

# Fluid Cooling Shell & Tube K Series

## COPPER & STEEL CONSTRUCTION

### Performance Notes

- Modine interchange
- Finned tube bundle
- 3/16" tube size
- Use EK for new application
- Cast iron hubs
- Steel shell



**OPTION**  
SAE internal O-Ring ports shell side

### Ratings

#### K-500 & K-700 Series

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

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

**Test Pressure - Shell Side**  
550 PSI

**Test Pressure - Tube Side**  
225 PSI

**Maximum Operating Temperature**  
350°F

### Ratings

#### K-1000 Series

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

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

**Test Pressure - Shell Side**  
450 PSI

**Test Pressure - Tube Side**  
225 PSI

**Maximum Operating Temperature**  
350°F

### Materials

**Shell** Steel

**Tubes** Copper

**Baffles** Steel

**Mounting Brackets** Steel

**Gaskets** Nitrile rubber/cellulose fiber

**Fins** Aluminum

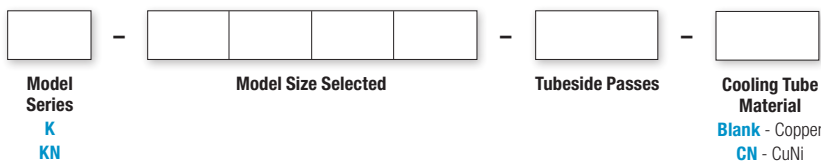
**End Hubs** Cast malleable iron

**End Bonnets** Cast iron

**Headers** Cast malleable iron

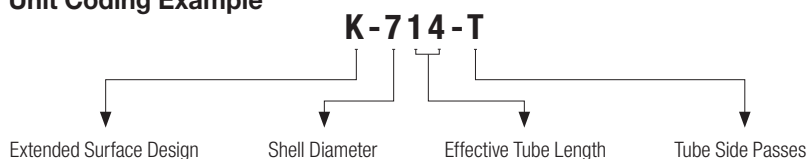
**Nameplate** Aluminum foil

## How to Order



"K" Prefix designates N.P.T. shell configurations. "KN" Prefix designates SAE internal thread O-ring shell connections.

