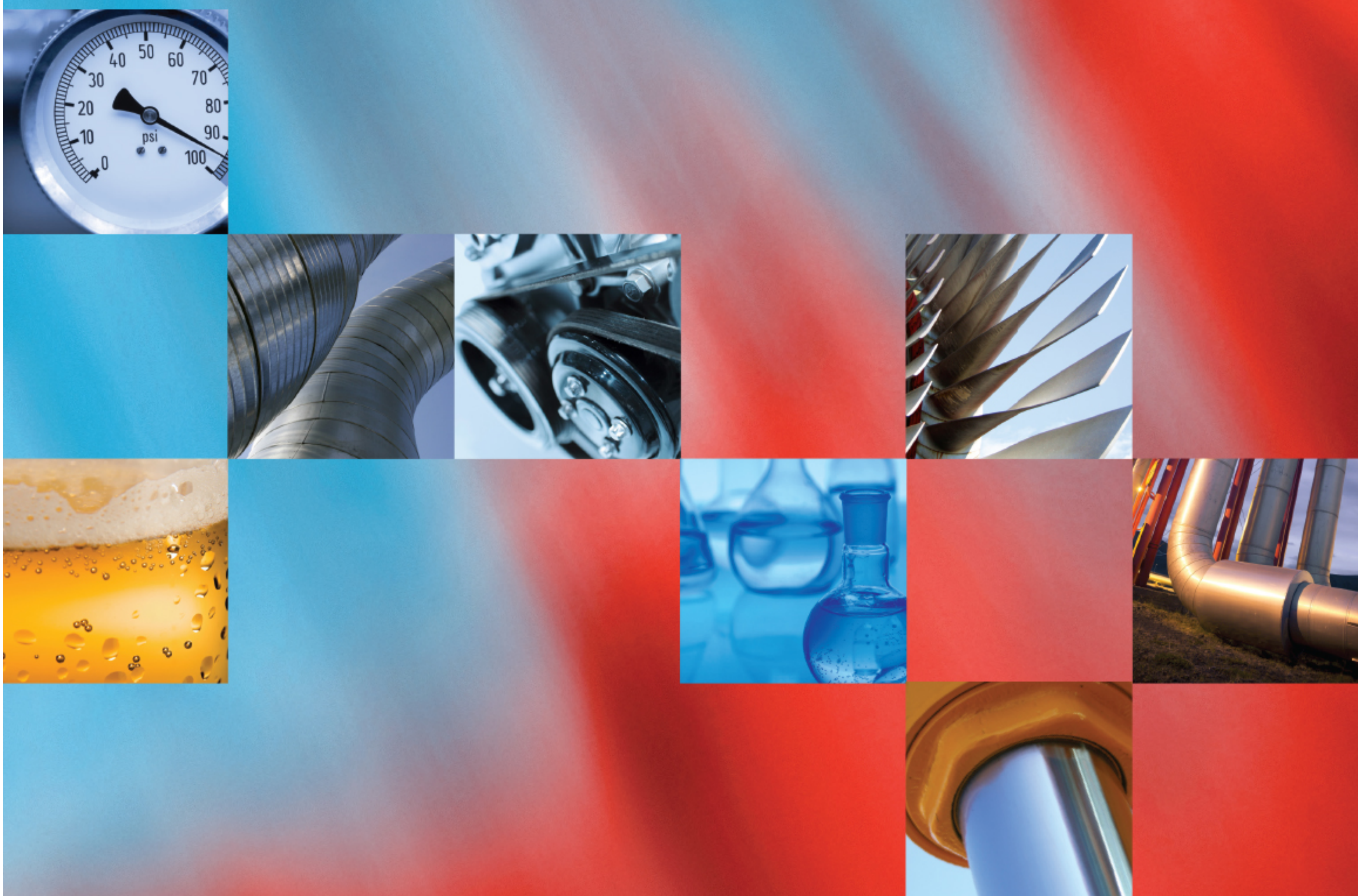
API HEAT TRANSFER

PERFORMANCE IS EVERYTHING



CONTENTS

This package of information about API Heat Transfer products and solutions was made especially for you based on your unique heat transfer needs. **If there's anything you'd like to add, visit apiheattransfer.com or call your API Heat Transfer contact today.**

API HEAT TRANSFER

CONTENTS

Aftercoolers with FinSep® Technology

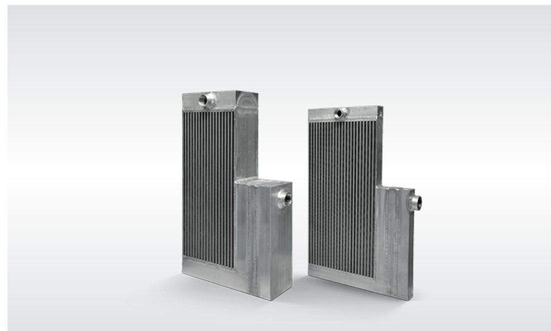
FinSep® Aftercoolers

Our innovative design allows the aftercooler to do considerably more than just cool air. With its compact integrated moisture separation capability, our compressor OEMs will enjoy increased efficiency and reduced total package cost with our FinSep® technology. API Heat Transfer's aftercoolers are an all-aluminum bar and plate design featuring a wide variety of thermally efficient internal and external fin patterns.

PERFORMANCE NOTES.

- Separation efficiencies up to 99%
- Reduced system pressure drop to increase overall efficiencies
- Reduced total package cost
- Reduced assembly time
- Less parts to manage and inventory
- Reduced space required in the compressor cabinet
- Reduced risk of leaks with fewer connections
- Reduced risk of performance issues associated with mesh pads that can become misaligned
- Reduced risk of scaling with all-aluminum construction
- Fins are laid between aluminum braze sheets and fitted with header and face bars, then vacuum brazed to produce an exceptionally rugged yet light weight cooler

Size Range:	6" x 6" to 60" x 60"
Depths:	2-1/4", 3-1/2", 4-1/2", and 6"



APPLICATIONS.

- Compressors

Bar and Plate Heat Exchangers

Bar and Plate Heat Exchangers

API Heat Transfer's line of Airtech and Covrad air cooled all-aluminum brazed bar and plate heat exchangers are supplied as a vital component to our mobile and industrial OEMs' products. Our flexible bar and plate construction allows countless core combinations and sizes, custom designed to your exact requirements with minimal or no tooling costs. Combi-cooler designs are available to cool multiple fluids in a single brazed unit.

PRODUCT TYPES AVAILABLE.

- Engine cooling systems
- PCR (pre-cooler, cooler, reheater) for refrigerated air dryers
- Charge air coolers
- Radiators
- Oil coolers
- Aftercoolers
- Combination coolers

Our bar and plate coolers feature a wide variety of thermally efficient internal and external fin patterns. Fins are laid between aluminum braze sheets and fitted with header and face bars. The assembled unit is placed into one of our modern brazing furnaces where precise control of time and temperature produces a unified core. Manifolds designed to meet each customer's particular piping requirements are welded into place to complete the cooler. We can also supply cores when manifolds already exist or must be fitted in the field.

These rugged, compact, light-weight units are ideal for both on- and off-highway markets. API Heat Transfer can also add value beyond the component cooler by packaging a complete cooling system consisting of multiple coolers (e.g., radiator, charge air cooler, hydraulic oil cooler).

From small individual coolers to large complex engine cooling systems, API Heat Transfer will design and manufacture the heat transfer solution that's right for you. Our engineering team is continually developing additional fin geometries to improve heat transfer efficiency so we can meet or exceed your expectations.

Aluminum Radiators

Aluminum Radiators

API Heat Transfer offers a wide range of brazed aluminum radiator styles and options. From small individual coolers to large complex engine cooling systems, from heavy duty bar and plate construction to plastic tank radiators, we have the right design for your mobile or industrial application. Our engineering team is continually developing additional fin geometries to improve heat transfer efficiency so we can meet or exceed your expectations.

BRAZED BAR AND PLATE RADIATORS

Fins are laid between aluminum braze sheets and fitted with header and face bars. The assembled unit is placed into one of our modern brazing furnaces where precise control of time and temperature produces a unified core. Manifolds designed to meet each customer's particular piping requirements are welded into place to complete the radiator.

- Ideal for heavy duty mobile and industrial applications
- Feature a wide variety of thermally efficient internal and external fin patterns
- Rugged, compact, lightweight units
- Infinite number of core configurations and sizes to custom design a solution specifically to your exact requirements
- Combi-cooler designs are available to cool multiple fluids in a single brazed unit
- Available as component cooler or packaged as a complete cooling system incorporating radiator and/or charge air cooler with oil cooler components

TBAR RADIATORS

Our patented TBAR replaces hot fins and bars with a single extruded tube for increased product durability.

- Highly flexible design
- Enhanced extruded tubes for improved charge air cooling
- Patented tube-to-bar joint ensures consistent brazing
- Extruded tubes provide unrivaled durability and fewer leak paths
- High-efficiency louvered fins for enhanced heat rejection
- Wide variety of debris resistant non-louvered fins
- Welded tank to core for a long leak-free service life
- Zinc-infused aluminum materials for unrivaled corrosion protection

APPLICATIONS.

- Industrial engines
- Mobile engines

- Low charge-air side pressure drop
- Stands up to heavy thermal cycle loads

TUBE AND HEADER RADIATORS

Our brazed aluminum tube and header radiators offer a cost effective, lightweight solution for stationary and mobile engine cooling applications. Radiators can be provided as a stand alone component, but most often would be combined with our bar and plate oil coolers and charge air cooler to form a complete engine cooling solution.

- Wide range of row depths
- Variety of external fins to match different environmental conditions
- Tanks designed to meet piping requirements and are welded into place for superior integrity
- Welded aluminum tanks can be fabricated, stamped or cast depending on application and volume

Charge Air Coolers

Brazed Aluminum Charge Air Coolers

Engine manufacturers and OEMs worldwide rely on our robust and reliable charge air cooler technology and expertise to meet ever changing emissions regulations. We've specially selected fin and tube options to provide the performance and durability the application calls for.

BAR AND PLATE CHARGE AIR COOLERS

Flexible bar and plate construction allows an infinite number of core configurations and sizes to custom design a solution specifically to your exact requirements with minimal or no tooling costs.

- Enhanced internal fin geometries for superior cooling
- Highly flexible design
- Wide variety of hot fins to balance internal pressure drop
- High-efficiency louvered fins for superior heat rejection
- Wide variety of debris resistant non-louvered fins
- Welded on tanks for a long leak-free life
- Rugged construction for heavy duty applications

TBAR CHARGE AIR COOLERS

Our patented TBAR replaces hot fins and bars with a single extruded tube for increased product durability.

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- High-efficiency louvered fins for enhanced heat rejection
- Wide variety of debris resistant non-louvered fins
- Welded tank to core for a long leak-free service life
- Zinc-Infused aluminum materials for unrivaled corrosion protection
- Low charge-air side pressure drop
- Stands up to heavy thermal cycle loads

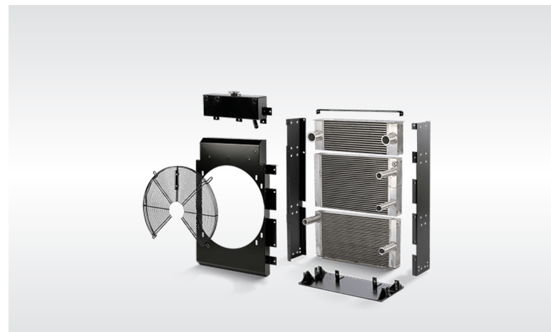
Engine Cooling Systems

Engine Cooling Systems

API Heat Transfer is your global source for engine cooling solutions. We're equipped to offer unparalleled engine cooling performance to meet the rigorous requirements of mobile and industrial customers worldwide.

We offer an array of internal and external fin configurations that produce some of the most efficient air-cooled heat exchange cores in the industry, so your engine has more power to perform, even under the harshest conditions.

We focus our engineering expertise on the markets you serve. By understanding your customer applications, we're able to offer a broad spectrum of components and complete engine cooling systems designed to fit the needs of engine markets across the world.



OUR TECHNOLOGIES.

API Heat Transfer offers the broadest, most complete air-cooled product lines available.

- CAB or vacuum-brazed aluminum
  - Bar-plate
  - Micro-channel
  - Tube and header
  - TBAR
- Copper-brass
  - Mechanical-bond
  - Soldered
  - Bolted tank

Copper-Brass Radiators

Copper-Brass Radiators

Our durable and versatile line of copper-brass heat exchanger technology can be applied to any set of operating conditions and is available in a wide range of sizes and types.

BOLTED PLATE-FIN RADIATORS

With thousands of our Bolted Plate-Fin radiators in the field, you won't find anyone with a better track record of reliability and customer loyalty.

- Pre-engineered or custom engineered to your exact specifications
- Wide product range
- Sizes from 3 sq. ft. to 120 sq. ft.
- Dimpled tubes provide superior performance
- High-efficiency louvered or clog resistant non-louvered fins
- Variety of heavy duty core types designed for any environment
- LF-20 lead free construction for long, worry-free service
- Hemmed Fins provides durability and maximum up-time

BOLTED SERPENTINE RADIATORS

When you need a high performance, cost competitive core with a durable bolted-tank design, our Bolted Serpentine-Fin radiators hit the mark.

We introduced our Bolted Serpentine cores as a cost competitive alternative to our traditional bolted plate-fin cores. Like our plate-fin line, our serpentine cores are built tough and provide enhanced heat transfer performance.

- Low cost of ownership
- Pre-engineered or custom engineered to your exact specifications
- Wide product range
- Dimpled tubes provide superior performance
- High-efficiency louvered cores suited for stationary gensets
- Variety of core types to fit your application
- LF-20 lead-free construction for long, worry-free service

MECHANICALLY BONDED PLATE-FIN RADIATORS

By forming a permanent mechanical bond joint between the tubes and steel header, we've created the ultimate in copper-core technology.

- Tubes are robotically expanded and rolled into a steel tube sheet
- Thermal expansion design reduces tube stress
- Rolled tube to header joint provides a long life mechanical bond
- Ideal for high shock and vibration applications
- Ideal for sub-zero temperature site conditions and consequential thermal shock
- High performance dimpled fins provide maximum performance
- The "Gold-Standard" for rail locomotive applications

OPTIONS AND ACCESSORIES

We source all ancillary components and combine them into a single, 100% compatible package, saving you time and effort in design, procurement, and installation of these components.

- Optional galvanized steel and heat exchanger coatings provide enhanced corrosion resistance
- Safe and durable fan, belt, and radiator core guards
- Fan shrouds
- Integrated fans and fan-drive components
- Electric and hydraulic motors
- Anti-recirculation baffles
- Hoses
- Coolant recovery tanks
- Level sensors and switch gages

S-BAR, T-BAR, P-BAR Modules

TTP Engine Cooling Modules

API Heat Transfer offers Thermal Transfer Products manufactured custom OE engine cooling modules for small gasoline engines to large-horsepower turbo diesel applications. Your choice of a variety of materials and core types (S-BAR, T-BAR, or P-BAR) offers design flexibility for high-performing radiators, CAC's, or oil cooling. Full system modeling and validation of cooling modules is provided.

Core types

Extruded Tubular Bar | Rugged & Refined

T-BAR™ (tubular micro-channel extrusion) brings you the most refined cooling technology on the market today.

Engineered with minimal components in an ideally simplified configuration

Unrivaled strength and rigidity to ensure durable performance

A flexible design using an extruded flow path

A high-performing, cost-effective domestic aluminum solution

Plate & Bar | High Volume & Low Variety Applications

P-BAR™ (custom plate & bar) is your best heat-transfer solution for higher volume (qty.) applications, and when competitive costs are key.

Custom-engineered engine cooling with remarkable heat rejection

High performance for mobile or industrial applications

A flexible design

A cost-effective LCC aluminum solution

Seam Welded Tube | Rugged & Refined

S-BAR™ is the most affordable, high-flow cooling technology on the market today.

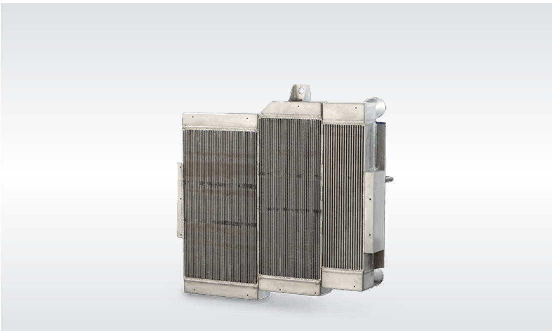
A high-strength automotive style core design

Durable, multi-row tube to header plate design

Engineered for use in applications with higher temperatures and heat loads

A lightweight, reliable and cost-effective aluminum solution

For application help and quoting, **visit our Full TTP site** or contact **ttpsales@apiheattransfer.com**



Thermal Transfer Products

An **API Heat Transfer** Company

2014

Core Solutions
for Diesel, Gas,
Alternative Fuels &
E-Fan Integration

EngineCooling

TBAR™ **Extruded Tube**

PBAR™ **Plate & Bar**

SBAR™ **Seam Welded Tube**

We **COOL** what you **POWER**

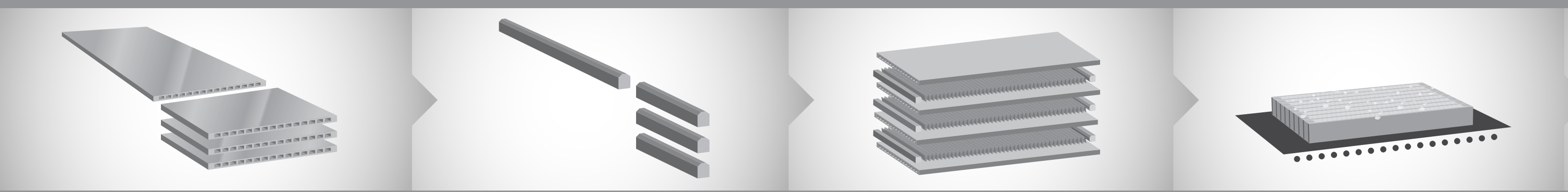
thermaltransfer.com ttpsales@apiheattransfer.com

Simplistic in Design

EXTRUDED TUBE CHANNEL (T-BAR™)

T-BAR is a proprietary extrusion design and one of the most clever cooling technologies available on the market today. Highly engineered on the front end, equals simplicity on the application end. **T-BAR** has unrivaled strength and rigidity, which ensures reliable field performance. **T-BAR** is factory zinc coated for cathodic protection, seam/leak free extruded and ultimately reliable.

T-BAR MANUFACTURING PROCESS:



CUTTING STATION

1: CUT EXTRUDED ALUMINUM TUBING

2: CUT SPACER BARS

STACKING STATION

3: STACK ASSEMBLE TUBE & BARS TO FORM CORE UNIT

FLUX STATION

4:FLUX CORE UNIT TO PREPARE FOR BRAZING

Flexible Cooling Solutions

With **T-BAR** technology, our OE-focused Application Engineers are ready to **solve the most challenging system requirements** for non-standard cooling modules.

Using proprietary **T-BAR** technology, our engineers design cooling solutions for rigorous performance and design requirements. We can custom-engineer solutions for even the most extreme requirements. **T-BAR** is the perfect fit for OEMs with low to medium production volume and high performing needs.

ADVANTAGES

- Superior performance - Aluminum has up to 25 percent higher heat transfer capacity in comparison to a traditional copper/brass cooling package.
- Rugged structure
- Zinc coated for salt spray & salt air resistance
- Handles high viscosity fluids
- No tooling requirements
- Seam/leak free

CORES

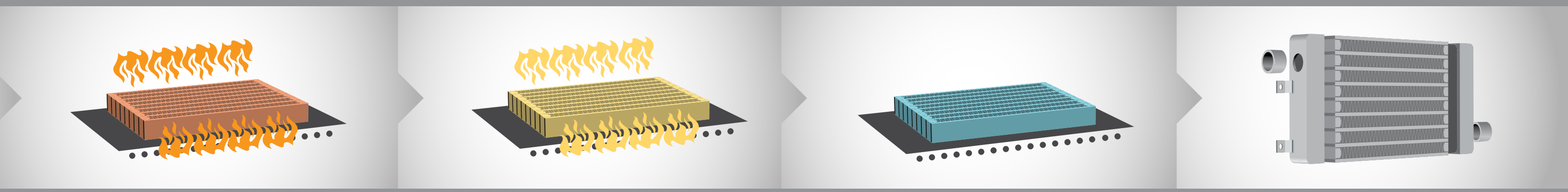
RADIATOR

CHARGE AIR COOLER

BOLTED RADIATOR/OIL COOLER COMBO

T-BAR is manufactured with Alloy 1100 aluminum micro channel and bars in our patented in-house tube-to-bar brazing process using a Nocolok CAB *(Controlled Atmosphere Brazing)* brazing technology furnace. Because our tubes are a solid extrusion, T-BAR is very robust—with no tube seams to fail and leak.

T-BAR core sizes can range in core height/width from 1 sq.ft. to 6 sq.ft. in various geometries. Core depths can vary from 1.25 inches to 5.5 inches. Cooling capability of these cores can range from 50-1000+ HP engines.



FURNACE

5:PRE-HEAT

6: BRAZE
1200˚ F

COOL-DOWN UNIT

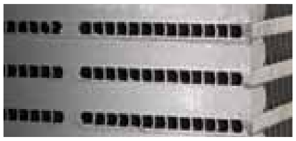
7: COOL

WELDING STATION

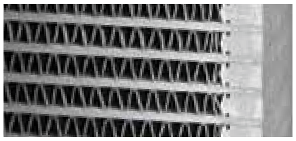
8: WELD TANK, PORTS & BRACKETRY TO CORE

TURN-KEY COOLING MODULES

- Fully pressure and leak tested, assembled and packaged.
- T-BAR provides numerous tube geometries to optimize performance for radiators, charge air coolers (CAC), oil coolers and after-coolers.
- T-BAR components can be mixed and matched to provide multiple circuit cooling within one core—or multiple cores combined to form a module.
- Thermal Transfer Products can supply complete cooling packages, including in-house designed framing, fan shroud, finger guard, expansion tank, etc.



HIGH-PERFORMANCE



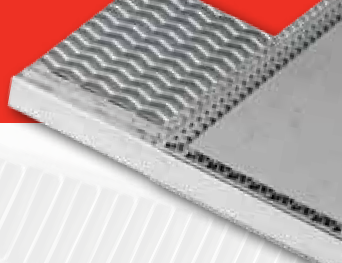
LOW-CLOGGING

UNIQUE SOLUTION

Look to T-BAR for demanding applications where performance is an absolute.

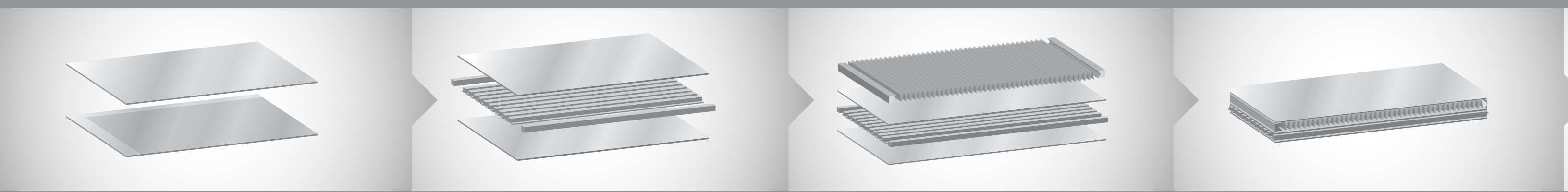
High Performing Plate & Bar

CUSTOM PLATE & BAR (P-BAR™)



P-BAR is the most efficient design solution in heat transfer today, utilizing an aggressive hot side turbulator. Perfect for all fluid medias in diesel engine cooling applications demands, while offering remarkable heat rejection levels for new Tier systems. **P-BAR** is a cost effective solution and excels in core combination packaging.

P-BAR MANUFACTURING PROCESS:



SELECT CORE DEPTH & POSITION PLATES
1: CUT TOP & BOTTOM PLATE

CUT & ASSEMBLE FLUID SIDE
2: POSITION TURBULATOR, SIDE SPACER BARS BETWEEN TOP AND BOTTOM PLATES

CUT & ASSEMBLE AIR SIDE
3: CUT & POSITION END SPACER BAR & AIR SIDE COOLING FIN

BUILD & STACK CORE LAYERS
4: REPEAT SEQUENCE UNTIL CORE HEIGHT IS ACHIEVED & METAL BAND CORE

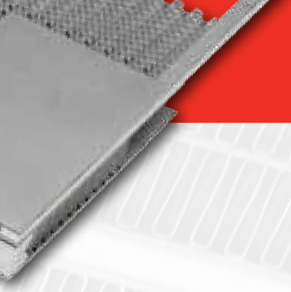
Industry Standard

With **P-BAR** technology, we offer an industry accepted standard solution for the majority of engine cooling requirements. Manufactured domestically and internationally, **P-BAR** is available and cost effective.

ADVANTAGES

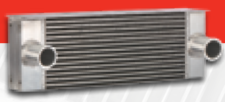
- Superior performance – Aluminum has up to 30% higher heat transfer capacity in comparison to traditional copper/brass cooling package
- Air-side fin design minimizes fouling and static pressure ensuring long-term, reliable performance
- Welded Aluminum fittings/ports and manifolds ensure structural integrity
- Standard ports – SAE, NPT and BSPP ports available
- High performing turbulator
- No tooling charges required
- Great dollar value per BTU
- Customized units are available to meet your specific performance requirements

CORES




OIL COOLER


RADIATOR

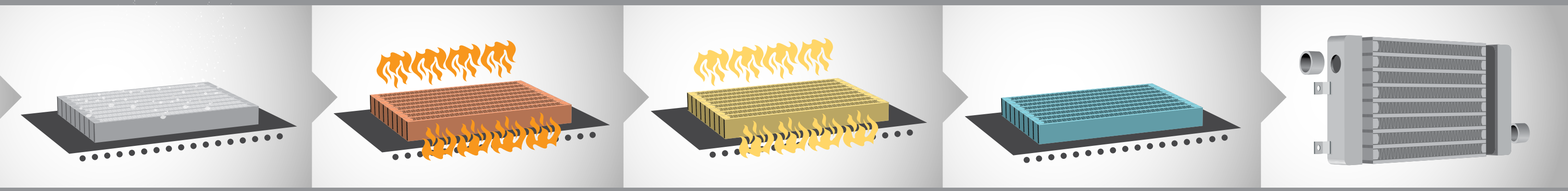

CHARGE AIR COOLER


WELDED RADIATOR/
OIL COOLER COMBO


BOLTED RADIATOR/
OIL COOLER COMBO

P-Bar heat exchangers are manufactured entirely of aluminum alloys. Our patented in-house brazing process uses aluminum alloys and our modern brazing furnace. The core components are available in a wide variety of types and sizes.

These robust coolers have high working temperatures and operating pressures. Units can be manufactured with any connection type and mounting elements.



FLUX STATION
5: FLUX CORE UNIT
TO PREPARE FOR BRAZING

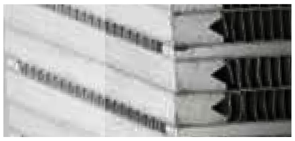
FURNACE
5:PRE-HEAT
6: BRAZE
1200° F

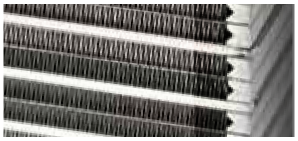
8: COOL

WELDING CELL
9: WELD TANK, PORTS &
BRACKETRY TO CORE

TURN-KEY COOLING MODULES

- Modules are pressure and leak tested, assembled and packaged
- Prototypes and production products can be completed in short lead times
- P-BAR provides core geometries for radiators (water-air), oil coolers (oil-air), air coolers for engines (CAC), air coolers for compressors (air-air), fuel coolers, air-oil welded combos, and turn-key engine cooling modules
- Complete cooling packages can be equipped with fan, motor, finger guard, expansion tank, etc.


HIGH-PERFORMANCE


LOW-CLOGGING

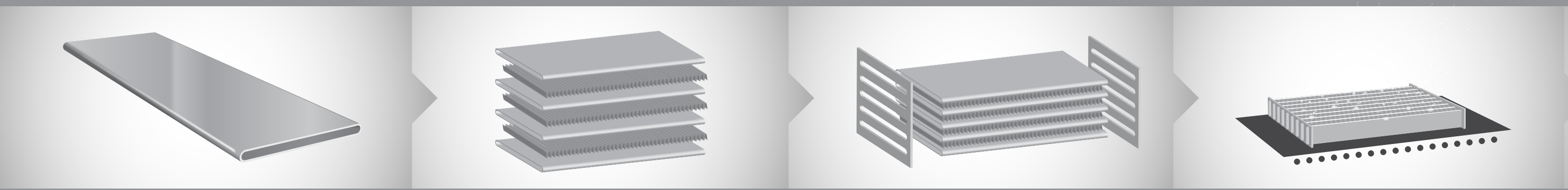
Look to P-BAR as an industry standard solution & available globally.

OE High Performing Radiators

SEAM WELDED TUBE (S-BAR™)

S-BAR is a high strength automotive design, utilizing a seam welded, free flowing tube design. Constructed in a tube to header plate fashion, with options for multiple rows, fin types and tank material (plastic or metal). **S-BAR** is the choice for engine water jacket cooling in lower HP ranges and OEM production volumes. Engineered for challenging heat loads and demanding ambient conditions.

S-BAR NOCOLOK™ BRAZED ALUMINUM MANUFACTURING PROCESS:



CUTTING STATIONS
1: CUT SEAM WELDED ALUMINUM TUBING

STACKING STATION
2: ASSEMBLE TUBE & FIN IN A HIGH SPEED CONTINUOUS CORE STACKER

ASSEMBLY STATION
3: ASSEMBLE TUBE & HEADER PLATES TO FORM CORE UNIT

FLUX STATION
4:FLUX CORE UNIT TO PREPARE FOR BRAZING

High Performing Radiators

With **S-BAR** technology, our OE-focused Application Engineers are ready to solve the **most challenging system requirements** for custom water jacket radiators.

Using **S-BAR** technology our engineers design clever engine radiators for performance and compact space claims. We can custom-engineer manifold connection requirements to suit the customers need. For higher volume applications, tooled and molded plastic top and bottom tanks can be designed.

ADVANTAGES

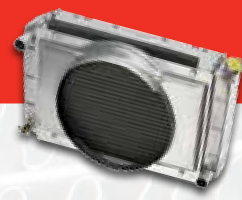
- Superior performance - S-BAR high flow tubes offer higher heat transfer capacity in comparison to traditional radiator cooling package designs
- Resistant to salt spray and salt air
- Compact & light weight
- Lower HP Application
- Fabricated or stamped aluminum tanks
- Plastic tank molding options

CORES

RADIATOR WITH
DETACHABLE OIL COOLER

RADIATOR WITH
METAL TANKS

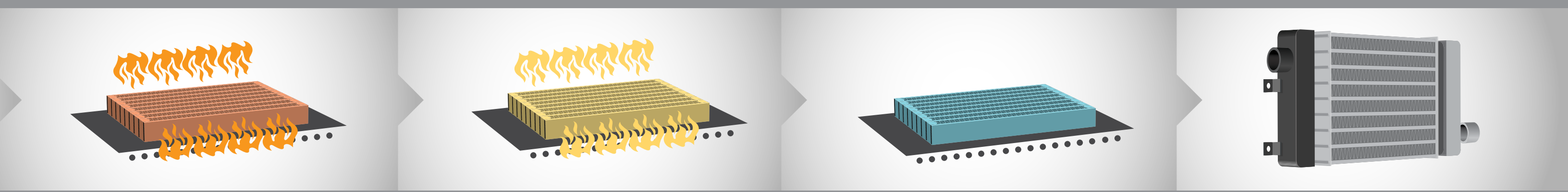
RADIATOR WITH PLASTIC TANKS &
INTEGRATED OPTIONS, E.G. TEMP SENSOR



RADIATOR WITH
FAN SHROUD

S-BAR is manufactured with a close-tolerance tube that has a longitudinal seam butt-welded by a high frequency (H.F.) welding process. This **permanently leak-tight tube**, produced in a high speed single pass operation, provides a **high burst pressure**. Diameters can be held within +/- .002". Tubes can be manufactured from copper, brass, clad aluminum and a variety of other materials.

S-BAR cores are manufactured in a wide variety of standard and custom sizes. Standard widths of 14.87” and 18.18” are available and a range of 8 standard core lengths from 17" up to 26.25”. Any custom size core design is tooled to the OE requirement. One and two row cores are available with the capacity of building multiple pass units.



FURNACE

5:PRE-HEAT

6: BRAZE 1200° F

SENT THROUGH A CONTROLLED ATMOSPHERIC BRAZING (CAB) FURNACE

COOL-DOWN UNIT

7: COOL

WELD/CRIMP STATION

8: WELD METAL OR CRIMP PLASTIC TANKS, PORTS & BRACKETRY TO CORE

TURN-KEY COOLING MODULES

- Fully pressure and leak tested, to 25 - 28 PSI assembled and packaged.
- Thermal Transfer Products can supply complete cooling packages, including in-house designed removable core guards, fan shroud, electric fan, and over flow bottle, etc.

HIGH-PERFORMANCE

LOW-CLOGGING

Look to S-BAR for high volume OE applications in small HP ranges.

Cooler Specifications

TBAR™

Fluid compatibility
- Petroleum/mineral oils
- Oil/water emulsion
- Phosphate ester
- Water/ethylene glycol
- Heated air

Core Ratings
- *Radiator*
  Maximum Operating Pressure: 30 psi
  Maximum Operating Temperature: 250°F
- *Charge Air Cooler*
  Maximum Operating Pressure: 30 psi
  Maximum Operating Temperature: 475°F
- *Oil Cooler / Transmission Cooler*
  Maximum Operating Pressure: 250 psi
  Maximum Operating Temperature: 350°F

PBAR™

Fluid Compatibility
- Petroleum/mineral oils
- Oil/water emulsion
- Phosphate ester
- Water/ethylene glycol
- Heated air

Core Ratings
- *Radiator*
  Maximum Operating Pressure: 30 psi
  Maximum Operating Temperature: 250°F
- *Charge Air Cooler*
  Maximum Operating Pressure: 30 psi
  Maximum Operating Temperature: 475°F
- *Oil Cooler / Transmission Cooler*
  Maximum Operating Pressure: 250 psi
  Maximum Operating Temperature: 350°F

SBAR™

Fluid compatibility
- Water/Glycol
  Mixtures rated for aluminum radiators

Core Ratings
- *Aluminum (3003) Tank Radiators*
  Maximum Operating Pressure: 25 psig
  Maximum Inlet Temperature: 250°F
  Maximum Coolant Flow Rate: 5 ft/sec through the tubes
- *Plastic (Nylon 6/6) Tank Radiators*
  Maximum Operating Pressure: 25 psig
  Maximum Inlet Temperature: 250°F
  Maximum Coolant Flow Rate: 5 ft/sec through the tubes

Quoting & Build Process

1. An application data sheet will need to be provided to Thermal Transfer Products to begin the quoting process. Include:
   - OE Engine data/Hydraulic Oil data/Fan data/Application data
   - Dimensional size of available envelope for cooling module
   - Sketch layout to show port locations and type
2. Thermal Transfer Products will provide initial predictive theoretical performance data sheet and dimensional size after required data is assembled.
3. After performance data approval by customer, a budgetary quote and prototype costing will be submitted for review.
4. A prototype order will trigger Thermal Transfer Products to design a top level drawing for customer signature approval.
5. Approved drawing design will start the manufacturing process. Lead times vary dependant on data discovery & complexity of cooling module. A lead time will be offered when quoted.

Contact Thermal Transfer Products

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www.thermaltransfer.com

We COOL what you POWER

API Heat Transfer
PERFORMANCE IS EVERYTHING

API Heat Transfer Inc. is a global leader in the design and manufacture of a wide range of specialty heat exchangers and heat transfer solutions. Customers benefit from the industry's broadest specialty heat-exchanger portfolio, best-in-class product development and testing capabilities, and an unmatched global sales and manufacturing infrastructure. **For more information visit www.apiheattransfer.com.**

Fan-Cooled Power Converter Coolers

Power Converter Coolers

API Heat Transfer power converter coolers are a line of our Airtech Fan-Cooled Heat Exchangers, ideally suited for the cooling of wind turbine power conversion equipment. Our conversion coolers prevent inlet temperatures from exceeding maximum recommendations to ensure safe and efficient operation.

Conversion coolers feature our vacuum brazed all-aluminum construction, resulting in a bonded unitary core for unparalleled performance and cost-effectiveness in a rugged, compact, and lightweight package. Plus, our array of internal and external fin configurations allow us to select the right combination to maximize heat transfer while minimizing pressure drop, ensuring suitability for the cooler's operating environment.

Cooling Modules

Aluminum and Copper-Brass Cooling Modules

At API Heat Transfer, we design each cooling module specifically for the unique duty the application calls for to ensure long-term performance and reliable service in a cost-effective package. Our vast range of heat exchanger technologies and expertise to integrate them into a custom cooling module solution is what sets us apart. We use the highest quality components and integrate them using proven cooling technologies gained through years of experience.

PERFORMANCE NOTES.

- Each cooling module is engineered to optimize weight, performance, and cost
- Radiators, charge air coolers, and oil coolers are designed to operate as a “system”
- Available in brazed-aluminum or copper-brass technology
- Designed for ease of installation and maintenance
- Complete customization with any cooling system component
- Multi-fan designs for low noise

OPTIONS AND ACCESSORIES.

We source all ancillary components and combine them into a single, 100% compatible package, saving you time and effort in design, procurement, and installation of these components.

- Safe and durable fan, belt, and radiator core guards
- Thermal and Vibration Isolation
- Integrated fans and fan-drive components
- Electric and hydraulic motors
- Hoses
- Fan shroud
- Anti-recirculation baffles
- Coolant recovery tanks
- Thermal and pressure relief valves
- Optional galvanized steel and heat exchanger coatings provide enhanced corrosion resistance
- Level sensors and switch gauges

Air Cooled Oil Coolers

Custom Oil Coolers

Oil cooling requirements vary widely depending on the type of equipment and duty cycle required. We've specially selected fin and tube options to provide the exact performance and durability the application calls for. Whether its high viscosity start up or full temperature operation, our brazed aluminum oil coolers keep it cool. We carefully select each oil cooler to be compatible with your system and each product is carefully designed to provide you the best combination of heat transfer and pressure drop.

Oil Cooler Technologies

BAR & PLATE OIL COOLERS

We've identified the best selection of hot and cold fin combinations to provide the ultimate in flexibility and provide the best heat transfer performance in the market.

- Highly flexible design options
- Enhanced internal fin geometries for superior cooling
- Wide variety of hot fins to balance internal pressure drop
- High-efficiency louvered fins for superior heat rejection
- Wide variety of debris resistant non-louvered fins
- Specially designed extruded tanks withstand high pressures
- Ideal for low viscosity fluids
- Welded tanks for a long leak-free life
- Integral bypass relief valves

TBAR OIL COOLERS

Our patented TBAR replaces hot fins and bars with a single extruded tube for increased product durability.

- Highly flexible design
- Patented tube-to-bar joint ensures consistent brazing
- Extruded tubes provide unrivaled durability & fewer leak paths
- High-efficiency louvered fins for enhanced heat rejection
- Debris resistant non-louvered fins
- Specially designed extruded tanks withstand high pressures

APPLICATIONS.

- Hydraulic oil coolers
- Transmission oil coolers

- Welded tank to core for a long leak-free service life
- Zinc-Infused aluminum cores for unrivaled corrosion protection
- Low oil side pressure drop
- Stands up to heavy pressure-cycle loads & pressure spikes
- Ideal for high viscosity fluids
- Integral bypass relief valves

- Hydrostatic oil coolers
- Brake oil coolers
- Diesel fuel coolers
- Gear box oil coolers

MICRO-CHANNEL

- Robust and flexible design
- Louvered and non-louvered air-side fins are available
- Efficient surface to maximize heat rejection

IN-TANK COOLERS

- Compact designs fit inside radiator bottom tanks for transmission oil cooling
- Available in stainless steel and aluminum construction

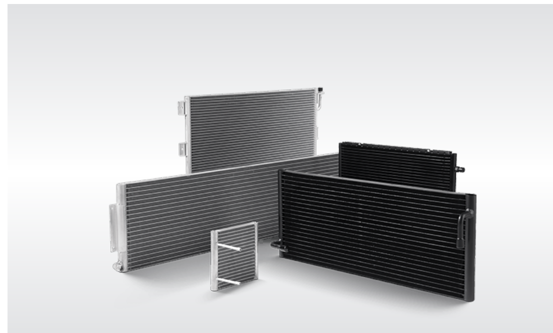
Parallel Flow Condensers

Parallel Flow Condensers

API Heat Transfer is a major supplier of all aluminum parallel flow condensers using extruded tubes. Brazed aluminum provides highly efficient, robust designs using lightweight all aluminum materials.

PERFORMANCE NOTES.

- Efficient designs using extruded tubes with small hydraulic diameters for optimum refrigerant heat transfer
- All aluminum construction provides longer product life against corrosion
- Face areas up to 30” fin height x 120” fin lengths
- Single and double row construction
- 18mm and 25.4mm tube depth options
- Threaded o-ring and brazed copper to aluminum connections
- Extruded tubes with zinc arc-spray coatings for optimum life
- UL listed up to R410a applications at high ambient conditions
- Micro-micro extruded tubes available
- Wavy and louvered fins available
- Our standard Uni-Fit product line is available for quick design and delivery.



PCR (Pre-cooler, Cooler, Reheater)

Airtech PCR

When warm, dry air is critical to the manufacturing process, air dryers are often installed as part of the plant's compressed air system. One of the most common designs is a non-cycling direct expansion refrigerated air-dryer. API Heat Transfer has developed the PCR, or pre-cooler, cooler, reheater, designed specifically to meet the needs of the refrigerated air dryer market.

The PCR is a compact multi-section all-aluminum heat exchanger featuring a brazed bar & plate design. The PCR pre-cools the incoming air using the cold air exiting the refrigerant section. It then final cools the air in the refrigerant section at which point the air stream enters a separation chamber to allow the condensed moisture to fall out. Since the air is reheated in the regeneration section, the final humidity remains below 25%.

API Heat Transfer makes a range of standard sizes or can custom design specific range of PCRs to meet the demands of high-volume OEMs.

STANDARD MODEL RANGE

- Models 1 through 6

STANDARD CAPACITIES

- 76 SCFM to 600 SCFM

INTEGRAL SEPARATOR

- Optional

Remote Cooling Kits

Remote Cooling Kits

Due to the constraints of space and because of thermal considerations in many environments, an increasing number of commercial power generation installations require the cooling equipment to be remotely located from the generator room.

The kits can be cooled by a separate secondary water source, such as a cooling tower or remote radiator, and can be offered to withstand the secondary water source up to 160 meters above the engine. This makes them ideal for cooling engines situated in the basement of tall buildings, where the radiators need to be on the roof.

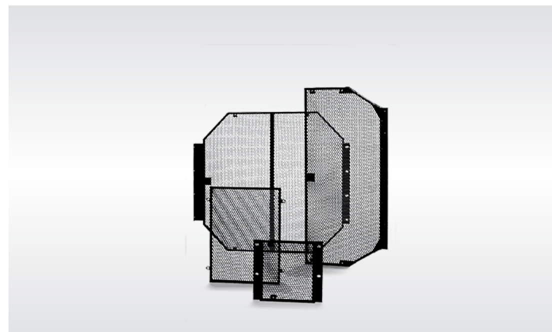
Base-frame mounted remote cooling kits consist of:

- Water-cooled charge air coolers
- Jacket water heat exchangers
- CCW and JW header tanks
- All pipework to the engine (jacket water optional)
- A fuel cooler can also be added, if required
- Coolant circulation pump for remote radiator loop can also be provided

Sand-Blast Protection Screens

Sand-Blast Grids

API Heat Transfer has developed a line of Covrad sand-blast grids that are made to protect your cooling package investment. Sand-blast grids consist of a steel hexagonal inter-locking matrix that mounts between the radiator core and the blower fan, protecting the core from “sand-blast erosion” in harsh environments.



FEATURES.

- Robust patented construction with mechanically interlocking tabs
- Cost effective solution to extend service life of cooling package
- Includes Steel “U-Edging” welded around the perimeter of the grid
- Mounting provisions designed to match any radiator
- Custom designed to fit any radiator size & configuration
- Designed to minimize space required…only 0.50” deep
- Can easily be retrofitted into existing installations
- Durable EDP coating

ADVANTAGES.

- Absorbs impact/energy of fan-propelled particles before they contact core
- Protects core from erosion resulting from sand abrasion
- Very low external static resistance to cooling air flow

BENEFITS.

- Negligible effect on cooling airflow
- Eliminates high proportion of “sandblasting” erosion of radiator core in blower fan applications
- Extends useful life of radiator compared to unprotected cores
- Eliminates costly downtime from replacing radiator cores

USES.

- Specify as “standard” or “optional” value-added component
- Specify anytime equipment is used in high sand/dirt/debris site conditions having blower fan arrangement

- Standard product consists of 40" x 40" and 48" x 48" kits, which include u-edging finish trim for perimeter

Turnkey Radiators

Turnkey Genset Radiators

Our line of Covrad turnkey radiator cooling packages feature our unique high-performance cores and low horsepower fan engineered into a compact envelope. Choose from pre-engineered models or request a custom sized solution based on your specific rating and site conditions.

PERFORMANCE NOTES.

- Turnkey radiators include all components needed to install and connect the radiator to your engine-genset:
  - Drive-Kit with premium belts, pulleys and stub-shaft
  - Pipe-Kit with custom-formed pipes to interface with your specific engine
  - Radiator base designed to interface with your specific engine rail
- Engineered to provide efficient engine cooling in all site conditions
- Optional galvanized steel and heat exchanger coatings provide enhanced corrosion protection

RHINODRIVE™ TURNKEY ENGINE-DRIVEN RADIATOR

Specify a RhinoDrive™ turnkey engine-driven radiator from API Heat Transfer for your next high horsepower (3MW+ direct drive off engine) gen set installation to avoid using costly remote radiators with electric motor driven fans.

- Reduce fan-drive stresses
- Reduce the complexity of your genset installation
- Engineered "Rhino tough"
- Avoid using remote radiators
- Provide a turnkey genset, including radiator, to your customer
- Lower “total cost of ownership”

API HEAT TRANSFER

AOL Series - Compressed Air

Thermal Transfer Products Compressed Air Aftercoolers

API Heat Transfer's line of Thermal Transfer Products compressed air aftercoolers is a complete series of standard catalog air-to-air and water-to-air aftercoolers for compressed air and lube oil cooling. All Thermal Transfer Products aftercoolers are available with a wide variety of standard options to best suit each application.

Water-Cooled

In-Line shell and tube

Up to 5000-cfm capacity

Large range of standard sizes

Low approach temperatures

Copper, copper-nickel, or stainless steel tubing

Air-Cooled

Belt Guard or fan-cooled units

Up to 5000-cfm capacity

Large range of standard sizes

AC, hydraulic, or air-motor fan drives

Copper tube aluminum fin

Brazed aluminum (P-BAR)

Heresite coating for offshore or corrosive environment operation

Customer Focused and Driven

All catalog products are available with short lead-times

Expert application engineers available to select and size the right product for your application

Custom designs are available

For application help and quoting, visit our Full TTP site or contact ttpsales@apiheattransfer.com.

Belt Guard Series

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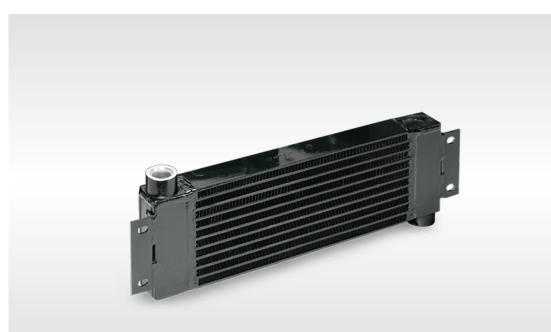

AHP Series

Thermal Transfer Products Compressed Air Aftercoolers

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Water-Cooled

In-Line shell and tube

Up to 5000-cfm capacity

Large range of standard sizes

Low approach temperatures

Copper, copper-nickel, or stainless steel tubing

Air-Cooled

Belt Guard or fan-cooled units

Up to 5000-cfm capacity

Large range of standard sizes

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AHPV Series

Thermal Transfer Products Compressed Air Aftercoolers

API Heat Transfer's line of Thermal Transfer Products compressed air aftercoolers is a complete series of standard catalog air-to-air and water-to-air aftercoolers for compressed air and lube oil cooling. All Thermal Transfer Products aftercoolers are available with a wide variety of standard options to best suit each application.

Water-Cooled

In-Line shell and tube

Up to 5000-cfm capacity

Large range of standard sizes

Low approach temperatures

Copper, copper-nickel, or stainless steel tubing

Air-Cooled

Belt Guard or fan-cooled units

Up to 5000-cfm capacity

Large range of standard sizes

AC, hydraulic, or air-motor fan drives

Copper tube aluminum fin

Brazed aluminum (P-BAR)

Heresite coating for offshore or corrosive environment operation

Customer Focused and Driven

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AA Series

Thermal Transfer Products Compressed Air Aftercoolers

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Water-Cooled

In-Line shell and tube

Up to 5000-cfm capacity

Large range of standard sizes

Low approach temperatures

Copper, copper-nickel, or stainless steel tubing

Air-Cooled

Belt Guard or fan-cooled units

Up to 5000-cfm capacity

Large range of standard sizes

AC, hydraulic, or air-motor fan drives

Copper tube aluminum fin

Brazed aluminum (P-BAR)

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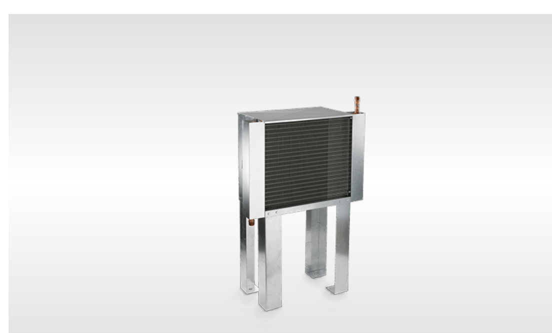

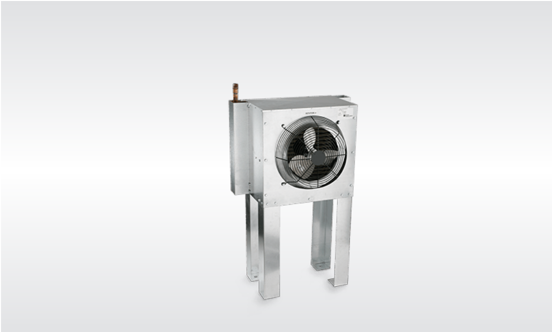

UPA Series

Thermal Transfer Products Compressed Air Aftercoolers

API Heat Transfer's line of Thermal Transfer Products compressed air aftercoolers is a complete series of standard catalog air-to-air and water-to-air aftercoolers for compressed air and lube oil cooling. All Thermal Transfer Products aftercoolers are available with a wide variety of standard options to best suit each application.

Water-Cooled

In-Line shell and tube

Up to 5000-cfm capacity

Large range of standard sizes

Low approach temperatures

Copper, copper-nickel, or stainless steel tubing

Air-Cooled

Belt Guard or fan-cooled units

Up to 5000-cfm capacity

Large range of standard sizes

AC, hydraulic, or air-motor fan drives

Copper tube aluminum fin

Brazed aluminum (P-BAR)

Heresite coating for offshore or corrosive environment operation

Customer Focused and Driven

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API HEAT TRANSFER

MA Series

Thermal Transfer Products Brazed Aluminum Mobile Hydraulic Oil Coolers

Made with 100% brazed aluminum bar and plate construction, API Heat Transfer's full line of Thermal Transfer Products standard mobile oil coolers is proven to stand-up in some of the toughest off-road environments. Our oil coolers are available with a wide variety of standard options to best suit each application and offer maximum performance.

Brazed Aluminum (P-BAR) Highlights

100% rugged bar and plate construction

Up to +400 HP of heat removal from hydraulic oil

Highest performing internal turbulator for maximum performance

Low-clogging / easy maintenance air side cooling fins

Standard Product Options

12 or 24 volt DC fans

Hydraulic fan motor drive

Built-in pressure bypass (30 or 60 psi for cold start-up)

Heresite coating for offshore or corrosive environment operation

Customer Focused and Driven

All catalog product is available with short lead-times

Expert application engineers available to select and size the right product for your application

Custom designs are available

Industry Applications

Our oil coolers are used in a wide variety of mobile applications across the globe.

Commercial duty lawnmowers

Municipal street cleaners

Hydrostatic drives

Tow-behind compressor lube cooling

Construction equipment

Underground mining

Engine oil cooling

For application help and quoting, visit our Full TTP site or contact ttpsales@apiheattransfer.com.

BRAZED ALUMINUM CONSTRUCTION

Features

- 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
- Fan motor assembly has an IP68 with AMP-#180908 connection
- 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
- Additional capabilities for radiators, charge-air-coolers, condensers, and multi-circuit units
- Optional temperature sensors *(see pg. 171)*

30/60 psi Bypass available

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

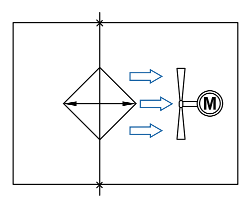
Materials

Core Brazed Aluminum Bar and Plate

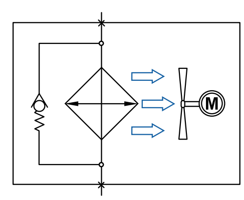
- Tanks – 5052 Aluminum
- Nose Bar & Little Bar – 3003-H Aluminum
- Air Fin, Plate, Turbulator & End Plate – 3003-O Aluminum

Connections Aluminum

Core Mounting Brackets Brazed Aluminum



Without Bypass



With Bypass

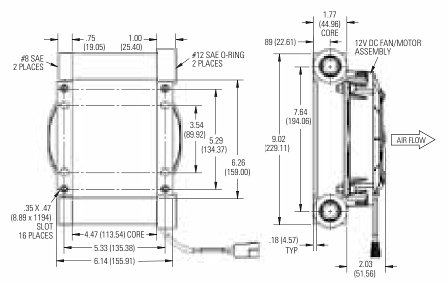
How to Order

Model Series	–	Model Size Selected	–	Connection Type*	–	Bypass*	–	Specify Motor Required
MA (MAR)		3, 3.5, 4, 12, 18, 32, 48, 232, 248		1 - NPT, 2 - SAE, 3 - BSPP		30 - 30 PSI, 60 - 60 PSI		4A - 12 VDC, 4B - 24 VDC

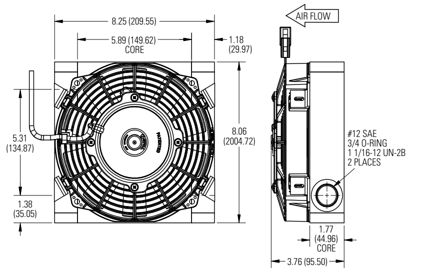
*Bypass available on MA-12, MA-18, MA-32, MA-48, MA-232, MA-248 only. (MAR)
MA-8, MA-14, MA-20, MA-66, MA-32 do not have fan option.
MA 3.5 available with fan only.

Dimensions - Fan/Core

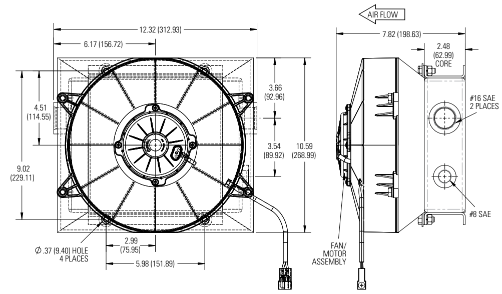
MA-3



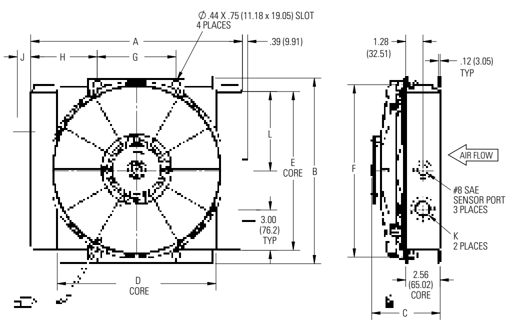
MA-3.5



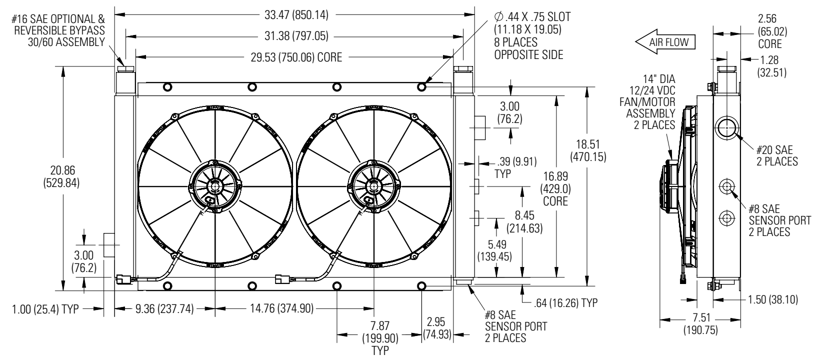
MA-4



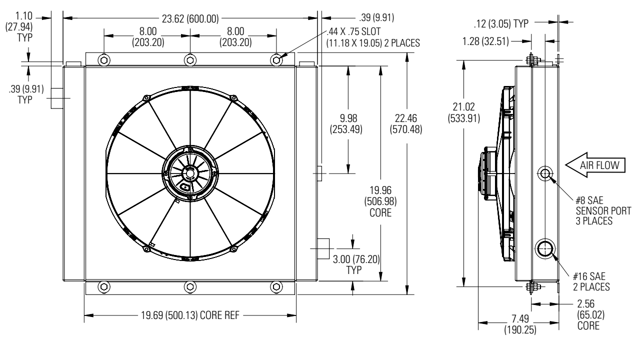
MA-12, MA-18, MA-32



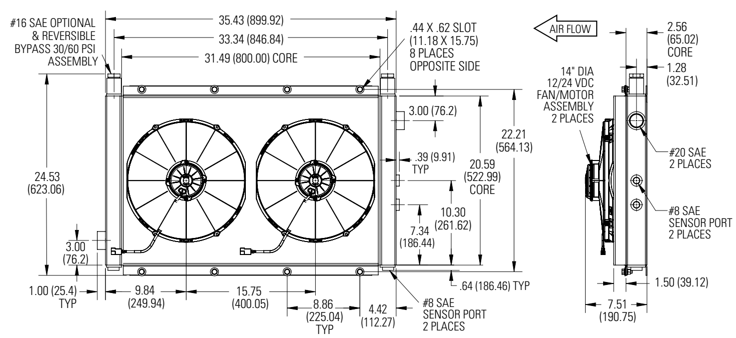
MA-232



MA-48



MA-248

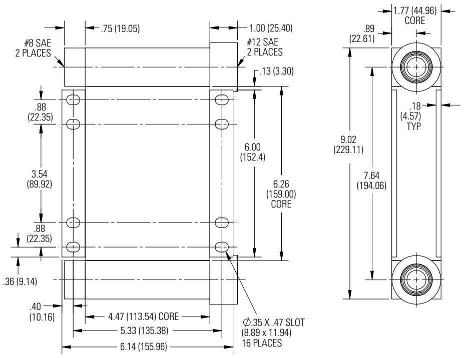


Model	A	B	C	D	E	F	G	H	J	K	L	DC Amp Draw 12V	24V	CFM (CMM)	Approx. Ship Wt. lbs (Kg)
MA-3	See diagram above			—	—	—	—	—	—	—	—	5.7	3.6	300 (8.50)	6 (2.72)
MA-3.5	See diagram above			—	—	—	—	—	—	—	—	12.5	6.3	370 (10.48)	9 (4.08)
MA-4	See diagram above			—	—	—	—	—	—	—	—	12.5	6.3	363 (10.28)	16 (7.26)
MA-12	13.78 (350.01)	11.81 (299.97)	6.26 (159.00)	9.84 (249.94)	9.96 (252.98)	10.87 (276.10)	5.71 (145.00)	4.41 (112.01)	1.00 (25.40)	#12 SAE	4.98 (126.49)	12.5	6.3	521 (14.75)	19 (8.62)
MA-18	15.75 (400.05)	13.81 (350.77)	5.04 128.02)	11.81 (299.97)	11.81 (299.97)	12.80 (325.12)	5.87 (149.10)	4.96 (125.98)	1.00 (25.40)	#12 SAE	5.91 (150.11)	10.6	5.3	783 (22.17)	23 (10.43)
MA-32	19.69 (500.15)	18.54 (470.92)	5.95 (151.13)	15.75 (400.05)	16.14 (409.96)	17.32 (439.93)	12.00 (304.8)	3.86 (98.04)	1.14 (28.96)	#16 SAE	8.07 (204.98)	22.2	11.1	1368 (38.74)	28 (12.70)
MA-48	See diagram above			—	—	—	—	—	—	—	—	22.2	11.1	1637 (46.40)	45 (20.40)
MA-232	See diagram above			—	—	—	—	—	—	—	—	19.3*	9.7*	2234 (63.26)	65 (29.48)
MA-248	See diagram above			—	—	—	—	—	—	—	—	19.3*	9.7*	2904 (82.24)	90 (40.80)

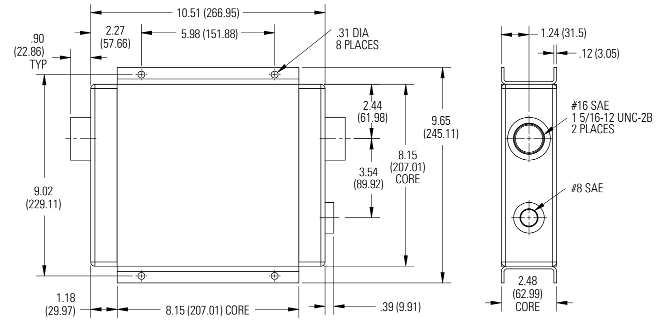
Note: We reserve the right to make reasonable design changes without notice. Dimensions are in inches and (millimeters).
**AMP draw listed as per FAN.*

Dimensions - Core Only

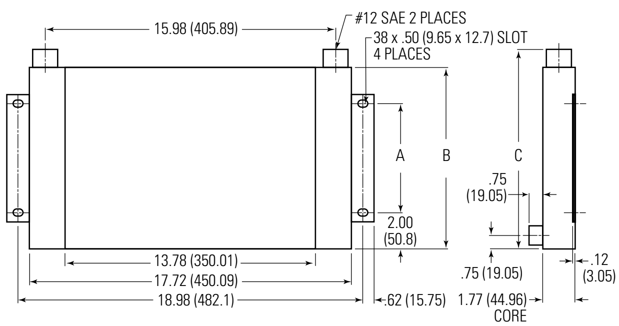
MA-3



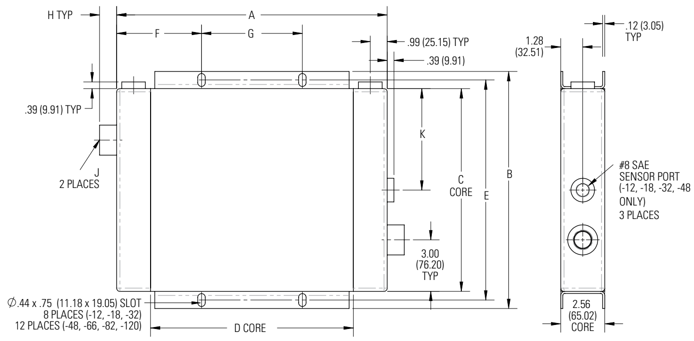
MA-4



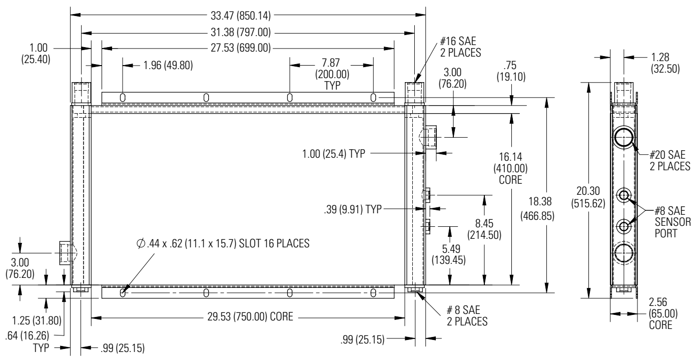
MA-8, MA-14, MA-20



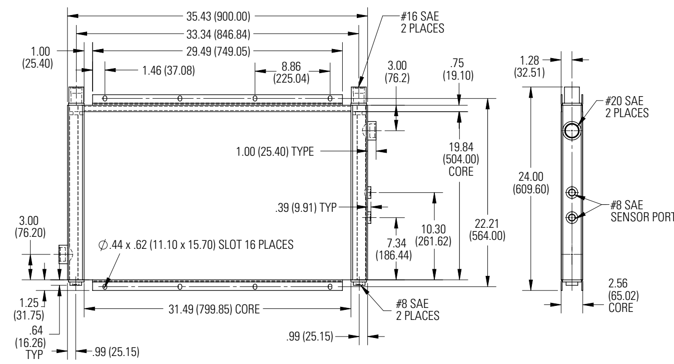
MA-12 thru MA-120



MA-232



MA-248



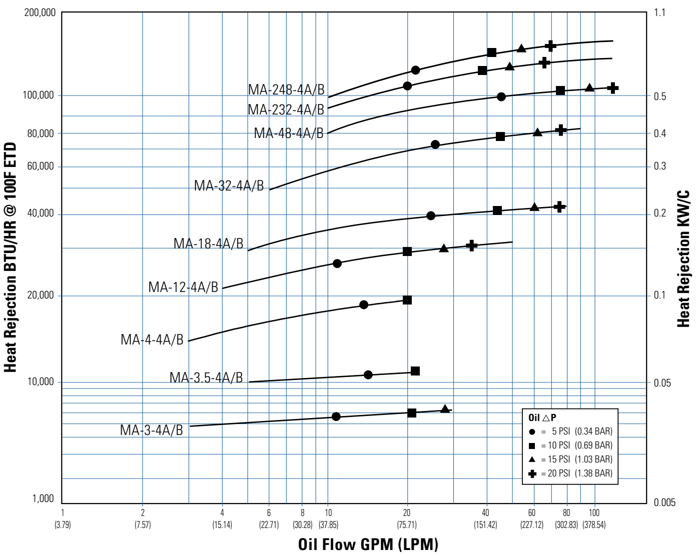
Model	A	B	C	D	E	F	G	H	J	K	Approx. Ship Wt. lbs (Kg)
MA-3	See diagram above			–	–	–	–	–	–	–	4 (1.81)
MA-4	See diagram above			–	–	–	–	–	–	–	7 (3.18)
MA-8	3.00 (76.2)	5.67 (144.02)	6.65 (168.9)	–	–	–	–	–	–	–	10 (4.54)
MA-12	13.78 (350.01)	11.81 (299.97)	9.96 (252.98)	9.84 (294.94)	10.98 (278.89)	4.04 (102.62)	5.71 (145.03)	1.00 (25.4)	#12 SAE	4.98 (126.49)	15 (6.8)
MA-14	6.00 (152.4)	10.00 (254.0)	10.98 (278.89)	–	–	–	–	–	–	–	14 (6.35)
MA-18	15.75 (400.05)	13.81 (350.77)	11.81 (299.97)	11.81 (299.97)	12.82 (325.63)	4.94 (125.48)	5.87 (149.10)	1.00 (25.4)	#12 SAE	5.91 (150.11)	18 (8.16)
MA-20	10.00 (254.0)	14.33 (363.98)	15.31 (388.87)	–	–	–	–	–	–	–	18 (8.16)
MA-32	19.69 (500.13)	18.54 (470.92)	16.14 (409.96)	15.75 (400.05)	17.32 (439.93)	3.85 (97.79)	12.00 (304.8)	1.10 (27.94)	#16 SAE	8.07 (204.98)	28 (12.7)
MA-48	23.62 (599.95)	22.13 (562.10)	19.96 (506.98)	19.69 (500.13)	21.02 (533.91)	3.81 (96.77)	8.00 (203.2)	1.10 (27.94)	#16 SAE	9.98 (253.49)	41 (18.60)
MA-66	27.56 (700.02)	25.83 (656.08)	23.54 (597.92)	23.62 (599.95)	24.72 (627.89)	3.78 (96.01)	10.00 (254.0)	1.58 (40.13)	#20 SAE	–	50 (22.68)
MA-82	31.50 (800.1)	27.68 (703.07)	25.39 (644.91)	27.56 (700.02)	26.57 (674.8)8	5.75 (146.05)	10.00 (254.0)	1.58 (40.13)	#24 SAE	–	65 (29.48)
MA-120	31.50 (800.1)	39.49 (1003.05)	37.20 (944.88)	27.56 (700.02)	38.39 (975.11)	5.75 (146.05)	10.00 (254.0)	1.58 (40.13)	#24 SAE	–	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 and (millimeters).

