Dual Displacement Radial Piston
Staffa Motor
HMC Series
The range of dual displacement motors extends from the HMC030 in 492 cc/rev to the HMC325 in 5,326 cc/rev.

There are seven frame sizes as shown in the table below:

<table>
<thead>
<tr>
<th>Motor Type</th>
<th>Max. Torque (275 bar (Nm))</th>
<th>Continuous shaft power (kW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HMC030</td>
<td>1,655**</td>
<td>60</td>
</tr>
<tr>
<td>HMC045</td>
<td>2,930</td>
<td>99</td>
</tr>
<tr>
<td>HMC080</td>
<td>6,560</td>
<td>138</td>
</tr>
<tr>
<td>HMC125</td>
<td>8,220</td>
<td>135</td>
</tr>
<tr>
<td>HMC200</td>
<td>12,820</td>
<td>174</td>
</tr>
<tr>
<td>HMC270</td>
<td>19,090</td>
<td>189</td>
</tr>
<tr>
<td>HMC325</td>
<td>22,110</td>
<td>189</td>
</tr>
</tbody>
</table>

*torque calculated at 241 bar

Kawasaki “Staffa” high torque, low speed radial piston motors use hydrostatic balancing techniques to achieve high efficiency, combined with good breakout torque and smooth running capability.

The HMC series dual displacement models have two pre-set displacements which can be chosen from a wide range to suit specific application requirements. The displacements are hydraulically selected by a directional control valve which can be remote mounted or directly on the motor. Motor displacement can be changed with ease when the motor is running.

These motors are also available in a continuously variable version using either hydro-mechanical or electro-hydraulic control methods.

Other mounting options are available on request to match many of the competitor interfaces.

■ Features

High torque at low speed

Smooth running

Wide range of displacements to suit specific applications

Displacement changes with ease when the motor is running

Electro-hydraulic or hydro-mechanical control methods available

Speed sensing options
1-1 Model Coding

**Fluid Type**
- Blank: Mineral oil
- F3: Phosphate ester (HFD fluid)
- F11: Water based fluids (HFA, HFB & HFC)
- Alternative fluids contact Kawasaki

**Motor Frame Size**
- See shaft type option list on Page 6

**Shaft Type**
- See shaft type option list on Page 6

**Shaft Orientation**
- Blank: Standard Orientation
- V: Vertically Up

**High Displacement Code**
- ###: See displacement code details on pages 21 to 28

**Low Displacement Code**
- ###: See displacement code details on pages 21 to 28

**Main Port Connections**
- See Port Connection details on page 7

**Design Series Number**
- Current series for HMC motors

**Special Features**
- P****: See options on page 5
- PL**: Non-catalogued features, "****" = number assigned by Kawasaki as required

**Shaft Seal Enhancements**
- A: High pressure shaft seal
- B: Improved shaft seal life
- C: High pressure shaft seal & improved shaft seal life
- D: None

**Valve Enhancements**
- A: Improved cavitation resistance
- B: Anti-clockwise
- C: Thermal shock resistance
- D: Improved cavitation resistance & anti-clockwise
- E: Improved cavitation resistance & thermal shock resistance
- F: Anti-clockwise & thermal shock resistance
- G: Improved cavitation resistance & anti-clockwise & thermal shock resistance
- H: None

**External Protection**
- A: Anti-pooling bolt heads
- B: Marine-specification primer paint
- C: Anti-pooling bolt heads & Marine-specification primer paint
- D: None

**Installation Features**
- A: Increased starting torque
- B: Drain port adaptor x 2
- C: 21 mm mounting holes
- D: 22 mm mounting holes
- E: 21 mm mounting holes & Drain port adaptor x 1
- F: 21 mm mounting holes & Drain port adaptor x 2
- G: 22 mm mounting holes & Drain port adaptor x 1
- H: 22 mm mounting holes & Drain port adaptor x 2
- I: None

**Performance Enhancements**
- A: Improved cavitation resistance
- B: Anti-clockwise
- C: Thermal shock resistance
- D: Improved cavitation resistance & anti-clockwise
- E: Improved cavitation resistance & thermal shock resistance
- F: Anti-clockwise & thermal shock resistance
- G: Improved cavitation resistance & anti-clockwise & thermal shock resistance
- H: None

**Threaded ports/ bi directional shaft rotation**
- X: X and Y ports C.I. (BSBF to ISO 228/1)
- ISO 4401 size 03 mounting face / bi-directional shaft rotation
- C: No shuttle
- CS: With shuttle

**ISO 4401 size 03 mount with Additional Regulation**
- CP18: Constant Pressure Regulator set to 180 bar
- CHP18: Constant Pressure Regulator set to 180 bar with override valve attached

Please state CP valve setting when placing order and note that maximum setting is 220 bar (ie CP22)

See pages 25 for further details
## 1-2 Shaft Options

<table>
<thead>
<tr>
<th>Product type</th>
<th>P</th>
<th>S</th>
<th>Z</th>
<th>Z2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HMC030</strong></td>
<td>Parallel keyed 55mm diameter shaft</td>
<td>Splined shaft 17 teeth BS3550</td>
<td>Splined shaft DIN5480 (W55x3x17x7h)</td>
<td>Splined shaft DIN5480 (W60x3x18x7h)</td>
</tr>
<tr>
<td><strong>HMC045</strong></td>
<td>Parallel keyed 55mm diameter shaft</td>
<td>Splined shaft 17 teeth BS3550</td>
<td>Splined shaft DIN5480 (W55x3x17x7h)</td>
<td>Splined shaft DIN5480 (W60x3x18x7h)</td>
</tr>
<tr>
<td><strong>HMC080</strong></td>
<td>Parallel keyed 60mm diameter shaft</td>
<td>Splined shaft 14 teeth BS3550</td>
<td>Splined shaft DIN5480 (W70x3x22x7h)</td>
<td>Long taper keyed shaft - 95.2 key slot</td>
</tr>
<tr>
<td><strong>HMC125 &amp; HMC200</strong></td>
<td>Parallel keyed 85mm diameter shaft</td>
<td>Splined shaft 20 teeth BS3550</td>
<td>Splined shaft 16 teeth BS3550</td>
<td>Long taper keyed shaft - 133.4 key slot</td>
</tr>
<tr>
<td><strong>HMC270 &amp; HMC325</strong></td>
<td>Parallel keyed 85mm diameter shaft</td>
<td>Splined shaft 20 teeth BS3550</td>
<td>Splined shaft DIN5480 (W80x4x21x7h)</td>
<td>Long taper keyed shaft - 133.4 key slot</td>
</tr>
</tbody>
</table>

Note:
For installations where the shaft is vertically upwards specify "V" after the shaft type designator so as to ensure that an additional high level drain port is provided within the front cover of the motor.

## 1-3 Main Port Connections

<table>
<thead>
<tr>
<th>Product type</th>
<th>P</th>
<th>S</th>
<th>Z</th>
<th>Z2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HMC030</strong></td>
<td>As per HMC045</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>HMC045</strong></td>
<td>1¼&quot; symmetrical ports with through-holes for manifold connection</td>
<td>1¼&quot; SAE 4-bolt flange</td>
<td>1¼&quot; SAE 4-bolt flange</td>
<td></td>
</tr>
<tr>
<td><strong>HMC080</strong></td>
<td>1¼&quot; symmetrical ports with through-holes for manifold connection</td>
<td>1¼&quot; SAE 4-bolt flange</td>
<td>1¼&quot; SAE 4-bolt flange</td>
<td></td>
</tr>
<tr>
<td><strong>HMC125</strong></td>
<td>1¼&quot; symmetrical ports with through-holes for manifold connection</td>
<td>1¼&quot; SAE 4-bolt flange</td>
<td>1¼&quot; SAE 4-bolt flange</td>
<td></td>
</tr>
<tr>
<td><strong>HMC200</strong></td>
<td>1¼&quot; symmetrical ports with through-holes for manifold connection</td>
<td>1¼&quot; SAE 4-bolt flange</td>
<td>1¼&quot; SAE 4-bolt flange</td>
<td></td>
</tr>
<tr>
<td><strong>HMC270</strong></td>
<td>1¼&quot; SAE code 62 4-bolt flange</td>
<td>1¼&quot; SAE code 62 4-bolt flange</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>HMC325</strong></td>
<td>1¼&quot; SAE code 62 4-bolt flange</td>
<td>1¼&quot; SAE code 62 4-bolt flange</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

See pages 42 to 80 for full dimensional details
1-4 Special Features

<table>
<thead>
<tr>
<th>Feature</th>
<th>Page</th>
<th>HMC030</th>
<th>HMC045</th>
<th>HMC080</th>
<th>HMC125</th>
<th>HMC200</th>
<th>HMC270</th>
<th>HMC325</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Pressure Shaft Seal</td>
<td>9</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Improved Shaft Seal Life</td>
<td>10</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Improved Cavitation Resistance</td>
<td>11</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Anti-pooling Bolt Heads</td>
<td>12</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Increased Starting Torque</td>
<td>13</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Anti-clockwise Rotation</td>
<td>15</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Thermal Shock Resistance</td>
<td>16</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Drain Port Adaptor - ½” BSPP</td>
<td>18</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>• 2.1mm Mounting Holes</td>
<td>19</td>
<td>○</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>• 2.2mm Mounting Holes</td>
<td>19</td>
<td>○</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Marine specification Primer Paint</td>
<td>20</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>

Available ○ Not available

If a motor is to be ordered with any special features listed, please contact Kawasaki.

High Pressure Shaft Seal

Description:
> > 10 bar rated
> Recommended for cold climates
> Rugged steel and PTFE construction

Technical Information
Where crankcase pressure will be higher than 3.5 bar, the high pressure shaft seal should be selected.

