Eaton
Char-Lynn
Low Speed, High Torque Motors

Orbit motor
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## Features

- Complete with a distinct reducing mechanism of its own based on Gerotor/Geroler, the motors of this series deliver high output torque throughout their speed range.
- No additional speed reducer is needed because of low-speed High-torque performance.
- It is possible to install the motors into the small space because of small and compact size.
- The motors operate smoothly in any installation points.
- The torque which occurs irrespective of the direction of rotation is the same. Also, it is possible to reverse, being immediate.
- The rotation speed can be easily and smoothly controlled by crossing in the wide range.
- Irrespective of the load, the rotation speed can be kept constant.

## Model code procedure

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐</td>
<td>1 0 0</td>
<td>A</td>
<td>D</td>
<td>2</td>
<td>☐</td>
<td>☐</td>
<td>J</td>
</tr>
</tbody>
</table>

- **Series**
  - H = H series
  - S = S series

- **Displacement**

- **Port**
  - A = G1/2 O-Ring ports
  - B = Manifold mount
  - C = 1/2NPTF ports
  - D = Rc1/2 ports

- **Shaft**
  - B = SAE Splined shaft
  - C = Ø1" Straight with Woodruff key
  - D = Ø25 Straight with Parallel key, 8mm

- **Flange mounting**
  - 2 = 2 Bolt
  - 4 = 4 Bolt

- **Special features (none of standard motor)**
  - B = Special seal for Phosphate Ester Fluid
  - D = Integral check valves (H series only)
  - F = Free running (H series only)
  - M = Metric mounting holes

- **Drain port**
  - = Without drain port (H series only)
  - x = With drain port (H series; option, S series; standard)

- **Design code**
  - H Series J = Model 9
  - S Series M = Model 12
## Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>Displacement</th>
<th>Continuous Speed</th>
<th>Intermittent Speed</th>
<th>Continuous Torque</th>
<th>Intermittent Torque</th>
<th>Continuous Pressure</th>
<th>Intermittent Pressure</th>
<th>Peak Back Pressure</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>H-040</td>
<td>40</td>
<td>930</td>
<td>1000</td>
<td>59 (6.0)</td>
<td>83 (8.5)</td>
<td>12.3 (125)</td>
<td>16.7 (170)</td>
<td>10.2 (105)</td>
<td>5.4</td>
</tr>
<tr>
<td>H-050</td>
<td>51</td>
<td>910</td>
<td>980</td>
<td>79 (8.0)</td>
<td>108 (11.0)</td>
<td>12.3 (125)</td>
<td>16.7 (170)</td>
<td>10.2 (105)</td>
<td>5.4</td>
</tr>
<tr>
<td>H-070</td>
<td>69</td>
<td>770</td>
<td>880</td>
<td>108 (11.0)</td>
<td>147 (15.0)</td>
<td>12.3 (125)</td>
<td>16.7 (170)</td>
<td>10.2 (105)</td>
<td>5.5</td>
</tr>
<tr>
<td>H-100</td>
<td>96</td>
<td>560</td>
<td>670</td>
<td>147 (15.0)</td>
<td>206 (21.0)</td>
<td>12.3 (125)</td>
<td>16.7 (170)</td>
<td>10.2 (105)</td>
<td>5.6</td>
</tr>
<tr>
<td>H-130</td>
<td>129</td>
<td>420</td>
<td>560</td>
<td>206 (21.0)</td>
<td>265 (27.0)</td>
<td>12.3 (125)</td>
<td>16.7 (170)</td>
<td>10.2 (105)</td>
<td>5.7</td>
</tr>
<tr>
<td>H-170</td>
<td>159</td>
<td>340</td>
<td>450</td>
<td>226 (23.0)</td>
<td>304 (31.0)</td>
<td>11.3 (115)</td>
<td>15.2 (155)</td>
<td>10.2 (105)</td>
<td>5.9</td>
</tr>
<tr>
<td>H-200</td>
<td>184</td>
<td>290</td>
<td>390</td>
<td>255 (26.0)</td>
<td>343 (35.0)</td>
<td>10.8 (110)</td>
<td>14.7 (150)</td>
<td>10.2 (105)</td>
<td>6.1</td>
</tr>
<tr>
<td>H-240</td>
<td>230</td>
<td>240</td>
<td>320</td>
<td>285 (29.0)</td>
<td>402 (41.0)</td>
<td>9.8 (100)</td>
<td>13.7 (140)</td>
<td>10.2 (105)</td>
<td>6.3</td>
</tr>
<tr>
<td>H-290</td>
<td>277</td>
<td>200</td>
<td>260</td>
<td>334 (34.0)</td>
<td>412 (42.0)</td>
<td>9.3 (95)</td>
<td>11.7 (120)</td>
<td>10.2 (105)</td>
<td>6.4</td>
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<tr>
<td>H-390</td>
<td>369</td>
<td>150</td>
<td>200</td>
<td>392 (40.0)</td>
<td>461 (47.0)</td>
<td>8.3 (85)</td>
<td>9.8 (100)</td>
<td>10.2 (105)</td>
<td>7.0</td>
</tr>
</tbody>
</table>

Note:
1. Intermittent Torque, Pressure and Speed: Intermittent operation, 10% of every minute. A simultaneous Intermittent Torque and Intermittent Speed condition must not occur.
2. Maximum pressure at the motor inlet port of 17.2 MPa (175 kgf/cm²).
3. Splined shafts are recommended whenever operating above 350 Nm of torque.
H Series

Performance data

The performance data on this catalogue show the typical Torque Efficiency and Volume Efficiency of H series motors at each pressure at 37 cSt.

\[ N_{th} = \text{Theoretical Speed (rpm)} \]
\[ q = \text{Displacement (cm}^3/\text{rev)} \]
\[ \eta_v = \text{Volumetric Efficiency} \]
\[ N = \text{Speed (rpm)} \]
\[ \Delta P = \text{Pressure Difference between inlet port and outlet port (MPa)} \]
\[ T_{th} = \text{Theoretical Torque (N-m)} \]
\[ Q = \text{Inlet Flow (l/min)} \]
\[ \eta_T = \text{Torque Efficiency} \]
\[ T = \text{Actual Torque (N-m)} \]

\[ N_{th} = Q \times 10^3/q \quad N = N_{th} \times \eta_v \]
\[ T_{th} = \Delta P \times q / 2\pi \quad T = T_{th} \times \eta_T \]

Note: These data are not guaranteed data.

**H - 040 (40cm}^3/\text{rev)**

**H - 050 (51cm}^3/\text{rev)**
H Series

H - 170 (159cm³/rev)

H - 200 (184cm³/rev)

H - 240 (230cm³/rev)
H Series

H - 290 (277cm³/rev)

H - 390 (369cm³/rev)
H Series

Dimensions and mount data

2 Bolt flange

4 Bolt flange

Port code A: G1/2 O-Ring port
Port code C: 1/2 NPTF
Port code D: Rc 1/2

When required, remove plug and connect the drain line (Option)

Rotation: Viewed from shaft end
- CW: Port A pressurized
- CCW: Port B pressurized

<table>
<thead>
<tr>
<th>Model</th>
<th>X: Gerotor Width</th>
<th>Y: Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>H-040</td>
<td>7.0</td>
<td>131.7</td>
</tr>
<tr>
<td>H-050</td>
<td>7.0</td>
<td>131.7</td>
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<tr>
<td>H-070</td>
<td>9.5</td>
<td>134.2</td>
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<td>H-100</td>
<td>13.2</td>
<td>137.9</td>
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<td>H-130</td>
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<td>142.5</td>
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<tr>
<td>H-170</td>
<td>21.9</td>
<td>146.6</td>
</tr>
<tr>
<td>H-200</td>
<td>25.4</td>
<td>150.1</td>
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<tr>
<td>H-240</td>
<td>31.8</td>
<td>156.5</td>
</tr>
<tr>
<td>H-290</td>
<td>38.1</td>
<td>162.8</td>
</tr>
<tr>
<td>H-390</td>
<td>50.8</td>
<td>175.5</td>
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</table>

Base Block Mounting Kits

<table>
<thead>
<tr>
<th>Kit no.</th>
<th>123-1007-001</th>
<th>123-1007-001-S3</th>
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</thead>
<tbody>
<tr>
<td>Port block</td>
<td>833-1</td>
<td>B33-4</td>
</tr>
<tr>
<td>Screw cap</td>
<td>21046S-4</td>
<td>21046S-5</td>
</tr>
<tr>
<td>O-Ring</td>
<td>15058</td>
<td>15058</td>
</tr>
<tr>
<td>Mass</td>
<td>1.4 kg</td>
<td>1.4 kg</td>
</tr>
</tbody>
</table>

Motor port thread size
- Need to select 5/16 UNC thread size
- Metric M8x1.25 with manifold mount only.

