BAF7 Bent Axis Piston Motor
Flange & Gearbox Mounting, Fixed Displacement

Peak Pressure 480 bar (6960 psi)
Displacement 055-063-075-090-108-125-160-180 cm³/r

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As the world’s demand for high-efficiency hydraulic systems for mobile and stationary applications increase, Eaton is helping to solve these challenges more reliably, efficiently, and sustainably. Our goal is simple; to provide unique solutions across a wide range of markets that keep businesses on the leading edge of change. Visit Eaton.com/hydraulics/fusion.

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Serving eight key segments - sharing one focus

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Produce at peak efficiency with the superior precision and repeatability of Eaton products. Eaton hydraulic components provide the precise control and consistent operation required for virtually every step in your manufacturing operation. With Eaton, we’ll help you redefine the meaning of raw productivity.

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As the oil & gas industry continues to face further globalization and consolidation, large-scale organizations that can meet your needs in every corner of the world are more difficult to find. At Eaton, our portfolio of products is only surpassed by our tremendous reach.

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Whatever your industry, no matter which processes you manage, Eaton parts and systems help keep you up and running. Our components make equipment more efficient and easier to use, so you get optimal machine performance and maximum productivity.

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Eaton technologies can make your driving operation more successful. Greater comfort and productivity help increase driver retention, while reduced emissions, leaks, and noise improve environmental performance. Increased efficiencies overall mean lower costs and higher net revenue.

Material Handling
Eaton hydraulic systems provide the precise control and consistent operation required for material handling and utility work. With a broad selection of products and solutions built in, Eaton helps make you a master of your domain.

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Understanding and helping our customers succeed
• Listening and understanding to requirements and business drivers
• Delivering solutions with value propositions to solve the critical business needs

Knowing what’s important to our customers and integrating that knowledge into the fabric of our business
• ...to deliver innovative, quality products
• ...to respond fast
• ...to provide dedicated customer service and support around the globe

Our strength is global reach with local responsiveness and support
• Customers served in more than 150 countries
• Diverse channels ensure reliable availability and support
• Design and engineering teams provide support for standard products and custom solutions
• Eaton experts offer efficient product and application training

Eaton provides reliable, efficient and safe power management for a growing number of industries.
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Bent Axis Motor – BAF7

**General Information - Features**

BAF7 series units are a family of fixed displacement motors, bent axis piston design for operation in both open and closed circuit. The proven design incorporating the lens shaped valve plate, the high quality components and manufacturing techniques allow the BAF7 series units able to provide up to 430 bar [6235 psi] continuous and 480 bar [6960 psi] peak performance. Fully laboratory tested and field proven, these units provide maximum efficiency and long life. Heavy duty bearings permit high radial and axial loads. Versatile design includes a variety of port plate, shaft end and valve packages that will fit the BAF7 series units to any application, both industrial and mobile. BAF7 series units are available in both ISO and SAE versions.

**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

Hydraulic Fluids
See page 34 for fluid related information.

Operating Pressure
The maximum permissible pressure on pressure ports is 430 bar [6235 psi] continuous and 480 bar [6960 psi] peak. If two motors are connected in series, total working pressure P1+P2 must be limited to 700 bar max. [10150 psi].

Case Drain Pressure
Maximum permissible case drain pressure is 10 bar [145 psi]. A higher pressure can damage the main shaft seal or reduce its life.

Output Shaft
The table below is a guide to determine maximum permissible loads. Values are calculated in such a way to assure at least 80% of the bearing operating life where no external load is applied. The published values are related to loads applied in the middle of shaft and in the least favourable direction.

<table>
<thead>
<tr>
<th>Displacement</th>
<th>055</th>
<th>063*</th>
<th>075</th>
<th>090</th>
<th>108</th>
<th>125</th>
<th>160</th>
<th>180*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Load</td>
<td>N/bar [lbf/psi]</td>
<td>25 [0.375]</td>
<td>30 [0.45]</td>
<td>25.7 [0.386]</td>
<td>28.5 [0.428]</td>
<td>35 [0.525]</td>
<td>37 [0.555]</td>
<td>41 [0.615]</td>
</tr>
<tr>
<td>Load</td>
<td>N [lbf]</td>
<td>&gt; 100 bar [217.5]</td>
<td>9 [0.135]</td>
<td>9 [0.135]</td>
<td>12 [0.18]</td>
<td>12 [0.18]</td>
<td>13 [0.195]</td>
<td>13 [0.195]</td>
</tr>
<tr>
<td>Load</td>
<td>N/bar [lbf/psi]</td>
<td>&gt; 100 bar [217.5]</td>
<td>9 [0.135]</td>
<td>9 [0.135]</td>
<td>12 [0.18]</td>
<td>12 [0.18]</td>
<td>13 [0.195]</td>
<td>13 [0.195]</td>
</tr>
</tbody>
</table>

* Under Development

(*)
Max permissible radial force with “30” Output Shaft code (BAF7 055-063):
Fq max = 6500 N [1462.5 lbf]
Max permissible radial force with “35” Output Shaft Code (BAF7 075-090):
Fq max = 6500 N [1462.5 lbf]
Max permissible radial force with “40” Output Shaft Code (BAF7 108-125):
Fq max = 6500 N [1462.5 lbf]
Max permissible radial force with “45” Output Shaft Code (BAF7 160-180):
Fq max = 6500 N [1462.5 lbf]
When an external side (radial) load is applied to the drive shaft, the bearing life will vary accordingly to the magnitude, location and direction of the load. The diagram shows how the bearing operating life varies versus the direction of the load. In the diagram 100% represents the bearing operating life where no external side load is applied to the drive shaft. The optimum direction is dependent on which port is pressurised.

The bearing operating life increases up to 30% when the load is applied in certain directions and the maximum increase is dependent on the operating pressure and the nominal size of the unit. When considering the permissible axial force, the force - transfer direction must be taken in account:
- Pushing axial loads increase the bearing life.
- Pulling axial loads reduce the bearing life (if possible pulling axial loads should be avoided).

Seals
Seals used on BAF7 series are of FKM (Fluoroelastomer). For applications with special fluids, contact Eaton.

Minimum rotating speed:
No limit to minimum speed; if uniformity of rotation is required, speed must not be less than 50 rpm. For lower speed operation, contact Eaton.

Installation
Mounting attitude for BAF7 units is unrestricted. These Bent Axis piston units have separate ports and drain chambers and so must always be drained.

