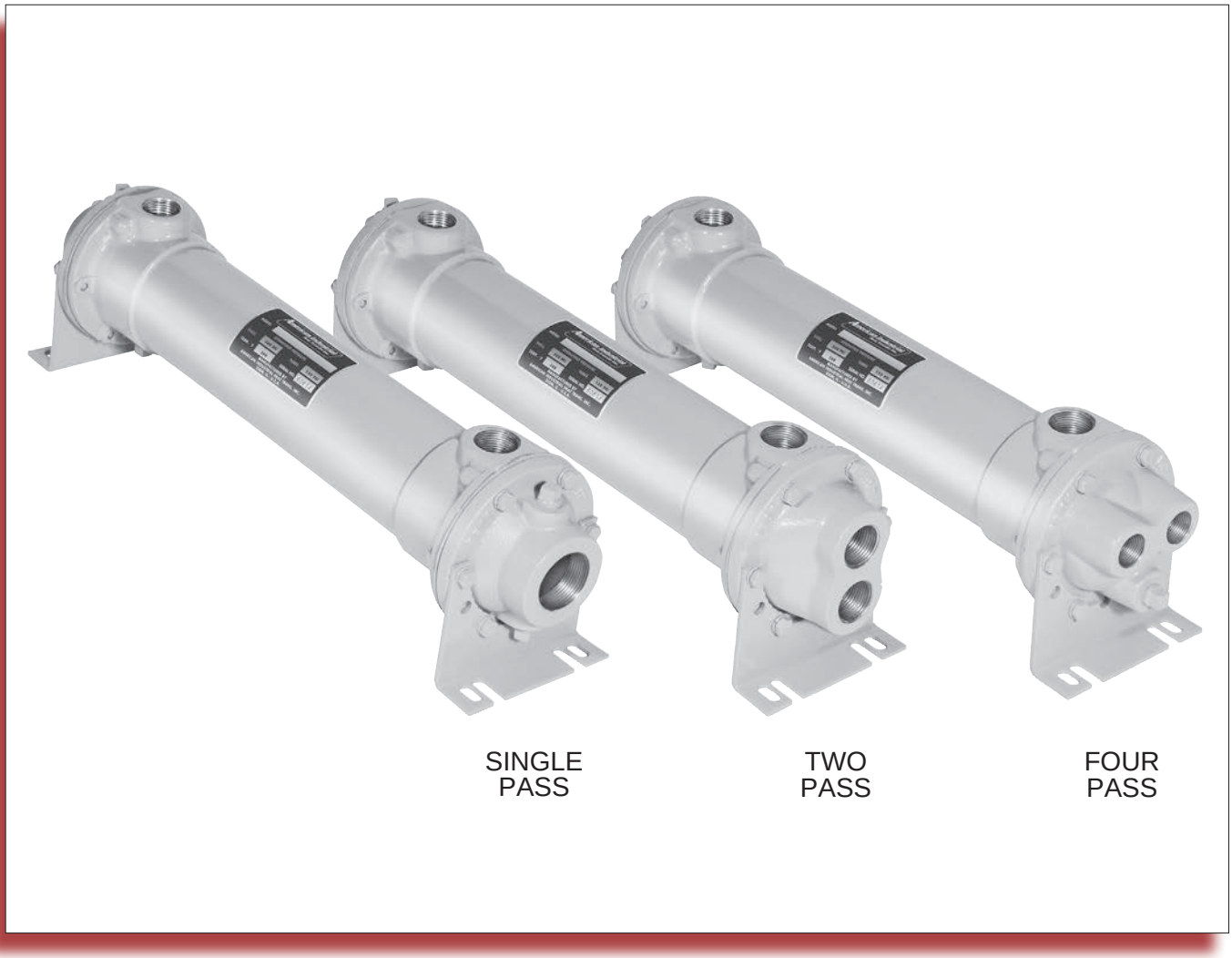
American Industrial
Heat Transfer Inc.

Manufacturer of Quality Heat Exchangers

AB - SAE - STS - EAB - SAB SERIES



Fixed Tube Bundle / Liquid Cooled

HEAT EXCHANGERS

- Computer generated data sheet available for any application
- Operating pressure for tubes 150 PSI.
- Operating pressure for shell 300 PSI.
- Operating temperature 300 °F.
- Can be customized to fit any applications.
- Cools: Fluid power systems, rock crushers, presses, shears, lubrication equipment for paper machinery, gear drives, marine transmissions, etc.

AB, SAE, STS, EAB & SAB Series *overview*

AB Series

Fixed tube construction heat exchangers with NPT connections. Made of brass with copper cooling tubes and cast iron end bonnets. Standard sizes from 2" through 8" diameters, and from 1.4 to 308 sq.ft. Standard one, two, and four pass models are available. Options include 90/10 copper nickel and 316 stainless steel cooling tubes, bronze bonnets and zinc anodes. Can be customized to fit your requirements.

Optional 10” diameter units in brass are available upon request.

SAE Series

Similar to AB series with the exception of the shell ports. SAE series from 2” through 6” diameter has SAE O-ring strait thread shell port connections. Size 8” diameter has SAE code 61 four bolt flange shell port connections.

STS Series

Similar in design to AB series with fixed tube construction and NPT connections made of all 316 stainless steel. Standard sizes from 2" through 8" diameters, and from 1.4 to 308 sq.ft. Standard one, two and four pass models are available. Larger diameters available upon request. Can be customized to fit your requirements.

EAB Series

Expansion bellow minimizes the effects of differential expansion and contraction between the shell and cooling tubing, prolonging the overall life of the heat exchanger by reducing fatigue. Fixed tube construction heat exchangers with NPT connections. Made of brass with 90/10 copper nickel cooling tubes, stainless steel expansion bellows, and cast iron end bonnets. Standard sizes from 3.5" through 8" diameters, and from 3.6 to 308 sq.ft. Standard one, two and four pass models are available.

AB, SAE, STS, EAB & SAB Series *construction*

TUBE JOINT
Roller expanded tube joint to integral forged hub.

THREAD
CNC precision threading to provide accurate leak-proof connections.

