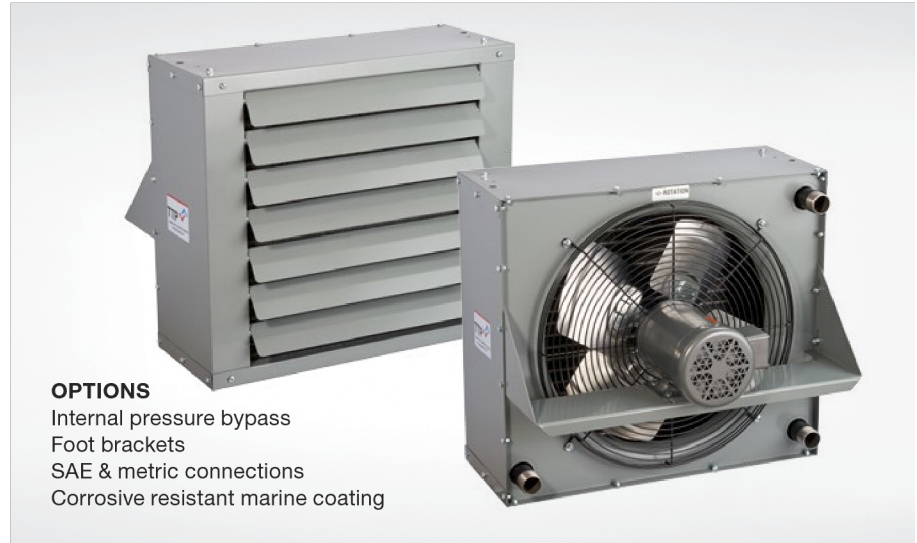


Fluid Cooling Industrial AO Series

Performance Notes

- Interchange for Young OCH
- Adjustable louvers (manual)
- Medium flow rates
- Moderate heat removal
- One or two pass



OPTIONS
 Internal pressure bypass
 Foot brackets
 SAE & metric connections
 Corrosive resistant marine coating

AIR COOLED AO

Ratings

Maximum Operating Pressure
 300 PSI

Test Pressure
 300 PSI

Maximum Operating Temperature
 400°F

Materials

Tubes Copper
Fins Aluminum
Turbulators Steel
Fan Blade Aluminum with steel hub
Fan Guard Zinc plated steel
Cabinet Steel with powder coat finish
Manifolds Steel
Connections Steel

Net Weight (LBS)

| Model | Weight |
|-------|--------|
| AO-5 | 47 |
| AO-10 | 62 |
| AO-15 | 72 |
| AO-20 | 86 |
| AO-25 | 120 |
| AO-30 | 135 |
| AO-35 | 160 |
| AO-40 | 185 |

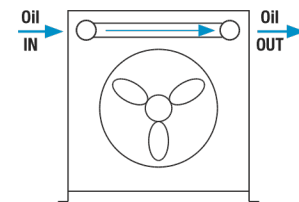
One Pass (Medium to High Oil Flows)

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

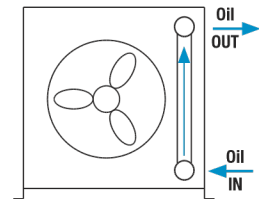
Two Pass (Low to Medium Oil Flows)

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

One Pass with Bypass



Two Pass with Bypass



How to Order

| | | | | | | | | | | | |
|--|---|----------------------------|---|---|---|--|---|---|---|---|---|
| | - | | - | | - | | - | | - | | |
| Model Series AO AOR - Internal pressure bypass included | | Model Size Selected | | Number of Passes* Blank - No Bypass 1 - One Pass 2 - Two Pass | | Connection Type Blank - NPT S - SAE M - Metric | | Bypass Setting* Blank - No Bypass 30 - 30 PSI 60 - 60 PSI | | Foot Mounted Brackets Blank - No Brackets FB - Foot Brackets | Specify Motor Required Single Phase Single Phase Expl. Proof Three Phase Three Phase 575 Volt Three Phase Expl. Proof |

*ADD FOR AOR MODELS ONLY: Bypass setting & number of passes
 This is a partial flow pressure bypass only. It is not designed to be a full flow system bypass.

