Supplement No. 6

To the 'Mutual Recognition within ship classification' First Report to the European Commission and the Member States, Oct 2012

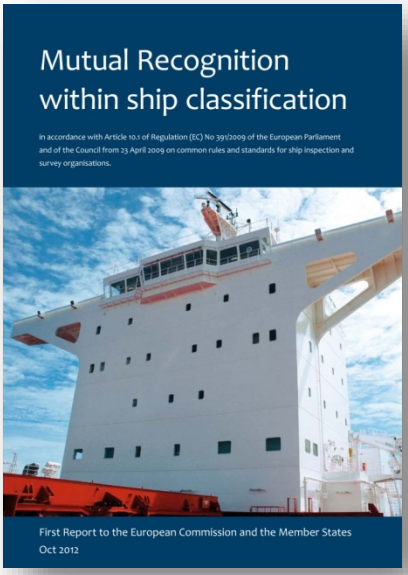
This supplement contains the agreed Technical Requirements for the new seventh tier of products (Tier 7) along with the revised Technical Requirements for existing Tiers 1, 2, 3, 4, 5 & 6. It also gives details of the recent updates to the EU RO Framework Document for the Mutual Recognition of Type Approval.

1 July2019

MUTUAL RECOGNITION IN SHIP CLASSIFICATION

Supplement No. 6

'Mutual Recognition within ship classification' First Report to the European Commission and the Member States, Oct 2012



Purpose of this Document

This supplement contains agreed Technical Requirements for a seventh tier of products (Tier 7) for Mutual Recognition in accordance with Article 10.1 of Regulation (EC) 391/2009 along with revised Technical Requirements for existing Tiers 1-6 products.

It also gives details of the *EU RO Framework for the Mutual Recognition of Type Approval*, which is a controlled document that replaces and updates the various documents and annexes contained within the First Report to the European Commission and the Member States, Oct 2012.

Supplements containing additional MR Technical Requirements will be issued from time to time to communicate to the Commission progress being made by the EU ROs on expanding and maintaining the mutual recognition certification programme.

According to the Maintenance Process Technical Requirements will revised regulary. This supplement contains all TRs revised until 31 December 2018.

MUTUAL RECOGNITION IN SHIP CLASSIFICATION

Contents

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2 Agreed MR Technical Requirements

2.1 Revised Tier 1, 2, 3, 4, 5 & 6 MR Technical Requirements

Tier	Technical Requirement	Version	Adoption Date	Page
1	Circuit Breakers	0.6	2018-07-01	10
1	Contactors	0.6	2018-07-01	17
1	Display Monitors, Video Screens, Terminals	0.3	2016-04-01	23
1	Electric Driven Motors < 20 kW	0.3	2016-04-01	33
1	Fuses	0.3	2016-04-01	39
1	LV Enclosures & Boxes	0.3	2016-04-01	46
1	LV Transformers	0.3	2016-04-01	53
1	Mechanical Joints	0.4	2018-01-01	64
1	Resin Chocks	0.3	2016-04-01	78
1	Sensors	0.4	2018-07-01	85
1	Switches	0.5	2018-07-01	93
2	Accumulator Battery	0.3	2016-04-01	99
2	Air Pipe Automatic Closing Device	0.4	2018-01-01	110
2	Cable Ties	0.3	2016-04-01	121
2	Class III Pipes Fittings (Dy≤500 mm)	0.3	2016-04-01	127
2	Computers and Programmable Logic Controllers (PLCs)	0.3	2016-04-01	134
2	Electrical/Electronic Relays	0.4	2018-07-01	150
2	Electric Cables – Heating Cables	0.3	2016-04-01	156
2	Expansion Joints	0.3	2016-04-01	161
2	Flameproof Luminaire (Lighting Fixture)	0.3	2016-04-01	167
2	Plastic Piping Systems (Components)	0.3	2016-04-01	188
2	Spark Arresters	0.3	2016-04-01	204
3	Adjustable Steel Chocks	0.2	2016-04-01	209
3	Air Compressor	0.2	2016-04-01	217
3	Battery Chargers	0.3	2018-07-01	222
3	Boiler Remote Level Indicator	0.2	2016-04-01	231
3	Cable Trays & Ducts (Glass Reinforced Plastic)	0.2	2016-04-01	237
3	Cable Trays & Ducts (Metallic)	0.2	2016-04-01	244
3	Connecting Systems for Cable Repair	0.2	2016-04-01	249

MUTUAL RECOGNITION IN SHIP CLASSIFICATION

Tier	Technical Requirement	Version	Adoption Date	Page
3	Electrical Actuators for Valves	0.2	2016-04-01	254
3	Insulation Panels for Provision Rooms & Chambers	0.2	2016-04-01	278
3	Pneumatic Actuators for Valves	0.2	2016-04-01	283
3	Solenoid Valve Assembly	0.2	2016-04-01	288
3	Stationary Lighting Fixtures/ Flood-light Projectors	0.2	2016-04-01	301
4	Circuit Breakers with Electronic Devices	0.2	2018-07-01	308
4	Contactors with Electronic Devices	0.2	2018-07-01	315
4	Tachometer	0.1	2016-04-01	321
4	Temperature Gauges and Transmitters	0.1	2016-04-01	329
4	Thermal Insulation of Organic Foams for Piping	0.1	2016-04-01	334
4	Valves for Bilge Systems	0.1	2016-04-01	338
4	Valves for Freshwater Systems	0.1	2016-04-01	345
4	Valves for Lubricating Oil & Hydraulic Oil Systems	0.1	2016-04-01	351
4	Valves for Sanitary Systems	0.1	2016-04-01	358
4	Valves for Seawater Systems	0.1	2016-04-01	365
5	AC Semiconductor Controllers	0.0	2016-04-01	372
5	Control and Protective Switching Devices	0.0	2016-07-01	378
5	Electronic Power Units for Valve Control	0.0	2016-07-01	383
5	Electro-Pneumatic Level Transmitters (EPLT)	0.0	2016-07-01	388
5	Flow Gauges/Transmitters	0.0	2016-07-01	393
5	Level Gauges/Transmitters	0.0	2016-07-01	398
5	LV Soft Starters	0.0	2016-07-01	432
5	Pilot Devices	0.1	2018-07-01	437
5	Pressure Gauges-Transmitters	0.0	2016-07-01	443
5	Valves for Cargo systems	0.0	2016-07-01	450
5	Valves for Fuel Oil Systems	0.0	2016-07-01	456
6	Anti-Acid Paints (Batteries' Storage Rooms)	0.0	2018-01-01	462
6	Electrical Insulation Mats	0.0	2018-01-01	468
6	Gaskets and Seals for Piping Systems	0.0	2018-01-01	473
6	Non-Metallic Gratings	0.0	2018-01-01	477
6	Touch Screen (i.e. a Display Monitor or a Video Screen that is also an Input Device)	0.0	2018-01-01	484
6	Valves - Boiler Water Systems (Class III)	0.0	2018-01-01	489
6	Valves - Steam Systems (Class III, Non-Essential Systems)	0.0	2018-01-01	496

New Tier 7 MR Technical Requirements

Tier	Technical Requirement	Version	Adoption Date	Page
7	Differential Pressure Switches	0.0	2019-01-01	503
7	Dual Temperature and Pressure Switches	0.0	2019-01-01	508
7	Flow Switches	0.0	2019-01-01	517
7	Level Switches	0.0	2019-01-01	521
7	Position Switches	0.0	2019-01-01	526
7	Pressure Relief Valve in Class III Piping System	0.0	2019-01-01	533
7	Pressure Switches	0.0	2019-01-01	542
7	Temperature Switches	0.0	2019-01-01	549

3 EU RO Framework Document for the Mutual Recognition of Type Approval (version 10.0 dated 1 July 2019)

The *EU RO Framework Document for the Mutual Recognition of Type Approval* was first issued on 31 January 2014 and subsequently revised to ensure consistency in the EU RO Mutual Recognition Type Approval process. The EU RO MR Type Approval Process currently consists of three main processes:

- The **Design Evaluation** involving Engineering evaluation and Witnessing of manufacturing and testing processes;
- The **Production Quality Assurance (PQA)** which aims to ensure the consistency of production with the approved design and manufacturing process;
- The **EU RO Maintenance Process** which aims to ensure all changes to EU RO MR Documentation go through the appropriate review and approval process - consulting with industry where necessary.

Version 10.0 of this document supersedes version 9.0 dated 1 July 2018 and also the following referenced documents and annexes within the 'Mutual Recognition within ship classification' First Report to the European Commission and the Member States, Oct 2012:

- 12.2 EU Recognised Organisations (EU ROs);
- 12.5 EU RO Mutual Recognition for Type Approval Terms and Conditions;
- 12.6 EU RO Mutual Recognition Procedure for Type Approval (including annexes).

Document	Version	Document Date	Controlled Version:
EU RO Framework Document for the Mutual Recognition of Type Approval	10.0	01/07/2019	www.euromr.org/ technical-requirements

EU RO MR Technical Requirements

Tiers 1 - 7

For controlled versions, please visit:

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

EU RO Mutual Recognition Technical Requirements

CIRCUIT BREAKERS (WITHOUT ELECTRONIC DEVICES)	Version	0.6
	Adoption Date	1 July 2018
	Application Date	1 January 2019
	Tier	1
This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements ***** Uncontrolled if downloaded or printed *****		

1. PRODUCT DESCRIPTION

1.a General description of the product

Description of product according to IEC IEV 441-14-20:

Circuit breaker: A mechanical switching device, capable of making, carrying and breaking currents under normal circuit conditions and also making, carrying for a specified time and breaking currents under specified abnormal circuit conditions such as those of short circuit.

1.b Application limitations†

a) Restricted to LV air circuit-breakers (ACBs) and moulded-case circuit-breaker (MCCBs) according to IEC 60947-2 were the rated voltage does not exceed 1000V a.c. (50/60 Hz) or 1500 V d.c. and without electronic devices;
b) Onboard ships with exceptions as per SOLAS Ch. I, Reg. 3;
c) Installation on board ships within locations with climatic, biological, chemically active, mechanically active and mechanical environmental conditions not exceeding those for which performance has been proved according to IEC 60721-3-6 (1987) + A2 (1997).

† 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.

1.c Intended use

a) Power supply system characteristics as per IEC 60092-101, 2.8;
b) For equipment tested according to their respective environmental categories I-IV (see 7. Background information/ References);
c) Circuit breaker shall have their energy for the tripping operation stored prior to the completion of the closing operation;
d) Circuit breakers are to be of the trip-free type and be fitted with anti-pumping control;
e) Circuit breakers are to be equipped with independent manual closing as per IEC 60947-2 Sub-clause 7.2.1.

1.d System context

See 1.c.

2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a i. Technical Requirements

a) Type, ratings and characteristics of circuit breakers for intended applications to be evaluated;
b) In general, IEC 60947 series applies.

2.a.ii. Technical documents to be submitted

Prior to tests:

a) Proposed test program and test schedule;
b) Description of the test specimens and explanation of the selected test sample(s) providing evidence that the selected sample meets the most rigorous and demanding requirements;

c) Product descriptions, manuals, data sheets, assembly drawings, dimension drawings etc. clearly identifying the product;
d) Complete accreditation certificate of the Test laboratory (prior the first test only; changes in the scope of accreditation must be informed);
e) Details of production sites;
f) Product specification;
g) Application, working area;
h) Instructions on fitting, assembly and operation;
i) QM-certificate according to ISO 9001.

After completion of tests:

j) The test report with an identification number must contain all relevant data and test results including place and date of the tests, the names of the responsible personnel carrying out the test;
k) Type references and serial numbers of the products tested;
l) Test reports and test records must be signed by the personnel members in charge of the test and are to be confirmed by the EU RO. by signing and marking the test report.

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) Environmental tests should be carried out in accordance with last revision of IACS UR E10 (applicable items) or in accordance with IEC 60947-2 and IEC 60947-1 Annex Q - Category D, with the severity conditions set by the IACS UR E10 as a minimum, notably for the resulting recovery times;

f) IEC 60947-2 Annex H, Test sequence for circuit-breakers for IT systems;

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

h) 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.euromr.org/technical-requirements).

3. PRODUCTION REQUIREMENTS

3.a. 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.b Special Requirements

a) Routine test according to IEC 60947-2 sub-clause 8.4;
b) Production certification according to ISO 9001 by accredited certification bodies;
c) QM/QS audit (annual) shall submitted to the EU RO. for review;
d) Production of the equipment is limited to those facility listed on the EU RO. certificate;
e) Changes to the product will void the EU RO MR TAC;

f) The EU RO shall be granted access to all manufacturing and testing facilities, and to be provided with all the information necessary to performance its duties;
g) General terms and conditions of the EU RO shall be observed.

4. MARKING REQUIREMENTS

Marking as required by IEC 60947-2 (sub-clause 5.2).