<table>
<thead>
<tr>
<th>Case pressure</th>
<th>≤ 10 bar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-operating temperature limits</td>
<td>Below -30°C and above 120°C</td>
</tr>
<tr>
<td>Minimum operating temperature</td>
<td>-15°C</td>
</tr>
<tr>
<td>Maximum operating temperature</td>
<td>80°C</td>
</tr>
<tr>
<td>Minimum viscosity</td>
<td>2000 cSt</td>
</tr>
<tr>
<td>Maximum viscosity</td>
<td>150 cSt</td>
</tr>
</tbody>
</table>

Applicable to:

<table>
<thead>
<tr>
<th>HMC030</th>
<th>HMC045</th>
<th>HMC080</th>
<th>HMC125</th>
<th>HMC200</th>
<th>HMC270</th>
<th>HMC325</th>
</tr>
</thead>
<tbody>
<tr>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>

Please contact Kawasaki to order this feature.
1-4 Special Features

Improved Shaft Seal Life

**Description:**
- Stainless steel sleeve prevents corrosion
- Improved wear resistance
- Recommended for corrosive environments

**Technical Information**
A well-established method of increasing rotary seal life in corrosive environments is to fit a thin-walled, stainless steel sleeve to the rotating shaft to provide a corrosion-resistant, wear-resistant counterface surface for the seal to run against. All HMC motors can be fitted with such sleeves upon request.

<table>
<thead>
<tr>
<th>Sleeve material</th>
<th>A304/301 Stainless Steel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sleeve surface finish</td>
<td>R, 0.25 to 0.5 μm (10 to 20 μm)</td>
</tr>
</tbody>
</table>

**Applicable to:**

<table>
<thead>
<tr>
<th>HMC030</th>
<th>HMC045</th>
<th>HMC080</th>
<th>HMC125</th>
<th>HMC200</th>
<th>HMC270</th>
<th>HMC325</th>
</tr>
</thead>
<tbody>
<tr>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>

Please contact Kawasaki to order this feature.

1-4 Special Features

Improved Cavitation Resistance

**Description:**
- Recommended for overrunning applications
- Protects against seal damage for short periods of operation in vacuum inlet conditions.

Cavitation can occur due to many different factors. Although it is not possible to make the HMC motor resistant to cavitation, certain features can be added to improve the motor’s resistance to short periods of lost port pressure.

In applications where the HMC motor can be driven (like a pump) a risk arises that insufficient fluid will be provided to maintain a positive pressure at both main ports of the motor causing cavitation. The results of extended running at these conditions can be catastrophic to the motor’s function.

The improved cavitation resistance feature should be considered where:
- Overrunning conditions may occur (load driving the motor)
- Loss of main port pressure while motor is rotating

**Applicable to:**

<table>
<thead>
<tr>
<th>HMC030</th>
<th>HMC045</th>
<th>HMC080</th>
<th>HMC125</th>
<th>HMC200</th>
<th>HMC270</th>
<th>HMC325</th>
</tr>
</thead>
<tbody>
<tr>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>

Please contact Kawasaki to order this feature.
1-4 Special Features

Anti-pooling Bolt Heads

**Description:**
- Removes potential for water pooling
- Improved corrosion resistance
- Recommended for marine environments

Technical Information

In many marine applications, water pooling in socket head cap screw heads presents a significant corrosion risk. Corroded cap screws can make service and repair of affected units impossible.

To significantly reduce the risk of water damage through pooling, HMC motors can be supplied with silicone filler in all the bolt heads.

**Applicable to:**

<table>
<thead>
<tr>
<th>HMC030</th>
<th>HMC045</th>
<th>HMC080</th>
<th>HMC125</th>
<th>HMC200</th>
<th>HMC270</th>
<th>HMC325</th>
</tr>
</thead>
<tbody>
<tr>
<td>🔹</td>
<td>🔹</td>
<td>🔹</td>
<td>🔹</td>
<td>🔹</td>
<td>🔹</td>
<td>🔹</td>
</tr>
</tbody>
</table>

Please contact Kawasaki to order this feature.

1-4 Special Features

Increased Starting Torque

**Description:**
- Optimised for high break-out torque
- Recommended for low speed operation
- Improved service life for low speed applications

Technical Information

If an application demands the drive motor be run at speeds of less than 10 rpm for most of the duty cycle, or involves frequent start/stop or forward/reverse operation, the Staffa HMC motor range has it covered.

By optimising the HMC motor’s design for low speeds, it is possible to increase the break out torque and low speed mechanical efficiency performance.

All figures given in Section 2-1 Performance Data are still valid when selecting this feature.
1-4 Special Features

Increasing Starting Torque (cont)

Volumetric Performance

In order to achieve increased torque at low speeds the volumetric characteristics of the motor performance are changed.

When calculating leakage and volumetric efficiency use the constants shown here in place of those given for the standard motor on page 29.

<table>
<thead>
<tr>
<th>Motor Type</th>
<th>Geometric Displacement</th>
<th>Zero Speed Constant</th>
<th>Speed Constant</th>
<th>Creep Speed Constant</th>
<th>Crankcase Leakage Constant</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>cc/rev</td>
<td>K1</td>
<td>K2</td>
<td>K3</td>
<td>K4</td>
</tr>
<tr>
<td>HMC030</td>
<td>492</td>
<td>11.66</td>
<td></td>
<td>17.42</td>
<td>10.26</td>
</tr>
<tr>
<td>HMC045</td>
<td>737</td>
<td>13.36</td>
<td>47.80</td>
<td>12.26</td>
<td>10.76</td>
</tr>
<tr>
<td>HMC080</td>
<td>1,639</td>
<td>16.26</td>
<td>45.70</td>
<td>9.65</td>
<td>14.66</td>
</tr>
<tr>
<td>HMC125</td>
<td>2,048</td>
<td>12.86</td>
<td>38.50</td>
<td>4.55</td>
<td>11.01</td>
</tr>
<tr>
<td>HMC200</td>
<td>3,087</td>
<td>12.86</td>
<td>38.50</td>
<td>3.02</td>
<td>11.01</td>
</tr>
<tr>
<td>HMC270</td>
<td>4,588</td>
<td>13.26</td>
<td>37.30</td>
<td>2.41</td>
<td>12.76</td>
</tr>
<tr>
<td>HMC325</td>
<td>5,326</td>
<td>13.26</td>
<td>40.00</td>
<td>2.08</td>
<td>12.76</td>
</tr>
</tbody>
</table>

Applicable to:

HMC030  HMC045  HMC080  HMC125  HMC200  HMC270  HMC325
●  ●  ●  ●  ●  ●  ●

Please contact Kawasaki to order this feature.

1-4 Special Features

Anti-Clockwise Rotation

Description:

> Reduce installation complexity
> Standardise equipment designs

Technical Information

All HMC motors can be specified with an anti-clockwise rotation valve configuration. All performance and volumetric characteristics remain unchanged.

Applicable to:

HMC030  HMC045  HMC080  HMC125  HMC200  HMC270  HMC325
●  ●  ●  ●  ●  ●  ●

Please contact Kawasaki to order this feature.
1-4 Special Features

Thermal Shock Resistance

Description:
- Recommended for cold climates
- Optimised for start-up in freezing temperatures
- Engineered for total peace of mind

Technical Information
Starting up a cold system with warm hydraulic fluid is a known cause of heavy wear and potential seizure of hydraulic machinery. To minimise this potential risk, the HMC motor can be configured to combat thermal shocks to give complete peace of mind when operating in very cold climates.

Volumetric Performance
In order to provide thermal shock resistance the volumetric characteristics of the motor performance are changed. When calculating leakage and volumetric efficiency use the constants shown on the next page in place of those given for the standard motor on page 29.

All figures given in Section 2-1 Performance Data are still valid when selecting this feature.

Note:
When operating at low temperature, consideration must be given to the guidance notes in Section 2-8 Motor Operation at Low Temperature (see page 37).

1-4 Special Features (cont)

Thermal Shock Resistance (cont)

<table>
<thead>
<tr>
<th>Motor Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>HMC080</td>
</tr>
<tr>
<td>HMC125</td>
</tr>
<tr>
<td>HMC200</td>
</tr>
<tr>
<td>HMC270</td>
</tr>
<tr>
<td>HMC325</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Volumetric Performance</th>
<th>Geometric Displacement</th>
<th>Zero Speed Constant</th>
<th>Speed Constant</th>
<th>Creep Speed Constant</th>
<th>Crankcase Leakage Constant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor Type</td>
<td>cc/rev</td>
<td>K1</td>
<td>K2</td>
<td>K3</td>
<td>K4</td>
</tr>
<tr>
<td>HMC080</td>
<td>1,639</td>
<td>11.10</td>
<td>45.70</td>
<td>6.99</td>
<td>7.90</td>
</tr>
<tr>
<td>HMC125</td>
<td>2,048</td>
<td>7.70</td>
<td>38.50</td>
<td>3.78</td>
<td>4.25</td>
</tr>
<tr>
<td>HMC200</td>
<td>3,087</td>
<td>7.98</td>
<td>38.50</td>
<td>2.61</td>
<td>4.25</td>
</tr>
<tr>
<td>HMC270</td>
<td>4,588</td>
<td>8.38</td>
<td>37.30</td>
<td>1.91</td>
<td>6.00</td>
</tr>
<tr>
<td>HMC325</td>
<td>5,326</td>
<td>8.38</td>
<td>40.00</td>
<td>1.65</td>
<td>6.00</td>
</tr>
</tbody>
</table>

Applicable to:

<table>
<thead>
<tr>
<th>HMC030</th>
<th>HMC045</th>
<th>HMC080</th>
<th>HMC125</th>
<th>HMC200</th>
<th>HMC270</th>
<th>HMC325</th>
</tr>
</thead>
<tbody>
<tr>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>

Please contact Kawasaki to order this feature.
**1-4 Special Features**

**Drain Port Adaptors**

**Description:**
- Improves manufacturing logistics
- Motor supplied ready for connection to 1 1/2" BSPP male fitting

**Technical Information**

<table>
<thead>
<tr>
<th>Motor Type</th>
<th>Adaptor Supplied</th>
</tr>
</thead>
<tbody>
<tr>
<td>HMC030</td>
<td>½&quot; UNF 2B to ½&quot; BSPP</td>
</tr>
<tr>
<td>HMC045</td>
<td>½&quot; UNF 2B to ½&quot; BSPP</td>
</tr>
<tr>
<td>HMC080</td>
<td>½&quot; UNF 2B to ½&quot; BSPP</td>
</tr>
<tr>
<td>HMC125</td>
<td>¾&quot; UNF 2B to ½&quot; BSPP</td>
</tr>
<tr>
<td>HMC200</td>
<td>¾&quot; UNF 2B to ½&quot; BSPP</td>
</tr>
<tr>
<td>HMC270</td>
<td>¾&quot; UNF 2B to ½&quot; BSPP</td>
</tr>
<tr>
<td>HMC325</td>
<td>¾&quot; UNF 2B to ½&quot; BSPP</td>
</tr>
</tbody>
</table>

One or two drain adaptors can be supplied.

