

Data Sheet

# EM-PMI375-T1100

Electric machine, permanent magnet internal

## FEATURES

- Synchronous Reluctance assisted Permanent Magnet (SRPM) technology
- Extremely compact and robust aluminum frame structure
- Highest efficiency throughout the operation range on the market (~96 %)
- Liquid cooled with 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 also be 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 torque: EM-PMI motor can produce instantly full torque to a non-rotating shaft
- 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                             |  |
|---|--|
| Nominal voltage (line-to-line)                            | 500 V <sub>AC</sub>  |
| Voltage stress  | IEC 60034-25:2009, Curve A: Without filters for motors up to 500 V <sub>AC</sub> |
| Nominal efficiency  | 96 %   |
| Pole pair number  | 6  |
| Power supply  | Inverter fed   |
| Nominal inverter switching frequency                      | 8 kHz  |
| Minimal inverter switching frequency                      | 4 kHz (with limited speed 1.4 times nominal speed)                               |
| Maximum phase-to-phase peak-to-peak voltage without du/dt | 1.5 kV   |
| Maximum voltage rise time without du/dt                   | 8 kV/μs  |

| Basic information                |   |
|----------------------------------|---|
| Machine type                     | Synchronous reluctance assisted permanent magnet  |
| Frame material                   | Aluminum  |
| Mounting direction               | Can be used in all directions, see user guide for details. Greased for life bearings required.  |
| Mounting (IEC 60034-7)           | IM 3009-B5 (flange horizontal),<br>IM 3019-V1 (flange and D-end down)   |
| Standard flange D-end (SAE J617) | SAE 3 transmission housing  |
| Standard axle spline D-end       | DIN5480 W55x2x26x8a   |
| Standard flange N-end (SAE J617) | SAE 4 flywheel housing  |
| Standard rotation direction      | Clockwise (both directions possible)  |
| Bearing type                     | Standard:<br>6214/C3 (with LGHP2 grease)<br>+BGL option:<br>6214-2RS1/C3WT<br>+BIN option:<br>D-end: 6214/C3 (with LGHP2 grease)<br>N-end: 6214/HC5C3 (with LGHP2 grease)<br>+BIA option:<br>6214/HC5C3WT (with LGHP2 grease)<br>+BGL, +BIN options:<br>D-end: 6214-2RS1/C3WT<br>N-end: 6214-2RS1/HC5C3WT<br>+BGL, +BIA options:<br>6214-2RS1/HC5C3 |
| Protection class                 | IP65<br>IP67 available as option +IP67  |
| Duty type (IEC 60034-1)          | S1/S9   |
| Machine coating                  | Dark grey RAL7024   |
| Altitude                         | Up to 4000 m, see Picture 3   |

| Mechanical   |   |
|--|---|
| Total weight   | 295 kg (no options)   |
| Moment of inertia  | 0.99 kgm <sup>2</sup>   |
| Torsional stiffness of shaft drive end                               | 7*10 <sup>5</sup> Nm/rad (from middle of the D-end spline to rotor air gap) |
| Rotating mass  | 111 kg  |
| Maximum static torque range on the shaft, max. 25000 cycles, R=0 (*) | 6800 Nm   |
| Maximum dynamic torque range on the shaft, max. 1e6 cycles, R=0 (*)  | 4000 Nm   |
| Maximum allowed vibratory torque range, 1e9...1e10 cycles (*)        | 0.3 x nominal torque of machine   |
| Maximum deceleration (fault stop)                                    | 2000 rad/s <sup>2</sup>   |

| Dimensions       |        |
|------------------|--------|
| Length (frame)   | 548 mm |
| Diameter (frame) | 450 mm |

| Cooling                                 |  |
|---|--|
| Cooling liquid                          | Plain water with appropriate corrosive inhibitor (max. 50 % corrosive inhibitor) |
| Cooling liquid corrosive inhibitor type | Ethylene glycol (Glysantin G48 recommended)                                      |
| Cooling method (IEC 60034-6)            | IC 71 W  |
| Minimum cooling liquid flow             | 20 l/min   |
| Coolant circuit capacity                | 2.8 l  |
| Maximum operating pressure              | 3 bar  |
| Pressure loss                           | 0.4 bar with 20 l/min (+25°C coolant)  |
| Nominal cooling liquid temperature      | +65°C (derating required if exceeded), +40°C with +CL option                     |
| Minimum cooling liquid temperature      | -20°C  |
| Maximum cooling liquid temperature      | +70°C  |

