

# Fluid Cooling Shell & Tube A Series

## Performance Notes

- ITT interchange
- B or HC series is recommended for new applications
- Competitively priced
- NPT, SAE O-Ring, SAE flange, or BSPP shell side connections available
- End bonnets removable for servicing
- Mounting feet included (may be rotated in 90° increments)



### Options

Non-ferrous construction (water-to-water service)  
90/10 copper nickel cooling tubes, bronze end bonnets for sea water service and zinc anodes

## Ratings

**Maximum Operating Pressure - Shell Side**  
300 PSI

**Maximum Operating Pressure - Tube Side**  
150 PSI

**Maximum Operating Temperature**  
300°F

## Materials

**Tubes** Copper  
**Hubs & Tubesheets** Steel or brass  
**Shell** Steel or brass  
**Baffles** Brass  
**End Bonnets** Cast iron  
**Mounting Brackets** Steel  
**Gaskets** Nitrile rubber/cellulose fiber  
**Nameplate** Aluminum foil

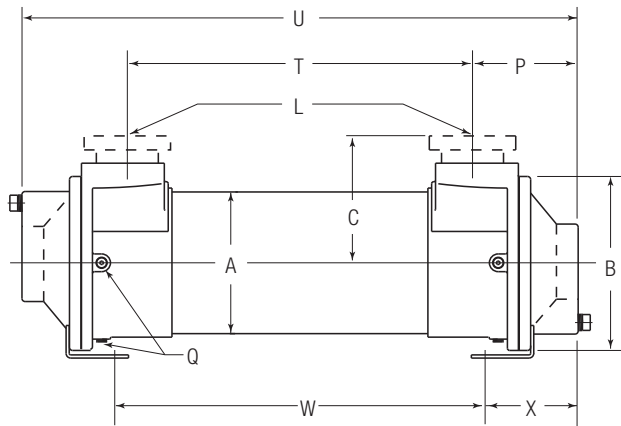
## How to Order

<input type="text"/>	-	<input type="text"/>	-	<input type="text"/>	-	<input type="text"/>	-	<input type="text"/>	-	<input type="text"/>	-	<input type="text"/>				
<b>Model Series</b>		<b>Model Size Selected</b>		<b>Baffle Spacing</b>		<b>Tube Diameter Code</b>		<b>Tubeside Passes</b>		<b>Shell Material</b>		<b>Cooling Tube Material</b>		<b>End Bonnet Material</b>		<b>Zinc Anodes</b>
SA SAF A AS AM AF AFM						4 - 1/4" 6 - 3/8"		0 - One Pass T - Two Pass F - Four Pass		Blank - Steel BR - Brass		Blank - Copper CN - CuNi		Blank - Cast Iron B - Bronze		Blank - None Z - Zinc

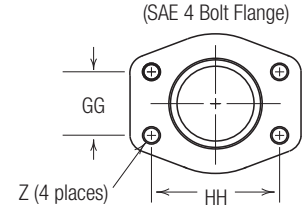
**SA** = NPT Shell side, NPT Tube. Available in 1200 & 1600 models only.  
**SAF** = SAE 4 Bolt Flange (with UNC threads) Shell side connections; NPT Tube side connections. Available in 1200 & 1600 models only.  
**A** = NPT Shell side connections; NPT Tube side connections (Not available in 400s. See SA)  
**AS** = SAE O-Ring Shell side connections; NPT Tube side connections  
**AM** = BSPP Shell side connections; BSPP Tube side connections  
**AF** = SAE 4 Bolt Flange (with UNC threads) Shell side connections; NPT Tube side connections  
**AFM** = SAE 4 Bolt Flange (with Metric threads) Shell side connections; BSPP Tube side connections  
**SAE flanges available on some models. Consult factory for details.**

# Dimensions

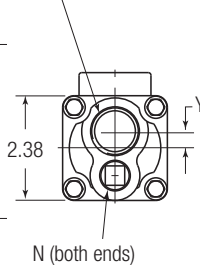
## One Pass



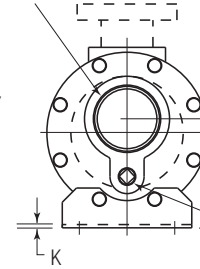
Y (Center of cooler to center of connection on opposite side)



