**Brushless DC-Servomotors**

**2 Pole Technology**

18.7 mNm

81 W

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### Series 1660 ... BHT

#### Values at 22°C and nominal voltage

<table>
<thead>
<tr>
<th>Value</th>
<th>1660 S</th>
<th>024 BHT</th>
<th>036 BHT</th>
<th>048 BHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal voltage (U_N)</td>
<td>24</td>
<td>36</td>
<td>48</td>
<td>V</td>
</tr>
<tr>
<td>Terminal resistance, phase-phase (R)</td>
<td>0.49</td>
<td>1.1</td>
<td>1.93</td>
<td>Ω</td>
</tr>
<tr>
<td>Efficiency, max. (\eta)</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>%</td>
</tr>
<tr>
<td>No-load speed (n_0)</td>
<td>34,900</td>
<td>35,200</td>
<td>35,500</td>
<td>min⁻¹</td>
</tr>
<tr>
<td>No-load current, typ. (with shaft ø 3 mm) (i_o)</td>
<td>0.133</td>
<td>0.09</td>
<td>0.069</td>
<td>A</td>
</tr>
<tr>
<td>Stall torque (M_{st})</td>
<td>344</td>
<td>341</td>
<td>343</td>
<td>mNm</td>
</tr>
<tr>
<td>Friction torque, static (C_F)</td>
<td>0.43</td>
<td>0.43</td>
<td>0.43</td>
<td>mNm</td>
</tr>
<tr>
<td>Friction torque, dynamic (C_D)</td>
<td>1.2·10⁻⁵</td>
<td>1.2·10⁻⁵</td>
<td>1.2·10⁻⁵</td>
<td>mNm/min⁻¹</td>
</tr>
<tr>
<td>Speed constant (k_s)</td>
<td>1368</td>
<td>918</td>
<td>694</td>
<td>min⁻¹/V</td>
</tr>
<tr>
<td>Back-EMF constant (k_s)</td>
<td>0.731</td>
<td>1.09</td>
<td>1.441</td>
<td>mV/min⁻¹</td>
</tr>
<tr>
<td>Torque constant (k_t)</td>
<td>6.98</td>
<td>10.4</td>
<td>13.7</td>
<td>mNm/°C</td>
</tr>
<tr>
<td>Current constant (k_I)</td>
<td>0.143</td>
<td>0.096</td>
<td>0.073</td>
<td>A/mNm</td>
</tr>
<tr>
<td>Slope of (n)-(M) curve (\Delta n / \Delta M)</td>
<td>95</td>
<td>97</td>
<td>97</td>
<td>min⁻¹/°C</td>
</tr>
<tr>
<td>Terminal inductance, phase-phase (L)</td>
<td>52</td>
<td>114</td>
<td>203</td>
<td>μH</td>
</tr>
<tr>
<td>Mechanical time constant (\tau_{mech})</td>
<td>6.8</td>
<td>6.8</td>
<td>6.8</td>
<td>s</td>
</tr>
<tr>
<td>Rotor inertia (J)</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
<td>gcm²</td>
</tr>
<tr>
<td>Angular acceleration (\alpha_{max})</td>
<td>796</td>
<td>772</td>
<td>787</td>
<td>rad/s²</td>
</tr>
<tr>
<td>Thermal resistance (R_{th1} / R_{th2})</td>
<td>2,1 / 18.2</td>
<td></td>
<td></td>
<td>K/W</td>
</tr>
<tr>
<td>Thermal time constant (\tau_{th1} / \tau_{th2})</td>
<td>6.8 / 631</td>
<td></td>
<td></td>
<td>s</td>
</tr>
<tr>
<td>Operating temperature range:</td>
<td></td>
<td></td>
<td></td>
<td>°C</td>
</tr>
<tr>
<td>– motor</td>
<td>-30 ... +125</td>
<td>+125</td>
<td>°C</td>
<td></td>
</tr>
<tr>
<td>– winding, max. permissible</td>
<td></td>
<td></td>
<td>°C</td>
<td></td>
</tr>
<tr>
<td>Shaft bearings</td>
<td>ball bearings, preloaded</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shaft load max.:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>– with shaft diameter</td>
<td>3</td>
<td></td>
<td></td>
<td>mm</td>
</tr>
<tr>
<td>– radial at 40 000 min⁻¹ (5 mm from mounting flange)</td>
<td>19</td>
<td>19</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>– axial at 40 000 min⁻¹ (push only)</td>
<td>9</td>
<td>9</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>– axial at standstill (push only)</td>
<td>44</td>
<td>44</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>Shaft play:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>– radial</td>
<td>0.01</td>
<td></td>
<td></td>
<td>mm</td>
</tr>
<tr>
<td>– axial</td>
<td>0</td>
<td></td>
<td></td>
<td>mm</td>
</tr>
<tr>
<td>Housing material</td>
<td>stainless steel</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mass</td>
<td>78</td>
<td></td>
<td></td>
<td>g</td>
</tr>
<tr>
<td>Direction of rotation</td>
<td>electronically reversible</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Speed up to (n_{max})</td>
<td>76 000</td>
<td></td>
<td></td>
<td>min⁻¹</td>
</tr>
<tr>
<td>Number of poles pairs</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hall sensors</td>
<td>digital</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Magnet material</td>
<td>NdFeB</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Rated values for continuous operation