| Temperature rating             |                               |
|--------------------------------|-------------------------------|
| Insulation class (IEC 60034-1) | H (+180°C)                    |
| Temperature rise (IEC 60034-1) | +85°C (F) / +110°C (H)        |
| Maximum winding temperature    | +175°C                        |
| Nominal ambient temperature    | +65°C / +45°C with +CL option |
| Min. ambient temperature       | -40°C                         |

| Vibration & Shock tolerance |  |
|-----------------------------|--|
| Mechanical vibration        | 5.9 G <sub>RMS</sub><br>ISO 16750-3<br>Test VII – Commercial vehicle, sprung masses – Table 12<br>Notes:<br>Test duration 8h axis (two axes tested; radial and axial)<br>Total spectral acceleration 5.91 G <sub>RMS</sub><br>Test done with EM-PMI375-T800 (with flange mounting) |
| Mechanical shock            | 50 G<br>ISO 16750-3<br>4.2.2 Test for devices on rigid points on the body and on the frame<br>Notes:<br>–acceleration: 500 m/s <sup>2</sup> ;<br>–duration: 6 ms;<br>–number of shocks: 10 per test direction<br>Test done with EM-PMI375-T800 (with flange mounting)              |

| Connections                              |  |
|--|--|
| Coolant connection                       | 2 x G3/4 bore (see dimension drawing for details)  |
| Cable direction                          | Standard cable direction towards D-end   |
| HV cables                                | 3 x 70 mm <sup>2</sup> max. (SINGLE winding model)<br>2 x 3 x 70 mm <sup>2</sup> max. (DUAL winding model)   |
| HV cable glands                          | Pflitsch blueglobe TRI bg 225ms tri  |
| HV cable recommended type                | HUBER+SUHNER Radox Elastomer S, screened, single core, automotive cable (FHLR4GC13X)<br><a href="http://www.hubersuhner.com">www.hubersuhner.com</a>   |
| HV cable lug size                        | 35-8, 50-8, 70-8   |
| Recommended cable lug                    | 35 mm <sup>2</sup> : Druseidt with narrow flange 03901<br>50 mm <sup>2</sup> : Druseidt with narrow flange 03903<br>70 mm <sup>2</sup> : Druseidt with narrow flange 03906<br><a href="http://www.druseidt.de">www.druseidt.de</a> |
| HV connection boxes                      | - 1 x 3 phase box (SINGLE winding model)<br>- 2 x 3 phase box (DUAL winding model)   |
| LV connector                             | 47 pin DEUTSCH HD34-24-47PE for resolver and temperature measurement<br><a href="https://www.te.com">https://www.te.com</a>  |
| LV connector type                        | DEUTSCH HD34-24-47PE   |
| LV connector pin type                    | Gold plated  |
| LV mating connector type                 | DEUTSCH HD36-24-47SE or DEUTSCH HD36-24-47SE-059 (**)  |
| LV mating connector pin type             | DEUTSCH 0462-201-1631<br>DEUTSCH 0462-005-2031<br>Plug: DEUTSCH 0413-204-2005 (size 20)<br>Plug: DEUTSCH 0413-003-1605 (size 16)   |
| LV connector pin configuration           | See Table 1  |
| LV connections (+LVB1 option)            | Connection box with 3 x M25, 1 x M20 cable glands (reserve/plugged 1 x M16) and terminal block for LV connections. See Table 4   |
| Anti-condensation heater (+HEAT1 option) | 130 W 230 V <sub>AC</sub> single phase heater resistor   |
| Angle/Speed sensor                       | Type: Externally excited SIN/COS resolver<br>Pole pair number 6<br>Input 7 V   |

