EURO SERIES

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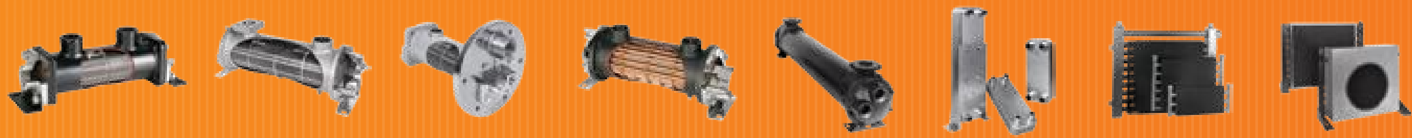
Water or Air Cooled Oil Coolers for Fluid Power Applications

EKM	ECM	EKTM	CM & SSCM	AM	BPM	RM	DH



COOL POWER SOLUTIONS

FOR ALL FLUID POWER INDUSTRIES

We COOL what you POWER

www.thermaltransfer.com TTPSales@thermasys.com

Thermal Transfer Products
A ThermaSys® Company

2011

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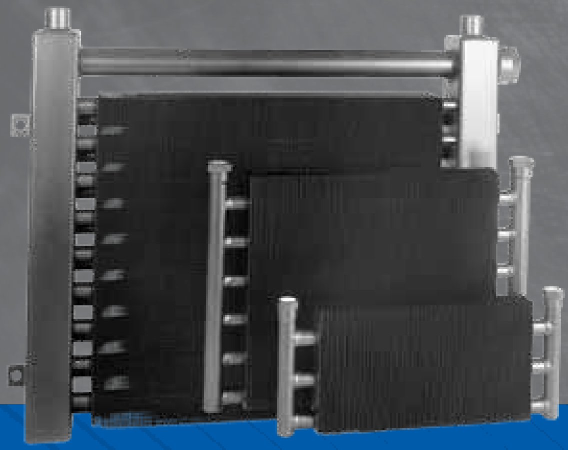
As a GLOBAL LEADER in manufacturing highly engineered heat transfer products, we provide application solutions in the mobile, industrial, process and compressor markets.

Our mission is to be the best supplier of highly engineered copper, brass and aluminum heat exchanger components and assemblies.

Utilizing broad applications of lean manufacturing techniques that enhance our operational excellence, we provide responsive on-time delivery at short catalog lead times.

We COOL what you POWER

Choose Thermal Transfer Products for supreme performance.



- **Competitive pricing**
- **Highest quality materials and workmanship**
- **Stringent quality control**
  Every water cooled and air cooled unit is leak-tested
- **Prompt delivery**
- **Responsive engineering assistance**
- **Custom product capability**
- **Highest integrity and honest business style**

COPPER & STEEL CONSTRUCTION

Features

- **Universal Hydraulik Interchange**
- **Marine/Seawater Option**
- **Compact Size**
- **High Efficiency Finned Bundle Design**
- **Low Cost**
- **Optional Patented Built-in Surge-Cushion® Relief Bypass**
- **.007mm Tube Size**
- Heat Removal up to 300 KW
- Oil Flow rates up to 300 LPM
- 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

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

Ratings

Maximum Shell Side Pressure 35 BAR

Maximum Tube Side Pressure 10 BAR

Maximum Temperature 121°C

Materials

Shell Steel

Tubesheets Carbon Steel
Optional: CuNi

End Bonnets Cast Iron
Optional: Electroless Nickel Plated

Baffles Steel

Mounting Brackets Steel

Gaskets Nitrile Rubber/Cellulose Fiber

Nameplate Aluminum Foil

Tubes Copper
Optional: CuNi

Fins Aluminum

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 (1 BAR).

Maximum Flow Rates

Unit Size	Shell Side LPM	Tube Side LPM		
		One Pass	Two Pass	Four Pass
500	76	49	23	N/A
700	227	91	45	23
1000	303	212	106	53

Incorrect installation can cause premature failure.

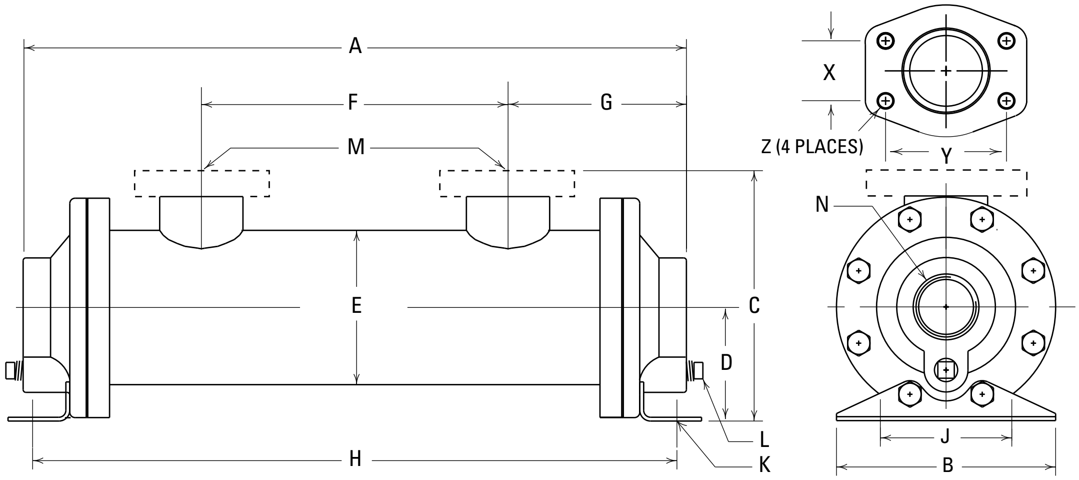
How to Order

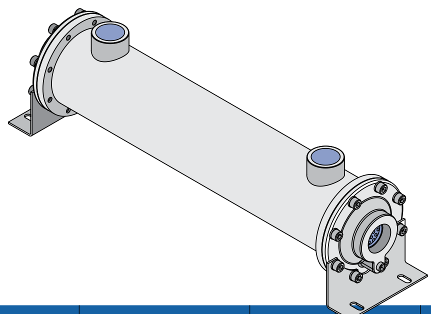
Model Series	Model Size Selected	Baffle Spacing	Tubeside Passes	Surge Cushion	Cooling Tube Material	Tubesheet Material	End Bonnet Material
EKM **EKFM**		EKM-1036 & EKM-1048 Models Only	**0** - One Pass **T** - Two Pass **F** - Four Pass	**Blank** - No Relief Bypass **R** - Relief Bypass	**Blank** - Copper **CN** - CuNi	**Blank** - Carbon Steel **W** - CuNi	**Blank** - Cast Iron **NP** - Electroless Nickel Plate

EKM = BSPP Oil connections; BSPP Water connections.
EKFM = SAE 4 Bolt Flange (Tapped Metric) Oil connections; BSPP Water connections.
Zinc Anodes not available.

Dimensions

One Pass





Flange Size	X	Y	EKFM Z
1-1/2″	36	70	M12
2″	43	76	M12

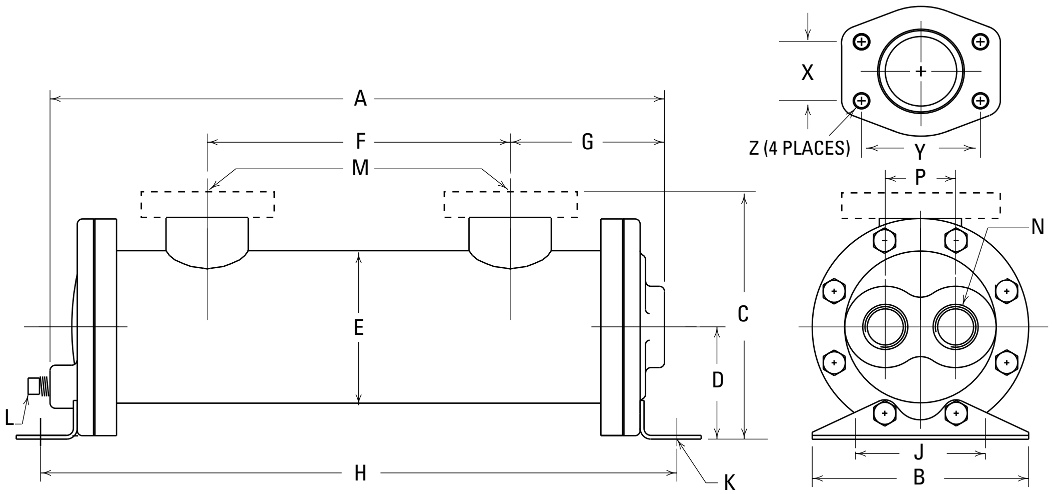
Model	A	B Max. Width	C		D	E Dia.	F	G	H	J	K Slot	L NPT	M		N BSPP
			BSPP	SAE Flange									SAE Flange	BSPP	
EKM-505	188	89	95	N/A	41	65	56	66	189	64	9 x 16	N/A	N/A	1/2″	3/4″
EKM-508	264	89	99	N/A	41	65	98	83	265	64	9 x 16	N/A	N/A	3/4″	3/4″
EKM-510	315	89	99	N/A	41	65	142	83	316	64	9 x 16	N/A	N/A	3/4″	3/4″
EKM-512	365	89	99	N/A	41	65	199	83	367	64	9 x 16	N/A	N/A	3/4″	3/4″
EKM-514	416	89	99	N/A	41	65	250	83	418	64	9 x 16	N/A	N/A	3/4″	3/4″
EKM-518	518	89	99	N/A	41	65	352	83	519	64	9 x 16	N/A	N/A	3/4″	3/4″
EKM-524	670	89	99	N/A	41	65	504	83	672	64	9 x 16	N/A	N/A	3/4″	3/4″
EKM-536	975	89	99	N/A	41	65	809	83	976	64	9 x 16	N/A	N/A	3/4″	3/4″
EKM-708	283	127	139	145	66	89	76	103	272	76	11 x 19	1/4″	1-1/2″	1-1/2″	1-1/4″
EKM-712	384	127	139	145	66	89	178	103	374	76	11 x 19	1/4″	1-1/2″	1-1/2″	1-1/4″
EKM-714	435	127	139	145	66	89	229	103	424	76	11 x 19	1/4″	1-1/2″	1-1/2″	1-1/4″
EKM-718	537	127	139	145	66	89	330	103	526	76	11 x 19	1/4″	1-1/2″	1-1/2″	1-1/4″
EKM-724	689	127	139	145	66	89	483	103	679	76	11 x 19	1/4″	1-1/2″	1-1/2″	1-1/4″
EKM-736	994	127	139	145	66	89	787	103	983	76	11 x 19	1/4″	1-1/2″	1-1/2″	1-1/4″
EKM-1012	389	165	194	210	102	128	157	116	393	102	11 x 25	1/4″	2″	1-1/2″	1-1/2″
EKM-1014	440	165	194	210	102	128	208	116	443	102	11 x 25	1/4″	2″	1-1/2″	1-1/2″
EKM-1018	542	165	194	210	102	128	309	116	545	102	11 x 25	1/4″	2″	1-1/2″	1-1/2″
EKM-1024	694	165	194	210	102	128	462	116	697	102	11 x 25	1/4″	2″	1-1/2″	1-1/2″
EKM-1036	999	165	194	210	102	128	767	116	1002	102	11 x 25	1/4″	2″	1-1/2″	1-1/2″
EKM-1048	1304	165	194	210	102	128	1071	116	1307	102	11 x 25	1/4″	2″	1-1/2″	1-1/2″

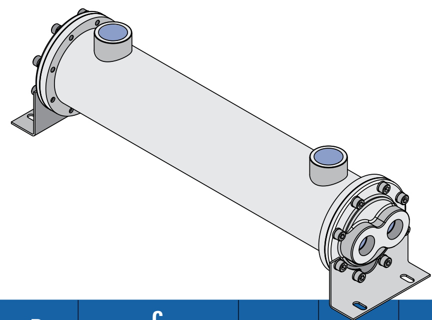
NOTE: We reserve the right to make reasonable design changes without notice. ***All dimensions are in millimeters, unless noted otherwise.***

EKM

Dimensions

Two Pass





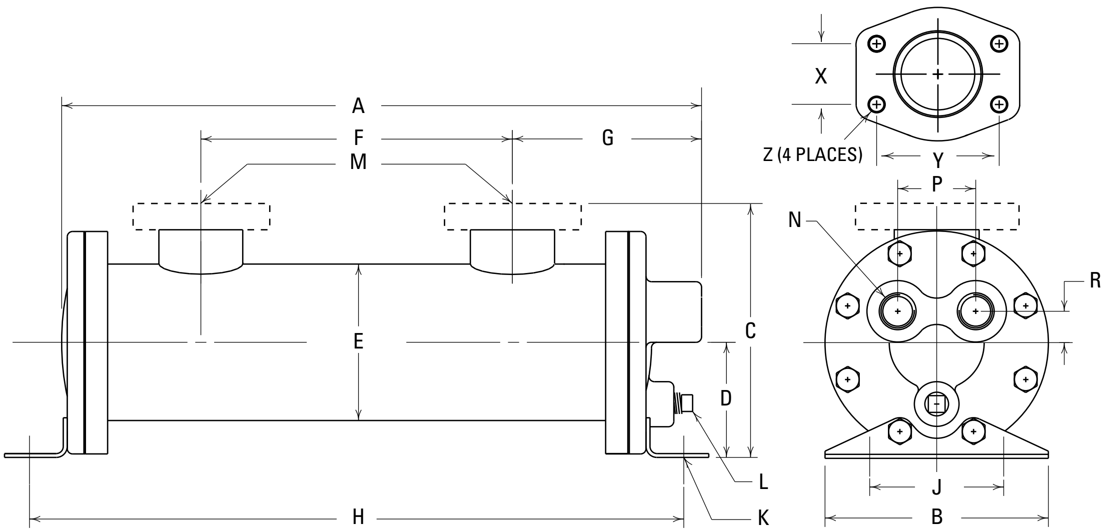
Flange Size	X	Y	EKFM Z
1-1/2"	36	70	M12
2"	43	76	M12

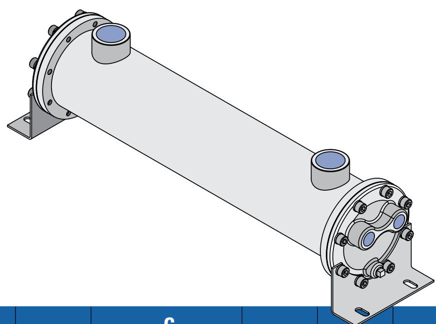
Model	A	B Max. Width	C BSPP	C SAE Flange	D	E Dia.	F	G	H	J	K Slot	L NPT	M SAE Flange	M BSPP	N BSPP	P
EKM-505	188	89	95	N/A	41	65	56	66	189	64	9 x 16	N/A	N/A	1/2"	3/8"	29
EKM-508	264	89	99	N/A	41	65	98	83	265	64	9 x 16	N/A	N/A	3/4"	3/8"	29
EKM-510	315	89	99	N/A	41	65	142	83	316	64	9 x 16	N/A	N/A	3/4"	3/8"	29
EKM-512	365	89	99	N/A	41	65	199	83	367	64	9 x 16	N/A	N/A	3/4"	3/8"	29
EKM-514	416	89	99	N/A	41	65	250	83	418	64	9 x 16	N/A	N/A	3/4"	3/8"	29
EKM-518	518	89	99	N/A	41	65	352	83	519	64	9 x 16	N/A	N/A	3/4"	3/8"	29
EKM-524	670	89	99	N/A	41	65	504	83	672	64	9 x 16	N/A	N/A	3/4"	3/8"	29
EKM-536	975	89	99	N/A	41	65	809	83	976	64	9 x 16	N/A	N/A	3/4"	3/8"	29
EKM-708	259	127	139	145	66	89	76	103	272	76	11 x 19	1/4	1-1/2"	1-1/2"	3/4"	41
EKM-712	361	127	139	145	66	89	178	103	374	76	11 x 19	1/4	1-1/2"	1-1/2"	3/4"	41
EKM-714	411	127	139	145	66	89	229	103	424	76	11 x 19	1/4	1-1/2"	1-1/2"	3/4"	41
EKM-718	513	127	139	145	66	89	330	103	526	76	11 x 19	1/4	1-1/2"	1-1/2"	3/4"	41
EKM-724	665	127	139	145	66	89	483	103	679	76	11 x 19	1/4	1-1/2"	1-1/2"	3/4"	41
EKM-736	996	127	139	145	66	89	787	103	983	76	11 x 19	1/4	1-1/2"	1-1/2"	3/4"	41
EKM-1012	370	165	194	210	102	128	157	116	393	102	11 x 25	1/4	2"	1-1/2"	1"	61
EKM-1014	421	165	194	210	102	128	208	116	443	102	11 x 25	1/4	2"	1-1/2"	1"	61
EKM-1018	523	165	194	210	102	128	309	116	545	102	11 x 25	1/4	2"	1-1/2"	1"	61
EKM-1024	615	165	194	210	102	128	462	116	697	102	11 x 25	1/4	2"	1-1/2"	1"	61
EKM-1036	980	165	194	210	102	128	767	116	1002	102	11 x 25	1/4	2"	1-1/2"	1"	61
EKM-1048	1285	165	194	210	102	128	1071	116	1307	102	11 x 25	1/4	2"	1-1/2"	1"	61

NOTE: We reserve the right to make reasonable design changes without notice. ***All dimensions are in millimeters, unless noted otherwise.***

Dimensions

Four Pass





Flange Size	X	Y	EKFM Z
1-1/2"	36	70	M12
2"	43	76	M12

Model	A	B Max. Width	C BSPP	C SAE Flange	D	E Dia.	F	G	H	J	K Slot	L NPT	M SAE Flange	M BSPP	N BSPP	P	R
EKM-708	263	127	139	145	66	89	76	108	272	76	11 x 19	1/4"	1-1/2"	1-1/2"	1/2"	45	18
EKM-712	365	127	139	145	66	89	178	108	374	76	11 x 19	1/4"	1-1/2"	1-1/2"	1/2"	45	18
EKM-714	416	127	139	145	66	89	229	108	424	76	11 x 19	1/4"	1-1/2"	1-1/2"	1/2"	45	18
EKM-718	517	127	139	145	66	89	330	108	526	76	11 x 19	1/4"	1-1/2"	1-1/2"	1/2"	45	18
EKM-724	670	127	139	145	66	89	483	108	679	76	11 x 19	1/4"	1-1/2"	1-1/2"	1/2"	45	18
EKM-736	975	127	139	145	66	89	787	108	983	76	11 x 19	1/4"	1-1/2"	1-1/2"	1/2"	45	18
EKM-1012	364	165	194	210	102	128	157	113	393	102	11 x 25	1/4"	2"	1-1/2"	3/4"	64	23
EKM-1014	415	165	194	210	102	128	208	113	443	102	11 x 25	1/4"	2"	1-1/2"	3/4"	64	23
EKM-1018	516	165	194	210	102	128	309	113	545	102	11 x 25	1/4"	2"	1-1/2"	3/4"	64	23
EKM-1024	669	165	194	210	102	128	462	113	697	102	11 x 25	1/4"	2"	1-1/2"	3/4"	64	23
EKM-1036	974	165	194	210	102	128	767	113	1002	102	11 x 25	1/4"	2"	1-1/2"	3/4"	64	23
EKM-1048	1278	165	194	210	102	128	1071	113	1307	102	11 x 25	1/4"	2"	1-1/2"	3/4"	64	23

NOTE: We reserve the right to make reasonable design changes without notice. ***All dimensions are in millimeters, unless noted otherwise.***

Selection Procedure

Performance Curves are based on 21.7 CST oil leaving the cooler 22°C higher than the incoming water temperature (22°C 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 KW. (Example: 100 KW Power Unit x .33 = 33 KW Heat load.)

If HP is known: KW = HP x .746

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

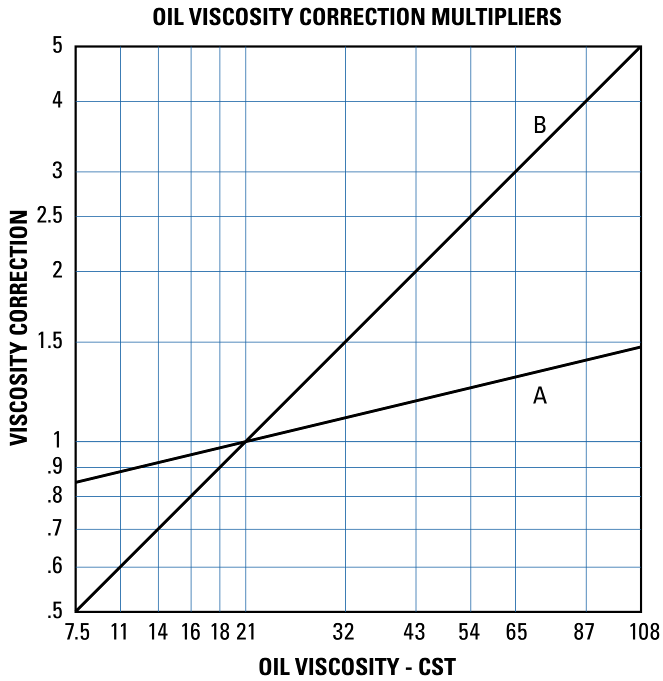
Step 3 **Determine Curve KW Heat Load.** Enter the information from above:

$$\text{KW heat load} \times \frac{22}{\text{Actual Approach}} \times \frac{\text{Viscosity}}{\text{Correction A}} = \frac{\text{Curve}}{\text{KW}}$$

Step 4 **Enter curves** at oil flow through cooler and curve KW. 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.

● = .35 BAR; ■ = .69 BAR; ▲ = 1.40 BAR.



Oil Temperature

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

Typical operating temperature ranges are:

Hydraulic Motor Oil	43°C - 54°C
Hydrostatic Drive Oil	54°C - 82°C
Lube Oil Circuits	43°C - 54°C
Automatic Transmission Fluid	93°C - 149°C

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=KW/(LPM Oil Flow x .029).

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 1.4 to 2.1 BAR. Excessive pressure drop should be avoided. Care should be taken to limit pressure drop to .35 BAR or less for case drain applications where high back pressure may damage the pump shaft seals.

