

EU RO Mutual Recognition Technical Requirements

VERTICAL SURFACE REFEREMCE SYSTEM FOR DP SYSTEM	Version	0.0
	Adoption Date:	01 January 2022
	Application Date:	01 July 2022
	Tier	9
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1. PRODUCT DESCRIPTION

1.a General description of the product

The vertical surface reference system for DP system is a motion sensor, which can measure the dynamic linear motion and attitude of the ship, and can measure the acceleration, roll, pitch, yaw, surge, sway and heave during the ship's operation, and has high accuracy.

1.b Application limitations[†]

- Applicable for ships as defined in Mutual Recognition provisions Article 10 Regulation on Common Rules and Standards for Ship Inspection and Survey Organisations;
- Not applicable for Ex-type equipment;
- This TR covers sensor and its electric interfaces for use in DP control systems. Other applications have not been considered. This TR does not cover NMEA protocol and similar higher-level requirements.

[†]The EU MR type approved product is generally not used as a stand-alone product, but integrated as component in a sub-system or system. When a product is presented with an EU RO MR Type Approval Certificate for given application, its acceptability with regards to

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conditions defined in 1b, 1c and 1d of this Technical Requirement will be evaluated by the EU RO in charge of classing the ship or being in charge of the unit/system certification.

1.c Intended use

Cover the following services:
vertical surface reference system for DP system

1.d System context

See 1.c.

2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a i. Technical Requirements

- a) Reliable operation of system shall be ensured under the following ambient temperature conditions:
 - 0°C to +55°C in enclosed spaces;
 - -25°C to + 45°C on open deck.No damage to sensors shall be caused by temperatures up to +70 °C;
- b) Reliable operation of system shall be ensured at relative air humidity of 100%;
- c) Reliable operation of system shall be ensured at vibrations having a frequency of 2 to 100 Hz, namely, with shift amplitude of ± 1 mm where the vibration frequency is between 2 and 13,2 Hz, and with an acceleration of ± 0.7 g where the vibration frequency is between 13.2 and 100 Hz;
- d) Reliable operation of system mounted upon vibration sources (engines (ICE), compressors, etc.) or installed in steering flats shall be ensured at vibration frequencies of 2 to 100 Hz, namely, with a shift amplitude of ± 1.6 mm where the frequency is between 2 and 25 Hz, and with an acceleration of ± 4.0 g where the frequency is between 25 and 100 Hz. For more severe conditions which may exist, for example, on exhaust manifolds of high speed ICE, 40 Hz to 2000 Hz – acceleration ± 10.0 g at 600 °C;
- e) Reliable operation of system shall be ensured at long- term heel up to 22.5° and at motions of 22.5° with a period of 10s;
- f) The protective enclosure of system shall be chosen in accordance with IEC 60529;

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- g) System shall operate reliably in case of deviation of the power parameters listed in Table 1 from nominal values:

Table 1

Parameter	Deviation from nominal value		
	Long-term.	Short-term	
	%	%	Time, s
Voltage (A. C.)	+10...-10	±20	1.5
Frequency	±5	±10	5
Voltage (D. C.)	±10	5 10	Cyclic deviation of ripple

System supplied from accumulator batteries shall operate reliably with the following voltage variations from the nominal value:

- from +30 to -25 per cent for the equipment, which is not disconnected from the battery during battery charging;
 - from + 20 to -25 per cent for the equipment, which is disconnected from the battery during battery charging.
- h) Provision shall be made to ensure the electromagnetic compatibility of system as specified IEC Publication 61000-4-2, IEC Publication 61000-4-3, IEC Publication 61000-4-4, IEC Publication 61000-4-5, IEC Publication 61000-4-6;
- i) System to be installed in locations with specific operating conditions (high or low temperature, excessive mechanical loads, etc,) shall be designed and tested with regard to the conditions;
- j) System shall be made of materials resistant to the marine environment or shall be reliably protected from its harmful effects;
- k) The requirements for accuracy will be set by the Manufacturer's specifications;
- l) If applicable, the system could have lever arm correction function, to eliminate the difference between the installation position and certain point (usually centre of gravity or monitoring point);
- m) Installations and settings of system shall be in accordance with IEC 60092-504 and IEC 60533.

2.a.ii. Technical documents to be submitted

- a) Explanatory note with description of the principle of operation and structural data of the sensor;

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- b) Specification with indication of the devices and appliances used and the technical characteristics thereof;
- c) General view drawings, structural units, appliances and instruments;
- d) Functional block diagrams of the article with indication of input and output signals, feedbacks, self-monitoring system, etc.;
- e) Documentation on the enterprise's quality system (description of the article quality control system functioning) operating when manufacturing a prototype or production samples (if any) – for new enterprises, hitherto unknown to the Society;
- f) The technical documentation must make it possible to assess the product's compliance with the agreed technical requirements, as described in the items 2.a.i above;
- g) Test programme and standards;
- h) For computer/microprocessor based system: Documents in accordance with the paragraph 10.11 of IEC 60092-504, as well as, Firmware Version, Changes List;
- i) For computer based electronics Software QA and other relevant documents according to the requirement class. Software quality plan to demonstrate that the provisions of ISO/IEC 90003 are incorporated. The plans are to define responsibilities for the lifecycle activities, including verification, validation, software module testing, integration with other components or systems and security policies to be applied.

