

EU RO Mutual Recognition Technical Requirements

PRESSURE GAUGES – TRANSMITTERS	Version	0.1
	Adoption Date:	1 January 2022
	Application Date:	1 July 2022
	Tier	5
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1. PRODUCT DESCRIPTION	1
2. DESIGN EVALUATION	2
3. PRODUCTION REQUIREMENTS	6
4. MARKING REQUIREMENTS	6
5. TYPE APPROVAL CERTIFICATE CONTENT	7
6. APPROVAL DATE AND REVISION NUMBER	7
7. BACKGROUND INFORMATION / REFERENCES.....	7
8. MAINTENANCE / CLARIFICATION OF TECHNICAL REQUIREMENTS	8

1. PRODUCT DESCRIPTION

1.a General description of the product

Pressure gauges/transmitters are electromechanical devices (typically stainless steel or ceramic diaphragm) suitable for marine use. It is used to deliver pressure information locally or to a remote position.

The conversion of pressure into an electrical signal is achieved by the physical deformation of strain gages which are bonded into the diaphragm of the pressure transducer. Pressure applied to the pressure transducer produces a deflection of the diaphragm which introduces strain to the gages. The strain will produce an electrical resistance change proportional to the pressure.

Generally, there are three different types of electrical output available:

i) Millivolt Output - Pressure Transducers:

The output of the millivolt transducer is nominally around 30mV. The actual output is directly proportional to the pressure transducer input power supply or excitation. If the excitation fluctuates, the output will change also. Because of this dependence on the excitation level, regulated power supplies are suggested for use with millivolt transducers. Because the output signal is so low, the transducer should not be located in an electrically noisy environment. The distances between the transducer and the readout instrument should also be kept relatively short.

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ii) Voltage Output - Pressure Transducers:

The output is normally 0-5Vdc or 0-10Vdc. Because they have a higher-level output these transducers are not as susceptible to electrical noise as millivolt transducers and can therefore be used in much more complicate environments.

iii) 4-20 mA Output - Pressure Transducers:

Since a 4-20mA signal is least affected by electrical noise and resistance in the signal wires, these transducers are often used when the signal must be transmitted to long distances. It is not uncommon to use these transducers in applications where the lead wire must be a few hundred meters or more.

1.b Application limitations

These technical requirements apply to Pressure Gauges - Transmitters intended for marine use.

1.c Intended use

Pressure gauge/transmitters shall be used in all control, alarm, monitoring and instrumentation systems necessary for the applications mentioned in 1.b subject to classification including ballast and service tank gauging.

1.d System context

Installation on board a ship within different locations with all climatic, chemically active and mechanically active surrounding and atmosphere for which is tested.

2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a i. Technical Requirements

All technical requirements shall fulfill IACS Unified Requirements E10, latest revision in use – Test Specification for Type Approval:

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- a) Reliable operation of electromechanical and electronic transmitter 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 parts shall be caused by temperature up to +70°C;
- b) Reliable operation of electrical and electronic part shall be ensured at relative air humidity of 100%;
- c) Reliable operation of electrical and electronic parts 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 transmitters 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;
- e) 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;
NOTE: *Mechanical resonances with amplification greater than 10 will not be accepted;*
- f) Reliable operation of electrical and electronic transmitters shall be ensured at long-term heel up to 22,5° and at motions of 22,5° with a period of 10 s;
- g) The protective enclosure of electrical and electronic transmitters shall be chosen in accordance with IEC 60529;
- h) Electrical and electronic transmitters 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

- i) Electrical and electronic transmitters supplied from accumulator batteries shall operate reliably with the following voltage variations from the nominal value:
 - **from +30 to -25 %** for the equipment, which is not disconnected from the battery during battery charging;
 - **from + 20 to -25 %** for the equipment, which is disconnected from the battery during battery charging;
- j) Provision shall be made to ensure the electromagnetic compatibility of electrical and electronic sensors as specified IEC 61000-4-2, IEC 61000-4-3, IEC 61000-4-4, IEC 61000-4-5, IEC 61000-4-6;
- k) Electrical and electronic transmitters which are installed in locations with specific operating conditions (high or low temperature, excessive mechanical loads, etc.) shall be designed and tested with regard to those operating conditions;
- l) Electrical and electronic transmitters shall be made of materials resistant to marine environment or shall be reliably protected from its harmful effect;
- m) Installations and Settings of Electrical and electronic transmitters shall be in accordance with IEC 60092-504 and IEC 60533.

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2.a.ii. 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 transmitter;
- 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) Details of the production site(s), production facility inspection report, production specifications and a valid QM certificate according to ISO 9001;
- f) The technical documentation must make it possible to assess the product's compliance with the agreed technical requirements, as described above.
- g) For products where the function is based on software the quality management system of the manufacturer has to maintain procedures for the life cycle activities and the version control.

2.b Type testing requirements

- a) In accordance with IACS UR E10 as specified in 2.a.i. and additional tests for confirmation of special features of pressure gauge/transmitters indicated in the technical documentation for specific operating conditions;
- b) Pressure test equal to 150% of maximum nominal pressure is generally a demand. 2 minute static pressure test at 150% of design pressure is required. The accuracy of the equipment should be documented before and after the static pressure test;
- c) The version of each type of installed software at the time of testing is to be identified;
- 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 a Nationally Accredited Laboratory, the presence of the EU RO's Surveyor may be omitted, provided that the scope of accreditation covers the relevant applicable standards.

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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>)

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

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

Changes to the embedded software (firmware/ system software), if software changes of relevance will void the EU RO certification. The EU RO shall be kept informed of all new version numbers including a description and impacts of change.

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, the following items to be marked at the suitable place:

- a) Manufacturer's name or equivalent;
- b) Type No. or symbol;
- c) Serial No. and date of manufacture;

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- d) Particulars or ratings, including IP grades and class of accuracy

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 of 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:

- Technical data which adequately express the basic article's features assuring its functional usage;
- Details of the EMC/environmental test levels applied;
- Hardware, firmware [major version. minor version], software name and revision, if and as applicable.

6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
2016-07-01	0.0	Approval by EU RO MR Advisory Board
		CRF030 (fast track), already aligned in June 2016
2021-12-28	0.1	Software update (18042g)

7. BACKGROUND INFORMATION / REFERENCES

- EU RO Framework Document for the Mutual Recognition of Type Approval;
- IACS UR E10
- IEC 60529
- IEC 61000-4-2, IEC 61000-4-3, IEC 61000-4-4, IEC 61000-4-5, and IEC 61000-4-6;
- IEC 60092-504;
- IEC 60533;
- ISO 9001.

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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>

- END -