Fluid Cooling P-BAR ▪ Mobile MA Series

BRAZED ALUMINUM CONSTRUCTION

Performance Notes

- Now available with brushless DC fan motors
- Bar and plate brazed aluminum core
- Rugged, lightweight and compact
- Provides the best heat transfer per given envelope size while minimizing pressure drop
- Air-side fin design minimizes fouling and static pressure ensuring long-term, reliable performance
- Fans compliant with IP 68 (brushed) and IP6k9k (brushless) with fully sealed motors
- Welded aluminum fittings/ports and manifolds ensure structural integrity
- Standard SAE ports – NPT and BSPP ports available
- Customized units are available to meet your specific performance requirements

Now offering axial fans equipped with brushless DC electric motors on standard MA Series!

Options
Brushless DC fan motor
Temperature sensors
Serviceable internal pressure bypass

Ratings

Maximum Operating Pressure
250 PSI (17 BAR)

Maximum Operating Temperature
300°F (150°C)

Fluid Compatability

Petroleum/mineral oils

Oil/water emulsion

Water/ethylene glycol

Materials

Core Brazed aluminum bar and plate
- Tanks – 5052 Aluminum
- Nose Bar & Little Bar – 3003-H Aluminum
- Air Fin, Plate, Turbulator & End Plate – 3003-O Aluminum

Connections Aluminum

Core Mounting Bracket Brazed aluminum

How to Order

	–		–		–		–	

Model Series
MA
(MAR)

Model Size Selected*
3 • 3.5 • 4 • 12 • 18
32 • 48 • 232 • 248
8 • 14 • 20 • 66 • 82 • 120

Connection Type
1 - NPT
2 - SAE
3 - BSPP

Bypass (MAR)**
Blank - No Bypass
25 - 25 PSI
60 - 60 PSI

Specify Motor Required
Blank - No Fan (Core Only)
4A - 12 VDC
4B - 24 VDC
4ABL - 12 VDC Brushless Fan***
4BBL - 24 VDC Brushless Fan***

*MA-8, MA-14, MA-20, MA-66,MA-82, MA-120 are not available with a DC fan.
**Internal pressure bypass available on MA-12, MA-18, MA-32, MA-48, MA-66, MA-82, MA-120, MA-232, MA-248 only. (MAR)
***Dimensions on MA coolers with brushless fans are different from brushed fans. Consult factory for details.
This is a partial flow pressure bypass only. It is not designed to be a full flow system bypass.

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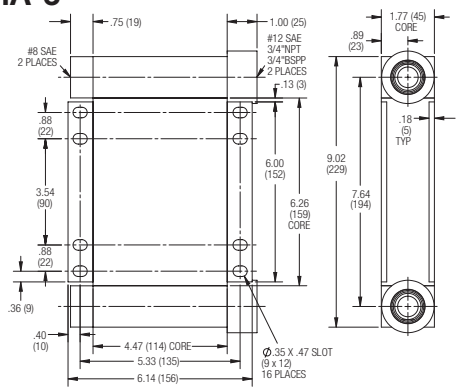
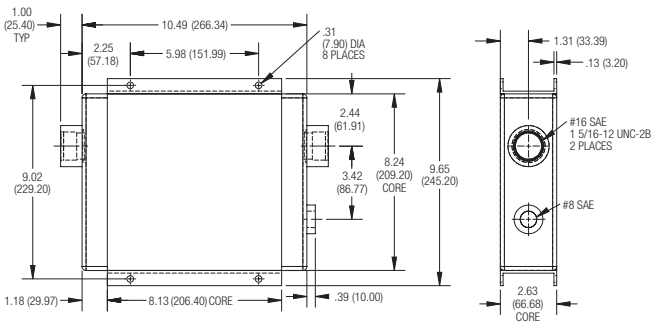
Dimensions - Core Only

