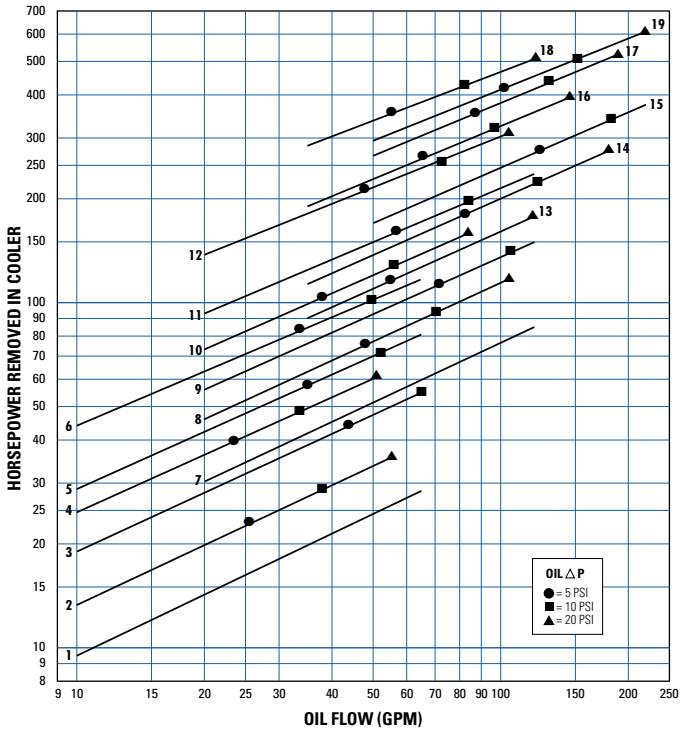
Maximum Flow Rates

Unit Size	Shell Side GPM	Tube Side GPM		
		One Pass	Two Pass	Four Pass
1000	70	65	32	16
1200	120	120	60	30
1700	250	220	110	65

Incorrect installation can cause premature failure.

Performance Curves

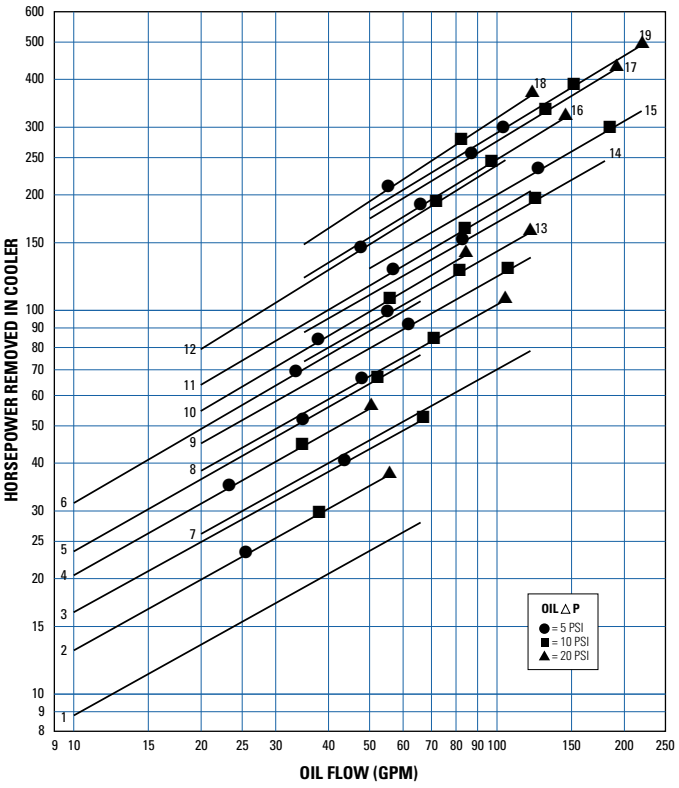
1:1 Oil to Water Ratio – High Water Usage



Curve Number	Model	Approx. Weights (lbs) Net	Shipping
1	EC-1014-7-0	28	32
2	EC-1014-4-0	28	32
3	EC-1024-6-0	45	50
4	EC-1024-4-0	45	50
5	EC-1036-6-0	66	70
6	EC-1054-7-0	105	140
7	EC-1224-12-0	98	105
8	EC-1224-6-0	98	105
9	EC-1236-9-0	125	145
10	EC-1236-6-0	125	145
11	EC-1254-9-0	155	180
12	EC-1272-9-0	210	250
13	EC-1724-6-0	145	175
14	EC-1736-9-0	201	235
15	EC-1754-14-0	275	305
16	EC-1754-9-0	275	305
17	EC-1772-12-0	330	380
18	EC-1772-9-0	330	380
19	EC-1784-14-0	390	450

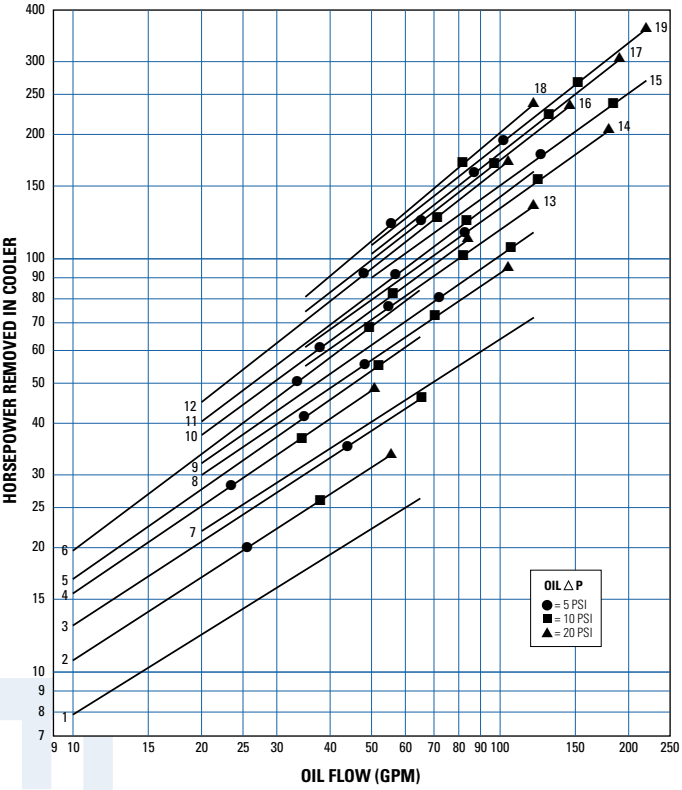
Performance Curves

2:1 Oil to Water Ratio – Medium Water Usage



Curve Number	Model	Approx. Weights (lbs) Net	Shipping
1	EC-1014-7-T	28	32
2	EC-1014-4-T	28	32
3	EC-1024-6-T	45	50
4	EC-1024-4-T	45	50
5	EC-1036-6-T	66	70
6	EC-1054-7-T	105	140
7	EC-1224-12-T	98	105
8	EC-1224-6-T	98	105
9	EC-1236-9-T	125	145
10	EC-1236-6-T	125	145
11	EC-1254-9-T	155	185
12	EC-1272-9-T	210	250
13	EC-1724-6-T	145	175
14	EC-1736-9-T	201	235
15	EC-1754-14-T	275	305
16	EC-1754-9-T	275	305
17	EC-1772-12-T	330	380
18	EC-1772-9-T	330	380
19	EC-1784-14-T	390	450

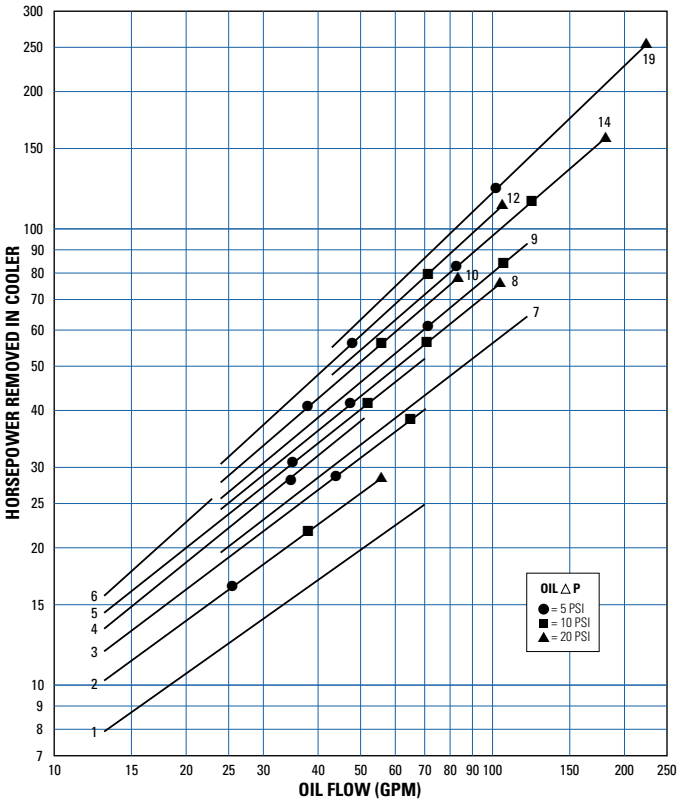
4:1 Oil to Water Ratio – Low Water Usage



Curve Number	Model	Approx. Weights (lbs) Net	Shipping
1	EC-1014-7-F	28	32
2	EC-1014-4-F	28	32
3	EC-1024-6-F	45	50
4	EC-1024-4-F	45	50
5	EC-1036-6-F	66	70
6	EC-1054-7-F	105	140
7	EC-1224-12-F	98	105
8	EC-1224-6-F	98	105
9	EC-1236-9-F	125	145
10	EC-1236-6-F	125	145
11	EC-1254-9-F	155	180
12	EC-1272-9-F	210	250
13	EC-1724-6-F	145	175
14	EC-1736-9-F	201	235
15	EC-1754-14-F	275	305
16	EC-1754-9-F	275	305
17	EC-1772-12-F	330	380
18	EC-1772-9-F	330	380
19	EC-1784-14-F	390	450

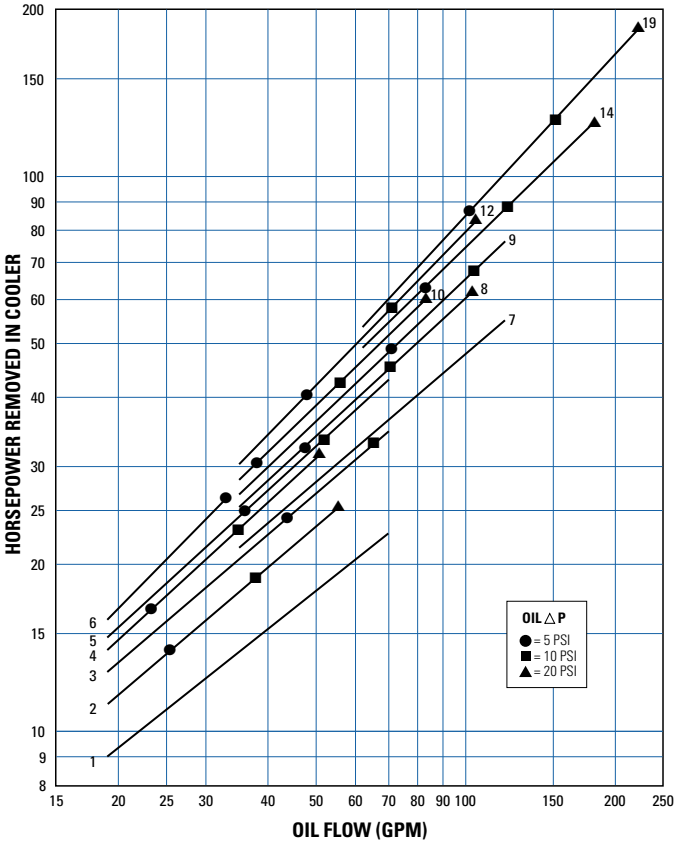
Performance Curves

7:1 Oil to Water Ratio – Lower Water Usage



Curve Number	Model	Approx. Weights (lbs) Net	Shipping
1	EC-1014-7-F	28	32
2	EC-1014-4-F	28	32
3	EC-1024-6-F	45	50
4	EC-1024-4-F	45	50
5	EC-1036-6-F	66	70
6	EC-1054-7-F	105	140
7	EC-1224-12-F	98	105
8	EC-1224-6-F	98	105
9	EC-1236-9-F	125	145
10	EC-1236-6-F	125	145
12	EC-1254-9-F	210	250
14	EC-1736-9-F	201	235
19	EC-1784-14-F	390	450

10:1 Oil to Water Ratio – Low Water Usage



Curve Number	Model	Approx. Weights (lbs) Net	Shipping
1	EC-1014-7-F	28	32
2	EC-1014-4-F	28	32
3	EC-1024-6-F	45	50
4	EC-1024-4-F	45	50
5	EC-1036-6-F	66	70
6	EC-1054-7-F	105	140
7	EC-1224-12-F	98	105
8	EC-1224-6-F	98	105
9	EC-1236-9-F	125	145
10	EC-1236-6-F	125	145
12	EC-1254-9-F	210	250
14	EC-1736-9-F	201	235
19	EC-1784-14-F	390	450

EK Series

Industrial Hydraulic Oil Coolers

Thermal Transfer Products offers a full line of standard catalog hydraulic oil coolers for all industrial machine hydraulics for system cooling.

Air to Oil Cooling

Up to +500 HP of heat removal from hydraulic oil

Round tube copper, brass or steel

Brazed aluminum plate & bar (P-BAR™)

Extruded aluminum tube (T-BAR™)

Aluminum/steel fin construction

All aluminum brazed

Water to Oil Cooling

Steel, copper, copper/nickel, or stainless steel construction

Brazed plate construction

Internal fins

Diameters up to 10 inches

Lengths up to 12 feet

Product Options

Thermal Transfer industrial hydraulic oil coolers are available with a host of options to meet the demands of your application.

Brass construction

Steel construction

Internal finned construction

Brazed plate construction

Internal bypass

Seawater service

Applications

Our hydraulic oil coolers are used worldwide in a broad range of industrial applications, including:

Hydraulic presses

Plastic injection molding

Lube oil coolers

Extrusion machinery

Gear boxes

Hydraulic power units

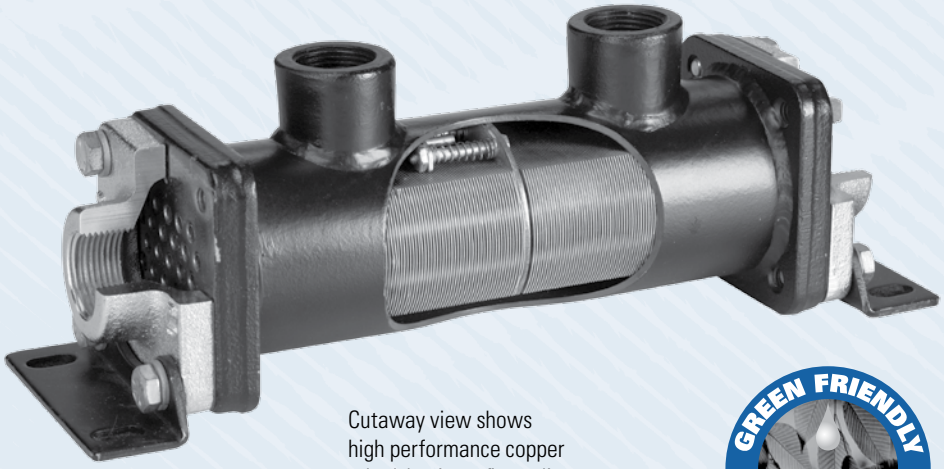
And more.

For application help and quoting, visit our **Full TTP site** or contact **ttpsales@apiheattransfer.com**.

COPPER & STEEL CONSTRUCTION

Features

- **Compact Size**
- **High Efficiency Finned Bundle Design**
- **Low Cost**
- **Optional Patented Built-in Surge-Cushion® Relief Bypass**
- **3/16" Tube Size**
- Heat Removal up to 400 Horsepower (300 kW)
- Oil Flow rates up to 80 U.S. GPM (300 Liters/min.)
- Large Oil Connections for Minimum Entering and Exiting Flow Restriction
- Removable End Bonnets for easy tube cleaning
- Mounting Brackets Designed so that Cooler can be Rotated in 90° Increments
- High Pressure Ratings
- Complete Line of Accessories Available



Cutaway view shows high performance copper tube/aluminum fin cooling chamber with patented SURGE-CUSHION® relief bypass valve.

GREEN FRIENDLY
Requires Less Cooling Water

Ratings

Maximum Pressure/Shell side 500 psi
Maximum Pressure/Tubeshell side 150 psi
Maximum Temperature 250° F

Materials

Shell Steel
Tube Sheets Steel
Baffles Steel
Mounting Brackets Steel
Gaskets Nitrile Rubber/Cellulose Fiber
Nameplate Aluminum Foil
Tubes Copper
Fins Aluminum
End Caps Grey Iron

Surge-Cushion (Option)

The SURGE-CUSHION® is a protective device (patented) designed to internally bypass a portion of the oil flow during cold start conditions, or when sudden flow surges temporarily exceed the maximum flow allowed for a given cooler. This device may replace an external bypass valve, but it is not intended to bypass the total oil flow.

Maximum Flow Rates

Unit Size	Shell Side GPM	Tube Side GPM		
		One Pass	Two Pass	Four Pass
500	20	13	6	N/A
700	60	24	12	6
1000	80	56	28	14

Incorrect installation can cause premature failure.

How to Order

[ ] – [ ][ ][ ][ ] – [ ] – [ ] – [ ] – [ ] – [ ]

Model Series
EK
EKS
EKM
EKF
EKFM

Model Size Selected

Baffle Spacing
EK-1036 & EK-1048 Models Only

Tubeside Passes
0 - One Pass
T - Two Pass
F - Four Pass

Surge Cushion
Blank - No Relief Bypass
R - Relief Bypass

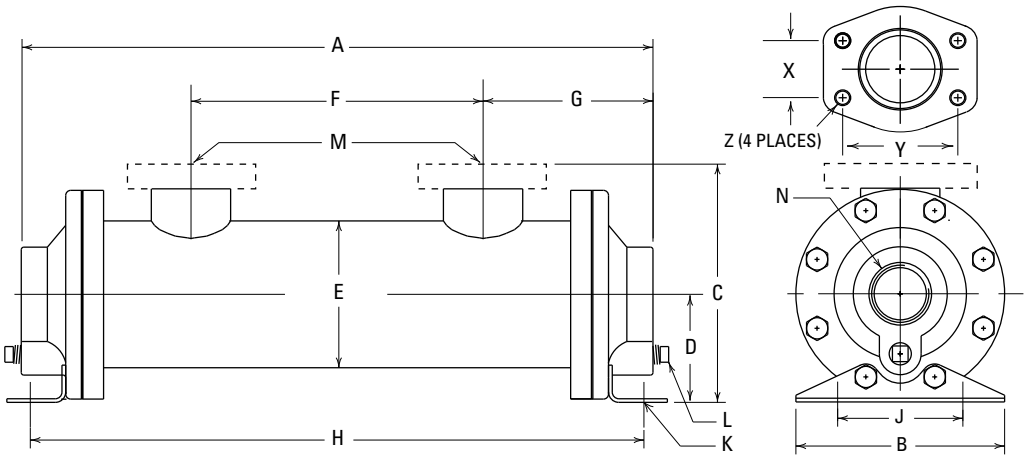
Cooling Tube Material
Blank - Copper
CN - CuNi

End Bonnet Material
Blank - Cast Iron
NP - Electroless Nickel Plate

EK = NPT Oil connections; NPT Water connections.
EKS = SAE O-Ring Oil connections; NPT Water connections.
EKM = BSPP Oil connections; BSPP Water connections.
EKF = SAE 4 Bolt Flange (Tapped SAE) Oil connections; NPT Water connections.
EKFM = SAE 4 Bolt Flange (Tapped Metric) Oil connections; BSPP Water connections.

Dimensions

One Pass



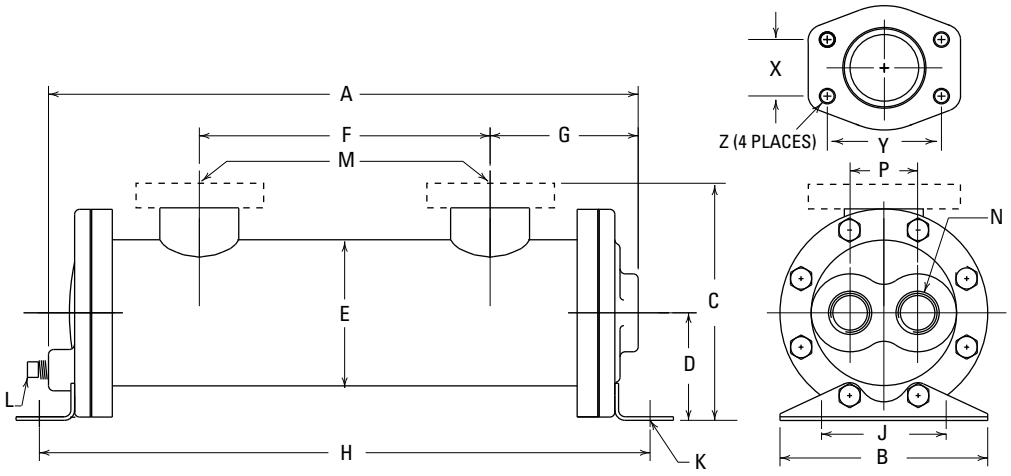
Flange Size	1-1/2	2
X	1.41	1.69
Y	2.75	3.06
EKF Z	1/2 - 13 UNC-28	
EKFM Z	M-12	

MODEL	A	B	C		D	E	F	G	H	J	K	L	M				N
			NPT / BSPP SAE O-RING	SAE FLANGE								NPT BSPP	NPT	SAE O-RING	SAE FLANGE	BSPP	NPT BSPP
EK-505	7.38	3.5 MAX. WIDTH	3.74	N/A	1.62	2.55 DIA.	2.19	2.59	7.44	2.50	.34 x .62 SLOT	N/A	1/2	#8 3/4-16 UNF-2B	N/A	1/2	3/4
EK-508	10.38		3.90				3.85	3.26	10.44				3/4	#12 $1^{1}/_{16}$-12 UN-2B		3/4	
EK-510	12.38						5.85		12.44								
EK-512	14.38						7.85		14.44								
EK-514	16.38						9.85		16.44								
EK-518	20.38						13.85		20.44								
EK-524	26.38						19.85		26.44								
EK-536	38.38						31.85		38.44								
EK-708	11.12	5.0 MAX. WIDTH	5.47	5.71	2.59	3.52 DIA.	3.00	4.07	10.71	3.00	.44 x .75 SLOT	1/4	$1^{1}/2$	#24 $1^{7}/_{8}$-12 UN-2B	$1^{1}/2$	$1^{1}/2$	$1^{1}/_{4}$
EK-712	15.12						7.00		14.71								
EK-714	17.12						9.00		16.71								
EK-718	21.12						13.00		20.71								
EK-724	27.12						19.00		26.71								
EK-736	39.12						31.00		38.71								
EK-1012	15.33	6.5 MAX. WIDTH	7.64	8.28	4.00	5.05 DIA.	6.18	4.57	15.45	4.00	.44 x 1.00 SLOT		2		2		$1^{1}/_{2}$
EK-1014	17.33						8.18		17.45								
EK-1018	21.33						12.18		21.45								
EK-1024	27.33						18.18		27.45								
EK-1036	39.33						30.18		39.45								
EK-1048	51.33						42.18		51.45								

NOTE: We reserve the right to make reasonable design changes without notice. All dimensions are in inches.

Dimensions

Two Pass



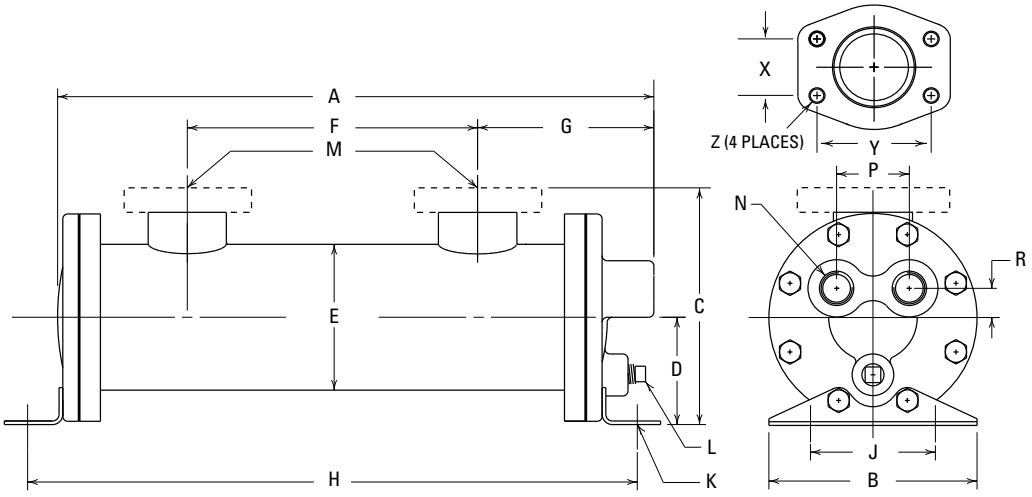
Flange Size	1-1/2	2
X	1.41	1.69
Y	2.75	3.06
EKF Z	1/2 - 13 UNC-28	
EKFM Z	M-12	

MODEL	A	B	C		D	E	F	G	H	J	K	L	M				N	P
			NPT / BSPP SAE O-RING	SAE FLANGE								NPT BSPP	NPT	SAE O-RING	SAE FLANGE	BSPP	NPT BSPP	
EK-505	7.38	3.5 MAX. WIDTH	3.74	N/A	1.62	2.55 DIA.	2.19	2.59	7.44	2.50	.34 x .62 SLOT	N/A	1/2	#8 3/4-16 UNF-2B	N/A	1/2	3/8	1.12
EK-508	10.38		3.90				3.85	3.26	10.44				3/4	#12 $1^{1}/_{16}$-12 UN-2B		3/4		
EK-510	12.38						5.85		12.44									
EK-512	14.38						7.85		14.44									
EK-514	16.38						9.85		16.44									
EK-518	20.38						13.85		20.44									
EK-524	26.38						19.85		26.44									
EK-536	38.38						31.85		38.44									
EK-708	10.19	5.0 MAX. WIDTH	5.47	5.71	2.59	3.52 DIA.	3.00	3.57	10.71	3.00	.44 x .75 SLOT	1/4	$1^{1}/_{2}$	#24 $1^{7}/_{8}$-12 UN-2B	$1^{1}/_{2}$	$1^{1}/_{2}$	3/4	1.62
EK-712	14.19						7.00		14.71									
EK-714	16.19						9.00		16.71									
EK-718	20.19						13.00		20.71									
EK-724	26.19						19.00		26.71									
EK-736	39.19						31.00		38.71									
EK-1012	14.58	6.5 MAX. WIDTH	7.64	8.28	4.00	5.05 DIA.	6.18	4.45	15.45	4.00	.44 x 1.00 SLOT		2		2		1.0	2.38
EK-1014	16.58						8.18		17.45									
EK-1018	20.58						12.18		21.45									
EK-1024	26.58						18.18		27.45									
EK-1036	38.58						30.18		39.45									
EK-1048	50.58						42.18		51.45									

NOTE: We reserve the right to make reasonable design changes without notice. All dimensions are in inches.

Dimensions

Four Pass



Flange Size	1-1/2	2
X	1.41	1.69
Y	2.75	3.06
EKF Z	1/2 - 13 UNC-28	
EKFM Z	M-12	

MODEL	A	B	C		D	E	F	G	H	J	K	L	M				N	P	R
			NPT / BSPP SAE O-RING	SAE FLANGE								NPT BSPP	NPT	SAE O-RING	SAE FLANGE	BSPP	NPT BSPP		
EK-708	10.37	5.0 MAX. WIDTH	5.47	5.71	2.59	3.52 DIA.	3.00	4.25	10.71	3.00	.44 x .75 SLOT	1/4	1 1/2	#24 17/8-12 UN-2B	1 1/2	1 1/2	1/2	1.75	.70
EK-712	14.37						7.00		14.71										
EK-714	16.37						9.00		16.71										
EK-718	20.37						13.00		20.71										
EK-724	26.37						19.00		26.71										
EK-736	38.37						31.00		38.71										
EK-1012	14.33	6.5 MAX. WIDTH	7.64	8.28	4.00	5.05 DIA.	6.18	4.45	15.45	4.00	.44 x 1.00 SLOT		2		2		3/4	2.50	.89
EK-1014	16.33						8.18		17.45										
EK-1018	20.33						12.18		21.45										
EK-1024	26.33						18.18		27.45										
EK-1036	38.33						30.18		39.45										
EK-1048	50.33						42.18		51.45										

NOTE: We reserve the right to make reasonable design changes without notice. All dimensions are in inches.

Selection Procedure

Performance Curves are based on 100SSU oil leaving the cooler 40°F higher than the incoming water temperature (40°F approach temperature).

Step 1 **Determine the Heat Load.** This will vary with different systems, but typically coolers are sized to remove 25 to 50% of the input nameplate horsepower. (Example: 100 HP Power Unit x .33 = 33 HP Heat load.)
If BTU/Hr. is known: $HP = \frac{BTU/Hr}{2545}$

Step 2 **Determine Approach Temperature.**
Desired oil leaving cooler °F − Water Inlet temp. °F = Actual Approach

Step 3 **Determine Curve Horsepower Heat Load.** Enter the information from above:
HP heat load x $\frac{40}{\text{Actual Approach}}$ x Viscosity Correction A = Curve Horsepower

Step 4 **Enter curves** at oil flow through cooler and curve horsepower. Any curve above the intersecting point will work.

Step 5 **Determine Oil Pressure Drop from Curves.** Multiply pressure drop from curve by correction factor B found on oil viscosity correction curve.
● = 5 PSI; ■ = 10 PSI; ▲ = 20 PSI.

Oil Temperature

Oil coolers can be selected by using entering or leaving oil tempertures.

Typical operating temperature ranges are:

Hydraulic Motor Oil	110°F - 130°F
Hydrostatic Drive Oil	130°F - 180°F
Lube Oil Circuits	110°F - 130°F
Automatic Transmission Fluid	200°F - 300°F

Desired Reservoir Temperature

Return Line Cooling: Desired temperature is the oil temperature leaving the cooler. This will be the same temperature that will be found in the reservoir.

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

Oil △T=(BTU's/Hr.)/GPM Oil Flow x 210).

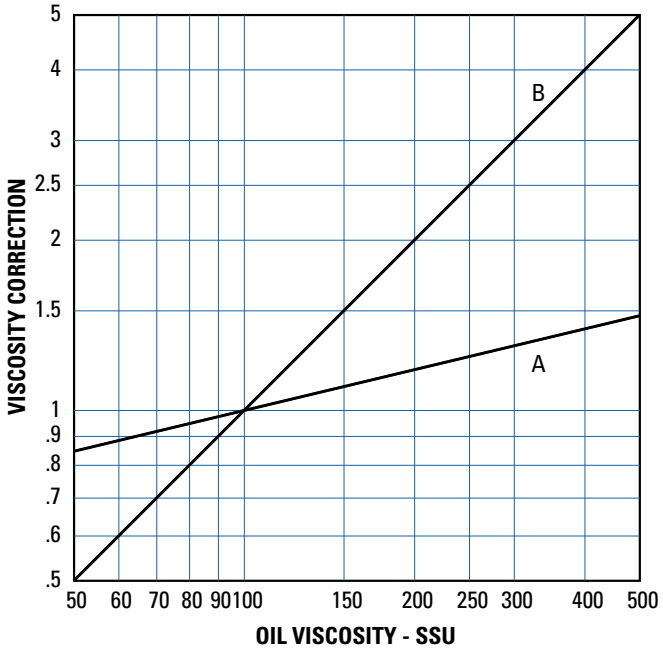
To calculate the oil leaving temperature from the cooler, use this formula:

Oil Leaving Temperature = Oil Entering Temperature - Oil △T.

This formula may also be used in any application where the only temperature available is the entering oil temperature.

Oil Pressure Drop: Most systems can tolerate a pressure drop through the heat exchanger of 20 to 30 PSI. Excessive pressure drop should be avoided. Care should be taken to limit pressure drop to 5 PSI or less for case drain applications where high back pressure may damage the pump shaft seals.

OIL VISCOSITY CORRECTION MULTIPLIERS



Recirculation Loop

Water Cooled Hydraulic Oil Coolers

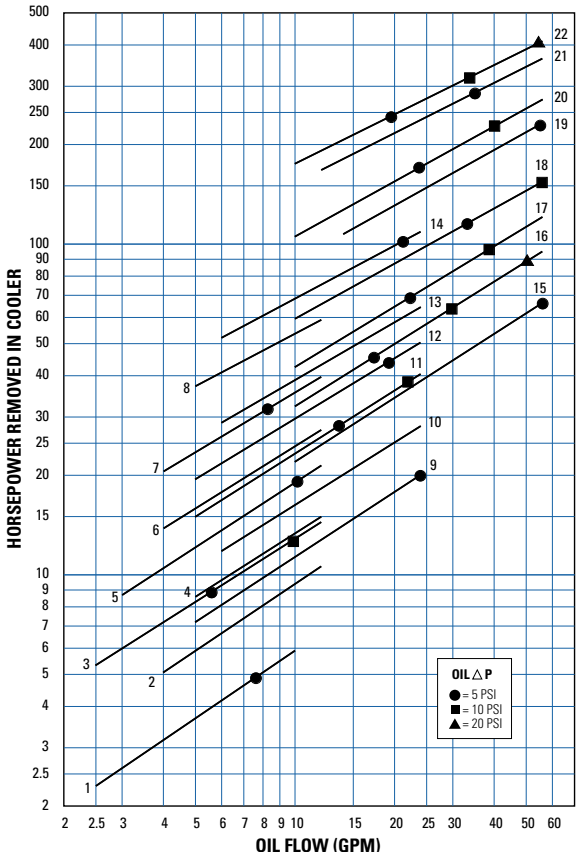
BASIS:

- 40°F Entering temperature difference (Maintain reservoir 40°F above the incoming water temperature)
- Heat removal 30% of input horsepower
- Hydraulic system flow (GPM) x 3 = Gallons; reservoir size
- 1 GPM cooler flow per HP heat to be removed
- Turn-over reservoir 3-4 times per hour
- Maximum flows

System Horsepower	HP Heat Load	Minimum Required GPM Oil Flow	Minimum Required GPM Water Flow	Heat Exchanger Model Number
3	.9	1	1	EK-505-T
5	1.5	2		
7.5	2.25			EK-512-T
10	3	3	1.5	
15	4.5	4.5	2	
20	6	6	3	
25	7.5	7.5	4	EK-712-T
30	9	9	4.5	
40	12	12	6	
50	15	15	7.5	EK-1012-T
60	18	18	9	
75	22.5	23	12	
100	30	30	15	

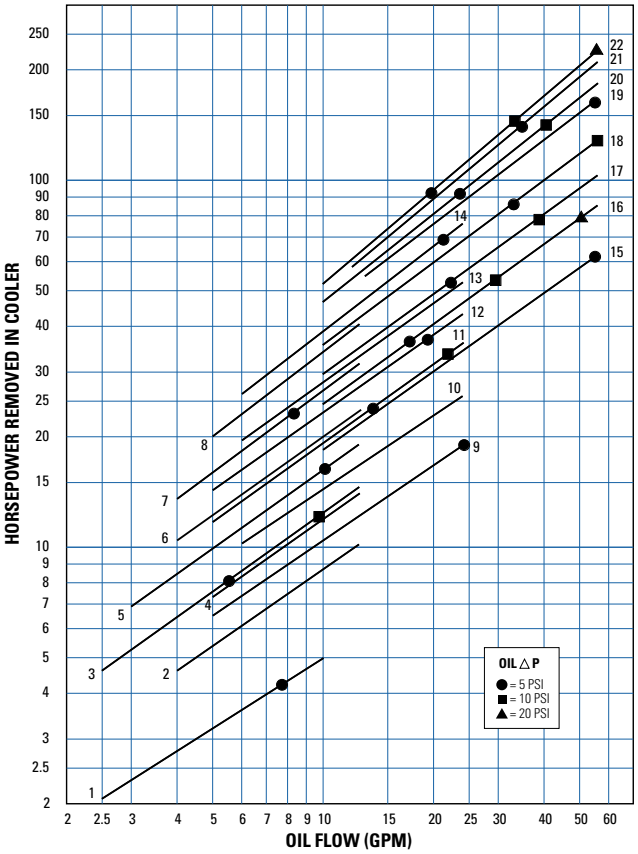
Performance Curves

1:1 Oil to Water Ratio – High Water Usage



Curve Number	Model	Approx. Weights (lbs) Net	Shipping
1	EK-505-0	6	7
2	EK-508-0	7	8
3	EK-510-0	8	9
4	EK-512-0	9	10
5	EK-514-0	10	11
6	EK-518-0	11	12
7	EK-524-0	13	14
8	EK-536-0	17	18
9	EK-708-0	15	16
10	EK-712-0	18	19
11	EK-714-0	19	20
12	EK-718-0	22	23
13	EK-724-0	26	28
14	EK-736-0	34	36
15	EK-1012-0	35	37
16	EK-1014-0	38	40
17	EK-1018-0	42	45
18	EK-1024-0	50	55
19	EK-1036-9-0	67	85
20	EK-1036-6-0	67	85
21	EK-1048-8-0	78	95
22	EK-1048-6-0	78	95

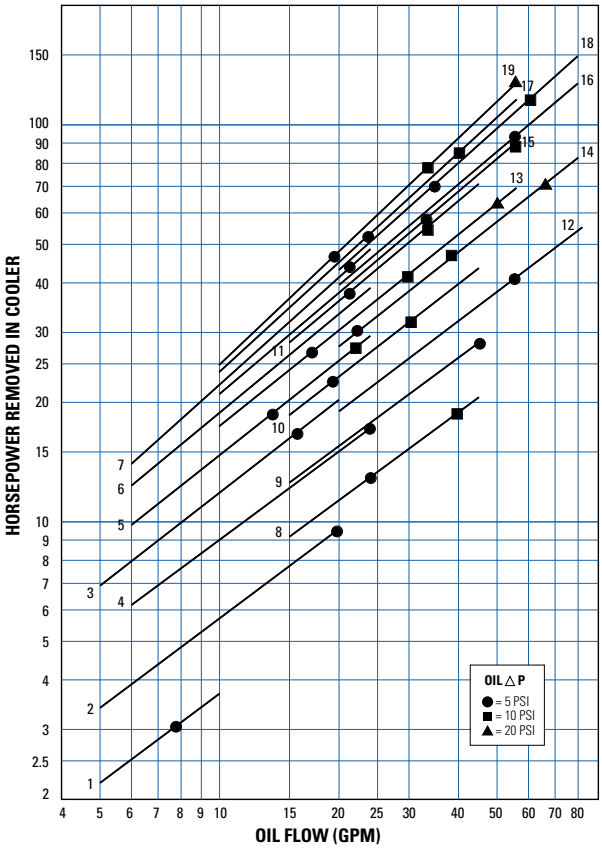
2:1 Oil to Water Ratio – Medium Water Usage



Curve Number	Model	Approx. Weights (lbs) Net	Shipping
1	EK-505-T	6	7
2	EK-508-T	7	8
3	EK-510-T	8	9
4	EK-512-T	9	10
5	EK-514-T	10	11
6	EK-518-T	11	12
7	EK-524-T	13	14
8	EK-536-T	17	18
9	EK-708-T	15	16
10	EK-712-T	18	19
11	EK-714-T	19	20
12	EK-718-T	22	23
13	EK-724-T	26	28
14	EK-736-T	34	36
15	EK-1012-T	35	37
16	EK-1014-T	38	40
17	EK-1018-T	42	45
18	EK-1024-T	50	55
19	EK-1036-9-T	67	85
20	EK-1036-6-T	67	85
21	EK-1048-8-T	78	95
22	EK-1048-6-T	78	95