SAE 6B Splined shaft

Port A
Port B

Port code A: M6x1.0
Port code B: 0.6
Port code C: Ø82.42
Port code D: 78.2

Max. torque 350 N.m
Max. Torque 350 N.m
Max. Torque 350 N.m
Max. Torque 350 N.m

Depth 14.5
Depth min. 14.5
Depth min. 14.5
Depth min. 14.5

Rotation: Viewed from shaft end
- CW: Port A pressurized
- CCW: Port B pressurized

EATON Low Speed, High Torque Orbit Motor E-MOOG-CC001-E July 2015
## Specifications

| Model | Displacement cm³/rev | Continuous Speed rpm | Continuous Inlet Flow L/min | Continuous Inlet Flow L/min | Continuous Torque N·m (kgf·m) | Intermittent Torque N·m (kgf·m) | Continuous Pressure MPa (kgf/cm²) | Intermittent Pressure MPa (kgf/cm²) | Peak Back Pressure MPa (kgf/cm²) | Weight Kg |
|-------|----------------------|----------------------|-----------------------------|-----------------------------|-------------------------------|--------------------------------||----------------------------------|----------------------------------|-----------------------------------|---------|
| S-050 | 58                   | 963                  | 57                          | 68                          | 106 (10.8)                    | 133 (13.6)                      | 13.8 (140)                      | 17.2 (175)                       | 10.3 (105)                        | 6.6     |
| S-070 | 76                   | 742                  | 57                          | 76                          | 139 (14.2)                    | 175 (17.9)                      | 13.8 (140)                      | 17.2 (175)                       | 10.3 (105)                        | 6.7     |
| S-100 | 93                   | 607                  | 57                          | 76                          | 174 (17.7)                    | 216 (22.0)                      | 13.8 (140)                      | 17.2 (175)                       | 10.3 (105)                        | 7.0     |
| S-120 | 120                  | 472                  | 57                          | 76                          | 224 (22.8)                    | 279 (28.5)                      | 13.8 (140)                      | 17.2 (175)                       | 10.3 (105)                        | 7.2     |
| S-140 | 144                  | 394                  | 57                          | 76                          | 258 (26.3)                    | 319 (32.5)                      | 13.1 (133)                      | 16.2 (165)                       | 10.3 (105)                        | 7.3     |
| S-160 | 165                  | 343                  | 57                          | 76                          | 296 (30.2)                    | 359 (36.6)                      | 13.1 (133)                      | 15.9 (162)                       | 10.3 (105)                        | 7.4     |
| S-190 | 186                  | 304                  | 57                          | 76                          | 326 (33.3)                    | 395 (40.3)                      | 12.8 (130)                      | 15.5 (158)                       | 10.3 (105)                        | 7.6     |
| S-220 | 224                  | 253                  | 57                          | 76                          | 359 (36.6)                    | 435 (44.4)                      | 11.7 (120)                      | 14.1 (144)                       | 10.3 (105)                        | 7.9     |
| S-300 | 299                  | 190                  | 57                          | 76                          | 422 (43.0)                    | 507 (51.7)                      | 10.3 (105)                      | 12.4 (126)                       | 10.3 (105)                        | 8.4     |
| S-380 | 371                  | 153                  | 57                          | 76                          | 457 (46.6)                    | 523 (53.3)                      | 9.0 (92)                        | 10.3 (105)                       | 10.3 (105)                        | 8.8     |

Note: 1. Intermittent Torque, Pressure, Flow and Speed: Intermittent operation, 10% of every minute. A simultaneous Intermittent Torque and Intermittent Speed and Flow condition must not occur.
2. Maximum pressure at the motor inlet port of 17.2MPa (175kgf/cm²)
3. Splined shafts are recommended whenever operating above 350N·m of torque.

## Sectional view

![Sectional view diagram of the S Series Geroler Orbit Motor E-MOGG-CC001-E](image-url)
Performance data

The performance data on this catalogue show the typical Torque Efficiency and Volume Efficiency of S series motors at each pressure at 37 cSt.

Nth = Theoretical Speed (rpm)
q = Displacement (cm³/rev)
ηv = Volumetric Efficiency
N = Speed (rpm)
ΔP = Pressure Difference between inlet port and outlet port (MPa)
Tth = Theoretical Torque (N·m)
Q = Inlet Flow (l/min)
ηT = Torque Efficiency
T = Actual Torque (N·m)

Nth = \( Q \times 10^{-3} / q \)
N = Nth × ηv
Tth = \( \Delta P \times q / 2\pi \)
T = Tth × ηT

Note: These data are not guaranteed data.
S Series

S - 160 (165cm³/rev)

S - 190 (186cm³/rev)

S - 220 (224cm³/rev)
S Series

S - 300 (299cm³/rev)

S - 380 (371cm³/rev)
Dimensions and mount data

Recommended tightening torque for motor mounting

<table>
<thead>
<tr>
<th>Port Size</th>
<th>Tightening Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>G1/2</td>
<td>59 N-m (8kgf-m)</td>
</tr>
<tr>
<td>Rc1/2</td>
<td>59 N-m (8kgf-m)</td>
</tr>
<tr>
<td>1/2-14NPTF</td>
<td>59 N-m (8kgf-m)</td>
</tr>
<tr>
<td>G3/8</td>
<td>39 N-m (4kgf-m)</td>
</tr>
<tr>
<td>G1/4</td>
<td>24.5 N-m (2.5kgf-m)</td>
</tr>
</tbody>
</table>
Instruction for use

Permissible back pressure and case pressure

- In case of series connection or closed circuit (HST circuit), a case drain is necessary.
- The permissible case pressure in the chart shows the permissible case pressure at each motor shaft speed.

1. S Series Motor has internal check valve, and the back pressure (return pressure) is permissible to the pressure in the chart.
   \[ P_c = P_2 \] (1)
2. H Series Motor doesn’t have internal check valve. The case pressure operates to shaft seal. Use for the case pressure which is calculated by the following formula to become under than the chart pressure.
   \[ P_c = Case \ Pressure \ (MPa) \]
   \[ P_c = 0.6\Delta P + P_2 \] (2)
   \[ \Delta P = P_1 - P_2 : Pressure \ Difference \ between \ inlet \ port \ and \ outlet \ port \ (MPa) \]
   \[ P_1: \ Inlet \ Port \ Pressure \ (MPa) \]
   \[ P_2: \ Outlet \ Port \ Pressure \ (Back \ Pressure) \ (MPa) \]
3. In case of the pressure which was calculated in (1) or (2) exceeds the permission case pressure of the chart, the case drain is necessary.

