Bent Axis Piston Motor
Variable Displacement

BAV7

Peak Pressure 480 bar (7000 psi)
Displacement 81-112-160 cm³/r (6.8-10 in³/r)
# General Overview BAV7

# Specifications and Performance Technical Data

# Model Code

## Control Options: Model Code 14, 15

- Working Pressure – PA
- Working Pressure – PB
- Hydraulic Two Position – HT
- Hydraulic Two Position with Pressure Override – HV
- Electric Two Position – ET
- Electric Two Position with Pressure Override – EV
- Hydraulic Proportional – HP
- Hydraulic Proportional with Pressure Override – HR
- Electric Proportional – EP
- Electric Proportional with Pressure Override – ER

## Dimensions – Mounting Flange

- ISO and SAE Mounting Flange 081
- ISO and SAE Mounting Flange 112
- ISO and SAE Mounting Flange 160

## Dimensions – Shafts

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- SAE Shaft Options

## Dimensions – Controls

- ISO Mounting 081
- SAE Mounting 081
- ISO Mounting 112
- SAE Mounting 112
- ISO Mounting 160
- SAE Mounting 160

## Optional Features

## Application Information

- Fluid and Filtration Guidelines
- Installation Guidelines
The new BAV7 series bent axis motors are designed for operation in both open and closed circuit. Incorporating the lens shaped proven design valve plate, high quality components and manufacturing techniques allow the BAV7 series motors to operate up at 430 bar (6235 psi) continuous and 480 bar (6960 psi) peak pressures. Fully laboratory tested and field proven, these motors provide maximum efficiency and long life even in the most demanding conditions. Heavy duty bearings permit high radial and axial loads. The versatile design includes a variety of control and mounting options that will adapt the BAV7 series motors to any industrial or mobile application.

A full range of options are available to tailor these units to your application needs. To optimize vehicle operating characteristics, an array of control options are available on variable displacement models; automatic, operator selectable, hydraulic pressure response and proportional, electric proportional, manual.

**Typical Applications:**
- Earth moving machines and construction equipment
- Agricultural and forestry vehicles
- Marine and off-shore equipment
- Industrial conveying, mixing & other stationary in-plant uses
Specifications and Performance
Technical Data

(Theoretical values, without considering $\eta_m, \eta_v$; approximate values). Peak operations must not exceed 1% of every minute. A simultaneous maximum pressure and maximum speed not recommended.

<table>
<thead>
<tr>
<th>Size (BAV7)</th>
<th>061*</th>
<th>081</th>
<th>112</th>
<th>161</th>
</tr>
</thead>
<tbody>
<tr>
<td>Displacement</td>
<td>V$_{max}$ cm$^3$/rev</td>
<td>61</td>
<td>80.6</td>
<td>112.5</td>
</tr>
<tr>
<td>(in$^3$/rev)</td>
<td>(3.72)</td>
<td>(4.91)</td>
<td>(6.86)</td>
<td>(9.81)</td>
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<tr>
<td>Standard</td>
<td>V$_{min}$ cm$^3$/rev</td>
<td>12.2</td>
<td>16</td>
<td>22</td>
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<tr>
<td>(in$^3$/rev)</td>
<td>(0.74)</td>
<td>(0.97)</td>
<td>(1.34)</td>
<td>(1.96)</td>
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<tr>
<td>Optional (5)</td>
<td>V$_{g0}$ cm$^3$/rev</td>
<td>0</td>
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<td></td>
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<tr>
<td>(in$^3$/rev)</td>
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<td></td>
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<td></td>
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<tr>
<td>Maximum Pressure</td>
<td>Continuous</td>
<td>P$_{nom}$ Bar</td>
<td>430</td>
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</tr>
<tr>
<td>(psi)</td>
<td>(6235)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peak</td>
<td>P$_{max}$ Bar</td>
<td>480</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(psi)</td>
<td>(6960)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum Flow</td>
<td>q$_{max}$ l/min</td>
<td>271</td>
<td>322</td>
<td>382</td>
</tr>
<tr>
<td>(US gpm)</td>
<td>(71.5)</td>
<td>(85)</td>
<td>(100.8)</td>
<td>(132)</td>
</tr>
<tr>
<td>Max speed at V$_{max}$ (2)</td>
<td>V$<em>{max}$ n$</em>{max}$ rpm</td>
<td>4450</td>
<td>4000</td>
<td>3400</td>
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<tr>
<td>V$<em>{min}$ n$</em>{max lim}$ rpm</td>
<td>7000</td>
<td>6150</td>
<td>5600</td>
<td>5000</td>
</tr>
<tr>
<td>V$<em>{g0}$ n$</em>{max}$ rpm</td>
<td>8350</td>
<td>7350</td>
<td>6300</td>
<td>5500</td>
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<tr>
<td>Specific Torque</td>
<td>T$_k$ Nm/bar</td>
<td>0.97</td>
<td>1.28</td>
<td>1.79</td>
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<tr>
<td>(lb-ft/psi)</td>
<td>(0.04)</td>
<td>(0.06)</td>
<td>(0.09)</td>
<td>(0.13)</td>
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<td>Max Power</td>
<td>P$_{max}$ kW</td>
<td>194</td>
<td>231</td>
<td>273</td>
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<tr>
<td>(hp)</td>
<td>(260)</td>
<td>(310)</td>
<td>(366)</td>
<td>(442)</td>
</tr>
<tr>
<td>Max Torque</td>
<td>Continuous T$_{nom}$ Nm</td>
<td>418</td>
<td>552</td>
<td>770</td>
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<tr>
<td>P$_{nom}$ (lb-ft)</td>
<td>(308)</td>
<td>(407)</td>
<td>(568)</td>
<td>(811)</td>
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<tr>
<td>Peak T$_{max}$ Nm</td>
<td>466</td>
<td>616</td>
<td>859</td>
<td>1230</td>
</tr>
<tr>
<td>P$_{max}$ (lb-ft)</td>
<td>(343)</td>
<td>(454)</td>
<td>(633)</td>
<td>(907)</td>
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<tr>
<td>Moment of Inertia</td>
<td>J kg-m$^2$</td>
<td>0.005</td>
<td>0.009</td>
<td>0.0124</td>
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<tr>
<td>(lb-ft$^2$)</td>
<td>(0.12)</td>
<td>(0.22)</td>
<td>(0.31)</td>
<td>(0.616)</td>
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<tr>
<td>Weight</td>
<td>m kg</td>
<td>28</td>
<td>36</td>
<td>47</td>
</tr>
<tr>
<td>(lbs)</td>
<td>(62)</td>
<td>(79)</td>
<td>(104)</td>
<td>(139)</td>
</tr>
<tr>
<td>Drain flow (4)</td>
<td>q$_d$ l/min</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>(US gpm)</td>
<td>(0.8)</td>
<td>(1.1)</td>
<td>(1.3)</td>
<td>(1.3)</td>
</tr>
</tbody>
</table>