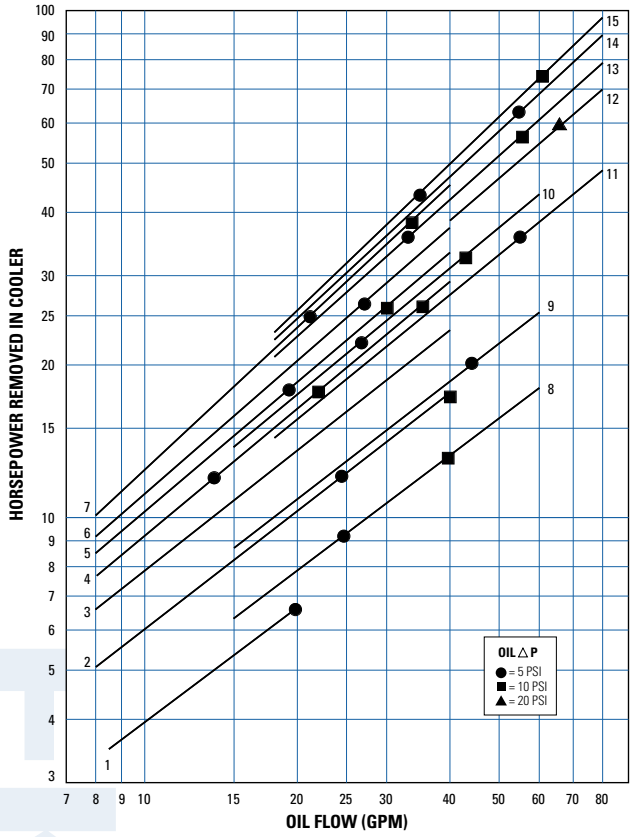
Performance Curves

4:1 Oil to Water Ratio – Low Water Usage



Curve Number	Model	Approx. Weights (lbs) Net	Shipping
1	EK-505-T	6	7
2	EK-508-T	7	8
3	EK-518-T	11	12
4	EK-708-F	15	16
5	EK-714-F	19	20
6	EK-724-F	26	28
7	EK-736-F	34	36
8	EK-708-T	15	16
9	EK-712-T	18	19
10	EK-718-T	22	23
11	EK-736-T	34	36
12	EK-1012-T	35	37
13	EK-1014-T	38	40
14	EK-1018-T	42	45
15	EK-1024-T	50	55
16	EK-1036-9-T	67	85
17	EK-1036-6-T	67	85
18	EK-1048-8-T	78	95
19	EK-1048-6-T	78	95

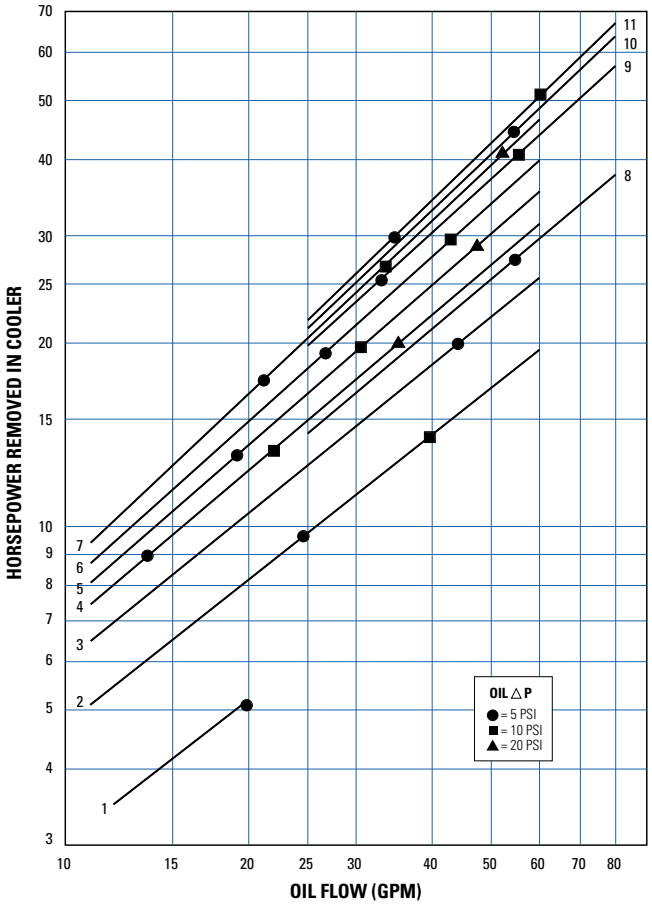
7:1 Oil to Water Ratio – Lower Water Usage



Curve Number	Model	Approx. Weights (lbs) Net	Shipping
1	EK-508-T	7	8
2	EK-708-F	15	16
3	EK-712-F	18	19
4	EK-714-F	19	20
5	EK-718-F	22	23
6	EK-124-F	26	28
7	EK-736-F	34	36
8	EK-708-T	15	16
9	EK-712-T	18	19
10	EK-724-T	26	28
11	EK-1012-T	35	37
12	EK-1018-T	42	45
13	EK-1024-T	50	55
14	EK-1036-9-T	67	85
15	EK-1048-8-T	78	95

Performance Curves

10:1 Oil to Water Ratio – Lowest Water Usage



Curve Number	Model	Approx. Weights (lbs) Net	Shipping
1	EK-508-T	7	8
2	EK-708-F	15	16
3	EK-712-F	18	19
4	EK-714-F	19	20
5	EK-718-F	22	23
6	EK-724-F	26	28
7	EK-736-F	34	36
8	EK-1012-F	35	37
9	EK-1014-F	50	55
10	EK-1036-9-F	67	85
11	EK-1048-8-F	78	95

Recirculation Loop

Water Cooled Hydraulic Oil Coolers

BASIS:

- 40°F Entering temperature difference (Maintain reservoir 40°F above the incoming water temperature)
- Heat removal 30% of input horsepower
- Hydraulic system flow (GPM) x 3 = Gallons; reservoir size
- 1 GPM cooler flow per HP heat to be removed
- Turn-over reservoir 3-4 times per hour
- Maximum flows

System Horsepower	HP Heat Load	Minimum Required GPM Oil Flow	Minimum Required GPM Water Flow	Heat Exchanger Model Number
3	.9	1	1	EK-505-T
5	1.5	2		
7.5	2.25			EK-512-T
10	3	3	1.5	
15	4.5	4.5	2	
20	6	6	3	
25	7.5	7.5	4	EK-712-T
30	9	9	4.5	
40	12	12	6	
50	15	15	7.5	EK-1012-T
60	18	18	9	
75	22.5	23	12	
100	30	30	15	

EKT Series

Industrial Hydraulic Oil Coolers

Thermal Transfer Products offers a full line of standard catalog hydraulic oil coolers for all industrial machine hydraulics for system cooling.

Air to Oil Cooling

Up to +500 HP of heat removal from hydraulic oil

Round tube copper, brass or steel

Brazed aluminum plate & bar (P-BAR™)

Extruded aluminum tube (T-BAR™)

Aluminum/steel fin construction

All aluminum brazed

Water to Oil Cooling

Steel, copper, copper/nickel, or stainless steel construction

Brazed plate construction

Internal fins

Diameters up to 10 inches

Lengths up to 12 feet

Product Options

Thermal Transfer industrial hydraulic oil coolers are available with a host of options to meet the demands of your application.

Brass construction

Steel construction

Internal finned construction

Brazed plate construction

Internal bypass

Seawater service

Applications

Our hydraulic oil coolers are used worldwide in a broad range of industrial applications, including:

Hydraulic presses

Plastic injection molding

Lube oil coolers

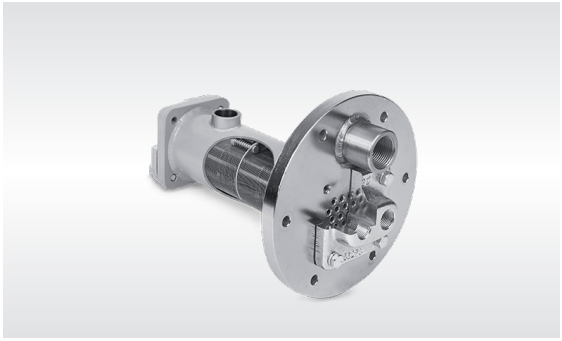
Extrusion machinery

Gear boxes

Hydraulic power units

And more.

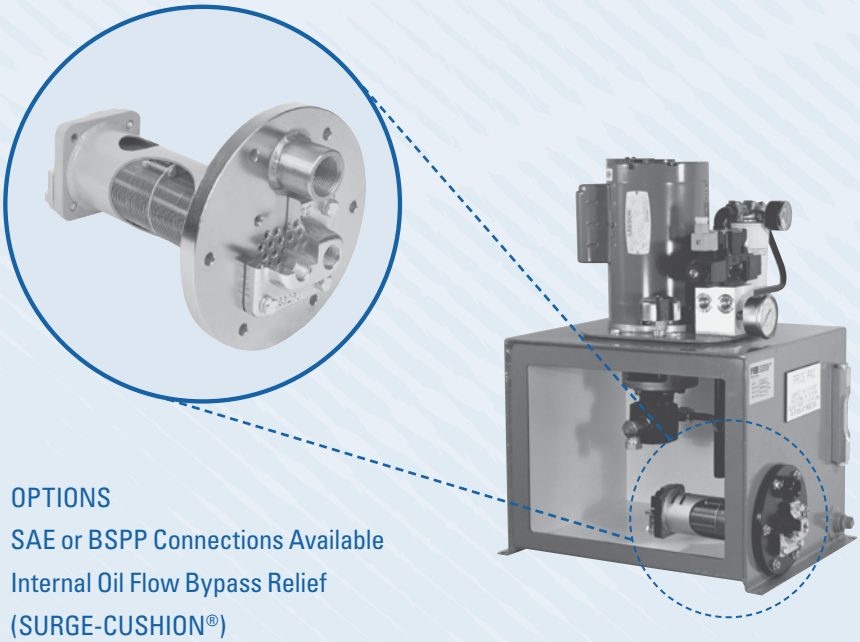
For application help and quoting, visit our Full TTP site or contact ttpsales@apiheattransfer.com.



COPPER & STEEL CONSTRUCTION

Features

- **HPU, In-tank Cooler**
- **Compact Size**
- **EK Style & Size**
- **High Efficiency Finned Bundle Design**
- **Serviceable**
- **Removable**
- In-tank Design Minimizes Space Requirements and Reduces Plumbing
- Internal Aluminum Fins Dramatically Increase Performance
- Removable End Bonnets Allow Water Passage Servicing
- High Strength Steel Shell



OPTIONS

SAE or BSPP Connections Available

Internal Oil Flow Bypass Relief (SURGE-CUSHION®)

Ratings

Operating Pressure:

Shellside 75 psi – **Tubeside** 150 psi

Test Pressure:

Shellside 75 psi – **Tubeside** 150 psi

Maximum Temperature 250° F

Materials

Shell Steel

Tubes Copper

Fins Aluminum

Tubesheets Steel

Baffles Steel

End Bonnets Cast Iron

Gaskets Nitrile Rubber/Cellulose Fiber

Surge-Cushion (Option)

The SURGE-CUSHION® is a protective device (patented) designed to internally bypass a portion of the oil flow during cold start conditions, or when sudden flow surges temporarily exceed the maximum flow allowed for a given cooler. This device may replace an external bypass valve, but it is not intended to bypass the total oil flow.

How to Order

	–		–	

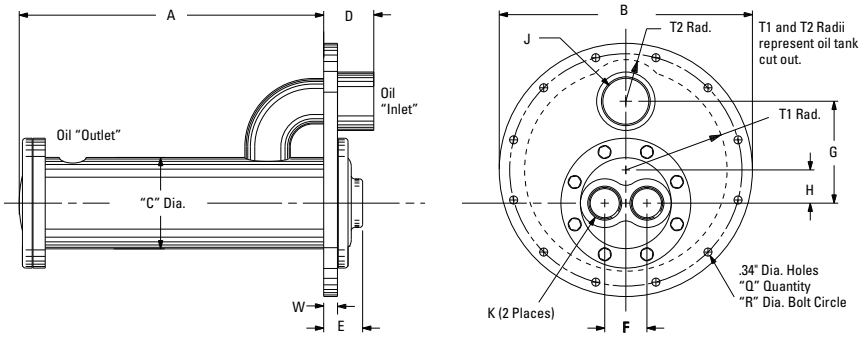
Model Series
EKT
EKTS
EKTM

Model Size Selected

SURGE-CUSHION®
Blank - No SURGE-CUSHION®
R - SURGE-CUSHION®

EKT = NPT Connections.
EKTS = SAE Oil Connections.
EKTM = All Metric Connections.

Dimensions



MODEL	A	B	C	D	E	F	G	H	J NPT or BSPF	J SAE	K NPT or BSPF	Q	R	T1	T2	W	Net. Wt.	Approx. Ship Wt.
EKT-508	8.87	6.79	2.55	1.84	1.68	1.12	2.44	.50	3/4"	#12	3/8"	6	5.60	2.25	.79	.62	11	14
EKT-518	18.87																14	16
EKT-708	8.72	9.75	3.52	2.22	1.67	1.62	3.94	1.25	1-1/2"	#24	3/4"	12	8.94	4.00	—	.70	23	27
EKT-718	18.72																30	34
EKT-1012	12.55	10.38	5.05		2.23	2.38	4.69	1.19			1"		9.62	4.38	1.12		42	46
EKT-1024	24.55																58	63

NOTE: We reserve the right to make reasonable design changes without notice. Certified drawings are available upon request. All dimensions in inches. Tank gasket is included. BSPP threads are 55° full form whitworth.

Selection Procedure

Performance Curves are based on a 40°F approach temperature, a 2:1 oil to water ratio and an average oil viscosity of 100 SSU. Example: oil leaving cooler at 125°F with 85°F cooling water (125°F - 85°F = 40°F). The 2:1 oil to water ratio means that for every GPM of oil circulated, a minimum of 1/2 GPM of water must must be circulated to obtain the curve results.

Step 1 **Corrections for approach temperature and oil viscosity.**

$$HP_{Heat\ Removed}\ in\ Cooler\ = HP_{Actual} \times \left[\frac{40°F}{Oil\ out\ and\ °F - Water\ in\ °F}\right] \times Correction\ A$$

Step 2 **Oil Pressure Drop Coding:** ● = 5 PSI; ■ = 10 PSI. Curves having no pressure drop symbol indicate that the oil pressure drop is less than 5 PSI to the highest oil flow rate for that curve. Multiply curve oil pressure drop by Correction B.

Viscosity Corrections

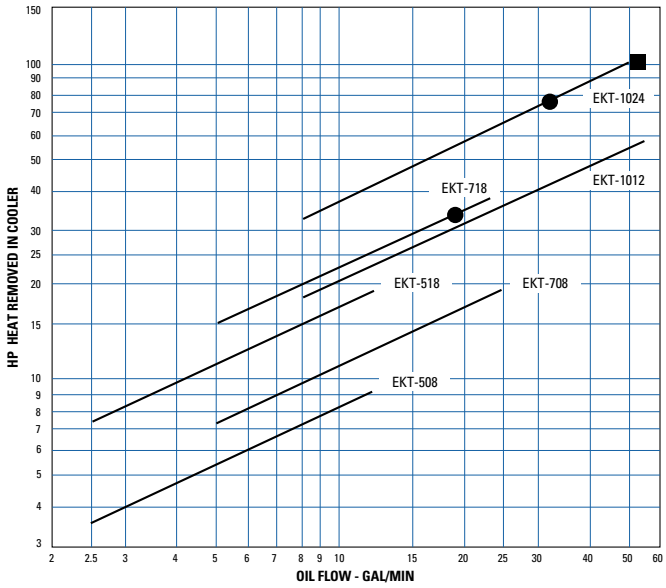
Average Oil SSU	A	B
50	0.84	0.6
100	1.0	1.0
200	1.14	2.0
300	1.24	3.1
400	1.31	4.1
500	1.37	5.1

Maximum Flow Rates

Unit Size	Shell Side GPM)	Tube Side(GPM)
500	20	6
700	60	12
1000	80	28

If maximum allowable flow rates are exceeded, premature failure may occur.

Performance Curves



AOL Series - Process Cooling

Thermal Transfer Products Process Coolers

Our Thermal Transfer Products brand offers a full line of process cooling heat exchangers.

Water-Cooled

Fixed bundle shell and tube

U-Tube Removable Bundle

Stainless Steel brazed plate

Large range of standard sizes

Air-Cooled

Copper-tube and fin

Brazed aluminum

Large range of standard sizes

Standard Product Options

Thermal Transfer process coolers are available with a wide variety of standard options to best suit each application.

Water-Cooled

Copper, copper-nickel, or stainless steel tubing

Nickel-braze plate coolers

Air-Cooled

AC, hydraulic, or air-motor fan drives

Copper tube aluminum fin

Brazed aluminum (P-BAR)

Heresite coating for offshore or corrosive environment operation

Customer Focused and Driven

All catalog product is available with short lead-times

Expert application engineers available to select and size the right product for your application

Custom designs are available

For application help and quoting, visit our Full TTP site or contact ttpsales@apiheattransfer.com.

BRAZED ALUMINUM CONSTRUCTION

HYDRAULIC OR COMPRESSOR OIL COOLING

Features

- **Large Oil Flow**
- **High Performance**
- **Industrial Duty**
- **Brazed Aluminum Bar and Plate Core**
- Compact all aluminum core assembly
- Ideal for converting water cooled equipment to air cooled
- Eliminates high water and sewer costs
- Eliminates corrosion problems associated with water cooled units
- Vertical air flow works well for heat recovery
- State-of-the-art heat transfer technology
- Hydraulic motors available
- Optional SAE Ports
- Marine corrosion control coatings available
- High performance air side fin design
- Detachable legs

Ratings

Maximum Operating Pressure
250 psi (17 BAR)

Maximum Operating Temperature
300° F (150° C)

Materials

Legs Steel with baked enamel finish

Shroud Steel

Standard Core Brazed Aluminum Bar and Plate
- Tanks – 5052 Aluminum
- Nose Bar & Little Bar – 3003-H Aluminum
- Air Fin, Plate, Turbulator & End Plate – 3003-O Aluminum

Fan Aluminum Hub, Plastic Blades

Motor TEFC

Fluid Compatability

Petroleum/mineral oils

Oil/water emulsion

Water/ethylene glycol

How to Order

AOL	–		–		–		–	

Model Series
AOL - Standard

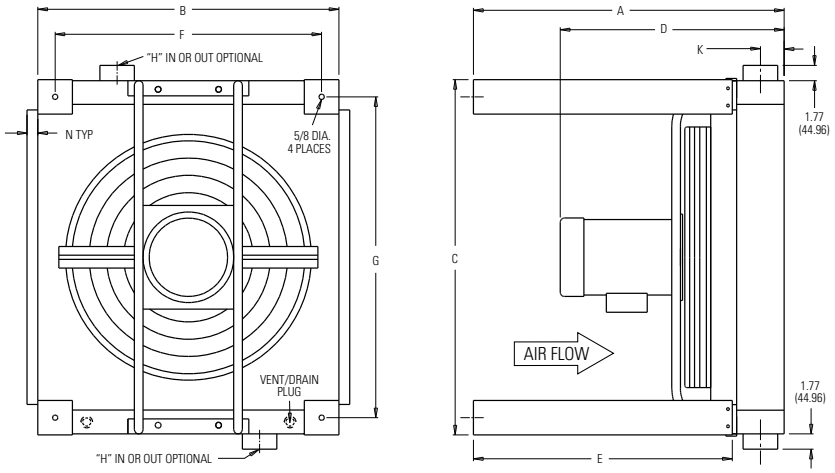
Model Size Selected
400
725
950
1200
1600
2000
2500
3000
3500

Connection Type
Blank - NPT
S - SAE

Specify Motor Required
0 - No Motor
2 - Single Phase
3 - Three Phase
6 - 575 Volt
9 - Hydraulic
18 - IEC Three Phase

Noise Level
Blank - Standard Noise Level
LN - Low Noise Level

Dimensions



Model	A	B	C	D Approx.	E	F	G	H NPT	H SAE	J	K	L	Net Weight Lbs.	Shipping Weight Lbs.
AOL-400	34.20 (868.68)	17.96 (456.18)	22.69 (576.33)	20.86 (529.84)	30.00 (762.00)	13.96 (354.58)	18.69 (474.73)	2.00	#32 SAE 2-1/2-12 UN-2B	5.93 (150.62)	1.85 (46.99)	1.25 (31.75)	109 (49.44)	148 (67.13)
AOL-725	34.20 (868.68)	22.37 (568.20)	30.57 (776.48)	20.86 (529.84)	30.00 (762.00)	18.37 (466.60)	26.57 (674.88)	2.00		5.88 (149.35)	1.85 (46.99)	1.25 (31.75)	151 (68.49)	170 (77.11)
AOL-950	36.01 (914.65)	26.78 (680.21)	37.25 (946.15)	23.62 (599.95)	30.00 (762.00)	22.78 (578.61)	33.25 (844.55)	2.00		6.82 (173.23)	2.76 (70.10)	1.25 (31.75)	221 (100.24)	300 (136.08)
AOL-1200	36.01 (914.65)	26.78 (680.21)	41.20 (1046.48)	25.51 (647.95)	30.00 (762.00)	22.78 (578.61)	37.20 (944.88)	2.00		6.00 (152.40)	2.76 (70.10)	1.25 (31.75)	296 (134.26)	430 (195.04)
AOL-1600	36.01 (914.65)	34.89 (886.21)	41.20 (1046.48)	27.51 (698.75)	30.00 (762.00)	30.89 (784.61)	37.20 (944.88)	2.50	2-1/2 SAE 4 Bolt FLG	8.00 (203.20)	2.76 (70.10)	1.25 (31.75)	355 (161.03)	515 (233.60)
AOL-2000	36.01 (914.65)	37.88 (962.15)	51.05 (1296.67)	26.25 (666.75)	30.00 (762.00)	33.88 (860.55)	47.05 (1195.07)	2.50		8.00 (203.20)	2.76 (70.10)	1.25 (31.75)	482 (218.63)	582 (263.99)
AOL-2500	36.01 (914.65)	43.70 (1109.98)	49.08 (1246.63)	28.51 (724.15)	30.00 (762.00)	39.70 (1008.38)	45.08 (1145.03)	3.00	3" SAE 4 Bolt FLG.	8.00 (203.20)	2.76 (70.10)	1.25 (31.75)	555 (251.74)	655 (297.10)
AOL-3000	36.01 (914.65)	52.52 (1334.01)	51.05 (1296.95)	30.51 (774.95)	30.00 (762.00)	48.52 (1232.41)	47.05 (1206.50)	3.00		8.00 (203.20)	2.76 (70.10)	1.25 (31.75)	724 (328.40)	825 (374.21)
AOL-3500	36.01 (914.65)	56.30 (1430.02)	51.05 (1296.95)	30.51 (774.95)	30.00 (762.00)	52.30 (13328.42	47.05 (1206.50)	3.00		8.00 (203.20)	2.76 (70.10)	1.25 (31.75)	760 (344.73)	860 (390.09)

Note: We reserve the right to make reasonable design changes without notice. All dimensions are in inches and (millimeters).

Selection Procedure

Performance Curves based on 100°F (55.56°C) E.T.D. or Entering Temperature Difference (E.T.D = Entering oil temperature minus ambient air temperature). SAE #10 oil @ 200°F (93.33°C).

Oil pressure drop coding:

- **X** = 5 PSI (.345 BAR)
- ● = 10 PSI (.689 BAR)
- ◆ = 15 PSI (1.03 BAR)
- ▲ = 20 PSI (1.38 BAR)
- ■ = 30 PSI (2.10 BAR)

E.T.D. temperature correction formula:

ENGLISH Version

$$HP_{Curve} = HP_{To\ Be\ Removed} \times \frac{100}{Desired\ E.T.D}$$

METRIC Version

$$\frac{KW}{°C} = \frac{Heatload\ (KW)}{Desired\ E.T.D.\ (°C)}$$

Conversion

$$Hp = \frac{KW}{°C} = X\ .745\ X\ E.T.D.\ (°F)$$

Notes

1. A three-way thermostatic valve is recommended to bypass the cold oil around the heat exchanger during start up.
2. Support piping as needed. Flexible connectors must be properly installed to validate warranty.
3. Coolers should not operate in ambient temperatures below 35°F (1°C). Consult factory for recommendations.
4. The fan cannot be cycled.
5. AOL coolers operated outdoors must be protected from weather. Consult factory for recommendations.
6. If duct work or additional static resistance is added to the cooler airstream, an auxiliary air mover may be required.
7. Can be mounted for horizontal air flow, with oil in at bottom port.

Maintenance

Periodic cleaning of the fins with compressed air is needed to remove the accumulation of dirt and dust. If the inside of the tubes need to be cleaned of oil and carbon, use a chlorinated solvent. Do not use strong solvents. Do not use acids or caustic cleaners.

Specifications

Electric Motor & Fan Data[1] (60 Hz Nema Frame)

Model	Fan CMM	Fan CFM	Motor H.P.	Voltage	Phase	Full Load Amps 230V	Frequency (Hz)	RPM	Nema Frame	Thermal Overload	Sound dB(A) at 3 ft.
AOL-400	62.30	2200	1.0	115/208-230	1	6.0	60[2]	3450	56C	No	97
	51.68/62.30	1825/2200	1.0	208-230/460[3]	3	3.6/3.2	50/60	2850/3450	56C	No	97
AOL-725	101.94	3600	1.5	115/208-230	1	8.5	60[2]	3450	56C	No	100
	84.95/102.94	3000/3600	1.5	208-230/460[4]	3	4.8/4.2	50/60	2850/3450	56C	No	100
AOL-950	133.09	4700	1.5	115/208-230	1	8.6	60[2]	1740	145TC	No	92
	133.09	4700	1.5	208-230/460	3	4.6	60[2]	1740	145TC	No	92
AOL-1200	198.22	7000	5.0	230	1	23.00	60[2]	1740	184TC	No	94
	198.22	7000	3.0	208-230/460	3	8.8	60[2]	1740	182TC	No	96
AOL-1600	223.70	7900	5.0	208-230/460	3	13.4	60[2]	1740	184TC	No	98
AOL-2000	311.49	14000	7.5	230/460	3	19.6	60[2]	1740	213TC	No	98
AOL-2500	396.44	14000	7.5	230/460	3	19.6	60[2]	1740	213TC	No	98
AOL-3000	495.54	17500	10.0	230/460	3	24.8	60[2]	1740	215TC	No	102
AOL-3500	495.54	17500	10.0	230/460	3	24.8	60[2]	1740	215TC	No	102

[1] Published electrical ratings are approximate, and may vary because of motor brand. Actual ratings are on motor nameplate.
[2] May also be operated at 50 hz. Consult factory for details.
[3] 50 Hz voltage: 190-200-208-220/380-400-415-440
[4] 50 Hz voltage: 190-208/380-415
All motors shown are TEFC—Other motor options available upon request.

Electric Motor Information (50 Hz IEC Frame)

Model	CMM	CFM	KW	Voltage	Phase	Frequency	RPM	Frame	Sound dB(A) at 1 meter
AOL-400	52.4	1850	.75	230/400/415	3	50 Hz	3000	80	81
AOL-725	85.0	3001	1.10	230/400/415	3	50 Hz	3000	80	80
AOL-950	108.2	3821	1.50	230/400/415	3	50 Hz	1500	90	78
AOL-1200	165.1	5834	2.20	230/400/415	3	50 Hz	1500	100	83
AOL-1600	186.4	6584	3.00	230/400/415	3	50 Hz	1500	100	85
AOL-2000	331.3	11700	4.00	230/400/415	3	50 Hz	1500	112	88
AOL-2500	331.3	11700	4.00	230/400/415	3	50 Hz	1500	112	88
AOL-3000	410.6	14500	7.50	230/400/415	3	50 Hz	1500	132	90
AOL-3500	410.6	14500	7.50	230/400/415	3	50 Hz	1500	132	90

All IEC frame motors have CE mark.
IEC motor voltages have +/- 10% tolerance.

Electric Motor Information (AOL-Low Noise)

Model	HP	Nema Frame	LN RPM	LN CFM	LN CMM	Voltage	Frequency (Hz)	Sound dB(A) at 3 ft.
AOL-400-1PH-LN	1	56C	1725	1100	31.15	115/230	60	72
AOL-400-3PH-LN	1	56C	1725	1100	31.15	230/460	60	72
AOL-725-1PH-LN	1.50	56C	1725	1780	50.40	115/230	60	82
AOL-725-3PH-LN	1.50	56C	1725	1780	50.40	230/460	60	82
AOL-950-3PH-LN	1.50	145TC	1160	3150	89.20	230/460	60	76
AOL-1200-3PH-LN	1.50	182TC	1160	4690	132.81	230/460	60	75
AOL-1600-3PH-LN	2	184TC	1160	6510	184.34	230/460	60	78
AOL-2000-3PH-LN	5	213TC	1160	8700	246.36	230/460	60	85
AOL-2500-3PH-LN	5	213TC	1160	11700	331.31	230/460	60	85
AOL-3000-3PH-LN	5	215TC	1160	13500	382.28	230/460	60	93
AOL-3500-3PH-LN*	10	256TCZ	1160	16200	458.73	230/460	60	91

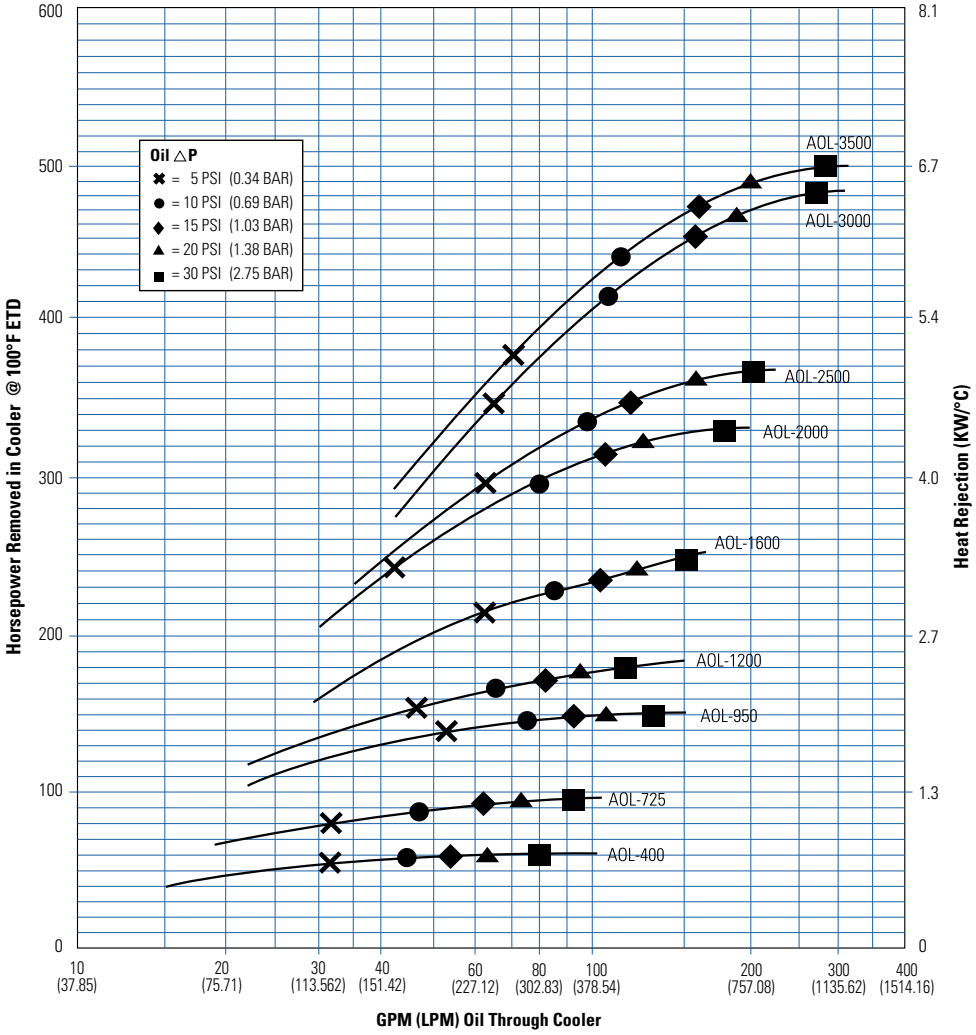
Available in 60 Hz Nema Frame only.

Hydraulic Motor Information

Model	Oil Flow Required GPM (LPM)	Min. Pressure Required PSI (BAR)	Motor IN^3/REV (CM^3/REV) Displacement	Sound dB(A) at 3 ft.
AOL-400	3.3 (12.49)	425 (29.31)	0.22 (3.6)	97
AOL-725	3.3 (12.49)	675 (46.54)	0.22 (3.6)	100
AOL-950	10.1 (38.23)	300 (20.68)	1.4 (22.94)	92
AOL-1200	10.1 (38.23)	725 (50.00)	1.4 (22.94)	94
AOL-1600	10.1 (38.23)	1100 (75.84)	1.4 (22.94)	98
AOL-2000	10.1 (38.23)	1650 (113.76)	1.4 (22.94)	98
AOL-2500	10.1 (38.23)	1650 (113.76)	1.4 (22.94)	98
AOL-3000	10.1 (38.23)	2000 (137.90)	1.4 (22.94)	102
AOL-3500	10.1 (38.23)	2000 (137.90)	1.4 (22.94)	102

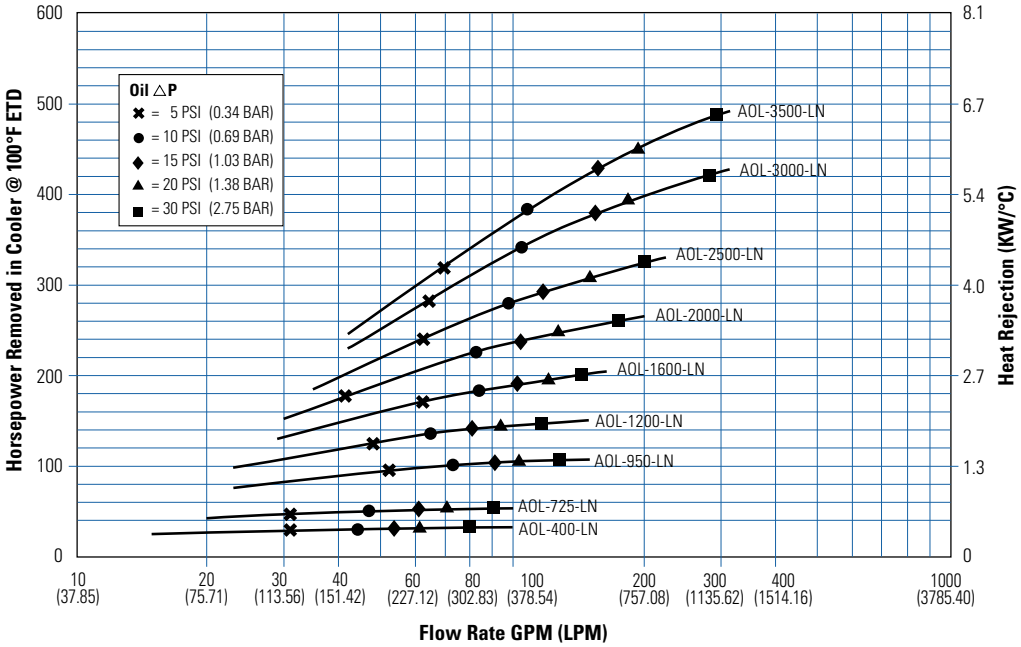
Notes: Maximum Pressure is 2000 psi. Stated Minimum Operating Pressure is at Inlet Port of Motor. 1000 psi Allowable Back Pressure.

Performance Curves



Note: Derate heat rejection values 15% if using 50Hz motors.

Low Noise Option



Available in 60 Hz Nema Frame only.

BOL Series - Process Cooling

Thermal Transfer Products Process Coolers

Our Thermal Transfer Products brand offers a full line of process cooling heat exchangers.

Water-Cooled

Fixed bundle shell and tube

U-Tube Removable Bundle

Stainless Steel brazed plate

Large range of standard sizes

Air-Cooled

Copper-tube and fin

Brazed aluminum

Large range of standard sizes

Standard Product Options

Thermal Transfer process coolers are available with a wide variety of standard options to best suit each application.

Water-Cooled

Copper, copper-nickel, or stainless steel tubing

Nickel-braze plate coolers

Air-Cooled

AC, hydraulic, or air-motor fan drives

Copper tube aluminum fin

Brazed aluminum (P-BAR)

Heresite coating for offshore or corrosive environment operation

Customer Focused and Driven

All catalog product is available with short lead-times

Expert application engineers available to select and size the right product for your application

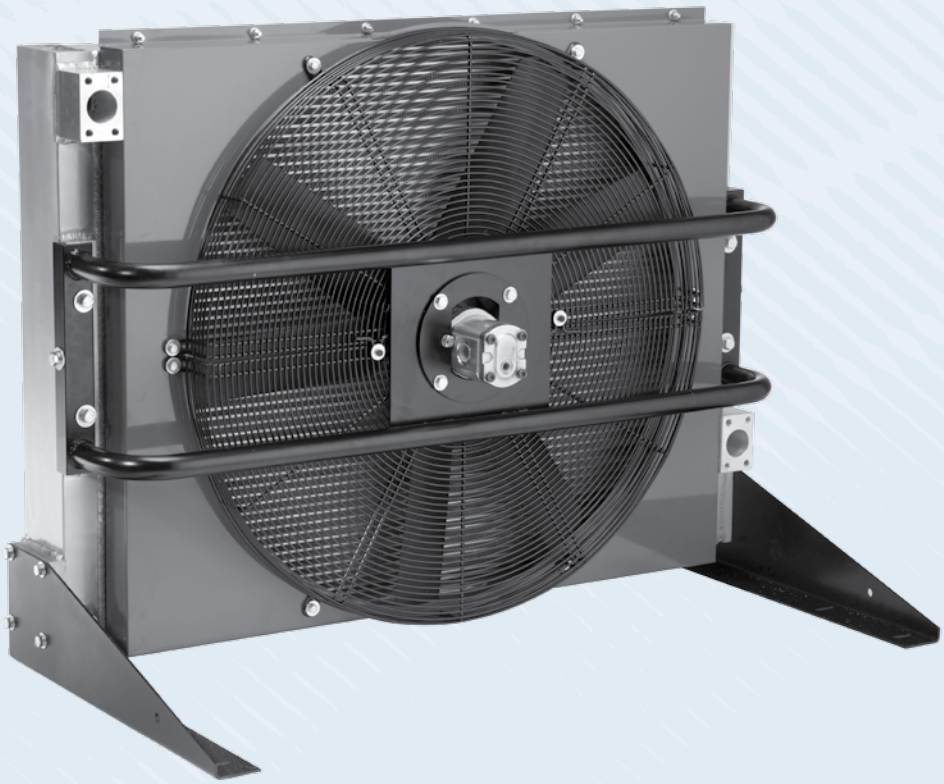
Custom designs are available

For application help and quoting, visit our Full TTP site or contact ttpsales@apiheattransfer.com.

