Description

The enhanced version of the standard C series motor includes special low friction components combined with crankcase flushing flow to achieve increased shaft power.

The range of HP motors extends from the HPC080 of 1600cc/rev to the HPC325 of 5326 cc/rev.

There are 5 frame sizes in this product range for performance details see table below;

<table>
<thead>
<tr>
<th>Motor Type</th>
<th>Max. torque @ 275 bar (Nm)</th>
<th>Continuous shaft power with flushing (kW)</th>
<th>Continuous shaft power without flushing (kW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HPC080</td>
<td>6630</td>
<td>165</td>
<td>138</td>
</tr>
<tr>
<td>HPC125</td>
<td>8470</td>
<td>202</td>
<td>135</td>
</tr>
<tr>
<td>HPC200</td>
<td>12980</td>
<td>261</td>
<td>174</td>
</tr>
<tr>
<td>HPC270</td>
<td>19280</td>
<td>278</td>
<td>189</td>
</tr>
<tr>
<td>HPC325</td>
<td>22440</td>
<td>278</td>
<td>189</td>
</tr>
</tbody>
</table>

Key Features

- Enhanced power performance
- Increased speed
- Improved starting and running efficiency
- Increased back pressure capability
  - High torques at low speed
  - Smooth running
  - Wide range of displacements to suit specific applications
  - Displacements change with ease when the motor is running
  - Electro-hydraulic or hydro-mechanical control methods available
  - Various mounting options available
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 HPC 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.

Note: To order the standard HMC series motor refer to bulletin data sheet M-1004
Performance data is valid for the range of HPC motors when fully run-in and operating with mineral oil.

The appropriate motor displacements can be selected using performance data shown on pages 4 to 8. Refer to the table on this page for pressures and speed limits when using fire-resistant fluids.

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 (r.p.m.)</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 petroleum 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 petroleum oil</td>
<td>All models</td>
</tr>
<tr>
<td>HFC water glycol</td>
<td>103</td>
<td>138</td>
<td>50% of limits of petroleum oil</td>
<td>All models</td>
</tr>
<tr>
<td>HFD phosphate ester</td>
<td>250</td>
<td>275</td>
<td>As for petroleum oil</td>
<td>All models</td>
</tr>
</tbody>
</table>

Specify make and type of fluid on your order if other than petroleum oil.

Rating definitions

Continuous rating
The motor must be operated 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 r.p.m. 15% duty for periods up to 5 minutes maximum.
(b) Over 50 r.p.m. 2% duty for periods up to 30 seconds maximum.

Static pressure to DNV rules 380 bar.
### Performance data

**HPC080 Motor** (Crankcase flushing required)

<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</td>
<td>cc/rev.</td>
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<td>1475</td>
<td>1393</td>
<td>1311</td>
<td>1229</td>
<td>1147</td>
<td>1065</td>
<td>983</td>
<td>901</td>
</tr>
<tr>
<td>Average actual running torque</td>
<td>Nm/bar</td>
<td>24.1</td>
<td>22.2</td>
<td>20.9</td>
<td>19.7</td>
<td>18.4</td>
<td>17.1</td>
<td>15.9</td>
<td>14.6</td>
<td>13.2</td>
</tr>
<tr>
<td>Average actual mechanical efficiency</td>
<td>%</td>
<td>94.5</td>
<td>94.5</td>
<td>94.3</td>
<td>94.2</td>
<td>94.0</td>
<td>93.8</td>
<td>93.5</td>
<td>93.0</td>
<td>92.2</td>
</tr>
<tr>
<td>Average actual start torque</td>
<td>Nm/bar</td>
<td>22.0</td>
<td>20.1</td>
<td>18.8</td>
<td>17.6</td>
<td>16.3</td>
<td>15.1</td>
<td>13.9</td>
<td>12.6</td>
<td>11.2</td>
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<tr>
<td>Average actual starting efficiency</td>
<td>%</td>
<td>86.2</td>
<td>85.7</td>
<td>84.9</td>
<td>84.1</td>
<td>83.4</td>
<td>82.6</td>
<td>81.5</td>
<td>80.1</td>
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<table>
<thead>
<tr>
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<th>655</th>
<th>574</th>
<th>492</th>
<th>410</th>
<th>328</th>
<th>246</th>
<th>164</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Displacement</td>
<td>cc/rev.</td>
<td>737</td>
<td>655</td>
<td>574</td>
<td>492</td>
<td>410</td>
<td>328</td>
<td>246</td>
<td>164</td>
</tr>
<tr>
<td>Average actual running torque</td>
<td>Nm/bar</td>
<td>10.6</td>
<td>9.3</td>
<td>8.0</td>
<td>6.6</td>
<td>5.3</td>
<td>4.1</td>
<td>2.8</td>
<td>1.6</td>
</tr>
<tr>
<td>Average actual mechanical efficiency</td>
<td>%</td>
<td>90.4</td>
<td>89.1</td>
<td>87.2</td>
<td>84.8</td>
<td>81.8</td>
<td>77.7</td>
<td>71.0</td>
<td>60.2</td>
</tr>
<tr>
<td>Average actual start torque</td>
<td>Nm/bar</td>
<td>8.5</td>
<td>7.2</td>
<td>5.9</td>
<td>4.5</td>
<td>3.3</td>
<td>2.0</td>
<td>0.7</td>
<td>/</td>
</tr>
<tr>
<td>Average actual starting efficiency</td>
<td>%</td>
<td>72.6</td>
<td>68.7</td>
<td>63.8</td>
<td>57.9</td>
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<table>
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<th>105</th>
<th>90</th>
<th>73</th>
<th>59</th>
<th>43</th>
<th>30</th>
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<th>0</th>
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<tbody>
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<td>Max continuous speed F3/FM3/SO3 valve assembly</td>
<td>r.p.m.</td>
<td>550</td>
<td>600</td>
<td>615</td>
<td>630</td>
<td>630</td>
<td>630</td>
<td>630</td>
<td>1500</td>
</tr>
<tr>
<td>Max continuous speed F4/FM4/SO4 valve assembly</td>
<td>r.p.m.</td>
<td>530</td>
<td>545</td>
<td>560</td>
<td>575</td>
<td>585</td>
<td>600</td>
<td>615</td>
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</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>
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</table>

Data shown is at 250 bar. Intermediate displacements can be made available to special order.
### HPC125 Motor (Crankcase flushing required)

