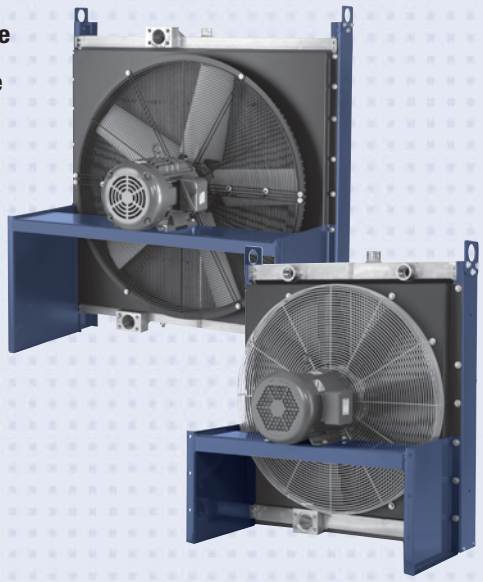
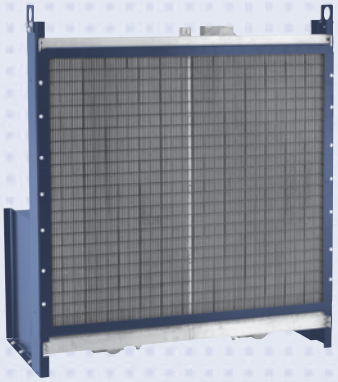
FLUID COOLING | Industrial & Mobile OCA Series

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

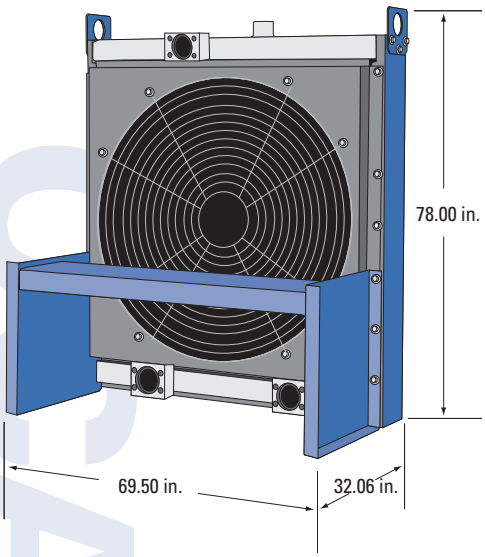
Ratings

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

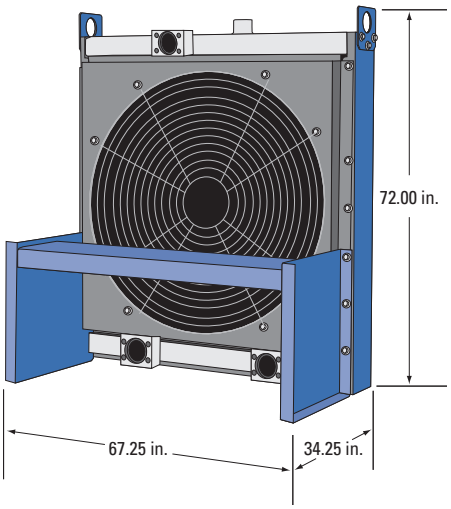
THERMAL PRODUCTS Inc.

