

Fluid Cooling P-BAR ■ Industrial BOL Series

BRAZED ALUMINUM CONSTRUCTION

Performance Notes

- Bar and plate brazed aluminum core
- 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 & BSPP available
- Customized units are available to meet your OE specific performance requirements
- T-BAR core optional for high viscosity oils or other highly fouling fluids. (See T-BAR Performance Curve)
- Optional internal temperature controlled bypass (T-BAR)

Ratings

Maximum Operating Pressure
250 PSI (17 BAR)

Maximum Operating Temperature
300°F (150°C)

Fluid Compatibility

- Petroleum/mineral oils
- Oil/water emulsion
- Water/ethylene glycol



Options

- Low noise
- T-BAR core
- Serviceable internal pressure and temperature bypass

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 – 3003-0 Aluminum

Fanguard Steel

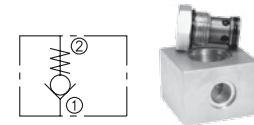
Connectors Aluminum

Fan Aluminum Hub, Plastic Blades

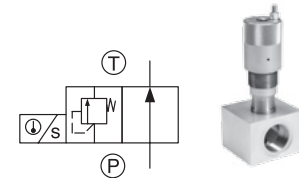
Shroud Steel

Motor TEFC & IEC

Internal Bypass Options



Pressure Bypass



Temperature Controlled Bypass with Integrated Pressure Relief

How to Order

| | | | | | | | | | | | | |
|--|---|---|---|--|---|--|---|--|---|--|--|---|
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| Model Series BOL BOLR - Internal pressure bypass included | | Model Size Selected 4 • 8 • 16* • 30 400* • 725* • 950 1200* • 1600* • 2000 | | Connection Type 1 - NPT 2 - SAE 3 - BSPP | | Bypass* Blank - No Bypass Pressure bypass only (P-BAR and T-BAR Cores) 25 - 25 PSI (1.7 BAR) 60 - 60 PSI (4.1 BAR) Thermal/pressure relief bypass with temperature rating of 140°F (60°C) (T-BAR Core only) 29 - 29 PSI (2.0 BAR) 87 - 87 PSI (6.0 BAR) 130 - 130 PSI (9.0 BAR) | | Specify Motor Required 2 - Single Phase 3 - Three Phase 6 - 575V Three Phase 9 - Hydraulic 18 - IEC Three Phase C - Core Only 0 - No Motor | | Core Blank - Standard P-BAR TB - T-BAR Core** | | Noise Level Blank - Standard Noise Level LN - Low Noise Level*** |

*BOL-4 is not offered with bypass.

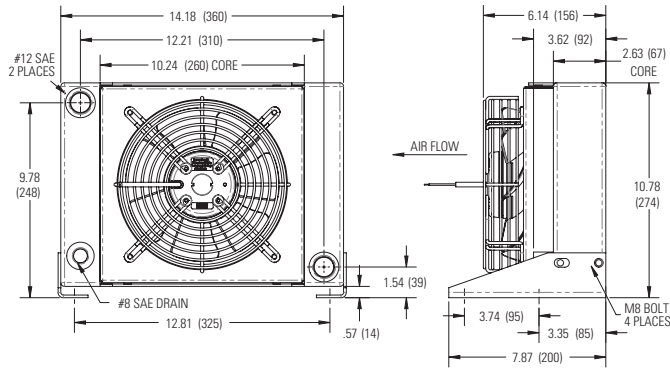
This is a partial flow pressure bypass only. It is not designed to be a full flow system bypass.

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

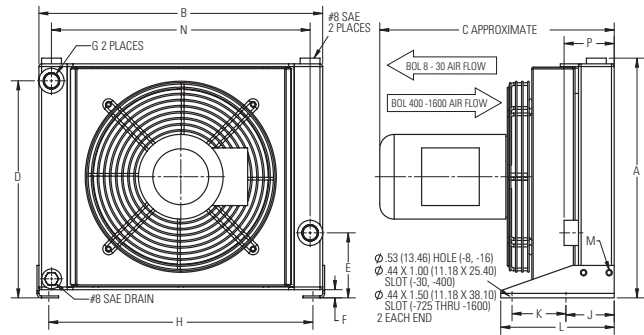
***Available in models 8-2000 only, the low noise option is done by lowering the fan speed. As a result, the performance will be reduced by approximately one model size.