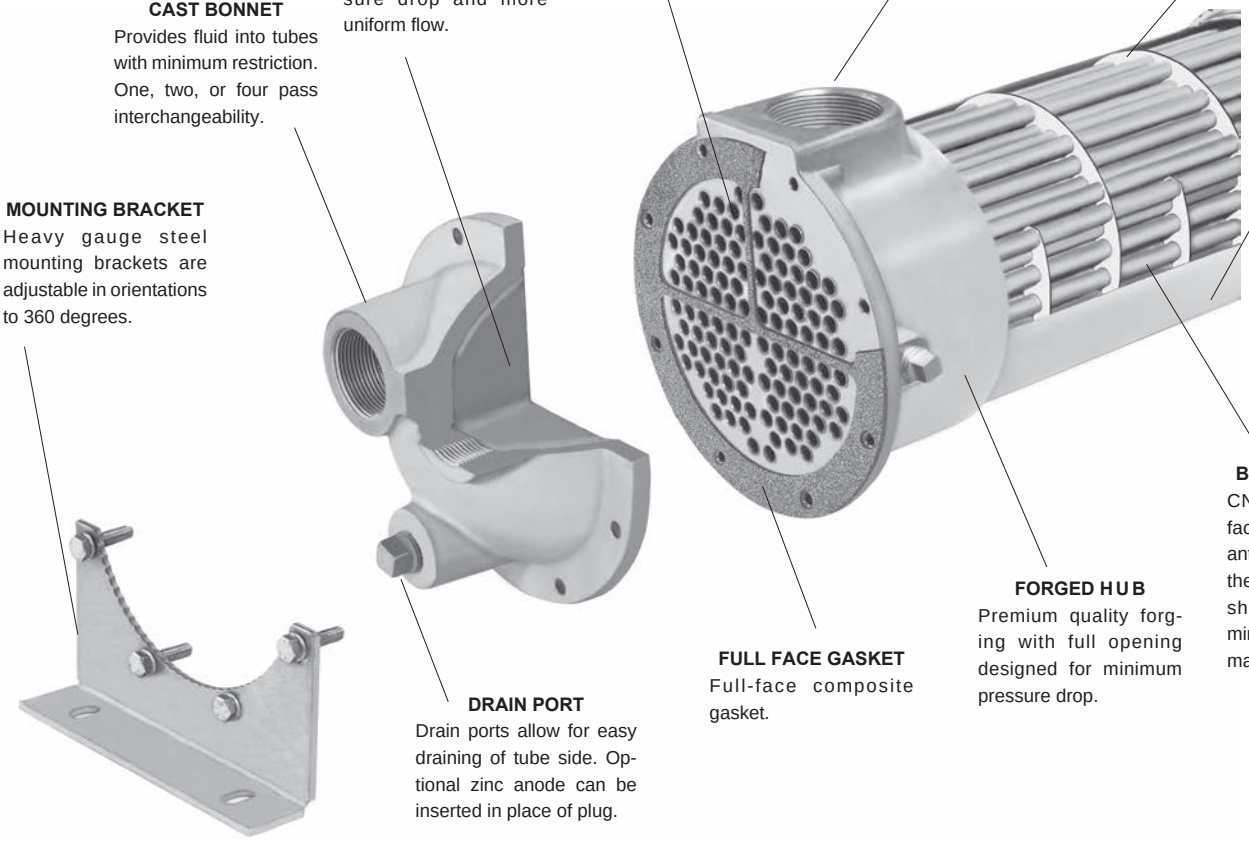
BAFFLES
CNC manufactured baffles to provide maximum turbulence and heat transfer with a minimum fluid pressure drop.

FLOW CAVITY
Generously sized to allow for minimum pressure drop and more uniform flow.

CAST BONNET
Provides fluid into tubes with minimum restriction. One, two, or four pass interchangeability.

FINISH
Gray semigloss enamel. Can be used as a base for additional coats.

MOUNTING BRACKET
Heavy gauge steel mounting brackets are adjustable in orientations to 360 degrees.



BUNDLE ASSEMBLY
CNC precision manufactured parts to guarantee a close fit between the baffles, tubes, and shell. Clearances are minimized to provide for maximum heat transfer.

FORGED HUB
Premium quality forging with full opening designed for minimum pressure drop.

FULL FACE GASKET
Full-face composite gasket.

DRAIN PORT
Drain ports allow for easy draining of tube side. Optional zinc anode can be inserted in place of plug.

UNIT CODING

Example Model

Options

AB - 1204 - C 4 - TP - CNT - B - Z

- **Model**: AB, SAE, STS, EAB, SAB
- **Shell Diameter**: 400 = 2.13", 700 = 3.65", 1000 = 5.13", 1200 = 6.13", 1600 = 8.00"
- **Effective Tube Length** (9" increments)
- **Baffle Spacing Code**: A = 1 1/8", B = 2 1/4", C = 4 1/2", D = 9 ", E = 18 "
- **Cooling Tube Diamenter**: 4 = 1/4", 6 = 3/8", 10 = 5/8"
- **Tube Side Passes**: SP = 1 pass, TP = 2 pass, FP = 4 pass
- **Tubing**: Blank = Copper; *Options*: CNT= 90/10 Cu Ni, STS = Stainless Steel, C = Carbon Steel
- **End Bonnets**: Blank = Cast Iron; *Options*: B = Bronze, SB = Stainless Steel
- **Zinc Anode**: Z = 1 Zinc Anode, 2Z = 2 Zinc Anode etc.

STANDARD CONSTRUCTION MATERIALS & RATINGS

Standard Model	AB Series	SAB & SSAE Series★	SAE Series	STS Series	EAB Series	Standard Unit Ratings
Shell	Brass	Steel	Brass	316 Stainless Steel	Steel	Operating Pressure
Tubes	Copper	Copper	Copper	316 Stainless Steel	90/10 Copper Nickel	Tubes.....150 psig
Baffle	Brass	Steel	Brass	316 Stainless Steel	Brass	
Integral End Hub	Forged Brass	Forged Brass	Forged Brass	316 Stainless Steel	Forged Brass	Operating Pressure
End Bonnets	Cast Iron	Cast Iron	Cast Iron	316 Stainless Steel	Cast Iron	Shell.....300 psig
Mounting Brackets	Steel	Steel	Steel	Steel	Steel	
Gasket	Hypalon Composite	Hypalon Composite	Hypalon Composite	Hypalon Composite	High Temp Gasket	Operating Temperature
Expansion Bellows	–	–	–	–	Stainless Steel	300 ºF

★Offered in 5" through 8" shell diameter.

AB, SAE, STS, EAB & SAB Series *selection*

STEP 1: Calculate the heat load

The heat load in BTU/HR or (Q) can be derived by using several methods. To simplify things, we will consider general specifications for hydraulic system oils and other fluids that are commonly used with shell & tube heat exchangers.

Terms

GPM = Gallons Per Minute
CN = Constant Number for a given fluid
△T = Temperature differential across the potential
PSI = Pounds per Square Inch (pressure) of the operating side of the system
MHP = Horsepower of the electric motor driving the hydraulic pump
Kw = Kilowatt (watts x 1000)
T_{in} = Hot fluid entering temperature in °F
T_{out} = Hot fluid exiting temperature in °F
t_{in} = Cold fluid temperature entering in °F
t_{out} = Cold fluid temperature exiting in °F
Q = BTU / HR

For example purposes, a hydraulic system has a 125 HP (93Kw) electric motor installed coupled to a pump that produces a flow of 80 GPM @ 2500 PSIG. The temperature differential of the oil entering the pump *vs* exiting the system is about 5.3°F. Even though our return line pressure operates below 100 psi, we must calculate the system heat load potential (Q) based upon the prime movers (pump) capability. We can use one of the following equations to accomplish this:

To derive the required heat load (Q) to be removed by the heat exchanger, apply ONE of the following. Note: The calculated heat loads may differ slightly from one formula to the next. This is due to assumptions made when estimating heat removal requirements. The factor *(v)* represents the percentage of the overall input energy to be rejected by the heat exchanger. The *(v)* factor is generally about 30% for most hydraulic systems, however it can range from 20%-70% depending upon the installed system components and heat being generated (ie. servo valves, proportional valves, etc…will increase the percentage required).

Formula	Example
A) Q = GPM x CN x actual △T	A) Q =80 x 210 x 5.3°F = 89,040 BTU/HR
B) Q = [(PSI x GPM) / 1714] x (*v*) x 2545	B) Q =[(2500x80)/1714] x .30 x 2545 = 89,090 BTU/HR
C) Q = MHP x (*v*) x 2545	C) Q =125 x .30 x 2545 = 95,347 BTU/HR
D) Q = Kw to be removed x 3415	D) Q =28 x 3415 = 95,620 BTU/HR
E) Q = HP to be removed x 2545	E) Q =37.5 x 2545 = 95,437 BTU/HR

Constant for a given fluid (CN)

1) Oil ..... CN = 210
2) Water..... CN = 500
3) 50% E. Glycol..... CN = 450

STEP 2: Calculate the Mean Temperature Difference

When calculating the MTD you will be required to choose a liquid flow rate to derive the Cold Side △T. If your water flow is unknown you may need to assume a number based on what is available. As a normal rule of thumb, for oil to water cooling a 2:1 oil to water ratio is used. For applications of water to water or 50 % Ethylene Glycol to water, a 1:1 ratio is common.