2.b Type testing requirements

- a) In accordance with IACS UR E10 and additional tests for confirmation of special features of sensors indicated in the technical documentation as per Table 2:

Table 2

No.	Test	Normative document	Test parameters and conditions	Test purpose, performance criteria
1	Protective enclosure	IEC 60529	The test is applicable for enclosures of the articles with operating voltage up to 1000V.	The equipment is considered to have passed the test, if it satisfies the Performance Criterion A and the requirements of IEC 60529.
2	Impact	-Acceleration – 5g, -Duration : 10 – 15 ms,	The test shall be carried out under	The equipment is considered to have

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No.	Test	Normative document	Test parameters and conditions	Test purpose, performance criteria
		:No of impacts: 20, Frequency of impacts: 40 – 80 impacts/min.	working condition, in three mutually perpendicular planes. Sinusoidal shape of the impact momentum is recommended	passed the test, if during and after the test it complies with the requirements specified in the technical documentation.
3	Exposure to solar radiation	-Temperature in the chamber: + 55°C.	Subjected to the test are appliances with the use of plastics which are intended for operation on the open deck in areas where they are continuously exposed to solar radiation	The equipment is considered to have passed the test, if:
		- Radiation intensity: 1125W/m ² .		- No deformation, cracking, stratification, buckling , ungluing of plastic pieces and other materials has taken place;
		(Including flux density of the ultra-violet portion of spectrum with a wavelength of 280 – 400 nm shall be not less than 42 W/m ²)		- No degradation of readability of inscriptions and signs on the instrument scales has not been detected; -Parameters and resistance of insulation have remained normal

- b) low temperature test for 16 hours at agreed temperature, for open deck at -25°C
- c) Examination of software for products that include programmable electronic systems (SW shall be installed during type approval tests and the proper function

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- of the product to be verified during type testing with applicable performance or functional tests)
- d) Test specimens shall be taken from the production line or from stocks†.
 - e) Tests shall be carried out in the presence of the EU RO Surveyor. In cases where the tests are conducted at Nationally Accredited Laboratories, the presence of the EU RO surveyor may be omitted†.

†For further clarification of witnessing of tests and sampling the test specimen(s), refer to paragraphs 6, 7 and 8 of the EU RO "Design Evaluation Scheme" procedure (Appendix V of EU RO Framework Document for the Mutual Recognition of Type Approval found on <https://www.euomr.org/technical-requirements>)

2.c Type testing requirement for certificate renewal

- a) The manufacturer is to notify the RO of any modification or changes to the manufacturing specifications that may affect the MR TA to be renewed.
- b) The Software history to be provided for review.

3. PRODUCTION REQUIREMENTS

3.1 General requirements

Refer to EU RO "Product Quality Assurance (PQA)" procedure (Appendix VI of EU RO Framework Document for the Mutual Recognition of Type Approval) found on <https://www.euomr.org/technical-requirements>

3.2 Special requirements

A serial (not type approved) product shall be tested in accordance with requirement specified in the IACS UR E10.

4. MARKING REQUIREMENTS

Manufacturers of the approved equipment are, in principle, to mark the product before shipment for identification of approved equipment and, in addition, at least the following items to be marked at the suitable place:

- a) Manufacturer's name or equivalent;

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- b) Type No. or symbol;
- c) Serial No. and date of manufacture;
- d) Particulars or ratings, including accuracy of the instrument.

5. TYPE APPROVAL CERTIFICATE CONTENT

The EU RO MR Type Approval Certificate shall contain the minimum information as defined in the "EU RO Framework Document for the Mutual Recognition of Type Approval" - see Appendix I EU RO MR Type Approval Certificate Information.

The following information is specifically applicable to products relevant to this Technical Requirement and shall be included on the EU RO MR Type Approval Certificate:

- a) Certificate Heading;
- b) Certificate number;
- c) Company Information;
- d) Product Information (Technical characteristics which adequately express the basic article's features assuring its functional usage, including the power supply parameters, version and/or revision of the software (if applicable), output signal interface, principle of operation, test report nos., approved documents etc);
- e) Term of Validity;
- f) Rules & Standards;
- g) Generic Sentence.

6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
2021-07-01	0.0	Approved by EU RO MR Steering Committee

7. BACKGROUND INFORMATION / REFERENCES

- a) EU RO Framework Document for the Mutual Recognition of Type Approval;
- b) IACS UR E10;
- c) IEC 60092-504;
- d) IEC 60529;
- e) IEC 606533;
- f) IEC Publication 61000-4-2;
- g) IEC Publication 61000-4-3;
- h) IEC Publication 61000-4-4;
- i) IEC Publication 61000-4-5;

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- j) IEC Publication 61000-4-6;
- k) EU RO Framework Document for the Mutual Recognition of Type Approval.

8. MAINTENANCE & CLARIFICATION OF TECHNICAL REQUIREMENTS

Anyone wishing to propose changes to this document or request clarification of technical issues should contact the EU RO MR Group Secretariat in the first instance:
Secretariat@euomr.org.

Review and approval of change requests shall follow the EU RO MR Maintenance Process detailed in the EU RO Framework Document for the Mutual Recognition of Type Approval: <https://www.euomr.org/technical-requirements>

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