Dimensions

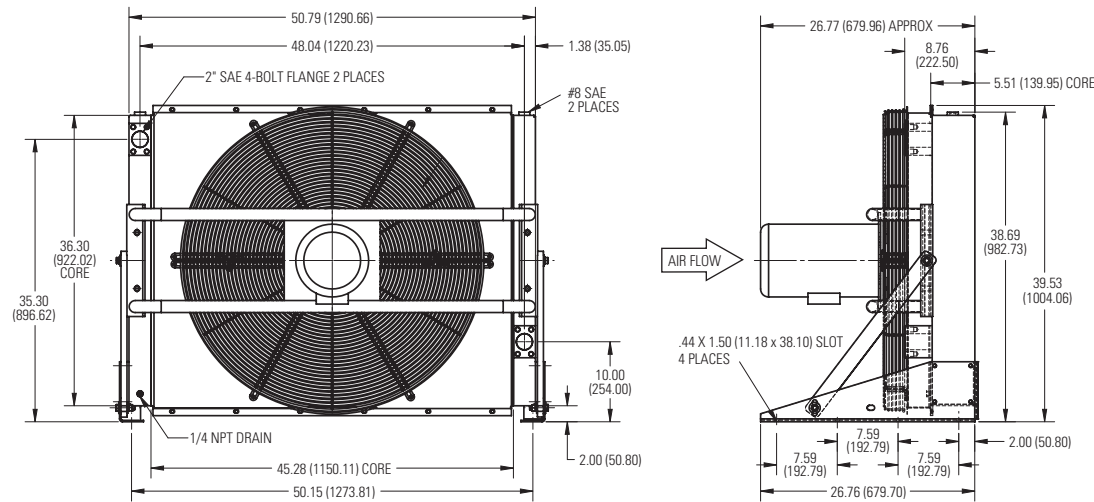
BOL-4



BOL-8 through BOL-1600



BOL-2000

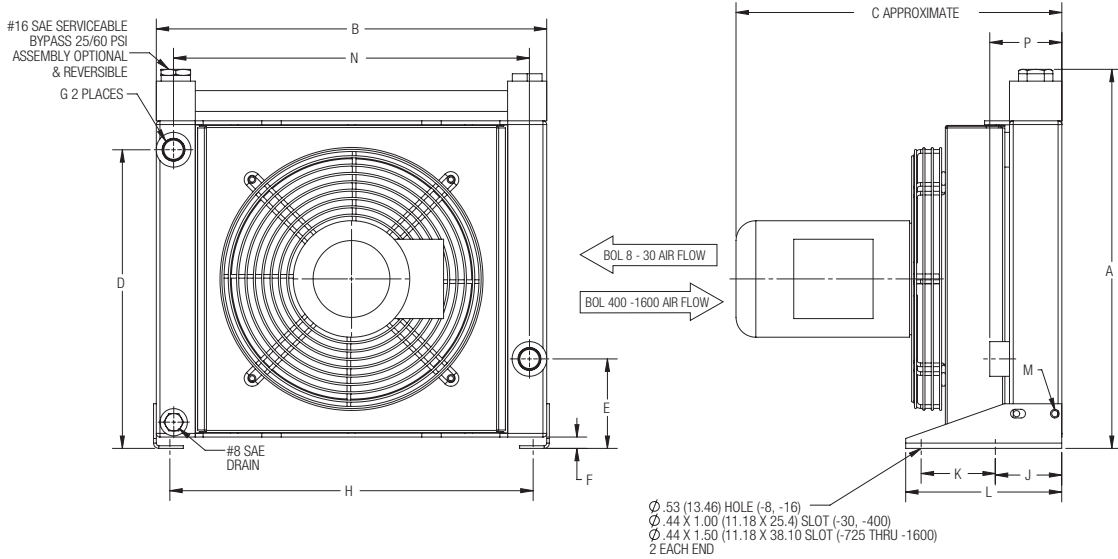


| Model | A | B | C | D | E | F | G | | H | J | K | L | M | N | P | Approx. Shipping Weight LBS (KG) |
|----------|-------------------|--------------|-------------|-------------|------------|------------|----------------------|------------|-------------------|------------|------------|------------|----------------|--------------|--------------|----------------------------------|
| | | | | | | | SAE | NPT & BSPP | | | | | | | | |
| BOL-4 | See diagram above | | | | | | #12 SAE | 3/4" | See diagram above | | | | | | 18 (8.16) | |
| BOL-8 | 12.56 (319) | 15.81 (402) | 15.94 (405) | 11.34 (288) | 4.51 (115) | 0.57 (14) | #12 SAE | 3/4" | 14.44 (361) | 3.36 (85) | 3.74 (95) | 7.87 (200) | M8 BOLT (2PL) | 13.99 (355) | 3.63 (92) | 45 (20.4) |
| BOL-16 | 16.33 (415) | 19.69 (500) | 16.43 (417) | 15.06 (383) | 4.57 (116) | 0.57 (14) | #12 SAE | 3/4" | 18.31 (465) | 3.35 (85) | 3.74 (95) | 7.87 (200) | M8 BOLT (2PL) | 17.95 (456) | 3.63 (92) | 55 (24.94) |
| BOL-30 | 20.13 (511) | 26.38 (670) | 17.88 (454) | 19.49 (495) | 5.26 (134) | 1.32 (340) | #20 SAE | 1 1/4" | 24.74 (628) | 4.15 (105) | 5.00 (127) | 9.9 (251) | M8 BOLT (4PL) | 24.34 (618) | 5.00 (127) | 125 (56.70) |