Dimension Range

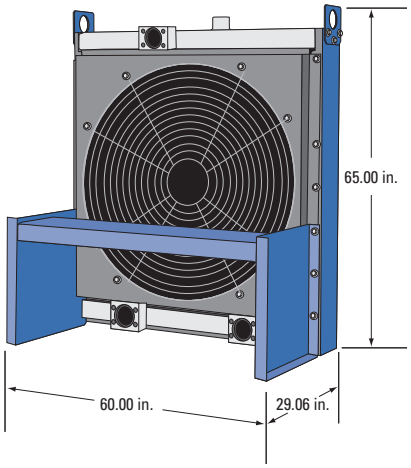
OCA-3100



OCA-2500



OCA-2000



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 #
4-BOLT FLANGE COVER PLT FOR 2" SAE 4-BOLT FLANGE	12076
4-BOLT FLANGE COVER PLT FOR 2-1/2" SAE 4-BOLT FLANGE	12011
4-BOLT FLANGE COVER PLT FOR 3" SAE 4-BOLT FLANGE	12012
4-BOLT FLANGE COVER PLT FOR 4" SAE 4-BOLT FLANGE	12013
*** FILL PLUG (#20 SAE)	50732
#20 SAE TO 1-1/4" NPT ADAPTER	50115
#24 SAE TO 1-1/2" NPT ADAPTER	50116
#32 SAE TO 2" NPT ADAPTER	50117
2" SAE 4-BOLT FLANGE TO 2" NPT ADAPTER	12077
2-1/2" SAE 4-BOLT FLANGE TO 2-1/2" NPT ADAPTER	12014
3" SAE 4-BOLT FLANGE TO 3" NPT ADAPTER	12015

ITEM	PART #
4" SAE 4-BOLT FLANGE TO 4" NPT ADAPTER	12016
#20 SAE TO 1-1/4" BSPP ADAPTER	50120
#24 SAE TO 1-1/2" BSPP ADAPTER	50121
#32 SAE TO 2" BSPP ADAPTER	50122
2" SAE 4-BOLT FLANGE TO 2" BSPP ADAPTER	12078
2-1/2" SAE 4-BOLT FLANGE TO 2-1/2" BSPP ADAPTER	63781
3" SAE 4-BOLT FLANGE TO 3" BSPP ADAPTER	63782
4" SAE 4-BOLT FLANGE TO 4" BSPP ADAPTER	63783
30 PSI EXTERNAL BYPASS KIT (FOR LARGER MODELS)	50602
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

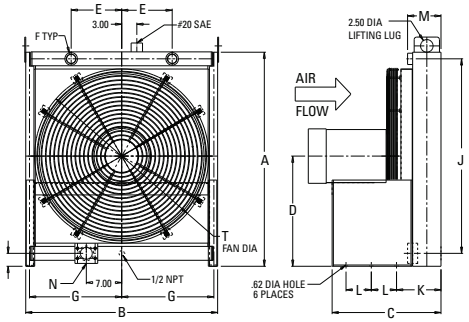
*Available for 2 Pass unit only. Pressure tolerance is (+5 PSI/-0 PSI). Consult factory for details.

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

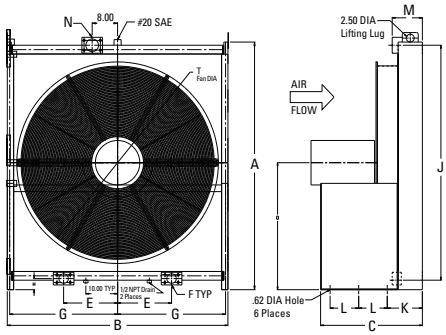
***Ports do not come plugged unless specified at time of order.

Dimensions

OCA-450 & 600

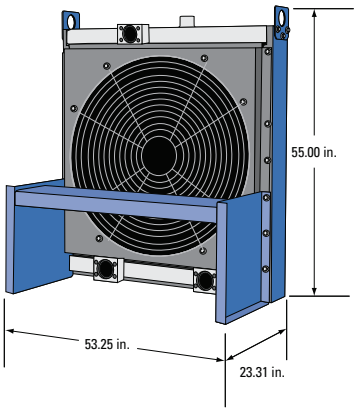


OCA-1000 Through OCA-3100

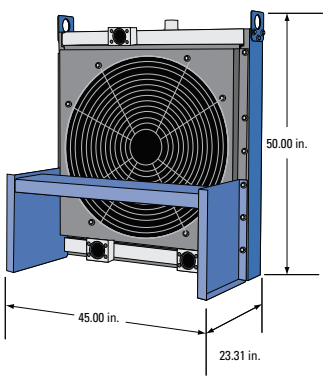


MODEL	A	B	C	D	E	F	G	H	J	K	L	M	N	T	Shipping WT (lbs)
OCA-450	36.38	33.00	21.56	18.50	8.00	#24	15.75	4.12	28.75	8.81	5.00	6.62	2.00	24.00	400
OCA-600	42.38	38.00	21.56	21.81	10.00	#24	18.25	2.56	35.50	8.81	5.00	6.62	2.50	32.00	497
OCA-1000	50.00	45.00	24.56	26.25	10.50	2.00	21.75	4.19	45.50	7.81	7.50	7.50	3.00	36.00	690
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
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
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
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