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 relevant EU RO MR Type Approval Certificate:

a) Technical data according to IEC marking;
b) Reference to approved technical documents;
c) Application and limitations.

6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
8 July 2012	0.0	Accepted by Advisory Board
19 Sept 2012	0.1	Errors corrected
31 January 2014	0.2	CRF001 incorporated improvements proposed by industry. Added reference to EU RO Framework Document for the Mutual Recognition of Type Approval).
31 January 2015	0.3	CRF017 – Amendments to 2.b Type testing requirements 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	0.4	CRF025 – Updated to new MR TR document format incl. par. 8;

		CRF026/026a – Witness testing & control of test specimen; CRF028 – addition of 6 month application clause.
1 October 2016	0.5	CRF034 – Test witnessing requirements aligned with TR Circuit Breakers (with electronic devices)
1 July 2018	0.6	Revision of par. 2.b – Type testing requirements (Alignment of Electrical TRs) Corrected reference to standard IEC 60721-3-6 (1987) + A2 (1997)

7. BACKGROUND INFORMATION / REFERENCES

a) IEC 60092-101; 2.8;
b) IEC 60721-3-6 (1987) + A2 (1997);
c) IEC 60947;
d) IEC IEV 441-14-20;
e) ISO 17025;
f) ISO 9001;
g) SOLAS Ch. 1, Reg. 3;
h) EU RO Framework Document for the Mutual Recognition of Type Approval);
i) Environmental Categories (**Table 1**).

Table 1 - Environmental Categories

Environmental Category	Environmental Conditions						Test Conditions					
	Closed Area			Open Deck Area			Temperature		Climate			
	Temperature	Relative Humidity	Vibrations	Temperature	Relative Humidity	Vibrations	Dry Heat	Cold	Temperature	Relative Humidity	Salt mist	Vibrations
I	0 °C to 45 °C	up to 100 %	0,7 g				55 °C	5 °C	55 °C	95 %	–	0,7 g
II	0 °C to 45 °C	up to 100 %	4 g				55 °C	5 °C	55 °C	95 %	–	4 g
III	0 °C to 55 °C	up to 100 %	0,7 g				70 °C	5 °C	55 °C	95 %	–	0,7 g
IV	0°C to 55 °C	up to 100 %	4 g				70 °C	5 °C	55 °C	95 %	–	4 g

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 -

EU RO Mutual Recognition Technical Requirements

CONTACTORS (WITHOUT ELECTRONIC DEVICES)	Version	0.6
	Adoption Date	1 July 2018
	Application Date	1 January 2019
	Tier	1
This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements ***** Uncontrolled if downloaded or printed *****		

1. PRODUCT DESCRIPTION

1.a General description of the product

The description of the product is used according to IEC IEV 441-14-33:

Contactor: a mechanical switching device having only one position of rest, operated otherwise than by hand, capable of making, carrying and breaking currents under normal circuit conditions including operating overload conditions.

1.b Application limitations†

a) Restricted to LV electromechanical contactors according IEC 60947-4-1 where the rated voltage does not exceed 1000V a.c. or 1500V d.c. and without electronic devices;
b) Onboard ships with exceptions as per SOLAS Ch. I, Reg. 3;
c) Installation on board ships within locations with climatic, biological, chemically active, mechanically active and mechanical environmental conditions not exceeding those for which performance has been proved according to IEC 60721-3-6 (1987) + A2 (1997).

† 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.

CONTACTORS (WITHOUT ELECTRONIC DEVICES)	Version	0.6
	Adoption Date	1 July 2018
	Application Date	1 January 2019
	Tier	1
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1.c Intended use

a) Power supply system characteristics as per IEC 60092-101, 2.8;
b) For equipment tested according to their respective environmental categories I-IV (see 7. Background information/ References).

1.d System context

See 1.c.

2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a i. Technical Requirements

a) Type, ratings and characteristics of contactors for intended applications to be evaluated;
b) In general, IEC 60947 series.

2.a.ii. Technical documents to be submitted

Prior to tests:

a) Proposed test program and test schedule;
b) Description of the test specimens and explanation of the selected test sample(s) providing evidence that the selected sample meets the most rigorous and demanding requirements.;
c) Product descriptions, manuals, data sheets, assembly drawings, dimension drawings, etc. clearly identifying the product;
d) Complete accreditation certificate of the Test laboratory (prior to the first test only; changes in the scope of accreditation must be informed);
e) Details of production sites;
f) Product specification;
g) Application, working area;
h) Instructions on fitting, assembly and operation;
i) QM-certificate according to ISO 9001.

After completion of tests:

j) The test report with an identification number must contain all relevant data and test results including place and date of the tests, the names of the responsible personnel carrying out the test;

k) Type references and serial numbers of the products tested;

l) Test reports and test records must be signed by the personnel members in charge of the test and are to be confirmed by the EU RO by signing and marking the test report;

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) Environmental tests should be carried out in accordance with last revision of IACS UR E10 (applicable items) or in accordance with IEC 60947-4-1 sub-clause 9.1.5.2 and IEC 60947-1 Annex Q - Category D, with the severity conditions set by the IACS UR E10 as a minimum, notably for the resulting recovery times;

f) All tests to be performed on agreed test samples. Test specimens shall be selected from 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 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.euromr.org/technical-requirements)

3. PRODUCTION REQUIREMENTS

3.a. 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.b Special Requirements

a) Routine test according to IEC 60947-4-1 sub-clause 9.1.3;
b) Production certification according to ISO 9001 by accredited certification bodies;
c) QM/QS audit (annual) shall be submitted to EU RO. for review;
d) Production of the equipment is limited to those facility listed on EU RO. certificate;
e) Changes to the product will void the EU RO MR TAC;
f) The EU RO shall be granted access to all manufacturing and testing facilities, and to be provided with all the information necessary to performance its duties;
g) General terms and conditions of EU RO shall be observed.

4. MARKING REQUIREMENTS

Marking as required by IEC 60947-4-1 (sub-clause 6.2).

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 relevant EU RO MR Type Approval Certificate:

a) Technical data according to IEC marking.
b) Reference to approved technical documents;
c) Application and limitations.

CONTACTORS (WITHOUT ELECTRONIC DEVICES)	Version	0.6
	Adoption Date	1 July 2018
	Application Date	1 January 2019
	Tier	1
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6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
8 July 2012	0.0	Accepted by Advisory Board
19 Sept 2012	0.1	Errors corrected
31 January 2014	0.2	CRF001 Incorporated improvements proposed by industry. Reference to RO Framework Document for the Mutual Recognition of Type Approval added.
31 January 2015	0.3	CRF017 – Amendments to 2.b Type testing requirements 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	0.4	CRF025 – Updated to new MR TR document format incl. par. 8; CRF026/026a – Witness testing & control of test specimen; CRF028 – Addition of 6 month application clause.
1 October 2016	0.5	CRF033 – Test witnessing requirements aligned with TR Contactors (with electronic devices)
1 July 2018	0.6	CRF032/CRF035 - Revision of par. 2.b – Type testing requirements (Alignment of Electrical TRs) Corrected reference to standard IEC 60721-3-6 (1987) + A2 (1997)

7. BACKGROUND INFORMATION / REFERENCES

a) IEC 60092-101; 2.8;
b) IEC 60721-3-6 (1987) + A2 (1997);
c) IEC 60947;
d) IEC IEV 441-14-33;
e) ISO 17025;
f) ISO 9001;
g) SOLAS Ch. 1, Reg. 3;
h) EU RO Framework Document for the Mutual Recognition of Type Approval);
i) Environmental Categories (see **Table 1**).

Table 1 - Environmental Categories

Environmental Category	Environmental Conditions						Test Conditions					
	Closed Area			Open Deck Area			Temperature		Climate			
	Temperature	Relative Humidity	Vibrations	Temperature	Relative Humidity	Vibrations	Dry Heat	Cold	Temperature	Relative Humidity	Salt mist	Vibrations
I	0°C to 45°C	up to 100%	0,7g				55°C	5°C	55°C	95%	–	0,7g
II	0°C to 45°C	up to 100%	4g				55°C	5°C	55°C	95%	–	4g
III	0°C to 55°C	up to 100%	0,7g				70°C	5°C	55°C	95%	–	0,7g
IV	0°C to 55°C	up to 100%	4g				70°C	5°C	55°C	95%	–	4g

8. MAINTENANCE & CLARIFICATION OF TECHNICAL REQUIREMENTS

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- END -

EU RO Mutual Recognition Technical Requirements

DISPLAY MONITORS, VIDEO SCREENS, TERMINALS	Version	0.3
	Adoption Date	1 April 2016
	Application Date	1 October 2016
	Tier	1
This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements ***** Uncontrolled if downloaded or printed *****		

1. PRODUCT DESCRIPTION

1.a General description of the product

Display monitors and video screens for monitoring the conditions of systems, machinery and equipment (this excludes touch screens or terminals with keys and buttons).

1.b Application limitations

Onboard ships with exceptions as per SOLAS Ch. I, Reg. 3. (naval, offshore and industrial applications).

1.c Intended use

Alarm and monitoring systems subject to classification.

1.d System context

N/a

2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a i. Technical Requirements

Ambient Conditions

a) The ambient condition given in **Table 2.1** shall be applied to the design, selection and arrangement of electrical installations in order to ensure their proper operation;
b) Electrical equipment shall be suitable for operations up to 55℃;
c) Electrical equipment shall be designed sufficiently enough to withstand any vibrations that occur under normal conditions.

Voltage and Frequency

a) Electrical equipment supplied from main and emergency switchboards shall be designed and manufactured so that it is capable of operating satisfactorily under the normally occurring voltage and frequency fluctuations. Such electrical equipment shall operate satisfactorily under those fluctuations in voltage and frequency that are given in **Table 2.2**. Any special systems, e.g. electronic circuits, whose functions cannot operate satisfactorily, within the limits given in this table, shall be supplied by some suitable means, i.e. through some stabilized supply.

Construction, Materials, Installations, etc.

b) All electrical equipment shall be constructed and installed so as not to cause injury when handled and touched in a normal manner;
c) Insulating materials and insulated windings shall be resistant to moisture, sea air and oil vapours;
d) Bolts, nuts, pins, screws, terminals, studs, springs and other such small parts shall be made of corrosion resistant material or shall be suitably protected against corrosion.

2.a.ii. Technical documents to be submitted

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

a) Specifications (description of the product name, type, principal particulars, use, construction, performance, etc.);

b) Product name, principal particulars, general dimensions and sectional assembly plan, material, quantity, applicable rules and standards, etc.);
c) Wiring diagram (electrical systems) including PCB layouts and parts list
d) Instruction manual (including operating procedure);
e) Inspection and test specification for quality control (including test data);
f) Environmental test procedures including appropriate measure of technical performance;
g) Certificate and test result certificate issued by bodies recognized by the EU RO (if any);
h) Quality control for software:
   - Quality standards;
   - A quality plan for software lifecycle;
   - Quality assurance procedures in production.
i) Documentation of software modification;
j) Work procedures for modifying program contents and data including upgrades.

2.b Type testing requirements

a) After the drawings and documents submitted in accordance with 2.a.ii have been examined, tests shall be carried out in accordance with the latest IACS UR E10 with modifications given in **Table 2.3** in the presence of the EU RO's surveyor, and they shall be proven to satisfy the criteria of the latest IACS UR E10 and **Table 2.3**.;
   In cases where the tests are conducted at Nationally Accredited Laboratories, the presence of the EU RO surveyor may be omitted†.
b) Test specimens shall be taken from the production line or from stocks†.
c) In case the documents in 2.a.ii (g) are deemed appropriate, a part of tests may be exempted;
d) Tests shall be carried out under normal temperatures (25°C - 1°C), normal humidity (60% - 30%), normal atmospheric pressures (96 kPa - 10 kPa), rated electrical source voltage and rated electrical source frequency unless otherwise specified. The number of test sample is, as a rule, to be one for each type. However, additional test sample may be required when deemed necessary by the EU RO.

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

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).

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.

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) Software name and version.

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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 the EU RO Framework Document for the Mutual Recognition of Type Approval.
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 Aril 2016	0.3	CRF025 – Updated to new MR TR document format incl. par. 8; CRF026/026a – Witness testing & control of test specimen; CRF028 – addition of 6 month application clause.

7. BACKGROUND INFORMATION / REFERENCES

a) IACS UR E10 "Test specification for type approval";
b) IEC 60092-504 "Electrical installations in ships – Special features, Control and instrumentation";
c) IEC 60945 "Maritime Navigation and Radio communication Equipment and Systems – General Requirements";
d) IEC 60533 "Electrical and electronic installations in ships – Electromagnetic compatibility";
e) 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.

