Přílohy
## Tabulka 1: Parametry motoru z RMxprt

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### STATOR DATA

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**ROTOR DATA**

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| MATERIAL CONSUMPTION | |
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| Arm. Wire Density (kg/m³): | 8900 | 8900 | 8900 | 8900 | 8900 | 8900 |
| Permanent Magnet Density (kg/m³): | 7400 | 7400 | 7400 | 7400 | 7400 | 7400 |
| Arm. Core Steel Density (kg/m³): | 7872 | 7872 | 7872 | 7872 | 7872 | 7872 |
| Rotor Core Steel Density (kg/m³): | 7872 | 7872 | 7872 | 7872 | 7872 | 7872 |
| Arm. Copper Weight (kg): | 0.88 | 1.01 | 1.08 | 0.94 | 1.21 | 1.05 |
| Permanent Magnet Weight (kg): | 0.89 | 0.89 | 0.32 | 0.32 | 0.26 | 0.26 |
| Arm. Core Steel Weight (kg): | 2.25 | 2.28 | 2.22 | 2.24 | 2.15 | 2.17 |
| Rotor Core Steel Weight (kg): | 1.78 | 1.78 | 0.90 | 0.90 | 1.19 | 1.19 |
| Total Net Weight (kg): | 5.80 | 5.96 | 4.51 | 4.40 | 4.99 | 4.67 |
| Arm. Core Steel Consumption (kg): | 4.95 | 4.95 | 4.95 | 4.95 | 5.47 | 5.47 |
| Rotor Core Steel Consumption (kg): | 2.93 | 2.93 | 2.93 | 2.93 | 2.64 | 2.64 |
### STEADY STATE PARAMETERS

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### NO-LOAD MAGNETIC DATA

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<td>1.014</td>
<td>1.009</td>
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<td>Stator-Teeth By-Pass Factor:</td>
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<td>0.02104</td>
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<td>Stator-Yoke By-Pass Factor:</td>
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<td>0.014728</td>
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<td>Rotor-Yoke By-Pass Factor:</td>
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<td>5.32E-05</td>
<td>0.00016</td>
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<td>8.05E-05</td>
<td>7.98E-05</td>
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<tr>
<td>Stator-Teeth Ampere Turns (A,T):</td>
<td>1069.0</td>
<td>1103.2</td>
<td>264.3</td>
<td>279.2</td>
<td>174.7</td>
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<td>IPM1</td>
<td>IPM2</td>
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<tr>
<td>Stator-Yoke Ampere Turns (A,T)</td>
<td>1003.4</td>
<td>987.2</td>
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<td>6.2</td>
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<td>Air-Gap Ampere Turns (A,T)</td>
<td>169.5</td>
<td>168.2</td>
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<td>Magnet Ampere Turns (A,T)</td>
<td>-2247.4</td>
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<td>Leakage-Flux Factor:</td>
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<td>1</td>
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<td>Correction Factor for Magnetic Circuit Length of Stator Yoke:</td>
<td>0,2213</td>
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<td>Correction Factor for Magnetic Circuit Length of Rotor Yoke:</td>
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<td>0,734</td>
<td>0,443</td>
<td>0,447</td>
<td>0,625</td>
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<td>No-Load Line Current (A):</td>
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<td>0,793</td>
<td>1,726</td>
<td>2,200</td>
<td>0,619</td>
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<tr>
<td>No-Load Input Power (W):</td>
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<td>145,07</td>
<td>98,25</td>
<td>108,07</td>
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<td>22,14</td>
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<td>Cogging Torque (N,m):</td>
<td>1,356</td>
<td>1,335</td>
<td>0,959</td>
<td>0,950</td>
<td>1,423</td>
<td>1,409</td>
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**FULL-LOAD DATA**