|   |   |
|---|---|
|   | Frequency 10 kHz<br>Output 2 V +/- 0.2 V<br>Input impedance 110 Ohm +/- 10 %<br>Output impedance 330 Ohm +/- 15 %   |
| Heater connector (+HEAT1 option)                      | Hummel art no. 7651 0 51 01 D (combination of housing 7651 0 00 00 0, insert 7084 9 51 10 1 / 7084 9 51 12 1, crimp pins 7010 9 42 01 1)<br><a href="https://www.hummel.com">https://www.hummel.com</a> |
| Heater mating connector                               | Hummel art no. 7550 6 51 02 D (combination of housing 7550 6 00 00 0, insert 7084 9 51 10 2 / 7084 9 51 12 2, crimp socket 7010 9 42 00 2)  |
| Heater connector pin type                             | Hummel 7010 9 42 01 1   |
| Heater connector pin configuration                    | See Table 2   |
| Bearing temp. measurement connector type              | 4-pin M12 A coded male  |
| Bearing temp. measurement mating type                 | 4-pin M12 A coded female  |
| Bearing temp. measurement connector pin configuration | See Table 3   |

(\* The values are based on structural analysis, and they are not applicable to any marine class rules or requirements.

(\*\* Connector IP-rating of IP67 is reached only when connector mating part is installed and all unused pin holes are plugged in the connector mating part with the following plugs, depending on the hole size: DEUTSCH 0413-003-1605 (size 16) or DEUTSCH 0413-204-2005 (size 20). For further information, contact the connector manufacturer TE connectivity directly.

| PIN | Description                                     | Option |
|-----|---|--------|
| 47  | Temperature 1, PT100 (P), windings              |        |
| 46  | Temperature 1, PT100 (N), windings              |        |
| 33  | Temperature 2, PT100 (P), windings              |        |
| 32  | Temperature 2, PT100 (N), windings              |        |
| 45  | Temperature 3, PT100 (P), windings              |        |
| 31  | Temperature 3, PT100 (N), windings              |        |
| 30  | Temperature 4, PT100 (P), windings              | +TEMP4 |
| 29  | Temperature 4, PT100 (N), windings              | +TEMP4 |
| 44  | Temperature 5, PT100 (P), windings              | +TEMP4 |
| 43  | Temperature 5, PT100 (N), windings              | +TEMP4 |
| 28  | Temperature 6, PT100 (P), windings              | +TEMP4 |
| 16  | Temperature 6, PT100 (N), windings              | +TEMP4 |
| 42  | Temperature 7, PT100 (P), windings              | +TEMP5 |
| 27  | Temperature 7, PT100 (N), windings              | +TEMP5 |
| 15  | Temperature 8, PT100, (P) windings              | +TEMP5 |
| 14  | Temperature 8, PT100 (N), windings              | +TEMP5 |
| 40  | Temperature 9, PT100 (P), windings              | +TEMP5 |
| 26  | Temperature 9, PT100 (N), windings              | +TEMP5 |
| 41  | Temperature 10, PT100 (P), windings             | +TEMP5 |
| 13  | Temperature 10, PT100 (N), windings             | +TEMP5 |
| 39  | Temperature 11, PT100 (P), windings             | +TEMP5 |
| 38  | Temperature 11, PT100 (N), windings             | +TEMP5 |
| 25  | Temperature 12, PT100 (P), windings             | +TEMP5 |
| 12  | Temperature 12, PT100 (N), windings             | +TEMP5 |
| 35  | Resolver, RES_COS_N, inbuilt non-contacting     |        |
| 20  | Resolver, RES_COS_P, inbuilt non-contacting     |        |
| 36  | Resolver, RES_SIN_N, inbuilt non-contacting     |        |
| 21  | Resolver, RES_SIN_P, inbuilt non-contacting     |        |
| 22  | Resolver, EXCN, inbuilt non-contacting          |        |
| 10  | Resolver, EXCP, inbuilt non-contacting          |        |
| 34  | Resolver, SHIELD/GROUND, inbuilt non-contacting |        |