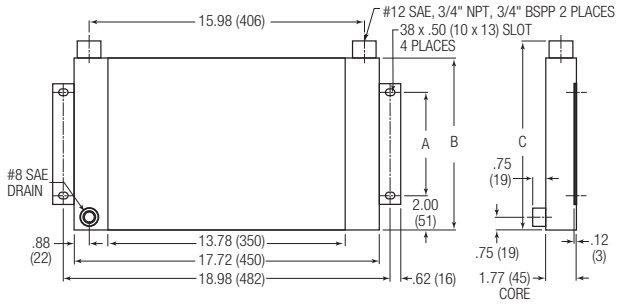
MA-3



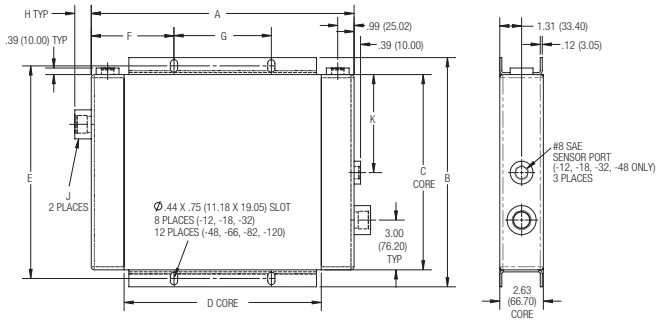
MA-4



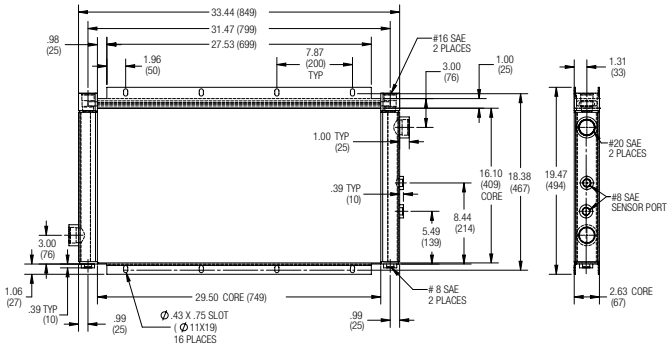
MA-8, MA-14, MA-20



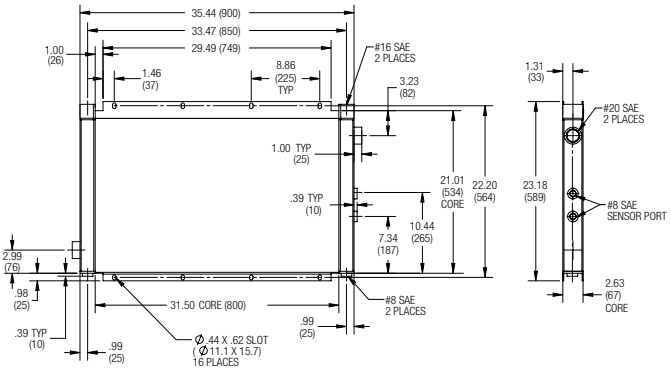
MA-12 thru MA-120



MA-232



MA-248

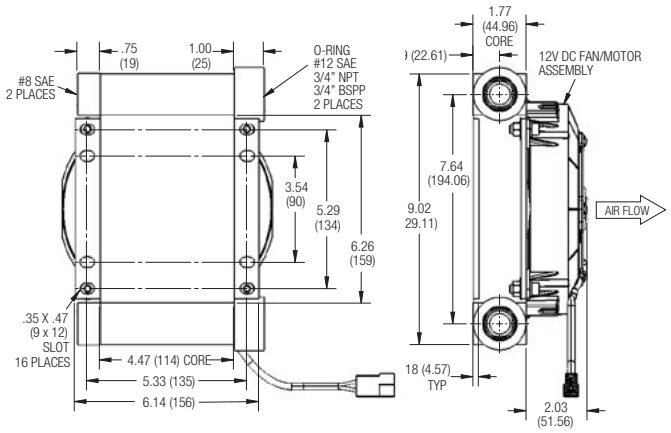


Model	A	B	C		D	E	F	G	H	J		K	Approx. Shipping Weight LBS (KG)
			Without Bypass Valve	With Bypass Valve						SAE	NPT & BSPP		
MA-3	See diagram above												4 (1.81)
MA-4	See diagram above												7 (3.18)
MA-8	3.00 (76)	5.67 (144)	6.65 (169)										10 (4.54)
MA-12	13.82 (351)	11.97 (304)	9.85 (250)	12.8 (325)	9.88 (251)	10.98 (279)	4.06 (103)	5.71 (145)	1.00 (25)	#12	3/4"	5.00 (127)	15 (6.8)
MA-14	6.00 (152)	10.00 (254)	10.98 (279)										14 (6.35)
MA-18	15.84 (402)	13.82 (351)	12.01 (305)	14.6 (371)	11.89 (302)	12.82 (326)	4.99 (127)	5.87 (149)	1.00 (25)	#12	3/4"	5.91 (150)	18 (8.16)
MA-20	10.00 (254)	14.33 (364)	15.31 (389)										18 (8.16)