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<td>Root-Mean-Square Line Current (A):</td>
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<td>Root-Mean-Square Phase Current (A):</td>
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<td>Arm. Thermal Load (A²/mm³):</td>
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<td>737</td>
<td>760</td>
<td>956</td>
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<td>Specific Electric Loading (A/mm):</td>
<td>43</td>
<td>45</td>
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<td>49</td>
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<td>50</td>
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<tr>
<td>Arm. Current Density (A/mm²):</td>
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<td>17</td>
<td>16</td>
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<td>14</td>
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<tr>
<td>Frictional and Windage Loss (W):</td>
<td>12</td>
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<td>Iron-Core Loss (W):</td>
<td>309,26200</td>
<td>315,3</td>
<td>221,73800</td>
<td>227,71800</td>
<td>198,09150</td>
<td>203,69700</td>
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<tr>
<td></td>
<td>IPM1</td>
<td>IPM1</td>
<td>IPM2</td>
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<tr>
<td>Arm. Copper Loss (W):</td>
<td>552</td>
<td>617</td>
<td>580</td>
<td>805</td>
<td>530</td>
<td>757</td>
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<td>Total Loss (W):</td>
<td>861</td>
<td>933</td>
<td>802</td>
<td>1032</td>
<td>728</td>
<td>961</td>
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<tr>
<td>Output Power (W):</td>
<td>14991</td>
<td>14999</td>
<td>14998</td>
<td>14994</td>
<td>15006</td>
<td>15000</td>
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<tr>
<td>Input Power (W):</td>
<td>15852</td>
<td>15932</td>
<td>15800</td>
<td>16027</td>
<td>15734</td>
<td>15961</td>
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<tr>
<td>Efficiency (%):</td>
<td>94,5</td>
<td>94,7</td>
<td>93,7</td>
<td>93,3</td>
<td>95,1</td>
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<tr>
<td>Synchronous Speed (rpm):</td>
<td>6000</td>
<td>6000</td>
<td>6000</td>
<td>6000</td>
<td>6000</td>
<td>6000</td>
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<tr>
<td>Rated Torque (N,m):</td>
<td>30,8589</td>
<td>23,8715</td>
<td>49,8699</td>
<td>50,8644</td>
<td>26,883</td>
<td>26,8733</td>
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<tr>
<td>Torque Angle (degree):</td>
<td>47,4391</td>
<td>48,0717</td>
<td>57,2638</td>
<td>58,3755</td>
<td>25,7223</td>
<td>26,9969</td>
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<tr>
<td>Max. Output Power (W):</td>
<td>57290,2</td>
<td>51504</td>
<td>328691,6</td>
<td>31720</td>
<td>29084,5</td>
<td>30412,9</td>
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<tr>
<td>Torque Constant KT (Nm/A):</td>
<td>0,100615</td>
<td>0,0150167</td>
<td>0</td>
<td>0,00533663</td>
<td>0,0927496</td>
<td>0,256445</td>
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</table>

**WINDING ARRANGEMENT**

- Angle per slot (elec, degrees): 30 30 30 30 30 30
- Phase-A axis (elec, degrees): 105 105 105 105 105 105
- First slot center (elec, degrees): 0 0 0 0 0 0

**TRANSIENT FEA INPUT DATA**

For Arm. Winding:

- No. of Turns: 138 144 168 168 186 186
- Parallel Branches: 2 2 2 2 2 2
- Terminal Resistance (ohm): 0,191 0,220 0,234 0,325 0,261 0,363
- End Leakage Inductance (H): 6,98E-05 0,000104 0,000106 0,00014 0,000138 0,00018
<table>
<thead>
<tr>
<th></th>
<th>IPM1</th>
<th>IPM1</th>
<th>IPM2</th>
<th>IPM2</th>
<th>SPM</th>
<th>SPM</th>
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<tr>
<td>Equivalent Model Depth (mm):</td>
<td>45</td>
<td>45</td>
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<tr>
<td>Equivalent Stator Stacking Factor:</td>
<td>0,95</td>
<td>0,95</td>
<td>0,95</td>
<td>0,95</td>
<td>0,95</td>
<td>0,95</td>
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<tr>
<td>Equivalent Rotor Stacking Factor:</td>
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<td>0,95</td>
<td>0,95</td>
<td>0,95</td>
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<tr>
<td>Equivalent Br (Tesla):</td>
<td>1,23</td>
<td>1,23</td>
<td>1,23</td>
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<td>1,23</td>
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<tr>
<td>Equivalent Hc (kA/m):</td>
<td>890</td>
<td>890</td>
<td>890</td>
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<tr>
<td>Rotor Inert. Moment (kg m²):</td>
<td>0,00418</td>
<td>0,00418</td>
<td>0,00418</td>
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<td>0,00403</td>
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</table>
4. Absolute Maximum Ratings

T<sub>c</sub>=25°C, V<sub>CC</sub>=15V unless otherwise specified.