Table 2.1 – Angles of Inclination

Static inclination	Dynamic inclination
22.5° (1)	22.5° (1)

Note:
In ships carrying liquefied gases in bulk and ships carrying dangerous chemicals in bulk, emergency power supplies are to remain operable with the ship flooded to a final athwart ships inclination up to a maximum of 30°. In this case the test level has to be named on the certificate.

Table 2.2 - Voltage and Frequency Fluctuation

(a) Voltage and frequency fluctuations for a.c. distribution systems (Note 1)

Type of fluctuation	**Fluctuation (Note 4)**	
	Permanent	**Transient**
Voltage	+10% , -10%	± 20% (within 1.5 sec)
Frequency	± 5%	± 10% (within 5 sec)

(b) Voltage fluctuations for d.c. distribution systems (Note 2)

Type of fluctuation	**Fluctuation (Note 4)**
Voltage fluctuation (Permanent)	± 10%
Voltage cyclic fluctuation deviation	5%
Voltage ripple	10%

(c) Voltage fluctuations for battery systems

Systems	**Fluctuation (Note 4)**
Components connected to the battery during charging (Note 3)	+30%, -25%
Components not connected to the battery during charging	+20%, -25%

Note 1: *A.C.* distribution systems mean *a.c.* generator circuits and *a.c.* power circuits produced by inverters.
Note 2: *D.C.* distribution systems mean *d.c.* generator circuits and *d.c.* power circuits produced by converters.

Note 3: Different voltage fluctuations as determined by charging and discharging characteristics, including voltage ripples from the charging devices, may be considered.

Note 4: The numerical values given in the table, excluding those values for time, mean percentages of rated values.

Table 2.3 – Modified testing condition and method of IACS UR E10

<table>
<tr><th>NO.</th><th>TEST</th><th>PROCEDURE ACC. TO:*</th><th>TEST PARAMETERS</th><th>OTHER INFORMATION</th></tr>
<tr><td>1.</td><td>Power supply variations
a) electric</td><td>-</td><td>
AC SUPPLY
<table>
<tr><th>Combination</th><th>Voltage variation permanent</th><th>Frequency variation permanent</th></tr>
<tr><td>1</td><td>+10</td><td>+5</td></tr>
<tr><td>2</td><td>+10</td><td>-5</td></tr>
<tr><td>3</td><td>-10</td><td>-5</td></tr>
<tr><td>4</td><td>-10</td><td>+5</td></tr>
<tr><td></td><td>voltage transient 1,5 s %</td><td>frequency transient 5s %</td></tr>
<tr><td>5</td><td>+20</td><td>+10</td></tr>
<tr><td>6</td><td>-20</td><td>-10</td></tr>
</table>
DC SUPPLY
<table>
<tr><td>Voltage tolerance Continuous</td><td>± 10%</td></tr>
<tr><td>Voltage cyclic Variation</td><td>5%</td></tr>
<tr><td>Voltage ripple</td><td>10%</td></tr>
</table>
Electric battery supply:
+30% to –25% for equipment connected to charging battery or as determined by the charging/discharging characteristics, including ripple voltage from the charging device;
</td><td></td></tr>
</table>

			• +20% to –25% for equipment not connected to the battery during charging.	
2.	Vibration	IEC Publication 60068-2-6 Test Fc	• 2(+3,-0)Hz to 13.2 Hz – amplitude ±1mm • 13.2 Hz to 100 Hz – acceleration ± 0.7 g. • For severe vibration conditions such as, e.g. on diesel engines, air compressors, etc. • 2.0 Hz to 25 Hz – amplitude ±1.6 mm • 25.0 Hz to 100 Hz – acceleration ± 4.0 g.	• duration in case of no resonance condition 90 minutes at 30 Hz; • duration at each resonance frequency at which Q≥ 2 is recorded - 90 minutes; • during the vibration test, functional tests are to be carried out; • tests to be carried out in three mutually perpendicular planes; • Q should not exceed 5. • where sweep test is to be carried out instead of the discrete frequency test and a number of resonant frequencies is detected close to each other duration of the test is to be 120 min. Sweep over a

				restricted frequency range between 0.8 and 1.2 times the critical frequencies can be used where appropriate. Note: Critical frequency is a frequency at which the equipment being tested may exhibit: • malfunction and/or performance deterioration • mechanical resonances and/or other response effects occur, e.g. chatter • mechanical resonances with amplification greater than 10 will not be accepted
3.	Compass safe distance measurement	IEC 60945		• the test is applied to equipment intended for installation on the navigation bridge
4.	Acoustic noise and signals measurement	IEC 60945		• the test is applied to equipment intended for installation on the navigation bridge
5.	Shock	IEC 60068-2-27	Acceleration (g): ±5.0 Shock duration (ms): 10 - 15 Number of shocks in each position: 20 Shock succession frequency (mm): 40 - 80	• The tests shall be earned out in operating condition under effect of shock load in each of the three mutually perpendicular directions in relation to the item, in turn. • The form of the shock pulse is recommended to be close to sine one. • The method of fastening the items for testing shall be

				indicated in the technical documentation with due account of the possible positions of the items in service. If the technical documentation on the items specifies different methods of fastening in service, the item shall be tested using the most dangerous method of fastening stated in the technical documentation. • The equipment shall be considered to have passed the tests if during and after the tests it meets the requirements set forth in the technical documentation for the test type concerned.

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EU RO Mutual Recognition Technical Requirements

ELECTRIC DRIVEN MOTORS < 20 kW	Version	0.3
	Adoption Date	1 April 2016
	Application Date	1 October 2016
	Tier	1
This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements ***** Uncontrolled if downloaded or printed *****		

1. PRODUCT DESCRIPTION

1.a General description of the product

These Technical Requirements apply to electric driven motors < 20 kW.

1.b Application limitations

This Technical Requirement is not applicable for propulsion motors and does not cover certification with respect to explosion protection.

1.c Intended use

Nil

1.d System context

Nil

ELECTRIC DRIVEN MOTORS < 20 kW	Version	0.3
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	Tier	1
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2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a i. Technical Requirements

Rating: Temperature rise of machines to be verified in relation to insulation class.

2.a.ii. Technical documents to be submitted

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

a) Main drawings for assembled machines revealing details of air gap, shaft and bearings with dimensions and tolerances inserted;
b) References to design standards, rules, specifications, etc.;
c) Test results (from tests already carried out, if any). One copy only;
d) Applicant's proposal to Product Sample Test and Routine Test;
e) Documentation of reliability and endurance on board ships and Mobile Offshore Units, if any;
f) Special operational limitations;
g) Field of Application;
h) List of Type designations for each variant;
i) Construction details:
   I. Voltage;
   II. Power;
   III. Speed;
   IV. Temperature class;
   V. Insulation class;
   VI. Enclosure (IP) class;
   VII. Explosion protection + certificate from recognised test laboratory;
   VIII. Special properties, if any.
j) Test programme, which as a minimum includes the elements for Type testing and routine testing. The test programme shall refer to the relevant IEC standards for each test.

2.b Type testing requirements

a) Visual inspection according to IACS URE13 (1);
b) Examination of technical documentation according to IACS URE13 (1);
c) Temperature-rise test at full load according to IACS URE13 (5) and IEC 60034-1/8;
d) Overspeed test: 20% in excess of the rated RPM for 2 min. (not applicable for squirrel cage motors) according to IACS URE13 (8) and IEC 60034-1/9.7;
e) High voltage test 1 min. according to IACS URE13 (9) and IEC 60034-1/9.2;
f) Insulation resistance to be measured according to IACS URE13 (2);
g) Winding's resistance to be measured according to IACS URE13 (3);
h) Checking vibration /balance including operation of the bearing or lubrication system according to IACS URE13 (10);
i) Verification of degree of enclosure protection (IP) according to IACS URE13 (11);
j) For DC motors: Measuring of speed vs. load within speed range;
k) For DC motors: Overload test: 50% in excess of the rated current for not less than 2 min and 60% in excess of the rated current for not less than 15sec operating at highest full-field speed in accordance with URE13 (6) and IEC 600034-1/9.3.3. Overload test to be performed both for type test and routine test;
l) For AC motors: No load current at rated voltage and frequency in accordance with IACS URE13 (10);
m) For AC motors: Overtorque test = 60% overtorque 15 sec. in accordance with IACS URE13 (6) and IEC 60034-1/9.4;
n) For HV machines: Dry lightning impulse test or equivalent of the coil interturn insulation in accordance with IEC 60034-15;
o) Tests to be carried out:
   I. cold endurance (IEC 60068-2-1);
   II. vibration (IEC 60068-2-6);
   III. dry and damp heat (IEC 60068-2-2 и 60068-2-30).
p) Type 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 EO RO's surveyor may be omitted †.
q) Test specimens shall be taken from the production line or at random from stocks †.

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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).

3. PRODUCTION REQUIREMENTS

a) Routine tests in accordance with IEC 60034-1;
b) Refer to EU RO "Product Quality Assurance (PQA)" procedure (Appendix VI of EU RO Framework Document for the Mutual Recognition of Type Approval).

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 trade mark;
b) Type designation under which the product is type approved;
c) Rated Voltage;
d) RPM;
e) Rated power;
f) Ambient temperature;
g) Power factor;
h) Rated current;
i) Rated frequency;
j) Insulation class;
k) IP class;
l) No. of phases (AC machines), serial No., duty type.

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 relevant EU RO MR Type Approval Certificate:

a) Type Approval Documentation;
b) Tests carried out;
c) Marking of product;
d) Certification retention survey.

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 the EU RO Framework Document for the Mutual Recognition of Type Approval.
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; CRF026/026a – Witness testing & control of test specimen; CRF028 – addition of 6 month application clause.

7. BACKGROUND AND REFERENCE DOCUMENTS

a) IACS UR E 13 Test requirements for rotating machines;
b) IEC Publication 60092-301 (1995-03): Part 301 Equipment-generators and motors;
c) IEC Publication 60034-1 (2004-04), Rotating electrical machines. Part 1: Rating and performance;
d) Other relevant parts of IEC Publication 60034-series;
e) IEC (2002), "IEC 60721 – Classification of environmental conditions";
f) IEC (2007), "IEC 60068 – Environmental Testing";

g) EU RO Framework Document for the Mutual Recognition of Type Approval.

8. MAINTENANCE & CLARIFICATION OF TECHNICAL REQUIREMENTS

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EU RO Mutual Recognition Technical Requirements

FUSES	Version	0.3
	Adoption Date	1 April 2016
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	Tier	1
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1. PRODUCT DESCRIPTION

1.a General description of the product

a) Fuses are over current protective devices that contain a calibrated current carrying element which melts and opens under specified over current conditions;
b) Fuses are individual devices and can have different shapes. Connection to a circuit is normally carried out through the use of single or multi fuse bases or fuse holders, as required;
c) Fuses are to be classified according to applicable parts of IEC standards 60269-1, IEC 60269-2, IEC 60068-2 and IEC 60721-3, as applicable.

1.b Application limitations

a) Fuses shall be used in low voltage (<1000V for AC systems and <1500V for DC systems) electrical installations of ships classed for unrestricted navigation and, designed, constructed and tested to operate satisfactorily under the worst environmental conditions, found on board, for each application case;
b) This technical requirement shall not apply to fuses used for the protection of internal circuitry, normally located inside of cabinets or enclosures such as semiconductor power converters, specific motor controllers, battery chargers and similar equipment;
c) This technical requirement shall not apply to -fuse bases and fuse-holders.

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1.c Intended use

Fuses used on protection of overload and short circuits in LV electrical installations, on power and lighting distribution systems, motor and transformer circuits or, as a backup, to increase the short circuit breaking capacity of electrical devices. Fuses may be used for overload protection only up to a rating of 315A.

1.d System context

See 1.c above.

2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a i. Technical Requirements

a) The terms and definitions, related to fuses, according to IEC 60269-1 shall apply;
b) Fuse elements shall be of a totally enclosed type and allow no arc ejection to the outside, sparking, or any other harmful effect upon the adjacent parts in the case the fuse blows;
c) Fuse elements shall be made of incombustible and non-hygroscopic insulating material;
d) Type testing conditions, namely those concerned with ambient air temperature, humidity, salt mist and vibration level, shall comply with the requirements of IEC 60269-2, IEC 60068-2 and IEC 60721-3 as applicable. These environmental operating conditions aim at reflecting the higher ambient air temperature, higher humidity and the presence of salt mist, all degrading factors with influence in the behaviour of a fuse link;
e) The system voltage, the currents to be carried and to be broken, the rated frequency and the power factor for AC systems, or the time constant for DC systems shall comply with IEC-60269-1as applicable.

2.a.ii. Technical documents to be submitted

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

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The manufacturer shall submit detailed information concerning:

a) Technical data and characteristics;
b) Construction drawings concerning all parts of each of the fuse link types;
c) Dimensions and tolerances;
d) Instructions on fitting, assembly and operation;
e) Materials specification;
f) Type of applied anticorrosive treatments;
g) Contact plating materials;
h) Application, working area.

