Eaton
ME Series
Low Speed High Torque
Hydraulic Motor

ADVANTAGES
“PROVEN IN INDUSTRIAL, MOBILE AND MARINE APPLICATIONS”
- HIGH PRESSURE – Continuous Operating Pressure 3600 psi
- SMOOTH OPERATION AT VERY LOW SPEED
  Multiple pistons and double swash plate result in
  smooth operation at speeds down to 1 rev/min
- HIGH STARTING TORQUE AND HIGH OVERALL
  EFFICIENCY
- COMPACT AND EASY TO INSTALL
- FULLY REVERSIBLE
- RUGGED CONSTRUCTION
- QUIET OPERATION
- UNAFFECTED BY THERMAL SHOCK (sudden
  changes in operating fluid temperature)

New Performance Data

<table>
<thead>
<tr>
<th>Model</th>
<th>Displacement</th>
<th>Rated Pressure</th>
<th>Peak Pressure</th>
<th>Rated Torque</th>
<th>Rated Speed</th>
<th>Max Speed</th>
<th>Max Horse Power</th>
<th>Weight</th>
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* Speed in ( ) is a value at 3000 psi.
Limit of hydraulic fluid temperature: -4°F to +196°F
Limit of hydraulic fluid viscosity: 17 - 230 SUS
(Normal operating fluid viscosity range: 120 - 460 SUS)

A Sumitomo-Eaton Product.
These options are available from Eaton Hydraulics Division. Contact your Eaton representative for more information.
Motor Selection Charts

Brake Motors

<table>
<thead>
<tr>
<th>Model</th>
<th>Product Number</th>
<th>Displacement (in³/cyl)</th>
<th>Brake Torque (lb-ft)</th>
<th>Brake Release Pressure (psi)</th>
<th>Weight (lbs)</th>
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<tr>
<td>ME100-FS-BL70F</td>
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<td>506</td>
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<td>ME300-FS-BA121F</td>
<td>131-1003-001</td>
<td>18.55</td>
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Hydraulic Fluid
(a) Mineral-based fluid
It is important to select a good quality fluid for use in the system. The fluid selected must be suitable for use both under cold-start conditions and at maximum operating temperature. Temperature range -4°F to +188°F. Shell Tellus S6 and equivalent fluids are approved for use with Dowexa motors. These fluids have the following characteristics:
- Optimum viscosity range from 98 SUS to 460 SUS at normal working temperatures
- Resistance to foaming, oxidation and emulsification
- Anti-rust and anti-corrosion properties
(b) Fire-resistant fluid
Phosphate-ester fluids need special seals. Because of low viscosity index a cooler may be needed to ensure constant temperature operation. Speed ratings are affected and advice from our Technical Sales Department should be sought.
Water-glycol fluid has only limited approval and our Technical Sales Department should be consulted whenever its use is considered.

Filtration
A filter of 10 microns standard, preferably with an element condition indicator, must be fitted in the return line from the motor (open circuit), or downstream of the boost pump (closed circuit).

Typical Circuit
Typical open loop and closed loop circuits are shown below.

Fluid Reservoir
The fluid reservoir must be of adequate size with easy access for cleaning.
A strainer of 100 mesh construction (0.15 mm or 0.006 in, gal) must be fitted to the pump suction line inside the reservoir. It must be of sufficient size to prevent cavitation and to allow for partial obstruction after a period of service.
The pump suction line should have a filter from a point several inches above the tank bottom to avoid sludge deposits, and the return line should be submerged to limit frothing of the fluid.
The suction and return connections should be positioned as far apart as possible so that fluid circulation is promoted within the tank to assist convection cooling. A baffle plate fitted between the two connections will help to do this.
Displacement volume must be allowed for by providing adequate air space and breathing. For this purpose an oil filler/breather must be fitted to the filling orifice in the top surface of the tank. This should comprise a fine mesh strainer for the filling orifice and an air filter to prevent the entry of dust particles through the breather.

Overrun Protection
Cavitation can take place if the motor is allowed to rotate under the influence of inertia forces or external loads after the fluid supply has been cut off. On these applications it is recommended that a closed circuit is used. Where this is not possible, motor cavitation can be prevented by using counter-balances or brake valves, anti-cavitation check valves, or by boosting the motor inlet. Boost pressure varies with motor speed and is shown in the Boost Pressure curves.

Geared Motors

<table>
<thead>
<tr>
<th>Model</th>
<th>Product Number</th>
<th>Motor Displacement (in³/cyl)</th>
<th>Gear Ratio</th>
<th>Rated Torque at 3000 psi (lb-ft)</th>
<th>Max. Torque at 3600 psi (lb-ft)</th>
<th>Rated Speed (rpm)</th>
<th>Allowable Radial Load (lbs)</th>
<th>Weight</th>
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<tbody>
<tr>
<td>ME175-GTE-SPHLF-66S</td>
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OPERATION

Fluid entering the supply port is directed via internal passages and timing plate to the center of the cylinder bores. Fluid pressure forces the pistons apart causing the slipper to slide on the angled faces of the swash plate and rotate the barrel and shaft assembly. After work, fluid is exhausted through the timing plate and internal passages to the return port.

APPLICATION

Motor Casing Drain Pipe
The motor casing drain pipe to the reservoir must be adequately sized so that the casing pressure cannot exceed 45 psi (3 bar), even under cold start conditions. As a guide the pipe diameter must be at least equal to the drain port diameter. Where case pressure exceeds 45 psi (3 bar), or where a long pipe run cannot be avoided, please consult us.

Installation Attitude
ME series motors are flange mounted and can be positioned in any attitude provided that one of the drain connections in the unit case is at the highest point of the unit — THIS IS MOST IMPORTANT.

Direct Drives
Wherever possible flexible couplings should be used to relieve the motor shaft of any radial or axial loads. When splined drives are contemplated it is important that the P.C. dia. of the female spline is concentric to the pilot diameter preferably within 0.002 in. T.I.R.