Note:
1. The standard type H motor doesn’t have a drain port. In case of needing a case drain, select a H motor with the drain port from the model numbering procedure.
2. H Series Motor has the special specification which has a check valve. Special features symbol is “D”

Side load capacity

- These charts are based on the load being applied at the location shown. Side load capacity decreases when load is applied at distances greater than shown.
- This side load chart shows relation between the shaft speed and the permission side load when the load acts on the 27 mm position from the flange mounting surface. The side load when the load position is different is calculated by the following formula.
Instruction

Fr : Side load from the chart (N)
Fro : Permission side load at the load point
X : The distance from rated side load point (27mm from flange mounting surface).
   The side of the end of the shaft is "+" and the side of the flange is "−".
Fro = 130Fr/(130+X)

External thrust load can be applied by maximum 4500N either direction simultaneously.

<Calculation Example>

1 Motor Shaft Speed 350rpm, Distance from flange mounting surface 40mm
   From the chart Fr = 3000N X = +13mm
   Fro = 130Fr/(130+X) = 130/143 ×3000 = 2700N

2 Motor Shaft Speed 350rpm, Distance from flange mounting surface 17mm
   From the chart Fr = 3000N X = -10mm
   Fro = 130Fr/(130+X) = 130/120 ×3000 = 3250N

Hydraulic fluid

Recommended Fluid; Mineral based Anti-Wear Hydraulic Fluid ISO VG32, VG46, VG56, VG68, or equivalent fluid
Allowable Fluid Temperature Range; from -30 to +80 degrees C.
Recommended Viscosity Range; from 24 to 50 cSt
The allowable lowest viscosity; 13 cSt (for H series ; 20 cSt)
The allowable highest viscosity; 2158 cSt
Recommended Filtration; 10 micron or finer
Fluid Cleanliness; ISO 18/13 or finer
Note: If the motor is used with special fluid such as flame-resistant fluid, please contact Eaton because special seals etc. are needed.

Inertia load application, etc.

When the motor is used in the inertia load application such as swing drive, it is necessary to use the brake valve in order to protect the motor and its shaft.

When the motor acts as a pump in the winch drive application or down-slope travel application, it is often necessary to use the counter balance valve in order to prevent the circuit cavitation or reckless driving by the self-weight.

In these cases, please contact Eaton for details.
Valves for H and S Series

VSE Brake valve for direct connection

**Features** Total system will be designed economically because this can be connected directly with H/S series motor. This valve prevents an irregular high pressure by inertia load at accelerating, decelerating and stopping and then safe operation is ensured.

**Specifications**
- Rated Flow: 15 l/min
- Pressure Range: 6.9–13.7 MPa (70–140 kgf/cm²)
- Weight: 1.9 kg

### VSE Pressure Override Performance

![VSE Pressure Override Performance Graph](image)

### Design Code

<table>
<thead>
<tr>
<th>VSE</th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-G1/4 O-Ring port</td>
<td>(Anti-cavitation port)</td>
<td></td>
</tr>
</tbody>
</table>

### Relief Set Pressure (kgf/cm²)

<table>
<thead>
<tr>
<th>Flow Rate at Set Pressure (l/min)</th>
<th>Design Code</th>
<th>Port Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>14MPa Setting</td>
<td>10.5MPa Setting</td>
<td>7MPa Setting</td>
</tr>
</tbody>
</table>

### Viscosity 37cSt

### O-Ring Port Codes

- JIS B2401
- 2-G1/2
- 2-G1/4
- 2-G1/8
- D-Ring 1B18

### Diagrams

- VSE Brake valve for H/S series motor (15 l/min)
- Flow rate at set pressure (l/min)
- Design code
- Relief set pressure (kgf/cm²)
Valves for H and S Series

VSC Counter balance valve for direct connection

<Features> Total system will be designed economically because this can be connected directly with H/S series motor. This can be connected directly with direct connected brake valve. The circuit cavitation or reckless driving by the self-weight can be prevented.

<Specifications> Max. Pressure: 172MPa (175kgf/cm²)
Rated Flow: 30l/min
Spool Cracking Pressure: 0.3MPa (3.5kgf/cm²)
Weight: 2.0kg

VSC Pressure Drop Performance

VSC A7 A

Design code
Port code
Counter balance valve for H/S series motor (30 l/min)

[Diagram of VSC Counter balance valve]

[Graph of VSC Pressure Drop Performance]

[Table of VSC A7 A Specifications]
Valves for H and S Series

VSA Counter balance valve for direct connection

**Features** Total system will be designed economically because this can be connected directly with H/S series motor. The circuit cavitation or reckless driving by the self-weight can be prevented.

**Specifications**
- Max. Pressure: 172MPa (175kgf/cm²)
- Rated Flow: 30l/min
- Spool Cracking Pressure: 0.3MPa (3.5kgf/cm²)
- Weight: 2.0kg

VSA Pressure Drop Performance

![Pressure Drop Performance Graph](image)

VSA A1 A

- Design code
- Port code
- Counter balance valve for H/S series motor (30 l/min)

Port BM
Port AM

![Diagram of VSA A1 A](image)

AM BM

![Diagram of AM BM](image)

Port Av
Port Bv

![Diagram of Port Av and Bv](image)

Motor mounting surface

2-G3/B O-Ring port

![Diagram of 2-G3/B O-Ring port](image)

Viscosity 37cSt
Valves for H and S Series

VSW Integrated brake valve and counter balance valve for direct connection

**Features** Total system will be designed economically because this can be connected directly with H/S series motor. This valve prevents an irregular high pressure by inertia load at accelerating, decelerating and stopping and then safe operation is ensured. The reckless driving by the self-weight can be prevented.

**Specifications**
- Max. Pressure: 172MPa (175kgf/cm²)
- Max. Flow: 60l/min
- Spool Cracking Pressure: 0.3MPa (3.5kgf/cm²)
- Pressure Range: 6.9~17.2MPa (70~175kgf/cm²)
- Weight: 3.8kg

\[\text{Flow rate at set pressure (l/min)}\]
\[\text{Relief set pressure (kgf/cm²)}\]
\[\text{Brake & counter valve for H/S series motor (60 l/min)}\]

\[\text{Pressure Drop (MPa)}\]
\[\text{Viscosity 37cSt}\]

\[\text{Flow (L/min)}\]
\[\text{VSW Pressure Override Performance}\]

\[\text{VSW Pressure Drop Performance}\]
Features

- **The light-weight and compact low-speed high torque motor**
  Because Geroler does a planetary motion, the torque which is the same as the case to have decelerated the hydraulic motor of other types in 1/6 with the mechanical reduction gear is gotten. Because nine types displacement of 78-393cm³/rev, even if it doesn’t use a reduction gear, the motor which was fitted to the purpose can be selected.

- **The high pressure rating**
  There are few internal oil leakage and they can be operated in rated pressure 20.6MPa (210kgf/cm²), maximum pressure 30.9MPa (315kgf/cm²), because it use of hydraulic pressure balanced type disk valve for the valve mechanism and it is using high-precision geroler.

- **The accurate valve timing**
  Because the disc valve is built independent structurally from the drive transmitting mechanism-device into motor, ensures the accurate valve timing and the high performance that stays stable for long operation hours.