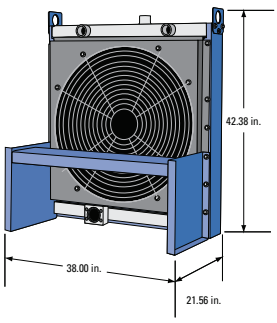
OCA-1500



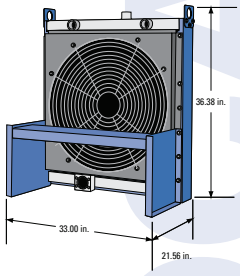
OCA-1000



OCA-600

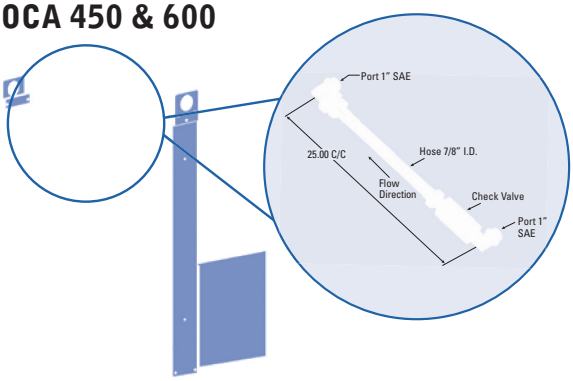


OCA-450

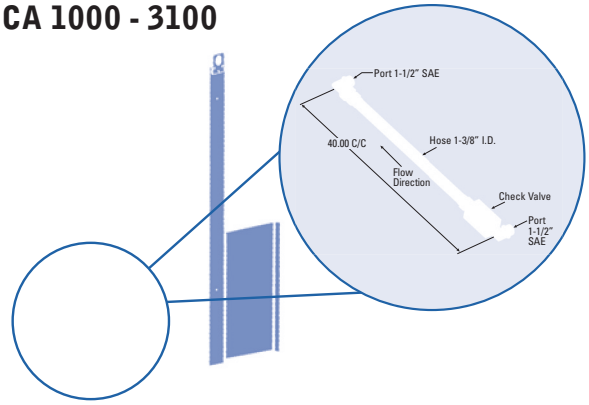


External Bypass Option

OCA 450 & 600

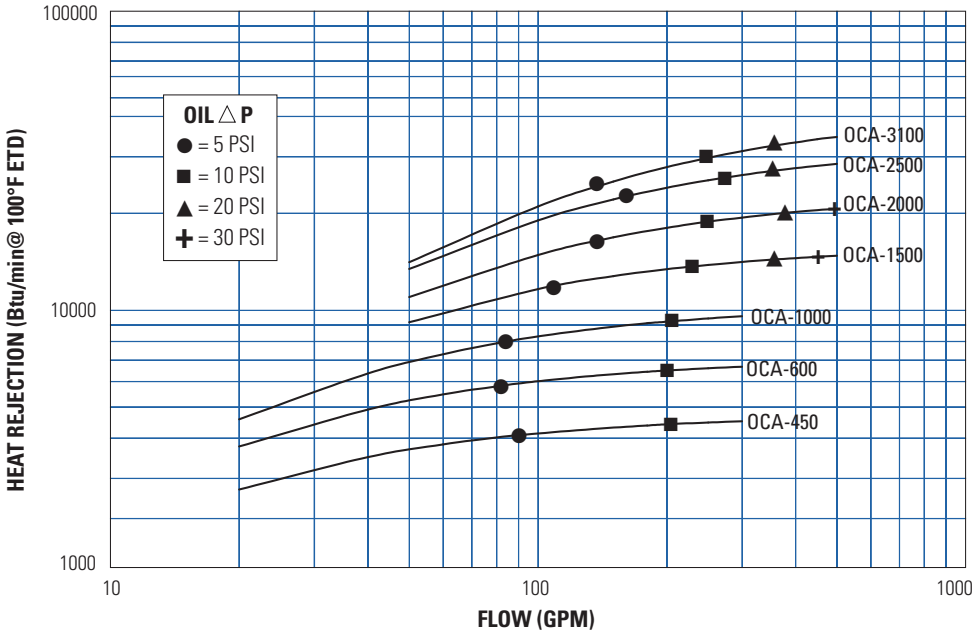


OCA 1000 - 3100

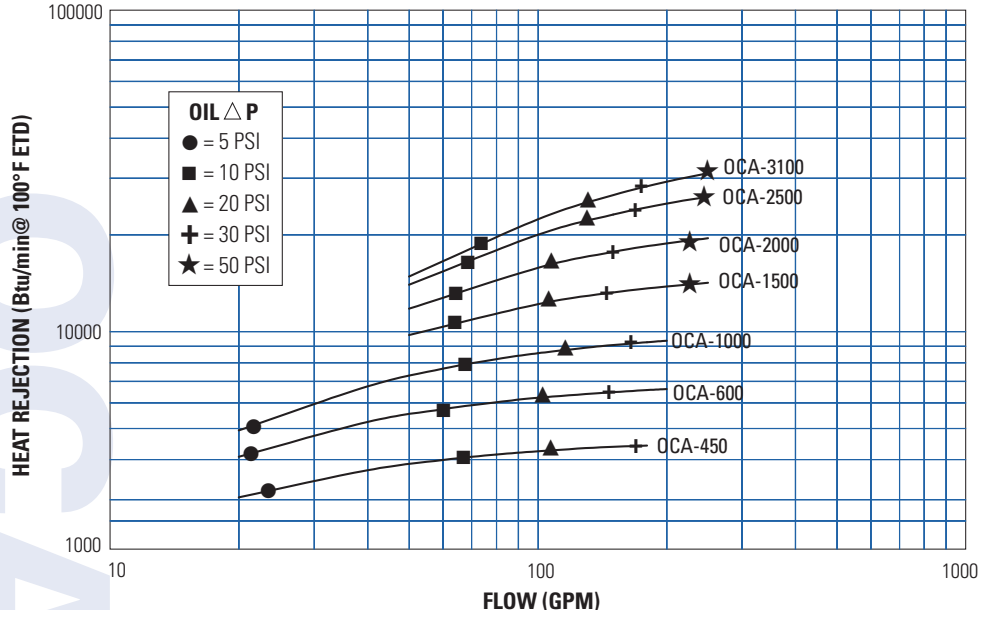


Performance Curves

One Pass Oil

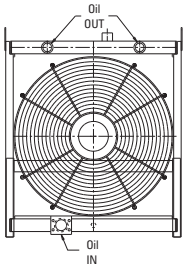


Two Pass Oil

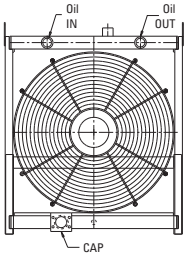


Oil Piping Diagram

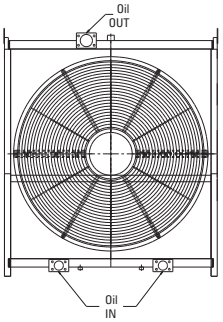
OCA 450 & 600 One Pass



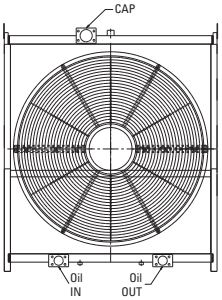
OCA 450 & 600 Two Pass



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.
- $P_{CORRECTED}$ = 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	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

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	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	2900	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 •

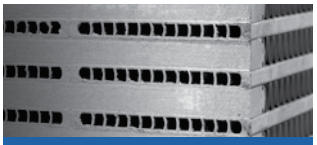
Advantages

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

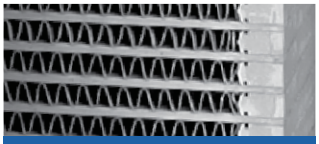
- **Superior performance**
  Aluminum has up to 25 percent higher heat transfer capacity in comparison to a traditional copper/brass cooling package.
- **Rugged Structure**
- **Resistant to Fouling**
- **Resistant to Salt Spray and Salt Air**
- **Compact**
- **Flexible Mounting and Port Configuration**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