
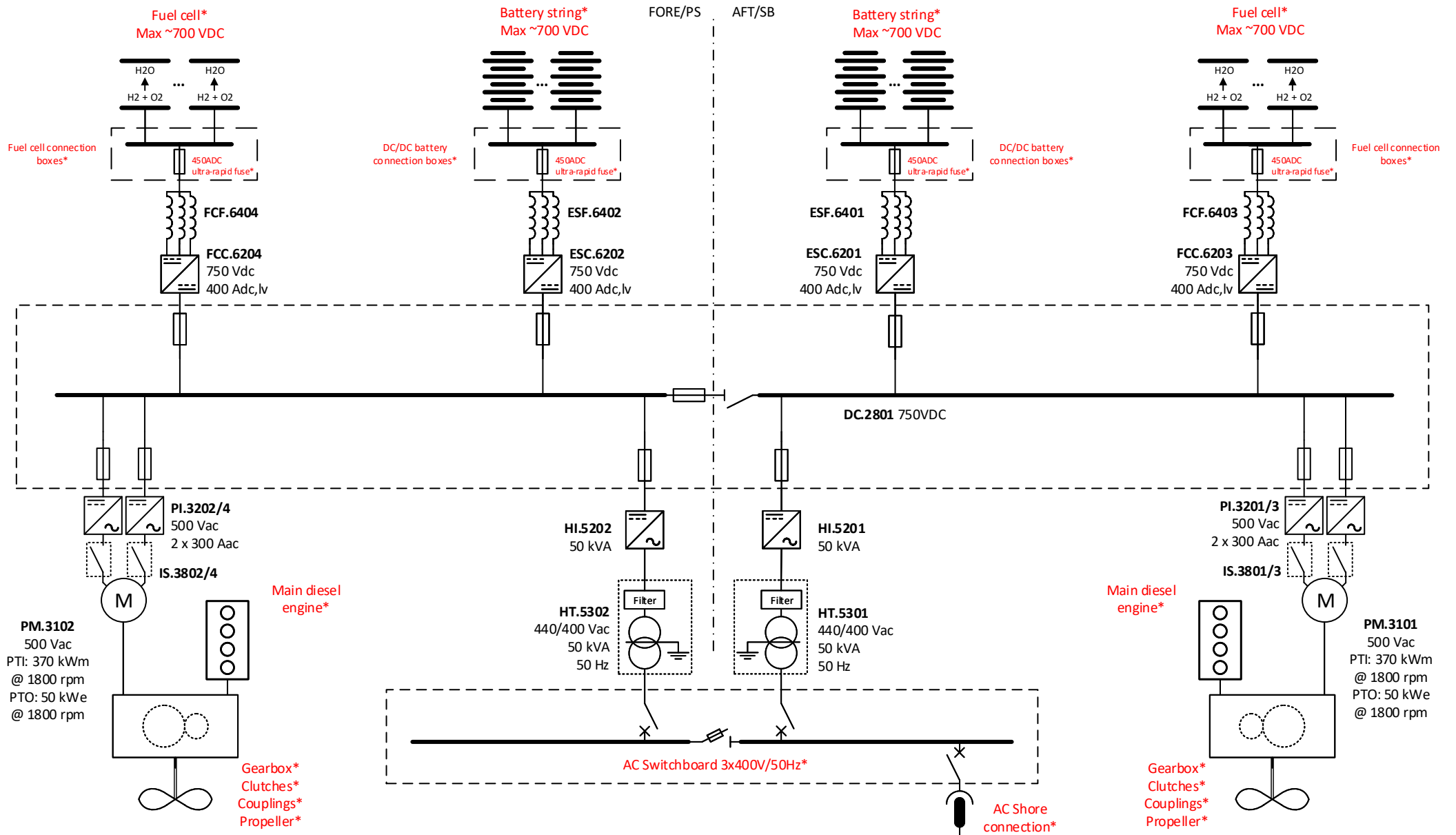



Pos.	Qty	Item	Type code	Rating	Weight [kg] per piece	Dimensions [mm]			Notes
						Length	Height	Depth	
2501...2502	2	ECS (Editron Control System)			70	760	760	210	Power and Energy Management System and Propulsion Control System
2801	1	DC-link cabinet, AN, IP23			810	1800	2100	500	Preliminary dimensions and weight
3101...3102	2	Permanent magnet machine, liquid cooled, IP65	EM-PMI540-T2000-1700	370 kW @1800 rpm	490	699	637	637	The propulsion motor does not have thrust bearing for propeller loads
3201...3204	4	Inverter for propulsion machine, liquid cooled, IP67	EC-C1200-450-L+MC300	300 Arms	17	244	482	205	
3501...3502	2	Box with local back-up control panel for propulsion system			8	380	300	210	
3801...3804	4	AC isolator for propulsion inverter			60	600	600	350	
5201...5202	2	Inverter for hotel transformer feed, liquid cooled, IP67	EC-C1200-450-L+UG350	50 kVA	15	244	482	109	
5301...5302	2	Hotel transformer with integrated LC-filter, AN, IP23	VPI AI/AI windings	50 kVA	465	920	1140	800	
6201...6204	4	DC/DC converter for energy storage, liquid cooled, IP67	EC-C1200-450-L+DC400	400 Adc, LV	15	244	482	109	
6401...6404	4	Inductor for DC/DC converter, liquid cooled, IP65	EC-LTS1200-410	400 Adc	23	403	147	287	
8901...8910	10	X1 connection cable for inverter/converter							3m Cable between inverter/converter and its junction box
JB-1-LC	2	I/O Junction box for single inverter, with local controls			2	300	300	210	
JB-1	4	I/O Junction box for single inverter			2	300	300	210	
JB-2	2	I/O Junction box for two inverters			4	380	300	210	