Model code procedure

```
2  - 1 0 0  A  J  2  □  □  -  E
```

1. **Series**
   - 2 = 2000 series

2. **Displacement**

3. **Type of motor**
   - A = Standard
   - B = Wheel

4. **Shaft**
   - J = Ø32 Straight with 10x8x31.5 key
   - B = Ø1-1/4" Splined
   - C = Ø1-1/4" Tapered
   - D = Ø1-1/4" Straight with 5/16" Square key
   - E = Ø1" Straight with Woodruff key

5. **Flange mounting**
   - 2 = 2 Bolt
   - 4 = 4 Bolt
   - 6 = 4 Bolt (unequally spaced)

6. **Special features (none of standard motor)**
   - None = G1/2 O-Ring ports
   - A = 7/8UNF Side ports
   - B = Special seal for Phosphate Ester Fluid
   - C = Rc1/2 Side ports
   - D = 7/8UNF Rear ports
   - B8 = G1/2 Rear ports
   - U = 7/8UNF Side ports (Pitch 50.8mm)
   - Y = Manifold ports (Pitch 50.8mm)

7. **Design code**
   - E = Model 5
## 2000 Series

### Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>Displacement</th>
<th>Continuous Speed</th>
<th>Intermittent Speed</th>
<th>Continuous Torque</th>
<th>Maximum Torque</th>
<th>Continuous Pressure</th>
<th>Maximum Pressure</th>
<th>Peak Back Pressure</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>cm³/rev</td>
<td>rpm</td>
<td>rpm</td>
<td>N-m (kgf-m)</td>
<td>N-m (kgf-m)</td>
<td>MPa (kgf/cm²)</td>
<td>MPa (kgf/cm²)</td>
<td>MPa (kgf/cm²)</td>
<td>Kg</td>
<td></td>
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<tr>
<td>2.080</td>
<td>78</td>
<td>850</td>
<td>850</td>
<td>235 (24)</td>
<td>343 (35)</td>
<td>20.6 (210)</td>
<td>30.9 (315)</td>
<td>6.9 (70)</td>
<td>9.6</td>
</tr>
<tr>
<td>2.100</td>
<td>97</td>
<td>690</td>
<td>850</td>
<td>284 (29)</td>
<td>383 (39)</td>
<td>20.6 (210)</td>
<td>27.4 (280)</td>
<td>6.9 (70)</td>
<td>9.8</td>
</tr>
<tr>
<td>2.125</td>
<td>123</td>
<td>550</td>
<td>690</td>
<td>324 (33)</td>
<td>392 (40)</td>
<td>18.1 (185)</td>
<td>22.1 (225)</td>
<td>6.9 (70)</td>
<td>10.1</td>
</tr>
<tr>
<td>2.160</td>
<td>158</td>
<td>430</td>
<td>540</td>
<td>334 (34)</td>
<td>471 (48)</td>
<td>14.7 (150)</td>
<td>20.6 (210)</td>
<td>6.9 (70)</td>
<td>10.4</td>
</tr>
<tr>
<td>2.200</td>
<td>195</td>
<td>350</td>
<td>440</td>
<td>373 (38)</td>
<td>520 (53)</td>
<td>13.2 (135)</td>
<td>18.6 (190)</td>
<td>6.9 (70)</td>
<td>10.8</td>
</tr>
<tr>
<td>2.250</td>
<td>244</td>
<td>280</td>
<td>350</td>
<td>373 (38)</td>
<td>579 (59)</td>
<td>10.8 (110)</td>
<td>16.7 (170)</td>
<td>6.9 (70)</td>
<td>11.3</td>
</tr>
<tr>
<td>2.290</td>
<td>288</td>
<td>250</td>
<td>300</td>
<td>422 (43)</td>
<td>608 (62)</td>
<td>10.3 (105)</td>
<td>14.7 (150)</td>
<td>6.9 (70)</td>
<td>11.8</td>
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<tr>
<td>2.315</td>
<td>306</td>
<td>230</td>
<td>280</td>
<td>432 (44)</td>
<td>608 (62)</td>
<td>9.8 (100)</td>
<td>13.7 (140)</td>
<td>6.9 (70)</td>
<td>12.0</td>
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<tr>
<td>2.390</td>
<td>393</td>
<td>190</td>
<td>230</td>
<td>441 (45)</td>
<td>638 (65)</td>
<td>7.8 (80)</td>
<td>11.3 (115)</td>
<td>6.9 (70)</td>
<td>13.0</td>
</tr>
</tbody>
</table>

Note: 1. Intermittent: 10% of every minute, Maximum: 1% of every minute, operation available.
2. Continuous Pressure, Maximum Pressure: Show true pressure difference between motor inlet and outlet ports. Maximum pressure at the motor inlet port of 30.9MPa (315kgf/cm²), outlet port of 17.2MPa (175kgf/cm²)
3. Because there is a torque by each output shaft type, use within the torque.
4. A simultaneous Intermittent Speed and Maximum Pressure condition must not occur.
5. Weight: Show the weight of Standard Motor.

### Sectional view

![Sectional view diagram of the 2000 Series Orbit Motor E-MOGG-CC001-E](image-url)
Performance data

The performance data on this catalogue show the typical Torque Efficiency and Volume Efficiency of 2000 series motors at each pressure at 34 cSt.

Note: These data are not guaranteed data.

2000 Series

Volumetric Efficiency (%)  

50 60 70 80 90 100

Torque Efficiency (%)  

0 50 100 150 200 250 300 350 400 450 500 550 600 650 700 750 800 850 900 950 1000

Speed (rpm)

2 - 080 (78cm³/rev)

2 - 100 (97cm³/rev)

20.6MPa  
17.1MPa  
13.7MPa  
10.3MPa  
6.87MPa
2000 Series

2 - 125 (123cm³/rev)

2 - 160 (158cm³/rev)

2 - 200 (195cm³/rev)
2000 Series

**2 - 250 (244cm³/rev)**

![Graph showing volumetric efficiency and torque efficiency for various pressures and speeds.]

**2 - 290 (288cm³/rev)**

![Graph showing volumetric efficiency and torque efficiency for various pressures and speeds.]

- Torque Efficiency (%)
- Speed (rpm)
2000 Series

2 - 315 (306cm³/rev)

2 - 390 (393cm³/rev)
2000 Series

**Dimensions and mounting data (side port)**

Rotation: Viewed from shaft end
- CW: Port A pressurized
- CCW: Port B pressurized

**Standard motor**

<table>
<thead>
<tr>
<th>Model</th>
<th>2-080</th>
<th>2-100</th>
<th>2-125</th>
<th>2-160</th>
<th>2-200</th>
<th>2-250</th>
<th>2-290</th>
<th>2-315</th>
<th>2-390</th>
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</thead>
<tbody>
<tr>
<td>X</td>
<td>176</td>
<td>180</td>
<td>185</td>
<td>191</td>
<td>196</td>
<td>207</td>
<td>215</td>
<td>218</td>
<td>234</td>
</tr>
<tr>
<td>Y</td>
<td>133</td>
<td>137</td>
<td>142</td>
<td>148</td>
<td>155</td>
<td>164</td>
<td>172</td>
<td>175</td>
<td>191</td>
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</table>
## 2000 Series

### Wheel motor

![Wheel motor diagram](image)

<table>
<thead>
<tr>
<th>Model</th>
<th>2-080</th>
<th>2-100</th>
<th>2-125</th>
<th>2-160</th>
<th>2-200</th>
<th>2-250</th>
<th>2-290</th>
<th>2-315</th>
<th>2-390</th>
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<tr>
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<td>93</td>
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<td>114</td>
<td>124</td>
<td>132</td>
<td>135</td>
<td>151</td>
</tr>
</tbody>
</table>

O-Ring plug for case drain
G1/4 : Code –, C
7/16-20UNF : Code A

---

**EATON** Low Speed, High Torque Orbit Motor E-MOGG-CC001-E July 2015
Dimensions and mounting data (wide side port)

Rotation: Viewed from shaft end
- CW: Port A pressurized
- CCW: Port B pressurized

Standard motor

<table>
<thead>
<tr>
<th>Model</th>
<th>2-080</th>
<th>2-100</th>
<th>2-125</th>
<th>2-160</th>
<th>2-200</th>
<th>2-250</th>
<th>2-290</th>
<th>2-315</th>
<th>2-390</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>176</td>
<td>180</td>
<td>185</td>
<td>191</td>
<td>198</td>
<td>207</td>
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<tr>
<td>Y</td>
<td>145</td>
<td>149</td>
<td>154</td>
<td>160</td>
<td>167</td>
<td>176</td>
<td>184</td>
<td>187</td>
<td>203</td>
</tr>
</tbody>
</table>

Model data:
- 4 Bolt flange
- 2 Bolt flange
- Wide port (Code U)
- Wide port (Code Y) (Manifold type)