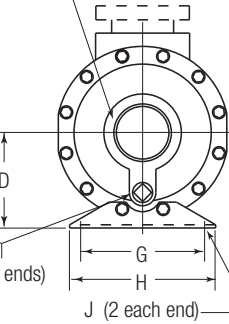
M (both ends)



M (both ends)



M (both ends)



Flange Size	GG	HH	Z - CF	Z - CFM
1	1.03	2.06	3/8-16 UNC	M-10
1.50	1.41	2.75	1/2-13 UNC	M-12
2	1.69	3.06	1/2-13 UNC	M-12
3	2.44	4.19	5/8-11 UNC	M-16

**A-400 Series**

**A-600  
A-800 Series**

**A-1000, A-1200  
A-1600 Series**

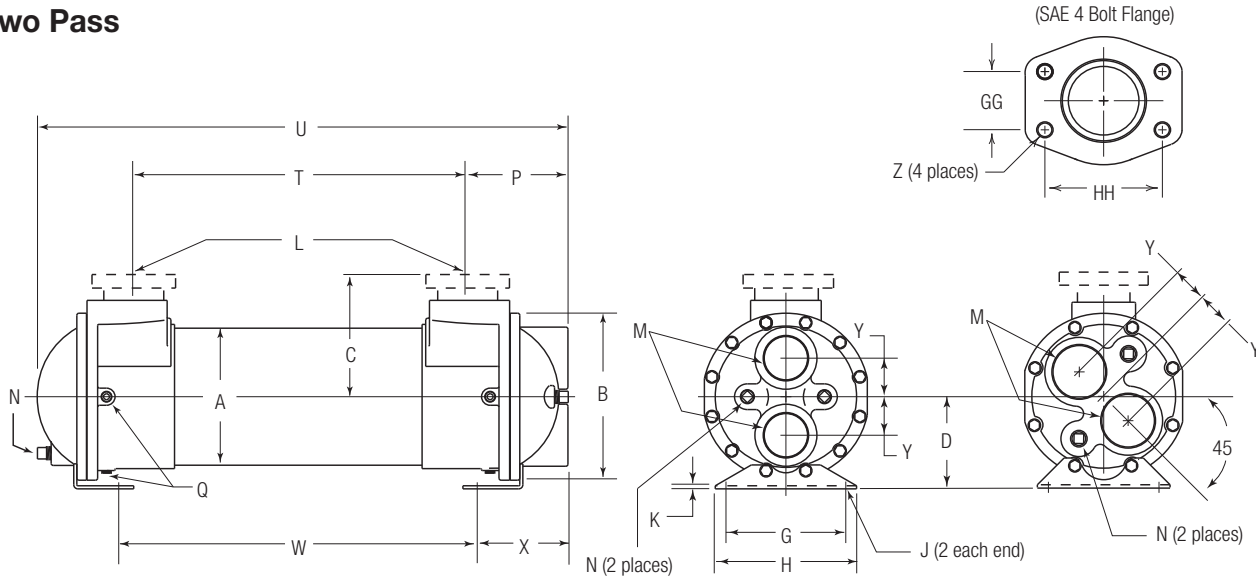
Model	A Dia.	B Dia.	C		D	G	H	J	K	L		M NPT	N NPT	P	Q NPT	T	U	W	X	Y
			NPT/BSPP SAE O-Ring	SAE 4 Bolt Flange						NPT/BSPP Flange	SAE O-Ring									
SA-408	2.12	—	1.69	—	—	—	—	—	1.00	N/A	.75	.38	2.38	—	6.25	11.00	—	—	—	.38
A-608	3.12	4.19	2.44	C/F	2.44	2.50	3.50	.38 x .88	.12	1.00	1.50	.38	2.56	(2) .25	6.12	11.25	5.47	3.06	.38	
A-614	3.12	4.19	2.44	C/F	2.44	2.50	3.50	.38 x .88	.12	1.00	1.50	.38	2.56	(2) .25	12.12	17.25	11.47	3.06	.38	
A-624	3.12	4.19	2.44	C/F	2.44	2.50	3.50	.38 x .88	.12	1.00	1.50	.38	2.56	(2) .25	22.12	27.25	21.47	3.06	.38	
A-814	4.12	5.88	3.12	C/F	3.50	3.50	4.75	.50 x 1.62	.12	1.50	2.00	.38	3.44	(6) .38	11.12	18.00	12.88	2.56	.50	
A-824	4.12	5.88	3.12	C/F	3.50	3.50	4.75	.50 x 1.62	.12	1.50	2.00	.38	3.44	(6) .38	21.12	28.00	22.88	2.56	.50	
A-836	4.12	5.88	3.12	C/F	3.50	3.50	4.75	.50 x 1.62	.12	1.50	2.00	.38	3.44	(6) .38	33.12	40.00	34.88	2.56	.50	
A-1014	5.12	6.50	3.62	4.34	3.50	4.00	5.00	.44 x 2.20	.12	1.50	2.50	.38	3.69	(6) .25	11.12	18.50	11.75	3.38	.50	
A-1024	5.12	6.50	3.62	4.34	3.50	4.00	5.00	.44 x 2.20	.12	1.50	2.50	.38	3.69	(6) .25	21.12	28.50	21.75	3.38	.50	
A-1036	5.12	6.50	3.62	4.34	3.50	4.00	5.00	.44 x 2.20	.12	1.50	2.50	.38	3.69	(6) .25	33.12	40.50	33.75	3.38	.50	
A-1224	6.12	7.50	4.25	4.84	4.12	5.00	6.00	.50 x .88	.12	2.00	3.00	.50	4.25	(6) .25	20.50	29.00	21.50	3.75	.50	
A-1236	6.12	7.50	4.25	4.84	4.12	5.00	6.00	.50 x .88	.12	2.00	3.00	.50	4.25	(6) .25	32.50	41.00	33.50	3.75	.50	
A-1248	6.12	7.50	4.25	4.84	4.12	5.00	6.00	.50 x .88	.12	2.00	3.00	.50	4.25	(6) .25	44.50	53.00	45.50	3.75	.50	
A-1260	6.12	7.50	4.25	4.84	4.12	5.00	6.00	.50 x .88	.12	2.00	3.00	.50	4.25	(6) .25	56.50	65.00	57.50	3.75	.50	
A-1624	8.00	9.75	5.62	6.12	5.38	7.00	8.25	.62 x 1.12	.19	3.00	3.00	.50	6.00	(6) .25	19.00	31.00	20.50	5.25	.50	
A-1636	8.00	9.75	5.62	6.12	5.38	7.00	8.25	.62 x 1.12	.19	3.00	3.00	.50	6.00	(6) .25	31.00	43.00	44.50	5.25	.50	
A-1648	8.00	9.75	5.62	6.12	5.38	7.00	8.25	.62 x 1.12	.19	3.00	3.00	.50	6.00	(6) .25	43.00	55.00	44.50	5.25	.50	
A-1660	8.00	9.75	5.62	6.12	5.38	7.00	8.25	.62 x 1.12	.19	3.00	3.00	.50	6.00	(6) .25	55.00	67.00	56.50	5.25	.50	
A-1672	8.00	9.75	5.62	6.12	5.38	7.00	8.25	.62 x 1.12	.19	3.00	3.00	.50	6.00	(6) .25	67.00	79.00	68.50	5.25	.50	

