# M Series - Mobile Air Cooled Copper Tube/Aluminum Fin Cores

The Mobile M Series heavy duty construction makes it one of the most rugged and robust heat exchangers in the Thermal Transfer Products family. It features high flows and high heat removal with an optional internal pressure bypass. The utilization of high/low turbulators allow for optimal heat rejection at lower flow rates. The design of this series is ideal for face-mounting to radiators.

Common applications include oil, fuel and transmission cooling.

TTP's XSelector sizing program can be used to help optimize the sizing of the cooler for better performance and value.

Option
Internal pressure bypass
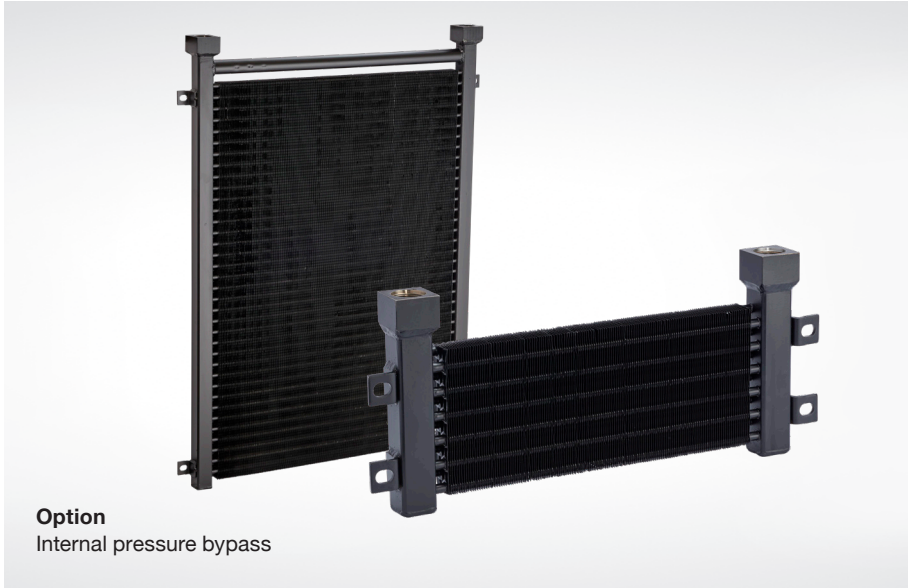
How to Order

Model Series

M
MR - Internal pressure bypass included

Model Size Selected

10, 15, 20, 25, 30, 35, 40, 45

Connection Type*

Blank - NPT
S - SAE

Bypass (MR only)

Blank - No Bypass
30 - 30 PSI
60 - 60 PSI

This is a partial flow pressure bypass only. It is not designed to be a full flow system bypass.

Features

High strength construction

Eliminate piping, reduce cost with optional internal pressure bypass

Mounting brackets included

Rugged steel manifolds

3/8" Copper tube

Aluminum fins

SAE, NPT connections

Materials

Tubes Copper

Fins Aluminum

Turbulators Steel

Manifolds Steel

Bypass Valve Steel

Connections Steel

Ratings

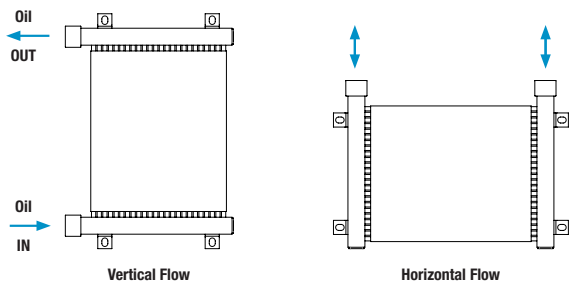**Maximum Operating Pressure**
300 PSI

Test Pressure
300 PSI

Maximum Operating Temperature
400°F

Heat removal
Up to 90,000 BTU/HR

Oil flows
Up to 100 GPM

Recommended Port Orientation

Oil OUT

Oil IN

Vertical Flow

Horizontal Flow

* To register for **XSelector** please go to **www.thermaltransfer.com/get-in-touch/** and complete the **XSelector** Inquiry form and submit.
  Download the **XSelector** for both Apple and Android formats by searching for **XSelector** in their App Stores. You must first register for **XSelector** before using it on mobile devices.
** For Salt Water applications a Zinc Anode needs to be plumbed in the water inlet of the cooler to prevent corrosion.

Selection Procedure

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

STEP 1 Determine Heat Load: Heat load may be expressed as either Horsepower or BTU/HR To convert Horsepower to BTU/Hr:
BTU/HR = Horsepower x 2545

STEP 2 Calculate entering temperature difference: The entering oil temperature is generally the maximum desired oil temperature.
ETD = Entering oil temperature - Ambient air temperature

STEP 3 Determine Air Velocity Correction Factor:
A. If SFPM (Standard Feet per Minute) air velocity is known, read value from curve above. A reasonable assumption for this value is 750 SFPM.