Note: X, Y dimensions are for reference and may vary based on specific model specifications.
2000 Series

Wheel motor

<table>
<thead>
<tr>
<th>Model</th>
<th>2-080</th>
<th>2-100</th>
<th>2-125</th>
<th>2-160</th>
<th>2-200</th>
<th>2-250</th>
<th>2-290</th>
<th>2-315</th>
<th>2-390</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>136</td>
<td>140</td>
<td>144</td>
<td>151</td>
<td>157</td>
<td>167</td>
<td>175</td>
<td>178</td>
<td>194</td>
</tr>
<tr>
<td>Y</td>
<td>105</td>
<td>109</td>
<td>113</td>
<td>120</td>
<td>126</td>
<td>136</td>
<td>144</td>
<td>147</td>
<td>163</td>
</tr>
</tbody>
</table>
Dimensions and mounting data (rear port)

Rotation: Viewed from shaft end
- CW: Port A pressurized
- CCW: Port B pressurized

Standard motor

<table>
<thead>
<tr>
<th>Model</th>
<th>2-080</th>
<th>2-100</th>
<th>2-125</th>
<th>2-160</th>
<th>2-200</th>
<th>2-250</th>
<th>2-290</th>
<th>2-315</th>
<th>2-390</th>
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<tbody>
<tr>
<td>X</td>
<td>183</td>
<td>186</td>
<td>191</td>
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<td>213</td>
<td>221</td>
<td>225</td>
<td>241</td>
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</table>
2000 Series

Wheel motor

<table>
<thead>
<tr>
<th>Model</th>
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<th>2-100</th>
<th>2-125</th>
<th>2-160</th>
<th>2-200</th>
<th>2-250</th>
<th>2-290</th>
<th>2-315</th>
<th>2-390</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>143</td>
<td>146</td>
<td>151</td>
<td>157</td>
<td>164</td>
<td>173</td>
<td>181</td>
<td>184</td>
<td>200</td>
</tr>
</tbody>
</table>
**Dimension data for shaft**

**Shaft code: J**  
Ø32° Straight shaft

**Shaft code: B**  
1-1/4" Involute splined shaft

**Shaft code: C**  
1-1/4" Tapered shaft (SAE) Taper: 1.5/12

**Shaft code: D**  
1-1/4" Straight shaft

**Shaft code: E**  
Ø1" Straight shaft (Max. Torque 395 N-m)

---

**1-1/4" SAE Involute Spline (External)**

<table>
<thead>
<tr>
<th>D.P.</th>
<th>12/24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of teeth</td>
<td>14</td>
</tr>
<tr>
<td>Pitch Dia.</td>
<td>29.634</td>
</tr>
<tr>
<td>Base Dia.</td>
<td>25.664</td>
</tr>
<tr>
<td>Pressure angle</td>
<td>30°</td>
</tr>
<tr>
<td>Type of fit</td>
<td>Side fit</td>
</tr>
<tr>
<td>Class of fit</td>
<td>II</td>
</tr>
<tr>
<td>Major Dia.</td>
<td>31.22/31.10</td>
</tr>
<tr>
<td>Minor Dia.</td>
<td>26.99/26.66</td>
</tr>
<tr>
<td>Form Dia.</td>
<td>Max. 27.488</td>
</tr>
<tr>
<td>Fillet radius</td>
<td>Max. 0.39</td>
</tr>
<tr>
<td>Dimension over two pins</td>
<td>35.797/35.750</td>
</tr>
<tr>
<td>Pin Dia.</td>
<td>4.064</td>
</tr>
</tbody>
</table>

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**SAE Involute Spline (Internal)**

<table>
<thead>
<tr>
<th>Shaft</th>
<th>d</th>
<th>0</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>J</td>
<td>32.00 + 0.025</td>
<td>10.000 + 0.018</td>
<td>3.2 + 0.2</td>
</tr>
<tr>
<td>B</td>
<td>Please reference internal spline</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>7.962 + 0.006</td>
<td>4.1 + 0.2</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>31.75 + 0.025</td>
<td>7.962 + 0.006</td>
<td>3.6 + 0.2</td>
</tr>
<tr>
<td>E</td>
<td>25.4 + 0.021</td>
<td>6.375 + 0.006</td>
<td>2.9 + 0.2</td>
</tr>
</tbody>
</table>

---

**Recommended shaft hole size**

**Shaft Hole**

- Standard motor
- Split or cotter pin 5x45

---

**Woodruff key**
Instruction for use

Permissible back pressure

The motors have an internal check valve system, and it becomes the internal case drain. The case internal pressure becomes the same as either of A or B port low pressure. This pressure is the back pressure.

Use to maintain the life of shaft seal long under continuous pressure 1.96MPa (20kgf/cm²) and peak maximum pressure 6.9MPa (70kgf/cm²).

When using equal to or more than two motors in series, or the high back pressure operates like the meter out control, the external drain line is necessary.

Radial load capacity

These curves indicate the radial load capacity of the 2000 Series Standard and Wheel Motor depending on the location of the radial load. The curves are based on 2000 hr. B-10 bearing life at 100rpm and at rated output torque. To determine the allowable radial load at speeds other than 100rpm, multiply the load values given on the bearing curves by the factors given in the chart. External thrust load can be applied by maximum 4500N either direction simultaneously.

![Graphs showing allowable side load for different shaft distances](image-url)
<table>
<thead>
<tr>
<th>rpm</th>
<th>Multiplication Factor</th>
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<tbody>
<tr>
<td>050</td>
<td>1.23</td>
</tr>
<tr>
<td>100</td>
<td>1.00</td>
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<td>200</td>
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<td>300</td>
<td>0.72</td>
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<td>400</td>
<td>0.66</td>
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<td>500</td>
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<td>600</td>
<td>0.58</td>
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<tr>
<td>700</td>
<td>0.56</td>
</tr>
<tr>
<td>800</td>
<td>0.54</td>
</tr>
</tbody>
</table>
Instruction

Hydraulic fluid

Recommended Fluid; Mineral based Anti-Wear Hydraulic Fluid ISO VG32, VG46, VG56, VG68, or equivalent fluid
Allowable Fluid Temperature Range; from -30 to +80 degrees C.
Recommended Viscosity Range; from 24 to 50 cSt
The allowable lowest viscosity; 13 cSt (for H series ; 20 cSt)
The allowable highest viscosity; 2158 cSt
Recommended Filtration; 10 micron or finer
Fluid Cleanliness; ISO 18/13 or finer
Note: If the motor is used with special fluid such as flame-resistant fluid, please contact Eaton because special seals etc. are needed.

Inertia load application, etc.

When the motor is used in the inertia load application such as swing drive, it is necessary to use the brake valve in order to protect the motor and its shaft.
When the motor acts as a pump in the winch drive application or down-slope travel application, it is often necessary to use the counter balance valve in order to prevent the circuit cavitation or reckless driving by the self-weight.
In these cases, please contact Eaton for details.
Valves for 2000 Series

V2A Brake valve for direct connection (for side port)

**Features** Total system will be designed economically because this can be connected directly with 2000 series motor. This valve prevents an irregular high pressure by inertia load at accelerating, decelerating and stopping and then safe operation is ensured.

