DNV·GL

Certificate No:
TAE00002HD

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Frequency Converter

with type designation(s)
PENTA MARINE

Issued to
ELETTRONICA SANTERNO S.P.A.
Castel Guelfo di Bologna BO, Italy

is found to comply with
DNV GL rules for classification – Ships, offshore units, and high speed and light craft

Application :

Products approved by this certificate are accepted for installation on all vessels classed by DNV GL.

Issued at **Høvik** on **2018-01-16**
This Certificate is valid until **2022-12-31**.
DNV GL local station: **Venice**

Approval Engineer: **Marta Alonso Pontes**

for **DNV GL**

Andreas Kristoffersen
Head of Section

This Certificate is subject to terms and conditions overleaf. Any significant change in design or construction may render this Certificate invalid.
The validity date relates to the Type Approval Certificate and not to the approval of equipment/systems installed.

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Job Id: **262.1-013495-4**
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Product description

Penta Marine: Variable speed controller for asynchronous and synchronous motors. Constant / variable torque applications. Air cooled only.

Range :	7A to 850A
Supply voltage range:	200 - 690 V, 50/60 Hz
Voltage variation:	- 15 %, + 10 %
Frequency variation:	± 5 %
Output frequency:	0 to 1000Hz
Temperature range in operation:	-10 to +55 °C (derating 2,0%/°C above 40 °C may apply to selected models; for details see SINUS PENTA Installation Guide)

Nomenclature description:

PENTA	MARINE		0005		4	T		B	A2	X	2
1	2		3		4	5		6	7	8	9

1	1 Product line:	PENTA MARINE inverter stand alone PENTA MARINE BOX inverter in BOX PENTA MARINE Cabinet
2	2 PENTA control type with 5 on board softwares available:	-IFD (Inverter Frequency Drive – V/f) -VTC (Vector Torque Control) -SYN (Synchronous) -FOC (Field Oriented Control) -RGN (Regenerative)
3	Inverter model	
4	Supply voltage	2 = Power supply 200÷240 VAC, 280÷340 VDC 4 = Power supply 380÷500 VAC, 530÷705 VDC 5 = Power supply 500÷600 VAC, 705÷845 VDC 6 = Power supply 575÷690 VAC, 845÷970 VDC
5	Type of power supply	T = three phase C = DC voltage
6	6 Braking chopper:	X = 0 no braking chopper B = Built in braking chopper
7	7 EMC filter type:	I = no filter A1 = integrated filter in accordance with IEC 61800-3 category C2 A2 = integrated filter in accordance with IEC 61800-3 category C3 B = integrated filter in accordance with IEC 61800-3 category C1
8	8 Programming panel:	X = without programming panel K = complete with programming panel
9	9 Protection degree:	0 = IP00 2 = IP20 5 = IP54

Models covered by the type approval:

	Size	Model	Voltage
2T/4T IP00 Product Range	S41	PENTA MARINE 0180 to 0260 2T/4T XA2K0	200÷240/380÷500
	S51	PENTA MARINE 0313 to 0402 2T/4T XA2K0	
5T/6T IP00 Product Range	S42	PENTA MARINE 0181 to 0259 5T/6T XA2K0	500÷600/575÷690
	S52	PENTA MARINE 0290 to 0401 5T/6T XA2K0	