Indirect Drives
Gear, chain and belt drives may be used provided the motor is mounted as shown in the diagram below and the resultant radial load on the shaft is within the permissible limits shown in the relevant section for each model. Loads are assumed to be applied at the center of the shaft extension. Please consult our representative for conditions outside the above recommendations and in cases where axial loading of the shaft is contemplated.

The dotted circles are the eyebolt locations for ME1000, ME2000 and ME4000.

Direction of Rotation
Motor rotation is reversible by changing over the fluid supply to the motor main ports. The relationship between the direction of rotation and the fluid flow is shown below. The direction of the shaft rotation for ME750A and ME850 is in reverse to the diagram below.

The dotted line is for ME100, ME150, ME175, ME300, ME350, ME600A, ME750A, ME850, ME1300A and ME3100.
Eaton® ME150

Displacement: 9.27 m³/rev
Rated Pressure: 4400 psi
Peak Pressure: 4700 psi
Rated Torque: 493 lbf-ft
Rated Speed: 600 rpm
Max. Speed: 800 rpm
Max. Horse Power: 56 hp
Weight: 92 lb

The graphs shown are mean values obtained from production units.

FLUID: SHELL TELLUS S6 (VISCOSITY 170 SUS @ 122°F)

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Eaton® ME4100

Displacement: 249.97 m³/rev
Rated Pressure: 3600 psi
Peak Pressure: 4700 psi
Rated Torque: 11928 lbf-ft
Rated Speed: 75 rpm
Max. Speed: 200 rpm
Max. Horse Power: 284 hp
Weight: 1147 lb

The graphs shown are mean values obtained from production units.

FLUID: SHELL TELLUS S6 (VISCOSITY 170 SUS @ 122°F)

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Fig. 1 Output torque vs speed

--- OVERALL EFFICIENCY %

OUTPUT TORQUE (lbf-ft)

MOTOR SPEED (rpm)

Fig. 2 Mechanical Efficiency

MOTOR SPEED (rpm)

MECHANICAL EFFICIENCY (%)

Fig. 3 Volumetric Efficiency

MOTOR SPEED (rpm)

MECHANICAL EFFICIENCY (%)

Volumetric efficiency at various speeds is shown for 4 motor pressures.

---

Fig. 2 Mechanical Efficiency

MOTOR SPEED (rpm)

MECHANICAL EFFICIENCY (%)

Fig. 3 Volumetric Efficiency

MOTOR SPEED (rpm)

VOLUMETRIC EFFICIENCY (%)

Volumetric efficiency at various speeds is shown for 4 motor pressures.
Fig. 4 Starting Torque
Starting torque versus effective pressure is shown. Oil viscosity will not affect the starting torque efficiency.

Fig. 5 Case Leakage
Case leakage (from motor drain port) relative to various speeds is shown for 4 motor pressures.

Fig. 6 Minimum Boost Pressure
It is important that sufficient inlet pressure is maintained when the motor is operated as a pump or when the load overruns the motor, to prevent cavitation.

Fig. 7 Pressure Drop
Pressure necessary to run motor without load is shown for various speeds.

Fig. 8 Bearing Life and Motor Shaft Radial Load

Note:
1. If motors are operated on the proper conditions, the operational life is determined by the Bearing Life.
2. In order to maintain the maximum bearing life, when a radial load is imposed on the output shaft, the motor should be installed as shown in Fig. 8.
3. For a unidirectional application, motor should be installed as shown in Fig. 8 to avoid installing the ball bearing on the output shaft.
4. For a bidirectional application, involving a radial load for each rotation, the motor should be installed as shown in Fig. 8.
5. The graph drawn above shows the bearing life (B10 Life) for various speeds and radial loads. When the shaft speed is below 100 rpm, the bearing life can be obtained by the formula below.

810 Life = Bearing Life obtainable in the graph at 100 rpm

Actual Shaft Speed
In case where the load less than a different position to the mid point of the shaft projection, please refer to us.

Optional Shaft Dimensions
Type of Spline: Involute Flat root side fit. Pressure angle 30° Pitch 5/10
Class 1 f/t To B.S. 3590 or A.S.A. — B.S. — 15.

No. of Teeth | Pitch Dia. | Base Diameter | D2 Diameter | D3 Diameter | D4 Diameter | Minor Diameter | Minor Diameter | Periphery Diameter | "A" | "J" |
---|---|---|---|---|---|---|---|---|---|---|

Spline Billet
Involute Spline (Flat root side fit. Class 1 f/t) B.S. 3590 or A.S.A-B.S.15
Allowable Pressure for Spline Billet: 3600 psi

No. of Teeth: 18
Pitch: 5/10
Pressure Angle: 30°
Pitch Dia.: 3.6000
Major Dia.: 3.8250
Minor Dia.: 3.4000
Space Width: 0.5150

Weight: 12.6 lbf

Tapered Shaft
Section X-X

Shaft seal land area is chrome plated.
Eaton® ME3100

- Displacement: 189.42 in³/rev.
- Rated Pressure: 3600 psi
- Peak Pressure: 4700 psi
- Rated Torque: 9039 lbf-ft
- Rated Speed: 110 rpm
- Max. Speed: 230 rpm
- Max. Horse Power: 251 hp
- Weight: 802 lb

The graphs shown are mean values obtained from production units. FLUID: SHELL TELLUS S6 VISCOUSITY 170 SUS at 122°F

Fig. 1 Output torque vs speed

Fig. 2 Mechanical Efficiency

Fig. 3 Volumetric Efficiency

Mechanical efficiency at various speeds is shown for 4 motor pressures.

Volumetric efficiency at various speeds is shown for 4 motor pressures.

Eaton® ME175

- Displacement: 10.68 in³/rev.
- Rated Pressure: 4000 psi
- Peak Pressure: 4700 psi
- Rated Torque: 566 lbf-ft
- Rated Speed: 600 rpm
- Max. Speed: 800 rpm
- Max. Horse Power: 65 hp
- Weight: 92 lb

The graphs shown are mean values obtained from production units. FLUID: SHELL TELLUS S6 VISCOUSITY 170 SUS at 122°F

Fig. 1 Output torque vs speed

Fig. 2 Mechanical Efficiency

Fig. 3 Volumetric Efficiency

Mechanical efficiency at various speeds is shown for 4 motor pressures.