**Specifications**
- Rated Flow: 30l/min
- Pressure Range: 6.9~20.6MPa (70~210kgf/cm²)
- Weight: 1.4kg

![V2A Pressure Override Performance](image)

Flow (L/min)

<table>
<thead>
<tr>
<th>Pressure (MPa)</th>
<th>Flow rate at set pressure (l/min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
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<tr>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>8</td>
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<td>16</td>
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<td>28</td>
<td>60</td>
</tr>
<tr>
<td>30</td>
<td>65</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Viscosity 37cSt</th>
<th>20.6MPa Setting</th>
<th>13.7MPa Setting</th>
<th>9.8MPa Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.0</td>
<td>20</td>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td>5.0</td>
<td>18</td>
<td>13</td>
<td>8</td>
</tr>
<tr>
<td>6.0</td>
<td>16</td>
<td>12</td>
<td>7</td>
</tr>
<tr>
<td>7.0</td>
<td>14</td>
<td>9</td>
<td>5</td>
</tr>
<tr>
<td>8.0</td>
<td>12</td>
<td>6</td>
<td>3</td>
</tr>
</tbody>
</table>

- Design code: V2A □□□ □□□ □□□
- Flow rate at set pressure (l/min)
- Port code: AMBM
- Brake valve for 2000 series motor (30 l/min)
- Relief set pressure (kgf/cm²)
- O-Ring (2 PLS.)
- JIS B2401 P18
- Bv AV
- BM AM
- O-Ring (2 PLS.)
- JIS B2401 P18
- 2-G1/2 (For O-Ring boss)
Valves for 2000 Series

V2B Counter balance valve for direct connection (for side port)

<Features> Total system will be designed economically because this can be connected directly with 2000 series motor. This can be connected directly with direct connected brake valve. The circuit cavitation or reckless driving by the self-weight can be prevented.

<Specifications> Max. Pressure: 20.6MPa (210kgf/cm²)
Rated Flow: 30l/min
Spool Cracking Pressure: 0.5MPa (5kgf/cm²)
Weight: 3.4kg

V2B Pressure Drop Performance

<table>
<thead>
<tr>
<th>Flow (L/min)</th>
<th>Free Flow</th>
<th>Control Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0.1</td>
</tr>
<tr>
<td>5</td>
<td>0.1</td>
<td>0.2</td>
</tr>
<tr>
<td>10</td>
<td>0.2</td>
<td>0.3</td>
</tr>
<tr>
<td>15</td>
<td>0.3</td>
<td>0.4</td>
</tr>
<tr>
<td>20</td>
<td>0.4</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Viscosity 37cSt
Valves for 2000 Series

V2L Brake valve for direct connection

**Features** Total system will be designed economically because this can be connected directly with 2000 series motor. This valve prevents an irregular high pressure by inertia load at accelerating, decelerating and stopping and then safe operation is ensured.

**Specifications**
- Rated Flow: 60l/min
- Pressure Range: 6.9~20.6MPa (70~210kgf/cm²)
- Weight: 4.4kg

![Diagram of V2L Brake valve](image)

### V2L Pressure Override Performance

<table>
<thead>
<tr>
<th>Pressure (MPa)</th>
<th>6</th>
<th>8</th>
<th>10</th>
<th>12</th>
<th>14</th>
<th>16</th>
<th>18</th>
<th>20</th>
<th>22</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure (kgf/cm²)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Flow rate at set pressure (l/min)

- 20.6MPa Setting
- 13.7MPa Setting
- 9.8MPa Setting

### Viscosity 37cSt

**Design code**
- Brake valve for 2000 series motor (60 l/min)

**Port code**
- BV Port
- AM Port
- BM Port

![Diagram of V2L Brake valve](image)
Valves for 2000 Series

**V2M Counter balance valve for direct connection (for side port)**

**<Features>** Total system will be designed economically because this can be connected directly with 2000 series motor. This can be connected directly with direct connected brake valve. The circuit cavitation or reckless driving by the self-weight can be prevented.

**<Specifications>**
- Max. Pressure: 20.6MPa (210kgf/cm²)
- Rated Flow: 60l/min
- Spool Cracking Pressure: 0.6MPa (6kgf/cm²)
- Weight: 3.8kg

---

**V2M Pressure Drop Performance**

- Free Flow
- Control Flow
- Viscosity 37cSt

---

**V2M A6 A**

Design code
Port code
Counter balance valve for 2000 series motor (60 l/min)

---

**V2M A6 A**

Pressure Drop Performance Chart

---

**Dimensions**
- Port code
  - AM
  - BM
- Port code
  - AV
  - BV
- AM Port
- BM Port
- O-Ring
- Z-7/8-14UNF
- G1/2
- D-Ring port

---

**Port codes**
- AV Port
- BV Port
- O-Ring
- Z-7/8-14UNF
- G1/2
- D-Ring port

---

**Dimensions**
- Port code
  - AM
  - BM
- Port code
  - AV
  - BV
- AM Port
- BM Port
- O-Ring
- Z-7/8-14UNF
- G1/2
- D-Ring port

---

**Dimensions**
- Port code
  - AM
  - BM
- Port code
  - AV
  - BV
- AM Port
- BM Port
- O-Ring
- Z-7/8-14UNF
- G1/2
- D-Ring port

---
S Series Motor with Mechanical Brake

Features

S Series Motor with a compact type mechanical brake built-in. The motor can be used widely in the fields of construction machines, fishing machines, industrial vehicles, general industrials, etc.

- Brake releasing by pressure (SBA, SBD, SBE, SBF)

Braking can be applied when the pilot pressure is not supplied. In case of SBD and SBE, mechanical releasing of brake is possible.

Specifications

<table>
<thead>
<tr>
<th>Series</th>
<th>Brake Torque</th>
<th>Brake Release Pressure</th>
<th>Brake Release System</th>
</tr>
</thead>
<tbody>
<tr>
<td>SBA</td>
<td>98N-m (10kgf-m)</td>
<td>1.0MPa (10kgf/cm²)</td>
<td>External Pilot</td>
</tr>
<tr>
<td>SBD</td>
<td>98N-m (10kgf-m)</td>
<td>1.0MPa (10kgf/cm²)</td>
<td>External Pilot + Mechanical System</td>
</tr>
<tr>
<td>SBE</td>
<td>157N-m (16kgf-m)</td>
<td>1.6MPa (16kgf/cm²)</td>
<td>External Pilot + Mechanical System</td>
</tr>
<tr>
<td>SBF</td>
<td>157N-m (16kgf-m)</td>
<td>1.6MPa (16kgf/cm²)</td>
<td>External Pilot</td>
</tr>
</tbody>
</table>

Note: 1. Other specifications are same as Standard S Series motor.
2. Fire resistant fluid need special specification motor. Please contact with our company.
3. This Brake can be used as a Parking Brake only. In case of dynamic brake application, please contact Eaton.
**Model code procedure**

```
SB  A  0  5  A  D  2  0  0  0  X  D
```

1. **Series**
   - SB = S Series motor with mechanical brake

2. **Brake specifications**
   - A = External pilot, 98N-m
   - D = External pilot + Mechanical release system, 98N-m
   - E = External pilot + Mechanical release system, 158N-m
   - F = External Pilot, 158N-m

3. **Displacement (cm³/rev)**
   - 05 = 58
   - 07 = 76
   - 10 = 93
   - 12 = 120
   - 14 = 144
   - 16 = 165
   - 19 = 186
   - 22 = 224
   - 30 = 299
   - 38 = 371

4. **Port**
   - A = G1/2 O-Ring ports
   - B = Manifold mount
   - C = 1/2NPTF Ports
   - D = Rc1/2 Ports

5. **Shaft**
   - B = Ø1" SAE 6B Splined shaft
   - C = Ø1" Straight with Woodruff key
   - D = Ø25 Straight with Parallel key, 8mm

6. **Flange mounting**
   - 2 = 2 Bolt
   - 4 = 4 Bolt

7. **Special features (none of standard motor)**
   - B = Special seal for Phosphate ester fluid
   - M = Metric mounting holes

8. **Drain port**
   - × = Standard, with Drain port

9. **Design code**
   - D = Model D

**How to release the brake mechanically**

The SBD and SBE Series are provided with a mechanical type brake releasing mechanism.

