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

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

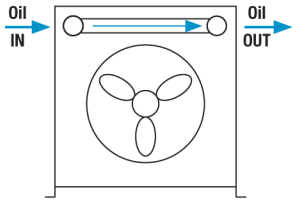
One Pass (Medium to High Oil Flows)

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

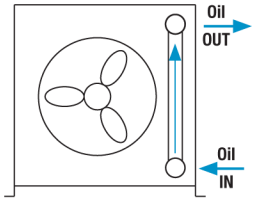
Two Pass (Low to Medium Oil Flows)

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

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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
A0-5	401/187 494	68 70	1/12 1/4	110/115 208-230/460	1 3	1.2/1.2 1.4-1.3/.65	50/60 60	48	1400/1700 1725	TEAO TEFC	A D	No	B
A0-10	576/700 710	68 70	1/12 1/4	110/115 208-230/460	1 3	1.2/1.2 1.4-1.3/.65	50/60 60	48	1400/1700 1725	TEAO TEFC	A D	No	B
A0-15	824/1000 1015	69 71	1/12 1/4	110/115 208-230/460	1 3	1.2/1.2 1.4-1.3/.65	50/60 60	48	1400/1700 1725	TEAO TEFC	A D	No	B
A0-20	1555	70 72	1/6 1/4	115/208-230 208-230/460	1 3	4/2.1-2 1.4-1.3/.65	60	48	1725	TEFC	C D	No	B
A0-25	2240	72 73	1/6	115/208-230 208-230/460	1 3	4.6/2.2 1.3-1.2/.6	60	48	1140	TEFC	C D	No	B
A0-30	3100	75 76	1/6	115/208-230 208-230/460	1 3	5.2/2.7-2.6 1.3-1.2/.6	60	48	1140	TEFC	C D	No	B
A0-35	4370	76 77	1/2	115/208-230 208-230/460	1 3	8/4.2-4 2.5-2.4/1.2	60	56	1140	TEFC	C D	No	B
A0-40	5450	78 79	1/2	115/208-230 208-230/460	1 3	8/4.2-4 2.5-2.4/1.2	60	56	1140	TEFC	C D	No	B

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
A0-5	494	68 70	1/4	115/230 208-230/460	1 3	5.8/2.9 1.4-1.3/.65	60	48	1725	FC	C D	Yes	B
A0-10	710	68 70	1/4	115/230 208-230/460	1 3	5.8/2.9 1.4-1.3/.65	60	48	1725	FC	C D	Yes	B
A0-15	1015	69 71	1/4	115/230 208-230/460	1 3	5.8/2.9 1.4-1.3/.65	60	48	1725	FC	C D	Yes	B
A0-20	1555	70 72	1/4	115/230 208-230/460	1 3	5.8/2.9 1.4-1.3/.65	60	48	1725	FC	C D	Yes	B
A0-25	2240	72 73	1/3	115/230 208-230/460	1 3	6.8/3.4 1.8-1.6/.8	60	56	1140	FC	C D	Yes	B
A0-30	3100	75 76	1/3	115/230 208-230/460	1 3	6.8/3.4 1.8-1.6/.8	60	56	1140	FC	C D	Yes	B
A0-35	4370	76 77	1/2	115/230 208-230/460	1 3	8/4 2.5-2.4/1.2	60	56	1140	FC	C D	Yes	B
A0-40	5450	78 79	1/2	115/230 208-230/460	1 3	8/4 2.5-2.4/1.2	60	56	1140	FC	C D	Yes	B

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
A0-5	494	70	1/4	575	3	.52	60	48	1725	TEFC	D	No	B
A0-10	710	70	1/4	575	3	.52	60	48	1725	TEFC	D	No	B
A0-15	1015	71	1/4	575	3	.52	60	48	1725	TEFC	D	No	B
A0-20	1555	72	1/4	575	3	.52	60	48	1725	TEFC	D	No	B
A0-25	2240	73	1/2	575	3	.88	60	56	1140	TEFC	D	No	B
A0-30	3100	76	1/2	575	3	.88	60	56	1140	TEFC	D	No	B
A0-35	4370	77	1/2	575	3	.88	60	56	1140	TEFC	D	No	B
A0-40	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

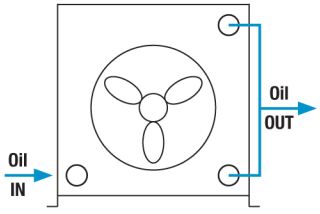
Dimensions

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 5/16-12UN-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	1¼"	#20 SAE 1 5/8-12UN-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	1¼"		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	1¼"		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	1¼"		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	1¼"		19.25	38.50	13.25

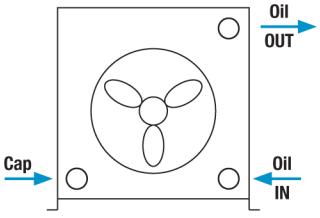
NOTE: All dimensions in inches.

