FEATURES

• Synchronous Reluctance assisted Permanent Magnet (SRPM) technology
• Extremely compact and robust structure
• Highest efficiency throughout the operation range on the market (~96 %)
• Liquid cooled with plain water or water/glycol mixture
• Low coolant flow required
• Allowed coolant temperature up to +65°C
• IP65 enclosure class to maximize reliability, IP67 available as option
• Multiple mounting possibilities

GENERATOR SPECIFIC FEATURES

• Standard SAE flange mounting to match the diesel engine connection
• Wide selection of speed ratings allowing the generator to be selected to customer specific applications with various voltage requirements
• Can be also used as starter motor for the ICE

MOTOR SPECIFIC FEATURES

• Extended speed and torque capabilities compared to standard PM motors from Danfoss reluctance assisted permanent magnet motor technology
• Motor structure is designed to be able to produce high starting torques: EM-PMI motor can produce instantly full torque to a non-moving axle
• Optimized speed range to meet the most common gear ratios used in heavy mobile machinery

GENERAL

The machine is developed especially for demanding applications. It is smaller, lighter and more efficient than conventional products on the market.

TYPICAL APPLICATIONS

• Generator for diesel-electric/ serial hybrid applications
• Traction/propulsion motor
• Generator/Motor for parallel hybrid applications
## SPECIFICATIONS

### General electrical properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal voltage (line to line)</td>
<td>500 V AC</td>
</tr>
<tr>
<td>Voltage stress</td>
<td>IEC 60034-25, Curve A Without filters for motors up to 500 V AC</td>
</tr>
<tr>
<td>Nominal efficiency</td>
<td>96 %</td>
</tr>
<tr>
<td>Pole pair number</td>
<td>6</td>
</tr>
<tr>
<td>Power supply</td>
<td>Inverter fed.</td>
</tr>
<tr>
<td>Nominal inverter switching frequency</td>
<td>8 kHz</td>
</tr>
</tbody>
</table>

### Basic information

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machine type</td>
<td>Synchronous reluctance assisted permanent magnet</td>
</tr>
<tr>
<td>Mounting (IEC 60034-7)</td>
<td>IM 3001 (Flange)</td>
</tr>
<tr>
<td>Standard Flange D-end (SAE J617)</td>
<td>SAE 3, transmission housing</td>
</tr>
<tr>
<td>Standard bearings</td>
<td>SKF 6211 2RS1 C3 WT</td>
</tr>
<tr>
<td>Standard axle spline D-end</td>
<td>DIN5480 W50x2x24x8f</td>
</tr>
<tr>
<td>Standard Flange N-end (SAE J617)</td>
<td>SAE 4, flywheel housing</td>
</tr>
<tr>
<td>Standard rotation direction</td>
<td>Clockwise (both directions possible)</td>
</tr>
<tr>
<td>Protection class</td>
<td>IP65 IP67 available as option +IP67 Tests: 0.3 bar under pressure held for 120 seconds. Pressure not allowed to drop under 0.25 bar</td>
</tr>
<tr>
<td>Duty type (IEC 60034-1)</td>
<td>S9</td>
</tr>
<tr>
<td>Standard color</td>
<td>Dark grey RAL7024 powder coating</td>
</tr>
</tbody>
</table>

### Mechanical

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total weight</td>
<td>98 kg (no options)</td>
</tr>
<tr>
<td>Moment of inertia</td>
<td>0.21 kgm²</td>
</tr>
<tr>
<td>Rotating mass</td>
<td>26.5 kg</td>
</tr>
<tr>
<td>Maximum static torque on the shaft</td>
<td>3400 Nm</td>
</tr>
<tr>
<td>Maximum dynamic torque on the shaft</td>
<td>2500 Nm</td>
</tr>
<tr>
<td>Maximum deceleration (shaft braking)</td>
<td>6000 rad/s²</td>
</tr>
<tr>
<td>Length (frame)</td>
<td>278 mm</td>
</tr>
<tr>
<td>Diameter (frame)</td>
<td>450 mm</td>
</tr>
</tbody>
</table>