MA-32	19.69 (500)	18.46 (469)	16.34 (415)	18.9 (480)	15.75 (400)	17.32 (440)	3.84 (98)	12.00 (305)	1.00 (25)	#16	1"	8.07 (205)	28 (12.7)
MA-48	23.69 (602)	22.09 (561)	20.12 (511)	22.7 (577)	19.76 (502)	21.02 (534)	3.85 (98)	8.00 (203)	1.00 (25)	#16	1"	10.00 (254)	41 (18.60)
MA-66	27.56 (700)	25.83 (656)	23.39 (594)	26.5 (673)	23.62 (600)	24.72 (628)	3.78 (96)	10.00 (254)	1.58 (40)	#20	1¼"		50 (22.68)
MA-82	31.46 (799)	27.68 (703)	25.55 (649)	28.6 (726)	27.52 (699)	26.57 (675)	5.73 (146)	10.00 (254)	2.00 (51)	#24	1½"		65 (29.48)
MA-120	31.46 (799)	39.6 (1006)	37.44 (951)	40.0 (1016)	27.52 (699)	38.38 (975)	5.73 (146)	10.00 (254)	2.00 (51)	#24	1½"		88 (39.92)
MA-232	See diagram above												55 (24.95)
MA-248	See diagram above												80 (36.29)

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

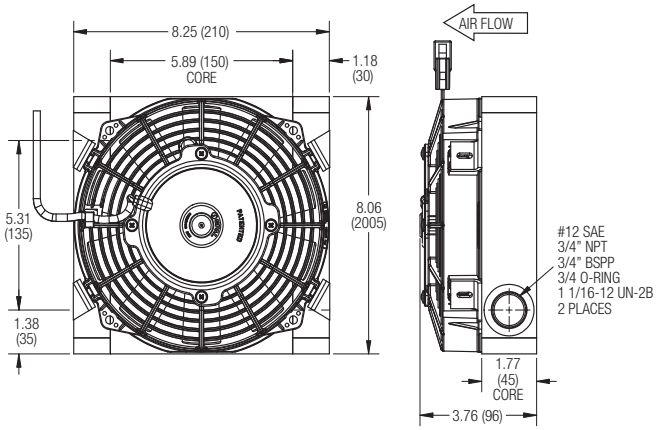
Dimensions - Fan/Core

MA-3



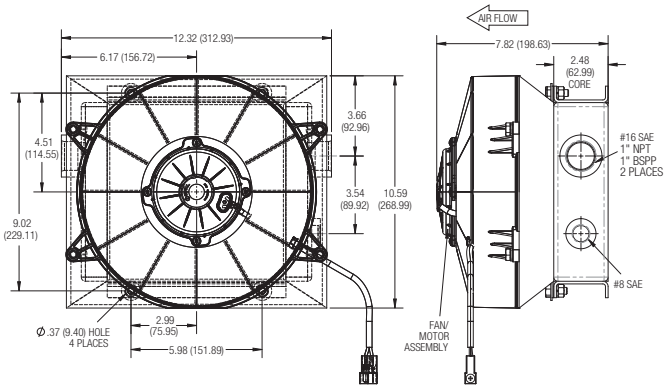
Brushless fan option not available for MA-3.

MA-3.5



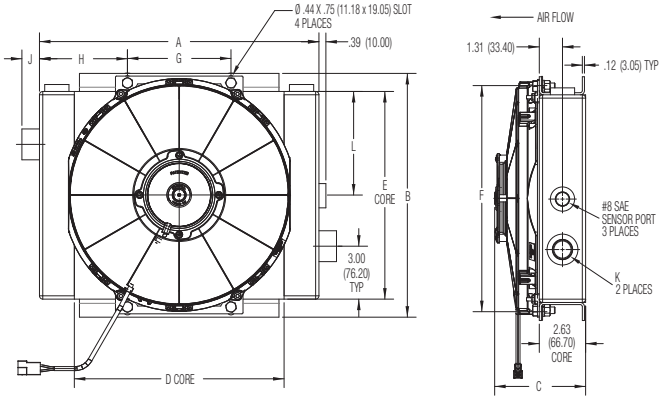
Brushless fan option not available for MA-3.5.