Prior to tests the manufacturer is to submit:

i) Proposed test program and test schedule;
j) Description of the test specimens and explanation of the selected test sample(s);
k) Complete accreditation certificate of the Test laboratory (prior the first test only; changes in the scope of accreditation must be informed);

After completion of tests the manufacturer is to submit:

l) The test report with an identification number containing all relevant data and test results including place and date of the tests;
m) Type references and serial numbers of the products tested;
n) Test reports and test records must be signed by the personnel members in charge of the test and are to be confirmed by the EU RO by signing and marking the test report;
o) The test laboratory shall be accredited according to ISO 17025 for relevant IEC standards, issued by one of the certification bodies under the LOVAG or IECEE Mutual Recognition Agreement.
p) Complete report of the tests carried out according to applicable procedures as per IEC 60269-1, Chapter 8, taking into account the particular shipboard conditions;
q) The manufacturer shall also submit tables with conventional time for non-fusing (Inf) and fusing current (If) as well as time-current characteristics and gates, with due corrections for shipboard conditions.

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2.b Type testing requirements

a) Fuse links shall be subject to a complete testing program carried out under the responsibility of the fuse manufacturer, in the presence of the EU RO's surveyor.

b) In cases where the tests are conducted at laboratories accredited by an Accreditation Body under the MLA regime of ILAC or by laboratories recognised either by LOVAG or IECEE, the presence of the EU RO's surveyor may be omitted†.

c) The test laboratory shall be authorized to conduct type tests according to the relevant IEC standards;

d) Test specimens shall be taken from the production line or from stocks†.

e) The complete tests as well as type tests shall be carried out, considering the recommended number of samples and following the applicable test program for the **"g"** or **"a"** fuse link types according to IEC 60269-1, Chapter 8, Table 7A, 7B or 7C;

f) The following environmental tests according to IACS UR E10 are to be carried out:

I. #5 (dry heat);
II. #6 (damp heat);
III. #7 (vibration) (20mm/s velocity amplitude in frequency range 5-50Hz is accepted);
IV. #11 (cold);
V. #12 (salt mist).

Verification shall be according to IEC 60269-1 chapter 8.

† 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)

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3. PRODUCTION REQUIREMENTS

a) EU RO Production Quality Assurance is to be applied. The manufacturer and its individual works are to be recognised by the EU RO for the type of product(s) fabricated. Plants, production and treatment procedures, testing equipment, laboratories, internal control systems and personnel qualification are to be suitable in the opinion of the EU RO. Production of the equipment is limited to those facilities listed in the certificate;

b) Manufacturing procedures and techniques are to be such as to reasonably ensure constant compliance of the product with the requirements. If tests and/or analyses are performed by external laboratories or third parties, these have to be recognized by the EU RO. Manufacturing process may be required to be approved and approval tests may have to be performed for the purpose. The EU RO shall be granted access to all manufacturing and testing facilities, and is to be provided with all the information necessary to perform its duties. Changes to the product will void the certification. General terms and conditions of the EU RO are to be observed;

c) Refer to EU RO “Product Quality Assurance (PQA)" procedure (Appendix VI of EU RO Framework Document for the Mutual Recognition of Type Approval).

4. MARKING REQUIREMENTS

a) The marking shall be durable and easily legible. Compliance is to be checked by inspection and by testing according to IEC 60269-1 chapter 6;

b) Markings on fuse links are to be in accordance with the IEC 60269-1 standard;

c) Additionally a code or mark, to be designated shall be marked on all type approved fuse links identifying the type approval and the EU RO.

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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 relevant EU RO MR Type Approval Certificate:

- Manufacturer's documentation* identification number for the product or series with date;

* Manufacturer's documentation is to include particular information for the product or series:

- Manufacturer type designation;
- Application category (breaking range and utilization category by code letters;,
- Rated current (or range of current ratings in case of a series of fuses);
- Voltage rating;
- Type of current (ac; dc; both);
- Rated frequency (if applicable);
- Rated breaking capacity;
- Rated power dissipation;
- Time current characteristics curves;
- Cut-off current characteristics;
- Others.

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8 July 2012	0.0	Accepted by Advisory Board
31 January 2014	0.1	Added reference to the EU RO Framework Document for the Mutual Recognition of Type Approval.
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; CRF026/026a – Witness testing & control of test specimen; CRF028 – addition of 6 month application clause.

7. BACKGROUND INFORMATION / REFERENCES

a) IEC (2006), "IEC 60269(2006) "Low-voltage fuses";
b) IEC (2002), "IEC 60721(2002) "Classification of environmental conditions";
c) IEC (2007), "IEC 60068(2007) "Environmental Testing";
d) IACS UR E10 (2011), "Unified Requirements concerning Electrical Installations "Test Specification for Type Approval - E10";
e) 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

- END -

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	Adoption Date	1 April 2016
	Application Date	1 October 2016
	Tier	1
This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements ***** Uncontrolled if downloaded or printed *****		

1. PRODUCT DESCRIPTION

1. a General description of the product

a) **Empty enclosure** - enclosures intended for support and installation of electrical equipment, whose internal space provides suitable protection against external influences, as well as a specified degree of protection against approach to or contact with live parts and against contact with moving parts;
b) **Empty box** - enclosures, generally of small dimensions and, in principle, intended to be mounted on a vertical plane.

1.b Application limitations

Enclosures and boxes used as part of switchgear and control gear assemblies of voltage up to 1000V a.c. at frequencies not exceeding 1000Hz or of voltage up to 1500V d.c.; intended for use onboard of ships; outdoor or indoor application. Enclosures and boxes intended for the below listed applications are excluded:

a) installation in areas where explosive gases or vapour atmospheres may occur;
b) appliances for which EMC requirements are to be met.

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1.c Intended use

Construction of electrical switchboards intended for distribution of electrical power and control or connection purposes.

1.d System context

See 1.b.

2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a i. Technical Requirements

a) Enclosures and boxes shall be capable of withstanding ambient temperatures of +45±2 °C for prolonged periods without suffering any defects. Frame construction, front plates, mounting plates and casings of enclosures and boxes shall be made of metallic or other incombustible materials. Such materials shall be at least moisture-resistant and oil vapour-resistant. Application of other materials should be given consideration by the EU RO;

b) Constructional components of enclosures and boxes shall be made of materials resistant to sea air (unless they are additionally protected onboard). Enclosures and boxes shall be of adequate rigidity and mechanical strength (resistant to mechanical stresses which may occur under service conditions or as a result of short-circuits). Screws, nuts, hinges, wall-fixing lugs and similar items of enclosures and boxes intended for installation on open decks or in spaces of humidity higher than normal shall be made of corrosion-resistant materials;

c) Where the framework or doors of enclosures or boxes are of steel, suitable measures shall be provided to prevent overheating due to the possible circulation of eddy currents;

d) Where screw fastenings are applied on/in enclosures and boxes, the means to exclude possibility of their self-unscrew shall be provided. Gaskets used in enclosures and boxes components (doors, covers, sight holes, cable glands, etc.) shall ensure required degree of protection under service conditions. Such gaskets shall be suitably fastened to those components;

e) Cable entrances shall not impair the degree of protection of the enclosures and boxes. Enclosures and boxes intended for installation in places accessible to

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unauthorized persons shall be provided with doors, which can only opened with a special key; the same shall apply for all the switchboards on the ship. Hinged doors are to be provided with fixing devices for keeping them in the open position. Casing and hinged or sliding doors shall have appropriate metal screwed connections intended for connection of protective conductor (to ensure continuity of the protective circuit). Such metal screwed connections shall be suitably assembled (welded) to casing and doors - proper electrical connection is to be retained;

f) Enclosures intended for construction of main switchboards, emergency switchboards, selected distribution boards, control desks shall be provided with insulated handrails or handles fitted in an appropriate position at the front of the switchboard. Where access to the rear is necessary for operational or maintenance purposes, insulated handrails or insulated handles shall be fitted. Such handrails or handles should be made of insulating material, wood (of adequate rigidity and mechanical strength) or earthed metal covered with a suitable insulating material.

2.a.ii. Technical documents to be submitted

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

a) Enclosure classification according to International Standard IEC 62208 First Edition 2002-11;
b) Relevant constructional and mechanical drawings and details;
c) Instructions necessary for correct handling, assembling, mounting and service conditions of the enclosure/box;
d) Information concerning the thermal power dissipation relative to the effective cooling surface.

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2.b Type testing requirements

a) The enclosures under test shall be mounted and installed as in normal use according to the manufacturer's instructions. Unless otherwise specified, the tests shall be carried out at an ambient temperature of (20±5) °C.

b) Test specimens shall be taken from the production line or from stocks†. Number of samples to be tested and order of test per sample (see **Table 1**) †.

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's 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).

Table 1

Test procedures	Test	Sample 1	Sample 2	Sample 3	Representative sample
International Standard IEC 62208 First Edition 2002-11	Static loads	1			
	Lifting	2			
	Verification of axial loads of metal inserts	3			
	Verification of degree of protection against external mechanical impacts (IK code)	4			
	Verification of degree of protection (IP code)	5			
	Verification of thermal stability		1		
	Verification of resistance to heat		2		
	Verification of resistance to abnormal heat and fire		3		
	Verification of dielectric strength	6			
	Verification of the continuity of the protective circuit	7		3	
	Verification of resistance to weathering				a)
	Verification of resistance to corrosion			1 c)	

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	Marking	8			
IACS UR E10	Verification of resistance to vibration - hinges, door lock, screws, etc. (Vibration test)	9 b)			
IACS UR E10	Verification of resistance to cold (Cold test)	10 c)			
Selected tests of group K according to IEC 60068-1 and substances according to IEC 60721-3-6	Test of resistance against liquids and chemicals			2 c)	

NOTES:

a) Tests shall be carried out on representative sample only;

b) Applicable for enclosures of dimensions of at least 3 00x3 00x15 0mm (H x W x D). Enclosures of other dimensions shall be visually examined;

c) Visual/functional examination of hinges, door lock, screws, coating, enclosure material, sealing etc. shall be carried out after test.

3. PRODUCTION REQUIREMENTS

3.a 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.b Special requirements

a) The enclosure or box shall be constructed only of material capable of withstanding the mechanical, electrical and thermal stresses as well as effects of humidity which are likely to be encountered in normal use.;

b) Protection against corrosion shall be ensured by the use of suitable materials or by the application of protective coating to the exposed surface, taking into account the intended conditions of use.

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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) Either the name, trade mark or identification mark of the enclosure manufacturer;
b) Type designation or identification number of the enclosure.

The enclosure or box shall be identifiable, making it possible for the final assembler to obtain relevant information from the enclosure manufacturer. The marking shall be durable and easily legible and may be inside the enclosure.

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 relevant EU RO MR Type Approval Certificate:

a) Type designations and dimensions of enclosures/boxes;
b) Technical data;
c) Additional conditions and remarks, limitations;
d) Environmental Category;
e) Range of application.

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6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
8 July 2012	0.0	Accepted by Advisory Board
31 January 2014	0.1	Reference to EU RO Framework Document for the Mutual Recognition of Type Approval added.
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; CRF026/026a – Witness testing & control of test specimen; CRF028 – addition of 6 month application clause.

7. BACKGROUND INFORMATION / REFERENCES

a) Rules of the certifying EU RO;
b) International Standard IEC 62208 First edition 2002-11;
c) International Standard IEC 60068-1 Edition 6.0;
d) International Standard IEC 60721-3-6. Edition 1.0;
e) EU RO Framework Document for the Mutual Recognition of Type Approval.

8. MAINTENANCE & CLARIFICATION OF TECHNICAL REQUIREMENTS

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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 -

EU RO Mutual Recognition Technical Requirements

LV TRANSFORMERS	Version	0.3
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1. PRODUCT DESCRIPTION

1.a General description of the product

a) This technical requirement applies to three-phase power transformers rated at greater than 5 kVA and single phase power transformers rated at greater than 1 kVA (including auto-transformers), up to a power limit of 50k VA **(50k VA when single phase)**;

b) This technical requirement does not apply to special transformers as per IEC 60076 -1;

c) This technical requirement does not apply to the special transformers intended for Ice Breakers and ships with an ice class, on high-speed crafts, on ships with nuclear power plant and on other special objects with more severe environmental conditions or where raised reliability of the equipment is required.

1.b Application limitations

Transformers shall be used in low voltage (<1000V AC systems) electrical installations of ships and off shore units classed for unrestricted navigation if, designed, constructed and tested to operate satisfactorily under the worst environmental conditions, found on board, for each application case.