Formula

HOT FLUID △T (Oil) = $\dfrac{Q}{CN \times GPM}$

COLD FLUID △t (Water) = $\dfrac{BTU / hr}{CN \times GPM}$

Example

$\triangle T = \dfrac{89{,}090\ BTU/hr}{210\ CN \times 80GPM}$ (from step 1,example B) = 5.3°F = △T Rejected

$\triangle t = \dfrac{89{,}090\ BTU/hr}{500\ CN \times 40GPM\ (\text{for a 2:1 ratio})}$ = 4.5°F = △t Absorbed

T_{in} = Hot Fluid entering temperature in degrees F
T_{out} = Hot Fluid exiting temperature in degrees F
t_{in} = Cold Fluid entering temperature in degrees F
t_{out} = Cold Fluid exiting temperature in degrees F

T_{in} = 125.3 °F
T_{out} = 120.0 °F
t_{in} = 70.0 °F
t_{out} = 74.5 °F

$$\frac{T_{out} - t_{in}}{T_{in} - t_{out}} = \frac{S\text{[smaller temperature difference]}}{L\text{ [larger temperature difference]}} = \left(\frac{S}{L}\right)$$

$$\frac{120.0°F - 70.0°F = 50.0°F}{125.3°F - 74.5°F = 50.8°F} = \frac{50.0°F}{50.8°F} = .984$$

STEP 3: Calculate Log Mean Temperature Difference (LMTD)

To calculate the LMTD please use the following method;

L = Larger temperature difference from step 2.
M = S/L number (LOCATED IN TABLE A).

$LMTD_i$ = L x M

$LMTD_i$ = 50.8 x .992 (FROM TABLE A) = 50.39

To correct the $LMTD_i$ for a multipass heat exchangers calculate **R** & **K** as follows:

Formula

$$R = \frac{T_{in} - T_{out}}{t_{out} - t_{in}}$$

$$K = \frac{t_{out} - t_{in}}{T_{in} - t_{in}}$$

Example

$$R = \frac{125.3°F - 120°F}{74.5°F - 70°F} = \frac{5.3°F}{4.5°F} = \textbf{\{1.17=R\}}$$

$$K = \frac{74.5°F - 70°F}{124.5°F - 70°F} = \frac{4.5°F}{55.4°F} = \textbf{\{0.081=K\}}$$

Locate the correction factor CF_B (FROM TABLE B)
$LMTD_c = LMTD_i \times CF_B$
$LMTD_c$ = 50.39 x 1 = **50.39**

AB, SAE, STS, EAB & SAB Series *performance*

Instructions

The selection chart provided contains an array of popular sizes for quick sizing. It does not provide curves for all models available. Refer to page 4 & 5 for detailed calculation information.

Computer selection data sheets for standard or special models are available through the engineering department of American Industrial. To use the followings graphs correctly, refer to the instruction notes "1-5".

1) HP Curves are based upon a 40°F approach temperature; for example: oil leaving a cooler at 125°F, using 85°F cooling water (125°F – 85°F = 40°F).

2) The oil to water ratio of 1:1 or 2:1 means that for every 1 gallon of oil circulated, a minimum of 1 or 1/2 gallon (respectively) of 85°F water must be circulated to match the curve results.

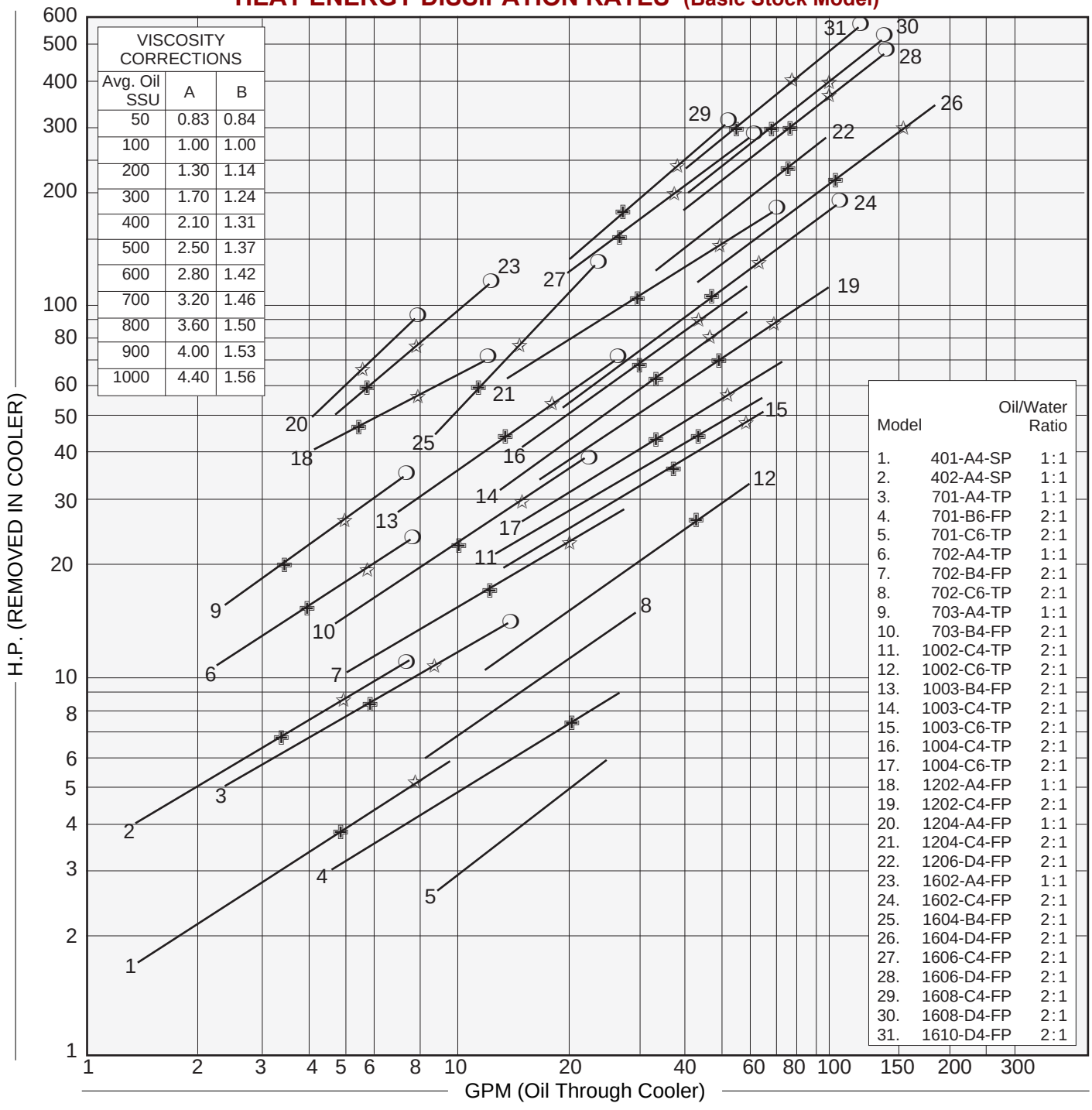
3) OIL PRESSURE DROP CODING: ✙ = 5 psi; ☆= 10 psi; ❍ = 20 psi; △ = 50psi. Curves that have no pressure drop code symbols indicate that the oil pressure drop is less than 5 psi for the flow rate shown.

