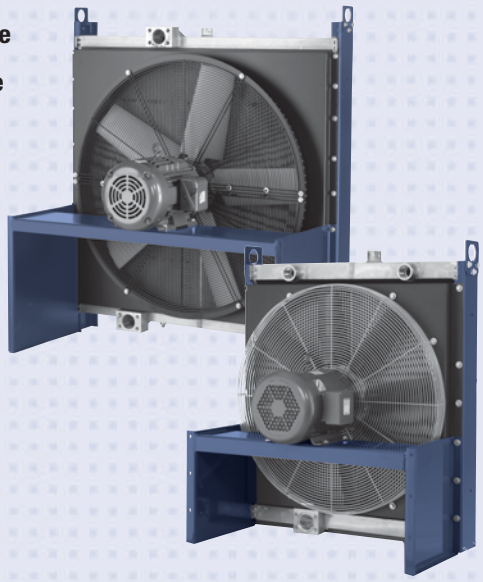
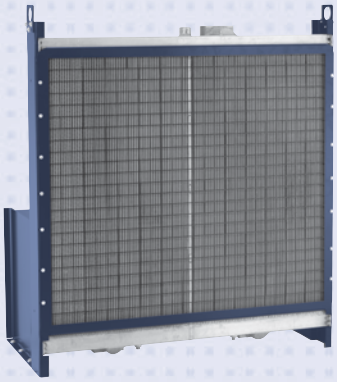
## FEATURES

- **Young Radiator – OCS Model Interchange**
- **American Industrial – AOCS Interchange**
- **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 New 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