Performance Curves

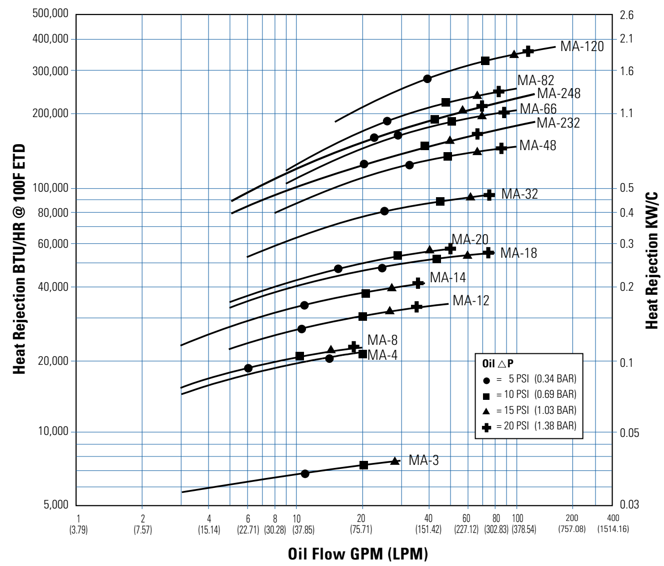
MA Models with DC Fan Assemblies

Performance Data Curve

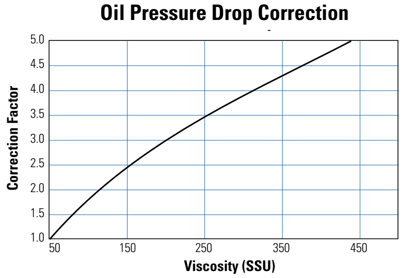


MA Models (No Fan, Core Only)

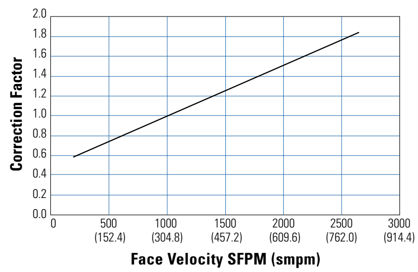
Performance Data Curve



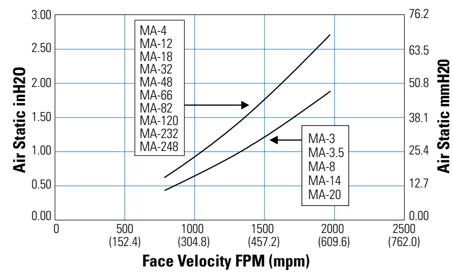
Oil Pressure Drop Correction



Air Static Correction



Air Static Pressure Drop



Selection Procedure

Step 1 **Determine Heat Load.** Typical Rule of Thumb, - size cooler for 1/3 of the input horsepower. Heat load may be expressed as either Horsepower or BTU/HR or KW/°C.

HP = BTU/HR ÷ 2545

BTU/HR = HP x 2545

$$\text{BTU/HR} = \frac{\text{KW}}{°\text{C}} \times 1895 \times \text{E.T.D.}(°\text{F})$$

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**
(Skip to Step 4 if using our DC Fan Assembly)

Calculate actual SFPM Air Velocity or SCFM (Standard Cubit 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

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

(BTU/HR) to use with selection chart

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

METRIC Version

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

Step 5 **Select Model From Curves** Enter the Performance Curves at the bottom with the 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 (E.T.D.)

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

BOL Series - Mobile

Thermal Transfer Products Brazed Aluminum Mobile Hydraulic Oil Coolers

Made with 100% brazed aluminum bar and plate construction, API Heat Transfer's full line of Thermal Transfer Products standard mobile oil coolers is proven to stand-up in some of the toughest off-road environments. Our oil coolers are available with a wide variety of standard options to best suit each application and offer maximum performance.

Brazed Aluminum (P-BAR) Highlights

100% rugged bar and plate construction

Up to +400 HP of heat removal from hydraulic oil

Highest performing internal turbulator for maximum performance

Low-clogging / easy maintenance air side cooling fins

Standard Product Options

12 or 24 volt DC fans

Hydraulic fan motor drive

Built-in pressure bypass (30 or 60 psi for cold start-up)

Heresite coating for offshore or corrosive environment operation

Customer Focused and Driven

All catalog product is available with short lead-times

Expert application engineers available to select and size the right product for your application

Custom designs are available

Industry Applications

Our oil coolers are used in a wide variety of mobile applications across the globe.

Commercial duty lawnmowers

Municipal street cleaners

Hydrostatic drives

Tow-behind compressor lube cooling

Construction equipment

Underground mining

Engine oil cooling

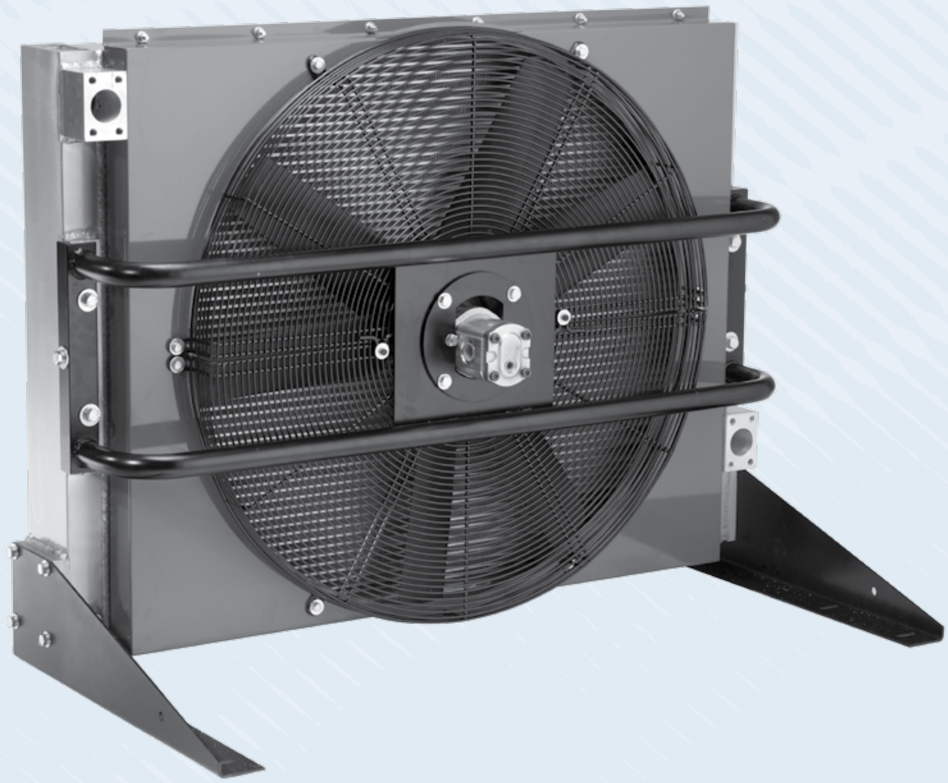
For application help and quoting, visit our Full TTP site or contact ttpsales@apiheattransfer.com.

FLUID COOLING | P-Bar Series Industrial BOL

BRAZED ALUMINUM CONSTRUCTION

Features

- **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**
- **Welded 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**
- T-BAR core optional for high viscosity oils or other highly fouling fluids. *See T-Bar Performance Curve
- Low Noise Option Available



Ratings

Maximum Operating Pressure
250 psi (17 BAR)

Maximum Operating Temperature
300° F (150° C)

Materials

Mounting Feet Steel

Standard 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

Fanguard Steel

Connectors Aluminum

Fan Aluminum Hub, Plastic Blades

Shroud Steel

Motor TEFC & IEC

Fluid Compatability

Petroleum/mineral oils

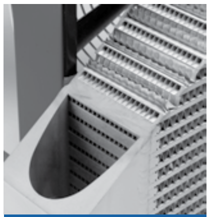
Oil/water emulsion

Water/ethylene glycol

How to Order

Model Series	Model Size Selected	Connection Type*	Specify Motor Required	Core	Noise Level
BOL	**4** **8** **16** **30** **400** **725** **950** **1200** **1600** **2000**	**1** - NPT **2** - SAE **3** - BSPP	**2** - Single Phase **3** - Three Phase **6** - 575 Volt **9** - Hydraulic **18** - IEC Three Phase	**Blank** - Standard Bar & Plate **TB** - T-BAR Core*	**Blank** - Standard Noise Level **LN** - Low Noise Level

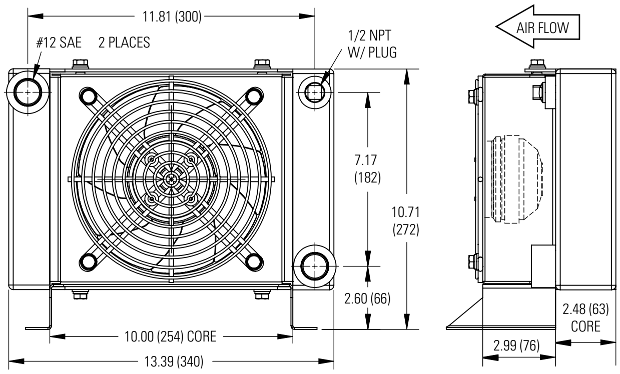
*T-BAR Core option provides a T-BAR core in BOL frame. Used for high fouling or high viscosity fluids. Performance is typically 15-25% less than the bar and plate core. Consult factory for details.



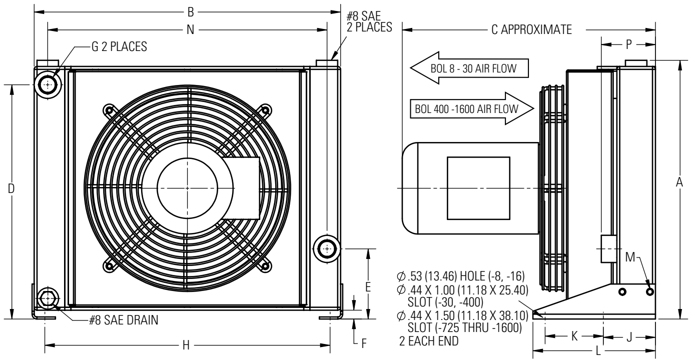
OPTIONAL T-BAR CORE SECTION CUTAWAY

Dimensions

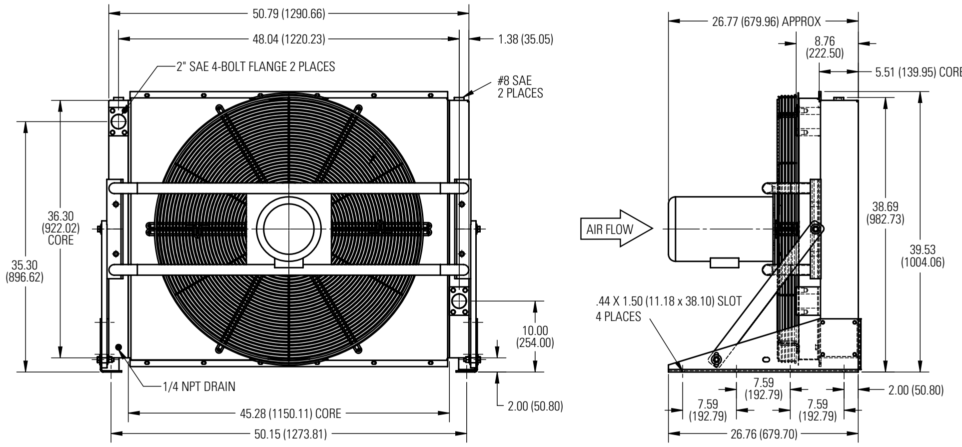
BOL-4



BOL-8 through BOL-1600



BOL-2000



Model	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Approx. Ship Wt. lbs (Kg)
BOL-4	See diagram above			—	—	—	—	—	—	—	—	—	—	—	18 (8.16)
BOL-8	12.93 (328.42)	15.75 (400.05)	14.72 (373.89)	11.30 (287.62)	3.27 (83.06)	.55 (13.97)	#12 SAE	14.53 (369.06)	3.07 (77.98)	3.75 (88.90)	7.36 (186.94)	M8 Bolt (2PL)	14.01 (355.85)	3.48 (88.40)	45 (20.4)
BOL-16	16.63 (422.40)	19.69 (500.13)	16.16 (410.46)	15.06 (382.52)	4.51 (114.56)	.57 (14.48)	#12 SAE	18.30 (464.82)	3.35 (85.09)	3.74 (95.00)	7.87 (199.90)	M8 Bolt (2PL)	17.95 (455.93)	3.46 (87.88)	55 (24.94)
BOL-30	21.09 (535.68)	26.38 (670.06)	18.23 (463.04)	19.49 (495.05)	5.26 (133.60)	1.32 (33.53)	#20 SAE	24.74 (628.40)	4.25 (107.95)	5.00 (127.00)	10.00 (254.00)	M10 Bolt (4PL)	24.34 (618.24)	5.28 (134.11)	125 (56.70)
BOL-400	19.20 (487.68)	22.45 (570.23)	18.80 (477.52)	17.31 (439.67)	6.50 (165.10)	2.00 (50.80)	#20 SAE	22.30 (566.42)	4.25 (107.95)	5.00 (127.00)	10.00 (254.00)	M10 Bolt (4PL)	20.08 (510.03)	5.20 (132.08)	148 (67.13)
BOL-725	23.49 (596.65)	30.32 (770.13)	18.60 (472.44)	21.60 (548.64)	6.50 (165.10)	2.00 (50.80)	#20 SAE	30.17 (766.32)	4.25 (107.95)	5.00 (127.00)	10.00 (254.00)	M10 Bolt (4PL)	27.95 (709.93)	5.20 (132.08)	170 (77.11)
BOL-950	27.94 (709.68)	37.03 (940.56)	22.69 (576.33)	24.55 (623.57)	9.50 (241.30)	2.00 (50.80)	2" SAE 4-Bolt Flange	35.89 (911.61)	6.05 (153.67)	9.20 (233.68)	16.00 (406.40)	M10 Bolt (4PL)	34.26 (870.20)	7.01 (178.05)	300 (136.08)
BOL-1200	27.94 (709.68)	40.96 (1040.38)	24.07 (611.38)	24.55 (623.57)	5.50 (139.70)	2.00 (50.80)		40.31 (1023.87)	6.05 (153.67)	9.20 (233.68)	16.00 (406.40)	M10 Bolt (4PL)	38.19 (970.03)	7.01 (178.05)	430 (195.04)
BOL-1600	36.01 (914.65)	40.96 (1040.38)	25.45 (646.43)	32.62 (828.55)	9.50 (241.30)	2.00 (50.80)		40.31 (1023.87)	6.05 (153.67)	9.20 (233.68)	16.00 (406.40)	M10 Bolt (4PL)	38.19 (970.03)	7.01 (178.05)	515 (233.60)
BOL-2000	See diagram above			—	—	—	—	—	—	—	—	—	—	—	582 (264.00)

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

Specifications

Electric Motor Information (60 Hz Nema Frame)

Model	CMM	CFM	Motor HP	Voltage	Phase	Full Load Amps 230V	Frequency	RPM	Frame	Thermal Overload	Sound dB(A) at 3ft
BOL-4	31.14	1203	1/4	230	1	—	60 Hz	2850	—	—	73
BOL-8	22.65	800	1/3	115/230	1	3.0	60 Hz	3450	48C	No	80
BOL-8	22.65	800	1/3	208-230/460	3	1.4	60 Hz	3450	48C	No	80
BOL-16	40.35	1425	1/2	115/230	1	3.7	60 Hz	3450	48C	No	85
BOL-16	40.35	1425	1/2	208-230/460	3	2.2	60 Hz	3450	48C	No	85
BOL-30	62.29	2200	1/2	115/230	1	3.7	60 Hz	1725	56C	No	85
BOL-30	62.29	2200	1/2	208-230/460	3	2.0	60 Hz	1725	56C	No	85
BOL-400	62.29	2200	1	115/230	1	6.0	60 Hz	3450	56C	No	97
BOL-400	62.29	2200	1	208-230/460	3	3.2	60 Hz	3450	56C	No	97
BOL-725	101.94	3600	1-1/2	115/230	1	8.5	60 Hz	3450	56C	No	100
BOL-725	101.94	3600	1-1/2	208-230/460	3	4.8	60 Hz	3450	56C	No	100
BOL-950	133.10	4700	1-1/2	115/230	1	8.6	60 Hz	1725	145TC	No	92
BOL-950	133.10	4700	1-1/2	208-230/460	3	4.6	60 Hz	1725	145TC	No	92
BOL-1200	198.22	7000	3	208-230/460	3	8.8	60 Hz	1725	182TC	No	94
BOL-1600	223.75	7900	5	208-230/460	3	13.4	60 Hz	1725	184TC	No	96
BOL-2000	396.44	14000	7.5	230/460	3	24.8	60 Hz	1725	213TC	No	98

Electric Motor Information (50 Hz IEC Frame)

Model	CMM	CFM	KW	Voltage	Phase	Frequency	RPM	Frame	Sound dB(A) at 3ft
BOL-4	28.4	1003	.20	230	1	50 Hz	3000	—	73
BOL-8	18.9	667	.25	230/400/415	3	50 Hz	3000	63	71
BOL-16	33.7	1188	.37	230/400/415	3	50 Hz	3000	71	77
BOL-30	52.4	1850	.37	230/400/415	3	50 Hz	1500	71	73
BOL-400	52.4	1850	.75	230/400/415	3	50 Hz	3000	80	81
BOL-725	85.0	3000	1.10	230/400/415	3	50 Hz	3000	80	80
BOL-950	108.2	3821	1.50	230/400/415	3	50 Hz	1500	90	78
BOL-1200	165.1	5834	2.20	230/400/415	3	50 Hz	1500	100	83
BOL-1600	186.4	6584	3.00	230/400/415	3	50 Hz	1500	100	85
BOL-2000	331.3	11700	4.00	230/400/415	3	50 Hz	1500	112	88

All IEC frame motors have CE mark.
IEC motor voltages have +/- 10% tolerance.

Hydraulic Motor Information

Model	Oil Flow Required GPM (LPM)	Min. Pressure Required PSI (BAR)	Motor IN³/REV (CM³/REV) Displacement	Sound dB(A) at 3 ft.
BOL-4	3.3 (12.49)	400 (27.58)	0.22 (3.6)	80
BOL-8	3.3 (12.49)	400 (27.58)	0.22 (3.6)	80
BOL-16	3.3 (12.49)	500 (34.47)	0.22 (3.6)	85
BOL-30	3.4 (12.87)	500 (34.47)	0.45 (7.3)	85
BOL-400	3.3 (12.49)	425 (29.30)	0.22 (3.6)	97

Model	Oil Flow Required GPM (LPM)	Min. Pressure Required PSI (BAR)	Motor IN³/REV (CM³/REV) Displacement	Sound dB(A) at 3 ft.
BOL-725	3.3 (12.49)	675 (46.50)	0.22 (3.6)	100
BOL-950	10.1 (38.23)	300 (20.70)	1.4 (22.9)	92
BOL-1200	10.1 (38.23)	725 (50.00)	1.4 (22.9)	94
BOL-1600	10.1 (38.23)	1100 (75.80)	1.4 (22.9)	96
BOL-2000	10.1 (38.23)	1650 (113.76)	1.4 (22.9)	98

Notes: Maximum Pressure is 2000 psi. Stated Minimum Operating Pressure is at Inlet Port of Motor. 1000 psi Allowable Back Pressure.

BOL

Selection Procedure

Step 1 **Determine Heat Load.** Typical Rule of Thumb, -size cooler for 1/3 of the input horsepower. Heat load may be expressed as either Horsepower or BTU/Hr or KW/°C.

HP=BTU/HR ÷ 2545

BTU/HR=HP x 2545

$$BTU/HR = \frac{KW}{°C} \times 1894.61 \times E.T.D.(°F)$$

Step 2 **Determine Entering Temperature Difference.** (Actual E.T.D.)

$$E.T.D. = \text{Entering oil temperature} - \text{Entering Ambient air temperature}$$

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.

Step 3 **Determine the Corrected Heat Dissipation to use the Curves**

ENGLISH Version

$$\text{Corrected Heat Rejection} = \text{(BTU/Hr) Heat Load} \times \frac{100°F}{\text{Desired E.T.D.}}$$

(BTU/HR) to use with selection chart

METRIC Version

$$\text{Corrected Heat Rejection } \frac{KW}{°C} = \frac{\text{Heatload (kw)}}{\text{Desired E.T.D. (°C)}}$$

Step 4 **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 3. Any Model or Curve on or above this point will meet these conditions.

Step 5 **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:

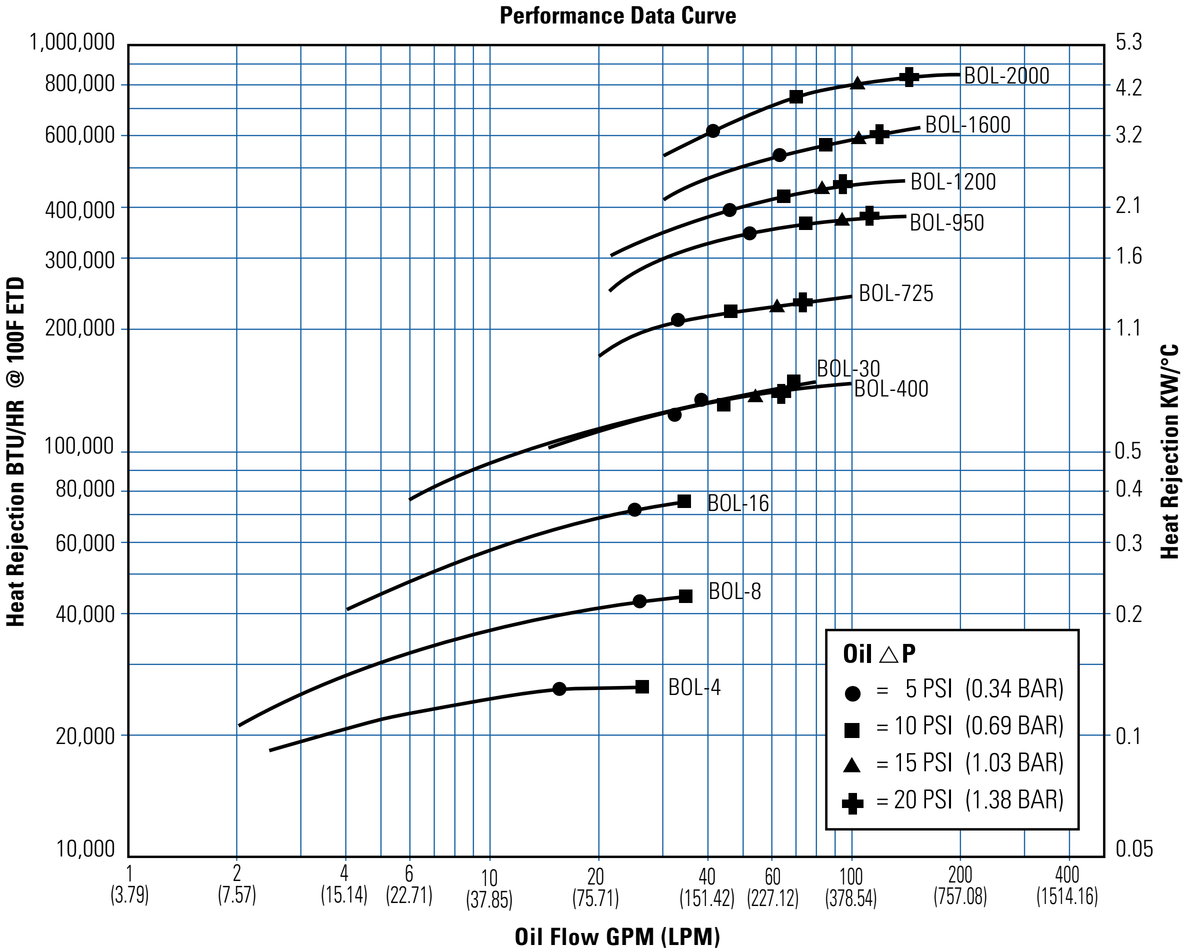
- 50 SSU (11 cSt) oil
- 100° F (55.56° C) Entering Temperature Difference (E.T.D.)

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

AIR COOLED BOL

Performance Curves

BOL Models with Standard P-BAR Core

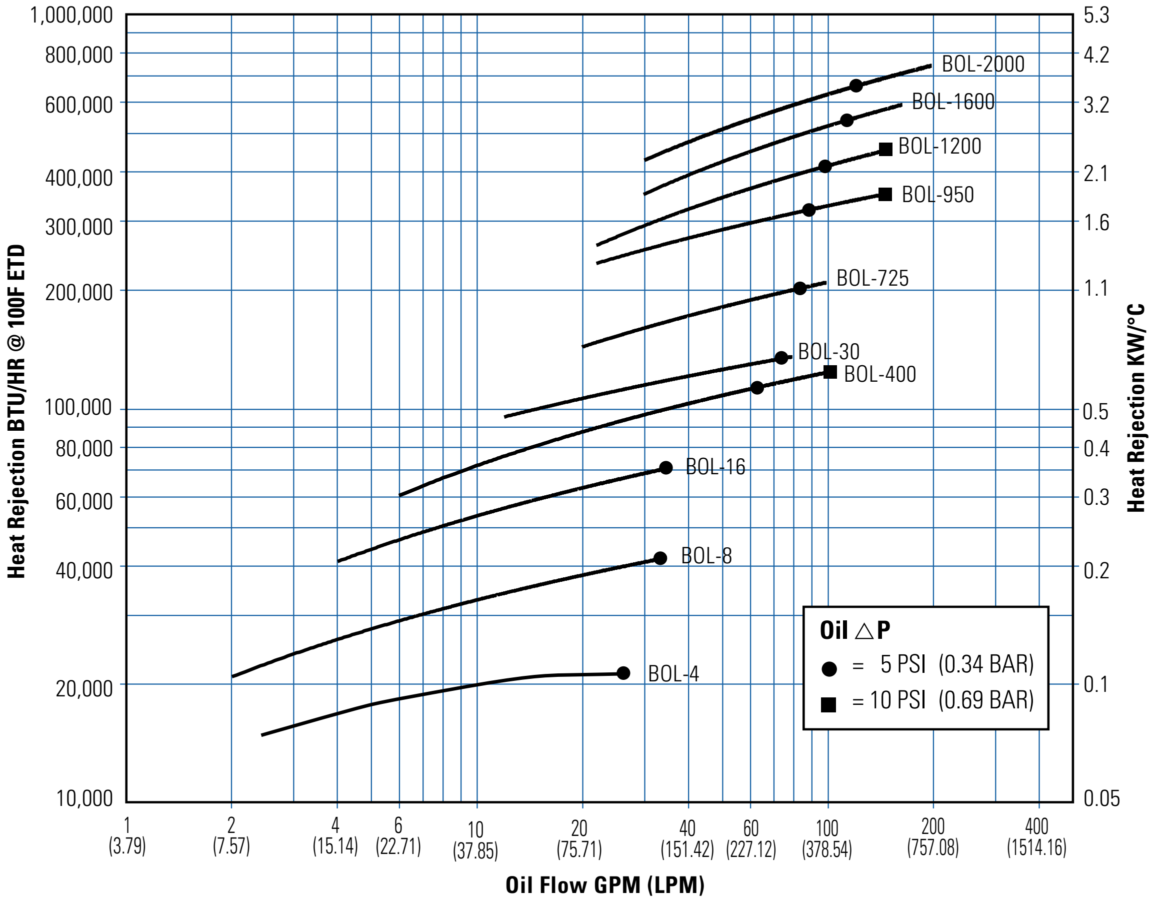


Note: Derate heat rejection values 15% if using 50Hz motors.

Performance Curves

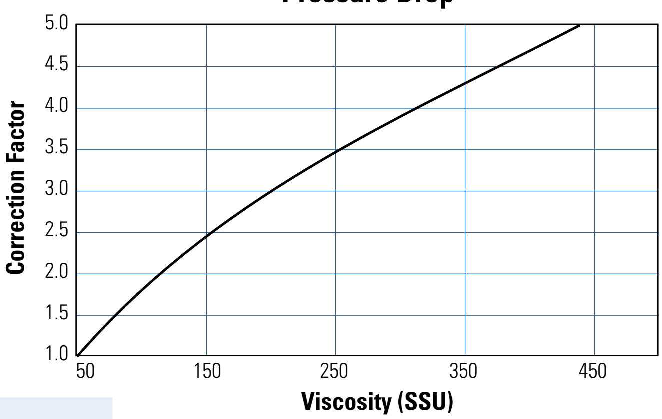
BOL Models with Optional T-BAR Core

Performance Data Curve



Note: Derate heat rejection values 15% if using 50Hz motors.

Pressure Drop



Oil Temperature

Typical operating temperature ranges are:

Hydraulic Motor Oil	120°F - 180°F (49°C - 82.2°C)
Hydrostatic Drive Oil	160°F - 180°F (71°C - 82.2°C)
Engine Lube Oil	180°F - 200°F (82.2°C - 93.3°C)
Automatic Transmission Fluid	200°F - 300°F (93.3°C - 149°C)

Desired Reservoir Temperature

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

Off-Line Recirculation Cooling Loop: Desired reservoir temperature is the oil temperature entering the cooler.

Return Line Cooling: Desired reservoir temperature is the oil temperature leaving the cooler. In this case, the oil temperature change must be determined so that the actual oil entering temperature can be found. Calculate the oil temperature change (oil △T) with this formula:

Oil △T = (BTU's/Hr.) / (GPM Oil Flow x 210).

To calculate the oil entering temperature to the cooler, use this formula:

Oil Entering Temp. = Oil Leaving Temp + Oil △T.

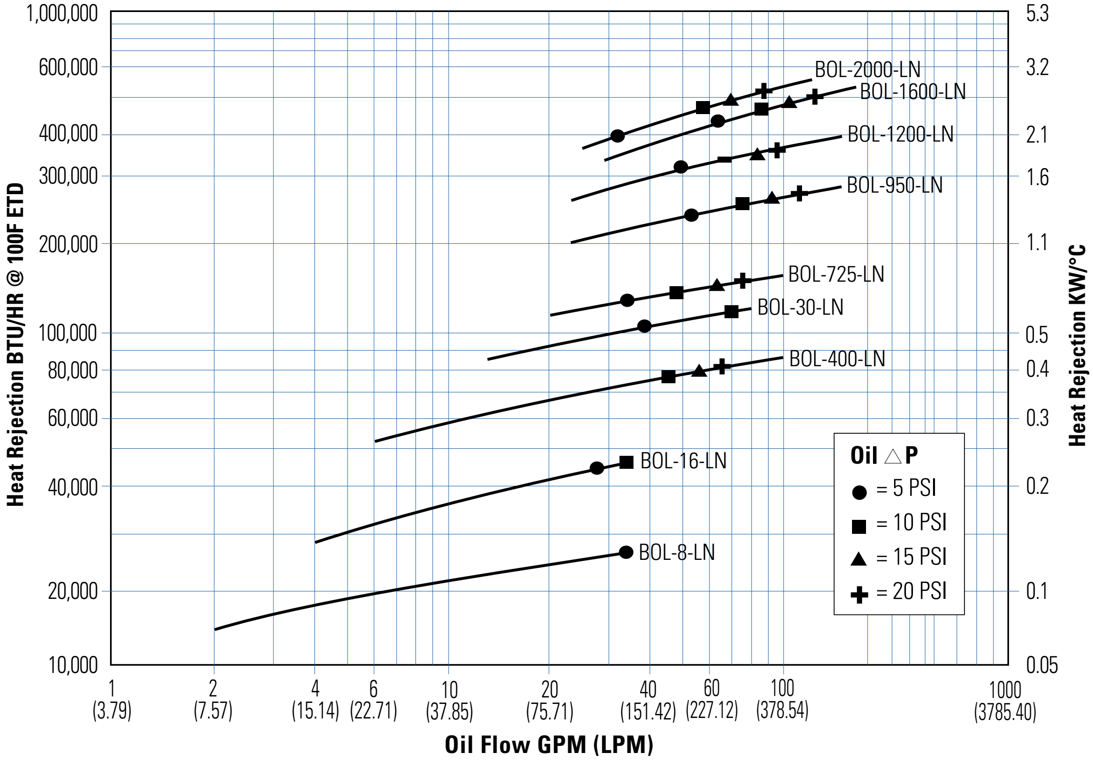
Oil Pressure Drop: Most systems can tolerate a pressure drop through the heat exchanger of 20 to 30 PSI. Excessive pressure drop should be avoided. Care should be taken to limit pressure drop to 5 PSI or less for case drain applications where high back pressure may damage the pump shaft seals.

Performance Curves

BOL Models with Low-Noise Option

The low noise option offers the BOL models with a reduced motor speed.
This allows a lower sound level output for noise-sensitive applications.

Performance Data Curve



Available on 60 Hz Nema frame only.

Electric Motor Information

Model	HP	Frame	Low Noise RPM	Low Noise CFM	Low Noise CMM	Voltage	Frequency (HZ)
8-1PH	0.33	48	1725	400	11.33	115/230	60
8-3PH	0.33	48	1725	400	11.33	208-230/460	60
16-1PH	0.50	48	1725	704	19.93	115/230	60
16-3PH	0.50	48	1725	704	19.93	208-230/460	60
30-1PH	0.50	56C	1160	1470	41.62	115/230	60
30-3PH	0.50	56C	1160	1470	41.62	208-230/460	60
400-1PH	1.00	56C	1725	1100	31.19	115/230	60
400-3PH	1.00	56C	1725	1100	31.19	208-230/460	60
725-1PH	1.50	56C	1725	1780	50.40	115/230	60
725-3PH	1.50	56C	1725	1780	50.40	208-230/460	60
950-1PH	1.50	145TC	1160	3150	89.19	115/230	60
950-3PH	1.50	145TC	1160	3150	89.19	208-230/460	60
1200-3PH	1.50	182TC	1160	4690	132.81	208-230/460	60
1600-3PH	2.00	184TC	1160	6510	184.34	208-230/460	60
2000-3PH	5.00	213TC	1160	8700	000.00	230/460	60

Sound Data

Model	DBA at 3 ft
BOL-8-LN	62
BOL-16-LN	69
BOL-30-LN	67
BOL-400-LN	72
BOL-725-LN	82
BOL-950-LN	76
BOL-1200-LN	75
BOL-1600-LN	78
BOL-2000-LN	85

DF DC/MF DC Fan Drive

Thermal Transfer Products Copper Tube and Fin Mobile Hydraulic Oil Coolers

API Heat Transfer's full line of Thermal Transfer Products standard mobile oil coolers is proven to stand-up in some of the toughest off-road environments. Our oil coolers are available with a wide variety of standard options to best suit each application and offer maximum performance.

Copper Tube and Fin Product Highlights

Aluminum or Steel fins available

Up to +100 HP of heat removal from hydraulic oil

Cost effective, industry proven designs

Large range of standard sizes

Standard Product Options

12 or 24 volt DC fans

Hydraulic fan motor drive

Built-in pressure bypass (30 or 60 psi for cold start-up)

Heresite coating for offshore or corrosive environment operation

Customer Focused and Driven

All catalog product is available with short lead-times

Expert application engineers available to select and size the right product for your application

Custom designs are available

Industry Applications

Our oil coolers are used in a wide variety of mobile applications across the globe.

Commercial duty lawnmowers

Municipal street cleaners

Hydrostatic drives

Tow-behind compressor lube cooling

Construction equipment

Underground mining

Engine oil cooling

For application help and quoting, visit our Full TTP site or contact ttpsales@apiheattransfer.com.

DH Series

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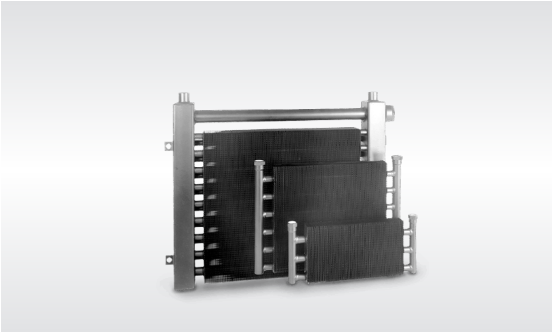
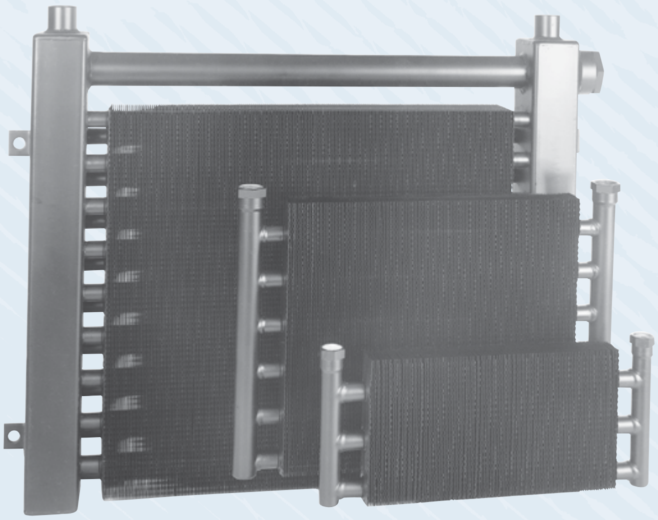


Features

- Hayden Interchange
- Excellent for Radiator Face Mount Cooling
- 3/4" 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 150 GPM, Heat Removal to 175,000 BTU/HR
- Oil Cooler
- Transmission Cooler
- Fuel Cooler



OPTIONS

Built-in Relief Bypass

Steel Components

Custom Sizes/ Mounting Brackets

Connection Sizes/ Locations

Corrosion Resistant Marine Coating

Ratings

Operating Pressure 300 psi

Test Pressure 300 psi

Operating Temperature 350° F

Materials

Tubes Copper

Fins Aluminum or Steel

Turbulators Aluminum

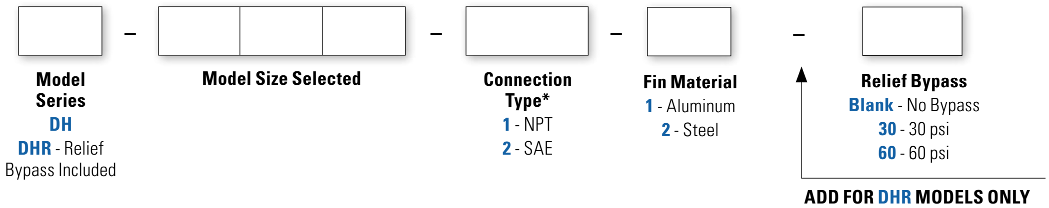
Manifolds Copper: Models DH-051 – DH-447
Steel: Models DH-513 – DH-670

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 30 psi or 60 psi settings. Bypass valve is built into tubes and does not effect external dimensions. All steel valves. Not serviceable.
DH-513	Available in either 30 psi or 60 psi settings. 3/4", external all steel valve. May be removed for servicing.
DH-524 thru DH-670	Available in either 30 psi or 60 psi settings. 1-1/2", external, all steel valve. May be removed for servicing.

How to Order



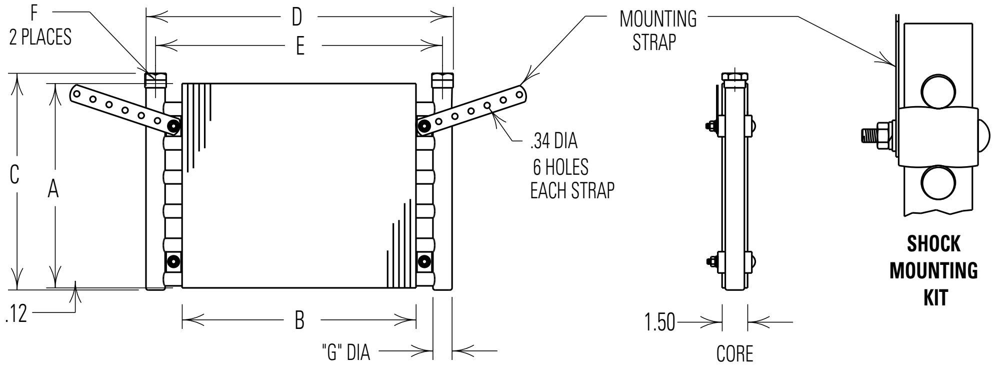
Examples: DH-051-1-1 or DHR-062-2-2-30

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.

Dimensions & Weights

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

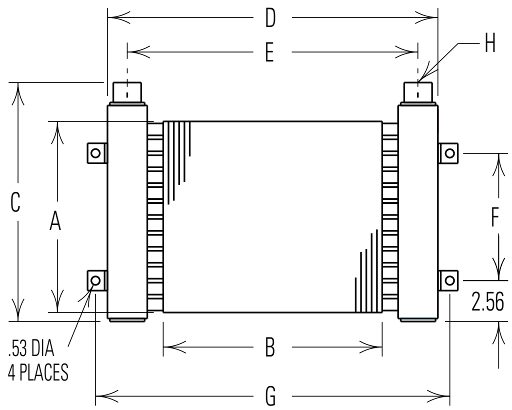
<table>
<tr><th rowspan="2">MODEL</th><th rowspan="2">A</th><th rowspan="2">B</th><th rowspan="2">C</th><th rowspan="2">D</th><th rowspan="2">E</th><th colspan="2">F</th><th rowspan="2">G DIA</th><th rowspan="2">QTY MTG KITS</th><th rowspan="2">FACE AREA SQ FT</th><th rowspan="2">WEIGHT LBS.</th></tr>
<tr><th>NPT</th><th>SAE</th></tr>
<tr><td>DH-051</td><td>4.00</td><td rowspan="2">11.25</td><td>4.50</td><td>15.00</td><td>14.12</td><td rowspan="7">0.50</td><td rowspan="7">#10</td><td rowspan="7">0.88</td><td>2</td><td>0.31</td><td>2</td></tr>
<tr><td>DH-062</td><td rowspan="3">6.00</td><td rowspan="3">6.50</td><td>15.00</td><td>14.12</td><td rowspan="11">4</td><td>0.47</td><td>3</td></tr>
<tr><td>DH-073</td><td>14.25</td><td>18.00</td><td>17.12</td><td>0.60</td><td>3</td></tr>
<tr><td>DH-084</td><td>20.25</td><td>24.00</td><td>23.12</td><td>0.84</td><td>4</td></tr>
<tr><td>DH-095</td><td rowspan="3">8.00</td><td>14.25</td><td rowspan="3">8.50</td><td>18.00</td><td>17.12</td><td>0.79</td><td>4</td></tr>
<tr><td>DH-106</td><td>17.25</td><td>21.00</td><td>20.12</td><td>0.96</td><td>5</td></tr>
<tr><td>DH-117</td><td>20.25</td><td>24.00</td><td>23.12</td><td>1.12</td><td>5</td></tr>
<tr><td>DH-194</td><td rowspan="3">12.00</td><td>13.75</td><td rowspan="3">12.73</td><td>18.00</td><td>16.88</td><td rowspan="5">0.75</td><td rowspan="5">#12</td><td rowspan="5">1.12</td><td>1.15</td><td>6</td></tr>
<tr><td>DH-205</td><td>16.75</td><td>21.00</td><td>19.88</td><td>1.40</td><td>7</td></tr>
<tr><td>DH-216</td><td rowspan="3">19.75</td><td>24.00</td><td>22.88</td><td>1.64</td><td>8</td></tr>
<tr><td>DH-227</td><td>14.00</td><td>14.73</td><td>24.00</td><td>22.88</td><td>1.92</td><td>9</td></tr>
<tr><td>DH-249</td><td>18.00</td><td>18.73</td><td>24.00</td><td>22.88</td><td>6</td><td>2.47</td><td>12</td></tr>
<tr><td>DH-326</td><td rowspan="2">24.00</td><td>19.25</td><td rowspan="2">25.00</td><td>24.00</td><td>22.62</td><td rowspan="5">1.00</td><td rowspan="5">#16</td><td rowspan="5">1.38</td><td rowspan="7">8</td><td>3.21</td><td>16</td></tr>
<tr><td>DH-337</td><td>25.25</td><td>30.00</td><td>28.62</td><td>4.21</td><td>20</td></tr>
<tr><td>DH-348</td><td rowspan="3">30.00</td><td>19.25</td><td rowspan="3">31.00</td><td>24.00</td><td>22.62</td><td>4.00</td><td>19</td></tr>
<tr><td>DH-359</td><td>25.25</td><td>30.00</td><td>28.62</td><td>5.26</td><td>24</td></tr>
<tr><td>DH-370</td><td>31.25</td><td>36.00</td><td>34.62</td><td>6.51</td><td>28</td></tr>
<tr><td>DH-425</td><td>36.00</td><td>24.75</td><td>37.41</td><td>30.00</td><td>28.38</td><td rowspan="2">1.25</td><td rowspan="2">#20</td><td rowspan="2">1.62</td><td>6.19</td><td>32</td></tr>
<tr><td>DH-447</td><td>40.00</td><td>36.75</td><td>41.41</td><td>42.00</td><td>40.38</td><td>10.21</td><td>43</td></tr>
</table>

All dimensions in inches. 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.

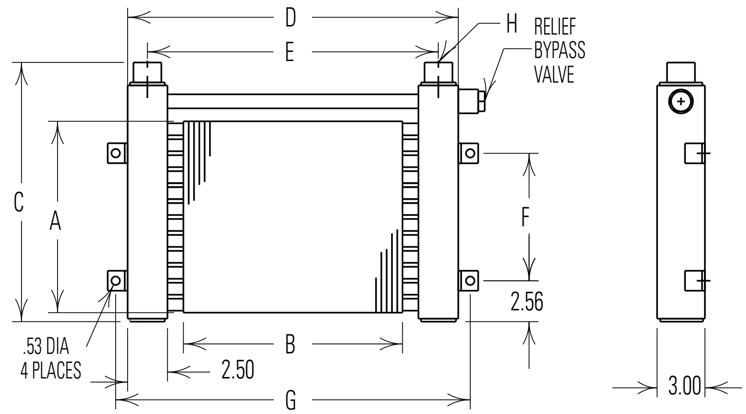
Dimensions & Weights

DH-513 thru DH-670

DH Series



DHR Series



			C		D					H		FACE AREA	WEIGHT
MODEL	A	B	DH	DHR	DH	DHR	E	F	G	NPT	SAE	SQ FT	LBS
DH-513	12.00	13.75	15.00	16.25	20.75	22.41	18.25	8.00	22.25	0.75	#12	1.15	16
DH-524	18.00	19.75	21.00	23.25	26.75	28.13	24.25	14.00	28.25			2.47	27
DH-535	24.00	19.25	27.00	29.25	26.75	27.63	23.75	20.00	27.75	1.00	#16	3.21	53
DH-626	36.00	22.75	39.03	41.20	29.75	31.13	27.25	32.00	31.25	2.00	#32	5.69	60
DH-670	40.00	34.75	43.03	45.28	41.75	43.13	39.25	36.00	43.25			9.65	115

All dimensions in inches. 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 = (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 $\triangle$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 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.

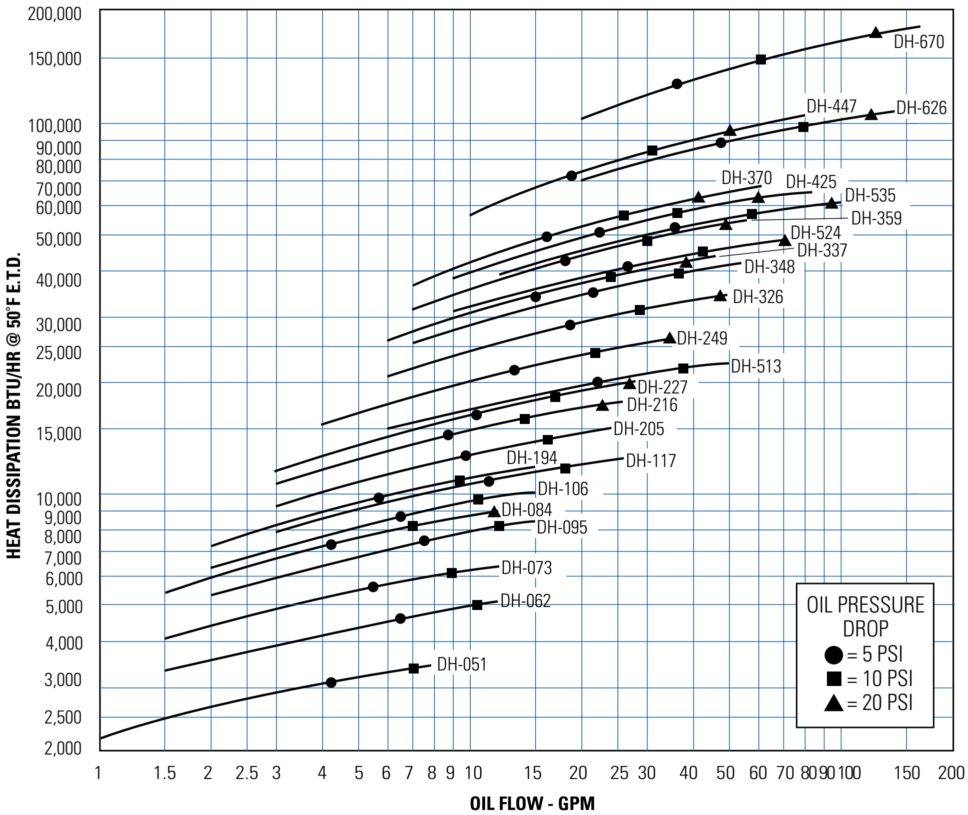
Oil Temperature

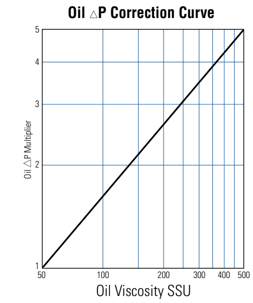
Typical operating temperature ranges are:

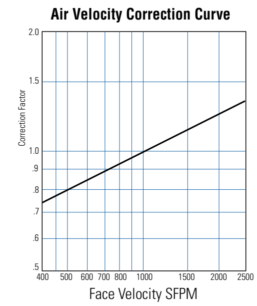
Hydraulic Motor Oil	110° - 130°F
Hydrostatic Drive Oil	130° - 180°F
Bearing Lube Oil	120° - 160°F
Lube Oil Circuits	110° - 130°F

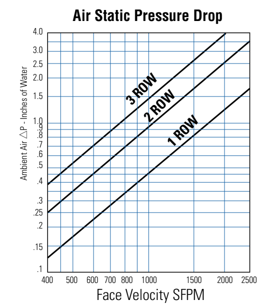
	TYPICAL OIL VISCOSITY, SSU				
Oil Temp °F	SAE 5	SAE 10	SAE 20	SAE 30	SAE 40
100	110	150	275	500	750
150	60	70	100	135	190
210	40	43	50	65	75

Performance Curves









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 (E.T.D.)
E.T.D. = Entering oil temperature - Ambient air temperature

Step 1 **Determine Heat Load:** Heat load may be expressed as either Horsepower or BTU/Hr. BTU/Hr. = Horsepower x 2545

Step 2 **Determine entering temperature difference:** The entering oil temperature is generally the maximum desired system temperature. E.T.D. = Entering oil temperature - Ambient air temperature.

Step 3 **Determine the corrected heat dissipation to use the curves:**

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

Step 4 **Enter the Performance Curves** at the bottom with the GPM oil flow and proceed upward to the adjusted heat load from Step 3. Any curve on or above this point will meet these conditions.

Step 5 **Calculate actual SFPM Air Velocity or SCFM** (Standard Cubic Feet Per Minute) using the Face Area from the table.

A. $\text{SFPM Air Velocity*} = \dfrac{\text{SCFM Air Flow}}{\text{Square Feet Face Area}}$

B. SCFM Air Flow = SFPM Air Velocity x Square Feet Face Area

*If the Air Velocity calculated is different than the value in Step 3, recheck Corrected oil Pressure Drop.

Step 6 **Multiply Oil Pressure Drop** from curve by correction factor found in Oil △ P Correction Curve.

*Note: If air velocity is unknown assume 750 SFPM.

C_V Viscosity Correction

	OIL				
Average Oil Temp °F	**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

AOHM/AOVHM Hydraulic Motor Drive

Thermal Transfer Products Copper Tube and Fin Mobile Hydraulic Oil Coolers

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Engine oil cooling

For application help and quoting, visit our Full TTP site or contact ttpsales@apiheattransfer.com.


ROTATION

Features

- AO/AOVH Series with Hydraulic Motor
- High Heat Removal
- Heavy Duty Construction
- Wide Flow Range
- Heat Removal up to 210,000 BTU/Hr.
- Long Life Hydraulic Motor
- NPT Connections

OPTIONS
Built-in Relief Bypass Valve
SAE or BSPP Connections
Corrosion Resistant Coating

Ratings

Operating Pressure 300 psi
Test Pressure 300 psi
Operating Temperature 400° F

Materials

Tubes Copper
Fins Aluminum
Turbulators Steel
Manifolds Steel
Connections Steel
Cabinet Steel with Baked Enamel Finish
Fan Blade Aluminum with Steel Hub
Fan Guard Zinc Plated Steel
Fan Adapter Steel

How to Order

Model Series	Model Size Selected	Number of Passes**	Connection Type*	Relief Bypass**	Foot Mounting Brackets
AOHM AOHMR AOVHM AOVHMR		Blank - No Bypass 1 - One Pass* 2 - Two Pass	Blank - NPT S - SAE	Blank - No Bypass 30 - 30 psi 60 - 60 psi	Blank - No Brackets FB - Foot Brackets

ADD FOR AOHM & AOHMR MODELS ONLY

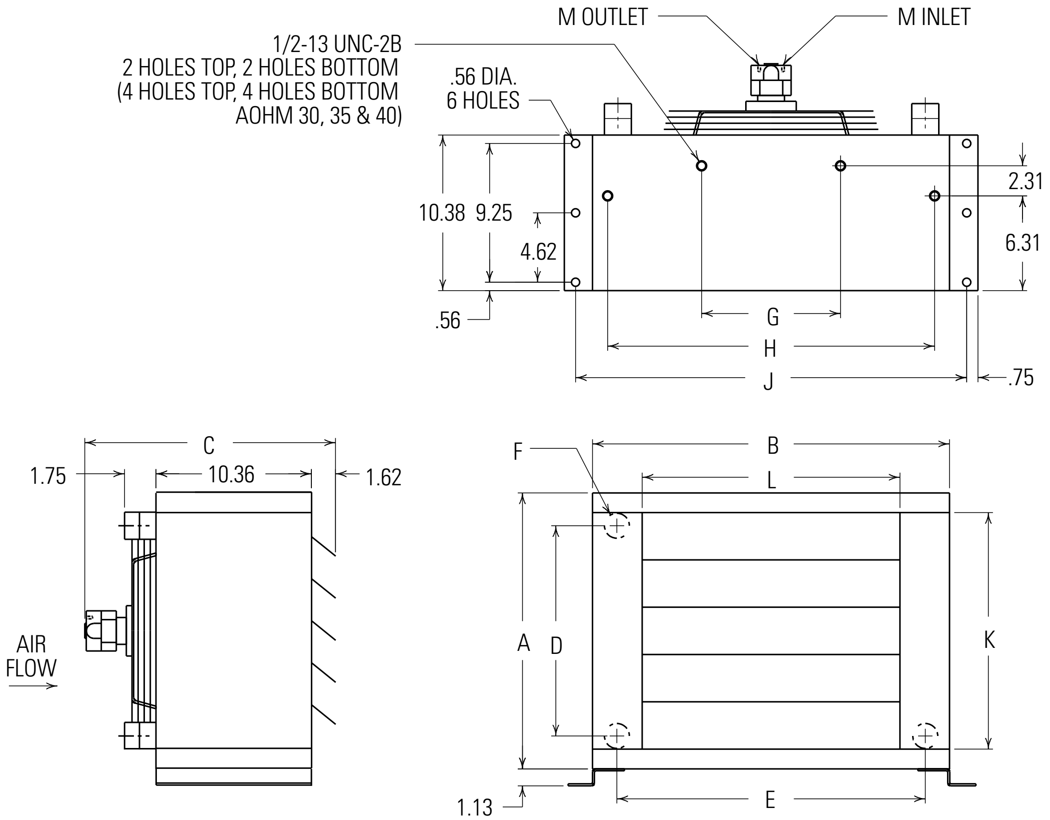
AOHMR - Relief Bypass Included
AOVHMR - Relief Bypass Included (available in 2 pass only)

*Other connection types available. Please consult factory for assistance.

**ADD FOR AOHMR & AOVHMR MODELS ONLY

Dimensions

Fan Rotating Clockwise/Facing Motor Shaft



Foot Brackets:
Optional for AOHM
Standard with AOVHM

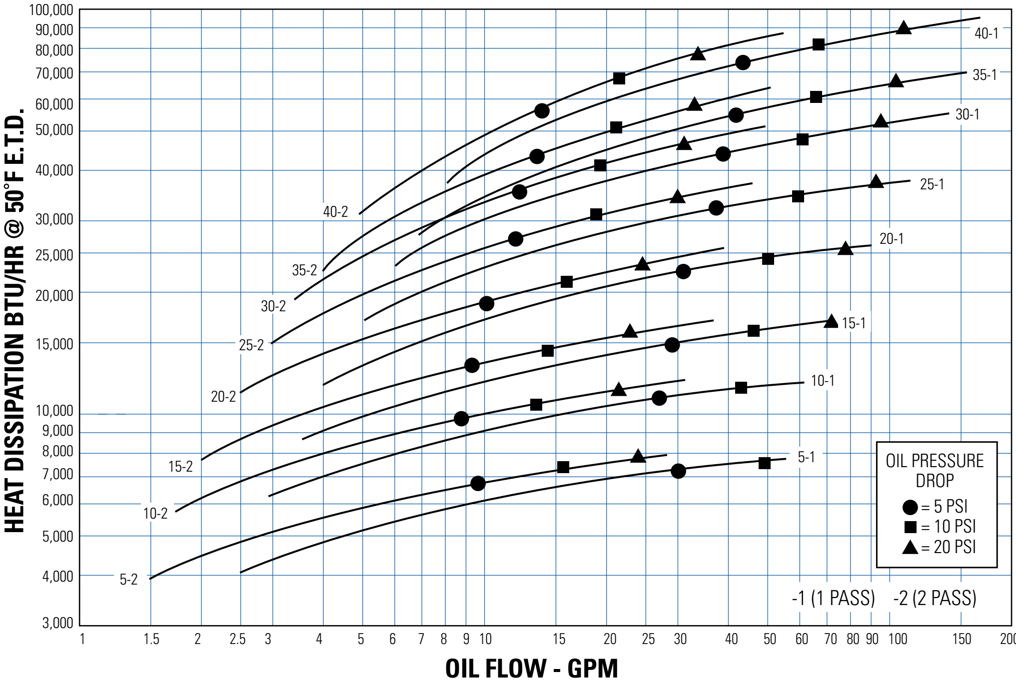
See dimensional chart for external NPT or optional internal SAE connection size.

MODEL	A	B	C	D	E	F NPT	F SAE	G	H	J	K	L	M (SAE)	NET WT (LBS)
AOHM-5	11.81	14.81	16.70	7.69	11.69	1″	#16	–	12.94	16.81	9.19	8.31	#8	35
AOVHM-5						1 1/2″	#24							59
AOHM-10	13.12	19.00		8.88	15.88	1″	#16		17.12	21.00	10.50	12.50		50
AOVHM-10						1 1/2″	#24							76
AOHM-15	15.75	20.38	17.09	11.50	17.25	1″	#16		18.50	22.38	13.12	13.88		60
AOVHM-15						1 1/2″	#24							89
AOHM-20	18.38	23.81		14.00	20.56	1 1/4″	#20		21.81	25.81	15.75	17.19		75
AOVHM-20						2″	#32							108
AOHM-25	23.62	26.68		19.25	23.56	1 1/4″	#20		24.81	28.68	21.00	20.19		110
AOVHM-25			17.25			2″	#32							143
AOHM-30	27.56	31.62	16.70	23.19	28.50	1 1/4″	#20	11.00	29.75	33.62	24.94	25.12		120
AOVHM-30			16.95			2″	#32							178
AOHM-35	30.19	33.81	16.70	25.81	30.69	1 1/4″	#20	11.00	31.94	35.81	27.56	27.31		135
AOVHM-35			17.22			2″	#32						#10	220
AOHM-40	36.75	41.62	16.70	32.38	38.50	1 1/4″	#20	13.25	39.75	43.62	34.12	35.12	#8	160
AOVHM-40			17.22			2″	#32						#10	286

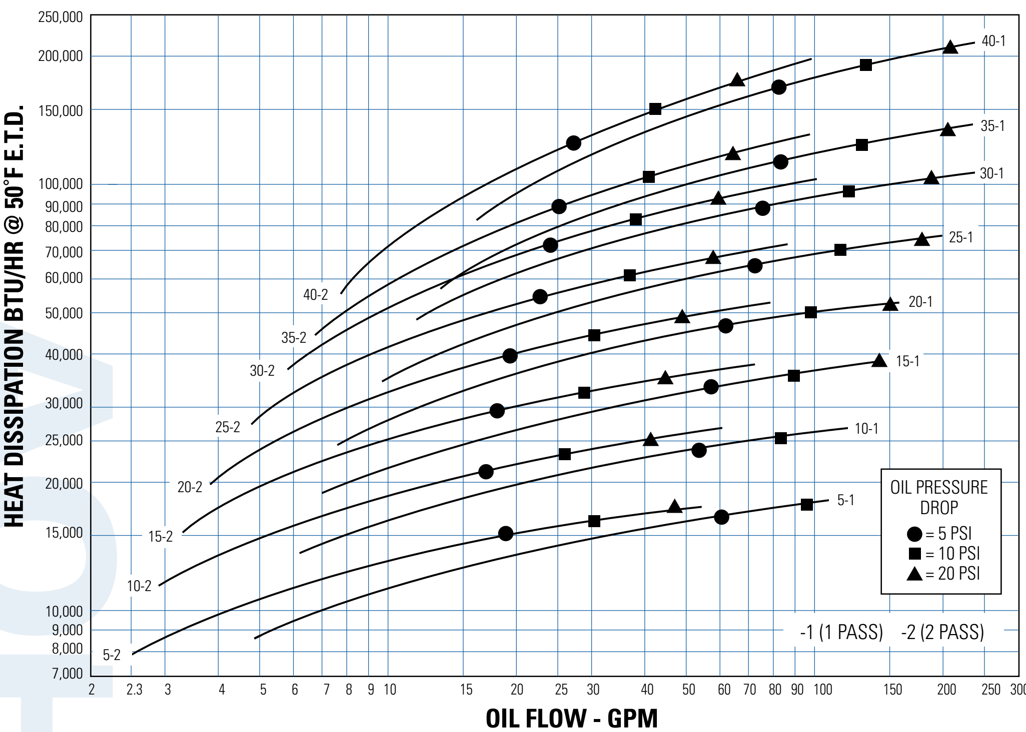
NOTE: We reserve the right to make reasonable design changes without notice. All dimensions are in inches.

Performance Curves

AOHM Series



AOVHM Series



AIR COOLED
AOHM/AOVHM

Selection Procedure

Performance Curves are based on 50 SSU oil entering the cooler 50°F higher than the ambient air temperature used for cooling. This is referred to as a 50°F E.T.D.

Step 1 **Determine the 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 **Determine Entering Temperature Difference.** The entering oil temperature is generally the maximum desired oil temperature.
Entering oil temperature – Ambient air temperature = E.T.D.

Step 3 **Determine the Corrected Heat Dissipation to use the curves.**
Corrected Heat Dissipation =
BTU/HR heat load x $\frac{50°F}{E.T.D.}$ x viscosity correction A.

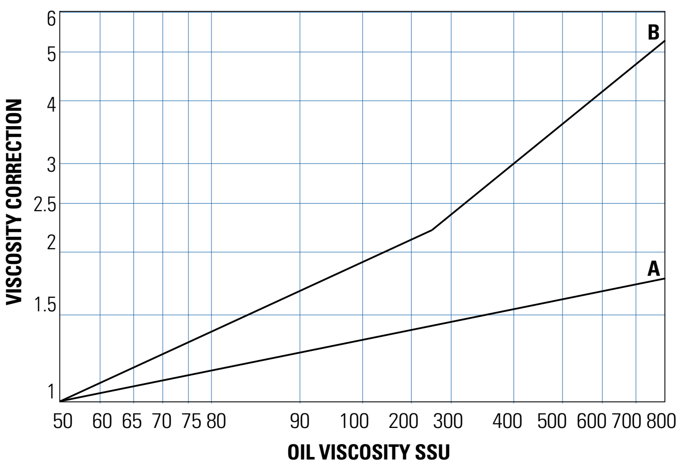
Step 4 **Enter curves** at oil flow through cooler and curve heat dissipation. Any curve above the intersecting point will work.

NOTE: *Performance curves shown are for 1 and 2 pass configuration.*

EXAMPLE: *35 - 2 is AOHM or AOVHM - 35*

Step 5 **Determine Oil Pressure Drop from Curves:**
● = 5 PSI; ■ = 10 PSI; ▲ = 20 PSI. Multiply pressure drop from curve by correction factor B found in oil viscosity correction curve.

OIL VISCOSITY CORRECTION MULTIPLIERS



Desired Reservoir Temperature

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

Off-Line Recirculation Cooling Loop: Desired reservoir temperature is the oil temperature entering the cooler.

Return Line Cooling: Desired reservoir temperature is the oil temperature leaving the cooler. In this case, the oil temperature change must be determined so that the actual oil entering temperature can be found. Calculate the oil temperature change (oil △T) with this formula:
Oil △T = (BTU's/Hr.) / (GPM Oil Flow x 210).

To calculate the oil entering temperature to the cooler, use this formula:
Oil Entering Temp. = Oil Leaving Temp + Oil △T.

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	120°F - 180°F
Hydrostatic Drive Oil	160°F - 180°F
Engine Lube Oil	180°F - 200°F
Automatic Transmission Fluid	200°F - 300°F

Hydraulic Motor

MODEL SIZE	MAXIMUM FAN SPEED (RPM)		OIL FLOW REQUIRED (GPM)		MIN. OPERATING PRESSURE (PSI)		SOUND dB(A)*		MOTOR (in^3/rev.) DISPLACEMENT		CFM	
	AOHM	AOVHM	AOHM	AOVHM	AOHM	AOVHM	AOHM	AOVHM	AOHM	AOVHM	AOHM	AOVHM
5	1725	3450	1.6	3.3	300	300	68	85	.22	.22	465	780
10							68	85			669	1110
15							69	91			956	1590
20							70	91			1460	2168
25	1140	1725	1.1	3.4	400	500	72	81		.45	2160	3000
30							75	84			2990	4095
35				5.2	900	1000	76	89		.70	4370	5921
40							78	91			5450	9609

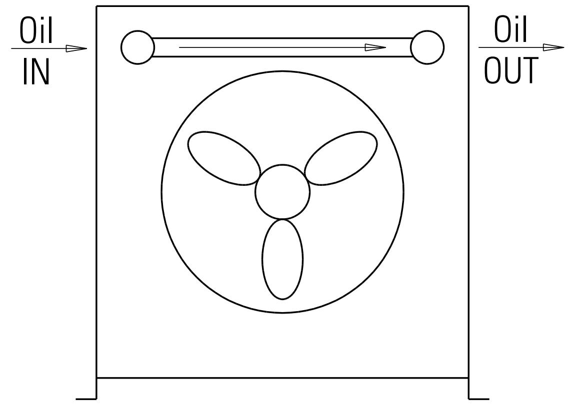
Notes: Maximum pressure is 2000 psi. Stated minimum operating pressure is at inlet port of motor. 1000 psi allowable back pressure.
**Catalog db(A) sound levels are at seven (7) feet. dB(A) sound levels increase by six (6) dB(A) for halving this distance and decrease by (6) dB(A) for doubling this distance.*

Built-In Relief Bypass

AOHMR Series

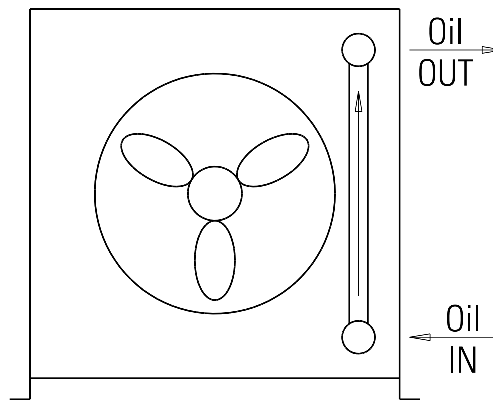
One Pass (Medium to High Oil Flows)

Model Number	Flow Range GPM (USA)
AOHMR - 5-1	2 - 80
AOHMR - 10-1	3 - 80
AOHMR - 15-1	4 - 80
AOHMR - 20-1	5 - 80
AOHMR - 25-1	6 - 100
AOHMR - 30-1	7 - 100
AOHMR - 35-1	8 - 112
AOHMR - 40-1	9 - 118



Two Pass (Low to Medium Oil Flows)

Model Number	Flow Range GPM (USA)
AOHMR - 5-2	2 - 25
AOHMR - 10-2	2 - 30
AOHMR - 15-2	2 - 40
AOHMR - 20-2	2 - 30
AOHMR - 25-2	2 - 40
AOHMR - 30-2	2 - 40
AOHMR - 35-2	3 - 40
AOHMR - 40-2	4 - 40

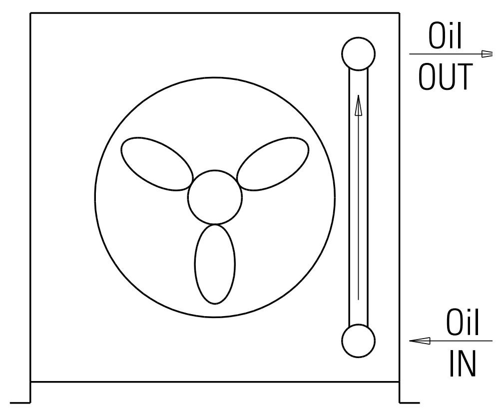


AOVHMR Series

Two Pass (Low to Medium Oil Flows)

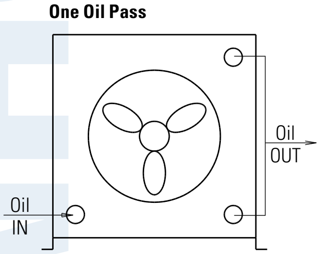
Model Number	Flow Range GPM (USA)
AOVHMR - 5-2	4 - 50
AOVHMR - 10-2	4 - 60
AOVHMR - 15-2	4 - 60
AOVHMR - 20-2	4 - 80
AOVHMR - 25-2	4 - 80
AOVHMR - 30-2	4 - 80
AOVHMR - 35-2	6 - 80
AOVHMR - 40-2	8 - 80

Bypass valve is available for 2 pass AOVHMR models only.