BRAZED ALUMINUM CONSTRUCTION

Features

- **Bar and Plate Brazed Aluminum Core**
- **Rugged, lightweight, and compact**
- **Provides the best heat transfer per given envelope size while minimizing pressure drop**
- **Air-side fin design minimizes fouling and static pressure ensuring long-term, reliable performance**
- **Welded fittings/ports and manifolds ensure structural integrity**
- **Standard SAE ports – NPT and BSPP ports available**
- **Customized units are available to meet your specific performance requirements**
- T-BAR core optional for high viscosity oils or other highly fouling fluids. *See T-Bar Performance Curve
- Low Noise Option Available



Ratings

Maximum Operating Pressure
250 psi (17 BAR)

Maximum Operating Temperature
300° F (150° C)

Materials

Mounting Feet Steel

Standard Core Brazed Aluminum Bar and Plate
- Tanks – 5052 Aluminum
- Nose Bar & Little Bar – 3003-H Aluminum
- Air Fin, Plate, Turbulator & End Plate – 3003-O Aluminum

Fanguard Steel

Connectors Aluminum

Fan Aluminum Hub, Plastic Blades

Shroud Steel

Motor TEFC & IEC

Fluid Compatability

Petroleum/mineral oils

Oil/water emulsion

Water/ethylene glycol

How to Order

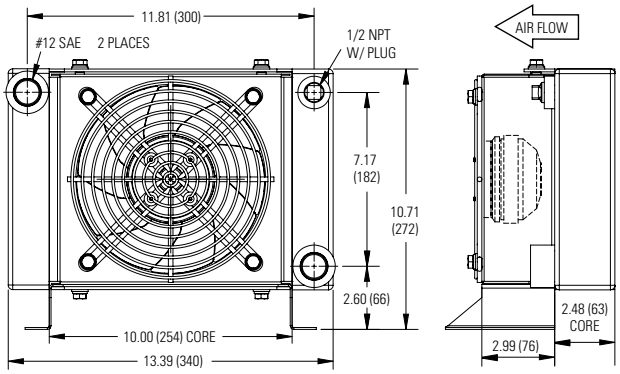
Model Series	**Model Size Selected**	**Connection Type***	**Specify Motor Required**	**Core**	**Noise Level**
BOL	**4** **8** **16** **30** **400** **725** **950** **1200** **1600** **2000**	**1** - NPT **2** - SAE **3** - BSPP	**2** - Single Phase **3** - Three Phase **6** - 575 Volt **9** - Hydraulic **18** - IEC Three Phase	**Blank** - Standard Bar & Plate **TB** - T-BAR Core*	**Blank** - Standard Noise Level **LN** - Low Noise Level

*T-BAR Core option provides a T-BAR core in BOL 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.

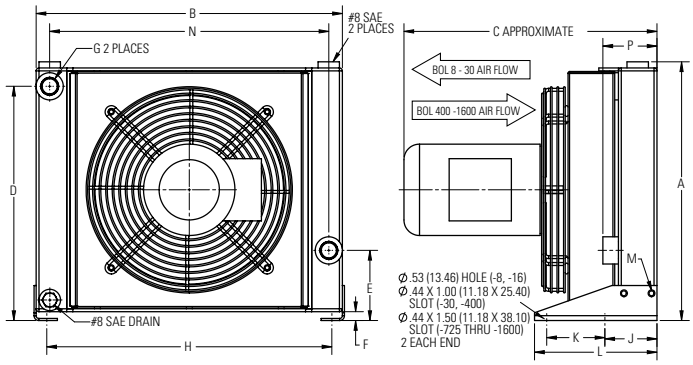
OPTIONAL T-BAR CORE SECTION CUTAWAY

Dimensions

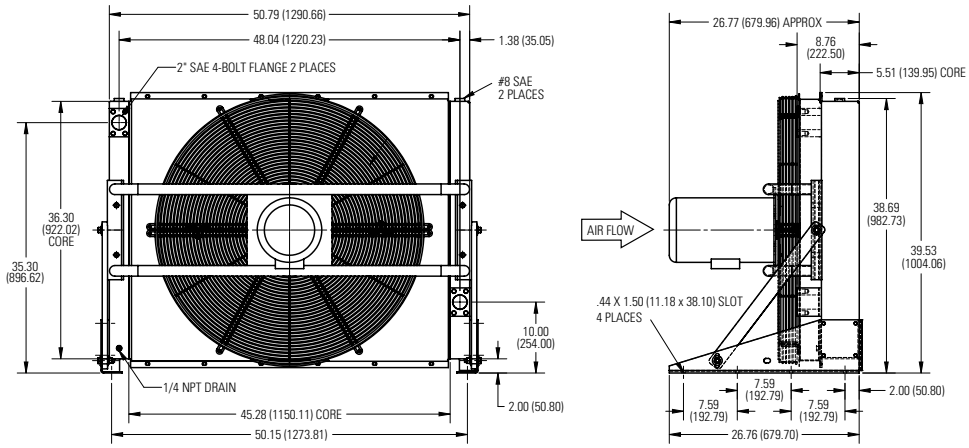
BOL-4



BOL-8 through BOL-1600



BOL-2000



Model	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Approx. Ship Wt. lbs (Kg)
BOL-4	See diagram above			—	—	—	—	—	—	—	—	—	—	—	18 (8.16)
BOL-8	12.93 (328.42)	15.75 (400.05)	14.72 (373.89)	11.30 (287.62)	3.27 (83.06)	.55 (13.97)	#12 SAE	14.53 (369.06)	3.07 (77.98)	3.75 (88.90)	7.36 (186.94)	M8 Bolt (2PL)	14.01 (355.85)	3.48 (88.40)	45 (20.4)
BOL-16	16.63 (422.40)	19.69 (500.13)	16.16 (410.46)	15.06 (382.52)	4.51 (114.56)	.57 (14.48)	#12 SAE	18.30 (464.82)	3.35 (85.09)	3.74 (95.00)	7.87 (199.90)	M8 Bolt (2PL)	17.95 (455.93)	3.46 (87.88)	55 (24.94)
BOL-30	21.09 (535.68)	26.38 (670.06)	18.23 (463.04)	19.49 (495.05)	5.26 (133.60)	1.32 (33.53)	#20 SAE	24.74 (628.40)	4.25 (107.95)	5.00 (127.00)	10.00 (254.00)	M10 Bolt (4PL)	24.34 (618.24)	5.28 (134.11)	125 (56.70)
BOL-400	19.20 (487.68)	22.45 (570.23)	18.80 (477.52)	17.31 (439.67)	6.50 (165.10)	2.00 (50.80)	#20 SAE	22.30 (566.42)	4.25 (107.95)	5.00 (127.00)	10.00 (254.00)	M10 Bolt (4PL)	20.08 (510.03)	5.20 (132.08)	148 (67.13)
BOL-725	23.49 (596.65)	30.32 (770.13)	18.60 (472.44)	21.60 (548.64)	6.50 (165.10)	2.00 (50.80)	#20 SAE	30.17 (766.32)	4.25 (107.95)	5.00 (127.00)	10.00 (254.00)	M10 Bolt (4PL)	27.95 (709.93)	5.20 (132.08)	170 (77.11)
BOL-950	27.94 (709.68)	37.03 (940.56)	22.69 (576.33)	24.55 (623.57)	9.50 (241.30)	2.00 (50.80)	2" SAE 4-Bolt Flange	35.89 (911.61)	6.05 (153.67)	9.20 (233.68)	16.00 (406.40)	M10 Bolt (4PL)	34.26 (870.20)	7.01 (178.05)	300 (136.08)
BOL-1200	27.94 (709.68)	40.96 (1040.38)	24.07 (611.38)	24.55 (623.57)	5.50 (139.70)	2.00 (50.80)		40.31 (1023.87)	6.05 (153.67)	9.20 (233.68)	16.00 (406.40)	M10 Bolt (4PL)	38.19 (970.03)	7.01 (178.05)	430 (195.04)
BOL-1600	36.01 (914.65)	40.96 (1040.38)	25.45 (646.43)	32.62 (828.55)	9.50 (241.30)	2.00 (50.80)		40.31 (1023.87)	6.05 (153.67)	9.20 (233.68)	16.00 (406.40)	M10 Bolt (4PL)	38.19 (970.03)	7.01 (178.05)	515 (233.60)
BOL-2000	See diagram above			—	—	—	—	—	—	—	—	—	—	—	582 (264.00)

Note: We reserve the right to make reasonable design changes without notice. All dimensions are in inches and (millimeters).

Specifications

Electric Motor Information (60 Hz Nema Frame)

Model	CMM	CFM	Motor HP	Voltage	Phase	Full Load Amps 230V	Frequency	RPM	Frame	Thermal Overload	Sound dB(A) at 3ft
BOL-4	31.14	1203	1/4	230	1	—	60 Hz	2850	—	—	73
BOL-8	22.65	800	1/3	115/230	1	3.0	60 Hz	3450	48C	No	80
BOL-8	22.65	800	1/3	208-230/460	3	1.4	60 Hz	3450	48C	No	80
BOL-16	40.35	1425	1/2	115/230	1	3.7	60 Hz	3450	48C	No	85
BOL-16	40.35	1425	1/2	208-230/460	3	2.2	60 Hz	3450	48C	No	85
BOL-30	62.29	2200	1/2	115/230	1	3.7	60 Hz	1725	56C	No	85
BOL-30	62.29	2200	1/2	208-230/460	3	2.0	60 Hz	1725	56C	No	85
BOL-400	62.29	2200	1	115/230	1	6.0	60 Hz	3450	56C	No	97
BOL-400	62.29	2200	1	208-230/460	3	3.2	60 Hz	3450	56C	No	97
BOL-725	101.94	3600	1-1/2	115/230	1	8.5	60 Hz	3450	56C	No	100
BOL-725	101.94	3600	1-1/2	208-230/460	3	4.8	60 Hz	3450	56C	No	100
BOL-950	133.10	4700	1-1/2	115/230	1	8.6	60 Hz	1725	145TC	No	92
BOL-950	133.10	4700	1-1/2	208-230/460	3	4.6	60 Hz	1725	145TC	No	92
BOL-1200	198.22	7000	3	208-230/460	3	8.8	60 Hz	1725	182TC	No	94
BOL-1600	223.75	7900	5	208-230/460	3	13.4	60 Hz	1725	184TC	No	96
BOL-2000	396.44	14000	7.5	230/460	3	24.8	60 Hz	1725	213TC	No	98

Electric Motor Information (50 Hz IEC Frame)

Model	CMM	CFM	KW	Voltage	Phase	Frequency	RPM	Frame	Sound dB(A) at 3ft
BOL-4	28.4	1003	.20	230	1	50 Hz	3000	—	73
BOL-8	18.9	667	.25	230/400/415	3	50 Hz	3000	63	71
BOL-16	33.7	1188	.37	230/400/415	3	50 Hz	3000	71	77
BOL-30	52.4	1850	.37	230/400/415	3	50 Hz	1500	71	73
BOL-400	52.4	1850	.75	230/400/415	3	50 Hz	3000	80	81
BOL-725	85.0	3000	1.10	230/400/415	3	50 Hz	3000	80	80
BOL-950	108.2	3821	1.50	230/400/415	3	50 Hz	1500	90	78
BOL-1200	165.1	5834	2.20	230/400/415	3	50 Hz	1500	100	83
BOL-1600	186.4	6584	3.00	230/400/415	3	50 Hz	1500	100	85
BOL-2000	331.3	11700	4.00	230/400/415	3	50 Hz	1500	112	88

All IEC frame motors have CE mark.
IEC motor voltages have +/- 10% tolerance.

Hydraulic Motor Information

Model	Oil Flow Required GPM (LPM)	Min. Pressure Required PSI (BAR)	Motor IN^3/REV (CM^3/REV) Displacement	Sound dB(A) at 3 ft.
BOL-4	3.3 (12.49)	400 (27.58)	0.22 (3.6)	80
BOL-8	3.3 (12.49)	400 (27.58)	0.22 (3.6)	80
BOL-16	3.3 (12.49)	500 (34.47)	0.22 (3.6)	85
BOL-30	3.4 (12.87)	500 (34.47)	0.45 (7.3)	85
BOL-400	3.3 (12.49)	425 (29.30)	0.22 (3.6)	97

Model	Oil Flow Required GPM (LPM)	Min. Pressure Required PSI (BAR)	Motor IN^3/REV (CM^3/REV) Displacement	Sound dB(A) at 3 ft.
BOL-725	3.3 (12.49)	675 (46.50)	0.22 (3.6)	100
BOL-950	10.1 (38.23)	300 (20.70)	1.4 (22.9)	92
BOL-1200	10.1 (38.23)	725 (50.00)	1.4 (22.9)	94
BOL-1600	10.1 (38.23)	1100 (75.80)	1.4 (22.9)	96
BOL-2000	10.1 (38.23)	1650 (113.76)	1.4 (22.9)	98

Notes: Maximum Pressure is 2000 psi. Stated Minimum Operating Pressure is at Inlet Port of Motor. 1000 psi Allowable Back Pressure.

Selection Procedure

Step 1 **Determine Heat Load.** Typical Rule of Thumb, -size cooler for 1/3 of the input horsepower. Heat load may be expressed as either Horsepower or BTU/Hr or KW/°C.

HP=BTU/HR ÷ 2545

BTU/HR=HP x 2545

$$\text{BTU/HR} = \frac{\text{KW}}{\text{°C}} \times 1894.61 \times \text{E.T.D.(°F)}$$

Step 2 **Determine Entering Temperature Difference.** (Actual E.T.D.)

$$\text{E.T.D.} = \text{Entering oil temperature} - \text{Entering Ambient air temperature}$$

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 **Determine the Corrected Heat Dissipation to use the Curves**

ENGLISH Version

$$\text{Corrected Heat Rejection} = \text{(BTU/Hr) Heat Load} \times \frac{100°\text{F}}{\text{Desired E.T.D.}}$$

(BTU/HR) to use with selection chart

METRIC Version

$$\text{Corrected Heat Rejection} \quad \frac{\text{KW}}{\text{°C}} = \frac{\text{Heatload (kw)}}{\text{Desired E.T.D. (°C)}}$$

Step 4 **Select Model From Curves** Enter the Performance Curves at the bottom with the GPM 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.

Step 5 **Calculate Oil Pressure Drop** Find the oil pressure drop correction factor and multiply it by the Oil Pressure Drop found on performance curve.

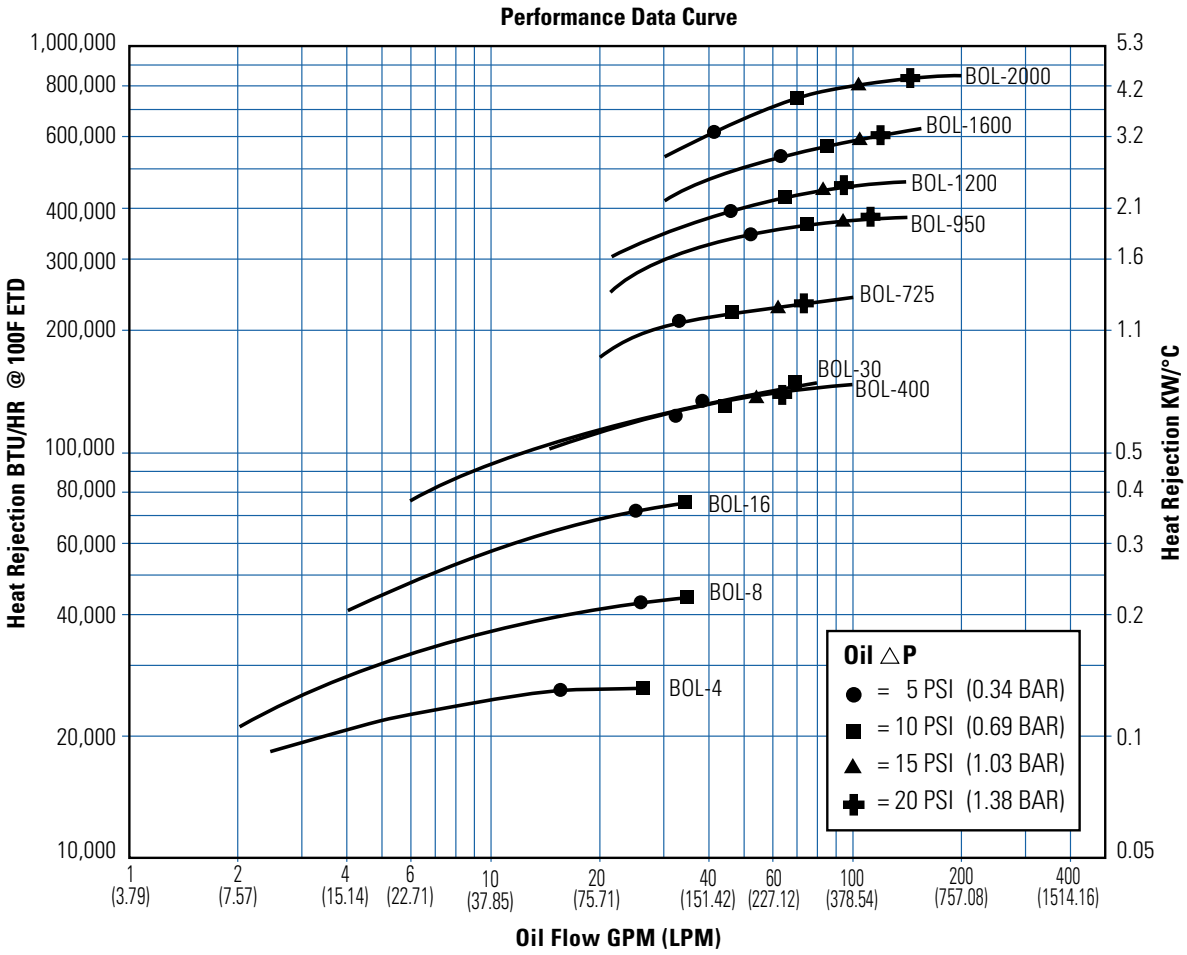
Listed Performance Curves are based on:

- 50 SSU (11 cSt) oil
- 100° F (55.56° C) Entering Temperature Difference (E.T.D.)

If your application conditions are different, then continue with the selection procedure.

Performance Curves

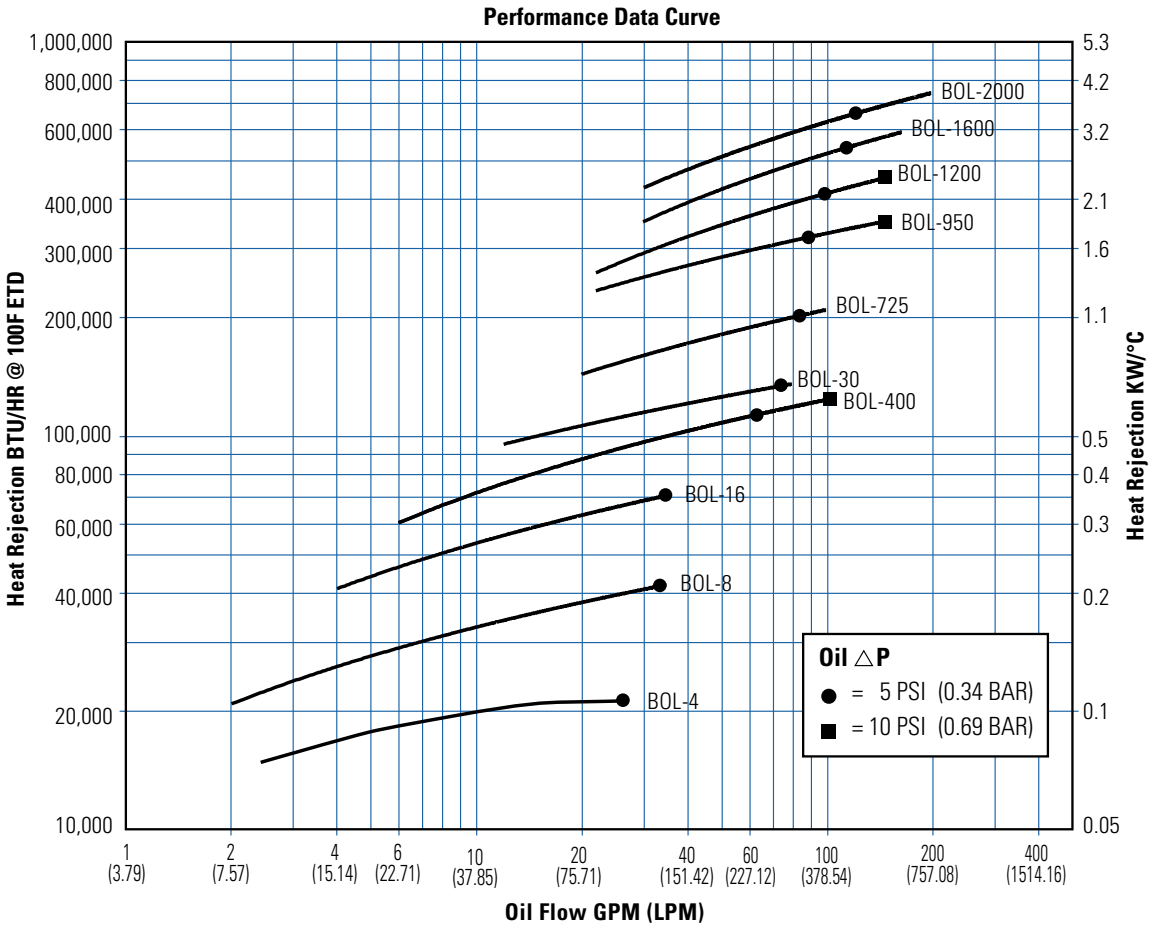
BOL Models with Standard P-BAR Core



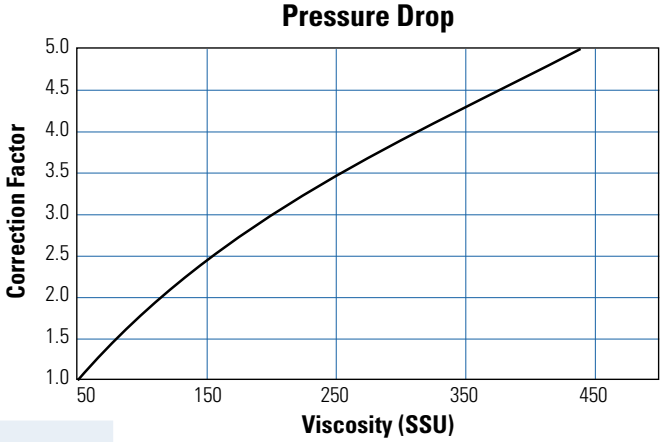
Note: Derate heat rejection values 15% if using 50Hz motors.

Performance Curves

BOL Models with Optional T-BAR Core



Note: Derate heat rejection values 15% if using 50Hz motors.



Oil Temperature

Typical operating temperature ranges are:

Hydraulic Motor Oil	120°F - 180°F (49°C - 82.2°C)
Hydrostatic Drive Oil	160°F - 180°F (71°C - 82.2°C)
Engine Lube Oil	180°F - 200°F (82.2°C - 93.3°C)
Automatic Transmission Fluid	200°F - 300°F (93.3°C - 149°C)

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 = (BTU's/Hr.) / (GPM Oil Flow x 210).

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

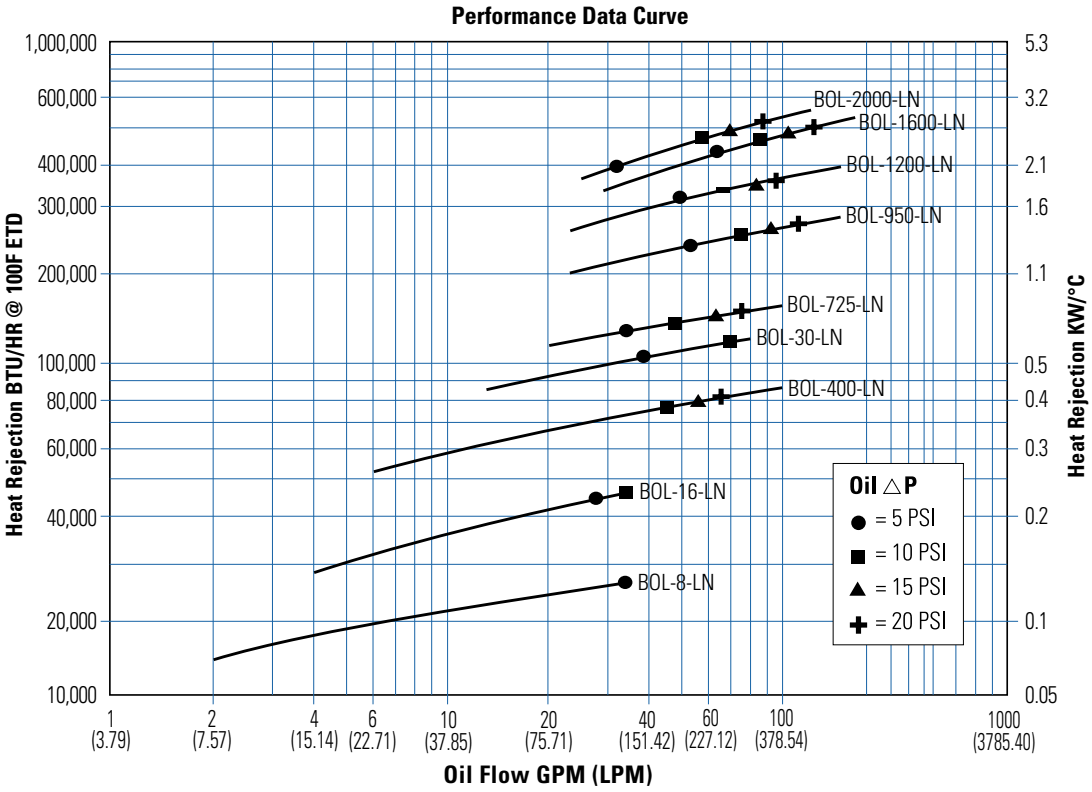
Oil Entering Temp. = Oil Leaving Temp + Oil △T.

Oil Pressure Drop: Most systems can tolerate a pressure drop through the heat exchanger of 20 to 30 PSI. Excessive pressure drop should be avoided. Care should be taken to limit pressure drop to 5 PSI or less for case drain applications where high back pressure may damage the pump shaft seals.

Performance Curves

BOL Models with Low-Noise Option

The low noise option offers the BOL models with a reduced motor speed.
This allows a lower sound level output for noise-sensitive applications.



Available on 60 Hz Nema frame only.

Electric Motor Information

Model	HP	Frame	Low Noise RPM	Low Noise CFM	Low Noise CMM	Voltage	Frequency (HZ)
8-1PH	0.33	48	1725	400	11.33	115/230	60
8-3PH	0.33	48	1725	400	11.33	208-230/460	60
16-1PH	0.50	48	1725	704	19.93	115/230	60
16-3PH	0.50	48	1725	704	19.93	208-230/460	60
30-1PH	0.50	56C	1160	1470	41.62	115/230	60
30-3PH	0.50	56C	1160	1470	41.62	208-230/460	60
400-1PH	1.00	56C	1725	1100	31.19	115/230	60
400-3PH	1.00	56C	1725	1100	31.19	208-230/460	60
725-1PH	1.50	56C	1725	1780	50.40	115/230	60
725-3PH	1.50	56C	1725	1780	50.40	208-230/460	60
950-1PH	1.50	145TC	1160	3150	89.19	115/230	60
950-3PH	1.50	145TC	1160	3150	89.19	208-230/460	60
1200-3PH	1.50	182TC	1160	4690	132.81	208-230/460	60
1600-3PH	2.00	184TC	1160	6510	184.34	208-230/460	60
2000-3PH	5.00	213TC	1160	8700	000.00	230/460	60

Sound Data

Model	DBA at 3 ft
BOL-8-LN	62
BOL-16-LN	69
BOL-30-LN	67
BOL-400-LN	72
BOL-725-LN	82
BOL-950-LN	76
BOL-1200-LN	75
BOL-1600-LN	78
BOL-2000-LN	85

AB Series - Hydraulic Cooling

Industrial Hydraulic Oil Coolers

Thermal Transfer Products offers a full line of standard catalog hydraulic oil coolers for all industrial machine hydraulics for system cooling.

Air to Oil Cooling

Up to +500 HP of heat removal from hydraulic oil

Round tube copper, brass or steel

Brazed aluminum plate & bar (P-BAR™)

Extruded aluminum tube (T-BAR™)

Aluminum/steel fin construction

All aluminum brazed

Water to Oil Cooling

Steel, copper, copper/nickel, or stainless steel construction

Brazed plate construction

Internal fins

Diameters up to 10 inches

Lengths up to 12 feet

Product Options

Thermal Transfer industrial hydraulic oil coolers are available with a host of options to meet the demands of your application.

Brass construction

Steel construction

Internal finned construction

Brazed plate construction

Internal bypass

Seawater service

Applications

Our hydraulic oil coolers are used worldwide in a broad range of industrial applications, including:

Hydraulic presses

Plastic injection molding

Lube oil coolers

Extrusion machinery

Gear boxes

Hydraulic power units

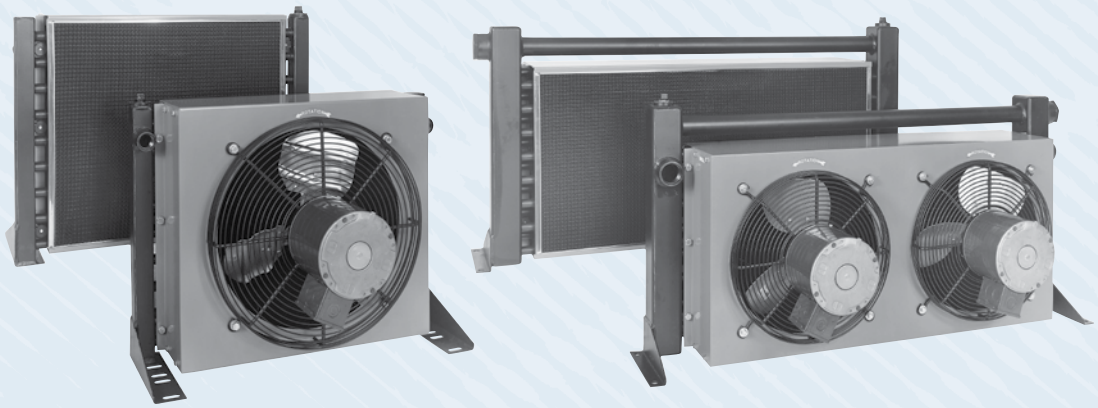
And more.

For application help and quoting, visit our Full TTP site or contact ttpsales@apiheattransfer.com.

FEATURES

- **AC Motors**
- **Core Filter**
- **3/4" Tubes**
- **Low Cost**
- **Industrial Duty**
- **Quiet Operation**
- For Low Flow Rates
- Oil Flows to 150 GPM
- Mounting Brackets Included
- SAE Connections
- Single or Three-Phase 60/50 Hz Motors
- Filter Standard

OPTIONS
Built-in Serviceable Bypass Valve;
NPT or BSPP Oil Connections



Ratings

Operating Pressure - 300 psi

Test Pressure - 300 psi

Operating Temperature - 350° F

Materials

Tubes Copper

Fins Aluminum

Turbulators Aluminum

Fan Blade Aluminum with steel hub

Fan Guard Steel with black baked enamel finish

Cabinet Steel with baked enamel finish

Manifolds Copper: Model AOC-08
Steel: Models AOC-19 – AOC-70

Connections Brass: Model AOC-08
Steel: Models AOC-19 – AOC-70

Nameplate Aluminum

Filter Stainless frame with washable media

Relief Bypass Valve Option

MODEL	DESCRIPTION
AOC-08	Available in one pass (30 and 60 psi), two pass (60 psi), designs only. Valves are built into tubes and do not affect external dimensions. All steel valves. Non-serviceable.
AOC-19 thru AOC-33	Available in 30 psi or 60 psi settings. 3/4", external, all steel valve. May be removed for servicing.
AOC-37 Thru AOC-70	Available in 30 psi or 60 psi settings. 1-1/2", external, all steel valve. May be removed for servicing.

How to Order (AOC-08 models only)

AOC	–	0	8	–			–		–	
Model Series		Model Size Selected			Number of Passes	Connection Type		Relief Bypass*		Specify Motor Required

Model Series
AOC - Standard

Model Size Selected

Number of Passes
1 - One Pass
2 - Two Pass
4 - Four Pass

Connection Type
1 - NPT
2 - SAE
3 - BSPP

Relief Bypass*
Blank - No Bypass
30 - 30 psi
60 - 60 psi

Specify Motor Required
115/230V Single Phase
No Motor

*Bypass not available in Four Pass

How to Order (Models AOC-19 through AOC-70)

AOC	–			–		–		–	
Model Series		Model Size Selected			Connection Type		Relief Bypass		Specify Motor Required

Model Series
AOC - Standard

Model Size Selected

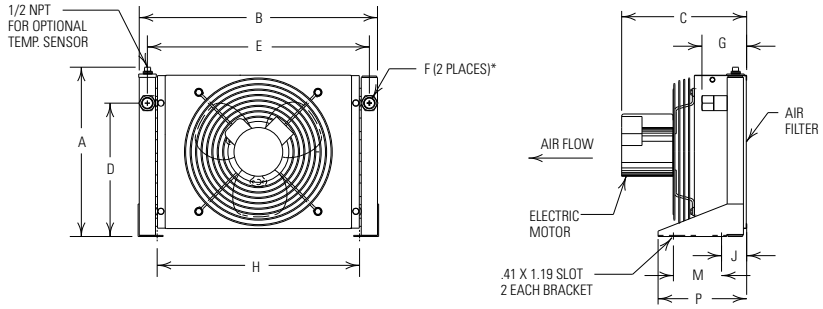
Connection Type
1 - NPT
2 - SAE
3 - BSPP

Relief Bypass
Blank - No Bypass
30 - 30 psi
60 - 60 psi

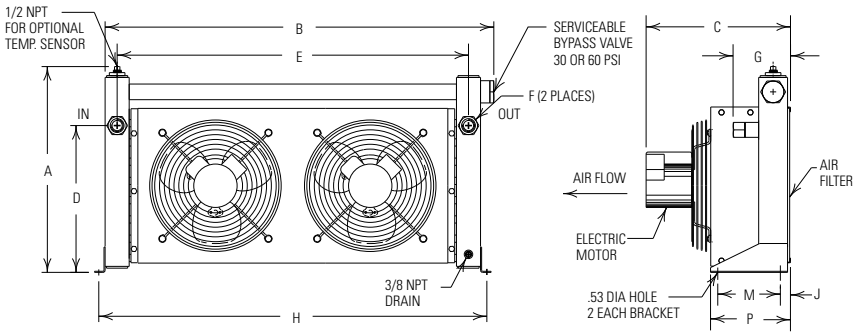
Specify Motor Required
115/230V Single Phase
208-230/460V Three Phase
575 Volt
No Motor

Dimensions

Models AOC-19 Through AOC-33



Models AOC-37 Through AOC-70



Model	A		B		C	D	E	F		G		H	J	M	P	LBS	60 Hz CFM
	No Bypass	Bypass	No Bypass	Bypass				SAE	NPT & BSPP	SAE	NPT & BSPP						
AOC-19	13.62	16.00	16.50	18.16	13.08	10.31	15.00	#12	.75	3.05	4.12	13.96	2.61	5.00	8.18	19	750
AOC-22	15.62	18.00	22.00	23.66	12.19	12.31	20.50					19.46				33	1150
AOC-24	19.62	22.00	24.75	26.41	13.19	16.31	23.25					22.21				46	1900
AOC-33	25.62	28.00	30.25	31.91		22.31	28.75	#16	1.00		4.34	27.71				65	2150
AOC-37	18.50	21.38	39.00	40.38	15.66	15.25	36.50	#20	1.25	4.62	5.97	40.50	1.06	6.50	8.31	95	2150
AOC-50	22.50	25.38	41.00	42.38	15.62	19.25	38.50			4.68	6.03	42.50	1.12		8.37	120	3200
AOC-54	30.50	33.28	42.00	43.38	17.09	27.25	39.50	#24	1.50	4.89	6.30	43.76	1.87	9.00	12.37	154	3800
AOC-57	36.50	39.38	48.00	49.38	16.72	32.75	45.50	#32	2.00	6.68	8.15	49.76				190	4200
AOC-70	38.38	41.25	51.00	52.38	22.62	34.00	48.50			8.44	9.91	52.75	1.62		12.12	322	7500

NOTE: All dimensions in inches. We reserve the right to make reasonable design changes without notice.
**Inlet and outlet oil ports reversible if relief bypass option is not used.*

Specifications

Electric Motor Data

MODEL	MOTOR POWER	# OF MOTORS	FRAME SIZE	SINGLE PHASE	THREE PHASE	575 VOLT	RPM	TYPE	B-BALL S-SLEEVE	THERMAL OVERLOAD	dB(A) 3 FT.
AOC-19 thru AOC-33	1/4	1	Custom	115/230V/60/50Hz 3.2/1.6 Amps Full Load 60 Hz 2.8/1.4 Amps Full Load 50 Hz	208-230/460V/60 Hz 190/380-415V/50 Hz 1.3/.65 Amps Full Load 60 Hz 1.1/.55 Amps Full Load 50 Hz	575/500V/60/50Hz .65 Amps Full Load 60 Hz .60 Amps Full Load 50 Hz	1700 (60 Hz) 1350 (50 Hz)	TEAO	B	YES	80
AOC-37 thru AOC-57		2									84
AOC-70	1		56C	115/208-230V/60 Hz 12.8/6.4 Amps Full Load	208-230/460V/60 Hz 190/380-415V/50 Hz 3.4/1.7 Amps Full Load 60 Hz 3.6/1.9 Amps Full Load 50 Hz	575/500V/60/50Hz 1.5 Amps Full Load 60 Hz 1.4 Amps Full Load 50 Hz	1725 (60 Hz) 1425 (50 Hz)	TEFC	B	NO	90

NOTE: Amp ratings are per motor.

Selection Procedure

Performance Curves are based on 50SSU oil leaving the cooler 40°F higher than the ambient air temperature used for cooling.This is also referred to as a 40°F approach temperature.

STEP 1 **Determine the Heat Load.**This will vary with different systems, but typically coolers are sized to remove 25 to 50% of the input nameplate horsepower.
(Example: 100 HP Power Unit x .33 = 33 HP Heat load.)
If BTU/Hr. is known: $HP = \frac{BTU/Hr}{2545}$

STEP 2 **Determine Approach Temperature.** Desired oil leaving cooler °F – Ambient air temp. °F = Actual Approach

STEP 3 **Determine Curve Horsepower Heat Load.** Enter the information from above:
Horsepower heat load x $\frac{40 \times Cv}{\text{Actual Approach}}$ = Curve Horsepower

STEP 4 **Enter curves** at oil flow through cooler and curve horsepower. Any curve above the intersecting point will work.

STEP 5 **Determine Oil Pressure Drop from Curves:**
● = 5 PSI; ■ = 10 PSI; ▲ = 20 PSI; ✛ = 40 PSI. Multiply pressure drop from curve by correction factor found in oil △P correction curve.

Desired Reservoir Temperature

Return Line Cooling: Desired temperature is the oil temperature leaving the cooler. This will be the same temperature that will be found in the reservoir.

Off-Line Recirculation Cooling Loop: Desired temperature is the oil temperature entering the cooler. In this case, the oil temperature change must be determined so that the actual oil leaving temperature can be found. Calculate the oil temperature change (oil △T) with this formula:
Oil △T = (BTU's/Hr.) / (GPM Oil Flow x 210).
To calculate the oil leaving temperature from the cooler, use this formula:
Oil Leaving Temp. = Oil Entering Temp – Oil △T.
This formula may also be used in any application where the only temperature available is the entering oil temperature.

