

EU RO Mutual Recognition Technical Requirements

SENSORS	Version	0.3
	Adoption Date	1 April 2016
	Application Date	1 October 2016
	Tier	1
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1. PRODUCT DESCRIPTION

1.1 General description of the product

Electrical and electronic sensors (including P & T transducers) suitable for marine use.

1.2 Application limitations

- a) Applicable for ships as defined in Mutual Recognition provisions Article 10 Regulation on Common Rules and Standards for Ship Inspection and Survey Organisations;
- b) Not applicable for a mobile offshore drilling unit (MODU);
- c) Not applicable for fishing vessels.

1.3 Intended use

Sensors intended to be used in all control, monitoring and instrumentation systems necessary for the applications mentioned in 1.2.

1.4 System context

Refer to the item 1.3.

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2. DESIGN EVALUATION

2.1 Engineering evaluation requirements

2.1.1 Technical Requirements

2.1.1.1 Design of electrical and electronic sensors

- a) Reliable operation of electrical and electronic sensors 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 electrical and electronic sensors shall be caused by temperatures up to +70 °C;
- b) Reliable operation of electrical and electronic sensors shall be ensured at relative air humidity of 100%;
- c) Reliable operation of electrical and electronic sensors 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 $\pm 0,7$ g where the vibration frequency is between 13,2 and 100 Hz;
- d) Reliable operation of electrical and electronic sensors 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 $\pm 1,6$ mm where the frequency is between 2 and 25 Hz, and with an acceleration of $\pm 4,0$ 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 electrical and electronic sensors shall be ensured at long-term heel up to 22,5° and at motions of 22,5° with a period of (8 ± 1) s;
- f) The protective enclosure of electrical and electronic sensors shall be chosen in accordance with IEC 60529;
- g) Electrical and electronic sensors shall operate reliably in case of deviation of the power parameters listed in **Table 1** from nominal values:

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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

Electrical and electronic sensors 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 electrical and electronic sensors 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) Electrical and electronic sensors 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) Electrical and electronic sensors shall be made of materials resistant to the marine environment or shall be reliably protected from its harmful effects.

2.1.1.2 Installations and Settings of Electrical and Electronic Sensors

- a) Installations and Settings of Electrical and Electronic Sensors shall be in accordance with IEC 60092-504 and IEC 60533.

2.1.2 Technical documents to be submitted

IMPORTANT: The English Language shall be used for all submitted documents.

- 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) In case when explosion-proof sensors are used, Certificates issued by competent authorities in accordance with requirements of EN/IEC 60079 series should be provided;
- g) The technical documentation must make it possible to assess the product's compliance with the agreed technical requirements, as described in the items 2.1.1.1 and 2.1.1.2 above;
- h) Test programme and standards;
- i) For computer/microprocessor based sensors: Documents in accordance with the paragraph 10.11 of IEC 60092-504, as well as, Firmware Version, Changes List;
- j) For computer based electronics Software QA and other relevant documents according to the requirement class.

2.2 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.

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No.	Test	Normative document	Test parameters and conditions	Test purpose, performance criteria
2	Impact	-Acceleration – 5g, -Duration : 10 – 15 ms, :No of impacts: 20, Frequency of impacts: 40 – 80 impacts/min.	The test shall be carried out under working condition, in three mutually perpendicular planes. Sinusoidal shape of the impact momentum is recommended	The equipment is considered to have 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 wave length 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) Test specimens shall be taken from the production line or from stocks†.

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- c) 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 <http://www.euromr.org/Guidance%20for%20Mutual%20Recognition>)

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).

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 as per referenced standard. In addition, and as a minimum, all units, devices, and test points shall be clearly and permanently marked. The marking shall be preferably placed adjacent to them.

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.

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

- a) Technical characteristics which adequately express the basic article's features assuring its functional usage;
- b) Other important characteristics specified by this Technical Requirement, including the power supply parameter;
- c) Version and/or revision of the software (if applicable).

6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
8 July 2012	0.0	Accepted by Advisory Board
31 January 2014	0.1	Added reference to EU RO Framework Document for the Mutual Recognition of Type Approval. Aligned with EU RO Framework document in part of type tests witness in accordance with CRF013
31 January 2015	0.2	CRF018 – Revision to par. 2.a.ii - Technical documents to be submitted in English; CRF020 – Revision to par. 5 - 'Type Approval Certificate Content'
1 April 2016	0.3	CRF025 – Updated to new MR TR document format incl. par. 8; RF026/026a – Witness testing & control of test specimen; CRF028 – addition of 6 month application clause.

7. BACKGROUND INFORMATION / REFERENCES

- a) EN / IEC 60079;
- 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;
- j) IEC Publication 61000-4-6;

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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@euromr.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: <http://www.euromr.org/Guidance%20for%20Mutual%20Recognition>.

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