Recirculation Loop

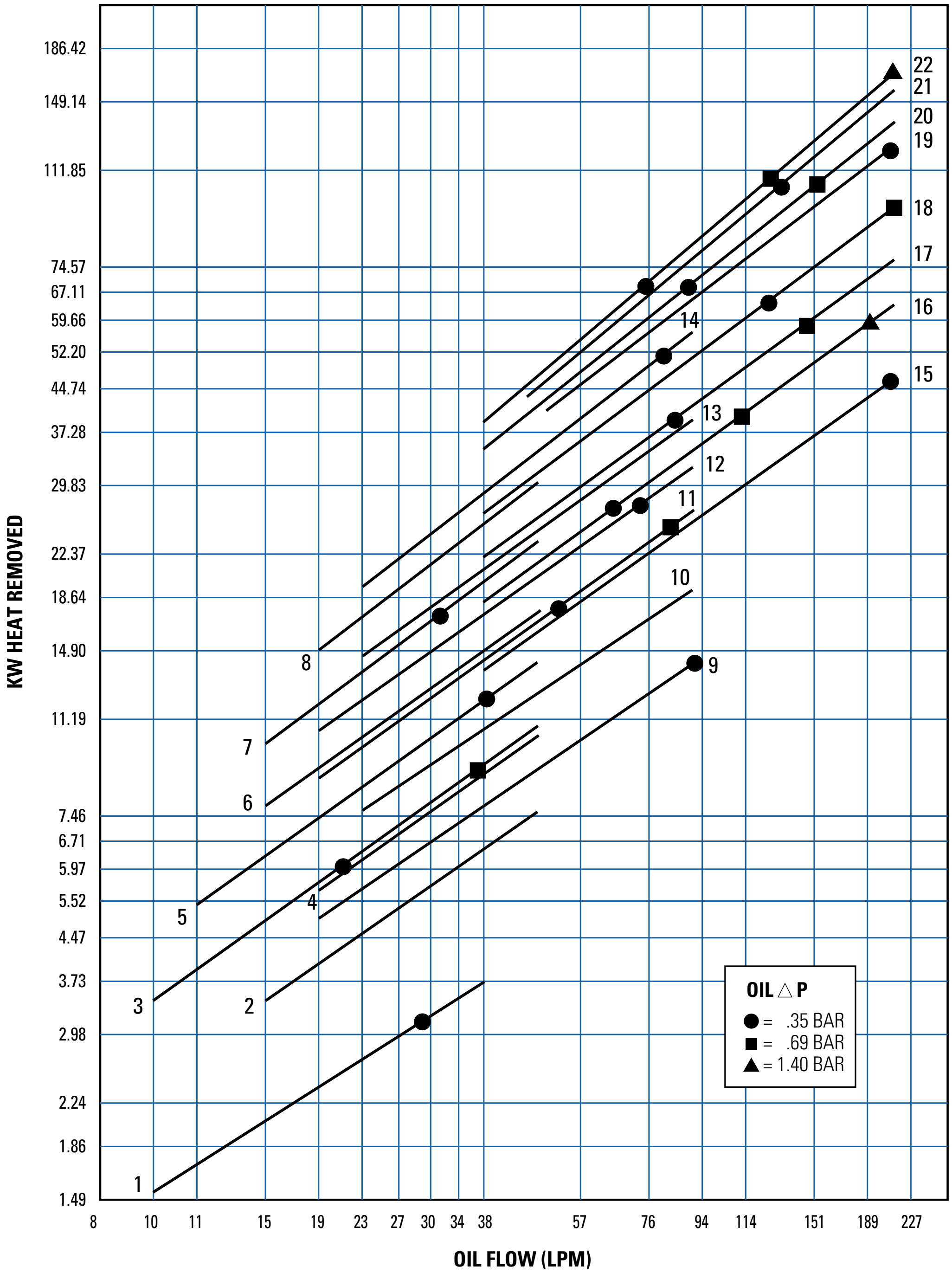
Water Cooled Hydraulic Oil Coolers

BASIS:

- 22°C Entering temperature difference
  (Maintain reservoir 22°C above the incoming water temperature)
- Heat removal 30% of input KW
- Hydraulic system flow (LPM) x 3 = Liters; reservoir size
- 5 LPM cooler flow per KW heat to be removed
- Turn-over reservoir 3-4 times per hour
- Maximum flows

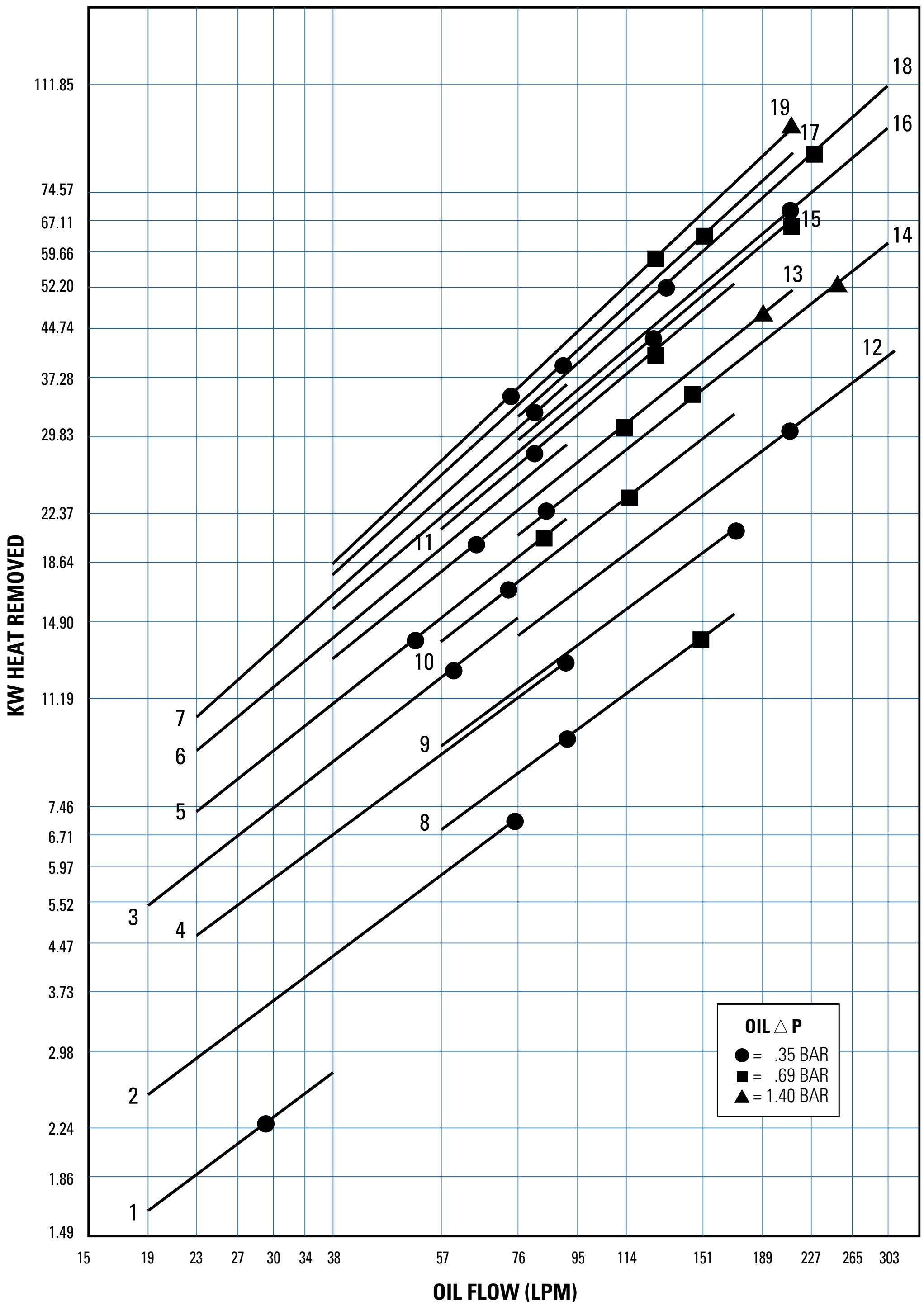
System KW	KW Heat Load	Minimum Required LPM Oil Flow	Minimum Required LPM Water Flow	Model Number
2.2	.67	4	4	EKM-505-T
3.7	1.20	8	4	EKM-505-T
5.6	1.68	8	4	EKM-512-T
7.5	2.24	11	6	EKM-512-T
11.2	3.36	17	8	EKM-512-T
15.0	4.47	23	11	EKM-521-T
18.6	5.60	28	15	EKM-712-T
22.4	6.70	34	17	EKM-712-T
30.0	8.95	45	23	EKM-712-T
37.3	11.20	57	28	EKM-1012-T
45.0	13.40	68	34	EKM-1012-T
56.0	16.78	87	45	EKM-1012-T
75.0	22.40	114	57	EKM-1012-T

2:1 Oil to Water Ratio – Medium Water Usage



Curve	Model	Approx. Weight (Kg) Net	Ship
1	EKM-505-T	3	3
2	EKM-508-T	3	4
3	EKM-510-T	4	4
4	EKM-512-T	4	5
5	EKM-514-T	5	5
6	EKM-518-T	5	5
7	EKM-524-T	6	6
8	EKM-536-T	8	8
9	EKM-708-T	7	7
10	EKM-712-T	8	9
11	EKM-714-T	9	9
12	EKM-718-T	10	10
13.	EKM-724-T	12	13
14	EKM-736-T	15	16
15	EKM-1012-T	16	17
16	EKM-1014-T	17	18
17	EKM-1018-T	19	20
18	EKM-1024-T	23	25
19	EKM-1036-9-T	30	39
20	EKM-1036-6-T	30	39
21	EKM-1048-8-T	35	43
22	EKM-1048-6-T	35	43

4:1 Oil to Water Ratio – Low Water Usage

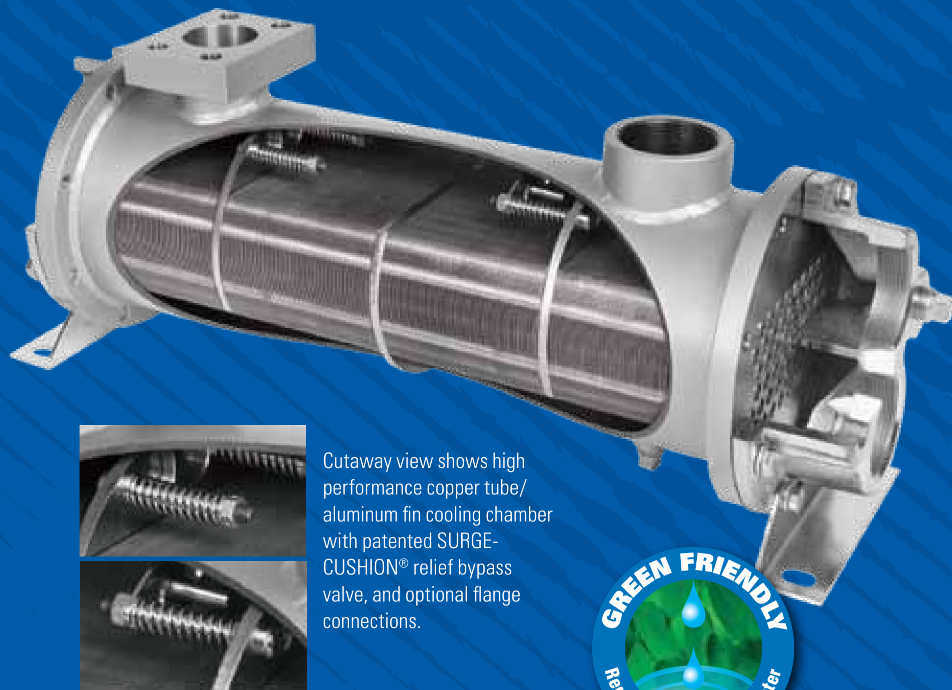


Curve	Model	Approx. Weight (Kg) Net	Approx. Weight (Kg) Ship
1	EKM-505-T	3	3
2	EKM-508-T	3	4
3	EKM-518-T	5	5
4	EKM-708-F	7	7
5	EKM-714-F	9	9
6	EKM-724-F	12	13
7	EKM-736-F	15	16
8	EKM-708-T	7	7
9	EKM-712-T	8	9
10	EKM-718-T	10	10
11	EKM-736-T	15	16
12	EKM-1012-T	16	17
13	EKM-1014-T	17	18
14	EKM-1018-T	19	20
15	EKM-1024-T	23	25
16	EKM-1036-9-T	30	39
17	EKM-1036-6-T	30	39
18	EKM-1048-8-T	35	43
19	EKM-1048-6-T	35	43

COPPER & STEEL CONSTRUCTION

Features

- **Marine/Seawater Option**
- **Rugged Steel Shell Construction**
- **9.5mm Tube Size**
- **Larger Shell Diameter than EKM, 216mm 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.

GREEN FRIENDLY
Requires Less Cooling Water

Ratings

Maximum Pressure 21 BAR

Maximum Temperature 149°C

Materials

Shell Steel

Tubesheets Steel
Optional: CuNi, 316 Stainless Steel

Tubes Copper
Optional: CuNi, 316 Stainless Steel, Admiralty Brass

Baffles Steel

Mounting Brackets Steel

Gaskets Nitrile Rubber/Cellulose Fiber

Nameplate Aluminum Foil

Fins Aluminum

End Bonnets Cast Iron
Optional: Bronze, 316 Stainless Steel

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 (1 BAR).

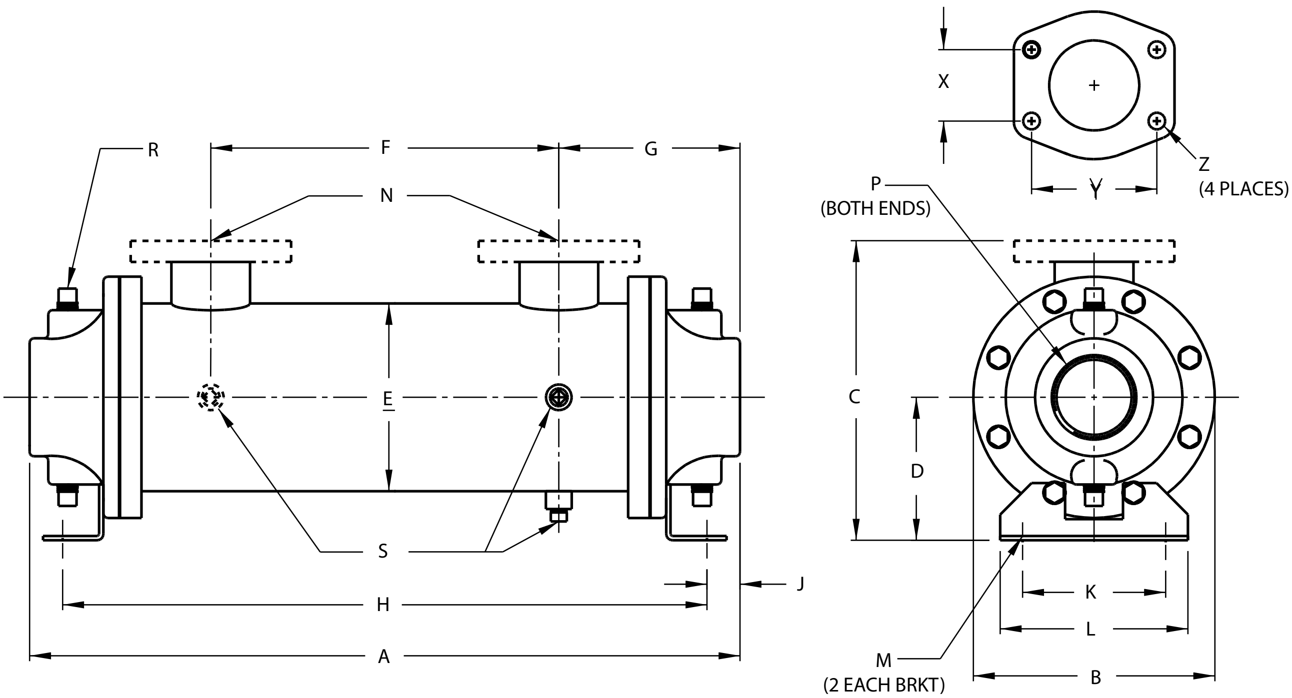
How to Order

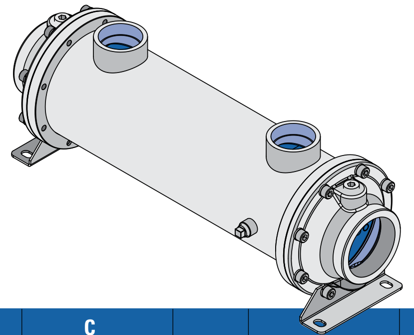
Model Series	Model Size Selected	Baffle Spacing	Tubeside Passes	Surge Cushion	Cooling Tube Material	End Bonnet Material	Tubesheet Material	Zinc Anodes
ECM **ECFM**			**O** - One Pass **T** - 2 Pass **F** - 4 Pass	**Blank** - No Valve **R** - Valve Included	**Blank** - Copper **CN** - CuNi **SS** - 316 Stainless Steel **AD** - Admiralty Brass	**Blank** - Cast Iron **B** - Bronze **SB** - 316 Stainless Steel	**Blank** - Steel **W** - CuNi **S** - 316 Stainless Steel	**Blank** - None **Z** - Zinc Anodes

ECM = BSPP Oil connections; BSPP Water connections.
ECFM = SAE 4 Bolt Flange (Tapped Metric) Oil connections; BSPP Water connections.

Dimensions

One Pass





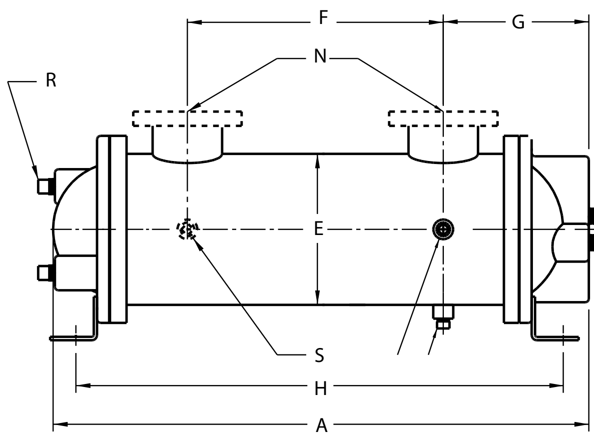
SAE Flange Size	X	Y	Z
1-1/2″	36	70	M12
2″	43	78	M12
3″	62	106	M16

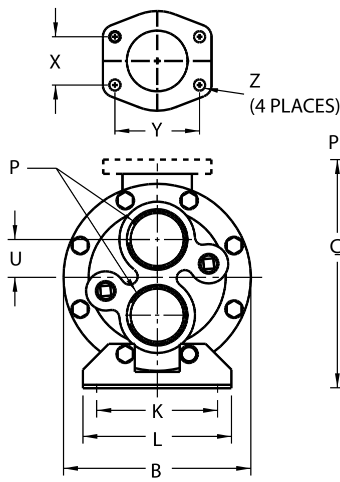
Model	A	B Dia.	C		D	E Dia.	F	G	H	J	K	L	M Slot	N BSPP/ Flange	P BSPP	Drain Port	
			BSPP	SAE Flange												R NPT	S NPT
ECM-1014	514	172	197	203	102	133	257	128	467	23	102	133	13 x 19	1-1/2″	2″	3/8″	3/8″
ECM-1024	768	172	197	203	102	133	511	128	721	23	102	133	13 x 19	1-1/2″	2″	3/8″	3/8″
ECM-1036	1072	172	197	203	102	133	816	128	1026	23	102	133	13 x 19	1-1/2″	2″	3/8″	3/8″
ECM-1054	1530	172	197	203	102	133	1273	128	1481	23	102	133	13 x 19	1-1/2″	2″	3/8″	3/8″
ECM-1224	780	197	222	238	114	159	482	149	707	36	127	159	13 x 19	2″	3″	3/8″	3/8″
ECM-1236	1085	197	222	238	114	159	787	149	1012	36	127	159	13 x 19	2″	3″	3/8″	3/8″
ECM-1254	1542	197	222	238	114	159	1244	149	1469	36	127	159	13 x 19	2″	3″	3/8″	3/8″
ECM-1272	2000	197	222	238	114	159	1701	149	1926	36	127	159	13 x 19	2″	3″	3/8″	3/8″
ECM-1724	818	267	292	318	146	216	476	1184	743	51	178	210	16 x 22	3″	4″	3/8″	3/8″
ECM-1736	1149	267	292	318	146	216	781	1184	1048	51	178	210	16 x 22	3″	4″	3/8″	3/8″
ECM-1754	1606	267	292	318	146	216	1238	1184	1505	51	178	210	16 x 22	3″	4″	3/8″	3/8″
ECM-1772	2063	267	292	318	146	216	1696	1184	1962	51	178	210	16 x 22	3″	4″	3/8″	3/8″
ECM-1784	1098	267	292	318	146	216	2000	1184	2267	51	178	210	16 x 22	3″	4″	3/8″	3/8″

NOTE: We reserve the right to make reasonable design changes without notice. ***All dimensions are in millimeters, unless noted otherwise.***

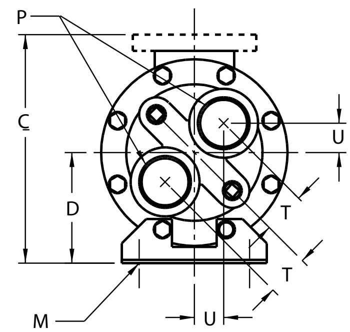
Dimensions

Two Pass

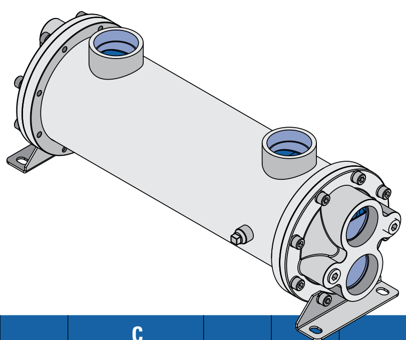




ECM-1200



ECM-1000 & ECM-1700

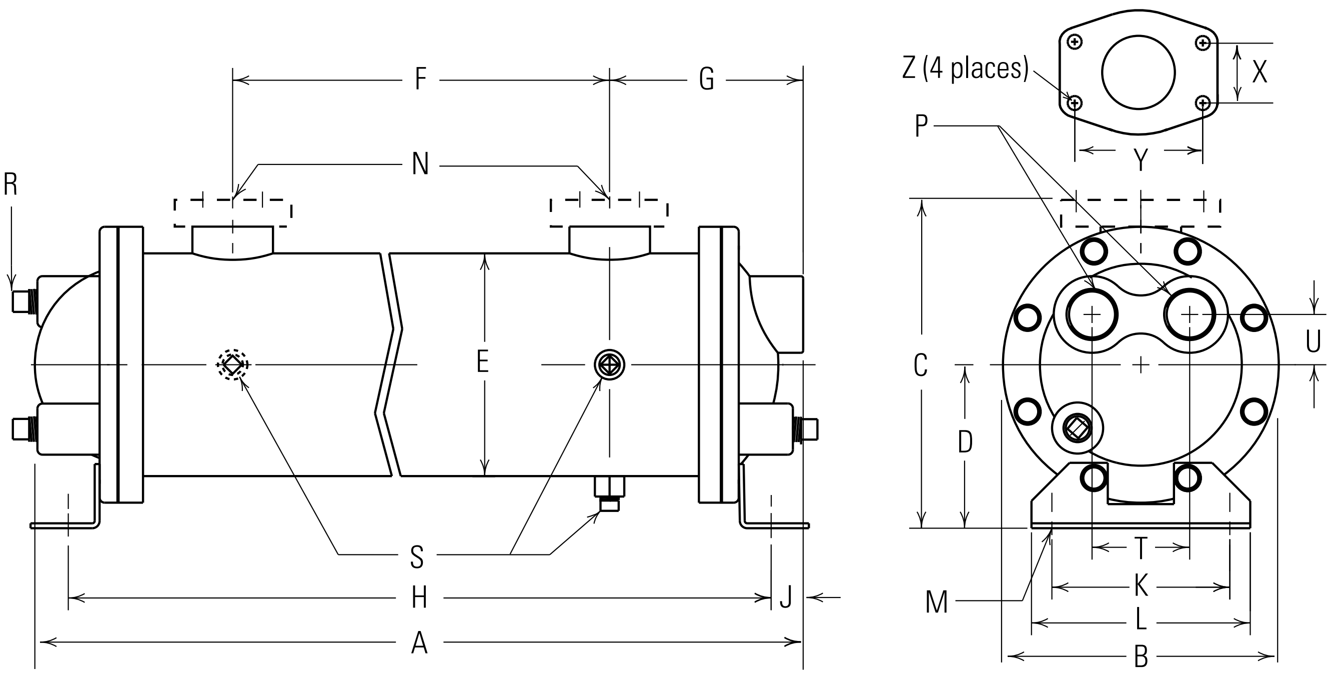


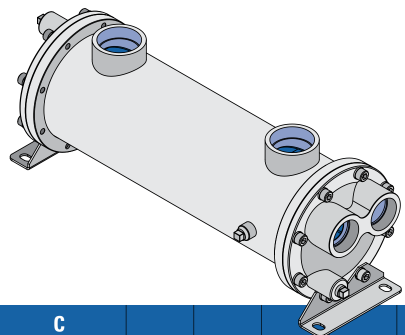
SAE Flange Size	X	Y	Z
1-1/2″	36	70	M12
2″	43	78	M12
3″	62	106	M16

Model	A	B Dia.	C BSPP	C SAE Flange	D	E Dia.	F	G	H	J	K	L	M Slot	N BSPP/ Flange	P BSPP	Drain Port R NPT	Drain Port S NPT	T	U
ECM-1014	502	172	197	203	102	133	257	128	467	23	102	133	13 x 19	1-1/2″	1-1/2″	3/8″	3/8″	38	27
ECM-1024	756	172	197	203	102	133	511	128	721	23	102	133	13 x 19	1-1/2″	1-1/2″	3/8″	3/8″	38	27
ECM-1036	1061	172	197	203	102	133	816	128	1026	23	102	133	13 x 19	1-1/2″	1-1/2″	3/8″	3/8″	38	27
ECM-1054	1518	172	197	203	102	133	1273	128	1481	23	102	133	13 x 19	1-1/2″	1-1/2″	3/8″	3/8″	38	27
ECM-1224	756	197	222	238	114	159	482	138	707	25	127	159	13 x 19	2″	2″	3/8″	3/8″	—	40
ECM-1236	1061	197	222	238	114	159	787	138	1012	25	127	159	13 x 19	2″	2″	3/8″	3/8″	—	40
ECM-1254	1518	197	222	238	114	159	1244	138	1469	25	127	159	13 x 19	2″	2″	3/8″	3/8″	—	40
ECM-1272	1975	197	222	238	114	159	1701	138	1926	25	127	159	13 x 19	2″	2″	3/8″	3/8″	—	40
ECM-1724	822	267	292	318	146	216	476	179	743	46	178	210	16 x 22	3″	2″	3/8″	3/8″	57	40
ECM-1736	1127	267	292	318	146	216	781	179	1048	46	178	210	16 x 22	3″	2″	3/8″	3/8″	57	40
ECM-1754	1584	267	292	318	146	216	1238	179	1505	46	178	210	16 x 22	3″	2″	3/8″	3/8″	57	40
ECM-1772	2011	267	292	318	146	216	1696	179	1962	46	178	210	16 x 22	3″	2″	3/8″	3/8″	57	40
ECM-1784	2346	267	292	318	146	216	2000	179	2267	46	178	210	16 x 22	3″	2″	3/8″	3/8″	57	40

NOTE: We reserve the right to make reasonable design changes without notice. ***All dimensions are in millimeters, unless noted otherwise.***

Four Pass





SAE Flange Size	X	Y	Z
1-1/2"	36	70	M12
2"	43	78	M12
3"	62	106	M16

Model	A	B Dia.	C BSPP	C SAE Flange	D	E Dia.	F	G	H	J	K	L	M Slot	N BSPP/ Flange	P BSPP	Drain Port R NPT	Drain Port S NPT	T	U
ECM-1014	505	172	197	203	102	133	257	123	467	19	102	133	13 x 19	1-1/2"	1"	3/8"	3/8"	61	31
ECM-1024	759	172	197	203	102	133	511	123	721	19	102	133	13 x 19	1-1/2"	1"	3/8"	3/8"	61	31
ECM-1036	1063	172	197	203	102	133	816	123	1026	19	102	133	13 x 19	1-1/2"	1"	3/8"	3/8"	61	31
ECM-1054	1521	172	197	203	102	133	1273	123	1481	19	102	133	13 x 19	1-1/2"	1"	3/8"	3/8"	61	31
ECM-1224	756	197	222	238	114	159	482	138	707	25	127	159	13 x 19	2"	1-1/2"	3/8"	3/8"	72	36
ECM-1236	1061	197	222	238	114	159	787	138	1012	25	127	159	13 x 19	2"	1-1/2"	3/8"	3/8"	72	36
ECM-1254	1518	197	222	238	114	159	1244	138	1469	25	127	159	13 x 19	2"	1-1/2"	3/8"	3/8"	72	36
ECM-1272	1976	197	222	238	114	159	1701	138	1926	25	127	159	13 x 19	2"	1-1/2"	3/8"	3/8"	72	36
ECM-1724	803	267	292	318	146	216	476	179	743	46	178	210	16 x 22	3"	2"	3/8"	3/8"	108	36
ECM-1736	1108	267	292	318	146	216	781	179	1048	46	178	210	16 x 22	3"	2"	3/8"	3/8"	108	36
ECM-1754	1565	267	292	318	146	216	1238	179	1505	46	178	210	16 x 22	3"	2"	3/8"	3/8"	108	36
ECM-1772	2023	267	292	318	146	216	1696	179	1962	46	178	210	16 x 22	3"	2"	3/8"	3/8"	108	36
ECM-1784	2327	267	292	318	146	216	2000	179	2267	46	178	210	16 x 22	3"	2"	3/8"	3/8"	108	36

NOTE: We reserve the right to make reasonable design changes without notice. ***All dimensions are in millimeters, unless noted otherwise.***

Performance Curves are based on 21.7 CST oil leaving the cooler 22°C higher than the incoming water temperature (22°C 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 KW. (Example: 100 KW Power Unit x .33 = 33 KW Heat load.)