### Cooling

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooling liquid</td>
<td>Plain water with appropriate corrosive inhibitor (max. 50 % corrosive inhibitor)</td>
</tr>
<tr>
<td>Cooling liquid corrosive inhibitor type</td>
<td>Ethylene glycol Glysantin G48 recommended</td>
</tr>
<tr>
<td>Cooling method (IEC 60034-6)</td>
<td>IC 95777 (Liquid cooled, external heat exchanger)</td>
</tr>
<tr>
<td>Minimum cooling liquid flow</td>
<td>20 l/min</td>
</tr>
<tr>
<td>Coolant circuit capacity</td>
<td>0.8 l</td>
</tr>
<tr>
<td>Maximum operating pressure</td>
<td>2 bar</td>
</tr>
<tr>
<td>Pressure loss</td>
<td>0.4 bar with 20l/min (+25°C coolant)</td>
</tr>
<tr>
<td>Cooling liquid temperature max</td>
<td>+65°C (Derating required if exceeded)</td>
</tr>
<tr>
<td>Temperature rating (IEC 60034-1)</td>
<td>H (180°C)</td>
</tr>
<tr>
<td>Temperature rise (IEC 60034-1)</td>
<td>85°C (F) / 110°C (H)</td>
</tr>
<tr>
<td>Maximum winding temperature</td>
<td>175°C</td>
</tr>
<tr>
<td>Nominal ambient temperature</td>
<td>65°C</td>
</tr>
<tr>
<td>Min. ambient temperature</td>
<td>-40°C</td>
</tr>
<tr>
<td>Nominal altitude (IEC 60034-1)</td>
<td>1000 m</td>
</tr>
</tbody>
</table>

### Vibration & Shock tolerance

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical vibration (ISO 16750-3)</td>
<td>5.9 Gms</td>
</tr>
<tr>
<td>Mechanical shock (ISO 16750-3)</td>
<td>50 G</td>
</tr>
</tbody>
</table>

### Notes:
- Test VII – Commercial vehicle, sprung masses – Table 12
- Test done with EM-PMI375-T800
Test done with EM-PMI375-T200

**Connections**

<table>
<thead>
<tr>
<th>Coolant connection</th>
<th>2 x G3/4 bore</th>
</tr>
</thead>
<tbody>
<tr>
<td>HV cables</td>
<td>3 x 70 mm² max.</td>
</tr>
<tr>
<td>HV cable glands</td>
<td>Pflitsch blueglobe TRI bg 225ms tri</td>
</tr>
<tr>
<td>HV cable</td>
<td>Recommended H+S Radox screened cable</td>
</tr>
<tr>
<td>HV cable lug size</td>
<td>35-8, 50-8, 70-8</td>
</tr>
<tr>
<td>HV connection boxes</td>
<td>1 x 3 phase box (SINGLE winding model)</td>
</tr>
<tr>
<td></td>
<td>2 x 3 phase box (DUAL winding model)</td>
</tr>
<tr>
<td>HV connection boxes</td>
<td>1 x 3 phase box (SINGLE winding model)</td>
</tr>
<tr>
<td></td>
<td>2 x 3 phase box (DUAL winding model)</td>
</tr>
<tr>
<td>LV connector</td>
<td>47 pin DEUTSCH HD34-24-47PE for resolver and temperature measurement.</td>
</tr>
<tr>
<td>LV connector type</td>
<td>DEUTSCH HD34-24-47PE</td>
</tr>
<tr>
<td>LV connector pin type</td>
<td>Gold plated</td>
</tr>
<tr>
<td>LV mating connector type</td>
<td>DEUTSCH HD36-24-47SE or DEUTSCH HD36-24-47SE-059</td>
</tr>
<tr>
<td>LV mating connector pin type</td>
<td>DEUTSCH 0462-201-1631</td>
</tr>
<tr>
<td></td>
<td>DEUTSCH 0462-005-2031</td>
</tr>
</tbody>
</table>

**HV connection boxes**

- 1 x 3 phase box (SINGLE winding model)
- 2 x 3 phase box (DUAL winding model)

**HV connection boxes**

- 1 x 3 phase box (SINGLE winding model)
- 2 x 3 phase box (DUAL winding model)

**LV connector**

- 47 pin DEUTSCH HD34-24-47PE for resolver and temperature measurement.