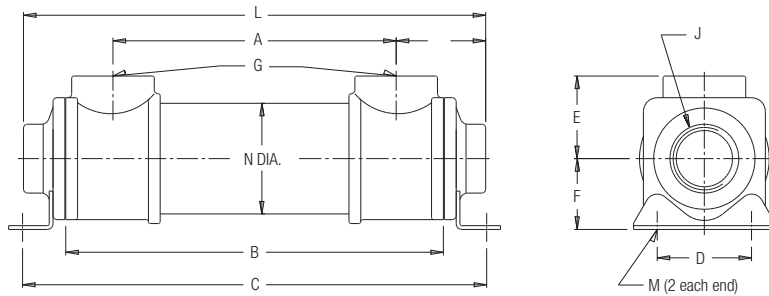
### Unit Coding Example



# Dimensions

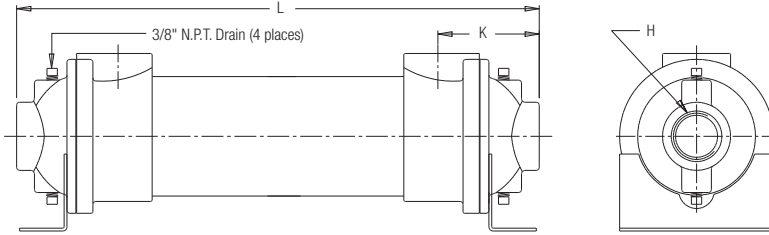
## One Pass

### K-500 & K-700 Series



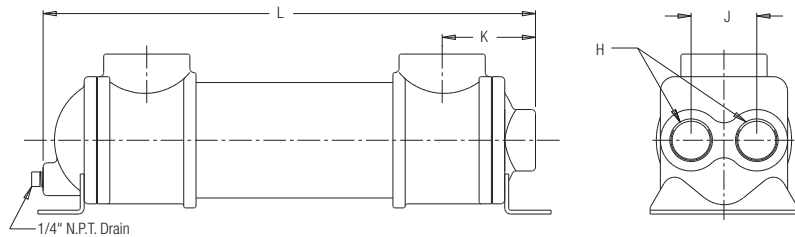
Model	L	H NPT	K
K-508-0	10.19	.75	2.22
K-512-0	14.19	.75	2.22
K-514-0	20.19	.75	2.22
K-708-0	10.69	1.25	2.87
K-712-0	14.69	1.25	2.87
K-714-0	16.69	1.25	2.87
K-718-0	20.69	1.25	2.87
K-1012-0	17.12	2.00	4.31
K-1014-0	19.12	2.00	4.31
K-1018-0	23.13	2.00	4.31
K-1024-0	29.12	2.00	4.31

## K-1000 Series



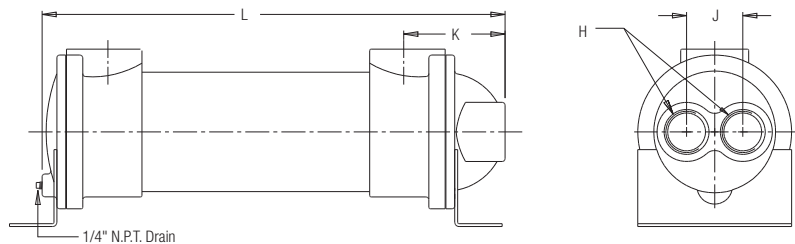
## Two Pass

### K-700 Series



Model	L	H NPT	J	K
K-708-T	10.69	1.00	2.00	2.87
K-712-T	14.69	1.00	2.00	2.87
K-714-T	16.69	1.00	2.00	2.87
K-718-T	20.69	1.00	2.00	2.87
K-1012-T	15.62	1.00	2.00	4.31
K-1014-T	17.62	1.50	2.38	4.31
K-1018-T	21.62	1.50	2.38	4.31
K-1024-T	27.62	1.50	2.38	4.31

## K-1000 Series



Model	A	B	C	D	E	F	G NPT	M	N DIA.	Weight (LBS)	G SAE (Optional)
K-508	5.75	8.00	10.25	2.50	1.88	1.62	.75	.34 X .50	2.50	7.75	#12 1-1/16 - 12 UN-2B
K-512	9.75	12.00	14.25	2.50	1.88	1.62	.75	.34 X .50	2.50	8.76	
K-514	11.75	14.00	16.25	2.50	1.88	1.62	.75	.34 X .50	2.50	9.12	
K-518	15.75	18.00	20.25	2.50	1.88	1.62	.75	.34 X .50	2.50	10.00	
K-708	5.00	8.00	10.75	3.00	2.62	2.25	1.50	.44 x .75	3.50	15.75	#24 1-7/8 - 12 UN-2B
K-712	9.00	12.00	14.75	3.00	2.62	2.25	1.50	.44 x .75	3.50	18.40	
K-714	11.00	14.00	16.75	3.00	2.62	2.25	1.50	.44 x .75	3.50	19.75	
K-718	15.00	18.00	20.75	3.00	2.62	2.25	1.50	.44 x .75	3.50	21.50	
K-1012	8.50	12.00	15.50	4.00	3.50	4.00	2.00	.44 x 1.00	5.00	42.50	#32 2-1/2 - 12 UN-2B
K-1014	10.50	14.00	17.50	4.00	3.50	4.00	2.00	.44 x 1.00	5.00	44.25	
K-1018	14.50	18.00	21.50	4.00	3.50	4.00	2.00	.44 x 1.00	5.00	49.00	
K-1024	20.50	24.00	27.50	4.00	3.50	4.00	2.00	.44 x 1.00	5.00	57.00	

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

# Selection Procedure

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

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

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

**STEP 2 Determine Approach Temperature.**

Desired oil leaving cooler °F - Water Inlet temp. °F =  $\frac{\text{Actual}}{\text{Approach}}$

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

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

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

**STEP 5 Determine Oil Pressure Drop from Curves.** Multiply pressure drop from curve by correction factor B found on oil viscosity correction curve.