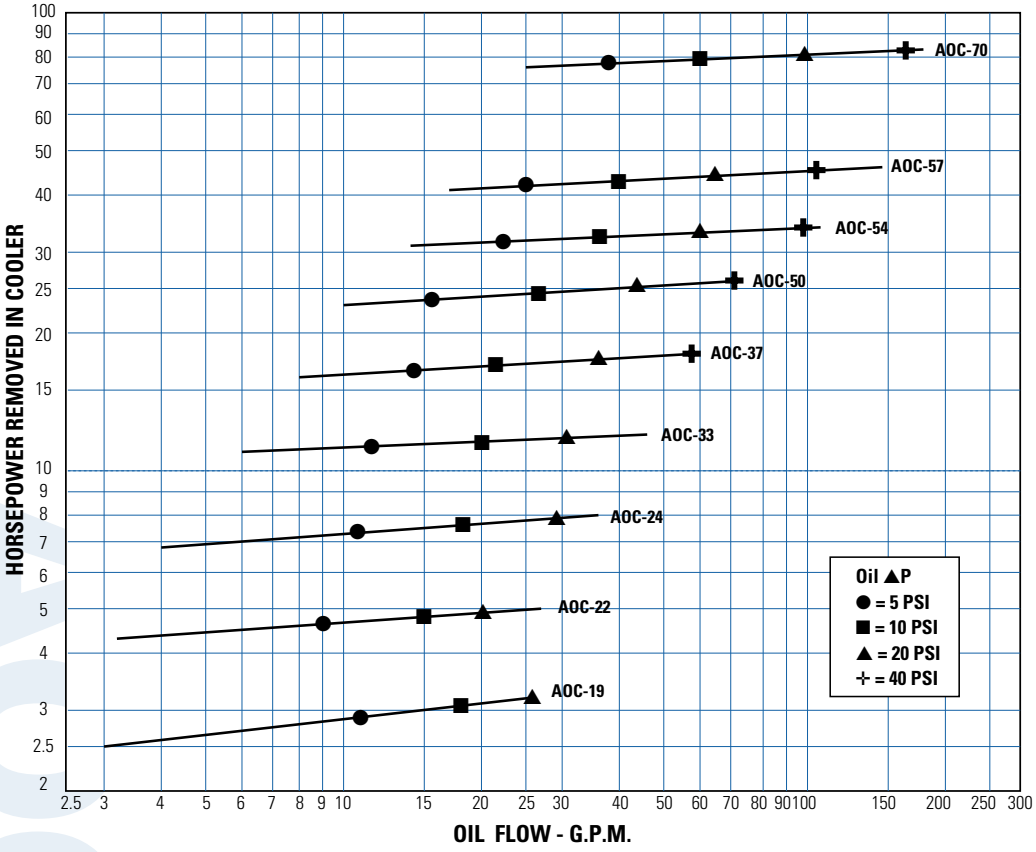
Oil Pressure Drop: Most systems can tolerate a pressure drop through the heat exchanger of 20 to 30 PSI. Excessive pressure drop should be avoided. Care should be taken to limit pressure drop to 5 PSI or less for case drain applications where high back pressure may damage the pump shaft seals.

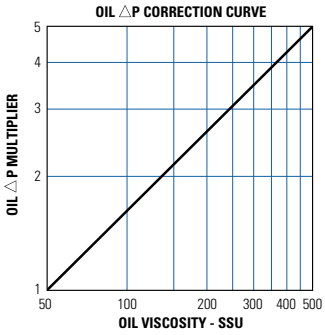
Oil Temperature

Typical operating temperature ranges are:

Hydraulic Motor Oil	110° - 130°F
Hydrostatic Drive Oil	130° - 180°F
Bearing Lube Oil	120° - 160°F
Lube Oil Circuits	110° - 130°F

Performance Curves





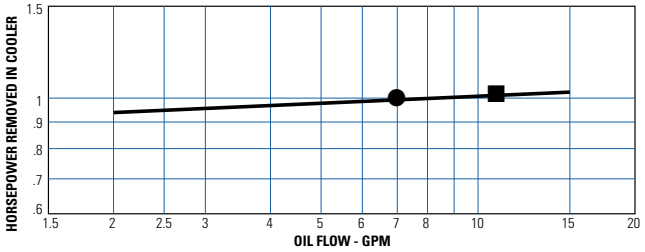
De-rate cooler performance by 10% when used in 50Hz service.

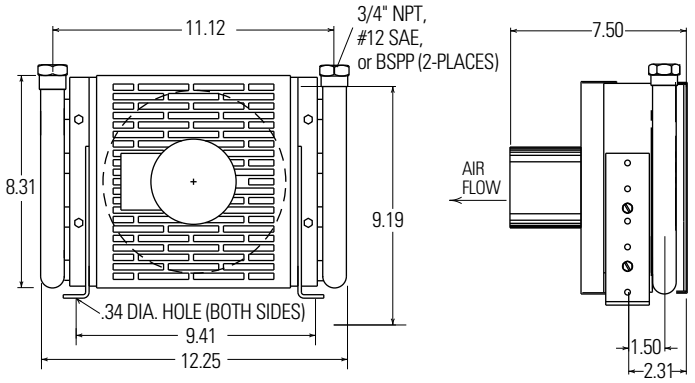
C_V Viscosity Correction

Average Oil Temp °F	OIL SAE 5 110 SSU at 100°F 40 SSU at 210°F	SAE 10 150 SSU at 100°F 43 SSU at 210°F	SAE 20 275 SSU at 100°F 50 SSU at 210°F	SAE 30 500 SSU at 100°F 65 SSU at 210°F	SAE 40 750 SSU at 100°F 75 SSU at 210°F
100	1.14	1.22	1.35	1.58	1.77
150	1.01	1.05	1.11	1.21	1.31
200	.99	1.00	1.01	1.08	1.10
250	.95	.98	.99	1.00	1.00

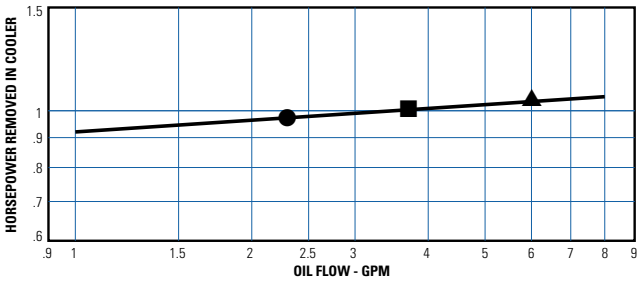
AOC-08 Model Only

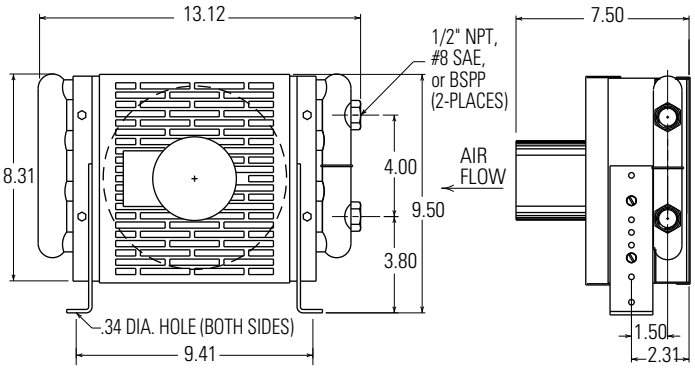
One Pass



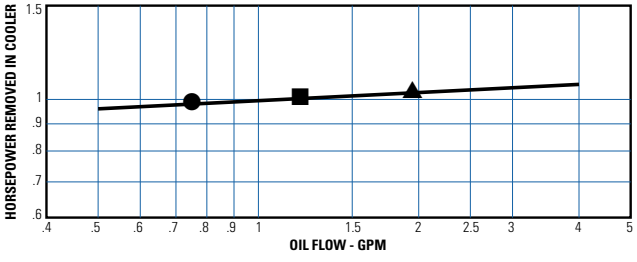


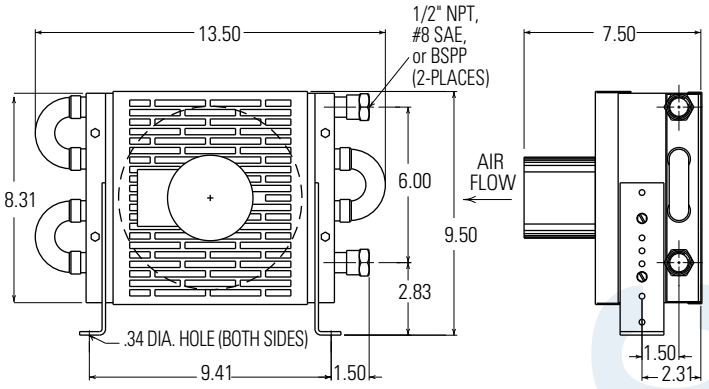
Two Pass





Four Pass





Specifications

Electric Motor Data

Model	MOTOR POWER	115/230 VOLT	50/60 Hz	TYPE	RPM	BEARINGS B-BALL S-SLEEVE	THERMAL OVERLOAD	SHIPPING WEIGHT (lbs.)	dB(A) 3 FT.	CFM
AOC-08	1/30	115 VOLT 230 VOLT	1.1 Amps Full Load .7 Amps Full Load	TEAO	3000	S	YES	12	70	208

C/UC/UCV Series

Industrial Hydraulic Oil Coolers

Thermal Transfer Products offers a full line of standard catalog hydraulic oil coolers for all industrial machine hydraulics for system cooling.

Air to Oil Cooling

Up to +500 HP of heat removal from hydraulic oil

Round tube copper, brass or steel

Brazed aluminum plate & bar (P-BAR™)

Extruded aluminum tube (T-BAR™)

Aluminum/steel fin construction

All aluminum brazed

Water to Oil Cooling

Steel, copper, copper/nickel, or stainless steel construction

Brazed plate construction

Internal fins

Diameters up to 10 inches

Lengths up to 12 feet

Product Options

Thermal Transfer industrial hydraulic oil coolers are available with a host of options to meet the demands of your application.

Brass construction

Steel construction

Internal finned construction

Brazed plate construction

Internal bypass

Seawater service

Applications

Our hydraulic oil coolers are used worldwide in a broad range of industrial applications, including:

Hydraulic presses

Plastic injection molding

Lube oil coolers

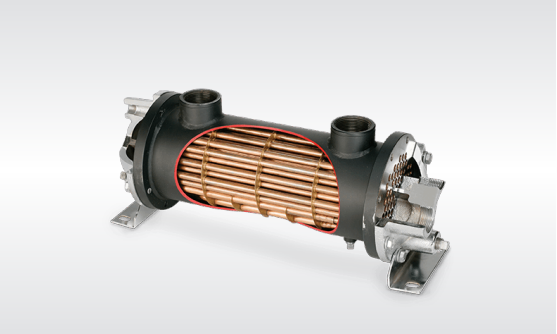
Extrusion machinery

Gear boxes

Hydraulic power units

And more.

For application help and quoting, visit our Full TTP site or contact ttpsales@apiheattransfer.com.



COPPER & STEEL CONSTRUCTION

Features

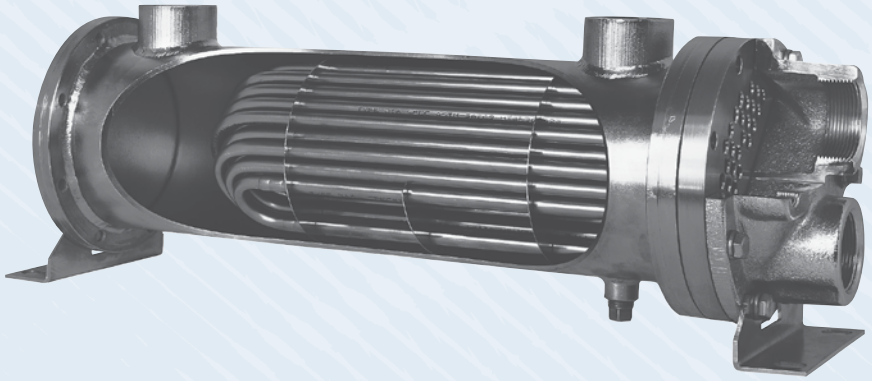
- **Steam & Large Temperature Differentials**
- **Removable Tube Bundle for Servicing**
- **Reduces Thermal Expansion Stresses**
- **3/8" Tubes**
- Built-In Expansion Chamber
- Threaded or Flanged Connections
- Mounting Brackets Included
- Steel Shell Assembly

OPTIONS

Wide Variety of Materials Available

Custom Sizes/Designs

Stainless Steel Hardware and Mounting



Ratings

UC SERIES

Maximum Shell Pressure 250 psi

Maximum Tube Side Pressure 150 psi

Maximum Temperature 400° F

UCV SERIES

Maximum Shell Pressure
600, 800, 1000 250 psi
1200, 1700 150 psi

Maximum Tube Side Pressure 150 psi

Maximum Temperature 400° F

Materials UC/UCV Series

Tubes Copper

Tube Sheets Steel

Shell Steel/316L Stainless Steel (UCV)

Shell Connections Steel

Baffles Stainless Steel

End Bonnets Cast Iron

Mounting Brackets Steel

Gaskets Non-Asbestos Fiber/Nitrile Rubber

Nameplate Aluminum Foil

Materials USSC/USSCV Series

Tubes 316L Stainless Steel

Tube Sheets 316L Stainless Steel

Shell 316L Stainless Steel

Shell Connections 316L Stainless Steel

Baffles 316L Stainless Steel

End Bonnets 316L Stainless Steel

Mounting Brackets Steel

Gaskets Non-Asbestos Fiber/Nitrile Rubber

Nameplate Aluminum Foil

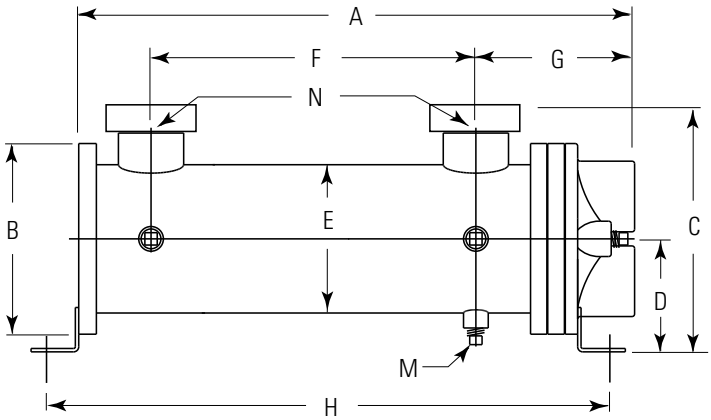
How to Order

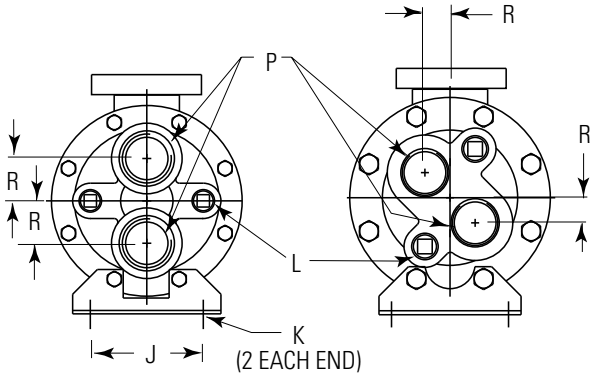
Model Series	Model Size Selected	Baffle Spacing	Tube Diameter	Tubeside Passes	Cooling Tube Material	End Bonnet Material	Tube Sheet Material	Zinc Anodes
UC/USSC **UCA/USSCA** **UCV/USSCV**				**T** - Two Pass **F** - Four Pass	**Blank** - Copper **CN** - CuNi **SS** - Stainless Steel	**Blank** - Cast Iron **B** - Bronze **SB** - Stainless Steel	**Blank** - Steel **W** - CuNi **S** - Stainless Steel	**Blank** - None **Z** - Zinc

UC/USSC = NPT Shell Connections; NPT Tube Connections
UCA/USSCA = ASME/ANSI Flange Shell Connections, NPT Tube Connections
UCV/USSCV = 1000 and Smaller: Inlet and Outlet NPT Shell Connections Rotated 180°, NPT Tube Side Connections
UCV/USSCV = 1200 and Larger: ASME/ANSI Flange Inlet and NPT Outlet Shell Connections Rotated 180°, NPT Tube Side Connections

Dimensions

UC Two Pass





All models except UC-800 & UC-1200 Series

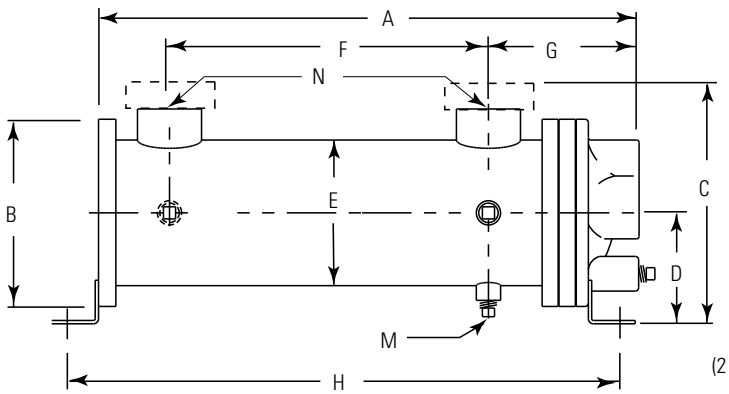
UC-800 & UC-1200 Series

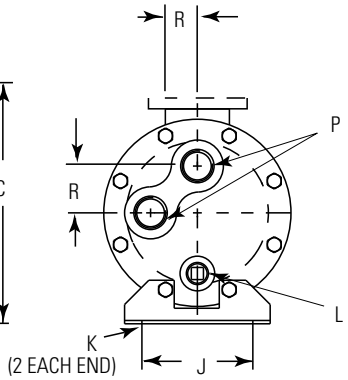
MODEL	A	B DIA	C NPT	C ASME* FLANGE	D	E DIA	F	G	H	J	K	L NPT	M NPT	N NPT	P NPT	R	FT² SURFACE AREA
612	17.22	4.50	5.38	6.75	2.75	3.25	11.25	4.03	17.66	3.25	.44 DIA	(2) .38	(3) .25	1.00	1.00	—	2.4
624	29.22						23.25		29.66							—	4.7
812	19.47	6.00	6.75	8.25	3.50	4.25	12.38	4.97	19.65	3.50	.44 DIA	(2) .38	(3) .25	1.50	1.25	0.75	4.0
824	31.47						24.38		31.65								7.9
836	43.47						36.38		43.65								11.9
1012	19.68	6.75	7.75	9.25	4.00	5.25	11.50	5.62	19.94	4.00	.50 x .75 SLOT	(2) .38	(3) .38	1.50	1.50	1.50	7.4
1024	31.68						23.50		31.94								14.5
1036	43.68						35.50		43.94								21.5
1218	26.22	7.75	8.75	10.38	4.50	6.25	17.38	5.89	26.12	5.00	.50 x .75 SLOT	(2) .50	(3) .38	2.00	2.00	1.10	15.3
1224	32.22						23.38		32.12								21.1
1236	44.22						35.38		44.12								31.3
1248	56.22						47.38		56.12								41.6
1724	34.69	10.50	11.58	13.00	5.75	8.62	23.50	7.81	34.27	7.00	.62 x .88 SLOT	(2) .50	(3) .38	3.00	2.50	2.25	47.7
1736	46.69						35.50		46.27								70.1
1748	58.69						47.50		58.27								92.5
1760	70.69						59.50		70.27								114.8

**150# ASME/ANSI Flange (Optional). NOTE: We reserve the right to make reasonable design changes without notice. Consult factory. All dimensions are inches.*

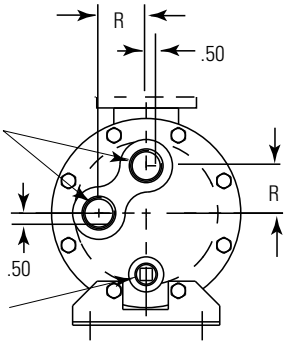
Dimensions

UC Four Pass





All models except UC-1700 Series



UC-1700 Series

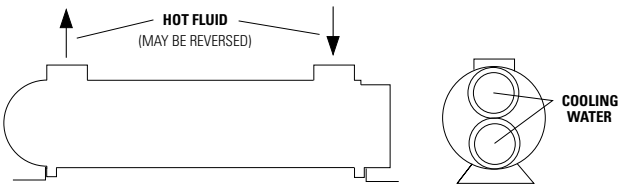
MODEL	A	B DIA	C NPT	C ASME* FLANGE	D	E DIA	F	G	H	J	K	L NPT	M NPT	N NPT	P NPT	R	FT² SURFACE AREA
612	17.20	4.50	5.38	6.75	2.75	3.25	11.25	4.01	17.66	3.25	.44 DIA	—	(3) .25	1.00	.75	1.00	2.4
624	29.20						23.25		29.66			—					4.7
812	19.47	6.00	6.75	8.25	3.50	4.25	12.00	4.97	19.65	3.50	.44 DIA	(2) .38	(3) .25	1.50	.75	1.25	4.0
824	31.47						24.00		31.65								7.9
836	43.47						36.00		43.65								11.9
1012	19.50	6.75	7.75	9.25	4.00	5.25	11.50	5.43	19.95	4.00	.50 x .75 SLOT	(2) .38	(3) .38	1.50	1.00	1.69	7.4
1024	31.50						23.50		31.95								14.5
1036	43.50						35.50		43.95								21.5
1218	26.22	7.75	8.75	10.38	4.50	6.25	17.38	5.89	26.12	5.00	.50 x .75 SLOT	(2) .38	(3) .38	2.00	1.50	2.00	15.3
1224	32.22						23.38		32.12								21.1
1236	44.22						35.38		44.12								31.3
1248	56.22						47.38		56.12								41.6
1724	34.69	10.50	11.58	13.00	5.75	8.62	23.50	7.81	34.27	7.00	.62 x .88 SLOT	(2) .38	(3) .38	3.00	2.00	2.50	47.7
1736	46.69						35.50		46.27								70.1
1748	58.69						47.50		58.27								92.5
1760	70.69						59.50		70.27								114.8

**150# ASME/ANSI Flange (Optional). NOTE: We reserve the right to make reasonable design changes without notice. Consult factory. All dimensions are inches.*

UC Applications

U-Tube Heat Exchangers allow the shell and tube bundle to expand and contract independently with temperature fluctuation. This reduces temperature dependent stresses so they are ideal in applications with large temperature differentials. Some typical examples for **UC** units include quench oil coolers, liquid to liquid heaters, and barrel oil coolers for plastic extrusion machines. The removable bundle design allows for easier cleaning of the shell side cavity when the bundle is removed.

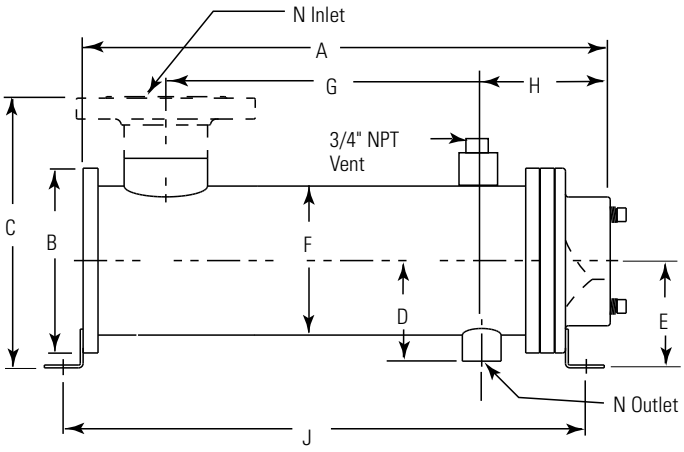
Piping Hook-up

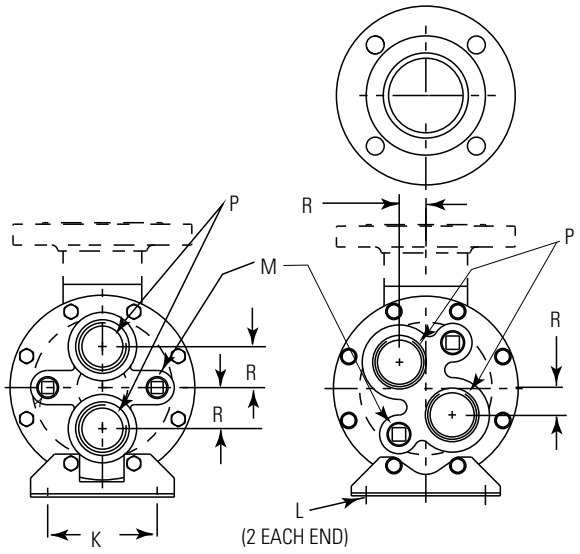


Specific applications may have different piping arrangements. Consult factory for assistance.

Dimensions

UCV Two Pass





All models except UCV-800 & UCV-1200 Series

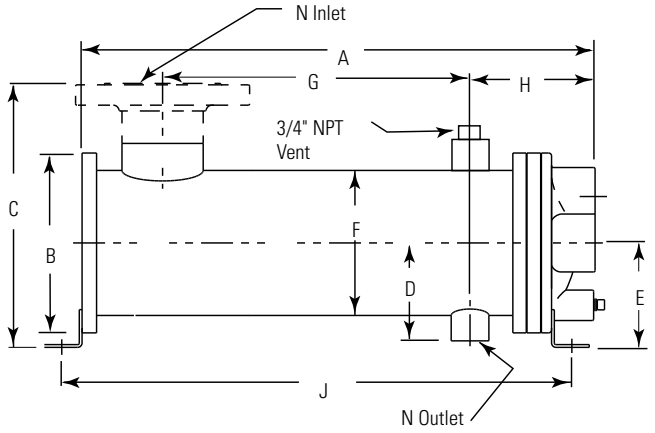
UCV-800 & UC-1200 Series

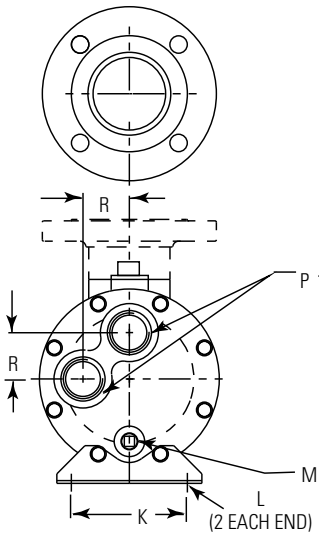
MODEL	A	B DIA	C	D	E	F DIA	G	H	J	K	L	M NPT	N INLET	N OUTLET	P NPT	R	FT^2 SURFACE AREA
612	17.22	4.50	5.25	2.62	2.75	3.25	11.00	4.00	17.66	3.25	.44 DIA	(2) .38	1.25	.75	1.00	—	2.4
624	29.22						23.00		29.66							—	4.7
812	19.47	6.00	6.75	3.15	3.50	4.25	12.00	4.60	19.65	3.50	.44 DIA	(2) .38	1.50	.75	1.25	0.75	4.0
824	31.47						24.00		31.65								7.9
836	43.47						36.00		43.65								11.9
1012	19.68	6.75	7.77	3.70	4.00	5.25	11.50	5.37	19.94	4.00	.50 x .75 SLOT	(2) .38	2.00	1.00	1.50	1.50	7.4
1024	31.68						23.50		31.94								14.5
1036	43.68						35.50		43.94								21.5
1218	26.22	7.75	11.38	4.22	4.50	6.25	17.38	5.38	26.12	5.00	.50 x .75 SLOT	(2) .50	3.00*	1.00	2.00	1.10	15.3
1224	32.22						23.38		32.12								21.1
1236	44.22						35.38		44.12								31.3
1248	56.22						47.38		56.12								41.6
1724	34.69	10.50	14.00	5.58	5.75	8.62	23.00	7.31	34.27	7.00	.62 x .88 SLOT	(2) .50	4.00*	1.50	2.50	2.25	47.7
1736	46.69						35.00		46.27								70.1
1748	58.69						47.00		58.27								92.5
1760	70.69						59.00		70.27								114.8

**150# ASME/ANSI Flange. NOTE: We reserve the right to make reasonable design changes without notice. Consult factory. All dimensions are inches.*

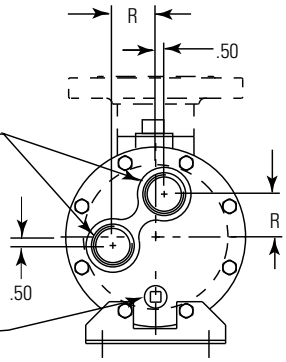
Dimensions

UCV Four Pass





All models except UCV-1700 Series



UCV-1700 Series

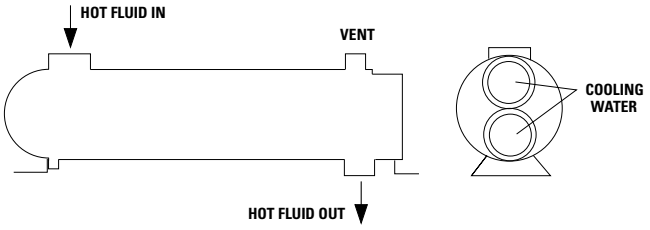
MODEL	A	B DIA	C	D	E	F DIA	G	H	J	K	L	M NPT	N INLET	N OUTLET	P NPT	R	FT² SURFACE AREA
612	17.20	4.50	5.25	2.62	2.75	3.25	11.00	3.98	17.66	3.25	.44 DIA	(2) .38	1.25	.75	.75	1.00	2.4
624	29.20						23.00		29.66								4.7
812	19.47	6.00	6.75	3.15	3.50	4.25	12.38	4.60	19.65	3.50	.44 DIA	(2) .38	1.50	.75	.75	1.25	4.0
824	31.47						24.38		31.65								7.9
836	43.47						36.38		43.65								11.9
1012	19.50	6.75	7.77	3.70	4.00	5.25	11.50	5.18	19.95	4.00	.50 x .75 SLOT	(2) .38	2.00	1.00	1.00	1.69	7.4
1024	31.50						23.50		31.95								14.5
1036	43.50						35.50		43.95								21.5
1218	26.22	7.75	10.38	4.22	4.50	6.25	17.38	5.38	26.12	5.00	.50 x .75 SLOT	(2) .38	3.00*	1.00	1.50	2.00	15.3
1224	32.22						23.38		32.12								21.1
1236	44.22						35.38		44.12								31.3
1248	56.22						47.38		56.12								41.6
1724	34.69	10.50	13.00	5.58	5.75	8.62	23.00	7.31	34.27	7.00	.62 x .88 SLOT	(2) .38	4.00*	1.50	2.00	2.50	47.7
1736	46.69						35.00		46.27								70.1
1748	58.69						47.00		58.27								92.5
1760	70.69						59.00		70.27								114.8

**150# ASME/ANSI Flange. NOTE: We reserve the right to make reasonable design changes without notice. Consult factory. All dimensions are inches.*

UCV Applications

U-Tube Heat Exchangers allow the shell and tube bundle to expand and contract independently with temperature fluctuation. This reduces temperature dependent stresses so they are ideal in applications with large temperature differentials. A typical example for **UCV** units is steam to liquid heaters. The removable bundle design allows for easier cleaning of the shell side cavity when the bundle is removed.

Piping Hook-up



Specific applications may have different piping arrangements. Consult factory for assistance.

BOL Series - Industrial

Industrial Hydraulic Oil Coolers

Thermal Transfer Products offers a full line of standard catalog hydraulic oil coolers for all industrial machine hydraulics for system cooling.

Air to Oil Cooling

Up to +500 HP of heat removal from hydraulic oil

Round tube copper, brass or steel

Brazed aluminum plate & bar (P-BAR™)

Extruded aluminum tube (T-BAR™)

Aluminum/steel fin construction

All aluminum brazed

Water to Oil Cooling

Steel, copper, copper/nickel, or stainless steel construction

Brazed plate construction

Internal fins

Diameters up to 10 inches

Lengths up to 12 feet

Product Options

Thermal Transfer industrial hydraulic oil coolers are available with a host of options to meet the demands of your application.

Brass construction

Steel construction

Internal finned construction

Brazed plate construction

Internal bypass

Seawater service

Applications

Our hydraulic oil coolers are used worldwide in a broad range of industrial applications, including:

Hydraulic presses

Plastic injection molding

Lube oil coolers

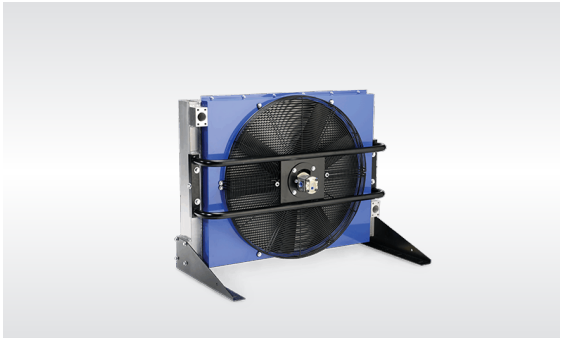
Extrusion machinery

Gear boxes

Hydraulic power units

And more.

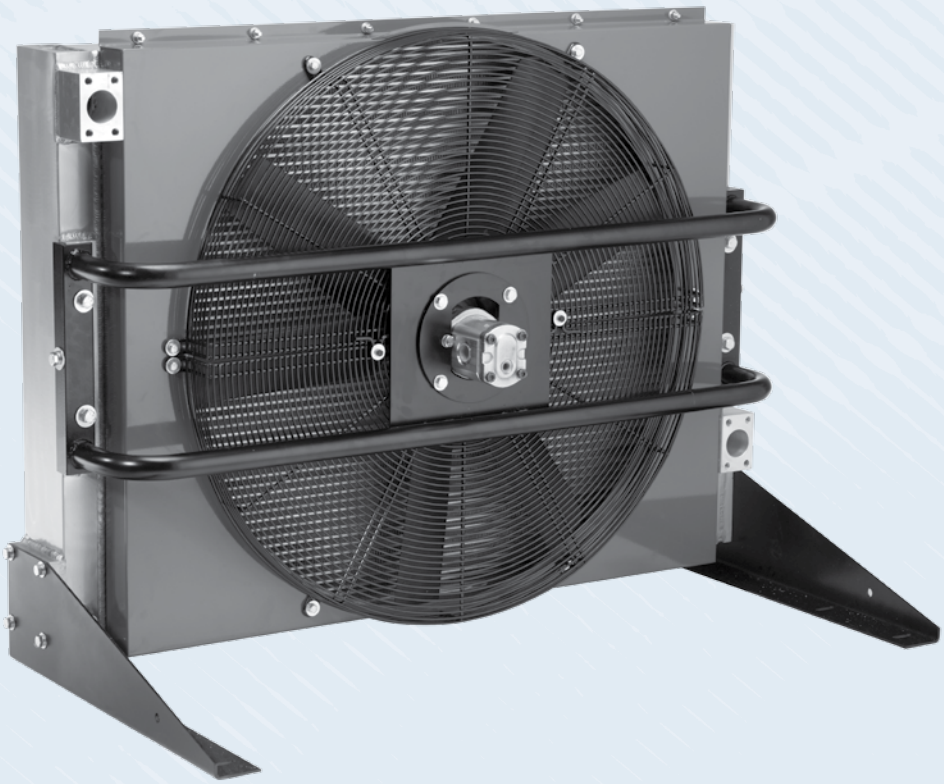
For application help and quoting, visit our **Full TTP site** or contact **ttpsales@apiheattransfer.com**.



BRAZED ALUMINUM CONSTRUCTION

Features

- **Bar and Plate Brazed Aluminum Core**
- **Rugged, lightweight, and compact**
- **Provides the best heat transfer per given envelope size while minimizing pressure drop**
- **Air-side fin design minimizes fouling and static pressure ensuring long-term, reliable performance**
- **Welded fittings/ports and manifolds ensure structural integrity**
- **Standard SAE ports – NPT and BSPP ports available**
- **Customized units are available to meet your specific performance requirements**
- T-BAR core optional for high viscosity oils or other highly fouling fluids. *See T-Bar Performance Curve
- Low Noise Option Available



Ratings

Maximum Operating Pressure
250 psi (17 BAR)

Maximum Operating Temperature
300° F (150° C)

Materials

Mounting Feet Steel

Standard Core Brazed Aluminum Bar and Plate
- Tanks – 5052 Aluminum
- Nose Bar & Little Bar – 3003-H Aluminum
- Air Fin, Plate, Turbulator & End Plate – 3003-O Aluminum

Fanguard Steel

Connectors Aluminum

Fan Aluminum Hub, Plastic Blades

Shroud Steel

Motor TEFC & IEC

Fluid Compatability

Petroleum/mineral oils

Oil/water emulsion

Water/ethylene glycol

How to Order

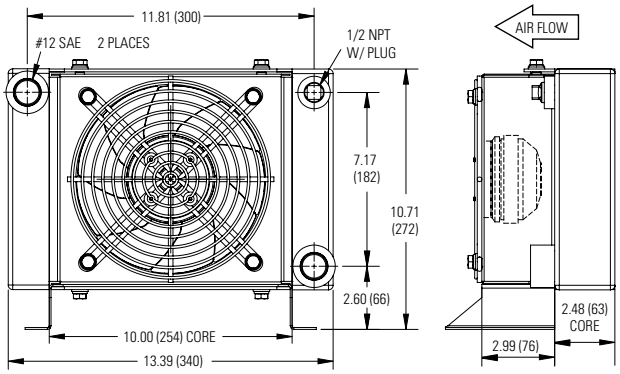
Model Series	**Model Size Selected**	**Connection Type***	**Specify Motor Required**	**Core**	**Noise Level**
BOL	**4** **8** **16** **30** **400** **725** **950** **1200** **1600** **2000**	**1** - NPT **2** - SAE **3** - BSPP	**2** - Single Phase **3** - Three Phase **6** - 575 Volt **9** - Hydraulic **18** - IEC Three Phase	**Blank** - Standard Bar & Plate **TB** - T-BAR Core*	**Blank** - Standard Noise Level **LN** - Low Noise Level

*T-BAR Core option provides a T-BAR core in BOL 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.

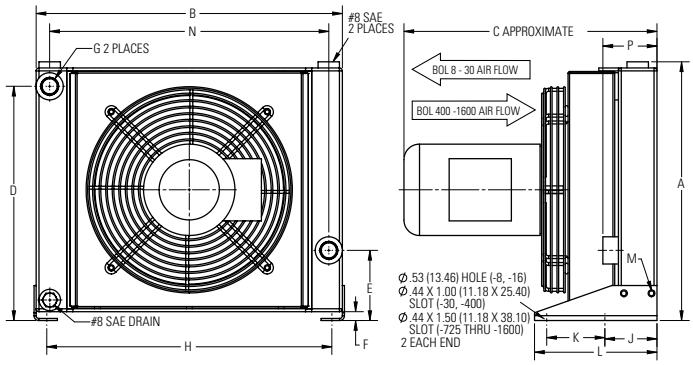
OPTIONAL T-BAR CORE SECTION CUTAWAY

Dimensions

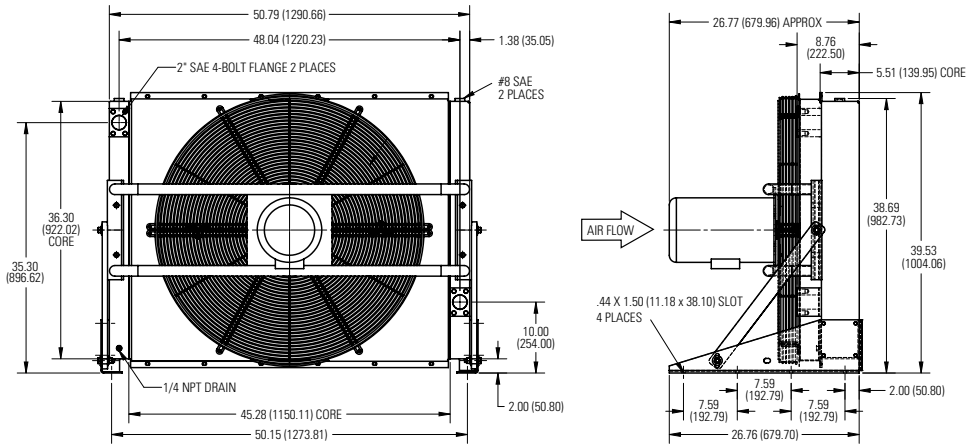
BOL-4



BOL-8 through BOL-1600



BOL-2000



Model	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Approx. Ship Wt. lbs (Kg)
BOL-4	See diagram above			—	—	—	—	—	—	—	—	—	—	—	18 (8.16)
BOL-8	12.93 (328.42)	15.75 (400.05)	14.72 (373.89)	11.30 (287.62)	3.27 (83.06)	.55 (13.97)	#12 SAE	14.53 (369.06)	3.07 (77.98)	3.75 (88.90)	7.36 (186.94)	M8 Bolt (2PL)	14.01 (355.85)	3.48 (88.40)	45 (20.4)
BOL-16	16.63 (422.40)	19.69 (500.13)	16.16 (410.46)	15.06 (382.52)	4.51 (114.56)	.57 (14.48)	#12 SAE	18.30 (464.82)	3.35 (85.09)	3.74 (95.00)	7.87 (199.90)	M8 Bolt (2PL)	17.95 (455.93)	3.46 (87.88)	55 (24.94)
BOL-30	21.09 (535.68)	26.38 (670.06)	18.23 (463.04)	19.49 (495.05)	5.26 (133.60)	1.32 (33.53)	#20 SAE	24.74 (628.40)	4.25 (107.95)	5.00 (127.00)	10.00 (254.00)	M10 Bolt (4PL)	24.34 (618.24)	5.28 (134.11)	125 (56.70)
BOL-400	19.20 (487.68)	22.45 (570.23)	18.80 (477.52)	17.31 (439.67)	6.50 (165.10)	2.00 (50.80)	#20 SAE	22.30 (566.42)	4.25 (107.95)	5.00 (127.00)	10.00 (254.00)	M10 Bolt (4PL)	20.08 (510.03)	5.20 (132.08)	148 (67.13)
BOL-725	23.49 (596.65)	30.32 (770.13)	18.60 (472.44)	21.60 (548.64)	6.50 (165.10)	2.00 (50.80)	#20 SAE	30.17 (766.32)	4.25 (107.95)	5.00 (127.00)	10.00 (254.00)	M10 Bolt (4PL)	27.95 (709.93)	5.20 (132.08)	170 (77.11)
BOL-950	27.94 (709.68)	37.03 (940.56)	22.69 (576.33)	24.55 (623.57)	9.50 (241.30)	2.00 (50.80)	2" SAE 4-Bolt Flange	35.89 (911.61)	6.05 (153.67)	9.20 (233.68)	16.00 (406.40)	M10 Bolt (4PL)	34.26 (870.20)	7.01 (178.05)	300 (136.08)
BOL-1200	27.94 (709.68)	40.96 (1040.38)	24.07 (611.38)	24.55 (623.57)	5.50 (139.70)	2.00 (50.80)		40.31 (1023.87)	6.05 (153.67)	9.20 (233.68)	16.00 (406.40)	M10 Bolt (4PL)	38.19 (970.03)	7.01 (178.05)	430 (195.04)
BOL-1600	36.01 (914.65)	40.96 (1040.38)	25.45 (646.43)	32.62 (828.55)	9.50 (241.30)	2.00 (50.80)		40.31 (1023.87)	6.05 (153.67)	9.20 (233.68)	16.00 (406.40)	M10 Bolt (4PL)	38.19 (970.03)	7.01 (178.05)	515 (233.60)
BOL-2000	See diagram above			—	—	—	—	—	—	—	—	—	—	—	582 (264.00)

Note: We reserve the right to make reasonable design changes without notice. All dimensions are in inches and (millimeters).