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	OSK-Shiptech	RaKn	28.10.2020
	Customer reference	Document	Size
Feggesund Ferry Parallel Hybrid H2	SLD	A4	
Our reference	Rev	Sheet	
CQ-20-00420693	A10	1/1	



*) Not included in Danfoss scope of supply

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Feggesund Ferry Parallel Hybrid H2	SLD	A4	
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CQ-20-00420693	A10	1/1	

Data Sheet

EC-C1200-450

Liquid cooled heavy duty converter

FEATURES

- Extremely compact design -converter unit only 15 kg
- High enclosure class IP67 – sealed from moisture and dust
- Liquid cooled with plain water or water/glycol mixture
- Ambient temperature up to +105°C and down to -40 °C
- Allowed coolant temperature up to +65°C
- Robust design withstanding high levels of mechanical vibrations and shocks
- Designed especially for highly cyclical loads typical in heavy mobile work machines

Software features:

- 2x Isolated CAN ports supporting CANopen and SAE J-1939 protocols
- Bidirectional energy flow control
- High performance current and voltage control
- Interleaved PWM between phases for lower ripple current and voltage
- Wide selection of protective functions
- PowerUSER PC-program for commissioning and diagnostics available



GENERAL

The device is a heavy-duty converter designed especially for electric or hybrid drive trains for mobile work machines, buses or marine vessels. It can act as motor inverter, active front end, create a microgrid or as a DC/DC-converter depending on the options selected.

Typical applications:

- Boosting battery voltage to higher DC-link voltage (+DC option)
- Charging high voltage batteries from higher DC-link voltage (+DC option)
- Controlling the speed and torque of electrical traction motors (+MC option)
- Converting alternating current (AC) from electrical generator to direct current (DC) for energy storage (+MC option)
- Active Front End for connecting to AC grid with regenerative power and low harmonic (+AFE option)
- Microgrid (+UG option)

+DC option requires an external inductance unit. See Danfoss EC-LTS data sheets for more information. (Contact Danfoss Editron)

+AFE and +UG options require an external LCL-filter unit. See Danfoss EC-LCL1200 data sheets for more information. (Contact Danfoss Editron)

SPECIFICATIONS

DC connection (+DC option)		Coolant volume	300 cm ³
HV-side voltage range	0-850 V _{DC}	Pressure loss	100 mbar with 10l/min (+25°C coolant)
HV-side nominal voltage	750 V _{DC}	Cooling liquid temperature	-40°C ... +65°C (with derating 1%/1°C max. +75°C)
HV-side nominal current	350 A	Ambient Conditions	
LV-side typical voltage	75-750 V _{DC} (maximum transformation ratio between LV and HV voltages is 1:10)	Storage temperature	-40°C...105°C
LV-side nominal current	See Table below	Operating temperature	-40°C...105°C (with nominal coolant temp.)
Nominal power	See Table below (output power is limited by the LV-side voltage and current)	Altitude	max. 2000 m
HV-side voltage range	0-850 V _{DC}	Relative humidity	100 %
Switching frequency	8 kHz	Enclosure class	IP67
DC connection (+MC/+AFE/+UG option)		Mechanical vibration	10 G ISO 16750-3 Test VII – Commercial vehicle, sprung masses – Table 12 Notes: test duration 8h axis (two axes tested; radial and axial) total spectral acceleration 5,91 grms
DC link voltage range	0-850 V _{DC}	Mechanical shock	50 G ISO 16750-3 4.2.2 Test for devices on rigid points on the body and on the frame Notes: –acceleration: 500 m/s ² ; –duration: 6 ms; –number of shocks: 10 per test direction.
DC link nominal voltage	750 V _{DC}	Connections	
AC connection (+MC/+AFE/+UG option)		Coolant connection	2 x 20 mm coolant hose connector
AC output voltage	0-560 V _{EFF} (U _{DC} = 800 V _{DC})	HV cable recommended type	HUBER+SUHNER Radox Elastomer S screened automotive cable www.hubersuhner.com
Maximum power	300 kW (500 V _{AC} , 350 A _{RMS})	HV cable cross section	≤70 mm ² (Cu)
Output frequency	0...580 Hz (Up to 1000 Hz as option)	HV cable glands (with +CG1 option)	Pflitsch blueglobe TRI bg 225ms tri
Switching frequency	8 kHz	HV cable glands (with +CE2 option)	Pflitsch blueglobe TRI bg 232ms tri
Control voltage input		HV cable lug size	35-8, 50-8, 70-8
Voltage range	7-33 V _{DC}	Recommended cable lug	50 mm ² : Druseidt part no. 10853 70 mm ² : Druseidt part no. 10857 www.druseidt.de
Power	14.4 W	LV connector	35-pin Tyco electronics AMPSEAL connector www.tycoelectronics.com
Current	0.6 A @ 24 V _{DC} 1.2 A @ 12 V _{DC}	LV connector type	part no. 776163-1
Mechanical			
Dimensions (WxHxL, mm)	244x109x482		
Weight	15 kg		
Cooling			
Cooling liquid	Plain water with appropriate corrosive inhibitor (max. 50 % corrosive inhibitor)		
Cooling liquid glycol type	Ethylene glycol (Glystantin G48 recommended)		
Minimum cooling liquid flow	10 l/min		
Maximum continuous pressure	2 bar		