● = 5 PSI   ■ = 10 PSI   ▲ = 20 PSI

## Oil Temperature

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

Typical operating temperature ranges are:

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

## Desired Reservoir Temperature

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

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

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

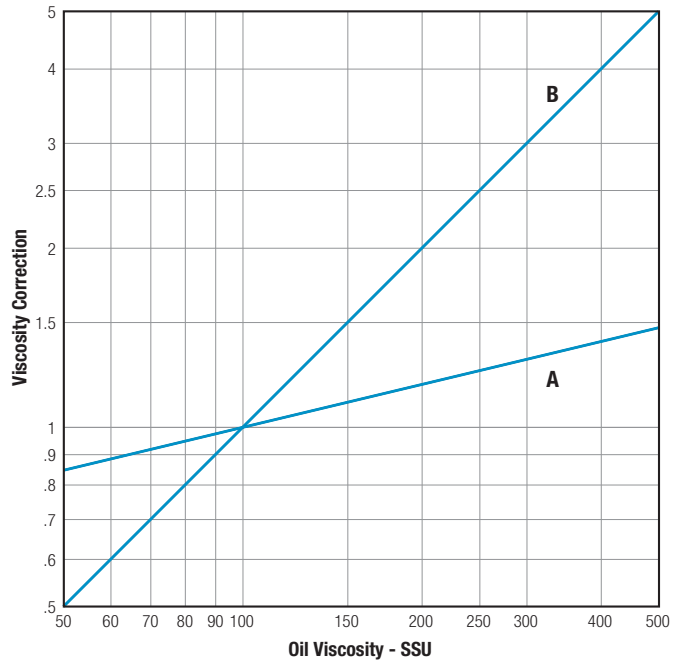
To calculate the oil leaving temperature from the cooler, use this formula:

Oil Leaving Temperature = Oil Entering Temperature - Oil  $\Delta T$ .

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

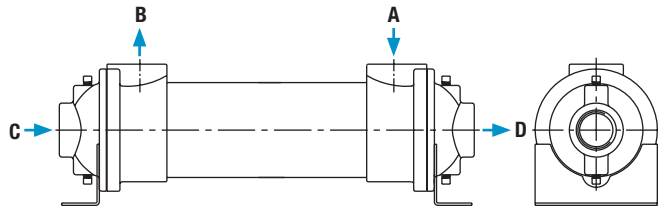
**Oil Pressure Drop:** Most systems can tolerate a pressure drop through the heat exchanger of 20 to 30 PSI. Excessive pressure drop should be avoided. Care should be taken to limit pressure drop to 5 PSI or less for case drain applications where high back pressure may damage the pump shaft seals.