Flange-mounted valves
Flange-mounted valves are available for motors both in open and closed loop.

Flushing valves
The motors can be equipped with flushing valves. To mount the flushing valve on motors, it is necessary to use a special port cover.

Relation between direction of rotation and direction of flow
The relation between direction of rotation of shaft and direction of flow in BAF7 piston units is shown in the diagram below.
### Technical Data

<table>
<thead>
<tr>
<th>Size</th>
<th>Vg cm³/rev</th>
<th>055</th>
<th>063*</th>
<th>075</th>
<th>090</th>
<th>108</th>
<th>125</th>
<th>160</th>
<th>180*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>[in³/rev]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cont.</td>
<td>p&lt;sub&gt;nom&lt;/sub&gt; bar</td>
<td>430</td>
<td>430</td>
<td>430</td>
<td>430</td>
<td>430</td>
<td>430</td>
<td>430</td>
<td>430</td>
</tr>
<tr>
<td></td>
<td>[psi]</td>
<td>[6235]</td>
<td>[6235]</td>
<td>[6235]</td>
<td>[6235]</td>
<td>[6235]</td>
<td>[6235]</td>
<td>[6235]</td>
<td>[6235]</td>
</tr>
<tr>
<td>Peak</td>
<td>p&lt;sub&gt;max&lt;/sub&gt; bar</td>
<td>480</td>
<td>480</td>
<td>480</td>
<td>480</td>
<td>480</td>
<td>480</td>
<td>480</td>
<td>480</td>
</tr>
<tr>
<td></td>
<td>[psi]</td>
<td>[6960]</td>
<td>[6960]</td>
<td>[6960]</td>
<td>[6960]</td>
<td>[6960]</td>
<td>[6960]</td>
<td>[6960]</td>
<td>[6960]</td>
</tr>
<tr>
<td>Max. speed Motor (cont.) n&lt;sub&gt;0 max&lt;/sub&gt; rpm</td>
<td>5000</td>
<td>5000</td>
<td>4500</td>
<td>4500</td>
<td>4000</td>
<td>4000</td>
<td>3600</td>
<td>3600</td>
<td></td>
</tr>
<tr>
<td>Max. flow Motor q&lt;sub&gt;max&lt;/sub&gt; L/min [U.S. gpm]</td>
<td>282</td>
<td>316</td>
<td>350</td>
<td>388</td>
<td>433</td>
<td>500</td>
<td>590</td>
<td>641</td>
<td></td>
</tr>
<tr>
<td></td>
<td>[74.45]</td>
<td>[83.42]</td>
<td>[92.4]</td>
<td>[102.5]</td>
<td>[114.31]</td>
<td>[132]</td>
<td>[155.76]</td>
<td>[169.22]</td>
<td></td>
</tr>
<tr>
<td>Max. power Motor P&lt;sub&gt;max&lt;/sub&gt; kW [hp]</td>
<td>202</td>
<td>226</td>
<td>251</td>
<td>278</td>
<td>310</td>
<td>358</td>
<td>423</td>
<td>459</td>
<td></td>
</tr>
<tr>
<td></td>
<td>[270.68]</td>
<td>[302.84]</td>
<td>[336.34]</td>
<td>[372]</td>
<td>[415.4]</td>
<td>[479.72]</td>
<td>[566.82]</td>
<td>[615.06]</td>
<td></td>
</tr>
<tr>
<td>Torque constant T&lt;sub&gt;k&lt;/sub&gt; Nm/bar [Ibf·ft/psi]</td>
<td>0.9</td>
<td>1</td>
<td>1.2</td>
<td>1.4</td>
<td>1.7</td>
<td>2</td>
<td>2.6</td>
<td>2.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>[0.045]</td>
<td>[0.05]</td>
<td>[0.06]</td>
<td>[0.07]</td>
<td>[0.085]</td>
<td>[0.1]</td>
<td>[0.13]</td>
<td>[0.14]</td>
<td></td>
</tr>
<tr>
<td>Max. torque cont. (p&lt;sub&gt;nom&lt;/sub&gt;) T&lt;sub&gt;nom&lt;/sub&gt; Nm [Ibf·ft]</td>
<td>386</td>
<td>433</td>
<td>533</td>
<td>590</td>
<td>742</td>
<td>855</td>
<td>1122</td>
<td>1219</td>
<td></td>
</tr>
<tr>
<td></td>
<td>[284.48]</td>
<td>[319.12]</td>
<td>[392.82]</td>
<td>[435.13]</td>
<td>[546.85]</td>
<td>[630.13]</td>
<td>[826.91]</td>
<td>[989.40]</td>
<td></td>
</tr>
<tr>
<td>Peak (p&lt;sub&gt;max&lt;/sub&gt;) T&lt;sub&gt;max&lt;/sub&gt; Nm [Ibf·ft]</td>
<td>431</td>
<td>484</td>
<td>595</td>
<td>659</td>
<td>829</td>
<td>954</td>
<td>1253</td>
<td>1361</td>
<td></td>
</tr>
<tr>
<td></td>
<td>[317.65]</td>
<td>[356.71]</td>
<td>[438.51]</td>
<td>[486.05]</td>
<td>[610.97]</td>
<td>[703.10]</td>
<td>[923.46]</td>
<td>[1003.06]</td>
<td></td>
</tr>
<tr>
<td>Moment of inertia (J) kg·m² [Ibf·ft²]</td>
<td>0.004</td>
<td>0.004</td>
<td>0.007</td>
<td>0.007</td>
<td>0.012</td>
<td>0.012</td>
<td>0.022</td>
<td>0.022</td>
<td></td>
</tr>
<tr>
<td></td>
<td>[0.094]</td>
<td>[0.094]</td>
<td>[0.1645]</td>
<td>[0.1645]</td>
<td>[0.2820]</td>
<td>[0.2820]</td>
<td>[0.5170]</td>
<td>[0.5170]</td>
<td></td>
</tr>
<tr>
<td>Weight (m) kg [lbs]</td>
<td>19</td>
<td>19</td>
<td>23.7</td>
<td>23.7</td>
<td>35</td>
<td>35</td>
<td>49</td>
<td>49</td>
<td></td>
</tr>
<tr>
<td></td>
<td>[41.876]</td>
<td>[41.876]</td>
<td>[52.23]</td>
<td>[52.23]</td>
<td>[77.14]</td>
<td>[77.14]</td>
<td>[105.79]</td>
<td>[105.79]</td>
<td></td>
</tr>
<tr>
<td>External drain flow (qₜ) L/min [U.S. gpm]</td>
<td>1.2</td>
<td>1.2</td>
<td>2.5</td>
<td>2.5</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>[0.317]</td>
<td>[0.317]</td>
<td>[0.66]</td>
<td>[0.66]</td>
<td>[0.79]</td>
<td>[0.79]</td>
<td>[0.79]</td>
<td>[0.79]</td>
<td></td>
</tr>
</tbody>
</table>