LV mating connector type	TE 776164-1		used to improve efficiency of the motor
LV mating connector pin type	0.5-1.25 mm ² : TE 770854-3 (Gold plated)	Protections	
LV connector pin configuration	See Table below	HW overcurrent trip	750 A _{peak}
CAN connections	2x isolated and unterminated CAN channels	HW overvoltage trip	1050 V _{DC}
CAN protocols	SAE J-1939 CANopen	SW overcurrent trip	programmable level
IO/analog output	5x isolated IO/analog output	SW overvoltage trip	programmable level
DC/DC control characteristics (+DC option)		Short circuit protection	yes
Converter topology	Bidirectional (Buck or Boost)	High-Voltage interlock loop	HV loop on signal connector for external monitoring, HV loop pins are connected on the inverter side
Control principle	Current control Voltage control Power control	Inverter temperature protection	Sophisticated thermal model that can lower the current if needed
Motor control characteristics (+MC option)		Inverter temperature trip	yes
Controllable motor types	Synchronous permanent magnet motors Asynchronous induction motors Danfoss synchronous reluctance assisted permanent magnet motors (SRPM)	External temperature measurement	yes, programmable warning, fault and trip levels
Control principle	Rotor flux oriented current vector control	Standards and classifications	
Control methods	Torque reference motor control Speed reference motor control DC-link voltage control	Pollution degree class 2	
Field weakening control	Maximizes the field weakening performance by optimizing the use of inverter current and torque production capability of the motor	IEC 60664-1 Overvoltage category III	
Working point optimization	Maximum torque per ampere working point optimization is	Immunity: IEC 61800-3 Sec.5.2, UNECE R10	
		Emissions: IEC 61800-3 Sec.6 (radiated), UNECE R10	

POWER AND CURRENT VARIANTS

Basic product type	Nominal power [kW]	Nominal current [A _{DC}]	Conditions
EC-C1200-450-L+DC150	90	150	LV-side voltage 600 V _{DC} , HV-side voltage 750 V _{DC}
EC-C1200-450-L+DC250	150	250	LV-side voltage 600 V _{DC} , HV-side voltage 750 V _{DC}
EC-C1200-450-L+DC300	180	300	LV-side voltage 600 V _{DC} , HV-side voltage 750 V _{DC}
EC-C1200-450-L+DC400	240	400	LV-side voltage 600 V _{DC} , HV-side voltage 750 V _{DC}

Table 1 Device current and power ratings for +DC option

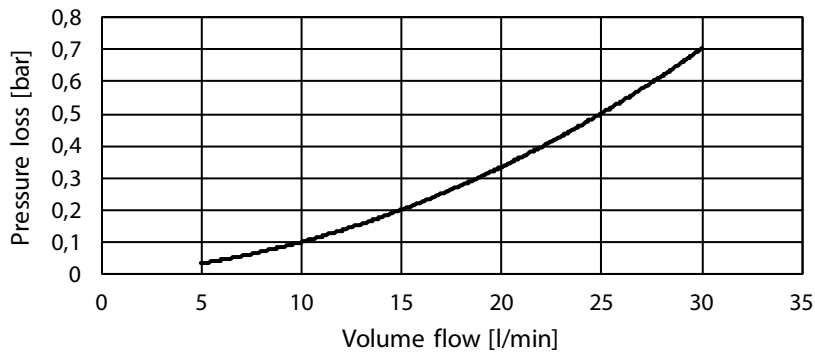
“-S” and “-L” versions have same ratings, see Topic “SMALL/LARGE SYSTEM DIFFERENCES”.

Basic product type	Nominal power [kVA]	Nominal current [A _{AVG}]
EC-C1200-450-L+MC70+AFE70+UG70	50	70
EC-C1200-450-L+MC120+AFE120+UG120	100	120
EC-C1200-450-L+MC180+AFE180+UG180	150	180
EC-C1200-450-L+MC240+AFE240+UG240	200	240
EC-C1200-450-L+MC300+AFE300+UG300	250	300
EC-C1200-450-L+MC350+AFE350+UG350	300	350