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1.c Intended use

Nil

1.d System context

Nil

2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a i. Technical Requirements

a) All transformers, except those used for motor starting, shall be double wound, with no electrical connections between primary and secondary windings;
b) Transformers shall be of the dry and air cooled type;
c) Acceptance of liquid immersed type transformers is subject to special consideration by the EU RO on a case-by-case basis. Liquid-immersed transformers should be in compliance with the requirements as below：
   I. Liquid fillings for transformers shall be non-toxic and of a type which does not readily support combustion. Such transformers shall have a pressure release device with an alarm and there shall be a suitable means provided to contain any liquid which may leak from the transformer due to the operation of the release device or damage to the tank;
   II. Where forced liquid cooling is used, there shall be temperature monitoring of the cooling medium and transformer windings with an alarm being given when the temperature exceeds a preset limit, and provision shall be made for reducing the load to a level commensurate with the cooling available;
   III. The construction shall be such that the liquid is not spilled in inclined position; a liquid gauge indicating the normal liquid level range shall be fitted;
   IV. The voltage drop of transformers supplying secondary distribution systems from no load to rated load at resistive load shall not exceed the following:

- 2.5% for single phase transformers rated more than 5 kVA or 3-phase transformers rated more than 15 kVA;
- 5% for single phase transformers rated up to 5 kVA or 3-phase transformers rated up to 15 kVA;

V. The temperature rise of transformers at windings is not to exceed the values given in **Table 1** during continuous operation at rated output, where the ambient air temperature is based on 45℃.

Table 1

Limit of Temperature Rise			
Type of transformers	Limit of temperature rise(K) windings		Method of measurement
Dry-type air-cooling transformers	Class A insulation	50	Resistance method
	Class E insulation	65	
	Class B insulation	75	
	Class F insulation	95	
	Class H insulation	120	
Liquid-immersed transformers	Identified as ON.. or OF.. in IEC60092-303	65	Thermometer or thermocouple
	Identified as OD.. in IEC60092-303	70	
• All transformers are to be capable of withstanding, without damage, the thermal and mechanical effects of a short-circuit at the terminals of any winding for 2 s. • Transformers are to be subjected to high voltage test according to the table showing below, applying a test voltage between primary and secondary windings and between windings and			

the earthed enclosure for 1 min without breakdown and flashover.			

Voltage of High Voltage Test	
Highest voltage （root-mean-square) kV	Rated short duration power frequency withstand voltage （root-mean-square） kV
⩽1.1	3
3.6	10
7.2	20
12.0	28
17.5	38
24.0	50
36.0	70

VI. Transformers are to withstand an induced high voltage test with a voltage twice the rated voltage. The duration of the test is to be 1 min with a frequency less than or equal to twice the rated frequency. If the frequency is greater than twice the rated frequency, the duration of the test is to be obtained from the following formula with a minimum of 15 s:

t = (60 × 2 × rated frequency) / test frequency (s)

VII. For transformers subject to temperature rise test, the induced high voltage test is to be carried out immediately after the temperature rise test;

VIII. Suitable terminals, clearly marked, shall be provided in an accessible position, convenient for external connections. The terminals shall be effectively secured and shall be so spaced and/or shielded that they cannot be accidentally earthed, short-circuited or touched;

IX. Transformers should be fitted with an earth terminal for the connection of a protective conductor. All exposed metallic conductive non-live parts should be connected to the earth terminal by construction or otherwise. Marine transformers with metal enclosures should be in compliance with the above-mentioned standards an in addition, the following requirements:

- Metal enclosures shall be of sufficient mechanical strength for mechanical protection, normal operation and safe handling of transformers;
- Metal enclosures shall have sufficient space to maintain enough air clearance and creepage distance between conducting parts and between conducting parts and non-conducting parts of transformers inside metal enclosures. When a transformer mounted in the metal enclosure is in normal operation, the temperature rise shall comply with **Table 1**;
- Degree of protection provided by metal enclosures should be appropriate to the ambient conditions of the location where transformers are installed;
- The temperature rise of transformer mounted in metal enclosure in normal operation shall comply with the aforementioned limits.

2.a.ii. Technical documents to be submitted

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

a) General drawings / plans;
b) Detailed drawings of main parts including frames, primary windings, secondary windings, magnetic cores (with type / model of the main material such as electromagnetic wire, silicon steel sheet, insulation material, etc.);
c) Detailed construction drawings of metallic enclosure if any）;
d) Nameplate drawings;
e) External connection terminal drawings;
f) Product specifications;
g) Type test plan;
h) Installation manual;
i) Process flow diagram with quality reference point marking.

2.b Type testing requirements

a) Test specimens shall be taken from the production line or from stocks†;
Tests shall be carried out in Laboratories recognized by the EU RO or 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†;

b) Unless otherwise specified, all tests are to be carried out under the following atmospheric conditions:
   i. Ambient temperature between 10℃ and 40℃ and with cooling water (if required) at any temperature not exceeding 25℃;
   ii. Relative humidity：30％RH～90％RH;
   iii. Air pressure：86～106 kPa.
   iv. As a minimum, type test of marine transformers shall be in accordance with **Table 2**:

Table 2

Test items	Requirements	Test method
Dielectric strength test	Clause 2.a.i of this part	IACS UR E10
Measurement of insulation resistance	IACS UR E10	IACS UR E10
Voltage regulation test	Clause 2.a.i of this part	Clause 2.1.1 3 of this part
Temperature-rise measurement	Clause 2.a.i of this part	IEC60076-2
Secondary terminal short-current test	Clause 2.a.i of this part	IEC60076-5
Degree of protection (for transformers with enclosure)	IP××	IEC60529
Damp heat test	IACS UR E10	IEC60068-2-30
Salt mist test	IACS UR E10	IEC60068-2-52
Measurement of winding resistance	Clause 15 of IEC60076-11	
Measurement of voltage ratio and vector	Clause 16 of IEC60076-11	
Measurement of impedance voltage , short-circuit imp. and load loss	Clause 17 of IEC60076-11	
Measurement of no-load loss and current	Clause 18 of IEC60076-11	
Dielectric tests	Clause 19 and 20 of IEC60076-11	
Measurement of zero-sequence impedance of 3 phase transformers	Clause 8.7 of IEC60076-11	

Measurement of harmonics of the no-load current functional test of supplement elements, if any (PT 100, cooling fans, protection devices etc.)	Clause 8.6 of IEC60076-11	

† 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

a) A basic production site, suitable product equipment and measurement equipment, and practical process documentation shall be provided by the manufacturer to ensure that the transformers comply with the drawings and technical documents approved by the EU RO;
b) A Quality Management System meeting the requirements of the EU RO "Product Quality Assurance (PQA)" procedure (Appendix VI of EU RO Framework Document for the Mutual Recognition of Type Approval);
c) The source of main material such as silicon steel sheet, electromagnetic core, insulation material, etc. shall be controlled effectively by the manufacturer to ensure the type / model is in compliance with the drawings and documents approved by the EU RO;
d) All of the silicon steel sheets shall have the same magnetic aligning for high magnetic permeability core;
e) The tests indicated below shall be carried out by manufacturer
   I. Observational check;
   II. Measurement of winding resistance(Clause 15 of IEC60076-11);
   III. Measurement of voltage ratio and check of phase displacement (Clause 16 of IEC60076-11);
   IV. Measurement of short-circuit impedance and load loss(Clause 17 of IEC60076-11);

V. Measurement of no-load loss and current(Clause 18 of IEC60076-11);
VI. Separator-source AC withstand voltage test (Clause 19 of IEC60076-11);
VII. Induced AC withstand voltage test (Clause 20 of IEC60076-11);
VIII. High voltage test ①②(IACS UR E10);
IX. Insulation resistance measurement (IACS UR E10) ;
X. Partial discharge measurement (when Um≥3.6kV) (Clause 22 of IEC60076-11);
XI. Voltage regulation test ③ (Clause 2.1.1.3 of this part),
XII. Measurement of temperature rise ④ (Clause 2.1.1.4 of this part).

Notes：

① For transformers subject to temperature rise test, the high voltage test shall be carried out immediately after the temperature rise test;
② The high voltage test is, in general, not to be repeated but if it is necessary, one additional test is permitted to be carried out with a test voltage equal to 75% of the voltage at the first test;
③ If the test is impracticable at the manufacturer's site (such as the manufacturer's power distribution is limited, etc.), it may be waived, subject to agreement of EU RO;
④ The test should only be carried out to the first product for batch products of the same type and specification.

4. MARKING REQUIREMENTS

4.1 Each transformer shall be provided with a clear symbol or mark near the terminals for external connections. A clear earthing mark shall be provided near the earthing terminal. The entry shall indelibly marked;

4.2 Each transformer shall be provided with a rating plate of weatherproof material, fitted in a visible position, showing the items indicated as below. The entries on the plate shall be indelibly marked (that is, by etching, engraving, stamping or by a photo-chemical process).

a) Kind of transformer;
b) Number and year of product standard;

c) Manufacturer's name;
d) Manufacturer's serial number;
e) Year of manufacture;
f) Insulation system temperature for each winding. The first letter shall refer to the high voltage winding, the second letter shall refer to the low voltage winding. When more than two windings are present, the letters shall be placed in the order of the windings from the high voltage to the low voltage;
g) Number of phases;
h) Rated power for each kind cooling;
i) Rated frequency;
j) Rated voltages, including tapping voltages, if any;
k) Rated currents for each kind cooling;
l) Connection symbol;
m) Short-circuit impedance at rated current and at the appropriate referenced temperature;
n) Type of cooling;
o) Total mass;
p) Insulation levels;
q) Degree of protection;
r) Environmental class;
s) Climatic class;
t) Fire behaviour class.

The rated withstand voltages for all windings shall appear on the rating plate. The principles of the standard notation are illustrated in Clause 5 of IEC60076-3.

4.3 Each transformer enclosure shall be provided with a rating plate of weatherproof material, fitted in a visible position, showing the items indicated in 4.1 above. The entries on the plate shall be indelibly marked (that is, by etching, engraving, stamping or by a photo-chemical process).

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 relevant EU RO MR Type Approval Certificate:

a) Insulation level；
b) Cooling method；
c) Degree of protection of enclosure (if any)；
d) Rated power;
e) Primary/secondary voltage;
f) Coupling index, etc.

6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
8 July 2012	0.0	Accepted by Advisory Board
31 January 2014	0.1	Updated as per CRF003, Reference to EU RO Framework Document for the Mutual Recognition of Type Approval added.
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; CRF026/026a – Witness testing & control of test specimen; CRF028 – addition of 6 month application clause.

7. BACKGROUND INFORMATION / REFERENCES

a) IEC60092-303 ed3.0 (1980-01), Electrical installations in ships. Part 303: Equipment - Transformers for power and lighting;
b) IEC 60092-303-am1 ed3.0 (1997-09), Amendment 1 - Electrical installations in ships. Part 303: Equipment - Transformers for power and lighting;
c) IEC 60076-1(2000-04) , Power transformers - Part 1: General;
d) IEC 60076-2(1993-04) , Power transformers - Part 2: Temperature rise;
e) IEC 60076-3(2000-03) , Power transformers - Part 3: Insulation levels, dielectric tests and external clearances in air;

f) IEC 60076-4(2002-06) , Power transformers - Part 4: Guide to the lightning impulse and switching impulse testing - Power transformers and reactors;
g) IEC 60076-5(2006-02) , Power transformers - Part 5: Ability to withstand short circuit;
h) IEC 60076-10(2005-07) , Power transformers - Part 10: Determination of sound levels;
i) IEC 60076-10-1(2005-10) , Power transformers - Part 10-1: Determination of sound levels - Application guide;
j) IEC 60076-11(2004-05) , Power transformers - Part 11: Dry-type transformers;
k) IEC 60905(1987-12) , Loading guide for dry-type power transformers;
l) IEC 60529 (2001-02) , Degrees of protection provided by enclosures (IP Code);
m) IEC 60068-2-30(2005-08) , Environmental testing - Part 2-30: Tests - Test Db: Damp heat, cyclic (12 h + 12 h cycle);
n) IEC 60068-2-11(1981-01) , Environmental testing - Part 2: Tests. Test Ka: Salt mist;
o) IACS UR E10;
p) RO Framework Document for the Mutual Recognition of Type Approval.