B. If SCFM (Standard Cubic Feet per Minute) air flow is known, calculate velocity as follows:

$$\text{SFPM Air Velocity} = \frac{\text{SCFM Air Flow}}{\text{Ft}^2 \text{ Face Area of Cooler}}$$

STEP 4 Calculate corrected heat load to enter curves:

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

STEP 5 Enter the Performance Curves at the bottom with the GPM oil flow and proceed upward to the adjusted heat load from Step 4. Any curve on or above this point will meet these conditions.

STEP 6 Multiply oil Pressure Drop from curve by correction factor found in Oil ⑨P Correction Curve.

Oil Pressure Correction

Oil △P Multiplier vs Oil Viscosity - SSU
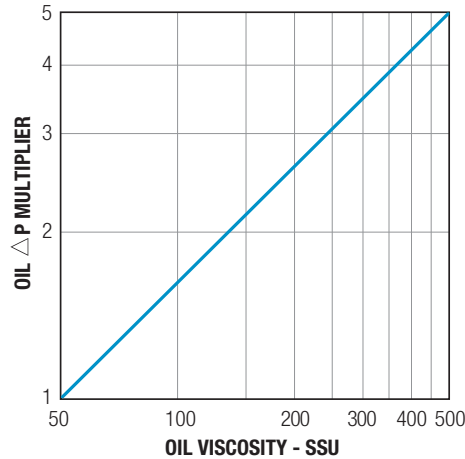
C$_V$ Viscosity Correction

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

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 ⑨T) with this formula:
Oil ⑨T = (BTU's/HR) / (GPM Oil Flow x 210).

To calculate the oil leaving temperature from the cooler, use this formula:
Oil Leaving Temp. = Oil Entering Temp – Oil ⑨T.

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

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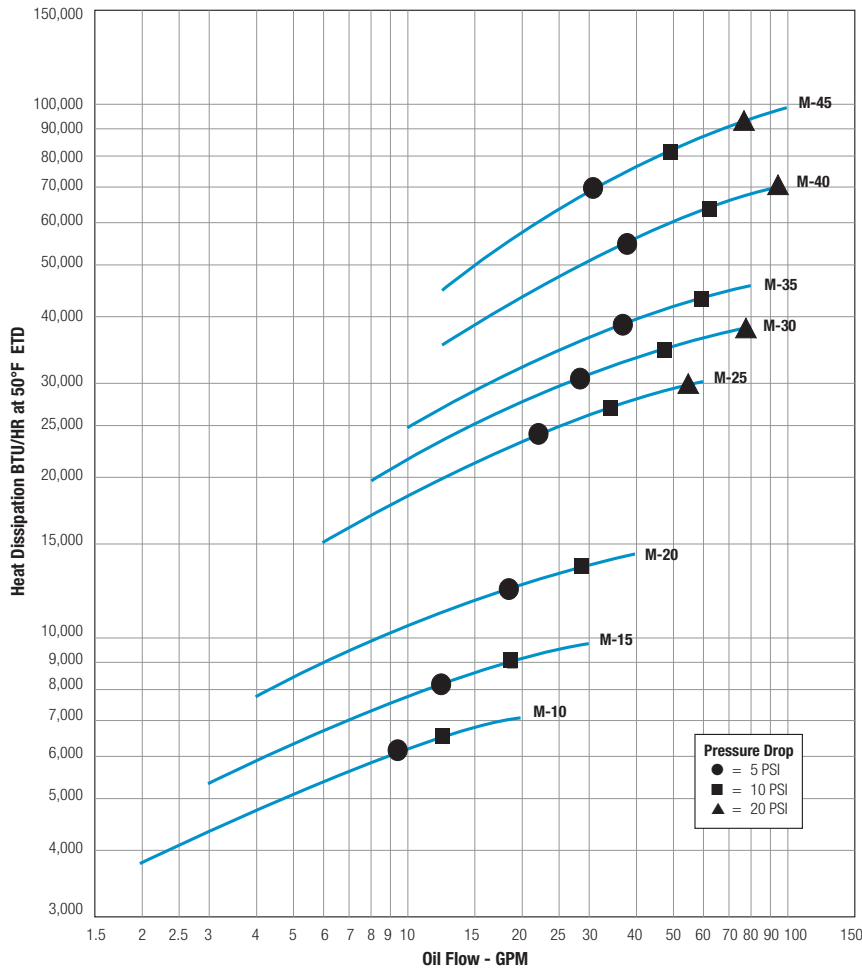
Oil Temperature
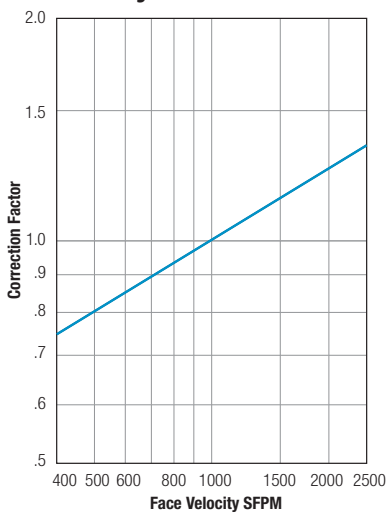
Typical operating temperature ranges are:

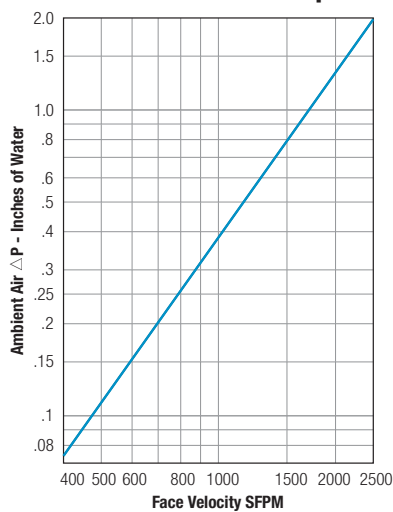|	
Hydraulic Motor Oil	110°- 130°F
Hydrostatic Drive Oil	130°- 180°F
Bearing Lube Oil	120°- 160°F
Lube Oil Circuits	110°- 130°F

Performance Curves

For additional sizing information consider using TTP's XSelector online sizing Program.*

Heat Dissipation BTU/HR at 50°F ETD vs Oil Flow - GPM

Curves labeled: M-45, M-40, M-35, M-30, M-25, M-20, M-15, M-10

Pressure Drop
● = 5 PSI
■ = 10 PSI
▲ = 20 PSI

Air Velocity Correction

Correction Factor vs Face Velocity SFPM

Air Static Pressure Drop

Ambient Air △P - Inches of Water vs Face Velocity SFPM
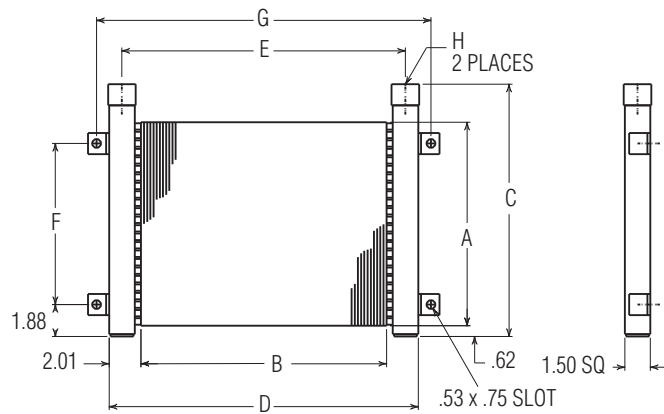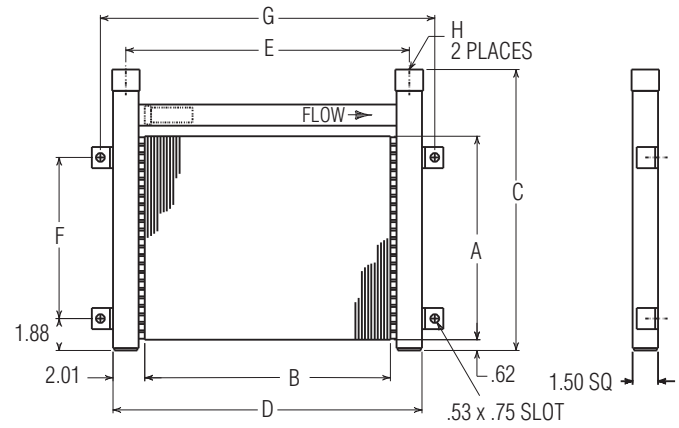
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Dimensions

M Series

MR Series

Units shown with optional internal pressure bypass

Model	A	B	C		D	E	F	G	H		Face Area (SQ FT)	Shipping Weight (LBS)
			M Series	MR Series					NPT	SAE		
M-10	6.00	14.20	8.88	10.58	18.22	16.72	3.50	19.64	1"	-16 1 5/16 -12	.60	11
M-15	8.00	14.20	10.88	12.58	18.22	16.72	5.50	19.64			.81	12
M-20	12.00	14.20	14.88	16.58	18.22	16.72	9.50	19.64			1.21	16
M-25	18.00	20.20	20.88	22.58	24.22	22.72	15.50	25.64			2.56	28
M-30	24.00	19.20	26.88	28.32	23.22	21.72	21.50	24.64	1 1/4"	-20 1 5/8 -12	3.25	34
M-35	30.00	19.20	32.88	34.32	23.22	21.72	27.50	24.64			4.06	40
M-40	36.00	24.70	38.62	40.38	28.72	27.22	33.50	30.14			6.25	56
M-45	36.00	35.20	38.62	40.38	39.22	37.72	33.50	40.64			8.88	73

**For 3D models and spec sheets visit the M product page on our website.
https://www.thermaltransfer.com/product/m-series**