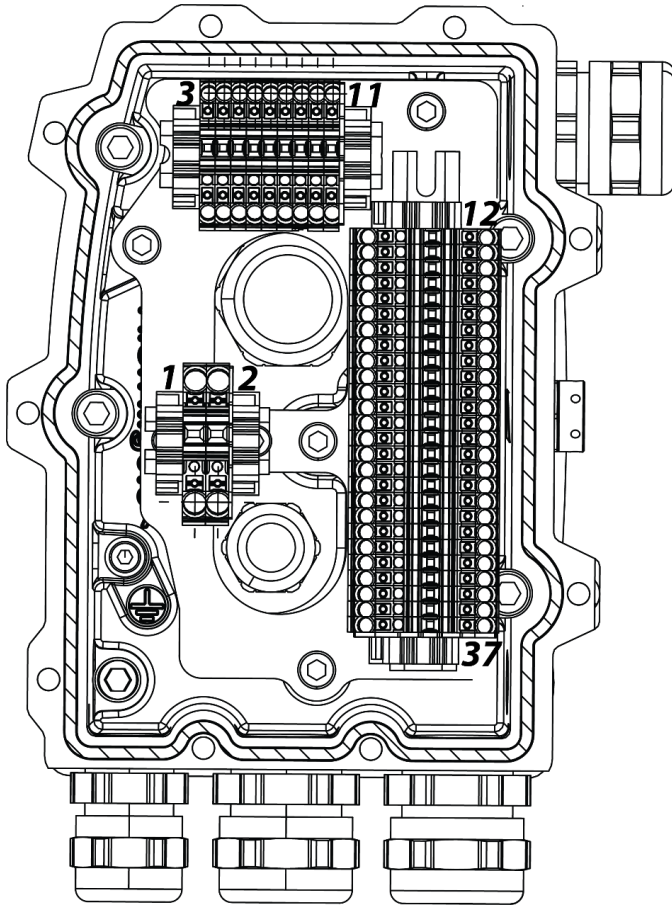
Table 1 Pin configuration of LV-connector

| PIN | Description                |
|-----|----------------------------|
| 1   | Phase, 230 V <sub>AC</sub> |
| 2   | Neutral                    |
| ⊥   | Ground / protective earth  |
| 4   | Reserve                    |
| 5   | Reserve                    |

Table 2 Pin configuration of heater with connector

| PIN | Description |
|-----|-------------|
| 1   | PT100       |
| 2   |             |
| 3   | PT100_GND   |
| 4   |             |

Table 3 Pin configuration of bearing temperature sensor connector (one sensor)