Piping Diagram

One Pass Without Bypass

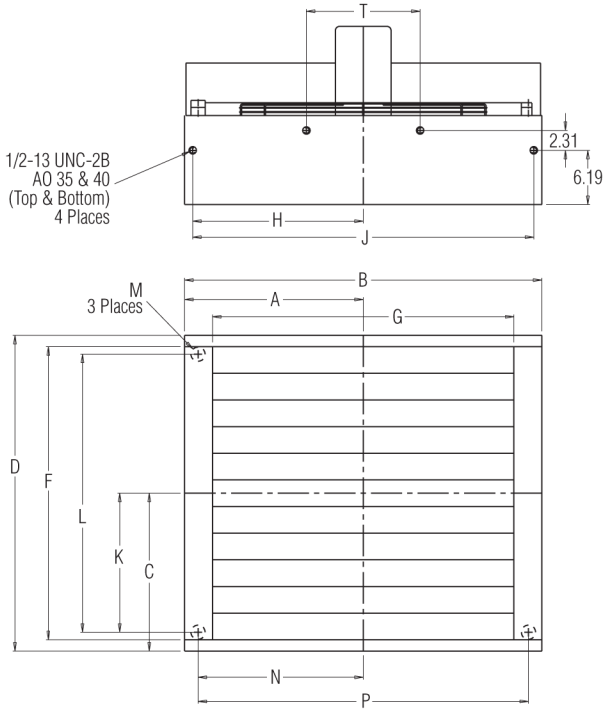


Two Pass Without Bypass



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

Fan Rotation Clockwise/Facing Motor Shaft



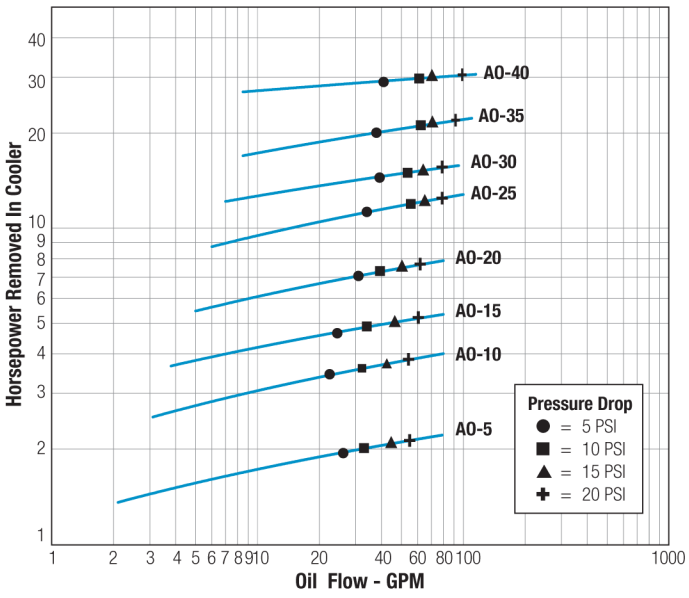
NOTE: MOTOR MOUNTING BRACKET ON AO-5 & AO-10 IS ROTATED 90°

C_V Viscosity Correction

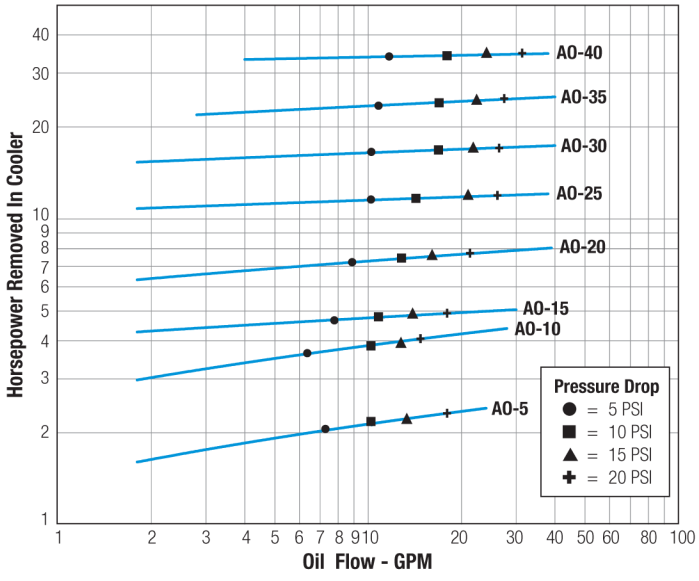
	OIL					
Average Oil Temp °F	**SAE 5** 110 SSU at 100°F 40 SSU at 210°F	**SAE 10** 150 SSU at 100°F 43 SSU at 210°F	**SAE 20** 275 SSU at 100°F 50 SSU at 210°F	**SAE 30** 500 SSU at 100°F 65 SSU at 210°F	**SAE 40** 750 SSU at 100°F 75 SSU at 210°F	**50-50 Ethylene Glycol & Water**
100	1.14	1.22	1.35	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

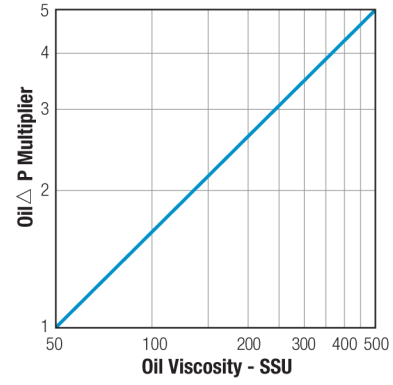
One Pass Oil



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:

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

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 ▲ = 14 PSI ✚ = 20 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