Volumetric efficiency at various speeds is shown for 4 motor pressures.
Eaton® ME1900

- Displacement: 113.97 m³/rev.
- Rated Pressure: 3600 psi
- Peak Pressure: 4700 psi
- Rated Torque: 5438 lb-ft
- Rated Speed: 140 rpm
- Max. Speed: 260 rpm
- Max. Horse Power: 173 hp
- Weight: 585 lb

The graphs shown are mean values obtained from production units. FLUID: SHELL TELLUS S5 (VISCOSITY 170 SUS at 92°F).

Fig. 1 Output torque vs speed

Fig. 2 Mechanical Efficiency

Fig. 3 Volumetric Efficiency

Eaton® ME350

- Displacement: 21.36 m³/rev.
- Rated Pressure: 4000 psi
- Peak Pressure: 4700 psi
- Rated Torque: 1133 lb-ft
- Rated Speed: 600 rpm
- Max. Speed: 800 rpm
- Max. Horse Power: 129 hp
- Weight: 117 lb

The graphs shown are mean values obtained from production units. FLUID: SHELL TELLUS S5 (VISCOSITY 170 SUS at 92°F).

Fig. 1 Output torque vs speed

Fig. 2 Mechanical Efficiency

Fig. 3 Volumetric Efficiency
Nominal Dimensions

Optional Shaft Dimensions

Spline Shaft

From flange mount surface

Type of Spline: Involute / Flat root side fit

Pressure angle: 30° / Pitch 12/24

Class 1 fit

To B.S 3550 or ASA B5-15

A

B

C

D

E

F

G

H

I

J

K

No. of Teeth

Pitch

Diameter

Major Diameter

Minor Diameter

Flank Diameter

Involute Spline (flat root side fit, Class 1 fit)

B.S. 3550 or A.S.A. B5-15

Allowable Pressure for Spline Billet: 4000 psi

No. of Teeth: 20

Pitch: 12/24

Pressure Angle: 30°

Pitch Dia: 1.6667

Major Dia: 1.7663/1.7500

Minor Dia: 1.6853/1.6763

Space Width: 0.1339/0.1326

Spline Billet

Weight: 2.0 lbf

Tapered Shaft

From flange mount surface

Taper: 1:10/10

Gear (sales lead area) is chrome plated.

Fig. 4 Starting Torque

Starting torque versus effective pressure is shown. Oil viscosity will not affect the starting torque efficiency.

Fig. 5 Case Leakage

Case leakage from motor drain port relative to various speeds is shown for 4 motor pressures.

Fig. 6 Minimum Boost Pressure

It is important that sufficient inlet pressure is maintained when the motor is operated as a pump or when the load overruns the motor to prevent cavitation.

Fig. 7 Pressure Drop

Pressure necessary to run motor without load is shown for various speeds.

Fig. 8 Bearing Life and Motor Shaft Radial Load

Note

1. If gears are operated on the proper conditions, the operational life is determined by the Bearing Life.

2. In order to maintain the maximum bearing life, when the load is increased on the output shaft, the motor should be installed as illustrated in Fig. 8.1.

3. For a given application, the motor should be installed as shown in Fig. 8.1.

4. The graphs shown are the bearing life (8.13 life) at 100 rpm shaft speed for various pressure and metal load.

5. Maximum allowable metal load (load applied at the midpoint of shaft projection) is shown in the graph at 100 rpm.
Eaton® ME600A

- Displacement: 36.74 in³/rev.
- Rated Pressure: 4000 psi
- Peak Pressure: 4700 psi
- Rated Torque: 1948 lb-ft
- Rated Speed: 450 rpm
- Max. Speed: 600 rpm
- Max. Horse Power: 187 hp
- Weight: 203 lb

The graphs shown are mean values obtained from production units.

**Fig. 1** Output torque vs speed

**Fig. 2** Mechanical Efficiency

**Fig. 3** Volumetric Efficiency

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Eaton® ME1300A

- Displacement: 82.06 in³/rev.
- Rated Pressure: 3600 psi
- Peak Pressure: 4700 psi
- Rated Torque: 3916 lb-ft
- Rated Speed: 200 rpm
- Max. Speed: 390 rpm
- Max. Horse Power: 186 hp
- Weight: 376 lb

The graphs shown are mean values obtained from production units.

**Fig. 1** Output torque vs speed

**Fig. 2** Mechanical Efficiency

**Fig. 3** Volumetric Efficiency

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Eaton® ME850

Displacement : 51.68 in³/rev.
Rated Pressure : 4000 psi
Peak Pressure : 4700 psi
Rated Torque : 2740 lbf-ft
Rated Speed : 350 rpm
Max. Speed : 450 rpm
Max. Horse Power : 183 hp
Weight : 265 lb

The graphs shown are mean values obtained from production units. FLUID: SHELL TELLUS S6 VISCOSITY 170 SUS @ 92°F

Fig. 1 Output torque vs speed

--- OVERALL EFFICIENCY %

Fig. 2 Mechanical Efficiency

--- 1000
--- 2000
--- 3000
--- 4000psi

Fig. 3 Volumetric Efficiency

--- 1000
--- 2000
--- 3000
--- 4000psi

Eaton® ME 750A

Displacement : 45.76 in³/rev.
Rated Pressure : 4000 psi
Peak Pressure : 4700 psi
Rated Torque : 2426 lbf-ft
Rated Speed : 400 rpm
Max. Speed : 520 rpm
Max. Horse Power : 185 hp
Weight : 265 lb

The graphs shown are mean values obtained from production units. FLUID: SHELL TELLUS S6 VISCOSITY 170 SUS @ 92°F