**LV connector type**

- DEUTSCH HD34-24-47PE
- Gold plated

**LV mating connector type**

- DEUTSCH HD36-24-47SE or DEUTSCH HD36-24-47SE-059
- DEUTSCH 0462-201-1631
- DEUTSCH 0462-005-2031

**LV connector pin type**

- Gold plated

**LV mating connector pin type**

- DEUTSCH 0462-201-1631
- DEUTSCH 0462-005-2031

---

Table 1 Pin configuration of LV-connector

<table>
<thead>
<tr>
<th>PIN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>47</td>
<td>Temperature 1, PT100 (P), windings</td>
</tr>
<tr>
<td>46</td>
<td>Temperature 1, PT100 (N), windings</td>
</tr>
<tr>
<td>33</td>
<td>Temperature 2, PT100 (P), windings</td>
</tr>
<tr>
<td>32</td>
<td>Temperature 2, PT100 (N), windings</td>
</tr>
<tr>
<td>45</td>
<td>Temperature 3, PT100 (P), windings</td>
</tr>
<tr>
<td>31</td>
<td>Temperature 3, PT100 (N), windings</td>
</tr>
<tr>
<td>30</td>
<td>Temperature 4, PT100 (P), windings option TEMP4</td>
</tr>
<tr>
<td>29</td>
<td>Temperature 4, PT100 (N), windings option TEMP4</td>
</tr>
<tr>
<td>44</td>
<td>Temperature 5, PT100 (P), windings option TEMP4</td>
</tr>
<tr>
<td>43</td>
<td>Temperature 5, PT100 (N), windings option TEMP4</td>
</tr>
<tr>
<td>28</td>
<td>Temperature 6, PT100 (P), windings option TEMP4</td>
</tr>
<tr>
<td>16</td>
<td>Temperature 6, PT100 (N), windings option TEMP4</td>
</tr>
<tr>
<td>35</td>
<td>Resolver, RES_COS_N, in-built non-contacting</td>
</tr>
<tr>
<td>20</td>
<td>Resolver, RES_COS_P, in-built non-contacting</td>
</tr>
<tr>
<td>36</td>
<td>Resolver, RES_SIN_N, in-built non-contacting</td>
</tr>
<tr>
<td>21</td>
<td>Resolver, RES_SIN_P, in-built non-contacting</td>
</tr>
<tr>
<td>22</td>
<td>Resolver, EXCN, in-built non-contacting</td>
</tr>
<tr>
<td>10</td>
<td>Resolver, EXCP, in-built non-contacting</td>
</tr>
<tr>
<td>34</td>
<td>Resolver, SHIELD/GROUND, in-built non-contacting</td>
</tr>
</tbody>
</table>

Table 2 Pin configuration of heater

<table>
<thead>
<tr>
<th>PIN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Phase, 230VAC</td>
</tr>
<tr>
<td>2</td>
<td>Neutral</td>
</tr>
<tr>
<td>3</td>
<td>Reserve</td>
</tr>
<tr>
<td>4</td>
<td>Reserve</td>
</tr>
<tr>
<td>5</td>
<td>Reserve</td>
</tr>
</tbody>
</table>

Table 3 Pin configuration of bearing temperature sensor connector

<table>
<thead>
<tr>
<th>PIN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PT-100</td>
</tr>
<tr>
<td>2</td>
<td>PT-100</td>
</tr>
<tr>
<td>3</td>
<td>PT-100_GND</td>
</tr>
<tr>
<td>4</td>
<td>PT-100_GND</td>
</tr>
</tbody>
</table>
**PRESSURE LOSS VS COOLANT FLOW**

![Pressure loss vs coolant flow graph](image)

**Picture 1** Pressure loss vs coolant flow

**MOTORS (temperature class F, maximum winding temperature 150°C)**

<table>
<thead>
<tr>
<th>Type</th>
<th>Coolant temperature +65°C</th>
<th>Coolant temperature +40°C</th>
<th>Coolant temperature +40 / +65°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>EM-PMI375-T200-600</td>
<td>190</td>
<td>12</td>
<td>16</td>
</tr>
<tr>
<td>EM-PMI375-T200-1000</td>
<td>197</td>
<td>21</td>
<td>28</td>
</tr>
<tr>
<td>EM-PMI375-T200-1400</td>
<td>186</td>
<td>27</td>
<td>34</td>
</tr>
<tr>
<td>EM-PMI375-T200-1900</td>
<td>184</td>
<td>37</td>
<td>51</td>
</tr>
<tr>
<td>EM-PMI375-T200-2600</td>
<td>170</td>
<td>46</td>
<td>61</td>
</tr>
<tr>
<td>EM-PMI375-T200-3200</td>
<td>161</td>
<td>54</td>
<td>72</td>
</tr>
</tbody>
</table>