* Under development

Notes
1 Maximum and minimum displacement can be changed in the field. When ordering, please state the V$_{max}$ and V$_{min}$ required.
2 Maximum speed can be increased by decreasing the displacement. Please use the chart below to determine maximum permissible speed.
3 Approximate values.
4 Maximum value at 250 bar (3625psi) with mineral oil at 45°C (113°F) and 35cSt viscosity.
5 Available with EX, EZ, HY, EP, HP controls with displacement setting 000. To use the motors in this condition, please contact Eaton.

Maximum Allowable Speed
The following 37 digit coding system has been developed to identify preferred feature options for the BAV7 Bent Axis Variable Displacement Axial-Piston Motor. Use this code to specify a motor with the desired features. All 37-digits of the code must be present to release a new product number for ordering.

### Model Code

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 |
| **B A V 7** | XXX | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | 0 | 0 | V | XXX | XXX | 0 | 0 | 0 | 0 | X | 1 | A |

#### Code Title
- BAV7 - Variable Displacement Bent Axis Piston Motor

#### Displacement
- 061 - 60 cm³/r (3.72 in³/r)*
- 081 - 80.58 cm³/r (4.91 in³/r)
- 112 - 112 cm³/r (6.86 in³/r)
- 160 - 160 cm³/r (9.76 in³/r)

#### Mounting Type
- C - SAE 4 bolt C (081 only)
- G - ISO 4 bolt gearbox	
- M - ISO 4 bolt
t
- S - SAE D 4 bolt (112 & 160)

#### Output Shaft Type
- A - SAE13 Tooth splined shaft 8/16 DP (112 & 160)
- B - SAE15 Tooth splined shaft 8/16 DP (160 only)
- C - SAE27 Tooth splined shaft 16/32 DP (112 & 160)
- D - 44.45 (1.75) Parallel keyed (112 & 160)
- E - 45 (1.77) Parallel keyed (160 only)
- F - W40x2x30x18 DIN5480
- G - W45x2x30x21 DIN5480 (112 & 160)
- H - W50x2x30x24 DIN5480 (160 only)
- K - 40 (1.57) Parallel Keyed (112 only)
- L - SAE 14 Tooth 12/24 DP (081 only)
- M - W35x2x30x16 DIN5480 (081 only)
- N - 35 (1.38) Parallel Keyed (081 only)

#### Ports
- 1 - Rear SAE Code 62 with M14 Threads
- 2 - Rear SAE Code 62 with .500 UNC Threads
- 3 - Side SAE Code 62 with M14 Threads
- 4 - Side SAE Code 62 with .500 UNC Threads

#### Control
- EP - Electric Proportional
- ER - Electric Proportional with Pressure Override
- ET - Electric Two position

#### Electrical Features
- 6 - Maximum Pilot Pressure Setting
- 17 - Working Pressure Setting
- 18 - Displacement Bias
- 19 - Control Orifice size

#### Displacement Bias
- 1 - Bias to Maximum (not available for PA & PB control option)
- 2 - Bias to Minimum (not available for ER, EV, HR & HV control option)

#### Control Orifice size
- 0.7 (0.027) (standard)
- A - 0.4 (0.015) (not available for ER & HR)

#### Maximum Displacement Setting
- 061 Model: 050 - 50 cm³/r (3.1 in³/r)
- 055 - 55 cm³/r (3.4 in³/r)
- 061 - 61 cm³/r (3.7 in³/r) (standard)
- 081 Model: 065 - 65 cm³/r (4.0 in³/r)
- 070 - 70 cm³/r (4.3 in³/r)
- 075 - 75 cm³/r (4.6 in³/r)
- 081 - 81 cm³/r (4.9 in³/r) (standard)