* Under Development
### Code Title
**BAF7** – Fixed displacement bent axis piston motor

### Displacement
<table>
<thead>
<tr>
<th>Model Code</th>
<th>Displacement</th>
</tr>
</thead>
<tbody>
<tr>
<td>055</td>
<td>56.35 cm³/r [3.437 in³/r]</td>
</tr>
<tr>
<td>063</td>
<td>63.26 cm³/r [3.859 in³/r]</td>
</tr>
<tr>
<td>075</td>
<td>77.82 cm³/r [4.747 in³/r]</td>
</tr>
<tr>
<td>090</td>
<td>86.23 cm³/r [5.26 in³/r]</td>
</tr>
<tr>
<td>108</td>
<td>108.4 cm³/r [6.612 in³/r]</td>
</tr>
<tr>
<td>125</td>
<td>124.8 cm³/r [7.613 in³/r]</td>
</tr>
<tr>
<td>160</td>
<td>163.9 cm³/r [9.982 in³/r]</td>
</tr>
<tr>
<td>180</td>
<td>178.1 cm³/r [10.864 in³/r]</td>
</tr>
</tbody>
</table>

* Under Development

### Output Shaft
<table>
<thead>
<tr>
<th>Model Code</th>
<th>Output Shaft</th>
</tr>
</thead>
<tbody>
<tr>
<td>03</td>
<td>30mm straight keyed shaft (055 and 063 displacement code, 3 mount code)</td>
</tr>
<tr>
<td>04</td>
<td>31.75mm [1.25 in] straight keyed shaft (055 and 063 displacement code, C mount code)</td>
</tr>
<tr>
<td>05</td>
<td>40mm straight keyed shaft (075 and 090 displacement code, 4 mount code)</td>
</tr>
<tr>
<td>08</td>
<td>40mm straight keyed shaft (108 and 125 displacement code, 5 mount code)</td>
</tr>
<tr>
<td>10</td>
<td>44.45mm straight keyed shaft (108, 125, 160 and 180 displacement code, 6 mount code)</td>
</tr>
<tr>
<td>06</td>
<td>45mm straight keyed shaft (108-125 displacement code, 5 mount code)</td>
</tr>
<tr>
<td>11</td>
<td>45mm straight keyed shaft (160-180 displacement code, 6 mount code)</td>
</tr>
<tr>
<td>07</td>
<td>50mm straight keyed shaft (160-180 displacement code, 6 mount code)</td>
</tr>
</tbody>
</table>

### Main Ports
<table>
<thead>
<tr>
<th>Model Code</th>
<th>Main Ports</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>Rear ports - 1/2 BPSP O-ring port (108 and 125 displacement code, 5 mount code)</td>
</tr>
<tr>
<td>E</td>
<td>Opposite side ports - 3/4 code 62 split flange with M10 threads (055 and 063 displacement code, 3 mount code)</td>
</tr>
<tr>
<td>A</td>
<td>Opposite side and rear ports G 1&quot; BPSP (055-063 displacement code, 3 mount code)</td>
</tr>
<tr>
<td>B</td>
<td>Rear ports G 1&quot; BPSP (055-063 displacement code, 3 mount code)</td>
</tr>
<tr>
<td>C</td>
<td>Opposite side G 1&quot; BPSP (055-063 displacement code, 3 mount code)</td>
</tr>
<tr>
<td>F</td>
<td>Opposite side ports - 1 code 62 SAE split flange with M12 bolts (075, and 090 displacement code, 4 mount code)</td>
</tr>
<tr>
<td>G</td>
<td>Opposite side ports - 1 1/4 code 62 split flange with M14 threads (108, 125, 160 and 180 displacement code, 5 and 6 mount code)</td>
</tr>
<tr>
<td>J</td>
<td>Same side ports bottom - 3/4 code 62 with M10 threads (055 and 063 displacement code, 3 mount code)</td>
</tr>
<tr>
<td>H</td>
<td>Same side ports bottom - 3/4 code 62 with 7/16-14 UNC thds (055 and 063 displacement code, C mount code)</td>
</tr>
<tr>
<td>P</td>
<td>Rear ports-3/4 code 62 with M10 threads (055 and 063 displacement code, 3 mount code)</td>
</tr>
<tr>
<td>R</td>
<td>Rear ports-3/4 code 62 with 7/16-14 UNC thds (055 and 063 displacement code, C mount code)</td>
</tr>
<tr>
<td>K</td>
<td>Same side ports bottom - 1 code 62 with M12 threads (075 and 090 displacement code, 4 mount code)</td>
</tr>
<tr>
<td>S</td>
<td>Same side ports bottom - 1 code 62 with 7/16-14 UNC thds (075 and 090 displacement code, D mount code)</td>
</tr>
<tr>
<td>M</td>
<td>Opposite side ports - 1 code 62 SAE split flange with 7/16-14 UNC thds bolts (075, and 090 displacement code, C mount code)</td>
</tr>
<tr>
<td>T</td>
<td>Rear ports- 1 code 62 with M12 threads (075 and 090 displacement code, 4 mount code)</td>
</tr>
<tr>
<td>U</td>
<td>Rear ports- 1 code 62 with 7/16-14 UNC thds (075 and 090 displacement code, D mount code)</td>
</tr>
<tr>
<td>N</td>
<td>Opposite side ports - 1 1/4 code 62 SAE split flange 1/2-13 UNC thds (055, 063, 075 and 090 displacement code, 5 and 6 mount code)</td>
</tr>
<tr>
<td>V</td>
<td>Rear ports - 1 1/4 code 62 SAE split flange with M14 threads (108, 125, 160 and 180 displacement code, D mount code)</td>
</tr>
</tbody>
</table>

### Control
<table>
<thead>
<tr>
<th>Model Code</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>No control - fixed displacement</td>
</tr>
<tr>
<td>01</td>
<td>Same side ports bottom - 1 code 62 split flange with M14 threads (108, 125, 160 and 180 displacement code, 5 and 6 mount code)</td>
</tr>
</tbody>
</table>