* Peak torque achieved with 1 (350A) inverter

**GENERATORS (temperature class F, maximum winding temperature 150°C)**

<table>
<thead>
<tr>
<th>Type</th>
<th>Coolant temperature +65°C</th>
<th>Coolant temperature +40°C</th>
<th>Coolant temperature +40 / +65°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>EM-PMI375-T200-600</td>
<td>15</td>
<td>15</td>
<td>16</td>
</tr>
<tr>
<td>EM-PMI375-T200-1000</td>
<td>25</td>
<td>24</td>
<td>27</td>
</tr>
<tr>
<td>EM-PMI375-T200-1400</td>
<td>31</td>
<td>31</td>
<td>33</td>
</tr>
<tr>
<td>EM-PMI375-T200-1900</td>
<td>44</td>
<td>39</td>
<td>50</td>
</tr>
<tr>
<td>EM-PMI375-T200-2600</td>
<td>52</td>
<td>49</td>
<td>60</td>
</tr>
<tr>
<td>EM-PMI375-T200-3200</td>
<td>59</td>
<td>55</td>
<td>71</td>
</tr>
</tbody>
</table>

**MOTORS (temperature class H, maximum winding temperature 175°C)**

<table>
<thead>
<tr>
<th>Type</th>
<th>Coolant temperature +65°C</th>
<th>Coolant temperature +40°C</th>
<th>Coolant temperature +40 / +65°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>EM-PMI375-T200-600</td>
<td>209</td>
<td>13</td>
<td>18</td>
</tr>
<tr>
<td>EM-PMI375-T200-1000</td>
<td>213</td>
<td>22</td>
<td>31</td>
</tr>
<tr>
<td>EM-PMI375-T200-1400</td>
<td>209</td>
<td>31</td>
<td>39</td>
</tr>
<tr>
<td>EM-PMI375-T200-1900</td>
<td>208</td>
<td>41</td>
<td>62</td>
</tr>
<tr>
<td>EM-PMI375-T200-2600</td>
<td>191</td>
<td>52</td>
<td>68</td>
</tr>
<tr>
<td>EM-PMI375-T200-3200</td>
<td>189</td>
<td>63</td>
<td>86</td>
</tr>
</tbody>
</table>
(*) Peak torque achieved with 1 (350A) inverter

GENERATORS (temperature class H, maximum winding temperature 175°C)

<table>
<thead>
<tr>
<th>Type</th>
<th>Coolant temperature +65°C</th>
<th>Coolant temperature +40°C</th>
<th>Coolant temperature +40 / +65°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>EM-PMI375-T200-600</td>
<td>17</td>
<td>16</td>
<td>18</td>
</tr>
<tr>
<td>EM-PMI375-T200-1000</td>
<td>27</td>
<td>26</td>
<td>31</td>
</tr>
<tr>
<td>EM-PMI375-T200-1400</td>
<td>36</td>
<td>35</td>
<td>38</td>
</tr>
<tr>
<td>EM-PMI375-T200-1900</td>
<td>54</td>
<td>46</td>
<td>61</td>
</tr>
<tr>
<td>EM-PMI375-T200-2600</td>
<td>59</td>
<td>55</td>
<td>67</td>
</tr>
<tr>
<td>EM-PMI375-T200-3200</td>
<td>74</td>
<td>67</td>
<td>84</td>
</tr>
</tbody>
</table>

(*** Back EMF for cold (20°C) generator)
## PRODUCT CODE AND OPTIONS

Use product code including all needed options for ordering. Standard options are not given with the code as they are selected by default if a non-standard option is not selected.