<table>
<thead>
<tr>
<th>Displacement Code</th>
<th>125</th>
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<th>110</th>
<th>100</th>
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<th>70</th>
<th>60</th>
<th>50</th>
<th>40</th>
</tr>
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<td>1966</td>
<td>1802</td>
<td>1639</td>
<td>1475</td>
<td>1311</td>
<td>1147</td>
<td>983</td>
<td>819</td>
</tr>
<tr>
<td>Average actual running torque</td>
<td>Nm/bar</td>
<td>30.8</td>
<td>29.5</td>
<td>27.1</td>
<td>24.5</td>
<td>21.8</td>
<td>19.1</td>
<td>16.5</td>
<td>13.8</td>
<td>11.3</td>
</tr>
<tr>
<td>Average actual mechanical efficiency</td>
<td>%</td>
<td>94.5</td>
<td>94.4</td>
<td>94.3</td>
<td>94.0</td>
<td>93.0</td>
<td>91.7</td>
<td>90.3</td>
<td>88.5</td>
<td>86.5</td>
</tr>
<tr>
<td>Average actual start torque</td>
<td>Nm/bar</td>
<td>26.4</td>
<td>25.0</td>
<td>22.5</td>
<td>20.0</td>
<td>17.4</td>
<td>14.7</td>
<td>12.0</td>
<td>9.1</td>
<td>6.3</td>
</tr>
<tr>
<td>Average actual starting efficiency</td>
<td>%</td>
<td>81.0</td>
<td>80.1</td>
<td>78.4</td>
<td>76.6</td>
<td>74.2</td>
<td>70.6</td>
<td>65.4</td>
<td>58.1</td>
<td>48.3</td>
</tr>
<tr>
<td>Max continuous speed F3/FM3/SO3 valve assembly</td>
<td>r.p.m.</td>
<td>215</td>
<td>225</td>
<td>240</td>
<td>270</td>
<td>300</td>
<td>340</td>
<td>390</td>
<td>450</td>
<td>500</td>
</tr>
<tr>
<td>Max continuous speed F4/FM4/SO4 valve assembly</td>
<td>r.p.m.</td>
<td>300</td>
<td>310</td>
<td>340</td>
<td>365</td>
<td>400</td>
<td>430</td>
<td>460</td>
<td>490</td>
<td>515</td>
</tr>
<tr>
<td>Max continuous power F3/FM3/SO3 valve assembly</td>
<td>kW</td>
<td>173</td>
<td>173</td>
<td>171</td>
<td>170</td>
<td>157</td>
<td>147</td>
<td>123</td>
<td>101</td>
<td>86</td>
</tr>
<tr>
<td>Max continuous power F4/FM4/SO4 valve assembly</td>
<td>kW</td>
<td>202</td>
<td>196</td>
<td>183</td>
<td>171</td>
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<tr>
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<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>
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</table>

<table>
<thead>
<tr>
<th>Displacement Code</th>
<th>30</th>
<th>20</th>
<th>10</th>
<th>00</th>
</tr>
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<tbody>
<tr>
<td>Displacement</td>
<td>cc/rev.</td>
<td>492</td>
<td>328</td>
<td>164</td>
</tr>
<tr>
<td>Average actual running torque</td>
<td>Nm/bar</td>
<td>6.4</td>
<td>4.1</td>
<td>0.8</td>
</tr>
<tr>
<td>Average actual mechanical efficiency</td>
<td>%</td>
<td>81.6</td>
<td>78.0</td>
<td>30.0</td>
</tr>
<tr>
<td>Average actual start torque</td>
<td>Nm/bar</td>
<td>/</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>Average actual starting efficiency</td>
<td>%</td>
<td>/</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>Max continuous speed F3/FM3/SO3 valve assembly</td>
<td>r.p.m.</td>
<td>630</td>
<td>630</td>
<td>630</td>
</tr>
<tr>
<td>Max continuous speed F4/FM4/SO4 valve assembly</td>
<td>r.p.m.</td>
<td>575</td>
<td>600</td>
<td>630</td>
</tr>
<tr>
<td>Max continuous power F3/FM3/SO3 valve assembly</td>
<td>kW</td>
<td>48</td>
<td>30</td>
<td>5</td>
</tr>
<tr>
<td>Max continuous power F4/FM4/SO4 valve assembly</td>
<td>kW</td>
<td>48</td>
<td>30</td>
<td>5</td>
</tr>
<tr>
<td>Max continuous pressure</td>
<td>bar</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>
</tr>
</tbody>
</table>

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

#### HPC200 Motor
(Crankcase flushing required)

<table>
<thead>
<tr>
<th>Displacement Code</th>
<th>188</th>
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<th>170</th>
<th>160</th>
<th>150</th>
<th>140</th>
<th>130</th>
<th>120</th>
<th>110</th>
<th>100</th>
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<td>2950</td>
<td>2790</td>
<td>2620</td>
<td>2460</td>
<td>2290</td>
<td>2130</td>
<td>1970</td>
<td>1800</td>
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<tr>
<td>Average actual running torque</td>
<td>Nm/bar</td>
<td>47.2</td>
<td>45.2</td>
<td>42.6</td>
<td>40.0</td>
<td>37.3</td>
<td>34.7</td>
<td>32.0</td>
<td>29.4</td>
<td>26.7</td>
</tr>
<tr>
<td>Average actual mechanical efficiency</td>
<td>%</td>
<td>96.3</td>
<td>96.2</td>
<td>96.0</td>
<td>95.8</td>
<td>95.4</td>
<td>95.0</td>
<td>94.5</td>
<td>94.0</td>
<td>93.2</td>
</tr>
<tr>
<td>Average actual start torque</td>
<td>Nm/bar</td>
<td>42.6</td>
<td>40.6</td>
<td>38.0</td>
<td>35.5</td>
<td>33.0</td>
<td>30.6</td>
<td>28.0</td>
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<tr>
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<td>r.p.m.</td>
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<td>180</td>
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<td>200</td>
<td>205</td>
<td>210</td>
<td>225</td>
<td>240</td>
</tr>
<tr>
<td>Max continuous speed F4/FM4/SO4 valve assembly</td>
<td>r.p.m.</td>
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<td>235</td>
<td>240</td>
<td>245</td>
<td>250</td>
<td>265</td>
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<td>340</td>
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<td>kW</td>
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<td>213</td>
<td>212</td>
<td>204</td>
<td>195</td>
<td>186</td>
<td>176</td>
<td>173</td>
<td>171</td>
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<tr>
<td>Max continuous power F4/FM4/SO4 valve assembly</td>
<td>kW</td>
<td>261</td>
<td>261</td>
<td>261</td>
<td>247</td>
<td>234</td>
<td>222</td>
<td>208</td>
<td>196</td>
<td>183</td>
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<tr>
<td>Max continuous pressure</td>
<td>bar</td>
<td>250</td>
<td>250</td>
<td>250</td>
<td>250</td>
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<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>
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<table>
<thead>
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<th>50</th>
<th>40</th>
<th>30</th>
<th>20</th>
<th>10</th>
<th>00</th>
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<tbody>
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<td>Displacement</td>
<td>cc/rev.</td>
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<td>1311</td>
<td>1150</td>
<td>983</td>
<td>820</td>
<td>655</td>
<td>492</td>
<td>328</td>
<td>164</td>
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<td>Average actual running torque</td>
<td>Nm/bar</td>
<td>21.5</td>
<td>18.9</td>
<td>16.3</td>
<td>13.8</td>
<td>11.3</td>
<td>8.8</td>
<td>6.4</td>
<td>4.2</td>
<td>1.0</td>
</tr>
<tr>
<td>Average actual mechanical efficiency</td>
<td>%</td>
<td>91.5</td>
<td>90.5</td>
<td>89.4</td>
<td>88.0</td>
<td>86.3</td>
<td>84.5</td>
<td>82.4</td>
<td>80.0</td>
<td>40.0</td>
</tr>
<tr>
<td>Average actual start torque</td>
<td>Nm/bar</td>
<td>17.5</td>
<td>14.8</td>
<td>12.0</td>
<td>9.4</td>
<td>6.0</td>
<td>3.4</td>
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<td>/</td>
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<tr>
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<td>%</td>
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<td>65.9</td>
<td>60.1</td>
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<td>/</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>Max continuous speed F3/FM3/SO3 valve assembly</td>
<td>r.p.m.</td>
<td>300</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>
</tr>
<tr>
<td>Max continuous speed F4/FM4/SO4 valve assembly</td>
<td>r.p.m.</td>
<td>400</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>
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<tr>
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<td>kW</td>
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<td>147</td>
<td>123</td>
<td>101</td>
<td>86</td>
<td>65</td>
<td>48</td>
<td>30</td>
<td>5</td>
</tr>
<tr>
<td>Max continuous power F4/FM4/SO4 valve assembly</td>
<td>kW</td>
<td>157</td>
<td>147</td>
<td>123</td>
<td>101</td>
<td>86</td>
<td>65</td>
<td>48</td>
<td>30</td>
<td>5</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>
<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>
<td>275</td>
</tr>
</tbody>
</table>