**Applicable to:**

- HMC030: ● ● ● ● ● ● ● ●
- HMC045: ● ● ● ● ● ● ● ●
- HMC080: ● ● ● ● ● ● ● ●
- HMC125: ● ● ● ● ● ● ● ●
- HMC200: ● ● ● ● ● ● ● ●
- HMC270: ● ● ● ● ● ● ● ●
- HMC325: ● ● ● ● ● ● ● ●

Please contact Kawasaki to order this feature.

**Mounting Hole Diameter**

**Description:**
- Matching mounting holes to bolts
- ø21mm and ø22mm options available

**Technical Information**

In different markets, different bolt standards are adopted which may not be best suited to the standard ø20 mm mounting hole diameter on the HMC motors. To give a correct fit and optimum installation, ø21 mm or ø22 mm holes can be selected on larger frame sizes.

**Applicable to:**

- HMC030: ○ ○ ● ● ● ● ● ●
- HMC045: ○ ○ ● ● ● ● ● ●
- HMC080: ○ ○ ● ● ● ● ● ●
- HMC125: ○ ○ ● ● ● ● ● ●
- HMC200: ○ ○ ● ● ● ● ● ●
- HMC270: ○ ○ ● ● ● ● ● ●
- HMC325: ○ ○ ● ● ● ● ● ●

Please contact Kawasaki to order this feature.
1-4 Special Features

Marine Specification Primer Paint

Description:
> Improves corrosion and water resistance of the finishing system
> Excellent adhesion strength
> Recommended for marine applications

Technical Information

<table>
<thead>
<tr>
<th>Colour</th>
<th>Red oxide</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Single pack epoxy etching primer</td>
</tr>
<tr>
<td>Standard</td>
<td>BS 3900 part A 8</td>
</tr>
<tr>
<td>Dry film thickness</td>
<td>&gt; 12 μm</td>
</tr>
</tbody>
</table>

Applicable to:

<table>
<thead>
<tr>
<th>HMC030</th>
<th>HMC045</th>
<th>HMC080</th>
<th>HMC125</th>
<th>HMC200</th>
<th>HMC270</th>
<th>HMC325</th>
</tr>
</thead>
<tbody>
<tr>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>

Please contact Kawasaki to order this feature.

2-1 Performance Data

Performance data is valid for the range of HMC motors when fully run-in and operating with mineral oil.

The appropriate motor displacements can be selected using performance data shown on pages 22 to 28. Refer to the table on this page for pressures and speed limits when using fire-resistant fluids.

Rating definitions

Continuous rating

For continuous duty the motor must be operating within each of the maximum values for speed, pressure and power.

Intermittent rating

Intermittent max pressure: 275 bar.

This pressure is allowable on the following basis:

a) Up to 50 rpm 15% duty for periods up to 5 minutes maximum.

b) Over 50 rpm 2% duty for periods up to 30 seconds maximum.

Static pressure to DNV rules 380 bar.

Intermittent power rating

This is permitted on a 15% duty basis for periods up to 5 minutes maximum.

Limits for fire resistant fluids

<table>
<thead>
<tr>
<th>Fluid Type</th>
<th>Continuous Pressure (bar)</th>
<th>Intermittent Pressure (bar)</th>
<th>Max Speed (rpm)</th>
<th>Model Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>HFA 5/95 oil-in-water emulsion</td>
<td>130</td>
<td>138</td>
<td>50% of limits of mineral oil</td>
<td>All models</td>
</tr>
<tr>
<td>HFB 60/40 water-in-oil emulsion</td>
<td>138</td>
<td>172</td>
<td>As for mineral oil</td>
<td>All models</td>
</tr>
<tr>
<td>HFC water glycol</td>
<td>103</td>
<td>138</td>
<td>50% of limits of mineral oil</td>
<td>All models</td>
</tr>
<tr>
<td>HFD phosphate ester</td>
<td>250</td>
<td>293</td>
<td>As for mineral oil</td>
<td>All models</td>
</tr>
</tbody>
</table>
### 2-1 Performance Data (cont)

#### HMC030 Motor (see page 30 for power calculation limits)

<table>
<thead>
<tr>
<th>Displacement Code</th>
<th>30</th>
<th>27</th>
<th>24</th>
<th>21</th>
<th>18</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Displacement</td>
<td>cc/rev</td>
<td>492</td>
<td>442</td>
<td>393</td>
<td>344</td>
<td>295</td>
</tr>
<tr>
<td>Average actual running torque</td>
<td>Nm/bar</td>
<td>6.86</td>
<td>6.08</td>
<td>5.3</td>
<td>4.59</td>
<td>3.88</td>
</tr>
<tr>
<td>Average actual mechanical efficiency</td>
<td>%</td>
<td>87.6</td>
<td>86.4</td>
<td>84.7</td>
<td>83.8</td>
<td>82.6</td>
</tr>
<tr>
<td>Average actual starting efficiency</td>
<td>%</td>
<td>82.8</td>
<td>81.4</td>
<td>79.6</td>
<td>77.1</td>
<td>73.9</td>
</tr>
<tr>
<td>Max continuous speed</td>
<td>rpm</td>
<td>450</td>
<td>500</td>
<td>525</td>
<td>550</td>
<td>575</td>
</tr>
<tr>
<td>Max continuous power</td>
<td>kW</td>
<td>60</td>
<td>60</td>
<td>55</td>
<td>49</td>
<td>42</td>
</tr>
<tr>
<td>Max intermittent power</td>
<td>kW</td>
<td>66</td>
<td>66</td>
<td>61</td>
<td>55</td>
<td>48</td>
</tr>
<tr>
<td>Max continuous pressure</td>
<td>bar</td>
<td>207</td>
<td>207</td>
<td>207</td>
<td>207</td>
<td>207</td>
</tr>
<tr>
<td>Max intermittent pressure</td>
<td>bar</td>
<td>241</td>
<td>241</td>
<td>241</td>
<td>241</td>
<td>241</td>
</tr>
</tbody>
</table>

Data shown is at 207 bar. Intermediate displacements can be made available to special order.

* See page 34: small displacements.

#### HMC045 Motor (see page 30 for power calculation limits)

<table>
<thead>
<tr>
<th>Displacement Code</th>
<th>45</th>
<th>40</th>
<th>35</th>
<th>30</th>
<th>25</th>
<th>20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Displacement</td>
<td>cc/rev</td>
<td>737</td>
<td>655</td>
<td>573</td>
<td>492</td>
<td>410</td>
</tr>
<tr>
<td>Average actual running torque</td>
<td>Nm/bar</td>
<td>10.63</td>
<td>9.4</td>
<td>8.04</td>
<td>6.88</td>
<td>5.68</td>
</tr>
<tr>
<td>Average actual mechanical efficiency</td>
<td>%</td>
<td>90.6</td>
<td>90.2</td>
<td>88.2</td>
<td>87.9</td>
<td>87.0</td>
</tr>
<tr>
<td>Average actual starting efficiency</td>
<td>%</td>
<td>84.5</td>
<td>83.0</td>
<td>81.1</td>
<td>78.4</td>
<td>74.9</td>
</tr>
<tr>
<td>Max continuous speed</td>
<td>rpm</td>
<td>450</td>
<td>550</td>
<td>600</td>
<td>600</td>
<td>600</td>
</tr>
<tr>
<td>Max continuous power</td>
<td>kW</td>
<td>99</td>
<td>89</td>
<td>79</td>
<td>67</td>
<td>65</td>
</tr>
<tr>
<td>Max intermittent power</td>
<td>kW</td>
<td>119</td>
<td>107</td>
<td>95</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>Max continuous pressure</td>
<td>bar</td>
<td>250</td>
<td>250</td>
<td>250</td>
<td>250</td>
<td>250</td>
</tr>
<tr>
<td>Max intermittent pressure</td>
<td>bar</td>
<td>275</td>
<td>275</td>
<td>275</td>
<td>275</td>
<td>275</td>
</tr>
</tbody>
</table>

Data shown is at 250 bar. Intermediate displacements can be made available to special order.

* A crankcase flushing flow of 15 l/min is required when freewheeling at 1,500 rpm.