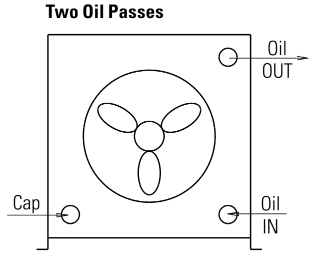


Installation Piping Diagrams

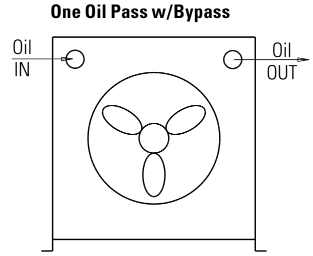
One Oil Pass



Two Oil Passes



One Oil Pass w/Bypass



OCA Series - Process Cooling

Thermal Transfer Products Process Coolers

Our Thermal Transfer Products brand offers a full line of process cooling heat exchangers.

Water-Cooled

Fixed bundle shell and tube

U-Tube Removable Bundle

Stainless Steel brazed plate

Large range of standard sizes

Air-Cooled

Copper-tube and fin

Brazed aluminum

Large range of standard sizes

Standard Product Options

Thermal Transfer process coolers are available with a wide variety of standard options to best suit each application.

Water-Cooled

Copper, copper-nickel, or stainless steel tubing

Nickel-braze plate coolers

Air-Cooled

AC, hydraulic, or air-motor fan drives

Copper tube aluminum fin

Brazed aluminum (P-BAR)

Heresite coating for offshore or corrosive environment operation

Customer Focused and Driven

All catalog product is available with short lead-times

Expert application engineers available to select and size the right product for your application

Custom designs are available

For application help and quoting, visit our Full TTP site or contact ttpsales@apiheattransfer.com.

API HEAT TRANSFER

FLUID COOLING | P-Bar Series Industrial AOL

BRAZED ALUMINUM CONSTRUCTION

HYDRAULIC OR COMPRESSOR OIL COOLING

Features

- **Large Oil Flow**
- **High Performance**
- **Industrial Duty**
- **Brazed Aluminum Bar and Plate Core**
- Compact all aluminum core assembly
- Ideal for converting water cooled equipment to air cooled
- Eliminates high water and sewer costs
- Eliminates corrosion problems associated with water cooled units
- Vertical air flow works well for heat recovery
- State-of-the-art heat transfer technology
- Hydraulic motors available
- Optional SAE Ports
- Marine corrosion control coatings available
- High performance air side fin design
- Detachable legs

Ratings

Maximum Operating Pressure
250 psi (17 BAR)

Maximum Operating Temperature
300° F (150° C)

Materials

Legs Steel with baked enamel finish

Shroud Steel

Standard 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

Fan Aluminum Hub, Plastic Blades

Motor TEFC

Fluid Compatability

Petroleum/mineral oils

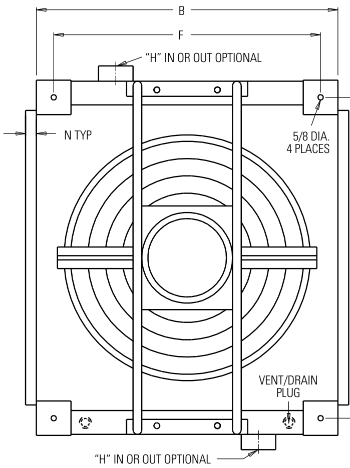
Oil/water emulsion

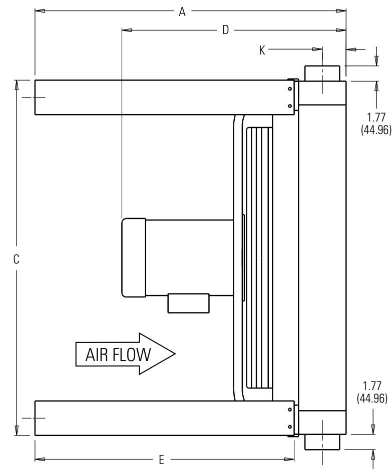
Water/ethylene glycol

How to Order

AOL	–		–		–		–	
Model Series **AOL** - Standard		**Model Size Selected** **400** **725** **950** **1200** **1600** **2000** **2500** **3000** **3500**		**Connection Type** **Blank** - NPT **S** - SAE		**Specify Motor Required** **0** - No Motor **2** - Single Phase **3** - Three Phase **6** - 575 Volt **9** - Hydraulic **18** - IEC Three Phase		**Noise Level** **Blank** - Standard Noise Level **LN** - Low Noise Level

Dimensions





Model	A	B	C	D Approx.	E	F	G	H NPT	H SAE	J	K	L	Net Weight Lbs.	Shipping Weight Lbs.
AOL-400	34.20 (868.68)	17.96 (456.18)	22.69 (576.33)	20.86 (529.84)	30.00 (762.00)	13.96 (354.58)	18.69 (474.73)	2.00	#32 SAE 2-1/2-12 UN-2B	5.93 (150.62)	1.85 (46.99)	1.25 (31.75)	109 (49.44)	148 (67.13)
AOL-725	34.20 (868.68)	22.37 (568.20)	30.57 (776.48)	20.86 (529.84)	30.00 (762.00)	18.37 (466.60)	26.57 (674.88)	2.00		5.88 (149.35)	1.85 (46.99)	1.25 (31.75)	151 (68.49)	170 (77.11)
AOL-950	36.01 (914.65)	26.78 (680.21)	37.25 (946.15)	23.62 (599.95)	30.00 (762.00)	22.78 (578.61)	33.25 (844.55)	2.00		6.82 (173.23)	2.76 (70.10)	1.25 (31.75)	221 (100.24)	300 (136.08)
AOL-1200	36.01 (914.65)	26.78 (680.21)	41.20 (1046.48)	25.51 (647.95)	30.00 (762.00)	22.78 (578.61)	37.20 (944.88)	2.00		6.00 (152.40)	2.76 (70.10)	1.25 (31.75)	296 (134.26)	430 (195.04)
AOL-1600	36.01 (914.65)	34.89 (886.21)	41.20 (1046.48)	27.51 (698.75)	30.00 (762.00)	30.89 (784.61)	37.20 (944.88)	2.50	2-1/2 SAE 4 Bolt FLG	8.00 (203.20)	2.76 (70.10)	1.25 (31.75)	355 (161.03)	515 (233.60)
AOL-2000	36.01 (914.65)	37.88 (962.15)	51.05 (1296.67)	26.25 (666.75)	30.00 (762.00)	33.88 (860.55)	47.05 (1195.07)	2.50		8.00 (203.20)	2.76 (70.10)	1.25 (31.75)	482 (218.63)	582 (263.99)
AOL-2500	36.01 (914.65)	43.70 (1109.98)	49.08 (1246.63)	28.51 (724.15)	30.00 (762.00)	39.70 (1008.38)	45.08 (1145.03)	3.00	3" SAE 4 Bolt FLG.	8.00 (203.20)	2.76 (70.10)	1.25 (31.75)	555 (251.74)	655 (297.10)
AOL-3000	36.01 (914.65)	52.52 (1334.01)	51.05 (1296.95)	30.51 (774.95)	30.00 (762.00)	48.52 (1232.41)	47.05 (1206.50)	3.00		8.00 (203.20)	2.76 (70.10)	1.25 (31.75)	724 (328.40)	825 (374.21)
AOL-3500	36.01 (914.65)	56.30 (1430.02)	51.05 (1296.95)	30.51 (774.95)	30.00 (762.00)	52.30 (13328.42	47.05 (1206.50)	3.00		8.00 (203.20)	2.76 (70.10)	1.25 (31.75)	760 (344.73)	860 (390.09)

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

Selection Procedure

Performance Curves based on 100°F (55.56°C) E.T.D. or Entering Temperature Difference (E.T.D = Entering oil temperature minus ambient air temperature). SAE #10 oil @ 200°F (93.33°C).

Oil pressure drop coding:

- **X** = 5 PSI (.345 BAR)
- ● = 10 PSI (.689 BAR)
- ◆ = 15 PSI (1.03 BAR)
- ▲ = 20 PSI (1.38 BAR)
- ■ = 30 PSI (2.10 BAR)

E.T.D. temperature correction formula:

ENGLISH Version

$$HP_{\text{Curve}} = HP_{\text{To Be Removed}} \times \frac{100}{\text{Desired E.T.D}}$$

METRIC Version

$$\frac{KW}{°C} = \frac{\text{Heatload (KW)}}{\text{Desired E.T.D. (°C)}}$$

Conversion

$$Hp = \frac{KW}{°C} = \times .745 \times \text{E.T.D. (°F)}$$

Notes

1. A three-way thermostatic valve is recommended to bypass the cold oil around the heat exchanger during start up.
2. Support piping as needed. Flexible connectors must be properly installed to validate warranty.
3. Coolers should not operate in ambient temperatures below 35°F (1°C). Consult factory for recommendations.
4. The fan cannot be cycled.
5. AOL coolers operated outdoors must be protected from weather. Consult factory for recommendations.
6. If duct work or additional static resistance is added to the cooler airstream, an auxiliary air mover may be required.
7. Can be mounted for horizontal air flow, with oil in at bottom port.

Maintenance

Periodic cleaning of the fins with compressed air is needed to remove the accumulation of dirt and dust. If the inside of the tubes need to be cleaned of oil and carbon, use a chlorinated solvent. Do not use strong solvents. Do not use acids or caustic cleaners.

Specifications

Electric Motor & Fan Data[1] (60 Hz Nema Frame)

Model	Fan CMM	Fan CFM	Motor H.P.	Voltage	Phase	Full Load Amps 230V	Frequency (Hz)	RPM	Nema Frame	Thermal Overload	Sound dB(A) at 3 ft.
AOL-400	62.30	2200	1.0	115/208-230	1	6.0	60[2]	3450	56C	No	97
	51.68/62.30	1825/2200	1.0	208-230/460[3]	3	3.6/3.2	50/60	2850/3450	56C	No	97
AOL-725	101.94	3600	1.5	115/208-230	1	8.5	60[2]	3450	56C	No	100
	84.95/102.94	3000/3600	1.5	208-230/460[4]	3	4.8/4.2	50/60	2850/3450	56C	No	100
AOL-950	133.09	4700	1.5	115/208-230	1	8.6	60[2]	1740	145TC	No	92
	133.09	4700	1.5	208-230/460	3	4.6	60[2]	1740	145TC	No	92
AOL-1200	198.22	7000	5.0	230	1	23.00	60[2]	1740	184TC	No	94
	198.22	7000	3.0	208-230/460	3	8.8	60[2]	1740	182TC	No	96
AOL-1600	223.70	7900	5.0	208-230/460	3	13.4	60[2]	1740	184TC	No	98
AOL-2000	311.49	14000	7.5	230/460	3	19.6	60[2]	1740	213TC	No	98
AOL-2500	396.44	14000	7.5	230/460	3	19.6	60[2]	1740	213TC	No	98
AOL-3000	495.54	17500	10.0	230/460	3	24.8	60[2]	1740	215TC	No	102
AOL-3500	495.54	17500	10.0	230/460	3	24.8	60[2]	1740	215TC	No	102

[1] Published electrical ratings are approximate, and may vary because of motor brand. Actual ratings are on motor nameplate.
[2] May also be operated at 50 hz. Consult factory for details.
[3] 50 Hz voltage: 190-200-208-220/380-400-415-440
[4] 50 Hz voltage: 190-208/380-415
All motors shown are TEFC—Other motor options available upon request.

Electric Motor Information (50 Hz IEC Frame)

Model	CMM	CFM	KW	Voltage	Phase	Frequency	RPM	Frame	Sound dB(A) at 1 meter
AOL-400	52.4	1850	.75	230/400/415	3	50 Hz	3000	80	81
AOL-725	85.0	3001	1.10	230/400/415	3	50 Hz	3000	80	80
AOL-950	108.2	3821	1.50	230/400/415	3	50 Hz	1500	90	78
AOL-1200	165.1	5834	2.20	230/400/415	3	50 Hz	1500	100	83
AOL-1600	186.4	6584	3.00	230/400/415	3	50 Hz	1500	100	85
AOL-2000	331.3	11700	4.00	230/400/415	3	50 Hz	1500	112	88
AOL-2500	331.3	11700	4.00	230/400/415	3	50 Hz	1500	112	88
AOL-3000	410.6	14500	7.50	230/400/415	3	50 Hz	1500	132	90
AOL-3500	410.6	14500	7.50	230/400/415	3	50 Hz	1500	132	90

All IEC frame motors have CE mark.
IEC motor voltages have +/- 10% tolerance.

Electric Motor Information (AOL-Low Noise)

Model	HP	Nema Frame	LN RPM	LN CFM	LN CMM	Voltage	Frequency (Hz)	Sound dB(A) at 3 ft.
AOL-400-1PH-LN	1	56C	1725	1100	31.15	115/230	60	72
AOL-400-3PH-LN	1	56C	1725	1100	31.15	230/460	60	72
AOL-725-1PH-LN	1.50	56C	1725	1780	50.40	115/230	60	82
AOL-725-3PH-LN	1.50	56C	1725	1780	50.40	230/460	60	82
AOL-950-3PH-LN	1.50	145TC	1160	3150	89.20	230/460	60	76
AOL-1200-3PH-LN	1.50	182TC	1160	4690	132.81	230/460	60	75
AOL-1600-3PH-LN	2	184TC	1160	6510	184.34	230/460	60	78
AOL-2000-3PH-LN	5	213TC	1160	8700	246.36	230/460	60	85
AOL-2500-3PH-LN	5	213TC	1160	11700	331.31	230/460	60	85
AOL-3000-3PH-LN	5	215TC	1160	13500	382.28	230/460	60	93
AOL-3500-3PH-LN*	10	256TCZ	1160	16200	458.73	230/460	60	91

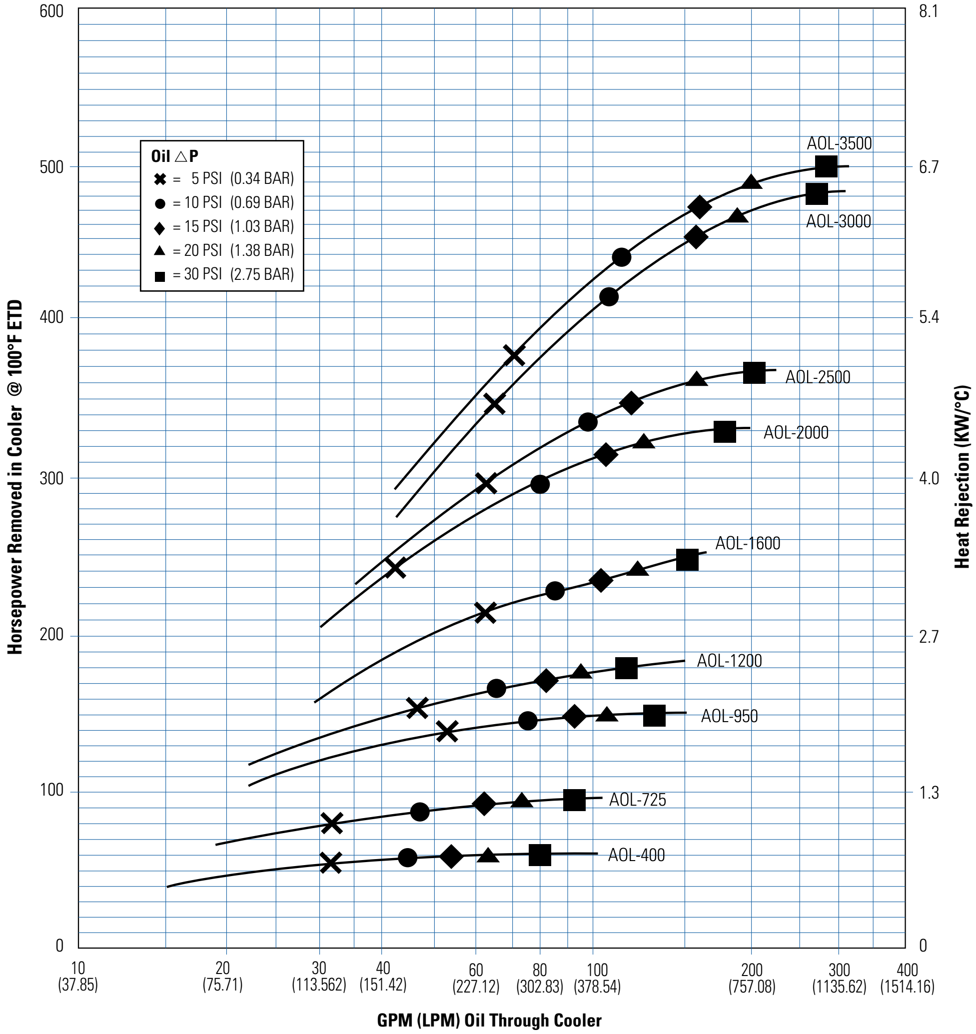
Available in 60 Hz Nema Frame only.

Hydraulic Motor Information

Model	Oil Flow Required GPM (LPM)	Min. Pressure Required PSI (BAR)	Motor IN³/REV (CM³/REV) Displacement	Sound dB(A) at 3 ft.
AOL-400	3.3 (12.49)	425 (29.31)	0.22 (3.6)	97
AOL-725	3.3 (12.49)	675 (46.54)	0.22 (3.6)	100
AOL-950	10.1 (38.23)	300 (20.68)	1.4 (22.94)	92
AOL-1200	10.1 (38.23)	725 (50.00)	1.4 (22.94)	94
AOL-1600	10.1 (38.23)	1100 (75.84)	1.4 (22.94)	98
AOL-2000	10.1 (38.23)	1650 (113.76)	1.4 (22.94)	98
AOL-2500	10.1 (38.23)	1650 (113.76)	1.4 (22.94)	98
AOL-3000	10.1 (38.23)	2000 (137.90)	1.4 (22.94)	102
AOL-3500	10.1 (38.23)	2000 (137.90)	1.4 (22.94)	102

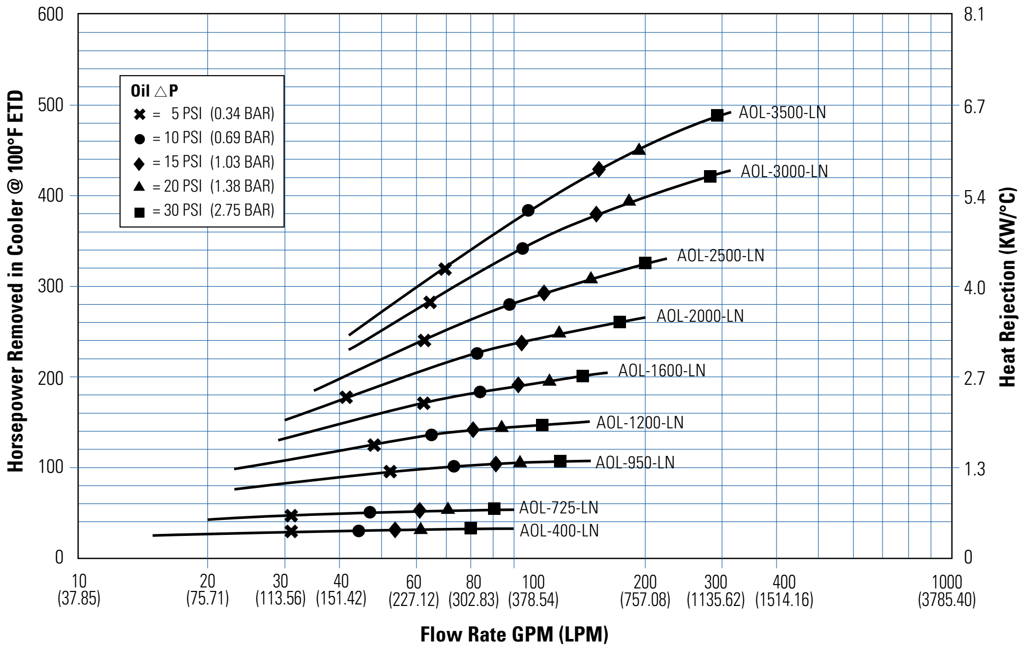
Notes: Maximum Pressure is 2000 psi. Stated Minimum Operating Pressure is at Inlet Port of Motor. 1000 psi Allowable Back Pressure.

Performance Curves



Note: Derate heat rejection values 15% if using 50Hz motors.

Low Noise Option

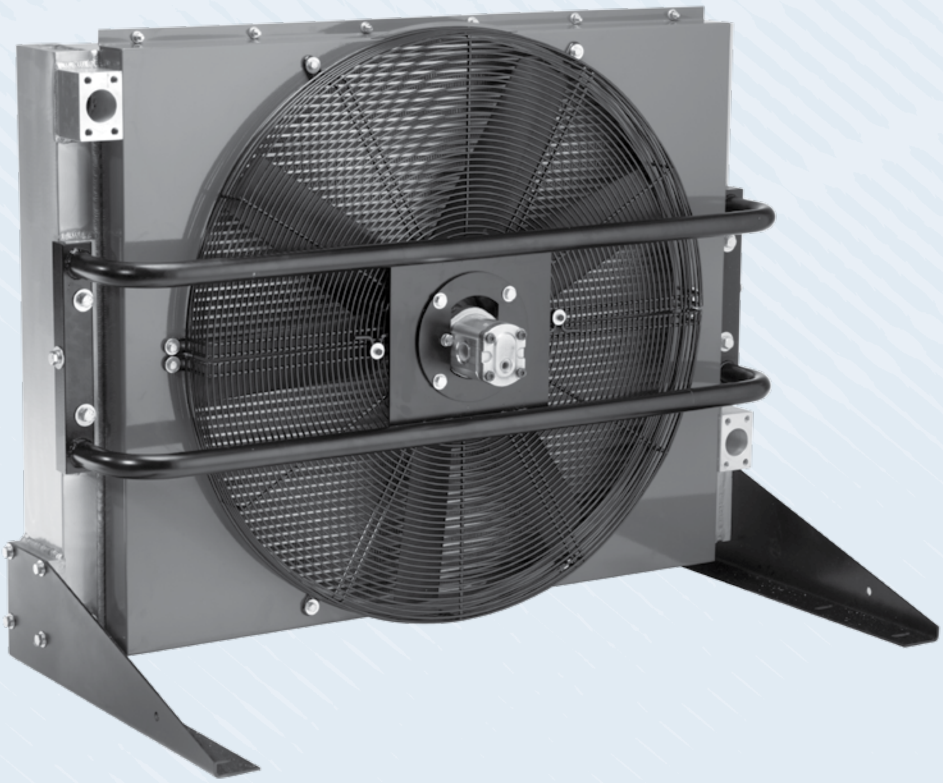


Available in 60 Hz Nema Frame only.

BRAZED ALUMINUM CONSTRUCTION

Features

- **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**
- **Welded 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**
- T-BAR core optional for high viscosity oils or other highly fouling fluids. *See T-Bar Performance Curve
- Low Noise Option Available



Ratings

Maximum Operating Pressure
250 psi (17 BAR)

Maximum Operating Temperature
300° F (150° C)

Materials

Mounting Feet Steel

Standard 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

Fanguard Steel

Connectors Aluminum

Fan Aluminum Hub, Plastic Blades

Shroud Steel

Motor TEFC & IEC

Fluid Compatability

Petroleum/mineral oils

Oil/water emulsion

Water/ethylene glycol

How to Order

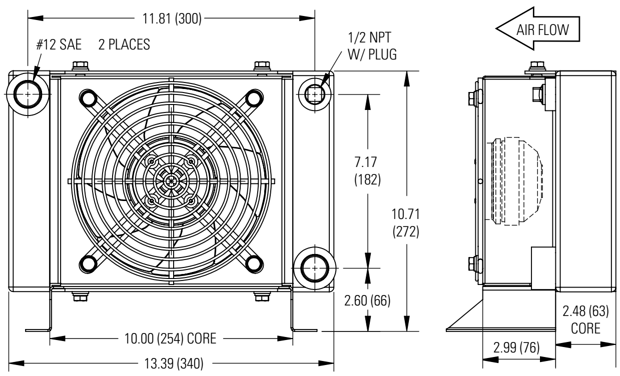
Model Series	Model Size Selected	Connection Type*	Specify Motor Required	Core	Noise Level
BOL	**4** **8** **16** **30** **400** **725** **950** **1200** **1600** **2000**	**1** - NPT **2** - SAE **3** - BSPP	**2** - Single Phase **3** - Three Phase **6** - 575 Volt **9** - Hydraulic **18** - IEC Three Phase	**Blank** - Standard Bar & Plate **TB** - T-BAR Core*	**Blank** - Standard Noise Level **LN** - Low Noise Level

*T-BAR Core option provides a T-BAR core in BOL frame. Used for high fouling or high viscosity fluids. Performance is typically 15-25% less than the bar and plate core. Consult factory for details.

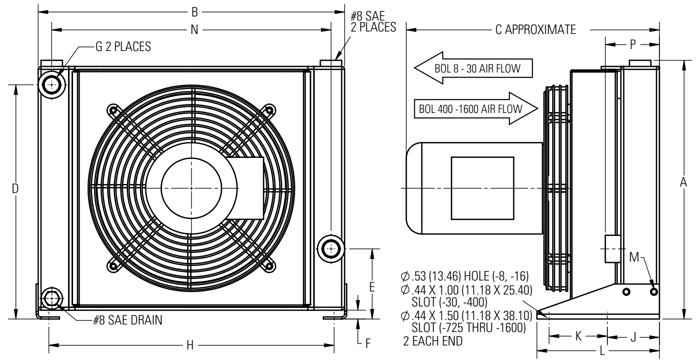
OPTIONAL T-BAR CORE SECTION CUTAWAY

Dimensions

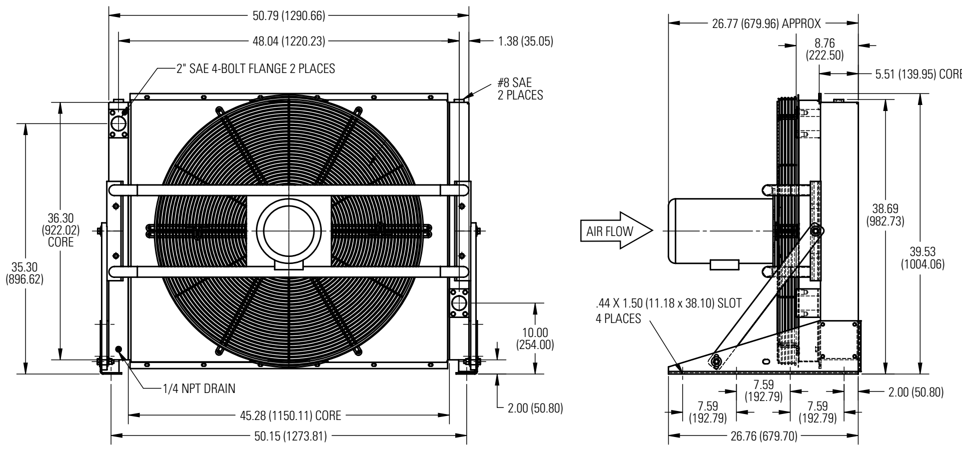
BOL-4



BOL-8 through BOL-1600



BOL-2000



Model	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Approx. Ship Wt. lbs (Kg)
BOL-4	See diagram above			—	—	—	—	—	—	—	—	—	—	—	18 (8.16)
BOL-8	12.93 (328.42)	15.75 (400.05)	14.72 (373.89)	11.30 (287.62)	3.27 (83.06)	.55 (13.97)	#12 SAE	14.53 (369.06)	3.07 (77.98)	3.75 (88.90)	7.36 (186.94)	M8 Bolt (2PL)	14.01 (355.85)	3.48 (88.40)	45 (20.4)
BOL-16	16.63 (422.40)	19.69 (500.13)	16.16 (410.46)	15.06 (382.52)	4.51 (114.56)	.57 (14.48)	#12 SAE	18.30 (464.82)	3.35 (85.09)	3.74 (95.00)	7.87 (199.90)	M8 Bolt (2PL)	17.95 (455.93)	3.46 (87.88)	55 (24.94)
BOL-30	21.09 (535.68)	26.38 (670.06)	18.23 (463.04)	19.49 (495.05)	5.26 (133.60)	1.32 (33.53)	#20 SAE	24.74 (628.40)	4.25 (107.95)	5.00 (127.00)	10.00 (254.00)	M10 Bolt (4PL)	24.34 (618.24)	5.28 (134.11)	125 (56.70)
BOL-400	19.20 (487.68)	22.45 (570.23)	18.80 (477.52)	17.31 (439.67)	6.50 (165.10)	2.00 (50.80)	#20 SAE	22.30 (566.42)	4.25 (107.95)	5.00 (127.00)	10.00 (254.00)	M10 Bolt (4PL)	20.08 (510.03)	5.20 (132.08)	148 (67.13)
BOL-725	23.49 (596.65)	30.32 (770.13)	18.60 (472.44)	21.60 (548.64)	6.50 (165.10)	2.00 (50.80)	#20 SAE	30.17 (766.32)	4.25 (107.95)	5.00 (127.00)	10.00 (254.00)	M10 Bolt (4PL)	27.95 (709.93)	5.20 (132.08)	170 (77.11)
BOL-950	27.94 (709.68)	37.03 (940.56)	22.69 (576.33)	24.55 (623.57)	9.50 (241.30)	2.00 (50.80)	2" SAE 4-Bolt Flange	35.89 (911.61)	6.05 (153.67)	9.20 (233.68)	16.00 (406.40)	M10 Bolt (4PL)	34.26 (870.20)	7.01 (178.05)	300 (136.08)
BOL-1200	27.94 (709.68)	40.96 (1040.38)	24.07 (611.38)	24.55 (623.57)	5.50 (139.70)	2.00 (50.80)		40.31 (1023.87)	6.05 (153.67)	9.20 (233.68)	16.00 (406.40)	M10 Bolt (4PL)	38.19 (970.03)	7.01 (178.05)	430 (195.04)
BOL-1600	36.01 (914.65)	40.96 (1040.38)	25.45 (646.43)	32.62 (828.55)	9.50 (241.30)	2.00 (50.80)		40.31 (1023.87)	6.05 (153.67)	9.20 (233.68)	16.00 (406.40)	M10 Bolt (4PL)	38.19 (970.03)	7.01 (178.05)	515 (233.60)
BOL-2000	See diagram above			—	—	—	—	—	—	—	—	—	—	—	582 (264.00)

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

Specifications

Electric Motor Information (60 Hz Nema Frame)

Model	CMM	CFM	Motor HP	Voltage	Phase	Full Load Amps 230V	Frequency	RPM	Frame	Thermal Overload	Sound dB(A) at 3ft
BOL-4	31.14	1203	1/4	230	1	—	60 Hz	2850	—	—	73
BOL-8	22.65	800	1/3	115/230	1	3.0	60 Hz	3450	48C	No	80
BOL-8	22.65	800	1/3	208-230/460	3	1.4	60 Hz	3450	48C	No	80
BOL-16	40.35	1425	1/2	115/230	1	3.7	60 Hz	3450	48C	No	85
BOL-16	40.35	1425	1/2	208-230/460	3	2.2	60 Hz	3450	48C	No	85
BOL-30	62.29	2200	1/2	115/230	1	3.7	60 Hz	1725	56C	No	85
BOL-30	62.29	2200	1/2	208-230/460	3	2.0	60 Hz	1725	56C	No	85
BOL-400	62.29	2200	1	115/230	1	6.0	60 Hz	3450	56C	No	97
BOL-400	62.29	2200	1	208-230/460	3	3.2	60 Hz	3450	56C	No	97
BOL-725	101.94	3600	1-1/2	115/230	1	8.5	60 Hz	3450	56C	No	100
BOL-725	101.94	3600	1-1/2	208-230/460	3	4.8	60 Hz	3450	56C	No	100
BOL-950	133.10	4700	1-1/2	115/230	1	8.6	60 Hz	1725	145TC	No	92
BOL-950	133.10	4700	1-1/2	208-230/460	3	4.6	60 Hz	1725	145TC	No	92
BOL-1200	198.22	7000	3	208-230/460	3	8.8	60 Hz	1725	182TC	No	94
BOL-1600	223.75	7900	5	208-230/460	3	13.4	60 Hz	1725	184TC	No	96
BOL-2000	396.44	14000	7.5	230/460	3	24.8	60 Hz	1725	213TC	No	98

Electric Motor Information (50 Hz IEC Frame)

Model	CMM	CFM	KW	Voltage	Phase	Frequency	RPM	Frame	Sound dB(A) at 3ft
BOL-4	28.4	1003	.20	230	1	50 Hz	3000	—	73
BOL-8	18.9	667	.25	230/400/415	3	50 Hz	3000	63	71
BOL-16	33.7	1188	.37	230/400/415	3	50 Hz	3000	71	77
BOL-30	52.4	1850	.37	230/400/415	3	50 Hz	1500	71	73
BOL-400	52.4	1850	.75	230/400/415	3	50 Hz	3000	80	81
BOL-725	85.0	3000	1.10	230/400/415	3	50 Hz	3000	80	80
BOL-950	108.2	3821	1.50	230/400/415	3	50 Hz	1500	90	78
BOL-1200	165.1	5834	2.20	230/400/415	3	50 Hz	1500	100	83
BOL-1600	186.4	6584	3.00	230/400/415	3	50 Hz	1500	100	85
BOL-2000	331.3	11700	4.00	230/400/415	3	50 Hz	1500	112	88

All IEC frame motors have CE mark.
IEC motor voltages have +/- 10% tolerance.

Hydraulic Motor Information

Model	Oil Flow Required GPM (LPM)	Min. Pressure Required PSI (BAR)	Motor IN³/REV (CM³/REV) Displacement	Sound dB(A) at 3 ft.
BOL-4	3.3 (12.49)	400 (27.58)	0.22 (3.6)	80
BOL-8	3.3 (12.49)	400 (27.58)	0.22 (3.6)	80
BOL-16	3.3 (12.49)	500 (34.47)	0.22 (3.6)	85
BOL-30	3.4 (12.87)	500 (34.47)	0.45 (7.3)	85
BOL-400	3.3 (12.49)	425 (29.30)	0.22 (3.6)	97

Model	Oil Flow Required GPM (LPM)	Min. Pressure Required PSI (BAR)	Motor IN³/REV (CM³/REV) Displacement	Sound dB(A) at 3 ft.
BOL-725	3.3 (12.49)	675 (46.50)	0.22 (3.6)	100
BOL-950	10.1 (38.23)	300 (20.70)	1.4 (22.9)	92
BOL-1200	10.1 (38.23)	725 (50.00)	1.4 (22.9)	94
BOL-1600	10.1 (38.23)	1100 (75.80)	1.4 (22.9)	96
BOL-2000	10.1 (38.23)	1650 (113.76)	1.4 (22.9)	98

Notes: Maximum Pressure is 2000 psi. Stated Minimum Operating Pressure is at Inlet Port of Motor. 1000 psi Allowable Back Pressure.

Selection Procedure

Step 1 **Determine Heat Load.** Typical Rule of Thumb, -size cooler for 1/3 of the input horsepower. Heat load may be expressed as either Horsepower or BTU/Hr or KW/°C.

HP=BTU/HR ÷ 2545

BTU/HR=HP x 2545

$$\text{BTU/HR} = \frac{\text{KW}}{°\text{C}} \times 1894.61 \times \text{E.T.D.(°F)}$$

Step 2 **Determine Entering Temperature Difference.** (Actual E.T.D.)

$$\text{E.T.D.} = \begin{matrix}\text{Entering oil}\\ \text{temperature}\end{matrix} - \begin{matrix}\text{Entering Ambient}\\ \text{air temperature}\end{matrix}$$

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.

Step 3 **Determine the Corrected Heat Dissipation to use the Curves**

ENGLISH Version

$$\begin{matrix}\text{Corrected}\\ \text{Heat Rejection}\end{matrix} = \begin{matrix}\text{(BTU/Hr)}\\ \text{Heat Load}\end{matrix} \times \frac{100°\text{F}}{\text{Desired E.T.D.}}$$

(BTU/HR) to use with selection chart

METRIC Version

$$\begin{matrix}\text{Corrected}\\ \text{Heat Rejection}\end{matrix} \frac{\text{KW}}{°\text{C}} = \frac{\text{Heatload (kw)}}{\text{Desired E.T.D. (°C)}}$$

Step 4 **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 3. Any Model or Curve on or above this point will meet these conditions.

Step 5 **Calculate Oil Pressure Drop** Find the oil pressure drop correction factor and multiply it by the Oil Pressure Drop found on performance curve.

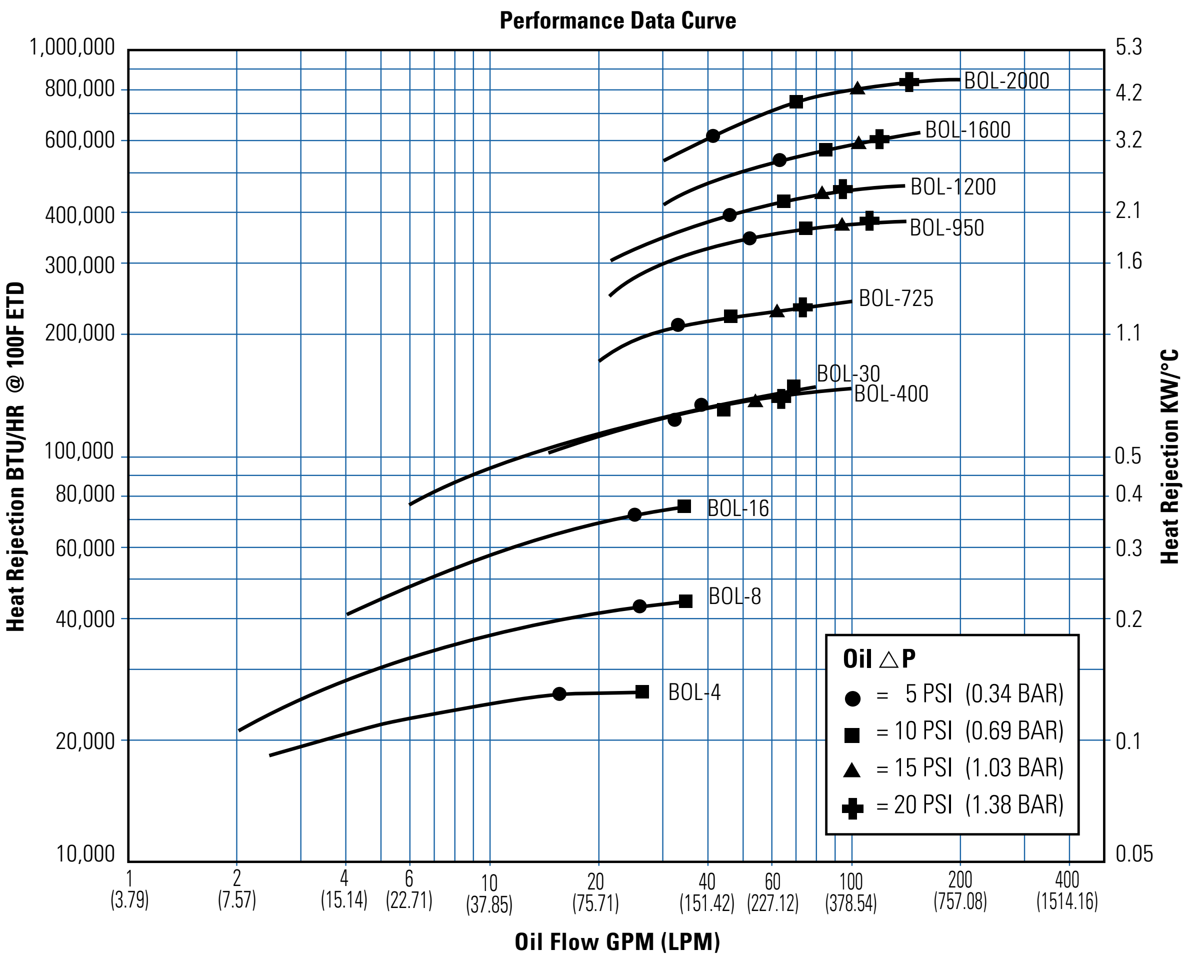
Listed Performance Curves are based on:

- 50 SSU (11 cSt) oil
- 100° F (55.56° C) Entering Temperature Difference (E.T.D.)

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

Performance Curves

BOL Models with Standard P-BAR Core

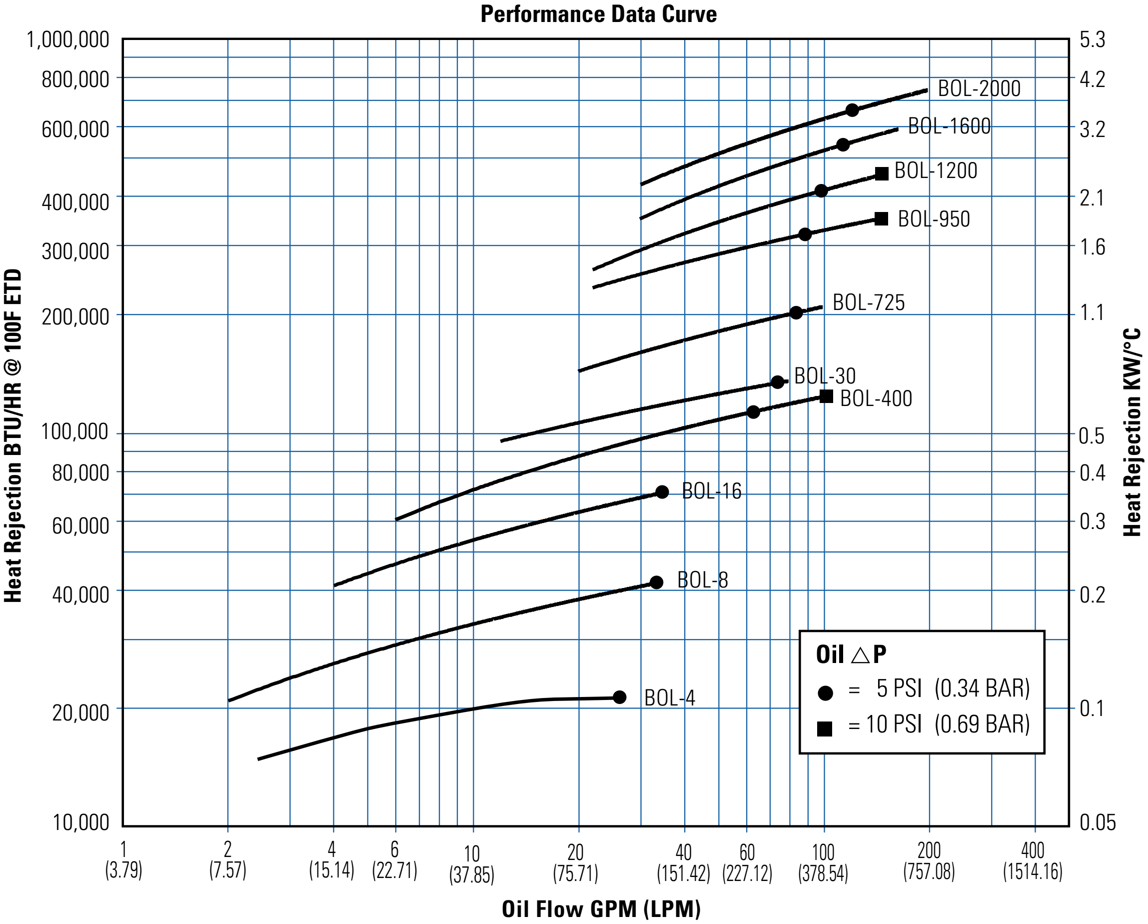


Note: Derate heat rejection values 15% if using 50Hz motors.

AIR COOLED BOL

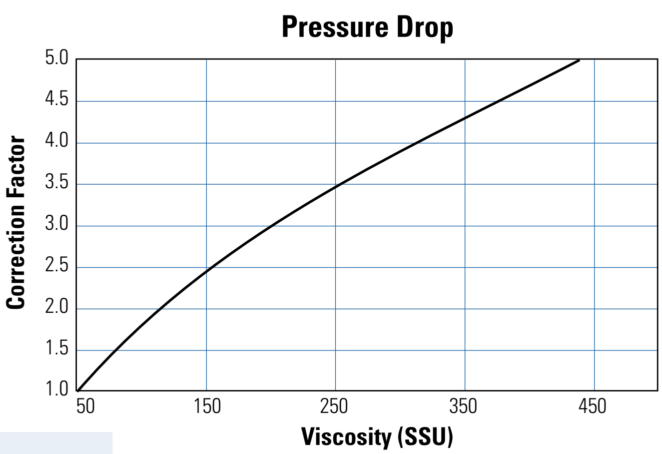
Performance Curves

BOL Models with Optional T-BAR Core



OPTIONAL T-BAR CORE SECTION CUTAWAY

Note: Derate heat rejection values 15% if using 50Hz motors.



Oil Temperature

Typical operating temperature ranges are:

Hydraulic Motor Oil	120°F - 180°F (49°C - 82.2°C)
Hydrostatic Drive Oil	160°F - 180°F (71°C - 82.2°C)
Engine Lube Oil	180°F - 200°F (82.2°C - 93.3°C)
Automatic Transmission Fluid	200°F - 300°F (93.3°C - 149°C)

Desired Reservoir Temperature

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

Off-Line Recirculation Cooling Loop: Desired reservoir temperature is the oil temperature entering the cooler.

Return Line Cooling: Desired reservoir temperature is the oil temperature leaving the cooler. In this case, the oil temperature change must be determined so that the actual oil entering temperature can be found. Calculate the oil temperature change (oil △T) with this formula:

Oil △T = (BTU's/Hr.) / (GPM Oil Flow x 210).

To calculate the oil entering temperature to the cooler, use this formula:

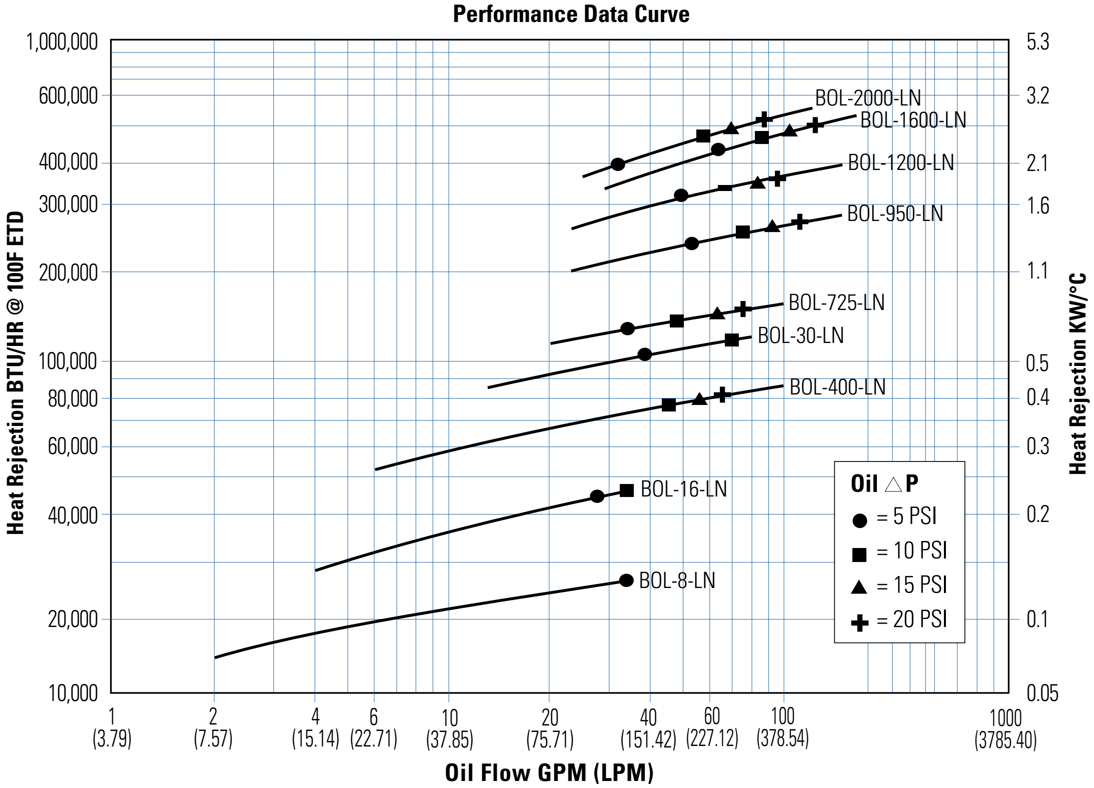
Oil Entering Temp. = Oil Leaving Temp + Oil △T.

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.

Performance Curves

BOL Models with Low-Noise Option

The low noise option offers the BOL models with a reduced motor speed. This allows a lower sound level output for noise-sensitive applications.



Available on 60 Hz Nema frame only.

Electric Motor Information

Model	HP	Frame	Low Noise RPM	Low Noise CFM	Low Noise CMM	Voltage	Frequency (HZ)
8-1PH	0.33	48	1725	400	11.33	115/230	60
8-3PH	0.33	48	1725	400	11.33	208-230/460	60
16-1PH	0.50	48	1725	704	19.93	115/230	60
16-3PH	0.50	48	1725	704	19.93	208-230/460	60
30-1PH	0.50	56C	1160	1470	41.62	115/230	60
30-3PH	0.50	56C	1160	1470	41.62	208-230/460	60
400-1PH	1.00	56C	1725	1100	31.19	115/230	60
400-3PH	1.00	56C	1725	1100	31.19	208-230/460	60
725-1PH	1.50	56C	1725	1780	50.40	115/230	60
725-3PH	1.50	56C	1725	1780	50.40	208-230/460	60
950-1PH	1.50	145TC	1160	3150	89.19	115/230	60
950-3PH	1.50	145TC	1160	3150	89.19	208-230/460	60
1200-3PH	1.50	182TC	1160	4690	132.81	208-230/460	60
1600-3PH	2.00	184TC	1160	6510	184.34	208-230/460	60
2000-3PH	5.00	213TC	1160	8700	000.00	230/460	60

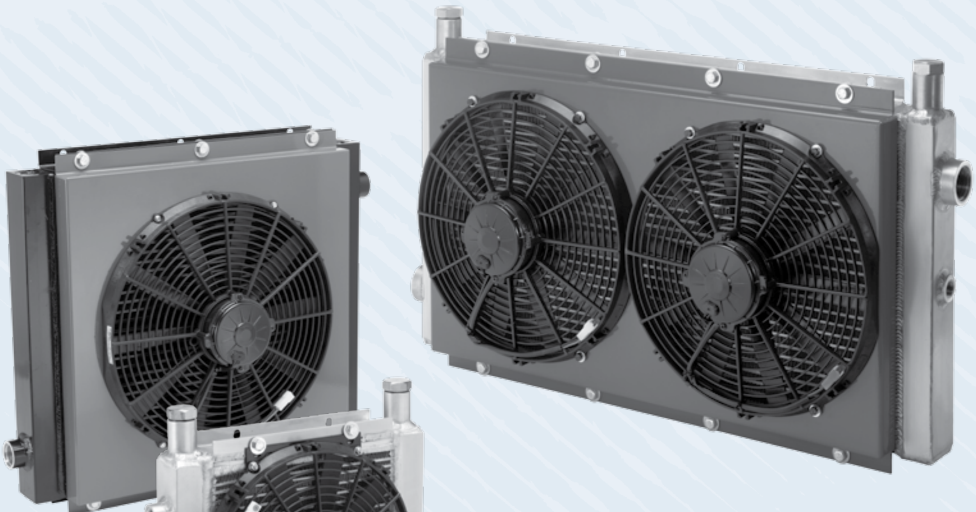
Sound Data

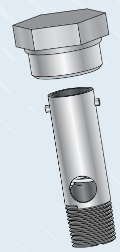
Model	DBA at 3 ft
BOL-8-LN	62
BOL-16-LN	69
BOL-30-LN	67
BOL-400-LN	72
BOL-725-LN	82
BOL-950-LN	76
BOL-1200-LN	75
BOL-1600-LN	78
BOL-2000-LN	85

BRAZED ALUMINUM CONSTRUCTION

Features

- 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
- Fan motor assembly has an IP68 with AMP-#180908 connection
- 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
- Additional capabilities for radiators, charge-air-coolers, condensers, and multi-circuit units
- Optional temperature sensors *(see pg. 171)*





30/60 psi Bypass available

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

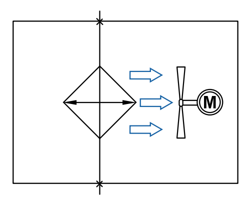
Materials

Core Brazed Aluminum Bar and Plate

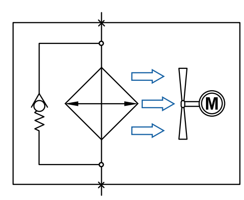
- Tanks – 5052 Aluminum
- Nose Bar & Little Bar – 3003-H Aluminum
- Air Fin, Plate, Turbulator & End Plate – 3003-O Aluminum

Connections Aluminum

Core Mounting Brackets Brazed Aluminum



Without Bypass



With Bypass

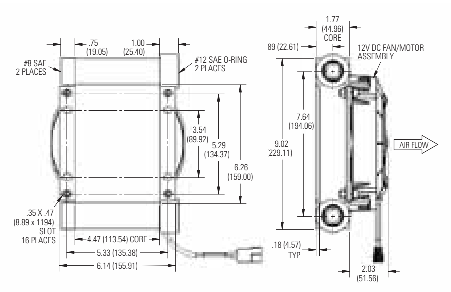
How to Order

Model Series	Model Size Selected	Connection Type*	Bypass*	Specify Motor Required
MA (MAR)	3, 3.5, 4, 12, 18, 32, 48, 232, 248	1 - NPT 2 - SAE 3 - BSPP	30 - 30 PSI 60 - 60 PSI	4A - 12 VDC 4B - 24 VDC

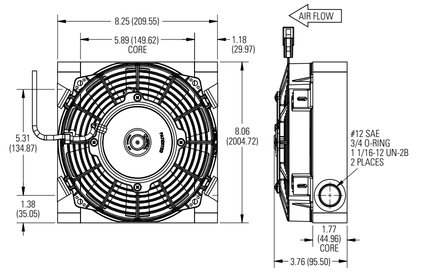
*Bypass available on MA-12, MA-18, MA-32, MA-48, MA-232, MA-248 only. (MAR)
MA-8, MA-14, MA-20, MA-66, MA-32 do not have fan option.
MA 3.5 available with fan only.

Dimensions - Fan/Core

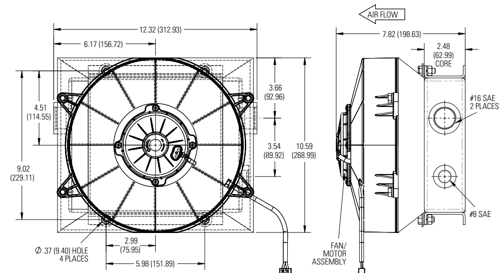
MA-3



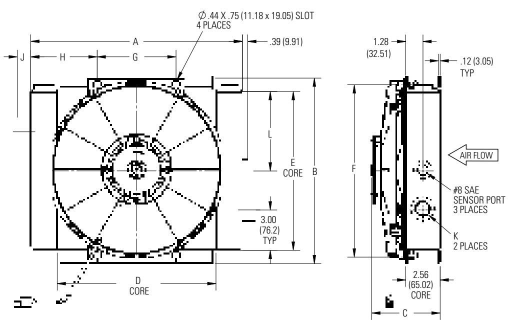
MA-3.5



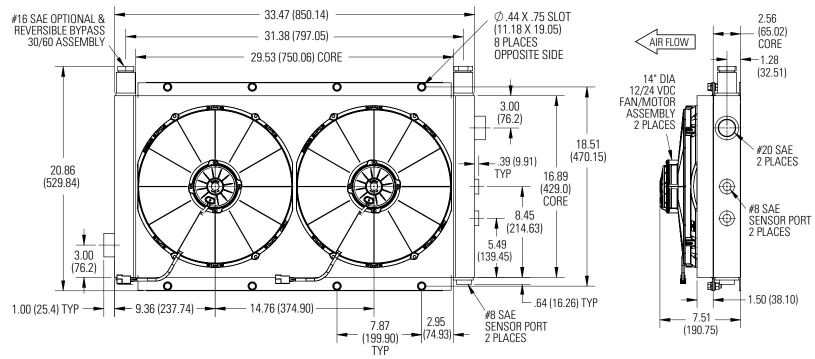
MA-4



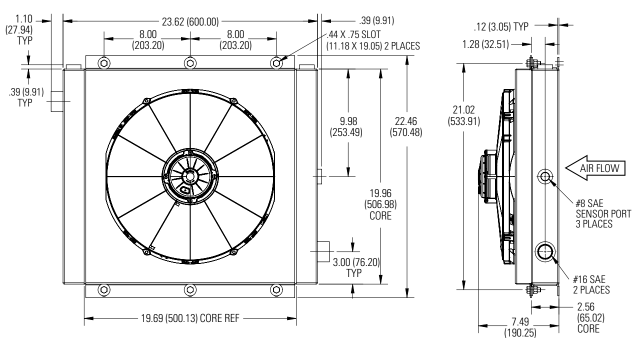
MA-12, MA-18, MA-32



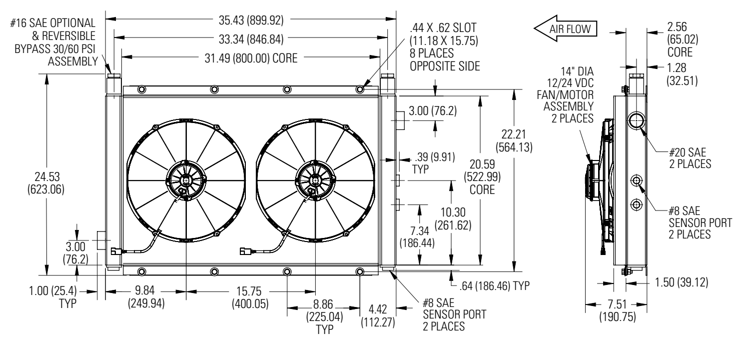
MA-232



MA-48



MA-248



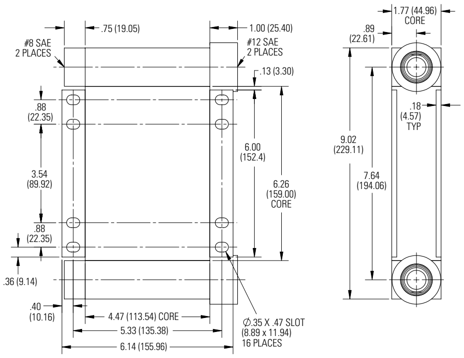
Model	A	B	C	D	E	F	G	H	J	K	L	DC Amp Draw 12V	24V	CFM (CMM)	Approx. Ship Wt. lbs (Kg)
MA-3	See diagram above			—	—	—	—	—	—	—	—	5.7	3.6	300 (8.50)	6 (2.72)
MA-3.5	See diagram above			—	—	—	—	—	—	—	—	12.5	6.3	370 (10.48)	9 (4.08)
MA-4	See diagram above			—	—	—	—	—	—	—	—	12.5	6.3	363 (10.28)	16 (7.26)
MA-12	13.78 (350.01)	11.81 (299.97)	6.26 (159.00)	9.84 (249.94)	9.96 (252.98)	10.87 (276.10)	5.71 (145.00)	4.41 (112.01)	1.00 (25.40)	#12 SAE	4.98 (126.49)	12.5	6.3	521 (14.75)	19 (8.62)
MA-18	15.75 (400.05)	13.81 (350.77)	5.04 128.02)	11.81 (299.97)	11.81 (299.97)	12.80 (325.12)	5.87 (149.10)	4.96 (125.98)	1.00 (25.40)	#12 SAE	5.91 (150.11)	10.6	5.3	783 (22.17)	23 (10.43)
MA-32	19.69 (500.15)	18.54 (470.92)	5.95 (151.13)	15.75 (400.05)	16.14 (409.96)	17.32 (439.93)	12.00 (304.8)	3.86 (98.04)	1.14 (28.96)	#16 SAE	8.07 (204.98)	22.2	11.1	1368 (38.74)	28 (12.70)
MA-48	See diagram above			—	—	—	—	—	—	—	—	22.2	11.1	1637 (46.40)	45 (20.40)
MA-232	See diagram above			—	—	—	—	—	—	—	—	19.3*	9.7*	2234 (63.26)	65 (29.48)
MA-248	See diagram above			—	—	—	—	—	—	—	—	19.3*	9.7*	2904 (82.24)	90 (40.80)

Note: We reserve the right to make reasonable design changes without notice. Dimensions are in inches and (millimeters).
**AMP draw listed as per FAN.*

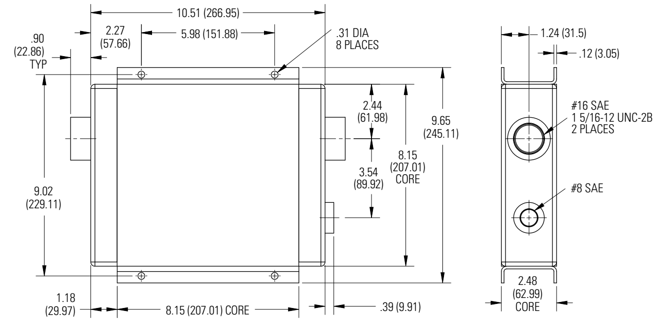
Dimensions - Core Only

AIR COOLED MA

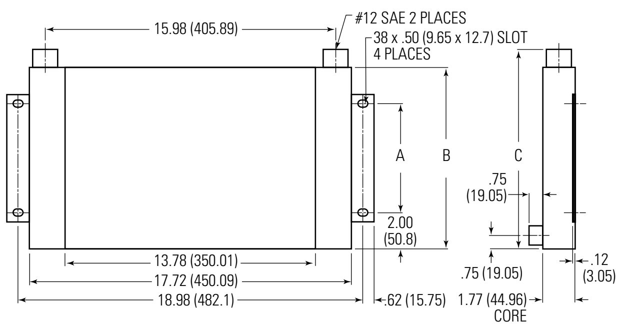
MA-3



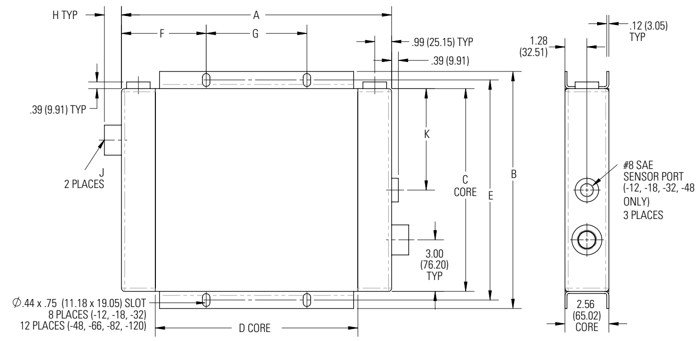
MA-4



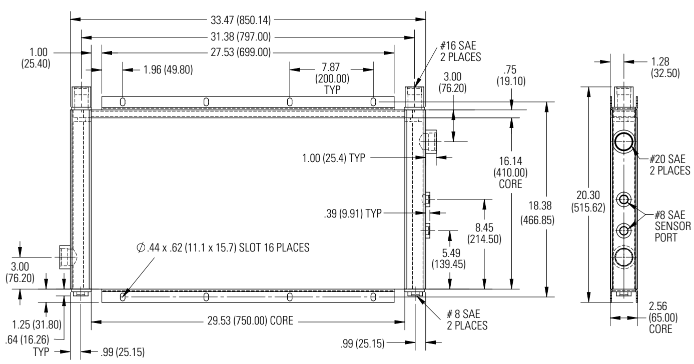
MA-8, MA-14, MA-20



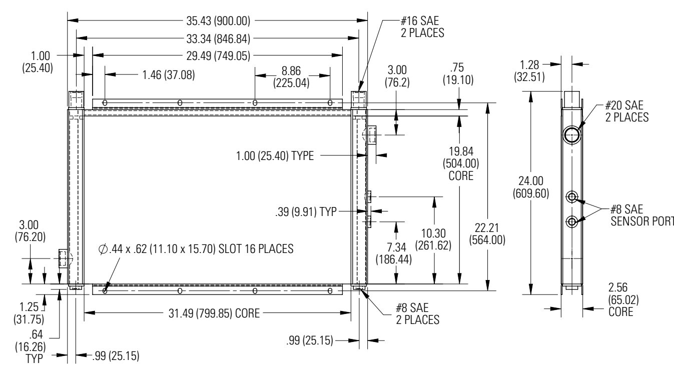
MA-12 thru MA-120



MA-232



MA-248



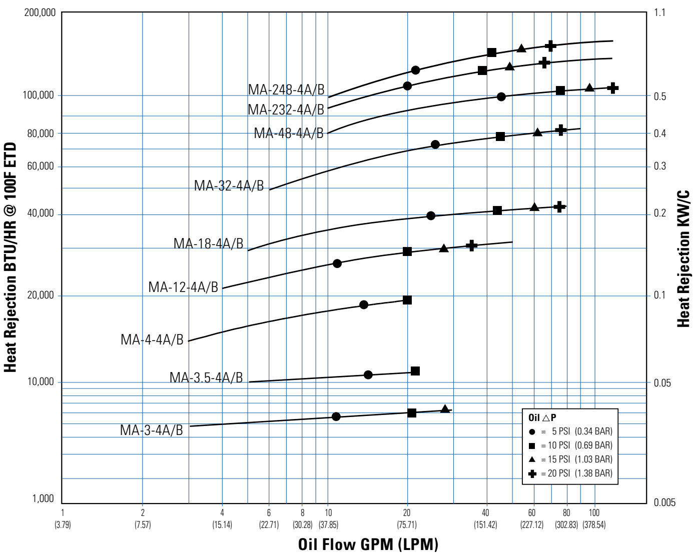
Model	A	B	C	D	E	F	G	H	J	K	Approx. Ship Wt. lbs (Kg)
MA-3	See diagram above			–	–	–	–	–	–	–	4 (1.81)
MA-4	See diagram above			–	–	–	–	–	–	–	7 (3.18)
MA-8	3.00 (76.2)	5.67 (144.02)	6.65 (168.9)	–	–	–	–	–	–	–	10 (4.54)
MA-12	13.78 (350.01)	11.81 (299.97)	9.96 (252.98)	9.84 (294.94)	10.98 (278.89)	4.04 (102.62)	5.71 (145.03)	1.00 (25.4)	#12 SAE	4.98 (126.49)	15 (6.8)
MA-14	6.00 (152.4)	10.00 (254.0)	10.98 (278.89)	–	–	–	–	–	–	–	14 (6.35)
MA-18	15.75 (400.05)	13.81 (350.77)	11.81 (299.97)	11.81 (299.97)	12.82 (325.63)	4.94 (125.48)	5.87 (149.10)	1.00 (25.4)	#12 SAE	5.91 (150.11)	18 (8.16)
MA-20	10.00 (254.0)	14.33 (363.98)	15.31 (388.87)	–	–	–	–	–	–	–	18 (8.16)
MA-32	19.69 (500.13)	18.54 (470.92)	16.14 (409.96)	15.75 (400.05)	17.32 (439.93)	3.85 (97.79)	12.00 (304.8)	1.10 (27.94)	#16 SAE	8.07 (204.98)	28 (12.7)
MA-48	23.62 (599.95)	22.13 (562.10)	19.96 (506.98)	19.69 (500.13)	21.02 (533.91)	3.81 (96.77)	8.00 (203.2)	1.10 (27.94)	#16 SAE	9.98 (253.49)	41 (18.60)
MA-66	27.56 (700.02)	25.83 (656.08)	23.54 (597.92)	23.62 (599.95)	24.72 (627.89)	3.78 (96.01)	10.00 (254.0)	1.58 (40.13)	#20 SAE	–	50 (22.68)
MA-82	31.50 (800.1)	27.68 (703.07)	25.39 (644.91)	27.56 (700.02)	26.57 (674.8)8	5.75 (146.05)	10.00 (254.0)	1.58 (40.13)	#24 SAE	–	65 (29.48)
MA-120	31.50 (800.1)	39.49 (1003.05)	37.20 (944.88)	27.56 (700.02)	38.39 (975.11)	5.75 (146.05)	10.00 (254.0)	1.58 (40.13)	#24 SAE	–	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 and (millimeters).