Data shown is at 250 bar. Intermediate displacements can be made available to special order.
## HPC270 Motor (Crankcase flushing required)

### Displacement Code: 280, 250, 220, 200, 180, 160, 140, 120, 100, 80

<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>
<th>80</th>
</tr>
</thead>
<tbody>
<tr>
<td>Displacement</td>
<td>cc/rev.</td>
<td>4588</td>
<td>4097</td>
<td>3605</td>
<td>3277</td>
<td>2950</td>
<td>2622</td>
<td>2294</td>
<td>1966</td>
<td>1639</td>
</tr>
<tr>
<td>Average actual running torque</td>
<td>Nm/bar</td>
<td>70.1</td>
<td>62.3</td>
<td>54.5</td>
<td>49.3</td>
<td>44.3</td>
<td>39.0</td>
<td>33.8</td>
<td>28.6</td>
<td>23.5</td>
</tr>
<tr>
<td>Average actual mechanical efficiency</td>
<td>%</td>
<td>96.0</td>
<td>95.6</td>
<td>95.0</td>
<td>94.6</td>
<td>94.3</td>
<td>93.5</td>
<td>92.5</td>
<td>91.5</td>
<td>90.0</td>
</tr>
<tr>
<td>Average actual start torque</td>
<td>Nm/bar</td>
<td>64.0</td>
<td>56.6</td>
<td>48.9</td>
<td>43.6</td>
<td>38.4</td>
<td>33.2</td>
<td>28.3</td>
<td>23.5</td>
<td>19.0</td>
</tr>
<tr>
<td>Average actual starting efficiency</td>
<td>%</td>
<td>87.6</td>
<td>86.9</td>
<td>85.2</td>
<td>83.7</td>
<td>81.8</td>
<td>79.7</td>
<td>77.5</td>
<td>75.1</td>
<td>72.6</td>
</tr>
<tr>
<td>Max continuous speed</td>
<td>r.p.m.</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>
<td>375</td>
</tr>
<tr>
<td>Max continuous power</td>
<td>kW</td>
<td>278</td>
<td>261</td>
<td>241</td>
<td>225</td>
<td>208</td>
<td>192</td>
<td>174</td>
<td>156</td>
<td>133</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>
<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>
<td>275</td>
</tr>
</tbody>
</table>

### Displacement Code: 60, 40, 30, 20, 00

<table>
<thead>
<tr>
<th>Displacement Code</th>
<th>60</th>
<th>40</th>
<th>30</th>
<th>20</th>
<th>00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Displacement</td>
<td>cc/rev.</td>
<td>983</td>
<td>655</td>
<td>492</td>
<td>328</td>
</tr>
<tr>
<td>Average actual running torque</td>
<td>Nm/bar</td>
<td>13.4</td>
<td>8.6</td>
<td>6.3</td>
<td>4.0</td>
</tr>
<tr>
<td>Average actual mechanical efficiency</td>
<td>%</td>
<td>85.5</td>
<td>82.0</td>
<td>80.0</td>
<td>76.0</td>
</tr>
<tr>
<td>Average actual start torque</td>
<td>Nm/bar</td>
<td>9.1</td>
<td>4.3</td>
<td>1.9</td>
<td>/</td>
</tr>
<tr>
<td>Average actual starting efficiency</td>
<td>%</td>
<td>57.8</td>
<td>40.7</td>
<td>23.5</td>
<td>/</td>
</tr>
<tr>
<td>Max continuous speed</td>
<td>r.p.m.</td>
<td>460</td>
<td>490</td>
<td>515</td>
<td>545</td>
</tr>
<tr>
<td>Max continuous power</td>
<td>kW</td>
<td>85</td>
<td>48</td>
<td>39</td>
<td>21</td>
</tr>
<tr>
<td>Max continuous pressure</td>
<td>bar</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>
</tr>
</tbody>
</table>

Data shown is at 250 bar. Intermediate displacements can be made available to special order.
### HPC325 Motor (Crankcase flushing required)

