#### DC-Micromotors

**Graphite Commutation**

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

<table>
<thead>
<tr>
<th>Values</th>
<th>2668 W</th>
<th>018 CR</th>
<th>024 CR</th>
<th>036 CR</th>
<th>048 CR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal voltage ($U_n$)</td>
<td>18</td>
<td>24</td>
<td>36</td>
<td>48</td>
<td>V</td>
</tr>
<tr>
<td>Terminal resistance ($R$)</td>
<td>0.57</td>
<td>1.03</td>
<td>2.53</td>
<td>4.23</td>
<td>Ω</td>
</tr>
<tr>
<td>Efficiency, max. ($\eta_{max}$)</td>
<td>86</td>
<td>87</td>
<td>87</td>
<td>88</td>
<td>%</td>
</tr>
<tr>
<td>No-load speed ($n_0$)</td>
<td>7,900</td>
<td>7,800</td>
<td>7,500</td>
<td>7,700</td>
<td>min⁻¹</td>
</tr>
<tr>
<td>No-load current, typ. (with shaft ø 4 mm) ($I_0$)</td>
<td>0.105</td>
<td>0.078</td>
<td>0.05</td>
<td>0.038</td>
<td>A</td>
</tr>
<tr>
<td>Stall torque ($M_{st}$)</td>
<td>653</td>
<td>656</td>
<td>632</td>
<td>660</td>
<td>mNm</td>
</tr>
<tr>
<td>Friction torque ($M_f$)</td>
<td>2.2</td>
<td>2.2</td>
<td>2.2</td>
<td>2.2</td>
<td>mNm</td>
</tr>
<tr>
<td>Speed constant ($k_c$)</td>
<td>448</td>
<td>331</td>
<td>211</td>
<td>162</td>
<td>mNm/min⁻¹</td>
</tr>
<tr>
<td>Back-EMF constant ($k_E$)</td>
<td>2.24</td>
<td>3.02</td>
<td>4.73</td>
<td>6.18</td>
<td>mV/min⁻¹</td>
</tr>
<tr>
<td>Torque constant ($k_M$)</td>
<td>21.3</td>
<td>28.9</td>
<td>45.2</td>
<td>59</td>
<td>mNmA</td>
</tr>
<tr>
<td>Current constant ($k_I$)</td>
<td>0.047</td>
<td>0.035</td>
<td>0.022</td>
<td>0.017</td>
<td>A/mNm</td>
</tr>
<tr>
<td>Slope of n-M curve ($\Delta n/\Delta M$)</td>
<td>12</td>
<td>11.8</td>
<td>11.6</td>
<td>11.6</td>
<td>min⁻¹/mNm</td>
</tr>
<tr>
<td>Rotor inductance ($L$)</td>
<td>87</td>
<td>158</td>
<td>390</td>
<td>660</td>
<td>µH</td>
</tr>
<tr>
<td>Mechanical time constant ($\tau_m$)</td>
<td>3.4</td>
<td>3.1</td>
<td>3.1</td>
<td>3.2</td>
<td>ms</td>
</tr>
<tr>
<td>Rotor inertia ($J$)</td>
<td>27</td>
<td>25</td>
<td>25</td>
<td>26</td>
<td>gcm²</td>
</tr>
<tr>
<td>Angular acceleration ($\alpha_{max}$)</td>
<td>242</td>
<td>263</td>
<td>253</td>
<td>254</td>
<td>rad/s²</td>
</tr>
<tr>
<td>Thermal resistance ($R_{th1}/R_{th2}$)</td>
<td>3</td>
<td>8</td>
<td>kW</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thermal time constant ($\tau_{th1}/\tau_{th2}$)</td>
<td>33</td>
<td>600</td>
<td>s</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating temperature range:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>– motor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>°C</td>
</tr>
<tr>
<td>– winding, max. permissible</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+155 °C</td>
</tr>
<tr>
<td>Shaft bearings</td>
<td>ball bearings, preloaded</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shaft load max.:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>– with shaft diameter</td>
<td>4</td>
<td>mm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>– radial at 3 000 min⁻¹ (3 mm from bearing)</td>
<td>20</td>
<td>N</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>– axial at 3 000 min⁻¹</td>
<td>2</td>
<td>N</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>– axial at standstill</td>
<td>20</td>
<td>N</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shaft play:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>– radial</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.015 mm</td>
</tr>
<tr>
<td>– axial</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0 mm</td>
</tr>
<tr>
<td>Housing material</td>
<td>steel, black coated</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mass</td>
<td>189</td>
<td>g</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direction of rotation</td>
<td>clockwise, viewed from the front face</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Speed up to ($n_{max}$)</td>
<td>10 000</td>
<td>min⁻¹</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of pole pairs</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Magnet material</td>
<td>NdFeB</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated values for continuous operation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated torque ($M_r$)</td>
<td>56</td>
<td>68</td>
<td>69</td>
<td>70</td>
<td>mNm</td>
</tr>
<tr>
<td>Rated current (thermal limit) ($I_r$)</td>
<td>3</td>
<td>2.8</td>
<td>1.8</td>
<td>1.4</td>
<td>A</td>
</tr>
<tr>
<td>Rated speed ($n_r$)</td>
<td>7 480</td>
<td>7 370</td>
<td>7 030</td>
<td>7 260</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%.

**Recommended operation areas (example: nominal voltage 48V)***

*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.*
**Options**

Example product designation: **2668W048CR-158**

<table>
<thead>
<tr>
<th>Option</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>U</td>
<td>Single Leads</td>
<td>For motors with single leads (PTFE), length 160 mm, red (+) / black (-)</td>
</tr>
<tr>
<td>158</td>
<td>Shaft end</td>
<td>No second shaft end</td>
</tr>
</tbody>
</table>

**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>22GPT</td>
<td>IE3-1024</td>
<td>SC 2804 S</td>
<td>MBZ</td>
</tr>
<tr>
<td>26A</td>
<td>IE3-1024 L</td>
<td>SC 5004 P</td>
<td>To view our large range of accessory parts, please refer to the “Accessories” chapter.</td>
</tr>
<tr>
<td>26/1</td>
<td>IERS3-500</td>
<td>SC 5008 S</td>
<td></td>
</tr>
<tr>
<td>26/1R</td>
<td>IERS3-500 L</td>
<td>MCDC 3003 P</td>
<td></td>
</tr>
<tr>
<td>30/1</td>
<td>IERS3-10000</td>
<td>MCDC 3006 S</td>
<td></td>
</tr>
<tr>
<td>30/1 S</td>
<td>IERS3-10000 L</td>
<td>MC 5004 P</td>
<td></td>
</tr>
<tr>
<td>32A</td>
<td></td>
<td>MC 5005 S</td>
<td></td>
</tr>
<tr>
<td>32ALN</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32GPT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32/3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32/3R</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

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