Table 2 Device current and power ratings for +MC, +AFE and +UG options

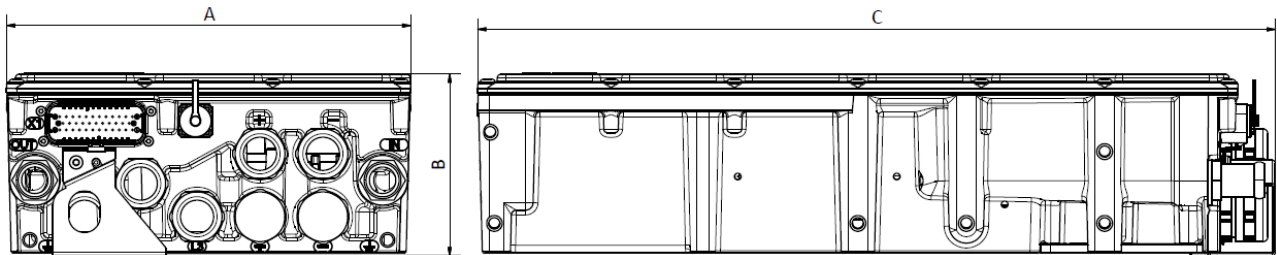
“-S” and “-L” versions have same ratings, see Topic “SMALL/LARGE SYSTEM DIFFERENCES”.

PRESSURE LOSS VS COOLANT FLOW

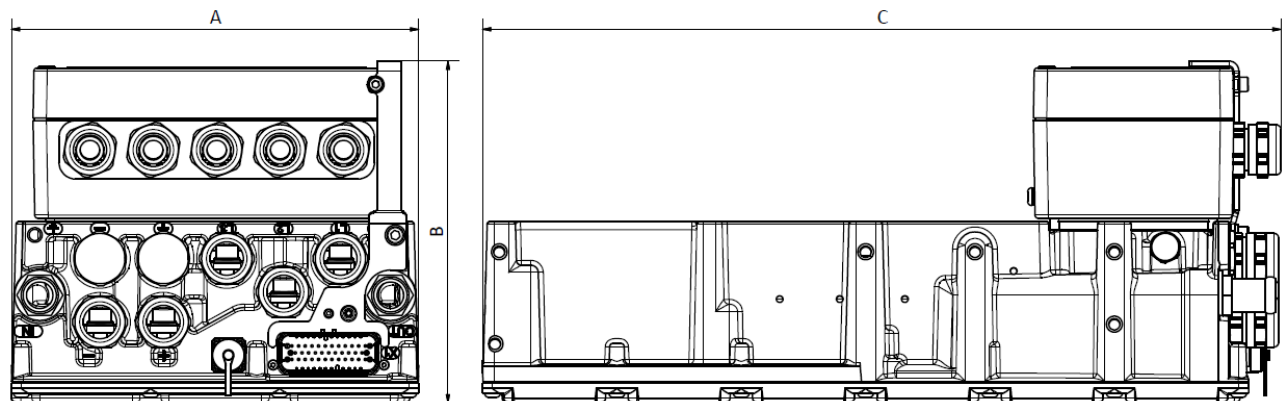


Picture 1 Device pressure loss vs coolant flow

DIMENSIONS



Picture 2 Device dimensions

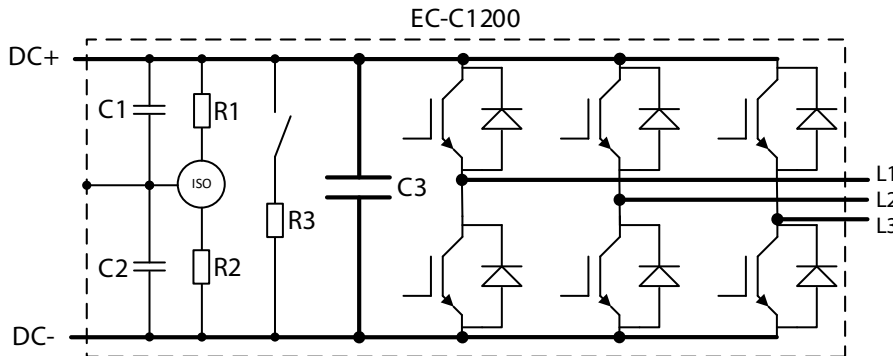


Picture 3 Device dimensions with +CE1 or +CE2 option

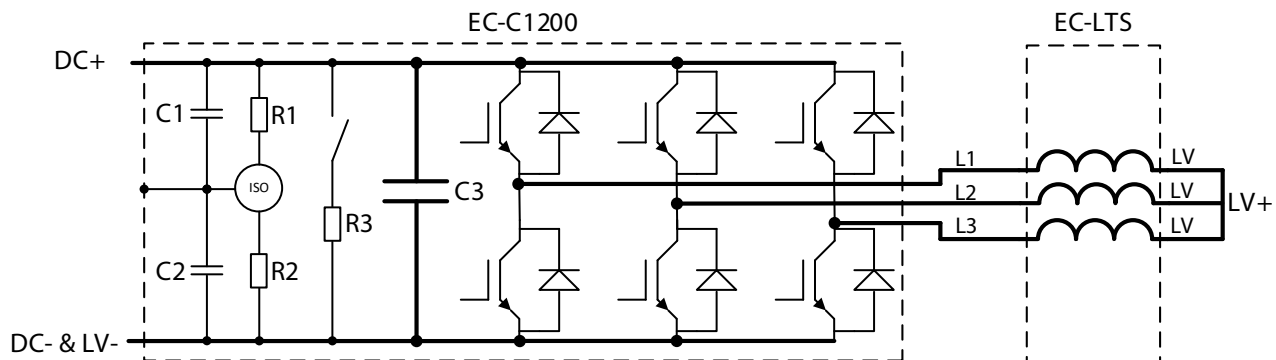
Dimension	Lengths for EC-C1200-450	Lengths for EC-C1200-450 with +CE1 or +CE2 option
A	244 mm	244 mm
B	109 mm	205 mm
C	482 mm	479 mm