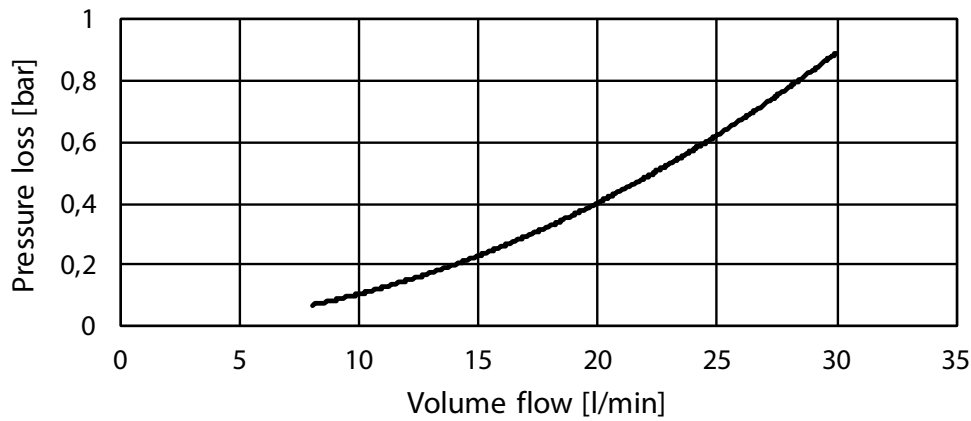
Picture 1 LVB1 terminal box

| Rails    | PIN         | Description                                  | Option                            |        |
|----------|-------------|--|-----------------------------------|--------|
| Rail 1   | 1           | Heater, phase, 230 V <sub>AC</sub>           | +HEAT1                            |        |
|          | 2           | Heater, neutral                              | +HEAT1                            |        |
| M4 screw | ⊥           | General shielding, ground / protective earth |                                   |        |
| Rail 2   | 3           | Resolver                                     | RES_COS_N, Inbuilt non-contacting | +RES1  |
|          | 4           | Resolver                                     | RES_COS_P, Inbuilt non-contacting | +RES1  |
|          | 5           | Resolver                                     | RES_SIN_N, Inbuilt non-contacting | +RES1  |
|          | 6           | Resolver                                     | RES_SIN_P, Inbuilt non-contacting | +RES1  |
|          | 7           | Resolver                                     | EXCN, Inbuilt non-contacting      | +RES1  |
|          | 8           | Resolver                                     | EXCP, Inbuilt non-contacting      | +RES1  |
|          | 9           | Not in use                                   |                                   |        |
|          | 10          | Temperature                                  | PT100 (P), bearing, N-end         | +BTMP1 |
| 11       | Temperature | PT100 (N), bearing, N-end                    | +BTMP1                            |        |
| Rail 3   | 12          | Temperature 1                                | PT100 (P), windings               |        |
|          | 13          | Temperature 1                                | PT100 (N), windings               |        |
|          | 14          | Temperature 2                                | PT100 (P), windings               |        |
|          | 15          | Temperature 2                                | PT100 (N), windings               |        |
|          | 16          | Temperature 3                                | PT100 (P), windings               |        |
|          | 17          | Temperature 3                                | PT100 (N), windings               |        |
|          | 18          | Temperature 4                                | PT100 (P), windings               | +TEMP4 |
|          | 19          | Temperature 4                                | PT100 (N), windings               | +TEMP4 |
|          | 20          | Temperature 5                                | PT100 (P), windings               | +TEMP4 |
|          | 21          | Temperature 5                                | PT100 (N), windings               | +TEMP4 |
|          | 22          | Temperature 6                                | PT100 (P), windings               | +TEMP4 |
|          | 23          | Temperature 6                                | PT100 (N), windings               | +TEMP4 |

|    |                |                     |        |
|----|----------------|---------------------|--------|
| 24 | Temperature 7  | PT100 (P), windings | +TEMP5 |
| 25 | Temperature 7  | PT100 (N), windings | +TEMP5 |
| 26 | Temperature 8  | PT100 (P), windings | +TEMP5 |
| 27 | Temperature 8  | PT100 (N), windings | +TEMP5 |
| 28 | Temperature 9  | PT100 (P), windings | +TEMP5 |
| 29 | Temperature 9  | PT100 (N), windings | +TEMP5 |
| 30 | Temperature 10 | PT100 (P), windings | +TEMP5 |
| 31 | Temperature 10 | PT100 (N), windings | +TEMP5 |
| 32 | Temperature 11 | PT100 (P), windings | +TEMP5 |
| 33 | Temperature 11 | PT100 (N), windings | +TEMP5 |
| 34 | Temperature 12 | PT100 (P), windings | +TEMP5 |
| 35 | Temperature 12 | PT100 (N), windings | +TEMP5 |
| 36 | Reserve        |                     |        |
| 37 | Reserve        |                     |        |

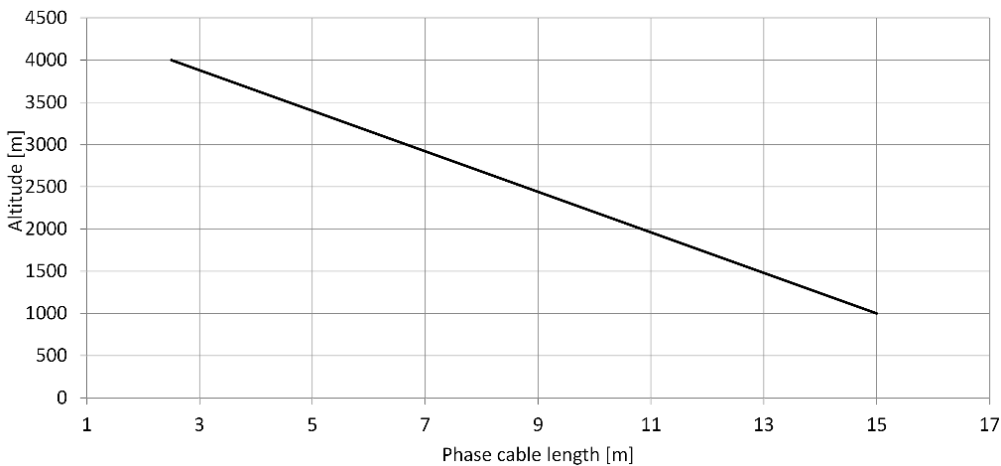
Table 4 Pin configuration of LV connections