Specifications

Electric motor & Fan data*

| Model | CFM | Sound dB(A)* at 7 FT | HP | Volts | Phase | Full Load Amps | HZ | Nema Frame | RPM | Type | Circuit | Thermal Overload | Bearing B-Ball |
|-------|----------|-------------------------|------|-------------|-------|-------------------|-------|---------------|-----------|------|---------|---------------------|-------------------|
| AO-5 | 401/187 | 68 | 1/12 | 110/115 | 1 | 1.2/1.2 | 50/60 | 48 | 1400/1700 | TEAO | A | No | B |
| | 494 | 70 | 1/4 | 208-230/460 | 3 | 1.4-1.3/.65 | 60 | | 1725 | TEFC | D | | |
| AO-10 | 576/700 | 68 | 1/12 | 110/115 | 1 | 1.2/1.2 | 50/60 | 48 | 1400/1700 | TEAO | A | No | B |
| | 710 | 70 | 1/4 | 208-230/460 | 3 | 1.4-1.3/.65 | 60 | | 1725 | TEFC | D | | |
| AO-15 | 824/1000 | 69 | 1/12 | 110/115 | 1 | 1.2/1.2 | 50/60 | 48 | 1400/1700 | TEAO | A | No | B |
| | 1015 | 71 | 1/4 | 208-230/460 | 3 | 1.4-1.3/.65 | 60 | | 1725 | TEFC | D | | |
| AO-20 | 1555 | 70 | 1/6 | 115/208-230 | 1 | 4/2.1-2 | 60 | 48 | 1725 | TEFC | C | No | B |
| | | 72 | 1/4 | 208-230/460 | 3 | 1.4-1.3/.65 | | | | | D | | |
| AO-25 | 2240 | 72 | 1/6 | 115/208-230 | 1 | 4.6/2.2 | 60 | 48 | 1140 | TEFC | C | No | B |
| | | 73 | | 208-230/460 | 3 | 1.3-1.2/.6 | | | | | D | | |
| AO-30 | 3100 | 75 | 1/6 | 115/208-230 | 1 | 5.2/2.7-2.6 | 60 | 48 | 1140 | TEFC | C | No | B |
| | | 76 | | 208-230/460 | 3 | 1.3-1.2/.6 | | | | | D | | |
| AO-35 | 4370 | 76 | 1/2 | 115/208-230 | 1 | 8/4.2-4 | 60 | 56 | 1140 | TEFC | C | No | B |
| | | 77 | | 208-230/460 | 3 | 2.5-2.4/1.2 | | | | | D | | |
| AO-40 | 5450 | 78 | 1/2 | 115/208-230 | 1 | 8/4.2-4 | 60 | 56 | 1140 | TEFC | C | No | B |
| | | 79 | | 208-230/460 | 3 | 2.5-2.4/1.2 | | | | | D | | |

Published electrical ratings are approximate, and may vary because of motor brand. Actual ratings are on motor nameplate.

*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 six (6) dB(A) for doubling this distance.

Explosion Proof Motors (Class I GP.D & Class II GP.F, G)*

| Model | CFM | Sound dB(A)* at 7 FT | HP | Volts | Phase | Full Load Amps | HZ | Nema Frame | RPM | Type | Circuit | Thermal Overload | Bearing B-Ball |
|-------|------|-------------------------|-----|-------------|-------|-------------------|----|---------------|------|------|---------|---------------------|-------------------|
| AO-5 | 494 | 68 | 1/4 | 115/230 | 1 | 5.8/2.9 | 60 | 48 | 1725 | FC | C | Yes | B |
| | | 70 | | 208-230/460 | 3 | 1.4-1.3/.65 | | | | | D | | |
| AO-10 | 710 | 68 | 1/4 | 115/230 | 1 | 5.8/2.9 | 60 | 48 | 1725 | FC | C | Yes | B |
| | | 70 | | 208-230/460 | 3 | 1.4-1.3/.65 | | | | | D | | |
| AO-15 | 1015 | 69 | 1/4 | 115/230 | 1 | 5.8/2.9 | 60 | 48 | 1725 | FC | C | Yes | B |
| | | 71 | | 208-230/460 | 3 | 1.4-1.3/.65 | | | | | D | | |
| AO-20 | 1555 | 70 | 1/4 | 115/230 | 1 | 5.8/2.9 | 60 | 48 | 1725 | FC | C | Yes | B |
| | | 72 | | 208-230/460 | 3 | 1.4-1.3/.65 | | | | | D | | |
| AO-25 | 2240 | 72 | 1/3 | 115/230 | 1 | 6.8/3.4 | 60 | 56 | 1140 | FC | C | Yes | B |
| | | 73 | | 208-230/460 | 3 | 1.8-1.6/.8 | | | | | D | | |
| AO-30 | 3100 | 75 | 1/3 | 115/230 | 1 | 6.8/3.4 | 60 | 56 | 1140 | FC | C | Yes | B |
| | | 76 | | 208-230/460 | 3 | 1.8-1.6/.8 | | | | | D | | |
| AO-35 | 4370 | 76 | 1/2 | 115/230 | 1 | 8/4 | 60 | 56 | 1140 | FC | C | Yes | B |
| | | 77 | | 208-230/460 | 3 | 2.5-2.4/1.2 | | | | | D | | |
| AO-40 | 5450 | 78 | 1/2 | 115/230 | 1 | 8/4 | 60 | 56 | 1140 | FC | C | Yes | B |
| | | 79 | | 208-230/460 | 3 | 2.5-2.4/1.2 | | | | | D | | |