If HP is known: KW = HP x .746

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

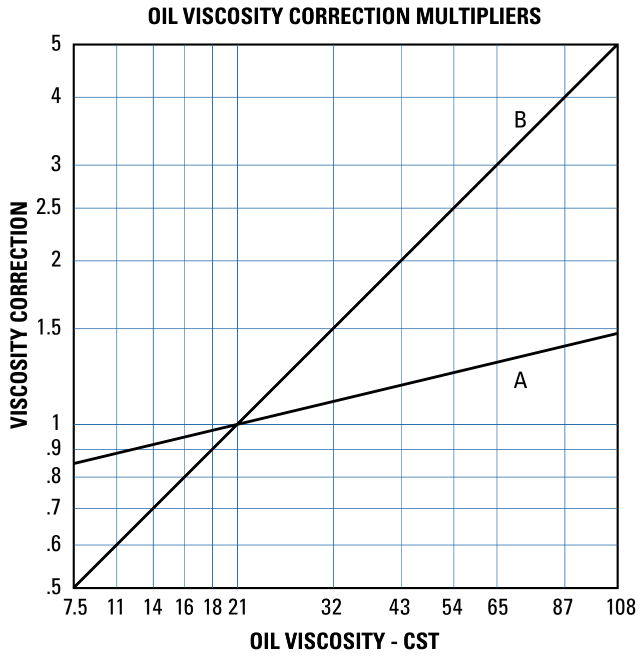
Step 3 **Determine Curve KW Heat Load.** Enter the information from above:

$$\text{KW heat load} \times \frac{22}{\text{Actual Approach}} \times \text{Viscosity Correction A} = \text{Curve KW}$$

Step 4 **Enter curves** at oil flow through cooler and curve KW. 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.

● = .35 BAR; ■ = .69 BAR; ▲ = 1.40 BAR.



Oil Temperature

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

Typical operating temperature ranges are:

Hydraulic Motor Oil	43°C - 54°C
Hydrostatic Drive Oil	54°C - 82°C
Lube Oil Circuits	43°C - 54°C
Automatic Transmission Fluid	93°C - 149°C

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=KW/(LPM Oil Flow x .029).

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.

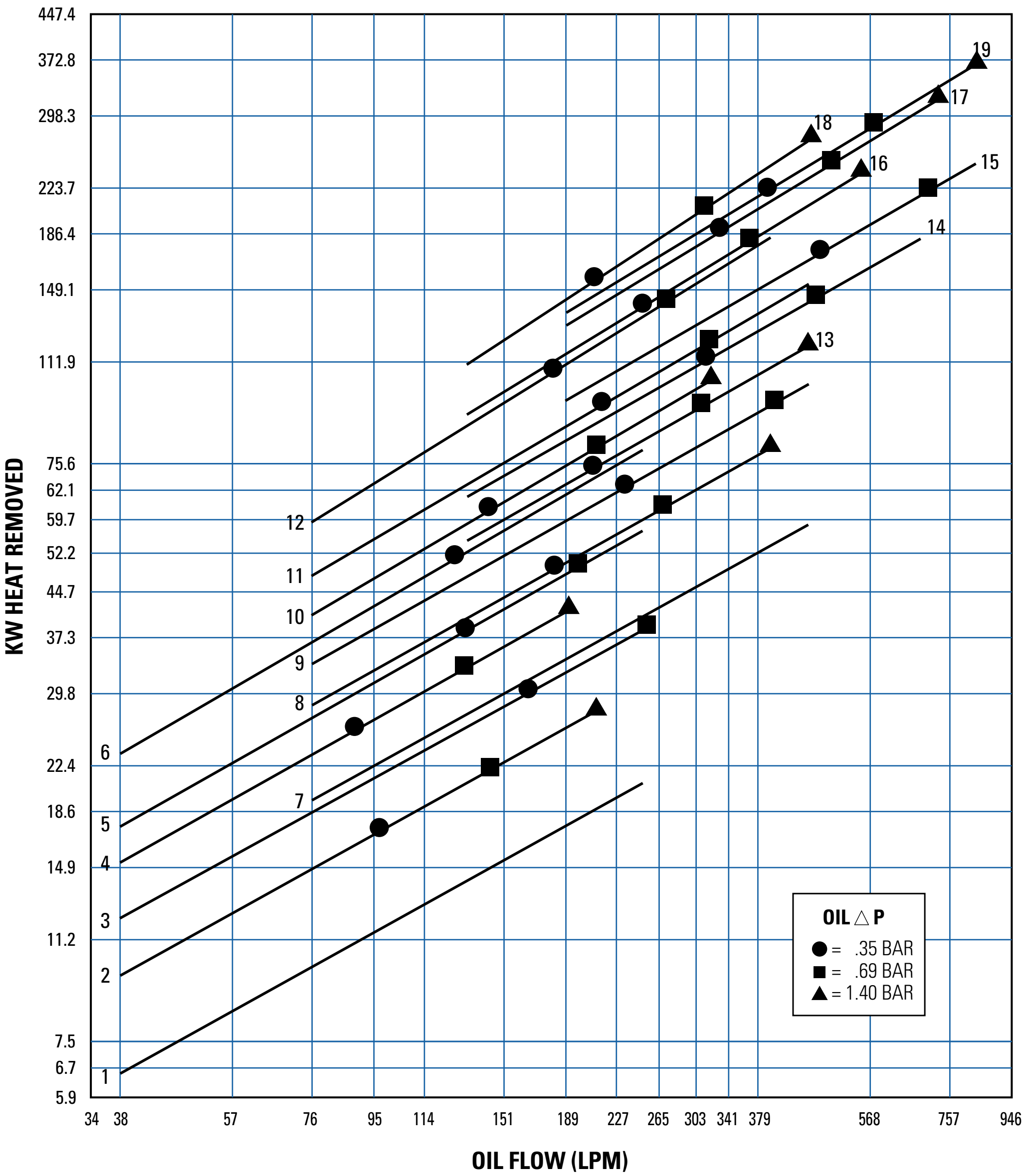
Oil Pressure Drop: Most systems can tolerate a pressure drop through the heat exchanger of 1.4 to 2.1 BAR. Excessive pressure drop should be avoided. Care should be taken to limit pressure drop to .35 BAR or less for case drain applications where high back pressure may damage the pump shaft seals.

Maximum Flow Rates

Unit Size	Shell Side LPM	Tube Side LPM		
		One Pass	Two Pass	Four Pass
1000	265	246	121	61
1200	454	454	227	114
1700	568	833	416	246

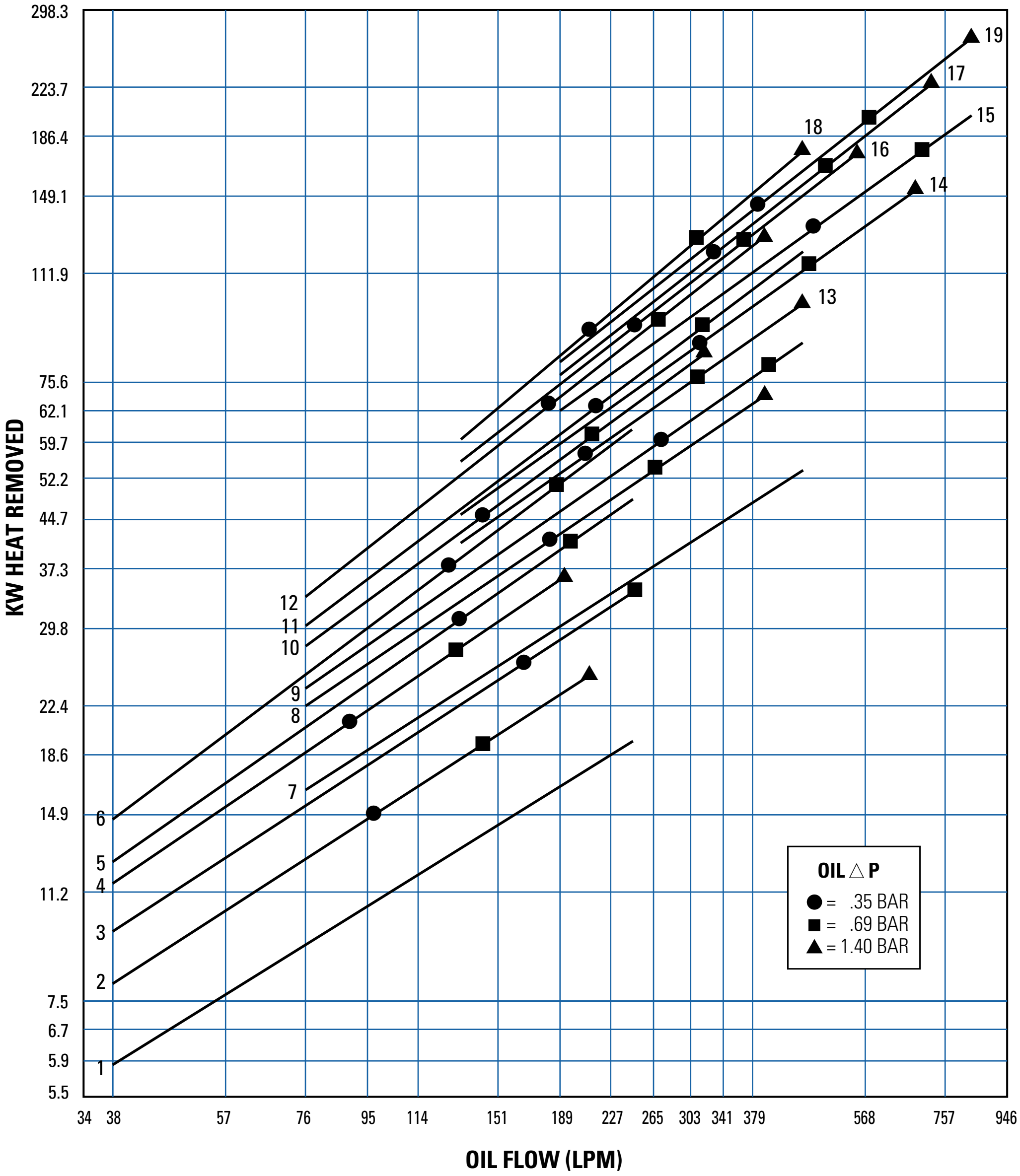
Incorrect installation can cause premature failure.

2:1 Oil to Water Ratio – Medium Water Usage



		Approx. Weight (Kg)	
Curve	Model	Net	Ship
1	ECM-1014-7-T	13	15
2	ECM-1014-4-T	13	15
3	ECM-1024-6-T	20	23
4	ECM-1024-4-T	20	23
5	ECM-1036-6-T	30	32
6	ECM-1054-7-T	48	64
7	ECM-1224-12-T	45	48
8	ECM-1224-6-T	45	48
9	ECM-1236-9-T	57	66
10	ECM-1236-6-T	57	66
11	ECM-1254-9-T	70	84
12	ECM-1272-9-T	95	113
13	ECM-1724-6-T	66	79
14	ECM-1736-9-T	91	235
15	ECM-1754-14-T	125	138
16	ECM-1754-9-T	125	138
17	ECM-1772-12-T	150	172
18	ECM-1772-9-T	150	172
19	ECM-1784-14-T	177	204

4:1 Oil to Water Ratio – Low Water Usage

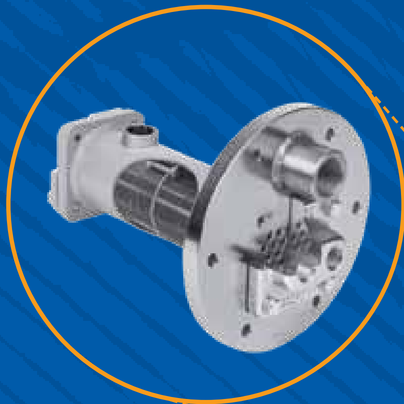


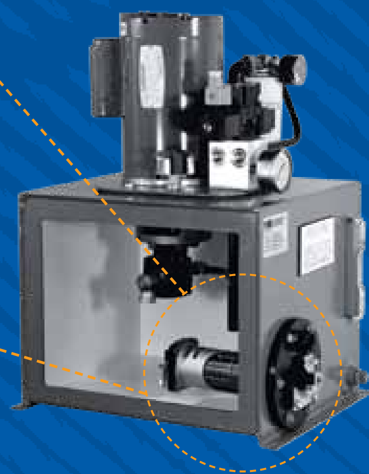
Curve	Model	Approx. Weight (Kg) Net	Ship
1	ECM-1014-7-F	13	15
2	ECM-1014-4-F	13	15
3	ECM-1024-6-F	20	23
4	ECM-1024-4-F	20	23
5	ECM-1036-6-F	30	32
6	ECM-1054-7-F	48	64
7	ECM-1224-12-F	45	48
8	ECM-1224-6-F	45	48
9	ECM-1236-9-F	57	66
10	ECM-1236-6-F	57	66
11	ECM-1254-9-F	70	84
12	ECM-1272-9-F	95	113
13	ECM-1724-6-F	66	79
14	ECM-1736-9-F	91	235
15	ECM-1754-14-F	125	138
16	ECM-1754-9-F	125	138
17	ECM-1772-12-F	150	172
18	ECM-1772-9-F	150	172
19	ECM-1784-14-F	177	204

COPPER & STEEL CONSTRUCTION

Features

- **HPU, In-tank Cooler**
- **Compact Size**
- **EKM 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





OPTION

Internal Oil Flow Bypass Relief (SURGE-CUSHION®)

Ratings

Maximum Shell Side Pressure 5.2 BAR

Maximum Tube Side Pressure 10.3 BAR

Maximum Temperature 121°C

Materials

Shell Steel

Tubes Copper
Optional: CuNi

Fins Aluminum

Tubesheets Steel

Baffles Steel

End Bonnets Cast Iron
Optional: Electroless Nickel Plate

Gaskets Nitrile Rubber/Cellulose Fiber

Surge-Cushion *(Option)*

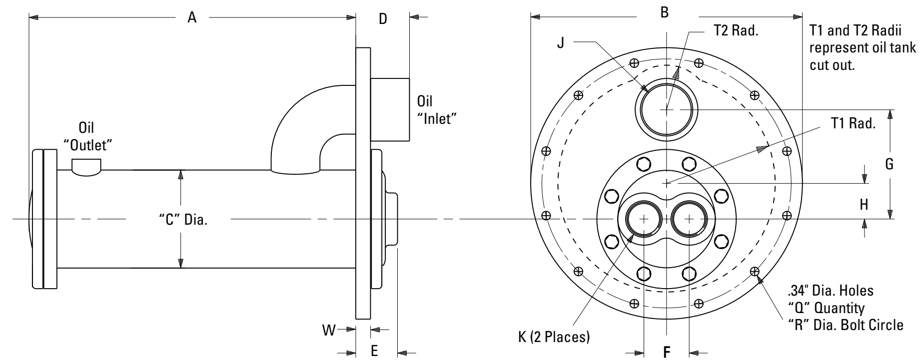
The SURGE-CUSHION® is a protective device (patented) designed to internally bypass a portion of the oil flow during cold start conditions, or when sudden flow surges temporarily exceed the maximum flow allowed for a given cooler. This device may replace an external bypass valve, but it is not intended to bypass the total oil flow (1 BAR).

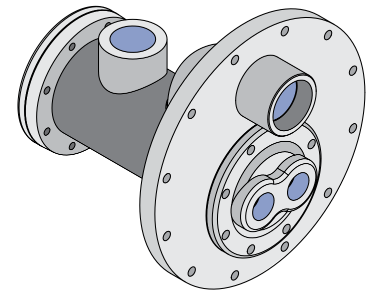
How to Order

Model Series	–	Model Size Selected	–	SURGE-CUSHION®	–	Cooling Tube Material	–	End Bonnet Material
EKTM				**Blank** - No SURGE-CUSHION® **R** - SURGE-CUSHION®		**Blank** - Copper **CN** - CuNi		**Blank** - Cast Iron **NP** - Electroless Nickel Plate

All Metric Connections.

Dimensions





Model	A	B	C Dia.	D	E	F	G	H	J BSPP	K BSPP	Q Qty.	R Dia.	T1	T2	W	Net Weight (Kg)	Ship Weight (Kg)
EKT-508	225	172	65	47	43	28	62	13	3/4"	3/8"	6	142	57	20	16	5	6
EKT-518	479	172	65	47	43	28	62	13	3/4"	3/8"	6	142	57	20	16	6	7
EKT-708	225	248	89	56	42	41	100	32	1-1/2"	3/4"	12	227	102	—	18	10	12
EKT-718	479	248	89	56	42	41	100	32	1-1/2"	3/4"	12	227	102	—	18	14	15
EKT-1012	319	264	128	56	57	60	119	30	1-1/2"	1"	12	244	111	28	18	19	21
EKT-1024	624	264	128	56	57	60	119	30	1-1/2"	1"	12	244	111	28	18	26	29

NOTE: We reserve the right to make reasonable design changes without notice. Certified drawings are available upon request. All dimensions are in millimeters, unless noted otherwise. Shipping weight is approximate. Tank gasket is included. BSPP threads are 55° full form whitworth.

Selection Procedure

Performance Curves are based on a 22°C approach temperature, a 2:1 oil to water ratio and an average oil viscosity of 21.7 CST. Example: oil leaving cooler at 52°C with 29°C cooling water (53°C - 29°C = 22°C). The 2:1 oil to water ratio means that for every LPM of oil circulated, a minimum of 1/2 LPM of water must must be circulated to obtain the curve results.

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

$KW_{\text{Heat Removed}}$ in Cooler =

$$KW_{\text{Actual}} \times \left[\frac{22°C}{\text{Oil out (°C) - Water (°C)}} \right] \times \text{Correction A}$$

Step 2 **Oil Pressure Drop Coding:** ● = .35 BAR; ■ = .69 BAR. Curves having no pressure drop symbol indicates that the oil pressure drop is less than .35 BAR to the highest oil flow rate for that curve. Multiply curve oil pressure drop by Correction B.