### PRESSURE LOSS VS COOLANT FLOW



Picture 2 Pressure loss vs coolant flow

### ALLOWED ALTITUDES VS PHASE CABLE LENGTH



Picture 3 Allowed altitudes vs phase cable length

MOTORS (temperature class F, maximum winding temperature +150°C, with +CL option)

| Type                 | Coolant temperature +65°C |                  |                  | Coolant temperature +40°C |                  |                  | Coolant temperature +40 / +65°C |                  |                        |                      |
|----------------------|---------------------------|------------------|------------------|---------------------------|------------------|------------------|---------------------------------|------------------|------------------------|----------------------|
|                      | Cont. Torque [Nm]         | Cont. Power [kW] | Nom. Current [A] | Cont. Torque [Nm]         | Cont. Power [kW] | Nom. Current [A] | Nom. speed [rpm]                | Max. speed [rpm] | Peak torque SINGLE (a) | Peak torque DUAL (b) |
| EM-PMI375-T1100-1200 | 1306                      | 164              | 207              | 1399                      | 176              | 221              | 1200                            | 2400             | 2100                   | 3270                 |
| EM-PMI375-T1100-1500 | 1175                      | 185              | 261              | 1310                      | 206              | 292              | 1500                            | 3000             | 1525                   | 2475                 |
| EM-PMI375-T1100-1800 | 1077                      | 203              | 271              | 1225                      | 231              | 310              | 1800                            | 3600             | 1350                   | 2475                 |
| EM-PMI375-T1100-2100 | 995                       | 219              | 288              | 1178                      | 259              | 343              | 2100                            | 4000 (c)         | 1080                   | 2130                 |
| EM-PMI375-T1100-2400 | 952                       | 239              | 323              | 1060                      | 266              | 358              | 2400                            | 4000 (c)         | 1040                   | 1980                 |
| EM-PMI375-T1100-2900 | 896                       | 272              | 367              | 998                       | 303              | 409              | 2900                            | 4000 (c)         | 780                    | 1480                 |

(a Peak torque achieved with one 350A inverter  
(b Peak torque achieved with two 350A inverters  
(c Mechanical maximum speed

GENERATORS (temperature class F, maximum winding temperature +150°C, with +CL option)

| Type                 | Coolant temperature +65°C |                  |                  |              | Coolant temperature +40°C |                  |                  |              | Coolant temperature +40 / +65°C |                 |  |
|----------------------|---------------------------|------------------|------------------|--------------|---------------------------|------------------|------------------|--------------|---------------------------------|-----------------|--|
|                      | Apparent power [kVA]      | Cont. power [kW] | Nom. Current [A] | Power factor | Apparent power [kVA]      | Cont. Power [kW] | Nom. Current [A] | Power factor | Nom. speed [rpm]                | Nom. Freq. [Hz] | Volt/ speed ratio [V <sub>AC</sub> /rpm] (d) |
| EM-PMI375-T1100-1200 | 179                       | 175              | 205              | 0.98         | 193                       | 188              | 219              | 0.97         | 1300                            | 130             | 0.462  |
| EM-PMI375-T1100-1500 | 222                       | 205              | 257              | 0.92         | 251                       | 229              | 288              | 0.92         | 1700                            | 170             | 0.347  |
| EM-PMI375-T1100-1800 | 232                       | 214              | 267              | 0.92         | 266                       | 243              | 305              | 0.92         | 1900                            | 190             | 0.308  |
| EM-PMI375-T1100-2100 | 245                       | 230              | 283              | 0.94         | 293                       | 271              | 338              | 0.93         | 2200                            | 220             | 0.277  |
| EM-PMI375-T1100-2400 | 270                       | 248              | 314              | 0.92         | 302                       | 277              | 351              | 0.92         | 2500                            | 250             | 0.231  |
| EM-PMI375-T1100-2900 | 308                       | 281              | 358              | 0.91         | 344                       | 312              | 401              | 0.91         | 3000                            | 300             | 0.193  |

(d Back EMF for cold (+20°C) generator

MOTORS (temperature class F, maximum winding temperature +150°C, with nominal voltage 400 V<sub>AC</sub>)

| Type                 | Coolant temperature +40°C |                  |                  |                  |                  |                  |
|----------------------|---------------------------|------------------|------------------|------------------|------------------|------------------|
|                      | Cont. Torque [Nm]         | Cont. Power [kW] | Nom. Current [A] | Nom. Speed [rpm] | Max. Speed [rpm] | Peak Torque [Nm] |
| EM-PMI375-T1100-1200 | 1436                      | 135              | 242              | 900              | 2400             | 2100             |
| EM-PMI375-T1100-1500 | 1346                      | 169              | 301              | 1200             | 3000             | 1525             |
| EM-PMI375-T1100-1800 | 1275                      | 187              | 320              | 1400             | 3600             | 1350             |
| EM-PMI375-T1100-2100 | 1254                      | 210              | 358              | 1600             | 4000 (c)         | 1080             |
| EM-PMI375-T1100-2400 | 1194                      | 225              | 401              | 1800             | 4000 (c)         | 1040             |
| EM-PMI375-T1100-2900 | 1143                      | 263              | 460              | 2200             | 4000 (c)         | 780              |