8. MAINTENANCE / CLARIFICATION OF TECHNICAL REQUIREMENTS

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- END -

EU RO Mutual Recognition Technical Requirements

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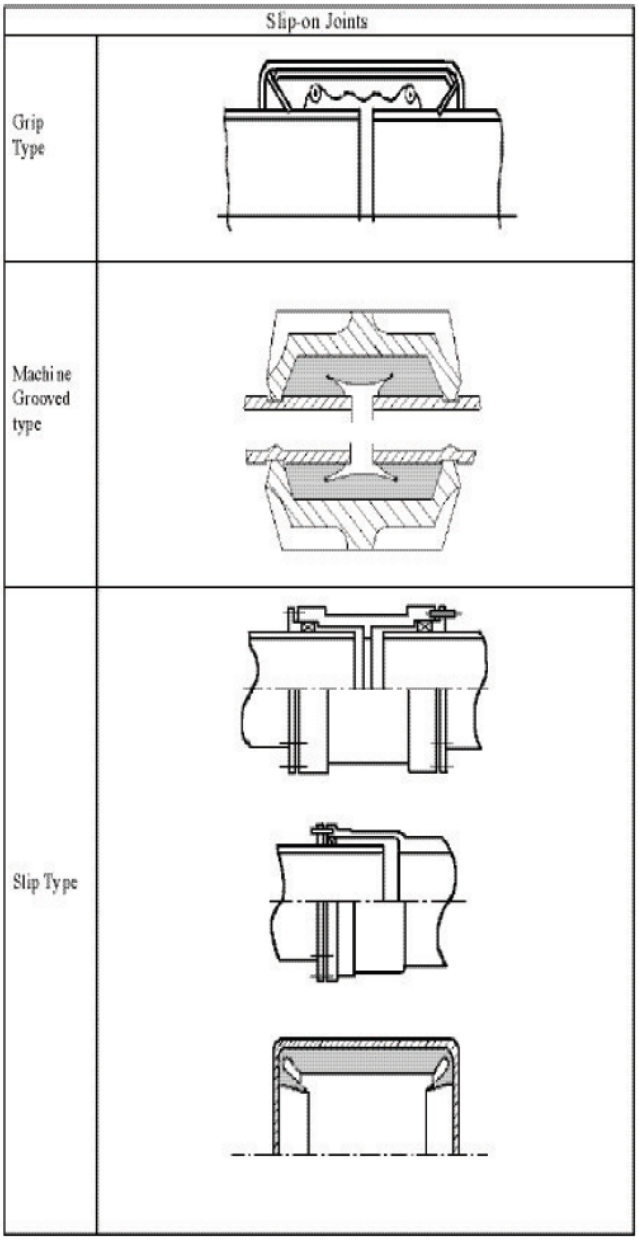
1. PRODUCT DESCRIPTION

1.a General description of the product

a) These Technical Requirements apply to mechanical joints, so called slip type or grip type or machine grooved type as shown in **Figure. 1** for both fire resistant and non-fire resistant type;

b) "**Mechanical joints**" means devices intended for direct connection of pipe lengths other than by welding, flanges or threaded joints.

Figure 1



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1.b Application limitations†

a) Application of mechanical joints, their acceptable use for each service, the dependence upon the class of piping system, pipe dimensions, working pressure and temperature are defined in the Classification Rules of individual EU ROs;

b) Piping, in which a mechanical joint is fitted, shall be adequately adjusted, aligned and supported. Supports or hangers shall not be used to force alignment of piping at the point of connection;

c) Typical application limitations are given by IACS UR P2 Rev.8 March 2016 in its tables 7 and 8 where classes of piping system are defined in its figure 1 and table 1.

† 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.

1.c Intended use

These Technical Requirements apply to mechanical joints intended for use in marine piping systems.

1.d System context

Application of the joint type for a given piping system of a given vessel is subject to the approval of the individual EU RO classing the vessel.

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	Adoption Date	1 January 2018
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	Tier	1
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2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a i. Technical Requirements

a) Due to the great variations in design and configuration of mechanical joints, no specific recommendation regarding calculation method for theoretical strength calculations is given in these Technical Requirements. The Type Approval is to be based on the results of testing of the actual joints;
b) The materials used for mechanical joints shall be compatible with the piping material and internal and external media;
c) The manufacturer shall submit evidence to substantiate that all components are adequately resistant to working the media at design pressure and temperature specified.

2.a.ii. Technical documents to be submitted

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

Following documents and information are to be submitted by Manufacturer:

a) Description of the product;
b) Typical sectional drawings with all dimensions necessary for evaluation of joint design;
c) Specification of materials used for all components of the assembly;

Along with documents showing:

d) Maximum design pressures (pressure and vacuum);
e) Maximum and minimum design temperatures;
f) Conveyed media;
g) Intended services;
h) Maximum axial, lateral and angular deviation, allowed by manufacturer;
i) Installation details;
j) Marking details.

2.b Type testing requirements

2.b.1 Test program†

The testing program shall be submitted to the EU RO for approval. Tests required are indicated in **Table 2**. These tests are to be witnessed by the EU RO. In cases where the tests are conducted at Nationally Accredited Laboratories, the presence of the EU RO surveyor may be omitted.

Table 2

Tests	Grip type & Machine grooved type	Slip type
Tightness test	+	+
Vibration (fatigue) test	+	-
Pressure pulsation test [1]	+	-
Burst pressure test	+	+
Pull-out test	+	-
Fire endurance test	+	+
Vacuum test	+	+
Repeated assembly test	+	-

Abbreviations:
+ Test is required
- Test is not required

NOTES:
1. for use in those systems where pressure pulsation other than water hammer is expected.

2.b.2 Selection of Test Specimen†

a) Test specimens shall be selected from production line or at random from stock in the presence of an EU RO surveyor;
b) Where approval is applied for a range of sizes of a given type of mechanical joints, at least three separate sizes representative of the range, from each type of joints shall be type tested;
c) The selected specimens shall be verified for compliance with the technical documentation to the satisfaction of the attending EU RO surveyor.

† 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.b.3 Mechanical Joint Assembly

a) Assembly of mechanical joints should consist of components selected in accordance with [**2.b.4 ii**] and the pipe sizes appropriate to the design of the joints;
b) Where pipe material could affect the performance of mechanical joints, the selection of joints for testing shall take the pipe material into consideration;
c) Where not specified, the length of pipes to be connected by means of the joint to be tested shall be at least five times the pipe diameter;
d) In all cases, the assembly of the joint shall be carried out only in accordance the manufacturer's instructions;
e) No adjustment operations on the joint assembly, other than that specified by the manufacturer, are permitted during the test.

2.b.4 Methods of tests

i. **Test fluid**

Unless otherwise specified, water or oil as test fluid is to be used.

ii. **Tightness test**

All mechanical joints are to be subjected to a tightness test, as follows;

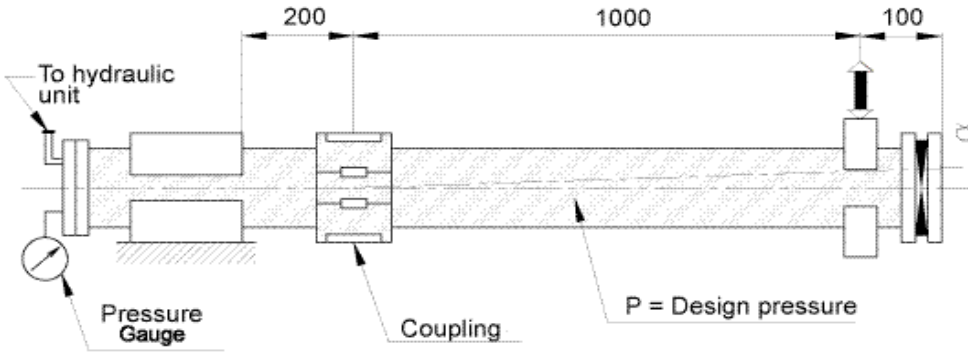
– The mechanical joint assembly test specimen shall be connected to the pipe or tubing in accordance with the requirements of [2.b.4 iii] and the manufacturer's instructions, filled with test fluid and de-aerated;
– The pressure inside the joint assembly shall be slowly increased to 1.5 times the design pressure. This test pressure shall be retained for a minimum period of 5 minutes. In the event of a drop in pressure or visible leakage, the test (including fire test) is to be repeated for two further

specimens. If, during the repeat test, one test piece fails the coupling is regarded as having failed.

iii. **Vibration (fatigue) test for grip type and machine grooved type joints**

- Mechanical joints assembly shall be subject to the vibration test detailed in **a)** to **h)** below. Conclusions of the vibration tests should show no leakage or damage
- Grip type joints and other similar joints containing elastic elements shall be tested in accordance with the method detailed in **a)** to **h)** below. A test rig of cantilever type used for testing fatigue strength of components may be used. The test specimen being tested is to be arranged in the test rig as shown in **Figure 2**:

Figure 2



a) Two lengths of pipes shall be connected by means of joint assembly specimen to be tested.
b) One end of the pipe shall be rigidly fixed while the other end shall be fitted to the vibrating element on the rig. The length of pipe connected to the fixed end should be kept as short as possible and in no case exceed 200 mm.
c) Mechanical joint assemblies shall not be longitudinally restrained.
d) The assembly shall be filled with test fluid, de-aerated and pressurized to the design pressure of the joint. Preliminary angle of deflection of pipe axis shall

be equal to the maximum angle of deflection, as recommended by the manufacturer.

e) The amplitude shall be measured at 1m distance from the centre line of the joint assembly at free pipe end connected to the rotating element of the rig. (see **Figure 2**).

f) Parameters of testing are to be as indicated below and to be carried out on the same assembly:

Number of cycles	Amplitude, mm	Frequency, Hz
$3 \cdot 10^6$	± 0.06	100
$3 \cdot 10^6$	± 0.5	45
$3 \cdot 10^6$	± 1.5	10

g) Pressure during the test shall be monitored. In the event of a drop in the pressure and visual signs of leakage the test is to be repeated as described in the Burst Pressure Test [see**2.b.4 v**];

h) Visual examination of the joint assembly is to be carried out for signs of damage which may eventually cause leakage.

iv. **Pressure pulsation test for grip type and machine grooved type joints**

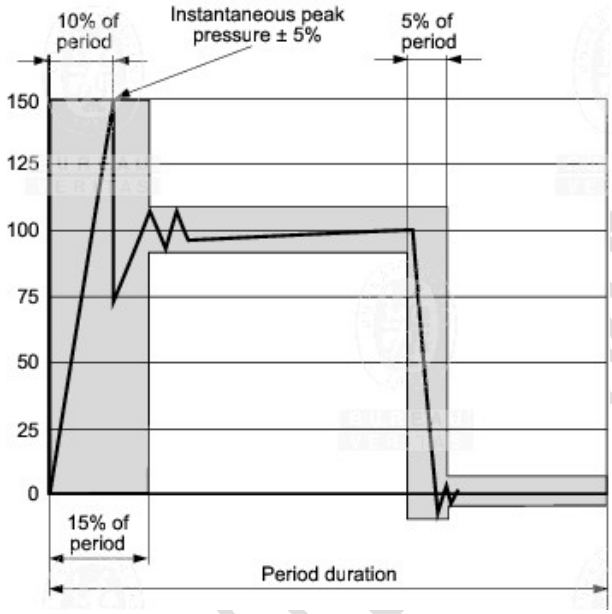
a) The mechanical joint test specimen for carrying out this test may be the same as that used in the tightness test above provided it passed that test;

b) The mechanical joint test specimen shall be connected to a pressure source capable of generating pressure pulses of magnitude as shown in **Figure 3;**

c) Impulse pressure is to be raised from 0 to 1.5 times the design pressure of the joint with a frequency equal to 30-100 cycles per minute. The number of cycles is not to be less than 5 x 105;

d) The mechanical joint is to be examined visually for sign of leakage or damage during the test.

Figure 3 - Impulse pressure diagram



v. Burst pressure test

a) Mechanical joints shall be tested where applicable, to a burst pressure of 4 times the design pressure. For design pressure above 200 bar the required burst pressure shall be agreed with the EU RO;

b) Mechanical joint test specimen shall be connected to the pipe or tubing in accordance with the requirements of Pressure pulsation test, filled with test fluid, de-aerated and pressurized to test pressure with an increasing rate of 10% per minute of test pressure. The mechanical joint assembly intended for use in rigid connections of pipe lengths shall not be longitudinally restrained;

c) Duration of this test shall not be less than 5 minutes at the maximum pressure.

d) Where considered convenient, the same mechanical joint test specimen used in the tightness test may be used for the burst test, provided it passed the tightness test;

e) The specimen may exhibit a small deformation whilst under test pressure, but no continuous movement on the pipe, leakage or visible cracks shall be permitted.

vi. Pull-out test for grip type and machine grooved type joints

a) In order to determine the ability of a mechanical joint assembly to withstand the axial loading likely to be encountered in service without the connecting pipe becoming detached, the following pull-out test is to be carried out;

b) Pipes of a suitable length shall be fitted to each end of the mechanical joint assembly test specimen. The test specimen is to be pressurized to its design pressure. When pressure is attained, an external axial load is to be imposed with a value calculated using the following formula:

$$L = \frac{\pi}{4} D^2 p$$

Where D =- Pipe outside diameter, mm
p =- Design pressure, N/mm^2
L =- Applied axial load, N

c) The pressure and axial load shall be maintained for a period of 5 minutes;

d) During the test, the pressure is to be monitored and relative movement between the joint assembly and the pipe shall be measured;

e) The mechanical joint assembly shall be visually examined for a drop in pressure and signs of leakage or damage. There shall be no movement between the mechanical joint assembly and the connecting pipes.

vii. Fire endurance test for fire resistant type

a) The fire endurance test shall be conducted on the selected test specimens as per the following standards and clarifications:

- ISO 19921: 2005(E): Ships and marine technology – Fire resistance of metallic pipe components with resilient and elastomeric seals – Test methods;
- ISO 19922: 2005(E): Ships and marine technology – Fire resistance of metallic pipe components with resilient and elastomeric seals –

Requirements imposed on the test bench.

b) Clarifications to the standard requirements :
- If the fire test is conducted with circulating water at a pressure different from the design pressure of the joint (however of at least 5 bar) the subsequent pressure test shall be carried out to twice the design pressure;
- A selection of representative nominal bores may be tested in order to evaluate the fire resistance of a series or range of mechanical joints of the same design. The smallest and biggest size of the range shall, in all cases, be tested. For the sizes between the smallest and biggest, the testing of a mechanical joint with nominal bore (Dn) will qualify other mechanical joints up to 2xDn.
-
- Thermal insulation materials applied on couplings are to be non-combustible in dry condition and when subjected to oil spray. A non-combustibility test according to ISO 1182 is to be carried out.

viii. Vacuum test

a) The mechanical joint assembly shall be connected to a vacuum pump and subjected to a pressure of 170 mbar absolute. Once this pressure is stabilized, the specimen under test shall be isolated from the vacuum pump and the pressure is to be maintained for a period of 5 minutes;
b) No internal pressure rise is permitted.

ix. Repeated assembly test for grip type and machine grooved type joints

a) The mechanical joint test specimens shall be dismantled and reassembled 10 times in accordance with manufacturer's instructions and then subjected to the tightness test.