Fig. 1 Output torque vs speed

--- OVERALL EFFICIENCY %

Fig. 2 Mechanical Efficiency

--- 1000
--- 2000
--- 3000
--- 4000psi

Fig. 3 Volumetric Efficiency

--- 1000
--- 2000
--- 3000
--- 4000psi
**Nominal Dimensions**

**Optional Shaft Dimensions**

**Spline Shaft**
- Type of Spline: Involute Flat root side fit
- Pressure angle: 30° / Pitch: 5/10
- Class 1 work: B.S.3550 or A.S.A.85-15
- Allowable Pressure for Spline Billet: 4000 psi

<table>
<thead>
<tr>
<th>No. of Teeth</th>
<th>Pitch Dia. (A)</th>
<th>Base Dia. (B)</th>
<th>Tooth Thickness (C)</th>
<th>Major Dia. (D)</th>
<th>Minor Dia. (E)</th>
<th>Form Dia. (F)</th>
<th>Minor Dia. (G)</th>
<th>Filer Radius (C)</th>
<th>&quot;H&quot;</th>
<th>&quot;J&quot;</th>
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<td>12</td>
<td>2.4000</td>
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<td>2.2059</td>
<td>2.1560</td>
<td>0.039</td>
<td>3.54</td>
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**Spline Billet**
- Weight: 3.3 lb

**Tapered Shaft**
- From flange mount surface
- Section X:

**Shaft (oil land area) is chrome plated.**

---

**Starting Torque**

Starting torque versus effective pressure is shown. Oil viscosity will not affect the starting torque efficiency.

**Case Leakage**

Case leakage from motor shaft for various speeds is shown for 4 motor pressures.

**Boost Pressure**

It is important that sufficient inlet pressure is maintained when the motor is operated as a pump or when the load overruns the motor, to prevent cavitation.

**Pressure Drop**

Pressure necessary to run motor without load is shown for various speeds.

**Bearing Life and Motor Shaft Radial Load**

Note:
1. If motors are operated in the proper conditions, the operational life is determined by the Bearing Life.
2. In order to maintain the maximum bearing life, a ratio of load to rpm must be maintained, the larger the load, the slower the rpm should be operated as indicated in Chart 8.2.
3. For a 90% rated application, motor should be operated in the same manner as indicated in Chart 8.1.
4. For a max load application, involving a radial load for each rotation, the motor should be operated in the same manner as indicated in Chart 8.3.
5. The graph shown in the bearing life (6/10) at 100 psi shaft load for various pressures and radial loads.

---

Fig. 4

Fig. 5

Fig. 6

Fig. 7

Fig. 8

---

23

24
**Eaton® ME850**

Displacement: 51.68 in³/rev.
Rated Pressure: 4000 psi
Peak Pressure: 4700 psi
Rated Torque: 2740 lb·ft
Rated Speed: 360 rpm
Max. Speed: 450 rpm
Max. Horse Power: 183 hp
Weight: 265 lb

---

**Eaton® ME 750A**

Displacement: 45.76 in³/rev.
Rated Pressure: 4000 psi
Peak Pressure: 4700 psi
Rated Torque: 2426 lb·ft
Rated Speed: 400 rpm
Max. Speed: 520 rpm
Max. Horse Power: 185 hp
Weight: 265 lb

---

The graphs shown are mean values obtained from production units.

**Fig. 1 Output torque vs speed**

**Fig. 2 Mechanical Efficiency**

**Fig. 3 Volumetric Efficiency**

Mechanical efficiency at various speeds is shown for 4 motor pressures.

Volumetric efficiency at various speeds is shown for 4 motor pressures.
**Fig. 4 Starting Torque**

Starting torque versus effective pressure is shown. Oil viscosity will not affect the starting torque efficiency.

**Fig. 5 Case Leakage**

Case leakage (from motor drain ports) relative to various speeds is shown for 4 motor pressures.

**Fig. 6 Minimum Boost Pressure**

It is important that sufficient inlet pressure is maintained when the motor is operated as a pump or when the load overloads the motor, to prevent cavitation.

**Fig. 7 Pressure Drop**

Pressure necessary to run motor without load is shown for various speeds.

**Fig. 8 Bearing Life and Motor Shaft Radial Load**

Bearing life (life = 100,000 hrs)

**Nominal Dimensions**

**Optional Shaft Dimensions**

**Spline Shaft**

From flange mount surface

**Spline Billet**

 involute spline (flattest side fit, pressure angle 30°, pitch 5/10)

Type of spline: Involute, flat root side fit pressure angle 30°, pitch 5/10

Class 1 fit: To B.S.3505 or A.S.A.—6B—15.

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Allowable Pressure for Spline Billet: 4000 psi

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<th>No. of Teeth</th>
<th>Pitch</th>
<th>Pressure Angle</th>
<th>Pitch Dia.</th>
<th>Major Dia.</th>
<th>Minor Dia.</th>
<th>Space Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
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<td>30°</td>
<td>2.4000</td>
<td>2.6250</td>
<td>2.1979</td>
<td>0.3183</td>
</tr>
</tbody>
</table>

**Tapered Shaft**

From flange mount surface

**Nominal Dimensions**

DIRECTION OF ROTATION
L: HIGH PRESSURE OIL SUPPLIED AT PORT L
R: HIGH PRESSURE OIL SUPPLIED AT PORT R

Feed ports
SAC 4flats split flange
SAC straight thread 0-ring boss connection

Note:
1. All motors are operated on the proper conditions, the operation life is determined by the Bearing Life.
2. In order to maintain the maximum bearing life, when a radial load is imposed on the output shaft, the motor should be installed as shown in Fig. 8.
3. For a horizontal application, the motor should be installed so that the side bolts are as shown in figure 8.2.
4. For a vertical application, involving a horizontal shaft, the motor should be installed so that the side bolts are as shown in figure 8.2.
5. The graph shown in the bearing life (8-10 Life) list is an average shaft speed for various pressures and radial loads. When the shaft speed differs from 1000 rpm, the bearing life can be determined by the formula below:

\[ \text{Bearing Life} = \frac{1000 \times \text{Shaft Speed}}{\text{1000}} \times \text{Life} \]

6. Maximum allowable radial load (fixed at the mid-point of shaft projection)

7. Maximum allowable thrust load (fixed at the mid-point of shaft projection)

8. Applications with axial thrust loads should be limited to 5000 rpm.
Fig. 4 Starting Torque
Starting torque versus effective pressure is shown. Oil viscosity will not affect the starting torque efficiency.