(c Mechanical maximum speed

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

| Type                 | Coolant temperature +65°C |                  |                  | Coolant temperature +40°C |                  |                  | Coolant temperature +40/+65°C |                  |                        |                      |
|----------------------|---------------------------|------------------|------------------|---------------------------|------------------|------------------|-------------------------------|------------------|------------------------|----------------------|
|                      | Cont. Torque [Nm]         | Cont. Power [kW] | Nom. Current [A] | Cont. Torque [Nm]         | Cont. Power [kW] | Nom. Current [A] | Nom. speed [rpm]              | Max. speed [rpm] | Peak torque SINGLE (a) | Peak torque DUAL (b) |
| EM-PMI375-T1100-1200 | 1410                      | 177              | 242              | 1515                      | 190              | 263              | 1200                          | 2400             | 2100                   | 3270                 |
| EM-PMI375-T1100-1500 | 1310                      | 206              | 292              | 1455                      | 228              | 294              | 1500                          | 3000             | 1525                   | 2475                 |
| EM-PMI375-T1100-1800 | 1187                      | 224              | 298              | 1338                      | 252              | 338              | 1800                          | 3600             | 1350                   | 2475                 |
| EM-PMI375-T1100-2100 | 1070                      | 235              | 310              | 1300                      | 286              | 380              | 2100                          | 4000 (c)         | 1080                   | 2130                 |
| EM-PMI375-T1100-2400 | 1036                      | 260              | 350              | 1155                      | 290              | 386              | 2400                          | 4000 (c)         | 1040                   | 1980                 |
| EM-PMI375-T1100-2900 | 976                       | 296              | 398              | 1098                      | 333              | 456              | 2900                          | 4000 (c)         | 780                    | 1480                 |

(a) Peak torque achieved with one 350A inverter  
 (b) Peak torque achieved with two 350A inverters  
 (c) Mechanical maximum speed

The maximum allowed peak torque duration at stator winding starting temperature +90°C is 2 minutes. The given values indicate typical duration and are not verified. In case more accurate values are required, cyclic dimensions are needed.

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

| Type                 | Coolant temperature +65°C |                  |                  |              | Coolant temperature +40°C |                  |                  |              | Coolant temperature +40/+65°C |                 |  |
|----------------------|---------------------------|------------------|------------------|--------------|---------------------------|------------------|------------------|--------------|-------------------------------|-----------------|--|
|                      | Apparent power [kVA]      | Cont. power [kW] | Nom. Current [A] | Power factor | Apparent power [kVA]      | Cont. Power [kW] | Nom. Current [A] | Power factor | Nom. speed [rpm]              | Nom. Freq. [Hz] | Volt/ speed ratio [V <sub>AC</sub> /rpm] (d) |
| EM-PMI375-T1100-1200 | 211                       | 199              | 239              | 0.94         | 229                       | 213              | 260              | 0.93         | 1400                          | 140             | 0.462  |
| EM-PMI375-T1100-1500 | 251                       | 230              | 288              | 0.92         | 279                       | 253              | 320              | 0.91         | 1700                          | 170             | 0.347  |
| EM-PMI375-T1100-1800 | 252                       | 239              | 292              | 0.95         | 287                       | 269              | 332              | 0.94         | 2000                          | 200             | 0.308  |
| EM-PMI375-T1100-2100 | 264                       | 246              | 305              | 0.93         | 325                       | 306              | 373              | 0.94         | 2200                          | 220             | 0.277  |
| EM-PMI375-T1100-2400 | 293                       | 269              | 343              | 0.92         | 328                       | 300              | 379              | 0.92         | 2500                          | 250             | 0.231  |
| EM-PMI375-T1100-2900 | 332                       | 307              | 385              | 0.93         | 384                       | 349              | 443              | 0.91         | 3100                          | 310             | 0.193  |