Performance Curves

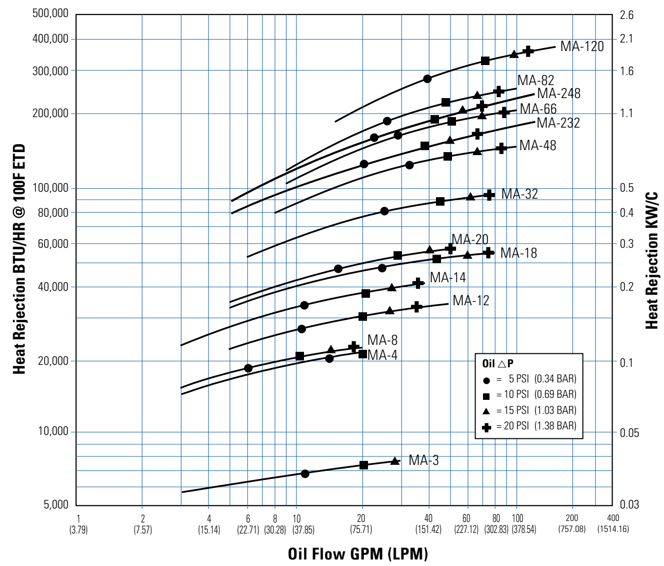
MA Models with DC Fan Assemblies

Performance Data Curve

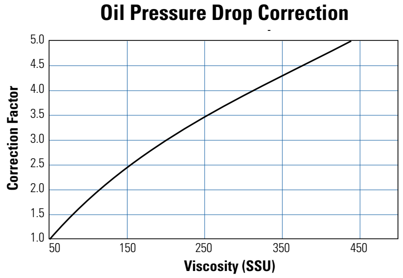


MA Models (No Fan, Core Only)

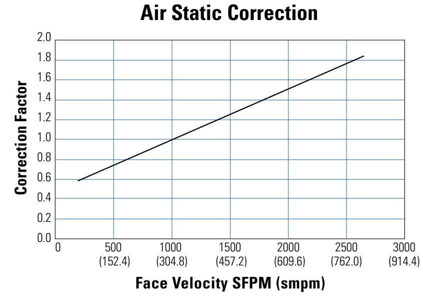
Performance Data Curve



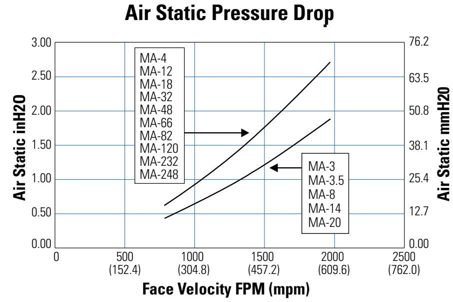
Oil Pressure Drop Correction



Air Static Correction



Air Static Pressure Drop



Selection Procedure

Step 1 **Determine Heat Load.** Typical Rule of Thumb, - size cooler for 1/3 of the input horsepower. Heat load may be expressed as either Horsepower or BTU/HR or KW/°C.

HP = BTU/HR ÷ 2545

BTU/HR = HP x 2545

$$BTU/HR = \frac{KW}{°C} \times 1895 \times E.T.D.(°F)$$

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**
(Skip to Step 4 if using our DC Fan Assembly)

Calculate actual SFPM Air Velocity or SCFM (Standard Cubit 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

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

(BTU/HR) to use with selection chart

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

METRIC Version

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

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

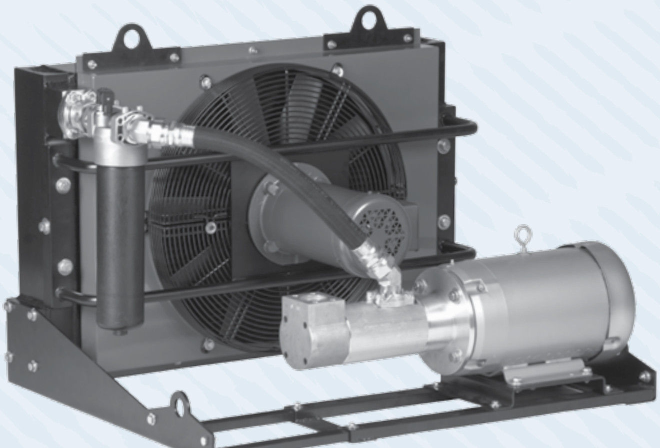
- 50 SSU (11 cSt) oil
- 1000 Standard Feet per Minute (SPFM) (304.8 MPM) Air Velocity
- 100° F (55.56° C) Entering Temperature Difference (E.T.D.)

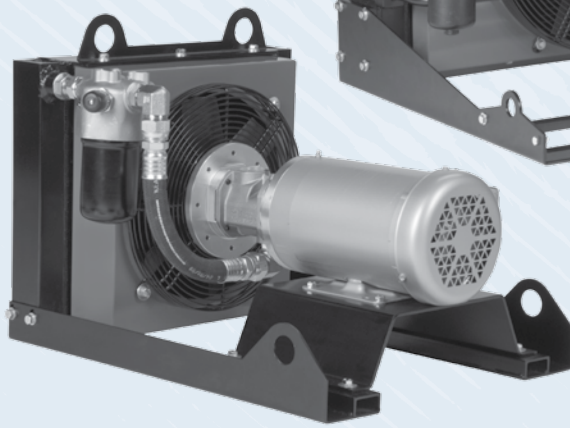
If your application conditions are different, then continue with the selection procedure.

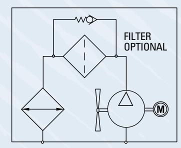
BRAZED ALUMINUM CONSTRUCTION

Features

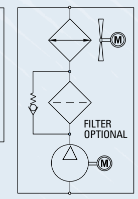
- Ideal for independent cooling and filtering of system oils
- Low to medium pressure applications utilizing low noise screw pump technology
- Pump flows ranging 9.5 gpm to 45 gpm
- Bar and Plate Brazed Aluminum P-BAR core with optional T-Bar core
- Best heat transfer per given envelope size while minimizing pressure drop
- Standard SAE ports - NPT and BSPP port adapters available
- Optional cartridge-style filters with both visual and electrical bypass indicator options
- Optional temperature sensors *(see pgs. 169 & 170)*







COL 8-400



COL 725-1600

Ratings

Maximum Operating Pressure
250 PSI (17 BAR)

Maximum Operating Temperature
300° F (150° C) without filter
230° F (110° C) with filter

Maximum Viscosity
P-BAR 150 cst
T-BAR 320 cst

Materials

Mounting Feet Steel

Standard Core Brazed Aluminum Plate and Bar (T-Bar is optional)

- Tanks 5052 Aluminum
- Nose Bar and Little Bar 3003-H Aluminum
- Air Fin, Plate, Turbulator and End Plate 3003-O Aluminum

Fanguard and Shroud Steel

Connectors Aluminum

Fan Aluminum Hub, Plastic Blades

Motor NEMA

Fluid Compatability

Petroleum
Water/ethylene glycol
Cutting oils (contact TTP)
Water-oil emulsions
Water-Ethylene Glycol emulsions
Mineral oil HLP and HLVP
Ecologic fluids HETG-HEPG-HEE
Lubrication high viscosity oils
MIL-H, SKYDROL/HFDR phosphate ester*

**Standard pump seals are not compatible with phosphate ester. Special pumps with EPDM seals are required. Consult factory for details.*

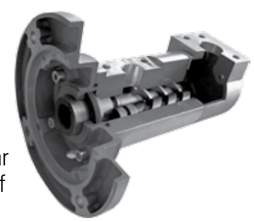
Micron Filtration

Utilize a modern in-line filter housing and cartridge

- Utilizes a standard cartridge element
- Filter Options:
  - 10 micron fiberglass, standard
  - 3, 6, and 25 micron fiberglass, optional
  - Consult factory for high viscosity fluids
- ß 1000 filtration efficiency
- Filtration indicator
  Visual, visual/electrical or electrical

Screw Pump Technology

offering significant maintenance and performance advantages.



Screw pumps meet the need of having a silent hydraulic component, unique pump design offers the characteristics of a gear pump and the silence of a screw pump.

- Reliable, high performance, low noise
- Run without pulsation, providing long life to your application
- Positive displacement rotary pump with axial flow design
- Only three moving parts
- Rolling action eliminates noise and vibration

How to Order

Model Series	Model Size Selected	Ports	Pump*	Motor	Filter	Indicator	Core	Heresite
COL	8 • 16 • 30 400 • 725 • 950 1200 • 1600	1 - NPT 2 - SAE 3 - BSPP	20 - 20cc 40 - 40cc 80 - 80cc 100 - 100cc	0 - No Motor 3 - 3ph	Blank - None 3 - 3µ 6 - 6µ 10 - 10µ 25 - 25µ	Blank - None V - Visual E - Electrical EV - Electrical/ Visual	Blank - Standard TB** - T-BAR Optional	Blank - Standard Paint HC - Heresite

*20cc & 40cc – Sizes 8, 16, 30, and 400 only. 80cc & 100cc – Sizes 725, 950, 1200, and 1600 only.
**T-BAR Core option provides a T-BAR core in COL frame. Used for high fouling or high viscosity fluids. Performance is typically 15-25% less than the bar and plate core. Consult factory for details.

Specifications

Pump/Fan Motor Data (COL-8 – COL-400)

Model	Actual Displacement CUIN (CC)	GPM (LPM) Flow	Operating Pressure PSI (BAR)	Motor HP	RPM	Voltage	PH/HZ	Full Load Amps 208-230/460	Frame Size	Fan CFM (CMM) Air Flow	Overall Sound dB(A) at 3 ft (1 m)
COL-8	1.22 (20)	9.5 (36)	130 (9)	1.5	1800	208-230/460	3/60	4.5-4.4/2.2	145TC	418 (11.83)	67
	2.44 (40)	21 (79)	130 (9)	3	1800	208-230/460	3/60	9-8.4/4.2	182TC	418 (11.83)	67
COL-16	1.22 (20)	9.5 (36)	130 (9)	1.5	1800	208-230/460	3/60	4.5-4.4/2.2	145TC	745 (21.09)	73
	2.44 (40)	21 (79)	130 (9)	3	1800	208-230/460	3/60	9-8.4/4.2	182TC	745 (21.09)	73
COL-30	1.22 (20)	9.5 (36)	130 (9)	1.5	1800	208-230/460	3/60	4.5-4.4/2.2	145TC	2200 (62.29)	85
	2.44 (40)	21 (79)	130 (9)	3	1800	208-230/460	3/60	9-8.4/4.2	182TC	2200 (62.29)	85
COL-400	1.22 (20)	9.5 (36)	130 (9)	1.5	1800	208-230/460	3/60	4.5-4.4/2.2	145TC	1149 (32.53)	77
	2.44 (40)	21 (79)	130 (9)	3	1800	208-230/460	3/60	9-8.4/4.2	182TC	1149 (32.53)	77

Performance based upon 46 cSt oil, 60 Hz

Pump Motor Data (COL-725 – COL-1600)

Model	Actual Displacement CUIN (CC)	GPM (LPM) Flow	Operating Pressure PSI (BAR)	Motor HP	RPM	Voltage	PH/HZ	Full Load Amps 208-230/460	Frame Size	Overall Sound dB(A) at 3 ft (1 m)
COL-725	4.52 (74)	35 (133)	218 (15)	7.5	1800	208-230/460	3/60	21-18.8/9.4	213TC	100
	5.68 (93)	45 (169)	203 (14)	7.5	1800	208-230/460	3/60	21-18.8-9.4	213TC	100
COL-950	4.52 (74)	35 (133)	218 (15)	7.5	1800	208-230/460	3/60	21-18.8/9.4	213TC	92
	5.68 (93)	45 (169)	203 (14)	7.5	1800	208-230/460	3/60	21-18.8-9.4	213TC	92
COL-1200	4.52 (74)	35 (133)	218 (15)	7.5	1800	208-230/460	3/60	21-18.8/9.4	213TC	94
	5.68 (93)	45 (169)	203 (14)	7.5	1800	208-230/460	3/60	21-18.8-9.4	213TC	94
COL-1600	4.52 (74)	35 (133)	218 (15)	7.5	1800	208-230/460	3/60	21-18.8/9.4	213TC	96
	5.68 (93)	45 (169)	203 (14)	7.5	1800	208-230/460	3/60	21-18.8-9.4	213TC	96

Performance based upon 46 cSt oil, 60 Hz

Fan Motor Data (COL-725 – COL-1600)

Model	Motor HP	RPM	Voltage	PH/HZ	Full Load Amps 208-230/460	Frame Size	Fan CFM (CMM) Air Flow
COL-725	1.5	3450	208-230/460	3/60	4.9-4.6/2.3	56C	3600 (101.94)
COL-950	1.5	1750	208-230/460	3/60	5.1-4.8/2.4	145TC	4700 (133.10)
COL-1200	3	1750	208-230/460	3/60	9.1-8.4/4.2	182TC	7000 (198.22)
COL-1600	5	1750	208-230/460	3/60	14.2-13.6/6.8	184TC	7900 (223.75)

Performance based upon 46 cSt oil, 60 Hz

Desired Reservoir Temperature

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

Off-Line Recirculation Cooling Loop: Desired reservoir temperature is the oil temperature entering the cooler.

Return Line Cooling: Desired reservoir temperature is the oil temperature leaving the cooler. In this case, the oil temperature change must be determined so that the actual oil entering temperature can be found. Calculate the oil temperature change (oil △T) with this formula:

Oil △T °F (°C) = (BTU/hr ÷ [GPM oil flow x 210])
[KW ÷ (LPM Oil Flow x .029)]

To calculate the oil entering temperature to the cooler, use this formula:

Oil Entering Temp. = Oil Leaving Temp + Oil △T.

Oil Pressure Drop: Most systems can tolerate a pressure drop through the heat exchanger of 19 to 30 PSI (1.3 to 2.1 BAR). Excessive pressure drop should be avoided. Care should be taken to limit pressure drop to 5 PSI (.35 BAR) or less for case drain applications where high back pressure may damage the pump shaft seals.

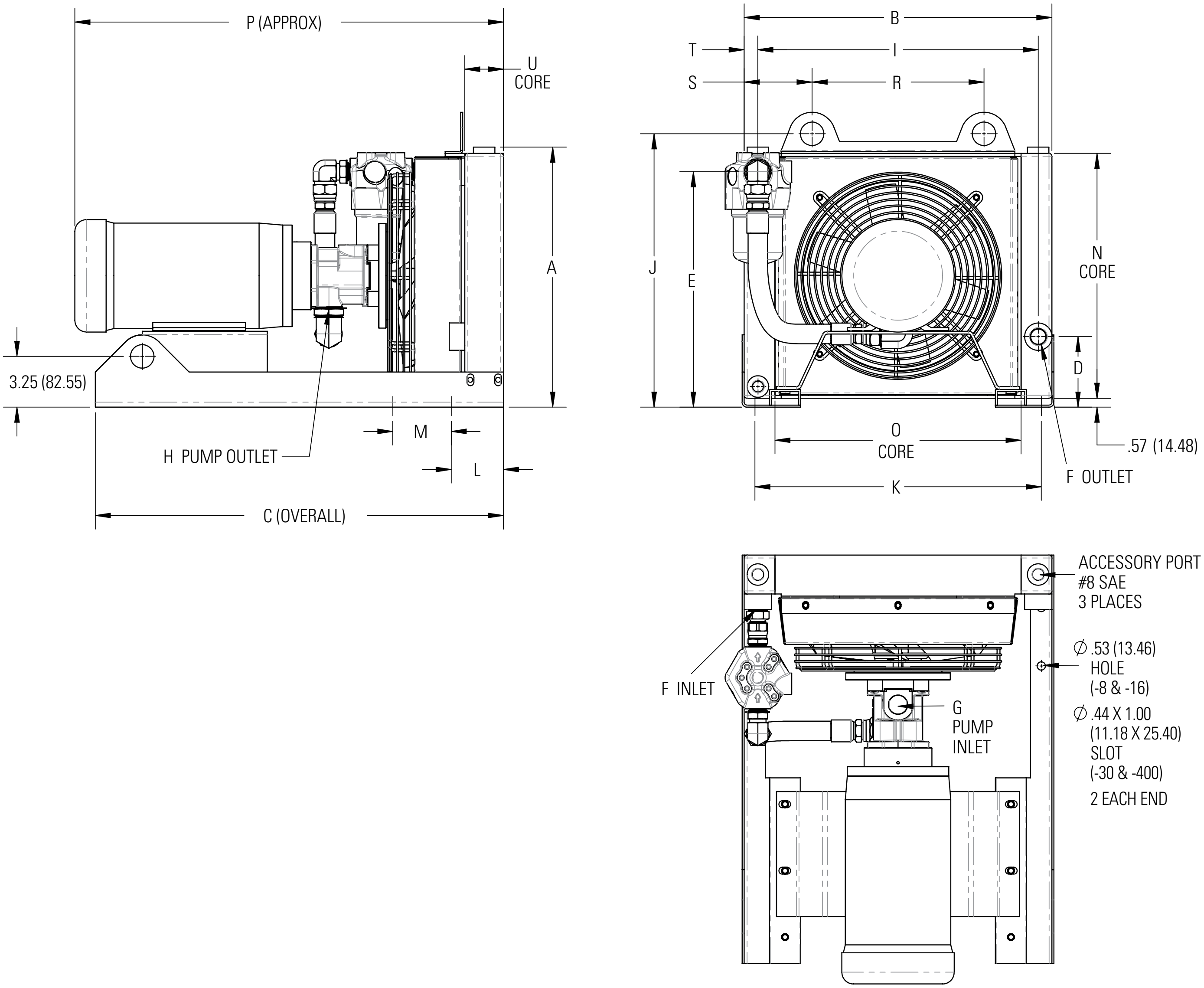
Oil Temperature

Typical operating temperature ranges are:

Hydraulic Motor Oil	120 - 180°F (49 - 82°C)
Hydrostatic Drive Oil	160 - 180°F (71 - 82°C)
Engine Lube Oil	180 - 199°F (82 - 93°C)
Automatic Transmission Fluid	199 - 300°F (93 - 149°C)

Dimensions

COL-8 through COL-400

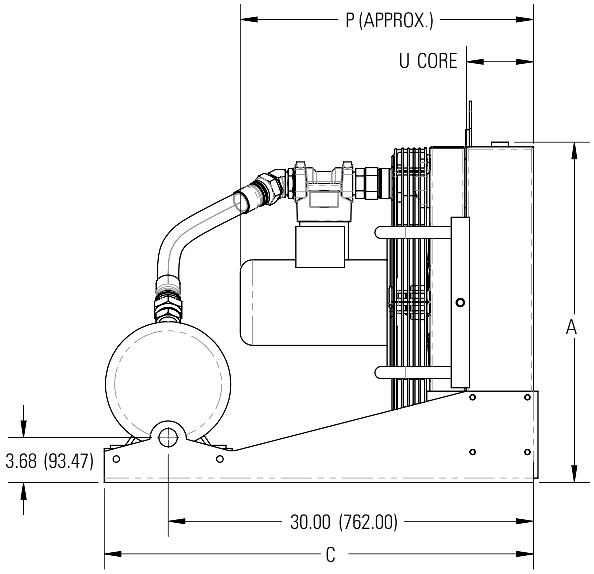


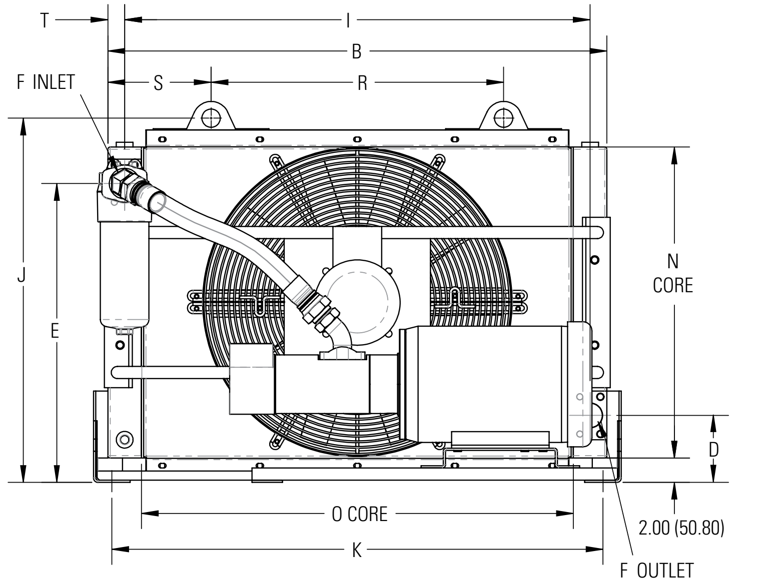
Model	A	B	C	D	E	F	G (Pump Intlet)	H (Pump Outlet)	I	J	K	L	M	N	O	P	R	S	T	U
COL-8-20	12.93 (328)	15.75 (400)	26.13 (664)	4.51 (115)	11.34 (288)	#12 SAE	#12 SAE	#16 SAE	13.99 (355)	13.79 (350)	14.39 (366)	3.35 (85)	3.74 (95)	11.97 (304)	11.81 (300)	27.09 (688)	6.50 (165)	3.75 (95)	0.88 (22)	2.48 (63)
COL-8-40	12.93 (328)	15.75 (400)	26.13 (664)	4.51 (115)	11.34 (288)	#12 SAE	#20 SAE	#24 SAE	13.99 (355)	13.79 (350)	14.39 (366)	3.35 (85)	3.74 (95)	11.97 (304)	11.81 (300)	29.71 (755)	6.50 (165)	3.75 (95)	0.88 (22)	2.48 (63)
COL-16-20	16.63 (422)	19.69 (500)	26.13 (664)	4.51 (115)	15.06 (383)	#12 SAE	#12 SAE	#16 SAE	17.95 (456)	17.49 (444)	18.33 (466)	3.35 (85)	3.74 (95)	15.67 (398)	15.75 (400)	27.44 (697)	11.00 (279)	4.35 (110)	0.87 (22)	2.48 (63)
COL-16-40	16.63 (422)	19.69 (500)	26.13 (664)	4.51 (115)	15.06 (383)	#12 SAE	#20 SAE	#24 SAE	17.95 (456)	17.49 (444)	18.33 (466)	3.35 (85)	3.74 (95)	15.67 (398)	15.75 (400)	30.05 (763)	11.00 (279)	4.35 (110)	0.87 (22)	2.48 (63)
COL-30-20	21.09 (536)	26.38 (670)	26.86 (682)	5.27 (134)	19.50 (495)	#20 SAE	#12 SAE	#16 SAE	24.34 (618)	22.07 (561)	24.74 (628)	4.25 (108)	5.00 (127)	19.37 (492)	21.65 (550)	28.35 (720)	17.00 (432)	4.69 (119)	1.02 (26)	3.70 (94)
COL-30-40	21.09 (536)	26.38 (670)	26.86 (682)	5.27 (134)	19.50 (495)	#20 SAE	#20 SAE	#24 SAE	24.34 (618)	22.07 (561)	24.74 (628)	4.25 (108)	5.00 (127)	19.37 (492)	21.65 (550)	30.96 (786)	17.00 (432)	4.69 (119)	1.02 (26)	3.70 (94)
COL-400-20	19.20 (488)	22.45 (570)	26.86 (682)	6.50 (165)	17.31 (440)	#20 SAE	#12 SAE	#16 SAE	20.08 (510)	20.69 (526)	22.31 (567)	4.25 (108)	5.00 (127)	16.81 (427)	17.72 (450)	28.47 (723)	11.00 (279)	5.73 (146)	1.19 (30)	3.70 (94)
COL-400-40	19.20 (488)	22.45 (570)	26.86 (682)	6.50 (165)	17.31 (440)	#20 SAE	#20 SAE	#24 SAE	20.08 (510)	20.69 (526)	22.31 (567)	4.25 (108)	5.00 (127)	16.81 (427)	17.72 (450)	31.09 (790)	11.00 (279)	5.73 (146)	1.19 (30)	3.70 (94)

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

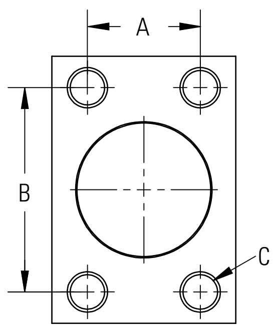
Dimensions

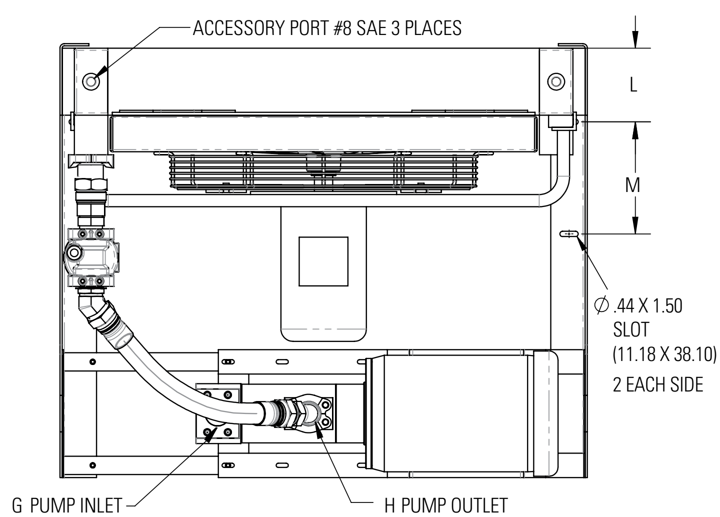
COL-725 through COL-1600





SAE Flange





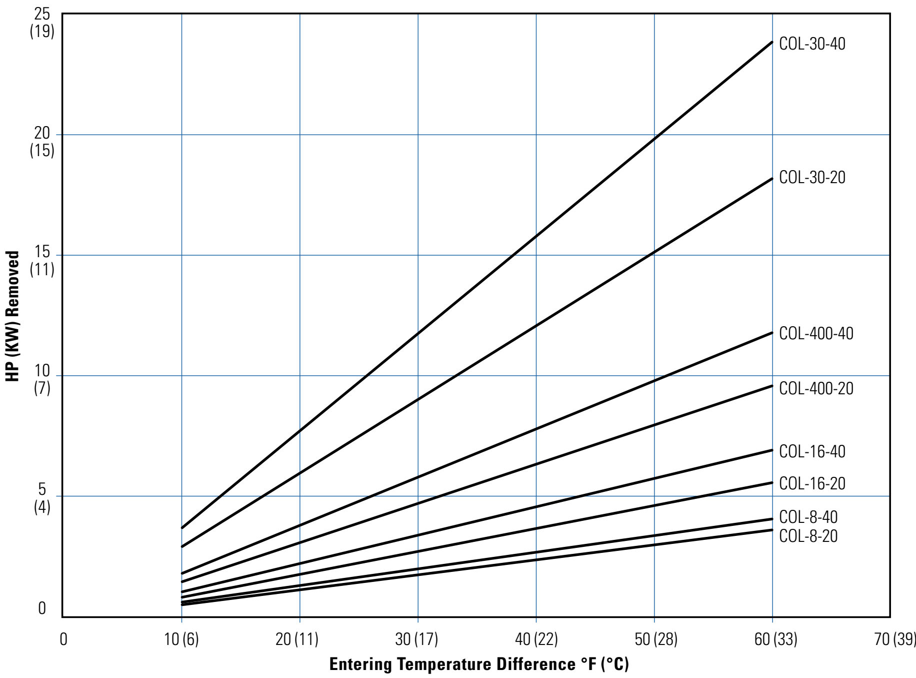
SAE Flange Size	A Inches (mm)	B Inches (mm)	C
1½"	1.41 (36)	2.75 (70)	1½ - 13 UNC
2"	1.69 (43)	3.06 (78)	1½ - 13 UNC
2½"	2.00 (51)	3.50 (89)	1½ - 13 UNC

Model	A	B	C	D	E	F	G (Pump Intlet)	H (Pump Outlet)	I	J	K	L	M	N	O	P	R	S	T	U
COL-725-80	23.49 (597)	30.32 (770)	35.00 (889)	6.50 (165)	21.60 (549)	#20 SAE	2" SAE Flange	1½" SAE Flange	27.95 (710)	25.48 (647)	30.18 (767)	4.25 (108)	5.00 (127)	21.10 (536)	25.59 (650)	24.07 (611)	11.98 (304)	9.16 (233)	1.19 (30)	3.70 (94)
COL-725-100	23.49 (597)	30.32 (770)	35.00 (889)	6.50 (165)	21.60 (549)	#20 SAE	2½" SAE Flange	2" SAE Flange	27.95 (710)	25.48 (647)	30.18 (767)	4.25 (108)	5.00 (127)	21.10 (536)	25.59 (650)	24.07 (611)	11.98 (304)	9.16 (233)	0.19 (5)	3.70 (94)
COL-950-80	27.94 (710)	37.01 (940)	35.25 (895)	9.50 (241)	24.55 (624)	2" SAE Flange	2" SAE Flange	1½" SAE Flange	34.26 (870)	29.93 (760)	35.87 (911)	6.05 (154)	9.20 (234)	25.55 (649)	31.50 (800)	22.69 (576)	18.00 (457)	9.51 (242)	1.38 (35)	5.51 (140)
COL-950-100	27.94 (710)	37.01 (940)	35.25 (895)	9.50 (241)	24.55 (624)	2" SAE Flange	2½" SAE Flange	2" SAE Flange	34.26 (870)	29.93 (760)	35.87 (911)	6.05 (154)	9.20 (234)	25.55 (649)	31.50 (800)	22.69 (576)	18.00 (457)	9.51 (242)	1.38 (35)	5.51 (140)
COL-1200-80	27.94 (710)	40.94 (1040)	35.25 (895)	5.50 (140)	24.55 (624)	2" SAE Flange	2" SAE Flange	1½" SAE Flange	38.19 (970)	29.93 (760)	40.30 (1024)	6.05 (154)	9.20 (234)	25.55 (649)	35.43 (900)	26.05 (662)	24.00 (610)	8.47 (215)	1.38 (35)	5.51 (140)
COL-1200-100	27.94 (710)	40.94 (1040)	35.25 (895)	5.50 (140)	24.55 (624)	2" SAE Flange	2½" SAE Flange	2" SAE Flange	38.19 (970)	29.93 (760)	40.30 (1024)	6.05 (154)	9.20 (234)	25.55 (649)	35.43 (900)	26.05 (662)	24.00 (610)	8.47 (215)	1.38 (35)	5.51 (140)
COL-1600-80	36.01 (915)	40.94 (1040)	35.25 (895)	9.50 (241)	32.62 (829)	2" SAE Flange	2" SAE Flange	1½" SAE Flange	38.19 (970)	37.88 (962)	40.30 (1024)	6.05 (154)	9.20 (234)	33.62 (854)	35.43 (900)	25.45 (646)	24.00 (610)	8.47 (215)	1.38 (35)	5.51 (140)
COL-1600-100	36.01 (915)	40.94 (1040)	35.25 (895)	9.50 (241)	32.62 (829)	2" SAE Flange	2½" SAE Flange	2" SAE Flange	38.19 (970)	37.88 (962)	40.30 (1024)	6.05 (154)	9.20 (234)	33.62 (854)	35.43 (900)	25.45 (646)	24.00 (610)	8.47 (215)	1.38 (35)	5.51 (140)

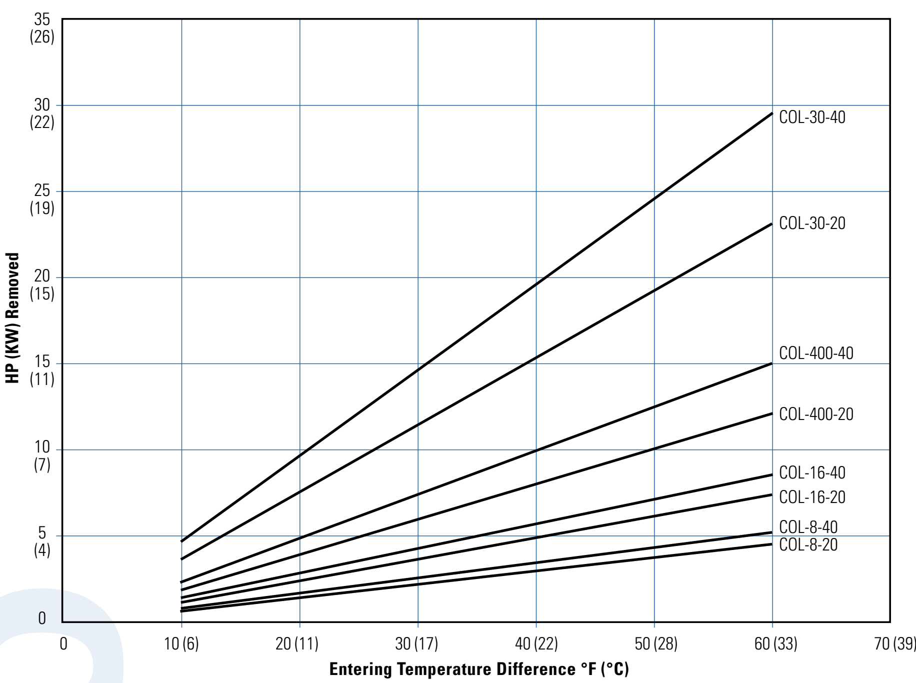
Note: We reserve the right to make reasonable design changes without notice. ***All dimensions in inches (millimeters), unless noted otherwise.***

Performance Curves

Single Motor 50hz/1500 RPM



Single Motor 60hz/1800 RPM



Note: T-Bar cores derate performance 15-25%. Consult factory for sizing information.

Selection Procedure

Step 1 **Determine Heat Load.** Most applications can have a cooler sized for 1/3 of the input HP (KW).

Step 2 **Determine Entering Temperature Difference.** (Actual E.T.D.)

E.T.D. = Entering oil temperature °F (°C) – Entering ambient air temperature °F (°C)

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.

Step 3 **Select Model From Curves.** Enter the Performance Curves at the bottom with the GPM (LPM) oil flow and proceed upward to the adjusted Heat Rejection from Step 3. Any Model or Curve on or above this point will meet these conditions.

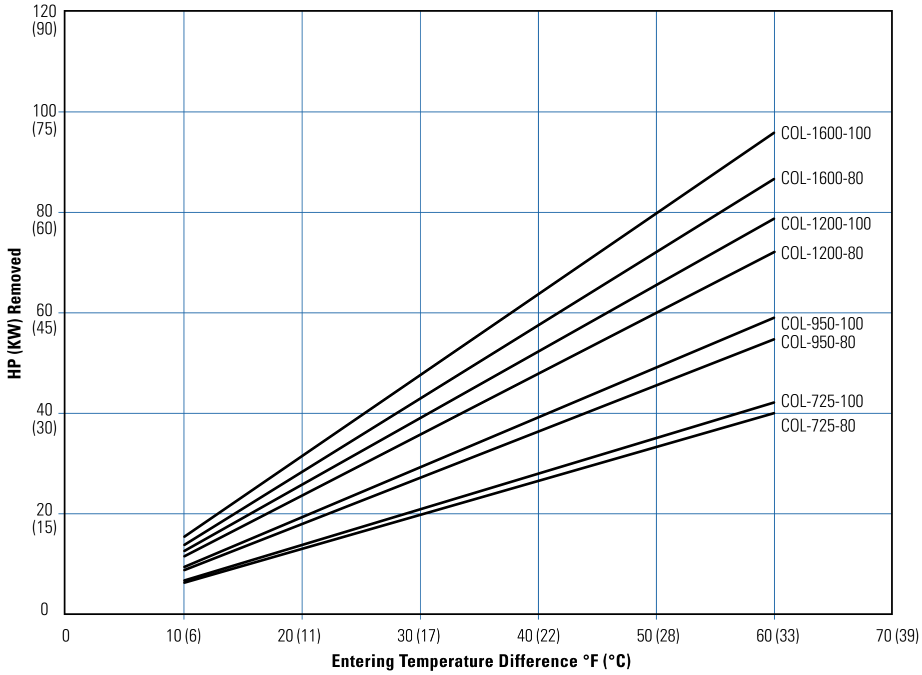
Listed Performance Curves are based on 46 cSt oil.

If your application conditions are different, consult factory for assistance.

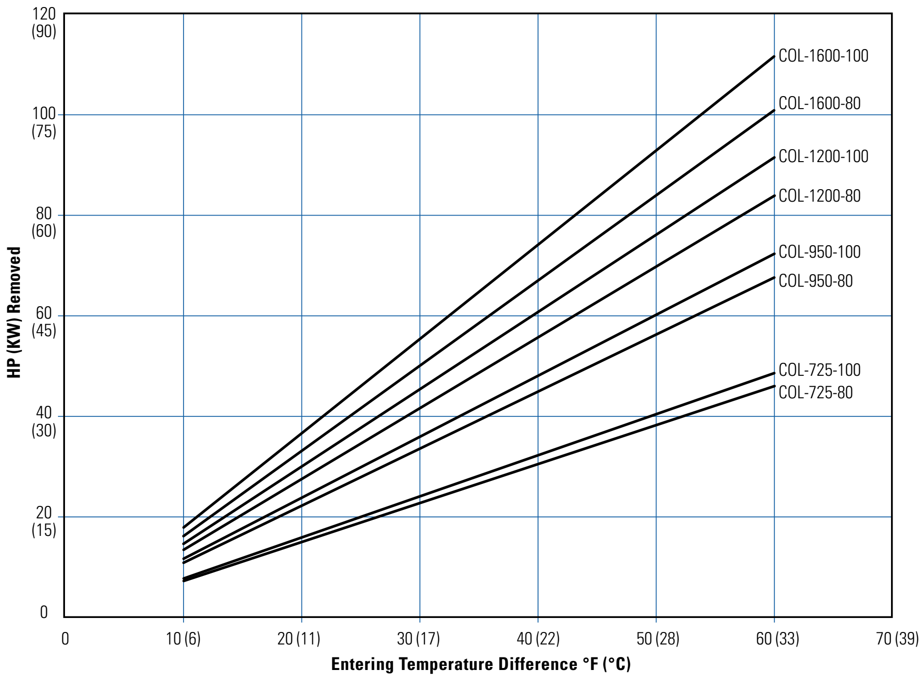
Model	50 Hz Flow Rate GPM (LPM)	60 Hz Flow Rate GPM (LPM)
COL-8-20	8 (30)	9.5 (36)
COL-8-40	16 (60)	21 (79)
COL-16-20	8 (30)	9.5 (36)
COL-16-40	16 (60)	21 (79)
COL-30-20	8 (30)	9.5 (36)
COL-30-40	16 (60)	21 (79)
COL-400-20	8 (30)	9.5 (36)
COL-400-40	16 (60)	21 (79)

Performance Curves / Selection Procedure

Dual Motor 50hz/1500 RPM



Dual Motor 60hz/1800 RPM

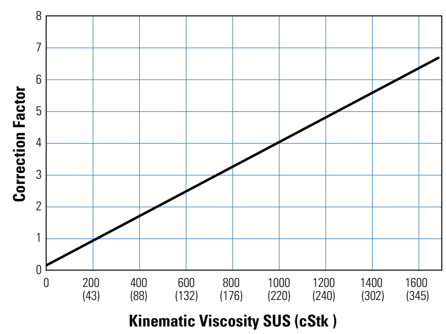


System Pressure Drop

Model	Oil Flow Rate GPM (LPM)	Estimated Pressure Drop with Filter PSI (BAR)	Estimated Pressure Drop without Filter PSI (BAR)
COL-8-20	9.5 (36)	14 (1.0)	5 (0.3)
COL-8-40	21.0 (79)	28 (2.0)	17 (1.2)
COL-16-20	9.5 (36)	14 (1.0)	5 (0.3)
COL-16-40	21.0 (79)	27 (1.9)	16 (1.1)
COL-30-20	9.5 (36)	12 (0.8)	3 (0.2)
COL-30-40	21.0 (79)	23 (1.6)	12 (0.8)
COL-400-20	9.5 (36)	13 (0.9)	3 (0.2)
COL-400-40	21.0 (79)	24 (1.7)	13 (0.9)
COL-725-80	35.0 (133)	25 (1.7)	16 (1.1)
COL-725-100	45.0 (169)	33 (2.3)	19 (1.3)
COL-950-80	35.0 (133)	19 (1.3)	11 (0.8)
COL-960-100	45.0 (169)	25 (1.7)	12 (0.8)
COL-1200-80	35.0 (133)	20 (1.4)	12 (0.8)
COL-1200-100	45.0 (169)	27 (1.9)	13 (0.9)
COL-1600-80	35.0 (133)	17 (1.2)	9 (0.6)
COL-1600-100	45.0 (169)	24 (1.7)	10 (0.7)

Total pressure drop is estimated using 46 cStk oil. 10 micron mesh filter is used in calculating filter pressure drop.

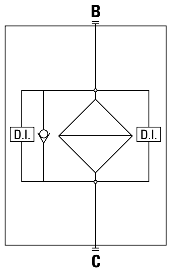
Oil Pressure Drop Correction

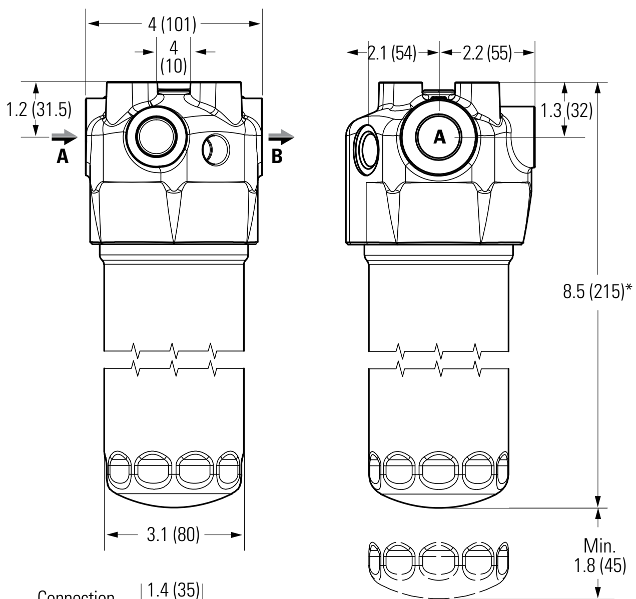


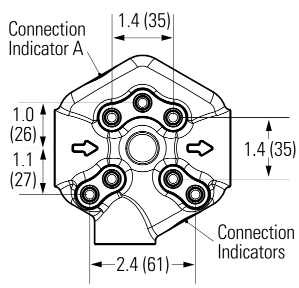
Model	50 Hz Flow Rate GPM (LPM)	60 Hz Flow Rate GPM (LPM)
COL-725-80	29.5 (112)	35 (133)
COL-725-100	37 (140)	45 (169)
COL-950-80	29.5 (112)	35 (133)
COL-950-100	37 (140)	45 (169)
COL-1200-80	29.5 (112)	35 (133)
COL-1200-100	37 (140)	45 (169)
COL-1600-80	29.5 (112)	35 (133)
COL-1600-100	37 (140)	45 (169)

Micron Filter Specifications

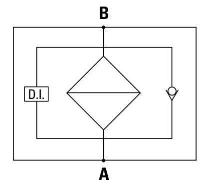
COL-8 – COL-400

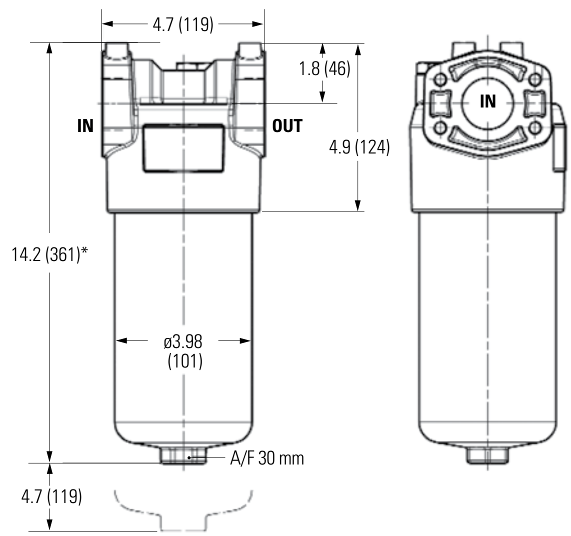


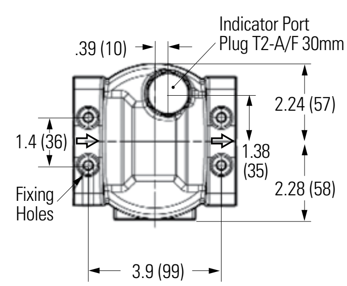




COL-725 – COL-1600







**Other bowl lengths available. Consult factory for details.*
All dimensions in inches (millimeters), unless noted otherwise.

Filter Housing Materials
- Head – Aluminum
- Housing – Phosphated Steel
- Bypass valve – Brass/Aluminum

Maximum Temperature
- 230°F (110°C)

Bypass valve
- Opening pressure – 51 PSI (3.5 BAR) ±10%
- Other opening pressures on request

Connection In/Out
- #12 SAE

Seals
- Standard NBR
- Optional FPM

Weight
- 4.0 lbs (1.8 kg)

Volume
- 0.21 gallons (0.81 liters)

Filter Housing Materials
- Head – Anodized Aluminum
- Housing – Anodized Aluminum
- Bypass valve – Nylon

Maximum Temperature
- 230°F (110°C)

Bypass valve
- Opening pressure – 51 PSI (3.5 BAR) ±10%
- Other opening pressures on request

Connection In/Out
- #24 SAE

Seals
- Standard NBR
- Optional FPM

Weight
- 7.7 lbs (3.5 kg)

Volume
- 0.40 gallons (1.5 liters)

Micron Filter Specifications

Filtration Media Composition

- Internal support mesh
- Filter media support
- Filtration media
- Prefilter media
- External support mesh

Compatibility with Fluids

The filter elements are compatible with:

- Mineral oils to ISO 2943-4
- Aqueous emulsions
- Synthetic fluids, water glycol

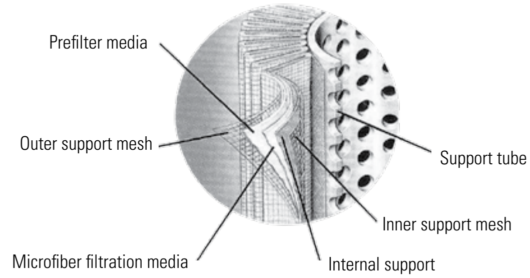
Seals, standard in NBR compatible with:

- Mineral oils to ISO 2943-4
- Aqueous emulsions
- Synthetic fluids, water glycol

FPM seals compatible with:

- Synthetic fluids type HS-HFDR-HFDS-HFDU to ISO 6743-4

Inorganic Microfiber



Multipass Test

In compliance with new ISO 16889 standard
Contaminant ISO MTD

Value ß	2	10	75	100	200	1000*
Filtration efficiency	50%	90%	98.70%	99%	99.50%	99.90%

**TTP Standard*

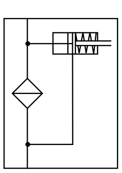
International Standards for Fluid Contamination Control

Components	Recommended Filtration								
Servo valves			●	●	●				
Proportional valves				●	●	●			
Variable displacement pumps					●	●	●		
Cartridge valves						●	●	●	
Piston pumps						●	●	●	
Vane pumps							●	●	●
Pressure/flow rate control valves							●	●	●
Solenoid valves							●	●	●
ISO code	12/10/7	13/11/8	14/12/9	15/13/10	16/14/11	17/15/12	18/16/13	19/17/14	20/18/15
NAS code	1	2	3	4	5	6	7	8	9
Absolute filtration recommended	3 micron				6 micron		10 micron*		>10 micron

**TTP Standard*

Filtration Indicators

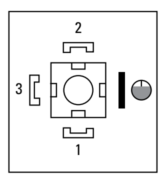
Visual "V"

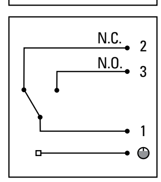


- Cover and lens: nylon
- Visual indicator green: cartridge clean
- Visual indicator red: cartridge clogged
- Weight: 4.8 oz (136 g)
- Tightening torque: 70 ft-lbs (95 Nm)

Electrical/Visual "EV"

Connector EN 175301-803 A/ISO4400

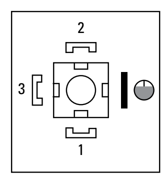


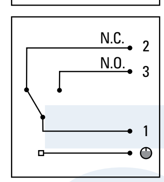


- Protection rating: IP 65
- Maximum contact rating: 5 A/250V~
- Voltage: 230 V~
- Connector: DIN 43650 Microswitch contact
- Cable gland: PG 9
- Cover and lens: nylon
- Visual indicator green: cartridge clean
- Visual indicator red: cartridge clogged
- Weight: 6.6 oz (187 g)
- Tightening torque: 70 ft-lbs (95 Nm)

Electric "E"

Connector EN 175301-803 A/ISO4400

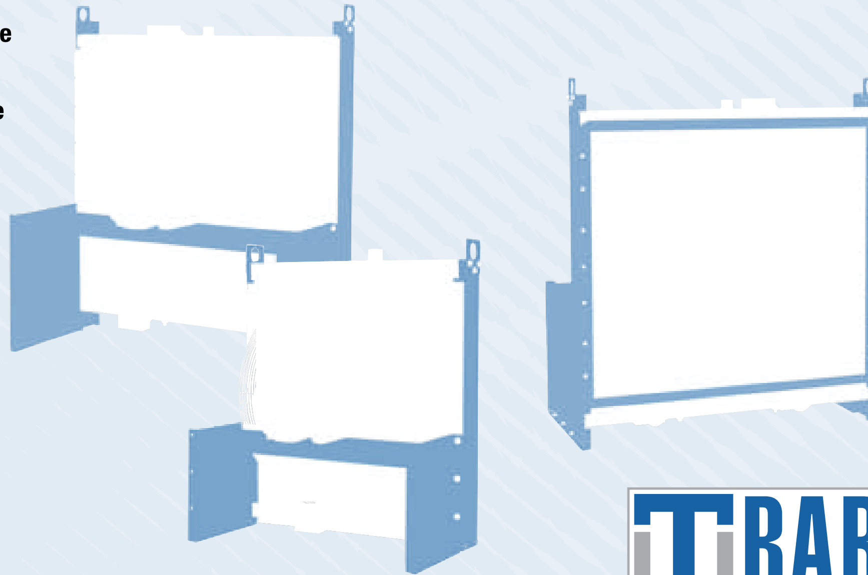




- Protection rating: IP 65
- Maximum contact rating: 5 A/250V~
- Voltage: 230 V~
- Connector: DIN 43650 Microswitch contact
- Cable gland: PG 9
- Weight: 6.5 oz (184 g)
- Tightening torque: 48 ft-lbs (65 Nm)

FEATURES

- **Young Radiator – OCS Model Interchange (approximate)**
- **American Industrial – AOCS Interchange (approximate)**
- **Hydraulic Circuits**
- **Machine Tool Cooling**
- **Gear Oil Cooling**
- **Lube Oil Cooling**
- **Process Cooling**
- **Torque Converters**
- **Marine Transmissions**
- Aerodynamically Designed Fan
- Brazed Aluminum Core
- Enclosed Fan Cooled Standard – TEFC



T-BAR™ • CORE INSIDE •

This Line Features

- High efficient, light weight, low fouling extruded core design
- Rugged construction with a patented T-Bar brazed aluminum core captured in steel framing
- Both mobile and industrial applications
- High flow capacity; with a flow range from 20-500 GPM
- Ability to handle high viscosity fluids i.e. gear oil cooling
- Available in 7 sizes with electric or hydraulic motor options
- Standard sizes available with short, lean lead time

Materials

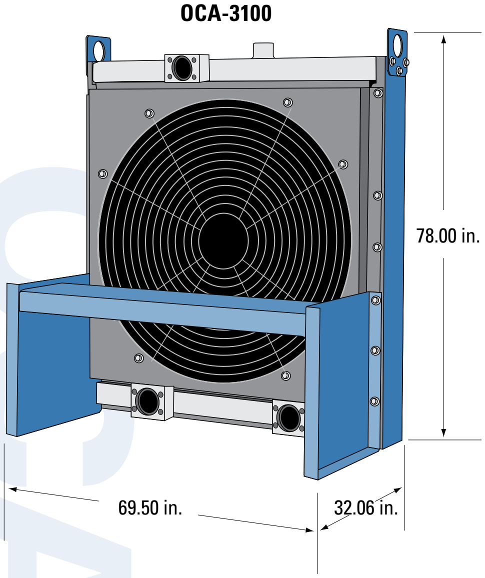
Fan Blade Composite with cast aluminum hub
Cabinet Steel with baked enamel finish
Connections Aluminum – Female SAE
Motor Support Steel
Shroud Steel
Core Brazed Aluminum
Motor TEFC & Hydraulic motor

Ratings

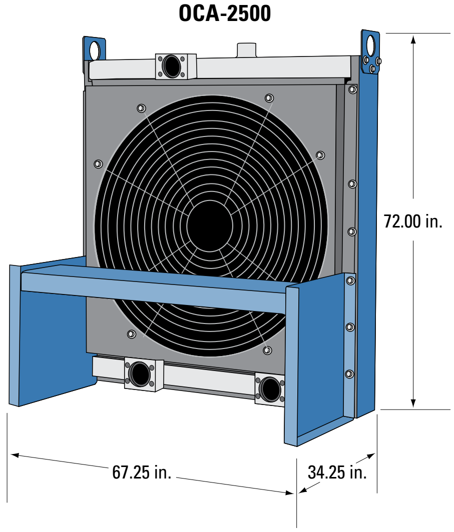
Max Operating Pressure - 250 psi
Max Operating Temperature - 350° F

Dimension Range

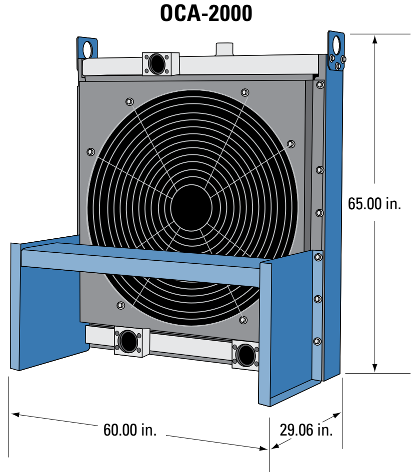
OCA-3100



OCA-2500



OCA-2000



How to Order

OCA	–		–		–		–		–	

Model Series
OCA - Standard

Model Size Selected

Connection Type
2 - SAE

[1] External Relief Bypass Kit
BLANK- NO BYPASS
30-30 PSI
60-60 PSI

Specify Motor Required
0 -NO-MOTOR
3 -THREE PHASE
6 -575 VOLT
9 -HYDRAULIC MOTOR
11 - THREE PH EXPLOSION PROOF
18 - THREE PH IEC

[2] Material Options
HC - HERESITE COATING (CORE)
G - GALVANIZED STEEL (CABINET)
SFG - STAINLESS STEEL (FAN GUARD)

Connection Conversion Kits - *order as separate line item*

	Part Number						
	OCA-450	OCA-600	OCA-1000	OCA-1500	OCA-2000	OCA-2500	OCA3100
2 Pass SAE (Flange Cover)	12076	12011	12012	12012	12012	12013	12013
1 Pass NPT	51166	51168	51170	51172	51174	51175	5178
2 Pass NPT[3]	51167	51169	51171	51173	51175	51177	51179
1 Pass BSPP	Consult Factory						
2 Pass BSPP[3]	Consult Factory						
Fill Plug (#20 SAE)[4]	50732						

[1] Available for 2 Pass unit only. Pressure tolerance is (+5 PSI/-0 PSI). Consult factory for details.

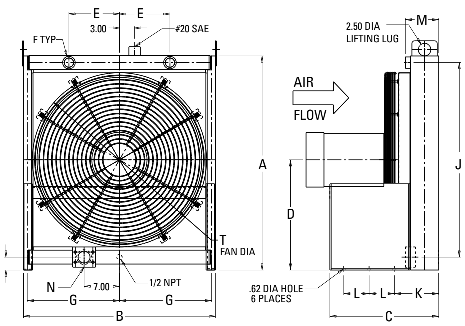
[2] Use HC-G-SFG if all three add-ons are desired.

[3] Two Pass adapter kits already include cover plate.

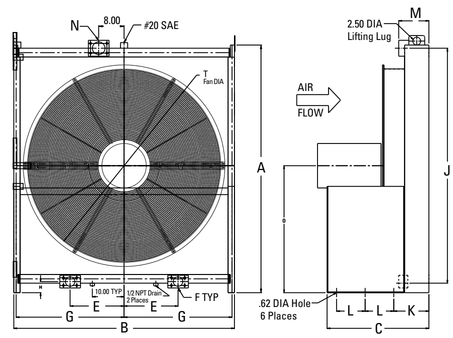
[4] Ports do not come plugged unless specified at time of order.

Dimensions

OCA-450 & 600

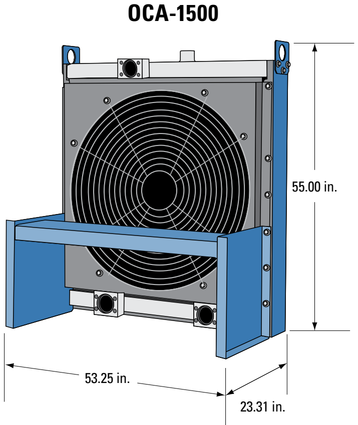


OCA-1000 Through OCA-3100

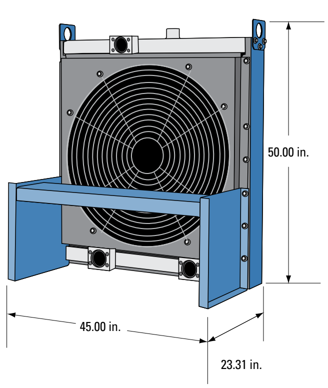


MODEL	A	B	C	D	E	F	G	H	J	K	L	M	N	T	Shipping WT (lbs)	DBA at 3 ft
OCA-450	36.38	33.00	21.56	18.50	8.00	#24	15.75	4.12	28.75	8.81	5.00	6.62	2.00	24.00	400	81
OCA-600	42.38	38.00	21.56	21.81	10.00	#24	18.25	2.56	35.50	8.81	5.00	6.62	2.50	32.00	497	84
OCA-1000	50.00	45.00	24.56	26.25	10.50	2.00	21.75	4.19	45.50	7.81	7.50	7.50	3.00	36.00	690	88
OCA-1500	55.00	53.25	23.31	28.50	12.50	2.00	25.75	4.31	49.75	7.79	7.00	8.50	3.00	42.00	832	92
OCA-2000	65.00	60.00	29.06	33.00	15.00	3.00	29.00	4.00	58.00	11.06	7.50	8.56	3.00	48.00	1223	96
OCA-2500	72.00	67.25	34.25	37.00	17.00	3.00	32.88	3.25	67.50	11.06	7.50	9.50	4.00	54.00	1723	96
OCA-3100	78.00	69.50	32.06	40.00	17.00	3.00	34.00	3.00	74.00	11.06	9.00	9.50	4.00	60.00	1806	96

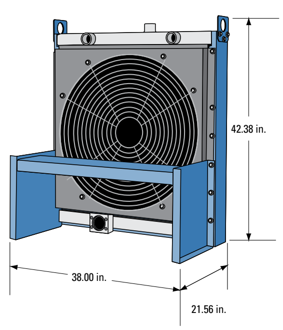
OCA-1500



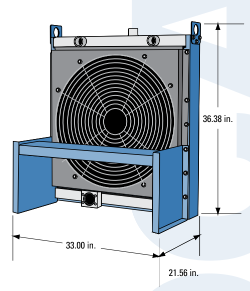
OCA-1000



OCA-600

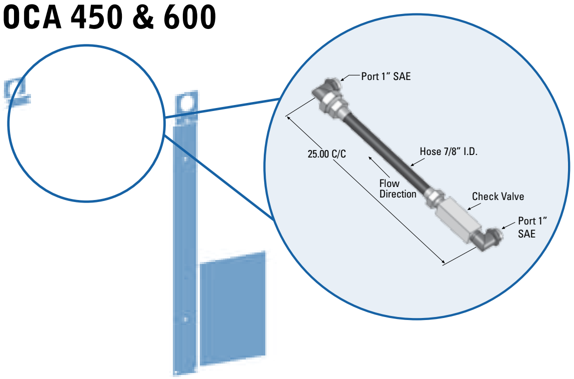


OCA-450

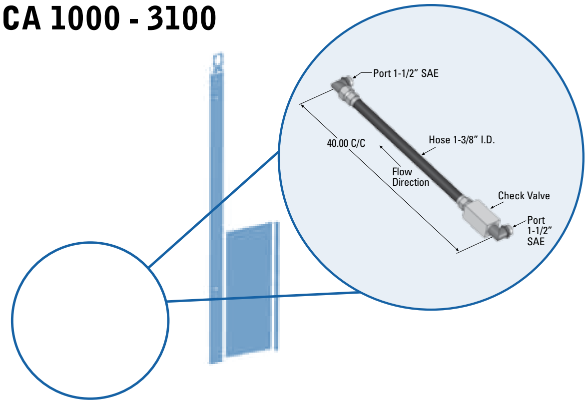


External Bypass Option (Extra port is removed for bypass options)

OCA 450 & 600

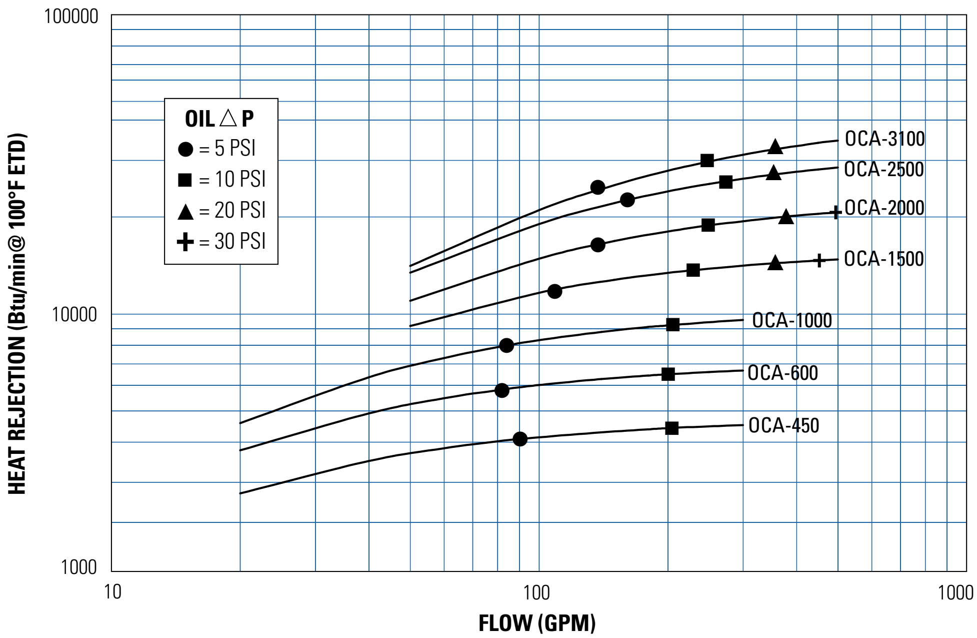


OCA 1000 - 3100

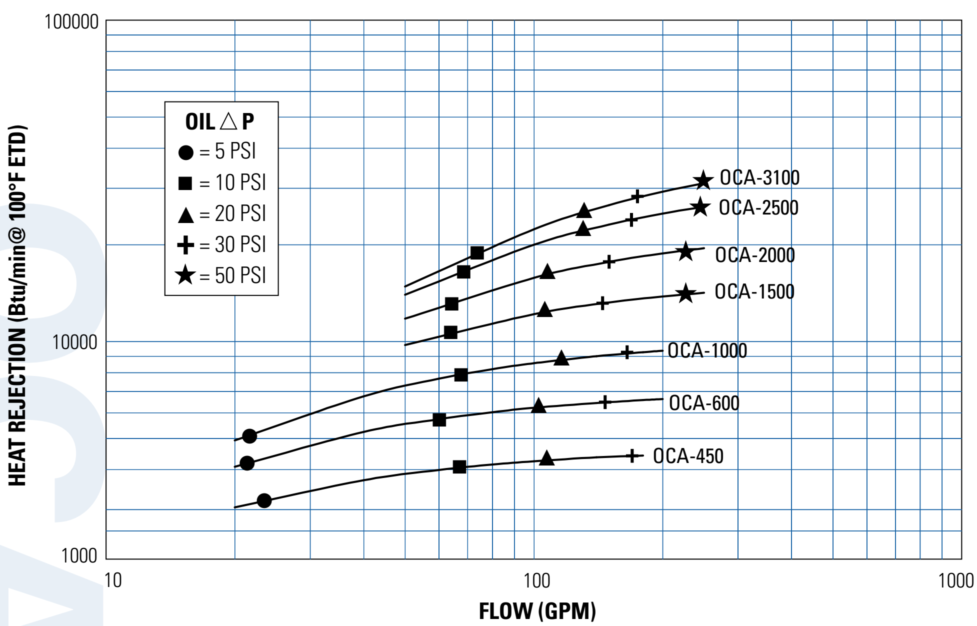


Performance Curves

One Pass Oil

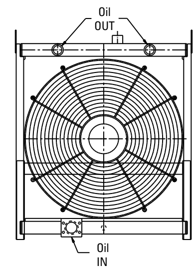


Two Pass Oil

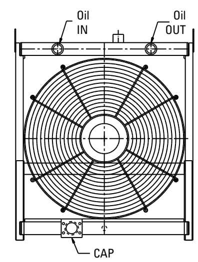


Oil Piping Diagram

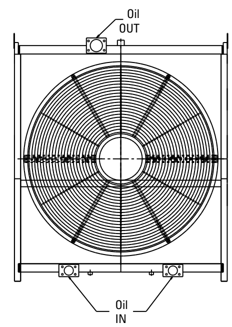
OCA 450 & 600 One Pass



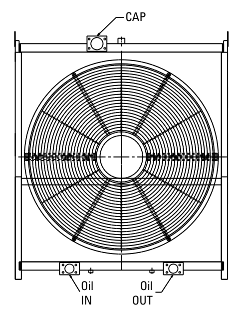
OCA 450 & 600 Two Pass



1000 - 3100 One Pass



1000 - 3100 Two Pass



Selection Procedure

Performance Curves are based on 50SSU oil entering the cooler 100°F higher than the ambient air temperature used for cooling. This is also referred to as a 100°F Entering Temperature Difference (ETD).

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.)
Convert HP to BTU/MIN: HP x 42.41 = BTU/MIN

STEP 2 **Determine Entering Temperature Difference (ETD).**
Desired oil entering cooler °F – Ambient air temp. °F = Actual ETD

STEP 3 **Determine Curve Horsepower Heat Load.**
Enter the information from above:
E.T.D. Temperature Correction Factor:

$$\text{Btu/Min}_{\text{corrected}} = \text{Input Btu/Min} \quad x \quad \frac{100 \ \ x \ \ Cv}{\text{Desired E.T.D.}}$$

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:**
● = 5 PSI; ■ = 10 PSI; ▲ = 20 PSI; ✛ = 30 PSI; ★ = 50 PSI.
Multiply pressure drop from curve by correction factor found in oil △P correction curve.

Example

FLUID = SAE 20 OIL
SYSTEM ELECTRIC NAMEPLATE HORSEPOWER = 300HP
ENTERING TEMPERATURE = 200°F
AMBIENT TEMPERATURE = 75°F
FLOW RATE = 200GPM

- Determine heat load.
  Generally, about 25% to 33% of the system horsepower is removed.

  300hp x 0.33 = 99hp

- Since the graphs have the heat load in terms of BTU/min, the units must be converted.

  99hp x 42.4167 = 4,199 BTU/min

- Calculate the entering temperature difference (E.T.D.). The E.T.D. is the inlet oil temperature minus the entering air temperature.

  ETD=200-75 =125

- Calculate the corrected curve heat load.
  Corrected curve heat load = actual heat load x (100/ETD) x Cv (viscosity correction factor obtained from the Cv table).

  4,199 BTU/min x (100/125) x 1.02= 3,426 BTU/min

- Find the intersection point between the corrected heat load and flow rate on the performance curves. Any curve above this point will work for this application. Usually the smallest cooler is most desired. In this case the intersecting point on the single pass graph indicates that the OCA-450 will suffice.

- The pressure drop should be found next. Find the point on the curve that is directly above the intersecting point. This point on the curve indicates the pressure drop.

  △P ≈ 6psi

- These curves are made for SAE 10 oil entering at 200°F. Therefore, the pressure drop needs to be corrected. The 1.24 is the pressure drop correction factor obtained in the Cp table.