<table>
<thead>
<tr>
<th>Displacement Code</th>
<th>325</th>
<th>310</th>
<th>300</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>Displacement</td>
<td>cc/rev.</td>
<td>5326</td>
<td>5080</td>
<td>4916</td>
<td>3605</td>
<td>3277</td>
<td>2950</td>
<td>2622</td>
<td>2294</td>
<td>1966</td>
</tr>
<tr>
<td>Average actual running torque</td>
<td>Nm/bar</td>
<td>81.6</td>
<td>77.8</td>
<td>75.2</td>
<td>54.5</td>
<td>49.3</td>
<td>44.1</td>
<td>38.8</td>
<td>33.6</td>
<td>28.5</td>
</tr>
<tr>
<td>Average actual mechanical efficiency</td>
<td>%</td>
<td>96.3</td>
<td>96.2</td>
<td>96.1</td>
<td>95.0</td>
<td>94.6</td>
<td>94.0</td>
<td>93.1</td>
<td>92.1</td>
<td>91.0</td>
</tr>
<tr>
<td>Average actual start torque</td>
<td>Nm/bar</td>
<td>74.5</td>
<td>71.1</td>
<td>68.7</td>
<td>49.0</td>
<td>43.9</td>
<td>38.8</td>
<td>33.8</td>
<td>28.8</td>
<td>24.0</td>
</tr>
<tr>
<td>Average actual starting efficiency</td>
<td>%</td>
<td>87.9</td>
<td>87.9</td>
<td>87.8</td>
<td>85.4</td>
<td>84.2</td>
<td>82.8</td>
<td>81.0</td>
<td>78.9</td>
<td>76.5</td>
</tr>
<tr>
<td>Max continuous speed</td>
<td>r.p.m.</td>
<td>130</td>
<td>135</td>
<td>140</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</td>
<td>kW</td>
<td>278</td>
<td>278</td>
<td>278</td>
<td>241</td>
<td>225</td>
<td>208</td>
<td>192</td>
<td>174</td>
<td>156</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>
<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>
<td>275</td>
</tr>
</tbody>
</table>

### HPC325 Motor (Crankcase flushing required)

<table>
<thead>
<tr>
<th>Displacement Code</th>
<th>95</th>
<th>80</th>
<th>60</th>
<th>40</th>
<th>30</th>
<th>00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Displacement</td>
<td>cc/rev.</td>
<td>1557</td>
<td>1311</td>
<td>983</td>
<td>655</td>
<td>492</td>
</tr>
<tr>
<td>Average actual running torque</td>
<td>Nm/bar</td>
<td>22.0</td>
<td>18.2</td>
<td>13.2</td>
<td>8.5</td>
<td>6.3</td>
</tr>
<tr>
<td>Average actual mechanical efficiency</td>
<td>%</td>
<td>88.8</td>
<td>87.2</td>
<td>84.6</td>
<td>81.6</td>
<td>80.0</td>
</tr>
<tr>
<td>Average actual start torque</td>
<td>Nm/bar</td>
<td>18.1</td>
<td>14.8</td>
<td>9.0</td>
<td>4.2</td>
<td>1.9</td>
</tr>
<tr>
<td>Average actual starting efficiency</td>
<td>%</td>
<td>73.0</td>
<td>70.7</td>
<td>57.8</td>
<td>40.7</td>
<td>23.5</td>
</tr>
<tr>
<td>Max continuous speed</td>
<td>r.p.m.</td>
<td>405</td>
<td>440</td>
<td>460</td>
<td>495</td>
<td>515</td>
</tr>
<tr>
<td>Max continuous power</td>
<td>kW</td>
<td>127</td>
<td>110</td>
<td>86</td>
<td>48</td>
<td>39</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.
The motor volumetric efficiency can be calculated as follows:

\[
\text{Volumetric efficiency} \, (\%) = \left( \frac{\text{speed} \times \text{disp.}}{\text{speed} \times \text{disp.} + Q_t} \right) \times 100
\]

**Example:**

**HPC200 motor with displacement of 3.087 l/rev.**

<table>
<thead>
<tr>
<th>Speed</th>
<th>60 rpm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Differential pressure</td>
<td>200 bar</td>
</tr>
<tr>
<td>Fluid viscosity</td>
<td>50 cSt</td>
</tr>
</tbody>
</table>

Total leakage = \((K_1 + n/K_2) \times \Delta P \times K_v \times 0.005\) (lpm)

= \((6.1 + 60/38.5) \times 200 \times 1 \times 0.005\)

= 7.7 l.p.m.

Volume efficiency = \(\left[ \frac{(60 \times 3.087)}{(60 \times 3.087) + 7.7} \right] \times 100\)

= **96%**
In order to achieve the maximum shaft power, a crankcase flushing flow of 15 l.p.m. should be directed through the motor case. To improve the cooling effect of flushing flow, the distance between the inlet and outlet drain port connections should be maximised.

* This assumes that the crankcase pressure is zero, if not then the check valve pressure will need to be increased to maintain the pressure drop across the orifice.

NOTE: If due to crankcase flushing flow, the crankcase pressure continuously exceeds 3.5 bar, then the motor build should include a high pressure shaft seal.

<table>
<thead>
<tr>
<th>Check valve pressure (bar) *</th>
<th>Orifice diameter (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>4.4</td>
</tr>
<tr>
<td>4</td>
<td>4.1</td>
</tr>
<tr>
<td>5</td>
<td>3.9</td>
</tr>
<tr>
<td>6</td>
<td>3.7</td>
</tr>
<tr>
<td>7</td>
<td>3.6</td>
</tr>
<tr>
<td>8</td>
<td>3.5</td>
</tr>
<tr>
<td>9</td>
<td>3.4</td>
</tr>
<tr>
<td>10</td>
<td>3.3</td>
</tr>
</tbody>
</table>
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.
Displacement control options

Example model code - HPC270/S/280/FM4/X/70

**Types: C, CS & C1**

MOUNTING INTERFACE FOR DIRECTIONAL CONTROL VALVE*
TO: ISO 4401 SIZE 03/ANSI B93.7M SIZE D03.
*DISPLACEMENT SELECTOR VALVE IS NOT SUPPLIED WITH MOTOR; SPECIFY & ORDER SEPARATELY

**Type: X**

2 PORTS G1/4" (BSPF) X 15 FULL THREAD DEPTH

DISPLACEMENT SELECTION (VIA REMOTELY LOCATED VALVE*)
HIGH DISPLACEMENT: P TO Y; X TO T
LOW DISPLACEMENT: P TO X; Y TO T
*DISPLACEMENT SELECTOR VALVE IS NOT SUPPLIED WITH MOTOR; SPECIFY & ORDER SEPARATELY

**Frame Size**

<table>
<thead>
<tr>
<th>Frame Size</th>
<th>Dim 'A'</th>
<th>Dim 'B'</th>
</tr>
</thead>
<tbody>
<tr>
<td>HPC080</td>
<td>173.5</td>
<td>477.0</td>
</tr>
<tr>
<td>HPC125</td>
<td>203.8</td>
<td>507.0</td>
</tr>
<tr>
<td>HPC200</td>
<td>216.4</td>
<td>520.0</td>
</tr>
<tr>
<td>HPC270</td>
<td>232.4</td>
<td>538.0</td>
</tr>
<tr>
<td>HPC325</td>
<td>232.4</td>
<td>538.0</td>
</tr>
</tbody>
</table>
Example model code - HPC200/S3/180/60/FM4/CS/70

Example model code - HPC200/S3/180/60/FM4/CS/70

CS Type shuttle endcap on F4 & FM4 assemblies only

CS Type shuttle on F3 & FM3 assemblies only

REFER TO CIRCUIT DIAGRAM ON PAGE 11 FOR 'CS' C-SPACERS

SEE TABLE ON PAGE 12

SEE VALVE HOUSING PAGE

MOUNTING FACE

Displacement control options
When applying large external radial loads, consideration should also be given to motor bearing lives, (see page 14).