(d) 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. Standard options are indicated by a star (\*).

| Product code                  | Description  |
|-------------------------------|--|
| EM-PMI375-T1100-1800          | Standard 1800 rpm unit with standard options               |
| EM-PMI375-T1100-1800+BIN+RES1 | Standard unit with insulated bearing in N-end and resolver |

Table 5 Product code examples

| Variant                  | Code  | Description   | Additional information  |
|--------------------------|-------|---|---|
| High voltage connections | *     | One three-phase system  | One connection box containing one three-phase system with one M25 cable gland per phase, total of 3 pcs M25 cable glands        |
|                          | -DUAL | Two galvanically isolated three-phase systems                       | Two connection boxes each containing one three-phase system with one M25 cable gland per phase, total of 6 pcs M25 cable glands |
| Low voltage connections  | *     | Low voltage connections done with connector                         | DEUTSCH HD34-24-47PE connector for LV connections   |
|                          | +LVB1 | Low voltage connections done with connection box and terminal strip | Connection box with 3 x M25, 1 x M20 cable glands (reserve/plugged 1 x M16) and terminal block for LV connections.              |

|  |        |                                    |   |
|--|--------|------------------------------------|---|
| N-end attachment                           | *      | Flange                             | SAE 4 flywheel housing  |
|  | +NE2   | Male shaft + Flange                | DIN5480 W55x2x26x8a + SAE 4 flywheel housing  |
| Bearing lubrication and mounting direction | *      | Grease lubricated                  | Deep groove ball bearing, open design. Horizontal mounting direction (see user guide for details)                                       |
|  | +BGL   | Greased for life                   | Deep groove ball bearing, non-contact seal on both sides. Any mounting direction (see user guide for details)<br>Maximum speed 3400 rpm |
| Bearing insulation                         | *      | Non-insulated bearings             | Non-insulated bearings  |
|  | +BIN   | Insulated bearing in N-end         | Insulated bearing in N-end  |
|  | +BIA   | Insulated bearing in both ends     | Insulated bearing in both ends  |
| Shaft grounding                            | *      | None                               |   |
|  | +SG1   | D-end shaft grounding              | Inbuilt grounding ring  |
| Protection class                           | *      | Standard protection class          | IP65 protection class   |
|  | +IP67  | IP67 protection class              | IP67 protection class (only available with +BGL option)   |
| Cable direction                            | *      | Cable direction fixed              | Cable direction towards D-end   |
|  | +CNE   | Cable direction towards N-end      | Cable direction towards N-end   |
| Rotation sensor                            | *      | None                               | No resolver   |
|  | +RES1  | Resolver                           | Inbuilt non-contacting resolver, 6-pole pair  |
| Side mounting                              | *      | None                               | No side mounting holes available. In case side mounting holes are present, they are plugged by default.                                 |
|  | +SM1   | Side mounting                      | 12 x side mounting threaded holes M10x1.5. Plugged by default with M10x10, DIN 913, (ISO 4026), set screw                               |
| Winding temperature sensors (**)           | *      | Temperature surveillance           | 3 x PT100 (two-wire) in windings  |
|  | +TEMP4 | Redundant temperature surveillance | 6 x PT100 (two-wire) in windings  |
|  | +TEMP5 | Redundant temperature surveillance | 12 x PT100 (two-wire) in windings   |
| Bearing temperature sensors                | *      | None                               |   |
|  | +BTMP1 | PT100 in bearings                  | Plug-in connector   |
| Anti-condensation heaters                  | *      | None                               |   |
|  | +HEAT1 | One anti-condensation heater       | 230 V <sub>AC</sub> / 130 W (see user guide for more information)   |
| Marine classification                      | *      | No marine classification           |   |
|  | +CL1   |                                    | ABS American Bureau of Shipping   |
|  | +CL2   |                                    | BV Bureau Veritas   |
|  | +CL3   |                                    | DNV   |
|  | +CL4   |                                    | LR Lloyd's Register   |
|  | +CL5   |                                    | RINA  |
|  | +CL6   |                                    | CCS China Classification Society  |

(\* Standard option

(\*\* Winding temperature sensors are for stator winding. The selection of high voltage connections does not have an influence on the quantity of PT100 elements.

Table 6 Option list

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