4) Pressure Drop is based upon oil with an average viscosity of 100 SSU. If the average oil viscosity is other than 100 SSU, then multiply the indicated Pressure Drop by the corresponding value from corrections table A.

5) Corrections for approach temperature and oil viscosity are as follows:

$$H.P._{(\text{Removed In Cooler})} = H.P._{(\text{Actual Heat Load})} \times \left(\frac{40}{\text{Actual Approach}}\right) \times B.$$

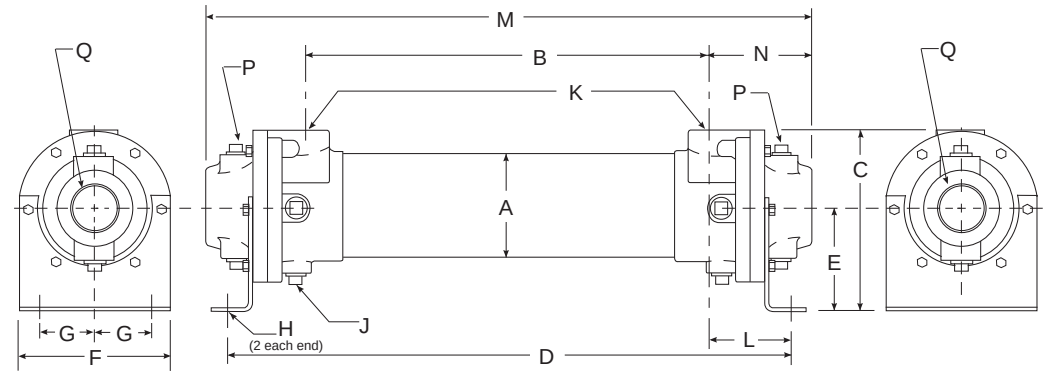
HEAT ENERGY DISSIPATION RATES (Basic Stock Model)



VISCOSITY CORRECTIONS		
Avg. Oil SSU	A	B
50	0.83	0.84
100	1.00	1.00
200	1.30	1.14
300	1.70	1.24
400	2.10	1.31
500	2.50	1.37
600	2.80	1.42
700	3.20	1.46
800	3.60	1.50
900	4.00	1.53
1000	4.40	1.56

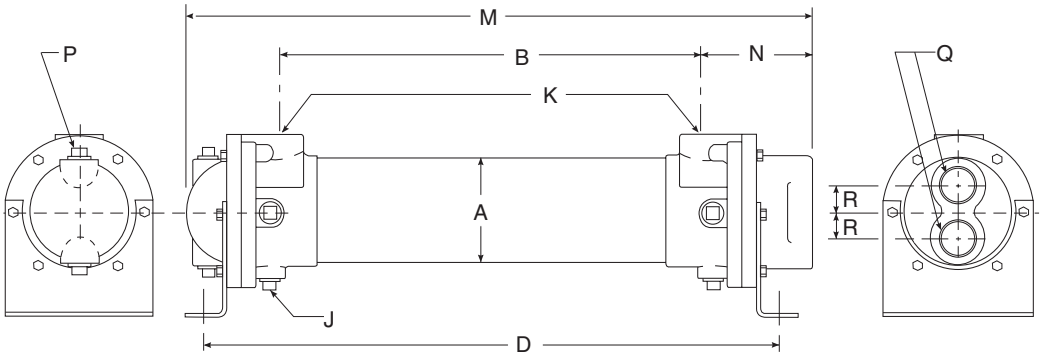
	Model	Oil/Water Ratio
1.	401-A4-SP	1:1
2.	402-A4-SP	1:1
3.	701-A4-TP	1:1
4.	701-B6-FP	2:1
5.	701-C6-TP	2:1
6.	702-A4-TP	1:1
7.	702-B4-FP	2:1
8.	702-C6-TP	2:1
9.	703-A4-TP	1:1
10.	703-B4-FP	2:1
11.	1002-C4-TP	2:1
12.	1002-C6-TP	2:1
13.	1003-B4-FP	2:1
14.	1003-C4-TP	2:1
15.	1003-C6-TP	2:1
16.	1004-C4-TP	2:1
17.	1004-C6-TP	2:1
18.	1202-A4-FP	1:1
19.	1202-C4-FP	2:1
20.	1204-A4-FP	1:1
21.	1204-C4-FP	2:1
22.	1206-D4-FP	2:1
23.	1602-A4-FP	1:1
24.	1602-C4-FP	2:1
25.	1604-B4-FP	2:1
26.	1604-D4-FP	2:1
27.	1606-C4-FP	2:1
28.	1606-D4-FP	2:1
29.	1608-C4-FP	2:1
30.	1608-D4-FP	2:1
31.	1610-D4-FP	2:1

AB Series *dimensions*



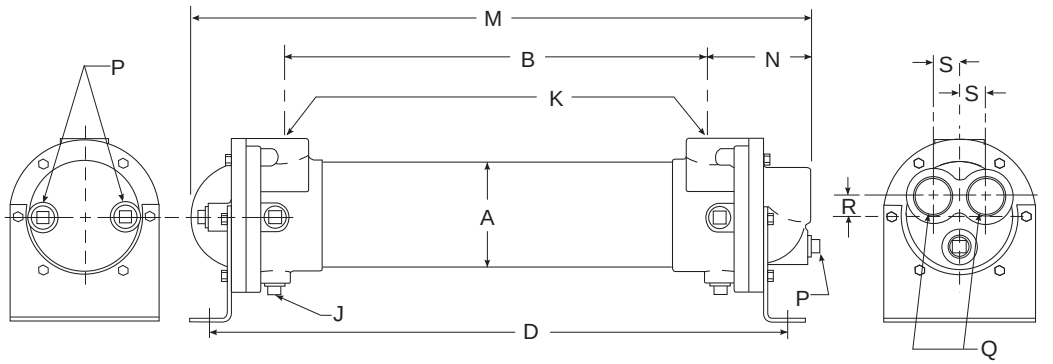
SINGLE PASS (SP)

Model	M	N	P NPT	Q NPT
AB-401	11.24	1.81	-	1.00
AB-402	20.24			
AB-701	13.47	3.24	(4) .38	1.50
AB-702	22.47			
AB-703	31.47			
AB-704	40.47			
AB-1002	23.60	4.05	(4) .38	2.00
AB-1003	32.60			
AB-1004	41.60			
AB-1202	24.38	4.88	(4) .50	3.00
AB-1203	33.25			
AB-1204	42.12			
AB-1205	51.12			
AB-1206	60.25			
AB-1207	69.25			
AB-1208	78.12			
AB-1209	87.12			
AB-1210	96.12			
AB-1602	26.62	6.52	(4) .50	4.00
AB-1603	35.62			
AB-1604	44.62			
AB-1605	53.62			
AB-1606	62.62			
AB-1607	71.62			
AB-1608	80.62			
AB-1609	89.62			
AB-1610	98.62			



TWO PASS (TP)

Model	M	N	P NPT	Q NPT	R
AB-701	13.28	3.30	(2) .38	1.00	.88
AB-702	22.28				
AB-703	31.28				
AB-704	40.28				
AB-1002	23.29	3.80	(2) .38	1.50	1.19
AB-1003	32.29				
AB-1004	41.29				
AB-1202	23.94	4.56	(2) .50	2.00	1.44
AB-1203	32.81				
AB-1204	41.69				
AB-1205	50.69				
AB-1206	59.81				
AB-1207	68.81				
AB-1208	77.69				
AB-1209	86.69				
AB-1210	95.69				
AB-1602	25.10	6.08	(2) .50	2.50	1.88
AB-1603	34.10				
AB-1604	43.10				
AB-1605	52.10				
AB-1606	61.10				
AB-1607	70.10				
AB-1608	79.10				
AB-1609	88.10				
AB-1610	97.10				