<table>
<thead>
<tr>
<th>Motor type</th>
<th>Maximum external radial bending moment (kNmm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HPC080</td>
<td>4500</td>
</tr>
<tr>
<td>HPC125</td>
<td>6500</td>
</tr>
<tr>
<td>HPC200</td>
<td>6750</td>
</tr>
<tr>
<td>HPHDC200</td>
<td>12200</td>
</tr>
<tr>
<td>HPC270</td>
<td>8250</td>
</tr>
<tr>
<td>HPHDC270</td>
<td>16000</td>
</tr>
<tr>
<td>HPC325</td>
<td>8250</td>
</tr>
</tbody>
</table>

**Example:**
Determine the maximum radial shaft load of a HPC080 motor:

Radial load offset, A = 100mm
Maximum radial load, W = 4500 (see table)/100
= 45kN (4587 kg)

A = Distance from mounting face to load centre
W = Side load
Consideration should be given to the required motor bearing life in terms of bearing service life. The factors that will determine bear life include:

1. Duty cycle - time spent on and off load
2. Speed
3. Differential pressure
4. Fluid viscosity, type, cleanliness and temperature
5. External radial shaft load
6. External axial shaft load

A heavy duty HP(HD)C motor can be ordered to further improve bearing life. Consult KPM for further details.
Displacement selection

To select either displacement, a pressure at least equal to 2/3 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 3-8).

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 r.p.m., then consult KPM.

If possible, always start the motor in high displacement.

Small displacements

The pressures given in the table on pages 4 to 8 for displacement code “00” are based on 1000 r.p.m. output shaft speed. This pressure can be increased for shaft speeds less than 1000 r.p.m.; consult Kawasaki for details. Speeds greater than 1000 r.p.m. may be applied but only after the machine duty cycle has been considered in conjunction with KPM.

A zero swept volume displacement (for freewheeling requirements) is available on request, consult KPM.

High back pressure

When both inlet and outlet ports are pressurised continuously, the lower pressure port must not exceed 100 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 boost formula:

\[ P = 1 + \frac{N^2 \times V^2 + C}{K} \]

Where P is in bar, \( N \) = motor speed (rpm), \( V \) = motor displacement (cc/rev.), \( C \) = Crankcase pressure (bar).

<table>
<thead>
<tr>
<th>Motor</th>
<th>Porting</th>
<th>Constant (K)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HPC080</td>
<td>FM3, S03, F3</td>
<td>1.6 x 10^{10}</td>
</tr>
<tr>
<td>HPC125</td>
<td>FM3, S03, F3</td>
<td>1.6 x 10^{10}</td>
</tr>
<tr>
<td>HPC200</td>
<td>F3, FM3, S03</td>
<td>1.6 x 10^{10}</td>
</tr>
<tr>
<td></td>
<td>F4, FM4, S04</td>
<td>3.3 x 10^{10}</td>
</tr>
<tr>
<td>HPC270</td>
<td>S04, F4, FM4</td>
<td>4 x 10^{10}</td>
</tr>
<tr>
<td>HPC325</td>
<td>S04, F4, FM4</td>
<td>4 x 10^{10}</td>
</tr>
</tbody>
</table>
The flow rate of oil for the make-up system can be estimated from the crankcase leakage data (see pages 9) plus an allowance for changing displacement:

**e.g.**

- **HPC080**  To change high to low in 0.25 sec requires 32 l.p.m.
- **HPC125**  To change high to low in 0.5 sec requires 15 l.p.m.
- **HPC200**  To change high to low in 0.5 sec requires 15 l.p.m.
- **HPC270**  To change high to low in 1 sec requires 24 l.p.m.
- **HPC325**  To change high to low in 1 sec requires 20 l.p.m.

Allowances should be made for other systems losses and also for “fair wear and tear” during the life of the motor, pump and system components.

**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 25 to 34) for maximum crankcase drain fitting depth.

**Hydraulic fluids**

Dependent on motor (see model code fluid type - page 38) suitable fluids include:

- **(a)** Antiwear 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 3.

Viscosity limits when using any fluid except oil-in-water (5/95) emulsions are:

- **Max. off load:** 2000 cSt (9270 SUS)
- **Max. on load:** 150 cSt (695 SUS)
- **Optimum:** 50 cSt (232 SUS)
- **Minimum:** 25 cSt (119 SUS)
**Temperature limits**

<table>
<thead>
<tr>
<th></th>
<th>Petroleum oil</th>
<th>Water- containing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min</td>
<td>-20°C</td>
<td>+10°C</td>
</tr>
<tr>
<td>Max. *</td>
<td>+80°C</td>
<td>+54°C</td>
</tr>
</tbody>
</table>

* To obtain optimum service life from both fluid and hydraulic systems components, 65°C normally is the maximum temperature expected for water-containing fluids.

**Filtration**

Full flow filtration (open circuit), or full boost flow filtration (close circuit) to ensure system cleanliness to ISO4406/1986 code 18/14 or cleaner. Note: If a CP valve is used, then 17/13 or cleaner is recommended.

**Noise levels**

The airborne noise level is less than 66.7 dBA (DIN) 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 resonance originating from liquid borne noise can be further attenuated by providing a return line back pressure of 2 to 5 bar.