- $P_{CORRECTED}$ = 6 x 1.24= 7.44 psi

C_V VISCOSITY CORRECTION FACTORS

Entering Liquid Temp	SAE 5	SAE 10	SAE 20	SAE 30	SAE 40	ISO 22	ISO 32	ISO 46	ISO 68	ISO 100	ISO 150	ISO 220	ISO 320	MIL-L 7808	Ester Polyglycol	Phosphate	50%EG
100	1.12	1.16	1.26	1.39	1.46	1.09	1.15	1.19	1.27	1.38	1.44	1.57	1.85	1.20	0.93	0.84	0.86
110	1.10	1.13	1.21	1.33	1.41	1.07	1.14	1.17	1.26	1.32	1.40	1.49	1.68	1.15	0.90	0.81	0.85
120	1.07	1.11	1.18	1.28	1.36	1.05	1.12	1.15	1.21	1.28	1.36	1.41	1.54	1.10	0.89	0.80	0.85
130	1.05	1.09	1.14	1.25	1.30	1.04	1.10	1.14	1.18	1.25	1.31	1.35	1.45	1.06	0.86	0.78	0.84
140	1.04	1.06	1.12	1.20	1.26	1.03	1.09	1.11	1.17	1.21	1.27	1.31	1.40	1.04	0.85	0.77	0.83
150	1.02	1.05	1.10	1.17	1.23	1.03	1.07	1.10	1.14	1.18	1.23	1.28	1.34	1.02	0.84	0.75	0.83
200	0.99	1.00	1.02	1.05	1.08	0.99	1.00	1.01	1.02	1.03	1.09	1.10	1.15	0.99	0.80	0.72	0.81
250	0.96	0.97	0.98	0.99	1.00	0.96	0.97	0.97	0.97	0.98	1.00	1.02	1.03	0.98	0.77	0.70	0.80

C_P PRESSURE DROP CORRECTION FACTORS

Entering Liquid Temp	SAE 5	SAE 10	SAE 20	SAE 30	SAE 40	ISO 22	ISO 32	ISO 46	ISO 68	ISO 100	ISO 150	ISO 220	ISO 320	MIL-L 7808	Ester Polyglycol	Phosphate	50%EG
100	2.04	2.44	4.44	6.44	8.84	1.11	1.57	1.86	2.58	4.23	6.48	9.42	13.60	1.30	3.04	3.54	0.770
110	1.74	2.14	3.64	5.14	6.74	1.08	1.49	1.76	2.39	3.77	5.74	8.37	11.67	1.24	2.44	2.94	0.760
120	1.54	1.84	3.04	4.24	5.64	1.06	1.42	1.64	2.19	3.30	5.95	7.27	9.77	1.18	2.14	2.54	0.749
130	1.44	1.64	2.64	3.44	4.54	1.03	1.34	1.53	1.98	2.84	4.18	6.23	7.84	1.12	1.94	2.24	0.738
140	1.34	1.54	2.27	2.94	3.74	1.01	1.27	1.42	1.79	2.42	3.51	5.24	6.15	1.07	1.94	2.04	0.726
150	1.24	1.34	1.94	2.54	3.14	0.99	1.21	1.34	1.65	2.08	2.94	4.39	4.81	1.02	1.74	1.94	0.716
200	0.97	1.00	1.24	1.44	1.64	0.93	1.03	1.12	1.22	1.37	2.63	1.78	1.99	0.94	1.24	1.34	0.675
250	0.85	0.86	0.96	1.01	1.09	0.89	0.97	1.00	1.07	1.15	1.25	1.26	1.27	0.87	1.04	1.09	0.596

Specifications

Electric Motor Data

(3 Phase TEFC)

Model	Motor HP	Phase	HZ	Voltage	RPM	Nema Frame	Full Load Amps	Net Weight
OCA-450	3	3	60	208-230/460	1725	182T	9.5-8.6/4.3	68
OCA-600	3	3	60	230/460	1160	213T	10/5	125
OCA-1000	5	3	60	230/460	1160	215T	16/8	138
OCA-1500	5	3	60	230/460	1160	215T	16/8	138
OCA-2000	10	3	60	230/460	1175	256T	28.8/14.4	269
OCA-2500	15	3	60	230/460	1175	284T	39.4/19.7	361
OCA-3100	20	3	60	230/460	1175	286T	52/26	368

(3 Phase Explosion Proof Class I Group D & Class II Group F&G)

Model	Motor HP	Phase	HZ	Voltage	RPM	Nema Frame	Full Load Amps	Net Weight
OCA-450	3	3	60	230/460	1750	182T	9.6/4.8	134
OCA-600	3	3	60	230/460	1160	213T	9.6/4.8	147
OCA-1000	5	3	60	230/460	1160	215T	16.2/8.1	161
OCA-1500	5	3	60	230/460	1160	215T	16.2/8.1	161
OCA-2000	10	3	60	230/460	1175	256T	28.8/14.4	357
OCA-2500	15	3	60	230/460	1170	284T	39/19.5	436
OCA-3100	20	3	60	230/460	1175	286T	51/25.5	522

(3 Phase 575V TEFC)

Model	Motor HP	Phase	HZ	Voltage	RPM	Nema Frame	Full Load Amps	Net Weight
OCA-450	3	3	60	575	1750	182T	3.4	68
OCA-600	3	3	60	575	1160	213T	4.1	111
OCA-1000	5	3	60	575	1160	215T	6.0	122
OCA-1500	5	3	60	575	1160	215T	6.0	122
OCA-2000	10	3	60	575	1180	256T	11.5	286
OCA-2500	15	3	60	575	1180	284T	15.0	425
OCA-3100	20	3	60	575	1175	286T	20.0	452

(3 Phase Metric/IEC)

Model	Motor KW/HP	Phase	HZ	Voltage	RPM	IEC Frame	Full Load Amps	Net Weight
OCA-450	2.2/3	3	60	208-230/460	1750	100	8.5-8.2/4.1	68
OCA-600	2.2/3	3	60	230/460	1160	132	9.6/4	110
OCA-1000	3.7/5	3	60	230/460	1160	132	17.6/8.8	123
OCA-1500	3.7/5	3	60	230/460	1160	132	17.6/8.8	123
OCA-2000	7.5/10	3	60	230/460	1180	160	28.4/14.2	247
OCA-2500	11/15	3	60	230/460	1180	180	42/21	361
OCA-3100	15/20	3	60	230/460	1175	180	52/26	368

Hydraulic Motor Data

Hydraulic Motors

Model	HP	Pressure (PSI)	Flow (GPM)	RPM	Displacement (CUIN/REV)
OCA-450	3	870	11.1	1750	1.37
OCA-600	3	1305	8.0	1160	1.37
OCA-1000	5	2030	8.0	1160	1.37
OCA-1500	5	2030	8.0	1160	1.37
OCA-2000	10	2090	8.2	1175	1.37
OCA-2500	15	2900	8.2	1175	1.71
OCA-3100	20	2320	13.3	1175	2.2

T-BAR™
• CORE INSIDE •

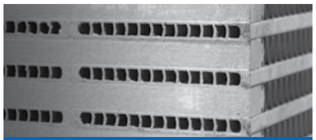
Advantages

T-BAR provides advantages and value far beyond typical aluminum core designs.

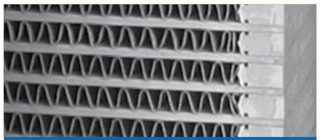
- **Extruded tubes for a leak free design**
- **Flows high viscosity fluids**
- **Low pressure drop due to absence of internal turbulator**
- **Resistance to fouling—transfer fluids without plugging**
- **Great for cooling cutting fluids or gear lube**
- **Resistant to salt spray and salt air**
- **Standard Zinc infused/coated core & fins for up to 10 times protection in salt conditions**
- **Domestic built**
- **Optional core for BOL model**

T-BAR is a flexible design, high performing, and a cost-effective aluminum solution.

Tubular Micro Channel Extrusion (T-BAR™)
T-BAR is manufactured with Alloy 1100 aluminum micro channel and bars, **with Zinc flame-sprayed extruded tubes and zinc alloy coated fins**, in our patented in-house tube-to-bar brazing process using a Nocolok CAB (Controlled Atmosphere Brazing) brazing technology furnace. Because our tubes are a solid extrusion, T-BAR is very robust — with no tube seams to fail and leak.



HIGH-PERFORMANCE



LOW-CLOGGING

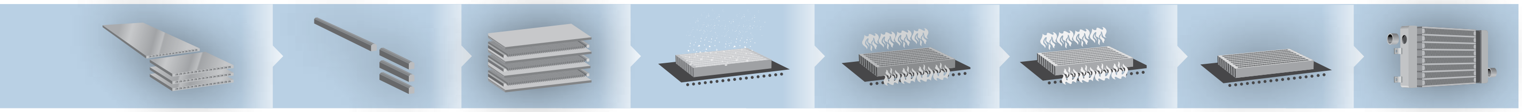
T-BAR CORE IN OCA ASSEMBLY

T-Bar Manufacturing Process

CUTTING STATIONS
1: CUT EXTRUDED ALUMINUM TUBING
2: CUT SPACER BARS

FLUX STATION
4: FLUX CORE UNIT TO PREPARE FOR BRAZING

COOL-DOWN UNIT
7: COOL



STACKING STATION
3: STACK ASSEMBLE TUBE & BARS TO FORM CORE UNIT

FURNACE
5: PRE-HEAT
6: BRAZE 1200° F

WELDING STATION
8: WELD TANK, PORTS & BRACKETRY TO CORE

AOC Series

Thermal Transfer Products Copper Tube and Fin Mobile Hydraulic Oil Coolers

API Heat Transfer's full line of Thermal Transfer Products standard mobile oil coolers is proven to stand-up in some of the toughest off-road environments. Our oil coolers are available with a wide variety of standard options to best suit each application and offer maximum performance.

Copper Tube and Fin Product Highlights

Aluminum or Steel fins available

Up to +100 HP of heat removal from hydraulic oil

Cost effective, industry proven designs

Large range of standard sizes

Standard Product Options

12 or 24 volt DC fans

Hydraulic fan motor drive

Built-in pressure bypass (30 or 60 psi for cold start-up)

Heresite coating for offshore or corrosive environment operation

Customer Focused and Driven

All catalog product is available with short lead-times

Expert application engineers available to select and size the right product for your application

Custom designs are available

Industry Applications

Our oil coolers are used in a wide variety of mobile applications across the globe.

Commercial duty lawnmowers

Municipal street cleaners

Hydrostatic drives

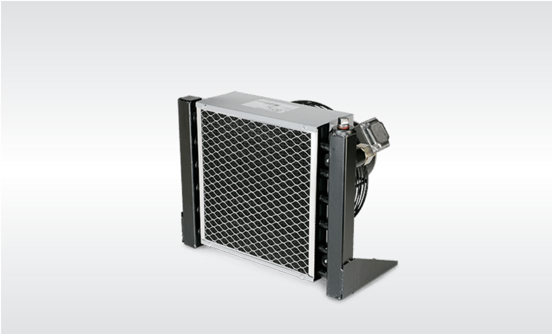
Tow-behind compressor lube cooling

Construction equipment

Underground mining

Engine oil cooling

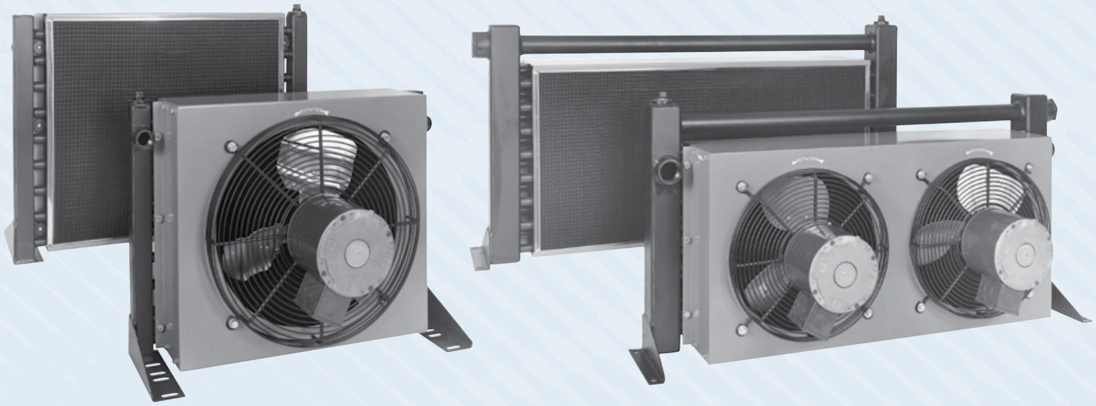
For application help and quoting, visit our Full TTP site or contact ttpsales@apiheattransfer.com.



FEATURES

- **AC Motors**
- **Core Filter**
- **3/4" Tubes**
- **Low Cost**
- **Industrial Duty**
- **Quiet Operation**
- For Low Flow Rates
- Oil Flows to 150 GPM
- Mounting Brackets Included
- SAE Connections
- Single or Three-Phase 60/50 Hz Motors
- Filter Standard

OPTIONS
Built-in Serviceable Bypass Valve;
NPT or BSPP Oil Connections



Ratings

Operating Pressure - 300 psi

Test Pressure - 300 psi

Operating Temperature - 350° F

Materials

Tubes Copper

Fins Aluminum

Turbulators Aluminum

Fan Blade Aluminum with steel hub

Fan Guard Steel with black baked enamel finish

Cabinet Steel with baked enamel finish

Manifolds Copper: Model AOC-08
Steel: Models AOC-19 – AOC-70

Connections Brass: Model AOC-08
Steel: Models AOC-19 – AOC-70

Nameplate Aluminum

Filter Stainless frame with washable media

Relief Bypass Valve Option

MODEL	DESCRIPTION
AOC-08	Available in one pass (30 and 60 psi), two pass (60 psi), designs only. Valves are built into tubes and do not affect external dimensions. All steel valves. Non-serviceable.
AOC-19 thru AOC-33	Available in 30 psi or 60 psi settings. 3/4", external, all steel valve. May be removed for servicing.
AOC-37 Thru AOC-70	Available in 30 psi or 60 psi settings. 1-1/2", external, all steel valve. May be removed for servicing.

How to Order (AOC-08 models only)

AOC	–	0 8	–			–		–	
Model Series **AOC** - Standard		**Model Size Selected**		**Number of Passes** **1** - One Pass **2** - Two Pass **4** - Four Pass	**Connection Type** **1** - NPT **2** - SAE **3** - BSPP		**Relief Bypass*** **Blank** - No Bypass **30** - 30 psi **60** - 60 psi		**Specify Motor Required** 115/230V Single Phase No Motor

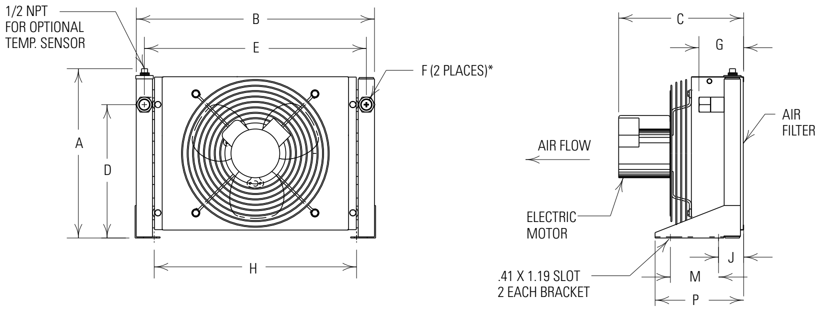
*Bypass not available in Four Pass

How to Order (Models AOC-19 through AOC-70)

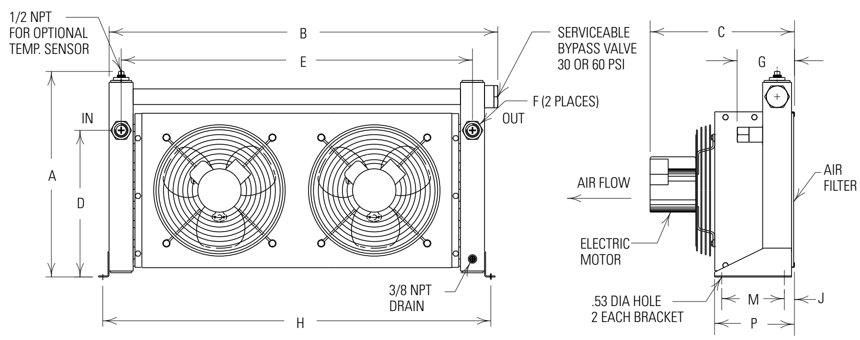
AOC	–		–		–		–	
Model Series **AOC** - Standard		**Model Size Selected**		**Connection Type** **1** - NPT **2** - SAE **3** - BSPP		**Relief Bypass** **Blank** - No Bypass **30** - 30 psi **60** - 60 psi		**Specify Motor Required** 115/230V Single Phase 208-230/460V Three Phase 575 Volt No Motor

Dimensions

Models AOC-19 Through AOC-33



Models AOC-37 Through AOC-70



Model	A		B		C	D	E	F		G		H	J	M	P	LBS	60 Hz CFM
	No Bypass	Bypass	No Bypass	Bypass				SAE	NPT & BSPP	SAE	NPT & BSPP						
AOC-19	13.62	16.00	16.50	18.16	13.08	10.31	15.00	#12	.75	3.05	4.12	13.96	2.61	5.00	8.18	19	750
AOC-22	15.62	18.00	22.00	23.66	12.19	12.31	20.50					19.46				33	1150
AOC-24	19.62	22.00	24.75	26.41	13.19	16.31	23.25					22.21				46	1900
AOC-33	25.62	28.00	30.25	31.91		22.31	28.75	#16	1.00		4.34	27.71				65	2150
AOC-37	18.50	21.38	39.00	40.38	15.66	15.25	36.50	#20	1.25	4.62	5.97	40.50	1.06	6.50	8.31	95	2150
AOC-50	22.50	25.38	41.00	42.38	15.62	19.25	38.50			4.68	6.03	42.50	1.12		8.37	120	3200
AOC-54	30.50	33.28	42.00	43.38	17.09	27.25	39.50	#24	1.50	4.89	6.30	43.76	1.87	9.00	12.37	154	3800
AOC-57	36.50	39.38	48.00	49.38	16.72	32.75	45.50	#32	2.00	6.68	8.15	49.76				190	4200
AOC-70	38.38	41.25	51.00	52.38	22.62	34.00	48.50			8.44	9.91	52.75	1.62		12.12	322	7500

NOTE: All dimensions in inches. We reserve the right to make reasonable design changes without notice.
**Inlet and outlet oil ports reversible if relief bypass option is not used.*

Specifications

Electric Motor Data

<table>
<tr><th>MODEL</th><th>MOTOR POWER</th><th># OF MOTORS</th><th>FRAME SIZE</th><th>SINGLE PHASE</th><th>THREE PHASE</th><th>575 VOLT</th><th>RPM</th><th>TYPE</th><th>B-BALL S-SLEEVE</th><th>THERMAL OVERLOAD</th><th>dB(A) 3 FT.</th></tr>
<tr><td>AOC-19 thru AOC-33</td><td rowspan="2">1/4</td><td>1</td><td rowspan="2">Custom</td><td rowspan="2">115/230V/60/50Hz
3.2/1.6 Amps Full Load 60 Hz
2.8/1.4 Amps Full Load 50 Hz</td><td rowspan="2">208-230/460V/60 Hz
190/380-415V/50 Hz
1.3/.65 Amps Full Load 60 Hz
1.1/.55 Amps Full Load 50 Hz</td><td rowspan="2">575/500V/60/50Hz
.65 Amps Full Load 60 Hz
.60 Amps Full Load 50 Hz</td><td rowspan="2">1700 (60 Hz)
1350 (50 Hz)</td><td rowspan="2">TEAO</td><td rowspan="2">B</td><td rowspan="2">YES</td><td>80</td></tr>
<tr><td>AOC-37 thru AOC-57</td><td rowspan="2">2</td><td>84</td></tr>
<tr><td>AOC-70</td><td>1</td><td>56C</td><td>115/208-230V/60 Hz
12.8/6.4 Amps Full Load</td><td>208-230/460V/60 Hz
190/380-415V/50 Hz
3.4/1.7 Amps Full Load 60 Hz
3.6/1.9 Amps Full Load 50 Hz</td><td>575/500V/60/50Hz
1.5 Amps Full Load 60 Hz
1.4 Amps Full Load 50 Hz</td><td>1725 (60 Hz)
1425 (50 Hz)</td><td>TEFC</td><td>B</td><td>NO</td><td>90</td></tr>
</table>

NOTE: Amp ratings are per motor.

Selection Procedure

Performance Curves are based on 50SSU oil leaving the cooler 40°F higher than the ambient air temperature used for cooling.This is also referred to as a 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 – Ambient air temp. °F = Actual Approach

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

$$\text{Horsepower heat load x } \frac{40 \text{ x Cv}}{\text{Actual Approach}} = \text{Curve Horsepower}$$

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:**
● = 5 PSI; ■ = 10 PSI; ▲ = 20 PSI; ✛ = 40 PSI. 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 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 = (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 △T.
This formula may also be used in any application where the only temperature available is the entering oil temperature.

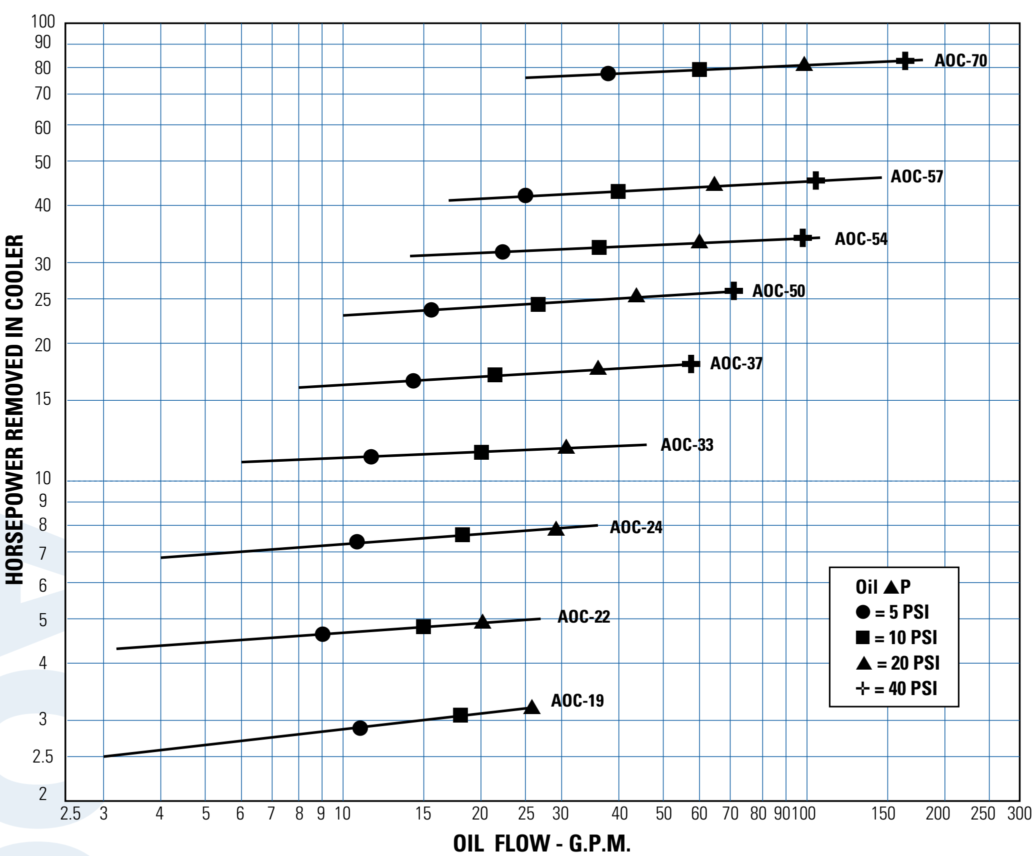
Oil Pressure Drop: Most systems can tolerate a pressure drop through the heat exchanger of 20 to 30 PSI. Excessive pressure drop should be avoided. Care should be taken to limit pressure drop to 5 PSI or less for case drain applications where high back pressure may damage the pump shaft seals.

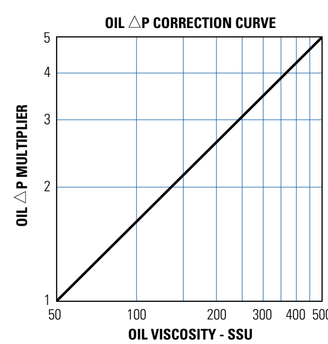
Oil Temperature

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





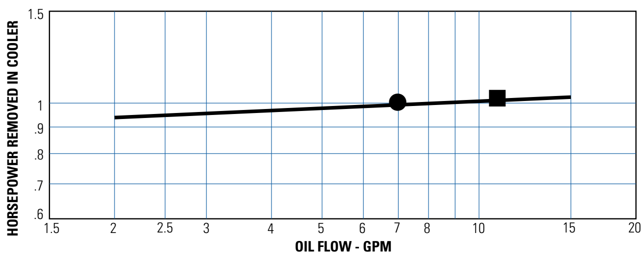
De-rate cooler performance by 10% when used in 50Hz service.

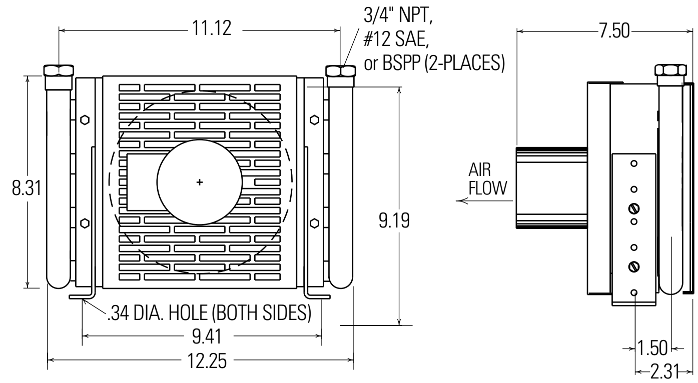
C_V Viscosity Correction

	OIL				
Average Oil Temp °F	**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

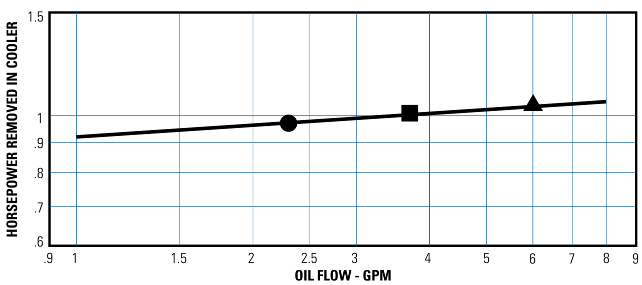
AOC-08 Model Only

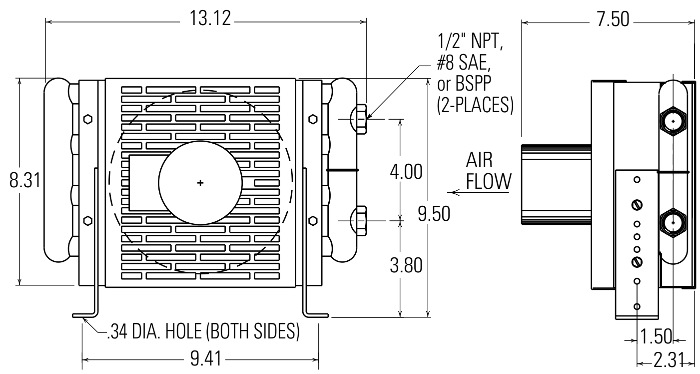
One Pass



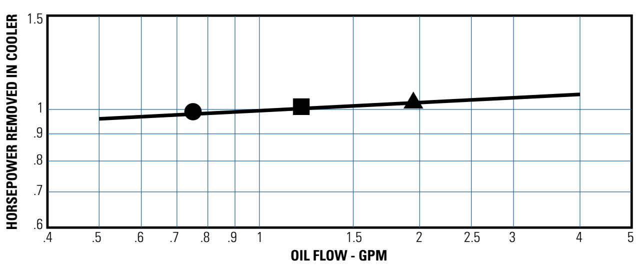


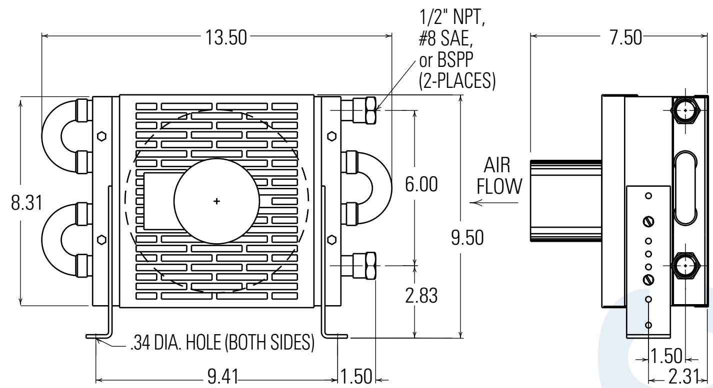
Two Pass





Four Pass





Specifications

Electric Motor Data

Model	MOTOR POWER	115/230 VOLT	50/60 Hz	TYPE	RPM	BEARINGS B-BALL S-SLEEVE	THERMAL OVERLOAD	SHIPPING WEIGHT (lbs.)	dB(A) 3 FT.	CFM
AOC-08	1/30	115 VOLT 230 VOLT	1.1 Amps Full Load .7 Amps Full Load	TEAO	3000	S	YES	12	70	208

AIR COOLED AOC

AOC

AOL Series - Process Cooling

Thermal Transfer Products Process Coolers

Our Thermal Transfer Products brand offers a full line of process cooling heat exchangers.

Water-Cooled

Fixed bundle shell and tube

U-Tube Removable Bundle

Stainless Steel brazed plate

Large range of standard sizes

Air-Cooled

Copper-tube and fin

Brazed aluminum

Large range of standard sizes

Standard Product Options

Thermal Transfer process coolers are available with a wide variety of standard options to best suit each application.

Water-Cooled

Copper, copper-nickel, or stainless steel tubing

Nickel-braze plate coolers

Air-Cooled

AC, hydraulic, or air-motor fan drives

Copper tube aluminum fin

Brazed aluminum (P-BAR)

Heresite coating for offshore or corrosive environment operation

Customer Focused and Driven

All catalog product is available with short lead-times

Expert application engineers available to select and size the right product for your application

Custom designs are available

For application help and quoting, visit our Full TTP site or contact ttpsales@apiheattransfer.com.

BRAZED ALUMINUM CONSTRUCTION

HYDRAULIC OR COMPRESSOR OIL COOLING

Features

- **Large Oil Flow**
- **High Performance**
- **Industrial Duty**
- **Brazed Aluminum Bar and Plate Core**
- Compact all aluminum core assembly
- Ideal for converting water cooled equipment to air cooled
- Eliminates high water and sewer costs
- Eliminates corrosion problems associated with water cooled units
- Vertical air flow works well for heat recovery
- State-of-the-art heat transfer technology
- Hydraulic motors available
- Optional SAE Ports
- Marine corrosion control coatings available
- High performance air side fin design
- Detachable legs

Ratings

Maximum Operating Pressure
250 psi (17 BAR)

Maximum Operating Temperature
300° F (150° C)

Materials

Legs Steel with baked enamel finish

Shroud Steel

Standard 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

Fan Aluminum Hub, Plastic Blades

Motor TEFC

Fluid Compatability

Petroleum/mineral oils

Oil/water emulsion

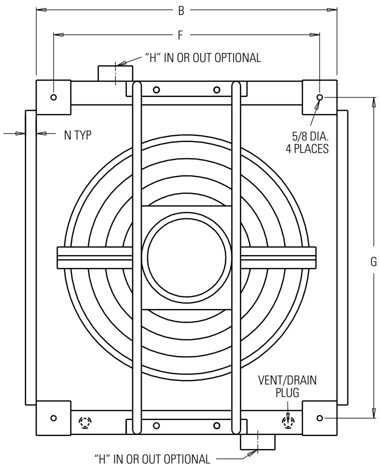
Water/ethylene glycol

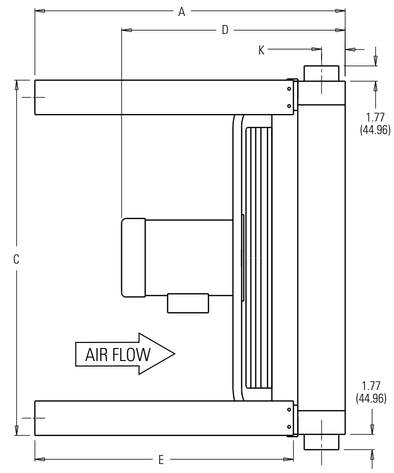
How to Order

AOL – [ ] – [ ] – [ ] – [ ]

Model Series	Model Size Selected	Connection Type	Specify Motor Required	Noise Level
AOL - Standard	**400**	**Blank** - NPT	**0** - No Motor	**Blank** - Standard Noise Level
	725	**S** - SAE	**2** - Single Phase	**LN** - Low Noise Level
	950		**3** - Three Phase	
	1200		**6** - 575 Volt	
	1600		**9** - Hydraulic	
	2000		**18** - IEC Three Phase	
	2500			
	3000			
	3500			

Dimensions





Model	A	B	C	D Approx.	E	F	G	H NPT	H SAE	J	K	L	Net Weight Lbs.	Shipping Weight Lbs.
AOL-400	34.20 (868.68)	17.96 (456.18)	22.69 (576.33)	20.86 (529.84)	30.00 (762.00)	13.96 (354.58)	18.69 (474.73)	2.00	#32 SAE 2-1/2-12 UN-2B	5.93 (150.62)	1.85 (46.99)	1.25 (31.75)	109 (49.44)	148 (67.13)
AOL-725	34.20 (868.68)	22.37 (568.20)	30.57 (776.48)	20.86 (529.84)	30.00 (762.00)	18.37 (466.60)	26.57 (674.88)	2.00		5.88 (149.35)	1.85 (46.99)	1.25 (31.75)	151 (68.49)	170 (77.11)
AOL-950	36.01 (914.65)	26.78 (680.21)	37.25 (946.15)	23.62 (599.95)	30.00 (762.00)	22.78 (578.61)	33.25 (844.55)	2.00		6.82 (173.23)	2.76 (70.10)	1.25 (31.75)	221 (100.24)	300 (136.08)
AOL-1200	36.01 (914.65)	26.78 (680.21)	41.20 (1046.48)	25.51 (647.95)	30.00 (762.00)	22.78 (578.61)	37.20 (944.88)	2.00		6.00 (152.40)	2.76 (70.10)	1.25 (31.75)	296 (134.26)	430 (195.04)
AOL-1600	36.01 (914.65)	34.89 (886.21)	41.20 (1046.48)	27.51 (698.75)	30.00 (762.00)	30.89 (784.61)	37.20 (944.88)	2.50	2-1/2 SAE 4 Bolt FLG	8.00 (203.20)	2.76 (70.10)	1.25 (31.75)	355 (161.03)	515 (233.60)
AOL-2000	36.01 (914.65)	37.88 (962.15)	51.05 (1296.67)	26.25 (666.75)	30.00 (762.00)	33.88 (860.55)	47.05 (1195.07)	2.50		8.00 (203.20)	2.76 (70.10)	1.25 (31.75)	482 (218.63)	582 (263.99)
AOL-2500	36.01 (914.65)	43.70 (1109.98)	49.08 (1246.63)	28.51 (724.15)	30.00 (762.00)	39.70 (1008.38)	45.08 (1145.03)	3.00	3" SAE 4 Bolt FLG.	8.00 (203.20)	2.76 (70.10)	1.25 (31.75)	555 (251.74)	655 (297.10)
AOL-3000	36.01 (914.65)	52.52 (1334.01)	51.05 (1296.95)	30.51 (774.95)	30.00 (762.00)	48.52 (1232.41)	47.05 (1206.50)	3.00		8.00 (203.20)	2.76 (70.10)	1.25 (31.75)	724 (328.40)	825 (374.21)
AOL-3500	36.01 (914.65)	56.30 (1430.02)	51.05 (1296.95)	30.51 (774.95)	30.00 (762.00)	52.30 (13328.42	47.05 (1206.50)	3.00		8.00 (203.20)	2.76 (70.10)	1.25 (31.75)	760 (344.73)	860 (390.09)

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

Selection Procedure

Performance Curves based on 100°F (55.56°C) E.T.D. or Entering Temperature Difference (E.T.D = Entering oil temperature minus ambient air temperature). SAE #10 oil @ 200°F (93.33°C).

Oil pressure drop coding:

- ✖ = 5 PSI (.345 BAR)
- ● = 10 PSI (.689 BAR)
- ◆ = 15 PSI (1.03 BAR)
- ▲ = 20 PSI (1.38 BAR)
- ■ = 30 PSI (2.10 BAR)

E.T.D. temperature correction formula:

ENGLISH Version

$$HP_{\text{Curve}} = HP_{\text{To Be Removed}} \times \frac{100}{\text{Desired E.T.D}}$$

METRIC Version

$$\frac{KW}{°C} = \frac{\text{Heatload (KW)}}{\text{Desired E.T.D. (°C)}}$$

Conversion

$$Hp = \frac{KW}{°C} = \times .745 \times \text{E.T.D. (°F)}$$

Notes

1. A three-way thermostatic valve is recommended to bypass the cold oil around the heat exchanger during start up.
2. Support piping as needed. Flexible connectors must be properly installed to validate warranty.
3. Coolers should not operate in ambient temperatures below 35°F (1°C). Consult factory for recommendations.
4. The fan cannot be cycled.
5. AOL coolers operated outdoors must be protected from weather. Consult factory for recommendations.
6. If duct work or additional static resistance is added to the cooler airstream, an auxiliary air mover may be required.
7. Can be mounted for horizontal air flow, with oil in at bottom port.

Maintenance

Periodic cleaning of the fins with compressed air is needed to remove the accumulation of dirt and dust. If the inside of the tubes need to be cleaned of oil and carbon, use a chlorinated solvent. Do not use strong solvents. Do not use acids or caustic cleaners.

Specifications

Electric Motor & Fan Data[1] (60 Hz Nema Frame)

Model	Fan CMM	Fan CFM	Motor H.P.	Voltage	Phase	Full Load Amps 230V	Frequency (Hz)	RPM	Nema Frame	Thermal Overload	Sound dB(A) at 3 ft.
AOL-400	62.30	2200	1.0	115/208-230	1	6.0	60[2]	3450	56C	No	97
	51.68/62.30	1825/2200	1.0	208-230/460[3]	3	3.6/3.2	50/60	2850/3450	56C	No	97
AOL-725	101.94	3600	1.5	115/208-230	1	8.5	60[2]	3450	56C	No	100
	84.95/102.94	3000/3600	1.5	208-230/460[4]	3	4.8/4.2	50/60	2850/3450	56C	No	100
AOL-950	133.09	4700	1.5	115/208-230	1	8.6	60[2]	1740	145TC	No	92
	133.09	4700	1.5	208-230/460	3	4.6	60[2]	1740	145TC	No	92
AOL-1200	198.22	7000	5.0	230	1	23.00	60[2]	1740	184TC	No	94
	198.22	7000	3.0	208-230/460	3	8.8	60[2]	1740	182TC	No	96
AOL-1600	223.70	7900	5.0	208-230/460	3	13.4	60[2]	1740	184TC	No	98
AOL-2000	311.49	14000	7.5	230/460	3	19.6	60[2]	1740	213TC	No	98
AOL-2500	396.44	14000	7.5	230/460	3	19.6	60[2]	1740	213TC	No	98
AOL-3000	495.54	17500	10.0	230/460	3	24.8	60[2]	1740	215TC	No	102
AOL-3500	495.54	17500	10.0	230/460	3	24.8	60[2]	1740	215TC	No	102

[1] Published electrical ratings are approximate, and may vary because of motor brand. Actual ratings are on motor nameplate.
[2] May also be operated at 50 hz. Consult factory for details.
[3] 50 Hz voltage: 190-200-208-220/380-400-415-440
[4] 50 Hz voltage: 190-208/380-415
All motors shown are TEFC—Other motor options available upon request.

Electric Motor Information (50 Hz IEC Frame)

Model	CMM	CFM	KW	Voltage	Phase	Frequency	RPM	Frame	Sound dB(A) at 1 meter
AOL-400	52.4	1850	.75	230/400/415	3	50 Hz	3000	80	81
AOL-725	85.0	3001	1.10	230/400/415	3	50 Hz	3000	80	80
AOL-950	108.2	3821	1.50	230/400/415	3	50 Hz	1500	90	78
AOL-1200	165.1	5834	2.20	230/400/415	3	50 Hz	1500	100	83
AOL-1600	186.4	6584	3.00	230/400/415	3	50 Hz	1500	100	85
AOL-2000	331.3	11700	4.00	230/400/415	3	50 Hz	1500	112	88
AOL-2500	331.3	11700	4.00	230/400/415	3	50 Hz	1500	112	88
AOL-3000	410.6	14500	7.50	230/400/415	3	50 Hz	1500	132	90
AOL-3500	410.6	14500	7.50	230/400/415	3	50 Hz	1500	132	90

All IEC frame motors have CE mark.
IEC motor voltages have +/- 10% tolerance.

Electric Motor Information (AOL-Low Noise)

Model	HP	Nema Frame	LN RPM	LN CFM	LN CMM	Voltage	Frequency (Hz)	Sound dB(A) at 3 ft.
AOL-400-1PH-LN	1	56C	1725	1100	31.15	115/230	60	72
AOL-400-3PH-LN	1	56C	1725	1100	31.15	230/460	60	72
AOL-725-1PH-LN	1.50	56C	1725	1780	50.40	115/230	60	82
AOL-725-3PH-LN	1.50	56C	1725	1780	50.40	230/460	60	82
AOL-950-3PH-LN	1.50	145TC	1160	3150	89.20	230/460	60	76
AOL-1200-3PH-LN	1.50	182TC	1160	4690	132.81	230/460	60	75
AOL-1600-3PH-LN	2	184TC	1160	6510	184.34	230/460	60	78
AOL-2000-3PH-LN	5	213TC	1160	8700	246.36	230/460	60	85
AOL-2500-3PH-LN	5	213TC	1160	11700	331.31	230/460	60	85
AOL-3000-3PH-LN	5	215TC	1160	13500	382.28	230/460	60	93
AOL-3500-3PH-LN*	10	256TCZ	1160	16200	458.73	230/460	60	91

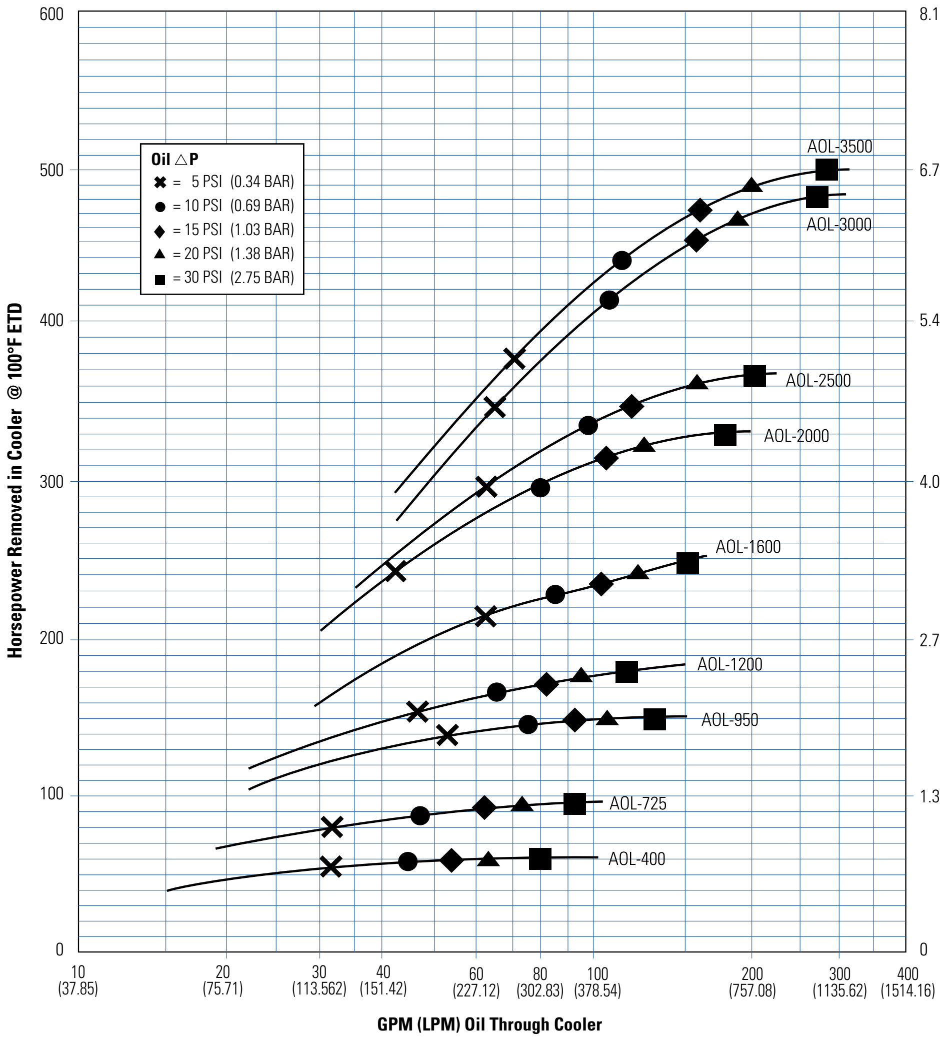
Available in 60 Hz Nema Frame only.

Hydraulic Motor Information

Model	Oil Flow Required GPM (LPM)	Min. Pressure Required PSI (BAR)	Motor IN^3/REV (CM^3/REV) Displacement	Sound dB(A) at 3 ft.
AOL-400	3.3 (12.49)	425 (29.31)	0.22 (3.6)	97
AOL-725	3.3 (12.49)	675 (46.54)	0.22 (3.6)	100
AOL-950	10.1 (38.23)	300 (20.68)	1.4 (22.94)	92
AOL-1200	10.1 (38.23)	725 (50.00)	1.4 (22.94)	94
AOL-1600	10.1 (38.23)	1100 (75.84)	1.4 (22.94)	98
AOL-2000	10.1 (38.23)	1650 (113.76)	1.4 (22.94)	98
AOL-2500	10.1 (38.23)	1650 (113.76)	1.4 (22.94)	98
AOL-3000	10.1 (38.23)	2000 (137.90)	1.4 (22.94)	102
AOL-3500	10.1 (38.23)	2000 (137.90)	1.4 (22.94)	102

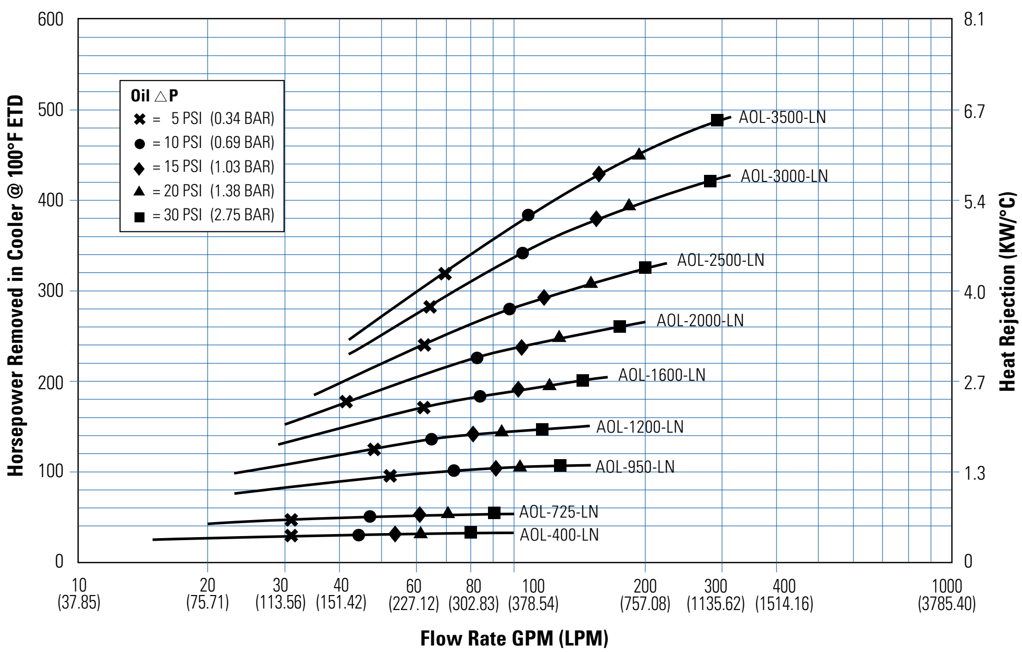
Notes: Maximum Pressure is 2000 psi. Stated Minimum Operating Pressure is at Inlet Port of Motor. 1000 psi Allowable Back Pressure.

Performance Curves



Note: Derate heat rejection values 15% if using 50Hz motors.

Low Noise Option



Available in 60 Hz Nema Frame only.

BOL Series - Process Cooling

Thermal Transfer Products Process Coolers

Our Thermal Transfer Products brand offers a full line of process cooling heat exchangers.

Water-Cooled

Fixed bundle shell and tube

U-Tube Removable Bundle

Stainless Steel brazed plate

Large range of standard sizes

Air-Cooled

Copper-tube and fin

Brazed aluminum

Large range of standard sizes

Standard Product Options

Thermal Transfer process coolers are available with a wide variety of standard options to best suit each application.

Water-Cooled

Copper, copper-nickel, or stainless steel tubing

Nickel-braze plate coolers

Air-Cooled

AC, hydraulic, or air-motor fan drives

Copper tube aluminum fin

Brazed aluminum (P-BAR)

Heresite coating for offshore or corrosive environment operation

Customer Focused and Driven

All catalog product is available with short lead-times

Expert application engineers available to select and size the right product for your application

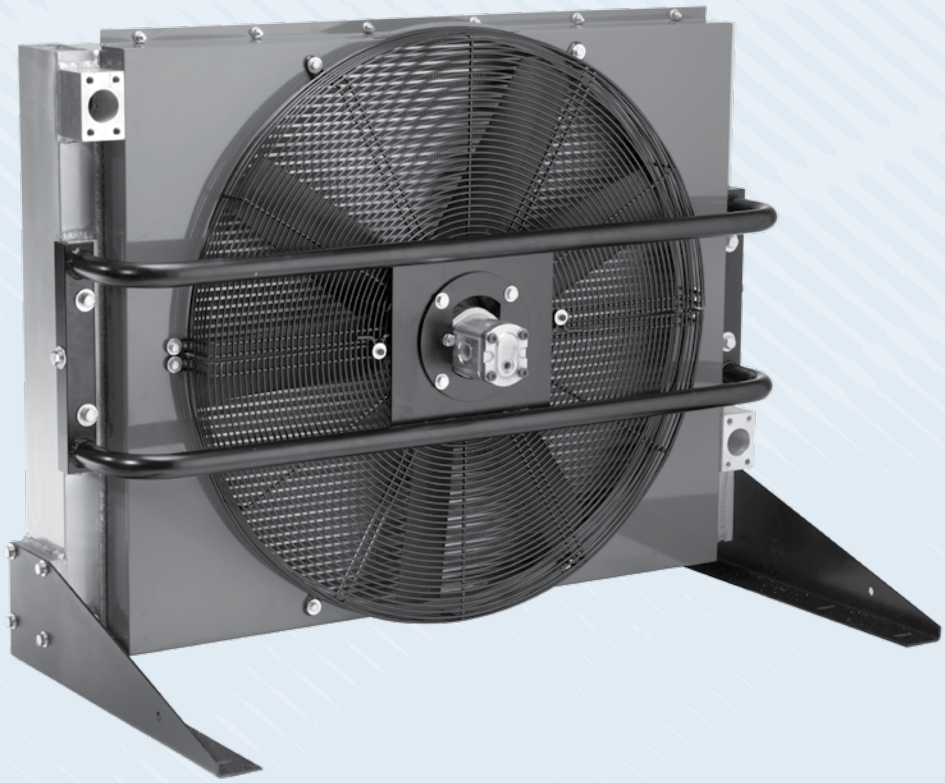
Custom designs are available

For application help and quoting, visit our Full TTP site or contact ttpsales@apiheattransfer.com.

BRAZED ALUMINUM CONSTRUCTION

Features

- 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
- Welded 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
- T-BAR core optional for high viscosity oils or other highly fouling fluids. *See T-Bar Performance Curve
- Low Noise Option Available



Ratings

Maximum Operating Pressure
250 psi (17 BAR)

Maximum Operating Temperature
300° F (150° C)

Materials

Mounting Feet Steel

Standard 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

Fanguard Steel

Connectors Aluminum

Fan Aluminum Hub, Plastic Blades

Shroud Steel

Motor TEFC & IEC

Fluid Compatability

Petroleum/mineral oils

Oil/water emulsion

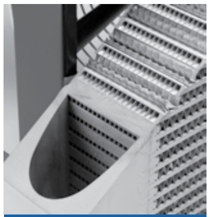
Water/ethylene glycol

How to Order

☐ – ☐ – ☐ – ☐ – ☐ – ☐

Model Series	Model Size Selected	Connection Type*	Specify Motor Required	Core	Noise Level
BOL	**4** **8** **16** **30** **400** **725** **950** **1200** **1600** **2000**	**1** - NPT **2** - SAE **3** - BSPP	**2** - Single Phase **3** - Three Phase **6** - 575 Volt **9** - Hydraulic **18** - IEC Three Phase	**Blank** - Standard Bar & Plate **TB** - T-BAR Core*	**Blank** - Standard Noise Level **LN** - Low Noise Level

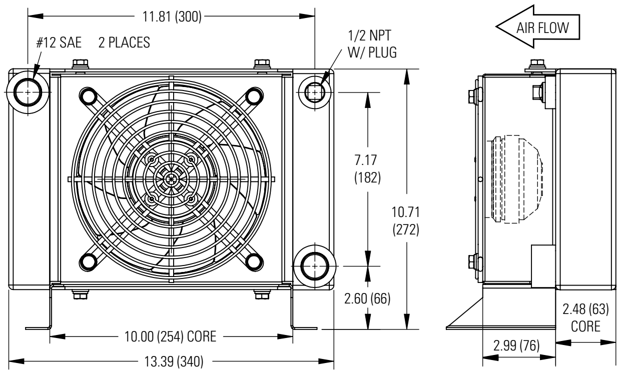
*T-BAR Core option provides a T-BAR core in BOL frame. Used for high fouling or high viscosity fluids. Performance is typically 15-25% less than the bar and plate core. Consult factory for details.



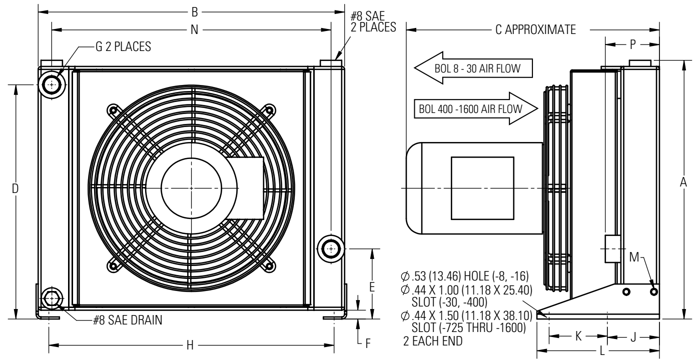
OPTIONAL T-BAR CORE SECTION CUTAWAY

Dimensions

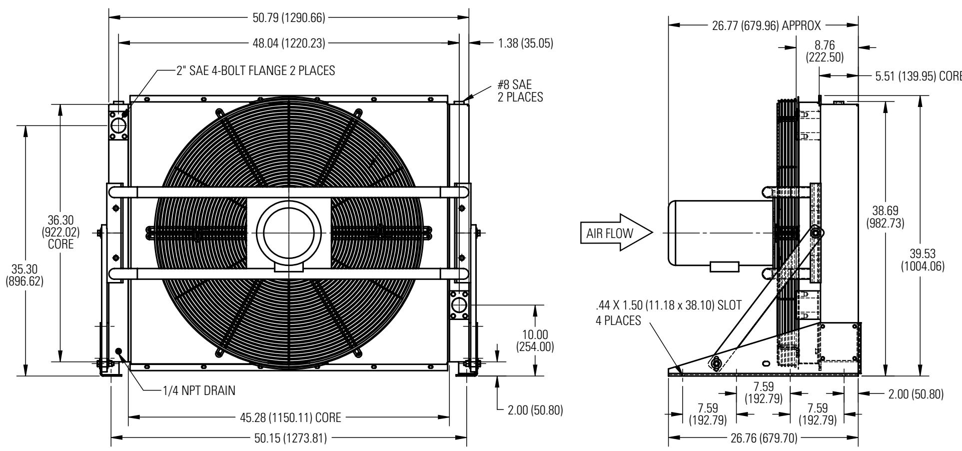
BOL-4



BOL-8 through BOL-1600



BOL-2000



Model	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Approx. Ship Wt. lbs (Kg)
BOL-4	See diagram above			—	—	—	—	—	—	—	—	—	—	—	18 (8.16)
BOL-8	12.93 (328.42)	15.75 (400.05)	14.72 (373.89)	11.30 (287.62)	3.27 (83.06)	.55 (13.97)	#12 SAE	14.53 (369.06)	3.07 (77.98)	3.75 (88.90)	7.36 (186.94)	M8 Bolt (2PL)	14.01 (355.85)	3.48 (88.40)	45 (20.4)
BOL-16	16.63 (422.40)	19.69 (500.13)	16.16 (410.46)	15.06 (382.52)	4.51 (114.56)	.57 (14.48)	#12 SAE	18.30 (464.82)	3.35 (85.09)	3.74 (95.00)	7.87 (199.90)	M8 Bolt (2PL)	17.95 (455.93)	3.46 (87.88)	55 (24.94)
BOL-30	21.09 (535.68)	26.38 (670.06)	18.23 (463.04)	19.49 (495.05)	5.26 (133.60)	1.32 (33.53)	#20 SAE	24.74 (628.40)	4.25 (107.95)	5.00 (127.00)	10.00 (254.00)	M10 Bolt (4PL)	24.34 (618.24)	5.28 (134.11)	125 (56.70)
BOL-400	19.20 (487.68)	22.45 (570.23)	18.80 (477.52)	17.31 (439.67)	6.50 (165.10)	2.00 (50.80)	#20 SAE	22.30 (566.42)	4.25 (107.95)	5.00 (127.00)	10.00 (254.00)	M10 Bolt (4PL)	20.08 (510.03)	5.20 (132.08)	148 (67.13)
BOL-725	23.49 (596.65)	30.32 (770.13)	18.60 (472.44)	21.60 (548.64)	6.50 (165.10)	2.00 (50.80)	#20 SAE	30.17 (766.32)	4.25 (107.95)	5.00 (127.00)	10.00 (254.00)	M10 Bolt (4PL)	27.95 (709.93)	5.20 (132.08)	170 (77.11)
BOL-950	27.94 (709.68)	37.03 (940.56)	22.69 (576.33)	24.55 (623.57)	9.50 (241.30)	2.00 (50.80)	2" SAE 4-Bolt Flange	35.89 (911.61)	6.05 (153.67)	9.20 (233.68)	16.00 (406.40)	M10 Bolt (4PL)	34.26 (870.20)	7.01 (178.05)	300 (136.08)
BOL-1200	27.94 (709.68)	40.96 (1040.38)	24.07 (611.38)	24.55 (623.57)	5.50 (139.70)	2.00 (50.80)		40.31 (1023.87)	6.05 (153.67)	9.20 (233.68)	16.00 (406.40)	M10 Bolt (4PL)	38.19 (970.03)	7.01 (178.05)	430 (195.04)
BOL-1600	36.01 (914.65)	40.96 (1040.38)	25.45 (646.43)	32.62 (828.55)	9.50 (241.30)	2.00 (50.80)		40.31 (1023.87)	6.05 (153.67)	9.20 (233.68)	16.00 (406.40)	M10 Bolt (4PL)	38.19 (970.03)	7.01 (178.05)	515 (233.60)
BOL-2000	See diagram above			—	—	—	—	—	—	—	—	—	—	—	582 (264.00)

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

AIR COOLED BOL

BOL

Specifications

AIR COOLED BOL

Electric Motor Information (60 Hz Nema Frame)

Model	CMM	CFM	Motor HP	Voltage	Phase	Full Load Amps 230V	Frequency	RPM	Frame	Thermal Overload	Sound dB(A) at 3ft
BOL-4	31.14	1203	1/4	230	1	—	60 Hz	2850	—	—	73
BOL-8	22.65	800	1/3	115/230	1	3.0	60 Hz	3450	48C	No	80
BOL-8	22.65	800	1/3	208-230/460	3	1.4	60 Hz	3450	48C	No	80
BOL-16	40.35	1425	1/2	115/230	1	3.7	60 Hz	3450	48C	No	85
BOL-16	40.35	1425	1/2	208-230/460	3	2.2	60 Hz	3450	48C	No	85
BOL-30	62.29	2200	1/2	115/230	1	3.7	60 Hz	1725	56C	No	85
BOL-30	62.29	2200	1/2	208-230/460	3	2.0	60 Hz	1725	56C	No	85
BOL-400	62.29	2200	1	115/230	1	6.0	60 Hz	3450	56C	No	97
BOL-400	62.29	2200	1	208-230/460	3	3.2	60 Hz	3450	56C	No	97
BOL-725	101.94	3600	1-1/2	115/230	1	8.5	60 Hz	3450	56C	No	100
BOL-725	101.94	3600	1-1/2	208-230/460	3	4.8	60 Hz	3450	56C	No	100
BOL-950	133.10	4700	1-1/2	115/230	1	8.6	60 Hz	1725	145TC	No	92
BOL-950	133.10	4700	1-1/2	208-230/460	3	4.6	60 Hz	1725	145TC	No	92
BOL-1200	198.22	7000	3	208-230/460	3	8.8	60 Hz	1725	182TC	No	94
BOL-1600	223.75	7900	5	208-230/460	3	13.4	60 Hz	1725	184TC	No	96
BOL-2000	396.44	14000	7.5	230/460	3	24.8	60 Hz	1725	213TC	No	98

Electric Motor Information (50 Hz IEC Frame)

Model	CMM	CFM	KW	Voltage	Phase	Frequency	RPM	Frame	Sound dB(A) at 3ft
BOL-4	28.4	1003	.20	230	1	50 Hz	3000	—	73
BOL-8	18.9	667	.25	230/400/415	3	50 Hz	3000	63	71
BOL-16	33.7	1188	.37	230/400/415	3	50 Hz	3000	71	77
BOL-30	52.4	1850	.37	230/400/415	3	50 Hz	1500	71	73
BOL-400	52.4	1850	.75	230/400/415	3	50 Hz	3000	80	81
BOL-725	85.0	3000	1.10	230/400/415	3	50 Hz	3000	80	80
BOL-950	108.2	3821	1.50	230/400/415	3	50 Hz	1500	90	78
BOL-1200	165.1	5834	2.20	230/400/415	3	50 Hz	1500	100	83
BOL-1600	186.4	6584	3.00	230/400/415	3	50 Hz	1500	100	85
BOL-2000	331.3	11700	4.00	230/400/415	3	50 Hz	1500	112	88

All IEC frame motors have CE mark.
IEC motor voltages have +/- 10% tolerance.

Hydraulic Motor Information

Model	Oil Flow Required GPM (LPM)	Min. Pressure Required PSI (BAR)	Motor IN^3/REV (CM^3/REV) Displacement	Sound dB(A) at 3 ft.
BOL-4	3.3 (12.49)	400 (27.58)	0.22 (3.6)	80
BOL-8	3.3 (12.49)	400 (27.58)	0.22 (3.6)	80
BOL-16	3.3 (12.49)	500 (34.47)	0.22 (3.6)	85
BOL-30	3.4 (12.87)	500 (34.47)	0.45 (7.3)	85
BOL-400	3.3 (12.49)	425 (29.30)	0.22 (3.6)	97

Model	Oil Flow Required GPM (LPM)	Min. Pressure Required PSI (BAR)	Motor IN^3/REV (CM^3/REV) Displacement	Sound dB(A) at 3 ft.
BOL-725	3.3 (12.49)	675 (46.50)	0.22 (3.6)	100
BOL-950	10.1 (38.23)	300 (20.70)	1.4 (22.9)	92
BOL-1200	10.1 (38.23)	725 (50.00)	1.4 (22.9)	94
BOL-1600	10.1 (38.23)	1100 (75.80)	1.4 (22.9)	96
BOL-2000	10.1 (38.23)	1650 (113.76)	1.4 (22.9)	98

Notes: Maximum Pressure is 2000 psi. Stated Minimum Operating Pressure is at Inlet Port of Motor. 1000 psi Allowable Back Pressure.

Selection Procedure

Step 1 **Determine Heat Load.** Typical Rule of Thumb, -size cooler for 1/3 of the input horsepower. Heat load may be expressed as either Horsepower or BTU/Hr or KW/°C.

HP=BTU/HR ÷ 2545

BTU/HR=HP x 2545

$$\text{BTU/HR} = \frac{\text{KW}}{°\text{C}} \times 1894.61 \times \text{E.T.D.(°F)}$$

Step 2 **Determine Entering Temperature Difference.** (Actual E.T.D.)

$$\text{E.T.D.} = \text{Entering oil temperature} - \text{Entering Ambient air temperature}$$

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.

Step 3 **Determine the Corrected Heat Dissipation to use the Curves**

ENGLISH Version

$$\text{Corrected Heat Rejection} = \text{(BTU/Hr) Heat Load} \times \frac{100°\text{F}}{\text{Desired E.T.D.}}$$

(BTU/HR) to use with selection chart

METRIC Version

$$\text{Corrected Heat Rejection}\ \frac{\text{KW}}{°\text{C}} = \frac{\text{Heatload (kw)}}{\text{Desired E.T.D. (°C)}}$$

Step 4 **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 3. Any Model or Curve on or above this point will meet these conditions.

Step 5 **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:

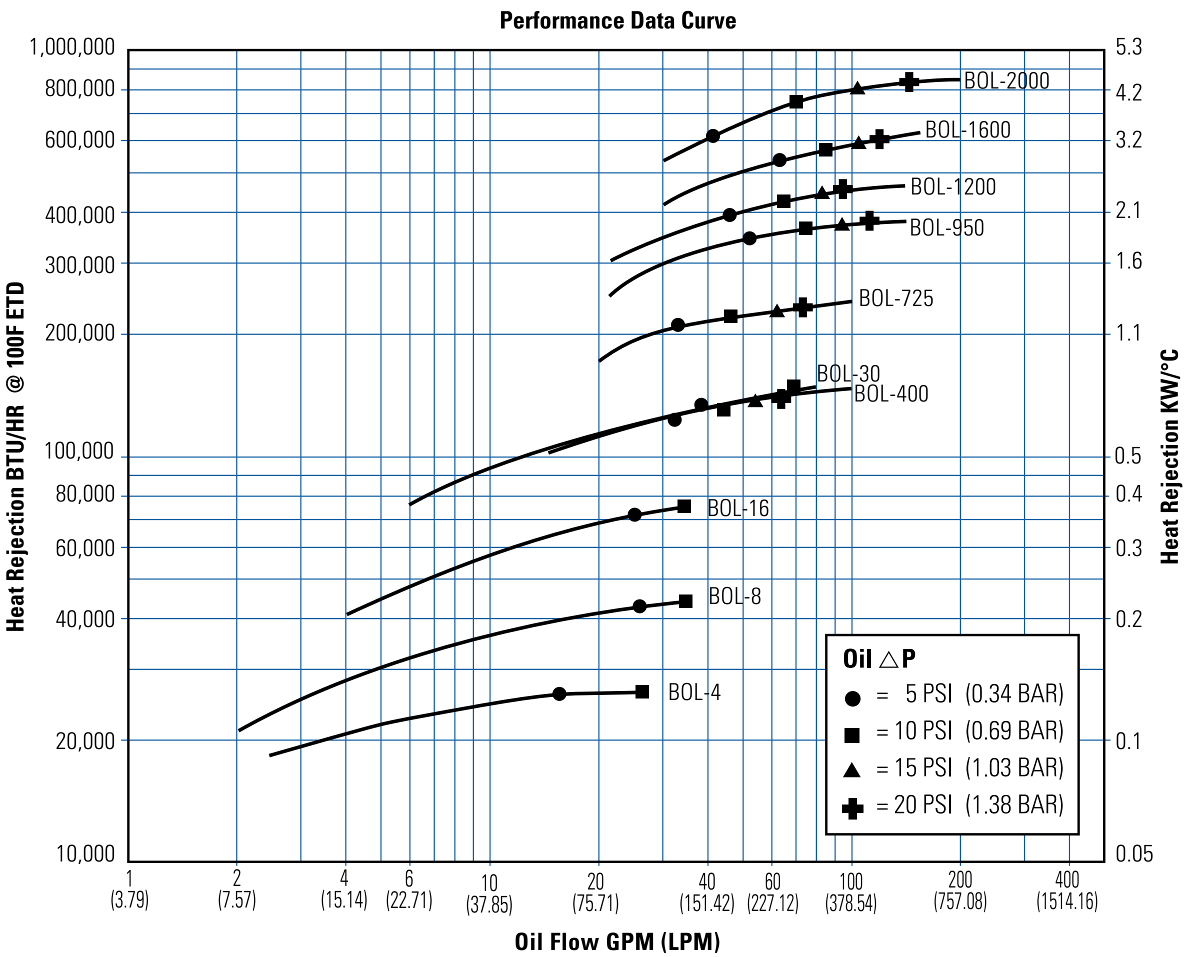
- 50 SSU (11 cSt) oil
- 100° F (55.56° C) Entering Temperature Difference (E.T.D.)