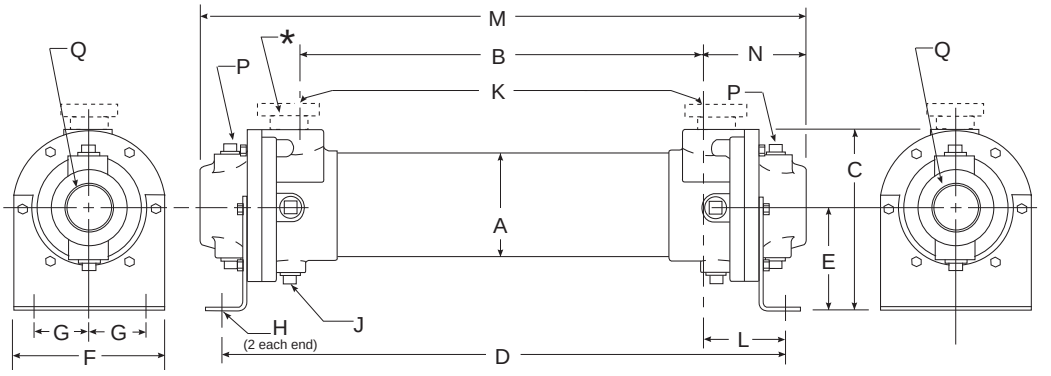
FOUR PASS (FP)

Model	M	N	P NPT	Q NPT	R	S
AB-701	13.42	3.24	(3) .38	.75	.62	.88
AB-702	22.42					
AB-703	31.42					
AB-704	40.42					
AB-1002	23.55	4.06	(3) .38	1.00	.75	1.19
AB-1003	32.55					
AB-1004	41.55					
AB-1202	24.44	4.90	(3) .50	1.50	1.06	1.44
AB-1203	33.31					
AB-1204	42.19					
AB-1205	51.19					
AB-1206	60.31					
AB-1207	69.31					
AB-1208	78.19					
AB-1209	87.19					
AB-1210	96.19					
AB-1602	26.72	6.48	(3) .50	2.00	1.38	1.88
AB-1603	35.72					
AB-1604	44.72					
AB-1605	53.72					
AB-1606	62.72					
AB-1607	71.72					
AB-1608	80.72					
AB-1609	89.72					
AB-1610	98.72					

COMMON DIMENSIONS & WEIGHTS

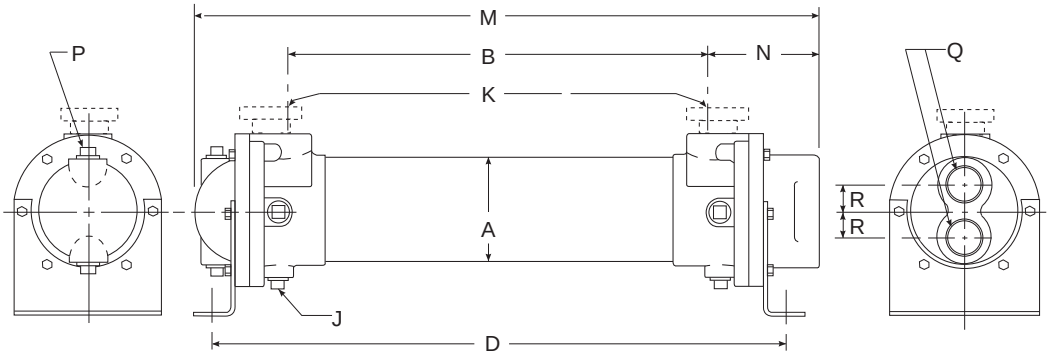
Model	A	B	C	D	E	F	G	H	J NPT	K NPT	L	Approx. Weight	Model
AB-401	2.13	7.62	3.50	10.91	1.94	2.62	.88	.41ϕ	-	.50	1.72	7	AB-401
AB-402		16.62		20.91								10	AB-402
AB-701	3.66	7.00	6.25	12.38	3.62	5.25	1.50	.44ϕ x 1.00	(2) .38	1.00	2.69	23	AB-701
AB-702		16.00		21.38								29	AB-702
AB-703		25.00		30.38								33	AB-703
AB-704		34.00		39.38								49	AB-704
AB-1002	5.13	15.50	7.38	21.62	4.00	6.75	2.00	.44ϕ x 1.00	(6) .38	1.50	3.06	54	AB-1002
AB-1003		24.50		30.62								76	AB-1003
AB-1004		33.50		39.62								82	AB-1004
AB-1202	6.13	14.62	8.81	21.50	4.75	7.50	2.50	.44ϕ x 1.00	(6) .38	2.00	3.44	79	AB-1202
AB-1203		23.50		30.38								98	AB-1203
AB-1204		32.38		39.25								115	AB-1204
AB-1205		41.38		48.25								130	AB-1205
AB-1206		50.50		57.38								150	AB-1206
AB-1207		59.50		66.38								170	AB-1207
AB-1208		68.38		75.25								190	AB-1208
AB-1209		77.38		84.25								210	AB-1209
AB-1210		86.38		93.25								230	AB-1210
AB-1602	8.00	13.60	12.13	22.38	6.50	10.00	3.50	.44ϕ x 1.00	(6) .38	3.00	4.39	145	AB-1602
AB-1603		22.60		31.38								170	AB-1603
AB-1604		31.60		40.38								200	AB-1604
AB-1605		40.60		49.38								225	AB-1605
AB-1606		49.60		58.38								250	AB-1606
AB-1607		58.60		67.38								275	AB-1607
AB-1608		67.60		76.38								315	AB-1608
AB-1609		76.60		85.38								350	AB-1609
AB-1610		85.60		94.38								390	AB-1610

SAE Series *dimensions*



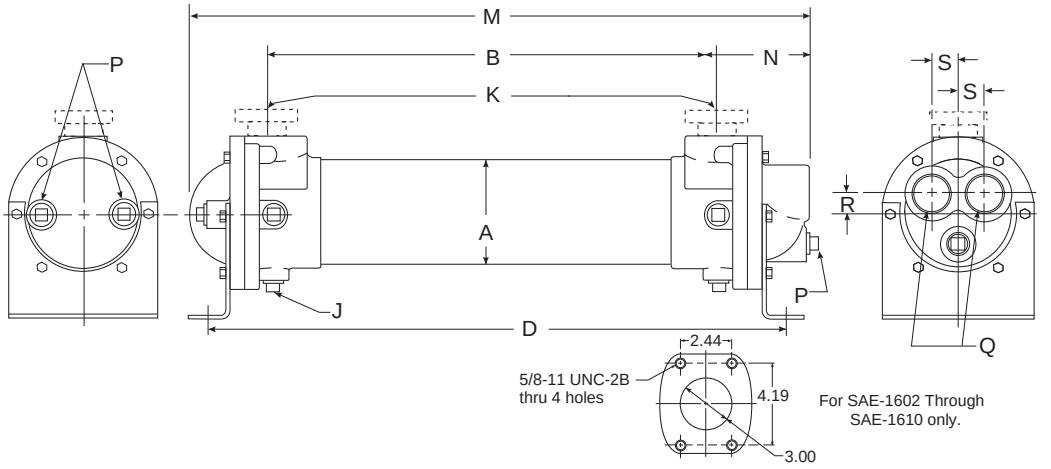
SINGLE PASS (SP)