| BOL-400 | 18.90 (480) | 22.38 (568) | 18.6 (472) | 17.31 (440) | 6.50 (165) | 2.00 (51) | #20 SAE | 1 1/4" | 22.31 (567) | 4.15 (105) | 5.00 (127) | 9.9 (251) | M8 BOLT (4PL) | 20.07 (510) | 5.00 (127) | 148 (67.13) |
| BOL-725 | 23.40 (594) | 30.25 (768) | 17.56 (446) | 21.62 (549) | 6.50 (165) | 2.00 (51) | #20 SAE | 1 1/4" | 30.11 (765) | 4.15 (105) | 5.00 (127) | 9.9 (251) | M10 BOLT (4PL) | 27.95 (710) | 5.00 (127) | 170 (77.11) |
| BOL-950 | 27.70 (705) | 37.01 (940) | 22.68 (576) | 24.55 (624) | 9.50 (241) | 2.00 (51) | 2" SAE 4 BOLT FLANGE | 2" | 35.87 (911) | 6.05 (154) | 9.20 (234) | 16 (406) | M10 BOLT (4PL) | 34.26 (9870) | 7.00 (178) | 300 (136.08) |
| BOL-1200 | 28.38 (721) | 40.98 (1041) | 24.05 (611) | 24.55 (624) | 5.50 (140) | 2.00 (51) | | 2" | 40.29 (1023) | 6.05 (154) | 9.20 (234) | 16 (406) | M10 BOLT (4PL) | 38.18 (970) | 8.75 (222) | 430 (195.04) |
| BOL-1600 | 36.50 (927) | 40.98 (1041) | 25.43 (646) | 32.80 (833) | 9.50 (241) | 2.00 (51) | | 2" | 40.29 (1023) | 6.05 (154) | 9.20 (234) | 16 (406) | M10 BOLT (4PL) | 38.18 (970) | 8.75 (222) | 515 (233.60) |
| BOL-2000 | See diagram above | | | | | | | 2" | See diagram above | | | | | | 582 (264.00) | |