\*SA-408 SAE Flange not available. \*\*SAF-1200 5.88. \*\*\*SAF-1600 7.38.

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

# Dimensions

## Two Pass



**A-600, A-800, A-1000  
A-1600 Series**

**A-1200 Series**

Flange Size	GG	HH	Z - CF	Z - CFM
1	1.03	2.06	3/8-16 UNC	M-10
1.50	1.41	2.75	1/2-13 UNC	M-12
2	1.69	3.06	1/2-13 UNC	M-12
3	2.44	4.19	5/8-11 UNC	M-16

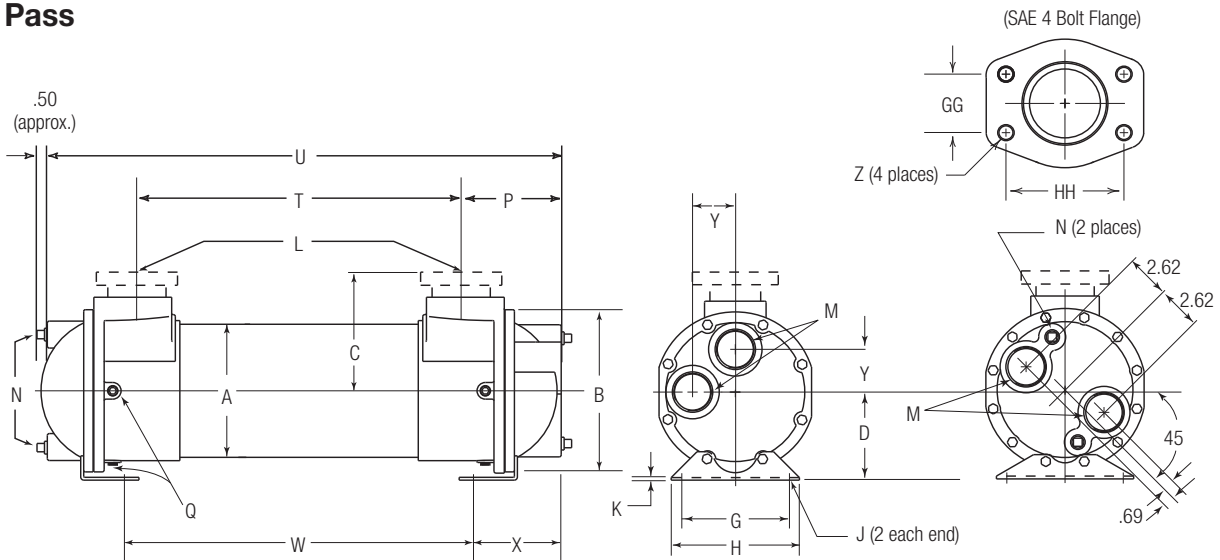
Model	A Dia.	B Dia.	C		D	G	H	J	K	L		M NPT	N NPT	P	Q NPT	T	U	W	X	Y
			NPT/BSPP SAE O-Ring	SAE 4 Bolt Flange						NPT/BSPP Flange	SAE O-Ring									
A-608	3.12	4.19	2.44	C/F	2.44	2.50	3.50	.38 x .88	.12	1.00	#16, 1 1/16-12 UNF-2b	1.00	.38	2.44	(2) .25	6.12	10.75	5.47	2.94	1.00
A-614	3.12	4.19	2.44	C/F	2.44	2.50	3.50	.38 x .88	.12	1.00	#16, 1 1/16-12 UNF-2b	1.00	.38	2.44	(2) .25	12.12	16.75	11.47	2.94	1.00
A-624	3.12	4.19	2.44	C/F	2.44	2.50	3.50	.38 x .88	.12	1.00	#16, 1 1/16-12 UNF-2b	1.00	.38	2.44	(2) .25	22.12	26.75	21.47	2.94	1.00
A-814	4.12	5.88	3.12	C/F	3.50	3.50	4.75	.50 x 1.62	.12	1.50	#24, 1 1/8-12 UN-2B	1.25	.38	3.44	(6) .38	11.12	17.62	12.88	2.56	1.19
A-824	4.12	5.88	3.12	C/F	3.50	3.50	4.75	.50 x 1.62	.12	1.50	#24, 1 1/8-12 UN-2B	1.25	.38	3.44	(6) .38	21.12	27.62	22.88	2.56	1.19
A-836	4.12	5.88	3.12	C/F	3.50	3.50	4.75	.50 x 1.62	.12	1.50	#24, 1 1/8-12 UN-2B	1.25	.38	3.44	(6) .38	33.12	39.62	34.88	2.56	1.19
A-1014	5.12	6.50	3.62	4.34	3.50	4.00	5.00	.44 x 2.20	.12	1.50	#24, 1 1/8-12 UN-2B	1.50	.38	3.69	(6) .25	11.12	18.31	11.75	3.38	1.50