SMALL/LARGE SYSTEM DIFFERENCES

Device has option for small systems (-S) and large systems (-L). Small system option is typical for vehicle applications and large system option is standard in marine applications because of the marine regulations. Complete system should be looked when choosing the option as for example vehicle system with many devices could also need the L-option to keep the isolation resistance or Y-capacitors at reasonable level. In large and small system options, there are differences in the isolation measurement resistance, DC-link discharge resistor and Y-capacitor values as shown in Picture 5 and Table 3.



Picture 4 EC-C1200-450 internal schematic



Picture 5 EC-C1200-450 internal schematic and application example when used in combination with external inductance unit EC-LTS

Component	Small-system option	Large-system option
Isolation measurement R1, R2	12 MΩ	240 MΩ
Discharge resistor R3	3.9 kΩ	39 kΩ
Y-capacitor C1, C2	330 nF	3.3 nF
DC-link capacitor C3	1 mF	1 mF
Isolation resistance from DC-link to enclosure	6 MΩ	120 MΩ

Table 3 S/L-system differences

Device with +MC, +AFE or +UG option has internal schematic shown in Picture 4. Possible additional equipment like LCL-filter or motor is connected to the phases L1, L2 and L3. Options +AFE and +UG are not compatible with the -S version of the device. Generally, option -L is recommended for all applications

Device with +DC option requires external inductors to work as seen in application example shown in Picture 5. LV+ and LV- can be connected, for example, to battery and DC+ and DC- to a higher voltage DC-link. Device is in control of the discharging and charging of the battery. +DCE option is recommended when using the device in combination with the external inductance unit.

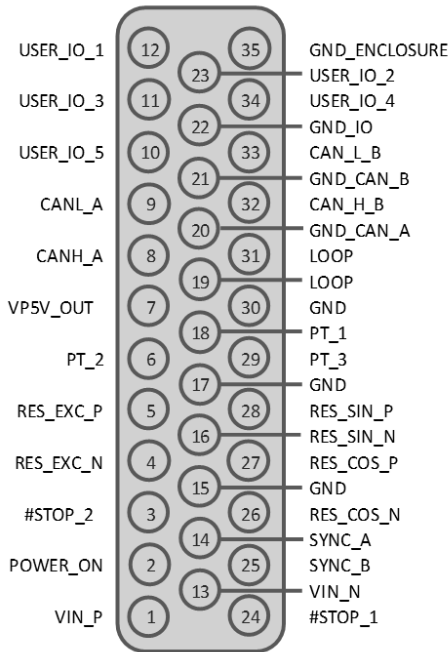
PARAMETRIZING, MONITORING AND DIAGNOSTIC OF THE DEVICE

PowerUSER monitoring and diagnostics software uses service connector on the device and PSSC service cable for connecting to the device. The PSSC is isolated RS485 and shielded cable specially designed for the demanding environments where the inverters are used, and it is available in 3 meter (PSSC-3M) and 10 meter version (PSSC-10M). The service cable is ordered separately.

Product code	Cable length	Description
PSSC-3M	3 meters	USB to RS485 isolated service cable
PSSC-10M	10 meters	USB to RS485 isolated service cable

Table 4 Service cables; ordered separately, needed for parametrizing, monitoring and diagnostics