Fig. 5 Case Leakage
Case leakage (from motor drain port) relative to various speeds is shown for 4 motor pressures.

Fig. 6 Minimum Boost Pressure
It is important that sufficient inlet pressure is maintained when the motor is operated as a pump, or when the load overruns the motor, to prevent cavitation.

Fig. 7 Pressure Drop
Pressure necessary to run motor without load is shown for various speeds.

Fig. 8 Bearing Life and Motor Shaft Radial Load
Bearing life (in OIL FILM)
N=100rpm
N=100rpm

Note:
1. If motors are operated on the proper conditions, the operational life is determined by the Bearing Life.
2. In order to maintain the maximum bearing life, a film of oil should be maintained in the bearing stator shaft should be installed as illustrated in Fig. 8.
3. For a radial roller element, motor should be mounted so that the bearing radial load is applied to the motor end of the shaft. For a bidirectional application, involving a radial load for each rotation, then the motor shaft should be mounted so that radial loads act as shown in Fig. 8.
4. The graph shown the bearing life (N=100rpm) on oil film thrust bearing for various pressures and radial loads.
When the shaft speeds differs from 100 rpm, the bearing life can be obtained by the formula below:

Bearing life (in oil film) = \frac{100}{N}

Fig. B-1
Fig. B-2

Nominal Dimensions
Diameter of Split Flange

Optional Shaft Dimensions
Splined Shaft
From flange mounting surface

Spline Billet
Involute Spline (Right hand side, Class 1 ftd)

Tapered Shaft
From flange mounting surface

Type of Spline: Involute Flat root side fit Pressure angle: 30° Pitch 8/16
Class 1.5 To B.S.3550 or A.S.A.-86-15

B.S.3550 or A.S.A.-86-15
Allowable Pressure for Spline Billet: 4000 psi

No. of Teeth
Pitch
8/16
Pitch Angle
30°
Pitch Dia.
2.3750
Major Dia.
2.5198/2.5000
Minor Dia.
2.2500
Space Width
0.1996/0.1982

Weight: 3.3 lb

Nominal Dimensions

DIRECTION OF ROTATION
L: HIGH PRESSURE OIL SUPPLIED AT PORT L
R: HIGH PRESSURE OIL SUPPLIED AT PORT R.

Feed ports
SAE 4 bolts split flange
Drain port
SAE straight thread O-ring boss connection

ME600A
Eaton® ME600A

Displacement: 36.74 in³/rev.
Rated Pressure: 4000 psi
Peak Pressure: 4700 psi
Rated Torque: 1948 lbf-ft
Rated Speed: 450 rpm
Max. Speed: 600 rpm
Max. Horse Power: 187 hp
Weight: 203 lb

The graphs shown are mean values obtained from production units.

Fig. 1 Output torque vs speed

[Graph showing output torque vs motor speed]

Fig. 2 Mechanical Efficiency

[Graph showing mechanical efficiency vs motor speed for different pressures]

Fig. 3 Volumetric Efficiency

[Graph showing volumetric efficiency vs motor speed for different pressures]

Eaton® ME1300A

Displacement: 82.06 in³/rev.
Rated Pressure: 3600 psi
Peak Pressure: 4700 psi
Rated Torque: 3916 lbf-ft
Rated Speed: 200 rpm
Max. Speed: 390 rpm
Max. Horse Power: 186 hp
Weight: 375 lb

The graphs shown are mean values obtained from production units.

Fig. 1 Output torque vs speed

[Graph showing output torque vs motor speed]

Fig. 2 Mechanical Efficiency

[Graph showing mechanical efficiency vs motor speed for different pressures]

Fig. 3 Volumetric Efficiency

[Graph showing volumetric efficiency vs motor speed for different pressures]
Nominal Dimensions

- 14.90
- 10.0 (Diameter)
- 6.08
- 11.86
- 7.76
- 3.50
- 3.50
- 2.77
- 5.50
- 3.14
- 2.71

Casing Pressure cannot exceed 45 psi.

- Feed ports: SAE 3400 split flange
- Drain port: SAE straight thread O-ring boss connection

DIRECTION OF ROTATION
- L: SUPPLIED HIGH PRESSURE OIL AT PORT L
- R: SUPPLIED HIGH PRESSURE OIL AT PORT R

Optional Shaft Dimensions

- Splined Shaft
  - From flange mount surface: 6.08
  - Type of Spline: Involute
  - Flat root side fit: Pressure angle 30°, Pitch 5/10
  - Class 1 fit: To S.S. 3500 or A.S.A. 85-15

- Involute Spline (Flat root side fit, Class 1 fit)
  - 6.35 outside diameter
  - 3.15 inside diameter

- Spline Billet
  - Weight: 6.6 lb

- Tapered Shaft
  - From flange mount surface: 6.65

- Shaft seal land area is chrome plated.

Fig. 4 Starting Torque

- Starting torque versus effective pressure is shown. Oil viscosity will not affect the starting torque efficiency.

Fig. 5 Case Leakage

- Case leakage (from motor shaft center) relative to various speeds is shown for 4 motor pressures.

Fig. 6 Minimum Boost Pressure

- Pressure necessary to run motor without load is shown for various speeds.

Fig. 7 Pressure Drop

- Pressure necessary to run motor without load is shown for various speeds.

Fig. 8 Bearing Life and Motor Shaft Radial Load

- Bearing life is determined by the bearing life equation.

- It is important that sufficient inlet pressure is maintained when the motor is operated as a pump or when the load overruns the motor, to prevent cavitation.

Note:

1. If motors are operated on the proper lubricants, the operational life is determined by the bearing life equation.

2. In order to maintain the maximum bearing life, either a proper lubricant is recommended to the motor manufacturer or the motor should be reassembled or replaced as shown in Fig. 4.