A-1024	5.12	6.50	3.62	4.34	3.50	4.00	5.00	.44 x 2.20	.12	1.50	#24, 1 1/8-12 UN-2B	1.50	.38	3.69	(6) .25	21.12	28.31	21.75	3.38	1.50
A-1036	5.12	6.50	3.62	4.34	3.50	4.00	5.00	.44 x 2.20	.12	1.50	#24, 1 1/8-12 UN-2B	1.50	.38	3.69	(6) .25	33.12	40.31	33.75	3.38	1.50
A-1224	6.12	7.50	4.25	4.84	4.12	5.00	6.00	.50 x .88	.12	2.00	#32, 2 1/2-12 UN-2B	2.00	.50	4.25	(6) .25	20.50	28.75	21.50	3.75	1.56
A-1236	6.12	7.50	4.25	4.84	4.12	5.00	6.00	.50 x .88	.12	2.00	#32, 2 1/2-12 UN-2B	2.00	.50	4.25	(6) .25	32.50	40.75	33.50	3.75	1.56
A-1248	6.12	7.50	4.25	4.84	4.12	5.00	6.00	.50 x .88	.12	2.00	#32, 2 1/2-12 UN-2B	2.00	.50	4.25	(6) .25	44.50	52.75	45.50	3.75	1.56
A-1260	6.12	7.50	4.25	4.84	4.12	5.00	6.00	.50 x .88	.12	2.00	#32, 2 1/2-12 UN-2B	2.00	.50	4.25	(6) .25	56.50	64.75	57.50	3.75	1.56
A-1624	8.00	9.75	5.62	6.12"	5.38	7.00	8.25	.62 x 1.12	.19	3.00	—	2.50	.50	6.00	(6) .25	19.00	30.50	20.50	5.25	2.25
A-1636	8.00	9.75	5.62	6.12"	5.38	7.00	8.25	.62 x 1.12	.19	3.00	—	2.50	.50	6.00	(6) .25	31.00	42.50	44.50	5.25	2.25
A-1648	8.00	9.75	5.62	6.12"	5.38	7.00	8.25	.62 x 1.12	.19	3.00	—	2.50	.50	6.00	(6) .25	43.00	54.50	44.50	5.25	2.25
A-1660	8.00	9.75	5.62	6.12"	5.38	7.00	8.25	.62 x 1.12	.19	3.00	—	2.50	.50	6.00	(6) .25	55.00	66.50	56.50	5.25	2.25
A-1672	8.00	9.75	5.62	6.12"	5.38	7.00	8.25	.62 x 1.12	.19	3.00	—	2.50	.50	6.00	(6) .25	67.00	78.50	68.50	5.25	2.25