MA-4



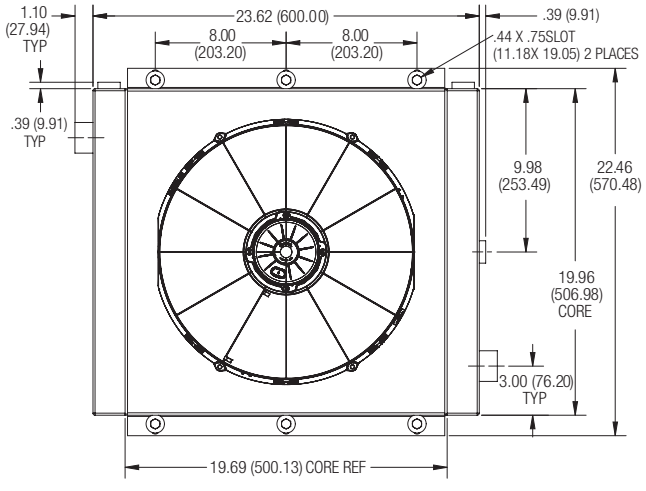
Brushless fan option has different dimensions. Consult factory.

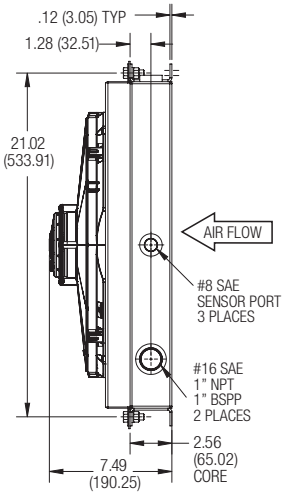
MA-12, MA-18, MA-32



Brushless fan option has different dimensions. Consult factory.

MA-48





Brushless fan option has different dimensions. Consult factory.

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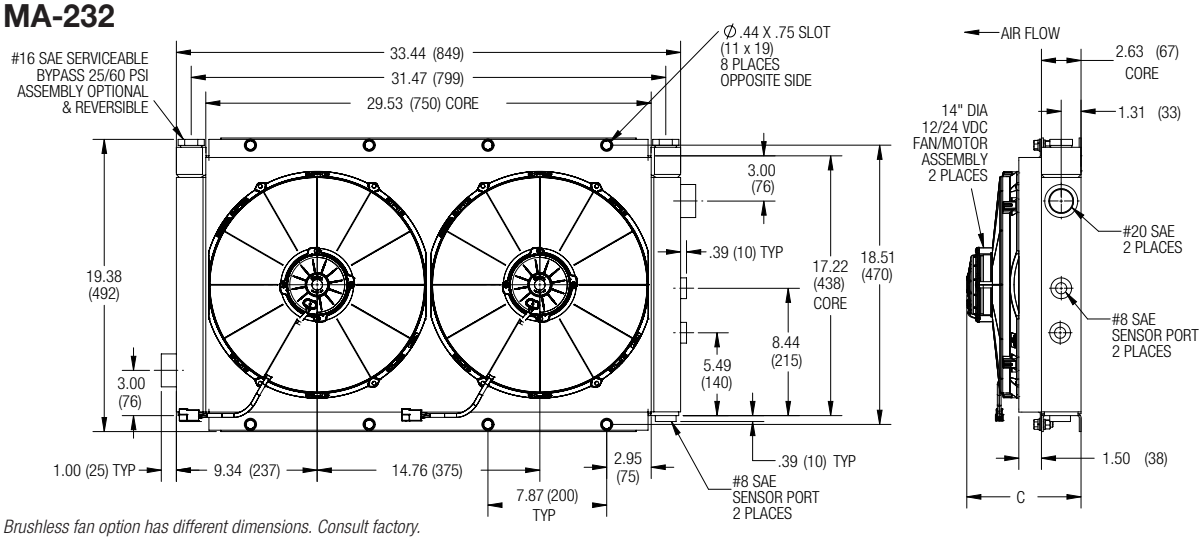
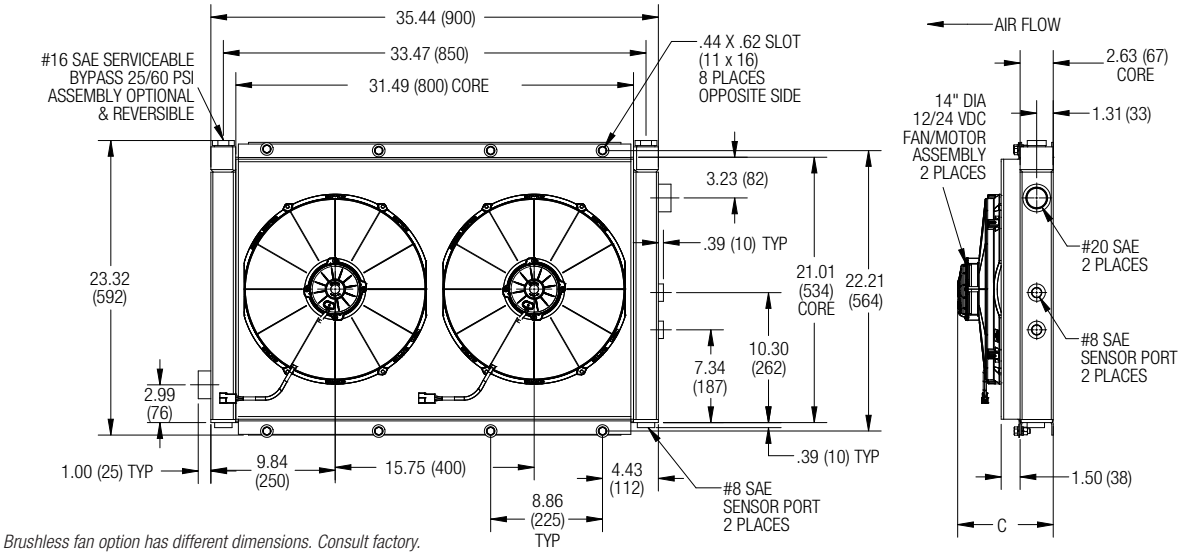
Dimensions - Fan/Core