<table>
<thead>
<tr>
<th>Value</th>
<th>1660 S</th>
<th>024 BHT</th>
<th>036 BHT</th>
<th>048 BHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated torque (M_{r})</td>
<td>13.9</td>
<td>13.7</td>
<td>13.6</td>
<td>mNm</td>
</tr>
<tr>
<td>Rated current (thermal limit) (i_t)</td>
<td>2.38</td>
<td>1.58</td>
<td>1.18</td>
<td>A</td>
</tr>
<tr>
<td>Rated speed (n_t)</td>
<td>34,490</td>
<td>34,740</td>
<td>35,070</td>
<td>min⁻¹</td>
</tr>
</tbody>
</table>

### Note:

Rated values are calculated with nominal voltage and at a 22°C ambient temperature. The \(R_{th2}\) value has been reduced by 25%.

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#### Note:

The diagram indicates the recommended speed in relation to the available torque at the output shaft for a given ambient temperature of 22°C.

The diagram shows the motor in a completely insulated as well as thermally coupled condition (\(R_{th2}\) 50% reduced).

The nominal voltage \(U_N\) curve shows the operating point at nominal voltage in the insulated and thermally coupled condition. Any points of operation above the curve at nominal voltage will require a higher operating voltage. Any points below the nominal voltage curve will require less voltage.

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**Recommended operation areas (example: nominal voltage 24V)**

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For notes on technical data and lifetime performance refer to "Technical Information".

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Dimensional drawing

Option, cable and connection information

Example product designation: 1660S024BHT

<table>
<thead>
<tr>
<th>Option</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No.</th>
<th>Function</th>
<th>Colour</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Phase C</td>
<td>yellow</td>
</tr>
<tr>
<td>2</td>
<td>Phase B</td>
<td>orange</td>
</tr>
<tr>
<td>3</td>
<td>Phase A</td>
<td>brown</td>
</tr>
<tr>
<td>4</td>
<td>GND</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>UDD (4,5 ... 5,5V)</td>
<td>grey</td>
</tr>
<tr>
<td>6</td>
<td>Hall sensor C</td>
<td>grey</td>
</tr>
<tr>
<td>7</td>
<td>Hall sensor B</td>
<td>grey</td>
</tr>
<tr>
<td>8</td>
<td>Hall sensor A</td>
<td>grey</td>
</tr>
<tr>
<td>9</td>
<td>Reserved</td>
<td>grey</td>
</tr>
</tbody>
</table>

Standard cable
- Single wires, material PTFE AWG24, Phase A/B/C
- Flat cable, material PVC AWG28, Pitch 1,27 mm
- Hall A/B/C, UDD, GND

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