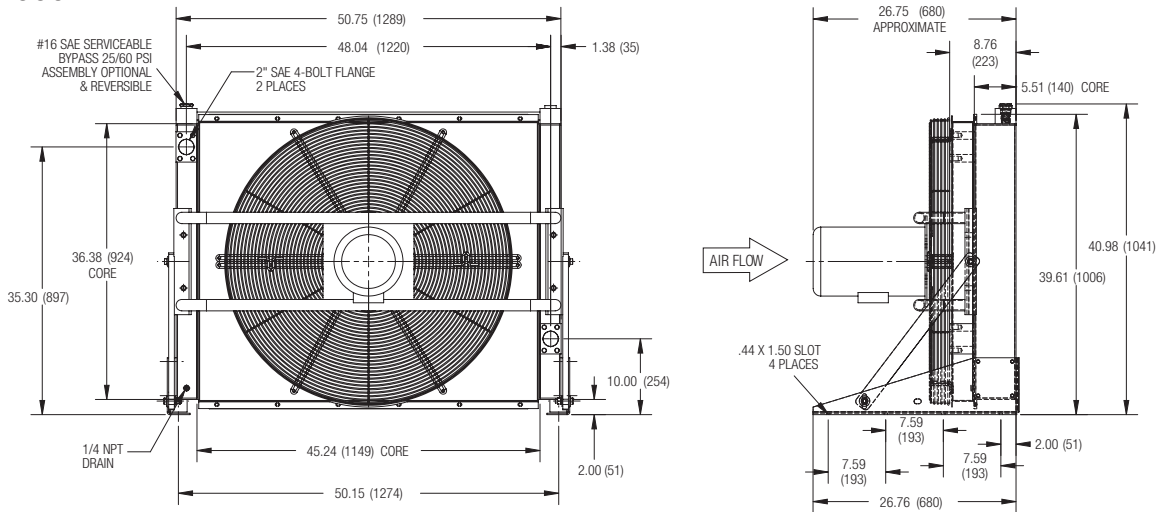
Note: We reserve the right to make reasonable design changes without notice. All dimensions are in inches (millimeters) unless noted otherwise.

Dimensions with Internal Pressure Bypass

BOLR-8 – BOLR-1600



BOLR-2000



| Model | A | B | C | D | E | F | G | | H | J | K | L | M | N | P | Approx. Ship Weight LBS (KG) |
|-----------|-------------------|--------------|-------------|-------------|------------|------------|----------------------|------------|-------------------|------------|------------|------------|----------------|--------------|------------|------------------------------|
| | | | | | | | SAE | NPT & BSPP | | | | | | | | |
| BOLR-8 | 15.34 (390) | 15.81 (402) | 15.94 (405) | 11.34 (288) | 4.51 (115) | 0.57 (14) | #12 SAE | 3/4" | 14.44 (361) | 3.36 (85) | 3.74 (95) | 7.87 (200) | M8 Bolt (2PL) | 13.99 (355) | 3.63 (92) | 60 (27.22) |
| BOLR-16 | 19.11 (485) | 19.69 (500) | 16.43 (417) | 15.06 (383) | 4.57 (116) | 0.57 (14) | #12 SAE | 3/4" | 18.31 (465) | 3.35 (85) | 3.74 (95) | 7.87 (200) | M8 Bolt (2PL) | 17.95 (456) | 3.63 (92) | 70 (31.75) |
| BOLR-30 | 23.66 (601) | 26.38 (670) | 17.88 (454) | 19.49 (495) | 5.26 (134) | 1.32 (340) | #20 SAE | 1 1/4" | 24.74 (628) | 4.15 (105) | 5.00 (127) | 9.9 (251) | M8 Bolt (4PL) | 24.34 (618) | 5.00 (127) | 140 (63.50) |
| BOLR-400 | 21.49 (546) | 22.38 (568) | 18.6 (472) | 17.31 (440) | 6.50 (165) | 2.00 (51) | #20 SAE | 1 1/4" | 22.31 (567) | 4.15 (105) | 5.00 (127) | 9.9 (251) | M8 Bolt (4PL) | 20.07 (510) | 5.00 (127) | 162 (73.48) |
| BOLR-725 | 25.82 (656) | 30.25 (768) | 17.56 (446) | 21.62 (549) | 6.50 (165) | 2.00 (51) | #20 SAE | 1 1/4" | 30.11 (765) | 4.15 (105) | 5.00 (127) | 9.9 (251) | M10 Bolt (4PL) | 27.95 (710) | 5.00 (127) | 185 (83.92) |
| BOLR-950 | 30.15 (766) | 37.01 (940) | 22.68 (576) | 24.55 (624) | 9.50 (241) | 2.00 (51) | 2" SAE 4 BOLT FLANGE | 2" | 35.87 (911) | 6.05 (154) | 9.20 (234) | 16 (406) | M10 Bolt (4PL) | 34.26 (9870) | 7.00 (178) | 315 (142.88) |
| BOLR-1200 | 30.15 (766) | 40.98 (1041) | 24.05 (611) | 24.55 (624) | 5.50 (140) | 2.00 (51) | | 2" | 40.29 (1023) | 6.05 (154) | 9.20 (234) | 16 (406) | M10 Bolt (4PL) | 38.18 (970) | 8.75 (222) | 445 (201.85) |
| BOLR-1600 | 38.26 (972) | 40.98 (1041) | 25.43 (646) | 32.80 (833) | 9.50 (241) | 2.00 (51) | | 2" | 40.29 (1023) | 6.05 (154) | 9.20 (234) | 16 (406) | M10 Bolt (4PL) | 38.18 (970) | 8.75 (222) | 530 (240.40) |
| BOLR-2000 | See diagram above | | | | | | | 2" | See diagram above | | | | | | | 597 (270.79) |

