



# TYPE APPROVAL CERTIFICATE

Certificate no.:  
**TAE00002HD**  
Revision No:  
**2**

**This is to certify:**  
**that the Frequency Converter**

with type designation(s)  
**PENTA MARINE**

issued to  
**Enertronica Santerno S.p.A.**  
**Castel Guelfo di Bologna BO, Italy**

is found to comply with  
**DNV 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.**

Issued at **Høvik** on **2024-02-23**

for **DNV**

This Certificate is valid until **2029-02-22**.

DNV local unit: **Venice**

Approval Engineer: **Carsten Hunsalz**

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.

LEGAL DISCLAIMER: Unless otherwise stated in the applicable contract with the holder of this document, or following from mandatory law, the liability of DNV AS, its parent companies and their subsidiaries as well as their officers, directors and employees ("DNV") arising from or in connection with the services rendered for the purpose of the issuance of this document or reliance thereon, whether in contract or in tort (including negligence), shall be limited to direct losses and under any circumstance be limited to 300,000 USD.



Form code: TA 251

Revision: 2023-09

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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	
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

	Size	Model	Voltage
	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 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 Rules Pt.4, Ch.8, Sec.1 Table 8. 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 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 be forwarded to DNV for evaluation and approval. Major changes in the software are to be approved before being installed in the converter.

## Type Approval documentation

### Technical info:

“Modello per Certificazione DNV-Marine” Spread sheet rev. 3 dated 2013-03-04.

User manual: 15P0102B100\_SINUS\_PENTA\_HW\_R00\_EN.pdf,

15W0102B500\_Motor\_Drives\_Accessories\_R00\_EN.pdf, 15R0102B200\_SINUS\_PENTA\_SW\_R03\_EN.pdf

### Test reports:

ENERTRONICA SANTERNO #12647\_RP\_PENTA MARINE S51 0402 4T\_Electronic Motor Overload Protection Tests according to IEC 61800-5-1:2022\_R02 dated 2023-11-20

TÜV test report IT23WE02 001 dated 04/11/2023 and IT23UR3C 001 dated 25/09/2023

TÜV test reports nos. VIBR 13\_174 dated 2013-06-17. REi test report No. SANT02280313 dated 2013-05-20, INTEK test report no RP 2013-052-00, EUROTTEST test report no CLM01 16521-130146 dated 2013-05-29 NEMKO Test report no. 234512TRFEMC dated 2013-06-12. Santerno test report “Compliance DNV Marine STD 2.4\_SINUS PENTA\_S51\_04T\_PTC\_605.pdf dated 2013-04-23.. DNV SURVEY REPORT dated 2013-04-23.

## 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, Electronic Motor Overload Protection Tests according to IEC 61800-5-1:2022

EMC: The following tests are in accordance with the DNV-CG-0339:2021 / 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