EU RO Mutual Recognition Technical Requirements

POSITION 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

Position switches and proximity switches suitable for marine use.
Definitions according to IEC 60947-5-1 and IEC 60947-5-2:

- Position switch: "a pilot switch the actuating system of which is operated by a moving part of the machine, when this part reaches a predetermined position";
- Proximity switch: "a position switch which is operated without mechanical contact with the moving part";

The output of a position/proximity switch is determined by the presence or absence of a designated object. This digital output could be represented by a switched-, voltage-, current-, resistance- or frequency signal.
Typical principles of operation for sensing includes, but are not limited to:

- mechanical, capacitive, inductive, ultrasonic, photoelectric.

1.b Application limitations†

a) These technical requirements are applicable to position switches for control, safety or alarm device of plant or system on board with rated voltage in electric circuit not exceeding 1000 V a.c. or 1500 V d.c.;
b) This TR is not intended for position or proximity sensors/transmitters that output position values other than presence or absence. E.g. distance;
c) 'Ex' certification is not within the scope of these Technical 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

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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.

1.c Intended use

Intended for use in systems that provide control, monitoring and alarm functions subject to classification requirements.

1.d System context

Application of the control, monitoring and alarm systems are subject for approval of the individual EU RO classing the vessel.

2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a i. Technical Requirements

All technical requirements shall fulfil IACS Unified Requirements E10, latest revision in use (Rev. 6) – Test Specification for Type Approval:

a) Reliable operation of electric and electronic part shall be ensured at relative air humidity of 100% under the 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;

b) Reliable operation of electrical and electronic parts shall be ensured at vibrations having a frequency of 2 Hz to 100 Hz, namely, with shift amplitude of ±1 mm where the vibration frequency is between 2 Hz and 13.2 Hz, and with an acceleration of ±0.7 g where the vibration frequency is between 13.2 Hz and 100 Hz;

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c) Reliable operation of electrical and electronic position switches mounted upon vibration sources (engines (ICE), compressors, etc.) or installed in steering flats shall be ensured at vibration frequencies of 2 Hz to 100 Hz, namely, with a shift amplitude of ±1.6 mm where the frequency is between 2 Hz and 25 Hz, and with an acceleration of ±4.0 g where the frequency is between 25 Hz and 100 Hz;

d) 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;

e) Reliable operation of electrical and electronic position switches shall be ensured at long-term heel up to 22.5° and at motions of 22.5° with a period of 10 s;

f) The protective enclosure of electrical and electronic position switches shall be chosen in accordance with IEC 60529;

g) Electrical and electronic position switches 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;

h) Electrical and electronic position switches shall be made of materials resistant to marine environment or shall be reliably protected from its harmful effect;

i) In general, IEC 60947 shall be observed. IEC 60947-5-1 for position switches (mechanically actuated), and IEC 60947-5-2 for proximity switches (non-mechanically actuated);

j) Switches shall operate reliably at shocks having an acceleration of ±5.0 g and at a frequency of 40 to 80 shocks per minute.

2.a.ii. Technical documents to be submitted

a) Explanatory note with description of the principle of operation and structural data of the position switch;

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) In case when explosion-proof position switches are used, Certificates issued by competent authorities in accordance with requirements of EN/IEC 60079 series should be provided;

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f) The technical documentation must make it possible to assess the product's compliance with the agreed technical requirements, as described in the item 2.a i. (Technical Requirements) above;
g) Test programme with reference to relevant standards.

2.b Type testing requirements

a) In general, the type test plan is to be agreed between the Manufacturer and the RO based on the characteristics of the product subject to testing.
b) The type tests are intended to demonstrate the performance of the prototype according to the requirements of the applicable International Standards and the relevant Manufacturer's specification.
c) The ability of the product to function as intended under the testing conditions specified in the latest revision of IACS UR E10 shall also be verified. Testing procedures according to the International Standards mentioned in this TR may be accepted by the RO, in lieu of those indicated in the IACS UR E10, provided that the test severity conditions set by the IACS UR E10 are fulfilled as a minimum.
d) Performance type tests according to the Manufacturer's specification and the applicable International Standards shall be carried out.
e) Type tests shall be carried out in accordance with IACS UR E10 as specified in 2.a.i. and additional tests for confirmation of special features of position switches indicated in the technical documentation as per table 1 'Test requirements additional to IACS UR E10', and for specific operating conditions as relevant (increased temperatures, vibration levels, etc.);

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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2	Impact	IEC 60068-2-27, Test Ea: - Acceleration: 5 g, - Duration: 10 ms – 15 ms, - No of impacts: 20 (10 per direction) - 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.

Table 1: Test requirements additional to IACS UR E10

f) All tests to be performed on agreed test samples. Test specimens shall be selected from the production line or at random from stocks †;
g) 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 †.

† For further clarification of witnessing of tests and sampling the test specimen(s), refer to paragraph 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.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) Manufacturer's name or equivalent;
b) Type No. or symbol;
c) Serial No. and date of manufacture;
d) Particulars or ratings, including operating temperature and IP rating.

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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) 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) List of EMC/environmental test levels applied, including IP rating.

6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
2018-07-01	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 Unified Requirements E10;
c) IEC 60947-5-1 Low-voltage switchgear and controlgear – Part 5-1: Control circuit devices and switching elements – Electromechanical control circuit devices;
d) IEC 60947-5-2 Low-voltage switchgear and controlgear – Part 5-2: Control circuit devices and switching elements – Proximity switches.

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

- END -

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