Specifications

Electric Motor Information (60 Hz Nema Frame)

Model	CMM	CFM	Motor HP	Voltage	Phase	Full Load Amps 230V	Frequency	RPM	Frame	Thermal Overload	Sound dB(A) at 3ft
BOL-4	31.14	1203	1/4	230	1	—	60 Hz	2850	—	—	73
BOL-8	22.65	800	1/3	115/230	1	3.0	60 Hz	3450	48C	No	80
BOL-8	22.65	800	1/3	208-230/460	3	1.4	60 Hz	3450	48C	No	80
BOL-16	40.35	1425	1/2	115/230	1	3.7	60 Hz	3450	48C	No	85
BOL-16	40.35	1425	1/2	208-230/460	3	2.2	60 Hz	3450	48C	No	85
BOL-30	62.29	2200	1/2	115/230	1	3.7	60 Hz	1725	56C	No	85
BOL-30	62.29	2200	1/2	208-230/460	3	2.0	60 Hz	1725	56C	No	85
BOL-400	62.29	2200	1	115/230	1	6.0	60 Hz	3450	56C	No	97
BOL-400	62.29	2200	1	208-230/460	3	3.2	60 Hz	3450	56C	No	97
BOL-725	101.94	3600	1-1/2	115/230	1	8.5	60 Hz	3450	56C	No	100
BOL-725	101.94	3600	1-1/2	208-230/460	3	4.8	60 Hz	3450	56C	No	100
BOL-950	133.10	4700	1-1/2	115/230	1	8.6	60 Hz	1725	145TC	No	92
BOL-950	133.10	4700	1-1/2	208-230/460	3	4.6	60 Hz	1725	145TC	No	92
BOL-1200	198.22	7000	3	208-230/460	3	8.8	60 Hz	1725	182TC	No	94
BOL-1600	223.75	7900	5	208-230/460	3	13.4	60 Hz	1725	184TC	No	96
BOL-2000	396.44	14000	7.5	230/460	3	24.8	60 Hz	1725	213TC	No	98

Electric Motor Information (50 Hz IEC Frame)

Model	CMM	CFM	KW	Voltage	Phase	Frequency	RPM	Frame	Sound dB(A) at 3ft
BOL-4	28.4	1003	.20	230	1	50 Hz	3000	—	73
BOL-8	18.9	667	.25	230/400/415	3	50 Hz	3000	63	71
BOL-16	33.7	1188	.37	230/400/415	3	50 Hz	3000	71	77
BOL-30	52.4	1850	.37	230/400/415	3	50 Hz	1500	71	73
BOL-400	52.4	1850	.75	230/400/415	3	50 Hz	3000	80	81
BOL-725	85.0	3000	1.10	230/400/415	3	50 Hz	3000	80	80
BOL-950	108.2	3821	1.50	230/400/415	3	50 Hz	1500	90	78
BOL-1200	165.1	5834	2.20	230/400/415	3	50 Hz	1500	100	83
BOL-1600	186.4	6584	3.00	230/400/415	3	50 Hz	1500	100	85
BOL-2000	331.3	11700	4.00	230/400/415	3	50 Hz	1500	112	88

All IEC frame motors have CE mark.
IEC motor voltages have +/- 10% tolerance.

Hydraulic Motor Information

Model	Oil Flow Required GPM (LPM)	Min. Pressure Required PSI (BAR)	Motor IN^3/REV (CM^3/REV) Displacement	Sound dB(A) at 3 ft.
BOL-4	3.3 (12.49)	400 (27.58)	0.22 (3.6)	80
BOL-8	3.3 (12.49)	400 (27.58)	0.22 (3.6)	80
BOL-16	3.3 (12.49)	500 (34.47)	0.22 (3.6)	85
BOL-30	3.4 (12.87)	500 (34.47)	0.45 (7.3)	85
BOL-400	3.3 (12.49)	425 (29.30)	0.22 (3.6)	97

Model	Oil Flow Required GPM (LPM)	Min. Pressure Required PSI (BAR)	Motor IN^3/REV (CM^3/REV) Displacement	Sound dB(A) at 3 ft.
BOL-725	3.3 (12.49)	675 (46.50)	0.22 (3.6)	100
BOL-950	10.1 (38.23)	300 (20.70)	1.4 (22.9)	92
BOL-1200	10.1 (38.23)	725 (50.00)	1.4 (22.9)	94
BOL-1600	10.1 (38.23)	1100 (75.80)	1.4 (22.9)	96
BOL-2000	10.1 (38.23)	1650 (113.76)	1.4 (22.9)	98

Notes: Maximum Pressure is 2000 psi. Stated Minimum Operating Pressure is at Inlet Port of Motor. 1000 psi Allowable Back Pressure.

Selection Procedure

Step 1 **Determine Heat Load.** Typical Rule of Thumb, -size cooler for 1/3 of the input horsepower. Heat load may be expressed as either Horsepower or BTU/Hr or KW/°C.

HP=BTU/HR ÷ 2545

BTU/HR=HP x 2545

$$\text{BTU/HR} = \frac{\text{KW}}{\text{°C}} \times 1894.61 \times \text{E.T.D.(°F)}$$

Step 2 **Determine Entering Temperature Difference.** (Actual E.T.D.)

$$\text{E.T.D.} = \text{Entering oil temperature} - \text{Entering Ambient air temperature}$$

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 **Determine the Corrected Heat Dissipation to use the Curves**

ENGLISH Version

$$\text{Corrected Heat Rejection} = \text{(BTU/Hr) Heat Load} \times \frac{100°\text{F}}{\text{Desired E.T.D.}}$$

(BTU/HR) to use with selection chart

METRIC Version

$$\text{Corrected Heat Rejection} \quad \frac{\text{KW}}{\text{°C}} = \frac{\text{Heatload (kw)}}{\text{Desired E.T.D. (°C)}}$$

Step 4 **Select Model From Curves** Enter the Performance Curves at the bottom with the GPM 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.

Step 5 **Calculate Oil Pressure Drop** Find the oil pressure drop correction factor and multiply it by the Oil Pressure Drop found on performance curve.

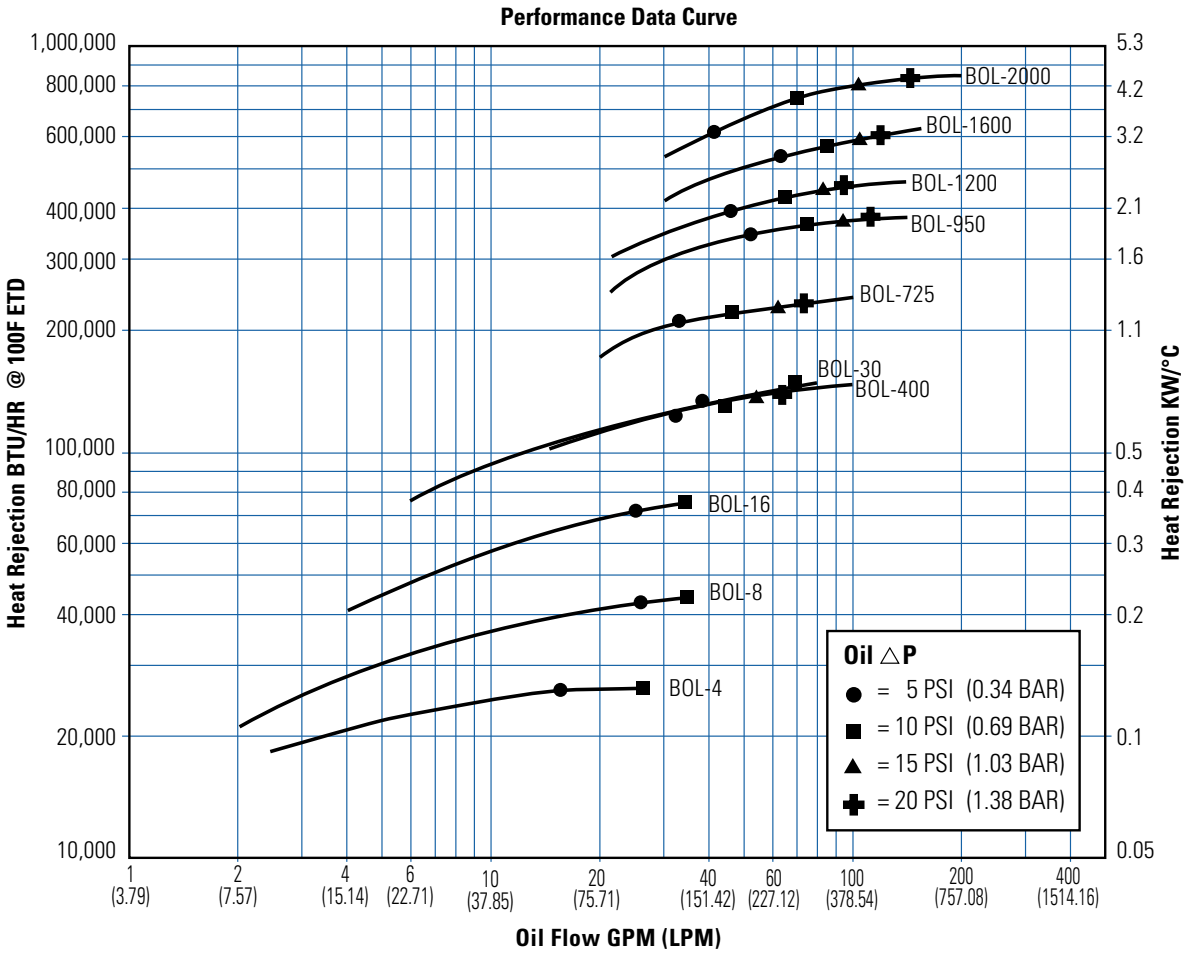
Listed Performance Curves are based on:

- 50 SSU (11 cSt) oil
- 100° F (55.56° C) Entering Temperature Difference (E.T.D.)

If your application conditions are different, then continue with the selection procedure.

Performance Curves

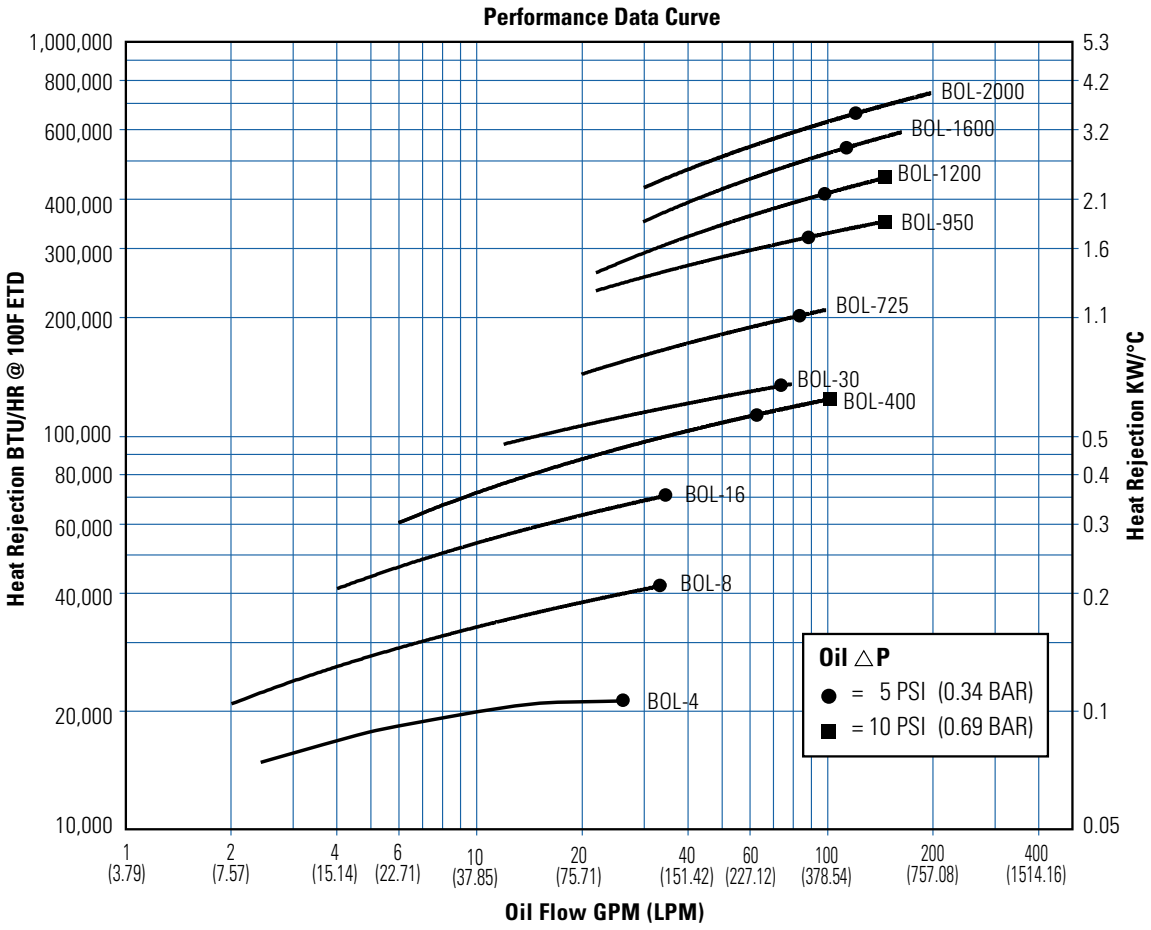
BOL Models with Standard P-BAR Core



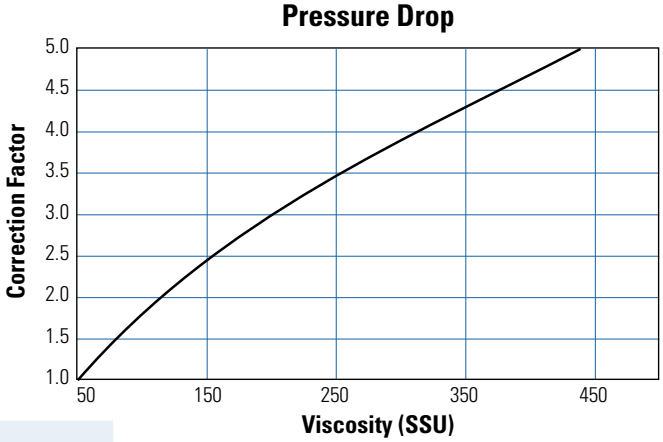
Note: Derate heat rejection values 15% if using 50Hz motors.

Performance Curves

BOL Models with Optional T-BAR Core



Note: Derate heat rejection values 15% if using 50Hz motors.



Oil Temperature

Typical operating temperature ranges are:

Hydraulic Motor Oil	120°F - 180°F (49°C - 82.2°C)
Hydrostatic Drive Oil	160°F - 180°F (71°C - 82.2°C)
Engine Lube Oil	180°F - 200°F (82.2°C - 93.3°C)
Automatic Transmission Fluid	200°F - 300°F (93.3°C - 149°C)

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 = (BTU's/Hr.) / (GPM Oil Flow x 210).

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

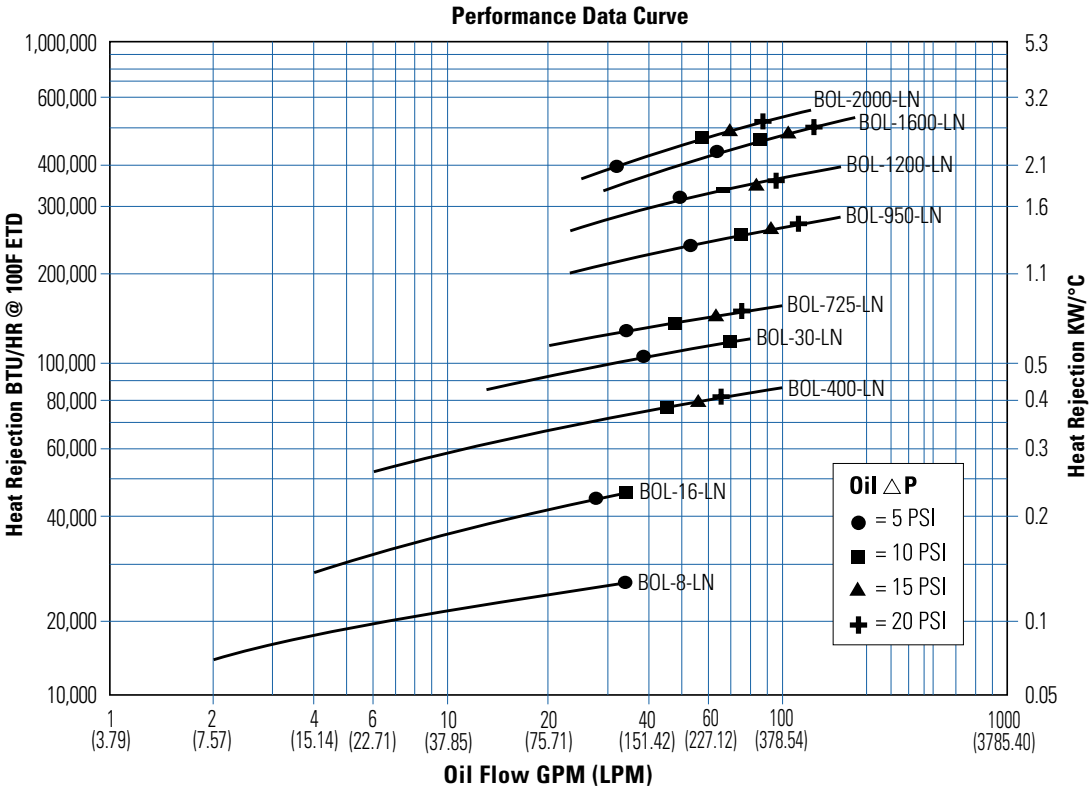
Oil Entering Temp. = Oil Leaving Temp + Oil △T.

Oil Pressure Drop: Most systems can tolerate a pressure drop through the heat exchanger of 20 to 30 PSI. Excessive pressure drop should be avoided. Care should be taken to limit pressure drop to 5 PSI or less for case drain applications where high back pressure may damage the pump shaft seals.

Performance Curves

BOL Models with Low-Noise Option

The low noise option offers the BOL models with a reduced motor speed.
This allows a lower sound level output for noise-sensitive applications.



Available on 60 Hz Nema frame only.

Electric Motor Information

Model	HP	Frame	Low Noise RPM	Low Noise CFM	Low Noise CMM	Voltage	Frequency (HZ)
8-1PH	0.33	48	1725	400	11.33	115/230	60
8-3PH	0.33	48	1725	400	11.33	208-230/460	60
16-1PH	0.50	48	1725	704	19.93	115/230	60
16-3PH	0.50	48	1725	704	19.93	208-230/460	60
30-1PH	0.50	56C	1160	1470	41.62	115/230	60
30-3PH	0.50	56C	1160	1470	41.62	208-230/460	60
400-1PH	1.00	56C	1725	1100	31.19	115/230	60
400-3PH	1.00	56C	1725	1100	31.19	208-230/460	60
725-1PH	1.50	56C	1725	1780	50.40	115/230	60
725-3PH	1.50	56C	1725	1780	50.40	208-230/460	60
950-1PH	1.50	145TC	1160	3150	89.19	115/230	60
950-3PH	1.50	145TC	1160	3150	89.19	208-230/460	60
1200-3PH	1.50	182TC	1160	4690	132.81	208-230/460	60
1600-3PH	2.00	184TC	1160	6510	184.34	208-230/460	60
2000-3PH	5.00	213TC	1160	8700	000.00	230/460	60

Sound Data

Model	DBA at 3 ft
BOL-8-LN	62
BOL-16-LN	69
BOL-30-LN	67
BOL-400-LN	72
BOL-725-LN	82
BOL-950-LN	76
BOL-1200-LN	75
BOL-1600-LN	78
BOL-2000-LN	85

OCA Series - Hydraulic Cooling

Industrial Hydraulic Oil Coolers

Thermal Transfer Products offers a full line of standard catalog hydraulic oil coolers for all industrial machine hydraulics for system cooling.

Air to Oil Cooling

Up to +500 HP of heat removal from hydraulic oil

Round tube copper, brass or steel

Brazed aluminum plate & bar (P-BAR™)

Extruded aluminum tube (T-BAR™)

Aluminum/steel fin construction

All aluminum brazed

Water to Oil Cooling

Steel, copper, copper/nickel, or stainless steel construction

Brazed plate construction

Internal fins

Diameters up to 10 inches

Lengths up to 12 feet

Product Options

Thermal Transfer industrial hydraulic oil coolers are available with a host of options to meet the demands of your application.

Brass construction

Steel construction

Internal finned construction

Brazed plate construction

Internal bypass

Seawater service

Applications

Our hydraulic oil coolers are used worldwide in a broad range of industrial applications, including:

Hydraulic presses

Plastic injection molding

Lube oil coolers

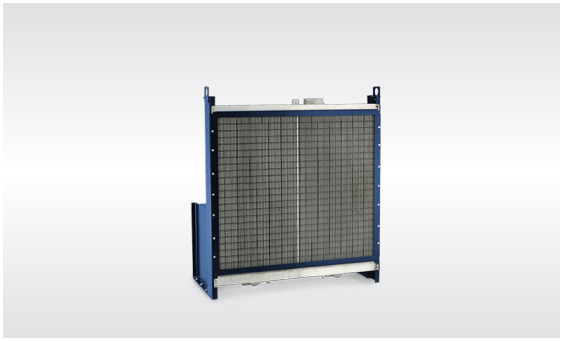
Extrusion machinery

Gear boxes

Hydraulic power units

And more.

For application help and quoting, visit our Full TTP site or contact ttpsales@apiheattransfer.com.



BRAZED ALUMINUM CONSTRUCTION

HYDRAULIC OR COMPRESSOR OIL COOLING

Features

- **Large Oil Flow**
- **High Performance**
- **Industrial Duty**
- **Brazed Aluminum Bar and Plate Core**
- Compact all aluminum core assembly
- Ideal for converting water cooled equipment to air cooled
- Eliminates high water and sewer costs
- Eliminates corrosion problems associated with water cooled units
- Vertical air flow works well for heat recovery
- State-of-the-art heat transfer technology
- Hydraulic motors available
- Optional SAE Ports
- Marine corrosion control coatings available
- High performance air side fin design
- Detachable legs

Ratings

Maximum Operating Pressure
250 psi (17 BAR)

Maximum Operating Temperature
300° F (150° C)

Materials

Legs Steel with baked enamel finish

Shroud Steel

Standard Core Brazed Aluminum Bar and Plate
- Tanks – 5052 Aluminum
- Nose Bar & Little Bar – 3003-H Aluminum
- Air Fin, Plate, Turbulator & End Plate – 3003-O Aluminum

Fan Aluminum Hub, Plastic Blades

Motor TEFC

Fluid Compatability

Petroleum/mineral oils

Oil/water emulsion

Water/ethylene glycol

How to Order

AOL	–		–		–		–	

Model Series
AOL - Standard

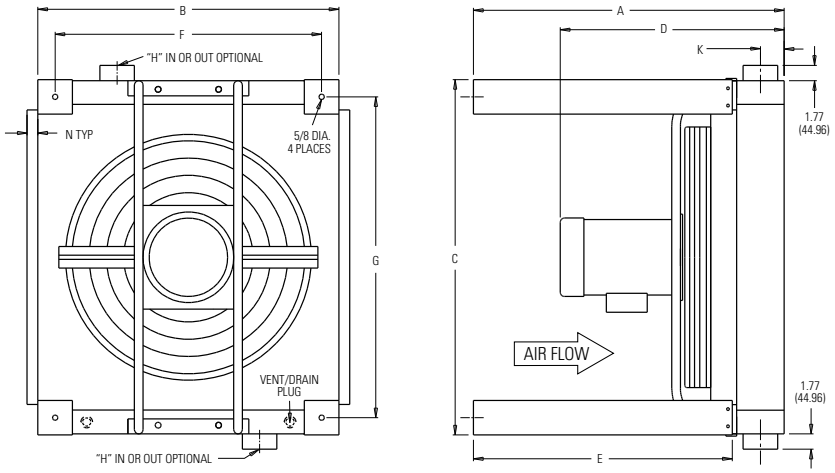
Model Size Selected
400
725
950
1200
1600
2000
2500
3000
3500

Connection Type
Blank - NPT
S - SAE

Specify Motor Required
0 - No Motor
2 - Single Phase
3 - Three Phase
6 - 575 Volt
9 - Hydraulic
18 - IEC Three Phase

Noise Level
Blank - Standard Noise Level
LN - Low Noise Level

Dimensions



Model	A	B	C	D Approx.	E	F	G	H NPT	H SAE	J	K	L	Net Weight Lbs.	Shipping Weight Lbs.
AOL-400	34.20 (868.68)	17.96 (456.18)	22.69 (576.33)	20.86 (529.84)	30.00 (762.00)	13.96 (354.58)	18.69 (474.73)	2.00	#32 SAE 2-1/2-12 UN-2B	5.93 (150.62)	1.85 (46.99)	1.25 (31.75)	109 (49.44)	148 (67.13)
AOL-725	34.20 (868.68)	22.37 (568.20)	30.57 (776.48)	20.86 (529.84)	30.00 (762.00)	18.37 (466.60)	26.57 (674.88)	2.00		5.88 (149.35)	1.85 (46.99)	1.25 (31.75)	151 (68.49)	170 (77.11)
AOL-950	36.01 (914.65)	26.78 (680.21)	37.25 (946.15)	23.62 (599.95)	30.00 (762.00)	22.78 (578.61)	33.25 (844.55)	2.00		6.82 (173.23)	2.76 (70.10)	1.25 (31.75)	221 (100.24)	300 (136.08)
AOL-1200	36.01 (914.65)	26.78 (680.21)	41.20 (1046.48)	25.51 (647.95)	30.00 (762.00)	22.78 (578.61)	37.20 (944.88)	2.00		6.00 (152.40)	2.76 (70.10)	1.25 (31.75)	296 (134.26)	430 (195.04)
AOL-1600	36.01 (914.65)	34.89 (886.21)	41.20 (1046.48)	27.51 (698.75)	30.00 (762.00)	30.89 (784.61)	37.20 (944.88)	2.50	2-1/2 SAE 4 Bolt FLG	8.00 (203.20)	2.76 (70.10)	1.25 (31.75)	355 (161.03)	515 (233.60)
AOL-2000	36.01 (914.65)	37.88 (962.15)	51.05 (1296.67)	26.25 (666.75)	30.00 (762.00)	33.88 (860.55)	47.05 (1195.07)	2.50		8.00 (203.20)	2.76 (70.10)	1.25 (31.75)	482 (218.63)	582 (263.99)
AOL-2500	36.01 (914.65)	43.70 (1109.98)	49.08 (1246.63)	28.51 (724.15)	30.00 (762.00)	39.70 (1008.38)	45.08 (1145.03)	3.00	3" SAE 4 Bolt FLG.	8.00 (203.20)	2.76 (70.10)	1.25 (31.75)	555 (251.74)	655 (297.10)
AOL-3000	36.01 (914.65)	52.52 (1334.01)	51.05 (1296.95)	30.51 (774.95)	30.00 (762.00)	48.52 (1232.41)	47.05 (1206.50)	3.00		8.00 (203.20)	2.76 (70.10)	1.25 (31.75)	724 (328.40)	825 (374.21)
AOL-3500	36.01 (914.65)	56.30 (1430.02)	51.05 (1296.95)	30.51 (774.95)	30.00 (762.00)	52.30 (13328.42	47.05 (1206.50)	3.00		8.00 (203.20)	2.76 (70.10)	1.25 (31.75)	760 (344.73)	860 (390.09)

Note: We reserve the right to make reasonable design changes without notice. All dimensions are in inches and (millimeters).

Selection Procedure

Performance Curves based on 100°F (55.56°C) E.T.D. or Entering Temperature Difference (E.T.D = Entering oil temperature minus ambient air temperature). SAE #10 oil @ 200°F (93.33°C).

Oil pressure drop coding:

- **X** = 5 PSI (.345 BAR)
- ● = 10 PSI (.689 BAR)
- ◆ = 15 PSI (1.03 BAR)
- ▲ = 20 PSI (1.38 BAR)
- ■ = 30 PSI (2.10 BAR)

E.T.D. temperature correction formula:

ENGLISH Version

$$HP_{Curve} = HP_{To\ Be\ Removed} \times \frac{100}{Desired\ E.T.D}$$

METRIC Version

$$\frac{KW}{°C} = \frac{Heatload\ (KW)}{Desired\ E.T.D.\ (°C)}$$

Conversion

$$Hp = \frac{KW}{°C} = X\ .745\ X\ E.T.D.\ (°F)$$

Notes

1. A three-way thermostatic valve is recommended to bypass the cold oil around the heat exchanger during start up.
2. Support piping as needed. Flexible connectors must be properly installed to validate warranty.
3. Coolers should not operate in ambient temperatures below 35°F (1°C). Consult factory for recommendations.
4. The fan cannot be cycled.
5. AOL coolers operated outdoors must be protected from weather. Consult factory for recommendations.
6. If duct work or additional static resistance is added to the cooler airstream, an auxiliary air mover may be required.
7. Can be mounted for horizontal air flow, with oil in at bottom port.

Maintenance

Periodic cleaning of the fins with compressed air is needed to remove the accumulation of dirt and dust. If the inside of the tubes need to be cleaned of oil and carbon, use a chlorinated solvent. Do not use strong solvents. Do not use acids or caustic cleaners.

Specifications

Electric Motor & Fan Data[1] (60 Hz Nema Frame)

Model	Fan CMM	Fan CFM	Motor H.P.	Voltage	Phase	Full Load Amps 230V	Frequency (Hz)	RPM	Nema Frame	Thermal Overload	Sound dB(A) at 3 ft.
AOL-400	62.30	2200	1.0	115/208-230	1	6.0	60[2]	3450	56C	No	97
	51.68/62.30	1825/2200	1.0	208-230/460[3]	3	3.6/3.2	50/60	2850/3450	56C	No	97
AOL-725	101.94	3600	1.5	115/208-230	1	8.5	60[2]	3450	56C	No	100
	84.95/102.94	3000/3600	1.5	208-230/460[4]	3	4.8/4.2	50/60	2850/3450	56C	No	100
AOL-950	133.09	4700	1.5	115/208-230	1	8.6	60[2]	1740	145TC	No	92
	133.09	4700	1.5	208-230/460	3	4.6	60[2]	1740	145TC	No	92
AOL-1200	198.22	7000	5.0	230	1	23.00	60[2]	1740	184TC	No	94
	198.22	7000	3.0	208-230/460	3	8.8	60[2]	1740	182TC	No	96
AOL-1600	223.70	7900	5.0	208-230/460	3	13.4	60[2]	1740	184TC	No	98
AOL-2000	311.49	14000	7.5	230/460	3	19.6	60[2]	1740	213TC	No	98
AOL-2500	396.44	14000	7.5	230/460	3	19.6	60[2]	1740	213TC	No	98
AOL-3000	495.54	17500	10.0	230/460	3	24.8	60[2]	1740	215TC	No	102
AOL-3500	495.54	17500	10.0	230/460	3	24.8	60[2]	1740	215TC	No	102

[1] Published electrical ratings are approximate, and may vary because of motor brand. Actual ratings are on motor nameplate.
[2] May also be operated at 50 hz. Consult factory for details.
[3] 50 Hz voltage: 190-200-208-220/380-400-415-440
[4] 50 Hz voltage: 190-208/380-415
All motors shown are TEFC—Other motor options available upon request.

Electric Motor Information (50 Hz IEC Frame)

Model	CMM	CFM	KW	Voltage	Phase	Frequency	RPM	Frame	Sound dB(A) at 1 meter
AOL-400	52.4	1850	.75	230/400/415	3	50 Hz	3000	80	81
AOL-725	85.0	3001	1.10	230/400/415	3	50 Hz	3000	80	80
AOL-950	108.2	3821	1.50	230/400/415	3	50 Hz	1500	90	78
AOL-1200	165.1	5834	2.20	230/400/415	3	50 Hz	1500	100	83
AOL-1600	186.4	6584	3.00	230/400/415	3	50 Hz	1500	100	85
AOL-2000	331.3	11700	4.00	230/400/415	3	50 Hz	1500	112	88
AOL-2500	331.3	11700	4.00	230/400/415	3	50 Hz	1500	112	88
AOL-3000	410.6	14500	7.50	230/400/415	3	50 Hz	1500	132	90
AOL-3500	410.6	14500	7.50	230/400/415	3	50 Hz	1500	132	90

All IEC frame motors have CE mark.
IEC motor voltages have +/- 10% tolerance.

Electric Motor Information (AOL-Low Noise)

Model	HP	Nema Frame	LN RPM	LN CFM	LN CMM	Voltage	Frequency (Hz)	Sound dB(A) at 3 ft.
AOL-400-1PH-LN	1	56C	1725	1100	31.15	115/230	60	72
AOL-400-3PH-LN	1	56C	1725	1100	31.15	230/460	60	72
AOL-725-1PH-LN	1.50	56C	1725	1780	50.40	115/230	60	82
AOL-725-3PH-LN	1.50	56C	1725	1780	50.40	230/460	60	82
AOL-950-3PH-LN	1.50	145TC	1160	3150	89.20	230/460	60	76
AOL-1200-3PH-LN	1.50	182TC	1160	4690	132.81	230/460	60	75
AOL-1600-3PH-LN	2	184TC	1160	6510	184.34	230/460	60	78
AOL-2000-3PH-LN	5	213TC	1160	8700	246.36	230/460	60	85
AOL-2500-3PH-LN	5	213TC	1160	11700	331.31	230/460	60	85
AOL-3000-3PH-LN	5	215TC	1160	13500	382.28	230/460	60	93
AOL-3500-3PH-LN*	10	256TCZ	1160	16200	458.73	230/460	60	91

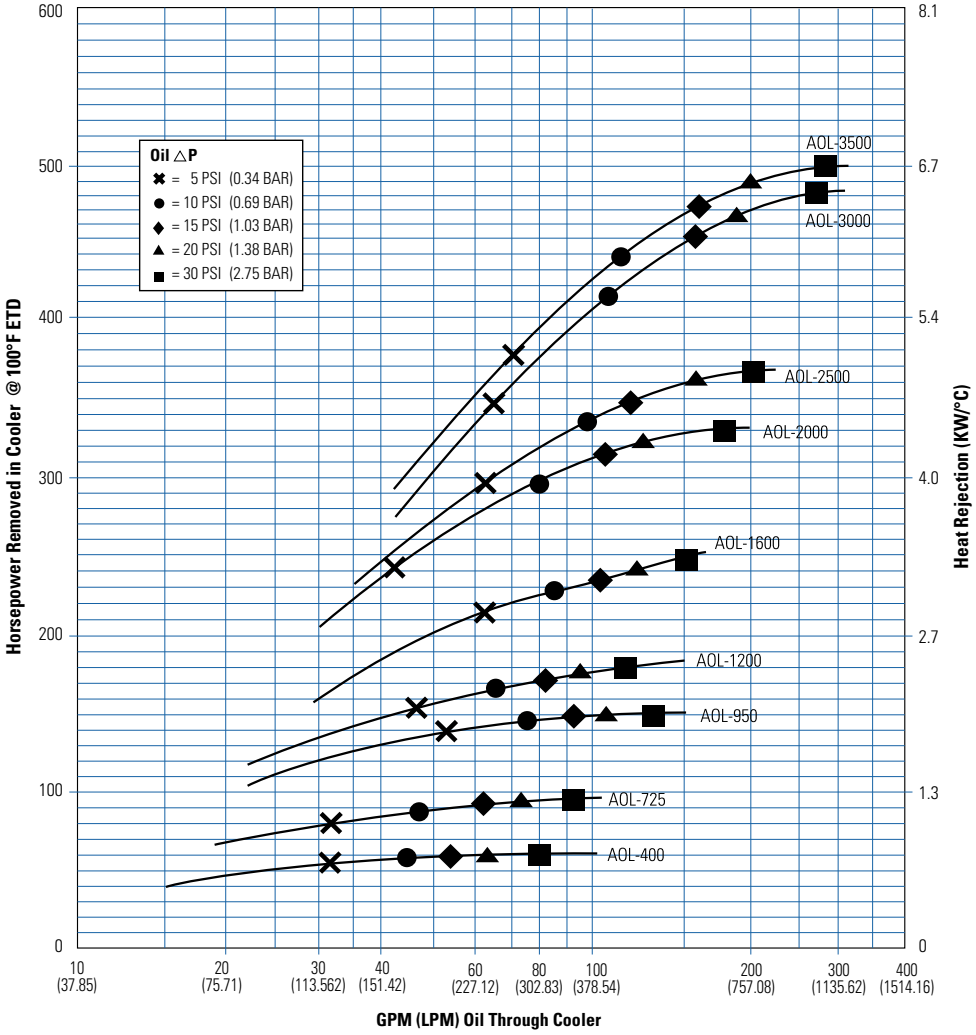
Available in 60 Hz Nema Frame only.