Thermal/Pressure Relief Bypass is different height than pressure only bypass. Consult factory for details.

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

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 3 FT |
|----------|--------|-------|----------|-------------|-------|---------------------|-----------|------|-------|------------------|---------------------|
| BOL-4* | 12.5 | 440 | 0.12 | 230 | 1 | 0.37 | 60 HZ | 2710 | N/A | Yes | 61 |
| BOL-8 | 22.65 | 800 | 1/3 | 115/230 | 1 | 3.0 | 60 HZ | 3450 | 48C | No | 80 |
| | 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 |
| | 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 |
| | 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 |
| | 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 |
| | 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 |
| | 133.10 | 4700 | 1-1/2 | 208-230/460 | 3 | 4.6 | 60 HZ | 1725 | 145TC | No | 92 |
| BOL-1200 | 198.22 | 7000 | 5 | 230 | 1 | 23 | 60 HZ | 1740 | 184TC | No | 92 |
| | 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 |

*BOL-4 is a custom 50/60 HZ motor. It is not NEMA or IEC. Additional 2 µF capacitor required (between black and brown wires). Not supplied with motor.

Electric Motor Information (50 HZ IEC Frame)

| Model | CMM | CFM | KW | Voltage | Phase | Frequency | RPM | Frame | Sound dB(A) at 3 FT |
|----------|-------|-------|------|-------------|-------|-----------|------|-------|---------------------|
| BOL-4* | 11.5 | 405 | 0.07 | 230 | 1 | 50 HZ | 2485 | N/A | 58 |
| 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 |

*BOL-4 is a custom 50/60 HZ motor. It is not NEMA or IEC. All IEC frame motors have CE mark. IEC motor voltages have +/- 5% 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-8 | 3.3 (12.49) | 175 (12.1) | 0.22 (3.6) | 80 |
| BOL-16 | 3.3 (12.49) | 275 (17.9) | 0.22 (3.6) | 85 |
| BOL-30 | 3.4 (12.87) | 275 (17.9) | 0.45 (7.3) | 85 |
| BOL-400 | 3.3 (12.49) | 520 (35.9) | 0.22 (3.6) | 97 |
| 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 application, size cooler for 1/3 of the input horsepower. Heat load may be expressed as either Horsepower or BTU/HR or KW/°C.

$$HP = BTU/HR \div 2545$$

$$KW = HP \times .745$$

$$BTU/HR = HP \times 2545$$

STEP 2 Determine Entering Temperature Difference.
(Actual ETD)

$$ETD = \text{Entering oil temperature} - \text{Entering Ambient air temperature}$$

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

$$\text{Corrected Heat Rejection} = \frac{\text{Heat Load (BTU/HR)}}{\text{Desired ETD}} \times \frac{100^\circ\text{F}}{100^\circ\text{F}}$$

(BTU/HR) to use with selection chart

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 (ETD)

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

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 ΔT) with this formula:

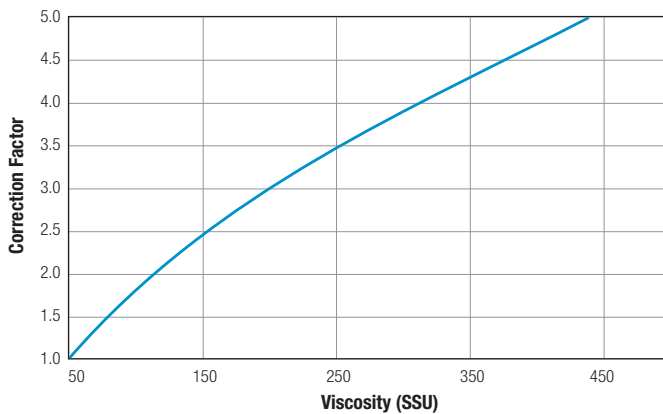
$$\text{Oil } \Delta T = (\text{BTU's/HR}) / (\text{GPM Oil Flow} \times 210).$$