MA-232



Brushless fan option has different dimensions. Consult factory.

MA-248



Brushless fan option has different dimensions. Consult factory.

Model	A	B	C	D	E	F		G	H	J	K		L	DC Amp Draw		CFM (CMM)	Approx. Shipping Weight LBS (KG)
						Without Bypass Valve	With Bypass Valve				SAE	NPT & BSPP		12V	24V		
MA-3	See diagram		Consult factory for dimension	See diagram										5.7	3.6	300 (8.50)	6 (2.72)
MA-3.5	See diagram			See diagram										12.5	6.3	370 (10.48)	9 (4.08)
MA-4	See diagram			See diagram										12.5	6.3	363 (10.28)	16 (7.26)
MA-12	13.82 (351)	11.97 (304)		9.88 (251)	9.85 (250)	10.98 (279)	12.8 (325)	5.71 (145)	4.06 (103)	1.00 (25)	#12 SAE	3/4"	5.00 (127)	12.5	6.3	521 (14.75)	19 (8.62)
MA-18	15.84 (402)	13.82 (351)		11.89 (302)	12.01 (305)	12.82 (326)	14.6 (371)	5.87 (149)	4.99 (127)	1.00 (25)	#12 SAE	3/4"	5.91 (150)	10.6	5.3	783 (22.17)	23 (10.43)
MA-32	19.69 (500)	18.46 (469)		15.75 (400)	16.34 (415)	17.32 (440)	18.9 (480)	12.00 (305)	3.84 (98)	1.10 (28)	#16 SAE	1"	8.07 (205)	22.2	11.1	1368 (38.74)	28 (12.70)
MA-48	See diagram			See diagram										22.2	11.1	1637 (46.40)	45 (20.40)
MA-232	See diagram			See diagram										19.3*	9.7*	2234 (63.26)	65 (29.48)
MA-248	See diagram			See diagram										19.3*	9.7*	2904 (82.24)	90 (40.80)

*Note: We reserve the right to make reasonable design changes without notice. All dimensions are in inches (millimeters) unless noted otherwise.*AMP draw listed as per FAN.*