Hydraulic Motor Information

Model	Oil Flow Required GPM (LPM)	Min. Pressure Required PSI (BAR)	Motor IN^3/REV (CM^3/REV) Displacement	Sound dB(A) at 3 ft.
AOL-400	3.3 (12.49)	425 (29.31)	0.22 (3.6)	97
AOL-725	3.3 (12.49)	675 (46.54)	0.22 (3.6)	100
AOL-950	10.1 (38.23)	300 (20.68)	1.4 (22.94)	92
AOL-1200	10.1 (38.23)	725 (50.00)	1.4 (22.94)	94
AOL-1600	10.1 (38.23)	1100 (75.84)	1.4 (22.94)	98
AOL-2000	10.1 (38.23)	1650 (113.76)	1.4 (22.94)	98
AOL-2500	10.1 (38.23)	1650 (113.76)	1.4 (22.94)	98
AOL-3000	10.1 (38.23)	2000 (137.90)	1.4 (22.94)	102
AOL-3500	10.1 (38.23)	2000 (137.90)	1.4 (22.94)	102

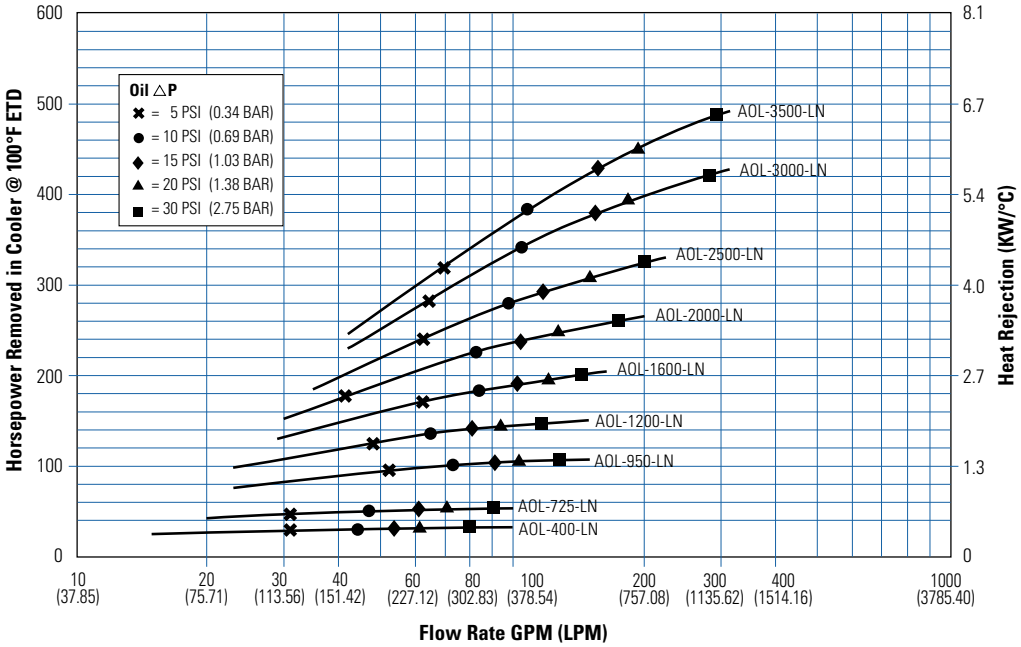
Notes: Maximum Pressure is 2000 psi. Stated Minimum Operating Pressure is at Inlet Port of Motor. 1000 psi Allowable Back Pressure.

Performance Curves



Note: Derate heat rejection values 15% if using 50Hz motors.

Low Noise Option

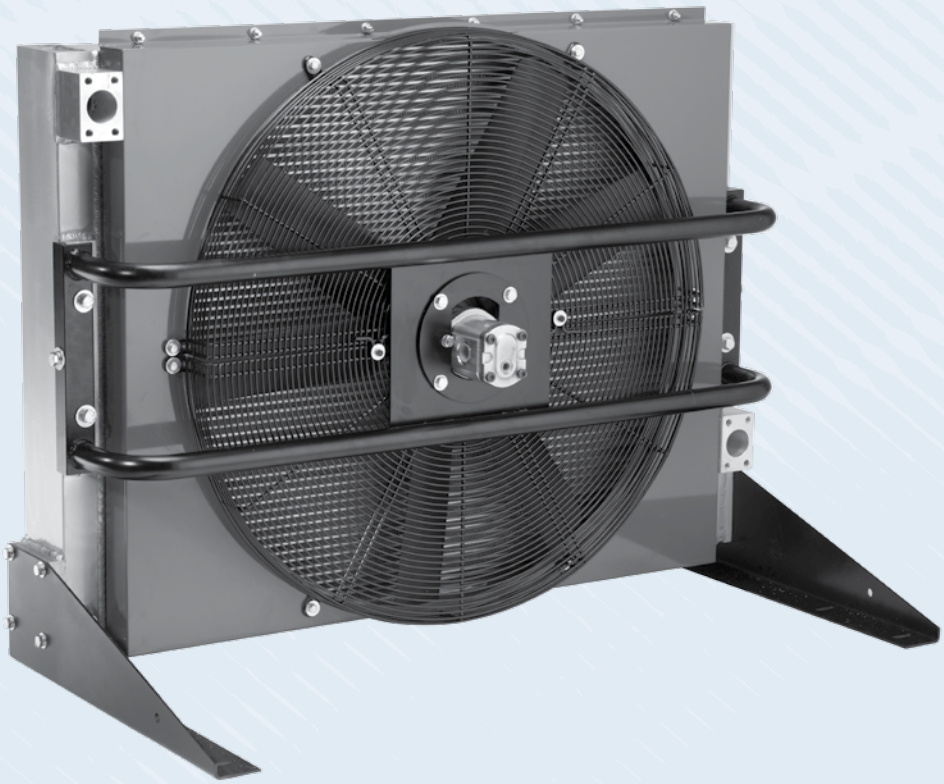


Available in 60 Hz Nema Frame only.

BRAZED ALUMINUM CONSTRUCTION

Features

- **Bar and Plate Brazed Aluminum Core**
- **Rugged, lightweight, and compact**
- **Provides the best heat transfer per given envelope size while minimizing pressure drop**
- **Air-side fin design minimizes fouling and static pressure ensuring long-term, reliable performance**
- **Welded fittings/ports and manifolds ensure structural integrity**
- **Standard SAE ports – NPT and BSPP ports available**
- **Customized units are available to meet your specific performance requirements**
- T-BAR core optional for high viscosity oils or other highly fouling fluids. *See T-Bar Performance Curve
- Low Noise Option Available



Ratings

Maximum Operating Pressure
250 psi (17 BAR)

Maximum Operating Temperature
300° F (150° C)

Materials

Mounting Feet Steel

Standard Core Brazed Aluminum Bar and Plate
- Tanks – 5052 Aluminum
- Nose Bar & Little Bar – 3003-H Aluminum
- Air Fin, Plate, Turbulator & End Plate – 3003-O Aluminum

Fanguard Steel

Connectors Aluminum

Fan Aluminum Hub, Plastic Blades

Shroud Steel

Motor TEFC & IEC

Fluid Compatability

Petroleum/mineral oils

Oil/water emulsion

Water/ethylene glycol

How to Order

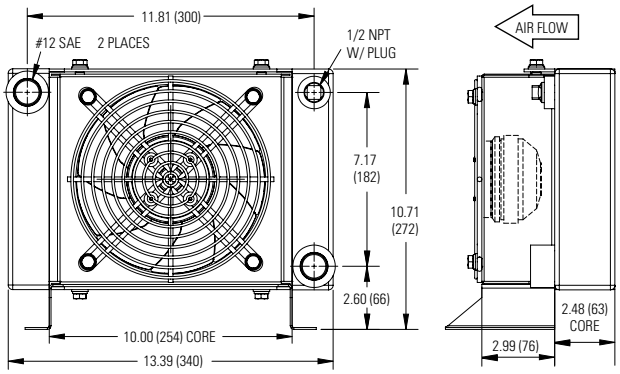
Model Series	**Model Size Selected**	**Connection Type***	**Specify Motor Required**	**Core**	**Noise Level**
BOL	**4** **8** **16** **30** **400** **725** **950** **1200** **1600** **2000**	**1** - NPT **2** - SAE **3** - BSPP	**2** - Single Phase **3** - Three Phase **6** - 575 Volt **9** - Hydraulic **18** - IEC Three Phase	**Blank** - Standard Bar & Plate **TB** - T-BAR Core*	**Blank** - Standard Noise Level **LN** - Low Noise Level

*T-BAR Core option provides a T-BAR core in BOL 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.

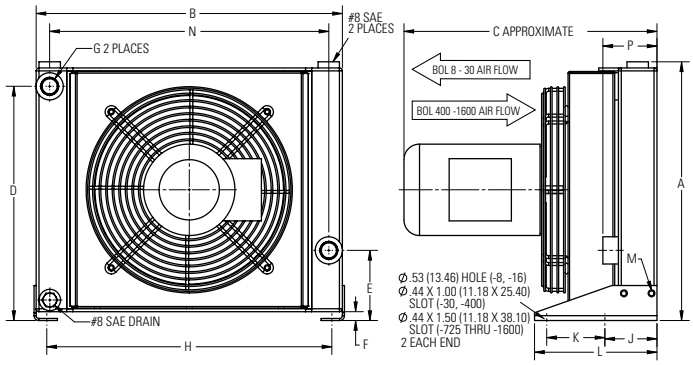
OPTIONAL T-BAR CORE SECTION CUTAWAY

Dimensions

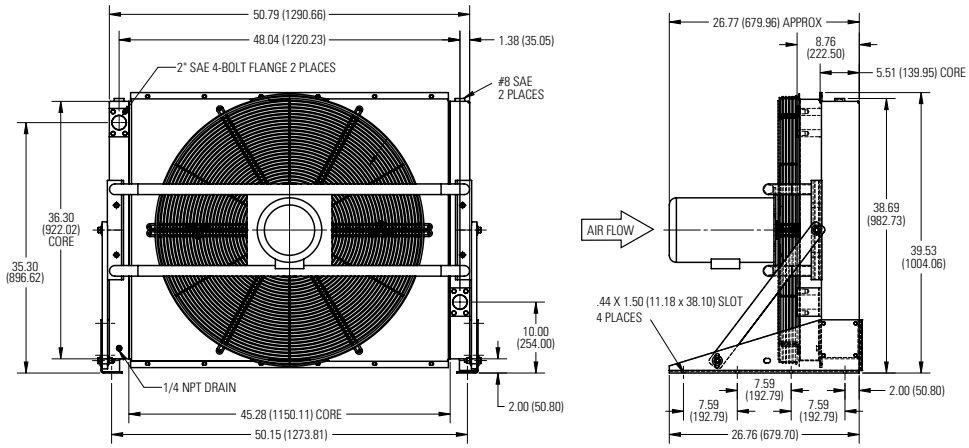
BOL-4



BOL-8 through BOL-1600



BOL-2000



Model	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Approx. Ship Wt. lbs (Kg)
BOL-4	See diagram above			—	—	—	—	—	—	—	—	—	—	—	18 (8.16)
BOL-8	12.93 (328.42)	15.75 (400.05)	14.72 (373.89)	11.30 (287.62)	3.27 (83.06)	.55 (13.97)	#12 SAE	14.53 (369.06)	3.07 (77.98)	3.75 (88.90)	7.36 (186.94)	M8 Bolt (2PL)	14.01 (355.85)	3.48 (88.40)	45 (20.4)
BOL-16	16.63 (422.40)	19.69 (500.13)	16.16 (410.46)	15.06 (382.52)	4.51 (114.56)	.57 (14.48)	#12 SAE	18.30 (464.82)	3.35 (85.09)	3.74 (95.00)	7.87 (199.90)	M8 Bolt (2PL)	17.95 (455.93)	3.46 (87.88)	55 (24.94)
BOL-30	21.09 (535.68)	26.38 (670.06)	18.23 (463.04)	19.49 (495.05)	5.26 (133.60)	1.32 (33.53)	#20 SAE	24.74 (628.40)	4.25 (107.95)	5.00 (127.00)	10.00 (254.00)	M10 Bolt (4PL)	24.34 (618.24)	5.28 (134.11)	125 (56.70)
BOL-400	19.20 (487.68)	22.45 (570.23)	18.80 (477.52)	17.31 (439.67)	6.50 (165.10)	2.00 (50.80)	#20 SAE	22.30 (566.42)	4.25 (107.95)	5.00 (127.00)	10.00 (254.00)	M10 Bolt (4PL)	20.08 (510.03)	5.20 (132.08)	148 (67.13)
BOL-725	23.49 (596.65)	30.32 (770.13)	18.60 (472.44)	21.60 (548.64)	6.50 (165.10)	2.00 (50.80)	#20 SAE	30.17 (766.32)	4.25 (107.95)	5.00 (127.00)	10.00 (254.00)	M10 Bolt (4PL)	27.95 (709.93)	5.20 (132.08)	170 (77.11)
BOL-950	27.94 (709.68)	37.03 (940.56)	22.69 (576.33)	24.55 (623.57)	9.50 (241.30)	2.00 (50.80)	2" SAE 4-Bolt Flange	35.89 (911.61)	6.05 (153.67)	9.20 (233.68)	16.00 (406.40)	M10 Bolt (4PL)	34.26 (870.20)	7.01 (178.05)	300 (136.08)
BOL-1200	27.94 (709.68)	40.96 (1040.38)	24.07 (611.38)	24.55 (623.57)	5.50 (139.70)	2.00 (50.80)		40.31 (1023.87)	6.05 (153.67)	9.20 (233.68)	16.00 (406.40)	M10 Bolt (4PL)	38.19 (970.03)	7.01 (178.05)	430 (195.04)
BOL-1600	36.01 (914.65)	40.96 (1040.38)	25.45 (646.43)	32.62 (828.55)	9.50 (241.30)	2.00 (50.80)		40.31 (1023.87)	6.05 (153.67)	9.20 (233.68)	16.00 (406.40)	M10 Bolt (4PL)	38.19 (970.03)	7.01 (178.05)	515 (233.60)
BOL-2000	See diagram above			—	—	—	—	—	—	—	—	—	—	—	582 (264.00)

Note: We reserve the right to make reasonable design changes without notice. All dimensions are in inches and (millimeters).

Specifications

Electric Motor Information (60 Hz Nema Frame)

Model	CMM	CFM	Motor HP	Voltage	Phase	Full Load Amps 230V	Frequency	RPM	Frame	Thermal Overload	Sound dB(A) at 3ft
BOL-4	31.14	1203	1/4	230	1	—	60 Hz	2850	—	—	73
BOL-8	22.65	800	1/3	115/230	1	3.0	60 Hz	3450	48C	No	80
BOL-8	22.65	800	1/3	208-230/460	3	1.4	60 Hz	3450	48C	No	80
BOL-16	40.35	1425	1/2	115/230	1	3.7	60 Hz	3450	48C	No	85
BOL-16	40.35	1425	1/2	208-230/460	3	2.2	60 Hz	3450	48C	No	85
BOL-30	62.29	2200	1/2	115/230	1	3.7	60 Hz	1725	56C	No	85
BOL-30	62.29	2200	1/2	208-230/460	3	2.0	60 Hz	1725	56C	No	85
BOL-400	62.29	2200	1	115/230	1	6.0	60 Hz	3450	56C	No	97
BOL-400	62.29	2200	1	208-230/460	3	3.2	60 Hz	3450	56C	No	97
BOL-725	101.94	3600	1-1/2	115/230	1	8.5	60 Hz	3450	56C	No	100
BOL-725	101.94	3600	1-1/2	208-230/460	3	4.8	60 Hz	3450	56C	No	100
BOL-950	133.10	4700	1-1/2	115/230	1	8.6	60 Hz	1725	145TC	No	92
BOL-950	133.10	4700	1-1/2	208-230/460	3	4.6	60 Hz	1725	145TC	No	92
BOL-1200	198.22	7000	3	208-230/460	3	8.8	60 Hz	1725	182TC	No	94
BOL-1600	223.75	7900	5	208-230/460	3	13.4	60 Hz	1725	184TC	No	96
BOL-2000	396.44	14000	7.5	230/460	3	24.8	60 Hz	1725	213TC	No	98

Electric Motor Information (50 Hz IEC Frame)

Model	CMM	CFM	KW	Voltage	Phase	Frequency	RPM	Frame	Sound dB(A) at 3ft
BOL-4	28.4	1003	.20	230	1	50 Hz	3000	—	73
BOL-8	18.9	667	.25	230/400/415	3	50 Hz	3000	63	71
BOL-16	33.7	1188	.37	230/400/415	3	50 Hz	3000	71	77
BOL-30	52.4	1850	.37	230/400/415	3	50 Hz	1500	71	73
BOL-400	52.4	1850	.75	230/400/415	3	50 Hz	3000	80	81
BOL-725	85.0	3000	1.10	230/400/415	3	50 Hz	3000	80	80
BOL-950	108.2	3821	1.50	230/400/415	3	50 Hz	1500	90	78
BOL-1200	165.1	5834	2.20	230/400/415	3	50 Hz	1500	100	83
BOL-1600	186.4	6584	3.00	230/400/415	3	50 Hz	1500	100	85
BOL-2000	331.3	11700	4.00	230/400/415	3	50 Hz	1500	112	88

All IEC frame motors have CE mark.
IEC motor voltages have +/- 10% tolerance.

Hydraulic Motor Information

Model	Oil Flow Required GPM (LPM)	Min. Pressure Required PSI (BAR)	Motor IN^3/REV (CM^3/REV) Displacement	Sound dB(A) at 3 ft.
BOL-4	3.3 (12.49)	400 (27.58)	0.22 (3.6)	80
BOL-8	3.3 (12.49)	400 (27.58)	0.22 (3.6)	80
BOL-16	3.3 (12.49)	500 (34.47)	0.22 (3.6)	85
BOL-30	3.4 (12.87)	500 (34.47)	0.45 (7.3)	85
BOL-400	3.3 (12.49)	425 (29.30)	0.22 (3.6)	97

Model	Oil Flow Required GPM (LPM)	Min. Pressure Required PSI (BAR)	Motor IN^3/REV (CM^3/REV) Displacement	Sound dB(A) at 3 ft.
BOL-725	3.3 (12.49)	675 (46.50)	0.22 (3.6)	100
BOL-950	10.1 (38.23)	300 (20.70)	1.4 (22.9)	92
BOL-1200	10.1 (38.23)	725 (50.00)	1.4 (22.9)	94
BOL-1600	10.1 (38.23)	1100 (75.80)	1.4 (22.9)	96
BOL-2000	10.1 (38.23)	1650 (113.76)	1.4 (22.9)	98

Notes: Maximum Pressure is 2000 psi. Stated Minimum Operating Pressure is at Inlet Port of Motor. 1000 psi Allowable Back Pressure.

Selection Procedure

Step 1 **Determine Heat Load.** Typical Rule of Thumb, -size cooler for 1/3 of the input horsepower. Heat load may be expressed as either Horsepower or BTU/Hr or KW/°C.

HP=BTU/HR ÷ 2545

BTU/HR=HP x 2545

$$\text{BTU/HR} = \frac{\text{KW}}{\text{°C}} \times 1894.61 \times \text{E.T.D.(°F)}$$

Step 2 **Determine Entering Temperature Difference.** (Actual E.T.D.)

$$\text{E.T.D.} = \text{Entering oil temperature} - \text{Entering Ambient air temperature}$$

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 **Determine the Corrected Heat Dissipation to use the Curves**

ENGLISH Version

$$\text{Corrected Heat Rejection} = \text{(BTU/Hr) Heat Load} \times \frac{100°\text{F}}{\text{Desired E.T.D.}}$$

(BTU/HR) to use with selection chart

METRIC Version

$$\text{Corrected Heat Rejection} \quad \frac{\text{KW}}{\text{°C}} = \frac{\text{Heatload (kw)}}{\text{Desired E.T.D. (°C)}}$$

Step 4 **Select Model From Curves** Enter the Performance Curves at the bottom with the GPM 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.

Step 5 **Calculate Oil Pressure Drop** Find the oil pressure drop correction factor and multiply it by the Oil Pressure Drop found on performance curve.

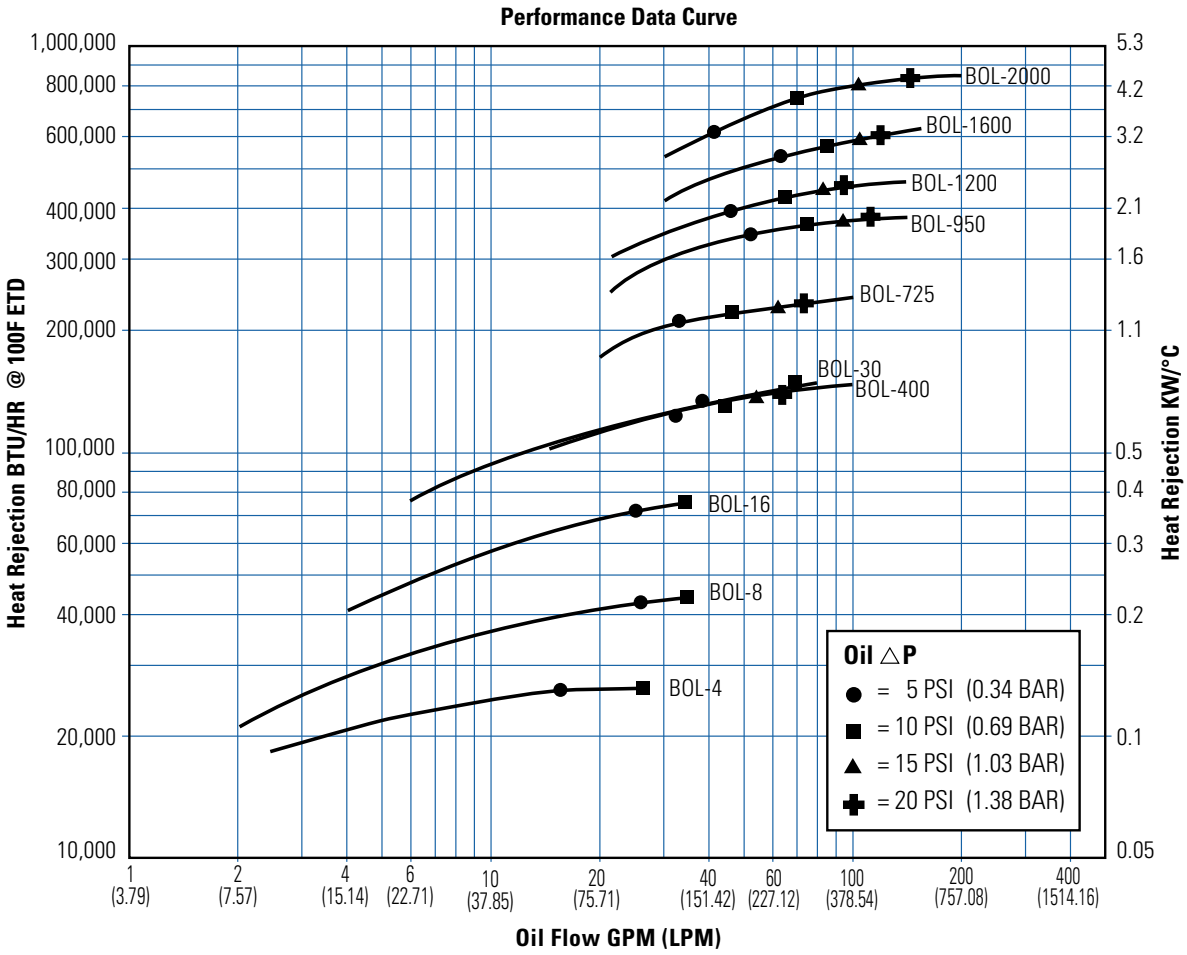
Listed Performance Curves are based on:

- 50 SSU (11 cSt) oil
- 100° F (55.56° C) Entering Temperature Difference (E.T.D.)

If your application conditions are different, then continue with the selection procedure.

Performance Curves

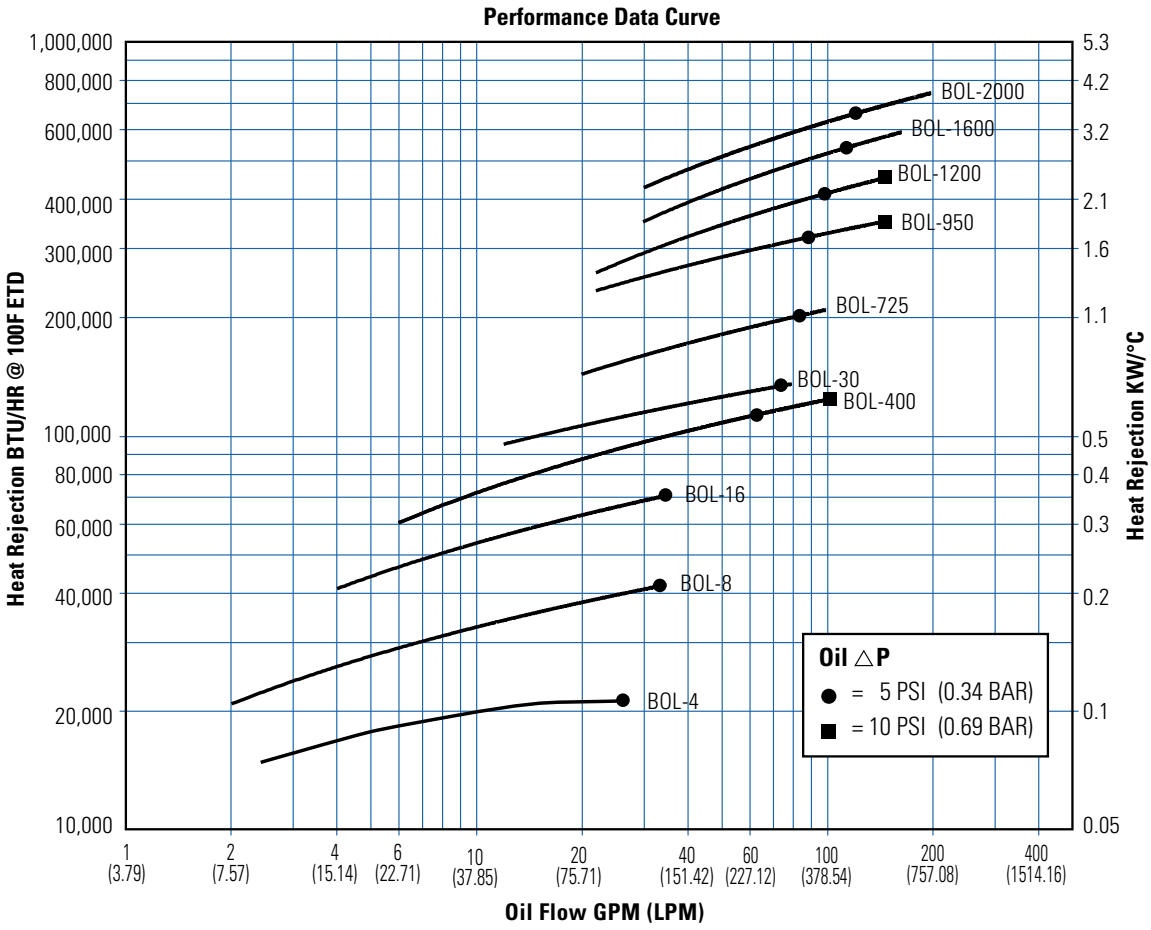
BOL Models with Standard P-BAR Core



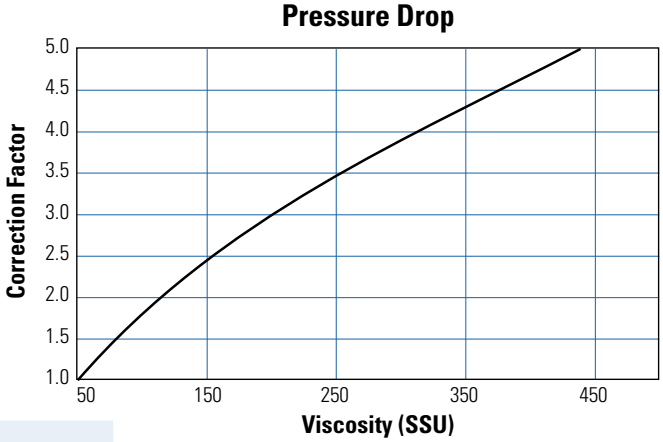
Note: Derate heat rejection values 15% if using 50Hz motors.

Performance Curves

BOL Models with Optional T-BAR Core



Note: Derate heat rejection values 15% if using 50Hz motors.



Oil Temperature

Typical operating temperature ranges are:

Hydraulic Motor Oil	120°F - 180°F (49°C - 82.2°C)
Hydrostatic Drive Oil	160°F - 180°F (71°C - 82.2°C)
Engine Lube Oil	180°F - 200°F (82.2°C - 93.3°C)
Automatic Transmission Fluid	200°F - 300°F (93.3°C - 149°C)

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 = (BTU's/Hr.) / (GPM Oil Flow x 210).

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

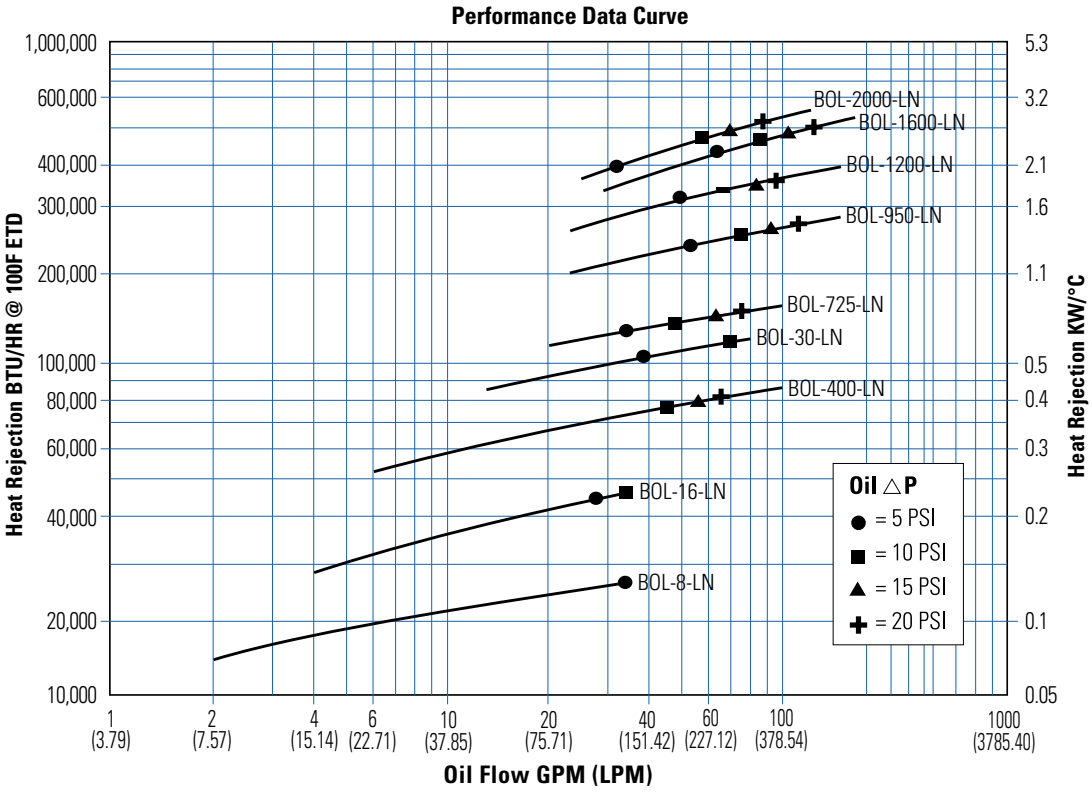
Oil Entering Temp. = Oil Leaving Temp + Oil △T.

Oil Pressure Drop: Most systems can tolerate a pressure drop through the heat exchanger of 20 to 30 PSI. Excessive pressure drop should be avoided. Care should be taken to limit pressure drop to 5 PSI or less for case drain applications where high back pressure may damage the pump shaft seals.

Performance Curves

BOL Models with Low-Noise Option

The low noise option offers the BOL models with a reduced motor speed.
This allows a lower sound level output for noise-sensitive applications.



Available on 60 Hz Nema frame only.

Electric Motor Information

Model	HP	Frame	Low Noise RPM	Low Noise CFM	Low Noise CMM	Voltage	Frequency (HZ)
8-1PH	0.33	48	1725	400	11.33	115/230	60
8-3PH	0.33	48	1725	400	11.33	208-230/460	60
16-1PH	0.50	48	1725	704	19.93	115/230	60
16-3PH	0.50	48	1725	704	19.93	208-230/460	60
30-1PH	0.50	56C	1160	1470	41.62	115/230	60
30-3PH	0.50	56C	1160	1470	41.62	208-230/460	60
400-1PH	1.00	56C	1725	1100	31.19	115/230	60
400-3PH	1.00	56C	1725	1100	31.19	208-230/460	60
725-1PH	1.50	56C	1725	1780	50.40	115/230	60
725-3PH	1.50	56C	1725	1780	50.40	208-230/460	60
950-1PH	1.50	145TC	1160	3150	89.19	115/230	60
950-3PH	1.50	145TC	1160	3150	89.19	208-230/460	60
1200-3PH	1.50	182TC	1160	4690	132.81	208-230/460	60
1600-3PH	2.00	184TC	1160	6510	184.34	208-230/460	60
2000-3PH	5.00	213TC	1160	8700	000.00	230/460	60

Sound Data

Model	DBA at 3 ft
BOL-8-LN	62
BOL-16-LN	69
BOL-30-LN	67
BOL-400-LN	72
BOL-725-LN	82
BOL-950-LN	76
BOL-1200-LN	75
BOL-1600-LN	78
BOL-2000-LN	85

BRAZED ALUMINUM CONSTRUCTION

Features

- **Bar and Plate Brazed Aluminum Core**
- **Rugged, lightweight, and compact**
- **Provides the best heat transfer per given envelope size while minimizing pressure drop**
- **Air-side fin design minimizes fouling and static pressure ensuring long-term, reliable performance**
- **Fan motor assembly has an IP68 with AMP-#180908 connection**
- **Welded aluminum fittings/ports and manifolds ensure structural integrity**
- **Standard SAE ports – NPT and BSPP ports available**
- **Customized units are available to meet your specific performance requirements**
- Additional capabilities for radiators, charge-air-coolers, condensers, and multi-circuit units
- Optional temperature sensors *(see pg. 171)*

30/60 psi Bypass available

Ratings

Maximum Operating Pressure
250 psi (17 BAR)

Maximum Operating Temperature
300° F (150° C)

Fluid Compatability

Petroleum/mineral oils

Oil/water emulsion

Water/ethylene glycol

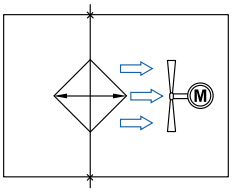
Materials

Core Brazed Aluminum Bar and Plate

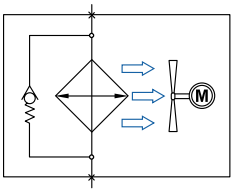
- Tanks – 5052 Aluminum
- Nose Bar & Little Bar – 3003-H Aluminum
- Air Fin, Plate, Turbulator & End Plate – 3003-O Aluminum

Connections Aluminum

Core Mounting Brackets Brazed Aluminum



Without Bypass



With Bypass

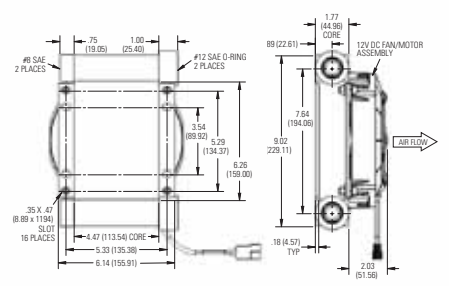
How to Order

Model Series	**Model Size Selected**	**Connection Type***	**Bypass***	**Specify Motor Required**
MA	**3**	**1** - NPT	**30** - 30 PSI	**4A** - 12 VDC
(MAR)	**3.5**	**2** - SAE	**60** - 60 PSI	**4B** - 24 VDC
	4	**3** - BSPP		
	12			
	18			
	32			
	48			
	232			
	248			

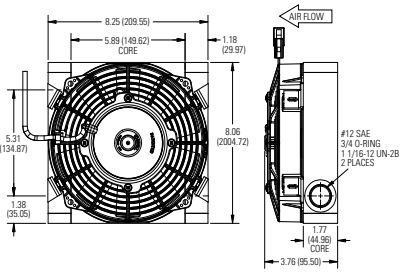
*Bypass available on MA-12, MA-18, MA-32, MA-48, MA-232, MA-248 only. (MAR)
MA-8, MA-14, MA-20, MA-66, MA-32 do not have fan option.
MA 3.5 available with fan only.