### Control Pressure
<table>
<thead>
<tr>
<th>Model Code</th>
<th>Control Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>None - fixed displacement</td>
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</table>

### Control Orifice
<table>
<thead>
<tr>
<th>Model Code</th>
<th>Control Orifice</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>None</td>
</tr>
</tbody>
</table>

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* EATON BAF7 Bent Axis Piston Motor - Fixed Displacement  E-MOPI-EC020-E  September 2012 *
Model Code

BAF7 055 30 E0 B0 00 00 00 00 00 00 A0 A

Control Special Features
0 – None

Min/Max Displacement
00 – Fixed displacement per model code positions 4,5,6

Valve Features
0 – Feature not necessary
1 – Setting range 30 to 350 bar [435 to 5075 psi] [piloting ratio 6.2:1] “VCR1” valve code, valve not set, user to set valve per requirement
2 – Setting range 0 to 350 bar [0 to 5075 psi] [piloting ratio 2.9:1] Control of rotation CW “VCD1” valve code, valve not set, user to set valve per requirement
6 – Setting range 0 to 350 bar [0 to 5075 psi] [piloting ratio 2.9:1] Control of rotation CCW “VCD1” valve code, valve not set, user to set valve per requirement
4 – Setting range 30 to 350 bar [435 to 5075 psi] [piloting ratio 6.2:1] Control of rotation CW “VCDM” valve code, valve not set, user to set valve per requirement
5 – Setting range 30 to 350 bar [435 to 5075 psi] [piloting ratio 6.2:1] Control of rotation CCW “VCDM” valve code, valve not set, user to set valve per requirement
3 – Setting range 250 to 500 bar [3625 to 7250 psi] [piloting ratio 13:1] control of rotation CW “VCD2” valve code, valve not set, user to set valve per requirement
7 – Setting range 30 to 350 bar [435 to 5075 psi] [piloting ratio 6.2:1] Control of rotation CCW “VCD2” valve code, valve not set, user to set valve per requirement

Flushing Valves
00 – None
06 – VSC/F flushing valve -6 L/min [1.58 U.S gpm] only available with opposite side ports and same side ports bottom configurations
09 – VSC/F flushing valve -10.5 L/min [2.77 U.S gpm] only available with opposite side ports and same side ports bottom configurations
15 – VSC/F flushing valve -15 L/min [3.96 U.S gpm] only available with opposite side ports and same side ports bottom configurations
21 – VSC/F flushing valve -20 L/min [5.28 U.S gpm] only available with opposite side ports and same side ports bottom configurations

Additional Features
0 – No additional features

Motor Special Features
00 – None
01 – SAE version with ISO ports
05 – High pressure shaft seal
06 – Motor with speed sensor

Paint
0 – No paint
A – Primer blue

Identification
0 – Eaton standard identification

Design Code
A – A
Dimensions ISO 4-Bolt Flange
BAF7 055-063 “3” Mount Code

S1, S2: Drain ports (1 plugged) - G 1/2 (BSPP)
A, B: Service line ports
R: Air bleed (plugged) - G 1/8 (BSPP)

“E” Port Code

“P” Port Code

“J” Port Code

“03” Output Shaft Code
Parallel Keyed Shaft

“35” Output Shaft Code
Splined Shaft

“30” Output Shaft Code
Splined Shaft
Dimensions ISO 4-Bolt Flange
BAF7 075-090 “4” Mount Code

S1, S2: Drain ports (1 plugged) - G 1/2 (BSPP)
A, B: Service line ports
R: Air bleed (plugged) - G 1/8 (BSPP)

"F" Port Code

"T" Port Code

"K" Port Code

"05" Output Shaft Code
Parallel Keyed Shaft

"35" Output Shaft Code
Splined Shaft

"40" Output Shaft Code
Splined Shaft
Dimensions ISO 4-Bolt Flange
BAF7 108-125 “5” Mount Code

S1, S2: Drain ports (1 plugged) - G 1/2 (BSPP)
A, B: Service line ports
R: Air bleed (plugged) - G 1/8 (BSPP)
Dimensions ISO 4-Bolt Flange
BAF7 160-180 “6” Mount Code

S1, S2: Drain ports (1 plugged) - G 3/4 (BSPP)
A, B: Service line ports
R: Air bleed (plugged) - G 1/8 (BSPP)

"G" Port Code

"V" Port Code

"1" Port Code

"11" Output Shaft Code
Parallel Keyed Shaft

"07" Output Shaft Code
Parallel Keyed Shaft

"45" Output Shaft Code
Splined Shaft

"50" Output Shaft Code
Splined Shaft
Dimensions SAE C 4-Bolt Flange
BAF7 055-063 “C” Mount Code

S1, S2: Drain ports (1 plugged) - 1” 1/16-12 UN 2B
A, B: Service line ports
R: Air bleed (plugged) - 7/16”-20 UNF

“L” Port Code

“R” Port Code

“H” Port Code

“04” Output Shaft Code
Parallel Keyed Shaft

“14” Output Shaft Code
Splined Shaft
Dimensions SAE C 4-Bolt Flange
BAF7 075-090 “C” Mount Code

S1, S2: Drain ports (1 plugged) - 1” 1/16-12 UN 2B
A, B: Service line ports
R: Air bleed (plugged) - 7/16”-20 UNF

“M” Port Code

“U” Port Code

“S” Port Code

“14” Output Shaft Code
Splined Shaft
Dimensions SAE D 4-Bolt Flange
108-125 “D” Mount Code

S1, S2: Drain ports (1 plugged) - 1” 1/16-12 UN 2B
A, B: Service line ports
R: Air bleed (plugged) - 7/16”-20 UNF

“N” Port Code

“W” Port Code

“2” Port Code

“10” Output Shaft Code

“13” Output Shaft Code

“23” Output Shaft Code
Dimensions SAE C 4-Bolt Flange
BAF7 160-180 “D” Mount Code

S1, S2: Drain ports (1 plugged) - 1” 3/16-12 UN 2B
A, B: Service line ports
R: Air bleed (plugged) - 7/16”-20 UNF