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

AIR COOLED BOL

Performance Curves

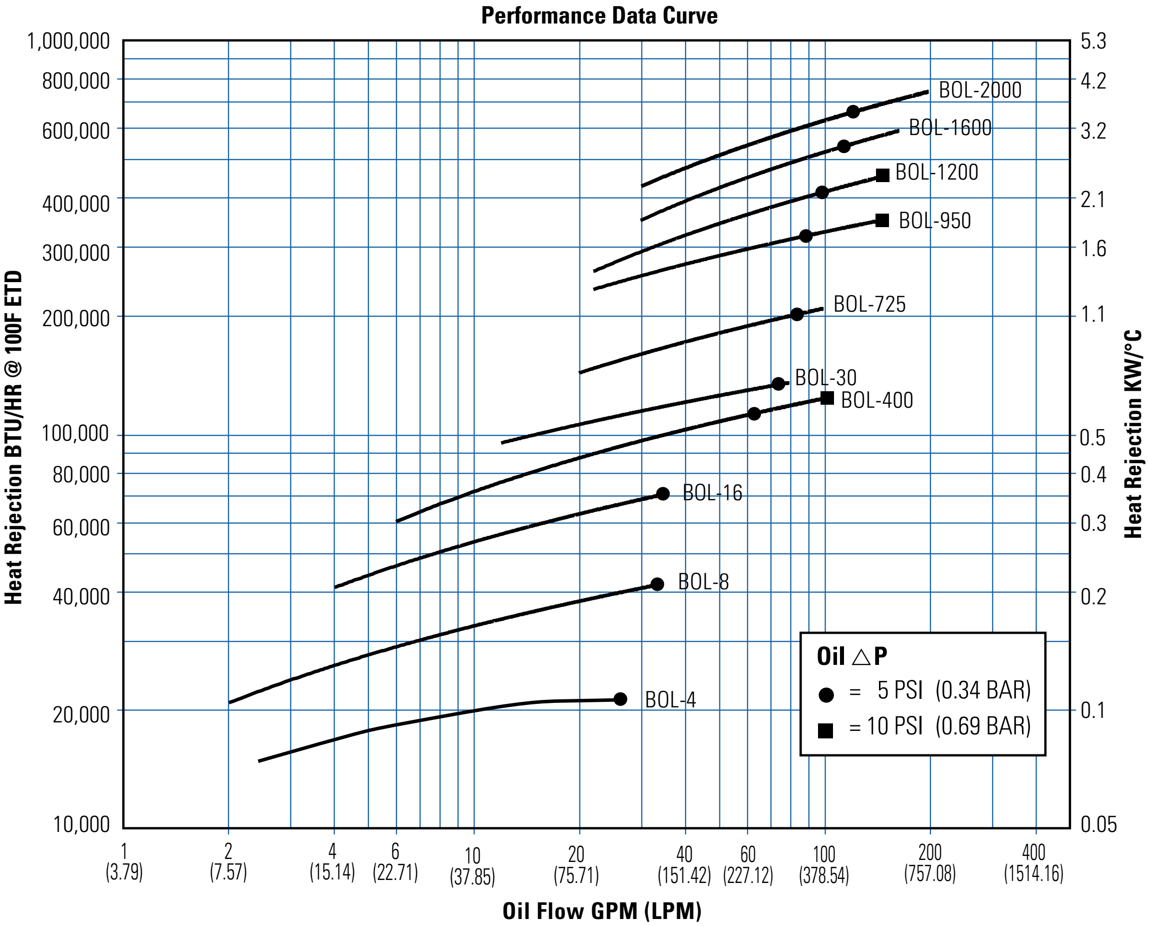
BOL Models with Standard P-BAR Core



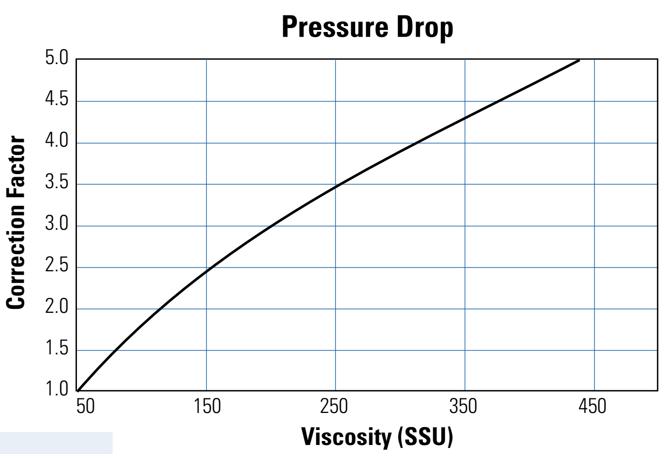
Note: Derate heat rejection values 15% if using 50Hz motors.

Performance Curves

BOL Models with Optional T-BAR Core



Note: Derate heat rejection values 15% if using 50Hz motors.



Oil Temperature

Typical operating temperature ranges are:

Hydraulic Motor Oil	120°F - 180°F (49°C - 82.2°C)
Hydrostatic Drive Oil	160°F - 180°F (71°C - 82.2°C)
Engine Lube Oil	180°F - 200°F (82.2°C - 93.3°C)
Automatic Transmission Fluid	200°F - 300°F (93.3°C - 149°C)

Desired Reservoir Temperature

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

Off-Line Recirculation Cooling Loop: Desired reservoir temperature is the oil temperature entering the cooler.

Return Line Cooling: Desired reservoir temperature is the oil temperature leaving the cooler. In this case, the oil temperature change must be determined so that the actual oil entering temperature can be found. Calculate the oil temperature change (oil △T) with this formula:

Oil △T = (BTU's/Hr.) / (GPM Oil Flow x 210).

To calculate the oil entering temperature to the cooler, use this formula:

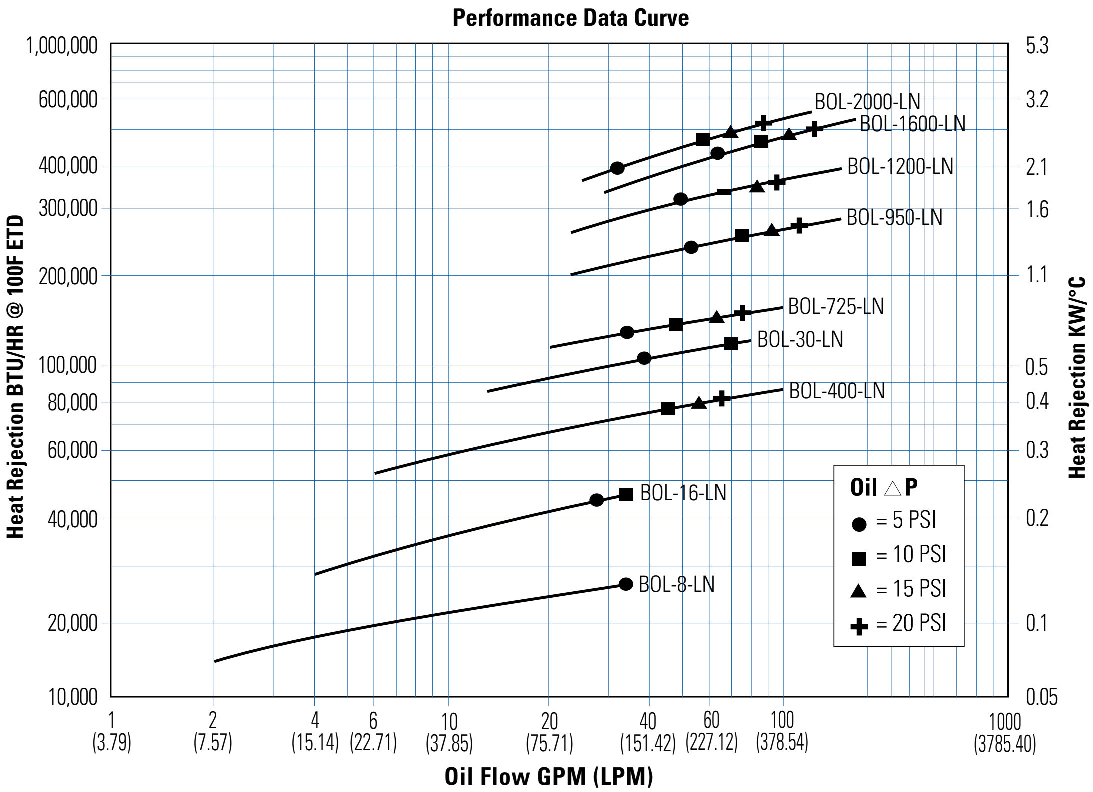
Oil Entering Temp. = Oil Leaving Temp + Oil △T.

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.

Performance Curves

BOL Models with Low-Noise Option

The low noise option offers the BOL models with a reduced motor speed.
This allows a lower sound level output for noise-sensitive applications.



Available on 60 Hz Nema frame only.

Electric Motor Information

Model	HP	Frame	Low Noise RPM	Low Noise CFM	Low Noise CMM	Voltage	Frequency (HZ)
8-1PH	0.33	48	1725	400	11.33	115/230	60
8-3PH	0.33	48	1725	400	11.33	208-230/460	60
16-1PH	0.50	48	1725	704	19.93	115/230	60
16-3PH	0.50	48	1725	704	19.93	208-230/460	60
30-1PH	0.50	56C	1160	1470	41.62	115/230	60
30-3PH	0.50	56C	1160	1470	41.62	208-230/460	60
400-1PH	1.00	56C	1725	1100	31.19	115/230	60
400-3PH	1.00	56C	1725	1100	31.19	208-230/460	60
725-1PH	1.50	56C	1725	1780	50.40	115/230	60
725-3PH	1.50	56C	1725	1780	50.40	208-230/460	60
950-1PH	1.50	145TC	1160	3150	89.19	115/230	60
950-3PH	1.50	145TC	1160	3150	89.19	208-230/460	60
1200-3PH	1.50	182TC	1160	4690	132.81	208-230/460	60
1600-3PH	2.00	184TC	1160	6510	184.34	208-230/460	60
2000-3PH	5.00	213TC	1160	8700	000.00	230/460	60

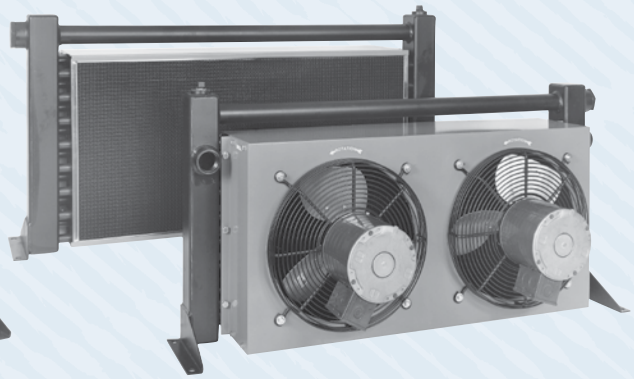
Sound Data

Model	DBA at 3 ft
BOL-8-LN	62
BOL-16-LN	69
BOL-30-LN	67
BOL-400-LN	72
BOL-725-LN	82
BOL-950-LN	76
BOL-1200-LN	75
BOL-1600-LN	78
BOL-2000-LN	85

FEATURES

- AC Motors
- Core Filter
- 3/4" Tubes
- Low Cost
- Industrial Duty
- Quiet Operation
- For Low Flow Rates
- Oil Flows to 150 GPM
- Mounting Brackets Included
- SAE Connections
- Single or Three-Phase 60/50 Hz Motors
- Filter Standard

OPTIONS
Built-in Serviceable Bypass Valve;
NPT or BSPP Oil Connections



Ratings

Operating Pressure - 300 psi

Test Pressure - 300 psi

Operating Temperature - 350° F

Materials

Tubes Copper

Fins Aluminum

Turbulators Aluminum

Fan Blade Aluminum with steel hub

Fan Guard Steel with black baked enamel finish

Cabinet Steel with baked enamel finish

Manifolds Copper: Model AOC-08
Steel: Models AOC-19 – AOC-70

Connections Brass: Model AOC-08
Steel: Models AOC-19 – AOC-70

Nameplate Aluminum

Filter Stainless frame with washable media

Relief Bypass Valve Option

MODEL	DESCRIPTION
AOC-08	Available in one pass (30 and 60 psi), two pass (60 psi), designs only. Valves are built into tubes and do not affect external dimensions. All steel valves. Non-serviceable.
AOC-19 thru AOC-33	Available in 30 psi or 60 psi settings. 3/4", external, all steel valve. May be removed for servicing.
AOC-37 Thru AOC-70	Available in 30 psi or 60 psi settings. 1-1/2", external, all steel valve. May be removed for servicing.

How to Order (AOC-08 models only)

AOC	–	0 8	–			–		–	
Model Series **AOC** - Standard		**Model Size Selected**		**Number of Passes** **1** - One Pass **2** - Two Pass **4** - Four Pass	**Connection Type** **1** - NPT **2** - SAE **3** - BSPP		**Relief Bypass*** **Blank** - No Bypass **30** - 30 psi **60** - 60 psi		**Specify Motor Required** 115/230V Single Phase No Motor

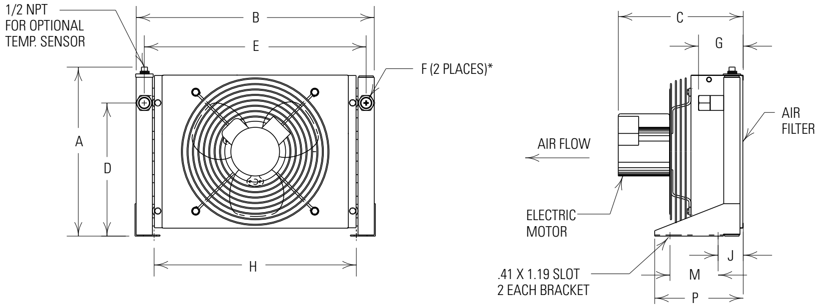
*Bypass not available in Four Pass

How to Order (Models AOC-19 through AOC-70)

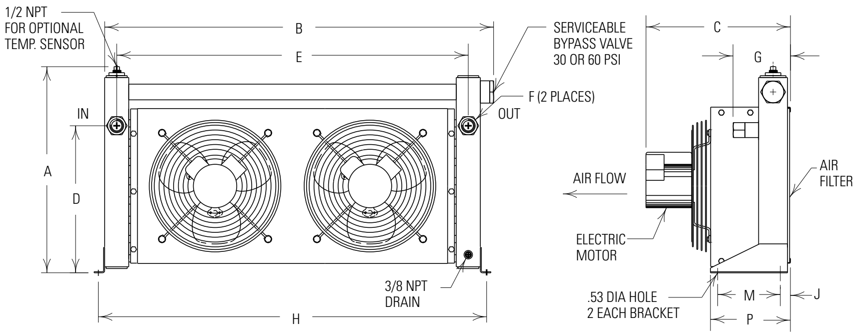
AOC	–		–		–		–	
Model Series **AOC** - Standard		**Model Size Selected**		**Connection Type** **1** - NPT **2** - SAE **3** - BSPP		**Relief Bypass** **Blank** - No Bypass **30** - 30 psi **60** - 60 psi		**Specify Motor Required** 115/230V Single Phase 208-230/460V Three Phase 575 Volt No Motor

Dimensions

Models AOC-19 Through AOC-33



Models AOC-37 Through AOC-70



Model	A		B		C	D	E	F		G		H	J	M	P	LBS	60 Hz CFM
	No Bypass	Bypass	No Bypass	Bypass				SAE	NPT & BSPP	SAE	NPT & BSPP						
AOC-19	13.62	16.00	16.50	18.16	13.08	10.31	15.00	#12	.75	3.05	4.12	13.96	2.61	5.00	8.18	19	750
AOC-22	15.62	18.00	22.00	23.66	12.19	12.31	20.50					19.46				33	1150
AOC-24	19.62	22.00	24.75	26.41	13.19	16.31	23.25					22.21				46	1900
AOC-33	25.62	28.00	30.25	31.91		22.31	28.75	#16	1.00		4.34	27.71				65	2150
AOC-37	18.50	21.38	39.00	40.38	15.66	15.25	36.50	#20	1.25	4.62	5.97	40.50	1.06	6.50	8.31	95	2150
AOC-50	22.50	25.38	41.00	42.38	15.62	19.25	38.50			4.68	6.03	42.50	1.12		8.37	120	3200
AOC-54	30.50	33.28	42.00	43.38	17.09	27.25	39.50	#24	1.50	4.89	6.30	43.76	1.87	9.00	12.37	154	3800
AOC-57	36.50	39.38	48.00	49.38	16.72	32.75	45.50	#32	2.00	6.68	8.15	49.76				190	4200
AOC-70	38.38	41.25	51.00	52.38	22.62	34.00	48.50			8.44	9.91	52.75	1.62		12.12	322	7500

NOTE: All dimensions in inches. We reserve the right to make reasonable design changes without notice.
**Inlet and outlet oil ports reversible if relief bypass option is not used.*

Specifications

Electric Motor Data

<table>
<tr><th>MODEL</th><th>MOTOR POWER</th><th># OF MOTORS</th><th>FRAME SIZE</th><th>SINGLE PHASE</th><th>THREE PHASE</th><th>575 VOLT</th><th>RPM</th><th>TYPE</th><th>B-BALL S-SLEEVE</th><th>THERMAL OVERLOAD</th><th>dB(A) 3 FT.</th></tr>
<tr><td>AOC-19 thru AOC-33</td><td rowspan="2">1/4</td><td>1</td><td rowspan="2">Custom</td><td rowspan="2">115/230V/60/50Hz
3.2/1.6 Amps Full Load 60 Hz
2.8/1.4 Amps Full Load 50 Hz</td><td rowspan="2">208-230/460V/60 Hz
190/380-415V/50 Hz
1.3/.65 Amps Full Load 60 Hz
1.1/.55 Amps Full Load 50 Hz</td><td rowspan="2">575/500V/60/50Hz
.65 Amps Full Load 60 Hz
.60 Amps Full Load 50 Hz</td><td rowspan="2">1700 (60 Hz)
1350 (50 Hz)</td><td rowspan="2">TEAO</td><td rowspan="2">B</td><td rowspan="2">YES</td><td>80</td></tr>
<tr><td>AOC-37 thru AOC-57</td><td rowspan="2">2</td><td>84</td></tr>
<tr><td>AOC-70</td><td>1</td><td>56C</td><td>115/208-230V/60 Hz
12.8/6.4 Amps Full Load</td><td>208-230/460V/60 Hz
190/380-415V/50 Hz
3.4/1.7 Amps Full Load 60 Hz
3.6/1.9 Amps Full Load 50 Hz</td><td>575/500V/60/50Hz
1.5 Amps Full Load 60 Hz
1.4 Amps Full Load 50 Hz</td><td>1725 (60 Hz)
1425 (50 Hz)</td><td>TEFC</td><td>B</td><td>NO</td><td>90</td></tr>
</table>

NOTE: Amp ratings are per motor.

Selection Procedure

Performance Curves are based on 50SSU oil leaving the cooler 40°F higher than the ambient air temperature used for cooling.This is also referred to as a 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 – Ambient air temp. °F = Actual Approach

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

$$\text{Horsepower heat load} \times \frac{40 \times Cv}{\text{Actual Approach}} = \text{Curve Horsepower}$$

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:**
● = 5 PSI; ■ = 10 PSI; ▲ = 20 PSI; ✛ = 40 PSI. 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 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 = (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 △T.
This formula may also be used in any application where the only temperature available is the entering oil temperature.

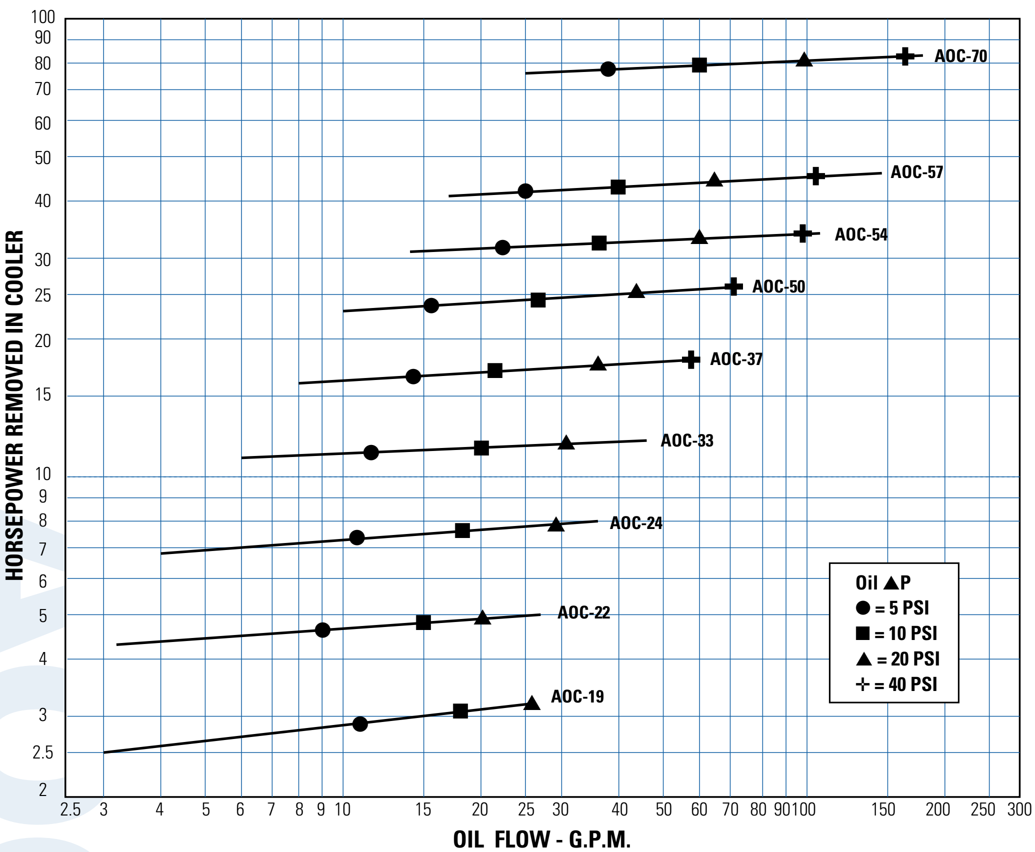
Oil Pressure Drop: Most systems can tolerate a pressure drop through the heat exchanger of 20 to 30 PSI. Excessive pressure drop should be avoided. Care should be taken to limit pressure drop to 5 PSI or less for case drain applications where high back pressure may damage the pump shaft seals.

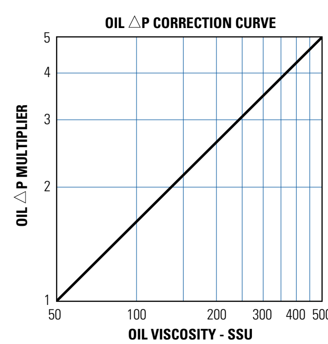
Oil Temperature

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





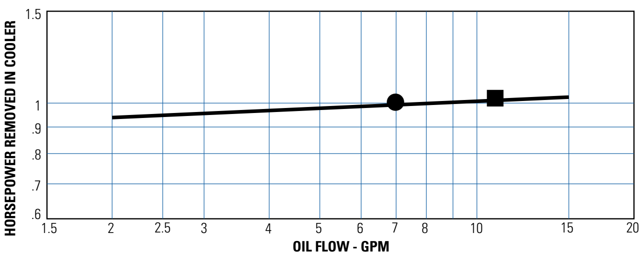
De-rate cooler performance by 10% when used in 50Hz service.

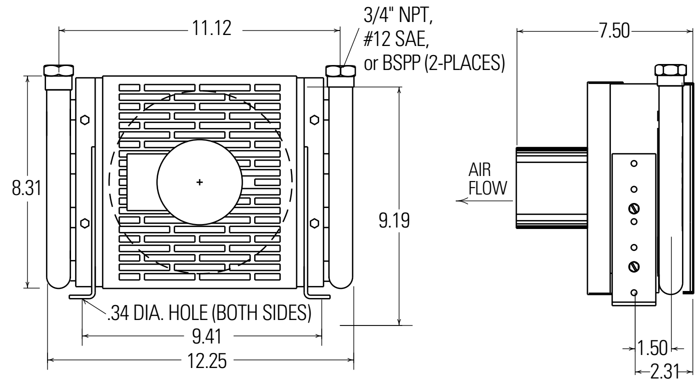
C_V Viscosity Correction

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

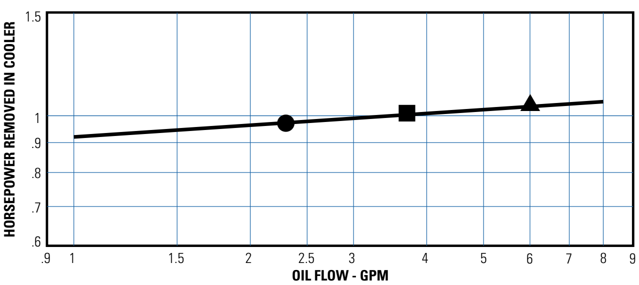
AOC-08 Model Only

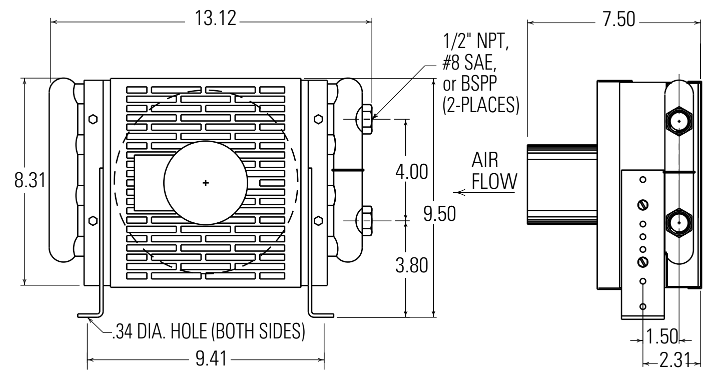
One Pass



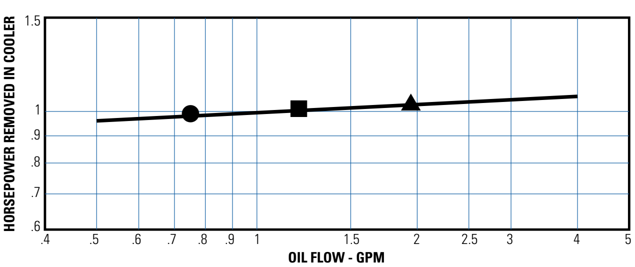


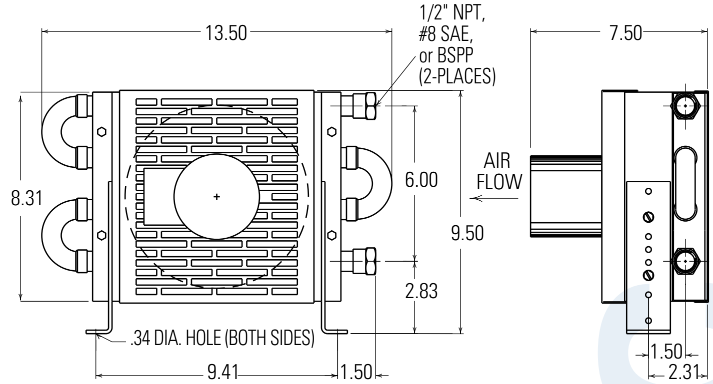
Two Pass





Four Pass





Specifications

Electric Motor Data

Model	MOTOR POWER	115/230 VOLT	50/60 Hz	TYPE	RPM	BEARINGS B-BALL S-SLEEVE	THERMAL OVERLOAD	SHIPPING WEIGHT (lbs.)	dB(A) 3 FT.	CFM
AOC-08	1/30	115 VOLT 230 VOLT	1.1 Amps Full Load .7 Amps Full Load	TEAO	3000	S	YES	12	70	208

BOL Series - Industrial

Industrial Hydraulic Oil Coolers

Thermal Transfer Products offers a full line of standard catalog hydraulic oil coolers for all industrial machine hydraulics for system cooling.

Air to Oil Cooling

Up to +500 HP of heat removal from hydraulic oil

Round tube copper, brass or steel

Brazed aluminum plate & bar (P-BAR™)

Extruded aluminum tube (T-BAR™)

Aluminum/steel fin construction

All aluminum brazed

Water to Oil Cooling

Steel, copper, copper/nickel, or stainless steel construction

Brazed plate construction

Internal fins

Diameters up to 10 inches

Lengths up to 12 feet

Product Options

Thermal Transfer industrial hydraulic oil coolers are available with a host of options to meet the demands of your application.

Brass construction

Steel construction

Internal finned construction

Brazed plate construction

Internal bypass

Seawater service

Applications

Our hydraulic oil coolers are used worldwide in a broad range of industrial applications, including:

Hydraulic presses

Plastic injection molding

Lube oil coolers

Extrusion machinery

Gear boxes

Hydraulic power units

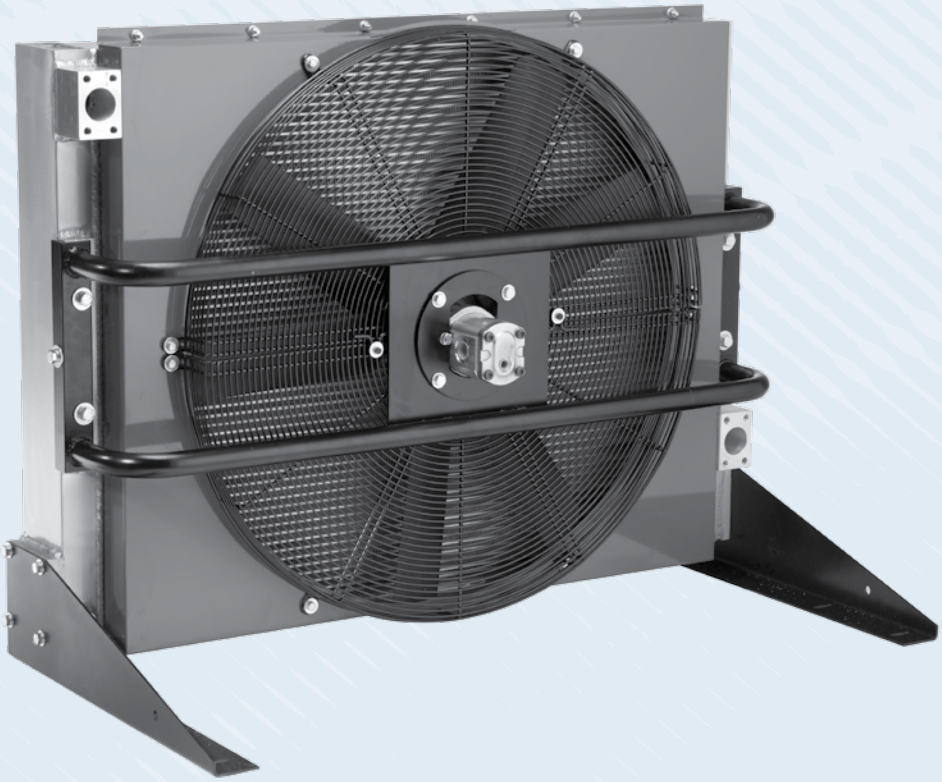
And more.

For application help and quoting, visit our **Full TTP site** or contact **ttpsales@apiheattransfer.com**.

BRAZED ALUMINUM CONSTRUCTION

Features

- **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**
- **Welded 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**
- T-BAR core optional for high viscosity oils or other highly fouling fluids. *See T-Bar Performance Curve
- Low Noise Option Available



Ratings

Maximum Operating Pressure
250 psi (17 BAR)

Maximum Operating Temperature
300° F (150° C)

Materials

Mounting Feet Steel

Standard 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

Fanguard Steel

Connectors Aluminum

Fan Aluminum Hub, Plastic Blades

Shroud Steel

Motor TEFC & IEC

Fluid Compatability

Petroleum/mineral oils

Oil/water emulsion

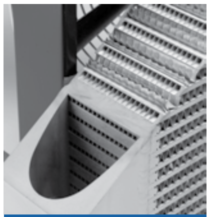
Water/ethylene glycol

How to Order

Model Series	Model Size Selected	Connection Type*	Specify Motor Required	Core	Noise Level
BOL	4 8 16 30 400 725 950 1200 1600 2000	1 - NPT 2 - SAE 3 - BSPP	2 - Single Phase 3 - Three Phase 6 - 575 Volt 9 - Hydraulic 18 - IEC Three Phase	Blank - Standard Bar & Plate TB - T-BAR Core*	Blank - Standard Noise Level LN - Low Noise Level

*T-BAR Core option provides a T-BAR core in BOL frame. Used for high fouling or high viscosity fluids. Performance is typically 15-25% less than the bar and plate core. Consult factory for details.

T-BAR™

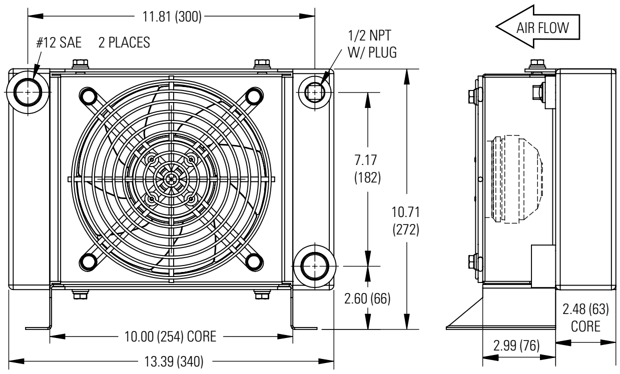


OPTIONAL T-BAR CORE SECTION CUTAWAY

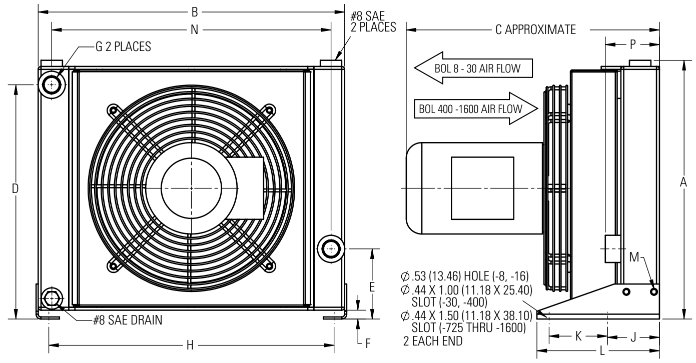
Dimensions

AIR COOLED BOL

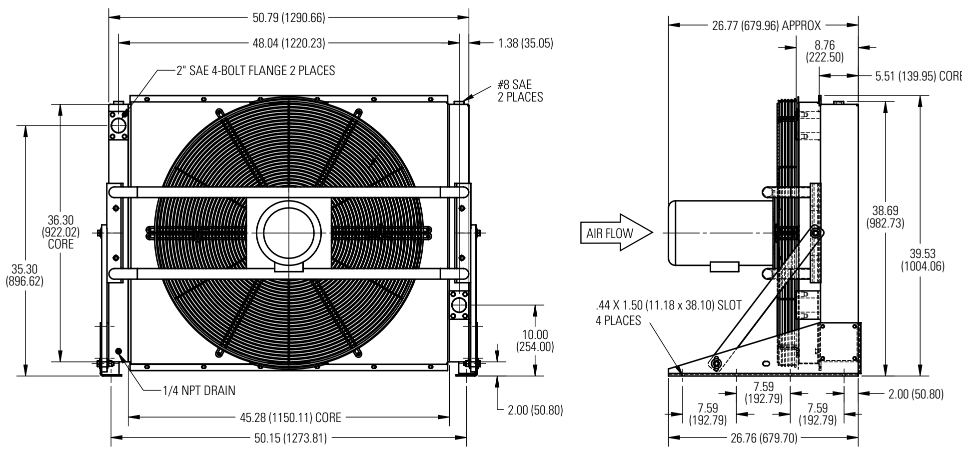
BOL-4



BOL-8 through BOL-1600



BOL-2000



Model	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Approx. Ship Wt. lbs (Kg)
BOL-4	See diagram above			—	—	—	—	—	—	—	—	—	—	—	18 (8.16)
BOL-8	12.93 (328.42)	15.75 (400.05)	14.72 (373.89)	11.30 (287.62)	3.27 (83.06)	.55 (13.97)	#12 SAE	14.53 (369.06)	3.07 (77.98)	3.75 (88.90)	7.36 (186.94)	M8 Bolt (2PL)	14.01 (355.85)	3.48 (88.40)	45 (20.4)
BOL-16	16.63 (422.40)	19.69 (500.13)	16.16 (410.46)	15.06 (382.52)	4.51 (114.56)	.57 (14.48)	#12 SAE	18.30 (464.82)	3.35 (85.09)	3.74 (95.00)	7.87 (199.90)	M8 Bolt (2PL)	17.95 (455.93)	3.46 (87.88)	55 (24.94)
BOL-30	21.09 (535.68)	26.38 (670.06)	18.23 (463.04)	19.49 (495.05)	5.26 (133.60)	1.32 (33.53)	#20 SAE	24.74 (628.40)	4.25 (107.95)	5.00 (127.00)	10.00 (254.00)	M10 Bolt (4PL)	24.34 (618.24)	5.28 (134.11)	125 (56.70)
BOL-400	19.20 (487.68)	22.45 (570.23)	18.80 (477.52)	17.31 (439.67)	6.50 (165.10)	2.00 (50.80)	#20 SAE	22.30 (566.42)	4.25 (107.95)	5.00 (127.00)	10.00 (254.00)	M10 Bolt (4PL)	20.08 (510.03)	5.20 (132.08)	148 (67.13)
BOL-725	23.49 (596.65)	30.32 (770.13)	18.60 (472.44)	21.60 (548.64)	6.50 (165.10)	2.00 (50.80)	#20 SAE	30.17 (766.32)	4.25 (107.95)	5.00 (127.00)	10.00 (254.00)	M10 Bolt (4PL)	27.95 (709.93)	5.20 (132.08)	170 (77.11)
BOL-950	27.94 (709.68)	37.03 (940.56)	22.69 (576.33)	24.55 (623.57)	9.50 (241.30)	2.00 (50.80)	2" SAE 4-Bolt Flange	35.89 (911.61)	6.05 (153.67)	9.20 (233.68)	16.00 (406.40)	M10 Bolt (4PL)	34.26 (870.20)	7.01 (178.05)	300 (136.08)
BOL-1200	27.94 (709.68)	40.96 (1040.38)	24.07 (611.38)	24.55 (623.57)	5.50 (139.70)	2.00 (50.80)		40.31 (1023.87)	6.05 (153.67)	9.20 (233.68)	16.00 (406.40)	M10 Bolt (4PL)	38.19 (970.03)	7.01 (178.05)	430 (195.04)
BOL-1600	36.01 (914.65)	40.96 (1040.38)	25.45 (646.43)	32.62 (828.55)	9.50 (241.30)	2.00 (50.80)		40.31 (1023.87)	6.05 (153.67)	9.20 (233.68)	16.00 (406.40)	M10 Bolt (4PL)	38.19 (970.03)	7.01 (178.05)	515 (233.60)
BOL-2000	See diagram above			—	—	—	—	—	—	—	—	—	—	—	582 (264.00)

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

BOL

Specifications

Electric Motor Information (60 Hz Nema Frame)

Model	CMM	CFM	Motor HP	Voltage	Phase	Full Load Amps 230V	Frequency	RPM	Frame	Thermal Overload	Sound dB(A) at 3ft
BOL-4	31.14	1203	1/4	230	1	—	60 Hz	2850	—	—	73
BOL-8	22.65	800	1/3	115/230	1	3.0	60 Hz	3450	48C	No	80
BOL-8	22.65	800	1/3	208-230/460	3	1.4	60 Hz	3450	48C	No	80
BOL-16	40.35	1425	1/2	115/230	1	3.7	60 Hz	3450	48C	No	85
BOL-16	40.35	1425	1/2	208-230/460	3	2.2	60 Hz	3450	48C	No	85
BOL-30	62.29	2200	1/2	115/230	1	3.7	60 Hz	1725	56C	No	85
BOL-30	62.29	2200	1/2	208-230/460	3	2.0	60 Hz	1725	56C	No	85
BOL-400	62.29	2200	1	115/230	1	6.0	60 Hz	3450	56C	No	97
BOL-400	62.29	2200	1	208-230/460	3	3.2	60 Hz	3450	56C	No	97
BOL-725	101.94	3600	1-1/2	115/230	1	8.5	60 Hz	3450	56C	No	100
BOL-725	101.94	3600	1-1/2	208-230/460	3	4.8	60 Hz	3450	56C	No	100
BOL-950	133.10	4700	1-1/2	115/230	1	8.6	60 Hz	1725	145TC	No	92
BOL-950	133.10	4700	1-1/2	208-230/460	3	4.6	60 Hz	1725	145TC	No	92
BOL-1200	198.22	7000	3	208-230/460	3	8.8	60 Hz	1725	182TC	No	94
BOL-1600	223.75	7900	5	208-230/460	3	13.4	60 Hz	1725	184TC	No	96
BOL-2000	396.44	14000	7.5	230/460	3	24.8	60 Hz	1725	213TC	No	98

Electric Motor Information (50 Hz IEC Frame)

Model	CMM	CFM	KW	Voltage	Phase	Frequency	RPM	Frame	Sound dB(A) at 3ft
BOL-4	28.4	1003	.20	230	1	50 Hz	3000	—	73
BOL-8	18.9	667	.25	230/400/415	3	50 Hz	3000	63	71
BOL-16	33.7	1188	.37	230/400/415	3	50 Hz	3000	71	77
BOL-30	52.4	1850	.37	230/400/415	3	50 Hz	1500	71	73
BOL-400	52.4	1850	.75	230/400/415	3	50 Hz	3000	80	81
BOL-725	85.0	3000	1.10	230/400/415	3	50 Hz	3000	80	80
BOL-950	108.2	3821	1.50	230/400/415	3	50 Hz	1500	90	78
BOL-1200	165.1	5834	2.20	230/400/415	3	50 Hz	1500	100	83
BOL-1600	186.4	6584	3.00	230/400/415	3	50 Hz	1500	100	85
BOL-2000	331.3	11700	4.00	230/400/415	3	50 Hz	1500	112	88

All IEC frame motors have CE mark.
IEC motor voltages have +/- 10% tolerance.

Hydraulic Motor Information

Model	Oil Flow Required GPM (LPM)	Min. Pressure Required PSI (BAR)	Motor IN³/REV (CM³/REV) Displacement	Sound dB(A) at 3 ft.
BOL-4	3.3 (12.49)	400 (27.58)	0.22 (3.6)	80
BOL-8	3.3 (12.49)	400 (27.58)	0.22 (3.6)	80
BOL-16	3.3 (12.49)	500 (34.47)	0.22 (3.6)	85
BOL-30	3.4 (12.87)	500 (34.47)	0.45 (7.3)	85
BOL-400	3.3 (12.49)	425 (29.30)	0.22 (3.6)	97

Model	Oil Flow Required GPM (LPM)	Min. Pressure Required PSI (BAR)	Motor IN³/REV (CM³/REV) Displacement	Sound dB(A) at 3 ft.
BOL-725	3.3 (12.49)	675 (46.50)	0.22 (3.6)	100
BOL-950	10.1 (38.23)	300 (20.70)	1.4 (22.9)	92
BOL-1200	10.1 (38.23)	725 (50.00)	1.4 (22.9)	94
BOL-1600	10.1 (38.23)	1100 (75.80)	1.4 (22.9)	96
BOL-2000	10.1 (38.23)	1650 (113.76)	1.4 (22.9)	98

Notes: Maximum Pressure is 2000 psi. Stated Minimum Operating Pressure is at Inlet Port of Motor. 1000 psi Allowable Back Pressure.

Selection Procedure

Step 1 **Determine Heat Load.** Typical Rule of Thumb, -size cooler for 1/3 of the input horsepower. Heat load may be expressed as either Horsepower or BTU/Hr or KW/°C.

HP=BTU/HR ÷ 2545

BTU/HR=HP x 2545

$$BTU/HR = \frac{KW}{°C} \times 1894.61 \times E.T.D.(°F)$$

Step 2 **Determine Entering Temperature Difference.** (Actual E.T.D.)

$$E.T.D. = \text{Entering oil temperature} - \text{Entering Ambient air temperature}$$

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.

Step 3 **Determine the Corrected Heat Dissipation to use the Curves**

ENGLISH Version

$$\text{Corrected Heat Rejection} = \text{(BTU/Hr) Heat Load} \times \frac{100°F}{\text{Desired E.T.D.}}$$

(BTU/HR) to use with selection chart

METRIC Version

$$\text{Corrected Heat Rejection } \frac{KW}{°C} = \frac{\text{Heatload (kw)}}{\text{Desired E.T.D. (°C)}}$$

Step 4 **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 3. Any Model or Curve on or above this point will meet these conditions.

Step 5 **Calculate Oil Pressure Drop** Find the oil pressure drop correction factor and multiply it by the Oil Pressure Drop found on performance curve.

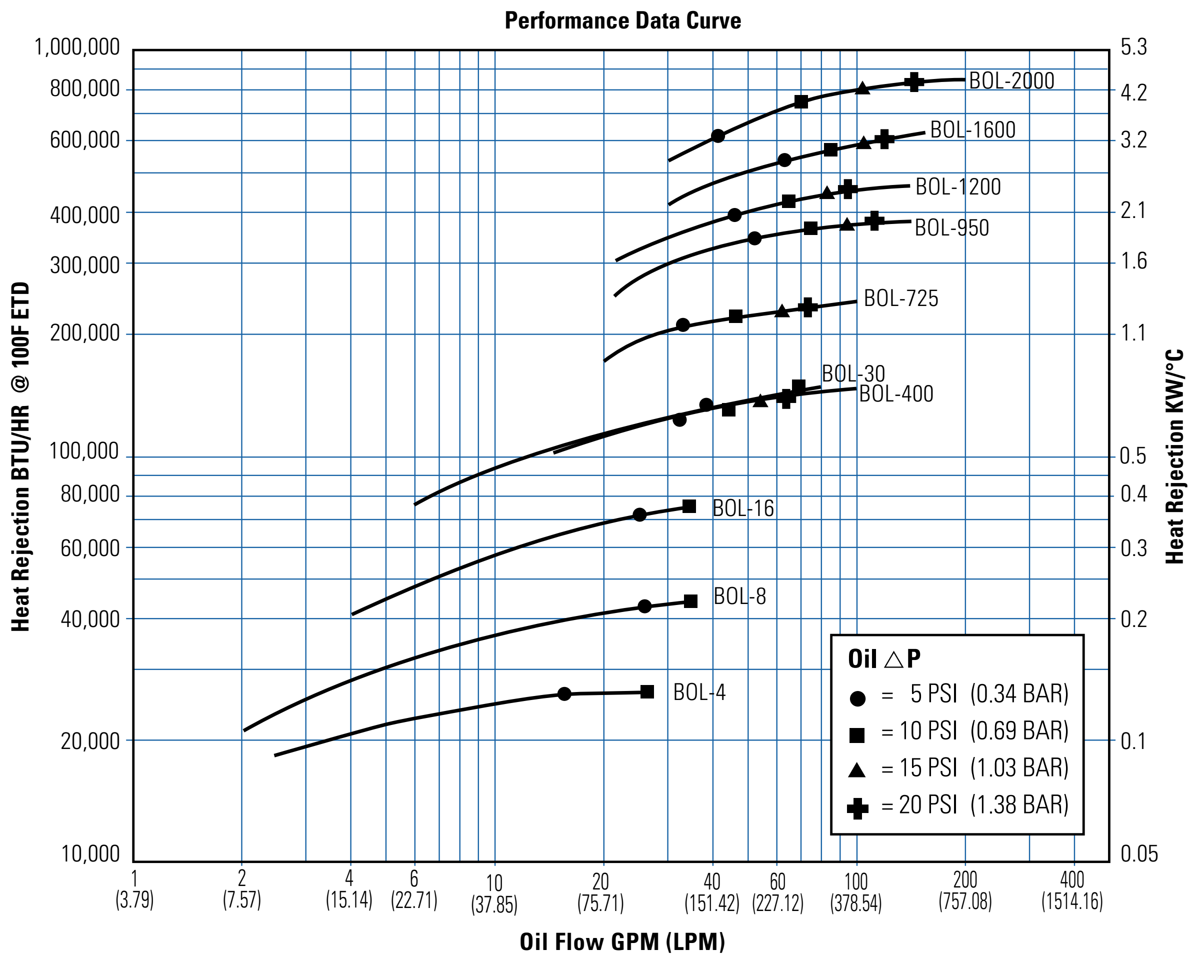
Listed Performance Curves are based on:

- 50 SSU (11 cSt) oil
- 100° F (55.56° C) Entering Temperature Difference (E.T.D.)

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

Performance Curves

BOL Models with Standard P-BAR Core



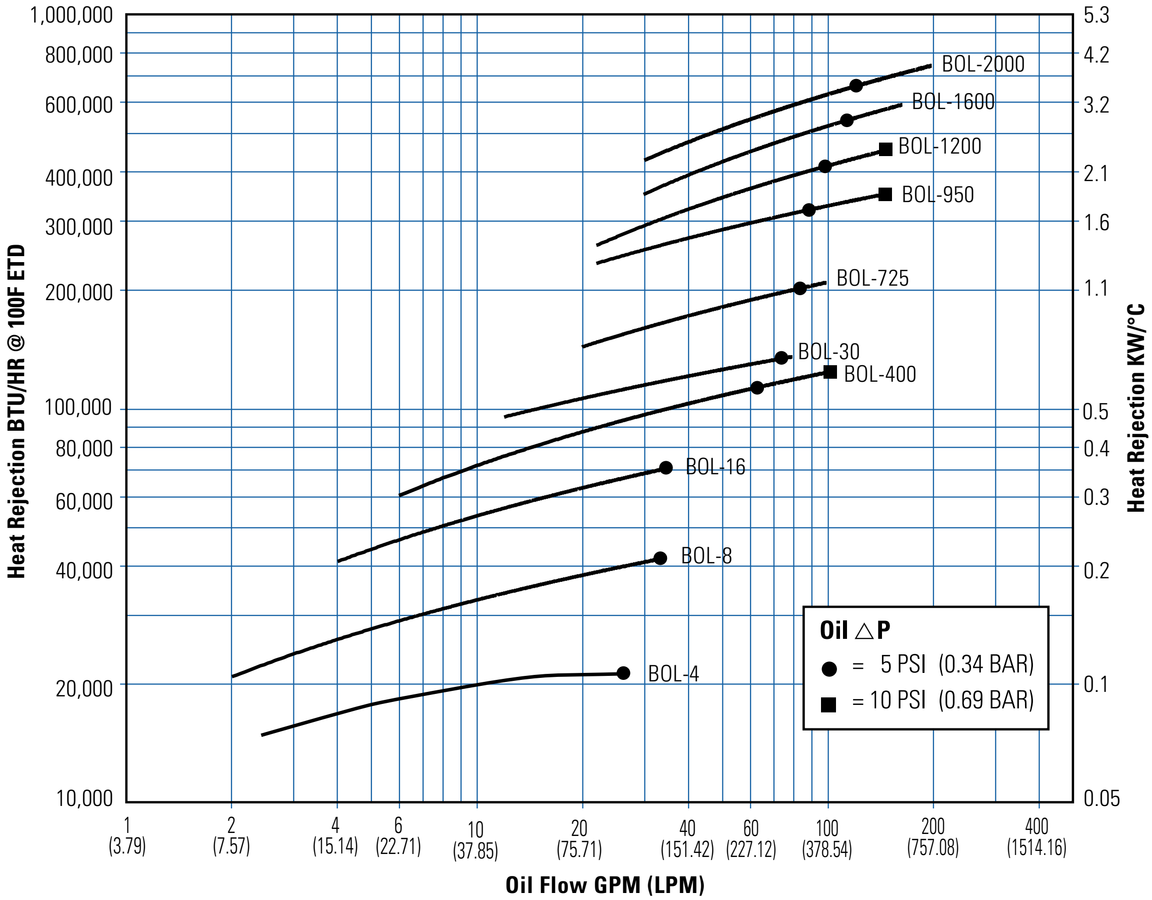
Note: Derate heat rejection values 15% if using 50Hz motors.

AIR COOLED BOL

Performance Curves

BOL Models with Optional T-BAR Core

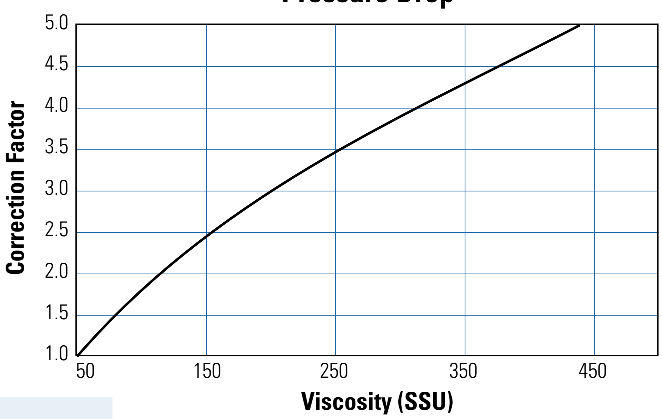
Performance Data Curve



OPTIONAL T-BAR CORE SECTION CUTAWAY

Note: Derate heat rejection values 15% if using 50Hz motors.

Pressure Drop



Oil Temperature

Typical operating temperature ranges are:

Hydraulic Motor Oil	120°F - 180°F (49°C - 82.2°C)
Hydrostatic Drive Oil	160°F - 180°F (71°C - 82.2°C)
Engine Lube Oil	180°F - 200°F (82.2°C - 93.3°C)
Automatic Transmission Fluid	200°F - 300°F (93.3°C - 149°C)

Desired Reservoir Temperature

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

Off-Line Recirculation Cooling Loop: Desired reservoir temperature is the oil temperature entering the cooler.

Return Line Cooling: Desired reservoir temperature is the oil temperature leaving the cooler. In this case, the oil temperature change must be determined so that the actual oil entering temperature can be found. Calculate the oil temperature change (oil △T) with this formula:

Oil △T = (BTU's/Hr.) / (GPM Oil Flow x 210).

To calculate the oil entering temperature to the cooler, use this formula:

Oil Entering Temp. = Oil Leaving Temp + Oil △T.

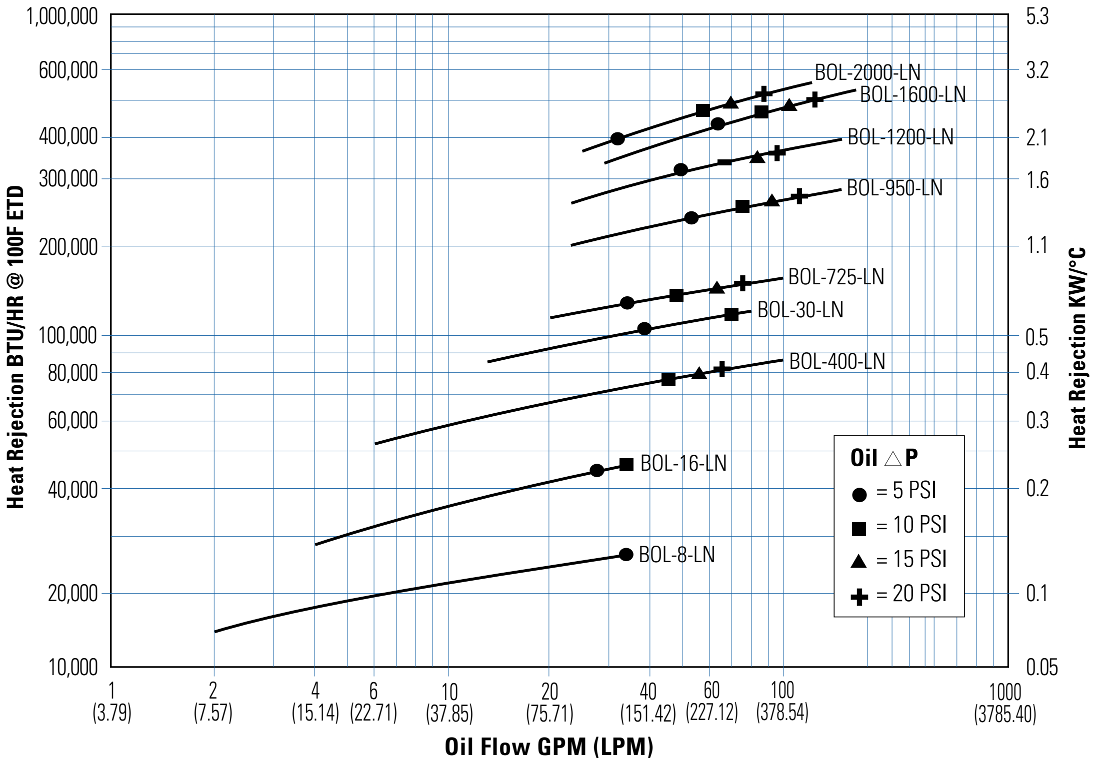
Oil Pressure Drop: Most systems can tolerate a pressure drop through the heat exchanger of 20 to 30 PSI. Excessive pressure drop should be avoided. Care should be taken to limit pressure drop to 5 PSI or less for case drain applications where high back pressure may damage the pump shaft seals.

Performance Curves

BOL Models with Low-Noise Option

The low noise option offers the BOL models with a reduced motor speed.
This allows a lower sound level output for noise-sensitive applications.

Performance Data Curve



Available on 60 Hz Nema frame only.

Electric Motor Information

Model	HP	Frame	Low Noise RPM	Low Noise CFM	Low Noise CMM	Voltage	Frequency (HZ)
8-1PH	0.33	48	1725	400	11.33	115/230	60
8-3PH	0.33	48	1725	400	11.33	208-230/460	60
16-1PH	0.50	48	1725	704	19.93	115/230	60
16-3PH	0.50	48	1725	704	19.93	208-230/460	60
30-1PH	0.50	56C	1160	1470	41.62	115/230	60
30-3PH	0.50	56C	1160	1470	41.62	208-230/460	60
400-1PH	1.00	56C	1725	1100	31.19	115/230	60
400-3PH	1.00	56C	1725	1100	31.19	208-230/460	60
725-1PH	1.50	56C	1725	1780	50.40	115/230	60
725-3PH	1.50	56C	1725	1780	50.40	208-230/460	60
950-1PH	1.50	145TC	1160	3150	89.19	115/230	60
950-3PH	1.50	145TC	1160	3150	89.19	208-230/460	60
1200-3PH	1.50	182TC	1160	4690	132.81	208-230/460	60
1600-3PH	2.00	184TC	1160	6510	184.34	208-230/460	60
2000-3PH	5.00	213TC	1160	8700	000.00	230/460	60

Sound Data

Model	DBA at 3 ft
BOL-8-LN	62
BOL-16-LN	69
BOL-30-LN	67
BOL-400-LN	72
BOL-725-LN	82
BOL-950-LN	76
BOL-1200-LN	75
BOL-1600-LN	78
BOL-2000-LN	85

OCA Series - Hydraulic Cooling

Industrial Hydraulic Oil Coolers

Thermal Transfer Products offers a full line of standard catalog hydraulic oil coolers for all industrial machine hydraulics for system cooling.

Air to Oil Cooling

Up to +500 HP of heat removal from hydraulic oil

Round tube copper, brass or steel

Brazed aluminum plate & bar (P-BAR™)

Extruded aluminum tube (T-BAR™)

Aluminum/steel fin construction

All aluminum brazed

Water to Oil Cooling

Steel, copper, copper/nickel, or stainless steel construction

Brazed plate construction

Internal fins

Diameters up to 10 inches

Lengths up to 12 feet

Product Options

Thermal Transfer industrial hydraulic oil coolers are available with a host of options to meet the demands of your application.

Brass construction

Steel construction

Internal finned construction

Brazed plate construction

Internal bypass

Seawater service

Applications

Our hydraulic oil coolers are used worldwide in a broad range of industrial applications, including:

Hydraulic presses

Plastic injection molding

Lube oil coolers

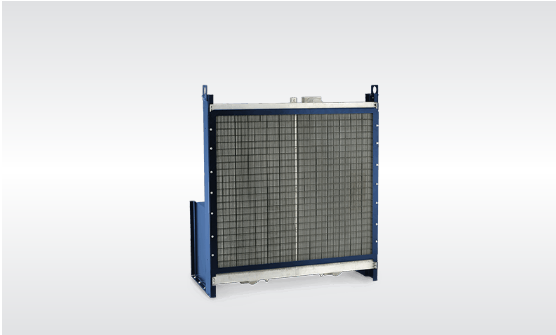
Extrusion machinery

Gear boxes

Hydraulic power units

And more.

For application help and quoting, visit our Full TTP site or contact ttpsales@apiheattransfer.com.



BRAZED ALUMINUM CONSTRUCTION

HYDRAULIC OR COMPRESSOR OIL COOLING

Features

- **Large Oil Flow**
- **High Performance**
- **Industrial Duty**
- **Brazed Aluminum Bar and Plate Core**
- Compact all aluminum core assembly
- Ideal for converting water cooled equipment to air cooled
- Eliminates high water and sewer costs
- Eliminates corrosion problems associated with water cooled units
- Vertical air flow works well for heat recovery
- State-of-the-art heat transfer technology
- Hydraulic motors available
- Optional SAE Ports
- Marine corrosion control coatings available
- High performance air side fin design
- Detachable legs

Ratings

Maximum Operating Pressure
250 psi (17 BAR)

Maximum Operating Temperature
300° F (150° C)

Materials

Legs Steel with baked enamel finish

Shroud Steel

Standard 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

Fan Aluminum Hub, Plastic Blades

Motor TEFC

Fluid Compatability

Petroleum/mineral oils

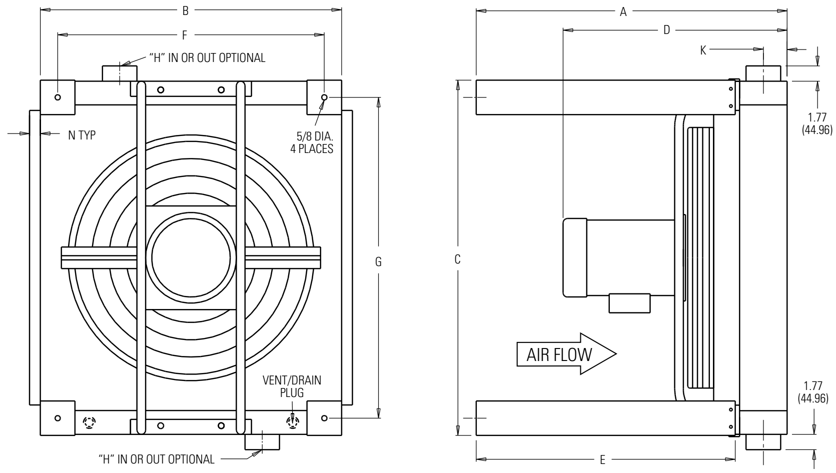
Oil/water emulsion

Water/ethylene glycol

How to Order

AOL	–		–		–		–	
Model Series		**Model Size Selected**		**Connection Type**		**Specify Motor Required**		**Noise Level**
AOL - Standard		**400**		**Blank** - NPT		**0** - No Motor		**Blank** - Standard Noise Level
		725		**S** - SAE		**2** - Single Phase		**LN** - Low Noise Level
		950				**3** - Three Phase		
		1200				**6** - 575 Volt		
		1600				**9** - Hydraulic		
		2000				**18** - IEC Three Phase		
		2500						
		3000						
		3500						

Dimensions



Model	A	B	C	D Approx.	E	F	G	H NPT	H SAE	J	K	L	Net Weight Lbs.	Shipping Weight Lbs.
AOL-400	34.20 (868.68)	17.96 (456.18)	22.69 (576.33)	20.86 (529.84)	30.00 (762.00)	13.96 (354.58)	18.69 (474.73)	2.00	#32 SAE 2-1/2-12 UN-2B	5.93 (150.62)	1.85 (46.99)	1.25 (31.75)	109 (49.44)	148 (67.13)
AOL-725	34.20 (868.68)	22.37 (568.20)	30.57 (776.48)	20.86 (529.84)	30.00 (762.00)	18.37 (466.60)	26.57 (674.88)	2.00		5.88 (149.35)	1.85 (46.99)	1.25 (31.75)	151 (68.49)	170 (77.11)
AOL-950	36.01 (914.65)	26.78 (680.21)	37.25 (946.15)	23.62 (599.95)	30.00 (762.00)	22.78 (578.61)	33.25 (844.55)	2.00		6.82 (173.23)	2.76 (70.10)	1.25 (31.75)	221 (100.24)	300 (136.08)
AOL-1200	36.01 (914.65)	26.78 (680.21)	41.20 (1046.48)	25.51 (647.95)	30.00 (762.00)	22.78 (578.61)	37.20 (944.88)	2.00		6.00 (152.40)	2.76 (70.10)	1.25 (31.75)	296 (134.26)	430 (195.04)
AOL-1600	36.01 (914.65)	34.89 (886.21)	41.20 (1046.48)	27.51 (698.75)	30.00 (762.00)	30.89 (784.61)	37.20 (944.88)	2.50	2-1/2 SAE 4 Bolt FLG	8.00 (203.20)	2.76 (70.10)	1.25 (31.75)	355 (161.03)	515 (233.60)
AOL-2000	36.01 (914.65)	37.88 (962.15)	51.05 (1296.67)	26.25 (666.75)	30.00 (762.00)	33.88 (860.55)	47.05 (1195.07)	2.50		8.00 (203.20)	2.76 (70.10)	1.25 (31.75)	482 (218.63)	582 (263.99)
AOL-2500	36.01 (914.65)	43.70 (1109.98)	49.08 (1246.63)	28.51 (724.15)	30.00 (762.00)	39.70 (1008.38)	45.08 (1145.03)	3.00	3" SAE 4 Bolt FLG.	8.00 (203.20)	2.76 (70.10)	1.25 (31.75)	555 (251.74)	655 (297.10)
AOL-3000	36.01 (914.65)	52.52 (1334.01)	51.05 (1296.95)	30.51 (774.95)	30.00 (762.00)	48.52 (1232.41)	47.05 (1206.50)	3.00		8.00 (203.20)	2.76 (70.10)	1.25 (31.75)	724 (328.40)	825 (374.21)
AOL-3500	36.01 (914.65)	56.30 (1430.02)	51.05 (1296.95)	30.51 (774.95)	30.00 (762.00)	52.30 (13328.42	47.05 (1206.50)	3.00		8.00 (203.20)	2.76 (70.10)	1.25 (31.75)	760 (344.73)	860 (390.09)

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

Selection Procedure

Performance Curves based on 100°F (55.56°C) E.T.D. or Entering Temperature Difference (E.T.D = Entering oil temperature minus ambient air temperature). SAE #10 oil @ 200°F (93.33°C).

Oil pressure drop coding:

- **X** = 5 PSI (.345 BAR)
- ● = 10 PSI (.689 BAR)
- ♦ = 15 PSI (1.03 BAR)
- ▲ = 20 PSI (1.38 BAR)
- ■ = 30 PSI (2.10 BAR)

E.T.D. temperature correction formula:

ENGLISH Version

$$HP_{\text{Curve}} = HP_{\text{To Be Removed}} \times \frac{100}{\text{Desired E.T.D}}$$

METRIC Version

$$\frac{KW}{°C} = \frac{\text{Heatload (KW)}}{\text{Desired E.T.D. (°C)}}$$

Conversion

$$Hp = \frac{KW}{°C} = \times .745 \times \text{E.T.D. (°F)}$$

Notes

1. A three-way thermostatic valve is recommended to bypass the cold oil around the heat exchanger during start up.
2. Support piping as needed. Flexible connectors must be properly installed to validate warranty.
3. Coolers should not operate in ambient temperatures below 35°F (1°C). Consult factory for recommendations.
4. The fan cannot be cycled.
5. AOL coolers operated outdoors must be protected from weather. Consult factory for recommendations.
6. If duct work or additional static resistance is added to the cooler airstream, an auxiliary air mover may be required.
7. Can be mounted for horizontal air flow, with oil in at bottom port.

Maintenance

Periodic cleaning of the fins with compressed air is needed to remove the accumulation of dirt and dust. If the inside of the tubes need to be cleaned of oil and carbon, use a chlorinated solvent. Do not use strong solvents. Do not use acids or caustic cleaners.