3. This graph shows the bearing life (in hours) at 150 psi shaft speed for various pressures and radial loads.

4. For the bearing life to be obtained by the formula presented, the shaft and seal must be of equal speed differences from 150 rpm to 2000 rpm.

5. Applications with small thrust loads should be referred to us.
Eaton® ME1900

Displacement: 113.97 m³/rev.
Rated Pressure: 3600 psi
Peak Pressure: 4700 psi
Rated Torque: 5438 lbf·ft
Rated Speed: 140 rpm
Max. Speed: 260 rpm
Max. Horse Power: 173 hp
Weight: 595 lb

The graphs shown are mean values obtained from production units.

FLUID: SHELL TELLUS S6 (VISCOSITY 170 SUS at 92°F)

Fig. 1 Output torque vs speed

--- OVERALL EFFICIENCY %

Fig. 2 Mechanical Efficiency

Mechanical efficiency at various speeds is shown for 4 motor pressures.

Fig. 3 Volumetric Efficiency

Volumetric efficiency at various speeds is shown for 4 motor pressures.
**Fig. 4 Starting Torque**

Starting torque versus effective pressure is shown. Oil viscosity will not affect the starting torque efficiency.

**Fig. 5 Case Leakage**

Case leakage (from motor drain ports) relative to various speeds is shown for 4 motor pressures.

**Fig. 6 Minimum Boost Pressure**

It is important that sufficient inlet pressure is maintained when the motor is operated as a pump or when the load overruns the motor, to prevent cavitation.

**Fig. 7 Pressure Drop**

Pressure necessary to run motor without load is shown for various speeds.

**Fig. 8 Bearing Life and Motor Shaft Radial Load**

Bearing life (life - 0.1 = life) at 1000 rpm. Designed for 5000 hr. Radial loads on both shafts are shown.

---

**Nominal Dimensions**

- **L**: High Pressure Oil Supplied at Port L
- **R**: High Pressure Oil Supplied at Port R

**Optional Shaft Dimensions**

**Spined Shaft**

- Type of Spine: Involute Flared root side fit Pressure angle 30° Pitch 5/10
- Class 1 fit: Type B.S.3550 or A.S.A.-B5-15

**Spline Billet**

- Involute Spline (Flared root side fit, Class 1 fit)
- B.S.3550 or A.S.A.-B5-15

**Tapered Shaft**

- Section X-X
- From flange mount surface

---

**Note**

1. If motors are operated at the proper conditions, the operating life is determined by the Bearing Life.

2. In order to maintain the maximum bearing life, a shaft load is limited to the critical shaft speed the motor should be installed as shown in Fig. 8. If a transversal application, motor should be mounted so to the side load acts as shown in Fig. 8.5.

3. The graph shown in the bearing life (life - 0.1 = life) at 1000 rpm. For various pressures and radial loads. When the shaft speed differs from 1000 rpm, the bearing life can be obtained by the formula shown.

4. The graph shown in the bearing life (life - 0.1 = life) at 1000 rpm. For various pressures and radial loads. When the shaft speed differs from 1000 rpm, the bearing life can be obtained by the formula shown.

5. Applications with axial thrust loads should be referred to us.
**Fig.4 Starting Torque**

Starting torque versus effective pressure is shown. Oil viscosity will not affect the starting torque efficiency.

**Fig.5 Case Leakage**

Case leakage from motor drain port relative to various speeds is shown for 4 motor pressures.

**Fig.6 Minimum Boost Pressure**

It is important that sufficient inlet pressure is maintained when the motor is operated as a pump or when the load overruns the motor, to prevent cavitation.

**Fig.7 Pressure Drop**

Pressure necessary to run motor without load is shown for various speeds.

**Fig.8 Bearing Life and Motor Shaft Radial Load**

Note

1. If motors are operated in the proper condition, the operational life is determined by the bearing life.

2. To obtain the maximum bearing life, a radial load is imposed on the output shaft. The motor should be installed as illustrated in Fig. 8.1.

3. The graph shown in the bearing life (8-10 life) at 1500 rpm shaft speed with various pressures and radial loads. When the shaft speed differs from 1500 rpm, the bearing life can be obtained by the formula: 8-10 life = 

4. Applications with axial loads should be referred to us.

**Nominal Dimensions**

**Optional Shaft Dimensions**

- **Spline Shaft**
  - Type of Spline: Involute Flat root side fit: Pressure angle 30° Pitch 12/24 Class 1 fit To B.S.3500 or ASA-B5-15
  - Allowable Pressure for Spline Billet: 4000 psi

- **Spline Billet**
  - Involute Spline (Flat root side fit, Class 1 fit) B.S.9550 or ASA-B5-15
  - No. of Teeth: 20
  - Pitch: 12/24
  - Pressure Angle: 30°
  - Pitch Dia: 1.6667
  - Major Dia: 1.7630
  - Minor Dia: 1.5883
  - Space Width: 0.1339

- **Tapered Shaft**
  - Section X-X
  - Shaft (sleeve and anil) is chrome plated.
  - Taper: 10/10

**Direction of Rotation**

L: HIGH PRESSURE OIL SUPPLIED AT PORT L. R: HIGH PRESSURE OIL SUPPLIED AT PORT R.