2.b.5 Test Results Acceptance Criteria

a) Where a mechanical joint assembly does not pass all or any part of the tests in **Table 2,** two assemblies of the same size and type that failed shall be tested and only those tests which the mechanical joint assembly failed in the first instance, are to be repeated;

b) In the event where one of the assemblies fails the second test, that size and type of assembly shall be considered unacceptable;
c) The methods and results of each test shall be recorded and reproduced as and when required.

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).

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

a) Manufacturer's name or logo;
b) Type designation;
c) Size;
d) Maximum working pressure;
e) Year/ serial number;
f) Clamping torque of screws;
g) Degree of fire resistance;
h) Sealing material.

Where it is impracticable to affix the above marking due to the size of the product, the product shall be marked with at least:

a) Manufacturer's name or logo;
b) Type designation;
c) Size;
d) Maximum working pressure.

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 relevant EU RO MR Type Approval Certificate:

a) Reference of the Technical Requirement and testing standards applied;
b) Material designation of major components, e.g. coupling housing, sealing etc.;
c) Product type;
d) Size range;
e) Pressure and temperature range;
f) Design drawing numbers;
g) Test reports;
h) Range of Application / Limitation;
i) Production places;
j) Marking of product.

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.
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; CRF026/026a – Witness testing & control of test specimen; CRF028 – addition of 6 month application clause.

MECHANICAL JOINTS	Version	0.4
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1 January 2018	0.4	CRF029 - Update to align item 2.b.4.vi (Pull-out test for grip type and machine grooved type jointswith IACS UR P2.11 Rev.4 March 2016; References to IACS UR P2 updated; Item 2.a.i (Technical Requirements) modified; Item 2.b.4.vii (Fire endurance test for fire resistant type) modified

7. BACKGROUND INFORMATION / REFERENCES

a) IACS UR P2.7.4 (Rev. 8 March 2016) Mechanical joints;
b) IACS UR P2.11 (Rev. 4 March 2016) type Approval of Mechanical Joints;
c) ISO 19921:2005 (E);
d) ISO 19922:2005 (E);
e) 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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EU RO Mutual Recognition Technical Requirements

RESIN CHOCKS	Version	0.3
	Adoption Date	1 April 2016
	Application Date	1 October 2016
	Tier	1
This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements ***** Uncontrolled if downloaded or printed *****		

1. PRODUCT DESCRIPTION

1.a General description of the product

Mixture of resins (usually epoxy resin) and specific additives, mainly characterized by high values of mechanical properties, with particular regard to compression module, resistance to water and oils, and stability over time

1.b Application limitations

Each specific installation of cast resin chocks shall normally to be carried out in compliance with installation drawings approved on a case-by-case basis, according to each specific EU RO's Rules. Such specific approval will normally take into account, as a minimum, the following:

a) Total deadweight of supported machinery;
b) Number, size, arrangement and material of chocks and bolts, complete with relevant detailed (dimensioned) drawings;
c) Bolts pre-load and/or elongation, complete with details of tightening procedure;
d) Locking arrangement for bolts and calculation of bolt elongation for bolt connection securing;
e) Longitudinal and lateral stopping arrangements;
f) Sealing arrangement (for installation in stern tube or shaft struts);
g) Anti-rotation devices (for shaft bearings and rudder stock bearings/bushes);

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h) Manufacturer's instructions (including instructions for special cases e.g. Thin small chock height or cracks in chocks).

Note:
The chocks shall only be poured by companies authorised to do so by the cast resin manufacturer whilst maintaining the boundary conditions required by the process. Authorization, respectively evidence of training the personnel performing the cast resin process, by the cast resin manufacturer has to be presented to the EU RO Surveyor upon request.

End of Note

1.c Intended use

Chocking of machinery and equipment (engines, gearboxes, steering gears, shaft bearings, stern tubes and arrangements), at initial installation or during repair, within the relevant application range (as a function of the specific product, e.g. ranges of application, supported [basic] materials, allowable temperature ranges etc.)

1.d System context

Propulsion shafting and machinery arrangement

2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a i. Technical Requirements

a) Ageing;
b) Compressive strength;
c) Creep properties;
d) Deformation under load;
e) Elastic shear modulus;
f) Elastic tensile modulus;
g) Flammability;
h) Flexural strength;
i) Friction coefficient;

j) Hardness;
k) Impact characteristics;
l) Measurement of exotherm temperature;
m) Pulsating compressive strength;
n) Resistance to oils;
o) Resistance to water;
p) Shrinkage during cure;
q) Tensile strength;
r) Thermal expansion;
s) Viscosity of compound at pouring stage (prior to curing);

Tests to be carried out as per recognized standard, in accordance with the Manufacturer's specifications; limit values to be specified, however *compressive creep for the specified load and service temperature to be less than 0.2% under application of critical alignment applications.*

2.a.ii. Technical documents to be submitted

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

a) Data sheet / specification of chocking compound (including all data as per 2.a.i. above);
b) Test reports for compliance with 2.b below;
c) Material Safety Data Sheet and curing/processing conditions;
d) Manufacturer's instructions and recommendations for use, including:
   i. Range of ambient conditions during installation (pouring/curing);
   ii. Gelling time (temperature sequence);
   iii. Curing conditions (tempering);
   iv. Minimum curing time prior to loading vs. ambient temperature;
   v. Surface treatment of supported materials;
   vi. Maximum and minimum chock thickness.

2.b Type testing requirements

a) ASTM D 695 - ISO 604 (elastic modulus / compressive strength);
b) ASTM D 638 - ISO 527-1,2,4,5 (all - as applicable) (tensile strength);
c) ASTM D 621 - (deformation under load);

d) ISO 75-2 (temperature of deflection under load);
e) ASTM D 256 - ISO 180 (impact testing);
f) EN 59 (Barcol Hardness as per ASTM D 2583 prior to bolt tightening and loading);
g) ASTM D 4065 (previously ASTM D 2236) - DIN 53445 - ISO 6721-1 (elastic shear modulus, logarithmic decrement);
h) ASTM D 790 - ISO 178 - ISO 14125 as applicable (flexural strength, maximum strain);
i) ISO 3521 (linear shrinkage during cure);
j) ASTM D 635 - FTP Code, Annex 1, Part V (flammability of self-supporting plastics, low flame spread);
k) DIN 50100 (pulsating compressive test);
l) EN 1465 (tensile lap shear strength);
m) ASTM D 732 (shear strength);
n) DIN 53752 (coefficient of thermal expansion);
o) ISO 175 (resistance to media of the application range);
p) Coefficient of friction against steel, with machined or cast specimen, with or without separating agents (to be defined);
q) Other standards may also be accepted, provided that they are not less effective. Tests shall be carried out in Laboratories recognized by the EU RO or 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 †.
r) Test specimens shall be taken from the production line or from stocks held by the Supplier. Sample conditions shall also be stated by Supplier†.

† 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

Refer to EU RO "Product Quality Assurance (PQA)" procedure (Appendix VI of EU RO Framework Document for the Mutual Recognition of Type Approval).

4. MARKING REQUIREMENTS

Each container of the product shall be marked, as a minimum, with:

a) Manufacturer's name or logo;
b) Type designation;
c) Year / lot number;
d) Expiry date (or shelf life);
e) Storage conditions.

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 relevant EU RO MR Type Approval Certificate:

a) Ratings (physical properties, max allowable specific load vs. design temp.)
b) Applicable Standards
c) Service Restrictions (special conditions, requirements for application)
d) Comments (see point 1.b)
e) Notes, Drawing and Documentation (incl. test reports).

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6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
8 July 2012	0.0	Accepted by Advisory Board
31 January 2014	0.1	Updated as per CRF003, Reference to EU RO Framework Document for the Mutual Recognition of Type Approval added.
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	CRF016 – Revision to technical & type test requirements taking into account the proposals from industry; CRF025 – Updated to new MR TR document format incl. par. 8; CRF026/026a – Witness testing & control of test specimen; CRF028 – addition of 6 month application clause.

7. BACKGROUND INFORMATION / REFERENCES

a) ASTM D 695 - ISO 604 (elastic modulus / compressive strength);
b) ASTM D 638 - ISO 527-1,2,4,5 (all - as applicable) (tensile strength);
c) ASTM D 621 - (deformation under load);
d) ISO 75-2 (temperature of deflection under load);
e) ASTM D 256 - ISO 180 (impact testing);
f) EN 59 (Barcol Hardness as per ASTM D 2583 prior to bolt tightening and loading);
g) ASTM D 4065 (previously ASTM D 2236) - DIN 53445 - ISO 6721-1 (elastic shear modulus, logarithmic decrement);
h) ASTM D 790 - ISO 178 - ISO 14125 as applicable (flexural strength, maximum strain);
i) ISO 3521 (linear shrinkage during cure);
j) ASTM D 635 - FTP Code, Annex 1, Part V (flammability of self-supporting plastics, low flame spread);
k) DIN 50100 (pulsating compressive test);
l) EN 1465 (tensile lap shear strength);
m) ASTM D 732 (shear strength);
n) DIN 53752 (coefficient of thermal expansion);

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o) ISO 175 (resistance to media of the application range);
p) Definition: Material Manufacturer - Licensed Material Producer - Application Enterprise - Authorized Application Company;
q) See also 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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EU RO Mutual Recognition Technical Requirements

SENSORS	Version	0.4
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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**.

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 ±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 ± 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 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 10s;

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:

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

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

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.
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 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†.
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†.

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

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.

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; CRF026/026a - Witness testing & control of test specimen; CRF028 - Addition of 6-month application clause.
1 July 2018	0.4	CRF038 – Item 2.1.1.1.e replaced

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;
k) EU RO Framework Document for the Mutual Recognition of Type Approval.

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8. MAINTENANCE / CLARIFICATION OF TECHNICAL REQUIREMENTS

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SWITCHES	Version	0.5
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	Tier	1
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1. PRODUCT DESCRIPTION

1.a General description of the product

Description of product according to IEC IEV 441-14-10:

Switch (mechanical): is a mechanical switching device capable of making, carrying and breaking currents under normal circuit conditions which may include specified operating overload conditions and also carrying for a specified time currents under specified abnormal circuit conditions such as those of short circuit.

Note: a switch may be capable of making but not breaking short circuit currents.

1.b Application limitations†

a) Restricted to LV mechanical switches according IEC 60947-3 where the rated voltage does not exceed 1000 V a.c. or 1500 V d.c. and without electronic devices;
b) Onboard ships with exceptions as per SOLAS Ch. I, Reg. 3;
c) Installation on board ships within locations with climatic, biological, chemically active, mechanically active and mechanical environmental conditions not exceeding those for which performance has been proved according to IEC 60721-3-6 (1987) + A2 (1997).

† 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.

1.c Intended use

a) Power supply system characteristics as per IEC 60092-101; 2.8.;
b) Environment category 6K4, 6B2, 6C2, 6S2 and 6M3 according to IEC 60721-3-6 (1987) + A2 (1997).

1.d System context

See 1.c.

2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a i. Technical Requirements

a) Type, ratings and characteristics of switches for intended applications shall be evaluated;
b) In general, IEC 60947 series shall be observed.

