Brushless DC-Servomotors
4 Pole Technology

**Series 2250 ... BX4**

<table>
<thead>
<tr>
<th>Values at 22°C and nominal voltage</th>
<th>2250 S</th>
<th>012 BX4</th>
<th>018 BX4</th>
<th>024 BX4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Nominal voltage $U_n$</td>
<td>12</td>
<td>18</td>
<td>24</td>
<td>V</td>
</tr>
<tr>
<td>2 Terminal resistance, phase-phase $R$</td>
<td>1.55</td>
<td>3.17</td>
<td>5.9</td>
<td>Ω</td>
</tr>
<tr>
<td>3 Efficiency, max. $\eta_{\text{max}}$</td>
<td>76</td>
<td>76</td>
<td>77</td>
<td>%</td>
</tr>
<tr>
<td>4 No-load speed $n_0$</td>
<td>6.000</td>
<td>6.400</td>
<td>6.200</td>
<td>min⁻¹</td>
</tr>
<tr>
<td>5 No-load current, typ. (with shaft ø 3 mm) $i_0$</td>
<td>0.128</td>
<td>0.094</td>
<td>0.066</td>
<td>A</td>
</tr>
<tr>
<td>6 Stall torque $M_H$</td>
<td>147</td>
<td>152</td>
<td>151</td>
<td>mNm</td>
</tr>
<tr>
<td>7 Friction torque, static $C_F$</td>
<td>0.8</td>
<td>0.8</td>
<td>0.8</td>
<td>mNm</td>
</tr>
<tr>
<td>8 Friction torque, dynamic $C_D$</td>
<td>2.6·10⁻⁴</td>
<td>2.6·10⁻⁴</td>
<td>2.6·10⁻⁴</td>
<td>mNm/min⁻¹</td>
</tr>
<tr>
<td>9 Speed constant $k_s$</td>
<td>502</td>
<td>354</td>
<td>255</td>
<td>min⁻¹ V⁻¹</td>
</tr>
<tr>
<td>10 Back-EMF constant $k_k$</td>
<td>1.994</td>
<td>2.825</td>
<td>3.927</td>
<td>mV/min⁻¹</td>
</tr>
<tr>
<td>11 Torque constant $k_M$</td>
<td>19</td>
<td>27</td>
<td>37.5</td>
<td>mNm/A</td>
</tr>
<tr>
<td>12 Current constant $k_I$</td>
<td>0.053</td>
<td>0.037</td>
<td>0.027</td>
<td>A/mNm</td>
</tr>
<tr>
<td>13 Slope of n-M curve $\Delta n / \Delta M$</td>
<td>40.8</td>
<td>41.6</td>
<td>40.3</td>
<td>m/min⁻¹</td>
</tr>
<tr>
<td>14 Terminal inductance, phase-phase $L_n$</td>
<td>62.8</td>
<td>126</td>
<td>250</td>
<td>μH</td>
</tr>
<tr>
<td>15 Mechanical time constant $\tau_M$</td>
<td>4.3</td>
<td>4.3</td>
<td>4.2</td>
<td>ms</td>
</tr>
<tr>
<td>16 Rotor inertia $J$</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>gcm²</td>
</tr>
<tr>
<td>17 Angular acceleration $\epsilon_{\text{max}}$</td>
<td>147</td>
<td>152</td>
<td>151</td>
<td>-10³ rad/s²</td>
</tr>
<tr>
<td>18 Thermal resistance $R_{\text{ax}} / R_{\text{az}}$</td>
<td>3.5 / 15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19 Thermal time constant $\tau_{\text{tw}} / \tau_{\text{tx}}$</td>
<td>12 / 660</td>
<td></td>
<td></td>
<td>s</td>
</tr>
<tr>
<td>20 Operating temperature range:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- motor</td>
<td>-40 ... +100</td>
<td></td>
<td></td>
<td>°C</td>
</tr>
<tr>
<td>- winding, max. permissible</td>
<td>+125</td>
<td></td>
<td></td>
<td>°C</td>
</tr>
<tr>
<td>21 Shaft bearings</td>
<td>ball bearings, preloaded</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22 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 3 000 min⁻¹ (5 mm from mounting flange)</td>
<td>20</td>
<td></td>
<td></td>
<td>N</td>
</tr>
<tr>
<td>- axial at 3 000 min⁻¹ (push / pull)</td>
<td>2</td>
<td></td>
<td></td>
<td>N</td>
</tr>
<tr>
<td>- axial at standstill (push / pull)</td>
<td>20</td>
<td></td>
<td></td>
<td>N</td>
</tr>
<tr>
<td>23 Shaft play:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- radial $\leq$</td>
<td>0.015</td>
<td></td>
<td></td>
<td>mm</td>
</tr>
<tr>
<td>- axial $\leq$</td>
<td>0</td>
<td></td>
<td></td>
<td>mm</td>
</tr>
<tr>
<td>24 Housing material</td>
<td>stainless steel</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25 Mass</td>
<td>105</td>
<td></td>
<td></td>
<td>g</td>
</tr>
<tr>
<td>26 Direction of rotation</td>
<td>electronically reversible</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27 Speed up to $n_{\text{max}}$</td>
<td>20 000</td>
<td></td>
<td></td>
<td>min⁻¹</td>
</tr>
<tr>
<td>28 Number of pole pairs</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29 Hall sensors</td>
<td>digital</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30 Magnet material</td>
<td>NdFeB</td>
<td></td>
<td></td>
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</tbody>
</table>