\*SAF-1200 5.88. \*\*SAF-1600 7.38.

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

# Dimensions

## Four Pass



**A-600, A-800, A-1000  
A-1200 Series**

**A-1600 Series**

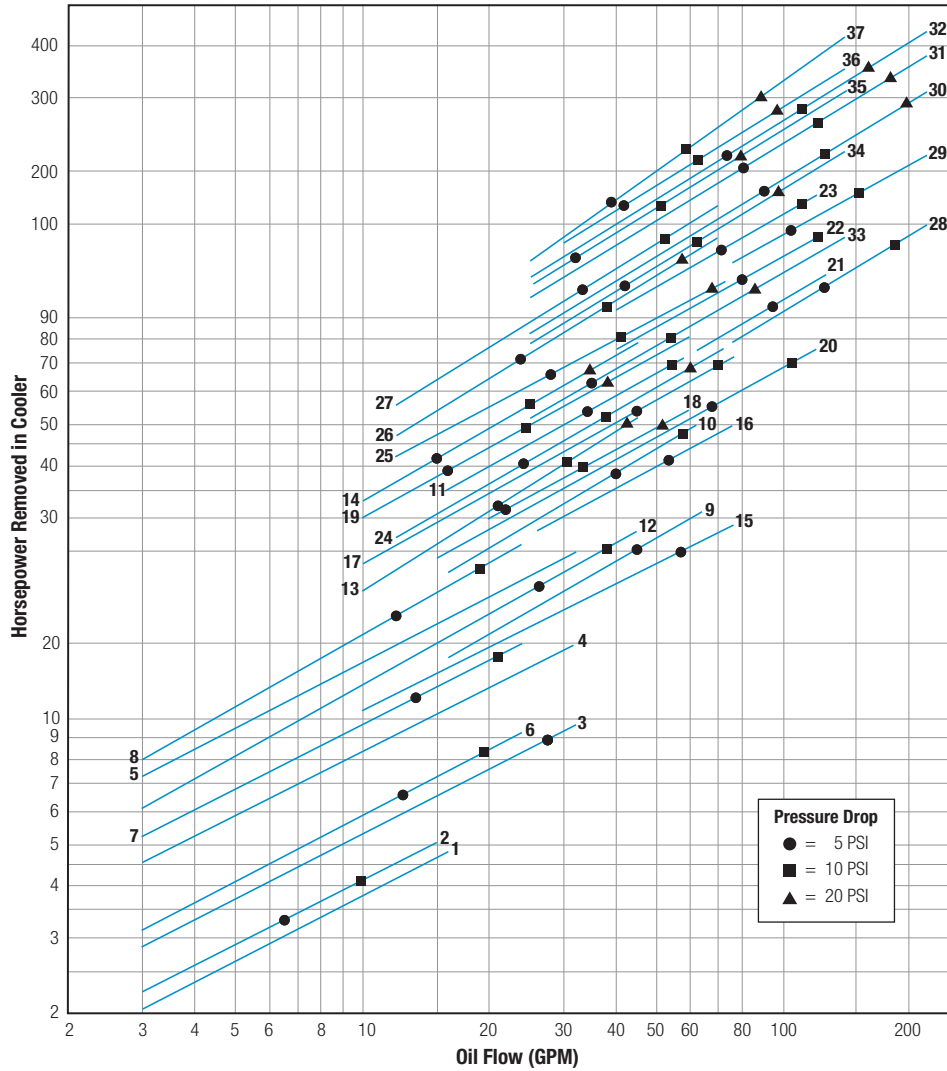
Flange Size	GG	HH	Z - CF	Z - CFM
1	1.03	2.06	3/8-16 UNC	M-10
1.50	1.41	2.75	1/2-13 UNC	M-12
2	1.69	3.06	1/2-13 UNC	M-12
3	2.44	4.19	5/8-11 UNC	M-16

Model	A Dia.	B Dia.	C		D	G	H	J	K	L		M NPT	N NPT	P	Q NPT	T	U	W	X	Y
			NPT/BSPP SAE O-Ring	SAE 4 Bolt Flange						NPT/BSPP Flange	SAE O-Ring									
A-608	3.12	4.19	2.44	C/F	2.44	2.50	3.50	.38 x .88	.12	1.00	#16,	.75	.38	2.31	(2) .25	6.12	10.88	5.47	2.81	1.00
A-614	3.12	4.19	2.44	C/F	2.44	2.50	3.50	.38 x .88	.12	1.00	1 1/16-12	.75	.38	2.31	(2) .25	12.12	16.88	11.47	2.81	1.00
A-624	3.12	4.19	2.44	C/F	2.44	2.50	3.50	.38 x .88	.12	1.00	UNF-2b	.75	.38	2.31	(2) .25	22.12	26.88	21.47	2.81	1.00
A-814	4.12	5.88	3.12	C/F	3.50	3.50	4.75	.50 x 1.62	.12	1.50	#24, 1 1/8-12 UN-2B	.75	.38	3.44	(6) .38	11.12	17.62	12.88	2.56	1.06
A-824	4.12	5.88	3.12	C/F	3.50	3.50	4.75	.50 x 1.62	.12	1.50		.75	.38	3.44	(6) .38	21.12	27.62	22.88	2.56	1.06
A-836	4.12	5.88	3.12	C/F	3.50	3.50	4.75	.50 x 1.62	.12	1.50		.75	.38	3.44	(6) .38	33.12	39.62	34.88	2.56	1.06
A-1014	5.12	6.50	3.62	4.34	3.50	4.00	5.00	.44 x 2.20	.12	1.50		1.00	.38	3.56	(6) .25	11.12	18.38	11.75	3.25	1.69