#### HMC030 Motor

<table>
<thead>
<tr>
<th>Displacement Code</th>
<th>12</th>
<th>09</th>
<th>06</th>
<th>03</th>
<th>00</th>
<th>00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Displacement</td>
<td>cc/rev</td>
<td>197</td>
<td>147</td>
<td>98</td>
<td>49</td>
<td>0</td>
</tr>
<tr>
<td>Average actual running torque</td>
<td>Nm/bar</td>
<td>251</td>
<td>183</td>
<td>115</td>
<td>0.44</td>
<td>0</td>
</tr>
<tr>
<td>Average actual mechanical efficiency</td>
<td>%</td>
<td>80.1</td>
<td>78.2</td>
<td>73.7</td>
<td>56.4</td>
<td>0</td>
</tr>
<tr>
<td>Average actual starting efficiency</td>
<td>%</td>
<td>62.6</td>
<td>51.6</td>
<td>29.1</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>Max continuous speed</td>
<td>rpm</td>
<td>600</td>
<td>600</td>
<td>600</td>
<td>600</td>
<td>1,000</td>
</tr>
<tr>
<td>Max continuous power</td>
<td>kW</td>
<td>27</td>
<td>20</td>
<td>10</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Max intermittent power</td>
<td>kW</td>
<td>32</td>
<td>24</td>
<td>13</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Max continuous pressure</td>
<td>bar</td>
<td>207</td>
<td>207</td>
<td>207</td>
<td>17&quot;</td>
<td>17&quot;</td>
</tr>
<tr>
<td>Max intermittent pressure</td>
<td>bar</td>
<td>241</td>
<td>241</td>
<td>241</td>
<td>17&quot;</td>
<td>17&quot;</td>
</tr>
</tbody>
</table>

Data shown is at 207 bar. Intermediate displacements can be made available to special order.

* See page 34: small displacements.

** A crankcase flushing flow of 15 l/min is required when freewheeling at 1,500 rpm.
### HMC080 Motor
#### Displacement Code
- **97.6** 1,600
- **90** 1,475
- **85** 1,393
- **80** 1,311
- **75** 1,229
- **70** 1,147
- **65** 1,065
- **60** 983
- **55** 901
- **50** 819

<table>
<thead>
<tr>
<th>Displacement Code</th>
<th>97.6</th>
<th>90</th>
<th>85</th>
<th>80</th>
<th>75</th>
<th>70</th>
<th>65</th>
<th>60</th>
<th>55</th>
<th>50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Displacement cc/rev</td>
<td>1,600</td>
<td>1,475</td>
<td>1,393</td>
<td>1,311</td>
<td>1,229</td>
<td>1,147</td>
<td>1,065</td>
<td>983</td>
<td>901</td>
<td>819</td>
</tr>
<tr>
<td>Average actual running torque Nm/bar</td>
<td>23.9</td>
<td>22.0</td>
<td>20.75</td>
<td>19.5</td>
<td>18.25</td>
<td>17.02</td>
<td>15.78</td>
<td>14.55</td>
<td>13.2</td>
<td>12.0</td>
</tr>
<tr>
<td>Average actual mechanical efficiency %</td>
<td>93.9</td>
<td>93.7</td>
<td>93.6</td>
<td>93.5</td>
<td>93.3</td>
<td>93.2</td>
<td>93.1</td>
<td>93.0</td>
<td>92.1</td>
<td>92.1</td>
</tr>
<tr>
<td>Average actual starting efficiency %</td>
<td>87.1</td>
<td>86.0</td>
<td>85.2</td>
<td>84.3</td>
<td>83.3</td>
<td>80.8</td>
<td>80.8</td>
<td>79.2</td>
<td>77.4</td>
<td>75.1</td>
</tr>
<tr>
<td>Max continuous speed (S03/F3/FM3) rpm</td>
<td>270</td>
<td>300</td>
<td>320</td>
<td>340</td>
<td>365</td>
<td>390</td>
<td>420</td>
<td>450</td>
<td>475</td>
<td>500</td>
</tr>
<tr>
<td>Max continuous pressure bar</td>
<td>250</td>
<td>250</td>
<td>250</td>
<td>250</td>
<td>250</td>
<td>250</td>
<td>250</td>
<td>250</td>
<td>250</td>
<td>250</td>
</tr>
<tr>
<td>Max intermittent pressure bar</td>
<td>275</td>
<td>275</td>
<td>275</td>
<td>275</td>
<td>275</td>
<td>275</td>
<td>275</td>
<td>275</td>
<td>275</td>
<td>275</td>
</tr>
</tbody>
</table>

**Data shown is at 250 bar. Intermediate displacements can be made available to special order.**

### HMC125 Motor
#### Displacement Code
- **125** 2,048
- **120** 1,966
- **110** 1,802
- **100** 1,639
- **90** 1,475
- **80** 1,311
- **70** 1,147
- **60** 983

<table>
<thead>
<tr>
<th>Displacement Code</th>
<th>125</th>
<th>120</th>
<th>110</th>
<th>100</th>
<th>90</th>
<th>80</th>
<th>70</th>
<th>60</th>
</tr>
</thead>
<tbody>
<tr>
<td>Displacement cc/rev</td>
<td>2,048</td>
<td>1,966</td>
<td>1,802</td>
<td>1,639</td>
<td>1,475</td>
<td>1,311</td>
<td>1,147</td>
<td>983</td>
</tr>
<tr>
<td>Average actual running torque Nm/bar</td>
<td>29.9</td>
<td>28.7</td>
<td>26.3</td>
<td>23.6</td>
<td>21.0</td>
<td>18.3</td>
<td>15.7</td>
<td>12.8</td>
</tr>
<tr>
<td>Average actual mechanical efficiency %</td>
<td>91.7</td>
<td>91.7</td>
<td>90.5</td>
<td>90.5</td>
<td>89.5</td>
<td>87.7</td>
<td>86.0</td>
<td>81.8</td>
</tr>
<tr>
<td>Average actual starting efficiency %</td>
<td>80.2</td>
<td>79.2</td>
<td>74.3</td>
<td>74.3</td>
<td>71.1</td>
<td>67.0</td>
<td>61.8</td>
<td>54.9</td>
</tr>
<tr>
<td>Max continuous speed (S03/F3/FM3) rpm</td>
<td>270</td>
<td>300</td>
<td>320</td>
<td>340</td>
<td>365</td>
<td>390</td>
<td>420</td>
<td>450</td>
</tr>
<tr>
<td>Max continuous pressure bar</td>
<td>250</td>
<td>250</td>
<td>250</td>
<td>250</td>
<td>250</td>
<td>250</td>
<td>250</td>
<td>250</td>
</tr>
<tr>
<td>Max intermittent pressure bar</td>
<td>275</td>
<td>275</td>
<td>275</td>
<td>275</td>
<td>275</td>
<td>275</td>
<td>275</td>
<td>275</td>
</tr>
</tbody>
</table>

**Data shown is at 250 bar. Intermediate displacements can be made available to special order.**

*See page 34: small displacements.

**A crankcase flushing flow of 15 l/min is required when freewheeling at 1,500 rpm.**
### HMC200 Motor

(see page 30 for power calculation limits)

<table>
<thead>
<tr>
<th>Displacement Code</th>
<th>80</th>
<th>70</th>
<th>60</th>
<th>50</th>
<th>40</th>
<th>30</th>
<th>20</th>
<th>10</th>
<th>5</th>
<th>0</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Displacement</td>
<td>cc/rev</td>
<td>1.311</td>
<td>1.150</td>
<td>0.983</td>
<td>0.820</td>
<td>0.655</td>
<td>0.492</td>
<td>0.328</td>
<td>0.164</td>
<td>0.052</td>
<td>0.000</td>
</tr>
<tr>
<td>Average actual running torque</td>
<td>Nm/bar</td>
<td>18.3</td>
<td>15.7</td>
<td>12.8</td>
<td>10.6</td>
<td>8.1</td>
<td>5.9</td>
<td>3.8</td>
<td>0.6</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Average actual mechanical efficiency</td>
<td>%</td>
<td>87.7</td>
<td>85.8</td>
<td>83.1</td>
<td>77.7</td>
<td>70.3</td>
<td>52.8</td>
<td>33.2</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Average actual starting efficiency</td>
<td>%</td>
<td>66.1</td>
<td>61.1</td>
<td>54.8</td>
<td>45.7</td>
<td>32.1</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>Max continuous speed (S03/F3/FM3) rpm</td>
<td>340</td>
<td>390</td>
<td>450</td>
<td>500</td>
<td>600</td>
<td>630</td>
<td>630</td>
<td>630</td>
<td>1,000</td>
<td>1,000</td>
<td>1,500**</td>
</tr>
<tr>
<td>Max continuous speed (S04/F4/FM4) rpm</td>
<td>430</td>
<td>460</td>
<td>485</td>
<td>515</td>
<td>545</td>
<td>575</td>
<td>600</td>
<td>630</td>
<td>1,000</td>
<td>1,000</td>
<td>1,500**</td>
</tr>
<tr>
<td>Max continuous power</td>
<td>kW</td>
<td>98</td>
<td>88</td>
<td>81</td>
<td>72</td>
<td>62</td>
<td>48</td>
<td>25</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Max intermittent power</td>
<td>kW</td>
<td>110</td>
<td>99</td>
<td>91</td>
<td>81</td>
<td>70</td>
<td>54</td>
<td>33</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Max continuous pressure</td>
<td>bar</td>
<td>250</td>
<td>250</td>
<td>250</td>
<td>250</td>
<td>250</td>
<td>250</td>
<td>250</td>
<td>17</td>
<td>17</td>
<td>17</td>
</tr>
<tr>
<td>Max intermittent pressure</td>
<td>bar</td>
<td>275</td>
<td>275</td>
<td>275</td>
<td>275</td>
<td>275</td>
<td>275</td>
<td>275</td>
<td>17</td>
<td>17</td>
<td>17</td>
</tr>
</tbody>
</table>

Data shown is at 250 bar. Intermediate displacements can be made available to special order.

* See page 34: small displacements.
** A crankcase flushing flow of 15 l/min is required when freewheeling at 1,500 rpm.