Viscosity Corrections

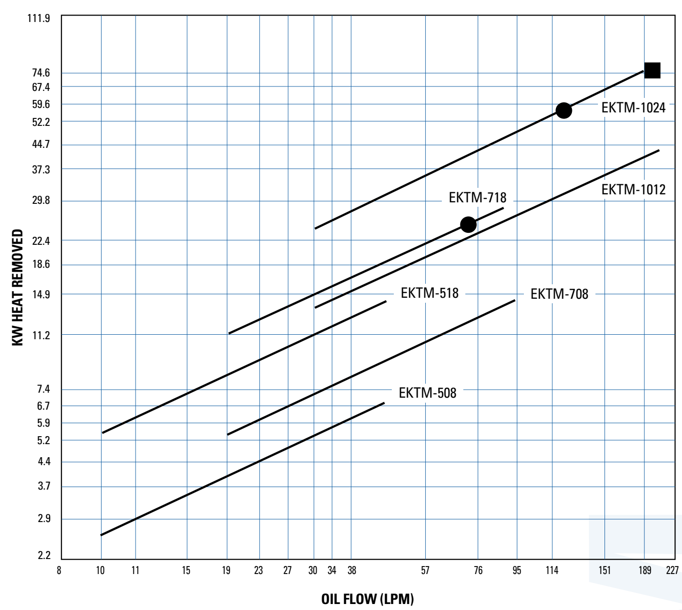
Average Oil CST	A	B
7.5	0.84	0.6
21	1.0	1.0
43	1.14	2.0
65	1.24	3.1
87	1.31	4.1
108	1.37	5.1

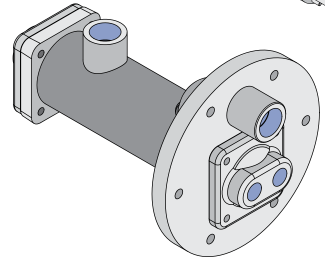
Maximum Flow Rates

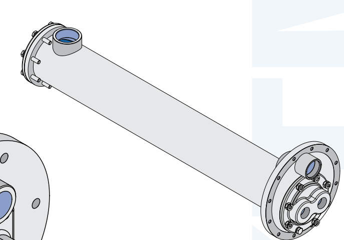
Unit Size	Shell Side (LPM)	Tube Side (LPM)
500	76	23
700	227	45
1000	303	106

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

Performance Curves





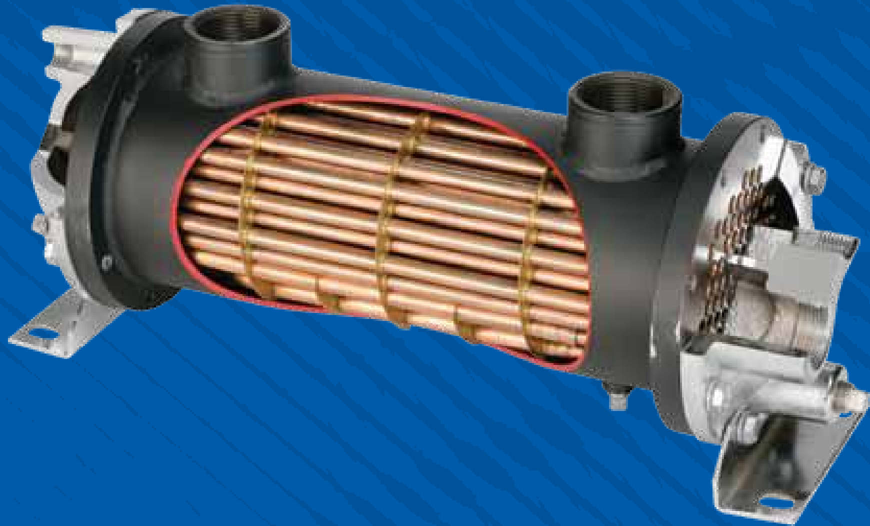


FLUID COOLING | Shell & Tube CM & SSCM Series

COPPER/STEEL OR STAINLESS STEEL CONSTRUCTION

Features

- **Preferred for New Oil-Water Applications**
- **API/BASCO Interchange**
- **Rugged Steel Construction**
- **Low Cost**
- **Type 316 Stainless Steel Construction Optional**
- **Custom Designs Available**
- **Competitively Priced**
- Optional Material Construction on CM-Series: Tubes, Tubesheets, End Bonnets
- 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)



Ratings

Maximum Shell Side Pressure 21 BAR

Maximum Tube Side Pressure 10 BAR

Maximum Temperature 149°C

Materials CM Series

Tubes Copper
Optional: CuNi, Stainless Steel, Admiralty Brass

Shell Steel

Shell Connections Steel

Baffles Brass

End Bonnets Cast Iron
Optional: Bronze, Stainless Steel

Tubesheets Steel
Optional: CuNi, Stainless Steel

Mounting Brackets Steel

Gaskets Nitrile Rubber/Cellulose Fiber

Nameplate Aluminum Foil

Materials SSCM Series

Tubes 316 Stainless Steel

Tubesheets 316 L Stainless Steel

Shell 316 L Stainless Steel

Shell Connections 316 L Stainless Steel

Baffles 316 Stainless Steel

End Bonnets 316 Stainless Steel

Mounting Brackets Mild Steel

Gaskets Nitrile Rubber/Cellulose Fiber

Nameplate Aluminum Foil

How to Order

[ ] – [ ][ ][ ][ ] – [ ] – [ ] – [ ] + [ ] – [ ] – [ ] – [ ]

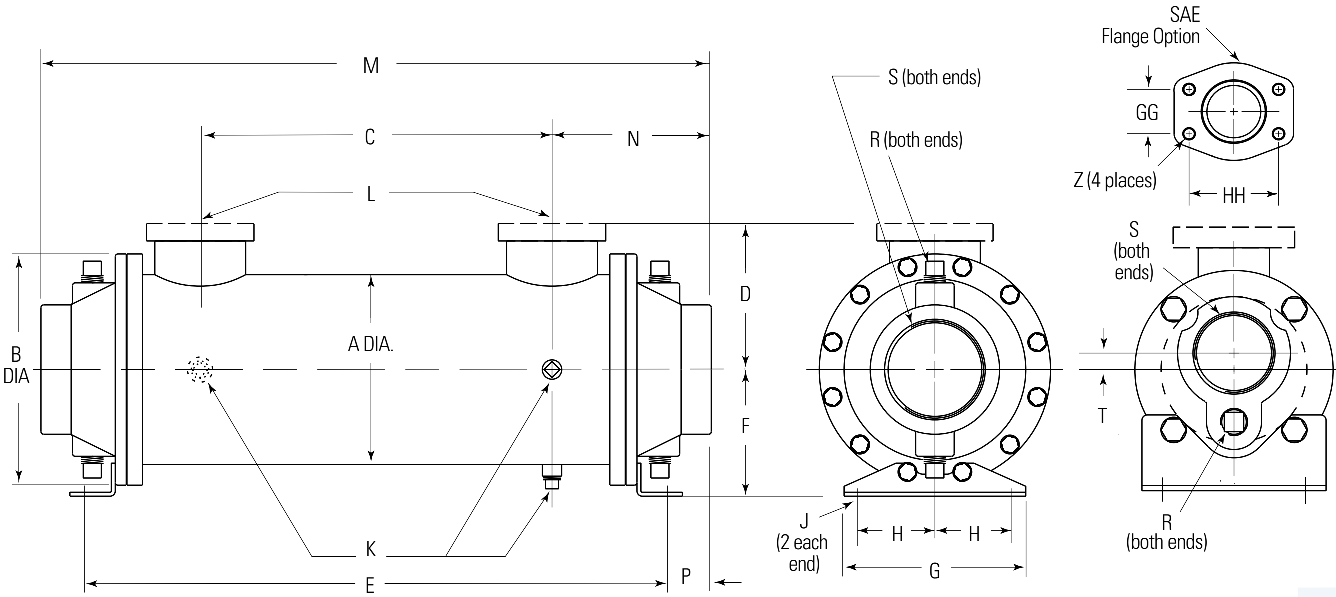
Model Series	Model Size Selected	Baffle Spacing	Tube Diameter Code	Tubeside Passes	+	Cooling Tube Material	End Bonnet Material	Tubesheet Material	Zinc Anodes
CM & SSCM **CFM**			**4** - 6 mm **6** - 10 mm	**0** - One Pass **T** - Two Pass **F** - Four Pass		**Blank** - Copper **CN** - CuNi **SS** - Stainless Steel **AD** - Admiralty Brass	**Blank** - Cast Iron **B** - Bronze **SB** - Stainless Steel	**Blank** - Steel **W** - CuNi **S** - Stainless Steel	**Blank** - None **Z** - Zinc

CM = BSPP Shell side connections; BSPP Tube side connections
CFM = SAE Flange (with Metric threads) Shell side connections; BSPP Tube side connections
SSCM = BSPP Shell side connections; BSPP Tube side connections

ADD FOR CM and CFM MODELS ONLY:
Cooling tube material, end bonnet material, tubesheet material & zinc anodes

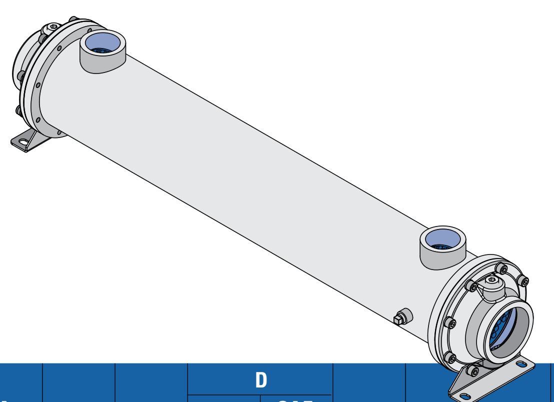
Dimensions

One Pass



All Models except CM-600 Series

CM-600 Series



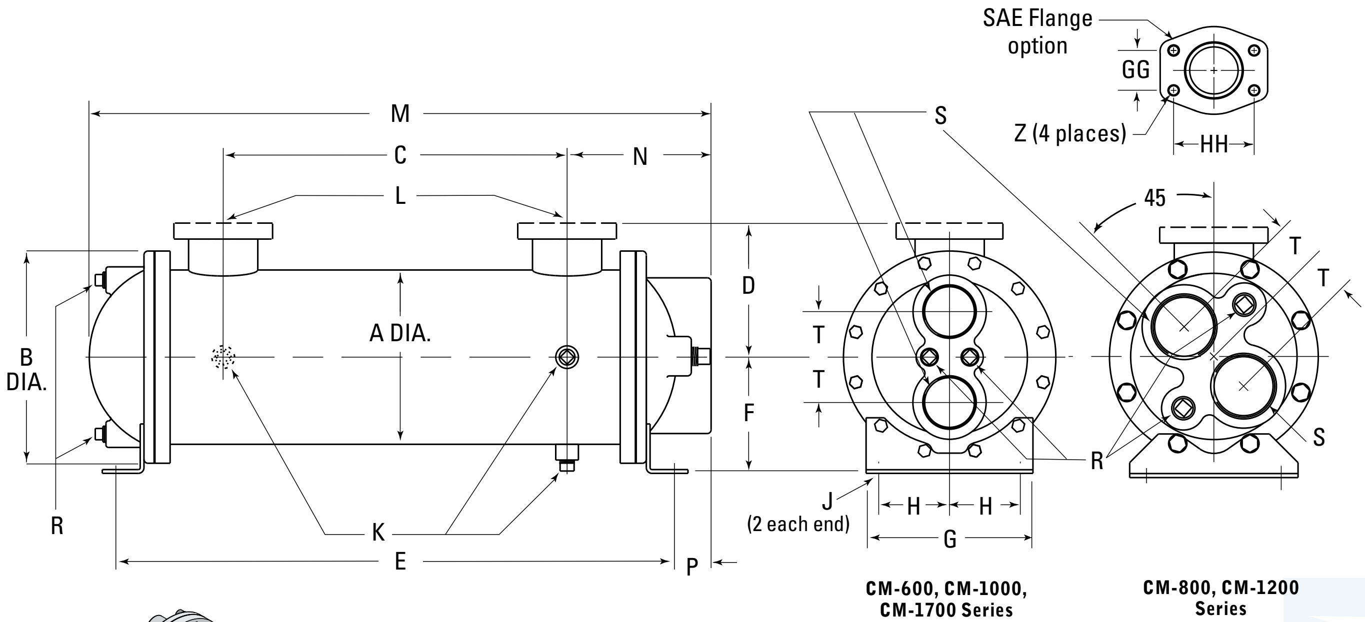
Flange Size	GG	HH	Z-CFM
1"	26	52	M10
1-1/2"	36	70	M12
2"	43	78	M12
3"	62	106	M16

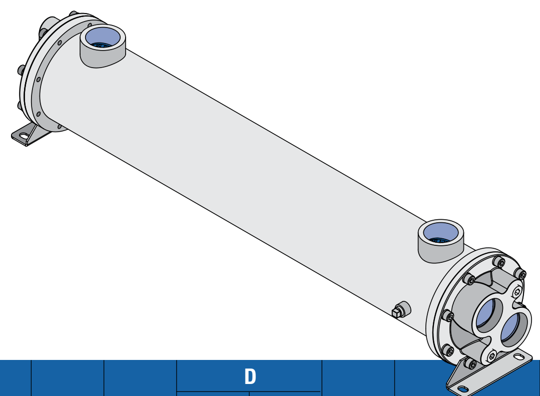
Model	A Dia.	B	C	D BSPP	D SAE Flange	E	F	G	H	J	K NPT	L BSPP/ Flange	M	N	P	Drain Ports R NPT	Drain Ports S BSPP	T
614	83	114	254	2.62	2.88	416	70	106	41	11	1/4" (3)	1"	436	91	10	3/8" (2)	1-1/2"	10
624	83	114	508	2.62	2.88	670	70	106	41	11	1/4" (3)	1"	690	91	10	3/8" (2)	1-1/2"	10
814	108	152	229	3.25	3.50	422	89	108	45	11	1/4" (3)	1-1/2"	454	113	16	3/8" (2)	2"	—
824	108	152	483	3.25	3.50	676	89	108	45	11	1/4" (3)	1-1/2"	708	113	16	3/8" (2)	2"	—
836	108	152	787	3.25	3.50	981	89	108	45	11	1/4" (3)	1-1/2"	1013	113	16	3/8" (2)	2"	—
1014	133	172	229	3.75	4.00	435	102	133	51	13 x 19	1/4" (3)	1-1/2"	485	128	23	3/8" (4)	2"	—
1024	133	172	483	3.75	4.00	689	102	133	51	13 x 19	1/4" (3)	1-1/2"	739	128	23	3/8" (4)	2"	—
1036	133	172	787	3.75	4.00	994	102	133	51	13 x 19	1/4" (3)	1-1/2"	1044	128	23	3/8" (4)	2"	—
1224	159	197	464	4.25	4.88	689	114	159	64	13 x 19	3/8" (3)	2"	762	149	36	1/2" (4)	3"	—
1236	159	197	768	4.25	4.88	994	114	159	64	13 x 19	3/8" (3)	2"	1067	149	36	1/2" (4)	3"	—
1248	159	197	1073	4.25	4.88	1299	114	159	64	13 x 19	3/8" (3)	2"	1372	149	36	1/2" (4)	3"	—
1260	159	197	1378	4.25	4.88	1604	114	159	64	13 x 19	3/8" (3)	2"	1677	149	36	1/2" (4)	3"	—
1724	219	267	432	5.84	6.81	699	146	210	89	16 x 22	3/8" (3)	3"	799	184	51	1/2" (4)	4"	—
1736	219	267	737	5.84	6.81	1003	146	210	89	16 x 22	3/8" (3)	3"	1104	184	51	1/2" (4)	4"	—
1748	219	267	1041	5.84	6.81	1308	146	210	89	16 x 22	3/8" (3)	3"	1409	184	51	1/2" (4)	4"	—
1760	219	267	1346	5.84	6.81	1613	146	210	89	16 x 22	3/8" (3)	3"	1714	184	51	1/2" (4)	4"	—
1772	219	267	1651	5.84	6.81	1918	146	210	89	16 x 22	3/8" (3)	3"	2019	184	51	1/2" (4)	4"	—

NOTE: We reserve the right to make reasonable design changes without notice. Consult factory. ***All dimensions are in millimeters, unless noted otherwise.***

Dimensions

Two Pass



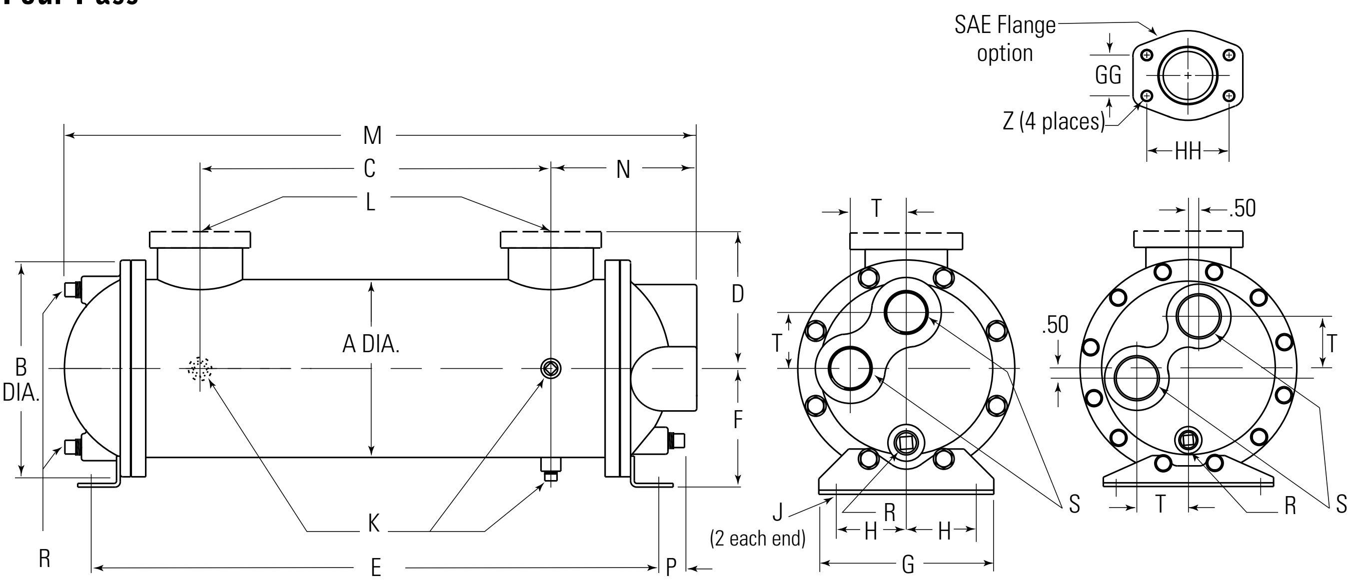


Flange Size	GG	HH	Z-CFM
1"	26	52	M10
1-1/2"	36	70	M12
2"	43	78	M12
3"	62	106	M16

Model	A Dia.	B	C	D BSPP	D SAE Flange	E	F	G	H	J	K NPT	L BSPP/ Flange	M	N	P	Drain Ports R NPT	Drain Ports S BSPP	T
614	83	114	254	2.62	2.88	416	70	106	41	11	1/4" (3)	1.00	436	91	10	3/8" (2)	1"	25
624	83	114	508	2.62	2.88	670	70	106	41	11	1/4" (3)	1.00	690	91	10	3/8" (2)	1"	25
814	108	152	229	3.25	3.50	422	89	108	45	11	1/4" (3)	1-1/2"	454	113	16	3/8" (2)	1-1/4"	27
824	108	152	483	3.25	3.50	676	89	108	45	11	1/4" (3)	1-1/2"	708	113	16	3/8" (2)	1-1/4"	27
836	108	152	787	3.25	3.50	981	89	108	45	11	1/4" (3)	1-1/2"	1013	113	16	3/8" (2)	1-1/4"	27
1014	133	172	229	3.75	4.00	435	102	133	51	13 x 19	1/4" (3)	1-1/2"	485	128	24	3/8" (4)	1-1/2"	38
1024	133	172	483	3.75	4.00	689	102	133	51	13 x 19	1/4" (3)	1-1/2"	739	128	24	3/8" (4)	1-1/2"	38
1036	133	172	787	3.75	4.00	994	102	133	51	13 x 19	1/4" (3)	1-1/2"	1044	128	24	3/8" (4)	1-1/2"	38
1224	159	197	464	4.25	4.88	689	114	159	64	13 x 19	3/8" (3)	2"	762	149	25	1/2" (4)	2"	40
1236	159	197	768	4.25	4.88	994	114	159	64	13 x 19	3/8" (3)	2"	1067	149	25	1/2" (4)	2"	40
1248	159	197	1073	4.25	4.88	1299	114	159	64	13 x 19	3/8" (3)	2"	1372	149	25	1/2" (4)	2"	40
1260	159	197	1378	4.25	4.88	1604	114	159	64	13 x 19	3/8" (3)	2"	1677	149	25	1/2" (4)	2"	40
1724	219	267	432	5.84	6.81	699	146	210	89	16 x 22	3/8" (3)	3"	799	184	46	1/2" (4)	2-1/2"	57
1736	219	267	737	5.84	6.81	1003	146	210	89	16 x 22	3/8" (3)	3"	1104	184	46	1/2" (4)	2-1/2"	57
1748	219	267	1041	5.84	6.81	1308	146	210	89	16 x 22	3/8" (3)	3"	1409	184	46	1/2" (4)	2-1/2"	57
1760	219	267	1346	5.84	6.81	1613	146	210	89	16 x 22	3/8" (3)	3"	1714	184	46	1/2" (4)	2-1/2"	57
1772	219	267	1651	5.84	6.81	1918	146	210	89	16 x 22	3/8" (3)	3"	2019	184	46	1/2" (4)	2-1/2"	57

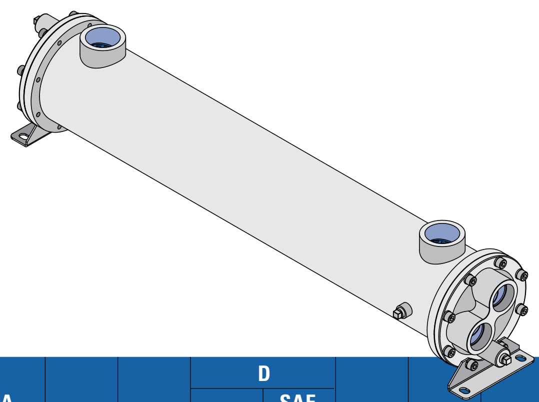
NOTE: We reserve the right to make reasonable design changes without notice. Consult factory. ***All dimensions are in millimeters, unless noted otherwise.***

Four Pass



All Models except CM-1700 Series

CM-1700 Series

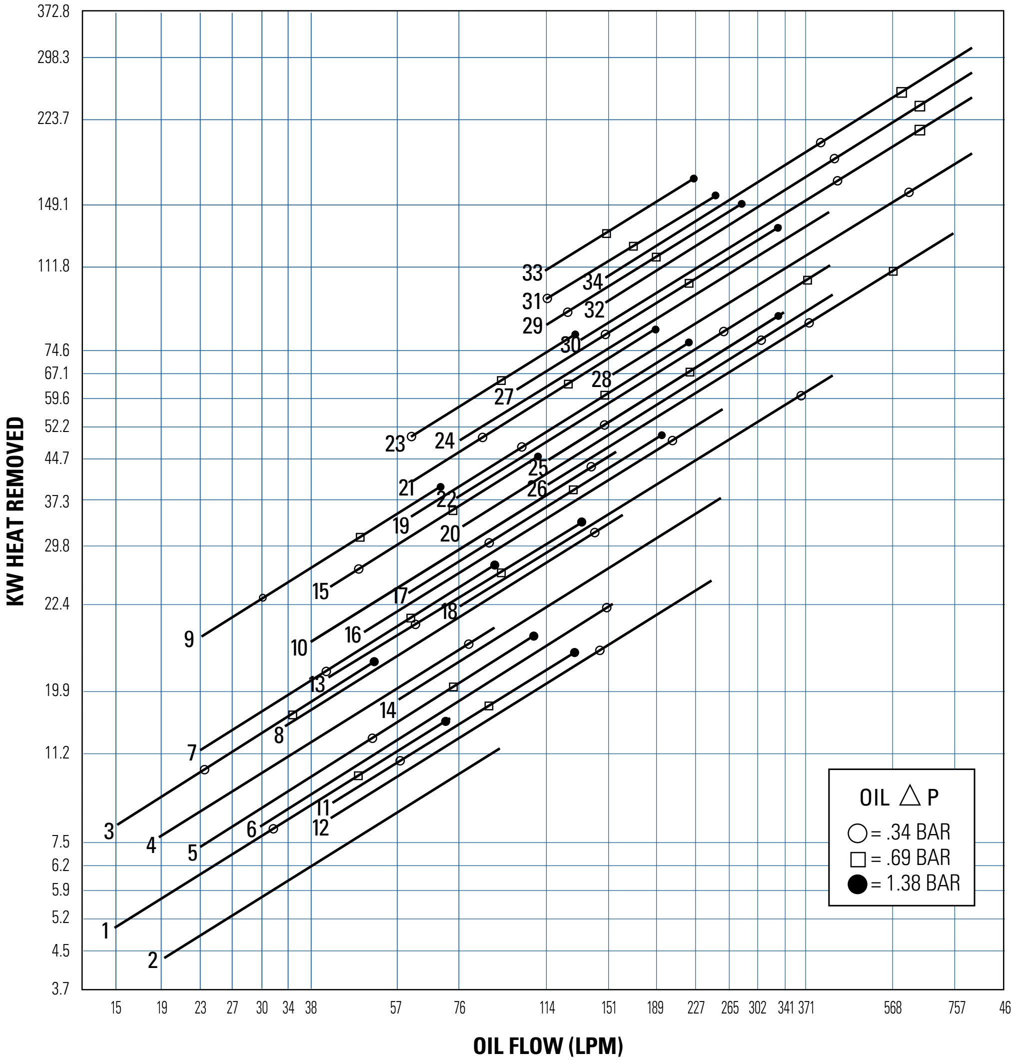


Flange Size	GG	HH	Z-CFM
1"	26	52	M10
1-1/2"	36	70	M12
2"	43	78	M12
3"	62	106	M16

Model	A Dia.	B	C	D BSPP	D SAE Flange	E	F	G	H	J	K NPT	L BSPP/ Flange	M	N	P	Drain Ports R NPT	Drain Ports S BSPP	T
614	83	114	254	2.62	2.88	416	70	106	41	11	1/4" (3)	1"	435	90	10	3/8" (2)	3/4"	25
624	83	114	508	2.62	2.88	670	70	106	41	11	1/4" (3)	1"	689	90	10	3/8" (2)	3/4"	25
814	108	152	229	3.25	3.50	422	89	108	45	11	1/4" (3)	1-1/2"	454	113	16	3/8" (3)	3/4"	32
824	108	152	483	3.25	3.50	676	89	108	45	11	1/4" (3)	1-1/2"	708	113	16	3/8" (3)	3/4"	32
836	108	152	787	3.25	3.50	981	89	108	45	11	1/4" (3)	1-1/2"	1013	113	16	3/8" (3)	3/4"	32
1014	133	172	229	3.75	4.00	435	102	133	51	13 x 19	1/4" (3)	1-1/2"	478	122	19	3/8" (3)	1"	43
1024	133	172	483	3.75	4.00	689	102	133	51	13 x 19	1/4" (3)	1-1/2"	732	122	19	3/8" (3)	1"	43
1036	133	172	787	3.75	4.00	994	102	133	51	13 x 19	1/4" (3)	1-1/2"	1037	122	19	3/8" (3)	1"	43
1224	159	197	464	4.25	4.88	689	114	159	64	13 x 19	3/8" (3)	2"	740	138	25	3/8" (3)	1-1/2"	51
1236	159	197	768	4.25	4.88	994	114	159	64	13 x 19	3/8" (3)	2"	1045	138	25	3/8" (3)	1-1/2"	51
1248	159	197	1073	4.25	4.88	1299	114	159	64	13 x 19	3/8" (3)	2"	1350	138	25	3/8" (3)	1-1/2"	51
1260	159	197	1378	4.25	4.88	1604	114	159	64	13 x 19	3/8" (3)	2"	1654	138	25	3/8" (3)	1-1/2"	51
1724	219	267	432	5.84	6.81	699	146	210	89	16 x 22	3/8" (3)	3"	759	179	46	3/8" (3)	2"	64
1736	219	267	737	5.84	6.81	1003	146	210	89	16 x 22	3/8" (3)	3"	1063	179	46	3/8" (3)	2"	64
1748	219	267	1041	5.84	6.81	1308	146	210	89	16 x 22	3/8" (3)	3"	1368	179	46	3/8" (3)	2"	64
1760	219	267	1346	5.84	6.81	1613	146	210	89	16 x 22	3/8" (3)	3"	1673	179	46	3/8" (3)	2"	64
1772	219	267	1651	5.84	6.81	1918	146	210	89	16 x 22	3/8" (3)	3"	1978	179	46	3/8" (3)	2"	64

NOTE: We reserve the right to make reasonable design changes without notice. Consult factory. ***All dimensions are in millimeters, unless noted otherwise.***

Performance Curves



Curve	Model	Approx. Shipping Weight (Kg)
1	CM/SSCM-614-1.3-4-F	8
2	CM/SSCM-614-3-4-F	8
3	CM/SSCM-624-1.3-4-F	11
4	CM/SSCM-624-3-4-F	11
5	CM/SSCM-814-1.7-4-F	15
6	CM/SSCM-814-4-4-F	15
7	CM/SSCM-824-1.7-4-F	19
8	CM/SSCM-824-4-4-F	19
9	CM/SSCM-836-1.7-4-F	24
10	CM/SSCM-836-4-4-F	24
11	CM/SSCM-1014-2-6-F	20
12	CM/SSCM-1014-5-6-F	20
13	CM/SSCM-1024-2-6-F	26
14	CM/SSCM-1024-5-6-F	26
15	CM/SSCM-1036-2-6-F	33
16	CM/SSCM-1036-5-6-F	33
17	CM/SSCM-1224-2.5-6-F	39
18	CM/SSCM-1224-6-6-F	39
19	CM/SSCM-1236-2.5-6-F	50
20	CM/SSCM-1236-6-6-F	50
21	CM/SSCM-1248-2.5-6-F	61
22	CM/SSCM-1248-6-6-F	61
23	CM/SSCM-1260-2.5-6-F	73
24	CM/SSCM-1260-6-6-F	73
25	CM/SSCM-1724-3.5-6-F	64
26	CM/SSCM-1724-8.4-6-F	64
27	CM/SSCM-1736-3.5-6-F	82
28	CM/SSCM-1736-8.4-6-F	82
29	CM/SSCM-1748-3.5-6-F	100
30	CM/SSCM-1748-8.4-6-F	100
31	CM/SSCM-1760-3.5-6-F	118
32	CM/SSCM-1760-8.4-6-F	118
33	CM/SSCM-1772-3.5-6-F	136
34	CM/SSCM-1772-8.4-6-F	136

Selection Procedure

Performance Curves are based on 21.7 CST oil leaving the cooler 22°C higher than the incoming water temperature (22°C 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 KW. (Example: 100 KW Power Unit x .33 = 33 KW Heat load.)