A-1024	5.12	6.50	3.62	4.34	3.50	4.00	5.00	.44 x 2.20	.12	1.50		1.00	.38	3.56	(6) .25	21.12	28.38	21.75	3.25	1.69
A-1036	5.12	6.50	3.62	4.34	3.50	4.00	5.00	.44 x 2.20	.12	1.50		1.00	.38	3.56	(6) .25	33.12	40.38	33.75	3.25	1.69
A-1224	6.12	7.50	4.25	4.84	4.12	5.00	6.00	.50 x .88	.12	2.00	#32, 2 1/2-12 UN-2B	1.50	.50	4.25	(6) .25	20.50	29.00	21.50	3.75	2.00
A-1236	6.12	7.50	4.25	4.84	4.12	5.00	6.00	.50 x .88	.12	2.00		1.50	.50	4.25	(6) .25	32.50	41.00	33.50	3.75	2.00
A-1248	6.12	7.50	4.25	4.84	4.12	5.00	6.00	.50 x .88	.12	2.00		1.50	.50	4.25	(6) .25	44.50	53.00	45.50	3.75	2.00
A-1260	6.12	7.50	4.25	4.84	4.12	5.00	6.00	.50 x .88	.12	2.00		1.50	.50	4.25	(6) .25	56.50	65.00	57.50	3.75	2.00
A-1624	8.00	9.75	5.62	6.12"	5.38	7.00	8.25	.62 x 1.12	.19	3.00	—	2.00	.50	6.00	(6) .25	19.00	30.75	20.50	5.25	—
A-1636	8.00	9.75	5.62	6.12"	5.38	7.00	8.25	.62 x 1.12	.19	3.00	—	2.00	.50	6.00	(6) .25	31.00	42.75	44.50	5.25	—
A-1648	8.00	9.75	5.62	6.12"	5.38	7.00	8.25	.62 x 1.12	.19	3.00	—	2.00	.50	6.00	(6) .25	43.00	54.75	44.50	5.25	—
A-1660	8.00	9.75	5.62	6.12"	5.38	7.00	8.25	.62 x 1.12	.19	3.00	—	2.00	.50	6.00	(6) .25	55.00	66.75	56.50	5.25	—
A-1672	8.00	9.75	5.62	6.12"	5.38	7.00	8.25	.62 x 1.12	.19	3.00	—	2.50	.50	6.00	(6) .25	67.00	78.75	68.50	5.25	—