**Polar moment of Inertia**

**Typical data:**

<table>
<thead>
<tr>
<th>Motor</th>
<th>Displacement code</th>
<th>Kgm²</th>
</tr>
</thead>
<tbody>
<tr>
<td>HPC080</td>
<td>90</td>
<td>0.052</td>
</tr>
<tr>
<td>HPC080</td>
<td>45</td>
<td>0.044</td>
</tr>
<tr>
<td>HPC125</td>
<td>125</td>
<td>0.20</td>
</tr>
<tr>
<td>HPC125</td>
<td>50</td>
<td>0.14</td>
</tr>
<tr>
<td>HPC200</td>
<td>188</td>
<td>0.23</td>
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<tr>
<td>HPC200</td>
<td>75</td>
<td>0.18</td>
</tr>
<tr>
<td>HPC270</td>
<td>280</td>
<td>0.83</td>
</tr>
<tr>
<td>HPC270</td>
<td>100</td>
<td>0.61</td>
</tr>
<tr>
<td>HPC325</td>
<td>325</td>
<td>0.87</td>
</tr>
<tr>
<td>HPC325</td>
<td>100</td>
<td>0.61</td>
</tr>
</tbody>
</table>

**Mass**

HPC080 Approx. all models 172kg.
HPC125 Approx. all models 235kg.
HPC200 Approx. all models 282kg.
HPC270 Approx. all models 450kg.
HPC325 Approx. all models 460kg.
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 2000 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 5 l/m 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></th>
<th>Non-operating temperature limits</th>
<th>Minimum operating temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medium pressure shaft seal</td>
<td>below minus 40 and above 100 degrees C</td>
<td>minus 30 degrees C</td>
</tr>
<tr>
<td>High pressure shaft seal</td>
<td>below minus 30 and above 120 degrees C</td>
<td>minus 15 degrees C</td>
</tr>
</tbody>
</table>

All seals are very brittle at 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.

It is recommended that the motor is operated by observing the rule for viscosity and the minimum operating temperature.
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 will be dependent on speed and displacement.

It should be noted that for ‘B’ series motors large flows will re-circulate around the motor. This will require a large re-circulating valve and consideration of circuit cooling as the motor will generate 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 10, 05 or 00.

Selecting the lowest available displacement of zero (00) will allow the motor shaft to be rotated at high speed without pumping fluid and with a minimum boost requirement. This will result in a minimum drive torque requirement for the freewheeling motor. Examples of the freewheeling feature on a winch are: dropping the load quickly in the case of an emergency and paying out cable. Consideration should be given when freewheeling such that the load does not drive the motor above its rated freewheeling speed.

### Displacement selection

If the motor inlet/outlet pressure is below 3.5 bar, then a minimum 3.5 bar control pressure is required in order to ensure that the motor remains in minimum displacement. It should be noted that in the event of loss of control pressure, the motor will shift to its highest displacement, which could result in damage to the motor. When freewheeling with displacement codes: 00, 05 or 10, it can be difficult to generate a 3.5 bar pressure. In these circumstances it is necessary to feed the displacement change control circuit from a separate source thus ensuring a minimum control pressure of 3.5 bar. Under all operating conditions the control pressure port should be at least 2/3 of the motor inlet/outlet pressure ports.

### Boost requirement

The required boost pressure is detailed on page 15. The actual required level will be determined by the expected maximum speed in maximum displacement during the overrunning condition. A maximum motor and control pressure of 17 bar at 1000 r.p.m. is stated in the bulletins, although for purposes of freewheeling it is better to maintain a minimum boost level that satisfies all motor operating conditions. The Staffa motor bulletin boost formulae does not apply to freewheeling displacements. High boost levels will increase motor losses at the conrod slipper interface and valve assembly, which will 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.p.m. can be used to control and reduce the temperature rise of the motor during the freewheeling operation. This should not be necessary for motor speeds up to 1000 r.p.m. If operating at speeds above 1000 r.p.m., then consult KPM.
**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 0.15mm. 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:

- **M18**: 312 +/- 7 Nm
- **5/8" UNF**: 265 +/- 14 Nm
- **M20**: 407 +/- 14 Nm
- **3/4" UNF**: 393 +/- 14 Nm

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

**Motor axis - horizontal**
The crankcase drain must be taken from a position above the horizontal centre line of the motor, (see page 22).

**Motor axis - vertical shaft up**
The recommended minimum pipe size for drain line lengths up to approx. 5m is 12.0mm 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, G1/4” (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 arrangement is not practical, please consult KPM.

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 set to its high displacement.
Crankcase drain connections

**Motor axis - horizontal**

The recommended minimum pipe size for drain line lengths up to approx. 5m is 12.0mm 1/2” 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, G1/4” (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.

**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.
HPC080 - Example model code - HPC080/P/90/20/FM3/X/70

**SPLINE DATA**

**S**
- TO BS 3550-1963
- 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
**Shaft options**

**HPC125** - Example model code - HPC125/P1/125/100/FM3/X/70

**T**

- M30 x 60 LG
- KEY HEAD SCREW
- BASIC TAPER, ON DIAMETER
- 0.1001 / 0.0999 PER mm

**P1**

- 3/4"-16 UNF-2B X 32
- FULL THREAD DEPTH

**S3** & **Z3**

- 3/4"-16 UNF-2B X 32
- FULL THREAD DEPTH

**Q**

- HPHDC125 ONLY

**SPLINE DATA**

- SPLINE TO BS3550-1963
- FLAT ROOT SIDE FIT
- CLASS 1
- NUMBER OF TEETH 34
- PITCH 12/24
- PRESSURE ANGLE 30°

- 'S3'
  - TO BS 3550-1963
  - FLAT ROOT SIDE FIT, 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

- 'Z3'
  - DIN 5480 W85 x 3 x 27 x 7h
**Shaft options**

**HPC200 - Example model code - HPC200/P1/180/60/FM3/X/70**

### MOUNTING FACE

- ** Shaft**
- **Options**

![Diagram of 'T' and 'Q' Mounting Faces]

#### 'T'
- Key supplied: 22.27/22.22 wide, 15.82/15.87 thick
- Basic taper, on diameter: 0.1001/0.0999 per mm
- M30 x 60 LG HEX HEAD SCREW

#### 'Q'
- HPHDC200 ONLY
- Spline data:
  - BS3550-1963 flat root side fit, class 1
  - Number of teeth: 20
  - Pressure angle: 12°/24°

#### '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

**SPLINE DATA**

#### 'S3'
- TO BS 3550-1963
- Flat root side fit, 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

#### 'Z3'
- DIN 5480 W85 x 3 x 27 x 7h

**Example for model code - HPC200/P1/180/60/FM3/X/70**

- HPC200
- P1
- 180
- 60
- FM3
- X
- 70
Shaft options

HPC270/HPC325 - Example model code - HPC270/S3/280/60/FM4/X/70
- Example model code - HPC325/S3/300/60/FM4/X/72