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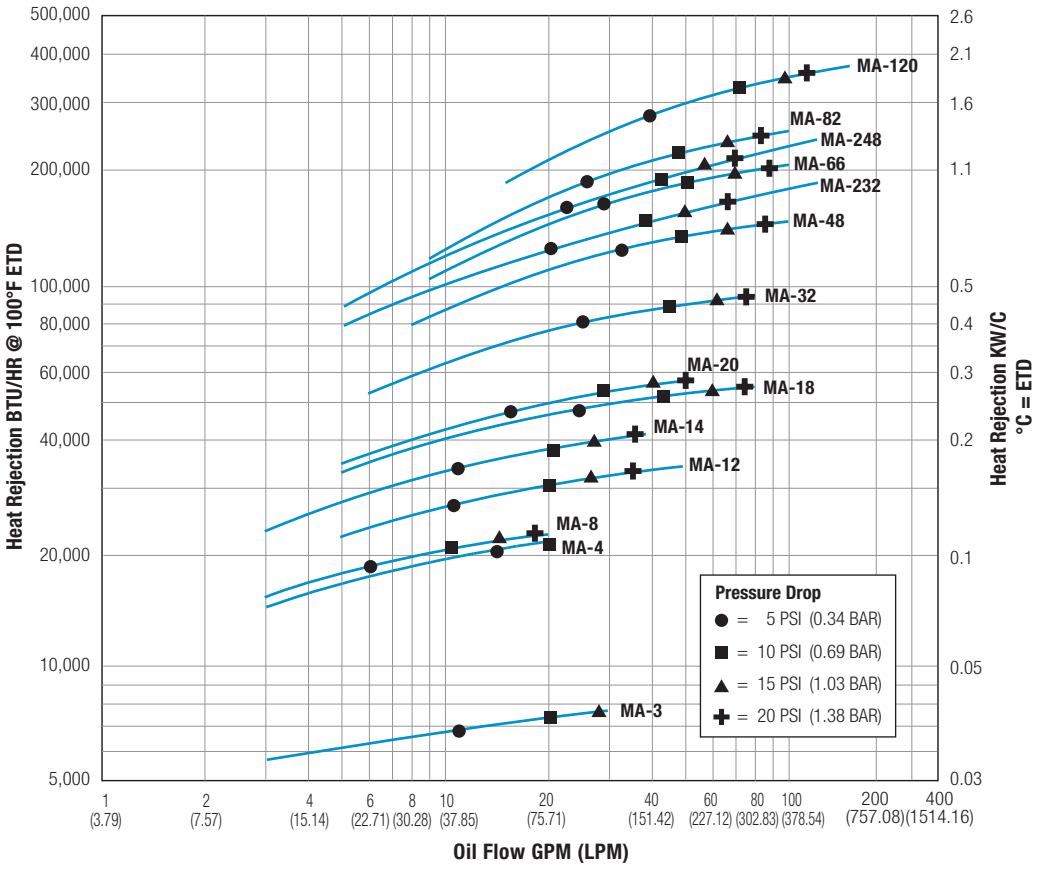
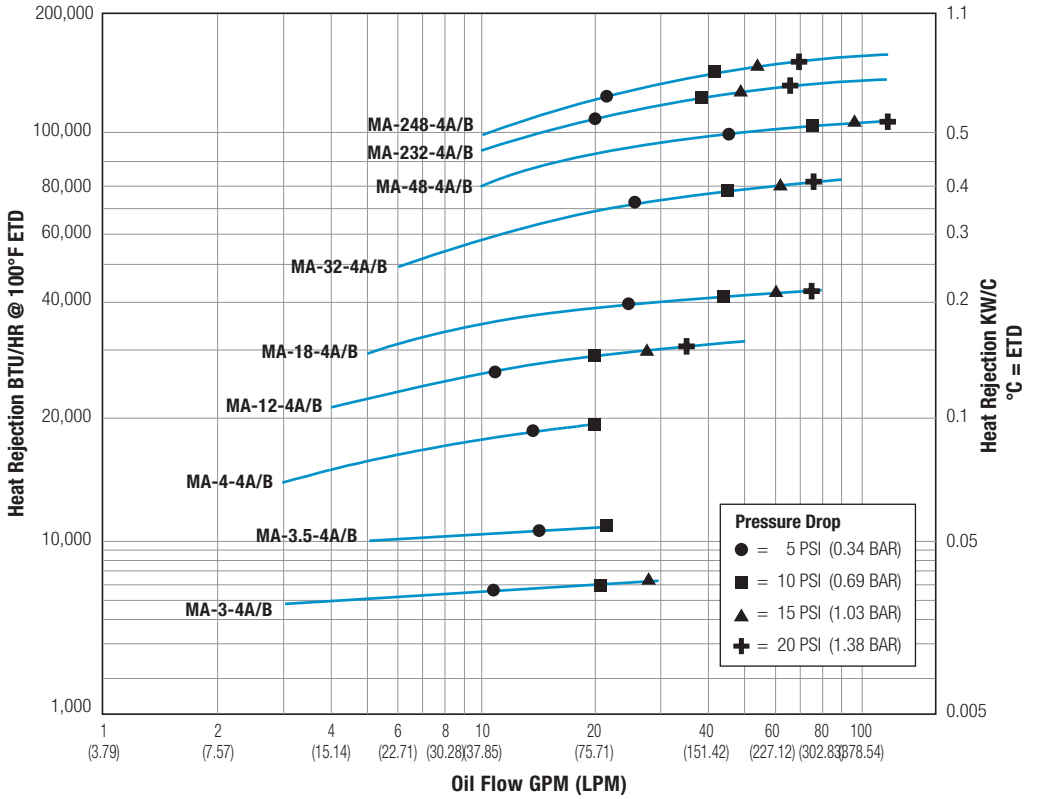
Performance Curves

MA Models (No Fan, Core Only)



MA Models with DC Fan Assemblies



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Selection Procedure

STEP 1 **Determine Heat Load.** Typical applications size cooler for 1/3 of the input horsepower. Heat load may be expressed as either Horsepower or BTU/HR or KW.