- Remove the (2) gaskets and alternately tighten two brake releasing plugs. The brake will be released mechanically.
- To restore braking, insert the gaskets and tighten the brake releasing plugs at a torque of 25.5~31.4N-m (At this time, clean the surface of sealing).
S Series Motor with Mechanical Brake

Dimension and mounting data

- Rotation: Viewed from shaft end
- CW: Port A pressurized
- CCW: Port B pressurized
- Need to select the port code B with metric 4-M8 thread
- A chang coupler of Rc3/8 is available (AH0039A)

<table>
<thead>
<tr>
<th>Model</th>
<th>X: Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>SB□05</td>
<td>177.0</td>
</tr>
<tr>
<td>SB□07</td>
<td>179.3</td>
</tr>
<tr>
<td>SB□10</td>
<td>181.5</td>
</tr>
<tr>
<td>SB□12</td>
<td>184.9</td>
</tr>
<tr>
<td>SB□14</td>
<td>188.1</td>
</tr>
<tr>
<td>SB□16</td>
<td>190.7</td>
</tr>
<tr>
<td>SB□19</td>
<td>193.4</td>
</tr>
<tr>
<td>SB□22</td>
<td>198.3</td>
</tr>
<tr>
<td>SB□30</td>
<td>208.0</td>
</tr>
<tr>
<td>SB□38</td>
<td>217.3</td>
</tr>
</tbody>
</table>

- Drain: G1/4 O-Ring boss drain plug (JIS B2351)
  - When necessary, remove the drain plug and connect the drain line

---

[Diagram illustrating motor and brake specifications with data tables and dimensions provided.]
2000 Series Motor with Mechanical Brake (Brake Torque 98-196N-m)

Features

This Series has a pressure-release mechanical brake built in the motor. Secure control of start and stop is possible because the brake is applied when pilot pressure is not supplied. Applications: Fishing Machines, Various Winches, Industrial Vehicles, Various Industrial Machines.

Specifications

<table>
<thead>
<tr>
<th>Model Code</th>
<th>Brake Torque</th>
<th>Brake Release Pressure</th>
<th>Brake Release System</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-□□□K□□□-E</td>
<td>98N-m (10kgf-m)</td>
<td>0.98MPa (10kgf/cm²)</td>
<td>External Pilot</td>
</tr>
<tr>
<td>2-□□□M□□□-E</td>
<td>196N-m (20kgf-m)</td>
<td>1.96MPa (20kgf/cm²)</td>
<td>External Pilot</td>
</tr>
<tr>
<td>2-□□□L□□□-E</td>
<td>98N-m (10kgf-m)</td>
<td>0.98MPa (10kgf/cm²)</td>
<td>Internal Pilot</td>
</tr>
<tr>
<td>2-□□□N□□□-E</td>
<td>196N-m (20kgf-m)</td>
<td>1.96MPa (20kgf/cm²)</td>
<td>Internal Pilot</td>
</tr>
</tbody>
</table>

Note: 1. Other specifications are same as Standard 2000 Series motor.
2. This Brake can be used as a Parking Brake only. In case of dynamic brake application, please contact Eaton.

Model code procedure

1 2 3 4 5 6 7

1 Series
2 Displacement (cm³/rev)
3 Brake Torque
4 Shaft
5 Flange mounting
6 Port connections
7 Design code

A = Ø32 Straight with 10x8x31.5 Key
B = Ø1-1/4" Splined
D = Ø1-1/4" Straight with 5/16" Square key

E = Model E
2000 Series Motor with Mechanical Brake
(Brake Torque 98-196N-m)

Dimension and mounting data

External pilot pressure

Ø32 Straight shaft

Ø1-1/4” Involute splined shaft

Ø1-1/4” Straight shaft

Ø1” Straight shaft

4 Bolt flange

2 Bolt flange

Model | X | Y
--- | --- | ---
2-080 | 229 | 186
2-100 | 232 | 189
2-125 | 237 | 194
2-160 | 243 | 200
2-200 | 250 | 207
2-250 | 259 | 216
2-290 | 267 | 224
2-315 | 271 | 228
2-390 | 286 | 243

1-1/4” SAE Involute Spline (External)

D.P. 12/24
Number of teeth 14
Pitch Dia. 29.634
Base Dia. 25.664
Pressure angle 30°
Type of fit Side fit
Class of fit II
Major Dia. 31.22/31.10
Minor Dia. 26.99/26.66
Form Dia. Max. 27.488
Fillet radius Max. 0.39
Dimension over two pins 35.797/35.750
Pin Dia. 4.064

Rotation: Viewed from shaft end
- CW: Port A pressurized
- CCW: Port B pressurized
2000 Series Motor with Mechanical Brake  
(Brake Torque 98-196N-m)

**Dimension and mounting data**

**Internal pilot pressure**

Ø32 Straight shaft

Ø1-1/4" Involute splined shaft

Ø1-1/4" Straight shaft

Ø1" Straight shaft

4 Bolt flange

2 Bolt flange

<table>
<thead>
<tr>
<th>Model</th>
<th>X</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-080</td>
<td>229</td>
<td>198</td>
</tr>
<tr>
<td>2-100</td>
<td>232</td>
<td>201</td>
</tr>
<tr>
<td>2-125</td>
<td>237</td>
<td>206</td>
</tr>
<tr>
<td>2-160</td>
<td>243</td>
<td>212</td>
</tr>
<tr>
<td>2-200</td>
<td>250</td>
<td>219</td>
</tr>
<tr>
<td>2-250</td>
<td>259</td>
<td>228</td>
</tr>
<tr>
<td>2-290</td>
<td>267</td>
<td>236</td>
</tr>
<tr>
<td>2-315</td>
<td>271</td>
<td>240</td>
</tr>
<tr>
<td>2-390</td>
<td>286</td>
<td>255</td>
</tr>
</tbody>
</table>

1-1/4" SAE Involute Spline (External)

<table>
<thead>
<tr>
<th>D.P.</th>
<th>Number of teeth</th>
<th>Pitch Dia.</th>
<th>Base Dia.</th>
<th>Pressure angle</th>
<th>Type of fit</th>
<th>Class of fit</th>
<th>Major Dia.</th>
<th>Minor Dia.</th>
<th>Form Dia.</th>
<th>Pressure angle</th>
<th>Type of fit</th>
<th>Class of fit</th>
<th>Major Dia.</th>
<th>Minor Dia.</th>
<th>Form Dia.</th>
<th>Pressure angle</th>
<th>Type of fit</th>
<th>Class of fit</th>
</tr>
</thead>
<tbody>
<tr>
<td>12/24</td>
<td>14</td>
<td>29.634</td>
<td>25.664</td>
<td>30°</td>
<td>Side fit</td>
<td>110</td>
<td>31.22/31.10</td>
<td>26.99/26.66</td>
<td>Max. 27.488</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Rotation: Viewed from shaft end
- CW: Port A pressurized
- CCW: Port B pressurized

Pin Dia. 4.064
# Specifications

<table>
<thead>
<tr>
<th>Model Code</th>
<th>Brake Torque</th>
<th>Brake Release Pressure</th>
<th>Brake Release System</th>
</tr>
</thead>
<tbody>
<tr>
<td>2BE □ □ □ □ □ □ □ □</td>
<td>294N-m (30kgf-m)</td>
<td>2.0MPa (20kgf/cm²)</td>
<td>External Pilot</td>
</tr>
<tr>
<td>2BF □ □ □ □ □ □ □ □</td>
<td>392N-m (40kgf-m)</td>
<td>2.5MPa (26kgf/cm²)</td>
<td>External Pilot</td>
</tr>
</tbody>
</table>

Note: 1. This Brake can be used as a Parking Brake only. In case of dynamic brake application, please contact Eaton.