**Dimensions (mm)**

- Diameter: 50
- Length: 150
- Pitch: 12/24
- Pressure Angle: 30°
- Pitch Dia: 1.6667
- Major Dia: 1.7630
- Minor Dia: 1.5883
- Space Width: 0.1339

**Allowable Pressure for Spline Billet:** 4000 psi

**Table:**

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<thead>
<tr>
<th>No. of teeth</th>
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<th>Base Dia. &quot;d&quot;</th>
<th>Tooth Diameter &quot;t&quot;</th>
<th>Major Dia. &quot;d1&quot;</th>
<th>Minor Dia. &quot;d2&quot;</th>
<th>Form Dia. &quot;d&quot;</th>
<th>Flute Height &quot;H&quot;</th>
<th>Flute Width &quot;W&quot;</th>
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<td>1.5827</td>
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</table>

**Bearing Life Distribution**

- Operating Load: 5000 psi
- Permissible Load: 10000 psi
- Actual Load: 1500 psi
- Bearing Life: 8-10 life

33
**Eaton® ME300**

- Displacement: 18.56 in³/rev.
- Rated Pressure: 4000 psi
- Peak Pressure: 4700 psi
- Rated Torque: 984 lbf·ft
- Rated Speed: 600 rpm
- Max. Speed: 900 rpm
- Max. Horse Power: 112 hp
- Weight: 117 lb

The graphs shown are mean values obtained from production units. Fluid: SHELL TELLUS S6 L VISCOSITY 170 SUS at 122°F

**Eaton® ME2600**

- Displacement: 157.29 in³/rev.
- Rated Pressure: 2500 psi
- Peak Pressure: 4700 psi
- Rated Torque: 7605 lbf·ft
- Rated Speed: 110 rpm
- Max. Speed: 230 rpm
- Max. Horse Power: 214 hp
- Weight: 772 lb

The graphs shown are mean values obtained from production units. Fluid: SHELL TELLUS S6 L VISCOSITY 170 SUS at 122°F

---

**Fig.1 Output torque vs speed**

- Overall Efficiency %
  - 85% @ 800 rpm
  - 88% @ 600 rpm
  - 93% @ 300 rpm

**Fig.2 Mechanical Efficiency**

- Mechanical efficiency at various speeds is shown for 4 motor pressures.

**Fig.3 Volumetric Efficiency**

- Volumetric efficiency at various speeds is shown for 4 motor pressures.
Eaton® ME3100

- Displacement: 189.42 m³/rev.
- Rated Pressure: 3600 psi
- Peak Pressure: 4700 psi
- Rated Torque: 9039 lbf-ft
- Rated Speed: 110 rpm
- Max. Speed: 230 rpm
- Max. Horse Power: 251 hp
- Weight: 802 lb

The graphs shown are mean values obtained from production units.

Fig. 1 Output torque vs speed

Fig. 2 Mechanical Efficiency

Fig. 3 Volumetric Efficiency

Mechanical efficiency at various speeds is shown for 4 motor pressures.

Volumetric efficiency at various speeds is shown for 4 motor pressures.

Eaton® ME175

- Displacement: 10.68 m³/rev.
- Rated Pressure: 4000 psi
- Peak Pressure: 4700 psi
- Rated Torque: 566 lbf-ft
- Rated Speed: 600 rpm
- Max. Speed: 800 rpm
- Max. Horse Power: 65 hp
- Weight: 92 lb

The graphs shown are mean values obtained from production units.

Fig. 1 Output torque vs speed

Fig. 2 Mechanical Efficiency

Fig. 3 Volumetric Efficiency

Mechanical efficiency at various speeds is shown for 4 motor pressures.

Volumetric efficiency at various speeds is shown for 4 motor pressures.
Eaton® ME150

Displacement: 9.27 in³/rev.
Rated Pressure: 4000 psi
Peak Pressure: 4700 psi
Rated Torque: 193 lbf·ft
Rated Speed: 600 rpm
Max. Speed: 800 rpm
Max. Horse Power: 56 hp
Weight: 92 lb

The graphs shown are mean values obtained from production units.

FLUID: SHELL TELLUS S6 (VISCOSITY 170 SUS @127°F)

Fig. 1 Output torque vs speed

OVERALL EFFICIENCY %

Fig. 2 Mechanical Efficiency

Fig. 3 Volumetric Efficiency

Eaton® ME4100

Displacement: 249.97 in³/rev.
Rated Pressure: 3600 psi
Peak Pressure: 4700 psi
Rated Torque: 11928 lbf·ft
Rated Speed: 75 rpm
Max. Speed: 200 rpm
Max. Horse Power: 284 hp
Weight: 1147 lb

The graphs shown are mean values obtained from production units.

FLUID: SHELL TELLUS S6 (VISCOSITY 170 SUS @127°F)

Fig. 1 Output torque vs speed

OVERALL EFFICIENCY %

Fig. 2 Mechanical Efficiency

Fig. 3 Volumetric Efficiency

Mechanical efficiency at various speeds is shown for 4 motor pressures.

Volumetric efficiency at various speeds is shown for 4 motor pressures.
**Nominal Dimensions**

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<td>0.371 x 0.371</td>
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</tbody>
</table>

**Optional Shaft Dimensions**

**Splined Shaft**

Type of Spine: Involute Flat root side fit, Pressure angle 30°, Pitch 16/32

<table>
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<tr>
<th>No. of Teeth</th>
<th>Pitch Dia.</th>
<th>Base Dia.</th>
<th>Top Dia.</th>
<th>Taper</th>
<th>Form Dia.</th>
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<td>1.102</td>
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**Spline Billet**

Weight: 1.8 lbf

**Tapered Shaft**

Section X-X

**Fig. 4 Starting Torque**

Starting torque versus effective pressure is shown. Oil viscosity will not affect the starting torque efficiency.

**Fig. 5 Case Leakage**

Case leakage from motor drain ports relates to various speeds is shown for 4 motor pressures.

**Fig. 6 Minimum Boost Pressure**

Pressure necessary to run motor without load is shown for various speeds.

**Fig. 7 Pressure Drop**

Pressure necessary to run motor without load is shown for various speeds.

**Fig. 8 Bearing Life and Motor Shaft Radial Load**

Note:
1. If motors are operated on the proper conditions, the operational life is determined by the Bearing Life.
2. In order to maintain the maximum bearing life, when a shaft load is imposed on the clutch shaft, the motor should be installed as illustrated in Fig. 8. For a unidirectional application, motor should be installed as shown in Fig. 8.
3. The graph above the bearing life (t = 3 Life Line) is in 1000 rpm shaft speed for various pressures and radial loads. The load that causes the line 1000 rpm is bearing life can be obtained by the formula below.