### HMC270 Motor

(see page 30 for power calculation limits)

<table>
<thead>
<tr>
<th>Displacement Code</th>
<th>280</th>
<th>250</th>
<th>220</th>
<th>200</th>
<th>180</th>
<th>160</th>
<th>140</th>
<th>120</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average actual running torque</td>
<td>Nm/bar</td>
<td>69.4</td>
<td>61.9</td>
<td>53.9</td>
<td>49</td>
<td>43.6</td>
<td>38.3</td>
<td>33.2</td>
<td>27.9</td>
</tr>
<tr>
<td>Average actual mechanical efficiency</td>
<td>%</td>
<td>95.0</td>
<td>94.9</td>
<td>93.9</td>
<td>93.9</td>
<td>92.9</td>
<td>91.8</td>
<td>90.9</td>
<td>89.2</td>
</tr>
<tr>
<td>Average actual starting efficiency</td>
<td>%</td>
<td>84.7</td>
<td>83.8</td>
<td>82.7</td>
<td>81.8</td>
<td>80.6</td>
<td>79.2</td>
<td>77.3</td>
<td>74.9</td>
</tr>
<tr>
<td>Max continuous speed</td>
<td>rpm</td>
<td>150</td>
<td>160</td>
<td>170</td>
<td>175</td>
<td>210</td>
<td>230</td>
<td>275</td>
<td>310</td>
</tr>
<tr>
<td>Max continuous power</td>
<td>kW</td>
<td>189</td>
<td>176</td>
<td>161</td>
<td>150</td>
<td>139</td>
<td>128</td>
<td>116</td>
<td>104</td>
</tr>
<tr>
<td>Max intermittent power</td>
<td>kW</td>
<td>213</td>
<td>198</td>
<td>181</td>
<td>169</td>
<td>156</td>
<td>144</td>
<td>132</td>
<td>120</td>
</tr>
<tr>
<td>Max continuous pressure</td>
<td>bar</td>
<td>250</td>
<td>250</td>
<td>250</td>
<td>250</td>
<td>250</td>
<td>250</td>
<td>250</td>
<td>250</td>
</tr>
<tr>
<td>Max intermittent pressure</td>
<td>bar</td>
<td>275</td>
<td>275</td>
<td>275</td>
<td>275</td>
<td>275</td>
<td>275</td>
<td>275</td>
<td>275</td>
</tr>
</tbody>
</table>

Data shown is at 250 bar. Intermediate displacements can be made available to special order.

* See page 34: small displacements.
** A crankcase flushing flow of 15 l/min is required when freewheeling at 1,500 rpm.
2-1 Performance Data (cont)

HMC325 Motor (see page 30 for power calculation limits)

<table>
<thead>
<tr>
<th>Displacement Code</th>
<th>325</th>
<th>310</th>
<th>300</th>
<th>280</th>
<th>250</th>
<th>220</th>
<th>200</th>
<th>180</th>
<th>160</th>
<th>140</th>
<th>120</th>
</tr>
</thead>
<tbody>
<tr>
<td>Displacement cc/rev</td>
<td>5,326</td>
<td>5,080</td>
<td>4,916</td>
<td>4,588</td>
<td>4,097</td>
<td>3,605</td>
<td>3,277</td>
<td>2,950</td>
<td>2,622</td>
<td>2,294</td>
<td>1,966</td>
</tr>
<tr>
<td>Average actual running torque Nm/bar</td>
<td>80.4</td>
<td>76.6</td>
<td>74.1</td>
<td>69.1</td>
<td>61.6</td>
<td>53.9</td>
<td>49</td>
<td>43.6</td>
<td>38.3</td>
<td>33.2</td>
<td>27.9</td>
</tr>
<tr>
<td>Average actual mechanical efficiency %</td>
<td>94.8</td>
<td>94.7</td>
<td>94.7</td>
<td>96.4</td>
<td>94.5</td>
<td>93.9</td>
<td>94.0</td>
<td>92.9</td>
<td>91.8</td>
<td>90.9</td>
<td>89.2</td>
</tr>
<tr>
<td>Average actual starting efficiency %</td>
<td>85.7</td>
<td>85.4</td>
<td>85.2</td>
<td>84.7</td>
<td>83.8</td>
<td>82.7</td>
<td>81.8</td>
<td>80.6</td>
<td>75.2</td>
<td>77.3</td>
<td>74.9</td>
</tr>
<tr>
<td>Max continuous speed rpm</td>
<td>130</td>
<td>135</td>
<td>140</td>
<td>150</td>
<td>160</td>
<td>170</td>
<td>190</td>
<td>215</td>
<td>230</td>
<td>275</td>
<td>330</td>
</tr>
<tr>
<td>Max continuous power kW</td>
<td>189</td>
<td>189</td>
<td>189</td>
<td>189</td>
<td>176</td>
<td>161</td>
<td>150</td>
<td>139</td>
<td>128</td>
<td>116</td>
<td>104</td>
</tr>
<tr>
<td>Max intermittent power kW</td>
<td>213</td>
<td>213</td>
<td>213</td>
<td>213</td>
<td>198</td>
<td>181</td>
<td>169</td>
<td>156</td>
<td>144</td>
<td>132</td>
<td>120</td>
</tr>
<tr>
<td>Max continuous pressure bar</td>
<td>250</td>
<td>250</td>
<td>250</td>
<td>250</td>
<td>250</td>
<td>250</td>
<td>250</td>
<td>250</td>
<td>250</td>
<td>250</td>
<td>250</td>
</tr>
<tr>
<td>Max intermittent pressure bar</td>
<td>275</td>
<td>275</td>
<td>275</td>
<td>275</td>
<td>275</td>
<td>275</td>
<td>275</td>
<td>275</td>
<td>275</td>
<td>275</td>
<td>275</td>
</tr>
</tbody>
</table>

Data shown is at 250 bar. Intermediate displacements can be made available to special order.

* See page 34 for small displacements.

** A crankcase flushing flow of 15 l/min is required when freewheeling at 1,500 rpm.

2-2 Volumetric Efficiency Data

<table>
<thead>
<tr>
<th>Motor Type</th>
<th>Geometric Displacement</th>
<th>Zero Speed Constant</th>
<th>Speed Constant</th>
<th>Creep Speed Constant</th>
<th>Crankcase Leakage Constant</th>
</tr>
</thead>
<tbody>
<tr>
<td>HMC030</td>
<td>492</td>
<td>490</td>
<td>*</td>
<td>10.00</td>
<td>3.50</td>
</tr>
<tr>
<td>HMC045</td>
<td>737</td>
<td>6.60</td>
<td>47.80</td>
<td>8.50</td>
<td>4.00</td>
</tr>
<tr>
<td>HMC080</td>
<td>1,639</td>
<td>6.00</td>
<td>45.70</td>
<td>5.80</td>
<td>7.90</td>
</tr>
<tr>
<td>HMC125</td>
<td>2.048</td>
<td>6.10</td>
<td>38.50</td>
<td>3.00</td>
<td>4.25</td>
</tr>
<tr>
<td>HMC200</td>
<td>3.087</td>
<td>6.10</td>
<td>39.50</td>
<td>2.00</td>
<td>4.20</td>
</tr>
<tr>
<td>HMC270</td>
<td>4.588</td>
<td>6.50</td>
<td>37.30</td>
<td>1.50</td>
<td>6.00</td>
</tr>
<tr>
<td>HMC325</td>
<td>5.326</td>
<td>6.50</td>
<td>40.00</td>
<td>1.30</td>
<td>6.00</td>
</tr>
</tbody>
</table>

Qt (total leakage) = \[(K_1 + n/K_2) \times \Delta P \times K_v \times 0.005\] l/min
Creep speed = \[K_3 \times \Delta P \times K_v \times 0.005\] rpm
Crankcase leakage = \[K_4 \times \Delta P \times K_v \times 0.005\] l/min
\(\Delta P\) = differential pressure bar
\(n\) = speed rpm

The motor volumetric efficiency can be calculated as follows:

Volumetric efficiency (%) = \[(\text{speed} \times \text{disp.}) / (\text{speed} \times \text{disp.}) + \text{Qt}\] \times 100

Example:

HMC200 motor with displacement of 3.087 l/rev.
Speed 60 rpm
Differential pressure 200 bar
Fluid viscosity 50 cSt

Total leakage = \[(K_1 + n/K_2) \times \Delta P \times K_v  \times 0.005\] l/min
= \[(6.1 + 60/38.5) \times 200 \times 1 \times 0.005\] l/min
= 7.7 l/min

Volumetric efficiency = \[((60 \times 3.087) - 7.7) / (60 \times 3.087)\] \times 100
= 96.9%
2-3 Shaft Power Calculation

**Example**

Firstly, to find the maximum differential pressure ΔP at rated speed:

Select the rated shaft power (W) for the motor from the performance data table (page 24). This is presented in kilowatts so must be converted to watts (x1000).

Then also take the Actual Average running torque in Nm/bar (Tₐ) and the rated shaft speed in rpm (n).

\[
W = \frac{Tₐ \cdot ΔP \cdot 2\pi \cdot n}{60}
\]

Or to find maximum ΔP then use:

\[
ΔP = \frac{60 \cdot W}{2\pi \cdot Tₐ \cdot n}
\]

**HMC270 Example** - with a displacement code of 280:

- Rated shaft power (W): 189,000
- Average actual running torque (Nm/bar): 69.4
- Rated shaft speed (rpm): 150

\[
ΔP = \frac{60 \times 189,000}{2\pi \times 69.4 \times 150}
\]

ΔP = 174 bar (max)

Secondly, to find the maximum speed at rated pressure (using the same information as before):

\[
n = \frac{60 \cdot W}{2\pi \cdot Tₐ \cdot ΔP}
\]

Rated pressure (bar):

\[
n = \frac{60 \times 189,000}{2\pi \times 69.4 \times 250}
\]

n = 104 rpm (max)

In summary, operating the motor within its shaft power limit, at rated speed, would give a maximum pressure of 174 bar, and operating the motor at rated pressure, would give a maximum speed of 104 rpm.

**Notes**

1) The maximum calculated speed is based on a rated inlet pressure of 250 bar.
2) The maximum shaft power is only allowable if the motor drain temperature remains below 80°C.
3) The maximum calculated differential pressure assumes that the low pressure motor port is less than 30 bar.