“N” Port Code

“W” Port Code

“2” Port Code

“10” Output Shaft Code
Parallel Keyed Shaft

“13” Output Shaft Code
Splined Shaft

Key: 0.42 x 0.36 x 2.36
**Motor Special Features**

### Output signal electronic tacho

- **Input signal**: Electronic tacho
- **Sensor**: Can be assembled only at S1 drain port
- **Number of pulses per revolution**: 14
- **Inductive principle**
- **Output current**: PNP
- **Voltage**: 10-65 V d.c.
- **Max load**: 300 mA
- **Max frequency**: 10000 Hz
- **Temperature range**: -25°C to +85°C
- **Enclosure**: IP 67

**Available versions:**
- Sensor with 2 metres three wires cable (cod. 424.0050.0000)

### Opposite Side Ports

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A</strong></td>
<td>41.7 (1.64)</td>
<td>37.5 (1.47)</td>
<td>41.9 (1.65)</td>
<td>42.5 (1.67)</td>
<td>41.7 (1.64)</td>
<td>37 (1.45)</td>
<td>42.9 (1.69)</td>
<td>42.5 (1.67)</td>
</tr>
<tr>
<td><strong>B</strong></td>
<td>161.2 (6.35)</td>
<td>177 (6.99)</td>
<td>207.4 (8.16)</td>
<td>222.8 (8.77)</td>
<td>184.8 (7.27)</td>
<td>200.8 (7.87)</td>
<td>240.8 (9.48)</td>
<td>254.9 (10.03)</td>
</tr>
</tbody>
</table>

### Same Side Bottom Ports

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A</strong></td>
<td>Opp Side ports</td>
<td>245.7 (9.67)</td>
<td>259.4 (10.21)</td>
<td>294.3 (11.58)</td>
<td>319.6 (12.58)</td>
<td>369.8 (10.62)</td>
<td>283.5 (11.16)</td>
<td>326.4 (12.85)</td>
</tr>
<tr>
<td><strong>B</strong></td>
<td>Opp side Ports</td>
<td>152.8 (6.01)</td>
<td>159.1 (6.26)</td>
<td>179.9 (7.08)</td>
<td>199.1 (7.84)</td>
<td>152.8 (6.01)</td>
<td>159.1 (6.26)</td>
<td>179.8 (7.08)</td>
</tr>
<tr>
<td><strong>A</strong></td>
<td>Same Side Bottom Ports</td>
<td>239.2 (9.41)</td>
<td>258.8 (10.18)</td>
<td>298.8 (11.76)</td>
<td>313.2 (12.33)</td>
<td>263.3 (10.36)</td>
<td>262.9 (11.13)</td>
<td>330.8 (13.02)</td>
</tr>
<tr>
<td><strong>B</strong></td>
<td>Same Side Bottom Ports</td>
<td>193.6 (8.08)</td>
<td>205.2 (8.59)</td>
<td>218.2 (9.12)</td>
<td>231.7 (9.72)</td>
<td>193.6 (8.08)</td>
<td>205.2 (8.59)</td>
<td>218.2 (9.12)</td>
</tr>
</tbody>
</table>

The sensor can be assembled only at S1 drain port.

---

**Number of pulses per revolution** = 14

- **Inductive principle**
- **Output current**: PNP
- **Voltage**: 10-65 V d.c.
- **Max load**: 300 mA
- **Max frequency**: 10000 Hz
- **Temperature range**: -25°C to +85°C
- **Enclosure**: IP 67
- **Available versions**:
  - Sensor with 2 metres three wires cable (cod. 424.0050.0000)
BAF7 (Gearbox Version)

General Information - Features

BAF7 (Gearbox Version) series are a family of fixed displacement motors, bent axis piston design for operation in both open and closed circuit. BAF7 (Gearbox Version) series motors are mainly intended for installation in mechanical gearboxes such as track drive and winches gear boxes. The proven design incorporating the lens shaped valve plate, the high quality components and manufacturing techniques make the BAF7 (Gearbox Version) series motors able to provide up to 430 bar [6235 psi] continuous and 480 bar [6960 psi] peak performance. Laboratory tested and field proven, these motors provide maximum efficiency and long life. Heavy duty bearings permit high radial and axial loads. Flange-mounted valves, both for open and closed circuit, enable BAF7 (Gearbox Version) series motors to meet the requirements of various types of applications.
Specifications and Performance
Technical Data

Hydraulic fluids
See page 34 for fluid related information

Operating pressure
The maximum permissible pressure on pressure ports is 430 bar [6235 psi] continuous and 480 bar [6960 psi] peak. If two motors are connected in series, total working pressure P1+P2 must be limited to 700 bar max. [10150 psi].

Case drain pressure
The service life of the shaft seal is influenced by the speed of rotation of the motor and by case pressure. It’s recommended not to exceed the value of 10 bar [145 psi], at reduced speed please see the diagram. Instantaneous pressure spikes (t<0.1 sec) up to 15 bar [217.5 psi] are permitted.

Output shaft
Main shaft has bearings that can bear both radial and axial loads. For permissible load values, see page 6.

Seals
Seals used on standard BAF7 (GB) series axial piston motors are made by FKM seals (Fluoroelastomer). For Applications with special fluids, contact Eaton.

Minimum rotating speed
No limit to minimum speed; if uniformity of rotation is required, speed must not be less than 50 rpm. For lower speed operation, contact Eaton.

Installation
BAF7 (Gearbox) motors can be installed in various position and directions; however, installation in vertical position with shaft towards upper is not allowed. These axial piston units have separated ports and drain chambers and so must be always drained. For further detail see at General installation guidelines.

Flange-mounted valves:
Flange-mounted valves are available for motors both in open and closed loop. For more information see the catalogue Axial Valves.

Flushing valves
The motors can be equipped with flushing valves. The mount the flushing valve on motors, it is necessary to use a special port cover. For more information see the catalogue Axial Valves.

Relation between direction of rotation and direction of flow
The relation between direction of rotation of shaft and direction of flow in BAF7 (Gearbox) piston units is shown in the picture below.