#### Flanged Valve
- 00 - None
- 2 - 24 VDC (EP, ER, ET, EV Controls only)

#### Seals
- V - Fluorocarbon (Viton® seals)

#### Minimum Displacement Setting
- 000 - 0 cm³/r [0 in³/r]

#### Model Numbers
- 001 - 15 cm³/r [0.9 in³/r]
- 005 - 150 cm³/r [9.2 in³/r]
- 012 - 12 cm³/r [0.7 in³/r]
- 015 - 15 cm³/r [0.9 in³/r]
- 020 - 20 cm³/r [1.2 in³/r]
- 025 - 25 cm³/r [1.5 in³/r]
- 030 - 30 cm³/r [1.8 in³/r]
- 032 - 32 cm³/r [1.9 in³/r]
- 035 - 35 cm³/r [2.1 in³/r]
- 040 - 40 cm³/r [2.4 in³/r] (standard for 081)
- 045 - 45 cm³/r [2.7 in³/r]
- 050 - 50 cm³/r [3.0 in³/r]

#### Model Numbers (112, 160 only)
- 055 - 55 cm³/r [3.3 in³/r] (standard for 112)
- 060 - 60 cm³/r [3.7 in³/r]
- 065 - 65 cm³/r [3.9 in³/r]
- 070 - 70 cm³/r [4.3 in³/r]
- 075 - 75 cm³/r [4.6 in³/r]
- 112 Model: 090 - 90 cm³/r [5.5 in³/r]
- 100 - 100 cm³/r [6.1 in³/r]
- 112 - 112 cm³/r [6.8 in³/r] (standard)
- 160 Model: 130 - 130 cm³/r [7.9 in³/r]
- 135 - 135 cm³/r [8.2 in³/r]
- 140 - 140 cm³/r [8.5 in³/r]
- 145 - 145 cm³/r [8.8 in³/r]
- 150 - 150 cm³/r [9.2 in³/r]
- 155 - 155 cm³/r [9.5 in³/r]
- 160 - 160 cm³/r [9.8 in³/r] (standard)

#### Special Features
- 00 - No Special Features
- 00 - No Motor Options
- 00 - No Paint
- 01 - Eaton Blue Primer
- 1 - Eaton

#### Design Code
- A - Design Code A

* Under development
# On request only
Control Options
Model Code Position 14,15

Working Pressure – PA

The working pressure control positions the motor displacement from $V_{g_{\text{min}}}$ to $V_{g_{\text{max}}}$ when the operating pressure rises beyond the preset operating pressure, so that the motor is at $V_{g_{\text{min}}}$ when min torque and max speed are required and at $V_{g_{\text{max}}}$ when max torque and min speed are required. The operating pressure applies a force on the spool which is matched by an adjustable spring. The motor keeps the minimum displacement $V_{g_{\text{min}}}$ until the operating pressure reaches the set value (pressure setting). Once the preset pressure rises beyond, the motor swivels from $V_{g_{\text{min}}}$ to $V_{g_{\text{max}}}$. The swivel range is from $V_{g_{\text{min}}}$ to $V_{g_{\text{max}}}$ displacement setting type 2 as per model code position 18). Start of control is adjustable between 100 and 400 bar (1450 and 5800 psi).

The relation between direction of rotation of shaft and direction of flow in the BAV7 motor is shown in the picture below.
Control Options
Model Code Position 14.15

**Working Pressure – PB**

The PB control allows a larger pressure range for displacement variation in comparison to PA control. The increase of pressure range for variation from \(V_{\text{gmin}}\) to \(V_{\text{gmax}}\) allows a smoother working of the motor during displacement variation. The PB allows the displacement variation with the pressure range shown in the table.

<table>
<thead>
<tr>
<th>(\Delta p) bar [psi]</th>
<th>(P_{\text{min}}) bar [psi]</th>
<th>(P_{\text{max}}) bar [psi]</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 [1450]</td>
<td>100 [1450]</td>
<td>350 [5075]</td>
</tr>
</tbody>
</table>

Where:
- \(\Delta p\) is the working pressure range that allows the displacement variation.
- \(P_{\text{min}}\) is the minimum pressure at which displacement variation starting can be set.
- \(P_{\text{max}}\) is the maximum pressure at which displacement variation starting can be set.

The relation between direction of rotation of shaft and direction of flow in BAV7 motor is shown in the picture below.

Warning: in case of displacement limitation, the control shall vary of a reduced \(\Delta p\) with respect to its standard one. Please contact Eaton for more information.
**Control Options**

Model Code Position 14,15

**Hydraulic Two Position – HT**

The hydraulic two positions control allows the displacement of the motor to be set to \( V_{g_{max}} \) or \( V_{g_{min}} \) by applying or not a pilot pressure at port \( X_2 \). The feedback spring is missing so \( V_{g_{max}} \) or \( V_{g_{min}} \) only can be set. Minimum required pilot pressure = 10 bar (145 psi) and maximum permissible pressure at port \( X_2 \)=100 bar (1450 psi). The swivel range is 1 or 2 (model code position 18).