Specifications

Electric Motor & Fan Data[1] (60 Hz Nema Frame)

Model	Fan CMM	Fan CFM	Motor H.P.	Voltage	Phase	Full Load Amps 230V	Frequency (Hz)	RPM	Nema Frame	Thermal Overload	Sound dB(A) at 3 ft.
AOL-400	62.30	2200	1.0	115/208-230	1	6.0	60[2]	3450	56C	No	97
	51.68/62.30	1825/2200	1.0	208-230/460[3]	3	3.6/3.2	50/60	2850/3450	56C	No	97
AOL-725	101.94	3600	1.5	115/208-230	1	8.5	60[2]	3450	56C	No	100
	84.95/102.94	3000/3600	1.5	208-230/460[4]	3	4.8/4.2	50/60	2850/3450	56C	No	100
AOL-950	133.09	4700	1.5	115/208-230	1	8.6	60[2]	1740	145TC	No	92
	133.09	4700	1.5	208-230/460	3	4.6	60[2]	1740	145TC	No	92
AOL-1200	198.22	7000	5.0	230	1	23.00	60[2]	1740	184TC	No	94
	198.22	7000	3.0	208-230/460	3	8.8	60[2]	1740	182TC	No	96
AOL-1600	223.70	7900	5.0	208-230/460	3	13.4	60[2]	1740	184TC	No	98
AOL-2000	311.49	14000	7.5	230/460	3	19.6	60[2]	1740	213TC	No	98
AOL-2500	396.44	14000	7.5	230/460	3	19.6	60[2]	1740	213TC	No	98
AOL-3000	495.54	17500	10.0	230/460	3	24.8	60[2]	1740	215TC	No	102
AOL-3500	495.54	17500	10.0	230/460	3	24.8	60[2]	1740	215TC	No	102

[1] Published electrical ratings are approximate, and may vary because of motor brand. Actual ratings are on motor nameplate.
[2] May also be operated at 50 hz. Consult factory for details.
[3] 50 Hz voltage: 190-200-208-220/380-400-415-440
[4] 50 Hz voltage: 190-208/380-415
All motors shown are TEFC—Other motor options available upon request.

Electric Motor Information (50 Hz IEC Frame)

Model	CMM	CFM	KW	Voltage	Phase	Frequency	RPM	Frame	Sound dB(A) at 1 meter
AOL-400	52.4	1850	.75	230/400/415	3	50 Hz	3000	80	81
AOL-725	85.0	3001	1.10	230/400/415	3	50 Hz	3000	80	80
AOL-950	108.2	3821	1.50	230/400/415	3	50 Hz	1500	90	78
AOL-1200	165.1	5834	2.20	230/400/415	3	50 Hz	1500	100	83
AOL-1600	186.4	6584	3.00	230/400/415	3	50 Hz	1500	100	85
AOL-2000	331.3	11700	4.00	230/400/415	3	50 Hz	1500	112	88
AOL-2500	331.3	11700	4.00	230/400/415	3	50 Hz	1500	112	88
AOL-3000	410.6	14500	7.50	230/400/415	3	50 Hz	1500	132	90
AOL-3500	410.6	14500	7.50	230/400/415	3	50 Hz	1500	132	90

All IEC frame motors have CE mark.
IEC motor voltages have +/- 10% tolerance.

Electric Motor Information (AOL-Low Noise)

Model	HP	Nema Frame	LN RPM	LN CFM	LN CMM	Voltage	Frequency (Hz)	Sound dB(A) at 3 ft.
AOL-400-1PH-LN	1	56C	1725	1100	31.15	115/230	60	72
AOL-400-3PH-LN	1	56C	1725	1100	31.15	230/460	60	72
AOL-725-1PH-LN	1.50	56C	1725	1780	50.40	115/230	60	82
AOL-725-3PH-LN	1.50	56C	1725	1780	50.40	230/460	60	82
AOL-950-3PH-LN	1.50	145TC	1160	3150	89.20	230/460	60	76
AOL-1200-3PH-LN	1.50	182TC	1160	4690	132.81	230/460	60	75
AOL-1600-3PH-LN	2	184TC	1160	6510	184.34	230/460	60	78
AOL-2000-3PH-LN	5	213TC	1160	8700	246.36	230/460	60	85
AOL-2500-3PH-LN	5	213TC	1160	11700	331.31	230/460	60	85
AOL-3000-3PH-LN	5	215TC	1160	13500	382.28	230/460	60	93
AOL-3500-3PH-LN*	10	256TCZ	1160	16200	458.73	230/460	60	91

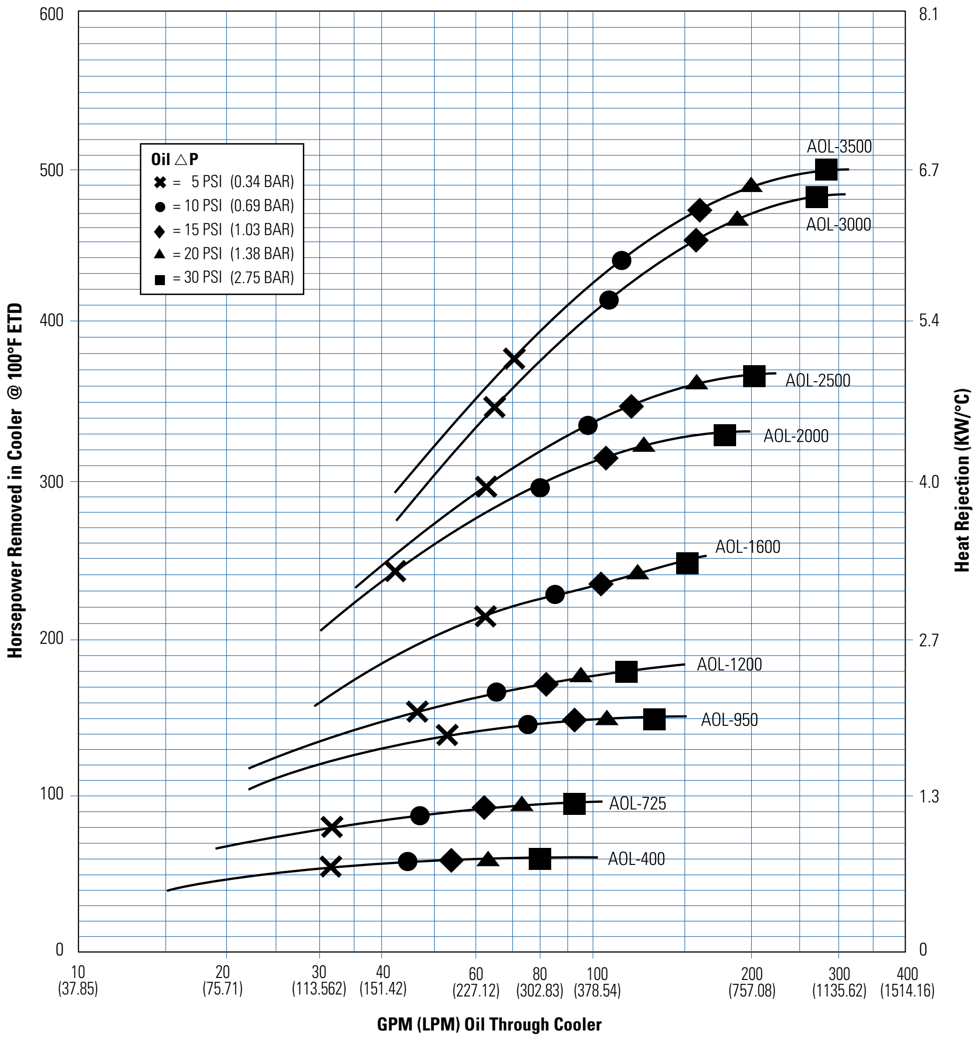
Available in 60 Hz Nema Frame only.

Hydraulic Motor Information

Model	Oil Flow Required GPM (LPM)	Min. Pressure Required PSI (BAR)	Motor IN³/REV (CM³/REV) Displacement	Sound dB(A) at 3 ft.
AOL-400	3.3 (12.49)	425 (29.31)	0.22 (3.6)	97
AOL-725	3.3 (12.49)	675 (46.54)	0.22 (3.6)	100
AOL-950	10.1 (38.23)	300 (20.68)	1.4 (22.94)	92
AOL-1200	10.1 (38.23)	725 (50.00)	1.4 (22.94)	94
AOL-1600	10.1 (38.23)	1100 (75.84)	1.4 (22.94)	98
AOL-2000	10.1 (38.23)	1650 (113.76)	1.4 (22.94)	98
AOL-2500	10.1 (38.23)	1650 (113.76)	1.4 (22.94)	98
AOL-3000	10.1 (38.23)	2000 (137.90)	1.4 (22.94)	102
AOL-3500	10.1 (38.23)	2000 (137.90)	1.4 (22.94)	102

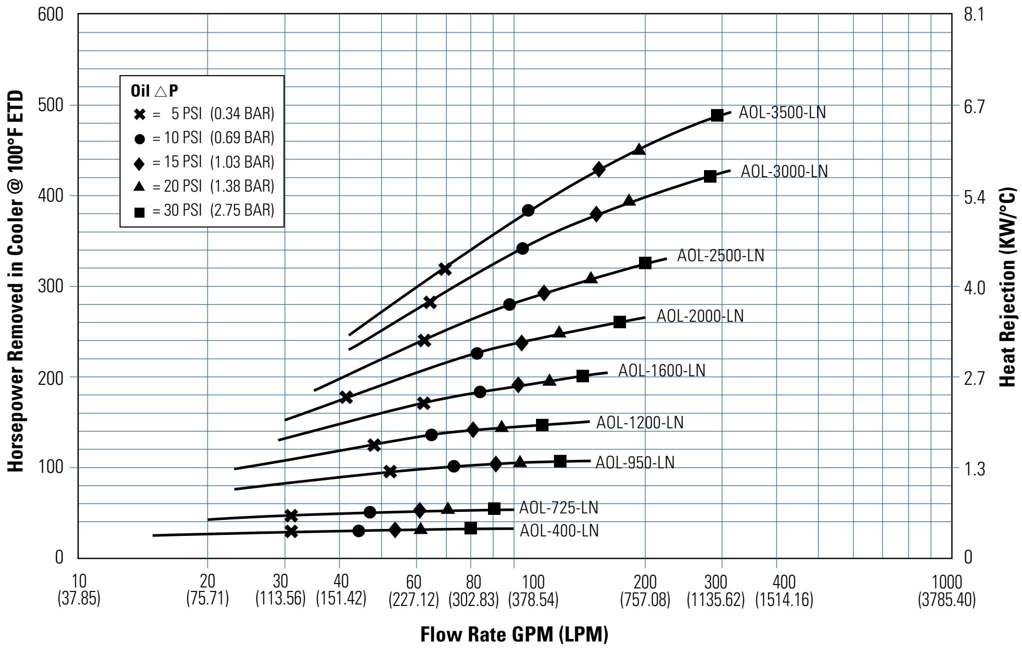
Notes: Maximum Pressure is 2000 psi. Stated Minimum Operating Pressure is at Inlet Port of Motor. 1000 psi Allowable Back Pressure.

Performance Curves



Note: Derate heat rejection values 15% if using 50Hz motors.

Low Noise Option



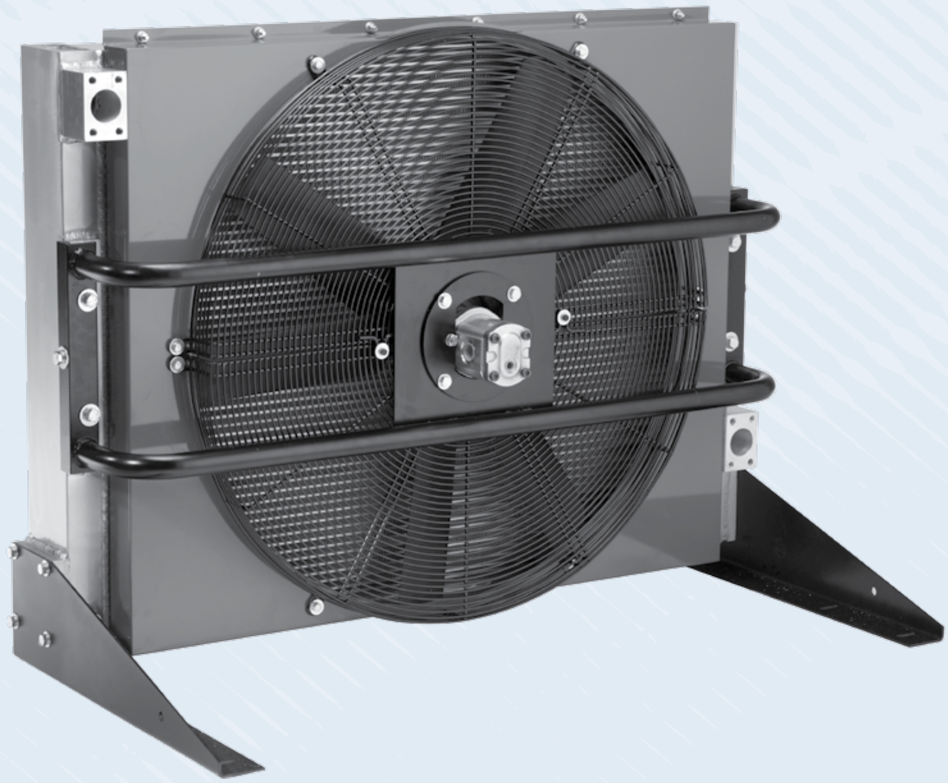
Available in 60 Hz Nema Frame only.

FLUID COOLING | P-Bar Series Industrial BOL

BRAZED ALUMINUM CONSTRUCTION

Features

- 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
- Welded 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
- T-BAR core optional for high viscosity oils or other highly fouling fluids. *See T-Bar Performance Curve
- Low Noise Option Available



Ratings

Maximum Operating Pressure
250 psi (17 BAR)

Maximum Operating Temperature
300° F (150° C)

Materials

Mounting Feet Steel

Standard 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

Fanguard Steel

Connectors Aluminum

Fan Aluminum Hub, Plastic Blades

Shroud Steel

Motor TEFC & IEC

Fluid Compatability

Petroleum/mineral oils

Oil/water emulsion

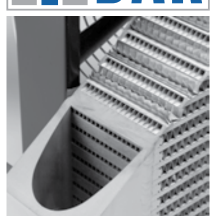
Water/ethylene glycol

How to Order

Model Series	Model Size Selected	Connection Type*	Specify Motor Required	Core	Noise Level
BOL	4 8 16 30 400 725 950 1200 1600 2000	1 - NPT 2 - SAE 3 - BSPP	2 - Single Phase 3 - Three Phase 6 - 575 Volt 9 - Hydraulic 18 - IEC Three Phase	Blank - Standard Bar & Plate TB - T-BAR Core*	Blank - Standard Noise Level LN - Low Noise Level

*T-BAR Core option provides a T-BAR core in BOL frame. Used for high fouling or high viscosity fluids. Performance is typically 15-25% less than the bar and plate core. Consult factory for details.

T-BAR™

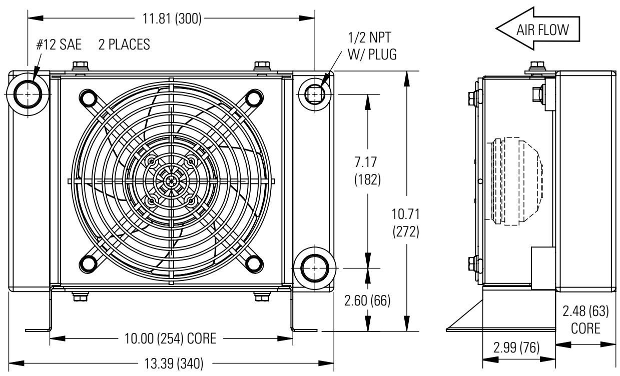


OPTIONAL T-BAR CORE SECTION CUTAWAY

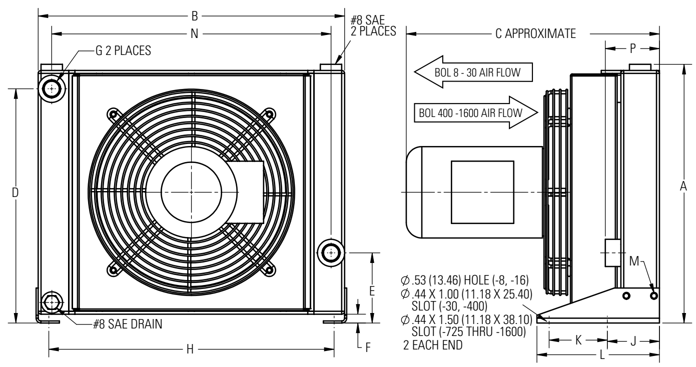
TTPSales@thermasys.com 262.554.8330 www.thermaltransfer.com

Dimensions

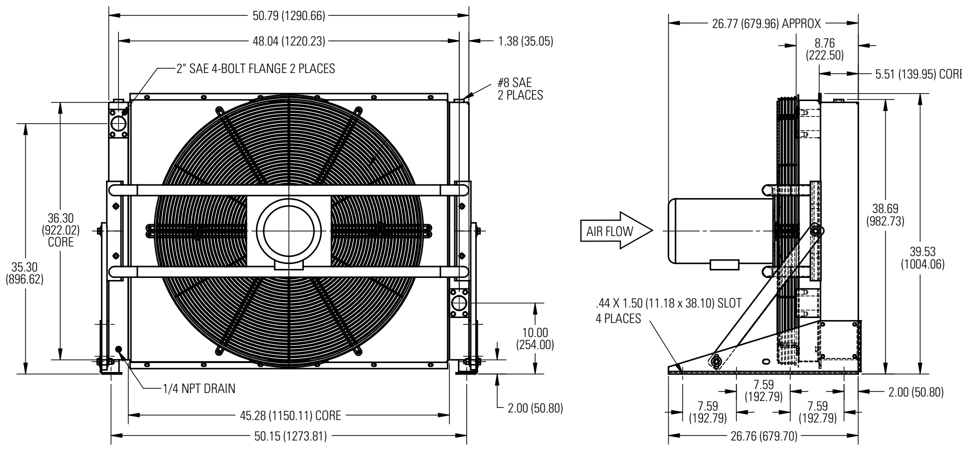
BOL-4



BOL-8 through BOL-1600



BOL-2000



Model	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Approx. Ship Wt. lbs (Kg)
BOL-4	See diagram above			—	—	—	—	—	—	—	—	—	—	—	18 (8.16)
BOL-8	12.93 (328.42)	15.75 (400.05)	14.72 (373.89)	11.30 (287.62)	3.27 (83.06)	.55 (13.97)	#12 SAE	14.53 (369.06)	3.07 (77.98)	3.75 (88.90)	7.36 (186.94)	M8 Bolt (2PL)	14.01 (355.85)	3.48 (88.40)	45 (20.4)
BOL-16	16.63 (422.40)	19.69 (500.13)	16.16 (410.46)	15.06 (382.52)	4.51 (114.56)	.57 (14.48)	#12 SAE	18.30 (464.82)	3.35 (85.09)	3.74 (95.00)	7.87 (199.90)	M8 Bolt (2PL)	17.95 (455.93)	3.46 (87.88)	55 (24.94)
BOL-30	21.09 (535.68)	26.38 (670.06)	18.23 (463.04)	19.49 (495.05)	5.26 (133.60)	1.32 (33.53)	#20 SAE	24.74 (628.40)	4.25 (107.95)	5.00 (127.00)	10.00 (254.00)	M10 Bolt (4PL)	24.34 (618.24)	5.28 (134.11)	125 (56.70)
BOL-400	19.20 (487.68)	22.45 (570.23)	18.80 (477.52)	17.31 (439.67)	6.50 (165.10)	2.00 (50.80)	#20 SAE	22.30 (566.42)	4.25 (107.95)	5.00 (127.00)	10.00 (254.00)	M10 Bolt (4PL)	20.08 (510.03)	5.20 (132.08)	148 (67.13)
BOL-725	23.49 (596.65)	30.32 (770.13)	18.60 (472.44)	21.60 (548.64)	6.50 (165.10)	2.00 (50.80)	#20 SAE	30.17 (766.32)	4.25 (107.95)	5.00 (127.00)	10.00 (254.00)	M10 Bolt (4PL)	27.95 (709.93)	5.20 (132.08)	170 (77.11)
BOL-950	27.94 (709.68)	37.03 (940.56)	22.69 (576.33)	24.55 (623.57)	9.50 (241.30)	2.00 (50.80)	2" SAE 4-Bolt Flange	35.89 (911.61)	6.05 (153.67)	9.20 (233.68)	16.00 (406.40)	M10 Bolt (4PL)	34.26 (870.20)	7.01 (178.05)	300 (136.08)
BOL-1200	27.94 (709.68)	40.96 (1040.38)	24.07 (611.38)	24.55 (623.57)	5.50 (139.70)	2.00 (50.80)		40.31 (1023.87)	6.05 (153.67)	9.20 (233.68)	16.00 (406.40)	M10 Bolt (4PL)	38.19 (970.03)	7.01 (178.05)	430 (195.04)
BOL-1600	36.01 (914.65)	40.96 (1040.38)	25.45 (646.43)	32.62 (828.55)	9.50 (241.30)	2.00 (50.80)		40.31 (1023.87)	6.05 (153.67)	9.20 (233.68)	16.00 (406.40)	M10 Bolt (4PL)	38.19 (970.03)	7.01 (178.05)	515 (233.60)
BOL-2000	See diagram above			—	—	—	—	—	—	—	—	—	—	—	582 (264.00)

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

AIR COOLED BOL

BOL

Specifications

Electric Motor Information (60 Hz Nema Frame)

Model	CMM	CFM	Motor HP	Voltage	Phase	Full Load Amps 230V	Frequency	RPM	Frame	Thermal Overload	Sound dB(A) at 3ft
BOL-4	31.14	1203	1/4	230	1	—	60 Hz	2850	—	—	73
BOL-8	22.65	800	1/3	115/230	1	3.0	60 Hz	3450	48C	No	80
BOL-8	22.65	800	1/3	208-230/460	3	1.4	60 Hz	3450	48C	No	80
BOL-16	40.35	1425	1/2	115/230	1	3.7	60 Hz	3450	48C	No	85
BOL-16	40.35	1425	1/2	208-230/460	3	2.2	60 Hz	3450	48C	No	85
BOL-30	62.29	2200	1/2	115/230	1	3.7	60 Hz	1725	56C	No	85
BOL-30	62.29	2200	1/2	208-230/460	3	2.0	60 Hz	1725	56C	No	85
BOL-400	62.29	2200	1	115/230	1	6.0	60 Hz	3450	56C	No	97
BOL-400	62.29	2200	1	208-230/460	3	3.2	60 Hz	3450	56C	No	97
BOL-725	101.94	3600	1-1/2	115/230	1	8.5	60 Hz	3450	56C	No	100
BOL-725	101.94	3600	1-1/2	208-230/460	3	4.8	60 Hz	3450	56C	No	100
BOL-950	133.10	4700	1-1/2	115/230	1	8.6	60 Hz	1725	145TC	No	92
BOL-950	133.10	4700	1-1/2	208-230/460	3	4.6	60 Hz	1725	145TC	No	92
BOL-1200	198.22	7000	3	208-230/460	3	8.8	60 Hz	1725	182TC	No	94
BOL-1600	223.75	7900	5	208-230/460	3	13.4	60 Hz	1725	184TC	No	96
BOL-2000	396.44	14000	7.5	230/460	3	24.8	60 Hz	1725	213TC	No	98

Electric Motor Information (50 Hz IEC Frame)

Model	CMM	CFM	KW	Voltage	Phase	Frequency	RPM	Frame	Sound dB(A) at 3ft
BOL-4	28.4	1003	.20	230	1	50 Hz	3000	—	73
BOL-8	18.9	667	.25	230/400/415	3	50 Hz	3000	63	71
BOL-16	33.7	1188	.37	230/400/415	3	50 Hz	3000	71	77
BOL-30	52.4	1850	.37	230/400/415	3	50 Hz	1500	71	73
BOL-400	52.4	1850	.75	230/400/415	3	50 Hz	3000	80	81
BOL-725	85.0	3000	1.10	230/400/415	3	50 Hz	3000	80	80
BOL-950	108.2	3821	1.50	230/400/415	3	50 Hz	1500	90	78
BOL-1200	165.1	5834	2.20	230/400/415	3	50 Hz	1500	100	83
BOL-1600	186.4	6584	3.00	230/400/415	3	50 Hz	1500	100	85
BOL-2000	331.3	11700	4.00	230/400/415	3	50 Hz	1500	112	88

All IEC frame motors have CE mark.
IEC motor voltages have +/- 10% tolerance.

Hydraulic Motor Information

Model	Oil Flow Required GPM (LPM)	Min. Pressure Required PSI (BAR)	Motor IN³/REV (CM³/REV) Displacement	Sound dB(A) at 3 ft.
BOL-4	3.3 (12.49)	400 (27.58)	0.22 (3.6)	80
BOL-8	3.3 (12.49)	400 (27.58)	0.22 (3.6)	80
BOL-16	3.3 (12.49)	500 (34.47)	0.22 (3.6)	85
BOL-30	3.4 (12.87)	500 (34.47)	0.45 (7.3)	85
BOL-400	3.3 (12.49)	425 (29.30)	0.22 (3.6)	97

Model	Oil Flow Required GPM (LPM)	Min. Pressure Required PSI (BAR)	Motor IN³/REV (CM³/REV) Displacement	Sound dB(A) at 3 ft.
BOL-725	3.3 (12.49)	675 (46.50)	0.22 (3.6)	100
BOL-950	10.1 (38.23)	300 (20.70)	1.4 (22.9)	92
BOL-1200	10.1 (38.23)	725 (50.00)	1.4 (22.9)	94
BOL-1600	10.1 (38.23)	1100 (75.80)	1.4 (22.9)	96
BOL-2000	10.1 (38.23)	1650 (113.76)	1.4 (22.9)	98

Notes: Maximum Pressure is 2000 psi. Stated Minimum Operating Pressure is at Inlet Port of Motor. 1000 psi Allowable Back Pressure.

Selection Procedure

Step 1 **Determine Heat Load.** Typical Rule of Thumb, -size cooler for 1/3 of the input horsepower. Heat load may be expressed as either Horsepower or BTU/Hr or KW/°C.

HP=BTU/HR ÷ 2545

BTU/HR=HP x 2545

$$\text{BTU/HR} = \frac{\text{KW}}{°\text{C}} \times 1894.61 \times \text{E.T.D.}(°\text{F})$$

Step 2 **Determine Entering Temperature Difference.** (Actual E.T.D.)

$$\text{E.T.D.} = \begin{array}{c}\text{Entering oil}\\ \text{temperature}\end{array} - \begin{array}{c}\text{Entering Ambient}\\ \text{air temperature}\end{array}$$

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.

Step 3 **Determine the Corrected Heat Dissipation to use the Curves**

ENGLISH Version

$$\begin{array}{c}\text{Corrected}\\ \text{Heat Rejection}\end{array} = \begin{array}{c}\text{(BTU/Hr)}\\ \text{Heat Load}\end{array} \times \frac{100°\text{F}}{\text{Desired E.T.D.}}$$

(BTU/HR) to use with selection chart

METRIC Version

$$\begin{array}{c}\text{Corrected}\\ \text{Heat Rejection}\end{array} \frac{\text{KW}}{°\text{C}} = \frac{\text{Heatload (kw)}}{\text{Desired E.T.D. (°C)}}$$

Step 4 **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 3. Any Model or Curve on or above this point will meet these conditions.

Step 5 **Calculate Oil Pressure Drop** Find the oil pressure drop correction factor and multiply it by the Oil Pressure Drop found on performance curve.

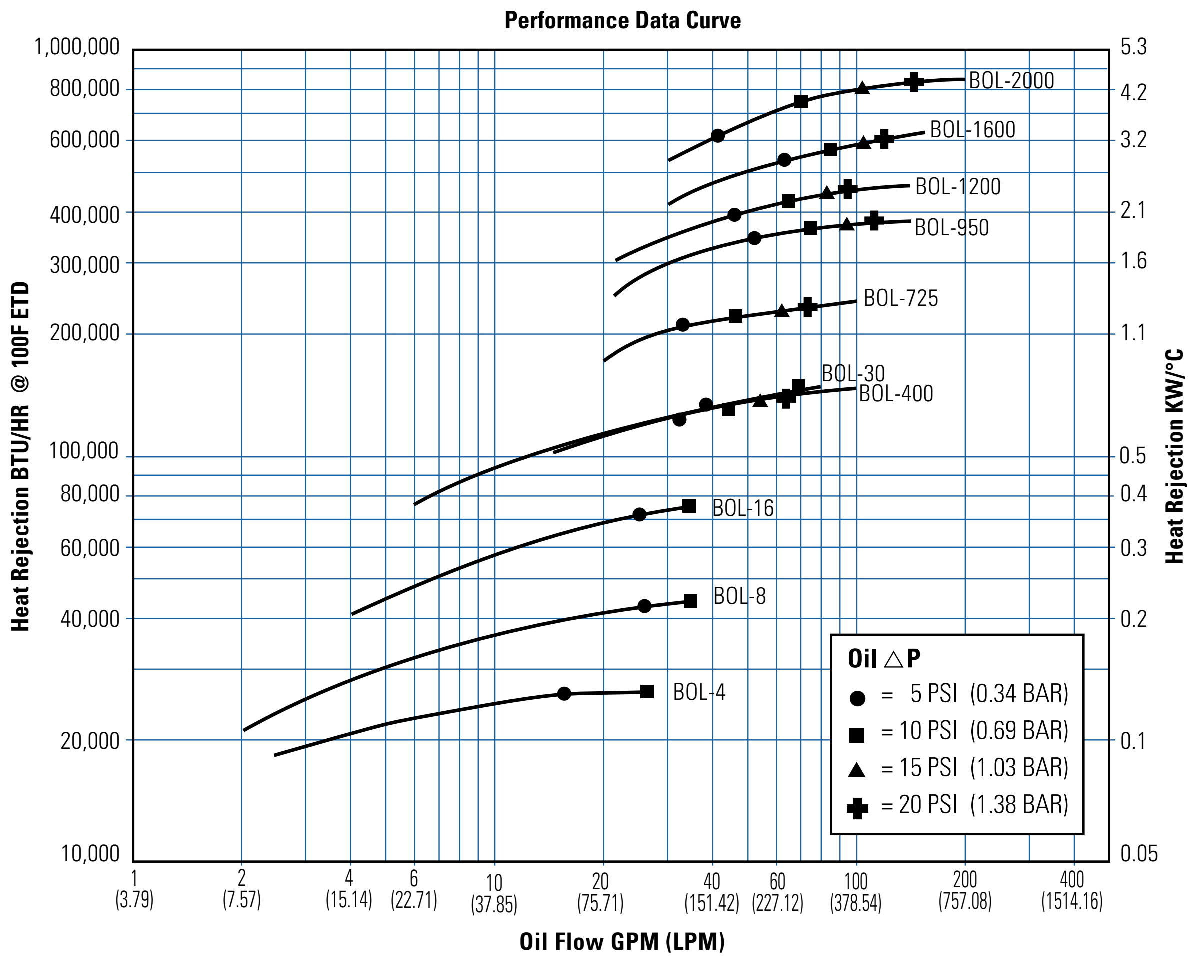
Listed Performance Curves are based on:

- 50 SSU (11 cSt) oil
- 100° F (55.56° C) Entering Temperature Difference (E.T.D.)

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

Performance Curves

BOL Models with Standard P-BAR Core

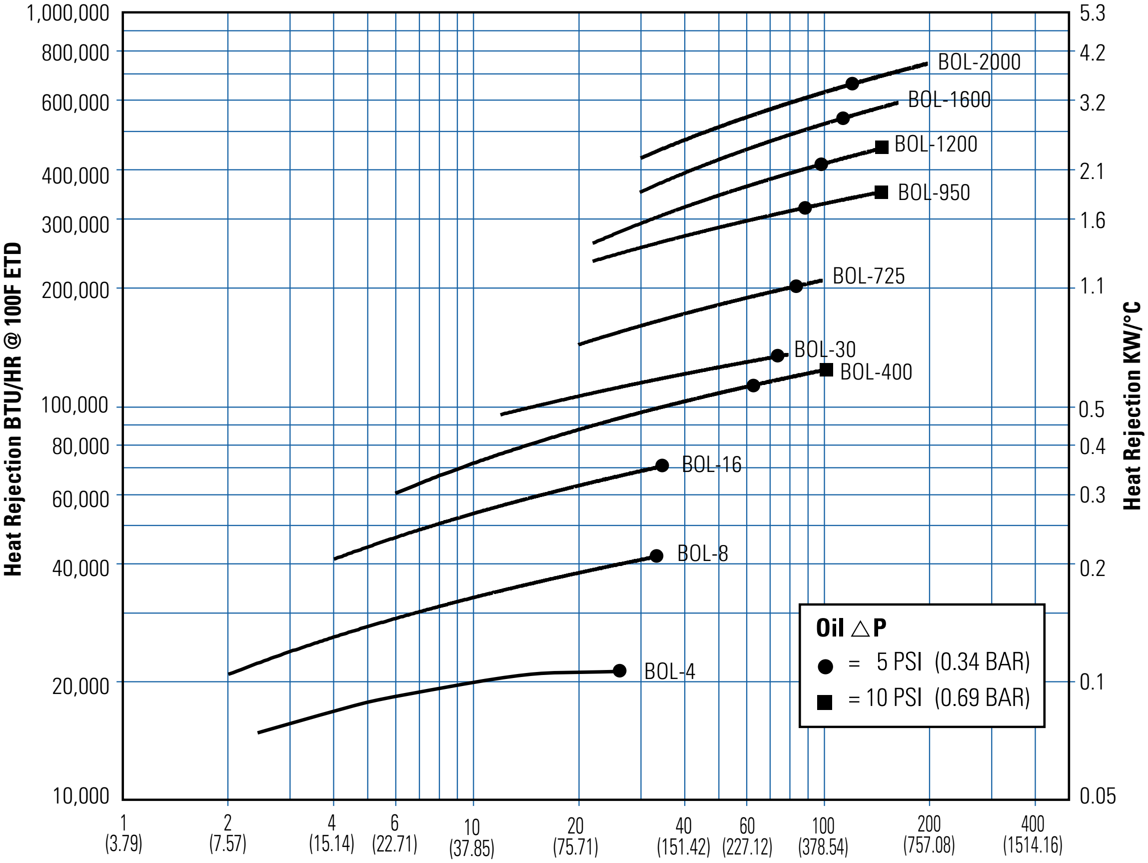


Note: Derate heat rejection values 15% if using 50Hz motors.

Performance Curves

BOL Models with Optional T-BAR Core

Performance Data Curve



Oil Flow GPM (LPM)

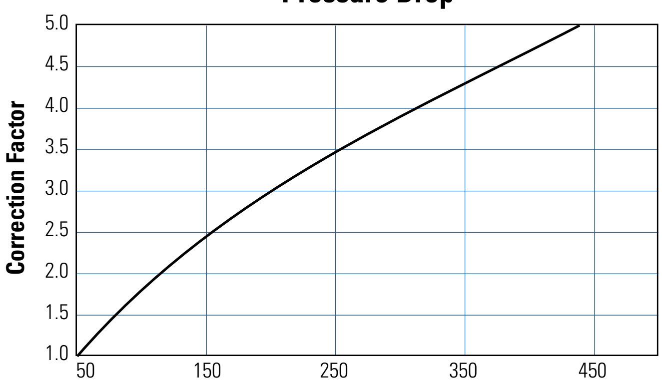
T-BAR™

OPTIONAL T-BAR CORE SECTION CUTAWAY

Note: Derate heat rejection values 15% if using 50Hz motors.

AIR COOLED BOL

Pressure Drop



Viscosity (SSU)

Oil Temperature

Typical operating temperature ranges are:

Hydraulic Motor Oil	120°F - 180°F (49°C - 82.2°C)
Hydrostatic Drive Oil	160°F - 180°F (71°C - 82.2°C)
Engine Lube Oil	180°F - 200°F (82.2°C - 93.3°C)
Automatic Transmission Fluid	200°F - 300°F (93.3°C - 149°C)

Desired Reservoir Temperature

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

Off-Line Recirculation Cooling Loop: Desired reservoir temperature is the oil temperature entering the cooler.

Return Line Cooling: Desired reservoir temperature is the oil temperature leaving the cooler. In this case, the oil temperature change must be determined so that the actual oil entering temperature can be found. Calculate the oil temperature change (oil △T) with this formula:

Oil △T = (BTU's/Hr.) / (GPM Oil Flow x 210).

To calculate the oil entering temperature to the cooler, use this formula:

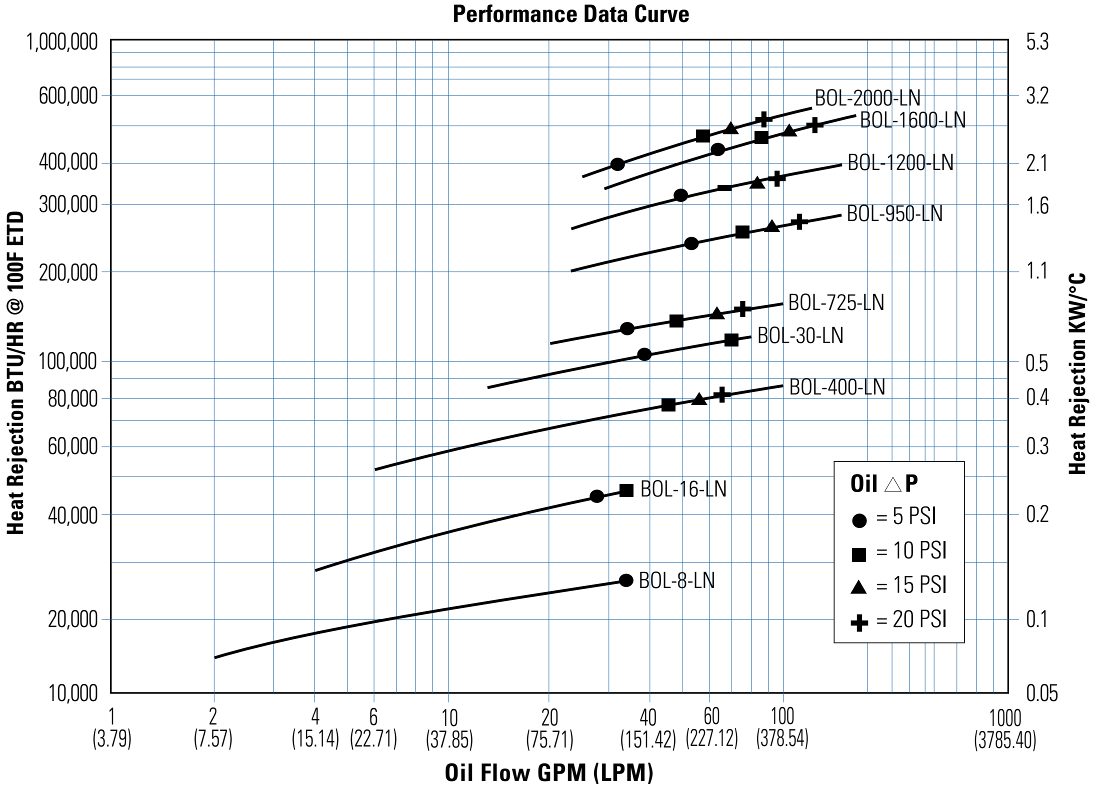
Oil Entering Temp. = Oil Leaving Temp + Oil △T.

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.

Performance Curves

BOL Models with Low-Noise Option

The low noise option offers the BOL models with a reduced motor speed.
This allows a lower sound level output for noise-sensitive applications.



Available on 60 Hz Nema frame only.

Electric Motor Information

Model	HP	Frame	Low Noise RPM	Low Noise CFM	Low Noise CMM	Voltage	Frequency (HZ)
8-1PH	0.33	48	1725	400	11.33	115/230	60
8-3PH	0.33	48	1725	400	11.33	208-230/460	60
16-1PH	0.50	48	1725	704	19.93	115/230	60
16-3PH	0.50	48	1725	704	19.93	208-230/460	60
30-1PH	0.50	56C	1160	1470	41.62	115/230	60
30-3PH	0.50	56C	1160	1470	41.62	208-230/460	60
400-1PH	1.00	56C	1725	1100	31.19	115/230	60
400-3PH	1.00	56C	1725	1100	31.19	208-230/460	60
725-1PH	1.50	56C	1725	1780	50.40	115/230	60
725-3PH	1.50	56C	1725	1780	50.40	208-230/460	60
950-1PH	1.50	145TC	1160	3150	89.19	115/230	60
950-3PH	1.50	145TC	1160	3150	89.19	208-230/460	60
1200-3PH	1.50	182TC	1160	4690	132.81	208-230/460	60
1600-3PH	2.00	184TC	1160	6510	184.34	208-230/460	60
2000-3PH	5.00	213TC	1160	8700	000.00	230/460	60

Sound Data

Model	DBA at 3 ft
BOL-8-LN	62
BOL-16-LN	69
BOL-30-LN	67
BOL-400-LN	72
BOL-725-LN	82
BOL-950-LN	76
BOL-1200-LN	75
BOL-1600-LN	78
BOL-2000-LN	85

BRAZED ALUMINUM CONSTRUCTION

Features

- 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
- Fan motor assembly has an IP68 with AMP-#180908 connection
- 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
- Additional capabilities for radiators, charge-air-coolers, condensers, and multi-circuit units
- Optional temperature sensors *(see pg. 171)*

30/60 psi Bypass available

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

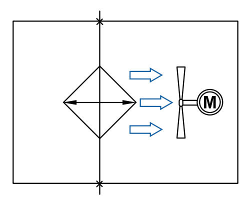
Materials

Core Brazed Aluminum Bar and Plate

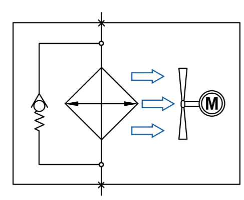
- Tanks – 5052 Aluminum
- Nose Bar & Little Bar – 3003-H Aluminum
- Air Fin, Plate, Turbulator & End Plate – 3003-O Aluminum

Connections Aluminum

Core Mounting Brackets Brazed Aluminum



Without Bypass



With Bypass

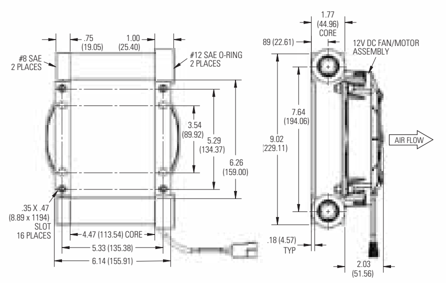
How to Order

Model Series	–	Model Size Selected	–	Connection Type*	–	Bypass*	–	Specify Motor Required
MA (MAR)		3 3.5 4 12 18 32 48 232 248		1 - NPT 2 - SAE 3 - BSPP		30 - 30 PSI 60 - 60 PSI		4A - 12 VDC 4B - 24 VDC

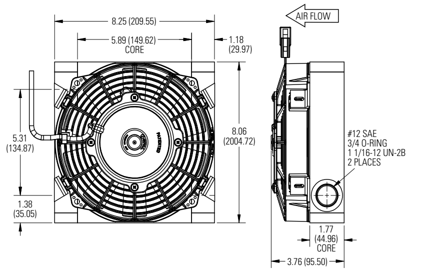
*Bypass available on MA-12, MA-18, MA-32, MA-48, MA-232, MA-248 only. (MAR)
MA-8, MA-14, MA-20, MA-66, MA-32 do not have fan option.
MA 3.5 available with fan only.

Dimensions - Fan/Core

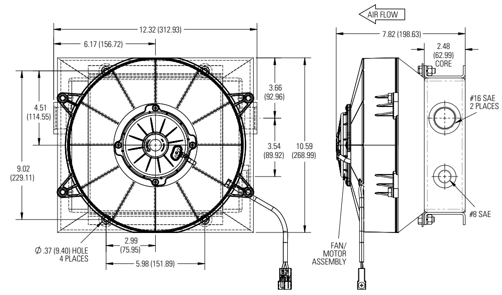
MA-3



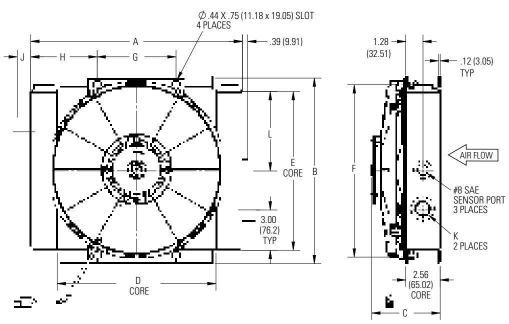
MA-3.5



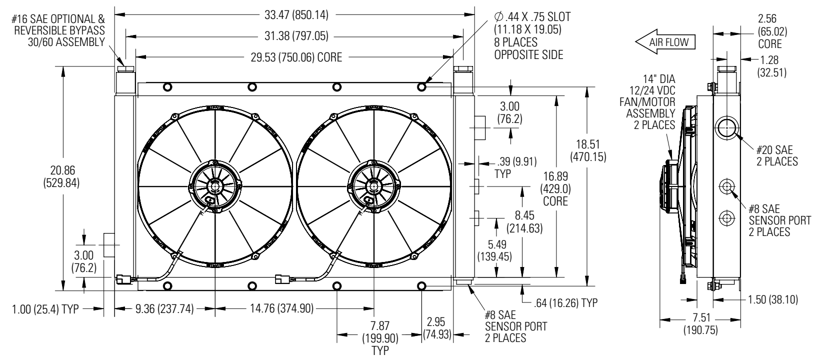
MA-4



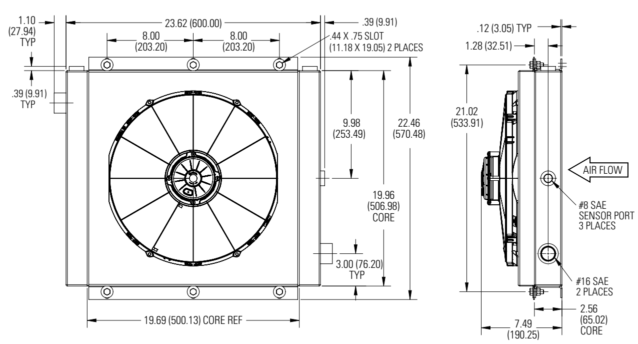
MA-12, MA-18, MA-32



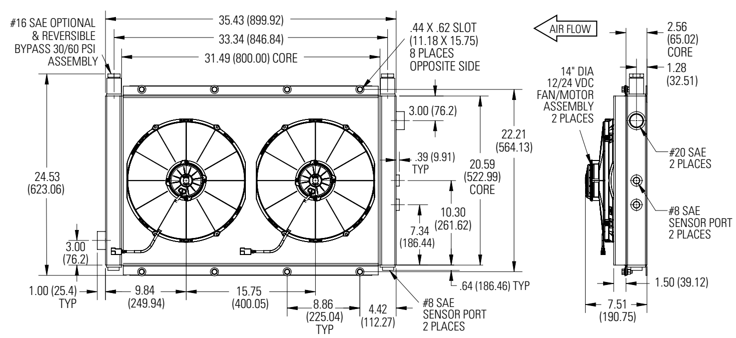
MA-232



MA-48



MA-248

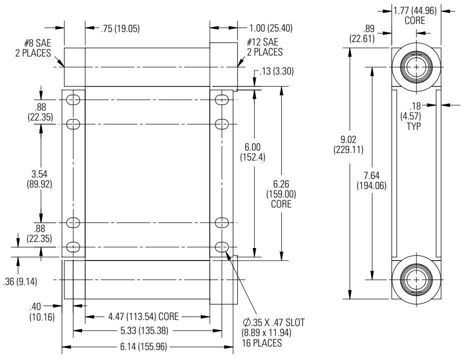


Model	A	B	C	D	E	F	G	H	J	K	L	DC Amp Draw 12V	24V	CFM (CMM)	Approx. Ship Wt. lbs (Kg)
MA-3	See diagram above			—	—	—	—	—	—	—	—	5.7	3.6	300 (8.50)	6 (2.72)
MA-3.5	See diagram above			—	—	—	—	—	—	—	—	12.5	6.3	370 (10.48)	9 (4.08)
MA-4	See diagram above			—	—	—	—	—	—	—	—	12.5	6.3	363 (10.28)	16 (7.26)
MA-12	13.78 (350.01)	11.81 (299.97)	6.26 (159.00)	9.84 (249.94)	9.96 (252.98)	10.87 (276.10)	5.71 (145.00)	4.41 (112.01)	1.00 (25.40)	#12 SAE	4.98 (126.49)	12.5	6.3	521 (14.75)	19 (8.62)
MA-18	15.75 (400.05)	13.81 (350.77)	5.04 128.02)	11.81 (299.97)	11.81 (299.97)	12.80 (325.12)	5.87 (149.10)	4.96 (125.98)	1.00 (25.40)	#12 SAE	5.91 (150.11)	10.6	5.3	783 (22.17)	23 (10.43)
MA-32	19.69 (500.15)	18.54 (470.92)	5.95 (151.13)	15.75 (400.05)	16.14 (409.96)	17.32 (439.93)	12.00 (304.8)	3.86 (98.04)	1.14 (28.96)	#16 SAE	8.07 (204.98)	22.2	11.1	1368 (38.74)	28 (12.70)
MA-48	See diagram above			—	—	—	—	—	—	—	—	22.2	11.1	1637 (46.40)	45 (20.40)
MA-232	See diagram above			—	—	—	—	—	—	—	—	19.3*	9.7*	2234 (63.26)	65 (29.48)
MA-248	See diagram above			—	—	—	—	—	—	—	—	19.3*	9.7*	2904 (82.24)	90 (40.80)

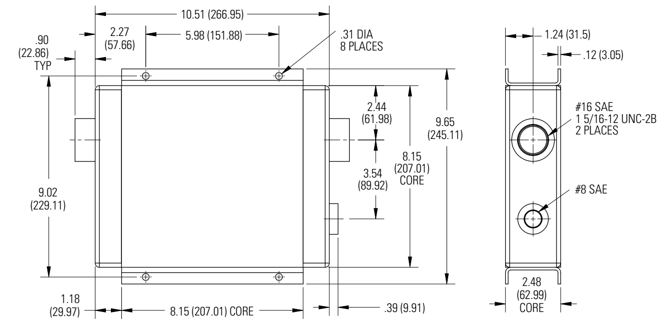
Note: We reserve the right to make reasonable design changes without notice. Dimensions are in inches and (millimeters).
**AMP draw listed as per FAN.*

Dimensions - Core Only

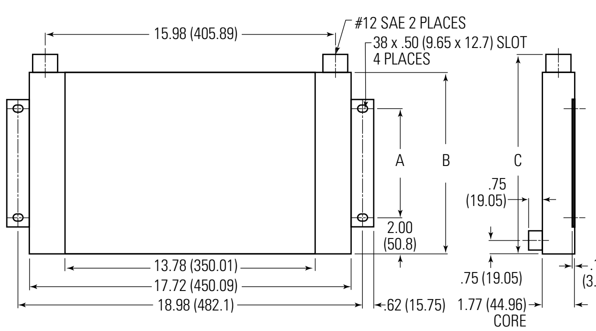
MA-3



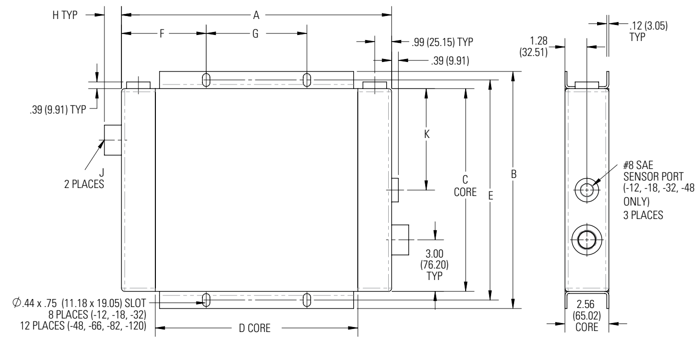
MA-4



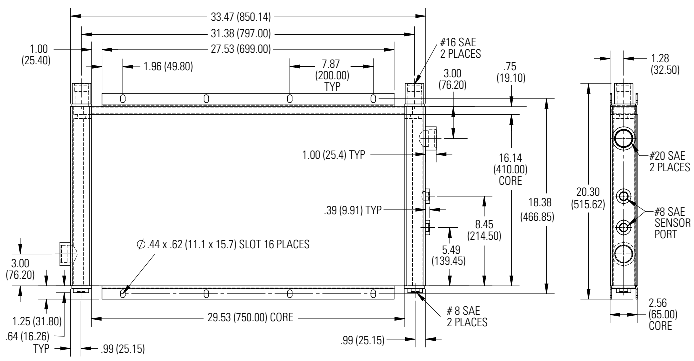
MA-8, MA-14, MA-20



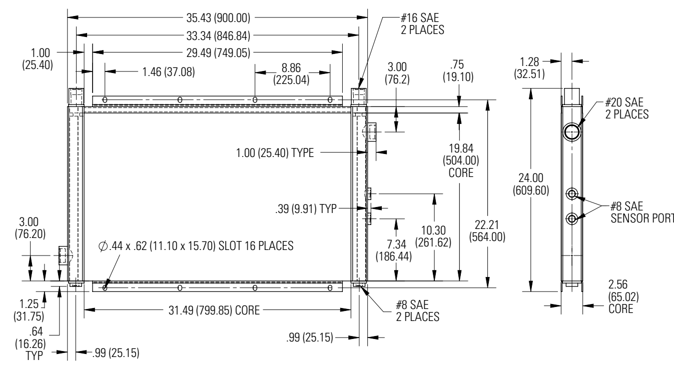
MA-12 thru MA-120



MA-232



MA-248



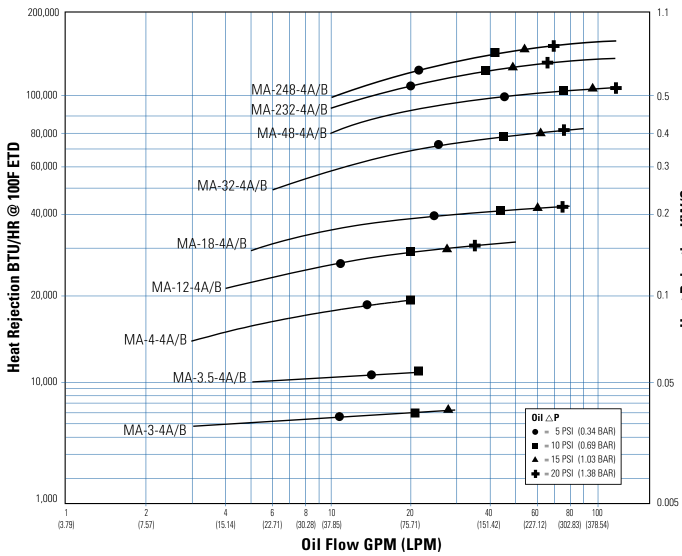
Model	A	B	C	D	E	F	G	H	J	K	Approx. Ship Wt. lbs (Kg)
MA-3	See diagram above			–	–	–	–	–	–	–	4 (1.81)
MA-4	See diagram above			–	–	–	–	–	–	–	7 (3.18)
MA-8	3.00 (76.2)	5.67 (144.02)	6.65 (168.9)	–	–	–	–	–	–	–	10 (4.54)
MA-12	13.78 (350.01)	11.81 (299.97)	9.96 (252.98)	9.84 (294.94)	10.98 (278.89)	4.04 (102.62)	5.71 (145.03)	1.00 (25.4)	#12 SAE	4.98 (126.49)	15 (6.8)
MA-14	6.00 (152.4)	10.00 (254.0)	10.98 (278.89)	–	–	–	–	–	–	–	14 (6.35)
MA-18	15.75 (400.05)	13.81 (350.77)	11.81 (299.97)	11.81 (299.97)	12.82 (325.63)	4.94 (125.48)	5.87 (149.10)	1.00 (25.4)	#12 SAE	5.91 (150.11)	18 (8.16)
MA-20	10.00 (254.0)	14.33 (363.98)	15.31 (388.87)	–	–	–	–	–	–	–	18 (8.16)
MA-32	19.69 (500.13)	18.54 (470.92)	16.14 (409.96)	15.75 (400.05)	17.32 (439.93)	3.85 (97.79)	12.00 (304.8)	1.10 (27.94)	#16 SAE	8.07 (204.98)	28 (12.7)
MA-48	23.62 (599.95)	22.13 (562.10)	19.96 (506.98)	19.69 (500.13)	21.02 (533.91)	3.81 (96.77)	8.00 (203.2)	1.10 (27.94)	#16 SAE	9.98 (253.49)	41 (18.60)
MA-66	27.56 (700.02)	25.83 (656.08)	23.54 (597.92)	23.62 (599.95)	24.72 (627.89)	3.78 (96.01)	10.00 (254.0)	1.58 (40.13)	#20 SAE	–	50 (22.68)
MA-82	31.50 (800.1)	27.68 (703.07)	25.39 (644.91)	27.56 (700.02)	26.57 (674.8)8	5.75 (146.05)	10.00 (254.0)	1.58 (40.13)	#24 SAE	–	65 (29.48)
MA-120	31.50 (800.1)	39.49 (1003.05)	37.20 (944.88)	27.56 (700.02)	38.39 (975.11)	5.75 (146.05)	10.00 (254.0)	1.58 (40.13)	#24 SAE	–	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 and (millimeters).

Performance Curves

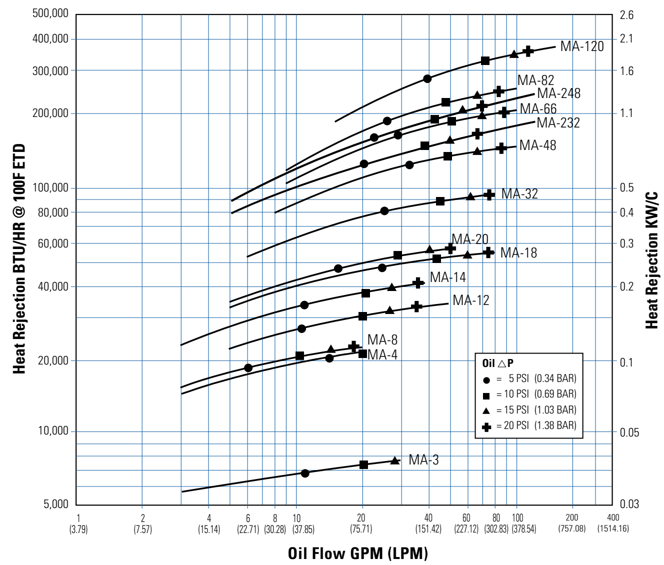
MA Models with DC Fan Assemblies

Performance Data Curve

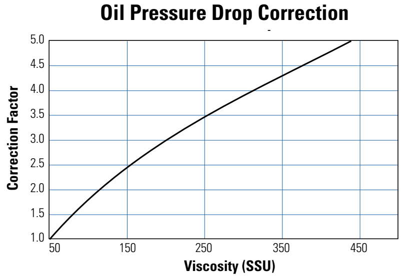


MA Models (No Fan, Core Only)

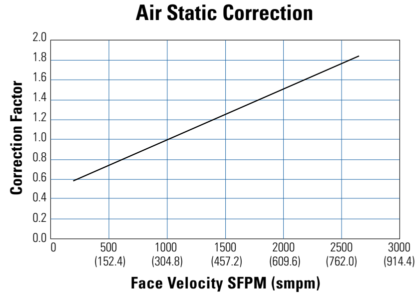
Performance Data Curve



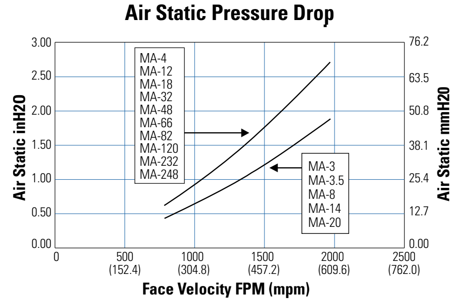
Oil Pressure Drop Correction



Air Static Correction



Air Static Pressure Drop



Selection Procedure

Step 1 **Determine Heat Load.** Typical Rule of Thumb, - size cooler for 1/3 of the input horsepower. Heat load may be expressed as either Horsepower or BTU/HR or KW/°C.

HP = BTU/HR ÷ 2545

BTU/HR = HP x 2545

$$\text{BTU/HR} = \frac{\text{KW}}{°\text{C}} \times 1895 \times \text{E.T.D.}(°\text{F})$$

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**
(Skip to Step 4 if using our DC Fan Assembly)

Calculate actual SFPM Air Velocity or SCFM (Standard Cubit 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

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

(BTU/HR) to use with selection chart

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

METRIC Version

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

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

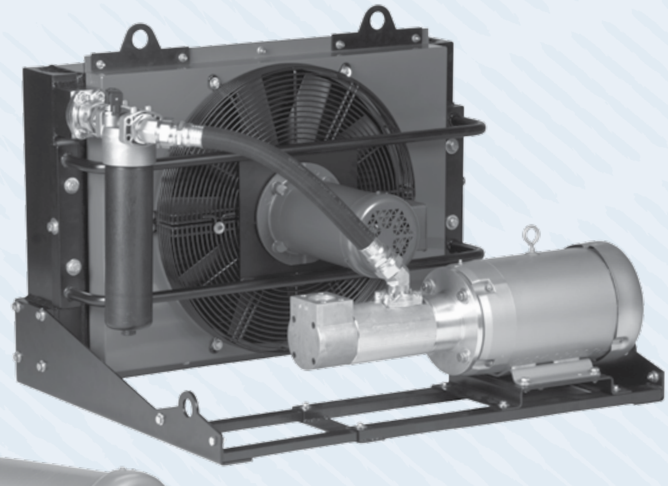
- 50 SSU (11 cSt) oil
- 1000 Standard Feet per Minute (SPFM) (304.8 MPM) Air Velocity
- 100° F (55.56° C) Entering Temperature Difference (E.T.D.)

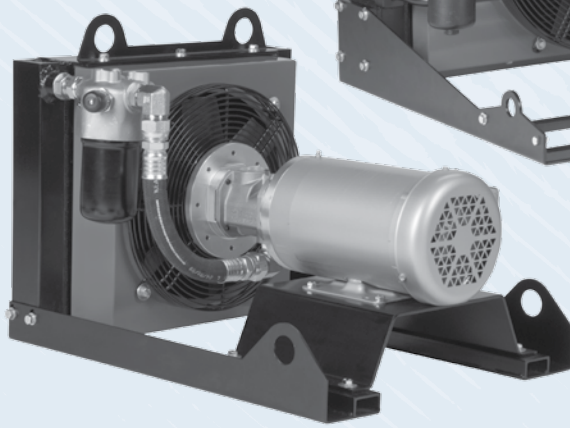
If your application conditions are different, then continue with the selection procedure.

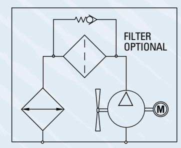
BRAZED ALUMINUM CONSTRUCTION

Features

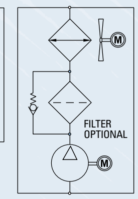
- **Ideal for independent cooling and filtering of system oils**
- **Low to medium pressure applications utilizing low noise screw pump technology**
- **Pump flows ranging 9.5 gpm to 45 gpm**
- **Bar and Plate Brazed Aluminum P-BAR core with optional T-Bar core**
- **Best heat transfer per given envelope size while minimizing pressure drop**
- **Standard SAE ports - NPT and BSPP port adapters available**
- Optional cartridge-style filters with both visual and electrical bypass indicator options
- Optional temperature sensors *(see pgs. 169 & 170)*







COL 8-400



COL 725-1600

Ratings

Maximum Operating Pressure
250 PSI (17 BAR)

Maximum Operating Temperature
300° F (150° C) without filter
230° F (110° C) with filter

Maximum Viscosity
P-BAR 150 cst
T-BAR 320 cst

Materials

Mounting Feet Steel

Standard Core Brazed Aluminum Plate and Bar (T-Bar is optional)

- Tanks 5052 Aluminum
- Nose Bar and Little Bar 3003-H Aluminum
- Air Fin, Plate, Turbulator and End Plate 3003-O Aluminum

Fanguard and Shroud Steel

Connectors Aluminum

Fan Aluminum Hub, Plastic Blades

Motor NEMA

Fluid Compatability

Petroleum
Water/ethylene glycol
Cutting oils (contact TTP)
Water-oil emulsions
Water-Ethylene Glycol emulsions
Mineral oil HLP and HLVP
Ecologic fluids HETG-HEPG-HEE
Lubrication high viscosity oils
MIL-H, SKYDROL/HFDR phosphate ester*

**Standard pump seals are not compatible with phosphate ester. Special pumps with EPDM seals are required. Consult factory for details.*

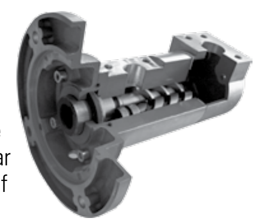
Micron Filtration

Utilize a modern in-line filter housing and cartridge

- Utilizes a standard cartridge element
- Filter Options:
  - 10 micron fiberglass, standard
  - 3, 6, and 25 micron fiberglass, optional
  - Consult factory for high viscosity fluids
- ß 1000 filtration efficiency
- Filtration indicator
  Visual, visual/electrical or electrical

Screw Pump Technology

offering significant maintenance and performance advantages.



Screw pumps meet the need of having a silent hydraulic component, unique pump design offers the characteristics of a gear pump and the silence of a screw pump.

- Reliable, high performance, low noise
- Run without pulsation, providing long life to your application
- Positive displacement rotary pump with axial flow design
- Only three moving parts
- Rolling action eliminates noise and vibration

How to Order

Model Series	Model Size Selected	Ports	Pump*	Motor	Filter	Indicator	Core	Heresite
COL	8 • 16 • 30 400 • 725 • 950 1200 • 1600	1 - NPT 2 - SAE 3 - BSPP	20 - 20cc 40 - 40cc 80 - 80cc 100 - 100cc	0 - No Motor 3 - 3ph	Blank - None 3 - 3μ 6 - 6μ 10 - 10μ 25 - 25μ	Blank - None V - Visual E - Electrical EV - Electrical/ Visual	Blank - Standard TB** - T-BAR Optional	Blank - Standard Paint HC - Heresite

*20cc & 40cc – Sizes 8, 16, 30, and 400 only. 80cc & 100cc – Sizes 725, 950, 1200, and 1600 only.
**T-BAR Core option provides a T-BAR core in COL frame. Used for high fouling or high viscosity fluids. Performance is typically 15-25% less than the bar and plate core. Consult factory for details.

Specifications

Pump/Fan Motor Data (COL-8 – COL-400)

Model	Actual Displacement CUIN (CC)	GPM (LPM) Flow	Operating Pressure PSI (BAR)	Motor HP	RPM	Voltage	PH/HZ	Full Load Amps 208-230/460	Frame Size	Fan CFM (CMM) Air Flow	Overall Sound dB(A) at 3 ft (1 m)
COL-8	1.22 (20)	9.5 (36)	130 (9)	1.5	1800	208-230/460	3/60	4.5-4.4/2.2	145TC	418 (11.83)	67
	2.44 (40)	21 (79)	130 (9)	3	1800	208-230/460	3/60	9-8.4/4.2	182TC	418 (11.83)	67
COL-16	1.22 (20)	9.5 (36)	130 (9)	1.5	1800	208-230/460	3/60	4.5-4.4/2.2	145TC	745 (21.09)	73
	2.44 (40)	21 (79)	130 (9)	3	1800	208-230/460	3/60	9-8.4/4.2	182TC	745 (21.09)	73
COL-30	1.22 (20)	9.5 (36)	130 (9)	1.5	1800	208-230/460	3/60	4.5-4.4/2.2	145TC	2200 (62.29)	85
	2.44 (40)	21 (79)	130 (9)	3	1800	208-230/460	3/60	9-8.4/4.2	182TC	2200 (62.29)	85
COL-400	1.22 (20)	9.5 (36)	130 (9)	1.5	1800	208-230/460	3/60	4.5-4.4/2.2	145TC	1149 (32.53)	77
	2.44 (40)	21 (79)	130 (9)	3	1800	208-230/460	3/60	9-8.4/4.2	182TC	1149 (32.53)	77

Performance based upon 46 cSt oil, 60 Hz

Pump Motor Data (COL-725 – COL-1600)

Model	Actual Displacement CUIN (CC)	GPM (LPM) Flow	Operating Pressure PSI (BAR)	Motor HP	RPM	Voltage	PH/HZ	Full Load Amps 208-230/460	Frame Size	Overall Sound dB(A) at 3 ft (1 m)
COL-725	4.52 (74)	35 (133)	218 (15)	7.5	1800	208-230/460	3/60	21-18.8/9.4	213TC	100
	5.68 (93)	45 (169)	203 (14)	7.5	1800	208-230/460	3/60	21-18.8-9.4	213TC	100
COL-950	4.52 (74)	35 (133)	218 (15)	7.5	1800	208-230/460	3/60	21-18.8/9.4	213TC	92
	5.68 (93)	45 (169)	203 (14)	7.5	1800	208-230/460	3/60	21-18.8-9.4	213TC	92
COL-1200	4.52 (74)	35 (133)	218 (15)	7.5	1800	208-230/460	3/60	21-18.8/9.4	213TC	94
	5.68 (93)	45 (169)	203 (14)	7.5	1800	208-230/460	3/60	21-18.8-9.4	213TC	94
COL-1600	4.52 (74)	35 (133)	218 (15)	7.5	1800	208-230/460	3/60	21-18.8/9.4	213TC	96
	5.68 (93)	45 (169)	203 (14)	7.5	1800	208-230/460	3/60	21-18.8-9.4	213TC	96

Performance based upon 46 cSt oil, 60 Hz

Fan Motor Data (COL-725 – COL-1600)

Model	Motor HP	RPM	Voltage	PH/HZ	Full Load Amps 208-230/460	Frame Size	Fan CFM (CMM) Air Flow
COL-725	1.5	3450	208-230/460	3/60	4.9-4.6/2.3	56C	3600 (101.94)
COL-950	1.5	1750	208-230/460	3/60	5.1-4.8/2.4	145TC	4700 (133.10)
COL-1200	3	1750	208-230/460	3/60	9.1-8.4/4.2	182TC	7000 (198.22)
COL-1600	5	1750	208-230/460	3/60	14.2-13.6/6.8	184TC	7900 (223.75)

Performance based upon 46 cSt oil, 60 Hz

Desired Reservoir Temperature

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

Off-Line Recirculation Cooling Loop: Desired reservoir temperature is the oil temperature entering the cooler.