EATON  BAF7 Bent Axis Piston Motor - Fixed Displacement  E-MOPI-MC020-E  September 2012  21
### Technical Data

#### Size

<table>
<thead>
<tr>
<th>Size</th>
<th>V_g</th>
<th>cm³/rev [in³/rev]</th>
<th>055</th>
<th>063*</th>
<th>075</th>
<th>090</th>
<th>108</th>
<th>125</th>
<th>160*</th>
<th>180*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Displacement</td>
<td>cm³/rev</td>
<td>[in³/rev]</td>
<td>56.35</td>
<td>63.26</td>
<td>77.82</td>
<td>86.23</td>
<td>108.4</td>
<td>124.8</td>
<td>163.9</td>
<td>178.1</td>
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<tr>
<td>Max. pressure cont.</td>
<td>p_nom</td>
<td>bar [psi]</td>
<td>430</td>
<td>5235</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. pressure peak</td>
<td>p_max</td>
<td>bar [psi]</td>
<td>480</td>
<td>6960</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Max. speed</td>
<td>n_max</td>
<td>rpm</td>
<td>5000</td>
<td>5000</td>
<td>4500</td>
<td>4500</td>
<td>4000</td>
<td>4000</td>
<td>3600</td>
<td>3600</td>
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<tr>
<td>Max. flow</td>
<td>q_max</td>
<td>L/min [U.S. gpm]</td>
<td>282</td>
<td>74.45</td>
<td>316</td>
<td>83.42</td>
<td>350</td>
<td>92.4</td>
<td>388</td>
<td>102.5</td>
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<tr>
<td>Max. power at p_nom</td>
<td>P_max</td>
<td>kW [hp]</td>
<td>202</td>
<td>270.68</td>
<td>226</td>
<td>302.84</td>
<td>251</td>
<td>336.34</td>
<td>275</td>
<td>372</td>
</tr>
<tr>
<td>Torque constant</td>
<td>T_s</td>
<td>Nm/bar [lbf·ft/psi]</td>
<td>0.9</td>
<td>0.045</td>
<td>1</td>
<td>0.05</td>
<td>1.2</td>
<td>0.06</td>
<td>1.4</td>
<td>0.07</td>
</tr>
<tr>
<td>Max. torque cont.</td>
<td>T_nom</td>
<td>Nm [lbf·ft]</td>
<td>386</td>
<td>284.48</td>
<td>433</td>
<td>319.12</td>
<td>533</td>
<td>392.62</td>
<td>590</td>
<td>435.16</td>
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<tr>
<td>Max. torque peak</td>
<td>T_max</td>
<td>Nm [lbf·ft]</td>
<td>431</td>
<td>317.65</td>
<td>484</td>
<td>356.71</td>
<td>595</td>
<td>438.51</td>
<td>659</td>
<td>486.05</td>
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<tr>
<td>Moment of inertia</td>
<td>J</td>
<td>kg·m² [lbf·ft²]</td>
<td>0.004</td>
<td>0.004</td>
<td>0.007</td>
<td>0.007</td>
<td>0.012</td>
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<tr>
<td>Weight</td>
<td>m</td>
<td>kg [lbs]</td>
<td>19</td>
<td>41.876</td>
<td>19</td>
<td>41.876</td>
<td>23.7</td>
<td>52.23</td>
<td>23.7</td>
<td>52.23</td>
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<tr>
<td>Drainage flow</td>
<td>q_d</td>
<td>L/min [U.S. gpm]</td>
<td>1.2</td>
<td>0.317</td>
<td>1.2</td>
<td>0.317</td>
<td>2.5</td>
<td>0.66</td>
<td>2.5</td>
<td>0.66</td>
</tr>
</tbody>
</table>

* Under Development

(Theoretical values, without considering n_m and n_a; approximate values). Peak operation must not exceed 1% of every minute. A simultaneous maximum pressure and maximum speed not recommended.

**Notes:**

1. Approximate values.
2. Average values at 250 bar [3600 psi] with mineral oil at 45°C [113°F] and 35 cSt of viscosity.
### Model Code

<table>
<thead>
<tr>
<th>BAF7</th>
<th>055</th>
<th>U</th>
<th>30</th>
<th>E</th>
<th>0</th>
<th>B</th>
<th>0</th>
<th>00</th>
<th>0</th>
<th>00</th>
<th>0</th>
<th>00</th>
<th>0</th>
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</tbody>
</table>

#### Code Title
BAF7 – Fixed displacement bent axis piston motor

#### Displacement
- **055** – 56.35 cm³/r [3.437 in³/r]
- **063** – 63.26 cm³/r [3.859 in³/r]
- **075** – 77.82 cm³/r [4.747 in³/r]
- **090** – 86.23 cm³/r [5.26 in³/r]
- **108** – 108.4 cm³/r [6.612 in³/r]
- **125** – 124.8 cm³/r [7.613 in³/r]
- **160** – 163.9 cm³/r [10.864 in³/r]
- **180** – 178.1 cm³/r [11.106 in³/r]

#### Mounting Type
- **U** – Gearbox 2-Bolt hub dia 160 mm (055 and 063 displacement code)
- **V** – Gearbox 2-Bolt hub dia 190 mm (075 and 090 displacement code)
- **W** – Gearbox 2-Bolt hub dia 200 mm (108, 125, 160 and 180 displacement code)

#### Output Shaft
- **30** – 14 tooth W30 splined shaft per DIN 5480 (055 and 063 displacement code, U mount code)
- **35** – 16 tooth W35 splined shaft per DIN 5480 (055, 063, 075 and 090 displacement code, U and V mount code)
- **40** – 18 tooth W40 splined shaft per DIN 5480 (075, 090, 108 and 125 displacement code, V and W mount code)
- **45** – 21 tooth W45 splined shaft per DIN 5480 (108 and 125 displacement code, W mount code)
- **50** – 24 tooth W50 splined shaft per DIN 5480 (160-180 displacement code, W mount code)

#### Direction of Rotation
- **0** – Reversible

#### Seals
- **V** – Fluorocarbon

#### Valves
- **0** – No optional valving
- **3** – VCD/M pilot assisted overcentre valve 055, 063, 075 and 090 displacement code, available with same side bottom ports and rear ports, U and V mount code
- **1** – VCD/1 pilot assisted overcentre valve 055, 063, 075, 090, 108, 125, 160 and 180 displacement code, available with opposite side ports, U, V, W mount code
- **2** – VCD/2 pilot assisted overcentre valve 075, 090, 108, 125, 160 and 180 displacement code, available with opposite side ports, U, V, W mount code
- **4** – VCR1 D/AF double acting overcentre valve 055, 063, 075 and 090 displacement code, available with same side bottom ports and U and V mount code
- **5** – VCDM “VCDM” valve code, valve not set, user to set valve per requirement
- **6** – Setting range 30 to 350 bar [435 to 5075 psi][piloting ratio 6:2:1] “VCR1” valve code, valve not set, user to set valve per requirement
- **7** – Setting range 30 to 350 bar [435 to 5075 psi][piloting ratio 6:2:1] Control of rotation CCW “VCD2” valve code, valve not set, user to set valve per requirement