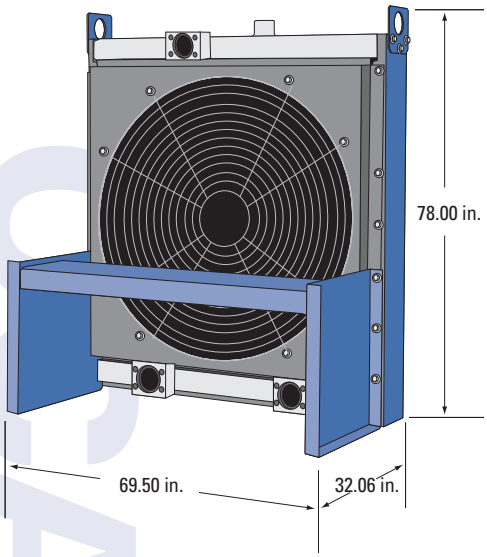
## Ratings

**Max Operating Pressure -** 250 psi

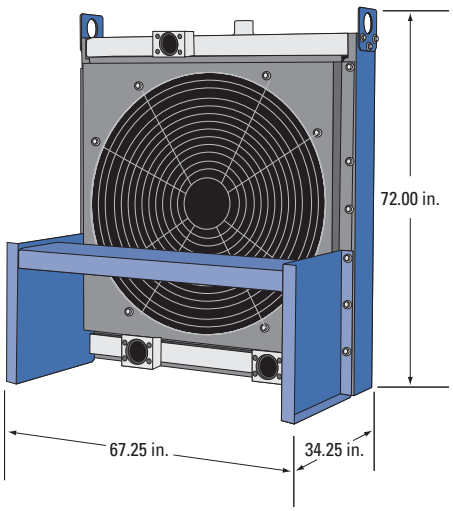
**Max Operating Temperature -** 350° F

## Dimension Range

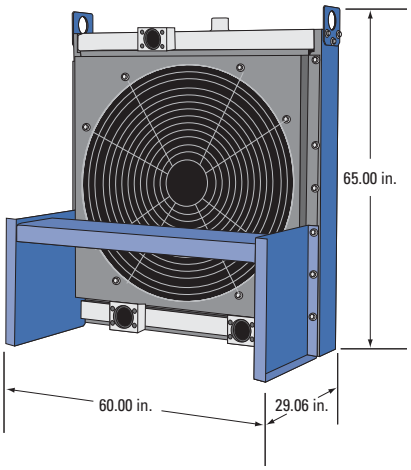
**OCA-3100**




**OCA-2500**




**OCA-2000**






TTPSales@thermasys.com 262.554.8330

# How to Order

| OCA | – | | – | | – | | – | | – | |
|---|---|---|---|---|---|---|---|---|---|---|

**Model Series**
**OCA** - Standard

**Model Size Selected**

**Connection Type**
**1** - NPT
**2** - SAE
**3** - BSPP

***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

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

### ADDITIONAL OPTIONS

| ITEM | PART # | ITEM | PART # |
|---|---|---|---|
| 4-BOLT FLANGE COVER PLT FOR 2-1/2" SAE 4-BOLT FLANGE | 12011 | 4" SAE 4-BOLT FLANGE TO 4" NPT ADAPTER | 12016 |
| 4-BOLT FLANGE COVER PLT FOR 3" SAE 4-BOLT FLANGE | 12012 | #20 SAE TO 1-1/4" BSPP ADAPTER | 50120 |
| 4-BOLT FLANGE COVER PLT FOR 4" SAE 4-BOLT FLANGE | 12013 | #24 SAE TO 1-1/2" BSPP ADAPTER | 50121 |
| *** FILL PLUG (#20 SAE) | 29643 | #32 SAE TO 2" BSPP ADAPTER | 50122 |
| #20 SAE TO 1-1/4" NPT ADAPTER | 50115 | 2-1/2" SAE 4-BOLT FLANGE TO 2-1/2" BSPP ADAPTER | 63781 |
| #24 SAE TO 1-1/2" NPT ADAPTER | 50116 | 3" SAE 4-BOLT FLANGE TO 3" BSPP ADAPTER | 63782 |
| #32 SAE TO 2" NPT ADAPTER | 50117 | 4" SAE 4-BOLT FLANGE TO 4" BSPP ADAPTER | 63783 |
| 2-1/2" SAE 4-BOLT FLANGE TO 2-1/2" NPT ADAPTER | 12014 | 30 PSI EXTERNAL BYPASS KIT (FOR LARGER MODELS) | 50602 |
| 3" SAE 4-BOLT FLANGE TO 3" NPT ADAPTER | 12015 | 60 PSI EXTERNAL BYBASS KIT (FOR LARGER MODELS) | 50603 |
| | | 30 PSI EXTERNAL BYPASS KIT (FOR SMALLER MODELS) | 50617 |
| | | 60 PSI EXTERNAL BYBASS KIT (FOR SMALLER MODELS) | 50618 |

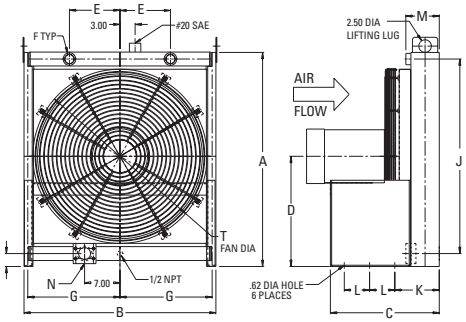
*Available for 2 Pass unit only. Pressure tolerance is (+5 PSI/-0 PSI). Consult factory for details.

**Use HC-G-SFG if all three add-ons are desired.

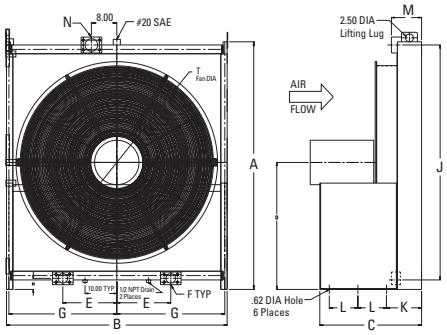
***Ports do not come plugged unless specified at time of order.

# Dimensions

## OCA-450 & 600

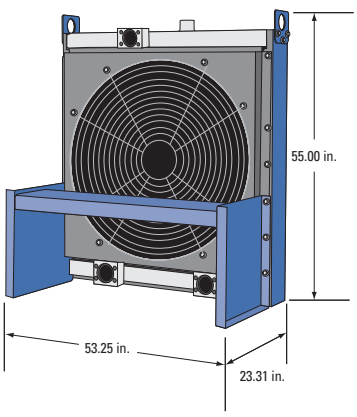



## OCA-1000 Through OCA-3100

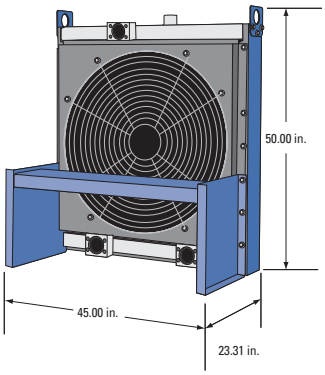



| MODEL | A | B | C | D | E | F | G | H | J | K | L | M | N | T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| OCA-450 | 36.38 | 33.00 | 21.56 | 18.50 | 8.00 | #24 | 15.75 | 4.12 | 28.75 | 8.81 | 5.00 | 6.62 | 2.00 | 24.00 |
| OCA-600 | 42.38 | 38.00 | 21.56 | 21.81 | 10.00 | #24 | 18.25 | 2.56 | 35.50 | 8.81 | 5.00 | 6.62 | 2.50 | 32.00 |
| 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 |
| 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 |
| 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 |
| 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 |
| 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 |