Model	M	N	P NPT	Q NPT
SAE-401	11.24	1.81	-	1.00
SAE-402	20.24			
SAE-701	13.47	3.24	(4) .38	1.50
SAE-702	22.47			
SAE-703	31.47			
SAE-704	40.47			
SAE-1002	23.60	4.05	(4) .38	2.00
SAE-1003	32.60			
SAE-1004	41.60			
SAE-1202	24.38	4.88	(4) .50	3.00
SAE-1203	33.25			
SAE-1204	42.12			
SAE-1205	51.12			
SAE-1206	60.25			
SAE-1207	69.25			
SAE-1208	78.12			
SAE-1209	87.12			
SAE-1210	96.12			
SAE-1602	26.62	6.52	(4) .50	4.00
SAE-1603	35.62			
SAE-1604	44.62			
SAE-1605	53.62			
SAE-1606	62.62			
SAE-1607	71.62			
SAE-1608	80.62			
SAE-1609	89.62			
SAE-1610	98.62			



TWO PASS (TP)

Model	M	N	P NPT	Q NPT	R
SAE-701	13.28	3.30	(2) .38	1.00	.88
SAE-702	22.28				
SAE-703	31.28				
SAE-704	40.28				
SAE-1002	23.29	3.80	(2) .38	1.50	1.19
SAE-1003	32.29				
SAE-1004	41.29				
SAE-1202	23.94	4.56	(2) .50	2.00	1.44
SAE-1203	32.81				
SAE-1204	41.69				
SAE-1205	50.69				
SAE-1206	59.81				
SAE-1207	68.81				
SAE-1208	77.69				
SAE-1209	86.69				
SAE-1210	95.69				
SAE-1602	25.10	6.08	(2) .50	2.50	1.88
SAE-1603	34.10				
SAE-1604	43.10				
SAE-1605	52.10				
SAE-1606	61.10				
SAE-1607	70.10				
SAE-1608	79.10				
SAE-1609	88.10				
SAE-1610	97.10				



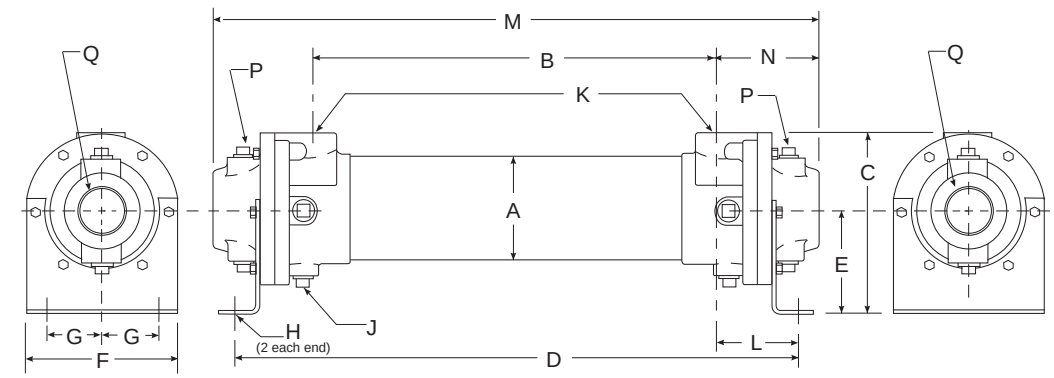
FOUR PASS (FP)

Model	M	N	P NPT	Q NPT	R	S
SAE-701	13.42	3.24	(3) .38	.75	.62	.88
SAE-702	22.42					
SAE-703	31.42					
SAE-704	40.42					
SAE-1002	23.55	4.06	(3) .38	1.00	.75	1.19
SAE-1003	32.55					
SAE-1004	41.55					
SAE-1202	24.44	4.90	(3) .50	1.50	1.06	1.44
SAE-1203	33.31					
SAE-1204	42.19					
SAE-1205	51.19					
SAE-1206	60.31					
SAE-1207	69.31					
SAE-1208	78.19					
SAE-1209	87.19					
SAE-1210	96.19					
SAE-1602	26.72	6.48	(3) .50	2.00	1.38	1.88
SAE-1603	35.72					
SAE-1604	44.72					
SAE-1605	53.72					
SAE-1606	62.72					
SAE-1607	71.72					
SAE-1608	80.72					
SAE-1609	89.72					
SAE-1610	98.72					

COMMON DIMENSIONS & WEIGHTS

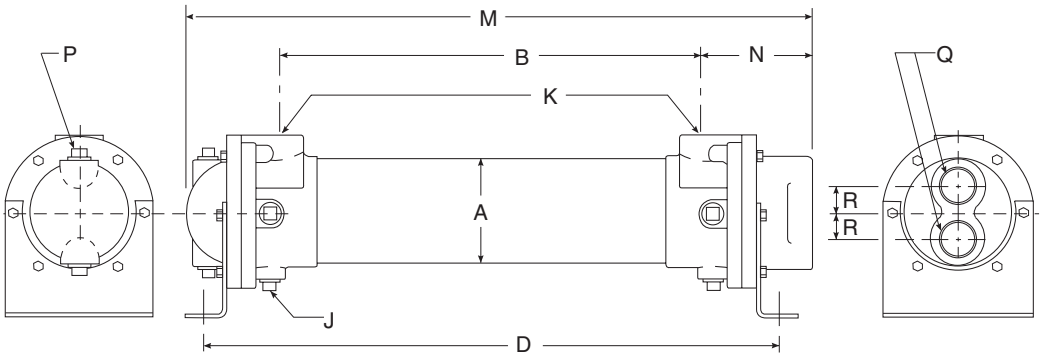
Model	A	B	C	D	E	F	G	H	J NPT	K SAE	L	Approx. Weight	Model
SAE-401	2.13	7.62	3.50	10.91	1.94	2.62	.88	.41ϕ	-	#8	1.72	7	SAE-401
SAE-402		16.62		20.91						3/4-16		10	SAE-402
SAE-701	3.66	7.00	6.25	12.38	3.62	5.25	1.50	.44ϕ x 1.00	(2) .38	#16 1 5/16-12	2.69	23	SAE-701
SAE-702		16.00		21.38								29	SAE-702
SAE-703		25.00		30.38								33	SAE-703
SAE-704		34.00		39.38								49	SAE-704
SAE-1002	5.13	15.50	7.38	21.62	4.00	6.75	2.00	.44ϕ x 1.00	(6) .38	#24 1 7/8-12	3.06	54	SAE-1002
SAE-1003		24.50		30.62								76	SAE-1003
SAE-1004		33.50		39.62								82	SAE-1004
SAE-1202	6.13	14.62	8.81	21.50	4.75	7.50	2.50	.44ϕ x 1.00	(6) .38	#32 2 1/2-12	3.44	79	SAE-1202
SAE-1203		23.50		30.38								98	SAE-1203
SAE-1204		32.38		39.25								115	SAE-1204
SAE-1205		41.38		48.25								130	SAE-1205
SAE-1206		50.50		57.38								150	SAE-1206
SAE-1207		59.50		66.38								170	SAE-1207
SAE-1208		68.38		75.25								190	SAE-1208
SAE-1209		77.38		84.25								210	SAE-1209
SAE-1210		86.38		93.25								230	SAE-1210
SAE-1602	8.00	13.60	12.13	22.38	6.50	10.00	3.50	.44ϕ x 1.00	(6) .38	3.0" Four bolt Flange	4.39	145	SAE-1602
SAE-1603		22.60		31.38								170	SAE-1603
SAE-1604		31.60		40.38								200	SAE-1604
SAE-1605		40.60		49.38								225	SAE-1605
SAE-1606		49.60		58.38								250	SAE-1606
SAE-1607		58.60		67.38								275	SAE-1607
SAE-1608		67.60		76.38								315	SAE-1608
SAE-1609		76.60		85.38								350	SAE-1609
SAE-1610		85.60		94.38								390	SAE-1610