HP = BTU/HR ÷ 2545

BTU/HR = HP x 2545

KW = HPx .745

STEP 2 **Determine Entering Temperature Difference.** (Actual ETD)
(ETD= 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**
(Skip to Step 4 if using our DC Fan Assembly)

Calculate actual SFPM Air Velocity or SCFM (Standard Cubic Feet per Minute) for selection using the Face Area from the table.

$$\text{SFPM Air Velocity*} = \frac{\text{SCFM Air Flow}}{\text{Square Feet Cooler Face Area}}$$

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

(SCFM Air Flow= SFPM Air Velocity x Square Feet Cooler Face Area)

*If the Air Velocity calculated is different than the value in Step 4, then recheck Corrected oil Pressure drop.

STEP 4 **Determine the Corrected Heat Dissipation to use the Curves**

ENGLISH Version

$$\text{Corrected Heat Rejection} = \text{(BTU/HR) Heat Load} \times \left[\frac{100°\text{F}}{\text{Desired E.T.D} \times \text{Air Velocity}^{\dagger} \text{ Correction Factor}} \right]$$

(BTU/HR) to use with selection chart

(Air Factor value not needed if using provided DC Fan assembly; omit in formula.)

STEP 5 **Select Model From Curves** Enter the Performance Curves at the bottom with the GPM 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.

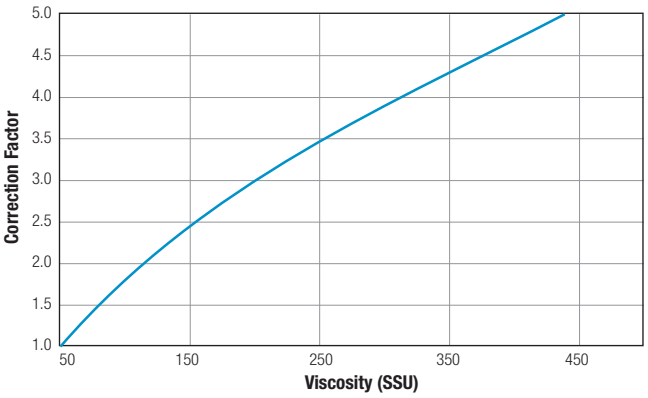
STEP 6 **Calculate Oil Pressure Drop** Find the oil pressure drop correction factor and multiply it by the Oil Pressure Drop found on performance curve.

Listed Performance Curves are based on:

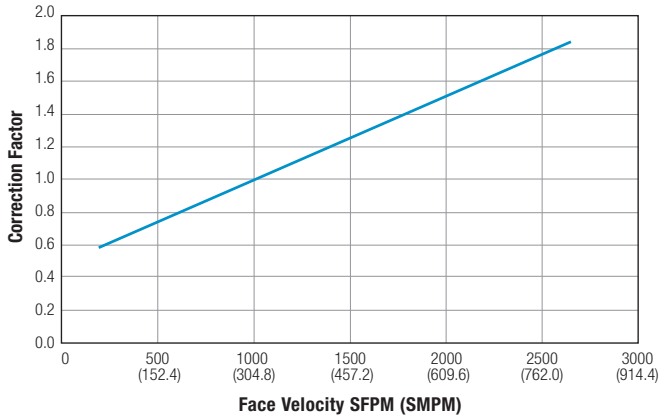
- 50 SSU (11 cSt) oil
- 1000 Standard Feet per Minute (SPFM) (304.8 MPM) Air Velocity
- 100°F (55.56°C) Entering Temperature Difference (ETD)