The relation between direction of rotation of shaft and direction of flow in BAV7 motor is shown in the picture below.
Control Options
Model Code Position 14.15

**Hydraulic Two Position with Pressure Override – HV**

The HV control version with the pressure override allows the motor to swivel to Vg\text{max} when the pressure setting is reached. Same as ‘HT’ control, the motor displacement is adjusted to Vg\text{min} when the pilot pressure applied at port X2. If the operating pressure rises beyond the pressure setting, the pressure limiting device the motor swivels out to Vg\text{max}. Swivel range is from Vg\text{max} to Vg\text{min} (model code position 18).

The relation between direction of rotation of shaft and direction of flow in BAV7 motor is shown in the picture below.
Control Options
Model Code Position 14,15

Electric Two Position – ET

The electric two position control allows the displacement of the motor to be set to $V_{g_{\text{max}}}$ or $V_{g_{\text{min}}}$ by switching an ON/OFF solenoid valve. The feedback spring is missing so $V_{g_{\text{max}}}$ or $V_{g_{\text{min}}}$ only can be set. 12V DC and 24V DC ON/OFF solenoid are available. The swivel range is 1 (from $V_{g_{\text{max}}}$ to $V_{g_{\text{min}}}$) or 2 (swivel range from $V_{g_{\text{min}}}$ to $V_{g_{\text{max}}}$) (model code position 18).

The relation between direction of rotation of shaft and direction of flow in BAV7 motor is shown in the picture below.
Control Options
Model Code Position 14,15

**Electric Two Position with Pressure Overrides – EV**

The EV control versions with the pressure override allows the motor to swivel to Vg<sub>max</sub> when the pressure setting is reached. Same as ‘ET’ control, when solenoid valve is switched off the motor is at Vg<sub>max</sub>. The motor displacement is adjusted to Vg<sub>min</sub> when the solenoid valve is switched on and if the operating pressure rises beyond the pressure setting, the pressure limiting device overrides the electric two positions control and the motor swivels out to Vg<sub>max</sub>. Swivel range is from Vg<sub>max</sub> to Vg<sub>min</sub> (displacement setting 1, model code position 18). Select voltage of solenoid in model code position 13.
Hydraulic Proportional – HP

The hydraulic proportional control allows a stepless adjustment of the motor displacement proportionally to the pilot pressure applied at port X2. The pilot pressure applies a force on the spool and the motor swivels until a force balance on the arm is stored by feedback spring. Therefore the motor displacement is adjusted in direct proportion with the pilot pressure. Usually the swivel range is from $V_{g_{\text{max}}}$ to $V_{g_{\text{min}}}$, displacement setting 1 (model code position 18) so that increasing the pilot pressure the motor swivels towards $V_{g_{\text{min}}}$, however, displacement setting type 2 (swivel range from $V_{g_{\text{min}}}$ to $V_{g_{\text{max}}}$) is also available. Setting pressure range from 5 bar [72.5 psi] to 20 bar [290 psi] around. Pilot pressure range 25 bar [362.5 psi]. Max permissible pilot pressure at port X2 = 100 bar [1450 psi].

The relation between direction of rotation of shaft and direction of flow in BAV7 motor is shown in the picture below.
Control Options
Model Code Position 14,15

Hydraulic Proportional with Pressure Override – HR

The HR control version with the pressure override allows the motor to swivel to \( V_{g_{\text{max}}} \) when the pressure setting is reached. Same as "HP" control, the motor displacement is adjusted to \( V_{g_{\text{min}}} \) when the pilot pressure applied at port X2.

If the operating pressure rises beyond the pressure setting, the pressure limiting device the motor swivels out to \( V_{g_{\text{max}}} \). Swivel range is from \( V_{g_{\text{max}}} \) to \( V_{g_{\text{min}}} \), displacement setting 1 (model code position 18).

The relation between direction of rotation of shaft and direction of flow in BAV7 motor is shown in the picture below.
The electrical proportional control allows stepless and programmable adjustment of the motor displacement proportionally to the current strength supplied to a proportional solenoid valve available in 12V DC and 24V DC version. The proportional solenoid valve applies a force on the spool proportional to the current strength and the motor swivels until a force balance is restored by a feed-back spring. To control the proportional solenoid valve a 24V DC (12V DC) supply is required. Current range between 200 (400) and 600 (1200) mA approx. (with standard setting of Max and Min displacement). Max permissible current = 800 (1600) mA. Usually the swivel range is from \( V_{g_{\text{max}}} \) to \( V_{g_{\text{min}}} \) (displacement setting type 1 as per model code position 18) so that increasing the current strength the motor swivels towards \( V_{g_{\text{min}}} \), however displacement setting type 2 (swivels range from \( V_{g_{\text{min}}} \) to \( V_{g_{\text{max}}} \)) is also available. The electronic devices are available to control the solenoid (they must be ordered separately).

The relation between direction of rotation of shaft and direction of flow in BAV7 motor is shown in the picture below.
Control Options
Model Code Position 14.15

Electric Proportional with Pressure Override – ER

The ER control version with the pressure override allows the motor to swivel to $V_{g_{\text{max}}}$ when the pressure setting is reached. Same as ‘EP’ control, when solenoid valve is switched off the motor is at $V_{g_{\text{max}}}$. The motor displacement is adjusted to $V_{g_{\text{min}}}$ when the solenoid valve is switched on and if the operating pressure rises beyond the pressure setting, the pressure limiting device overrides the electric two positions control and the motor swivels out to $V_{g_{\text{max}}}$. Swivel range is from $V_{g_{\text{max}}}$ to $V_{g_{\text{min}}}$, displacement setting 1 (model code position 18).