<table>
<thead>
<tr>
<th>Items</th>
<th>Symbol</th>
<th>Min.</th>
<th>Max.</th>
<th>Units</th>
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<tbody>
<tr>
<td>Collector-Emitter Voltage</td>
<td>V&lt;sub&gt;CES&lt;/sub&gt;</td>
<td>0</td>
<td>600</td>
<td>V</td>
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<tr>
<td>Short Circuit Voltage</td>
<td>V&lt;sub&gt;SC&lt;/sub&gt;</td>
<td>200</td>
<td>400</td>
<td>V</td>
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<tr>
<td>Inverter</td>
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<tr>
<td>Collector Current</td>
<td>I&lt;sub&gt;C&lt;/sub&gt;</td>
<td>-</td>
<td>400</td>
<td>A</td>
</tr>
<tr>
<td>Duty=68.6%</td>
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<tr>
<td>Collector Power Dissipation</td>
<td>P&lt;sub&gt;C&lt;/sub&gt;</td>
<td>-</td>
<td>1066</td>
<td>W</td>
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<tr>
<td>Brake</td>
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<tr>
<td>Collector Current</td>
<td>I&lt;sub&gt;C&lt;/sub&gt;</td>
<td>-</td>
<td>200</td>
<td>A</td>
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<tr>
<td>Forward Current of Diode</td>
<td>I&lt;sub&gt;F&lt;/sub&gt;</td>
<td>-</td>
<td>200</td>
<td>A</td>
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<tr>
<td>Collector Power Dissipation</td>
<td>P&lt;sub&gt;C&lt;/sub&gt;</td>
<td>-</td>
<td>714</td>
<td>A</td>
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<tr>
<td>Supply Voltage of Pre- Driver</td>
<td>V&lt;sub&gt;CC&lt;/sub&gt;</td>
<td>0.5</td>
<td>20</td>
<td>V</td>
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<tr>
<td>Input Signal Voltage</td>
<td>V&lt;sub&gt;n&lt;/sub&gt;</td>
<td>-0.5</td>
<td>VCC+0.5</td>
<td>V</td>
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<tr>
<td>Alarm Signal Voltage</td>
<td>V&lt;sub&gt;ALM&lt;/sub&gt;</td>
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<td>VCC</td>
<td>V</td>
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<tr>
<td>Alarm Signal Current</td>
<td>I&lt;sub&gt;ALM&lt;/sub&gt;</td>
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<td>20</td>
<td>mA</td>
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<td>Junction Temperature</td>
<td>T&lt;sub&gt;j&lt;/sub&gt;</td>
<td>-</td>
<td>150</td>
<td>°C</td>
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<tr>
<td>Operating Case Temperature</td>
<td>T&lt;sub&gt;OP&lt;/sub&gt;</td>
<td>-20</td>
<td>110</td>
<td>°C</td>
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<tr>
<td>Storage Temperature</td>
<td>T&lt;sub&gt;stg&lt;/sub&gt;</td>
<td>-40</td>
<td>125</td>
<td>°C</td>
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<tr>
<td>Solder Temperature</td>
<td>T&lt;sub&gt;s&lt;sup&gt;2&lt;/sup&gt;&lt;/sub&gt;</td>
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<td>Isolating Voltage</td>
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<td>Vrms</td>
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<td>Screw Torque</td>
<td>Terminal (M5)</td>
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<td></td>
<td>Mounting (M5)</td>
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</table>

Notes

*1: V<sub>CES</sub> shall be applied to the input voltage between all Collector and Emitter.


*2: Duty=125°C/R<sub>EQD</sub>[<sub>2</sub>]max[<sub>2</sub>]+100

*3: P<sub>C</sub>=125°C/R<sub>EQD</sub>[<sub>2</sub>]+100 (Inverter & Brake)

*4: V<sub>CC</sub> shall be applied to the input voltage between terminal No.3 and 1, 7 and 5, 11 and 9, 14 and 13.

*5: V<sub>n</sub> shall be applied to the input voltage between terminal No.2 and 1, 6 and 5, 10 and 9, 15 and 18 and 13.

*6: V<sub>ALM</sub> shall be applied to the voltage between terminal No.4 and 1, 8 and 5, 12 and 9, 19 and 13.

*7: I<sub>ALM</sub> shall be applied to the input current to terminal No.4, 8, 12 and 19.

*8: Immersion time 10±1sec, 1 time

*9: Terminal to base, 50/60Hz sine wave 1min. All terminals should be connected together during the test.
Datový list materiálu Hiperco 50A
Datový list motoru TG Drives N6-1800

**RATED DATA**

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<th>Motor type</th>
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<th>1800</th>
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<tr>
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<tr>
<td>Rated Speed $n_r$</td>
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<td>DC Bus Voltage $U_d$</td>
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<tr>
<td>Nominal AC Voltage $U_n$</td>
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<td>Rated Motor Voltage $U_m$</td>
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<td>Rated Torque $M_n$</td>
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<tr>
<td>Rated AC Current $I_n$</td>
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<td>Stall Torque $M_0$</td>
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<td>Stall AC Current $I_0$</td>
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<td>Peak Current $I_{\text{max}}$</td>
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<td>Max. Speed $n_{\text{max}}$</td>
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<tr>
<td>EMF Constant $K_e$</td>
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<tr>
<td>Torque Constant $K_t$</td>
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<td>Terminal Resistance $R_{\text{2ph}}$</td>
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<td>Terminal Inductance $L_{\text{2ph}}$</td>
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<td>Number of poles $2p$</td>
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</tbody>
</table>

| No Load Speed $n_{nl}$ | 9490 min⁻¹ | | | |
| Torque at $I_{\text{max}}/U_n$ $M_x$ | 50 Nm | | | |
| Speed at $I_{\text{max}}/U_n$ $n_r$ | 4240 min⁻¹ | | | |
| Max. Torque at $n_0$ $M_x$ | 19.8 Nm | | | |

| El. Time Constant $T_{\text{el}}$ | 12.3 ms | | | |
| Mech. Time Constant $T_{\text{mech}}$ | 0.88 ms | | | |
| Thermal Time Constant $T_{\theta}$ | 42 min | | | |
| Rotor Inertia $J$ | 18.5 kgcm² | | | |

**Torque/Speed curves**

15.10.2014

XIII