	Size	Model	Voltage
2T/4T IP20 Product Range	S05	PENTA MARINE 0007 to 0020 2T BA1K2	200÷240
	S12	PENTA MARINE 0023 to 0037 2T BA2K2	200÷240
	S05	PENTA MARINE 0005 to 0014 4T BA1K2	380÷500
	S12	PENTA MARINE 0016 to 0030 4T BA1K2	380÷500
		PENTA MARINE 0034 to 0036 4T BA2K2	380÷500
	S15	PENTA MARINE 0040 to 0049 2T/4T BA2K2	200÷240/380÷500
	S20	PENTA MARINE 0060 to 0086 2T/4T BA2K2	200÷240/380÷500
	S30	PENTA MARINE 0113 to 0162 2T/4T BA2K2	200÷240/380÷500
5T/6T IP20 Product Range	S12	PENTA MARINE 0003 to 0018 5T XA2K2	500÷600
	S14	PENTA MARINE 0003 to 0018 6T XA2K2	575÷690
		PENTA MARINE 0019 to 0032 5T/6T XA2K2	500÷600/575÷690
		PENTA MARINE 0019 to 0032 5T/6T BA2K2	500÷600/575÷690
		PENTA MARINE 0003 to 0018 5T/6T BA2K2	500÷600/575÷690
	S22	PENTA MARINE 0042 to 0069 5T/6T XA2K2	500÷600/575÷690
		PENTA MARINE 0042 to 0069 5T/6T BA2K2	500÷600/575÷690
	S32	PENTA MARINE 0076 to 0164 5T/6T XA2K2	500÷600/575÷690
		PENTA MARINE 0076 to 0164 5T/6T BA2K2	500÷600/575÷690
2T/4T IP54 Product Range	S05	PENTA MARINE 0007 to 0020 2T BA1K5	200÷240
	S12	PENTA MARINE 0023 to 0037 2T BA2K5	200÷240
	S05	PENTA MARINE 0005 to 0014 4T BA1K5	380÷500
	S12	PENTA MARINE 0016 to 0030 4T BA1K5	380÷500
		PENTA MARINE 0034 to 0036 4T BA2K5	380÷500
	S15	PENTA MARINE 0040 to 0049 2T/4T BA2K5	200÷240/380÷500
	S20	PENTA MARINE 0060 to 0086 2T/4T BA2K5	200÷240/380÷500
	S30	PENTA MARINE 0113 to 0162 2T/4T BA2K5	200÷240/380÷500
5T/6T IP54 Product Range	S12	PENTA MARINE 0003 to 0018 5T XA2K5	500÷600
	S14	PENTA MARINE 0003 to 0018 6T XA2K5	500÷600/575÷690
		PENTA MARINE 0003 to 0018 5T/6T BA2K5	500÷600/575÷690
		PENTA MARINE 0019 to 0032 5T/6T XA2K5	500÷600/575÷690
		PENTA MARINE 0019 to 0032 5T/6T BA2K5	500÷600/575÷690
	S22	PENTA MARINE 0042 to 0069 5T/6T XA2K5	500÷600/575÷690
		PENTA MARINE 0042 to 0069 5T/6T BA2K5	500÷600/575÷690
	S32	PENTA MARINE 0076 to 0164 5T/6T XA2K5	500÷600/575÷690
		PENTA MARINE 0076 to 0164 5T/6T BA2K5	500÷600/575÷690

Options: Options: AC Inductors; DC inductors; EMI/RFI filters; braking units; sine filters; regenerative interfaces.

Application/Limitation

Temperature class:	A
Vibration class:	A
Humidity class:	B
EMC class*:	A / IEC 61800-3* To be used on EMC class A locations
IP Class**:	IP00 / 20 / 54**

The PENTA MARINE shall be regarded as a component. The actual installation to be designed according to 15P0102BX SINUS PENTA Installation Guide, 15W0102BX Motor Drives Accessories and according to the applicable DNV GL Rules for the actual application. The selection of size shall be based on an ambient temperature of 45 °C.

Documents for the actual application are to be submitted for approval in each case in accordance with DNV GL Rules Pt.4, Ch.8, Sec.1 Table 2. A Product Certificate is required for converters ≥ 100 kW.

* Converters EMC classed C3 according to IEC 61800-3 can be installed in "special distribution zone" and "general power distribution zone" in accordance with IEC 60533 provided precautions are taken to attenuate these effects on the distribution system, so the safe operation is assured.

** To be installed in an enclosure with an IP degree in accordance with DNV GL Rules w.r.t. location.

The Type Approval covers hardware and software for the basic controller.

Clause for software control:

All changes in software are to be recorded as long as the system is in use on board. The records of all changes are to beforwarded to DNV for evaluation and approval. Major changes in the software are to be approved before being installed in the converter.

Type Approval documentation

Tests carried out

Visual inspection, Performance/heat run, Power supply failure, Power supply variations, Voltage/frequency variation, Vibration, Dry heat, Damp heat, Insulation resistance, High voltage.

EMC: The following tests are in accordance with the DNV GL CG-0339/ IEC 61800-3: Electrical fast transient (Burst), electrical slow transient (Surge), RF-common mode Voltage, radiated RF-electromagnetic fields, electric discharge (ESD), radiated and conducted emission. (See under application limitation).

Marking of product

PENTA MARINE – Type designation – Current – Voltage

Periodical assessment

The scope of the periodical assessment is to verify that the conditions stipulated for the Type approval are complied with and that no alterations are made to the product design or choice of materials.

The main elements of the assessment are:

- Inspection on factory samples, selected at random from the production line (where practicable)
- Results from Routine Tests (RT) checked (if not available tests according to RT to be carried out)
- Review of type approval documentation
- Review of possible change in design, materials and performance
- Ensuring traceability between manufacturer’s product type marking and Type Approval Certificate.

Periodical assessment is to be performed after 2 years and after 3.5 years. A renewal assessment will be performed at renewal of the certificate.

END OF CERTIFICATE