The relation between direction of rotation of shaft and direction of flow in BAV7 motor is shown in the picture below.
**Dimensions – Mounting Flange**

ISO and SAE Mounting Flange – BAV7 081

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### ISO Mounting Flange

**4 Bolt**

![Diagram of ISO Mounting Flange](image)

- Dimensions - Mounting Flange
- ISO and SAE Mounting Flange – BAV7 081

### SAE Mounting Flange

**4 Bolt**

![Diagram of SAE Mounting Flange](image)

- Dimensions - Mounting Flange
- ISO and SAE Mounting Flange – BAV7 081

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**BAV7 081 Motor**

**Mounting Flange ISO 4 Bolts (M)**

- A-B: Service line ports - 1" SAE 6000
- C: Air bleed bearings flushing port - 1/4 G (BSPP)
- S1-S2: Case drain port - 1/2 G (BSPP)
- Y1: Working pressure piloting port - 1/8 G (BSPP)

**BAV7 081 Motor**

**Mounting Flange SAE-C 4 Bolts (C)**

- A-B: Service line ports - 1" SAE 6000
- C: Air bleed bearings flushing port - 7/16"-20 UNF
- S1-S2: Case drain port - 1/16-12 UN 2B
- Y1: Working pressure piloting port - 7/16"-20 UNF-2B
### ISO Mounting Flange

ISO and SAE Mounting Flange – BAV7 112

**BAV 712 Motor**

**Mounting Flange ISO 4 Bolts (M)**

- A-B: Service line ports - 1” SAE 6000
- C: Air bleed bearings flushing port - 1/4 G (BSPP)
- S1-S2: Case drain port - 1/2 G (BSPP)
- Y1: Working pressure piloting port - 1/8 G (BSPP)

**BAV 712 Motor**

**Mounting Flange SAE-D 4 Bolts (S)**

- A-B: Service line ports - 1” SAE 6000
- C: Air bleed bearings flushing port - 7/16-20 UNF
- S1-S2: Case drain port - 1"1/16-12 UN 2B
- Y1: Working pressure piloting port - 7/16-20 UNF-2B
ISO Mounting Flange

ISO Mounting Flange

SAE Mounting Flange

SAE Mounting Flange

BAV7 160 Motor
Mounting Flange ISO 4 Bolts (M)
A-B: Service line ports - 1" 1/4 SAE 6000
C: Air bleed bearings flushing port - 1/2 G (BSPP)
S1-S2: Case drain port - 3/4 G (BSPP)
Y1: Working pressure piloting port - 1/8 G (BSPP)

BAV7 160 Motor
Mounting Flange SAE-D 4 Bolts (S)
A-B: Service line ports – 1” 1/4 SAE 6000
C: Air bleed bearings flushing port – 3/4-16 UNF-2B
S1-S2: Case drain port – 1”1/16-12 UN 2B
Y1: Working pressure piloting port – 7/16”-20 UNF-2B
Dimensions – Shafts

ISO Shaft Options

**E**
Parallel Keyed (160 only)
Ø45 mm [1.772 in]

![Diagram E]

**G**
Splined
W45x2x30x21 - DIN 5480

![Diagram G]

**H**
Splined (160 only)
W50x2x30x24 - DIN 5480

![Diagram H]

**K**
Parallel Keyed (112 only)
Ø40 mm [1.56 in]

![Diagram K]

**M**
Splined
W35x2x30x16 - DIN 5480 (081 Only)

![Diagram M]

**N**
Parallel Keyed
Ø35 mm [1.377 in] (081 Only)

![Diagram N]
Dimensions – Shafts

SAE Shaft Options

D
Parallel Keyed
Ø44.45 mm [1.75 in]

A
Splined
13T 8/16 DP

C
Splined
27T 16/32 DP

B
Splined
15T 8/16 DP

L
Splined
14T 12/24 DP

Dimensions:

- **A**: Splined, 13T 8/16 DP
  - Ø13 [0.511] x 1/2" - 20 UNF
  - 0.44x0.36x2.36 Key
  - 36 (1.42)
  - 13 (0.511)

- **B**: Splined, 15T 8/16 DP
  - Ø13 [0.511] x 1/2" - 20 UNF
  - 67.5 (2.66)
  - 8 (0.314)

- **C**: Splined, 27T 16/32 DP
  - Ø13 [0.511] x 1/2" - 20 UNF
  - 79.6 (3.13)
  - 37.5 (1.46)

- **D**: Parallel Keyed, Ø44.45 mm [1.75 in]
  - Ø44.45 [1.75]
  - 0.44x0.36x2.36 Key
  - 49.1 (1.94)
  - 7.9 (0.311)

- **L**: Splined, 14T 12/24 DP
  - Ø30.8 [1.21] x 3/8" - 16 UNC 2B
  - 32 (1.26)
  - 79.6 (3.13)
Dimensions – Controls

ISO Mounting – BAV7 081

Ev Control

ET Control

Hv Control

Heat Control

X2: 2 position hydraulic piloting port - 1/4 G (BSPP)

X2: 2 position hydraulic piloting port - 1/4 G (BSPP)