2-4 Functional Symbols

**Example model code:**

**HMC***/P/***/*FM3/X/...**

X - external pilot supply to 'X' and 'Y' ports

**Example model code:**

**HMC***/P/***/*FM3/C/...**

C - single external supply to PC port

There is a single port (PC) in the 'C' spacer.

Pressure ports in FM3 & FM4 valve housings can be called up as special features when required.
2-5 Stress Limits

When applying large external radial loads, consideration should also be given to motor bearing lives (see page 33).

<table>
<thead>
<tr>
<th>Motor Frame Size</th>
<th>Maximum External Radial Bending Moment [Nm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>HMC030</td>
<td>2,600</td>
</tr>
<tr>
<td>HMC045</td>
<td>3,300</td>
</tr>
<tr>
<td>HMC080</td>
<td>4,500</td>
</tr>
<tr>
<td>HMC125</td>
<td>6,500</td>
</tr>
<tr>
<td>HMC200</td>
<td>6,750</td>
</tr>
<tr>
<td>HMC270</td>
<td>8,250</td>
</tr>
<tr>
<td>HMC325</td>
<td>8,250</td>
</tr>
</tbody>
</table>

Example:

Determine the maximum radial shaft load of a HMC080 motor:

Radial load offset, \( A \) = 100 mm

Maximum radial load, \( W \) = 4,500 (see table)/100 = 45kN (4,587 kg)

\[ W = \text{Side load (N)} \]

\[ A = \text{Distance from mounting face to load centre (mm)} \]

[Note]
The offset distance \( A \) is assumed to be greater than 50 mm. Contact KPM UK if this is not the case.

2-6 Bearing Life Notes

Consideration should be given to the required motor bearing life in terms of bearing service life. The factors that will determine bearing life include:

1) Duty cycle - time spent on and off load
2) Speed
3) Differential pressure
4) Fluid viscosity
5) External radial shaft load
6) External axial shaft load
2-7 Circuit and Application Notes

**Limits for fire resistant fluids**
To select either displacement, a pressure at least equal to 67% of the motor inlet/outlet pressure (whichever is higher) is required. In most applications the motor inlet pressure will be used. If the inlet/outlet pressure is below 3.5 bar, a minimum control pressure of 3.5 bar is required. In the event of loss of control pressure the motor will shift to its highest displacement.

**Starting torque**
Refer to performance data, (see pages 7 to 13).

**Low speed operation**
The minimum operating speed is determined by load inertia, drive elasticity, motor displacement and system internal leakage. If the application speed is below 3 rpm, consult KPM UK.

If possible, always start the motor in high displacement.

**Small displacements**
The pressures given in the tables on pages 22 to 28 for displacement code “00” are based on 1,000 rpm output shaft speed. This pressure can be increased for shaft speeds less than 1,000 rpm; consult KPM UK for details. Speeds greater than 1,000 rpm may be applied but only after the machine duty cycle has been considered in conjunction with KPM UK. A zero swept volume displacement (for freewheeling requirements) is available on request; consult KPM UK.

**High back pressure**
When both inlet and outlet ports are pressurised continuously, the lower pressure port must not exceed 70 bar at any time. Note that high back pressure reduces the effective torque output of the motor.

**Boost pressure**
When operating as a motor the outlet pressure should equal or exceed the crankcase pressure. If pumping occurs (i.e. overrunning loads) then a positive pressure, “P”, is required at the motor ports. Calculate “P” (bar) from the operating formula Boost Formula

\[ P = k \times N^2 + C \]

Where P is in bar, N = motor speed (rpm), V = motor displacement (cc/rev), C = Crankcase pressure (bar) and K = a constant from the table below.

### Motorcase pressure
The motorcase pressure should not continuously exceed 3.5 bar with a standard shaft seal fitted. On installations with long drain lines a relief valve is recommended to prevent over-pressurising the seal.

#### Notes
1. The motorcase pressure at all times must not exceed either the motor inlet or outlet pressure.
2. High pressure shaft seals are available to special order for casing pressures of 10 bar continuous and 15 bar intermittent.
3. Check installation dimensions (pages 27 to 67) for maximum motorcase drain fitting depth.

### Hydraulic Fluids
Dependent on motor (see model code fluid type - page 3) suitable fluids include:

- **a)** Antwear hydraulic oils
- **b)** Phosphate ester (HFD fluids)
- **c)** Water glycols (HFC fluids)
- **d)** 60/40% water-in-oil emulsions (HFB fluids)
- **e)** 5/95% oil-in-water emulsions (HFA fluids)

Reduce pressure and speed limits, as per table on page 21.

### Mineral oil recommendations
The fluid should be a good hydraulic grade, non-detergent Mineral Oil. It should contain anti-oxidant, antifoam and demulsifying additives. It must contain antiwear or EP additives. Automatic transmission fluids and motor oils are not recommended.

### Biodegradable Fluid Recommendations
Well-designed environmentally acceptable lubricants (EALs) may be used with Staffa motors. The EAL must be designed for use in hydraulic systems and have a synthetic ester base. Additives should be as listed for mineral oils, above. The performance of EALs with hydraulic systems vary widely and so checks for seal compatibility, copper alloy compatibility, oxidation resistance and lubrication properties should be carried out before selecting an EAL. For help with EALs please contact KPM UK.
2-7 Circuit and Application Notes (cont)

Temperature limits

Ambient min.  -30°C (-22°F)
Ambient max.  +70°C (158°F)
Max. operating temperature range:
Mineral oil  Water containing
Min. -20°C (-4°F)  +10°C (50°F)
Max. +80°C (176°F)  +54°C (130°F)

Note: To obtain optimum service life from both fluid and hydraulic systems components, a fluid operating temperature of 40°C is recommended.

Filtration

Full flow filtration (open circuit), or full boost flow filtration (close circuit) to ensure system cleanliness to ISO 4406/1986 code 18/14 or cleaner.

Noise levels

The airborne noise level is less than 66.7 dB(A) DIN & dB(A) NFPA through the “continuous” operating envelope. Where noise is a critical factor, installation resonances can be reduced by isolating the motor by elastomeric means from the structure and the return line installation. Potential return line resonances originating from liquid borne noise can be further attenuated by providing a return line back pressure of 2 to 5 bars.

Polar moment of inertia and mass table

<table>
<thead>
<tr>
<th>Motor Frame Size</th>
<th>Displacement code</th>
<th>Polar Moment of Inertia (kg.m²) (Typical data)</th>
<th>Mass (kg) (Approx. all models)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HMC030</td>
<td>30</td>
<td>0.0120</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>0.0094</td>
<td></td>
</tr>
<tr>
<td>HMC045</td>
<td>45</td>
<td>0.0440</td>
<td>150</td>
</tr>
<tr>
<td></td>
<td>30</td>
<td>0.0410</td>
<td></td>
</tr>
<tr>
<td>HMC080</td>
<td>90</td>
<td>0.0520</td>
<td>172</td>
</tr>
<tr>
<td></td>
<td>45</td>
<td>0.0440</td>
<td></td>
</tr>
<tr>
<td>HMC125</td>
<td>125</td>
<td>0.2000</td>
<td>235</td>
</tr>
<tr>
<td></td>
<td>50</td>
<td>0.1400</td>
<td></td>
</tr>
<tr>
<td>HMC200</td>
<td>188</td>
<td>0.2300</td>
<td>282</td>
</tr>
<tr>
<td></td>
<td>75</td>
<td>0.1800</td>
<td></td>
</tr>
<tr>
<td>HMC270</td>
<td>280</td>
<td>0.4900</td>
<td>450</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>0.4700</td>
<td></td>
</tr>
<tr>
<td>HMC325</td>
<td>325</td>
<td>0.5000</td>
<td>460</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>0.4700</td>
<td></td>
</tr>
</tbody>
</table>

2-8 Motor Operation at Low Temperature

When operating the motor at low temperature consideration should be given to the fluid viscosity. The maximum fluid viscosity before the shaft should be turned is 2,000 cSt. The maximum fluid viscosity before load is applied to the motor shaft is 150 cSt.

If low ambient temperature conditions exist, then a crankcase flushing flow of at least 5 l/min should be applied to the motor during periods when the motor is not in use.

The shaft seal temperature limits for both medium and high pressure applications are shown in the table below.

<table>
<thead>
<tr>
<th>Non-operating temperature limits</th>
<th>Minimum operating temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard pressure shaft seal</td>
<td>below minus 40°C and above 100°C</td>
</tr>
<tr>
<td>High pressure shaft seal</td>
<td>below minus 30°C and above 120°C</td>
</tr>
</tbody>
</table>

All seals are very brittle below minus 40°C and are likely to break very easily and due to their sluggish response may not provide a 100% leak free condition.

It should be noted that the maximum continuous operating temperature within the motor crankcase is plus 80°C.
2-9 Crankcase Drain Connections

◆ Motor axis - horizontal
The recommended minimum pipe size for drain line lengths up to approx. 5m is 12.0 mm (½”) bore. Longer drain lines should have their bore size increased to keep the crankcase pressure within limits.

Connect to a drain port above motor centre line

◆ Motor axis - vertical shaft up
Specify "V" within the model code for extra drain port, G¼" (BSPF). Connect this port into the main drain line downstream of a 0.35 bar check valve to ensure good bearing lubrication. The piping arrangement must not allow syphoning from the motorcase. (Refer to installation drawing for details).

◆ Motor axis - vertical shaft down
The piping, from any drain port, must be taken above the level of the motorcase to ensure good bearing lubrication. The arrangement must not allow syphoning from the motorcase.

2-10 Freewheeling Notes

All Staffa motors can be used in freewheeling applications. In all circumstances it is essential that the motor is unloaded ("A" and "B" ports connected together) and that the circuit is boosted. The required boost pressure is dependent on both the speed and displacement conditions of the motor determined by the maximum overrunning load condition (see boost pressure calculation method on page 19).