Dimensions - Fan/Core

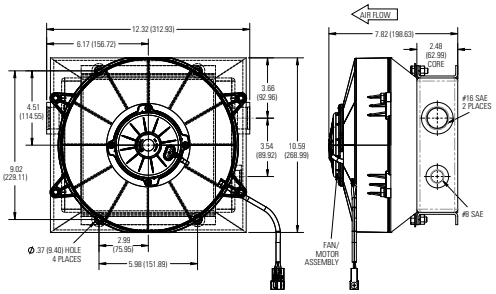
MA-3



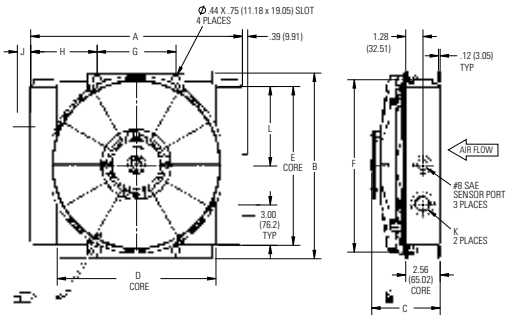
MA-3.5



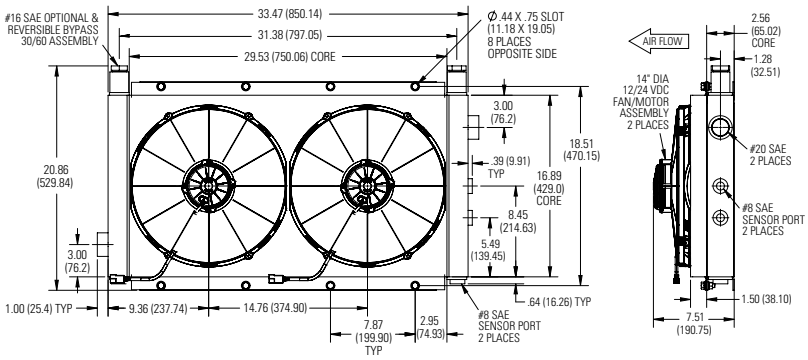
MA-4



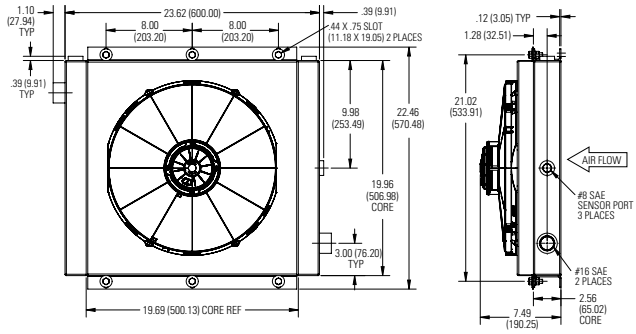
MA-12, MA-18, MA-32



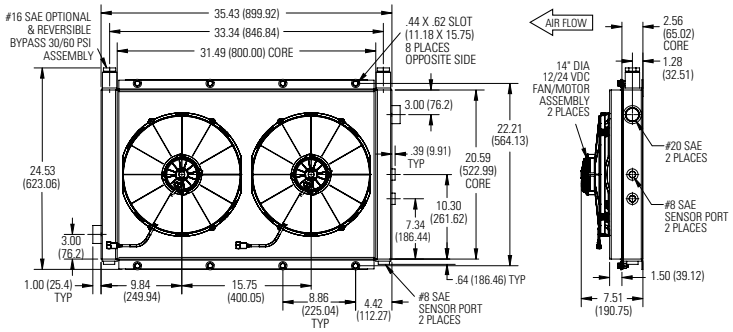
MA-232



MA-48



MA-248

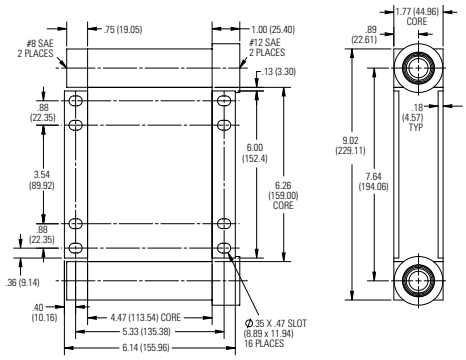


Model	A	B	C	D	E	F	G	H	J	K	L	DC Amp Draw 12V	DC Amp Draw 24V	CFM (CMM)	Approx. Ship Wt. lbs (Kg)
MA-3	See diagram above			—	—	—	—	—	—	—	—	5.7	3.6	300 (8.50)	6 (2.72)
MA-3.5	See diagram above			—	—	—	—	—	—	—	—	12.5	6.3	370 (10.48)	9 (4.08)
MA-4	See diagram above			—	—	—	—	—	—	—	—	12.5	6.3	363 (10.28)	16 (7.26)
MA-12	13.78 (350.01)	11.81 (299.97)	6.26 (159.00)	9.84 (249.94)	9.96 (252.98)	10.87 (276.10)	5.71 (145.00)	4.41 (112.01)	1.00 (25.40)	#12 SAE	4.98 (126.49)	12.5	6.3	521 (14.75)	19 (8.62)
MA-18	15.75 (400.05)	13.81 (350.77)	5.04 128.02)	11.81 (299.97)	11.81 (299.97)	12.80 (325.12)	5.87 (149.10)	4.96 (125.98)	1.00 (25.40)	#12 SAE	5.91 (150.11)	10.6	5.3	783 (22.17)	23 (10.43)
MA-32	19.69 (500.15)	18.54 (470.92)	5.95 (151.13)	15.75 (400.05)	16.14 (409.96)	17.32 (439.93)	12.00 (304.8)	3.86 (98.04)	1.14 (28.96)	#16 SAE	8.07 (204.98)	22.2	11.1	1368 (38.74)	28 (12.70)
MA-48	See diagram above			—	—	—	—	—	—	—	—	22.2	11.1	1637 (46.40)	45 (20.40)
MA-232	See diagram above			—	—	—	—	—	—	—	—	19.3*	9.7*	2234 (63.26)	65 (29.48)
MA-248	See diagram above			—	—	—	—	—	—	—	—	19.3*	9.7*	2904 (82.24)	90 (40.80)

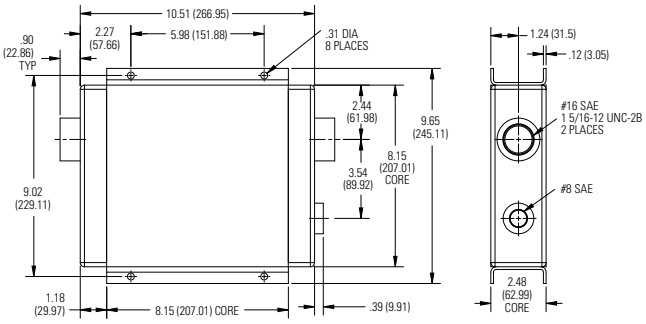
Note: We reserve the right to make reasonable design changes without notice. Dimensions are in inches and (millimeters).
**AMP draw listed as per FAN.*

Dimensions - Core Only

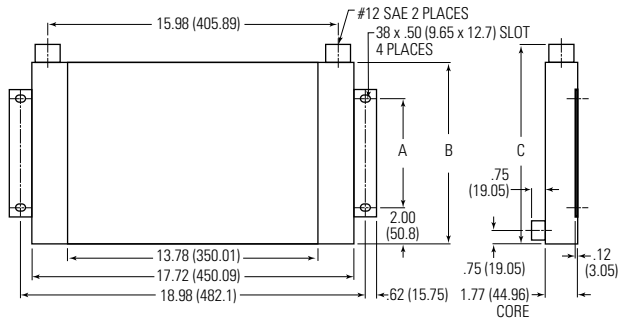
MA-3



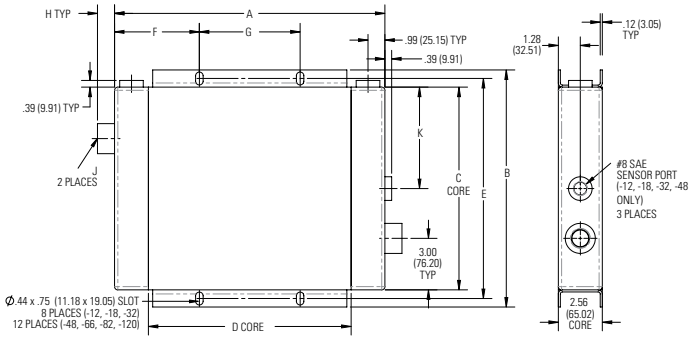
MA-4



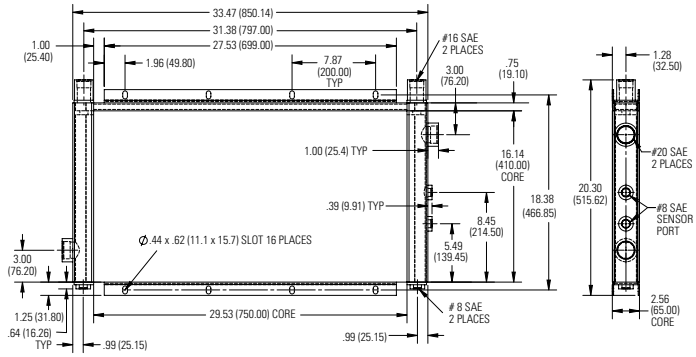
MA-8, MA-14, MA-20



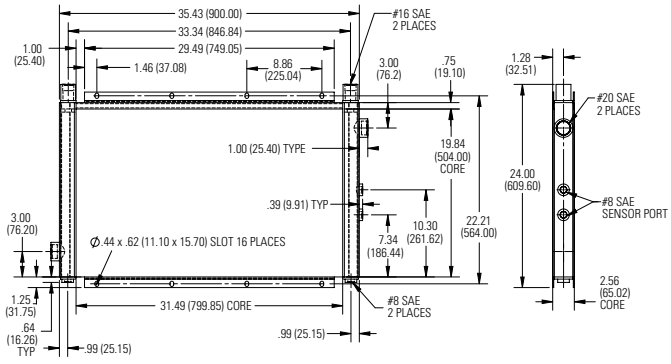
MA-12 thru MA-120



MA-232



MA-248



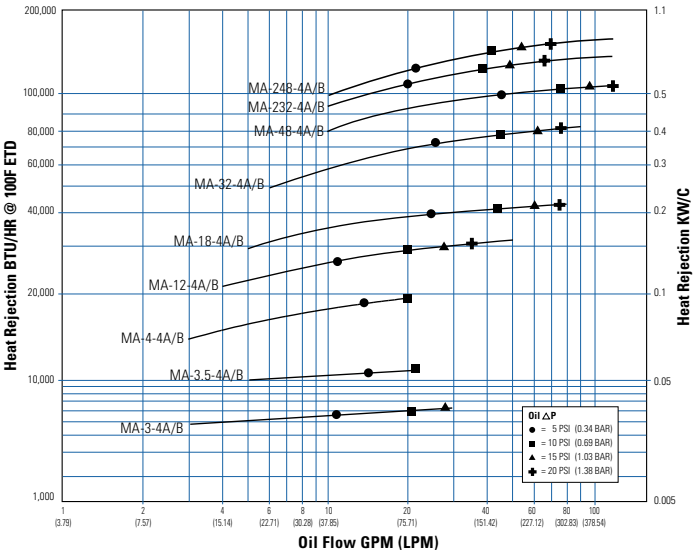
Model	A	B	C	D	E	F	G	H	J	K	Approx. Ship Wt. lbs (Kg)
MA-3	See diagram above			–	–	–	–	–	–	–	4 (1.81)
MA-4	See diagram above			–	–	–	–	–	–	–	7 (3.18)
MA-8	3.00 (76.2)	5.67 (144.02)	6.65 (168.9)	–	–	–	–	–	–	–	10 (4.54)
MA-12	13.78 (350.01)	11.81 (299.97)	9.96 (252.98)	9.84 (294.94)	10.98 (278.89)	4.04 (102.62)	5.71 (145.03)	1.00 (25.4)	#12 SAE	4.98 (126.49)	15 (6.8)
MA-14	6.00 (152.4)	10.00 (254.0)	10.98 (278.89)	–	–	–	–	–	–	–	14 (6.35)
MA-18	15.75 (400.05)	13.81 (350.77)	11.81 (299.97)	11.81 (299.97)	12.82 (325.63)	4.94 (125.48)	5.87 (149.10)	1.00 (25.4)	#12 SAE	5.91 (150.11)	18 (8.16)
MA-20	10.00 (254.0)	14.33 (363.98)	15.31 (388.87)	–	–	–	–	–	–	–	18 (8.16)
MA-32	19.69 (500.13)	18.54 (470.92)	16.14 (409.96)	15.75 (400.05)	17.32 (439.93)	3.85 (97.79)	12.00 (304.8)	1.10 (27.94)	#16 SAE	8.07 (204.98)	28 (12.7)
MA-48	23.62 (599.95)	22.13 (562.10)	19.96 (506.98)	19.69 (500.13)	21.02 (533.91)	3.81 (96.77)	8.00 (203.2)	1.10 (27.94)	#16 SAE	9.98 (253.49)	41 (18.60)
MA-66	27.56 (700.02)	25.83 (656.08)	23.54 (597.92)	23.62 (599.95)	24.72 (627.89)	3.78 (96.01)	10.00 (254.0)	1.58 (40.13)	#20 SAE	–	50 (22.68)
MA-82	31.50 (800.1)	27.68 (703.07)	25.39 (644.91)	27.56 (700.02)	26.57 (674.8)8	5.75 (146.05)	10.00 (254.0)	1.58 (40.13)	#24 SAE	–	65 (29.48)
MA-120	31.50 (800.1)	39.49 (1003.05)	37.20 (944.88)	27.56 (700.02)	38.39 (975.11)	5.75 (146.05)	10.00 (254.0)	1.58 (40.13)	#24 SAE	–	88 (39.92)
MA-232	See diagram above			–	–	–	–	–	–	–	55 (24.95)
MA-248	See diagram above			–	–	–	–	–	–	–	80 (36.29)

Note: We reserve the right to make reasonable design changes without notice. All dimensions are in inches and (millimeters).

Performance Curves

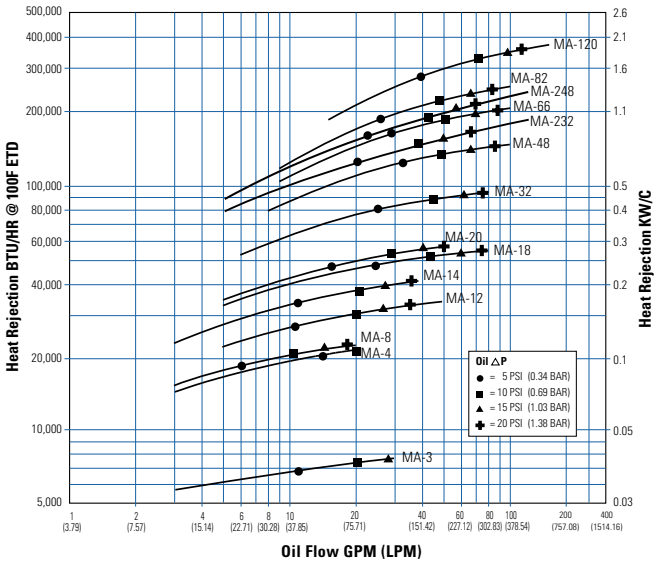
MA Models with DC Fan Assemblies

Performance Data Curve

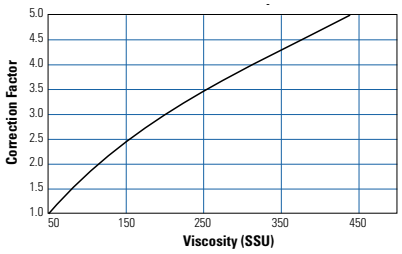


MA Models (No Fan, Core Only)

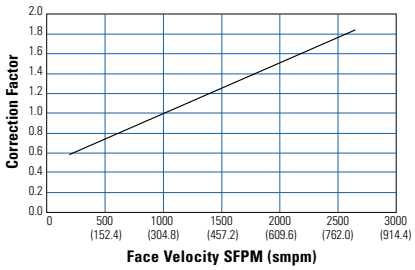
Performance Data Curve



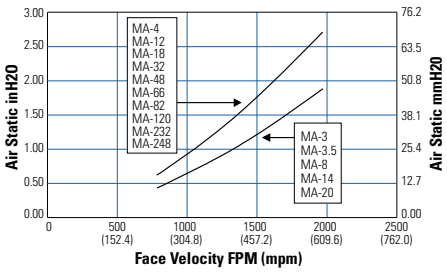
Oil Pressure Drop Correction



Air Static Correction



Air Static Pressure Drop



Selection Procedure

Step 1 **Determine Heat Load.** Typical Rule of Thumb, - size cooler for 1/3 of the input horsepower. Heat load may be expressed as either Horsepower or BTU/HR or KW/°C.

HP = BTU/HR ÷ 2545

BTU/HR = HP x 2545

$$BTU/HR = \frac{KW}{°C} \times 1895 \times E.T.D.(°F)$$

Step 2 **Determine Entering Temperature Difference.** (Actual E.T.D.)
(E.T.D.= Entering oil temperature – Entering Ambient air temperature)

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, plus – add any pre-heating of the air prior to its entering the cooler. Pay special attention if air is drawn from the engine compartment for cooling.

Step 3 **Find Air Velocity Correction Factor**
(Skip to Step 4 if using our DC Fan Assembly)

Calculate actual SFPM Air Velocity or SCFM (Standard Cubit Feet per Minute) for selection using the Face Area from the table.

$$SFPM\ Air\ Velocity^{*} = \frac{SCFM\ Air\ Flow}{Square\ Feet\ Cooler\ Face\ Area}$$

$$SMPM = \frac{SCMM}{Square\ Meter\ Cooler\ Face\ Area}$$

(SCFM Air Flow= SFPM Air Velocity x Square Feet Cooler Face Area)

*If the Air Velocity calculated is different than the value in Step 4, then recheck Corrected oil Pressure drop.

Step 4 **Determine the Corrected Heat Dissipation to use the Curves**

ENGLISH Version

$$\text{Corrected Heat Rejection} = \frac{\text{(BTU/Hr) Heat Load}}{\left[\frac{\text{Desired E.T.D}}{100°F} \times \text{Air Velocity Correction Factor}\right]}$$

(BTU/HR) to use with selection chart

(Air Factor value not needed if using provided DC Fan assembly; Omit in formula)

METRIC Version

$$\text{Corrected Heat Rejection}\left[\frac{KW}{°C}\right] = \frac{\text{Heatload (kw)}}{\text{Desired E.T.D (°C)} \times \text{Air Velocity Correction Factor}}$$

Step 5 **Select Model From Curves** Enter the Performance Curves at the bottom with the GPM oil flow and proceed upward to the adjusted Heat Rejection from Step 4. Any Model or Curve on or above this point will meet these conditions.

Step 6 **Calculate Oil Pressure Drop** Find the oil pressure drop correction factor and multiply it by the Oil Pressure Drop found on performance curve.

Listed Performance Curves are based on:

- 50 SSU (11 cSt) oil
- 1000 Standard Feet per Minute (SPFM) (304.8 MPM) Air Velocity
- 100° F (55.56° C) Entering Temperature Difference (E.T.D.)

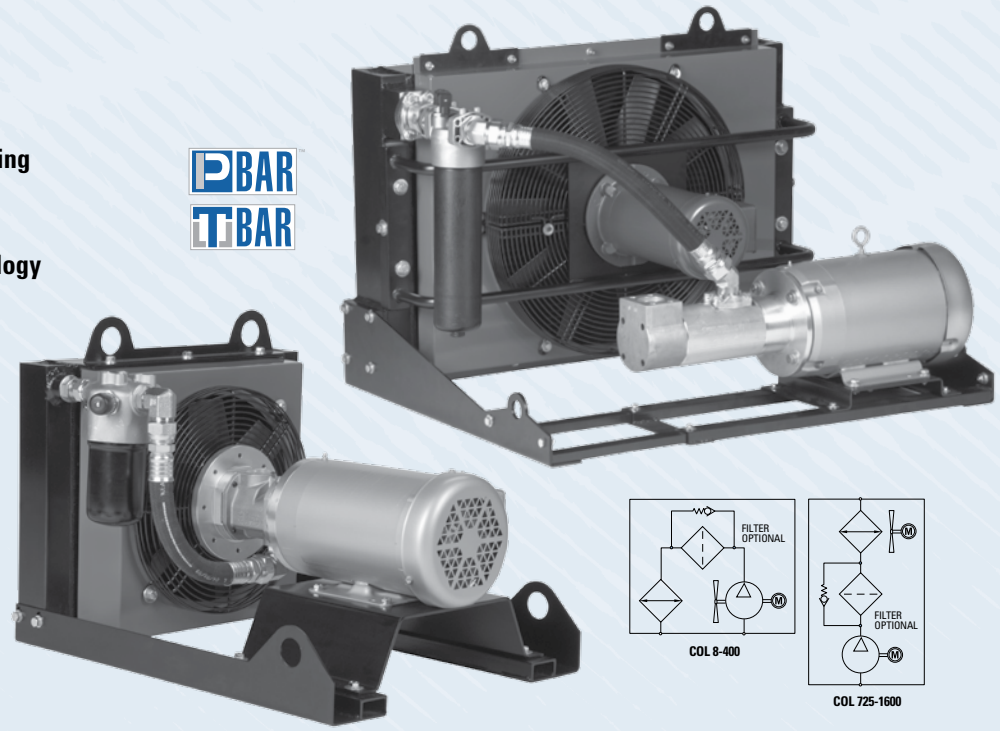
If your application conditions are different, then continue with the selection procedure.

BRAZED ALUMINUM CONSTRUCTION

Features

- **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**
- **Best heat transfer per given envelope size while minimizing pressure drop**
- **Standard SAE ports - NPT and BSPP port adapters available**
- Optional cartridge-style filters with both visual and electrical bypass indicator options
- Optional temperature sensors *(see pgs. 169 & 170)*

P-BAR
T-BAR



COL 8-400

COL 725-1600

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*

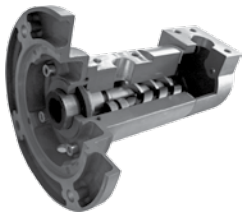
**Standard pump seals are not compatible with phosphate ester. Special pumps with EPDM seals are required. Consult factory for details.*

Micron Filtration

Utilize a modern in-line filter housing and cartridge
- Utilizes a 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

offering 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.

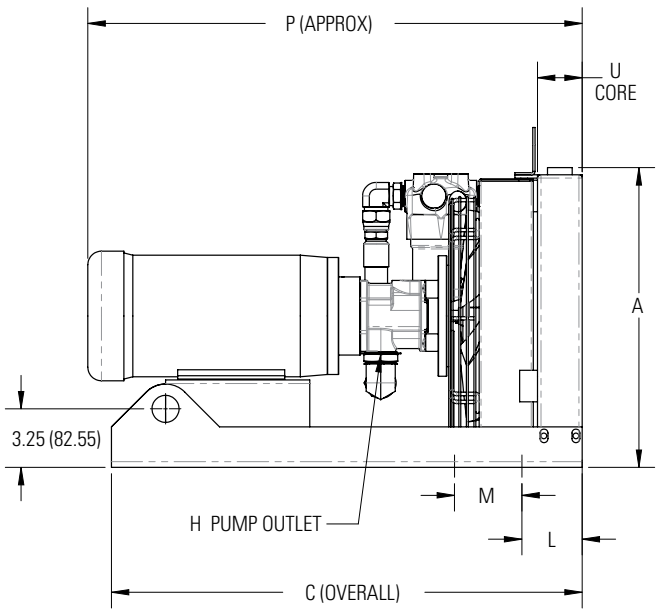
Oil Temperature

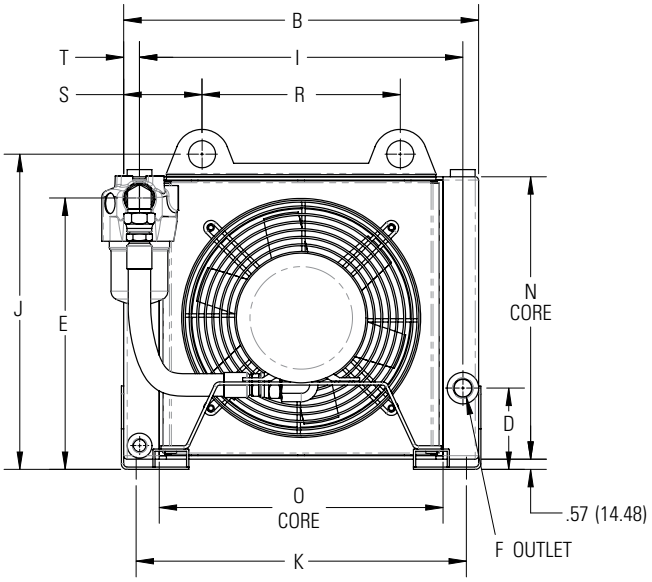
Typical operating temperature ranges are:

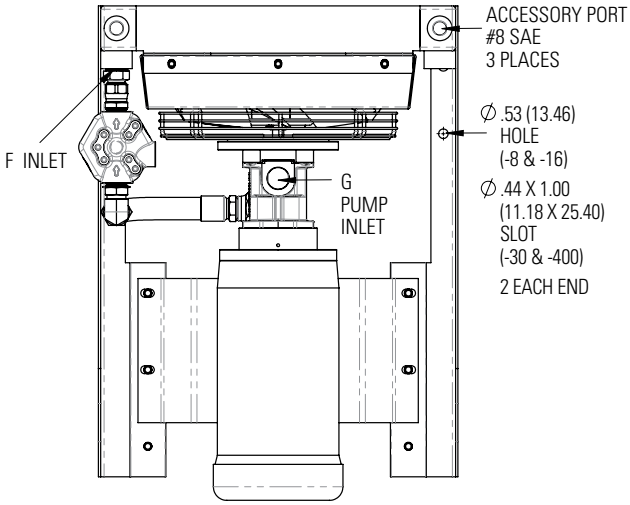
Hydraulic Motor Oil	120 - 180°F (49 - 82°C)
Hydrostatic Drive Oil	160 - 180°F (71 - 82°C)
Engine Lube Oil	180 - 199°F (82 - 93°C)
Automatic Transmission Fluid	199 - 300°F (93 - 149°C)

Dimensions

COL-8 through COL-400





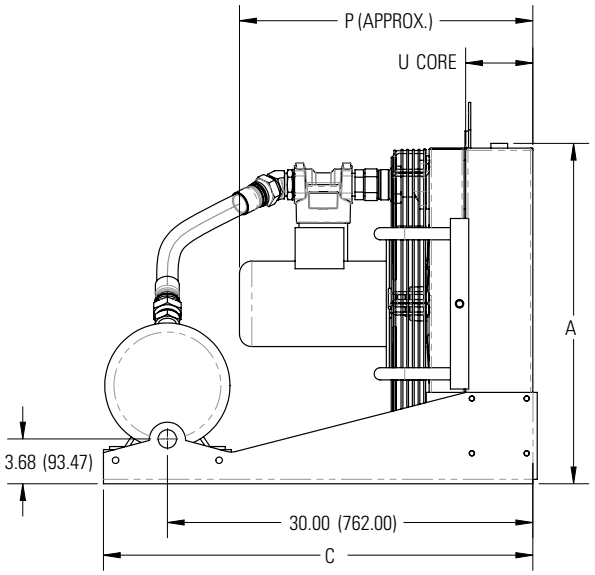


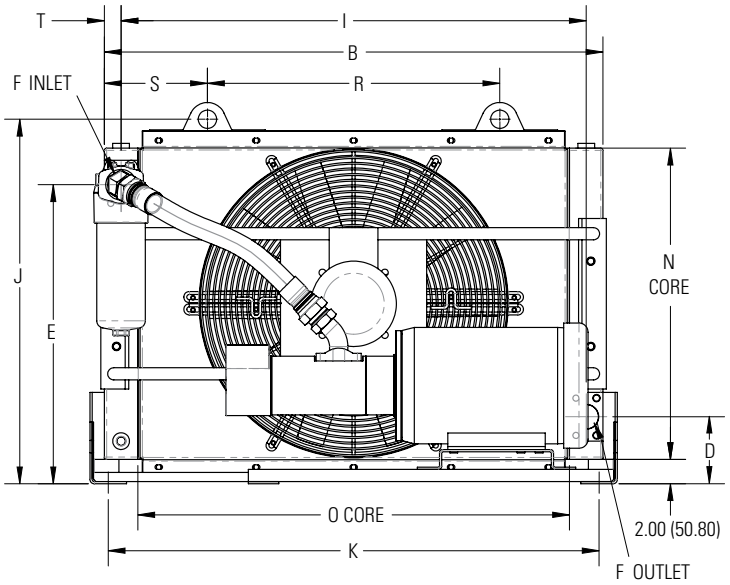
Model	A	B	C	D	E	F	G (Pump Intlet)	H (Pump Outlet)	I	J	K	L	M	N	O	P	R	S	T	U
COL-8-20	12.93 (328)	15.75 (400)	26.13 (664)	4.51 (115)	11.34 (288)	#12 SAE	#12 SAE	#16 SAE	13.99 (355)	13.79 (350)	14.39 (366)	3.35 (85)	3.74 (95)	11.97 (304)	11.81 (300)	27.09 (688)	6.50 (165)	3.75 (95)	0.88 (22)	2.48 (63)
COL-8-40	12.93 (328)	15.75 (400)	26.13 (664)	4.51 (115)	11.34 (288)	#12 SAE	#20 SAE	#24 SAE	13.99 (355)	13.79 (350)	14.39 (366)	3.35 (85)	3.74 (95)	11.97 (304)	11.81 (300)	29.71 (755)	6.50 (165)	3.75 (95)	0.88 (22)	2.48 (63)
COL-16-20	16.63 (422)	19.69 (500)	26.13 (664)	4.51 (115)	15.06 (383)	#12 SAE	#12 SAE	#16 SAE	17.95 (456)	17.49 (444)	18.33 (466)	3.35 (85)	3.74 (95)	15.67 (398)	15.75 (400)	27.44 (697)	11.00 (279)	4.35 (110)	0.87 (22)	2.48 (63)
COL-16-40	16.63 (422)	19.69 (500)	26.13 (664)	4.51 (115)	15.06 (383)	#12 SAE	#20 SAE	#24 SAE	17.95 (456)	17.49 (444)	18.33 (466)	3.35 (85)	3.74 (95)	15.67 (398)	15.75 (400)	30.05 (763)	11.00 (279)	4.35 (110)	0.87 (22)	2.48 (63)
COL-30-20	21.09 (536)	26.38 (670)	26.86 (682)	5.27 (134)	19.50 (495)	#20 SAE	#12 SAE	#16 SAE	24.34 (618)	22.07 (561)	24.74 (628)	4.25 (108)	5.00 (127)	19.37 (492)	21.65 (550)	28.35 (720)	17.00 (432)	4.69 (119)	1.02 (26)	3.70 (94)
COL-30-40	21.09 (536)	26.38 (670)	26.86 (682)	5.27 (134)	19.50 (495)	#20 SAE	#20 SAE	#24 SAE	24.34 (618)	22.07 (561)	24.74 (628)	4.25 (108)	5.00 (127)	19.37 (492)	21.65 (550)	30.96 (786)	17.00 (432)	4.69 (119)	1.02 (26)	3.70 (94)
COL-400-20	19.20 (488)	22.45 (570)	26.86 (682)	6.50 (165)	17.31 (440)	#20 SAE	#12 SAE	#16 SAE	20.08 (510)	20.69 (526)	22.31 (567)	4.25 (108)	5.00 (127)	16.81 (427)	17.72 (450)	28.47 (723)	11.00 (279)	5.73 (146)	1.19 (30)	3.70 (94)
COL-400-40	19.20 (488)	22.45 (570)	26.86 (682)	6.50 (165)	17.31 (440)	#20 SAE	#20 SAE	#24 SAE	20.08 (510)	20.69 (526)	22.31 (567)	4.25 (108)	5.00 (127)	16.81 (427)	17.72 (450)	31.09 (790)	11.00 (279)	5.73 (146)	1.19 (30)	3.70 (94)

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

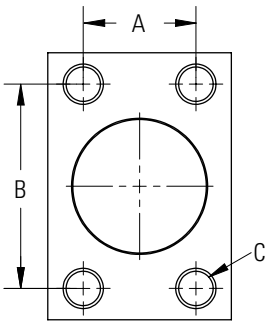
Dimensions

COL-725 through COL-1600

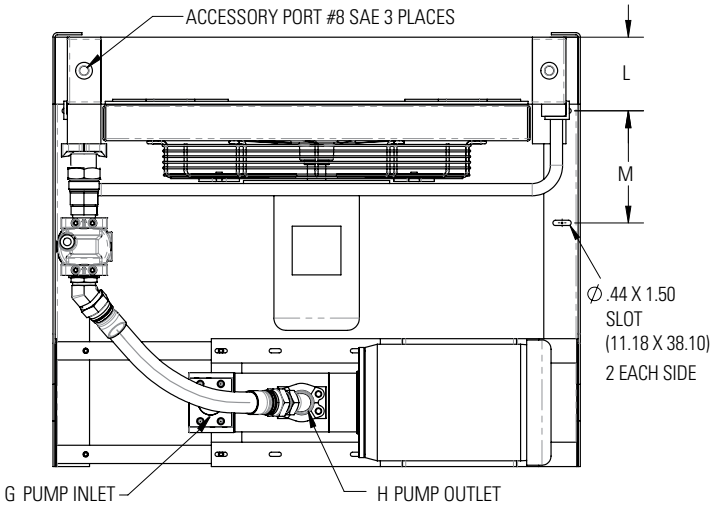




SAE Flange



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

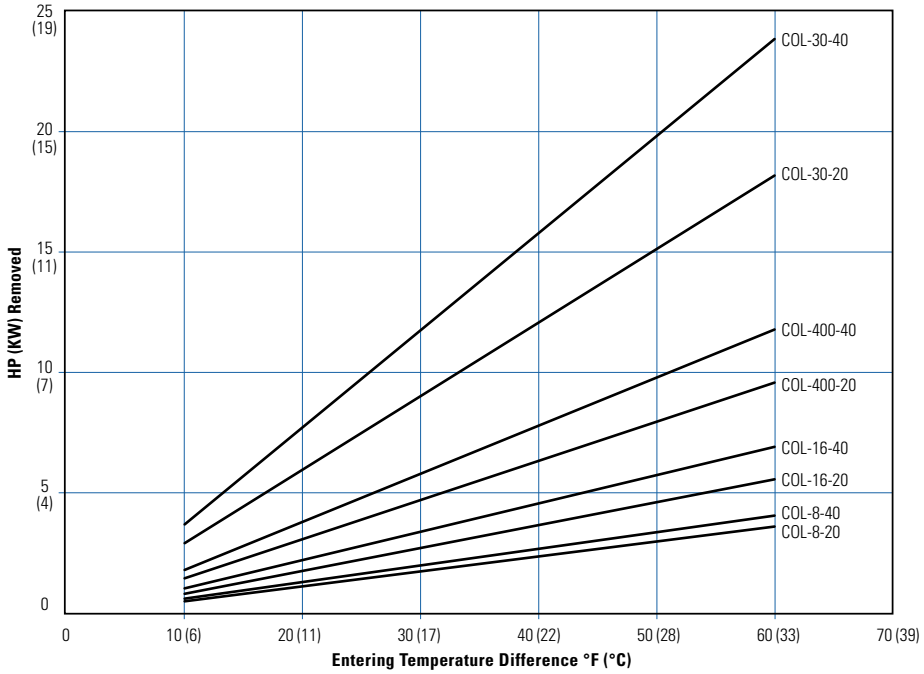


Model	A	B	C	D	E	F	G (Pump Intlet)	H (Pump Outlet)	I	J	K	L	M	N	O	P	R	S	T	U
COL-725-80	23.49 (597)	30.32 (770)	35.00 (889)	6.50 (165)	21.60 (549)	#20 SAE	2" SAE Flange	1½" SAE Flange	27.95 (710)	25.48 (647)	30.18 (767)	4.25 (108)	5.00 (127)	21.10 (536)	25.59 (650)	24.07 (611)	11.98 (304)	9.16 (233)	1.19 (30)	3.70 (94)
COL-725-100	23.49 (597)	30.32 (770)	35.00 (889)	6.50 (165)	21.60 (549)	#20 SAE	2½" SAE Flange	2" SAE Flange	27.95 (710)	25.48 (647)	30.18 (767)	4.25 (108)	5.00 (127)	21.10 (536)	25.59 (650)	24.07 (611)	11.98 (304)	9.16 (233)	0.19 (5)	3.70 (94)
COL-950-80	27.94 (710)	37.01 (940)	35.25 (895)	9.50 (241)	24.55 (624)	2" SAE Flange	2" SAE Flange	1½" SAE Flange	34.26 (870)	29.93 (760)	35.87 (911)	6.05 (154)	9.20 (234)	25.55 (649)	31.50 (800)	22.69 (576)	18.00 (457)	9.51 (242)	1.38 (35)	5.51 (140)
COL-950-100	27.94 (710)	37.01 (940)	35.25 (895)	9.50 (241)	24.55 (624)	2" SAE Flange	2½" 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)	22.69 (576)	18.00 (457)	9.51 (242)	1.38 (35)	5.51 (140)
COL-1200-80	27.94 (710)	40.94 (1040)	35.25 (895)	5.50 (140)	24.55 (624)	2" SAE Flange	2" SAE Flange	1½" SAE Flange	38.19 (970)	29.93 (760)	40.30 (1024)	6.05 (154)	9.20 (234)	25.55 (649)	35.43 (900)	26.05 (662)	24.00 (610)	8.47 (215)	1.38 (35)	5.51 (140)
COL-1200-100	27.94 (710)	40.94 (1040)	35.25 (895)	5.50 (140)	24.55 (624)	2" SAE Flange	2½" SAE Flange	2" SAE Flange	38.19 (970)	29.93 (760)	40.30 (1024)	6.05 (154)	9.20 (234)	25.55 (649)	35.43 (900)	26.05 (662)	24.00 (610)	8.47 (215)	1.38 (35)	5.51 (140)
COL-1600-80	36.01 (915)	40.94 (1040)	35.25 (895)	9.50 (241)	32.62 (829)	2" SAE Flange	2" SAE Flange	1½" SAE Flange	38.19 (970)	37.88 (962)	40.30 (1024)	6.05 (154)	9.20 (234)	33.62 (854)	35.43 (900)	25.45 (646)	24.00 (610)	8.47 (215)	1.38 (35)	5.51 (140)
COL-1600-100	36.01 (915)	40.94 (1040)	35.25 (895)	9.50 (241)	32.62 (829)	2" SAE Flange	2½" SAE Flange	2" SAE Flange	38.19 (970)	37.88 (962)	40.30 (1024)	6.05 (154)	9.20 (234)	33.62 (854)	35.43 (900)	25.45 (646)	24.00 (610)	8.47 (215)	1.38 (35)	5.51 (140)

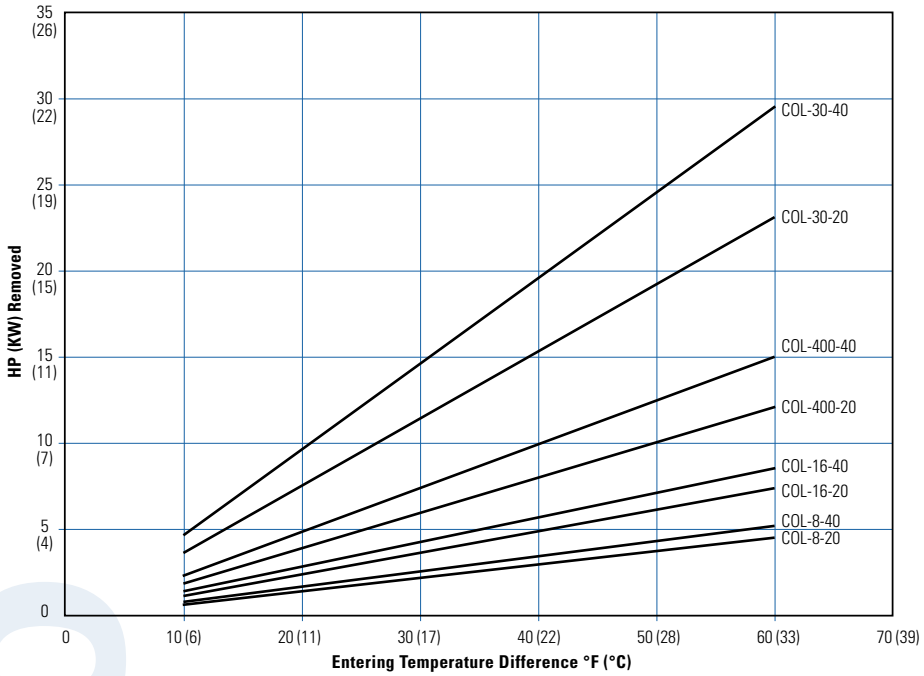
Note: We reserve the right to make reasonable design changes without notice. ***All dimensions in inches (millimeters), unless noted otherwise.***

Performance Curves

Single Motor 50hz/1500 RPM



Single Motor 60hz/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 E.T.D.)

E.T.D. = 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.

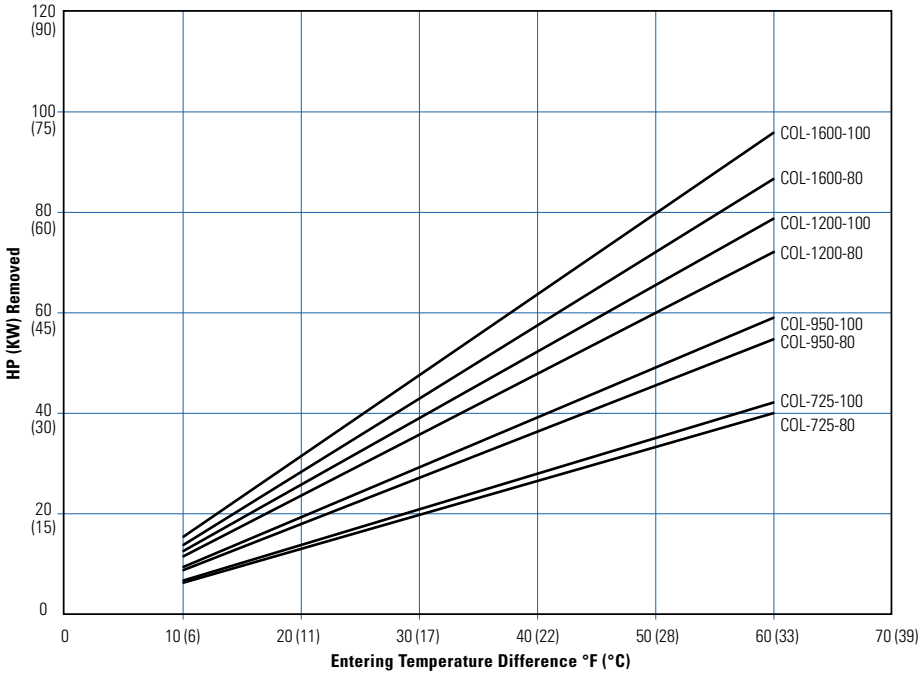
Listed Performance Curves are based on 46 cSt oil.