SIGNAL CONNECTOR PINOUT



Pin number	Signal name	RevR/S/T	Comments
1	VIN_P		Positive Power Supply (7-33V)
2	POWER_ON		Active High, Turn ON @ >7.4V, Turn OFF @ < 5.8V
3	#STOP_2		Active Low, STOP @ < 1.2V, RUN @ > 4.65V Pulling one #STOP down stops the inverter
4	RES_EXC_N		Resolver excitation, use twisted pair and shield
5	RES_EXC_P		Resolver excitation, use twisted pair and shield
6	PT_2		PT100 or PT1000 temperature sensor input Connect sensor against signal GND
7	VP5V_OUT		+5V/200mA output for external sensors. Software control
8	CANH_A		CAN bus A, isolated (Functional isolation <100 VDC)
9	CANL_A		CAN bus A, isolated (Functional isolation <100 VDC)
10	USER_IO_5		Digital input ('1' @ 3V, '0' @ 2V) (max. 10 mA) Digital output ('1' = 4.8V, '0' = 0V) (max. 10 mA) Digital output open collector (max. 80mA)
11	USER_IO_3		Digital input ('1' @ 3V, '0' @ 2V) (max. 10 mA) Digital output ('1' = 4.8V, '0' = 0V) (max. 10 mA) Digital output open collector (max. 80 mA) Analog input (0-32V) (input impedance ~100 kOhm)
12	USER_IO_1		Digital input ('1' @ 3V, '0' @ 2V) (max. 10 mA) Digital output ('1' = 4.8V, '0' = 0V) (max. 10 mA) Digital output open collector (max. 80 mA) Analog input (0-32V) (input impedance ~100 kOhm)
13	VIN_N		Negative Power Supply (0V)
14	SYNC_A		SYNC_A for Master/Slave
15	GND		Signal GND / PT100 or PT1000 GND
16	RES_SIN_N		Resolver input, use twisted pair and shield
17	GND		Signal GND / PT100 or PT1000 GND
18	PT_1		PT100 or PT1000 temperature sensor input Connect sensor against signal GND
19	LOOP		High Voltage Diagnostic Loop
20	GND_CAN_A		GND for CAN bus A
21	GND_CAN_B		GND for CAN bus B
22	GND_IO		GND for IO, IO is isolated (Functional isolation <100 VDC)
23	USER_IO_2		Digital input ('1' @ 3V, '0' @ 2V) (max. 10 mA) Digital output ('1' = 4.8V, '0' = 0V) (max. 10 mA) Digital output open collector (max. 80 mA) Analog input (0-32V) (input impedance ~100 kOhm)
24	#STOP_1		Active Low, STOP @ < 1.2V, RUN @ > 4.65V Pulling one #STOP down stops the inverter
25	SYNC_B		SYNC_B for Master/Slave
26	RES_COS_N		Resolver input, use twisted pair and shield
27	RES_COS_P		Resolver input, use twisted pair and shield
28	RES_SIN_P		Resolver input, use twisted pair and shield
29	PT_3		PT100 or PT1000 temperature sensor input Connect sensor against signal GND
30	GND		Signal GND / PT100 or PT1000 GND
31	LOOP		High Voltage Diagnostic Loop
32	CAN_H_B		CAN bus B, isolated (Functional isolation <100 VDC)
33	CAN_L_B		CAN bus B, isolated (Functional isolation <100 VDC)
34	USER_IO_4		Digital input ('1' @ 3V, '0' @ 2V) (max. 10 mA) Digital output ('1' = 4.8V, '0' = 0V) (max. 10 mA) Digital output open collector (max. 80 mA) Analog input (0-32V) (input impedance ~100 kOhm)
35	GND_ENCLOSURE		Enclosure ground

PRODUCT CODE AND OPTIONS

Use product code including all needed options for ordering. Standard options do not need to be listed in the code as they are selected by default if a non-standard option is not selected. Standard options are indicated by a star (*).

Device with +DC option requires external inductors to work. Separate inductor unit can be ordered with product name EC-LTS1200-400 (see EC-LTS1200-400 data sheet for details).

Options +MC, +AFE and +UG can be selected to the same unit at same time if necessary. +DC option can only be selected alone without other control options.

Options +AFE and +UG are not compatible with the option -S. **Generally, option -L is recommended for all applications.**

Product code	Description
EC-C1200-450-L+MC300	L-version unit for controlling motor with 300 A current limit
EC-C1200-450-L+MC300+CG1	L-version unit for controlling motor with cable glands and 300 A current limit
EC-C1200-450-S+DC400+DCE	S-version unit for DCDC applications with double DC-connections and 400 A _{DC} current limit

Table 5 Product code examples

Variant	Code	Description	Additional information
System size	-S	Small system	Default EC-C unit for individual or small system installations
	-L	Large system	EC-C unit for large system installations
Control	+MC70	Motor control, current limit 70 A	Converter for motor/generator applications
	+MC180	Motor control, current limit 180 A	Converter for motor/generator applications
	+MC240	Motor control, current limit 240 A	Converter for motor/generator applications
	+MC300	Motor control, current limit 300 A	Converter for motor/generator applications
	+MC350	Motor control, current limit 350 A	Converter for motor/generator applications
	+AFE120	Active front end, current limit 120 A	Converter for active front end applications
	+AFE180	Active front end, current limit 180 A	Converter for active front end applications
	+AFE240	Active front end, current limit 240 A	Converter for active front end applications
	+AFE300	Active front end, current limit 300 A	Converter for active front end applications
	+AFE350	Active front end, current limit 350 A	Converter for active front end applications
	+UG120	Microgrid, current limit 120 A	Converter for microgrid applications
	+UG180	Microgrid, current limit 180 A	Converter for microgrid applications
	+UG240	Microgrid, current limit 240 A	Converter for microgrid applications
	+UG300	Microgrid, current limit 300 A	Converter for microgrid applications
	+UG350	Microgrid, current limit 350 A	Converter for microgrid applications
	DCDC control	+DC150	DCDC control, current limit 150 A _{DC}
+DC250		DCDC control, current limit 250 A _{DC}	Converter for DC/DC applications
+DC300		DCDC control, current limit 300 A _{DC}	Converter for DC/DC applications
+DC400		DCDC control, current limit 400 A _{DC}	Converter for DC/DC applications
Speed option	*	Normal speed version (<580 Hz output frequency)	EC-C with motor/generator control firmware, capable of speeds below 580 Hz
	+HS	High speed version (>580 Hz output frequency)	EC-C with motor/generator control firmware, capable of speeds up to 1000 Hz
Communication	*	CAN1939	EC-C with Standard SAE1939-communication
	+CO	CANopen	EC-C with CANopen-communication