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

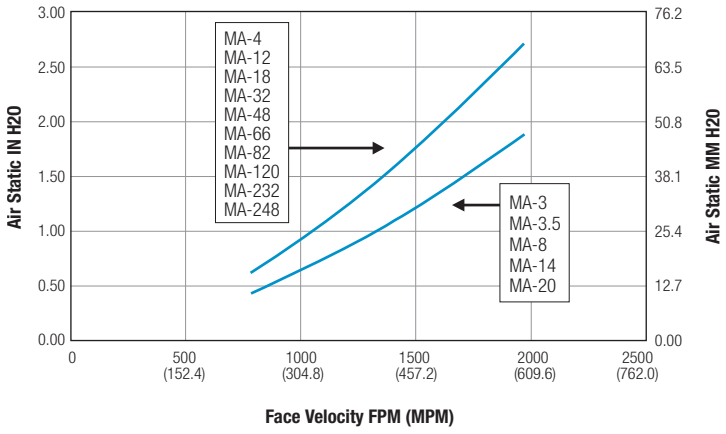
Oil Pressure Drop Correction



Air Static Correction



Air Static Pressure Drop



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MagHex Fan Controller

Compact Programmable Temperature Sensor

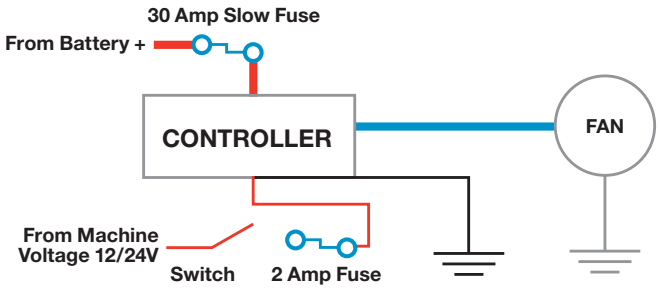
This combined sensor and controller is designed to mount directly to the heat exchanger. It provides accurate temperature control by cycling the electric cooling fan to maintain desired oil temperature. A single housing reduces wiring and mechanical installation. The MAGHEX magnetic wand is used to set up and program the sensor. Not needed for operation. LEDs indicate the oil temperature setting.

Features

- Easy installation and integration into MA Series (any SAE#8 port or cavity).
- Creates a simple drive circuit with just a few wires and minimal programming.
- Low cost alternative to complex control systems.
- Utilize built-in temperature sensor to activate the fan based upon current set point.
- Capable of providing on board programming & status without the additional component requirements.
- 12 or 24 volt DC operation up to 30 amps.
- Temperature sensor and operation controller in single aluminum housing.
- Select from 20 temperature settings from 100°F to 200°F (38 to 93°C)
- Mounts directly to the cooler.
- Connector to fan is included and pre-wired.
- Solid-state design, no moving parts, fully sealed microprocessor/FET design.
- Manual override feature built-in.
- Shuts off 7 degrees below set point.
- Improved circuitry to accommodate higher amperage applications.
- Housing is used as a heat sink for internal components.
- Automatic low voltage shut down.
- Proportional Speed Control (Brushless version only)

Installation

1. Insert controller sensor into #8 SAE sensor port on cooler.
2. Connect controller to DC fan (see wire diagram).
3. Provide 30 amp slow fused power to the fan.
4. Connect 2 amp fused power to controller (see wire diagram).
5. Use MAGHEX Programming Wand to set controller to desired temperature.



Single Fan Controller - Part Number 57565
Dual Fan Controller - Part Number 57566

This sensor will drive one single fan or two dual fans based on 20 adjustable set points in 5°F degree increments from 100°F to 200°F (38 to 93°C).

PWM Variable Fan Controller
Part Number 57567

This sensor will drive one PWM fan based on 20 adjustable set points in 5°F degree increments from 100°F to 200°F (38 to 93°C). There must be a minimum of 20°F degrees between the two set points (20-100% ramp).

Specifications

Operating Voltage	12 or 24 VDC Systems
Min/Max Voltage	9 VDC / 32 VDC
Current Rating	30 AMPS
Switch Type	Normally open, high side
Ambient Operating Temperature	-40° to +185°F (-40° to +85°C)
Measurement Temperature Range	100°F to 200°F (38 to 93°C)
Current Draw	20 mA
Setpoint Selections	20 set points in 5°F degree increments from 100°F to 200°F (38 to 93°C)
Selection method	Magnetic programming wand
Enclosure Rating	IP69K
Sealed Housing	High-grade Automotive Potting Compound
Housing Material	Anodized Aluminum
Weight	Approximately 8 OZ (.23 KG) including wire
Mounting	#8 SAE Thread
Fan Connector	AMP Connector - Single and Dual Controllers Yazaki Connector - PWM Variable Controller

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