## Model code procedure

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2B</td>
<td>E = 294N-m, External pilot</td>
<td>08 = 78</td>
<td>A = Standard</td>
<td>A = Ø32 Straight with 10x8x31.5 Key</td>
<td>4 = 4 Bolt (PC.D. 127)</td>
<td>None = G1/2 O-Ring ports</td>
<td>B = Model B</td>
</tr>
<tr>
<td></td>
<td>F = 392N-m, External pilot</td>
<td>10 = 97</td>
<td></td>
<td>B = Ø1-1/4&quot; Spline</td>
<td></td>
<td>C = Rc1/2 Side ports</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>12 = 123</td>
<td></td>
<td>C = Ø1-1/4&quot; Tapered</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>16 = 158</td>
<td></td>
<td>D = Ø1-1/4&quot; Straight with 5/16&quot; Square key</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>20 = 195</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>25 = 244</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>29 = 288</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>31 = 306</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>39 = 393</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2000 Series Motor with Mechanical Brake
(Brake Torque 294-392N-m)

Dimension and mounting data

External pilot pressure

Ø1-1/4" Involute splined shaft

- Model: X Y
  - 2BF08: 208 165
  - 2BF10: 211 168
  - 2BF12: 216 173
  - 2BF16: 223 180
  - 2BF20: 229 186
  - 2BF25: 238 195
  - 2BF29: 246 203
  - 2BF31: 250 207
  - 2BF39: 266 223

1-1/4" SAE Involute Spline (External)

- D.P: 12/24
- Number of teeth: 14
- Pitch Dia.: 29.634
- Base Dia.: 25.664
- Pressure angle: 30°
- Type of fit: Side fit
- Class of fit: II
- Major Dia.: 31.22/31.10
- Minor Dia.: 26.99/26.66
- Form Dia.: Max. 27.488
- Fillet radius: Max. 0.39
- Dimension over two pins: 35.797/35.750
- Pin Dia.: 4.064

Rotation: Viewed from shaft end
- CW: Port A pressurized
- CCW: Port B pressurized

Ø1-1/4" Tapered shaft (SAE) Taper: 1.5/12

- Model: X Y
  - 2BF08: 208 165
  - 2BF10: 211 168
  - 2BF12: 216 173
  - 2BF16: 223 180
  - 2BF20: 229 186
  - 2BF25: 238 195
  - 2BF29: 246 203
  - 2BF31: 250 207
  - 2BF39: 266 223

Ø32 Straight shaft

- Model: X Y
  - 2BF08: 208 165
  - 2BF10: 211 168
  - 2BF12: 216 173
  - 2BF16: 223 180
  - 2BF20: 229 186
  - 2BF25: 238 195
  - 2BF29: 246 203
  - 2BF31: 250 207
  - 2BF39: 266 223

Ø1-1/4" Straight shaft
Orbit Motor, Optional Products

**S Series motor with Pin brake**
- The brake is of a simplified parking brake type, especially developed for use on track-mounted slewing cranes. Compared with conventional disk brake, the pin brake is much simple in construction and available with a low price.
- Applications: Construction Machine, Material Handling

**S Series motor with rotation detecting shaft**
- Because of their rotation detecting shaft, this series of Orbit Motors are suited to usage in combination with such as tachometers and encoders. We recommend them for use in injection molding machines needing rpm detection and in robot machines needing rpm-based control.
- Applications: Plastic Injection Machine, Industrial Machine and Mobile

**2000 Series motor with rotation detecting shaft**
- By the rotation detecting shaft, these motors are especially adapted to combination with tachometers, encoders and the like. In particular, Injection molding machines needing rpm detection will find the most convenient detecting in these motors.
- Applications: Plastic Injection Machine, Industrial Machine and Mobile

**Orbit motor with GJ type planetary-gear reducer**
- The motors of this series are combinations of H, S, 2000 Series Motor and planetary-gear reducer. The reducer shaft, not frame, is the driving member.
- Applications: Industrial Machines, Fishing Machines

**Orbit motor with GW type planetary-gear reducer**
- The motors of this series are intended for use driving travelling mechanism and winches, each being a combination of 2000 Series Motor and planetary-gear reducer. The reducer frame is the driving member.
- Applications: Construction Machines, Agricultural and Forestry Machines, Fishing Machines
### Direct Mount Valves

<table>
<thead>
<tr>
<th>Valve Type</th>
<th>Model</th>
<th>Rated Flow</th>
<th>Max. Working Pressure</th>
<th>Adjustable Pressure Range</th>
<th>Host Orbit Motor Series</th>
<th>Valve Circuit Diagram</th>
</tr>
</thead>
<tbody>
<tr>
<td>Counter Balance Valve</td>
<td>VSA1A</td>
<td>30</td>
<td>17.2 (175)</td>
<td>—</td>
<td>H/S</td>
<td><img src="image1" alt="Counter Balance Valve Circuit" /></td>
</tr>
<tr>
<td></td>
<td>VSC1A</td>
<td>30</td>
<td>17.2 (175)</td>
<td>—</td>
<td>H/S</td>
<td><img src="image2" alt="Counter Balance Valve Circuit" /></td>
</tr>
<tr>
<td></td>
<td>V2CA1A</td>
<td>15</td>
<td>20.6 (210)</td>
<td>—</td>
<td>2000</td>
<td><img src="image3" alt="Counter Balance Valve Circuit" /></td>
</tr>
<tr>
<td></td>
<td>V2BA1B</td>
<td>30</td>
<td>20.6 (210)</td>
<td>—</td>
<td>2000</td>
<td><img src="image4" alt="Counter Balance Valve Circuit" /></td>
</tr>
<tr>
<td></td>
<td>V2MA1B</td>
<td>60</td>
<td>20.6 (210)</td>
<td>—</td>
<td>2000</td>
<td><img src="image5" alt="Counter Balance Valve Circuit" /></td>
</tr>
<tr>
<td>Counter Balance Valve with Shuttle Valve</td>
<td>VSCAA4A+AC0578A</td>
<td>30</td>
<td>17.2 (175)</td>
<td>—</td>
<td>S</td>
<td><img src="image6" alt="Counter Balance Valve with Shuttle Valve Circuit" /></td>
</tr>
<tr>
<td></td>
<td>V2FA5D-P2LFDA</td>
<td>30</td>
<td>20.6 (210)</td>
<td>—</td>
<td>2000</td>
<td><img src="image7" alt="Counter Balance Valve with Shuttle Valve Circuit" /></td>
</tr>
<tr>
<td></td>
<td>V2PA6A-P2LFDA</td>
<td>60</td>
<td>20.6 (210)</td>
<td>—</td>
<td>2000</td>
<td><img src="image8" alt="Counter Balance Valve with Shuttle Valve Circuit" /></td>
</tr>
<tr>
<td>Brake Valve</td>
<td>V2A1C1A</td>
<td>30</td>
<td>20.6 (210)</td>
<td>6.9–20.6 (70–210)</td>
<td>2000</td>
<td><img src="image9" alt="Brake Valve Circuit" /></td>
</tr>
<tr>
<td></td>
<td>V2LA6B1A</td>
<td>60</td>
<td>20.6 (210)</td>
<td>6.9–20.6 (70–210)</td>
<td>2000</td>
<td><img src="image10" alt="Brake Valve Circuit" /></td>
</tr>
<tr>
<td>Brake Valve with Anti-Cavitation Check Valve</td>
<td>VSE3A1A</td>
<td>15</td>
<td>17.2 (175)</td>
<td>6.9–13.7 (70–140)</td>
<td>H/S</td>
<td><img src="image11" alt="Brake Valve with Anti-Cavitation Check Valve Circuit" /></td>
</tr>
<tr>
<td>Super Shockless Brake Valve</td>
<td>VNS1A1A</td>
<td>30</td>
<td>20.6 (210)</td>
<td>6.9–20.6 (70–210)</td>
<td>2000</td>
<td><img src="image12" alt="Super Shockless Brake Valve Circuit" /></td>
</tr>
<tr>
<td></td>
<td>V4S1A1A</td>
<td>30</td>
<td>20.6 (210)</td>
<td>6.9–20.6 (70–210)</td>
<td>2000</td>
<td><img src="image13" alt="Super Shockless Brake Valve Circuit" /></td>
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