

Data Sheet

# EM-PMI300-T310

Electric machine, permanent magnet internal

## 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
- 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 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		Maximum dynamic torque on the shaft	2200 Nm
Nominal voltage (line to line)	500 V <sub>AC</sub>	Maximum deceleration (shaft braking)	6000 rad/s <sup>2</sup>
Voltage stress	IEC 60034-25, Curve A: Without filters for motors up to 500 V <sub>AC</sub>	Dimensions	
Nominal efficiency	96 %	Length (frame)	377 mm
Pole pair number	6	Diameter (frame)	408 mm
Power supply	Inverter fed.	Cooling	
Nominal inverter switching frequency	8 kHz	Cooling liquid	Plain water with appropriate corrosive inhibitor (max. 50 % corrosive inhibitor)
Basic information		Cooling liquid corrosive inhibitor type	Ethylene glycol Glysantin G48 recommended
Machine type	Synchronous reluctance assisted permanent magnet	Cooling method (IEC 60034-6)	IC 71 W
Mounting direction	Can be used in any direction, see user guide for details. Greased for life bearings required	Minimum cooling liquid flow	10 l/min
Mounting (IEC 60034-7)	IM 3001 (Flange)	Coolant circuit capacity	0.65 l
Standard Flange D-end (SAE J617)	SAE 4 mating transmission housing	Maximum operating pressure	2 bar
Standard axle spline D-end	DIN5480 W50x2x24x8f, shaft length 75mm	Pressure loss	0.1 bar with 10l/min (+25°C coolant)
Bearing type	Standard: 6211-2RS1/C3WT +BHS option: 6211/C3 (with LGHP2 grease) +BIN option: D-end: 6211-2RS1/C3WT, N-end: 6211-2RS1/HC5C3WT +BIA option: 6211-2RS1/HC5C3WT +BHS+BIN options: D-end: 6211/C3 (with LGHP2 grease), N-end: 6211/HC5C3WT (with LGHP2 grease) +BHS+BIA options: 6211/HC5C3 (with LGHP2 grease)	Cooling liquid temperature max	+65°C / +40°C with +CL option (derating required if exceeded)
Standard rotation direction	Clockwise (both directions possible)	Temperature rating	
Protection class	IP65 Following best design principles	Insulation class (IEC 60034-1)	F (155°C)
Duty type (IEC 60034-1)	S9	Temperature rise (IEC 60034-1)	85°C
Standard color	Dark grey RAL7024 powder coating	Maximum winding temperature	150°C
Mechanical		Nominal ambient temperature	+65°C / +45°C with +CL option
Total weight	125 kg (no options)	Min. ambient temperature	-40°C
Moment of inertia	0.21 kgm <sup>2</sup>	Nominal altitude (IEC 60034-1)	1000 m
Rotating mass	40 kg	Connections	
Maximum static torque on the shaft	3300 Nm	Coolant connection	2 x G3/4 bore
		Cable direction	Standard cable direction towards D-end
		HV cables	3 x 50 mm <sup>2</sup> max.
		HV cable glands	Pflitsch blueglobe TRI bg 225ms tri
		HV cable	Recommended H+S Radox screened cable
		HV cable lug size	35-8, 50-8

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HV connection boxes	1 x 3 phase box
LV connector	12 pin TE HDSCS
LV connector type	TE 1-1564520-1
LV connector pin type	Gold plated
LV mating connector type	TE 1-1703639-1
LV mating connector pin type	TE 1241380-2 (Gold plated)
LV connector pin configuration	See Table below
LV connections (+LVB1 option)	Connection box with 2x M25 cable glands (reserve 2x plugged M16 threads available) and terminal block for LV connections. See Table below
Anti-condensation heater (+HEAT1 option)	65 W 230 V <sub>AC</sub> single phase heater resistor (requires +LVB1 option)

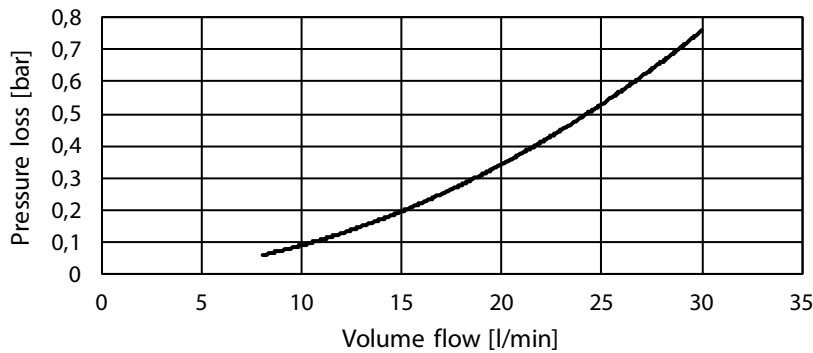
PIN	Description
1	Resolver, RES_COSN
2	Resolver, RES_SINN
3	Resolver, EXCN
4	Temperature, PT100, windings
5	Temperature, PT100, windings
6	Temperature, PT100, windings
7	Resolver, RES_COSP
8	Resolver, RES_SINP
9	Resolver, EXCP
10	Temperature, PT100, windings GND
11	Temperature, PT100, windings GND
12	Temperature, PT100, windings GND