<table>
<thead>
<tr>
<th>Product code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>EM-PMI375-T200-2600</td>
<td>Standard 2600 rpm unit with standard options</td>
</tr>
<tr>
<td>EM-PMI375-T200-2600+BIN+RES1</td>
<td>Standard unit otherwise but with insulated bearing in N-end and resolver</td>
</tr>
</tbody>
</table>

### Table 3 Product code examples

<table>
<thead>
<tr>
<th>Variant code</th>
<th>Description</th>
<th>Variant code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>+NE1</td>
<td>Flange</td>
<td>+NE2</td>
<td>Male shaft + Flange</td>
</tr>
<tr>
<td>+NE1</td>
<td>Flange</td>
<td>+NE2</td>
<td>Male shaft + Flange</td>
</tr>
<tr>
<td>*</td>
<td>Non-insulated bearings</td>
<td>+BIN</td>
<td>Insulated bearing in N-end</td>
</tr>
<tr>
<td>*</td>
<td>Non-insulated bearings</td>
<td>+BIN</td>
<td>Insulated bearing in N-end</td>
</tr>
<tr>
<td>*</td>
<td>Insulated bearing in both ends</td>
<td>+BIA</td>
<td>Insulated bearing in both ends</td>
</tr>
<tr>
<td>*</td>
<td>Insulated bearing in both ends</td>
<td>+BIA</td>
<td>Insulated bearing in both ends</td>
</tr>
<tr>
<td>*</td>
<td>None</td>
<td>+SG1</td>
<td>D-end shaft grounding</td>
</tr>
<tr>
<td>*</td>
<td>None</td>
<td>+SG1</td>
<td>D-end shaft grounding</td>
</tr>
<tr>
<td>*</td>
<td>Standard protection class</td>
<td>+IP67</td>
<td>IP67 protection class</td>
</tr>
<tr>
<td>*</td>
<td>Standard protection class</td>
<td>+IP67</td>
<td>IP67 protection class</td>
</tr>
<tr>
<td>*</td>
<td>Cable direction fixed</td>
<td>+CNE</td>
<td>Cable direction towards N-end</td>
</tr>
<tr>
<td>*</td>
<td>Cable direction fixed</td>
<td>+CNE</td>
<td>Cable direction towards N-end</td>
</tr>
<tr>
<td>*</td>
<td>None</td>
<td>+RES1</td>
<td>Resolver</td>
</tr>
<tr>
<td>*</td>
<td>None</td>
<td>+RES1</td>
<td>Resolver</td>
</tr>
<tr>
<td>*</td>
<td>Temperature surveillance</td>
<td>+TEMP4</td>
<td>Redundant temperature surveillance</td>
</tr>
<tr>
<td>*</td>
<td>Temperature surveillance</td>
<td>+TEMP4</td>
<td>Redundant temperature surveillance</td>
</tr>
<tr>
<td>*</td>
<td>None</td>
<td>+BTMP1</td>
<td>PT100 in bearings</td>
</tr>
<tr>
<td>*</td>
<td>None</td>
<td>+BTMP1</td>
<td>PT100 in bearings</td>
</tr>
<tr>
<td>*</td>
<td>None</td>
<td>+HEAT1</td>
<td>One anticondensation heater</td>
</tr>
<tr>
<td>*</td>
<td>None</td>
<td>+HEAT1</td>
<td>One anticondensation heater</td>
</tr>
</tbody>
</table>

### Table 4 Option list

<table>
<thead>
<tr>
<th>Variant code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>s = standard</td>
<td>o = option</td>
</tr>
<tr>
<td>s</td>
<td>SA4 4 FH</td>
</tr>
<tr>
<td>o</td>
<td>DIN5480 W50x2x24x8f + SA4 4 FH</td>
</tr>
<tr>
<td>s</td>
<td>Bearing types according to greased for life bearing</td>
</tr>
<tr>
<td>o</td>
<td>SKF 6211 insulated bearing in N-end</td>
</tr>
<tr>
<td>o</td>
<td>SKF 6211 insulated bearing in both ends</td>
</tr>
<tr>
<td>s</td>
<td>In-built grounding ring</td>
</tr>
<tr>
<td>o</td>
<td>In-built non contacting resolver, 6-pole pair</td>
</tr>
<tr>
<td>3 x PT100 (two wire) in windings</td>
<td></td>
</tr>
<tr>
<td>o</td>
<td>6 x PT100 (two wire) in windings</td>
</tr>
<tr>
<td>o</td>
<td>plug in connector</td>
</tr>
<tr>
<td>o</td>
<td>plug in connector</td>
</tr>
<tr>
<td>o</td>
<td>230VAC/50W</td>
</tr>
</tbody>
</table>