#### Flushing Valves
- **0** – None
- **06** – VSC/F flushing valve -6 L/min [1.58 U.S gpm] only available with opposite side ports and same side ports bottom configurations
- **09** – VSC/F flushing valve -10.5 L/min [2.77 U.S gpm] only available with opposite side ports and same side ports bottom configurations
- **15** – VSC/F flushing valve -15 L/min [3.96 U.S gpm] only available with opposite side ports and same side ports bottom configurations
- **21** – VSC/F flushing valve -20 L/min [5.28 U.S gpm] only available with opposite side ports and same side ports bottom configurations

#### Motor Special Features
- **00** – None
- **04** – Drain plugs reversed
- **06** – Motor with speed sensor

#### Paint
- **0** – No paint
- **A** – Primer blue

#### Identification
- **0** – Eaton standard identification

#### Design Code
- **A** – A

---

Dimensions 2-Bolt Flange
BAF7(GB) 055-063 “U” Mount Code

S1, S2: Drain ports - G 1/2 (BSPP)
A, B: Service line ports

“J” Port Code

“E” Port Code

“30” Output Shaft Code Splined Shaft

“35” Output Shaft Code Splined Shaft

Maximum working pressure for 063 displacement: 300 bar [4350 psi]
Dimensions 2-Bolt Flange
BAF7(GB) 075-090 “V” Mount Code

S1, S2: Drain ports - G 1/2 (BSPP)
A, B: Service line ports

“K” Port Code

“F” Port Code

“35” Output Shaft Code Splined Shaft

“40” Output Shaft Code Splined Shaft

Maximum working pressure for 090 displacement: 300 bar [4350 psi]
Dimensions 2-Bolt Flange

BAF7(GB) 108-125 “W” Mount Code

S1, S2: Drain ports - G 1/2 (BSPP)
A, B: Service line ports

“1” Port Code

“G” Port Code

“40” Output Shaft Code Splined Shaft

“45” Output Shaft Code Splined Shaft

Maximum working pressure for 125 displacement: 300 bar [4350 psi]
Dimensions 2-Bolt Flange
BAF7(GB) 160-180 “W” Mount Code

S1, S2: Drain ports - G 1/2 (BSPP)
A, B: Service line ports

“1” Port Code

“G” Port Code

“45” Output Shaft Code Splined Shaft

“50” Output Shaft Code Splined Shaft

Maximum working pressure for 180 displacement: 300 bar [4350 psi]
Motor Special Features

Speed Sensor

Output signal electronic tacho

- Number of pulses per revolution = 14
- Inductive principle
- Output current PNP
- Voltage 10-65 V d.c.
- Max load 300 mA
- Max frequency 10000 Hz
- Temperature range -25°C +85°C
- Enclosure IP 67

Available versions:
- Sensor with 2 metres three wires cable (cod. 424.0050.0000)

The sensor can be assembled at S1 drain location.

### Same Side Bottom Ports

#### Port Cover

<table>
<thead>
<tr>
<th></th>
<th>BAF7(GB) 055-063</th>
<th>BAF7(GB) 075-090</th>
<th>BAF7(GB) 108-125</th>
<th>BAF7(GB) 160-180</th>
</tr>
</thead>
<tbody>
<tr>
<td>B (mm [in])</td>
<td>44.5 [1.75]</td>
<td>40 [1.57]</td>
<td>42 [1.65]</td>
<td>41.7 [1.64]</td>
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</table>

### Opposite Side Ports

#### Port Cover

<table>
<thead>
<tr>
<th></th>
<th>BAF7(GB) 055-063</th>
<th>BAF7(GB) 075-090</th>
<th>BAF7(GB) 108-125</th>
<th>BAF7(GB) 160-180</th>
</tr>
</thead>
<tbody>
<tr>
<td>A (mm [in])</td>
<td>Opposite Side Ports 185.8 [7.31]</td>
<td>182.2 [7.17]</td>
<td>211.8 [8.33]</td>
<td>236.8 [9.32]</td>
</tr>
<tr>
<td>B (mm [in])</td>
<td>Opposite Side Ports 152.8 [6.01]</td>
<td>159.3 [6.27]</td>
<td>179.9 [7.08]</td>
<td>199.9 [7.87]</td>
</tr>
</tbody>
</table>

| A (mm [in])| Same Side Ports 178 [7.01] | 181 [7.12] | 216.5 [8.52] | 223.4 [8.79] |
Motor Special Features
Drain Plugs Reversed

For the BAF7(GB) motors it is possible to request the drain plug reversed compared to standard. For the reverse configuration specify '04' in positions 26 and 27 of the model code.

Standard Version

<table>
<thead>
<tr>
<th>S1</th>
<th>S2</th>
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</thead>
<tbody>
<tr>
<td>Metallic plug.</td>
<td>Plastic plug.</td>
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</tbody>
</table>

Drain plugs reversed “04” Version

<table>
<thead>
<tr>
<th>S1</th>
<th>S2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plastic plug.</td>
<td>Metallic plug.</td>
</tr>
</tbody>
</table>
Flushing Valve
Model Code Pos. 23-24

The VSC flushing valve allows an oil cooling action, which is recommended when operating at high speed and power. The unit consists of a 3-way spool valve which allows a small oil flow from the low pressure side of the circuit into the case of the motor via an internal connection. For correct operation it is necessary to connect the drain port of the motor to tank.

<table>
<thead>
<tr>
<th>Description</th>
<th>Theoretical Flow (391 psi)</th>
<th>Orifice Diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>VSC-06F Valve</td>
<td>6 L/min [1.5 US gpm]</td>
<td>1.5 mm [0.05 in]</td>
</tr>
<tr>
<td>VSC-09F Valve</td>
<td>10.5 L/min [2.7 US gpm]</td>
<td>2 mm [0.07 in]</td>
</tr>
<tr>
<td>VSC-15F Valve</td>
<td>15 L/min [3.9 US gpm]</td>
<td>2.5 mm [0.09 in]</td>
</tr>
<tr>
<td>VSC-21F Valve</td>
<td>20 L/min [5.2 US gpm]</td>
<td>3.3 mm [0.12 in]</td>
</tr>
</tbody>
</table>

*Dimensions shown above are only for VSC-06F valve and may vary based on the flow required.