It should be noted that for "B" motors large flows will re-circulate around the motor. This will require a large recirculating valve and consideration of circuit cooling as the motor will be generating a braking torque. It is for these reasons that "C" series motors are the preferred option for freewheeling applications. It is normal to select displacement codes 00, 05 or 10.

Selecting the lowest zero displacement option (00) will allow the motor shaft to be rotated at high speed without pumping fluid and with a minimum boost and drive torque requirement. Consideration must also be given when freewheeling that the load does not drive the motor above its rated freewheeling speed condition. (See pages 22 to 28).

◆ Displacement selection
Under all operating conditions the control pressure port should be at least 67% of the motor inlet/outlet pressure whichever is the higher.

A minimum control pressure at the low displacement selection port of 3.5 bar is necessary to ensure that the motor remains in its minimum displacement condition. A separate pressure supply may be necessary to ensure this condition is always maintained. It should be noted that with the loss of control pressure, the motor will shift to its high displacement condition, which could result in damage to the motor.

◆ Boost requirement
The minimum required boost pressure as noted above can be ascertained utilising the calculation method shown on page 19. The maximum motor and control pressure at 100 rpm is 17 bar and must not be exceeded since higher pressures will increase motor losses at the conrod slipper interface and valve assembly and thereby will significantly increase the motor operating temperature.

The boost flow required should be sufficient to make-up circuit leakage loss and provide cooling for recirculating flow pressure drop.

◆ Crankcase cooling
A crankcase flushing flow of up to 15 l/min can be used to control and reduce the temperature rise of the motor during the freewheel operation.

This should not be necessary for speeds below 1,000 rpm.

For speeds above this up to 1,500 rpm then crankcase flushing flow must be used.
2-11 Constant Pressure Regulator (CP)

Introduction

The constant pressure regulator control has been developed for the HMC dual displacement motor series. Whereas the standard dual displacement motor operates only at either maximum or minimum displacement, the constant pressure regulator continually adjusts the motor displacement within the selected displacement range so as to keep the hydraulic inlet pressure constant. In order to provide an infinite smooth and controllable displacement change an enhanced low friction crankshaft assembly with anti-scuffing features is utilised.

Description

A constant pressure regulated motor incorporates a pressure sensing control (CP in model code) which senses and responds to variations in motor inlet pressure. Changes in inlet pressure from a chosen, preset value cause the control to direct oil to the relevant displacement piston chamber within the crankshaft, thereby altering displacement so as to maintain the inlet motor pressure constant.

The factory preset pressure of this valve is matched to the specific power requirements of the application.

An optional ISO4401, size 3 override valve (CHP in the model code) can be incorporated which enables high and low displacements to be selected individually.

It should be noted that for inlet pressures below 7 bar, independent of the preset pressure setting, the motor will stay in its fail safe high displacement condition. An increasing pressure thereafter will instantaneously force the motor to its low displacement condition after which the constant pressure regulation will commence.

Consult KPM UK for further details.

2-12 Installation Data

General

Spigot

The motor should be located by the mounting spigot on a flat, robust surface using correctly sized bolts. The diametrical clearance between the motor spigot and the mounting must not exceed 0.15 mm. If the application incurs shock loading, frequent reversing or high speed running, then high tensile bolts should be used, including one fitted bolt.

Bolt Torque

The recommended torque wrench setting for bolts is as follows:

<table>
<thead>
<tr>
<th>Diameter</th>
<th>Torque (Nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M18</td>
<td>312 +/- 7</td>
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<tr>
<td>5/8&quot; UNF</td>
<td>265 +/- 14</td>
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<tr>
<td>M20</td>
<td>407 +/- 14</td>
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<tr>
<td>3/4&quot; UNF</td>
<td>393 +/- 14</td>
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Shaft coupling:

Where the motor is solidly coupled to a shaft having independent bearings the shaft must be aligned to within 0.13 mm TIR.

Motor axis - horizontal

The crankcase drain must be taken from a position above the horizontal centre line of the motor, (refer to installation drawing for details).

Motor axis - vertical shaft up

The recommended minimum pipe size for drain line lengths up to approx. 5 m is 12.0 mm as an internal diameter. If using longer drain lines, then increase the pipe internal bore diameter to keep the motorcase pressure within specified limits.

Specify “V” in the model code for extra drain port, G¼” (BSPF). Connect this port into main drain line downstream of a 0.35 bar check valve.

Motor axis - vertical shaft down

Piping (from any drain port) must be taken above level of motorcase.

Bearing lubrication - piping

The installation arrangement must not allow syphoning from the motorcase. Where this is not practical, please consult KPM UK.

Any of the drain port positions can be used, but the drain line should be run above the level of the uppermost bearing and if there is risk of syphoning then a syphon breaker should be fitted.

Start - up

Fill the crankcase with system fluid. Where practical, a short period (30 minutes) of "running in" should be carried out with the motor unloaded and set to its high displacement.
3 Dimensions

Conversion Table

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<td>0.264 US</td>
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<tr>
<td>1</td>
<td>0.219 UK</td>
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</table>

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<th></th>
</tr>
</thead>
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<td>inch</td>
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<tr>
<td>25.4</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

3-1 HMC030 (cont)

- ’F3’ & ’FM3’ Valve Housings

SPLINE DATA

’S’
- TO BS 3550 (ANSI B92.1 CLASS 5)
- FLAT ROOT SIDE FT, CLASS 1
- PRESSURE ANGLE 30°
- NUMBER OF TEETH 17
- PITCH 8/16
- MAJOR DIAMETER 56.41/56.29
- FORM DIAMETER 50.70
- MINOR DIAMETER 50.0/49.90
- PIN DIAMETER 6.096
- DIAMETER OVER PINS 62.984/62.931

’Z’
- DIN 5480 W55 x 3 x 17 x 7h

’ZZ’
- DIN 5480 W60 x 3 x 18 x 7h
3-1 HMC030 (cont)

'C', 'CS' & 'X' C Spacers

Installation

Types C & CS Displacement Control

Type X Displacement Control

Mounting Interface for Directional Control
Value - ID 4401 SIZE 02/400 SIZE 03/02

Displacement Selection Value is Noted with Motor; Specify & Order Separately

Connection to P Port 1/2" BSP x 15
Full周边 Integral Supplied Plugged

Displacement Selection
High Displacement: P to R, A to Y
Low Displacement: P to A, B to Y

5 Holes #10, equally spaced
Shown on 4-3/8" P.C.D. Spotfaced to Give an Effective #35

Holes #10

Reverse Port Connections for Opposite Direction of Shaft Rotation

Flow Direction for All LVH Models Except F3/FM3

SEE C-SPACERS

CS Type Shuttle on F3 & FM3 Assemblies Only
3-2 HMC045

• 'P', 'S', 'Z' & 'Z2' Shafts

**SPLINE DATA**

**'S'**
- TO BS 3550 (ANSI B92.1 CLASS 5)
- FLAT ROOT SIDE FIT, CLASS 1
- PRESSURE ANGLE 30°
- NUMBER OF TEETH 17
- PITCH 8/18
- MAJOR DIAMETER 56.41/56.29
- FORM DIAMETER 50.70
- MINOR DIAMETER 50.05/49.60
- PIN DIAMETER 6.096
- DIAMETER OVER PINS 62.984/62.931

**'Z'**
- DIN 5480 W55 x 3 x 17 x 7h

**'Z2'**
- DIN 5480 W60 x 3 x 18 x 7h
3-2 HMC045 (cont)

-F3' & 'FM3' Valve Housings

-MOUNTING FACE

PORT FLANGE BOLT TAPPING SIZE -
F3: 7/16"-14 UNC-2B X 27 FULL THREAD DEPTH
FM3: M12 X P1.75 X 27 FULL THREAD DEPTH

H3 HOLE, SET TABLE FOR THREAD SIZES

-MOUNTING FACE

3-2 HMC045 (cont)

-'C', 'CS' & 'X' C Spacers

-MOUNTING FACE

DISPLACEMENT SELECTION
HIGH DISPLACEMENT: F to B: A to 1
LOW DISPLACEMENT: P to A: 8 to 1

REMOTELY LOCATED VALVE
HIGH DISPLACEMENT: F to Y: X to 1
LOW DISPLACEMENT: P to X: Y to 1

NOT SUPPLIED WITH MOTOR, SPECIFY & ORDER SEPARATELY

CS TYPE SHUTTLE ON F3 & FM3 ASSEMBLIES ONLY
**3-2 HMC045 (cont)**

**Installation**

3/4"-UNF-2B DRAIN (CHOICE OF 3 POSITIONS)
(2 NORMALLY PLUGGED)

**NOTE:** ENSURE ON INSTALLATION THAT DRAIN IS
TAKEN FROM ABOVE MOTOR CENTRELINE.
DO NOT EXCEED 12 DEPTH OF COUPLING
IN TO DRAIN PORT.