## Oil Viscosity Correction Multipliers

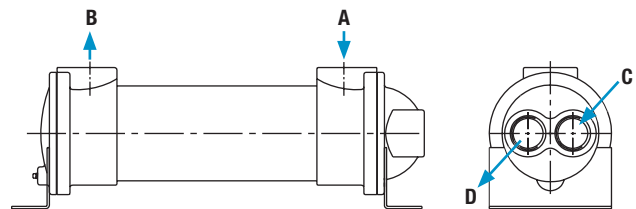


## Piping Diagram

### Single Pass Model



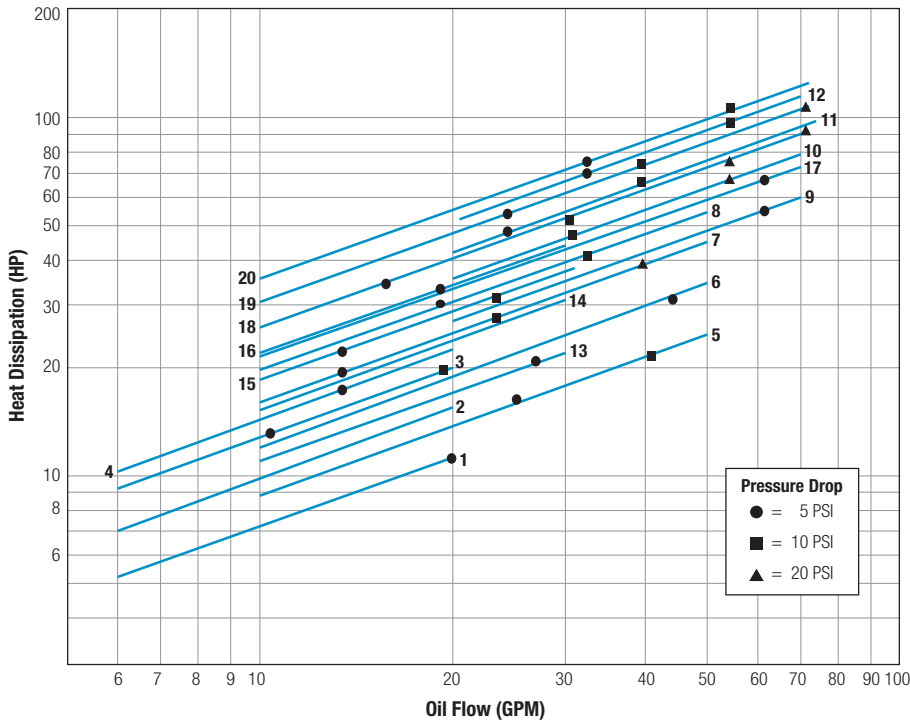
### Two Pass Model



- A = Hot fluid to be cooled
- B = Cooled fluid
- C = Cooling water in
- D = Cooling water out

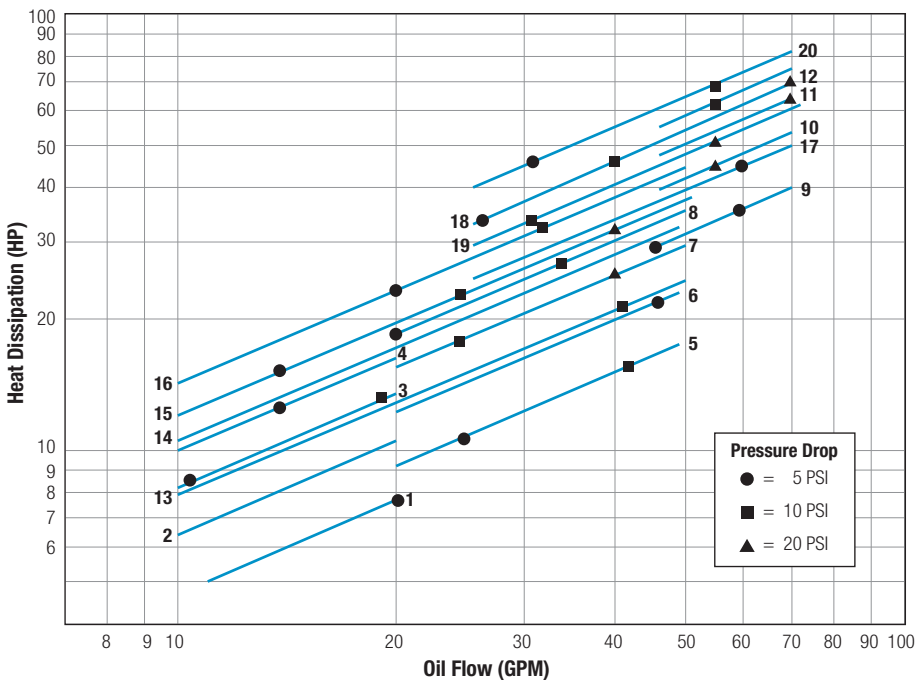
# Performance Curves

## 2 to 1 Oil to Water Ratio



Curve Number	Model
1	K-508-0
2	K-512-0
3	K-514-0
4	K-518-0
5	K-708-0
6	K-712-0
7	K-714-0
8	K-718-0
9	K-1012-0
10	K-1014-0
11	K-1018-0
12	K-1024-0
13	K-708-T
14	K-712-T
15	K-714-T
16	K-718-T
17	K-1012-T
18	K-1014-T
19	K-1018-T
20	K-1024-T

## 4 to 1 Oil to Water Ratio



## Maximum Flow Rates

Unit Size	Shell Side GPM	Tube Side	
		O	T
500	20	13	—
700	70	24	12
1000	100	56	28