Connections	*	Normal connections	EC-C with default HV connections
	+CE1	Connection extension 1	EC-C with double DC and AC connectivity with connection extension box 1 (double M25 cable gland threads) (Not compatible with +DCE option)
	+CE2	Connection extension 2	EC-C with M32 cable gland threads on AC connection with connection extension box 2 (choose also +DCE if double DC connection is required)
	+DCE	DC-extension	EC-C with double DC-connections: copper bushings for double connection (compatible with +CE2/+CG4/+CG5)
Cable glands	*	No cable glands	EC-C with no cable glands or plugs
	+CG1	Default M25 cable glands	EC-C with 5x M25 cable glands and 2x M25 plugs
	+CG2	Default M25/M32 cable glands	EC-C with 2x M25 cable glands, 3xM32 cable glands and 3xM25 plugs (for +CE2 option)
	+CG3	Default M25 cable glands	EC-C with 10x M25 cable glands (for +CE1 option with double DC-link connections)
	+CG4	Default M25 cable glands	EC-C with 7x M25 cable glands (for +DCE option)
	+CG5	Default M25/M32 cable glands	EC-C with 4x M25 cable glands, 3xM32 cable glands and 3xM25 plugs (for combined +CE2 and +DCE options)
	+CG6	Default M25 cable glands	EC-C with 8x M25 cable glands and 2x M25 plugs (for +CE1 option with single DC-link connections)
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
Customer specific	*	Default unit firmware-wise	EC-C with default parameters and application
	+CS	Customer specific parameters or application in FW	EC-C with separately specified application and/or parameters

* Standard option

Table 6 Option list

NOTE! Products delivered with high speed option (+HS option) are subject to export control as dual-use items when transported outside of European community according to CE 428/2009 regulation.

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Data Sheet

EM-PMI540-T2000

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. The design of these machines makes them 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 deceleration (shaft braking)	850 rad/s ²
Nominal voltage (line to line)	500 V _{AC}	Dimensions	
Voltage stress	IEC 60034-25, Curve A: Without filters for motors up to 500 V _{AC}	Length (frame)	598 mm
Nominal efficiency	96 %	Diameter (frame)	648 mm
Pole pair number	8	Cooling	
Power supply	Inverter fed.	Cooling liquid	Plain water with appropriate corrosive inhibitor (max. 50 % corrosive inhibitor)
Nominal inverter switching frequency	8 kHz	Cooling liquid corrosive inhibitor type	Ethylene glycol Glysantin G48 recommended
Basic information		Cooling method (IEC 60034-6)	IC 71 W
Machine type	Synchronous reluctance assisted permanent magnet	Minimum cooling liquid flow	20 l/min
Mounting direction	Horizontal or vertical assembly (V1, D-end shaft down), see user guide for details	Coolant circuit capacity	3.9 l
Mounting (IEC 60034-7)	IM 3001 (Flange)	Maximum operating pressure	2 bar
Standard Flange D-end (SAE J617)	SAE ½ mating transmission housing	Pressure loss	0.4 bar with 20l/min (+25°C coolant)
Standard axle spline D-end	DIN5480 W55x2x26x8a	Cooling liquid temperature max	+65°C / +40°C with +CL option (derating required if exceeded)
Bearing type	Standard: 6214/C3 (with LGHP2 grease) +BIN option: D-end: 6214/C3 (with LGHP2 grease), N-end: 6214/HC5C3 (with LGHP2 grease) +BIA option: 6214/HC5C3WT (with LGHP2 grease)	Temperature rating	
Standard rotation direction	Clockwise (both directions possible)	Insulation class (IEC 60034-1)	H (180°C)
Protection class	IP65 Tests: 0.3 bar under pressure held for 120 seconds. Pressure not allowed to drop under 0.1 bar	Temperature rise (IEC 60034-1)	85°C
Duty type (IEC 60034-1)	S9	Maximum winding temperature	150°C
Standard color	Dark grey RAL7024 powder coating	Nominal ambient temperature	+65°C / +45°C with +CL option
Mechanical		Min. ambient temperature	-40°C
Total weight	490 kg (no options)	Nominal altitude (IEC 60034-1)	1000 m
Moment of inertia	4.73 kgm ²	Vibration & Shock tolerance	
Rotating mass	189 kg	Mechanical vibration	5.9 G _{RMS} ISO 16750-3 Test VII – Commercial vehicle, sprung masses – Table 12 Notes: test duration 8h axis (two axes tested; radial and axial) total spectral acceleration 5,91 grms Test done with EM-PMI540-T1500
Maximum static torque on the shaft	6800 Nm	Mechanical shock	50 G ISO 16750-3
Maximum dynamic torque on the shaft	4000 Nm		