Published electrical ratings are approximate, and may vary because of motor brand. Actual ratings are on motor nameplate.

*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 six (6) dB(A) for doubling this distance.

575 Volt

| Model | CFM | Sound dB(A)** at 7 FT | HP | Volts | Phase | Full Load Amps | HZ | Nema Frame | RPM | Type | Circuit | Thermal Overload | Bearing B-Ball |
|-------|------|--------------------------|-----|-------|-------|-------------------|----|---------------|------|------|---------|---------------------|-------------------|
| AO-5 | 494 | 70 | 1/4 | 575 | 3 | .52 | 60 | 48 | 1725 | TEFC | D | No | B |
| AO-10 | 710 | 70 | 1/4 | 575 | 3 | .52 | 60 | 48 | 1725 | TEFC | D | No | B |
| AO-15 | 1015 | 71 | 1/4 | 575 | 3 | .52 | 60 | 48 | 1725 | TEFC | D | No | B |
| AO-20 | 1555 | 72 | 1/4 | 575 | 3 | .52 | 60 | 48 | 1725 | TEFC | D | No | B |
| AO-25 | 2240 | 73 | 1/2 | 575 | 3 | .88 | 60 | 56 | 1140 | TEFC | D | No | B |
| AO-30 | 3100 | 76 | 1/2 | 575 | 3 | .88 | 60 | 56 | 1140 | TEFC | D | No | B |
| AO-35 | 4370 | 77 | 1/2 | 575 | 3 | .88 | 60 | 56 | 1140 | TEFC | D | No | B |
| AO-40 | 5450 | 79 | 1/2 | 575 | 3 | .88 | 60 | 56 | 1140 | TEFC | D | No | B |

*D Squirrel Cage

**Catalog dB (A) sound levels at seven (7) feet. dB (A) sound levels increase by six (6) dB (A) for halving this distance, and decrease by six (6) dB (A) for doubling this distance.

Lubrication Notes

Caution: Do not over oil or over grease. **Ball bearings** – No grease needed at start up. Grease as follows:

| | |
|--|------------------------|
| 5,000 Hours/Year | 5 Year Grease Interval |
| Continuous — Normal Applications | 2 Years |
| Seasonal Service — Motor is idle for 6 months or more | 1 Year |
| Continuous — High ambients, dirty or moist locations, high vibration | 6 Months |