Displacement shift from Maximum to Minimum (1)
Dimensions – Controls

ISO Mounting – BAV7 081

ET Control

HT Control

PA Control

X2: 2 position hydraulic piloting port - 1/4 G (BSPP)

Control starting pressure adjustment

Displacement shift from Minimum to Maximum (2)
Dimensions – Controls

SAE Mounting – BAV7 081

X2: 2 position hydraulic piloting port - 7/16”-20 UNF

Displacement shift from Maximum to Minimum (1)
Dimensions – Controls

SAE Mounting – BAV7 081

ET Control

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Unit 1</th>
<th>Unit 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>X2</td>
<td>2 position hydraulic piloting port</td>
<td>7/16'-20 UNF</td>
</tr>
</tbody>
</table>

HT Control

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Unit 1</th>
<th>Unit 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>X2</td>
<td>2 position hydraulic piloting port</td>
<td>7/16'-20 UNF</td>
</tr>
</tbody>
</table>

PA Control

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Unit 1</th>
<th>Unit 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control starting pressure adjustment</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Displacement shift from Minimum to Maximum (2)
Dimensions – Controls
ISO Mounting – BAV7 112

EV Control

X2: 2 position hydraulic piloting port - 1/4 G (BSPP)

Control starting pressure adjustment

ET Control

X2: 2 position hydraulic piloting port - 1/4 G (BSPP)

HT Control

Control starting pressure adjustment

EP Control

ER Control

Control starting pressure adjustment

344 (13.54) 131.8 (5.19) 59.5 (2.34)

344 (13.54) 43.8 (1.72) 59.5 (2.34)

Displacement shift from Maximum to Minimum (1)
Dimensions – Controls

ISO Mounting – BAV7 112

HR Control

HP Control

X2: Proportional hydraulic piloting port - 1/4 G (BSPP)

Displacement shift from Maximum to Minimum (1)
Dimensions – Controls

ISO Mounting – BAV7 112

PA Control

X2: 2 position hydraulic piloting port - 1/4 G (BSPP)

HT Control

EP Control

X2: Proportional hydraulic piloting port - 1/4 G (BSPP)

PB Control

ET Control

X2: Proportional hydraulic piloting port - 1/4 G (BSPP)

Displacement shift from Minimum to Maximum (2)
Dimensions – Controls

SAE Mounting – BAV7 112

**EV Control**

- Control starting pressure adjustment
- X2: 2 position hydraulic piloting port - 7/16"-20 UNF

**ET Control**

- Control starting pressure adjustment

**HV Control**

- Control starting pressure adjustment
- X2: 2 position hydraulic piloting port - 7/16"-20 UNF

**HT Control**

- X2: 2 position hydraulic piloting port - 7/16"-20 UNF

**ER Control**

- Control starting pressure adjustment

**EP Control**

- Control starting pressure adjustment

Displacement shift from Maximum to Minimum (1)
Dimensions – Controls

SAE Mounting – BAV7 112

Displacement shift from Maximum to Minimum (1)

HR Control

Control starting pressure adjustment

X2: Proportional hydraulic piloting port - 7/16”-20 UNF

HP Control

X2: Proportional hydraulic piloting port - 7/16”-20 UNF
Dimensions – Controls

SAE Mounting – BAV7 112

PA Control

Control starting pressure adjustment

X2: 2 position hydraulic piloting port - 7/16"-20 UNF

PB Control

X2: Proportional hydraulic piloting port - 7/16"-20 UNF

HV Control

X2: 2 position hydraulic piloting port - 7/16"-20 UNF

ET Control

X2: Proportional hydraulic piloting port - 7/16"-20 UNF

HP Control

X2: Proportional hydraulic piloting port - 7/16"-20 UNF

PB Control

X2: Proportional hydraulic piloting port - 7/16"-20 UNF

X2: Proportional hydraulic piloting port - 7/16"-20 UNF

EP Control

X2: Proportional hydraulic piloting port - 7/16"-20 UNF

Displacement shift from Minimum to Maximum (2)
Dimensions – Controls
ISO Mounting – BAV7 160

Displacement shift from Maximum to Minimum (1)

X2: 2 position hydraulic piloting port - 1/4 G (BSPP)

X2: 2 position hydraulic piloting port - 1/4 G (BSPP)
Dimensions – Controls

ISO Mounting – BAV7 160

Displacement shift from Maximum to Minimum (1)

X2: Proportional hydraulic piloting port - 1/4 G (BSPP)

HR Control

Control starting pressure adjustment

133 (5.24) 66 (2.6)

HP Control

254.3 (13.95)

331.1 (13.04)

45 (1.77) 66 (2.6)

130.9 (5.15) 192.1 (7.56)

X2: Proportional hydraulic piloting port - 1/4 G (BSPP)
Dimensions – Controls

ISO Mounting – BAV7 160

Displacement shift from Minimum to Maximum (2)

PA Control

Control starting pressure adjustment

HT Control

X2: 2 position hydraulic piloting port - 1/4 G (BSPP)

ET Control

PB Control

X2: Proportional hydraulic piloting port - 1/4 G (BSPP)

HP Control

EP Control

X2: Proportional hydraulic piloting port - 1/4 G (BSPP)
Dimensions – Controls

SAE Mounting – BAV7 160

Displacement shift from Maximum to Minimum (1)