**Rated values for continuous operation**

| 31 Rated torque $M_n$ | 26.2 | 25.5 | 26.2 | mNm |
| 32 Rated current (thermal limit) $i_n$ | 1.66 | 1.15 | 0.85 | A |
| 33 Rated speed $n_{\text{ru}}$ | 4 740 | 5 140 | 4 870 | min⁻¹ |

**Note:**
Rated values are calculated with nominal voltage and at a 22°C ambient temperature. The $R_{\text{ax}}$ value has been reduced by 25%.

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 ($R_{\text{ax}}$ 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.

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

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Edition 2019
Dimensional drawing

Orientation with respect to motor cable ±5°

Option, cable and connection information

Example product designation: 2250S024BX4-3692

<table>
<thead>
<tr>
<th>Option</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3830</td>
<td>Connector</td>
<td>AWG 26 / PVC ribbon cable with connector Molex Microfit 3.0, 43025-0800,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>recommended mating connector 43020-0800</td>
</tr>
<tr>
<td>4935</td>
<td>Single wires</td>
<td>Motor with single wires (PTFE), length 175 mm, AWG26</td>
</tr>
<tr>
<td>X4935</td>
<td>Single wires</td>
<td>Motor with single wires (PTFE), length 300 mm, AWG26</td>
</tr>
<tr>
<td>Y4935</td>
<td>Single wires</td>
<td>Motor with single wires (PTFE), length 600 mm, AWG26</td>
</tr>
<tr>
<td>X4747</td>
<td>Temperature range</td>
<td>Up to 150°C, winding max. 150°C, with single wires (PTFE), length 175 mm,</td>
</tr>
<tr>
<td>Y4747</td>
<td>Temperature range</td>
<td>Up to 150°C, winding max. 150°C, with single wires (PTFE), length 300 mm,</td>
</tr>
<tr>
<td>Y158</td>
<td>Shaft end</td>
<td>Motor without second shaft end</td>
</tr>
<tr>
<td>3692</td>
<td>Controller combination</td>
<td>Analog Hall sensors for combination with Motion Controller MCBL</td>
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</tbody>
</table>

Connection standard

<table>
<thead>
<tr>
<th>Option 4935/4747</th>
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<tbody>
<tr>
<td>No. Function</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td>6</td>
</tr>
<tr>
<td>7</td>
</tr>
<tr>
<td>8</td>
</tr>
</tbody>
</table>

Standard cable

Insulation: PVC
8 conductors, AWG 26, pitch 1.27 mm, wires tinned

Example product designation:

Option: 4935/4747

Product combination

<table>
<thead>
<tr>
<th>Precision Gearheads / Lead Screws</th>
<th>Encoders</th>
<th>Drive Electronics</th>
<th>Cables / Accessories</th>
</tr>
</thead>
<tbody>
<tr>
<td>22F</td>
<td>IE3-1024</td>
<td>SC 2402 P</td>
<td>To view our large range of accessory parts, please refer to the</td>
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<tr>
<td>22/7</td>
<td>IE3-1024 L</td>
<td>SC 2804 S</td>
<td>“Accessories” chapter.</td>
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<tr>
<td>26A</td>
<td>IER3-10000</td>
<td>SC 5004 P</td>
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<tr>
<td>BS22-1.5</td>
<td>IER3-10000 L</td>
<td>SC 5008 S</td>
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<td></td>
<td>AES-4096</td>
<td>MCBL 3002 P</td>
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<tr>
<td></td>
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<td>MCBL 3002 S AES</td>
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<td>MCBL 3003 P</td>
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<td>MCBL 3003 P AES</td>
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<td>MCBL 3006 S AES</td>
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<td>MC 5004 P</td>
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<td>MC 5004 P STO</td>
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<td></td>
<td></td>
<td>MC 5005 S</td>
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