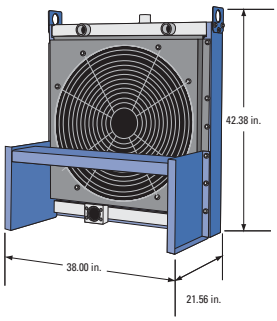
**OCA-1500**



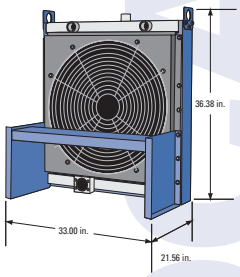

**OCA-1000**




**OCA-600**

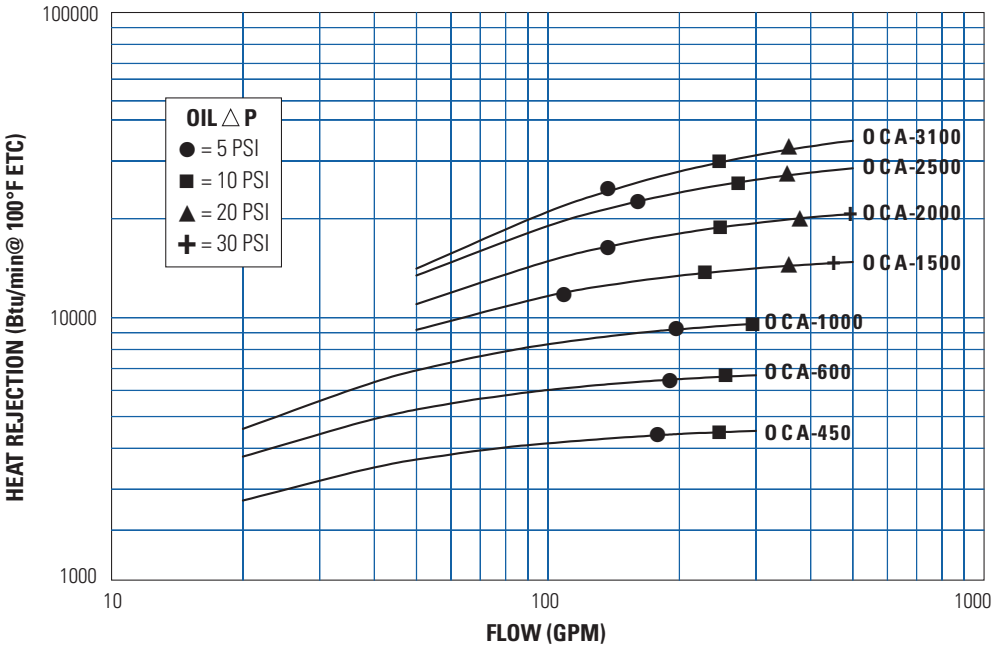



**OCA-450**

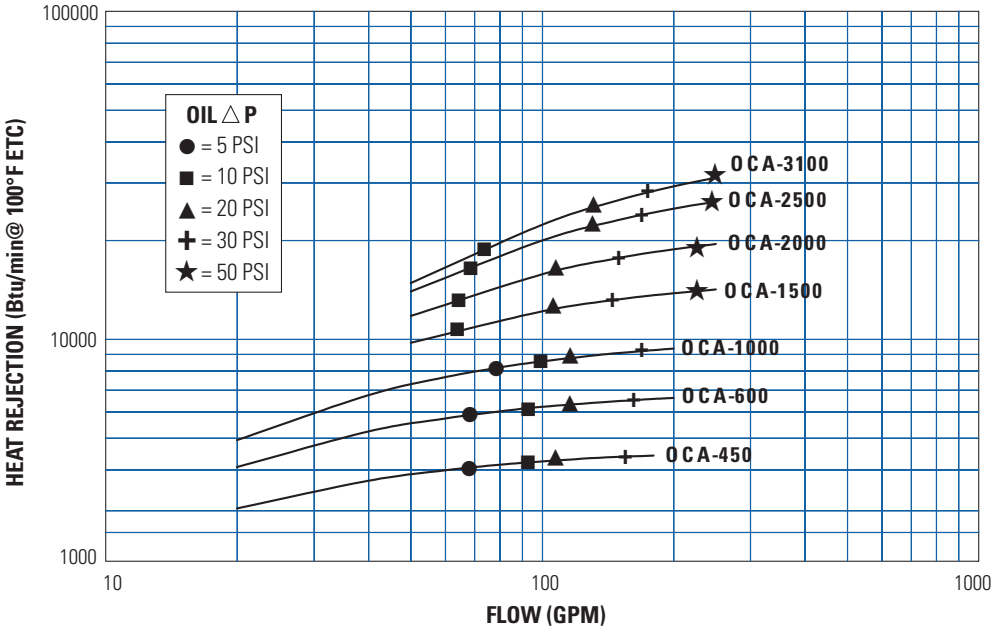


# Performance Curves

## One Pass Oil

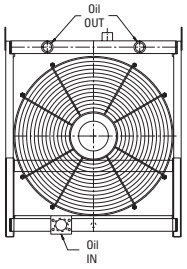



## Two Pass Oil

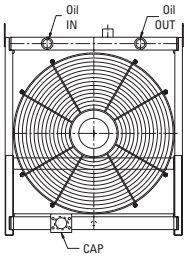



## Oil Piping Diagram

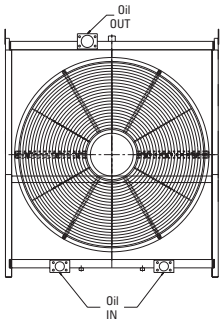
### OCA 450 & 600 One Pass



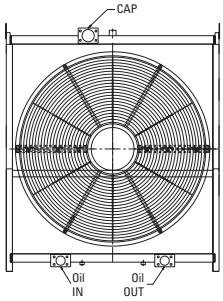

### OCA 450 & 600 Two Pass




### 1000 - 3100 One Pass




### 1000 - 3100 Two Pass




### $C_v$ 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 | MIL-L ISO 320 | 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 |

# Selection Procedure

Performance Curves are based on 100SSU 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:
E.T.D. Temperature Correction Factor:

$$HP_{chart} = HP_{compressor} \times \frac{100 \times Cv}{\text{Desired E.T.D.}}$$

**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.

  33hp 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

**$C_p$ 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 | MIL-L ISO 320 | 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 | 112 | 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 | 1450 | 5.8 | 1750 | 0.67 |
| OCA-600 | 3 | 1450 | 6.1 | 1160 | 0.98 |