If HP is known: KW = HP x .746

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

Step 3 **Determine Curve KW Heat Load.** Enter the information from above:

$$\text{KW heat load} \times \frac{22}{\text{Actual Approach}} \times \text{Viscosity Correction A} = \text{Curve KW}$$

Step 4 **Enter curves** at oil flow through cooler and curve KW. 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.

○ = .35 BAR; □ = .69 BAR; ● = 1.38 BAR.

Oil Temperature

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

Typical operating temperature ranges are:

Hydraulic Motor Oil	43°C - 54°C
Hydrostatic Drive Oil	54°C - 82°C
Lube Oil Circuits	43°C - 54°C
Automatic Transmission Fluid	93°C - 149°C

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:

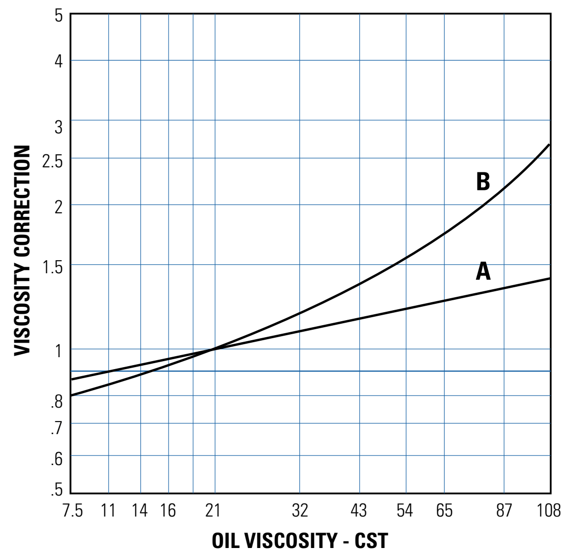
Oil △T=KW/(LPM Oil Flow x .029).

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 1.4 to 2.1 BAR. Excessive pressure drop should be avoided. Care should be taken to limit pressure drop to .35 BAR or less for case drain applications where high back pressure may damage the pump shaft seals.



Maximum Flow Rates

Example Model No.

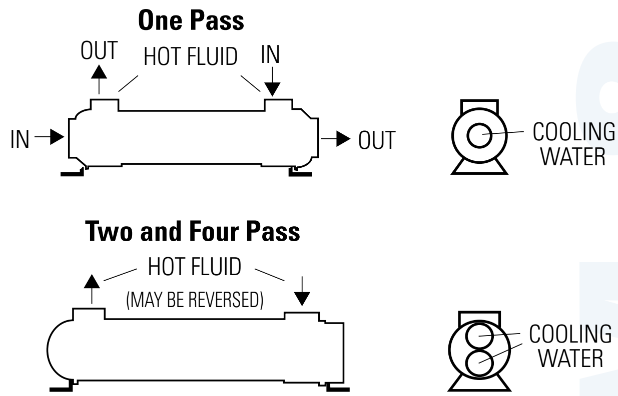
CM/SSCM - 1024 - 2 - 6 - F

Unit Size	Baffle Spacing	Shell Side (LPM)	Tube Side (LPM) O	T	F
600	1.3, 3	72, 110	102	91	46
800	1.7, 4	121, 261	318	159	79
1000	2, 5	155, 261	553	276	140
1200	2.5, 6	227, 435	848	424	212
1700	3.5, 8.4	473, 958	1760	878	439

Exceptions to Maximum Shell Side Flows	
CM/SSCM-814-4-4-*	238 LPM Max.
CM/SSCM-1014-2-6-*	125 LPM Max.
CM/SSCM-1014-5-6-*	250 LPM Max.
CM/SSCM-1724-3.5-6-*	397 LPM Max.
CM/SSCM-1724-8.4-6-*	757 LPM Max.

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

Piping Hook-up



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

FLUID COOLING | Shell & Tube AM Series

COPPER & STEEL CONSTRUCTION

Features

- **B or C Series is Recommended for New Applications**
- **Standard Brass Shell**
- **ITT Interchange**
- **Competitively Priced**
- Optional Non-Ferrous Construction (Water-to-Water Service)
- Optional 90/10 Copper Nickel Cooling Tubes and Bronze End Bonnets for Sea Water Service
- End Bonnets Removable for Servicing
- Mounting Feet Included (May be Rotated in 90° Increments)

Ratings

Maximum Shell Side Pressure 21 BAR

Maximum Tube Side Pressure 10 BAR

Maximum Temperature 149°C

Materials

Tubes Copper
Optional: CuNi

Hubs & Tubesheets Steel or Brass

Shell Brass
Optional: Steel

Baffles Brass

End Bonnets Cast Iron
Optional: Bronze

Mounting Brackets Steel

Gaskets Nitrile Rubber/Cellulose Fiber

Nameplate Aluminum Foil

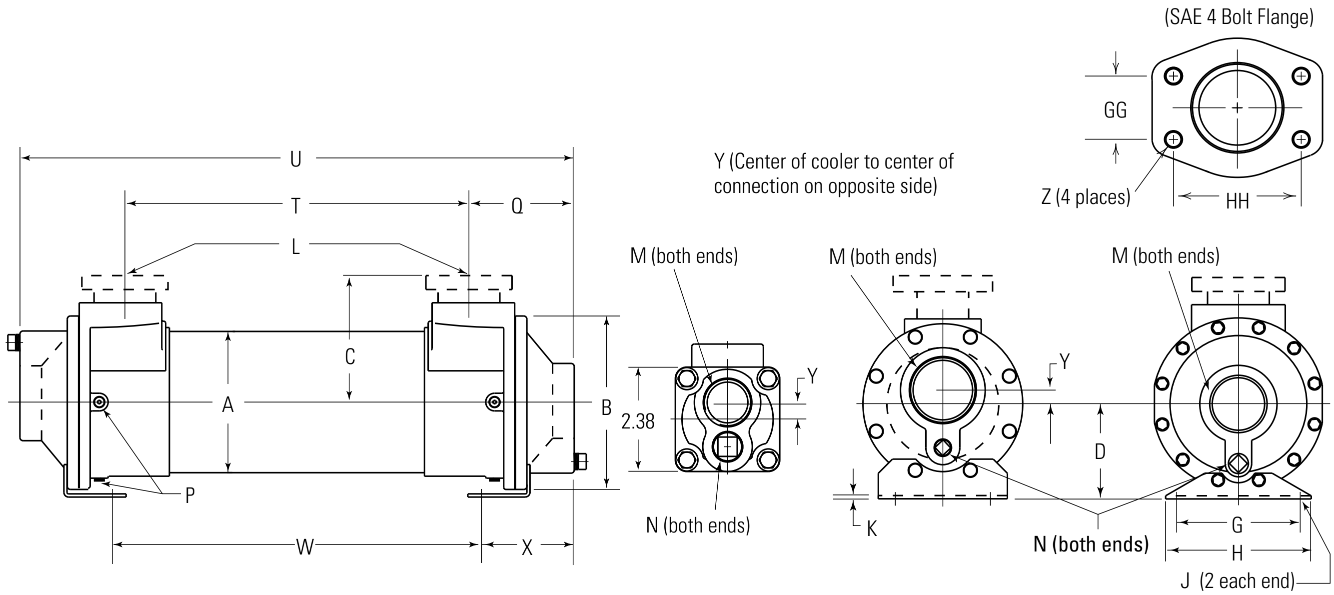
Anodes Zinc *(non-standard, optional)*

How to Order

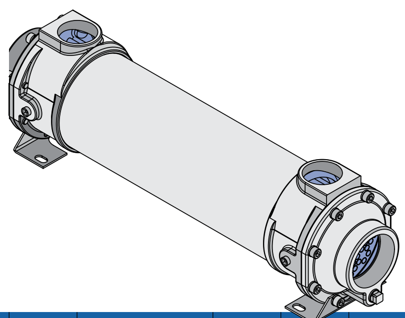
Model Series	Model Size Selected	Baffle Spacing	Tube Diameter Code	Tubeside Passes	Shell Material	Cooling Tube Material	End Bonnet Material	Zinc Anodes
SAFM **AM** **AFM**			**4** - 6 mm **6** - 10 mm	**0** - One Pass **T** - Two Pass **F** - Four Pass	**Blank** - Steel **BR** - Brass	**Blank** - Copper **CN** - CuNi	**Blank** - Cast Iron **B** - Bronze	**Blank** - None **Z** - Zinc

SAFM = SAE 4 Bolt Flange (with Metric threads) Shell side connections; BSPP Tube side connections. *Available in 1200/1600 models only.*
AM = BSPP Shell side connections; BSPP 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.

One Pass



AM-400 Series **AM-600 & AM-800 Series** **AM-1000, AM-1200 & AM-1600 Series**



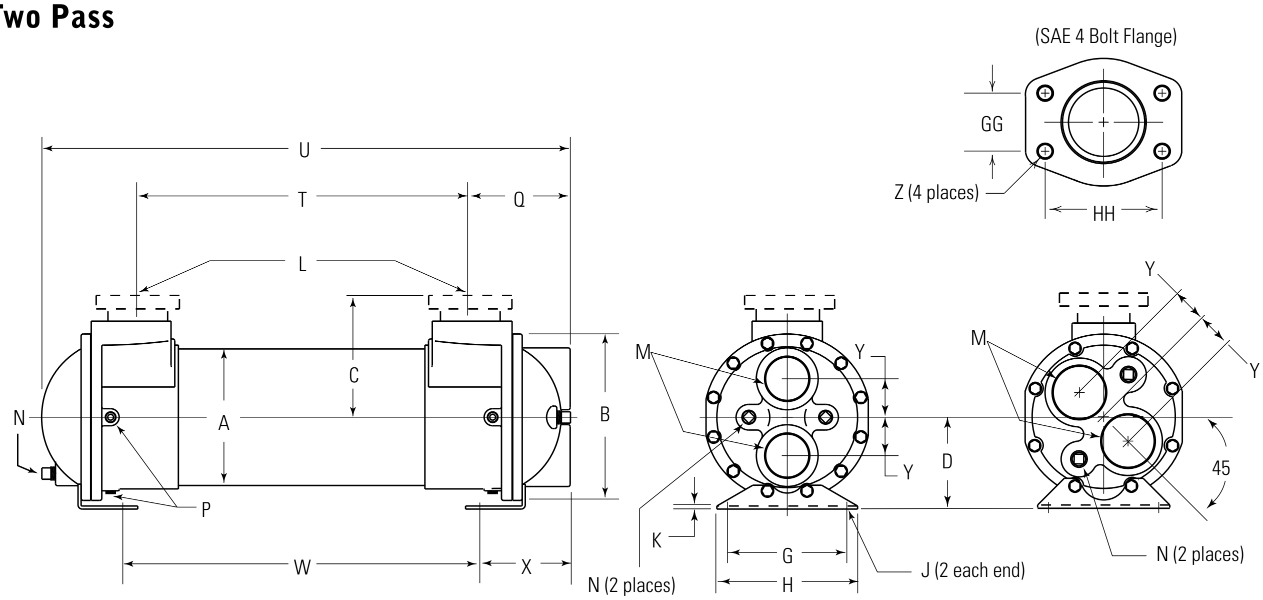
Flange Size	GG	HH	Z-CFM
1"	26	52	M10
1-1/2"	36	70	M12
2"	43	78	M12
3"	62	106	M16

Model	A Dia.	B Dia.	C BSPP	C SAE Flange	D	G	H	J	K	L BSPP	M BSPP	Drain Ports N NPT	Drain Ports P NPT	Q	T	U	W	X	Y
AM-408	54	—	1.69	—	—	—	—	—	—	1"*	3/4"	3/8"	—	2.38	159	271	—	—	10
AM-608	79	107	2.44	C/F	62	64	89	10x22	3	1"	1-1/2"	3/8"	1/4" (2)	2.56	156	286	139	78	10
AM-614	79	107	2.44	C/F	62	64	89	10x22	3	1"	1-1/2"	3/8"	1/4" (2)	2.56	283	438	291	78	10
AM-624	79	107	2.44	C/F	62	64	89	10x22	3	1"	1-1/2"	3/8"	1/4" (2)	2.56	537	616	454	78	10
AM-814	105	149	3.12	C/F	89	89	121	13x41	3	1-1/2"	2"	3/8"	3/8" (6)	3.44	203	457	327	65	13
AM-824	105	149	3.12	C/F	89	89	121	13x41	3	1-1/2"	2"	3/8"	3/8" (6)	3.44	537	711	581	65	13
AM-836	105	149	3.12	C/F	89	89	121	13x41	3	1-1/2"	2"	3/8"	3/8" (6)	3.44	841	1016	886	65	13
AM-1014	130	165	3.62	4.34	89	102	127	13x22	3	1-1/2"	2-1/2"	3/8"	1/4" (6)	3.69	283	470	299	86	13
AM-1024	130	165	3.62	4.34	89	102	127	13x22	3	1-1/2"	2-1/2"	3/8"	1/4" (6)	3.69	537	724	552	86	13
AM-1036	130	165	3.62	4.34	89	102	127	13x22	3	1-1/2"	2-1/2"	3/8"	1/4" (6)	3.69	841	1029	857	86	13
AM-1224	156	191	4.25	4.84**	105	127	153	13x22	3	2"	3"	1/2"	1/4" (6)	4.25	521	737	546	95	—
AM-1236	156	191	4.25	4.84**	105	127	153	13x22	3	2"	3"	1/2"	1/4" (6)	4.25	826	1011	851	95	—
AM-1248	156	191	4.25	4.84**	105	127	153	13x22	3	2"	3"	1/2"	1/4" (6)	4.25	1130	1347	1156	95	—
AM-1260	156	191	4.25	4.84**	105	127	153	13x22	3	2"	3"	1/2"	1/4" (6)	4.25	1435	1651	1461	95	—
AM-1624	203	248	5.62	6.12***	137	178	210	16x28	5	3"	3"	1/2"	1/4" (6)	6.00	483	787	521	133	—
AM-1636	203	248	5.62	6.12***	137	178	210	16x28	5	3"	3"	1/2"	1/4" (6)	6.00	787	1092	826	133	—
AM-1648	203	248	5.62	6.12***	137	178	210	16x28	5	3"	3"	1/2"	1/4" (6)	6.00	1092	1397	1130	133	—
AM-1660	203	248	5.62	6.12***	137	178	210	16x28	5	3"	3"	1/2"	1/4" (6)	6.00	1397	1702	1435	133	—
AM-1672	203	248	5.62	6.12***	137	178	210	16x28	5	3"	3"	1/2"	1/4" (6)	6.00	1702	2007	1740	133	—

**A-408 SAE Flange not available. **SAFM-1200 5.88. ***SAFM-1600 7.38.*

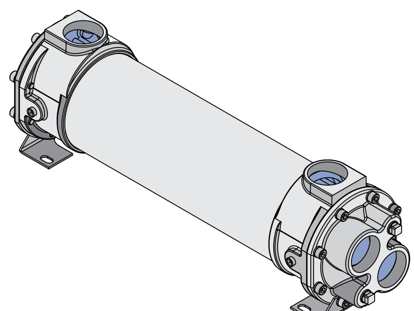
NOTE: We reserve the right to make reasonable design changes without notice. Consult factory. ***All dimensions are in millimeters, unless noted otherwise.***

Two Pass



AM-600, AM-800, AM-1000 & AM-1600 Series

AM-1200 Series



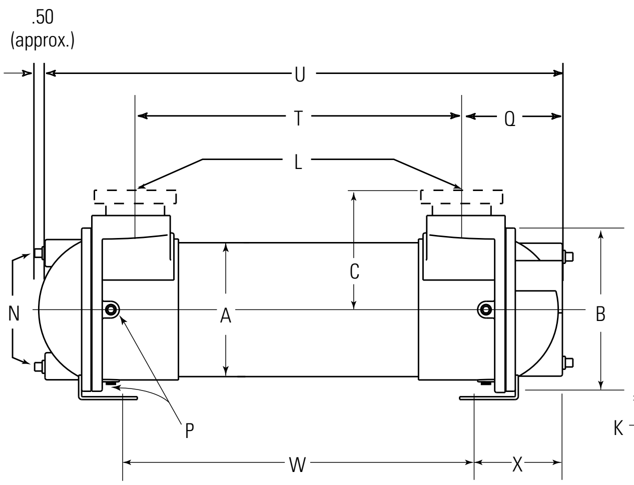
Flange Size	GG	HH	Z-CFM
1"	26	52	M10
1-1/2"	36	70	M12
2"	43	78	M12
3"	62	106	M16

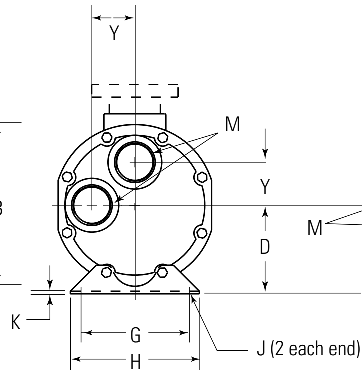
Model	A Dia.	B Dia.	C BSPP	C SAE Flange	D	G	H	J	K	L BSPP	M BSPP	Drain Ports N NPT	Drain Ports P NPT	Q	T	U	W	X	Y
AM-608	79	107	2.44	C/F	62	64	89	10x22	3	1"	1-1/2"	3/8"	1/4" (2)	2.56	156	273	139	75	23
AM-614	79	107	2.44	C/F	62	64	89	10x22	3	1"	1-1/2"	3/8"	1/4" (2)	2.56	283	426	291	75	23
AM-624	79	107	2.44	C/F	62	64	89	10x22	3	1"	1-1/2"	3/8"	1/4" (2)	2.56	537	680	545	75	23
AM-814	105	149	3.12	C/F	89	89	121	13x41	3	1-1/2"	2"	3/8"	3/8" (6)	3.44	203	448	327	65	30
AM-824	105	149	3.12	C/F	89	89	121	13x41	3	1-1/2"	2"	3/8"	3/8" (6)	3.44	537	702	531	65	30
AM-836	105	149	3.12	C/F	89	89	121	13x41	3	1-1/2"	2"	3/8"	3/8" (6)	3.44	841	1006	886	65	30
AM-1014	130	165	3.62	4.34	89	102	127	13x22	3	1-1/2"	2-1/2"	3/8"	1/4" (6)	3.69	283	465	299	86	38
AM-1024	130	165	3.62	4.34	89	102	127	13x22	3	1-1/2"	2-1/2"	3/8"	1/4" (6)	3.69	537	719	553	86	38
AM-1036	130	165	3.62	4.34	89	102	127	13x22	3	1-1/2"	2-1/2"	3/8"	1/4" (6)	3.69	841	1024	857	86	38
AM-1224	156	191	4.25	4.84**	105	127	153	13x22	3	2"	3"	1/2"	1/4" (6)	4.25	521	730	546	95	40
AM-1236	156	191	4.25	4.84**	105	127	153	13x22	3	2"	3"	1/2"	1/4" (6)	4.25	826	1035	851	95	40
AM-1248	156	191	4.25	4.84**	105	127	153	13x22	3	2"	3"	1/2"	1/4" (6)	4.25	1130	1340	1156	95	40
AM-1260	156	191	4.25	4.84**	105	127	153	13x22	3	2"	3"	1/2"	1/4" (6)	4.25	1435	1645	1461	95	40
AM-1624	203	248	5.62	6.12***	137	178	210	16x28	5	3"	3"	1/2"	1/4" (6)	6.00	483	775	521	133	57
AM-1636	203	248	5.62	6.12***	137	178	210	16x28	5	3"	3"	1/2"	1/4" (6)	6.00	787	1080	826	133	57
AM-1648	203	248	5.62	6.12***	137	178	210	16x28	5	3"	3"	1/2"	1/4" (6)	6.00	1092	1384	1130	133	57
AM-1660	203	248	5.62	6.12***	137	178	210	16x28	5	3"	3"	1/2"	1/4" (6)	6.00	1397	1689	1435	133	57
AM-1672	203	248	5.62	6.12***	137	178	210	16x28	5	3"	3"	1/2"	1/4" (6)	6.00	1702	1994	1740	133	57

**SAFM-1200 5.88. **SAFM-1600 7.38.*

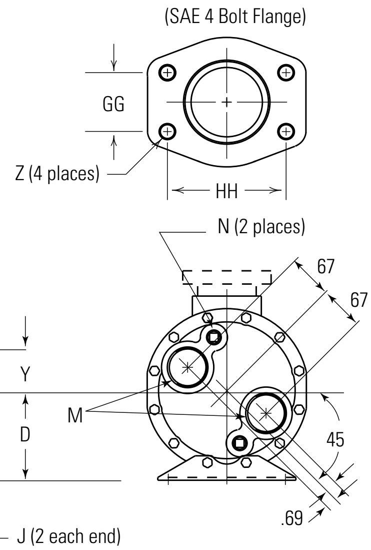
NOTE: We reserve the right to make reasonable design changes without notice. Consult factory. ***All dimensions are in millimeters, unless noted otherwise.***