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

$$\text{Oil Entering Temp.} = \text{Oil Leaving Temp.} + \text{Oil } \Delta T.$$

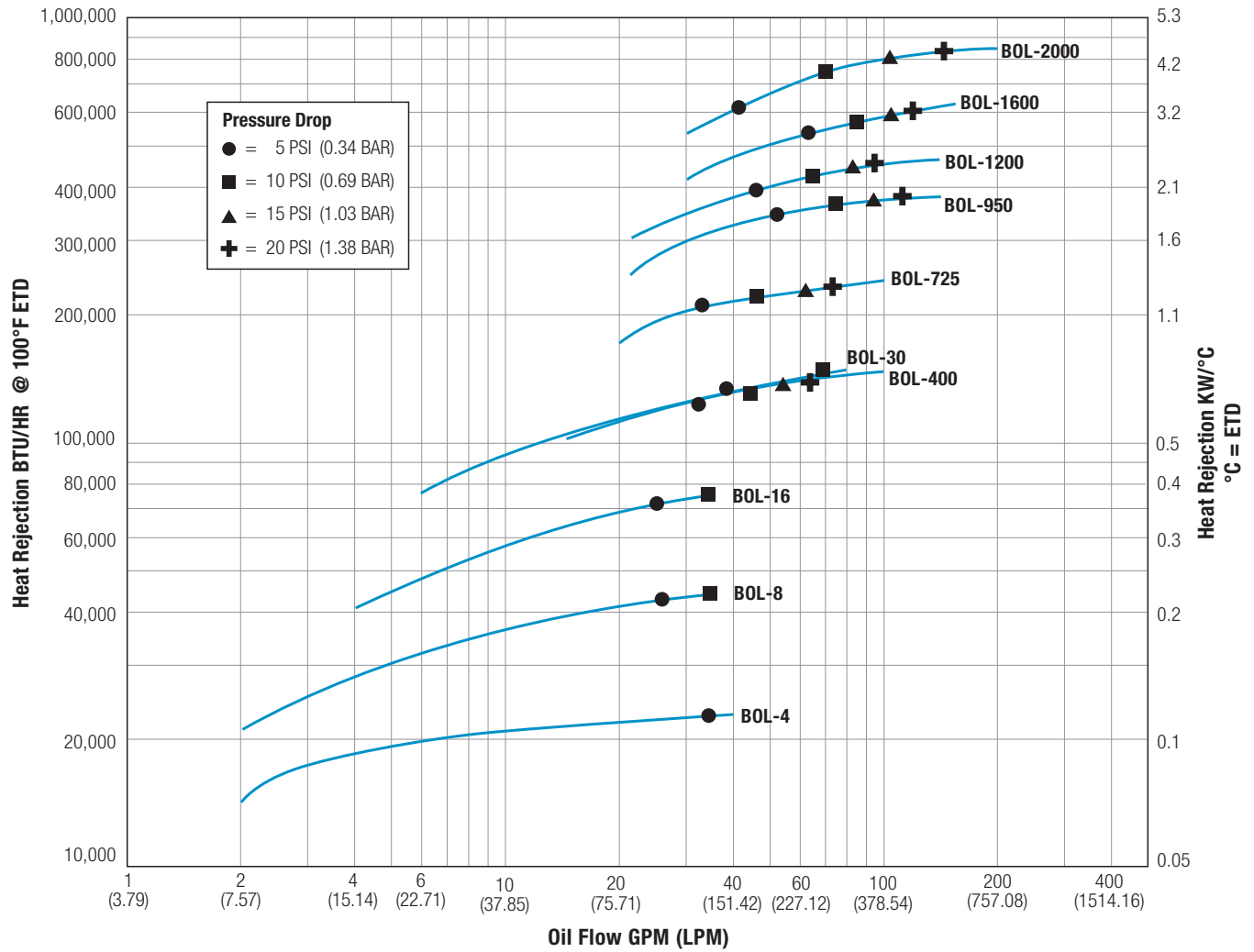
Oil Pressure Drop: Most systems can tolerate a pressure drop through the heat exchanger of 20 to 30 PSI. Excessive pressure drop should be avoided. Care should be taken to limit pressure drop to 5 PSI or less for case drain applications where high back pressure may damage the pump shaft seals.