	4.2.2 Test for devices on rigid points on the body and on the frame Notes: –acceleration: 500 m/s ² ; –duration: 6 ms; –number of shocks: 10 per test direction. Test done with EM-PMI540-T1500		Plug: DEUTSCH 0413-003-1605 (size 16)
Connections		LV connector pin configuration	See Table below
Coolant connection	2 x G3/4 bore	Anti-condensation heater (+HEAT1 option)	130W 230 V _{AC} single phase heater resistor
HV cables	2 x 3 x 95 mm ² max.	Heater connection (+HEAT1 option)	Pflitsch blueglobe mstri212 (M12) and terminal strip inside connection box
HV cable glands	Pflitsch blueglobe TRI bg 232ms tri	Heater terminal strip pin configuration	See Table below
HV cable	Recommended H+S Radox screened cable	Bearing temp. measurement connector type	4-pin M12 A coded male
HV cable lug size	35-8, 50-8, 70-8	Bearing temp. measurement mating type	4-pin M12 A coded female
HV connection boxes	2 x 3 phase box	Bearing temp. measurement connector pin configuration	See Table below
LV connector	47 pin DEUTSCH HD34-24-47PE for resolver and temperature measurement.		
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 DEUTSCH 0462-005-2031 Plug: DEUTSCH 0413-204-2005 (size 20)		

PIN	Description
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 option)
29	Temperature 4, PT100 (N), windings (+TEMP4 option)
44	Temperature 5, PT100 (P), windings (+TEMP4 option)
43	Temperature 5, PT100 (N), windings (+TEMP4 option)
28	Temperature 6, PT100 (P), windings (+TEMP4 option)
16	Temperature 6, PT100 (N), windings (+TEMP4 option)
35	Resolver, RES_COS_N, in-built non-contacting
20	Resolver, RES_COS_P, in-built non-contacting
36	Resolver, RES_SIN_N, in-built non-contacting
21	Resolver, RES_SIN_P, in-built non-contacting
22	Resolver, EXCN, in-built non-contacting
10	Resolver, EXCP, in-built non-contacting
34	Resolver, SHIELD/GROUND, in-built non-contacting

Table 1 Pin configuration of LV-connector

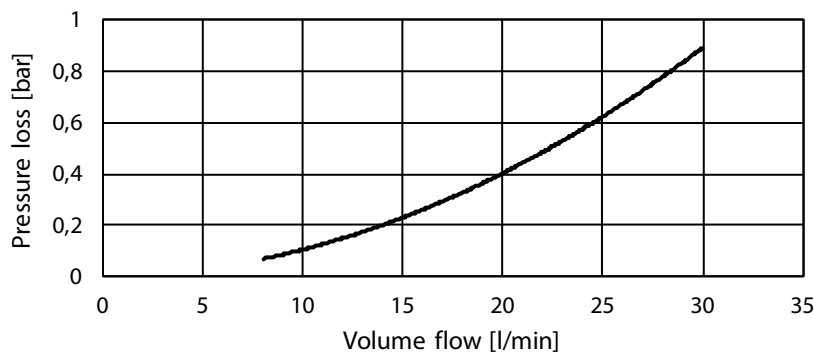
PIN	Description
1	Phase, 230 V _{AC} / Neutral
2	Phase, 230 V _{AC} / Neutral
⊥	Ground/protective earth, M5 screw connection inside connection box

Table 2 Pin configuration of heater (pin configuration does not matter)

PIN	Description
1	PT-100
2	
3	PT-100_GND
4	

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

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 SINGLE (*)	Peak torque DUAL (**)
EM-PMI540-T2000-700	2462	180	242	2716	199	267	700	1400	3400	3700
EM-PMI540-T2000-1300	2303	313	413	2386	325	431	1300	2600	1850	3700
EM-PMI540-T2000-1700	2009	358	485	2276	405	543	1700	3400	1400	2800
EM-PMI540-T2000-2100	1919	422	569	2153	473	633	2100	4000	1150	2300

(* Peak torque achieved with one 350A inverter)

(** Peak torque achieved with two 350A inverters)

GENERATORS

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/rpm] (***)
EM-PMI540-T2000-700	211	201	241	0.95	233	221	266	0.95	800	107	0.714
EM-PMI540-T2000-1300	355	331	410	0.93	372	347	428	0.93	1400	186	0.363
EM-PMI540-T2000-1700	436	413	506	0.95	466	440	538	0.94	1900	253	0.272
EM-PMI540-T2000-2100	482	454	562	0.94	573	536	666	0.94	2300	307	0.227

(*** 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-PMI540-T2000-1700-DUAL	Standard 1700 rpm unit with standard options
EM-PMI540-T2000-1700-DUAL+BIN	Standard unit with insulated bearing in N-end

Table 4 Product code examples

Variant	Code	Description	Additional information
High voltage connections	-DUAL	Two galvanically isolated 3 phase systems	Two connection boxes each containing one 3 phase system with one M32 cable gland per phase
Connection extension	*	None	Two connection boxes each containing one 3 phase system with one M32 cable gland per phase
	+CE1	Double phase connections	Extended connection boxes with two M32 cable glands per phase
N-end attachment	*	None	
	+NE4	Male shaft, no flange	DIN5480 W55x2x26x8a
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	In-built grounding ring
Rotation sensor	*	None	No resolver
	+RES1	Resolver	In-built non contacting resolver, 8-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
Bearing temperature sensors	*	None	
	+BTMP1	PT100 in bearings	Plug-in connector
Anti-condensation heaters	*	None	
	+HEAT1	One anti-condensation heater	230 V _{AC} / 130 W
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 5 Option list

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