STS Series *dimensions*



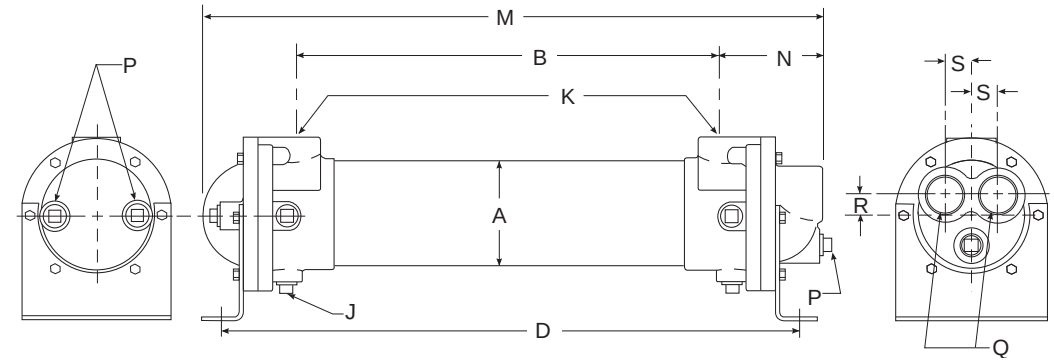
SINGLE PASS (SP)

Model	M	N	P NPT	Q NPT
STS-401	11.24	1.81	-	1.00
STS-402	20.24			
STS-701	13.47	3.24	(4) .38	1.50
STS-702	22.47			
STS-703	31.47			
STS-704	40.47			
STS-1002	23.60	4.05	(4) .38	2.00
STS-1003	32.60			
STS-1004	41.60			
STS-1202	24.38	4.88	(4) .50	3.00
STS-1203	33.25			
STS-1204	42.12			
STS-1205	51.12			
STS-1206	60.25			
STS-1207	69.25			
STS-1208	78.12			
STS-1209	87.12			
STS-1210	96.12			
STS-1602	26.62	6.52	(4) .50	4.00
STS-1603	35.62			
STS-1604	44.62			
STS-1605	53.62			
STS-1606	62.62			
STS-1607	71.62			
STS-1608	80.62			
STS-1609	89.62			
STS-1610	98.62			



TWO PASS (TP)

Model	M	N	P NPT	Q NPT	R
STS-701	13.28	3.30	(2) .38	1.00	.88
STS-702	22.28				
STS-703	31.28				
STS-704	40.28				
STS-1002	23.29	3.80	(2) .38	1.50	1.19
STS-1003	32.29				
STS-1004	41.29				
STS-1202	23.94	4.56	(2) .50	2.00	1.44
STS-1203	32.81				
STS-1204	41.69				
STS-1205	50.69				
STS-1206	59.81				
STS-1207	68.81				
STS-1208	77.69				
STS-1209	86.69				
STS-1210	95.69				
STS-1602	25.10	6.08	(2) .50	2.50	1.88
STS-1603	34.10				
STS-1604	43.10				
STS-1605	52.10				
STS-1606	61.10				
STS-1607	70.10				
STS-1608	79.10				
STS-1609	88.10				
STS-1610	97.10				



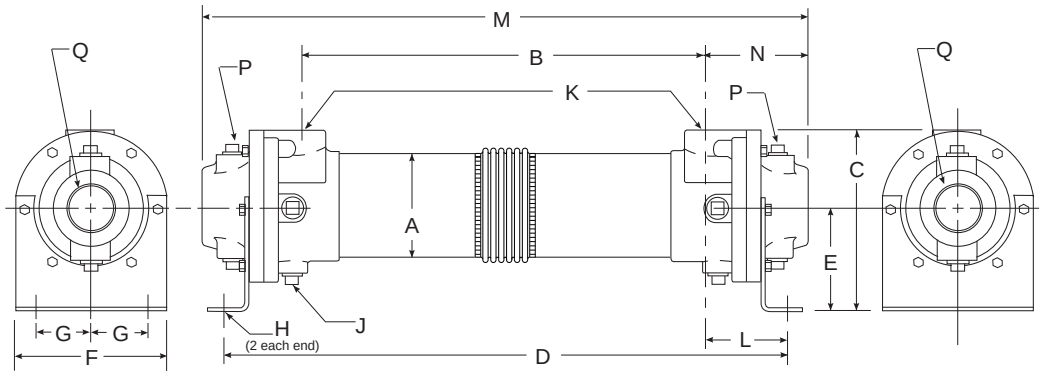
FOUR PASS (FP)

Model	M	N	P NPT	Q NPT	R	S
STS-701	13.42	3.24	(3) .38	.75	.62	.88
STS-702	22.42					
STS-703	31.42					
STS-704	40.42					
STS-1002	23.55	4.06	(3) .38	1.00	.75	1.19
STS-1003	32.55					
STS-1004	41.55					
STS-1202	24.44	4.90	(3) .50	1.50	1.06	1.44
STS-1203	33.31					
STS-1204	42.19					
STS-1205	51.19					
STS-1206	60.31					
STS-1207	69.31					
STS-1208	78.19					
STS-1209	87.19					
STS-1210	96.19					
STS-1602	26.72	6.48	(3) .50	2.00	1.38	1.88
STS-1603	35.72					
STS-1604	44.72					
STS-1605	53.72					
STS-1606	62.72					
STS-1607	71.72					
STS-1608	80.72					
STS-1609	89.72					
STS-1610	98.72					

COMMON DIMENSIONS & WEIGHTS

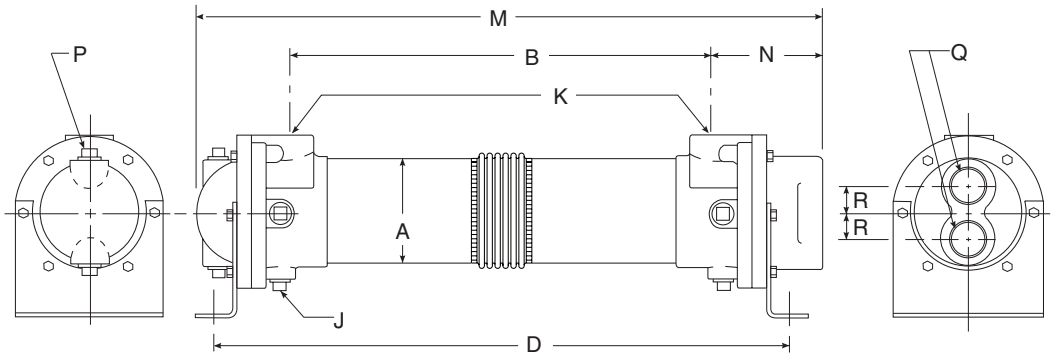
Model	A	B	C	D	E	F	G	H	J NPT	K NPT	L	Approx. Weight	Model
STS-401	2.13	7.62	3.50	10.91	1.94	2.62	.88	.41ϕ	-	.50	1.72	7	STS-401
STS-402		16.62		20.91								10	STS-402
STS-701	3.66	7.00	6.25	12.38	3.62	5.25	1.50	.44ϕ x 1.00	(2) .38	1.00	2.69	23	STS-701
STS-702		16.00		21.38								29	STS-702
STS-703		25.00		30.38								33	STS-703
STS-704		34.00		39.38								49	STS-704
STS-1002	5.13	15.50	7.38	21.62	4.00	6.75	2.00	.44ϕ x 1.00	(6) .38	1.50	3.06	54	STS-1002
STS-1003		24.50		30.62								76	STS-1003
STS-1004		33.50		39.62								82	STS-1004
STS-1202	6.13	14.62	8.81	21.50	4.75	7.50	2.50	.44ϕ x 1.00	(6) .38	2.00	3.44	79	STS-1202
STS-1203		23.50		30.38								98	STS-1203
STS-1204		32.38		39.25								115	STS-1204
STS-1205		41.38		48.25								130	STS-1205
STS-1206		50.50		57.38								150	STS-1206
STS-1207		59.50		66.38								170	STS-1207
STS-1208		68.38		75.25								190	STS-1208
STS-1209		77.38		84.25								210	STS-1209
STS-1210		86.38		93.25								230	STS-1210
STS-1602	8.00	13.60	12.13	22.38	6.50	10.00	3.50	.44ϕ x 1.00	(6) .38	3.00	4.39	145	STS-1602
STS-1603		22.60		31.38								170	STS-1603
STS-1604		31.60		40.38								200	STS-1604
STS-1605		40.60		49.38								225	STS-1605
STS-1606		49.60		58.38								250	STS-1606
STS-1607		58.60		67.38								275	STS-1607
STS-1608		67.60		76.38								315	STS-1608
STS-1609		76.60		85.38								350	STS-1609
STS-1610		85.60		94.38								390	STS-1610