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

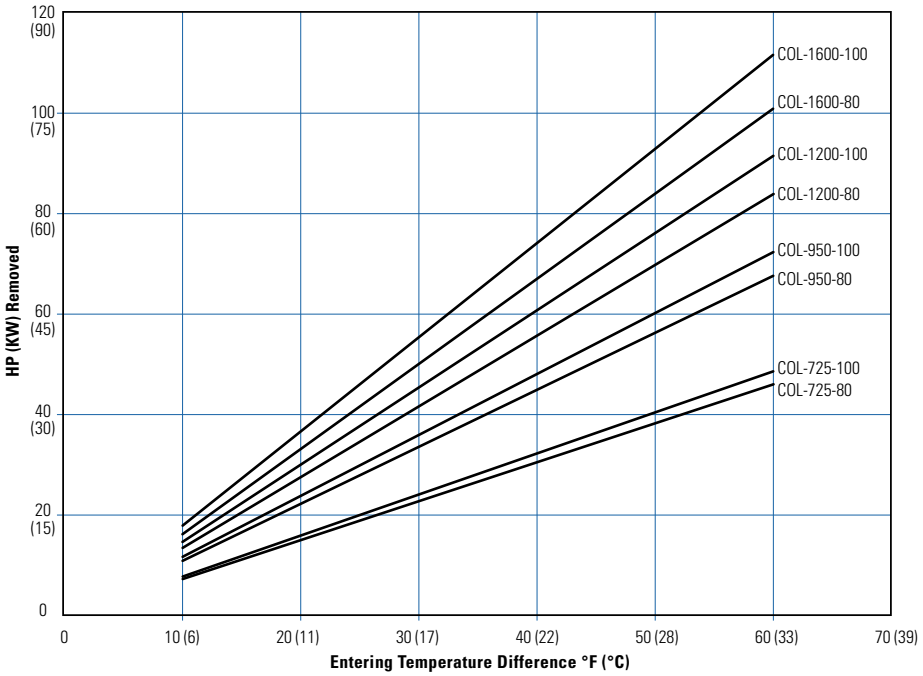
Model	50 Hz Flow Rate GPM (LPM)	60 Hz Flow Rate GPM (LPM)
COL-8-20	8 (30)	9.5 (36)
COL-8-40	16 (60)	21 (79)
COL-16-20	8 (30)	9.5 (36)
COL-16-40	16 (60)	21 (79)
COL-30-20	8 (30)	9.5 (36)
COL-30-40	16 (60)	21 (79)
COL-400-20	8 (30)	9.5 (36)
COL-400-40	16 (60)	21 (79)

Performance Curves / Selection Procedure

Dual Motor 50hz/1500 RPM



Dual Motor 60hz/1800 RPM

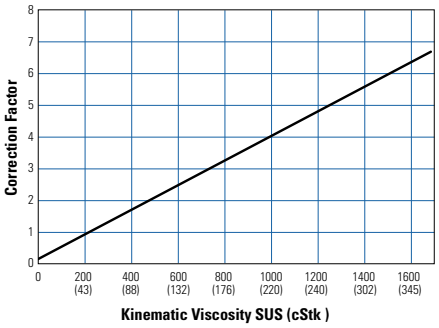


System Pressure Drop

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.

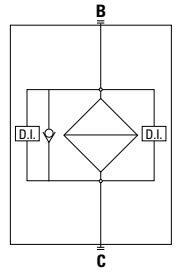
Oil Pressure Drop Correction

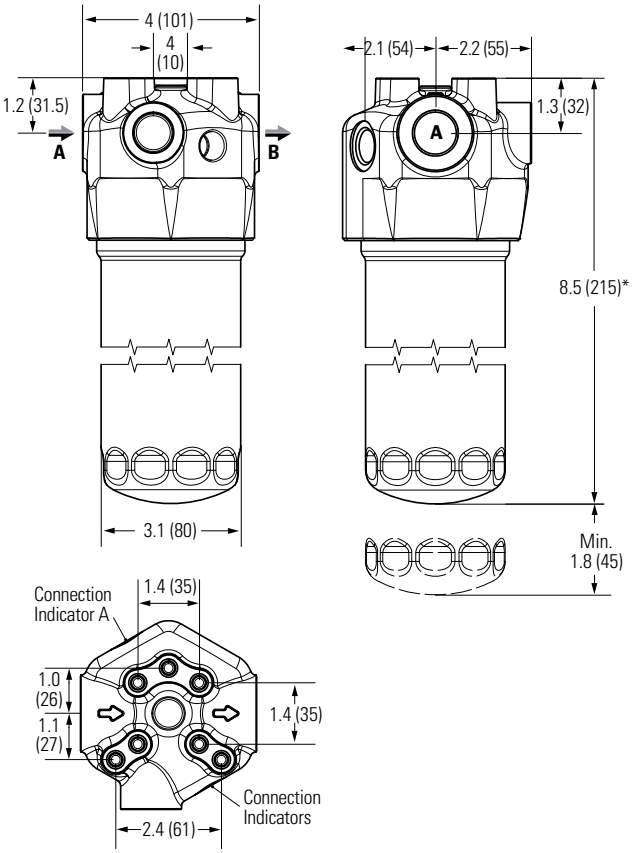


Model	50 Hz Flow Rate GPM (LPM)	60 Hz Flow Rate GPM (LPM)
COL-725-80	29.5 (112)	35 (133)
COL-725-100	37 (140)	45 (169)
COL-950-80	29.5 (112)	35 (133)
COL-950-100	37 (140)	45 (169)
COL-1200-80	29.5 (112)	35 (133)
COL-1200-100	37 (140)	45 (169)
COL-1600-80	29.5 (112)	35 (133)
COL-1600-100	37 (140)	45 (169)

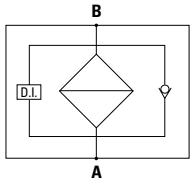
Micron Filter Specifications

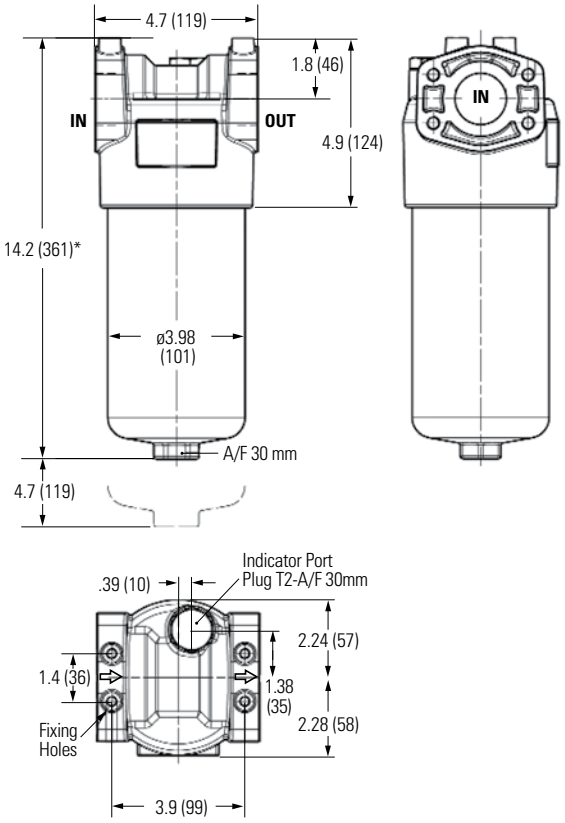
COL-8 – COL-400





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
- Bypass valve – Brass/Aluminum

Maximum Temperature
- 230°F (110°C)

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
- Bypass valve – Nylon

Maximum Temperature
- 230°F (110°C)

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

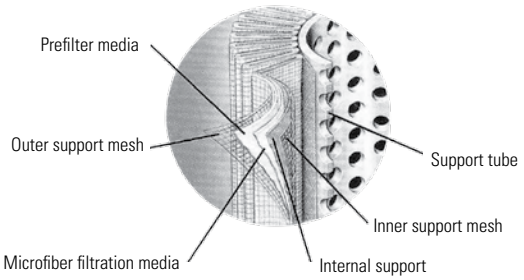
Seals, standard in NBR compatible with:

- 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*

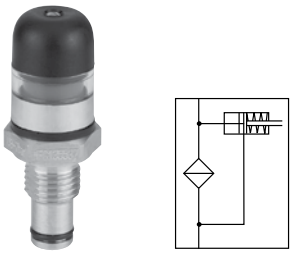
International Standards for Fluid Contamination Control

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

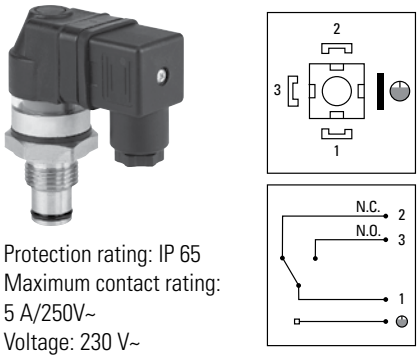
Visual "V"



- 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"

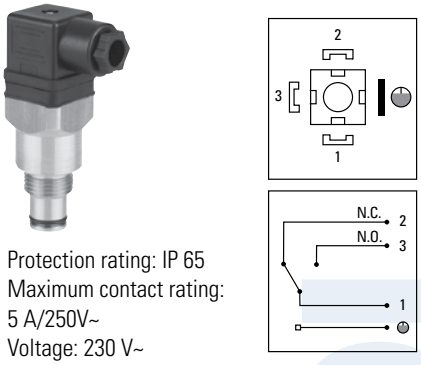
Connector EN 175301-803 A/ISO4400



- 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"

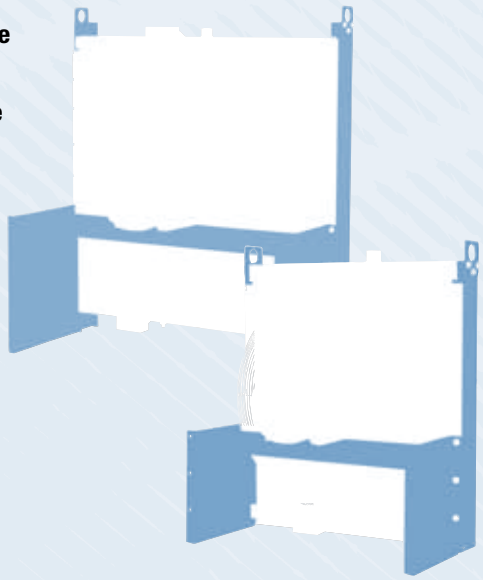
Connector EN 175301-803 A/ISO4400

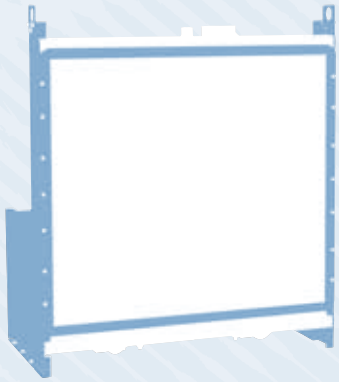


- Protection rating: IP 65
- Maximum contact rating: 5 A/250V~
- Voltage: 230 V~
- Connector: DIN 43650 Microswitch contact
- Cable gland: PG 9
- Weight: 6.5 oz (184 g)
- Tightening torque: 48 ft-lbs (65 Nm)

FEATURES

- **Young Radiator – OCS Model Interchange (approximate)**
- **American Industrial – AOCS Interchange (approximate)**
- **Hydraulic Circuits**
- **Machine Tool Cooling**
- **Gear Oil Cooling**
- **Lube Oil Cooling**
- **Process Cooling**
- **Torque Converters**
- **Marine Transmissions**
- Aerodynamically Designed Fan
- Brazed Aluminum Core
- Enclosed Fan Cooled Standard – TEFC





T-BAR™ • CORE INSIDE •

This Line Features

- High efficient, light weight, low fouling extruded core design
- Rugged construction with a patented T-Bar brazed aluminum core captured in steel framing
- Both mobile and industrial applications
- High flow capacity; with a flow range from 20-500 GPM
- Ability to handle high viscosity fluids i.e. gear oil cooling
- Available in 7 sizes with electric or hydraulic motor options
- Standard sizes available with short, lean lead time

Materials

Fan Blade Composite with cast aluminum hub

Cabinet Steel with baked enamel finish

Connections Aluminum – Female SAE

Motor Support Steel

Shroud Steel

Core Brazed Aluminum

Motor TEFC & Hydraulic motor

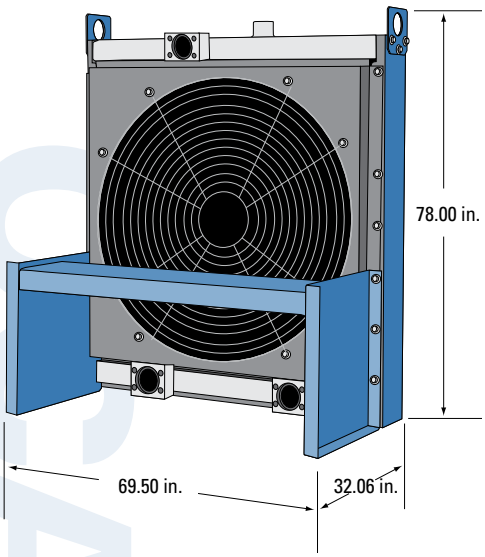
Ratings

Max Operating Pressure - 250 psi

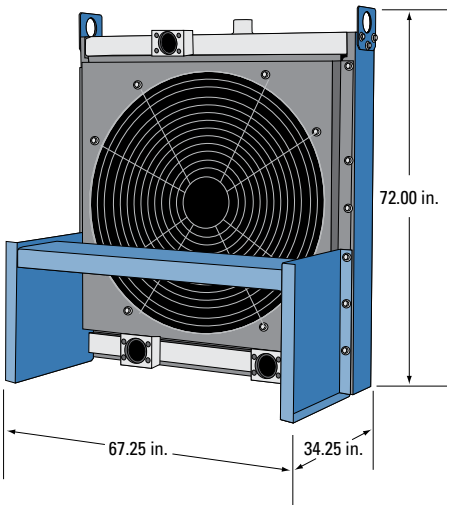
Max Operating Temperature - 350° F

Dimension Range

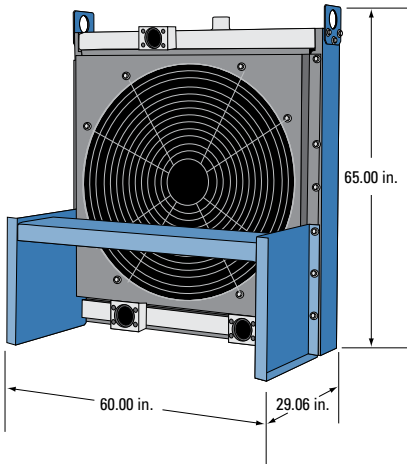
OCA-3100



OCA-2500



OCA-2000



How to Order

OCA	–		–		–		–		–	

Model Series
OCA - Standard

Model Size Selected

Connection Type
2 - SAE

[1] External Relief Bypass Kit
BLANK- NO BYPASS
30-30 PSI
60-60 PSI

Specify Motor Required
0 -NO-MOTOR
3 -THREE PHASE
6 -575 VOLT
9 -HYDRAULIC MOTOR
11 - THREE PH EXPLOSION PROOF
18 - THREE PH IEC

[2] Material Options
HC - HERESITE COATING (CORE)
G - GALVANIZED STEEL (CABINET)
SFG - STAINLESS STEEL (FAN GUARD)

Connection Conversion Kits - *order as separate line item*

	Part Number						
	OCA-450	OCA-600	OCA-1000	OCA-1500	OCA-2000	OCA-2500	OCA3100
2 Pass SAE (Flange Cover)	12076	12011	12012	12012	12012	12013	12013
1 Pass NPT	51166	51168	51170	51172	51174	51175	5178
2 Pass NPT[3]	51167	51169	51171	51173	51175	51177	51179
1 Pass BSPP	Consult Factory						
2 Pass BSPP[3]	Consult Factory						
Fill Plug (#20 SAE)[4]	50732						

[1] Available for 2 Pass unit only. Pressure tolerance is (+5 PSI/-0 PSI). Consult factory for details.

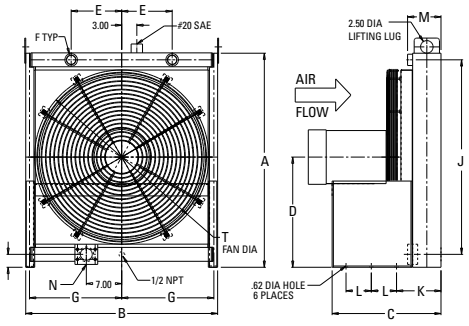
[2] Use HC-G-SFG if all three add-ons are desired.

[3] Two Pass adapter kits already include cover plate.

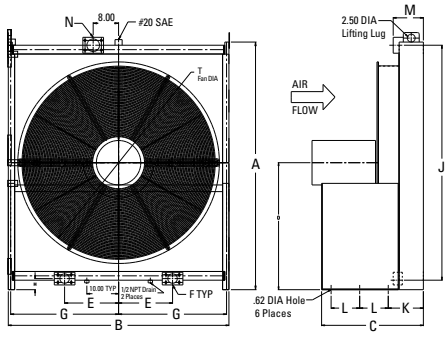
[4] Ports do not come plugged unless specified at time of order.

Dimensions

OCA-450 & 600

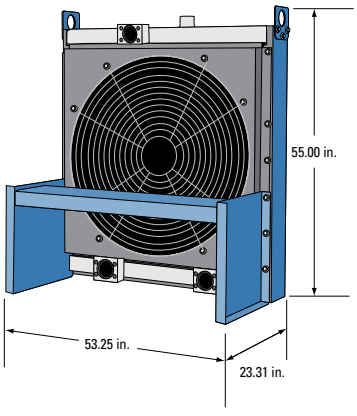


OCA-1000 Through OCA-3100

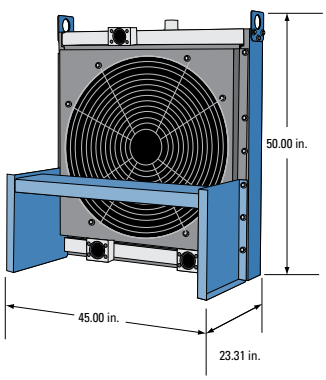


MODEL	A	B	C	D	E	F	G	H	J	K	L	M	N	T	Shipping WT (lbs)	DBA at 3 ft
OCA-450	36.38	33.00	21.56	18.50	8.00	#24	15.75	4.12	28.75	8.81	5.00	6.62	2.00	24.00	400	81
OCA-600	42.38	38.00	21.56	21.81	10.00	#24	18.25	2.56	35.50	8.81	5.00	6.62	2.50	32.00	497	84
OCA-1000	50.00	45.00	24.56	26.25	10.50	2.00	21.75	4.19	45.50	7.81	7.50	7.50	3.00	36.00	690	88
OCA-1500	55.00	53.25	23.31	28.50	12.50	2.00	25.75	4.31	49.75	7.79	7.00	8.50	3.00	42.00	832	92
OCA-2000	65.00	60.00	29.06	33.00	15.00	3.00	29.00	4.00	58.00	11.06	7.50	8.56	3.00	48.00	1223	96
OCA-2500	72.00	67.25	34.25	37.00	17.00	3.00	32.88	3.25	67.50	11.06	7.50	9.50	4.00	54.00	1723	96
OCA-3100	78.00	69.50	32.06	40.00	17.00	3.00	34.00	3.00	74.00	11.06	9.00	9.50	4.00	60.00	1806	96

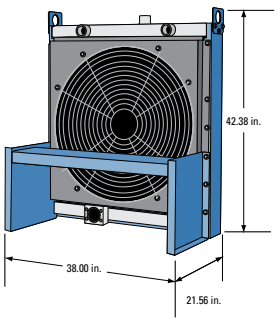
OCA-1500



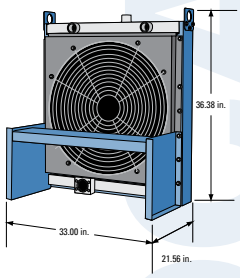
OCA-1000



OCA-600

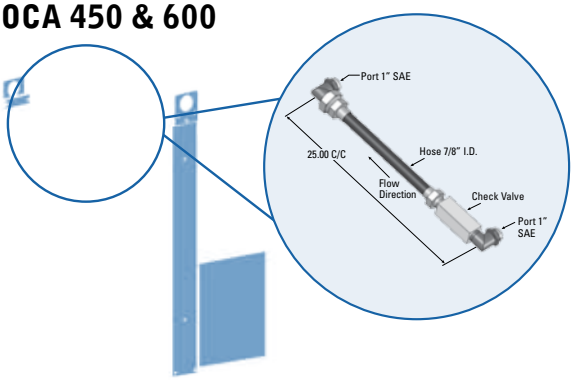


OCA-450

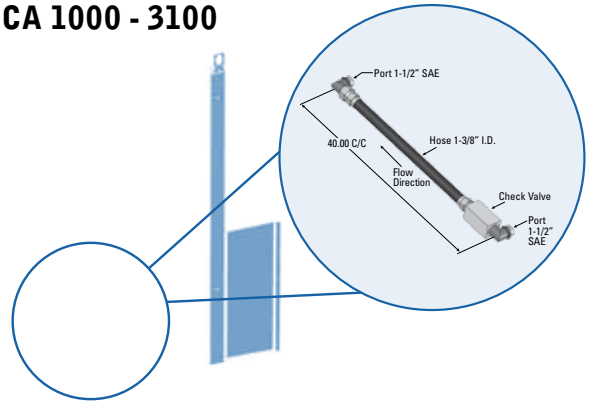


External Bypass Option (Extra port is removed for bypass options)

OCA 450 & 600

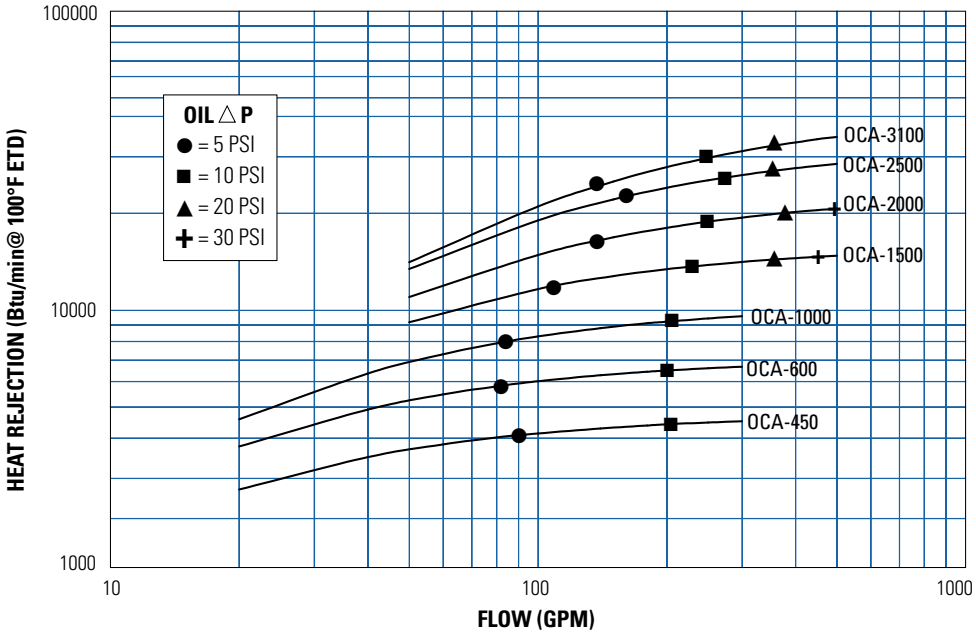


OCA 1000 - 3100

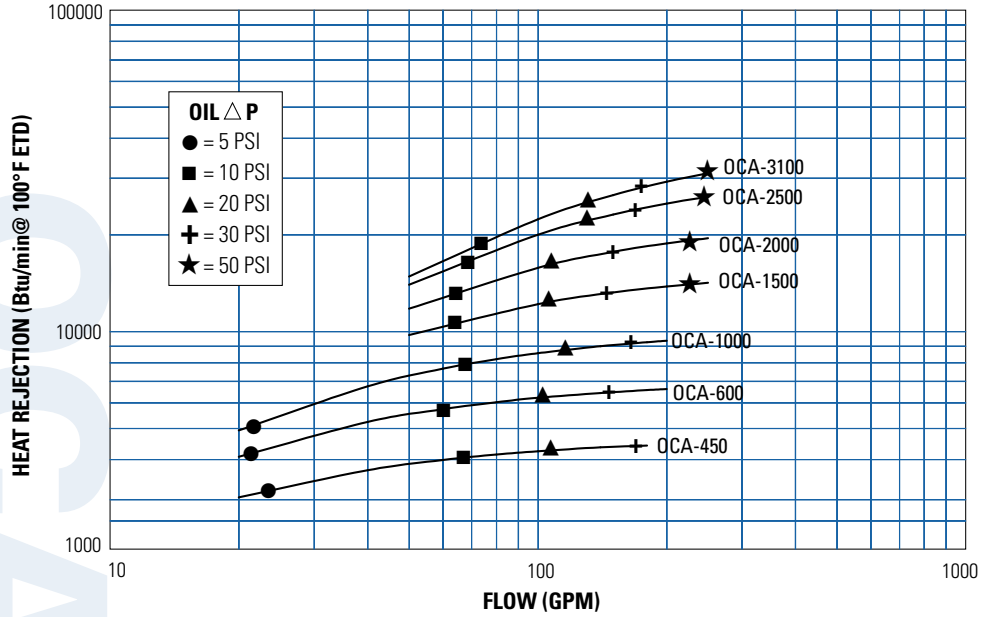


Performance Curves

One Pass Oil

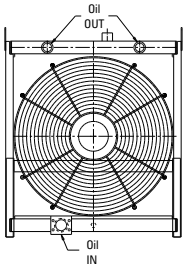


Two Pass Oil

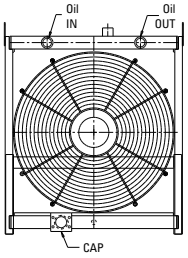


Oil Piping Diagram

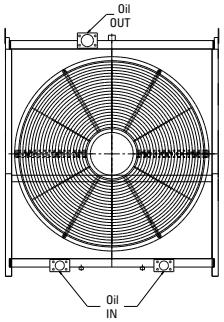
OCA 450 & 600 One Pass



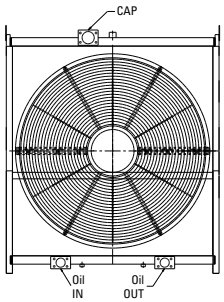
OCA 450 & 600 Two Pass



1000 - 3100 One Pass



1000 - 3100 Two Pass



Selection Procedure

Performance Curves are based on 50SSU oil entering the cooler 100°F higher than the ambient air temperature used for cooling. This is also referred to as a 100°F Entering Temperature Difference (ETD).

STEP 1 **Determine the Heat Load.** This will vary with different systems, but typically coolers are sized to remove 25 to 50% of the input nameplate horsepower.
(Example: 100 HP Power Unit x .33 = 33 HP Heat load.)
Convert HP to BTU/MIN: HP x 42.41 = BTU/MIN

STEP 2 **Determine Entering Temperature Difference (ETD).**
Desired oil entering cooler °F – Ambient air temp. °F = Actual ETD

STEP 3 **Determine Curve Horsepower Heat Load.**
Enter the information from above:
E.T.D. Temperature Correction Factor:

$$\text{Btu/Min}_{\text{corrected}} = \text{Input Btu/Min} \times \frac{100 \times Cv}{\text{Desired E.T.D.}}$$

Enter curves at oil flow through cooler and curve horsepower. Any curve above the intersecting point will work.

STEP 5 **Determine Oil Pressure Drop from Curves:**
● = 5 PSI; ■ = 10 PSI; ▲ = 20 PSI; ✢ = 30 PSI; ★ = 50 PSI.
Multiply pressure drop from curve by correction factor found in oil △P correction curve.

Example

FLUID = SAE 20 OIL
SYSTEM ELECTRIC NAMEPLATE HORSEPOWER = 300HP
ENTERING TEMPERATURE = 200°F
AMBIENT TEMPERATURE = 75°F
FLOW RATE = 200GPM

- Determine heat load.
  Generally, about 25% to 33% of the system horsepower is removed.

  300hp x 0.33 = 99hp
- Since the graphs have the heat load in terms of BTU/min, the units must be converted.

  99hp x 42.4167 = 4,199 BTU/min
- Calculate the entering temperature difference (E.T.D.). The E.T.D. is the inlet oil temperature minus the entering air temperature.

  ETD=200-75 =125
- Calculate the corrected curve heat load.
  Corrected curve heat load = actual heat load x (100/ETD) x Cv (viscosity correction factor obtained from the Cv table).

  4,199 BTU/min x (100/125) x 1.02= 3,426 BTU/min
- Find the intersection point between the corrected heat load and flow rate on the performance curves. Any curve above this point will work for this application. Usually the smallest cooler is most desired. In this case the intersecting point on the single pass graph indicates that the OCA-450 will suffice.
- The pressure drop should be found next. Find the point on the curve that is directly above the intersecting point. This point on the curve indicates the pressure drop.

  △P ≈ 6psi
- These curves are made for SAE 10 oil entering at 200°F. Therefore, the pressure drop needs to be corrected. The 1.24 is the pressure drop correction factor obtained in the Cp table.
- $P_{CORRECTED}$ = 6 x 1.24= 7.44 psi

C_V VISCOSITY CORRECTION FACTORS

Entering Liquid Temp	SAE 5	SAE 10	SAE 20	SAE 30	SAE 40	ISO 22	ISO 32	ISO 46	ISO 68	ISO 100	ISO 150	ISO 220	ISO 320	MIL-L 7808	Ester Polyglycol	Phosphate	50%EG
100	1.12	1.16	1.26	1.39	1.46	1.09	1.15	1.19	1.27	1.38	1.44	1.57	1.85	1.20	0.93	0.84	0.86
110	1.10	1.13	1.21	1.33	1.41	1.07	1.14	1.17	1.26	1.32	1.40	1.49	1.68	1.15	0.90	0.81	0.85
120	1.07	1.11	1.18	1.28	1.36	1.05	1.12	1.15	1.21	1.28	1.36	1.41	1.54	1.10	0.89	0.80	0.85
130	1.05	1.09	1.14	1.25	1.30	1.04	1.10	1.14	1.18	1.25	1.31	1.35	1.45	1.06	0.86	0.78	0.84
140	1.04	1.06	1.12	1.20	1.26	1.03	1.09	1.11	1.17	1.21	1.27	1.31	1.40	1.04	0.85	0.77	0.83
150	1.02	1.05	1.10	1.17	1.23	1.03	1.07	1.10	1.14	1.18	1.23	1.28	1.34	1.02	0.84	0.75	0.83
200	0.99	1.00	1.02	1.05	1.08	0.99	1.00	1.01	1.02	1.03	1.09	1.10	1.15	0.99	0.80	0.72	0.81
250	0.96	0.97	0.98	0.99	1.00	0.96	0.97	0.97	0.97	0.98	1.00	1.02	1.03	0.98	0.77	0.70	0.80

C_P PRESSURE DROP CORRECTION FACTORS

Entering Liquid Temp	SAE 5	SAE 10	SAE 20	SAE 30	SAE 40	ISO 22	ISO 32	ISO 46	ISO 68	ISO 100	ISO 150	ISO 220	ISO 320	MIL-L 7808	Ester Polyglycol	Phosphate	50%EG
100	2.04	2.44	4.44	6.44	8.84	1.11	1.57	1.86	2.58	4.23	6.48	9.42	13.60	1.30	3.04	3.54	0.770
110	1.74	2.14	3.64	5.14	6.74	1.08	1.49	1.76	2.39	3.77	5.74	8.37	11.67	1.24	2.44	2.94	0.760
120	1.54	1.84	3.04	4.24	5.64	1.06	1.42	1.64	2.19	3.30	5.95	7.27	9.77	1.18	2.14	2.54	0.749
130	1.44	1.64	2.64	3.44	4.54	1.03	1.34	1.53	1.98	2.84	4.18	6.23	7.84	1.12	1.94	2.24	0.738
140	1.34	1.54	2.27	2.94	3.74	1.01	1.27	1.42	1.79	2.42	3.51	5.24	6.15	1.07	1.94	2.04	0.726
150	1.24	1.34	1.94	2.54	3.14	0.99	1.21	1.34	1.65	2.08	2.94	4.39	4.81	1.02	1.74	1.94	0.716
200	0.97	1.00	1.24	1.44	1.64	0.93	1.03	1.12	1.22	1.37	2.63	1.78	1.99	0.94	1.24	1.34	0.675
250	0.85	0.86	0.96	1.01	1.09	0.89	0.97	1.00	1.07	1.15	1.25	1.26	1.27	0.87	1.04	1.09	0.596

Specifications

Electric Motor Data

(3 Phase TEFC)

Model	Motor HP	Phase	HZ	Voltage	RPM	Nema Frame	Full Load Amps	Net Weight
OCA-450	3	3	60	208-230/460	1725	182T	9.5-8.6/4.3	68
OCA-600	3	3	60	230/460	1160	213T	10/5	125
OCA-1000	5	3	60	230/460	1160	215T	16/8	138
OCA-1500	5	3	60	230/460	1160	215T	16/8	138
OCA-2000	10	3	60	230/460	1175	256T	28.8/14.4	269
OCA-2500	15	3	60	230/460	1175	284T	39.4/19.7	361
OCA-3100	20	3	60	230/460	1175	286T	52/26	368

(3 Phase Explosion Proof Class I Group D & Class II Group F&G)

Model	Motor HP	Phase	HZ	Voltage	RPM	Nema Frame	Full Load Amps	Net Weight
OCA-450	3	3	60	230/460	1750	182T	9.6/4.8	134
OCA-600	3	3	60	230/460	1160	213T	9.6/4.8	147
OCA-1000	5	3	60	230/460	1160	215T	16.2/8.1	161
OCA-1500	5	3	60	230/460	1160	215T	16.2/8.1	161
OCA-2000	10	3	60	230/460	1175	256T	28.8/14.4	357
OCA-2500	15	3	60	230/460	1170	284T	39/19.5	436
OCA-3100	20	3	60	230/460	1175	286T	51/25.5	522

(3 Phase 575V TEFC)

Model	Motor HP	Phase	HZ	Voltage	RPM	Nema Frame	Full Load Amps	Net Weight
OCA-450	3	3	60	575	1750	182T	3.4	68
OCA-600	3	3	60	575	1160	213T	4.1	111
OCA-1000	5	3	60	575	1160	215T	6.0	122
OCA-1500	5	3	60	575	1160	215T	6.0	122
OCA-2000	10	3	60	575	1180	256T	11.5	286
OCA-2500	15	3	60	575	1180	284T	15.0	425
OCA-3100	20	3	60	575	1175	286T	20.0	452

(3 Phase Metric/IEC)

Model	Motor KW/HP	Phase	HZ	Voltage	RPM	IEC Frame	Full Load Amps	Net Weight
OCA-450	2.2/3	3	60	208-230/460	1750	100	8.5-8.2/4.1	68
OCA-600	2.2/3	3	60	230/460	1160	132	9.6/4	110
OCA-1000	3.7/5	3	60	230/460	1160	132	17.6/8.8	123
OCA-1500	3.7/5	3	60	230/460	1160	132	17.6/8.8	123
OCA-2000	7.5/10	3	60	230/460	1180	160	28.4/14.2	247
OCA-2500	11/15	3	60	230/460	1180	180	42/21	361
OCA-3100	15/20	3	60	230/460	1175	180	52/26	368

Hydraulic Motor Data

Hydraulic Motors

Model	HP	Pressure (PSI)	Flow (GPM)	RPM	Displacement (CUIN/REV)
OCA-450	3	870	11.1	1750	1.37
OCA-600	3	1305	8.0	1160	1.37
OCA-1000	5	2030	8.0	1160	1.37
OCA-1500	5	2030	8.0	1160	1.37
OCA-2000	10	2090	8.2	1175	1.37
OCA-2500	15	2900	8.2	1175	1.71
OCA-3100	20	2320	13.3	1175	2.2

T-BAR™
• CORE INSIDE •

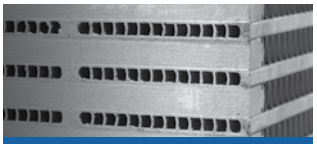
Advantages

T-BAR provides advantages and value far beyond typical aluminum core designs.

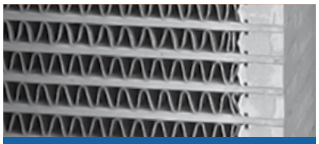
- **Extruded tubes for a leak free design**
- **Flows high viscosity fluids**
- **Low pressure drop due to absence of internal turbulator**
- **Resistance to fouling—transfer fluids without plugging**
- **Great for cooling cutting fluids or gear lube**
- **Resistant to salt spray and salt air**
- **Standard Zinc infused/coated core & fins for up to 10 times protection in salt conditions**
- **Domestic built**
- **Optional core for BOL model**

T-BAR is a flexible design, high performing, and a cost-effective aluminum solution.

Tubular Micro Channel Extrusion (T-BAR™)
T-BAR is manufactured with Alloy 1100 aluminum micro channel and bars, **with Zinc flame-sprayed extruded tubes and zinc alloy coated fins**, in our patented in-house tube-to-bar brazing process using a Nocolok CAB (Controlled Atmosphere Brazing) brazing technology furnace. Because our tubes are a solid extrusion, T-BAR is very robust — with no tube seams to fail and leak.



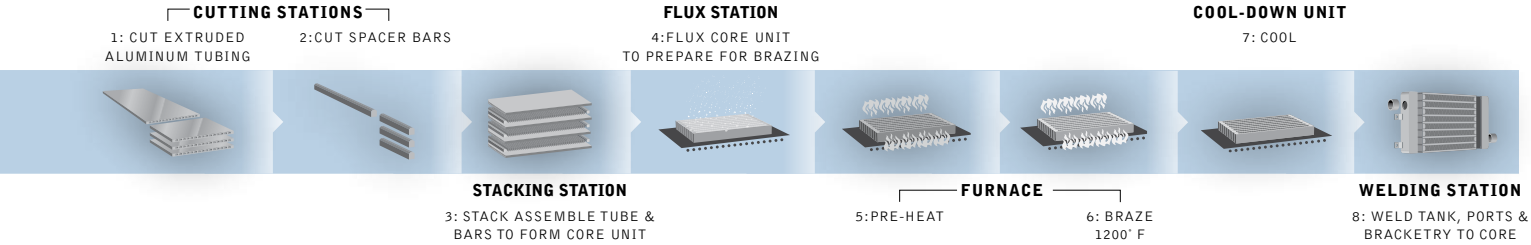
HIGH-PERFORMANCE



LOW-CLOGGING

T-BAR CORE IN OCA ASSEMBLY

T-Bar Manufacturing Process



Heat transfer performance to the highest degree.

Everything about API Heat Transfer is focused on performance. It's a part of our 130-year heritage designing and delivering world-class heat transfer products for nearly every industry. It's bolstered by our worldwide network of manufacturing facilities and more than 1,800 employees who provide sales, service, and support. And it's ingrained in a process that has served customers around the world well for nearly a century and a half. Upon working with us, you'll find it's our performance that sets us apart.
There's heat transfer. Then there's API Heat Transfer.

UNITED STATES

Buffalo, NY
Global Headquarters
+1.716.684.6700
2777 Walden Avenue
Buffalo, NY 14225, USA

Arcade, NY
+1.585.496.5755
91 North Street
Arcade, NY 14009, USA

Franklin, WI
+1.414.761.4500
4700 Ironwood Drive
Franklin, WI 53132, USA

Iron Ridge, WI
+1.920.387.4200
1025 Industrial Road
Iron Ridge, WI 53035, USA

Racine, WI
+1.262.554.8330
5215 21st Street
Racine, WI 53406, USA

Montgomery, AL
+1.334.277.1810
2760 Gunter Park Drive West
Montgomery, AL 36109, USA

UNITED KINGDOM

Coventry, UK
+44 (0) 24.7667.5544
Sir Henry Parkes Road
Canley, Coventry
CV5 6BN, United Kingdom

GERMANY

Bretten, DE
+49 (0) 7252.53.0
Langenmorgen 4
75015 Bretten, Germany

Dortmund, DE
+49.231.9920.119
Breisenbachstrasse 87
44357 Dortmund, Germany

CHINA

Suzhou Facility - Building 1
+86.512.8816.8000
156 Qingqiu Street, 3rd District
Suzhou Industrial Park
Suzhou, Jiangsu 215126, China

Suzhou Facility - Building 2
+86.512.8816.8000
126 Qingqiu Street, 3rd District
Suzhou Industrial Park
Suzhou, Jiangsu 215126, China