**Fig. 9-1**

**Fig. 9-2**

In order where the shaft load is a different position to the end of the shaft projection please refer to it.

1. All ball thrust loads that apply at the midpoint of shaft projection.
OPERATION

Direct Drives
Whenever possible flexible couplings should be used to relieve the motor shaft of any radial or axial loads. When splined drives are contemplated it is important that the P.C. dia. of the female spline is concentric to the pilot diameter preferably within 0.002 in. T.I.R.

Indirect Drives
Gear, chain and belt drives may be used provided the motor is mounted as shown in the diagram below and the resultant radial load on the shaft is within the permissible limits shown in the relevant section for each model. Loads are assumed to be applied at the center of the shaft extension. Please consult our representative for conditions outside the above recommendations and in cases where axial loading of the shaft is contemplated.

APPLICATION

Motor Casing Drain Pipe
The motor casing drain pipe to the reservoir must be adequately sized so that the casing pressure cannot exceed 45 psi (3 bar), even under cold start conditions. As a guide the pipe diameter must be at least equal to the drain port diameter. Where case pressure exceeds 45 psi (3 bar), or where a long pipe run cannot be avoided, please consult us.

Installation Attitude
ME series motors are flange mounted and can be positioned in any attitude provided that one of the drain connections in the unit case is at the highest point of the unit — THIS IS MOST IMPORTANT.

Fluid entering the supply port is directed via internal passages and timing plate to the center of the cylinder bores. Fluid pressure forces the pistons apart causing the slippers to slide on the angled faces of the swash plate and rotate the barrel and shaft assembly. After work, fluid is exhausted through the timing plate and internal passages to the return port.

---

The dotted circles are the eyebolt locations for ME100, ME200 and ME400.

Direction of Rotation
Motor rotation is reversible by changing over the fluid supply to the motor main ports. The relationship between the direction of rotation and the fluid flow is shown below. The direction of the shaft rotation for ME760A and ME850 is in reverse to the diagram below.

The dotted line is for ME100, ME150, ME175, ME300, ME350, ME600A, ME750A, ME850, ME1300A and ME3100.
Motor Selection Charts

Motor Torque (lbf-ft)

Brake Motors

<table>
<thead>
<tr>
<th>Model</th>
<th>Product Number</th>
<th>Displacement (in³/rev)</th>
<th>Brake Torque (lbf-ft)</th>
<th>Brake Release Pressure (psi)</th>
<th>Weight (lbs)</th>
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Hydraulic Fluid
(a) Mineral-based fluid
It is important to select a good quality fluid for use in the system. The fluid selected must be suitable for use both under cold-start conditions and at maximum operating temperature. Temperature range from -4°F to +168°F. Shell Tellus S6 and equivalent fluids are approved for use with Dowmax motors. These fluids have the following characteristics:
- Optimum viscosity range from 98 SUS to 460 SUS at normal working temperatures
- Resistance to foaming, oxidation and emulsification
- Anti-rust and anti-corrosion properties

(b) Fire-resistant fluid
Phosphate-ester fluids need special seals. Because of low viscosity index a cooler may be needed to ensure constant temperature operation. Speed ratings are affected and advice from our Technical Sales Department should be sought.
- Water-glycol fluid has only limited approval and our Technical Sales Department should be consulted whenever its use is considered.

Filtration
A filter of 10 microns standard, preferably with an element condition indicator, must be fitted in the return line from the motor (open circuit), or downstream of the boost pump (closed circuit).

Typical Circuit
Typical open loop and closed loop circuits are shown below.

Fluid Reservoir
The fluid reservoir must be of adequate size with easy access for cleaning.
A strainer of 100 mesh construction (0.15 mm or 0.006 in. gap) must be fitted to the pump suction line inside the reservoir. It must be of sufficient size to prevent cavitation and to allow for partial obstruction after a period of service.
- The pump suction line should draw fluid from a point several inches above the tank bottom to avoid sludge deposits, and the return line should be submerged to limit frothing of the fluid.
- The suction and return connections should be positioned as far apart as possible so that fluid circulation is promoted within the tank to assist convection cooling. A baffle plate fitted between the two connections will help to do this.
- Displacement volume must be allowed for by providing adequate air space and breathing. For this purpose an oil filler/breather must be fitted to the filling orifice in the top surface of the tank. This should comprise a fine mesh strainer for the filling orifice and an air filter to prevent the entry of dust particles through the breather.

Overrun Protection
Cavitation can take place if the motor is allowed to rotate under the influence of inertia forces or external loads after the fluid supply has been cut off. On these applications it is recommended that a closed circuit is used. Where this is not possible, motor cavitation can be prevented by using counter-balance or brake valves, anti-cavitation check valves, or by boosting the motor inlet. Boost pressure varies with motor speed and is shown in the Boost Pressure curves.

Geared Motors

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Closed Loop Circuit
Open Loop Circuit
These options are available from Eaton Hydraulics Division. Contact your Eaton representative for more information.
Eaton
ME Series
Low Speed High Torque
Hydraulic Motor

ADVANTAGES
"PROVEN IN INDUSTRIAL, MOBILE AND MARINE APPLICATIONS"

- HIGH PRESSURE – Continuous Operating Pressure 3600 psi
- SMOOTH OPERATION AT VERY LOW SPEED
  Multiple pistons and double swash plate result in
  smooth operation at speeds down to 1 rev/min
- HIGH STARTING TORQUE AND HIGH OVERALL
  EFFICIENCY
- COMPACT AND EASY TO INSTALL
- FULLY REVERSIBLE
- RUGGED CONSTRUCTION
- QUIET OPERATION
- UNAFFECTED BY THERMAL SHOCK (sudden
  changes in operating fluid temperature)

New Performance Data

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Notes:
- Speed in ( ) is a value at 3000 psi.
- Limit of hydraulic fluid temperature: -4°F ~ 176°F
- Limit of hydraulic fluid viscosity: 17 ~ 230 SU6
- Normal operating fluid viscosity range: 120 ~ 460 SUS