EV Control

Control starting pressure adjustment

<table>
<thead>
<tr>
<th>Control</th>
<th>Starting Pressure Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>136 (5.35)</td>
<td>137(5.39)</td>
</tr>
<tr>
<td>273 (10.75)</td>
<td></td>
</tr>
</tbody>
</table>

ET Control

Control starting pressure adjustment

<table>
<thead>
<tr>
<th>Control</th>
<th>Starting Pressure Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>136 (5.35)</td>
<td>137(5.39)</td>
</tr>
<tr>
<td>273 (10.75)</td>
<td></td>
</tr>
</tbody>
</table>

HV Control

Control starting pressure adjustment

<table>
<thead>
<tr>
<th>Control</th>
<th>Starting Pressure Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>136 (5.35)</td>
<td>137(5.39)</td>
</tr>
<tr>
<td>273 (10.75)</td>
<td></td>
</tr>
</tbody>
</table>

HT Control

Control starting pressure adjustment

<table>
<thead>
<tr>
<th>Control</th>
<th>Starting Pressure Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>136 (5.35)</td>
<td>137(5.39)</td>
</tr>
<tr>
<td>273 (10.75)</td>
<td></td>
</tr>
</tbody>
</table>

X2: 2 position hydraulic piloting port - 7/16”-20 UNF-2B

ER Control

Control starting pressure adjustment

<table>
<thead>
<tr>
<th>Control</th>
<th>Starting Pressure Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>136 (5.35)</td>
<td>137(5.39)</td>
</tr>
<tr>
<td>273 (10.75)</td>
<td></td>
</tr>
</tbody>
</table>

EP Control

Control starting pressure adjustment

<table>
<thead>
<tr>
<th>Control</th>
<th>Starting Pressure Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>136 (5.35)</td>
<td>137(5.39)</td>
</tr>
<tr>
<td>273 (10.75)</td>
<td></td>
</tr>
</tbody>
</table>

X2: 2 position hydraulic piloting port - 7/16”-20 UNF-2B
Dimensions – Controls

SAE Mounting – BAV7 160

Displacement shift from Maximum to Minimum (1)

HR Control

Control starting pressure adjustment

HP Control

X2: Proportional hydraulic piloting port - 7/16"-20 UNF-2B

X2: Proportional hydraulic piloting port - 7/16"-20 UNF-2B
Dimensions – Controls

SAE Mounting – BAV7 160

Displacement shift from Minimum to Maximum (2)

**PA Control**

Control starting pressure adjustment

136 (5.35)  62.2 (2.45)

**PB Control**

344.3 (13.55)

213.8 (8.42)

133.2 (5.24)

**HT Control**

X2: 2 position hydraulic piloting port

360.7 (14.2)

51.5 (2.03)

74 (2.91)

**ET Control**

137 (5.39)

51.5 (2.03)

360.7 (14.2)

**HP Control**

364.2 (14.34)

230.6 (9.06)

119.2 (4.69)

X2: Proportional hydraulic piloting port - 7/16"-20 UNF-2B

274.3 (10.8)

66 (2.6)

45 (1.77)

**EP Control**

364.2 (14.34)

300.5 (11.83)

119.7 (4.71)

66 (2.6)

45 (1.77)
Optional Features

Flushing Valve

For closed circuit operation, the motors can be equipped with built in flushing valve. Specify by selecting one of the optional 4 flow rates in model code position 23,24.

Flushing Valve

Only for BAV7 160 with two positions controls.
Optional Features

Flushing Valve
(only for BAV7 081)
1. Types of fluid
The table below shows the main categories of hydraulic fluid as referenced in ISO 6743-4. Under normal operating conditions, Eaton Hydraulics recommends mineral oil-based fluids with anticorrosive and anti-wear additives (HL or HM grade) for its bent-axis piston units. Flame resistant fluids (HF grade) and organic fluids (HE grade) may not be fully compatible with materials and may therefore reduce the maximum pressure and speed specification of Bent Axis piston units. Customers are advised to contact Eaton Hydraulics before using flame-resistant or organic fluids.

Mineral Oil-Based Fluids

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HH</td>
<td>Additive-free</td>
</tr>
<tr>
<td>HL</td>
<td>Anticorrosive, antioxidant</td>
</tr>
<tr>
<td>HM</td>
<td>HL and anti-wear additives</td>
</tr>
<tr>
<td>HV</td>
<td>HM additives and viscosity controls</td>
</tr>
</tbody>
</table>

2. Viscosity index
The optimum viscosity of the hydraulic fluid at normal system operating temperature (temperature of the tank for open circuits or temperature of the circuit for closed circuits) must fall between the minimum and maximum values shown below. The minimum viscosity shown is permitted in extreme conditions and for short intervals. This value refers to a maximum fluid temperature of 90°C (temperature at case drain). The maximum viscosity for short intervals and during cold starts is shown below. The temperature of the fluid should not exceed a maximum of +115°C or minimum of -25°C.

<table>
<thead>
<tr>
<th>Fluid Type</th>
<th>Minimum (cSt)</th>
<th>Maximum (cSt)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable</td>
<td>10</td>
<td>1000</td>
</tr>
<tr>
<td>Fixed</td>
<td>10</td>
<td>1000</td>
</tr>
</tbody>
</table>

3. Viscosity grades
Under the ISO standard, hydraulic fluids are divided into 6 grades of viscosity. In order to choose the correct type of fluid, it is essential to know the operating temperature of the fluid (temperature of the tank for open circuits or temperature of the circuit for closed circuits). At normal system operating temperature, the viscosity of the fluid must fall within the optimum viscosity range above.