Four Pass

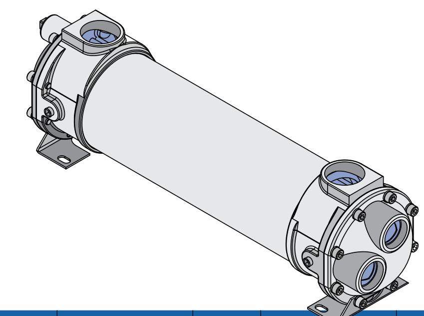




AM-600, AM-800, AM-1000 & AM-1200 Series



AM-1600 Series

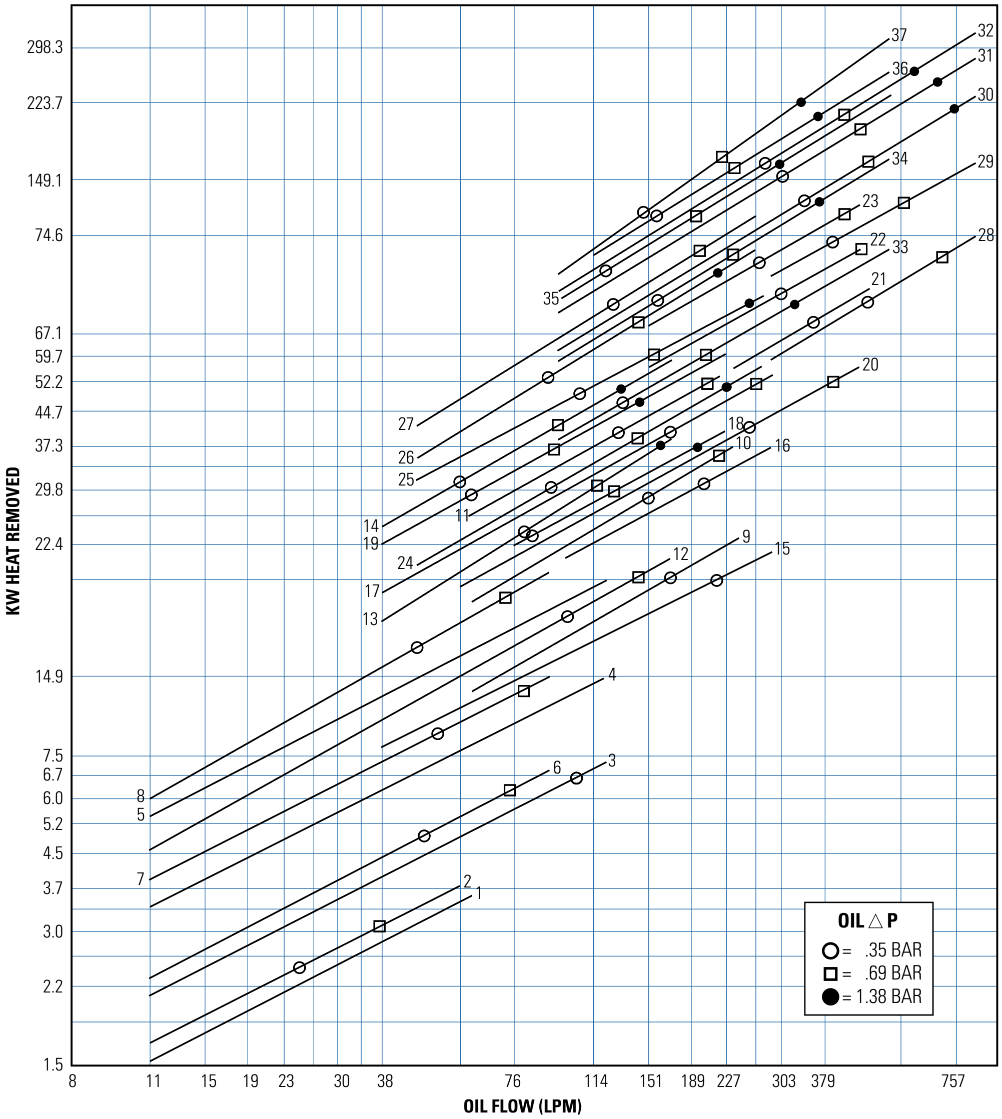


Flange Size	GG	HH	Z-CFM
1″	26	52	M10
1-1/2″	36	70	M12
2″	43	78	M12
3″	62	106	M16

Model	A Dia.	B Dia.	C BSPP	C SAE Flange	D	G	H	J	K	L BSPP	M BSPP	Drain Ports N NPT	Drain Ports P NPT	Q	T	U	W	X	Y
AM-608	79	107	2.44	C/F	62	64	89	10x22	3	1″	1-1/2″	3/8″	1/4″ (2)	2.56	156	276	139	71	25
AM-614	79	107	2.44	C/F	62	64	89	10x22	3	1″	1-1/2″	3/8″	1/4″ (2)	2.56	283	429	291	71	25
AM-624	79	107	2.44	C/F	62	64	89	10x22	3	1″	1-1/2″	3/8″	1/4″ (2)	2.56	537	683	545	71	25
AM-814	105	149	3.12	C/F	89	89	121	13x41	3	1-1/2″	2″	3/8″	3/8″ (6)	3.44	203	448	327	65	27
AM-824	105	149	3.12	C/F	89	89	121	13x41	3	1-1/2″	2″	3/8″	3/8″ (6)	3.44	537	702	531	65	27
AM-836	105	149	3.12	C/F	89	89	121	13x41	3	1-1/2″	2″	3/8″	3/8″ (6)	3.44	841	1006	886	65	27
AM-1014	130	165	3.62	4.34	89	102	127	13x22	3	1-1/2″	2-1/2″	3/8″	1/4″ (6)	3.69	283	467	299	83	43
AM-1024	130	165	3.62	4.34	89	102	127	13x22	3	1-1/2″	2-1/2″	3/8″	1/4″ (6)	3.69	537	721	553	83	43
AM-1036	130	165	3.62	4.34	89	102	127	13x22	3	1-1/2″	2-1/2″	3/8″	1/4″ (6)	3.69	841	1026	857	83	43
AM-1224	156	191	4.25	4.84**	105	127	153	13x22	3	2″	3″	1/2″	1/4″ (6)	4.25	521	737	546	95	51
AM-1236	156	191	4.25	4.84**	105	127	153	13x22	3	2″	3″	1/2″	1/4″ (6)	4.25	826	1041	851	95	51
AM-1248	156	191	4.25	4.84**	105	127	153	13x22	3	2″	3″	1/2″	1/4″ (6)	4.25	1130	1346	1156	95	51
AM-1260	156	191	4.25	4.84**	105	127	153	13x22	3	2″	3″	1/2″	1/4″ (6)	4.25	1435	1651	1461	95	51
AM-1624	203	248	5.62	6.12***	137	178	210	16x28	5	3″	3″	1/2″	1/4″ (6)	6.00	483	781	521	133	—
AM-1636	203	248	5.62	6.12***	137	178	210	16x28	5	3″	3″	1/2″	1/4″ (6)	6.00	787	1086	826	133	—
AM-1648	203	248	5.62	6.12***	137	178	210	16x28	5	3″	3″	1/2″	1/4″ (6)	6.00	1092	1391	1130	133	—
AM-1660	203	248	5.62	6.12***	137	178	210	16x28	5	3″	3″	1/2″	1/4″ (6)	6.00	1397	1695	1435	133	—
AM-1672	203	248	5.62	6.12***	137	178	210	16x28	5	3″	3″	1/2″	1/4″ (6)	6.00	1702	2000	1740	133	—

**SAFM-1200 5.88. **SAFM-1600 7.38.*

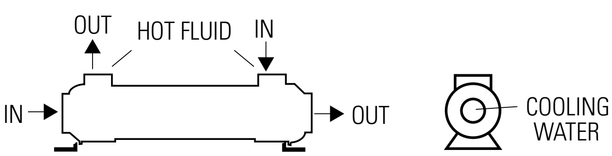
NOTE: We reserve the right to make reasonable design changes without notice. Consult factory. ***All dimensions are in millimeters, unless noted otherwise.***



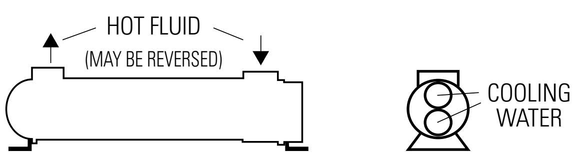
Curve	Model	Approx. Shipping Weight (Kg)
1	AM-408-2-4-O	3
2	AM-408-.75-4-O	3
3	AM-608-2-4-F	5
4	AM-614-4-4-F	8
5	AM-624-4-4-F	9
6	AM-608-1-4-F	5
7	AM-614-1.5-4-F	8
8	AM-624-2-4-F	9
9	AM-814-3-4-F	18
10	AM-824-4-4-F	23
11	AM-836-4-4-F	26
12	AM-814-1.5-4-F	18
13	AM-824-2-4-F	23
14	AM-836-2-4-F	26
15	AM-1014-3-6-F	22
16	AM-1024-4-6-F	29
17	AM-1036-4-6-F	33
18	AM-1024-2-6-F	29
19	AM-1036-2-6-F	33
20	AM-1224-4-6-F	35
21	AM-1236-6-6-F	54
22	AM-1248-6-6-F	65
23	AM-1260-6-6-F	75
24	AM-1224-2-6-F	35
25	AM-1236-3-6-F	54
26	AM-1248-3-6-F	65
27	AM-1260-4-6-F	75
28	AM-1624-6-6-F	82
29	AM-1636-6-6-F	95
30	AM-1648-6-6-F	113
31	AM-1660-6-6-F	130
32	AM-1672-6-6-F	150
33	AM-1624-2-6-F	82
34	AM-1636-3-6-F	95
35	AM-1648-3-6-F	113
36	AM-1660-4-6-F	130
37	AM-1672-4-6-F	150

Piping Hook-up

One Pass



Two and Four Pass



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

Performance Curves are based on 21.7 CST oil leaving the cooler 22°C higher than the water temperature used for cooling. This is also referred to as a 22°C 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 KW. (Example: 100 KW Power Unit x .33 = 33 KW Heat load.)

If HP is known: KW = HP x .746

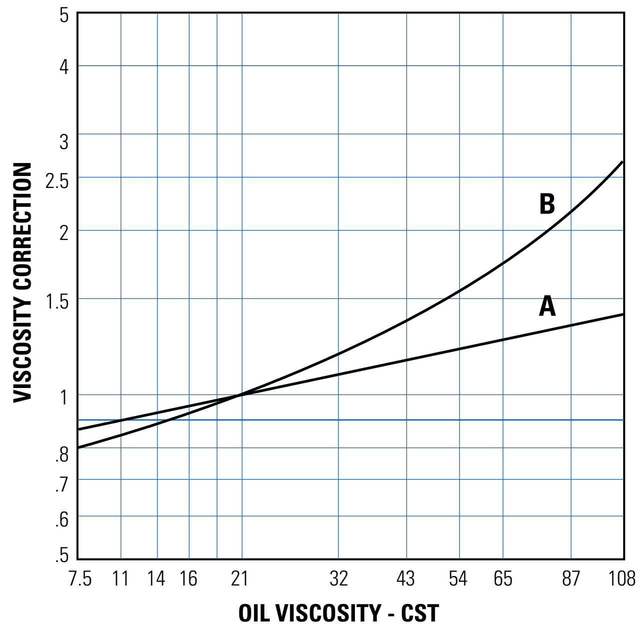
Step 2 **Determine Approach Temperature.**
Desired oil leaving cooler °C – Water Inlet temp. °C = Actual Approach

Step 3 **Determine Curve KW Heat Load.** Enter the information from above:

$$\text{KW heat load} \times \frac{22}{\text{Actual Approach}} \times \frac{\text{Viscosity}}{\text{Correction A}} = \frac{\text{Curve}}{\text{KW}}$$

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

Step 5 **Determine Oil Pressure Drop from Curves:**
◯ = .35 BAR; ☐ = .69 BAR; ● = 1.38 BAR.
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 Motor Oil	43°C - 54°C
Hydrostatic Drive Oil	54°C - 82°C
Lube Oil Circuits	43°C - 54°C
Automatic Transmission Fluid	93°C - 149°C

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 = KW/(LPM Oil Flow x .029).

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

Oil Leaving Temperature = 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 1.4 to 2.1 BAR. Excessive pressure drop should be avoided. Care should be taken to limit pressure drop to .35 BAR or less for case drain applications where high back pressure may damage the pump shaft seals.

Maximum Flow Rates

Example Model No.

A - 1024 - 2 - 6 - F

Unit Size	Baffle Spacing	Shell Side (LPM)	Tube Side (LPM) O	T	F
400	.75, 2	26, 72	68	–	–
608	1, 2	53, 110	182	91	45
614	1.5, 4	79, 110	182	91	45
624	2, 4	110	182	91	45
814	1.5, 3	110, 216	329	167	83
824 & 836	2, 4	144, 261	329	167	83
1014	1.5, 3	121, 242	553	276	140
1024 & 1036	2, 4	159, 261	553	276	140
1224	2, 4	193, 390	848	45	212
1236 & 1248	3, 6	291, 435	848	45	212
1260	4, 6	390, 435	848	45	212
1624	2, 6	250, 757	1060	151	265
1636 & 1648	3, 6	379, 757	1060	151	265
1660 & 1672	4, 6	503, 757	1060	151	265

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

STAINLESS STEEL CONSTRUCTION

Features

- **Stacked/Brazed Plate**
- **Stainless Steel**
- **Copper Brazed**
- **Oil to Water Applications**
- **High Performance**
- **Compact Design**
- **BSPP 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
177°C at 31 BAR*

Maximum Working Pressure 31 BAR**

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

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

Materials

Plate Material 316L Stainless Steel

Braze Material Copper
Optional: Nickel/Chrome

Stud Bolts 304 Stainless Steel

Front and Back Pressure Plates
304 Stainless Steel

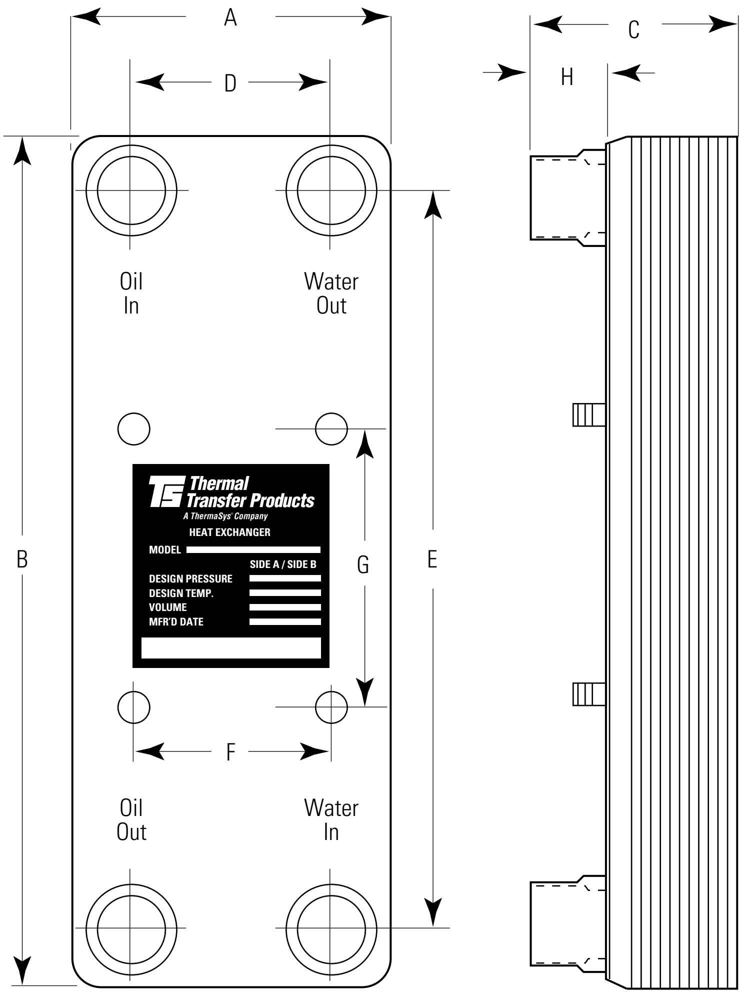
Connectors 304 Stainless Steel

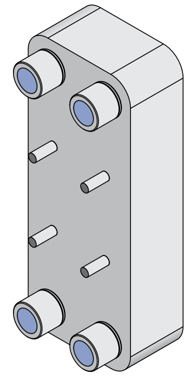
Foot Mounting Brackets 304 Stainless Steel

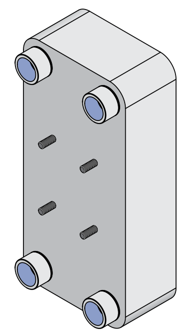
How to Order

Model Series	–	Number of Plates	–	Model Size Selected	–	Side A "In"	–	Side A "Out"	–	Side B "In"	–	Side B "Out"	–	Options
BPM **BPMN** - Nickel/ Chrome Brazed				**12 x 5** **20 x 5**										**FB** - Foot Mounting Brackets

Dimensions

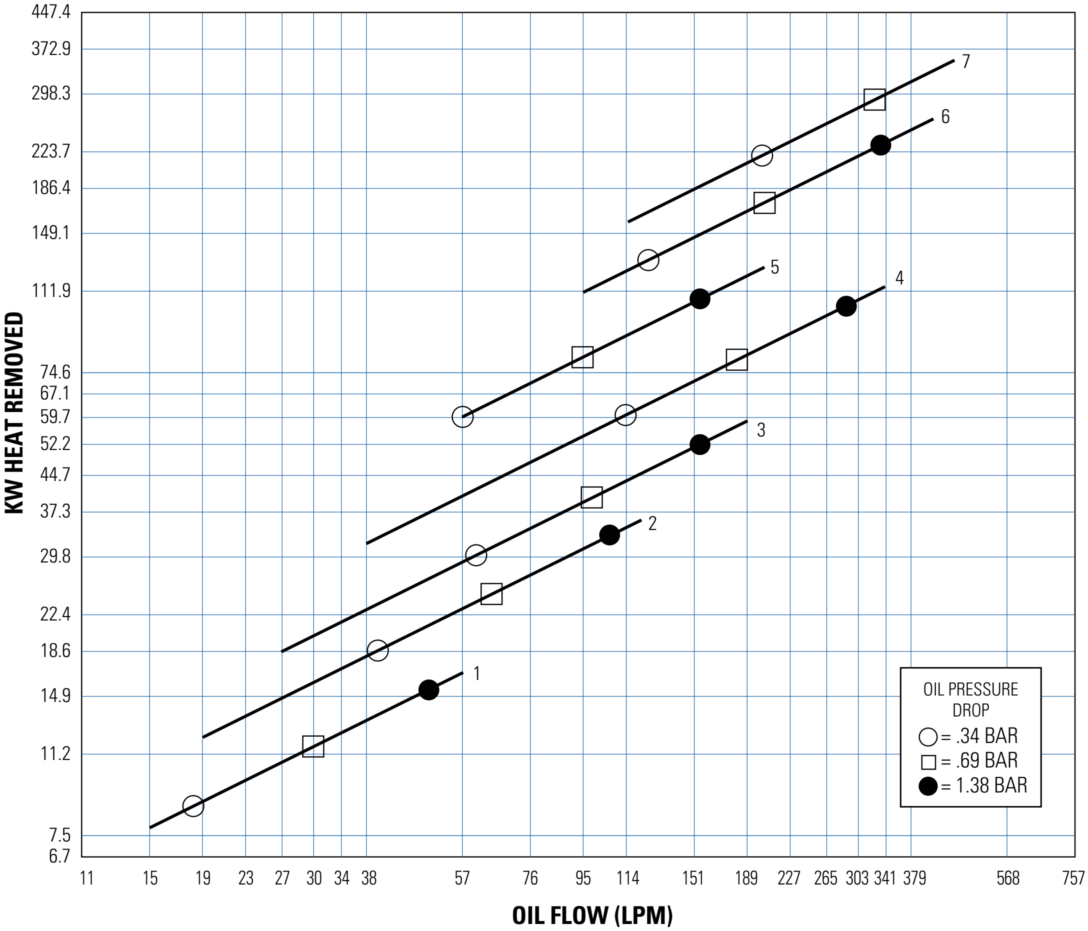






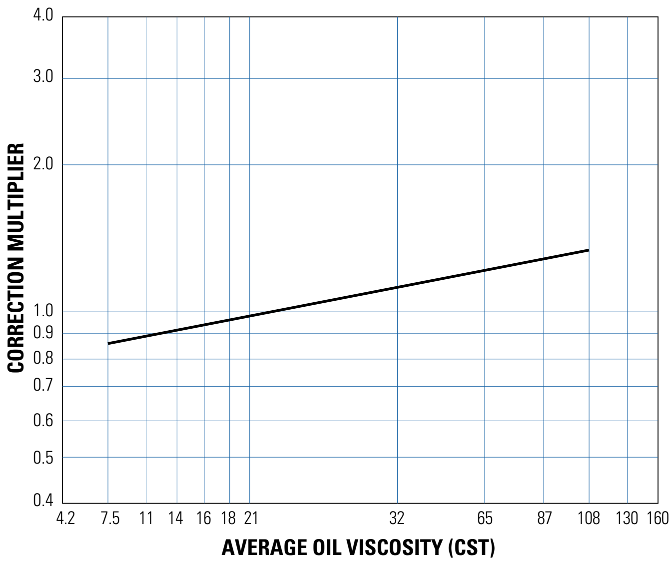
Model	A	B	C	D	E	F	G	H	Oil BSPP	Water BSPP	Weight Kg
BPM-12-12x5	125	310	66	69	252	64	89	32	3/4"	3/4"	4
BPM-24-12x5	125	310	95	69	252	64	89	32	1-1/4"	1-1/4"	5
BPM-36-12x5	125	310	127	69	252	64	89	36	1-1/4"	1-1/4"	7
BPM-70-12x5	125	310	208	69	252	64	89	36	1-1/4"	1-1/4"	12
BPM-24-20x10	249	516	101	165	432	102	140	38	1-1/2"	1-1/2"	18
BPM-50-20x10	249	516	164	165	432	102	140	38	1-1/2"	1-1/2"	31
BPM-80-20x10	249	516	235	165	432	102	140	38	1-1/2"	1-1/2"	45

NOTE: We reserve the right to make reasonable design changes without notice. ***All dimensions are in millimeters, unless noted otherwise.***
BSPP Connections are internal threads (female).

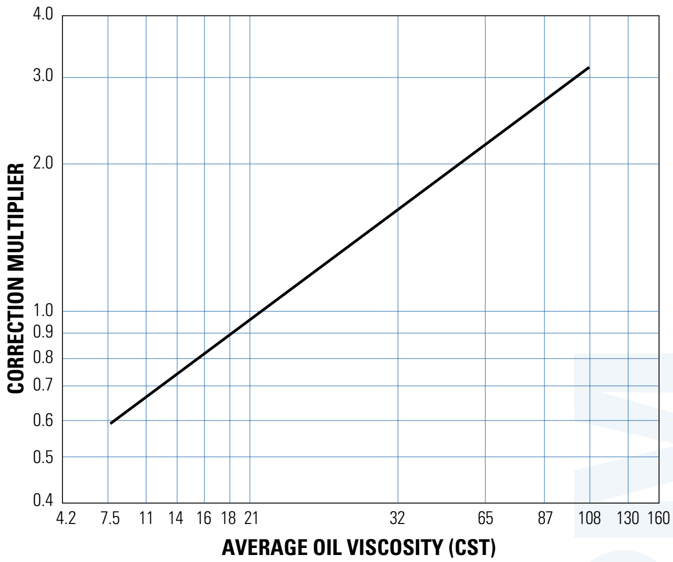


Curve	Model
1	BPM-12-12X5
2	BPM-24-12X5
3	BPM-36-12X5
4	BPM-70-12X5
5	BPM-24-20X10
6	BPM-50-20X10
7	BPM-80-20X10

Performance Correction



Pressure Drop Correction



Performance Curves are based on 21 CST oil at 22°C approach temperature (51°C oil leaving cooler, 29°C water entering cooler), 2:1 oil: water ratio (1 LPM water flow for each 2 LPM oil flow).

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

$$\text{KW heat load} \times \frac{22}{\text{Oil leaving cooler °C Minus water entering cooler °C}} \times \text{Performance Correction Multiplier} = \text{Curve KW Heat to be Removed}$$

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	43°C - 54°C
Hydrostatic Drive Oil	54°C - 82°C
Lube Oil Circuits	43°C - 54°C
Automatic Transmission Fluid	93°C - 149°C

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=KW/(LPM Oil Flow x .029).

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 1.4 to 2.1 BAR. Excessive pressure drop should be avoided. Care should be taken to limit pressure drop to .35 BAR or less for case drain applications where high back pressure may damage the pump shaft seals.

FLUID COOLING | Industrial RM Series

Features

- Mounts to Rear of Electric Motor – IEC Frame
- Utilizes Electric Motor Fan Air Flow
- Ideal for Case Drain Applications
- Compact, Efficient Design
- Low Flow & Heat Removal
- Mounts Behind Existing TEFC Motor for Compact, Low Cost Application
- SAE, NPT Also Available
- Mounting Brackets Included

Motor not included.