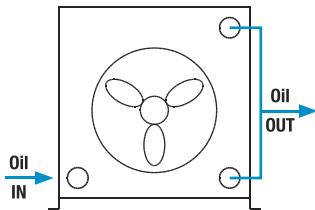
Dimensions

| Model | A | B | C | D | E | F | G | H | J | K | L | M NPT | M SAE | N | P | T |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|--------------------------------------|-------|-------|-------|
| AO-5 | 7.40 | 14.81 | 5.90 | 11.81 | 20.00 | 9.19 | 8.31 | 6.47 | 12.94 | 3.78 | 7.56 | 1" | #16 SAE 1 1/16"-12UN-2B Thread | 5.84 | 11.69 | — |
| AO-10 | 9.50 | 19.00 | 6.56 | 13.12 | 19.25 | 10.50 | 12.50 | 8.56 | 17.12 | 4.44 | 8.88 | 1" | | 7.94 | 15.88 | — |
| AO-15 | 10.19 | 20.38 | 7.87 | 15.75 | 19.25 | 13.12 | 13.88 | 9.25 | 18.50 | 5.75 | 11.50 | 1" | | 8.62 | 17.25 | — |
| AO-20 | 11.91 | 23.81 | 9.19 | 18.38 | 19.25 | 15.75 | 17.91 | 10.90 | 21.81 | 7.00 | 14.00 | 1 1/4" | #20 SAE 1 1/2"-12UN-2B Thread | 10.28 | 20.56 | — |
| AO-25 | 13.34 | 26.68 | 11.81 | 23.62 | 19.25 | 21.00 | 20.19 | 12.40 | 24.81 | 9.62 | 19.25 | 1 1/4" | | 11.78 | 23.56 | — |
| AO-30 | 15.81 | 31.62 | 13.78 | 27.56 | 19.50 | 24.94 | 25.12 | 14.87 | 29.75 | 11.59 | 23.19 | 1 1/4" | | 14.25 | 28.50 | 11.00 |
| AO-35 | 16.90 | 33.81 | 15.09 | 30.19 | 21.50 | 27.56 | 27.31 | 15.97 | 31.94 | 12.90 | 25.81 | 1 1/4" | | 15.34 | 30.69 | 11.00 |
| AO-40 | 20.81 | 41.62 | 18.37 | 36.75 | 20.50 | 34.12 | 35.12 | 19.87 | 39.75 | 16.19 | 32.38 | 1 1/4" | | 19.25 | 38.50 | 13.25 |

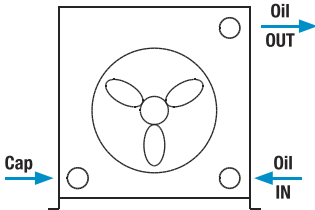
NOTE: All dimensions in inches.

Piping Diagram

One Pass Without Bypass

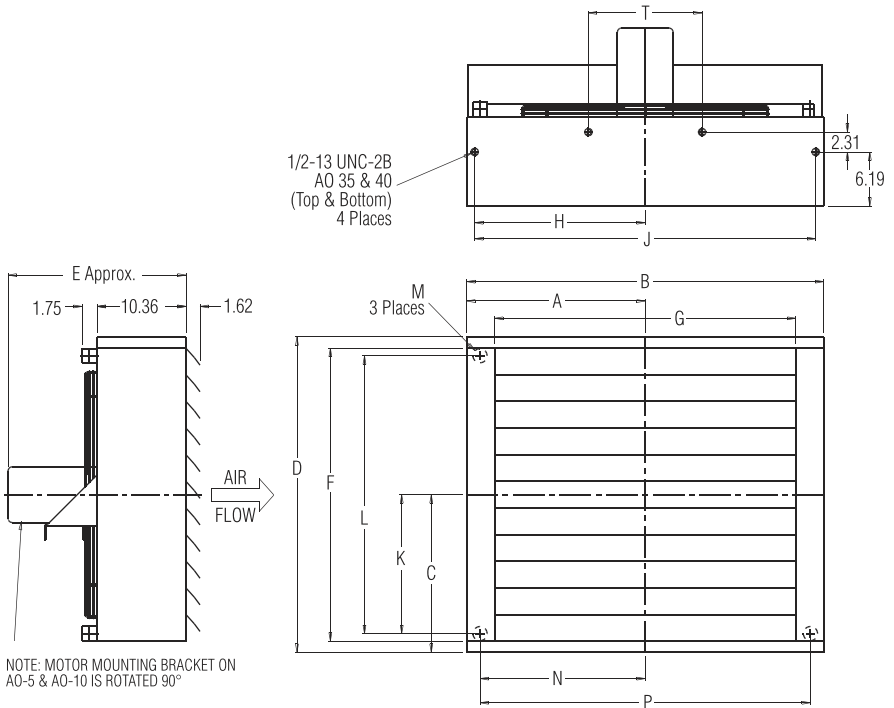


Two Pass Without Bypass



*See dimension chart for NPT or optional internal SAE connection size.