\*SAF-1200 5.88. \*\*SAF-1600 7.38.

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

# Performance Curves

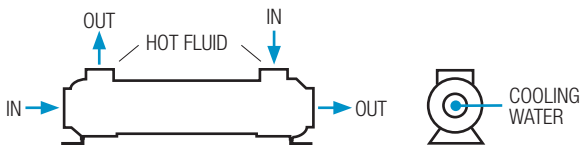


Curve Number	Model	Shipping Weight (LBS)
1	SA-408-2-4-0	7
2	SA-408-.75-4-0	7
3	A-608-2-4-F	12
4	A-614-4-4-F	17
5	A-624-4-4-F	20
6	A-608-1-4-F	12
7	A-614-1.5-4-F	17
8	A-624-2-4-F	20
9	A-814-3-4-F	40
10	A-824-4-4-F	50
11	A-836-4-4-F	58
12	A-814-1.5-4-F	40
13	A-824-2-4-F	50
14	A-836-2-4-F	58
15	A-1014-3-6-F	49
16	A-1024-4-6-F	63
17	A-1036-4-6-F	72
18	A-1024-2-6-F	63
19	A-1036-2-6-F	72
20	A-1224-4-6-F	78
21	A-1236-6-6-F	118
22	A-1248-6-6-F	143
23	A-1260-6-6-F	165
24	A-1224-2-6-F	78
25	A-1236-3-6-F	118
26	A-1248-3-6-F	143
27	A-1260-4-6-F	165
28	A-1624-6-6-F	180
29	A-1636-6-6-F	210
30	A-1648-6-6-F	250
31	A-1660-6-6-F	286
32	A-1672-6-6-F	330
33	A-1624-2-6-F	180
34	A-1636-3-6-F	210
35	A-1648-3-6-F	250
36	A-1660-4-6-F	286
37	A-1672-4-6-F	330

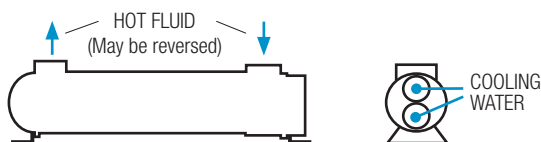
Shipping weights are approximate.