4. Contamination Grades
Efficient filtering is essential for hydraulic systems to operate properly. A good quality fluid extends the working life of hydraulic parts and makes the system more reliable.

<table>
<thead>
<tr>
<th>Filtering Grade</th>
<th>Efficiency</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>50%</td>
<td>Average size of filter pores equal to smallest particles</td>
</tr>
<tr>
<td>20</td>
<td>95%</td>
<td>Normal retention</td>
</tr>
<tr>
<td>100</td>
<td>99%</td>
<td>Absolute retention</td>
</tr>
</tbody>
</table>

5. Filtering Grade
ISO 4572 states that the filtering grade ßx is the ratio between the number of particles of contaminant (per unit volume) of a size greater than or equal to x mm entering the filter and the number of particles of the same size leaving the filter. The grade ßx therefore gives a good indication of the quality of the filter.

Bent Axis Design Motors And Pumps: Flushing the Bearings
The operating temperature influences the operating life of the bearings to a significant degree. As a result it is essential to maintain oil temperature at the bearings at acceptable levels. These units are designed to allow flushing the shaft bearings by utilizing the optional flushing valve. Flushing is recommended where pumps/motors are installed vertically and where operating cycles display long periods at high pressure (> 250 bar).
Installation Guidelines

1. Filling the Case
The case of bent axis piston motors must be pre-filled with hydraulic oil before the system is started for the first time. Use the case drain connection at the highest point to ensure the case remains full at all times. See figure below.
Caution: Starting the motor with little or no oil in the case causes immediate and permanent damage to the piston unit.

2. Connections
To reduce noise levels, flexible hoses are recommended (Main system pressure lines as well as case drain lines). Case drain hoses should be as short as possible. Minimize pressure drops due to couplings, elbows and differences in diameter. Where non-flexible tubes are used, ensure that the pipes do not pull on the cover of the motor.
All hoses connected to tank (case drain lines) should be immersed at least 200 mm [8 in.] below the minimum oil level and at least 150 mm [6 in.] from the bottom of the tank.

Drive Shaft
Take special care to ensure that mechanical parts of the motor are coupled correctly. Ensure that the shaft and flange are lined up accurately to prevent additional loads on the shaft bearings. Flexible couplings should be used.
Caution: incorrectly aligned parts significantly reduce the service life of the bearings.
Application information
Installation Guidelines (Continued)

Installation Position
Motors may be installed both above and below the level of the fluid in the tank, (lowest level of the oil when the system is operating). When motors are used in open circuit applications, the oil level is affected by the number and size of any hydraulic cylinders used in the system. For mobile installations it is important to take into account the slope of the ground and the effect of centrifugal forces on the oil level.

Installation Above the Tank
Particular care should be taken when installing units above the tank. Special case drain hoses must always be used to prevent the case from being siphoned out. Always use the highest case drain port available and ensure that the line is designed such that the motor case remains full at all times.

Installation Below the Tank
Installation below the minimum level of the fluid (or immersed in fluid) does not create particular problems. Gearbox mount motors should not be installed vertically with the shaft turned upwards.

Flushing
If Bent Axis piston motors are to be installed with shaft turned upwards, or run at high oil temperature inside the tank (>50°C), or if units are used for a long operation time at high pressures (>250 bar), it is recommended to flush the motor with the optional flushing valve (model code position 23,24) and selecting the desired flow rate.

The oil level of the units should be checked at regular intervals. It is essential to check the level if the system is out of service for extended periods of time, since the force of gravity causes oil to drain from the case.

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If Bent Axis piston motors are to be installed with shaft turned upwards, or run at high oil temperature inside the tank (>50°C), or if units are used for a long operation time at high pressures (>250 bar), it is recommended to flush the motor with the optional flushing valve (model code position 23,24) and selecting the desired flow rate.

The oil level of the units should be checked at regular intervals. It is essential to check the level if the system is out of service for extended periods of time, since the force of gravity causes oil to drain from the case.
System Start-up
Before starting system for the first time, fill system components with new and filtered oil. In addition, clean the reservoir and fill with the same type of oil. We recommend flushing the circuit. Verify that charge pressure is correct (closed circuits). Check reservoir level and top-off if necessary.

Closed Circuit Cleaning Procedure
Hydrostatic transmission circuits must be cleaned without load for a period of one hour. Afterwards, remove system pressure hoses from port connections A and B on the motor and connect them together so as to short circuit the pump. Insert a filter in series (working pressure: 50 bar [750 psi]) on the connection A of the pump. Make sure the direction of rotation of the pump ensures the flow as shown by the arrows. If necessary insert a non-return valve. A 10 mm filter in series is recommended.

Maintenance
Replace filter after first 50 hours of operation, and then every 500 hours. Change oil after first 500 hours of operation. Subsequently change oil every 2,000 hours. Maintenance intervals should be reduced when the filter indicator shows that the filter is dirty or when the system is operated in an especially dusty environment.

Figure 5 - Closed circuit cleaning