---

**3-3 HMC080**

**'P', 'S' & 'Z' Shafts**

**SPLINE DATA**

- **'S'**
  - TO BS 3550 (ANSI B92.1 CLASS 5)
  - FLAT ROOT SIDE FIT, CLASS 1
  - PRESSURE ANGLE 30°
  - NUMBER OF TEETH 14
  - PITCH 6/12
  - MAJOR DIAMETER 62.553/62.425
  - FORM DIAMETER 55.052
  - MINOR DIAMETER 54.084/53.525
  - PIN DIAMETER 8.128
  - DIAMETER OVER PINS 71.593/71.544

- **'Z'**
  - DIN 5480 W70 x 3 x 30 x 22 x 7h

---

**MOUNTING FACE**

- KEY SUPPLIED
  - 18.037/18.019 WIDE
  - 11.99/11.94 THICK

- 1/2"-20 UNF-2B X 32 FULL THREAD DEPTH
3-3 HMC080 (cont)

- 'F3' & 'FM3' Valve Housings

- 'F4' & 'FM4' Valve Housings
3-3 HMC080 (cont)

- 'C', 'CS' & 'X' C Spacers

- Installation

- Displacement Selection:
  - 'C': Not Supplied with Motor, Specify & Order Separately
  - 'CS': Not Supplied with Motor, Specify & Order Separately
  - 'X': Not Supplied with Motor, Specify & Order Separately

- 3/4"-18UNF-2B Drain (Choice of 3 Positions)
  - Normal Flows Plugged
  - Ensure on Installation that Drain is Taken from Above Motor Centreline.
  - Do Not Exceed 12 Depth of Coupling in to Drain Port

- Reverse Port Connections for Opposite Direction of Shaft Rotation

- Flow Direction for All AV & HS Variants

- 5 Holes #20 Equi-Spaced as Shown on A 337.735 P.C.D. Spotted
  - Use an Effective #40

- See C-Spacers

- CS4 Type Shuttle Endcap on F4 & FM4 Assemblies Only

- CS4 Type Shuttle on F3 & FM3 Assemblies Only
**3-4 HMC125**

- **'P1', 'S3' & 'Z3' Shafts**

- **'T' Shaft**

---

**SPLINE DATA**

<table>
<thead>
<tr>
<th>Type</th>
<th>Value</th>
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<td>NUMBER OF TEETH</td>
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<td>PITCH</td>
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<td>MAJOR DIAMETER</td>
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<td>FORM DIAMETER</td>
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<tr>
<td>MINOR DIAMETER</td>
<td>79.485/78.925</td>
</tr>
<tr>
<td>PIN DIAMETER</td>
<td>8.126</td>
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<tr>
<td>DIAMETER OVER PINS</td>
<td>97.084/97.030</td>
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</tbody>
</table>

**DIMENSIONS**

- **'P1'**
  - KEY SUPPLIED
  - 24.066/24.000 WIDE
  - 16.05/16.00 THICK
  - 3/4"-16 UNF - 2B X 32
  - FULL THREAD DEPTH

- **'S3' & 'Z3'**
  - 76 MIN STRAIGHT
  - 3/4"-16 UNF - 2B X 32
  - FULL THREAD DEPTH

- **'T'**
  - KEY SUPPLIED
  - 22.27/22.22 WIDE
  - 15.92/15.87 THICK
  - 1/4"-20 x 60 LG HEX HEAD SCREW
  - BASIC TAPER, ON DIAMETER 0.100/0.0999 PER inch

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**NOTES**

- DIN 5480 WB5 x 3 x 27 x 7h
3-4 HMC125 (cont)

- 'SM3' Valve Housing

![Diagram of 'SM3' Valve Housing]

3-4 HMC125 (cont)

- 'F3' & 'FM3' Valve Housings

![Diagram of 'F3' & 'FM3' Valve Housings]
3-4 HMC125 (cont)

- ‘F4’ & ‘FM4’ Valve Housings

- ‘C’, ‘CS’ & ‘X’ C Spacers
3-4 HMC125 (cont)

Installation

3/8"-16 UNF-2B DRILL (CHOICE OF 3 POSITIONS)
(2 NORMALLY PLUGGED)

NOTE - ENSURE ON INSTALLATION THAT DRILL IS TAKEN FROM ABOVE MOTOR CENTRELINE.
DON'T EXCEED 12 DEPTH OF COUPLING IN 12 DRAIN PORT.

SPLINE DATA

'S'

- TO BS 3550 (ANSI B92.1, CLASS 5)
- FLAT ROOT SIDI 0.7, CLASS 1
- PRESSURE ANGLE 30°
- NUMBER OF TEETH 20
- PITCH 6.12
- MAJOR DIAMETER 87.953/87.825
- FORM DIAMETER 80.264
- MINOR DIAMETER 79.485/78.925
- PIN DIAMETER 8.128
- DIAMETER OVER PINS 97.084/97.030

'Z'

- DIN 5480 W85 x 3 x 27 x 7h

3-5 HMC200

'P1', 'S3' & 'Z3' Shafts

MOUNTING FACE

KEY SUPPLIED -
- 24.06E/24.06E WIDE
- 16.05/18.00 THICK
- 3/4"-16 UNF-2B X 32 FULL THREAD DEPTH
- 76 MIN STRAIGHT
- 3/4"-16 UNF-2B X 32 FULL THREAD DEPTH
3-5 HMC200 (cont)

'T' Shaft

3-5 HMC200 (cont)

'SM3' Valve Housing
3-5 HMC200 (cont)

- 'F3' & 'FM3' Valve Housings

- 'F4' & 'FM4' Valve Housings
3-5 HMC200 (cont)

- ‘C’, ‘CS’ & ‘X’ C Spacers

- Installation

- Displacement Control
- Type X
- Types C & CS

- Connection to P Ports
- Mounting Interface for Directional Control
- Mounting Interface for Displacement

- CS Type Shuttle Endcap on F4 & FM4 Assemblies Only

- CS Type Shuttle on F3 & FM3 Assemblies Only

- 3/4"-18 NSF-20 Drain (Choice of 3 Positions)
- 2 Normally Plugged

- Note - Ensure on installation that drain is taken from above motor centerline.
  Do not exceed 12 depth of coupling in to drain port.

- Reverse Port Connections
- Flow Direction
- Clockwise Direction of Rotation

- See C Spacers
3-6 HMC270

‘P1’, ‘S3’ & ‘Z4’ Shafts

SPLINE DATA
S
TO BS 3550 (ANS B92.1, CLASS 5)
PLAT ROOT SIDE PT, CLASS 1
PRESSURE ANGLE 30°
NUMBER OF TEETH 20
PITCH 6/12
MAJOR DIAMETER 87.953/87.825
FORM DIAMETER 80.764
MINOR DIAMETER 79.445/78.925
PIN DIAMETER 8.128
DIAMETER OVER PINS 97.084/97.030

T
DIN 5480 W90 x 4 x 21 x 7h

3-6 HMC270 (cont)

‘T’ Shaft

SPRING DATA
KEY SUPPLIED – 25.45/25.40 WIDE
17.539/17.463 THICK

26 MIN STRAIGHT

3/4”-18 UNF-2B X 32
FULL THREAD DEPTH
3-6 HMC270 (cont)

```
- 'F4' & 'FM4' Valve Housings
- C, 'CS' & 'X' C Spacers

F4/FM4 -
4" VALVE HOUSING WITH
# 1/2" SAE 4 BOLT FLANGES

PORT FLANGE BOLT TAPPING SIZE -
F4: 5/8"-11 UNC-2B X 35 FULL THREAD DEPTH
FM4: M16 X P2 X 35 FULL THREAD DEPTH

# 1/2" SAE (CODE 62)
PORTS (6000 SERIES)

8 HOLES - SEE TABLE FOR THREAD DEPTHS

PORT 1
PORT 2
PORT 3
PORT 4

MOUNTING FACE

3-6 HMC270 (cont)

DISPLACEMENT SELECTION VIA REMOTELY LOCATED VALVE:
LOW DISPLACEMENT: P TO X A TO T
HIGH DISPLACEMENT: P TO X B TO T

X: DISPLACEMENT SELECTION NOT SUPPLIED WITH MOTOR, SPECIFY & ORDER SEPARATELY

C & CS TYPES DISPLACEMENT CONTROL

ENDCAP ON F4 & FM4 ASSEMBLES ONLY
```
3-6 HMC270 (cont)

Installation

3/4"-18 UNF-2B drain (choice of 3 positions)

Note: Ensure drain is selected at top from above motor enclosure.

Do not exceed 12" depth of coupling in 1/2 drain port.

3-7 HMC325

‘P1’, ‘S3’ & ‘Z4’ Shafts

SPLINE DATA

S

To BS 3550 (ansi B92.1, class 5)

Flat root, class 1

Pressure angle 30°

Number of teeth 20

Pitch 6/12

Major diameter 87.953/87.825

Form diameter 90.264

Minor diameter 79.485/78.925

Pin diameter 8.128

Diameter over pins 97.034/97.030

Z

DIN 5480 W90 x 4 x 21 x 7h
3-7 HMC325 (cont)

- 'T' Shaft

- 'F4' & 'FM4' Valve Housings
**3-7 HMC325 (cont)**

- **C', 'CS' & 'X' C Spacers**

- **Installation**

**DISPLACEMENT SELECTION**
- Use displacement, 0 to 10, 0 to 10, 0 to 10
- Displacement selector value is not supplied with motor, specify & order separately.

**MOUNTING FACE**

- 3/4"-14 UNC-2B DRILL (choose of 3 positions)
- [Option A: Normally Plugged]

**NOTE:** Ensure on installation that drain is taken from above motor centerline.
Do not exceed 12 depth of coupling in 12 drain port.

**REVERSE PORT CONNECTIONS**
- For opposite direction of shaft rotation.

**SEE C-Spacers**

- CS Type Shuttle
- ENCAP on F4 & FM4 assemblies only.
3-12 Speed Sensing Options

**Tj speed sensor with Tk readout option**

**Tj Speed Sensor Technical Specification**

The Tj speed sensor is a hall effect dual channel speed probe that can provide feedback of both speed and direction.

- **Signal Outputs:** Square wave plus directional signal
- **Power Supply:** 8 to 32 V @ 40 mA
- **Protection class:** IP68
- **Output frequency:** 16 pulses/revolution

**Installation Details**

**Tk Output Module**

The Tk option consists of the Tj speed sensor together with the optional T401 output module.

The addition of the T401 module provides a software configured single channel tachometer and relay with a 0/4-20 mA analogue current output.

The software and calibration cable is also provided.
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Devon, PL5 2SA, England

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Fax: +44 1752 364816
Mail: info@kpm-uk.co.uk
Website: www.kpm-eu.com

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Website: www.flutek.co.kr

The specified data is for product description purposes only and may not be deemed to be guaranteed unless expressly confirmed in the contract.

Data sheet: M-2005/03.17