Pilot Assisted Overcentre Valves
Model Code Pos. 14

The pilot assisted overcentre valves prevent the motor from “running ahead” pulled by a driving load and allow cavitation free operation. The relief section limits the pressure shocks. These valves incorporate also a shuttle valve to release the fail safe brake. The setting pressure value must be approx. 1.3 times the load induced pressure. To allow the descent of the load, a minimum pilot pressure must be supplied to the control valve. This is usually determined with the following formula:

\[ PP = \frac{PS - PL}{R + 1} \]

Where:
PP = pilot pressure
PS = pressure setting of relief valve section
PL = load induced pressure
R = piloting ratio
Pilot Assisted Overcentre Valves
Model Code Pos. 14

Alluminium Alloy Casing

Corrosion Protected

|------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|

VCD/M
Piloting ratio: .................................................. 6.2:1
Setting range: .................................................. 30÷350 bar [435÷5075psi]
MAX. Flow rate: .................................................. 350 L/min [92.4 U.S. gpm]

MAX. Flow rate: .................................................. 350 L/min [92.4 U.S. gpm]

Portata MAX.: .................................................. 350 L/min [92.4 U.S. gpm]
Setting range: ...................... 30÷350 bar [435÷5075psi]
Campo di taratura: .................................................. 30÷350 bar [435÷5075psi]
Rapporto di pilotaggio: .................................................. 6.2:1

Peso: .................................................. 4.2 kg [9.26 lbf]
Pressione indotta dal carico: .................................................. 27.8 bar [406 psi]
Pressione di taratura della valvola di massima: .................................................. 57.2 bar [834 psi]
Pressione di pilotaggio: .................................................. 11 bar [158 psi]
Pilot Assisted Overcentre Valves Dimensions
Model Code Pos. 14

Steel Casing
Valve is supplied with screws, o-rings and flange

<table>
<thead>
<tr>
<th>BAF7</th>
<th>A [mm]</th>
<th>B [mm]</th>
<th>ØC [mm]</th>
<th>ØD [mm]</th>
<th>E [mm]</th>
<th>D1</th>
<th>F/Pp</th>
<th>Peso / Weight [kg/lbf]</th>
</tr>
</thead>
<tbody>
<tr>
<td>055/063</td>
<td>23.8</td>
<td>50.8</td>
<td>11</td>
<td>17</td>
<td>12</td>
<td>G1” (BSPP)</td>
<td>G1/4 (BSPP)</td>
<td>4.7</td>
</tr>
<tr>
<td>075/090</td>
<td>27.8</td>
<td>57.1</td>
<td>13</td>
<td>19</td>
<td>14</td>
<td>G1” (BSPP)</td>
<td>G1/4 (BSPP)</td>
<td>4.7</td>
</tr>
<tr>
<td>108/125</td>
<td>31.6</td>
<td>66.7</td>
<td>15</td>
<td>22</td>
<td>16</td>
<td>G1” (BSPP)</td>
<td>G1/4 (BSPP)</td>
<td>4.7</td>
</tr>
</tbody>
</table>

Pilot Assisted Overcentre Valves Dimensions
Model Code Pos. 14

Steel Casing
Valve is supplied with screws and O-rings.

VCD/1
Piloting ratio.......................... 2.9:1
Setting range .......................... 0÷350 bar [0÷5075 psi]
MAX. Flow rate.................. 180 L/min [47.5 U.S. gpm]

VCD/2
Piloting ratio.......................... 13:1
Setting range .......................... 250÷500 bar [3625÷7250 psi]
MAX. Flow rate.................. 180 L/min [47.5 U.S. gpm]
Double Acting Overcentre Valve
Model Code Pos 14

<table>
<thead>
<tr>
<th>BAF7</th>
<th>A [mm] [in]</th>
<th>B [mm] [in]</th>
<th>C [mm] [in]</th>
<th>D [mm] [in]</th>
<th>E [mm] [in]</th>
<th>F [mm] [in]</th>
<th>G [mm] [in]</th>
<th>V1-V2</th>
<th>O-RING</th>
<th>Weight kg [lb]</th>
</tr>
</thead>
</table>

VCR1 D/AF
Piloting ratio: .....................................................6.2:1
Setting range: .....................................................30 to 350 bar [435 to 5075 psi]
Standard setting (Q=5 L/min [1.32 U.S. gpm]) .....150 to170 bar [2175 to 2465 psi]
Application Information
Fluid and Filtration Guidelines

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 (HM or HV) 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.

Viscosity
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. The maximum viscosity for short intervals and during cold starts is shown below. The temperature of the fluid should not exceed a maximum of +90°C or minimum of -25°C.

Viscosity Recommendation for Variable and Fixed Displacement Motors

<table>
<thead>
<tr>
<th>Type</th>
<th>Optimum</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed Bent Axis Motors</td>
<td>15-40 (cSt)</td>
<td>10 (cSt)</td>
<td>800 (cSt)</td>
</tr>
</tbody>
</table>

Viscosity grades
Under the ISO standard, hydraulic fluids are divided into 8 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.

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.

Filtering Grade
ISO 4572 states that the filtering ratio $\beta_x$ is the ratio of the number of particles greater than given size upstream of test filter divided by number of particles of same size downstream. The grade $\beta_x$ therefore gives a good indication of the quality of the filter.

Example: A filter with a filtering ratio of $\beta_{20} \geq 100$ is able to capture 99% of particles greater than or equal to 20 $\mu$m. Eaton Hydraulics recommends filters with the following $\beta_x$ ratios for its Bent Axis piston motors:

<table>
<thead>
<tr>
<th>Maximum Contamination Grades</th>
<th>ISO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed Bent Axis Motors</td>
<td>21/19/16</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ratio $\beta_x$</th>
<th>Filtering 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>

Bent Axis Design Motors:
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 motors are installed vertically and where operating cycles display long periods at high pressure (> 250 bar).
Application Information

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 (Cont...)

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.

It is recommended to position a pre-loaded check valve in the cased drain line (maximum pressure when open: 0.5 bar [8 psi]) to prevent oil from draining from the motor case when the system is not in use.

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.

Fig. 1
Fig. 2
Fig. 3
Fig. 4
Fig. 5
Application Information
Installation Guidelines (Cont...)

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 nonreturn valve. A 10 μm filter in series is recommended.

Maintenance
Replace system filters after the 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