Table 1 Pin configuration of LV-connector

PIN	Description
1	Temperature 1, PT100 (P), windings
2	Temperature 1, PT100 (N), windings
3	Temperature 2, PT100 (P), windings
4	Temperature 2, PT100 (N), windings
5	Temperature 3, PT100 (P), windings
6	Temperature 3, PT100 (N), windings
7	Temperature 4, PT100 (P), windings (+TEMP4 option)
8	Temperature 4, PT100 (N), windings (+TEMP4 option)
9	Temperature 5, PT100 (P), windings (+TEMP4 option)
10	Temperature 5, PT100 (N), windings (+TEMP4 option)
11	Temperature 6, PT100 (P), windings (+TEMP4 option)
12	Temperature 6, PT100 (N), windings (+TEMP4 option)
16	Heater, phase, 230 V <sub>AC</sub>
17	Heater, neutral
⊥	Heater, ground / protective earth, M4 screw inside connection box
⊥	General shielding, ground / protective earth, M4 screw inside connection box
18	Resolver, RES_COS_N, in-built non-contacting
19	Resolver, RES_COS_P, in-built non-contacting
20	Resolver, RES_SIN_N, in-built non-contacting
21	Resolver, RES_SIN_P, in-built non-contacting
22	Resolver, EXCN, in-built non-contacting
23	Resolver, EXCP, in-built non-contacting
24	Temperature, PT100 (P), bearings N-end (+BTMP1 option)
25	Temperature, PT100 (N), bearings N-end (+BTMP1 option)

Table 2 Pin configuration of LV connections (+LVB1 option)

PRESSURE LOSS VS COOLANT FLOW



Picture 1 Pressure loss vs coolant flow

MOTORS

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 (*)
EM-PMI300-T310-1100	353	41	54	399	46	64	1100	2200	700
EM-PMI300- T310-1300	353	48	63	398	54	73	1300	2600	700
EM-PMI300- T310-1600	351	59	78	389	65	90	1600	3200	700
EM-PMI300- T310-2200	345	79	105	390	90	121	2200	4000	700
EM-PMI300- T310-2800	312	91	123	369	108	148	2800	4000	700
EM-PMI300- T310-3200	279	94	125	338	113	149	3200	4000	700

(\* Peak torque achieved with one (350A) inverter

GENERATORS

Type	Coolant temperature +65°C			Coolant temperature +40°C			Coolant temperature +40 / +65°C			
	Apparent power [kVA]	Cont. power [kW]	Nom. Current [A]	Apparent power [kVA]	Cont. Power [kW]	Nom. Current [A]	Nom. speed [rpm]	Nom. Freq. [Hz]	Power factor	Volt/ speed ratio [V/rpm] (***)
EM-PMI300-T310-1100	44	44	52	49	49	58	1200	113	0.91	0.498
EM-PMI300- T310-1300	53	53	62	61	61	71	1400	134	0.91	0.415
EM-PMI300- T310-1600	65	65	75	72	72	85	1700	165	0.90	0.332
EM-PMI300- T310-2200	86	86	100	100	100	116	2300	227	0.91	0.249
EM-PMI300- T310-2800	103	102	120	120	119	139	2900	288	0.89	0.194
EM-PMI300- T310-3200	124	124	145	145	145	168	3200	330	0.89	0.166

(\*\*\* 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-PMI300-T310-1600	Standard 1600 rpm unit with standard options
EM-PMI300-T310-1600+BHS+RES1	Standard unit with grease lubricated bearings and resolver

Table 3 Product code examples

Variant	Code	Description	Additional information
Low voltage connections	*	Low voltage connections done with connector	TYCO TE 1-1564520-1 connector for LV connections
	+LVB1	Low voltage connections done with connection box and terminal strip	Connection box with 2x M25 cable glands (reserve 2x plugged M16 threads available) and terminal block for LV connections
N-end attachment	*	None	
	+NE1	Flange	SAE 4 mating transmission housing
	+NE2	Male shaft + Flange	DIN5480 W50x2x24x8f + SAE 4 mating transmission housing
Bearing lubrication and mounting direction	*	Greased for life	Deep groove ball bearing, contact seal on both sides, any mounting direction (see user guide for details)
	+BHS	Grease lubricated	Deep groove ball bearing, open design, horizontal mounting direction (see user guide for details)
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
Rotation sensor	*	None	No resolver
	+RES1	Resolver	In-built non contacting resolver, 6-pole pair
Winding temperature sensors	*	Temperature surveillance	3 x PT100 (two wire) in windings
	+TEMP4	Redundant temperature surveillance	6 x PT100 (two wire) in windings (requires +LVB1 option)
Anti-condensation heaters	*	None	
	+HEAT1	One anti-condensation heater	230 V <sub>AC</sub> / 65 W (requires +LVB1 option)
Marine classification	*	No marine classification	
	+CL1		ABS American Bureau of Shipping
	+CL2		BV Bureau Veritas
	+CL3		DNV GL DNV GL AS
	+CL4		LR Lloyd's Register
	+CL5		RINA

\*Standard option

Table 4 Option list

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