Fan Rotation Clockwise/Facing Motor Shaft

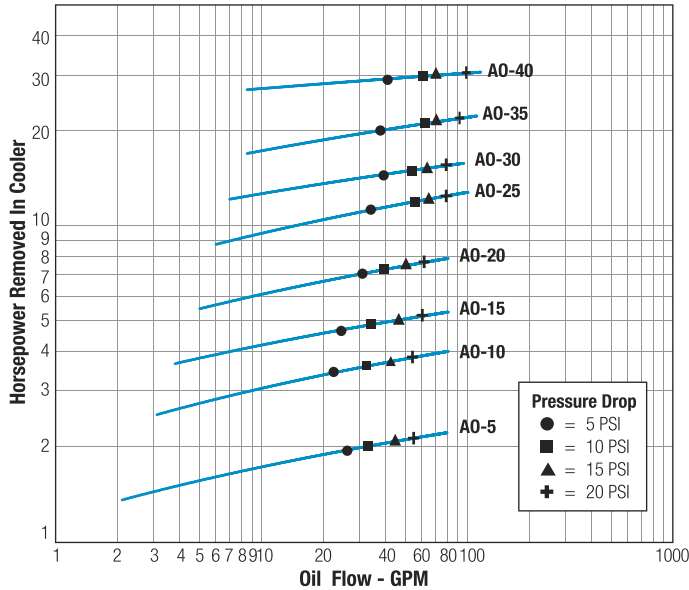


C_v Viscosity Correction

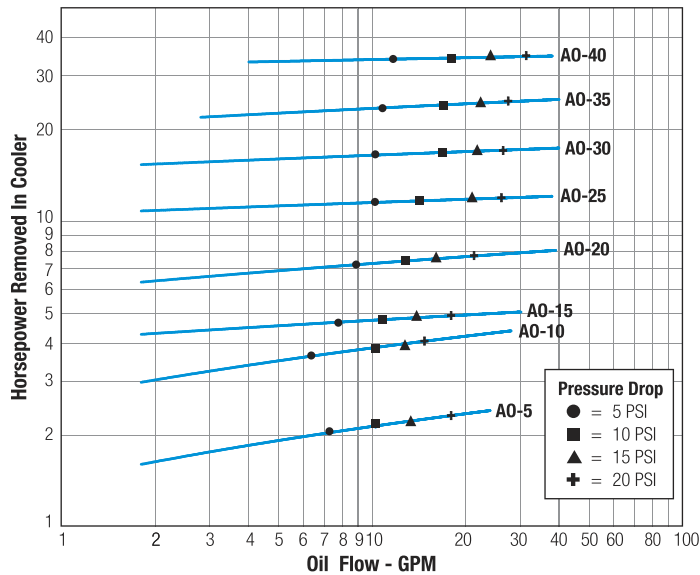
| Average Oil Temp °F | OIL | | | | | |
|---------------------|--|---|---|---|---|-------------------------------------|
| | SAE 5 110 SSU at 100°F 40 SSU at 210°F | SAE 10 150 SSU at 100°F 43 SSU at 210°F | SAE 20 275 SSU at 100°F 50 SSU at 210°F | SAE 30 500 SSU at 100°F 65 SSU at 210°F | SAE 40 750 SSU at 100°F 75 SSU at 210°F | 50-50 Ethylene Glycol & Water |
| 100 | 1.14 | 1.22 | 1.35 | 1.58 | 1.77 | 1.11 |
| 150 | 1.01 | 1.05 | 1.11 | 1.21 | 1.31 | 1.02 |
| 200 | .99 | 1.00 | 1.01 | 1.08 | 1.10 | .96 |
| 250 | .95 | .98 | .99 | 1.00 | 1.00 | .95 |

Performance Curves

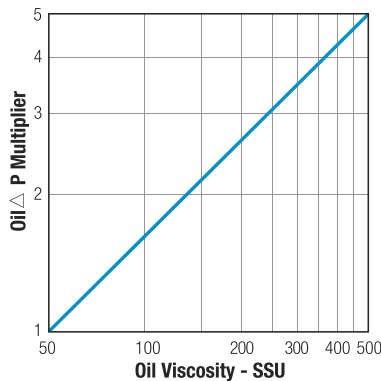
One Pass Oil



Two Pass Oil



Oil Pressure Correction



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:
Horsepower heat load x $\frac{40 \times Cv}{Actual Approach}$ = 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 ▲ = 15 PSI + = 20 PSI Multiply pressure drop from curve by correction factor found in oil ΔP 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 Δ T) with this formula:
 $Oil \Delta T = (BTU's/HR) / (GPM Oil Flow \times 210)$

To calculate the oil leaving temperature from the cooler, use this formula:
 $Oil Leaving Temp. = Oil Entering Temp - Oil \Delta T$

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 |