Return Line Cooling: Desired reservoir temperature is the oil temperature leaving the cooler. In this case, the oil temperature change must be determined so that the actual oil entering temperature can be found. Calculate the oil temperature change (oil △T) with this formula:

Oil △T °F (°C) = (BTU/hr ÷ [GPM oil flow x 210])
[KW ÷ (LPM Oil Flow x .029)]

To calculate the oil entering temperature to the cooler, use this formula:

Oil Entering Temp. = Oil Leaving Temp + Oil △T.

Oil Pressure Drop: Most systems can tolerate a pressure drop through the heat exchanger of 19 to 30 PSI (1.3 to 2.1 BAR). Excessive pressure drop should be avoided. Care should be taken to limit pressure drop to 5 PSI (.35 BAR) or less for case drain applications where high back pressure may damage the pump shaft seals.

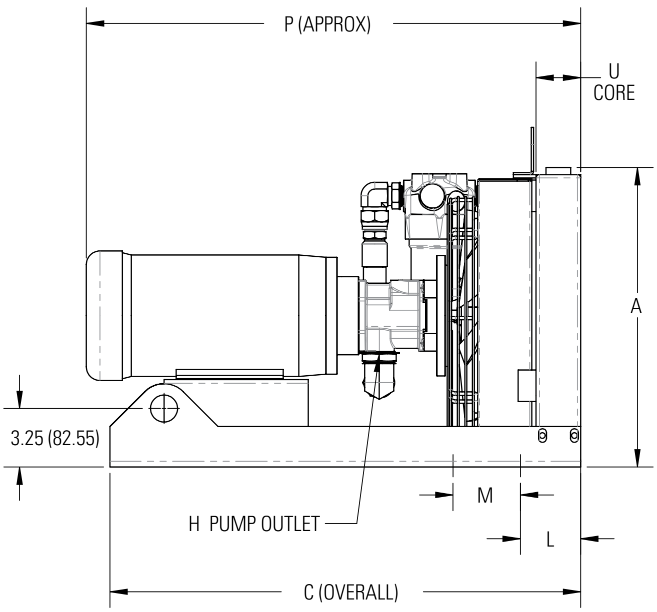
Oil Temperature

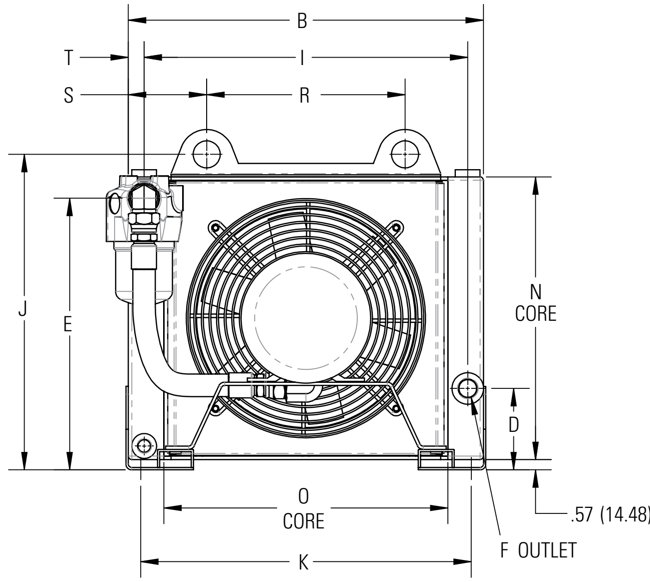
Typical operating temperature ranges are:

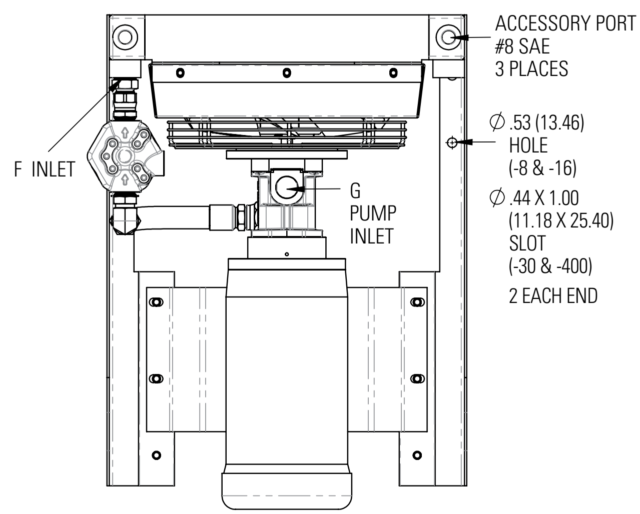
Hydraulic Motor Oil	120 - 180°F (49 - 82°C)
Hydrostatic Drive Oil	160 - 180°F (71 - 82°C)
Engine Lube Oil	180 - 199°F (82 - 93°C)
Automatic Transmission Fluid	199 - 300°F (93 - 149°C)

Dimensions

COL-8 through COL-400





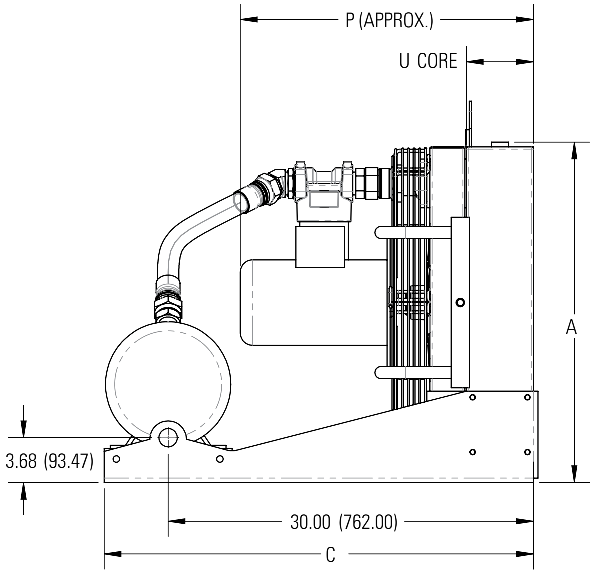


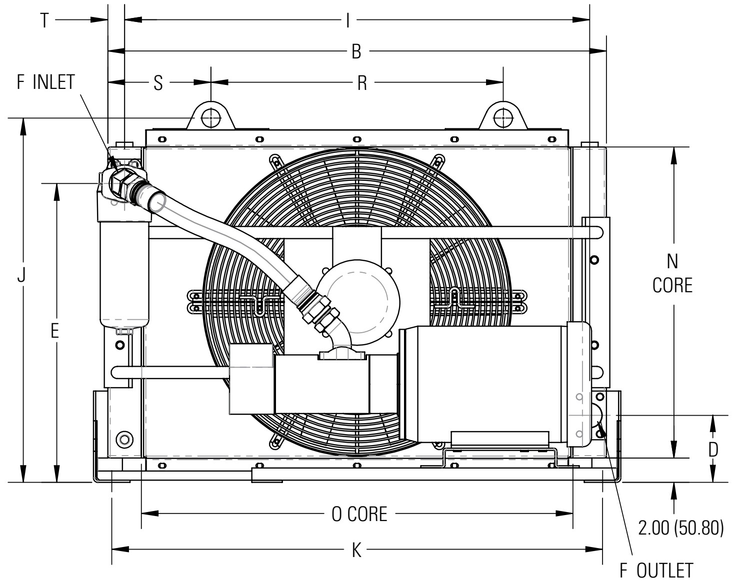
Model	A	B	C	D	E	F	G (Pump Intlet)	H (Pump Outlet)	I	J	K	L	M	N	O	P	R	S	T	U
COL-8-20	12.93 (328)	15.75 (400)	26.13 (664)	4.51 (115)	11.34 (288)	#12 SAE	#12 SAE	#16 SAE	13.99 (355)	13.79 (350)	14.39 (366)	3.35 (85)	3.74 (95)	11.97 (304)	11.81 (300)	27.09 (688)	6.50 (165)	3.75 (95)	0.88 (22)	2.48 (63)
COL-8-40	12.93 (328)	15.75 (400)	26.13 (664)	4.51 (115)	11.34 (288)	#12 SAE	#20 SAE	#24 SAE	13.99 (355)	13.79 (350)	14.39 (366)	3.35 (85)	3.74 (95)	11.97 (304)	11.81 (300)	29.71 (755)	6.50 (165)	3.75 (95)	0.88 (22)	2.48 (63)
COL-16-20	16.63 (422)	19.69 (500)	26.13 (664)	4.51 (115)	15.06 (383)	#12 SAE	#12 SAE	#16 SAE	17.95 (456)	17.49 (444)	18.33 (466)	3.35 (85)	3.74 (95)	15.67 (398)	15.75 (400)	27.44 (697)	11.00 (279)	4.35 (110)	0.87 (22)	2.48 (63)
COL-16-40	16.63 (422)	19.69 (500)	26.13 (664)	4.51 (115)	15.06 (383)	#12 SAE	#20 SAE	#24 SAE	17.95 (456)	17.49 (444)	18.33 (466)	3.35 (85)	3.74 (95)	15.67 (398)	15.75 (400)	30.05 (763)	11.00 (279)	4.35 (110)	0.87 (22)	2.48 (63)
COL-30-20	21.09 (536)	26.38 (670)	26.86 (682)	5.27 (134)	19.50 (495)	#20 SAE	#12 SAE	#16 SAE	24.34 (618)	22.07 (561)	24.74 (628)	4.25 (108)	5.00 (127)	19.37 (492)	21.65 (550)	28.35 (720)	17.00 (432)	4.69 (119)	1.02 (26)	3.70 (94)
COL-30-40	21.09 (536)	26.38 (670)	26.86 (682)	5.27 (134)	19.50 (495)	#20 SAE	#20 SAE	#24 SAE	24.34 (618)	22.07 (561)	24.74 (628)	4.25 (108)	5.00 (127)	19.37 (492)	21.65 (550)	30.96 (786)	17.00 (432)	4.69 (119)	1.02 (26)	3.70 (94)
COL-400-20	19.20 (488)	22.45 (570)	26.86 (682)	6.50 (165)	17.31 (440)	#20 SAE	#12 SAE	#16 SAE	20.08 (510)	20.69 (526)	22.31 (567)	4.25 (108)	5.00 (127)	16.81 (427)	17.72 (450)	28.47 (723)	11.00 (279)	5.73 (146)	1.19 (30)	3.70 (94)
COL-400-40	19.20 (488)	22.45 (570)	26.86 (682)	6.50 (165)	17.31 (440)	#20 SAE	#20 SAE	#24 SAE	20.08 (510)	20.69 (526)	22.31 (567)	4.25 (108)	5.00 (127)	16.81 (427)	17.72 (450)	31.09 (790)	11.00 (279)	5.73 (146)	1.19 (30)	3.70 (94)

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

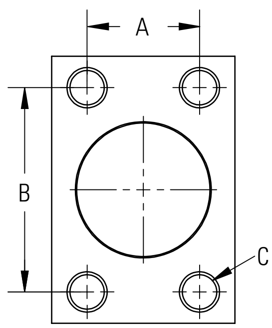
Dimensions

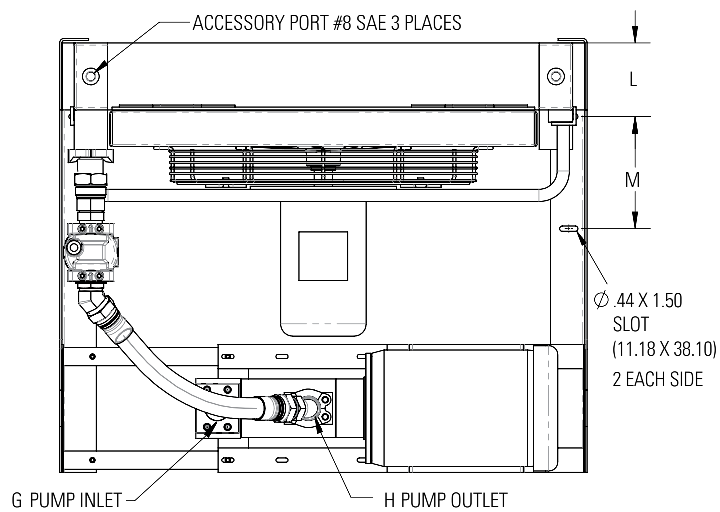
COL-725 through COL-1600





SAE Flange





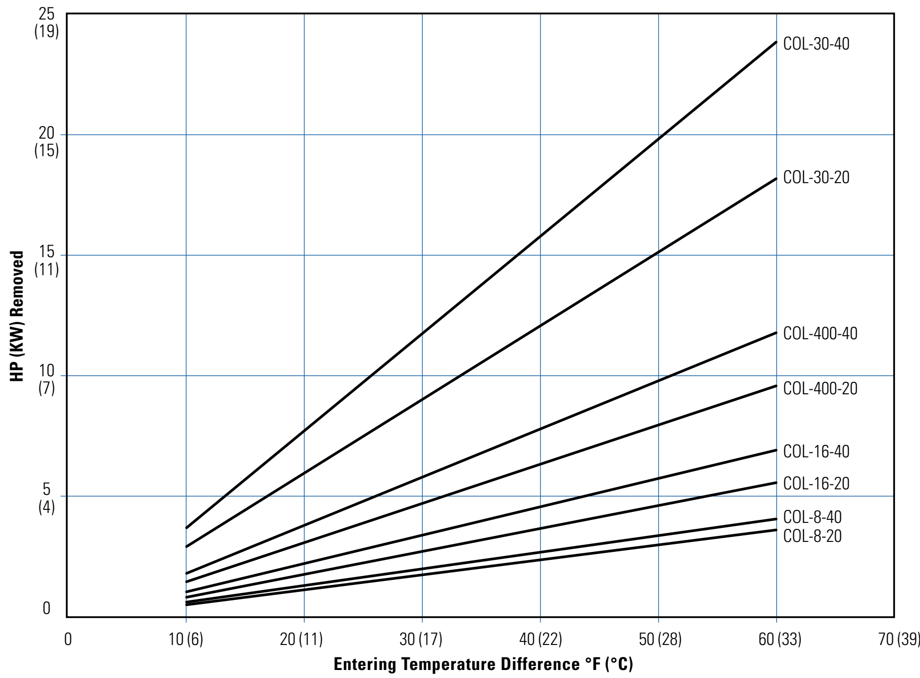
SAE Flange Size	A Inches (mm)	B Inches (mm)	C
1½"	1.41 (36)	2.75 (70)	1½ - 13 UNC
2"	1.69 (43)	3.06 (78)	1½ - 13 UNC
2½"	2.00 (51)	3.50 (89)	1½ - 13 UNC

Model	A	B	C	D	E	F	G (Pump Intlet)	H (Pump Outlet)	I	J	K	L	M	N	O	P	R	S	T	U
COL-725-80	23.49 (597)	30.32 (770)	35.00 (889)	6.50 (165)	21.60 (549)	#20 SAE	2" SAE Flange	1½" SAE Flange	27.95 (710)	25.48 (647)	30.18 (767)	4.25 (108)	5.00 (127)	21.10 (536)	25.59 (650)	24.07 (611)	11.98 (304)	9.16 (233)	1.19 (30)	3.70 (94)
COL-725-100	23.49 (597)	30.32 (770)	35.00 (889)	6.50 (165)	21.60 (549)	#20 SAE	2½" SAE Flange	2" SAE Flange	27.95 (710)	25.48 (647)	30.18 (767)	4.25 (108)	5.00 (127)	21.10 (536)	25.59 (650)	24.07 (611)	11.98 (304)	9.16 (233)	0.19 (5)	3.70 (94)
COL-950-80	27.94 (710)	37.01 (940)	35.25 (895)	9.50 (241)	24.55 (624)	2" SAE Flange	2" SAE Flange	1½" SAE Flange	34.26 (870)	29.93 (760)	35.87 (911)	6.05 (154)	9.20 (234)	25.55 (649)	31.50 (800)	22.69 (576)	18.00 (457)	9.51 (242)	1.38 (35)	5.51 (140)
COL-950-100	27.94 (710)	37.01 (940)	35.25 (895)	9.50 (241)	24.55 (624)	2" SAE Flange	2½" SAE Flange	2" SAE Flange	34.26 (870)	29.93 (760)	35.87 (911)	6.05 (154)	9.20 (234)	25.55 (649)	31.50 (800)	22.69 (576)	18.00 (457)	9.51 (242)	1.38 (35)	5.51 (140)
COL-1200-80	27.94 (710)	40.94 (1040)	35.25 (895)	5.50 (140)	24.55 (624)	2" SAE Flange	2" SAE Flange	1½" SAE Flange	38.19 (970)	29.93 (760)	40.30 (1024)	6.05 (154)	9.20 (234)	25.55 (649)	35.43 (900)	26.05 (662)	24.00 (610)	8.47 (215)	1.38 (35)	5.51 (140)
COL-1200-100	27.94 (710)	40.94 (1040)	35.25 (895)	5.50 (140)	24.55 (624)	2" SAE Flange	2½" SAE Flange	2" SAE Flange	38.19 (970)	29.93 (760)	40.30 (1024)	6.05 (154)	9.20 (234)	25.55 (649)	35.43 (900)	26.05 (662)	24.00 (610)	8.47 (215)	1.38 (35)	5.51 (140)
COL-1600-80	36.01 (915)	40.94 (1040)	35.25 (895)	9.50 (241)	32.62 (829)	2" SAE Flange	2" SAE Flange	1½" SAE Flange	38.19 (970)	37.88 (962)	40.30 (1024)	6.05 (154)	9.20 (234)	33.62 (854)	35.43 (900)	25.45 (646)	24.00 (610)	8.47 (215)	1.38 (35)	5.51 (140)
COL-1600-100	36.01 (915)	40.94 (1040)	35.25 (895)	9.50 (241)	32.62 (829)	2" SAE Flange	2½" SAE Flange	2" SAE Flange	38.19 (970)	37.88 (962)	40.30 (1024)	6.05 (154)	9.20 (234)	33.62 (854)	35.43 (900)	25.45 (646)	24.00 (610)	8.47 (215)	1.38 (35)	5.51 (140)

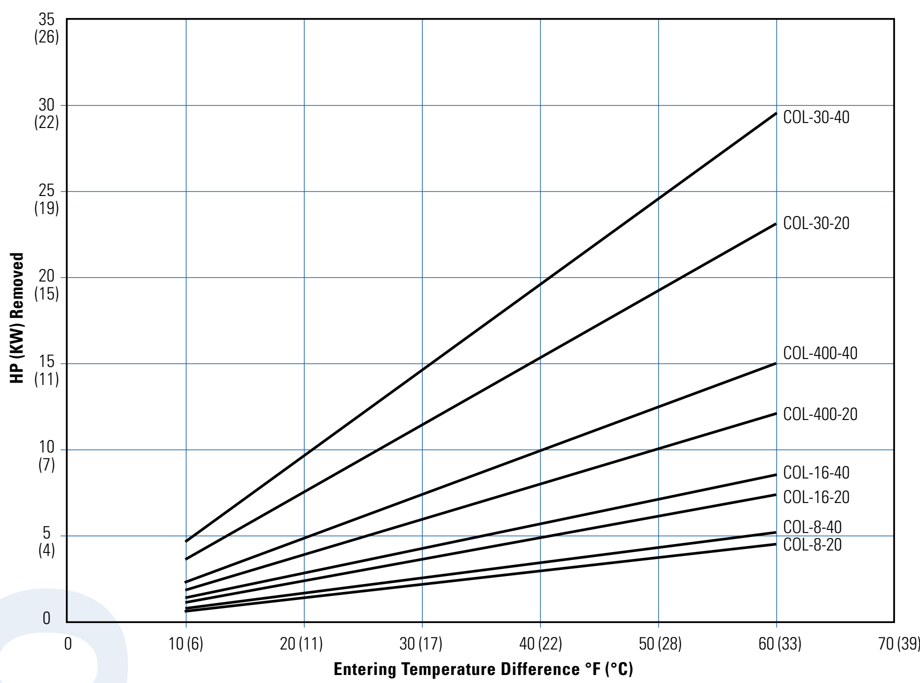
Note: We reserve the right to make reasonable design changes without notice. ***All dimensions in inches (millimeters), unless noted otherwise.***

Performance Curves

Single Motor 50hz/1500 RPM



Single Motor 60hz/1800 RPM



Note: T-Bar cores derate performance 15-25%. Consult factory for sizing information.

Selection Procedure

Step 1 **Determine Heat Load.** Most applications can have a cooler sized for 1/3 of the input HP (KW).

Step 2 **Determine Entering Temperature Difference.** (Actual E.T.D.)

E.T.D. = Entering oil temperature °F (°C) – Entering ambient air temperature °F (°C)

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.

Step 3 **Select Model From Curves.** Enter the Performance Curves at the bottom with the GPM (LPM) oil flow and proceed upward to the adjusted Heat Rejection from Step 3. Any Model or Curve on or above this point will meet these conditions.

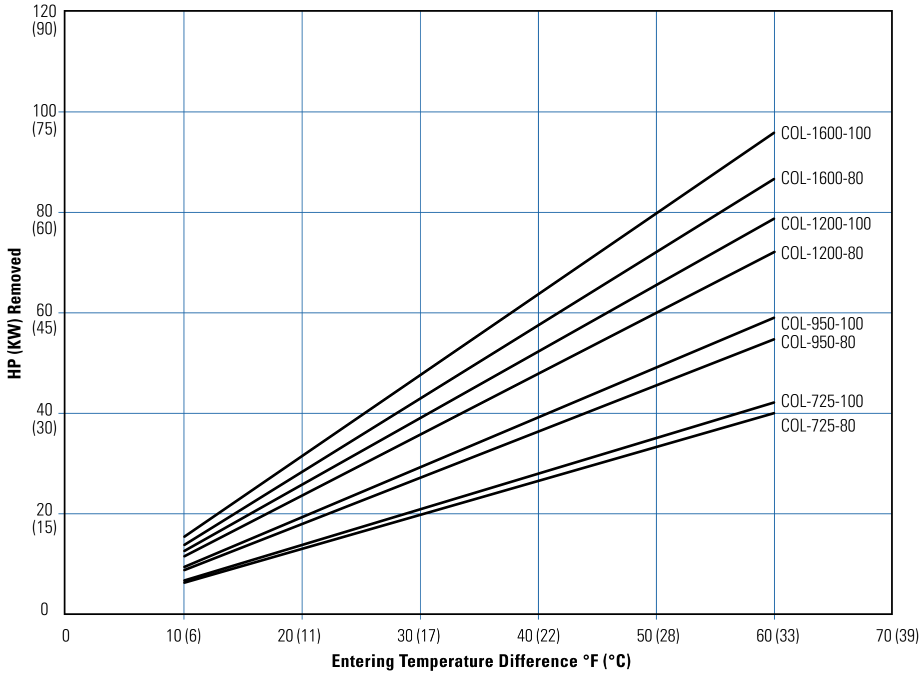
Listed Performance Curves are based on 46 cSt oil.

If your application conditions are different, consult factory for assistance.

Model	50 Hz Flow Rate GPM (LPM)	60 Hz Flow Rate GPM (LPM)
COL-8-20	8 (30)	9.5 (36)
COL-8-40	16 (60)	21 (79)
COL-16-20	8 (30)	9.5 (36)
COL-16-40	16 (60)	21 (79)
COL-30-20	8 (30)	9.5 (36)
COL-30-40	16 (60)	21 (79)
COL-400-20	8 (30)	9.5 (36)
COL-400-40	16 (60)	21 (79)

Performance Curves / Selection Procedure

Dual Motor 50hz/1500 RPM

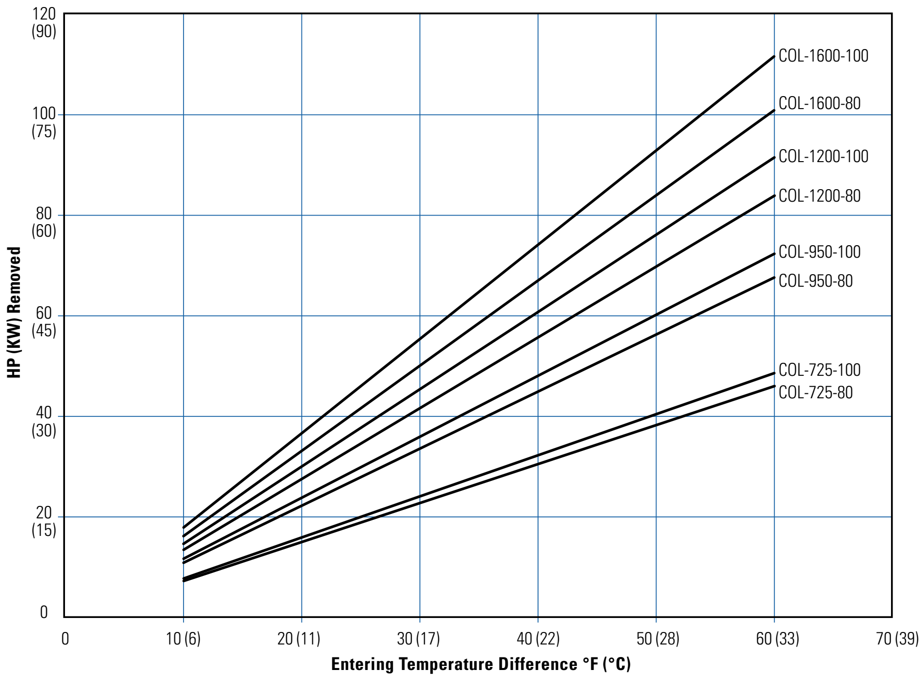


System Pressure Drop

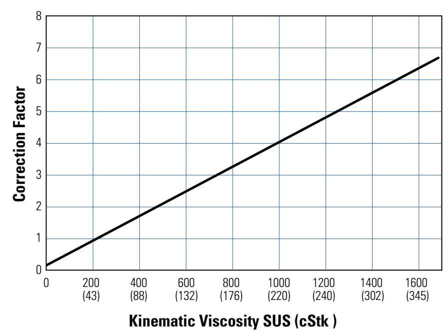
Model	Oil Flow Rate GPM (LPM)	Estimated Pressure Drop with Filter PSI (BAR)	Estimated Pressure Drop without Filter PSI (BAR)
COL-8-20	9.5 (36)	14 (1.0)	5 (0.3)
COL-8-40	21.0 (79)	28 (2.0)	17 (1.2)
COL-16-20	9.5 (36)	14 (1.0)	5 (0.3)
COL-16-40	21.0 (79)	27 (1.9)	16 (1.1)
COL-30-20	9.5 (36)	12 (0.8)	3 (0.2)
COL-30-40	21.0 (79)	23 (1.6)	12 (0.8)
COL-400-20	9.5 (36)	13 (0.9)	3 (0.2)
COL-400-40	21.0 (79)	24 (1.7)	13 (0.9)
COL-725-80	35.0 (133)	25 (1.7)	16 (1.1)
COL-725-100	45.0 (169)	33 (2.3)	19 (1.3)
COL-950-80	35.0 (133)	19 (1.3)	11 (0.8)
COL-960-100	45.0 (169)	25 (1.7)	12 (0.8)
COL-1200-80	35.0 (133)	20 (1.4)	12 (0.8)
COL-1200-100	45.0 (169)	27 (1.9)	13 (0.9)
COL-1600-80	35.0 (133)	17 (1.2)	9 (0.6)
COL-1600-100	45.0 (169)	24 (1.7)	10 (0.7)

Total pressure drop is estimated using 46 cStk oil. 10 micron mesh filter is used in calculating filter pressure drop.

Dual Motor 60hz/1800 RPM



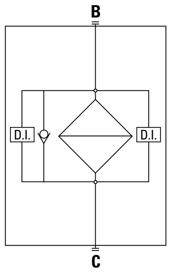
Oil Pressure Drop Correction

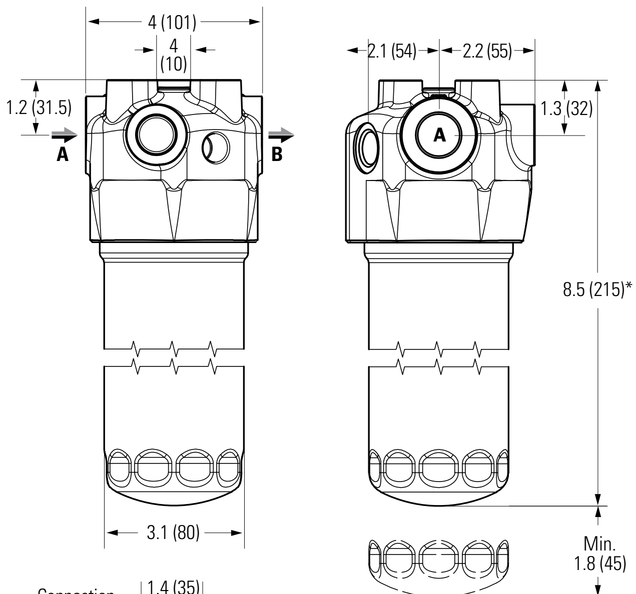


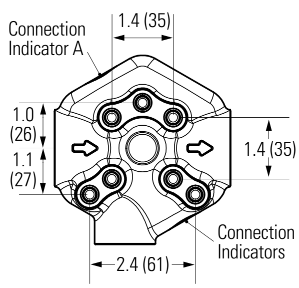
Model	50 Hz Flow Rate GPM (LPM)	60 Hz Flow Rate GPM (LPM)
COL-725-80	29.5 (112)	35 (133)
COL-725-100	37 (140)	45 (169)
COL-950-80	29.5 (112)	35 (133)
COL-950-100	37 (140)	45 (169)
COL-1200-80	29.5 (112)	35 (133)
COL-1200-100	37 (140)	45 (169)
COL-1600-80	29.5 (112)	35 (133)
COL-1600-100	37 (140)	45 (169)

Micron Filter Specifications

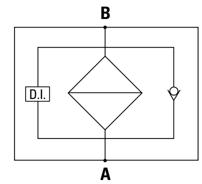
COL-8 – COL-400

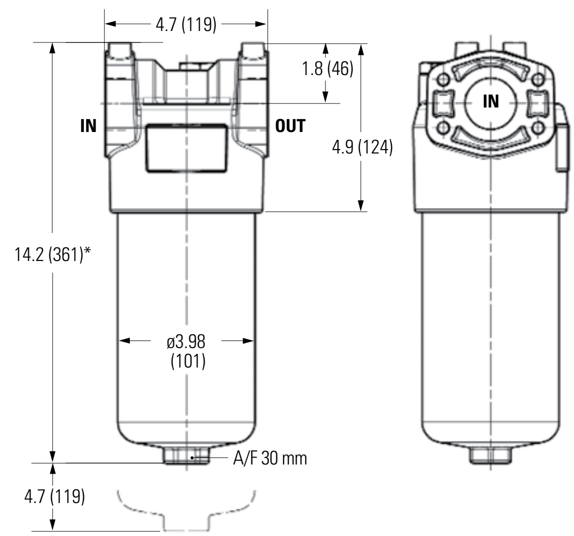


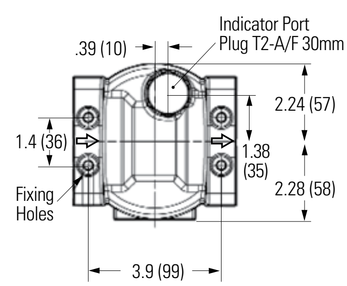




COL-725 – COL-1600







**Other bowl lengths available. Consult factory for details.*
All dimensions in inches (millimeters), unless noted otherwise.

Filter Housing Materials
- Head – Aluminum
- Housing – Phosphated Steel
- Bypass valve – Brass/Aluminum

Maximum Temperature
- 230°F (110°C)

Bypass valve
- Opening pressure – 51 PSI (3.5 BAR) ±10%
- Other opening pressures on request

Connection In/Out
- #12 SAE

Seals
- Standard NBR
- Optional FPM

Weight
- 4.0 lbs (1.8 kg)

Volume
- 0.21 gallons (0.81 liters)

Filter Housing Materials
- Head – Anodized Aluminum
- Housing – Anodized Aluminum
- Bypass valve – Nylon

Maximum Temperature
- 230°F (110°C)

Bypass valve
- Opening pressure – 51 PSI (3.5 BAR) ±10%
- Other opening pressures on request

Connection In/Out
- #24 SAE

Seals
- Standard NBR
- Optional FPM

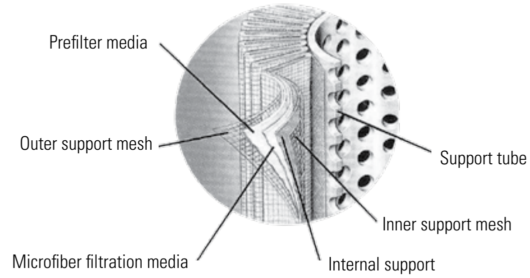
Weight
- 7.7 lbs (3.5 kg)

Volume
- 0.40 gallons (1.5 liters)

Micron Filter Specifications

Filtration Media Composition
- Internal support mesh
- Filter media support
- Filtration media
- Prefilter media
- External support mesh

Inorganic Microfiber



Compatibility with Fluids
The filter elements are compatible with:
- Mineral oils to ISO 2943-4
- Aqueous emulsions
- Synthetic fluids, water glycol

Seals, standard in NBR compatible with:
- Mineral oils to ISO 2943-4
- Aqueous emulsions
- Synthetic fluids, water glycol

FPM seals compatible with:
- Synthetic fluids type HS-HFDR-HFDS-HFDU to ISO 6743-4

Multipass Test
In compliance with new ISO 16889 standard
Contaminant ISO MTD

Value ß	2	10	75	100	200	1000*
Filtration efficiency	50%	90%	98.70%	99%	99.50%	99.90%

**TTP Standard*

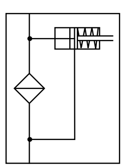
International Standards for Fluid Contamination Control

Components	Recommended Filtration								
Servo valves			●	●	●				
Proportional valves				●	●	●			
Variable displacement pumps					●	●	●		
Cartridge valves						●	●	●	
Piston pumps						●	●	●	
Vane pumps							●	●	●
Pressure/flow rate control valves							●	●	●
Solenoid valves							●	●	●
ISO code	12/10/7	13/11/8	14/12/9	15/13/10	16/14/11	17/15/12	18/16/13	19/17/14	20/18/15
NAS code	1	2	3	4	5	6	7	8	9
Absolute filtration recommended	3 micron				6 micron		10 micron*		>10 micron

**TTP Standard*

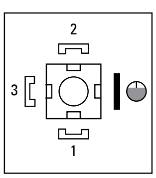
Filtration Indicators

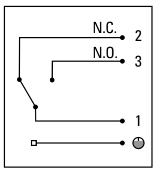
Visual "V"



- Cover and lens: nylon
- Visual indicator green: cartridge clean
- Visual indicator red: cartridge clogged
- Weight: 4.8 oz (136 g)
- Tightening torque: 70 ft-lbs (95 Nm)

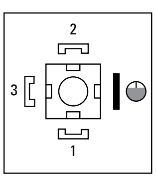
Electrical/Visual "EV"
Connector EN 175301-803 A/ISO4400

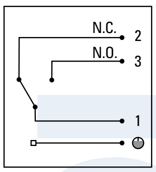




- Protection rating: IP 65
- Maximum contact rating: 5 A/250V~
- Voltage: 230 V~
- Connector: DIN 43650 Microswitch contact
- Cable gland: PG 9
- Cover and lens: nylon
- Visual indicator green: cartridge clean
- Visual indicator red: cartridge clogged
- Weight: 6.6 oz (187 g)
- Tightening torque: 70 ft-lbs (95 Nm)

Electric "E"
Connector EN 175301-803 A/ISO4400



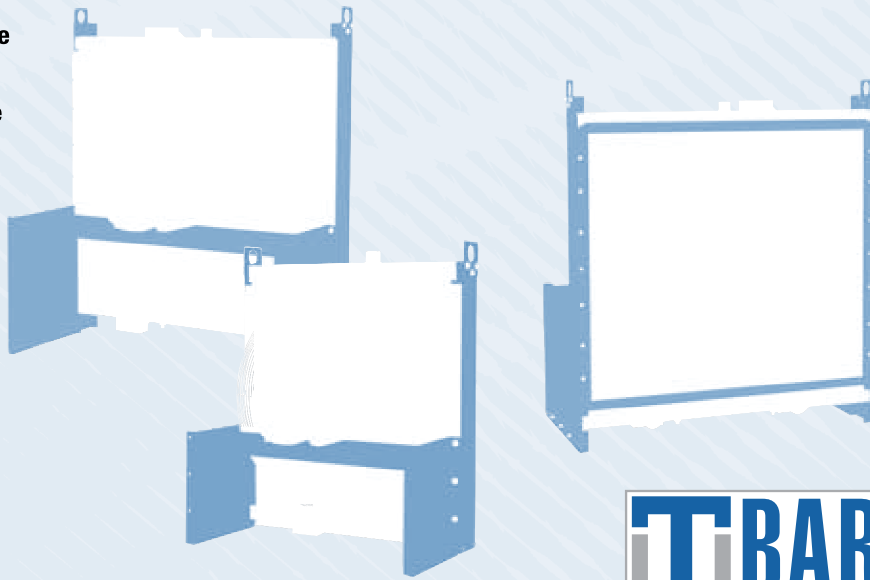


- Protection rating: IP 65
- Maximum contact rating: 5 A/250V~
- Voltage: 230 V~
- Connector: DIN 43650 Microswitch contact
- Cable gland: PG 9
- Weight: 6.5 oz (184 g)
- Tightening torque: 48 ft-lbs (65 Nm)

FLUID COOLING | Industrial & Mobile OCA Series

FEATURES

- Young Radiator – OCS Model Interchange (approximate)
- American Industrial – AOCS Interchange (approximate)
- Hydraulic Circuits
- Machine Tool Cooling
- Gear Oil Cooling
- Lube Oil Cooling
- Process Cooling
- Torque Converters
- Marine Transmissions
- Aerodynamically Designed Fan
- Brazed Aluminum Core
- Enclosed Fan Cooled Standard – TEFC



T-BAR™ • CORE INSIDE •

This Line Features

- High efficient, light weight, low fouling extruded core design
- Rugged construction with a patented T-Bar brazed aluminum core captured in steel framing
- Both mobile and industrial applications
- High flow capacity; with a flow range from 20-500 GPM
- Ability to handle high viscosity fluids i.e. gear oil cooling
- Available in 7 sizes with electric or hydraulic motor options
- Standard sizes available with short, lean lead time

Materials

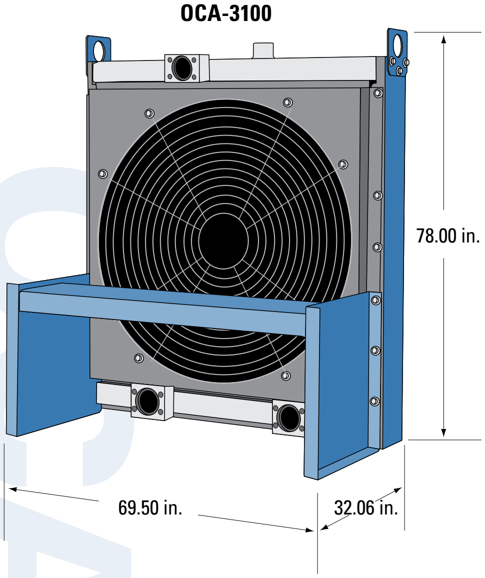
Fan Blade Composite with cast aluminum hub
Cabinet Steel with baked enamel finish
Connections Aluminum – Female SAE
Motor Support Steel
Shroud Steel
Core Brazed Aluminum
Motor TEFC & Hydraulic motor

Ratings

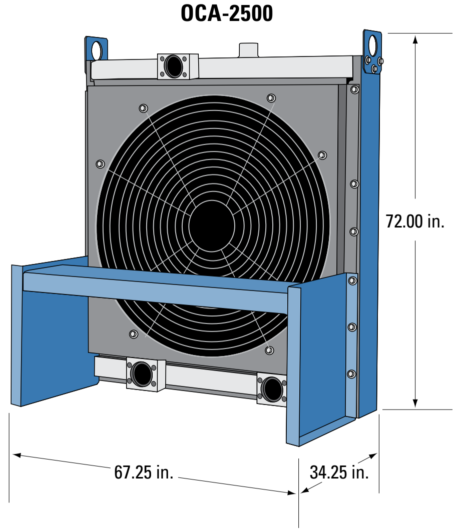
Max Operating Pressure - 250 psi
Max Operating Temperature - 350° F

Dimension Range

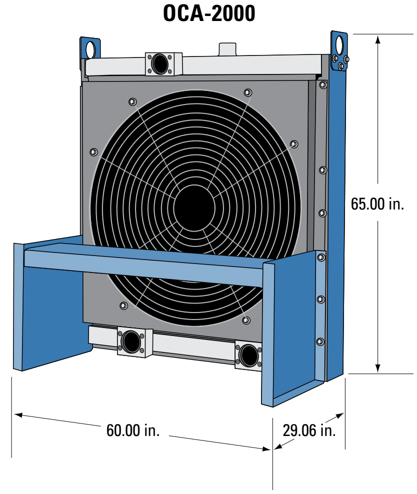
OCA-3100



OCA-2500



OCA-2000



How to Order

OCA	–		–		–		–		–	

Model Series
OCA - Standard

Model Size Selected

Connection Type
2 - SAE

[1] External Relief Bypass Kit
BLANK- NO BYPASS
30-30 PSI
60-60 PSI

Specify Motor Required
0 -NO-MOTOR
3 -THREE PHASE
6 -575 VOLT
9 -HYDRAULIC MOTOR
11 - THREE PH EXPLOSION PROOF
18 - THREE PH IEC

[2] Material Options
HC - HERESITE COATING (CORE)
G - GALVANIZED STEEL (CABINET)
SFG - STAINLESS STEEL (FAN GUARD)

Connection Conversion Kits - *order as separate line item*

	Part Number						
	OCA-450	OCA-600	OCA-1000	OCA-1500	OCA-2000	OCA-2500	OCA3100
2 Pass SAE (Flange Cover)	12076	12011	12012	12012	12012	12013	12013
1 Pass NPT	51166	51168	51170	51172	51174	51175	5178
2 Pass NPT[3]	51167	51169	51171	51173	51175	51177	51179
1 Pass BSPP	Consult Factory						
2 Pass BSPP[3]	Consult Factory						
Fill Plug (#20 SAE)[4]	50732						

[1] Available for 2 Pass unit only. Pressure tolerance is (+5 PSI/-0 PSI). Consult factory for details.

[2] Use HC-G-SFG if all three add-ons are desired.

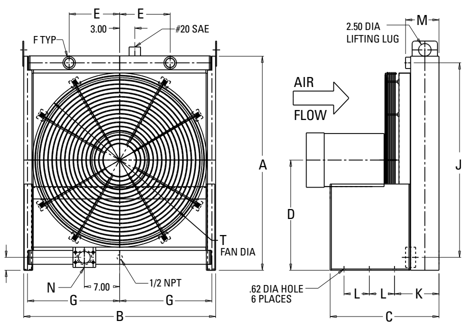
[3] Two Pass adapter kits already include cover plate.

[4] Ports do not come plugged unless specified at time of order.

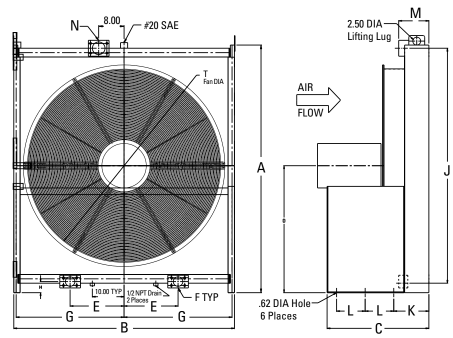
AIR COOLED OCA

Dimensions

OCA-450 & 600

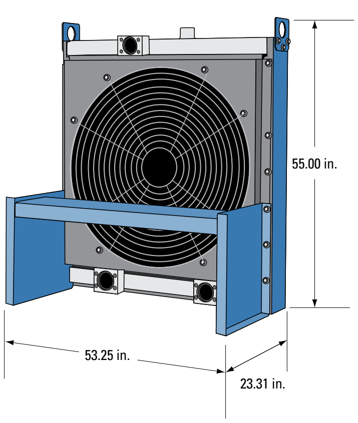


OCA-1000 Through OCA-3100

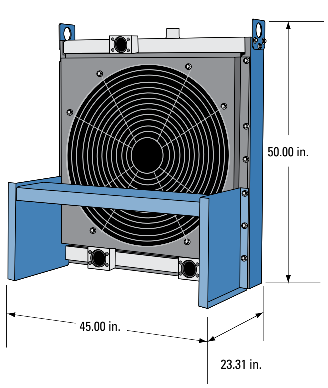


MODEL	A	B	C	D	E	F	G	H	J	K	L	M	N	T	Shipping WT (lbs)	DBA at 3 ft
OCA-450	36.38	33.00	21.56	18.50	8.00	#24	15.75	4.12	28.75	8.81	5.00	6.62	2.00	24.00	400	81
OCA-600	42.38	38.00	21.56	21.81	10.00	#24	18.25	2.56	35.50	8.81	5.00	6.62	2.50	32.00	497	84
OCA-1000	50.00	45.00	24.56	26.25	10.50	2.00	21.75	4.19	45.50	7.81	7.50	7.50	3.00	36.00	690	88
OCA-1500	55.00	53.25	23.31	28.50	12.50	2.00	25.75	4.31	49.75	7.79	7.00	8.50	3.00	42.00	832	92
OCA-2000	65.00	60.00	29.06	33.00	15.00	3.00	29.00	4.00	58.00	11.06	7.50	8.56	3.00	48.00	1223	96
OCA-2500	72.00	67.25	34.25	37.00	17.00	3.00	32.88	3.25	67.50	11.06	7.50	9.50	4.00	54.00	1723	96
OCA-3100	78.00	69.50	32.06	40.00	17.00	3.00	34.00	3.00	74.00	11.06	9.00	9.50	4.00	60.00	1806	96

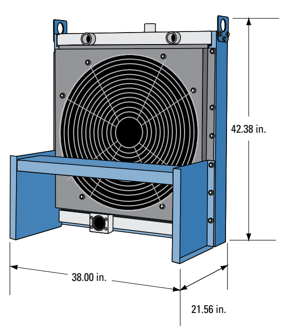
OCA-1500



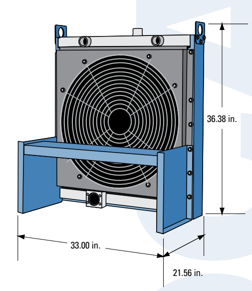
OCA-1000



OCA-600

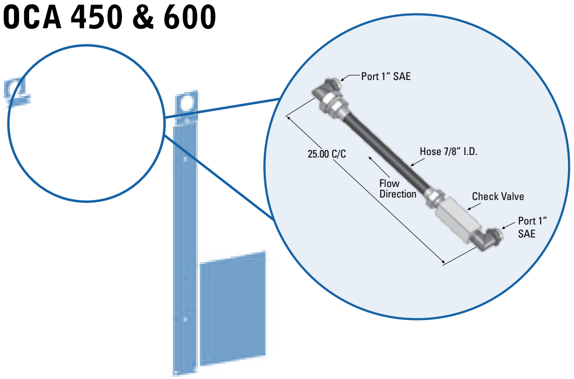


OCA-450

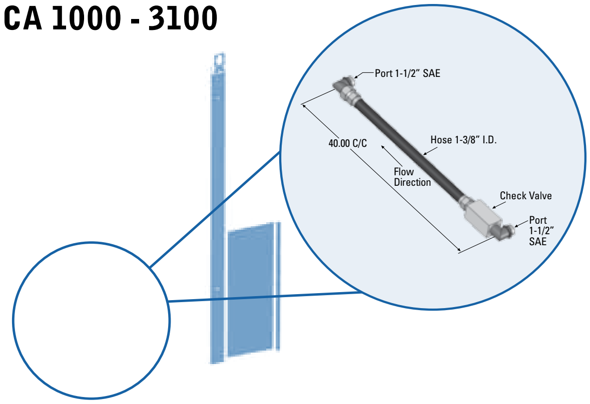


External Bypass Option (Extra port is removed for bypass options)

OCA 450 & 600

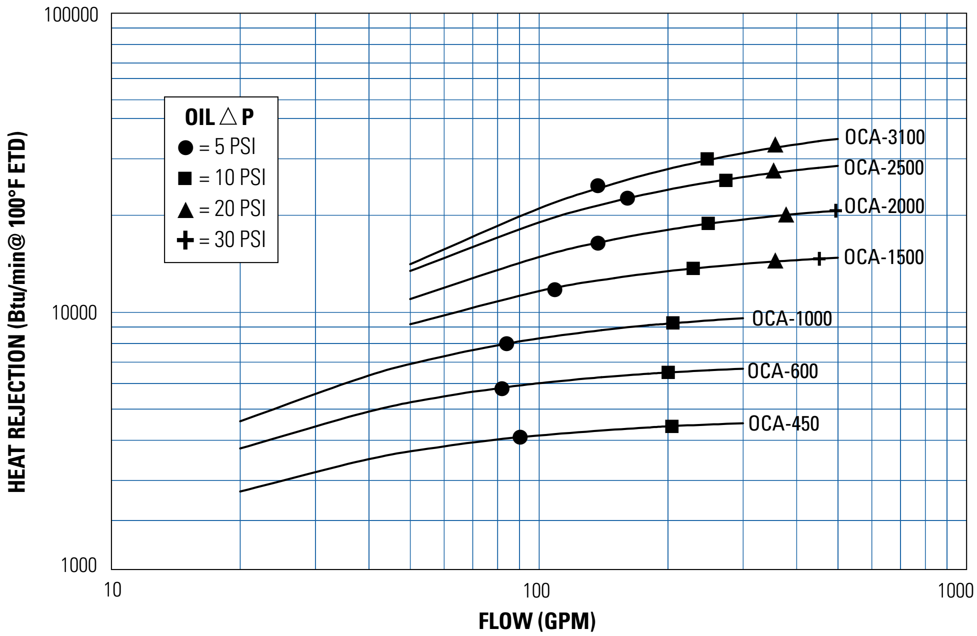


OCA 1000 - 3100

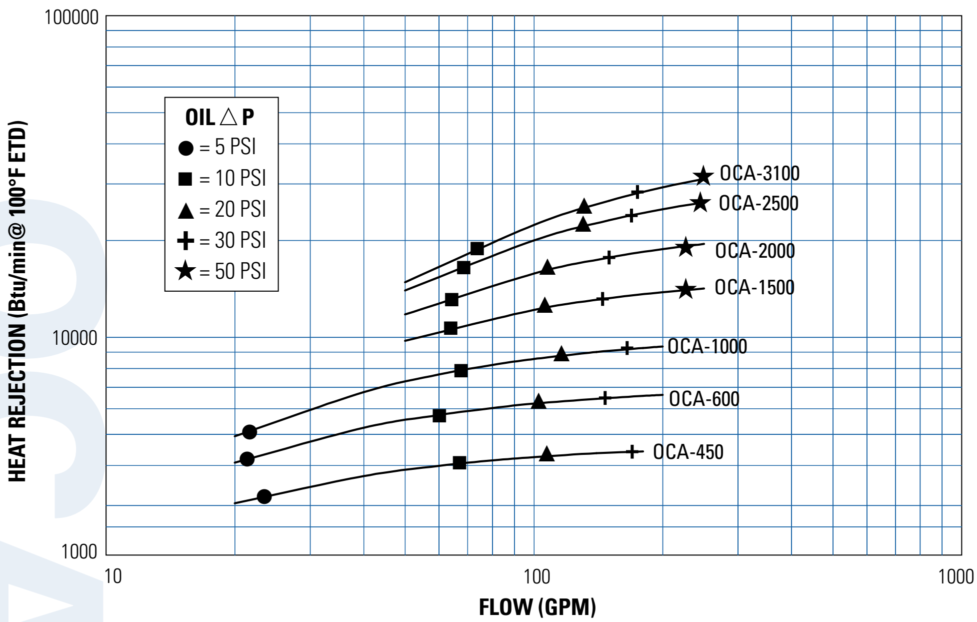


Performance Curves

One Pass Oil

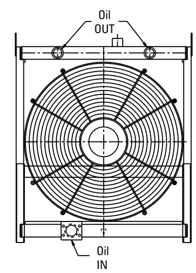


Two Pass Oil

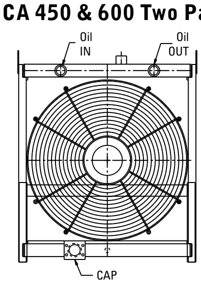


Oil Piping Diagram

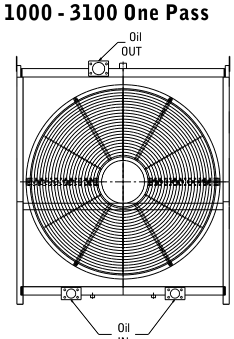
OCA 450 & 600 One Pass



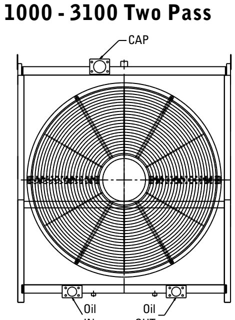
OCA 450 & 600 Two Pass



1000 - 3100 One Pass



1000 - 3100 Two Pass



Selection Procedure

Performance Curves are based on 50SSU oil entering the cooler 100°F higher than the ambient air temperature used for cooling. This is also referred to as a 100°F Entering Temperature Difference (ETD).

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.)
Convert HP to BTU/MIN: HP x 42.41 = BTU/MIN

STEP 2 **Determine Entering Temperature Difference (ETD).**
Desired oil entering cooler °F – Ambient air temp. °F = Actual ETD

STEP 3 **Determine Curve Horsepower Heat Load.**
Enter the information from above:
E.T.D. Temperature Correction Factor:

$$\text{Btu/Min}_{\text{corrected}} = \text{Input Btu/Min} \times \frac{100 \times Cv}{\text{Desired E.T.D.}}$$

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:**
● = 5 PSI; ■ = 10 PSI; ▲ = 20 PSI; ✛ = 30 PSI; ★ = 50 PSI.
Multiply pressure drop from curve by correction factor found in oil △P correction curve.

Example

FLUID = SAE 20 OIL
SYSTEM ELECTRIC NAMEPLATE HORSEPOWER = 300HP
ENTERING TEMPERATURE = 200°F
AMBIENT TEMPERATURE = 75°F
FLOW RATE = 200GPM

- Determine heat load.
  Generally, about 25% to 33% of the system horsepower is removed.

  300hp x 0.33 = 99hp

- Since the graphs have the heat load in terms of BTU/min, the units must be converted.

  99hp x 42.4167 = 4,199 BTU/min

- Calculate the entering temperature difference (E.T.D.). The E.T.D. is the inlet oil temperature minus the entering air temperature.

  ETD=200-75 =125

- Calculate the corrected curve heat load.
  Corrected curve heat load = actual heat load x (100/ETD) x Cv (viscosity correction factor obtained from the Cv table).

  4,199 BTU/min x (100/125) x 1.02= 3,426 BTU/min

- Find the intersection point between the corrected heat load and flow rate on the performance curves. Any curve above this point will work for this application. Usually the smallest cooler is most desired. In this case the intersecting point on the single pass graph indicates that the OCA-450 will suffice.

- The pressure drop should be found next. Find the point on the curve that is directly above the intersecting point. This point on the curve indicates the pressure drop.

  △P ≈ 6psi

- These curves are made for SAE 10 oil entering at 200°F. Therefore, the pressure drop needs to be corrected. The 1.24 is the pressure drop correction factor obtained in the Cp table.

- $P_{\text{CORRECTED}}$ = 6 x 1.24= 7.44 psi

C_V VISCOSITY CORRECTION FACTORS

Entering Liquid Temp	SAE 5	SAE 10	SAE 20	SAE 30	SAE 40	ISO 22	ISO 32	ISO 46	ISO 68	ISO 100	ISO 150	ISO 220	ISO 320	MIL-L 7808	Ester Polyglycol	Phosphate	50%EG
100	1.12	1.16	1.26	1.39	1.46	1.09	1.15	1.19	1.27	1.38	1.44	1.57	1.85	1.20	0.93	0.84	0.86
110	1.10	1.13	1.21	1.33	1.41	1.07	1.14	1.17	1.26	1.32	1.40	1.49	1.68	1.15	0.90	0.81	0.85
120	1.07	1.11	1.18	1.28	1.36	1.05	1.12	1.15	1.21	1.28	1.36	1.41	1.54	1.10	0.89	0.80	0.85
130	1.05	1.09	1.14	1.25	1.30	1.04	1.10	1.14	1.18	1.25	1.31	1.35	1.45	1.06	0.86	0.78	0.84
140	1.04	1.06	1.12	1.20	1.26	1.03	1.09	1.11	1.17	1.21	1.27	1.31	1.40	1.04	0.85	0.77	0.83
150	1.02	1.05	1.10	1.17	1.23	1.03	1.07	1.10	1.14	1.18	1.23	1.28	1.34	1.02	0.84	0.75	0.83
200	0.99	1.00	1.02	1.05	1.08	0.99	1.00	1.01	1.02	1.03	1.09	1.10	1.15	0.99	0.80	0.72	0.81
250	0.96	0.97	0.98	0.99	1.00	0.96	0.97	0.97	0.97	0.98	1.00	1.02	1.03	0.98	0.77	0.70	0.80

C_P PRESSURE DROP CORRECTION FACTORS

Entering Liquid Temp	SAE 5	SAE 10	SAE 20	SAE 30	SAE 40	ISO 22	ISO 32	ISO 46	ISO 68	ISO 100	ISO 150	ISO 220	ISO 320	MIL-L 7808	Ester Polyglycol	Phosphate	50%EG
100	2.04	2.44	4.44	6.44	8.84	1.11	1.57	1.86	2.58	4.23	6.48	9.42	13.60	1.30	3.04	3.54	0.770
110	1.74	2.14	3.64	5.14	6.74	1.08	1.49	1.76	2.39	3.77	5.74	8.37	11.67	1.24	2.44	2.94	0.760
120	1.54	1.84	3.04	4.24	5.64	1.06	1.42	1.64	2.19	3.30	5.95	7.27	9.77	1.18	2.14	2.54	0.749
130	1.44	1.64	2.64	3.44	4.54	1.03	1.34	1.53	1.98	2.84	4.18	6.23	7.84	1.12	1.94	2.24	0.738
140	1.34	1.54	2.27	2.94	3.74	1.01	1.27	1.42	1.79	2.42	3.51	5.24	6.15	1.07	1.94	2.04	0.726
150	1.24	1.34	1.94	2.54	3.14	0.99	1.21	1.34	1.65	2.08	2.94	4.39	4.81	1.02	1.74	1.94	0.716
200	0.97	1.00	1.24	1.44	1.64	0.93	1.03	1.12	1.22	1.37	2.63	1.78	1.99	0.94	1.24	1.34	0.675
250	0.85	0.86	0.96	1.01	1.09	0.89	0.97	1.00	1.07	1.15	1.25	1.26	1.27	0.87	1.04	1.09	0.596

Specifications

Electric Motor Data

(3 Phase TEFC)

Model	Motor HP	Phase	HZ	Voltage	RPM	Nema Frame	Full Load Amps	Net Weight
OCA-450	3	3	60	208-230/460	1725	182T	9.5-8.6/4.3	68
OCA-600	3	3	60	230/460	1160	213T	10/5	125
OCA-1000	5	3	60	230/460	1160	215T	16/8	138
OCA-1500	5	3	60	230/460	1160	215T	16/8	138
OCA-2000	10	3	60	230/460	1175	256T	28.8/14.4	269
OCA-2500	15	3	60	230/460	1175	284T	39.4/19.7	361
OCA-3100	20	3	60	230/460	1175	286T	52/26	368

(3 Phase Explosion Proof Class I Group D & Class II Group F&G)

Model	Motor HP	Phase	HZ	Voltage	RPM	Nema Frame	Full Load Amps	Net Weight
OCA-450	3	3	60	230/460	1750	182T	9.6/4.8	134
OCA-600	3	3	60	230/460	1160	213T	9.6/4.8	147
OCA-1000	5	3	60	230/460	1160	215T	16.2/8.1	161
OCA-1500	5	3	60	230/460	1160	215T	16.2/8.1	161
OCA-2000	10	3	60	230/460	1175	256T	28.8/14.4	357
OCA-2500	15	3	60	230/460	1170	284T	39/19.5	436
OCA-3100	20	3	60	230/460	1175	286T	51/25.5	522

(3 Phase 575V TEFC)

Model	Motor HP	Phase	HZ	Voltage	RPM	Nema Frame	Full Load Amps	Net Weight
OCA-450	3	3	60	575	1750	182T	3.4	68
OCA-600	3	3	60	575	1160	213T	4.1	111
OCA-1000	5	3	60	575	1160	215T	6.0	122
OCA-1500	5	3	60	575	1160	215T	6.0	122
OCA-2000	10	3	60	575	1180	256T	11.5	286
OCA-2500	15	3	60	575	1180	284T	15.0	425
OCA-3100	20	3	60	575	1175	286T	20.0	452

(3 Phase Metric/IEC)

Model	Motor KW/HP	Phase	HZ	Voltage	RPM	IEC Frame	Full Load Amps	Net Weight
OCA-450	2.2/3	3	60	208-230/460	1750	100	8.5-8.2/4.1	68
OCA-600	2.2/3	3	60	230/460	1160	132	9.6/4	110
OCA-1000	3.7/5	3	60	230/460	1160	132	17.6/8.8	123
OCA-1500	3.7/5	3	60	230/460	1160	132	17.6/8.8	123
OCA-2000	7.5/10	3	60	230/460	1180	160	28.4/14.2	247
OCA-2500	11/15	3	60	230/460	1180	180	42/21	361
OCA-3100	15/20	3	60	230/460	1175	180	52/26	368

Hydraulic Motor Data

Hydraulic Motors

Model	HP	Pressure (PSI)	Flow (GPM)	RPM	Displacement (CUIN/REV)
OCA-450	3	870	11.1	1750	1.37
OCA-600	3	1305	8.0	1160	1.37
OCA-1000	5	2030	8.0	1160	1.37
OCA-1500	5	2030	8.0	1160	1.37
OCA-2000	10	2090	8.2	1175	1.37
OCA-2500	15	2900	8.2	1175	1.71
OCA-3100	20	2320	13.3	1175	2.2

T BAR™
• CORE INSIDE •

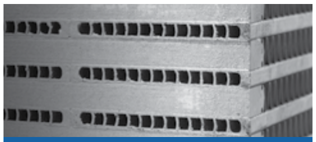
Advantages

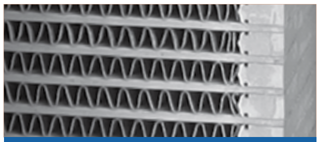
T-BAR provides advantages and value far beyond typical aluminum core designs.

- **Extruded tubes for a leak free design**
- **Flows high viscosity fluids**
- **Low pressure drop due to absence of internal turbulator**
- **Resistance to fouling—transfer fluids without plugging**
- **Great for cooling cutting fluids or gear lube**
- **Resistant to salt spray and salt air**
- **Standard Zinc infused/coated core & fins for up to 10 times protection in salt conditions**
- **Domestic built**
- **Optional core for BOL model**

T-BAR is a flexible design, high performing, and a cost-effective aluminum solution.

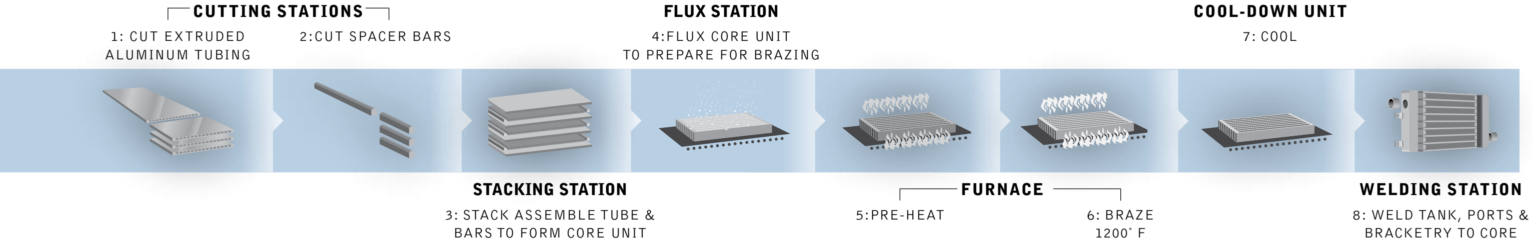
Tubular Micro Channel Extrusion (T-BAR™)
T-BAR is manufactured with Alloy 1100 aluminum micro channel and bars, **with Zinc flame-sprayed extruded tubes and zinc alloy coated fins**, in our patented in-house tube-to-bar brazing process using a Nocolok CAB (Controlled Atmosphere Brazing) brazing technology furnace. Because our tubes are a solid extrusion, T-BAR is very robust — with no tube seams to fail and leak.


HIGH-PERFORMANCE


LOW-CLOGGING


T-BAR CORE IN OCA ASSEMBLY

T-Bar Manufacturing Process

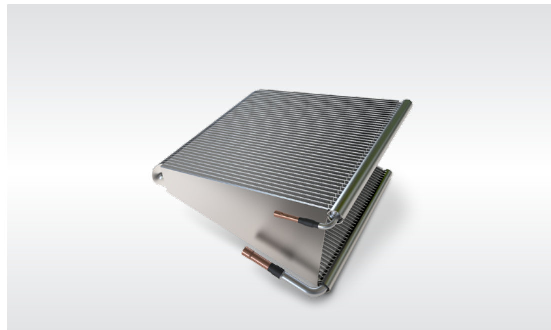


Micro Channel Evaporator Coils

Airtech® Micro Channel Evaporator Coils.

We're excited to introduce new micro channel evaporator coil technology to our line of air cooled heat exchangers. Using flat micro channel tubes with highly efficient louvered fins, our all-aluminum micro channel evaporator coils provide a high level of thermal performance at a low air-side pressure drop.

Used in conjunction with our existing line of micro channel condensers, these coils can be utilized in both conventional HVAC and heat pump applications that require reversing between condensing (heating) and evaporating (cooling). Lightweight and robust, the micro channel evaporator coils provide the latest technology to the HVAC industry.



PERFORMANCE NOTES.

- All-aluminum brazed construction with protected copper transition connections for conventional solder attachment
- Improved efficiency to meet higher SEER requirements
- Lower refrigerant charge levels and greater cost savings due to the smaller internal volume
- Reduced weight versus the conventional tube and fin products
- Better corrosion resistance with aluminum alloys
- Longer life span than conventional (bi-metal) RTPF tube and fin coils
- Less leak potential due to all joints being furnace brazed (compared to the 50-plus manually brazed joints on conventional tube and fin coils)
- Easier cleaning with a pressure washer
- Field repairable with two-part epoxies
- Available in straight core, A-coil, and 180-degree formed coil designs

APPLICATIONS.

- Transportation (A/C and refrigeration)
- Residential (A/C air handlers and heat pumps)
- Commercial (rooftops and packaged systems)

Frac Pumper Cube Cooling Module

Frac Pumper Cube Cooling Module

API Heat Transfer now offers a line of frac pumper cooling modules in a cube configuration for applications that require a lighter, more compact cooling package than our standard horizontal units.

These modules are made with aluminum heat exchanger technology and feature critical design enhancements that greatly improve maintenance, including a large cab-side access door for on-site cleaning.

TURNKEY COOLING SOLUTIONS.

- 20% lighter in weight than traditional horizontal units
- All-aluminum cooling modules
- Laser-cut, high-strength steel framework
- Custom designed cab-side door for easy access maintenance
- Plumbing of ancillary coolers to internal bulkhead
- Available in both three-point and four-point mounting options
- Complete standard black powder coat of all steel, with custom colors available
- Improved design for ease of cleaning the heat exchanger cores from the outside or inside

Heat transfer performance to the highest degree.

Everything about API Heat Transfer is focused on performance. It's a part of our 130-year heritage designing and delivering world-class heat transfer products for nearly every industry. It's bolstered by our worldwide network of manufacturing facilities and more than 1,800 employees who provide sales, service, and support. And it's ingrained in a process that has served customers around the world well for nearly a century and a half. Upon working with us, you'll find it's our performance that sets us apart.
There's heat transfer. Then there's API Heat Transfer.

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