Pressure Drop



Performance Curves

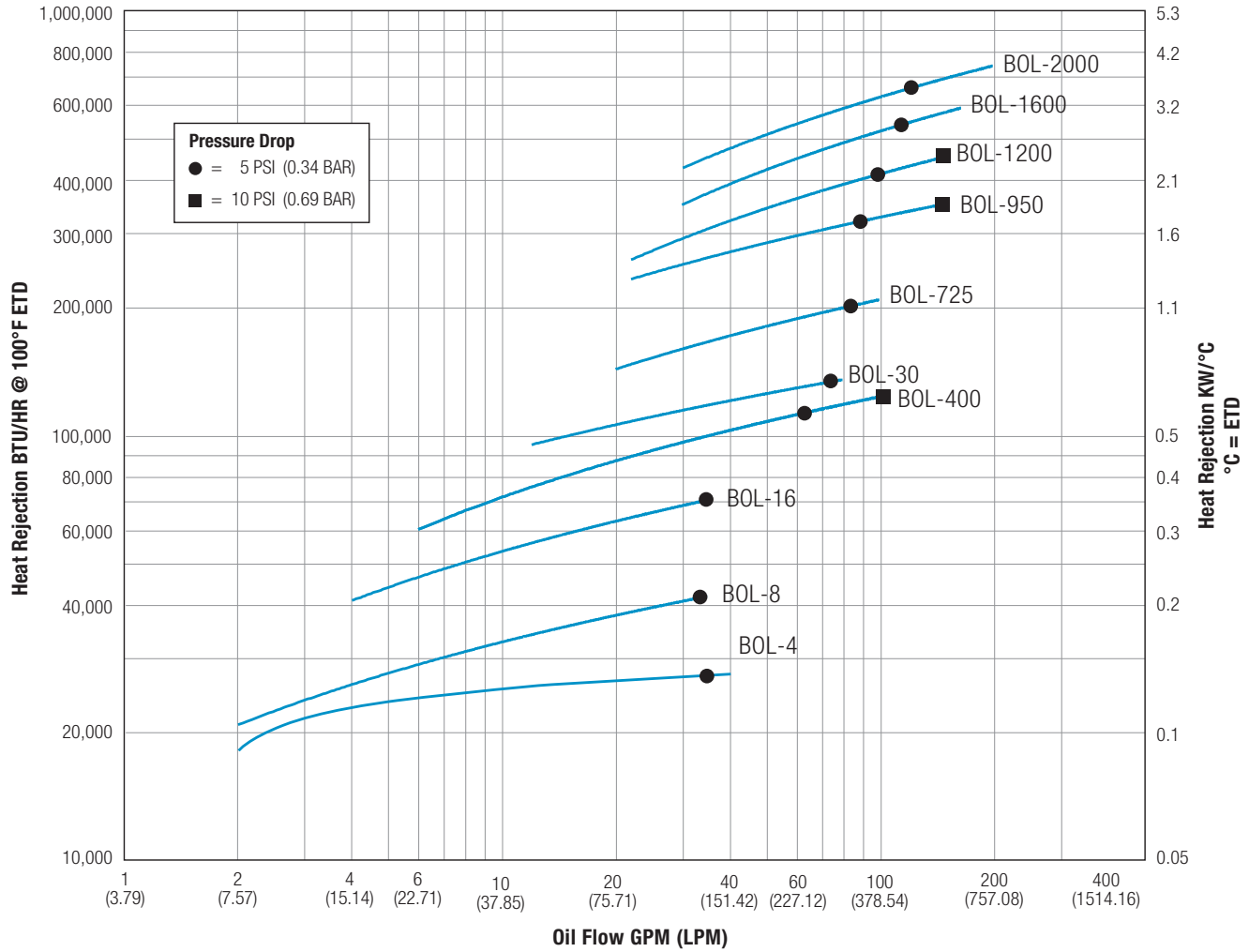
BOL Models with Standard P-BAR Core



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

Performance Curves

BOL Models with Optional T-BAR Core

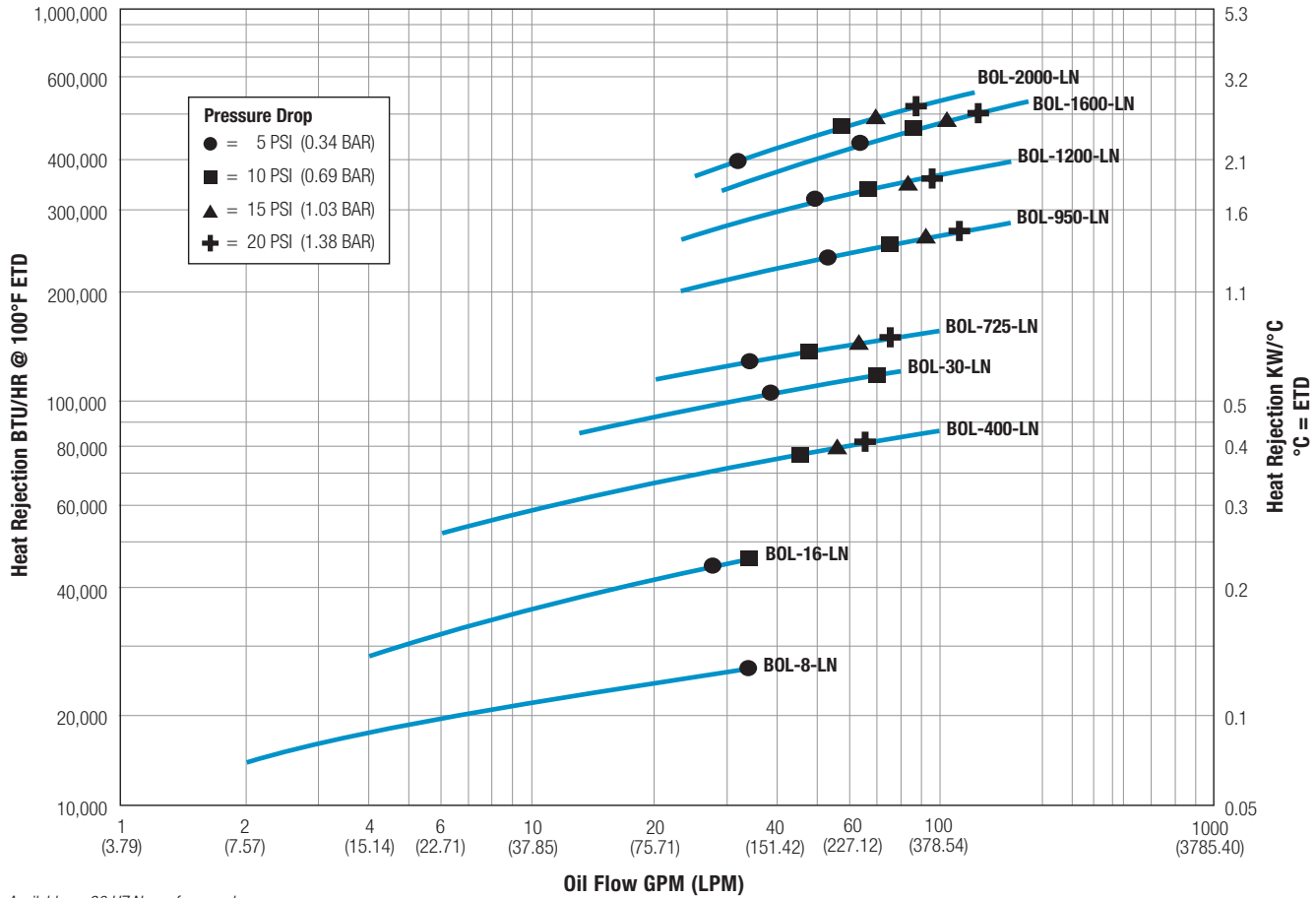


Note: Derate heat rejection values 15% if using 50 HZ motors.

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 |

Low noise ratings are lab tested in a 1/4 spherical pattern. Additional nearby objects can increase the sound level.