**T**

- Key supplied - 25.45/25.40 wide
- 17.539/17.463 thick

**P1**

- Key supplied - 24.066/24.000 wide
- 16.05/16.00 thick

**S3** & **Z4**

- 3/4"-16 UNF-2B x 32 full thread depth

**SPLINE DATA**

**S3**
- To BS 3550:1963
- Flat root side fit, class 1
- Pressure angle: 30°
- Number of teeth: 20
- Pitch: 6/12
- Major diameter: 87.953/87.925
- Form diameter: 80.264
- Minor diameter: 79.485/78.925
- Pin diameter: 8.128
- Diameter over pins: 97.084/97.030

**Z4**
- DIN 5480 W90 x 4 x 21 x 7h
Example model code - HPC080/P/90/20/FM3/X/70

Example model code - HPC080/S/90/20/FM3/X/70

Example model code - HPC080/P/90/20/FM3/X/70

Example model code - HPC080/S/90/20/FM3/X/70

Example model code - HPC080/P/90/20/FM3/X/70

Example model code - HPC080/S/90/20/FM3/X/70

Example model code - HPC080/P/90/20/FM3/X/70

Example model code - HPC080/S/90/20/FM3/X/70
3/4"-16UNF-2B DRAIN (CHOICE OF 3 POSITION S) (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

5 HOLE Ø30 EQUI-SPACED AS SHOWN ON A 0.01 IN. PC. D. SPOTFACED TO GIVE AN EFFECTIVE Ø40.

8 HOLES, SEE TABLE FOR THREAD SIZES

REVERSE PORT CONNECTIONS FOR OPPOSITE DIRECTION OF SHAFT ROTATION
FLOW DIRECTION FOR ALL VL/VHS VARIANTS

CLOCKWISE DIRECTION OF ROTATION

*SEE SEPARATE SHEETS FOR C-SPACER AND SHAFT VARIANTS
Example model code - HPC125/S3/125/100/FM3/X/70

**SO3** - 3" VALVE HOUSING WITH 6-BOLT FLANGE

**SO4** - 4" VALVE HOUSING WITH 6-BOLT FLANGE

**F3/FM3** - 3" VALVE HOUSING WITH 1 1/4" SAE 4-BOLT FLANGES

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

NOTES:
- CORRECT TAPPING SIZE FOR 3/4" PORT
- INSTALLATION DIRECTIONS
- SEE SEPARATE SHEETS FOR C-SPACER AND SHAFT VARIANTS
- CLARKWISE DIRECTION OF ROTATION

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

INSTALLATION PAGE 30
F4/FM4
4" VALVE HOUSING WITH
1 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

REVERSE PORT CONNECTIONS
FOR OPPOSITE DIRECTION OF 
SHAFT ROTATION
FLOW DIRECTION FOR 
ALL VLV HSG VARIANTS

5 HOLES Ø20 EQUI-SPACED AS 
SHOWN ON A 419.1 PCD. SPOTFACED 
TO GIVE AN EFFECTIVE Ø40

*SEE SEPARATE SHEETS 
FOR C-SPACER AND 
SHAFT VARIANTS

NOTE: ENSURE ON INSTALLATION THAT DRAIN IS TAKEN FROM ABOVE MOTOR CENTRELINE
DO NOT EXCEED 12MM DEPTH OF COUPLING IN TO DRAIN PORT
NOTE: ENSURE ON INSTALLATION THAT DRAIN IS TAKEN FROM ABOVE MOTOR CENTRELINE
DO NOT EXCEED 12 DEPTH OF COUPLING INTO DRAIN PORT
REVERSE PORT CONNECTIONS FOR OPPOSITE DIRECTION OF SHAFT ROTATION
FLOW DIRECTION FOR ALL VLV HSG VARIANTS
3/4"-16UNF-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.  

8 HOLES, SEE TABLE FOR THREAD SIZES  

8 HOLES. SEE TABLE FOR THREAD SIZES  

8 HOLES, SEE TABLE FOR THREAD SIZES  

FLOW DIRECTION FOR ALL VLV/HSG VARIANTS  

5 HOLES Ø20 FULL-SPACED AS SHOWN ON ALL PCB SPOTTED TO GIVE AN EFFECTIVE Ø40  

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  

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

CLOCKWISE DIRECTION OF ROTATION  

* SEE SEPARATE SHEETS FOR C-SPACER AND SHAFT VARIANTS  

* SEE SEPARATE SHEETS FOR C-SPACER AND SHAFT VARIANTS  

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

F4/FM4 -  
4" VALVE HOUSING WITH 1 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  

* SEE SEPARATE SHEETS FOR C-SPACER AND SHAFT VARIANTS  

* SEE SEPARATE SHEETS FOR C-SPACER AND SHAFT VARIANTS
SO4 -
4" VALVE HOUSING WITH 6-BOLT FLANGE

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

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

NOTE: ENSURE ON INSTALLATION THAT DRAIN IS TAKEN FROM ABOVE MOTOR CENTRELINE
DO NOT EXCEED 12MM DEPTH OF COUPLING INTO DRAIN PORT

*PORT FLANGE BOLT TAPING SIZE -
F4: 5/8"-11 UNC-2B X 35 FULL THREAD DEPTH
FM4: M16 X P2 X 35 FULL THREAD DEPTH
NOTE: ENSURE ON INSTALLATION THAT DRAIN IS TAKEN FROM ABOVE MOTOR CENTRELINE
DO NOT EXCEED 12MM DEPTH OF COUPLING INTO DRAIN PORT

REVERSE PORT CONNECTIONS FOR OPPOSITE DIRECTION OF SHAFT ROTATION
FLOW DIRECTION FOR ALL VALVE VARIANTS

* SEE SEPARATE SHEETS FOR C-SPACER AND SHAFT VARIANTS

3/4”-16UNF DRAIN (CHOICE OF 3 POSITIONS)
2” NORMALLY PLUGGED
NOTE: ENSURE ON INSTALLATION THAT DRAIN IS TAKEN FROM ABOVE MOTOR CENTRELINE
DO NOT EXCEED 12MM DEPTH OF COUPLING

* F4/FM4 - 4” VALVE HOUSING WITH 1 1/2” SAE 4-BOLT FLANGES
SO4 - 4” VALVE HOUSING WITH 6-BOLT FLANGE MOUNTING FACE

HPC270
EXAMPLE FOR MODEL CODE - HPC270/S/280/60/FM4/X/71
Example model code - HPC325/S3/300/60/FM4/X/72

SO4:
4" VALVE HOUSING WITH 6-BOLT FLANGE

F4/FM4:
4" VALVE HOUSING WITH 1 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

Example model code - HPC325/S3/300/60/FM4/X/72

Example model code - HPC325/S3/300/60/FM4/X/72

Example model code - HPC325/S3/300/60/FM4/X/72
3/4"-16UNF-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

