

EU RO Mutual Recognition Technical Requirements

TEMPERATURE SWITCHES	Version	0.0
	Adoption Date:	1 January 2019
	Application Date:	1 July 2019
	Tier	7
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1. PRODUCT DESCRIPTION

1.a General description of the product

Temperature Switches has temperature measurement capabilities with relevant output change-over. Switches may have electric and/or electronic parts and be externally power supplied.

Temperature sensors may be based on several working principles: bi-metallic (BM), liquid expansion (LE), gas-expansion (GE), thermo-resistors (RTD), thermocouples (TC), infrared (IR), etc.; the relevant features of which vary accordingly. According their working principle the movement directly act on the opening and closing of an electrical switch or the sensor respond to temperature by changing the electrical performance.

1.b Application limitations[†]

- a) These technical requirements are applicable to temperature switches for control, safety or alarm device of equipment on board used in electric circuit at a voltage not exceeding 1000 V a.c. or 1500 V d.c.;
- b) 'Ex' certification is not within the scope of these Technical Requirements;
- c) Not applicable for a mobile offshore drilling unit (MODU);
- d) Not applicable for fishing vessels.

†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 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.

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1.c Intended use

Switch by temperature (of fluids or solids, as applicable) in piping systems, pressure vessels, tanks, cargo holds, enclosed or open spaces, or machinery components.

1.d System context

Piping systems, pressure vessels, tanks, cargo holds, enclosed or open spaces, machinery components.

2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a.i. Technical Requirements

- a) The materials shall be suitable for marine use and the material of sensor shall be compatible with the fluid whose temperature is intended to be sensed and have high thermal conductivity;
- b) Reliable operation of electrical and electronic part shall be ensured at relative air humidity of 100% under following ambient temperature conditions:
 - 0°C to +55°C in enclosed spaces
 - 0°C to +70°C (minimum) close to combustion engines, boilers and similar; in case of components intended to be mounted on machinery associated with, or in spaces subject to, higher temperature, the relevant ambient temperature range is to be in accordance with specific machinery and installation, or with specific ambient temperature
 - -25°C to +45°C on open deck (-25°C to +55°C for electronic equipment)No damage to electrical and electronic parts shall be caused by temperature up to +70°C;
- c) Reliable operation of switches 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 switches 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

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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 switches 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) Switches having electric or electronic parts shall operate reliably in case of deviation of the power source parameters listed in Table 1 from nominal values:

Parameter	Deviation from nominal value		
	Long-term, %	Short-term	
		%	Time, s
Voltage (a.c.)	+6...-10	± 20	1,5
Frequency	± 5	± 10	5
Voltage (d.c.)	± 10	5 10	Cyclic deviation Ripple

Table 1

- h) Switches having electrical and/or electronic parts and 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;
- i) Provision shall be made to ensure the electromagnetic compatibility of electrical and electronic parts of switches 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;
- j) Switches shall be reliable at shocks having an acceleration of $\pm 5,0$ g and at a frequency of 40 to 80 shocks per minute;

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- k) Switches 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;
- l) Electrical and electronic sensors shall be made of materials resistant to the marine environment or shall be reliably protected from its harmful effects;
- m) Provision shall be made to prevent incorrect connection of plug-in-sockets to the switches outputs;
- n) The devices shall be capable of being tested during normal operation;
- o) Replaceable components, which require adjustment, as well as check-up points (terminals, monitoring jacks) shall be so arranged that easy access is possible at any time;
- p) The minimum degree of protection, as applicable, shall be in accordance with the requirements set forth by the EU RO in charge of the vessel's classification, as a function of the intended location;
- q) Switches used for measuring temperature of fire-hazardous, toxic liquids, vapours and gases, liquids, vapours and gases under pressure shall be isolated from the medium tested.

2.a.ii. Technical documents to be submitted

- a) Technical specifications, data sheets, drawings, installation sheets and type test reports, describing the type and working principles of the temperature switches and showing compliance with the relevant technical requirements as per above point 2.a.i.

2.b Type testing requirements

- a) Type tests shall be carried out in accordance with IACS UR E10 and selected suitable recognized standard;
- b) Regardless of a), duration of cold test shall not be less than 16 hours;
- c) Test specimens shall be taken from the production line or from stocks*.
- d) 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 an 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

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V of EU RO Framework Document for the Mutual Recognition of Type Approval found on <https://www.euromr.org/technical-requirements>)

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 <https://www.euromr.org/technical-requirements>)

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) Type No. or symbol;
- b) Serial No. and date of manufacture;
- c) Serial No. and date of manufacture;
- d) Particulars and ratings including IP grade and operating temperature.

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) Environmental test items and test levels applied, if any;
- b) Approval conditions including limitations, if any.

6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
2018-07-01	0.0	Approved by EU RO MR Steering Committee

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7. BACKGROUND INFORMATION / REFERENCES

- a) EU RO Framework Document for the Mutual Recognition of Type Approval;
- b) IACS UR E10.
- c) IEC 60947-1
- d) IEC 60947-5-1

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: <https://www.euromr.org/technical-requirements>

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