Ratings

Maximum Pressure 21 BAR

Maximum Temperature 177°C

Materials

Tubes Copper

Fins Aluminum

Turbulators Aluminum

Cabinet Steel with baked enamel finish

Filter Stainless frame with washable media

Manifolds RM-08: Copper
RM-19 & RM-24: Steel

Connections RM-08: Brass
RM-19 & RM-24: Steel

Nameplate Aluminum

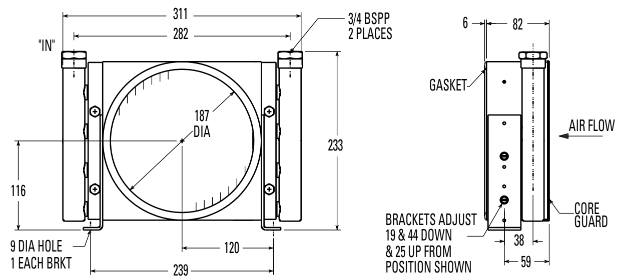
How to Order - RM-08 Models Only

RM	–	0	8	–		
Model Series		**Model Size Selected**			**Number of Passes** **1** - 1 Pass **2** - 2 Pass **4** - 4 Pass	**Connection Type** **3** - BSPP

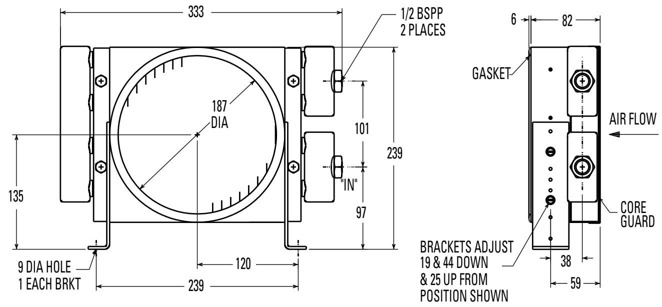
How to Order - all models except RM-08 Size

RM	–			–		
Model Series		**Model Size Selected**			**Number of Passes** **1** - 1 Pass **2** - 2 Pass	**Connection Type** **3** - BSPP

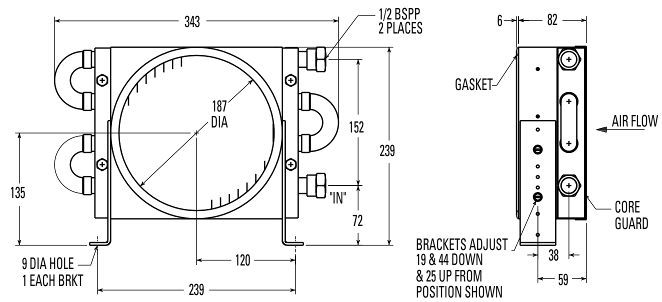
RM-08-1
One Pass

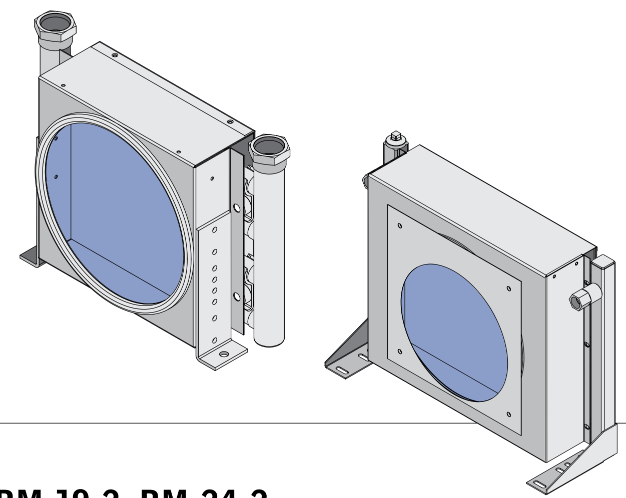


RM-08-2
Two Pass

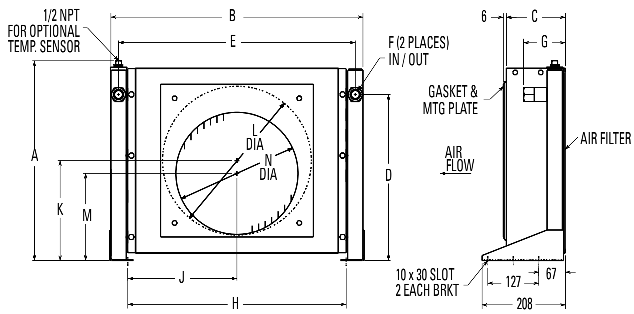


RM-08-4
Four Pass

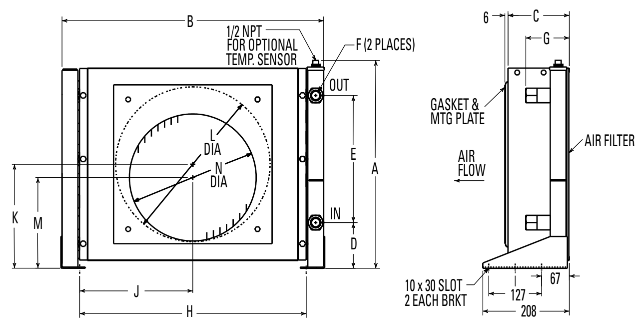




RM-19-1, RM-24-1
One Pass



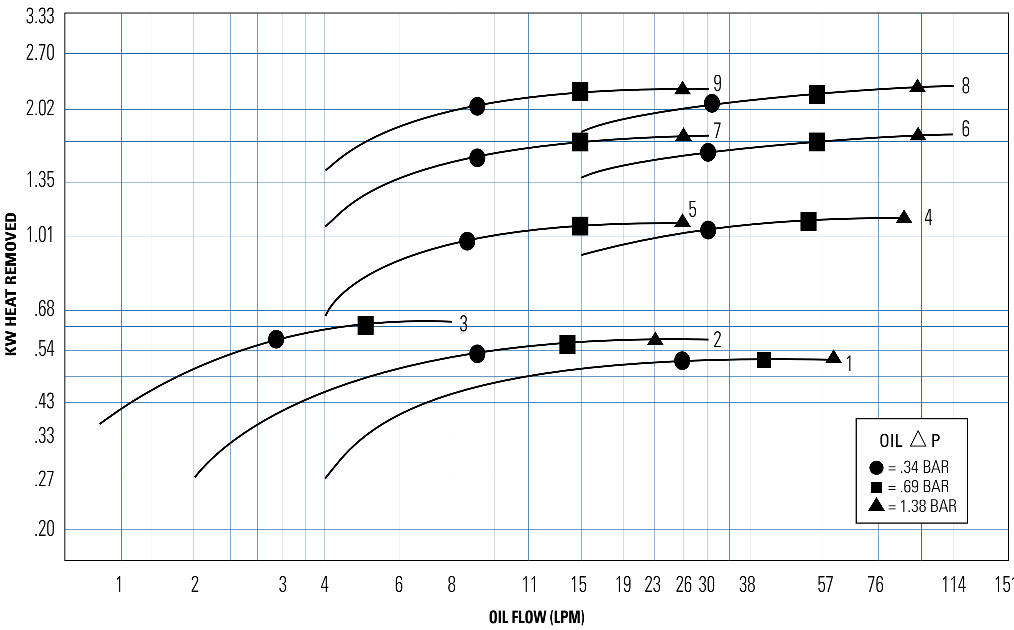
RM-19-2, RM-24-2
Two Pass



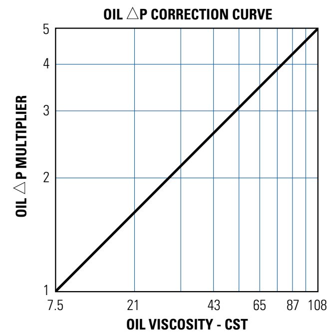
Model	A	B	C	D	E	F BSPP	G	H	J	K	L	M	N	Weight Kg
RM-19-1	346	419	130	262	381	3/4"	105	375	187	173	264	148	191	7
RM-19-2	346	419	130	109	152	3/4"	105	375	187	173	264	148	191	7
RM-24-1	498	629	149	414	591	3/4"	105	545	272	249	371	217	305	31
RM-24-2	498	629	149	109	305	3/4"	105	545	272	249	371	217	305	31

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

Performance Curves



Curve	Model	IEC Motor Frame Sizes
1	RM-08-1	71-112
2	RM-08-2	71-112
3	RM-08-4	71-112
4	RM-19-1	132-160
5	RM-19-2	132-160
6	RM-24-1	160-180
7	RM-24-2	160-180
8	RM-24-1	200-225
9	RM-24-2	200-225



Selection Procedure

Performance Curves are based on 8 CST oil leaving the cooler 20°C higher than the ambient air temperature used for cooling and 1500 RPM motor speed. This is also referred to as a 22°C 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 KW. (Example: 100 KW Power Unit x .33 = 33 KW Heat load. For 1200 RPM motors, multiply Heat Load by 1.5.)

If HP is known: KW = HP x .746

STEP 2 **Determine Approach Temperature.**

Desired oil leaving cooler °C – Ambient air temp. °C = Actual Approach

STEP 3 **Determine Curve KW Heat Load.** Enter the information from above:

$$\text{KW heat load} \times \frac{22 \times Cv}{\text{Actual Approach}} = \text{Curve KW}$$

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

STEP 5 **Determine Oil Pressure Drop from Curves:** ● = .35 BAR; ■ = .69 BAR; ▲ = 1.38 BAR. 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 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=KW/(LPM Oil Flow x .029).

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 1.4 to 2.1 BAR. Excessive pressure drop should be avoided. Care should be taken to limit pressure drop to .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:

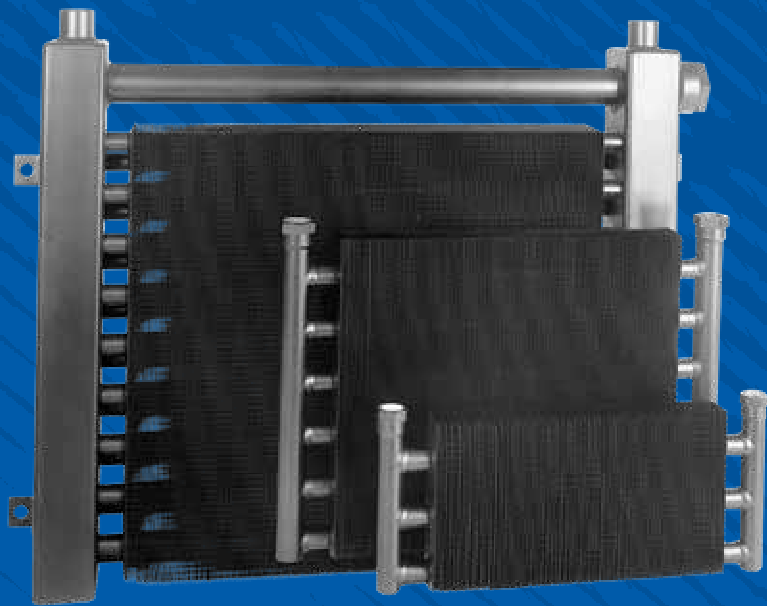
Hydraulic Motor Oil	43°C - 54°C
Hydrostatic Drive Oil	54°C - 82°C
Lube Oil Circuits	43°C - 54°C
Automatic Transmission Fluid	93°C - 149°C

C_V Viscosity Correction

	OIL				
Average Oil Temp °C	**ISO22** 22 CST at 38°C 4.3 CST at 99°C	**ISO32** 32 CST at 38°C 5.2 CST at 99°C	**ISO46** 46 CST at 38°C 7.5 CST at 99°C	**ISO100** 100 CST at 38°C 12 CST at 99°C	**ISO150** 150 CST at 38°C 15 CST at 99°C
37.7	1.14	1.22	1.35	1.58	1.77
65.6	1.01	1.05	1.11	1.21	1.31
93.3	.99	1.00	1.01	1.08	1.10
121.1	.95	.98	.99	1.00	1.00

Features

- **Excellent for Radiator Face Mount Cooling**
- **19mm 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 40 LPM, Heat Removal to 51.3 KW
- Oil Cooler
- Transmission Cooler
- Fuel Cooler



OPTIONS

Built-in Relief Bypass

Steel Components

Custom Sizes/Mounting Brackets

Connection Sizes/ Locations

Ratings

Maximum Pressure 20.6 BAR

Maximum Temperature 177°C

Materials

Tubes Copper

Fins Aluminum
Optional: 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 2.1 BAR or 4.1 BAR settings. Bypass valve is built into tubes and does not effect external dimensions. All steel valves. Not serviceable.
DH-513	Available in either 2.1 BAR or 4.1 BAR settings. 19mm, external all steel valve. May be removed for servicing.
DH-524 thru DH-670	Available in either 2.1 BAR or 4.1 BAR settings. 38mm, external, all steel valve. May be removed for servicing.

How to Order

[ ] – [ ][ ][ ] – [ ] – [ ] – [ ]

Model Series	Model Size Selected	Connection Type*	Fin Material	Relief Bypass
DH **DHR** - Relief Bypass Included		**3** - BSPP	**1** - Aluminum **2** - Steel	**Blank** - No Bypass **30** - 2.1 BAR **60** - 4.1 BAR

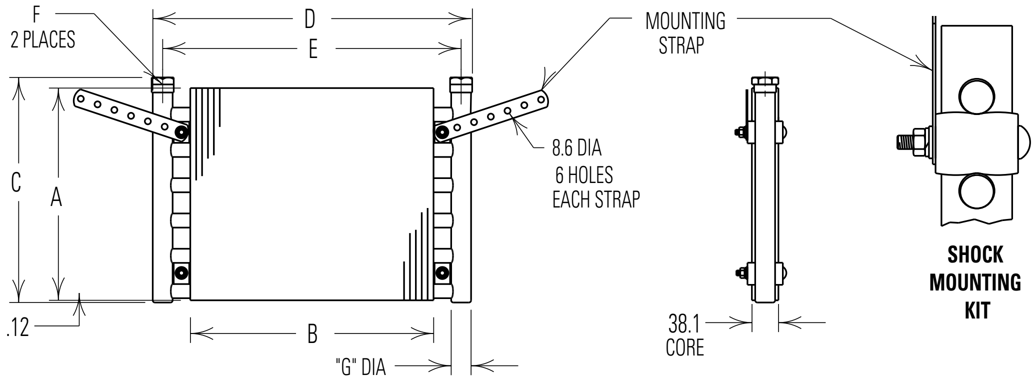
ADD FOR DHR MODELS ONLY (Relief Bypass)

Examples: DH-051-3-1 or DHR-062-3-2-30

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.

DH-051 thru DH-447



Mounting Kits

Optional Mounting Kits are available with or without straps.

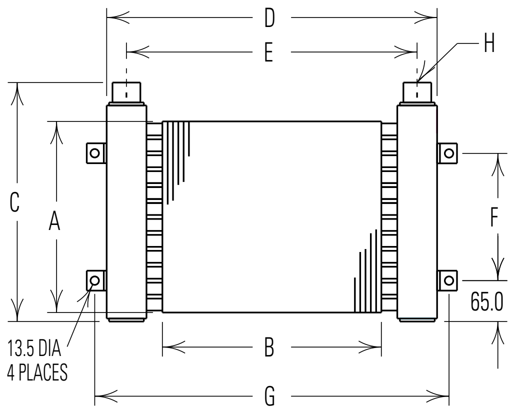
	Part Number
With strap	L-84741
Without strap	L-84740

Model	A	B	C	D	E	F BSPP	G Dia.	Qty MTG Kits	Face Area Sq Meters	Weight Kg
DH-051	102	286	114	381	359	1/2"	0.88	2	.03	1
DH-062	152	286	165	381	359	1/2"	0.88	4	.04	2
DH-073	152	362	165	457	435	1/2"	0.88	4	.06	2
DH-084	152	514	165	610	587	1/2"	0.88	4	.08	2
DH-095	203	362	216	457	435	1/2"	0.88	4	.07	2
DH-106	203	438	216	533	511	1/2"	0.88	4	.09	2
DH-117	203	514	216	610	587	1/2"	0.88	4	.10	2
DH-194	305	349	323	457	429	3/4"	1.12	4	.11	3
DH-205	305	425	323	533	505	3/4"	1.12	4	.13	3
DH-216	305	502	323	610	581	3/4"	1.12	4	.15	4
DH-227	356	502	374	610	581	3/4"	1.12	4	.18	4
DH-249	457	502	476	610	581	3/4"	1.12	6	.23	5
DH-326	610	489	635	610	575	1"	1.38	8	.30	8
DH-337	610	641	635	762	727	1"	1.38	8	.39	9
DH-348	762	489	635	610	575	1"	1.38	8	.37	9
DH-359	762	641	787	762	727	1"	1.38	8	.49	11
DH-370	762	794	787	914	879	1"	1.38	8	.61	13
DH-425	914	629	950	762	721	1-1/4"	1.62	8	.58	15
DH-447	1016	933	1052	1067	1026	1-1/4"	1.62	8	.95	20

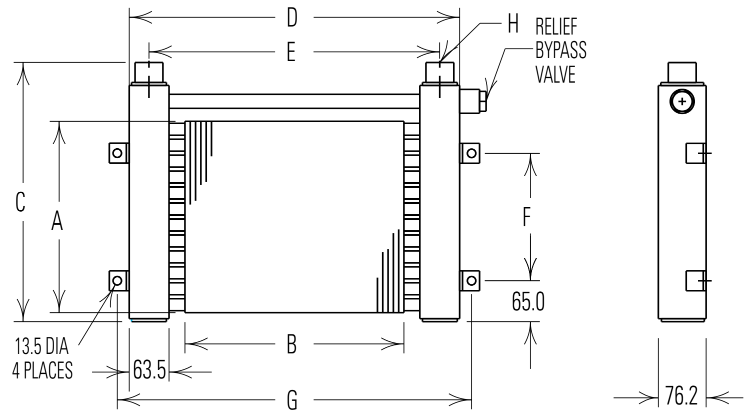
All dimensions are in millimeters, unless noted otherwise. *Weights are for aluminum fins.*
After making your base model selection with the connection of your choice, please refer to the How to Order section.
Note: We reserve the right to make reasonable design changes without notice.

DH-513 thru DH-670

DH Series



DHR Series



Model	A	B	C		D		E	F	G	H	Face Area	Weight
			DH	DHR	DH	DHR				BSPP	Sq Meters	Kg
DH-513	305	349	381	413	527	569	464	203	565	3/4″	.11	7
DH-524	457	502	533	591	680	715	616	356	718	3/4″	.23	12
DH-535	610	489	686	743	680	702	603	508	705	1″	.30	24
DH-626	914	578	991	1045	756	791	692	813	794	2″	.53	27
DH-670	1016	883	1093	1150	1061	1096	997	914	1099	2″	.90	52

All dimensions are in millimeters, unless noted otherwise. *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.

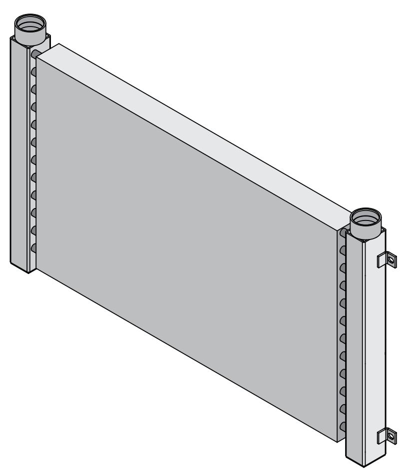
Off-Line Recirculation Cooling Loop: Desired temperature is the oil temperature entering the cooler. In this case, the oil temperature change must be determined so that the actual oil leaving temperature can be found.
Calculate the oil temperature change (Oil $\triangle$T) with this formula:
Oil $\triangle$T = (KW/HR) / (LPM Oil Flow x .029).
To calculate the oil leaving temperature from the cooler, use this formula:
Oil Leaving Temp. = Oil Entering Temp – Oil $\triangle$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 1.4 to 2.1 BAR. Excessive pressure drop should be avoided. Care should be taken to limit pressure drop to .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:

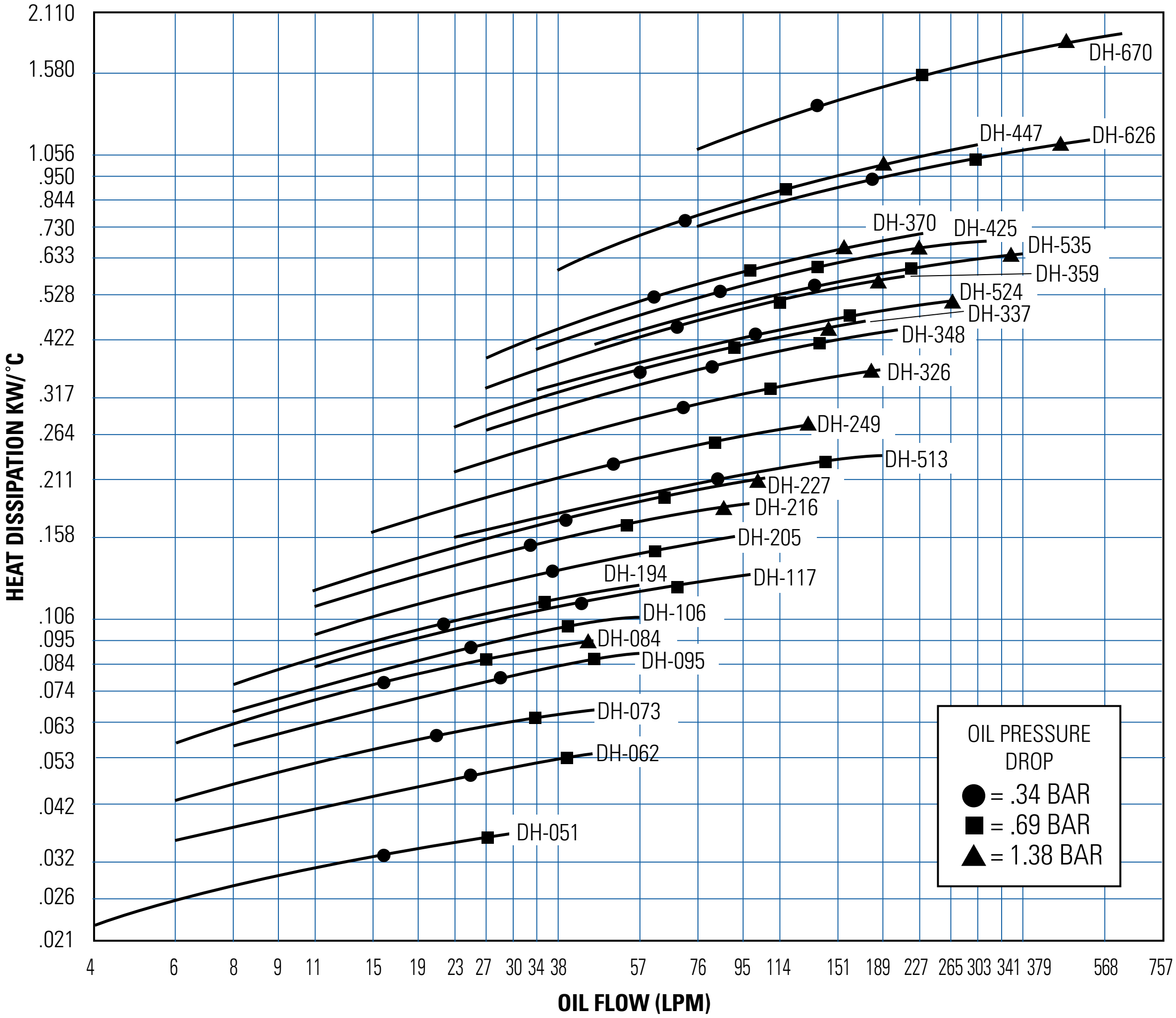
Hydraulic Motor Oil	43°C - 54°C
Hydrostatic Drive Oil	54°C - 82°C
Bearing Lube Oil	43°C - 54°C
Lube Oil Circuits	93°C - 149°C



Typical Oil Viscosity, CST

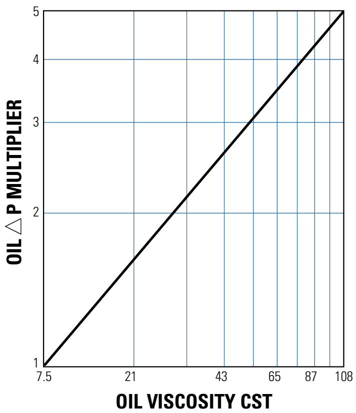
Oil Temp °C	ISO22	ISO32	ISO46	ISO68	ISO150
38	22	32	46	68	150
66	11	14	21	28	30
99	4.3	5.2	7.5	12	15

Performance Curves

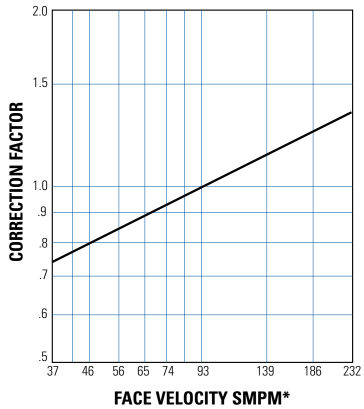


Note: Steel fins derate performance by 10%

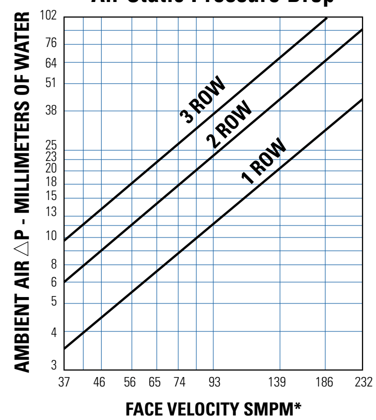
Oil △ P Correction Curve



Air Velocity Correction Curve



Air Static Pressure Drop



**SMPM = Standard Meters Per Minute*

Selection Procedure

Step 1 **Determine Heat Load.** Typical Rule of Thumb, size cooler for 1/3 of the input KW.