EAB Series *dimensions*



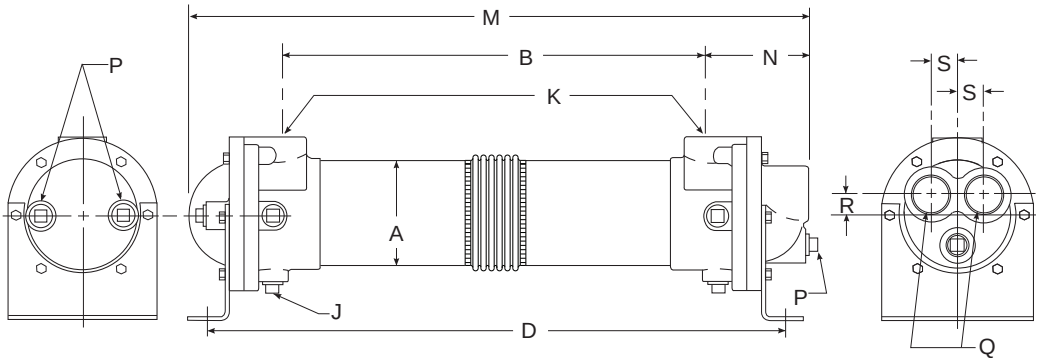
Single Pass (SP)

Model	M	N	P NPT	Q NPT
EAB-701	13.47	3.24	(4) .38	1.50
EAB-702	22.47			
EAB-703	31.47			
EAB-704	40.47			
EAB-1002	23.60	4.05	(4) .38	2.00
EAB-1003	32.60			
EAB-1004	41.60			
EAB-1202	24.38	4.88	(4) .50	3.00
EAB-1203	33.25			
EAB-1204	42.12			
EAB-1205	51.12			
EAB-1206	60.25			
EAB-1207	69.25			
EAB-1208	78.12			
EAB-1209	87.12			
EAB-1210	96.12			
EAB-1602	26.62	6.52	(4) .50	4.00
EAB-1603	35.62			
EAB-1604	44.62			
EAB-1605	53.62			
EAB-1606	62.62			
EAB-1607	71.62			
EAB-1608	80.62			
EAB-1609	89.62			
EAB-1610	98.62			



Two Pass (TP)

Model	M	N	P NPT	Q NPT	R
EAB-701	13.28	3.30	(2) .38	1.00	.88
EAB-702	22.28				
EAB-703	31.28				
EAB-704	40.28				
EAB-1002	23.29	3.80	(2) .38	1.50	1.19
EAB-1003	32.29				
EAB-1004	41.29				
EAB-1202	23.94	4.56	(2) .50	2.00	1.44
EAB-1203	32.81				
EAB-1204	41.69				
EAB-1205	50.69				
EAB-1206	59.81				
EAB-1207	68.81				
EAB-1208	77.69				
EAB-1209	86.69				
EAB-1210	95.69				
EAB-1602	25.10	6.08	(2) .50	2.50	1.88
EAB-1603	34.10				
EAB-1604	43.10				
EAB-1605	52.10				
EAB-1606	61.10				
EAB-1607	70.10				
EAB-1608	79.10				
EAB-1609	88.10				
EAB-1610	97.10				



Four Pass (FP)

Model	M	N	P NPT	Q NPT	R	S
EAB-701	13.42	3.24	(3) .38	.75	.62	.88
EAB-702	22.42					
EAB-703	31.42					
EAB-704	40.42					
EAB-1002	23.55	4.06	(3) .38	1.00	.75	1.19
EAB-1003	32.55					
EAB-1004	41.55					
EAB-1202	24.44	4.90	(3) .50	1.50	1.06	1.44
EAB-1203	33.31					
EAB-1204	42.19					
EAB-1205	51.19					
EAB-1206	60.31					
EAB-1207	69.31					
EAB-1208	78.19					
EAB-1209	87.19					
EAB-1210	96.19					
EAB-1602	26.72	6.48	(3) .50	2.00	1.38	1.88
EAB-1603	35.72					
EAB-1604	44.72					
EAB-1605	53.72					
EAB-1606	62.72					
EAB-1607	71.72					
EAB-1608	80.72					
EAB-1609	89.72					
EAB-1610	98.72					

COMMON DIMENSIONS & WEIGHTS

Model	A	B	C	D	E	F	G	H	J NPT	K NPT	L	Approx. Weight	Model
EAB-701	3.66	7.00	6.25	12.38	3.62	5.25	1.50	.44ϕ x 1.00	(2) .38	1.00	2.69	23	EAB-701
EAB-702		16.00		21.38								29	EAB-702
EAB-703		25.00		30.38								33	EAB-703
EAB-704		34.00		39.38								49	EAB-704
EAB-1002	5.13	15.50	7.38	21.62	4.00	6.75	2.00	.44ϕ x 1.00	(6) .38	1.50	3.06	54	EAB-1002
EAB-1003		24.50		30.62								76	EAB-1003
EAB-1004		33.50		39.62								82	EAB-1004
EAB-1202	6.13	14.62	8.81	21.50	4.75	7.50	2.50	.44ϕ x 1.00	(6) .38	2.00	3.44	79	EAB-1202
EAB-1203		23.50		30.38								98	EAB-1203
EAB-1204		32.38		39.25								115	EAB-1204
EAB-1205		41.38		48.25								130	EAB-1205
EAB-1206		50.50		57.38								150	EAB-1206
EAB-1207		59.50		66.38								170	EAB-1207
EAB-1208		68.38		75.25								190	EAB-1208
EAB-1209		77.38		84.25								210	EAB-1209
EAB-1210		86.38		93.25								230	EAB-1210
EAB-1602	8.00	13.60	12.13	22.38	6.50	10.00	3.50	.44ϕ x 1.00	(6) .38	3.00	4.39	145	EAB-1602
EAB-1603		22.60		31.38								170	EAB-1603
EAB-1604		31.60		40.38								200	EAB-1604
EAB-1605		40.60		49.38								225	EAB-1605
EAB-1606		49.60		58.38								250	EAB-1606
EAB-1607		58.60		67.38								275	EAB-1607
EAB-1608		67.60		76.38								315	EAB-1608
EAB-1609		76.60		85.38								350	EAB-1609
EAB-1610		85.60		94.38								390	EAB-1610