REVERSE PORT CONNECTIONS FOR OPPOSITE DIRECTION OF SHAFT ROTATION
FLOW DIRECTION FOR ALL VLV HSG VARIANTS

*CLOCKWISE DIRECTION OF ROTATION

*SEE SEPARATE SHEETS FOR C-SPACER AND SHAFT VARIANTS
## Product type

### HPC080

<table>
<thead>
<tr>
<th>Product Type</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>SO3</td>
<td>Staffa 3&quot; 6-bolt flange</td>
</tr>
<tr>
<td>SO4</td>
<td>6-bolt UNF flange Staffa original valve housing</td>
</tr>
<tr>
<td>F3</td>
<td>1 1/4&quot; SAE 4-bolt flange</td>
</tr>
<tr>
<td>FM3</td>
<td>1 1/4&quot; SAE 4-bolt flange</td>
</tr>
<tr>
<td>F4</td>
<td>SAE 1 1/2&quot; 4-bolt UNC flanges</td>
</tr>
<tr>
<td>FM4</td>
<td>SAE 1 1/2&quot; 4-bolt metric flanges</td>
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### HPC125

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<th>Description</th>
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<td>SO3</td>
<td>Staffa 3&quot; 6-bolt flange</td>
</tr>
<tr>
<td>SO4</td>
<td>6-bolt UNF flange Staffa original valve housing</td>
</tr>
<tr>
<td>F3</td>
<td>1 1/4&quot; 3000 series SAE 4-bolt flange</td>
</tr>
<tr>
<td>FM3</td>
<td>1 1/4&quot; 3000 series SAE 4-bolt flange</td>
</tr>
<tr>
<td>F4</td>
<td>SAE 1 1/2&quot; 4-bolt UNC flanges</td>
</tr>
<tr>
<td>FM4</td>
<td>SAE 1 1/2&quot; 4-bolt metric flanges</td>
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</table>

### HPC200

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<tr>
<th>Product Type</th>
<th>Description</th>
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<tr>
<td>SO3</td>
<td>Staffa 3&quot; 6-bolt flange</td>
</tr>
<tr>
<td>SO4</td>
<td>6-bolt UNF flange Staffa original valve housing</td>
</tr>
<tr>
<td>F3</td>
<td>1 1/4&quot; SAE code 61 4-bolt flange</td>
</tr>
<tr>
<td>FM3</td>
<td>1 1/4&quot; SAE code 61 4-bolt flange</td>
</tr>
<tr>
<td>F4</td>
<td>SAE 1 1/2&quot; 4-bolt UNC flanges</td>
</tr>
<tr>
<td>FM4</td>
<td>SAE 1 1/2&quot; 4-bolt metric flanges</td>
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### HPC270

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<th>Product Type</th>
<th>Description</th>
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<tbody>
<tr>
<td>SO4</td>
<td>Staffa 4&quot; 6-bolt flange</td>
</tr>
<tr>
<td>F4</td>
<td>1 1/2&quot; SAE code 62 4-bolt flange</td>
</tr>
<tr>
<td>FM4</td>
<td>1 1/2&quot; SAE code 62 4-bolt flange</td>
</tr>
</tbody>
</table>

### HPC325

<table>
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<tr>
<th>Product Type</th>
<th>Description</th>
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<tbody>
<tr>
<td>SO4</td>
<td>Staffa 4&quot; 6-bolt flange</td>
</tr>
<tr>
<td>F4</td>
<td>1 1/2&quot; SAE code 62 4-bolt flange</td>
</tr>
<tr>
<td>FM4</td>
<td>1 1/2&quot; SAE code 62 4-bolt flange</td>
</tr>
</tbody>
</table>
**Speed sensing options**

**HOG 71 - encoder**

- **Model code:**
  - HOG71 DN 1024 TTL
  - HOG71 DN 1024 HTL
- **IP66**
- **Power supply:**
  - 5V @ 100 mA
  - 9 TO 26V @ 100 mA
- **Output signal:**
  - Two TTL signals displaced by 90 deg. and plus maker and inverted signals
  - As per TTL but with HTL signals

**GTB 9 - tacho**

- **Model code:**
  - GTB9.06 L 420 H04 (12mm Ø shaft)
- **IP68**
- **Output signal:**
  - 20V/1000 r.p.m.

**Note:** Speed sensors should be ordered as a separate item from Hubner.
Technische spezifikation:

Beschreibung: Hall effect dual channel speed probe
Signal outputs: Square wave plus direction signal
Zubehör: 8 to 32V @ 40 mA
Schutzklasse: IP68
Ausgangsfrequenz: 16 pulses/revolution

Tj cable assembly

Tj speed probe and Tk optional T401 module. See model code detail on page 40. The T401 is software configured for both speed calibration and relay speed trip setting.
**HPC series motor**

**Fluid type**
Blank: Mineral oil.
**F3:** Phosphate ester (HFD fluid).
**F11:** Water-based fluids (HFA, HFB & HFC).
Alternative fluids contact Kawasaki Precision Machinery UK Ltd. Nominate fluid type and make on order.

**Model type**
HP: High Power
HPHD: High Power Heavy Duty

**Motor frame size**
- C080
- C125
- C200
- C270
- C325

**Shaft type**
See shaft type option list on pages 22-26

**Shaft**
Vertically up

**High displacement code**
See displacement code details on pages 4 to 8

**Low displacement code**
See displacement code details on pages 4 to 8

**Main port connections**
See port connection details on page 37

**Displacement control ports** *(pages 11-12)*
Threaded ports/bi-directional shaft rotation:
- **X:** X and Y ports G1/4" (BSPF to ISO 228/1)
ISO 4401 size 03 mounting face/bi-directional shaft rotation:
- **C:** No shuttle
- **CS:** With shuttle valve *(see options by product type)*
ISO 4401 size 03 mounting face/uni-directional shaft rotation *(viewed on shaft end):*
- **C1:** Control pressure from main port 1 *(shaft rotation clockwise with flow into port 1)*

**Special features**
PL****: Non-catalogued features, (***) number assigned as required.

eg:
- High pressure shaft seals.
- Alternative port connections.
- Stainless steel shaft sleeves.
- Alternative encoder and tacho drives.
- Motor valve housing orientation.
- Special paint.

**Tacho/Encoder drive**
- **Tj:** Square wave output with directional signal.
- **Tk:** Combines Tj with the T401 instrument to give a 4 to 20 mA output proportional to speed, directional signal and speed relay output.
- **Th:** Encoder system with a pulsed frequency output proportional to speed.
- **Tg:** Tachogenerator with a D.C. output signal proportional to speed.

**Design number**
- **C080:**
- **C270:**
- **C125:**
- **C325:**
- **C200:**