| OCA-1000 | 5 | 2175 | 6.1 | 1160 | 0.98 |
| OCA-1500 | 5 | 2175 | 6.1 | 1160 | 0.98 |
| OCA-2000 | 10 | 2900 | 7.4 | 1175 | 1.16 |
| OCA-2500 | 15 | 2900 | 8.2 | 1175 | 1.71 |
| OCA-3100 | 20 | 2900 | 10.8 | 1175 | 2.2 |

T-BAR™
• CORE INSIDE •

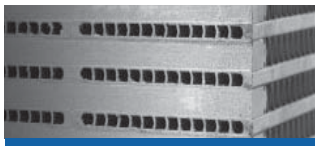
## Advantages

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

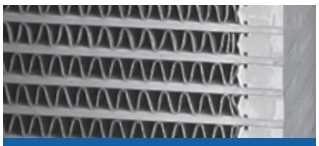
- **Superior performance**
  Aluminum has up to 25 percent higher heat transfer capacity in comparison to a traditional copper/brass cooling package.
- **Rugged Structure**
- **Resistant to Fouling**
- **Resistant to Salt Spray and Salt Air**
- **Compact**
- **Flexible Mounting and Port Configuration**
- **Great Dollar Value Per BTU**

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

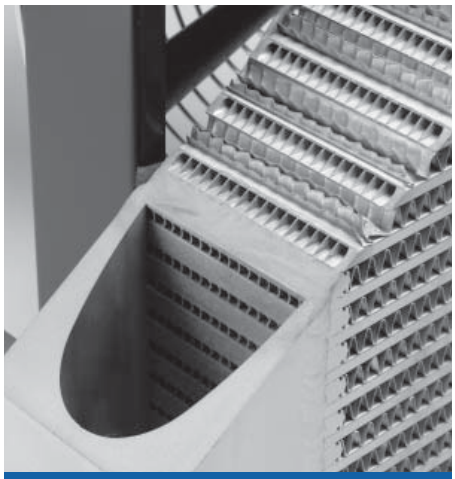
**Tubular Micro Channel Extrusion (T-BAR™)**
T-BAR is manufactured with Alloy 1100 aluminum micro channel and bars in our patented in-house tube-to-bar brazing process using a Nocolok CAB (Controlled Atmosphere Brazing) brazing technology furnace. Because our tubes are a solid extrusion, T-BAR is very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



HIGH-PERFORMANCE



LOW-CLOGGING



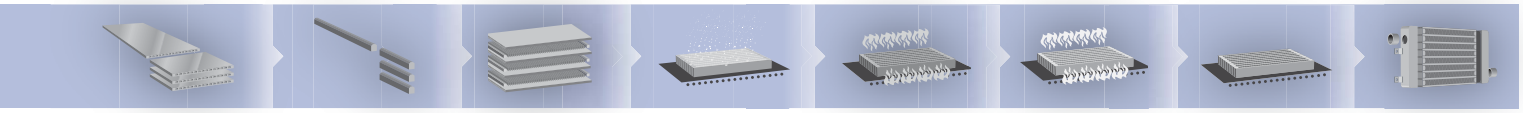
T-BAR CORE IN OCA ASSEMBLY

## 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