## Piping Diagram

### One Pass



### Two and Four Pass



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

# Selection Procedure

Performance Curves are based on 100SSU oil leaving the cooler 40°F higher than the water temperature used for cooling. This is also referred to as a 40°F approach temperature. Curves are based on a 2:1 oil to water flow 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.)

$$\text{If BTU/HR is known: } \text{HP} = \frac{\text{BTU/HR}}{2545}$$

**STEP 1 Determine Approach Temperature.** Desired oil leaving cooler °F – Water Inlet temp. °F = Actual Approach (Max. reservoir temp.)

**STEP 1 Determine Curve Horsepower Heat Load.** Enter the information from above:

$$\text{Horsepower heat load} \times \frac{40}{\text{Actual Approach}} \times \frac{\text{Viscosity}}{\text{Correction A}} = \frac{\text{Curve Horsepower}}{\text{Correction A}}$$

**STEP 1 Enter curves** at oil flow through cooler and curve horsepower. Any curve above the intersecting point will work.

**STEP 1 Determine Oil Pressure Drop from Curves:**

● = 5 PSI ■ = 10 PSI ▲ = 20 PSI Multiply pressure drop from curve by correction factor B found on oil viscosity correction curve.

## Oil Temperature

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

Typical operating temperature ranges are:

Hydraulic Oil	110°F - 130°F
Hydrostatic Drive Oil	130°F - 180°F
Bearing Lube Oil	120°F - 160°F
Lube Oil Circuits	110°F - 130°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 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 ΔT) with this formula:

$$\text{Oil } \Delta T = (\text{BTUs/HR}) / (\text{GPM Oil Flow} \times 210)$$

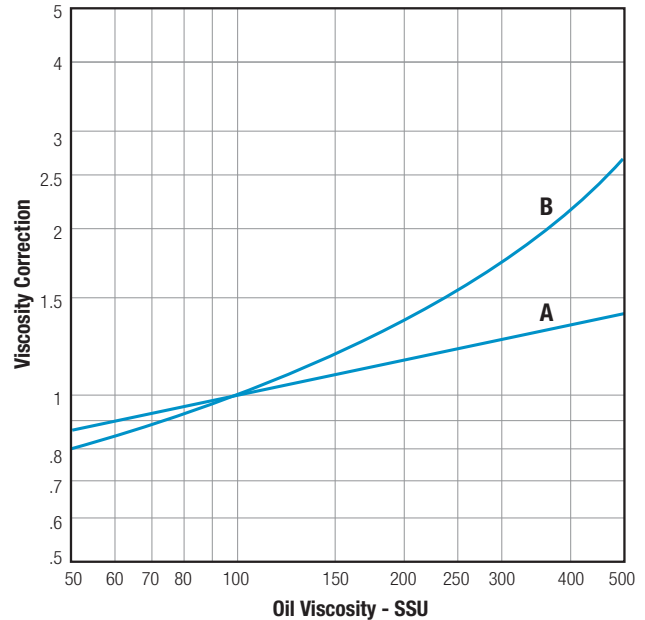
To calculate the oil leaving temperature from the cooler, use this formula:

$$\text{Oil Leaving Temp.} = \text{Oil Entering Temp} - \text{Oil } \Delta T$$

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.

## Viscosity Correction



## Maximum Flow Rates

Example Model No.

**A - 1024 - 2 - 6 - F**

Unit Size	Baffle Spacing	Shell Side (GPM)	Tube Side (GPM)		
			O	T	F
400	.75, 2	7, 19	18	–	–
608	1, 2	14, 29	48	24	12
614	1.5, 4	21, 29	48	24	12
624	2, 4	29	48	24	12
814	1.5, 3	29, 57	87	44	22
824 & 836	2, 4	38, 69	87	44	22
1014	1.5, 3	32, 64	146	73	37
1024 & 1036	2, 4	42, 69	146	73	37
1224	2, 4	51, 103	224	112	56
1236 & 1248	3, 6	77, 115	224	112	56
1260	4, 6	103, 115	224	112	56
1624	2, 6	66, 200	280	140	70
1636 & 1648	3, 6	100, 200	280	140	70
1660 & 1672	4, 6	133, 200	280	140	70

**Caution:** Incorrect installation can cause this product to fail prematurely, causing the shell side and tube side fluids to intermix.