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.**

Calculate actual SMPM Air Velocity or SCMM (Standard Cubic Meter per Minute) for selection.

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

(SCMM Air Flow = SMPM Air Velocity x Square Meter Cooler Face Area)

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

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

Step 5 **Select Model From Curves.** Enter the Performance Curves at the bottom with the LPM 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:

- 11 cSt oil
- 304.8 Standard Meters per Minute (SMPM) Air Velocity

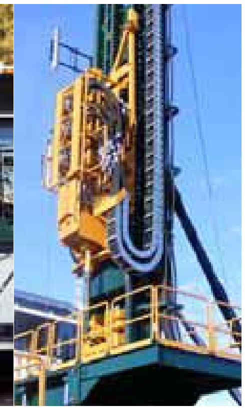
If your application conditions are different, then continue with the selection procedure.

C_V Viscosity Correction

	OIL				
Average Oil Temp °C	**ISO22** 22 CST at 38°C 4.3 CST at 99°C	**ISO32** 32 CST at 38°C 5.2 CST at 99°C	**ISO46** 46 CST at 38°C 7.5 CST at 99°C	**ISO100** 100 CST at 38°C 12 CST at 99°C	**ISO150** 150 CST at 38°C 15 CST at 99°C
38	1.14	1.22	1.35	1.58	1.77
66	1.01	1.05	1.11	1.21	1.31
93	.99	1.00	1.01	1.08	1.10
121	.95	.98	.99	1.00	1.00





EURO SERIES

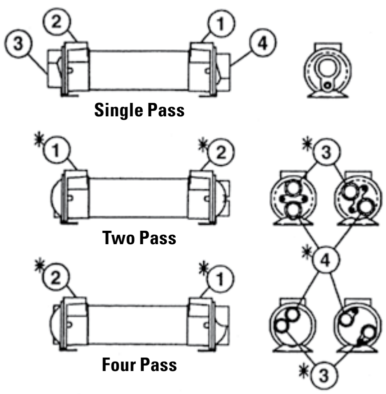
Water or Air Cooled Oil Coolers
for Fluid Power Applications

EKM ECM EKTM CM & SSCM AM BPM RM DH

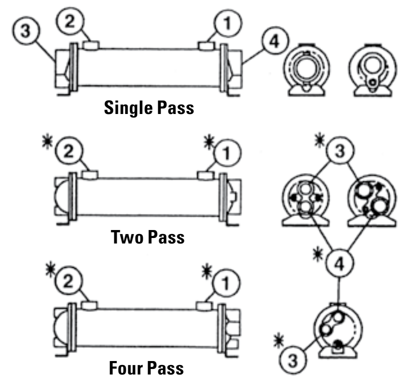
INSTALLATION & SERVICE REFERENCE

Heat Exchanger Piping Hook-up

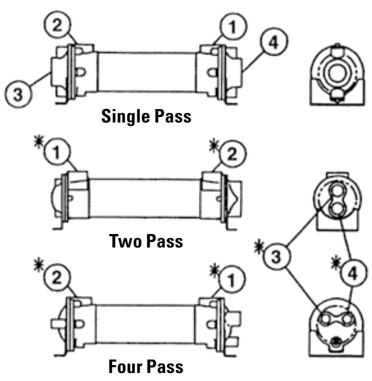
AM Series



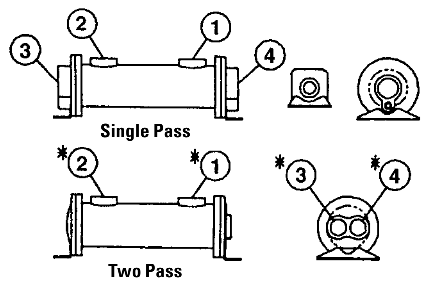
CM Series



ECFM Series



EKFM & EKTM Series



(1) **Hot Fluid In**

(2) **Cooled Fluid Out**

(3) **Cooling Water In**

(4) **Cooling Water Out**

*Note: For all two pass and four pass heat exchangers: connections (1) and (2) may be reversed, and connections (3) and (4) may be reversed with no effect on performance.

Shell & Tube Heat Exchanger Installation & Service Recommendations

Installation The satisfactory use of this heat exchange equipment is dependent upon precautions which must be taken at the time of the installation.

1. Connect and circulate the hot fluid in the shell side (over small tubes) and the cooling water in the tube side (inside small tubes). Note piping diagrams.
2. If an automatic water regulating valve is used, place it on the INLET connection of the cooler. Arrange the water outlet piping so that the exchanger remains flooded with water, but at little or no pressure. The temperature probe is placed in the hydraulic reservoir to sense a system temperature rise. Write the factory for water regulating valve recommendations.
3. There are normally no restrictions as to how this cooler may be mounted. The only limitation regarding the mounting of this equipment is the possibility of having to drain either the water or the oil chambers after the cooler has been installed. Both fluid drain plugs should be located on the bottom of the cooler to accomplish the draining of the fluids. Drains are on most models.
4. It is possible to protect your cooler from high flow and pressure surges of hot fluid by installing a fast-acting relief valve in the inlet line to the cooler
5. It is recommended that water strainers be installed ahead of this cooler when the source of cooling water is from other than a municipal water supply. Dirt and debris can plug the water passages very quickly, rendering the cooler ineffective. Write the factory for water strainer recommendations
6. Fixed bundle heat exchangers are generally not recommended for steam service. For steam applications, a floating bundle exchanger is required. Note: When installing floating bundle unit, secure one end firmly and opposite end loosely to allow bundle to expand and contract. Consult factory for selection assistance.
7. Piping must be properly supported to prevent excess strain on the heat exchanger ports. If excessive vibration is present, the use of shock absorbing mounts and flexible connectors is recommended.

Service Each heat exchanger has been cleaned at the factory and should not require further treatment. It may be well to inspect the unit to be sure that dirt or foreign matter has not entered the unit during shipment. The heat exchanger should be mounted firmly in place with pipe connections tight.

Caution If sealant tape is used on pipe threads, the degree of resistance between mating parts is less, and there is a greater chance for cracking the heat exchanger castings. Do not overtighten. When storing the unit, be sure to keep the oil and water ports sealed. If storage continues into cold winter months, the water chamber must be drained to prevent damage by freezing.

Performance information should be noted and recorded on newly installed units so that any reduction in effectiveness can be detected. Any loss in efficiency can normally be traced to an accumulation of oil sludge, or water scale.

Recommendations Replace gaskets when removing end castings. It is recommended that gaskets be soaked in oil to prevent corrosion and ensure a tight seal.

Salt water should not be used in standard models. Use salt water in special models having 90/10 copper-nickel tubes, tube sheets*, bronze bonnets and zinc anodes on the tube side. Dirty/raw water or other corrosive fluids may require special materials of construction.

Anode When zinc anodes are used for a particular application, they should be inspected two weeks after initial startup.

At this time, by visual inspection of the anode, determination of future inspection intervals can be made, based on the actual corrosion rate of the zinc metal.

The zinc anodes must be replaced when 70% of the zinc volume has been consumed.

Cleaning The oil chamber of the exchanger may become filled with sludge accumulation and require cleaning. It is recommended that the unit be flooded with a commercial solvent and left to soak for one-half hour. Backflowing with the solvent or regular oil will remove most sludge. Repeated soaking and backflowing may be required, depending on the degree of sludge buildup.

It may be necessary to clean the inside of the cooling tubes to remove any contamination and/or scale buildup. It is recommended that a fifty-fifty percent solution of inhibited muriatic acid and water may be used. For severe problems, the use of a brush through the tubes may be of some help. Be sure to use a soft bristled brush to prevent scouring the tube surface causing accelerated corrosion. Upon completion of cleaning, be certain that all chemicals are removed from the shellside and the tubeside before the heat exchanger is placed into service.

When ordering replacement parts or making an inquiry regarding service, mention model number, serial number, and the original purchase order number.

It may be necessary to drain the water chambers of the exchanger to protect it from damage by freezing temperatures. Drains are provided in most standard models.

**Available on CM Series models only.*

Maximum Shell & Tube Flow Rates

CAUTION Incorrect installation can cause this product to fail prematurely, causing the shell side and tube side fluids to intermix. Maximum allowable flow rates are as charted below.

AM Series Model No. Example: AM-1024-2-6-F

Unit Size	Baffle Spacing	Shell Side (LPM)	Tube Side (LPM)		
			O	T	F
400	.75, 2	26, 72	68	—	—
600	1, 1.5, 2, 4	53, 80, 110, 110	182	91	46
800	1.5, 2, 3, 4	110, 144, 216, 261	329	163	80
1000	1.5, 2, 3, 4	121, 159, 227, 261	553	276	140
1200	2, 3, 4, 6	193, 292, 390, 435	848	424	212
1600	2, 3, 4, 6	250, 379, 504, 757	1060	769	382

CM Series Model No. Example: CM-1024-2-6-F

Unit Size	Baffle Size	Shell Side (LPM)	Tube Side (LPM)		
			O	T	F
600	1.38, 2, 3	72, 110, 110	182	91	45
800	1.38, 1.7, 2, 3, 4	98, 121, 144, 216, 261	318	159	80
1000	1.38, 2, 3, 5	91, 155, 242, 261	553	87	140
1200	2.5, 3, 3.62, 5, 6	227, 292, 352, 435, 435	848	424	212
1700	3.5, 4, 4.5, 5, 6, 7, 8.4	473, 541, 610, 678, 814, 950, 958	1760	878	439

ECM Series Model No. Example: ECM-1236-6-F

Unit Size	Baffle Size	Shell Side (LPM)	Tube Side (LPM)		
			O	T	F
1000	4, 6, 8	208, 265, 265	250	125	57
1200	4, 6, 8, 12	246, 379, 435, 435	454	227	106
1700	4, 6, 8, 12	341, 530, 719, 965	833	416	197

EKM Series Model No. Example: EKM-712-F

Unit Size	Shell Side (LPM)	Tube Side (LPM)		
		O	T	F
500	76	49	23	—
700	265	91	46	23
1000	379	212	106	53

Brazed Plate — BPM Series

Liquid To Liquid Service

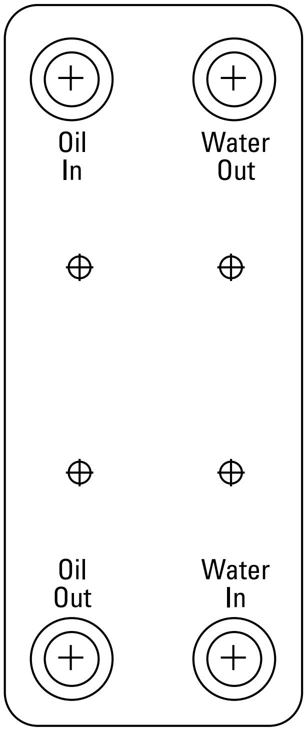
Installation Units may be mounted in any orientation. The only limitation regarding the mounting of this equipment is the possibility of having to drain the unit after installation. It may be necessary to drain the fluids to protect the unit from damage by freezing temperatures.

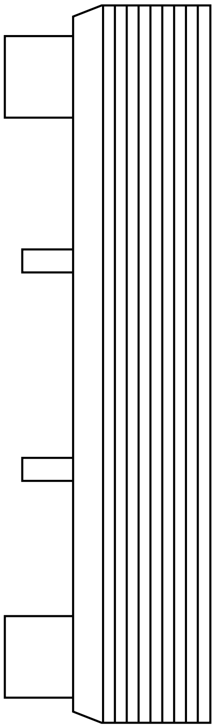
Water Strainer A water strainer should be installed in the water inlet to protect the unit from particulate matter. 16-20 mesh minimum (20-40 mesh best choice).

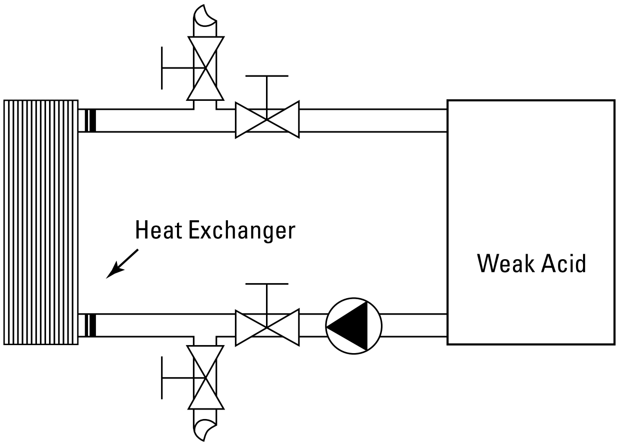
Piping Piping must be properly supported to prevent excess strain on the heat exchanger ports. Type 304 Stainless steel is typically not satisfactory for salt water service.

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.

BPM Series







Cleaning in place

RM Series

Unpacking Instructions

Read carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. Failure to comply with instructions could result in personal injury and/or property damage! Retain instructions for future reference.

Description RM series forced air oil coolers are used for high-efficiency oil cooling in hydraulic systems. Units utilize the latest in heat transfer technology to reduce the physical size and provide the ultimate in cooling capacity. By maintaining a lower oil temperature, hydraulic components and fluids work better and have a longer life expectancy.

General Safety Information

1. Do not exceed the pressure rating of the oil cooler, nor any other component in the hydraulic system.
2. Do not exceed the published maximum flow rates as the potential can result in damage to the hydraulic system.
3. Release all oil pressure from the system before installing or servicing the oil cooler.
4. These oil coolers are not suitable for use in hydraulic systems operating with water-glycol or high water base fluids without a corrosion inhibitor suitable for aluminum and copper component protection.

Unpacking After unpacking the unit. inspect for any loose, missing or damaged parts. Any minor damage to the cooling fins can generally be corrected by gently straightening them.

WARNING Do not exceed the maximum pressure of 21 BAR, or the maximum temperature of 178°C as oil cooler failure can occur.

1. These hydraulic oil coolers should be installed on either the low pressure return line, or a dedicated recirculation cooling loop.
2. Turn off the hydraulic system and drain any oil from the return lines before installing these coolers.
3. A strainer located ahead of the cooler inlet should be installed to trap scale, dirt, or sludge that may be present in piping and equipment, or that may accumulate with use. A thermostatic or spring loaded bypass/relief valve installed ahead of the cooler may be helpful to speed warm-up and relieve the system of excessive pressures.

   CAUTION
   Use of a back-up wrench is recommended to prevent twisting of the manifolds when installing the oil piping.

   If pipe sealant is used on threads, the degree of resistance between mating parts is less, and there is an increased chance for cracking the heat exchanger fittings. Do not over tighten.

4. Piping must be properly supported to prevent excess strain on the heat exchanger ports.

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

Heat Transfer Surfaces Dirt and dust should be removed by brushing the fins and tubes and blowing loose dirt off with compressed air. Should the surface be greasy, the cooler should be brushed or sprayed with a mild alkaline solution, or a non-flammable degreasing fluid. Follow with hot water rinse and dry thoroughly. A steam cleaner may also be used effectively. Do not use caustic cleaners.

Casing Dirt and grease should be removed. Rusty or corroded surfaces should be sanded clean and repainted.

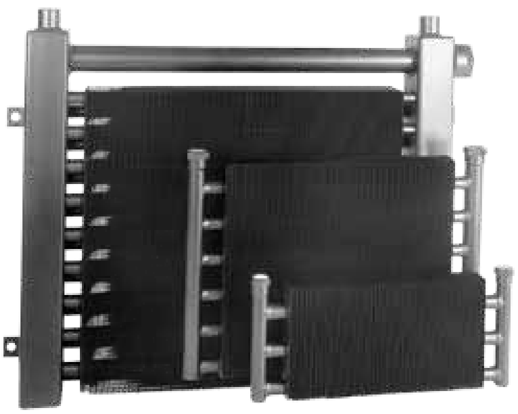
Internal Cleaning At least once a year piping should be disconnected and decreasing agent or flushing oil circulated through the unit to remove sludge form turbulators and internal tube surfaces to return the unit to full thermal capacity. A thorough cleaning of the entire system in the same manner is preferable to avoid carry-over from uncleaned piping, pumps and accessories. The strained or any filtering devices should be removed and serviced following this cleaning operation.

Trouble Shooting Chart

Symptom	Possible Cause	Corrective Action
Not cooling adequately	1. Not enough air flow 2. Unit is fouled 3. Unit is undersized	1. Consult specifications and adjust if required 2. Clean exchanger (see maintenance) 3. Check specifications and change size if necessary
Leaking at connections	1. Not tight 2. No thread sealant	1. Tighten carefully 2. Remove pipe, apply thread sealant and reinstall

DH Series

Read carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. Failure to comply with instructions could result in personal injury and/or property damage! Retain instructions for future reference.



Description DH series mobile oil coolers are used for high-efficiency oil cooling in hydraulic systems. Units utilize the latest in heat transfer technology to reduce the physical size and provide the ultimate in cooling capacity. By maintaining a lower oil temperature, hydraulic components and fluids work better and have a longer life expectancy.

General Safety Information

1. Do not exceed the pressure rating of the oil cooler, nor any other component in the hydraulic system.
2. Do not exceed the published maximum flow rates as the potential can result in damage to the hydraulic system.
3. Release all oil pressure from the system before installing or servicing the oil cooler.
4. These oil coolers are not suitable for use in hydraulic systems operating with water-glycol or high water base fluids without a corrosion inhibitor suitable for aluminum and copper component protection.

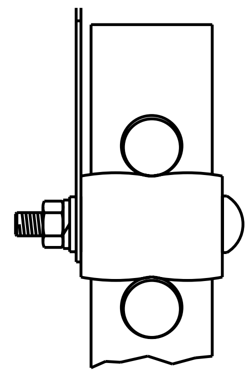
Unpacking After unpacking the unit. inspect for any loose, missing or damaged parts. Any minor damage to the cooling fins can generally be corrected by gently straightening them.

Installation

WARNING Do not exceed the maximum pressure of 21 BAR, or the maximum temperature of 177°C as oil cooler failure can occur.

1. These hydraulic oil coolers should be installed on either the low pressure return line, or a dedicated recirculation cooling loop.
2. Turn off the hydraulic system and drain any oil from the return lines before installing these coolers.
3. Installation of a fast acting relief/bypass valve is recommended to protect the oil cooler from excessive pressure and/or oil flow rates.
4. These coolers are normally installed in front of the engine radiator to obtain the coolest possible air flow.
5. There are no restrictions as to how the unit may be mounted; however, the unit must be flooded with oil to obtain the full cooling potential.
6. Mount the unit with the brackets (optional) by installing them between any two adjacent exchanger tubes. Use the most convenient tubes for your specific location. See figure 1 below for details.

Figure 1
Shock Mounting Kit
(brackets are optional)



CAUTION If pipe sealant is used on threads, the degree of resistance between mating parts is less, and there is an increased chance for cracking the heat exchanger fittings. Do not overtighten.

Operation Once unit is installed, the system may be operated normally. If the source of cooling air is other than the main engine fan, be sure that the fan is running.

Maintenance

1. Performance information should be noted on newly installed units so that any reduction in effectiveness can be detected.
2. Inspect the unit regularly for corrosion and dirty or clogged heat transfer surfaces. Dirt and dust can be removed by washing, brushing, or blowing out with compressed air. A steam cleaner is also effective in cleaning dirty or greasy surfaces. Do not use caustic cleaners.
3. The oil chamber may become filled with sludge accumulation and require cleaning. It is recommended that the unit be flooded with a commercial solvent, and left to soak for one-half hour. Repeated soakings and back flowing may be required, depending on the amount of sludge accumulated.

Trouble Shooting Chart

Symptom	Possible Cause	Corrective Action
Not cooling adequately	1. Not enough air flow 2. Unit is fouled 3. Unit is undersized	1. Consult specifications and adjust if required 2. Clean exchanger (see maintenance) 3. Check specifications and change size if necessary

Conversion and Formula Summary

There are many conversions and formulas used in selecting oil coolers. This will be a brief summary of those most commonly used.

Conversions

A. HP = (BTU's/hr) / 2545 = (BTU's/min) / 42.4 = KW/.746,
or BTU's/hr = HP x 2545; BTU's/min = HP x 42.4; KW = HP x .746

B. GPM = (L/min) / 3.78 or L/min = GPM x 3.78

C. °F = (1.8 x °C) + 32 or °C = (°F - 32) / 1.8

D. Mobile Series: Air Velocity SFPM = SCFM/Face Area in Ft^2,
or SCFM = Ft^2 Face Area x Face Velocity SFPM

Methods to Determine Heat Loads

A. Hydraulic oil cooling: Assume 30% of the input KW will be rejected to heat. If the input KW is unknown, this formula may be used: KW = System BAR x LPM Flow x .002 x .3

B. Hydrostatic oil cooling: Assume 25% of the input KW will be rejected to heat.

C. Automatic transmission: Assume 30% of the engine KW will be rejected to heat.

D. Engine oil cooling: Assume 10% of the engine KW will be rejected to heat.

Heat Loads

A. KW = (Input KW) x (.25 — .5)

B. KW = (System LPM Capacity) x (System BAR Pressure) x (.002) x (.25 — .5)

C. KW = (BAR Pressure Drop) x (LPM Oil Flow) x (.002) x (% Time)

D. KW = (KW to Gearbox) x (.05 — .5)

E. KW = (Compressor KW) x (1.1) x (.85)

F. KW = (Max Temp. Rise °C/hr) x (Liters of Oil Changing Temp.) x (.00049)

G. KW = (LPM Oil Flow) x (Oil $\triangle$°C) x (.029)

Conversions

°F = (1.8 x °C) + 32

BAR = PSI ÷ 14.5

BTU/hr = Watts ÷ .2931

BTU/min = KW ÷ .01757

m^2 = mm^2 ÷ 1,000,000

m^2 = Ft^2 ÷ 10.76

GPM = LPM ÷ 3.78

HP = KW ÷ 0.746

in^2 = mm^2 ÷ 645.2

in^3 = Liters ÷ .01639

m^3 = gal ÷ 264.2

m^3 = Liters ÷ 1000

mm = 25.4 x inch

Temperature Changes

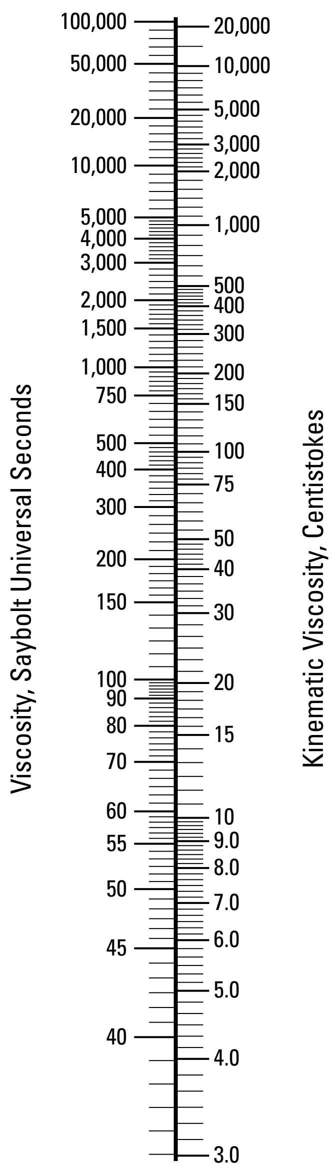
A. Oil $\triangle T^C$ = (KW) / (LPM Oil Flow x .029)

B. Water $\triangle T^C$ = (KW) / (LPM Water Flow x .070)

C. 50/50 Ethylene Glycol $\triangle T^C$ = (KW) / (LPM Flow x .060)

D. Air $\triangle T^C$ = (KW) / (SCFM Air Flow x .02)

Centistokes to Saybolt Universal Seconds Conversion





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