Simulator for Manufacturing Deviations

Technical data

- Surface mounted permanent magnet synchronous machine
  - 6 teeth and 4 poles
  - 2 mm air gap width
- Free adjustable static eccentricity (0 to 2 mm)
- Rotors for dynamic eccentricity (0.25 mm and 0.5 mm)
- Six exchangeable single tooth windings with the possibility of different numbers of turns
- Possibility of magnetization deviation of permanent magnets

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated speed</td>
<td>3000 rpm</td>
</tr>
<tr>
<td>Rated torque</td>
<td>3 Nm</td>
</tr>
<tr>
<td>Rated current</td>
<td>5 A</td>
</tr>
<tr>
<td>Maximum Speed</td>
<td>5000 rpm</td>
</tr>
<tr>
<td>Maximum Torque</td>
<td>9 Nm</td>
</tr>
</tbody>
</table>

Equipment

- dSPACE rapid control prototyping system DS1103 PPC controller board to control the permanent magnet synchronous machine
- 4-quadrant amplifier DM 15000/PAS (Spitzenberger & Spies) to supply the electrical machine with ideal sinusoidal currents
- Water-cooled magnetic particle brake 1PB43 (Magtrol) with a rated torque of 5 Nm, a rated power of 500 W and a maximum speed of 4000 rpm
- Torque measuring shaft T22 (HBM) with 10 Nm measurement range and accuracy class 0.5

Application

- Study of manufacturing tolerance’s influence on the acoustics of the electrical machine and retroactive effects on the machine control
- Simple stator geometry without tooth tip, to simplify the validation with analytical models
- Detection of manufacturing deviations through measurement of machine parameters
- Investigation of specific current injection in order to compensate the effects aroused by manufacturing deviations

Spatial Order

Rad. Force Density $f_{rad}$ in dB (1 N/m²)

Sum Forces (xy-direction)

Sum Force $F_x$ in N

Sum Force $F_y$ in N

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