2.a.ii. Technical documents to be submitted

Prior to tests:

a) Proposed test program and test schedule;
b) Description of the test specimens and explanation of the selected test sample(s) providing evidence that the selected sample meets the most rigorous and demanding requirements;
c) Product descriptions, manuals, data sheets, assembly drawings, dimension drawings, etc. clearly identifying the product.;
d) Complete accreditation certificate of the Test Laboratory;
e) Details of production sites;
f) Product specification;
g) Application, working area;
h) Instructions on fitting, assembly and operation;
i) QM-certificate according to ISO 9001.

After completion of tests:

j) The test report with an identification number shall contain all relevant data and test results including place and date of the tests, the names of the responsible personnel carrying out the test;

k) Type references and serial numbers of the products tested;

l) Test reports and test records must be signed by the personnel members in charge of the test and are to be confirmed by the EU RO by signing and marking the test report;

m) Certificate of conformity to IEC Standards issued by one of the Certification Body under the ILAC or LOVAG or IECEE mutual recognition agreement.

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) Environmental tests should be carried out in accordance with last revision of IACS UR E10 (applicable items) or in accordance with IEC 60947-3 and IEC 60947-1 Annex Q - Category D, with the severity conditions set by the IACS UR E10 as a minimum, notably for the resulting recovery times;

f) All tests to be performed on agreed test samples. Test specimens shall be selected from 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 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.euromr.org/technical-requirements).

3. PRODUCTION REQUIREMENTS

3.a. General Requirements

a) Refer to EU RO **"Design Evaluation Scheme**" procedure (Appendix V of EU RO Framework Document for the Mutual Recognition of Type Approval);
b) Refer to EU RO **"Product Quality Assurance (PQA)"** procedure (Appendix VI of EU RO Framework Document for the Mutual Recognition of Type Approval).

3.b Special Requirements

a) Routine test according to IEC 60947-3 sub-clause 8.1.3;
b) Production certification according to ISO 9001 by accredited certification bodies;
c) QM/QS audit (annual) to be submitted to EU RO for review;
d) Production of the equipment is limited to those facility listed on EU RO certificate;
e) Changes to the product will void the EU RO certification;
f) EU RO shall be granted access to all manufacturing and testing facilities, and to be provided with all the information necessary to performance its duties;
g) General terms and conditions of the EU RO shall be observed.

4. MARKING REQUIREMENTS

Marking as required by IEC 60947-3 (sub-clause 5.2).

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 relevant EU RO MR Type Approval Certificate:

a) Technical data according to IEC marking;
b) Validity according to "EU RO Product Quality Assurance, validity";
c) RO certificate is void if IEC standards are up-dated or withdrawn;
d) Reference to approved technical documents;
e) Application and limitations.

6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
8 July 2012	0.0	Accepted by Advisory Board
19 September 2012	0.1	Errors corrected
31 January 2014	0.2	Added reference to the EU RO Framework Document for the Mutual Recognition of Type Approval.
31 January 2015	0.3	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	0.4	CRF025 – Updated to new MR TR document format incl. par. 8; CRF026/026a – Witness testing & control of test specimen; CRF028 – Addition of 6-month application clause.
1 July 2018	0.5	CRF032/CRF035 - Revision of par. 2.b – Type testing requirements (Alignment of Electrical TRs) Corrected reference to standard IEC 60721-3-6 (1987) + A2 (1997)

7. BACKGROUND INFORMATION / REFERENCES

a) IEC 60092-101; 2.8;
b) IEC 60721-3-6 (1987) + A2 (1997);
c) IEC 60947;
d) IEC IEV 441-14-10;
e) ISO 9001;
f) SOLAS Ch. 1, Reg. 3;
g) EU RO Framework Document for the Mutual Recognition of Type Approval.

8. MAINTENANCE & CLARIFICATION OF TECHNICAL REQUIREMENTS

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EU RO Mutual Recognition Technical Requirements

ACCUMULATOR BATTERY	Version	0.3
	Adoption Date	1 April 2016
	Application Date	1 October 2016
	Tier	2
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1. PRODUCT DESCRIPTION

1.a General description of the product

a) Accumulator battery also known as storage battery is secondary battery designed to be electrically rechargeable. Lead acid battery is a type of accumulator battery widely used on board as main or emergency power source for automatic system and equipment, communication, lighting appliance etc. and for engine starting. The lead acid battery can be subdivided into two types-**vented type** and **valve regulated type**:

- **Vented (flooded) battery**: a vented battery is a secondary battery having a cover provided with one or more openings through which gaseous products may escape;
- **Valve-regulated (with gas recombination) battery**: a valve-regulated battery is a secondary battery that is closed under normal conditions and has an arrangement that allows the escape of gas if the internal pressure exceeds a predetermined value. The battery cannot normally receive an addition of water or electrolyte. In this type of battery, the electrolyte is immobilised

1.b Application limitations

a) These technical requirements only apply to permanently installed lead acid accumulator batteries of the vented and valve- regulated type;

b) These technical requirements do not apply to batteries for propulsion purpose and to batteries used in explosion-proof appliances.

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1.c Intended use

a) Starter batteries - engine starting;
a) Stationary lead-acid batteries;
b) Battery powered system for automatic and alarm system and equipment, e.g. control and alarm, communication, and lighting systems;
c) Uninterrupted Power Supply (UPS)

Note:
Although starter and stationary batteries require different characteristics, some products can meet the technical requirements of both categories.

End of Note

1.d System context

Selection, application and installation of the accumulator battery is subject to approval by the EU RO responsible for the classification of the vessel.

2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a i. Technical Requirements

Environmental conditions

a) The environmental conditions given in **Table 2.1, Table 2.2** and **Table 2.3** in Appendix 1 shall be applied, unless otherwise specified;
b) Accumulator battery shall be suitable for operations at a temperature range 0°C to 45°C. When designed to work at other temperature ranges, due consideration should be given by the individual EU RO;
c) Accumulator battery shall be designed to be sufficiently robust as to withstand the inclinations and vibrations as specified in **Table 2.2** and **Table 2.3**.in Appendix 1;

Construction, Materials and Installations

d) All pole plates shall be of a rigid construction, and shall be so designed to keep the shedding of active material to a minimum. The cells shall be so constructed as

to prevent spilling of electrolyte due to an inclination of 40°from the normal, and to prevent emission of acid spray.

e) The battery container shall be of flame retardant and moisture-resistant material;
f) The cells shall be grouped in crates or trays of rigid construction and suitable material and equipped with means to facilitate handling. The weight of the assembled batteries shall not exceed 100kg. This requirement does not apply to cells that cannot be assembled in the above-mentioned crates or trays due to their weight;
g) The batteries to be so designed and arranged as to ensure that they will function satisfactorily at full rated power when the ship is upright or when inclined at any angle up to 22.5°, or inclined up to 10°either way in the fore or aft direction, or in any combination of angles within the afore-said limits;
h) Crates and covers of the battery shall be made of solid and corrosion-resistant materials. The battery posts shall be of adequate size to carry the charge/discharge current. Means to effectively lock the battery posts and cable terminals shall be provided;

2.a.ii. Technical documents to be submitted

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

a) List of product or product range applied for approval;
b) Product descriptions, list of major parts or components, data sheets, assembly drawings, dimension drawings, etc. clearly identifying the product;
c) Product specifications including the Discharge characteristic curves and temperature characteristic curves as the basis of required capacity calculation for the services to be supplied;
d) Proposed test program and/or test schedule including description of the test specimens and explanation of the principle of sampling;
e) A certificate of accreditation for the selected laboratory (if any);
f) Documentation about the production quality assurance system;
g) Production flow chart with quality control point marking;
h) Instruction manual, user manuals, Installation manual etc.as relevant and special operational limitations, if any;
i) Description of product's marking;
j) Certificate of conformity to IEC Standards issued by one of the Certification Body under the ILAC or LOVAG or IECEE mutual recognition agreement (if any).

2.b Type testing requirements

a) Tests given in **Table 2.4** in Appendix 2 shall be carried out in accordance with approved test program. The test conditions, test sequence and test methods shall be in accordance with the accepted IEC standards listed in the test program, unless otherwise specified in the program;

b) Test specimens shall be taken from the production line or from stocks†.
The tests shall be conducted at test site or laboratory agreed by the EU RO in the presence of the EU RO Surveyor. In cases where tests are conducted at Nationally Accredited Laboratories, the presence of the EU RO's surveyor may be omitted†.

c) It is the manufacturer's responsibility to make sure that the type testing is performed in accordance with the approved test program.

† 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

Refer to EU RO "Product Quality Assurance (PQA)" procedure (Appendix VI of EU RO Framework Document for the Mutual Recognition of Type Approval).

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 and address;
b) Type designation;
c) Voltage;
d) Capacity in ampere-hour at a specific rate of discharge and the chosen reference temperature;

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e) Nominal cranking current(for starter battery);
f) Serial number or batch number and the date of manufacture;
g) Certificate Number and EU RO;
h) Electrolyte density (for vented type) / open circuit voltage (for valve regulated type) in full charged condition at the chosen reference temperature;
i) Charge retention storage time.

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.

6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
30 April 2013	0.0	Accepted by Advisory Board
31 January 2014	0.1	CRF006 - Corrected title and content to 'Accumulator battery';
31 January 2015	0.2	CRF018 – Revision to par. 2.a.ii - Test results to be 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; CRF026/026a – Witness testing & control of test specimen; CRF028 – addition of 6 month application clause.

7. BACKGROUND INFORMATION / REFERENCES

a) IACS UR E10 Test specification for type approval;
b) IEC 60092-305 Electrical installations in ships Part 305: Equipment - Accumulator (storage) batteries;
c) IEC 60095-1 Lead-acid starter batteries –Part 1: General requirements and methods of test;
d) IEC 60896-21 Stationary lead-acid batteries Part 21: Valve regulated types -Methods of test;
e) IEC 60896-22 Stationary lead-acid batteries Part 22: Valve regulated types-Requirements;

f) IEC 60896-11 Stationary lead-acid batteries Part 11: vented types-General requirements and methods of test;
g) EU RO Framework Document for the Mutual Recognition of Type Approval.

8. MAINTENANCE / CLARIFICATION OF TECHNICAL REQUIREMENTS

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- **See Appendices 1 and 2 below:**

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Appendix 1 Environmental conditions

Table 2.1 Ambient Air Temperatures

Location, arrangement	Temperature (℃)
In enclosed spaces	0 to 45
In spaces subject to temperatures exceeding 55℃ and below 0℃	According to design conditions
On open decks	-25 to 45

Note: Most of the batteries used onboard are installed in Battery room or in enclosed spaces. When installed in other spaces, due consideration should be given.

Table 2.2 Angles of Inclination

Athwartships		Bow-and-stern	
Static inclination	Dynamic inclination	Static inclination	Dynamic inclination
(List)	(Rolling)	(Trim)	(Pitching)
22.5°	22.5°	10°	10°

Note:

1. In ships carrying liquefied gases in bulk and ships carrying dangerous chemicals in bulk, emergency power supplies shall remain operable with the ship flooded to a final athwart ships inclination up to a maximum of 30°. In this case the test level has to be named on the certificate.
2. Athwartships and bow-and-stern inclinations may simultaneously occur.

Table 2.3 Vibration conditions

Frequency(Hz)	Amplitude(mm)	Acceleration(m/s2)
to 13.2	±1	N.A.
13.2 to 100	N.A.	6.9

Appendix 2 Type Test Requirements

Table 2.4 Testing condition and methods

(Any changes made to IACS UR E10 in Revision 6.0 needs to be implemented in this test plan.)

NO.	TEST	PROCEDURE ACC. TO:*	TEST PARAMETERS	OTHER INFORMATION
* indicates the testing procedure which is normally to be applied. However, equivalent testing procedure may be accepted by the RO provided that the requirements stated in the other columns are fulfilled.				
1.	Visual inspection	-	-	conformance to drawings, design data，product markings
2.	Performance test	Tests shall be carried out in accordance with approved test program. For starter battery: All type tests described in IEC 60095-1 shall be conducted except sub-clause 9.8. For stationary batter: (1) vented type: All type tests described in IEC 60896-11 shall be conducted. (2) valve regulated type: All type tests described in IEC 60896-21, IEC60896-22 shall be conducted	standard atmosphere conditions -temperature: 25°C ± 10°C -relative humidity: 60% ± 30% -air pressure: 96kPa ± 10kPa	a) The product standards may specified testing condition different from the standard atmosphere conditions. b) For valve regulated battery, the valve operation test specified in sub-clause 6.8 of IEC60896-21 shall be conducted.

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NO.	TEST	PROCEDURE ACC. TO:*	TEST PARAMETERS	OTHER INFORMATION
3	Vibration	IEC Publication 60068-2-6 Test Fc	-2_0^{+3} Hz to 13.2 Hz – amplitude ±1mm -13.2 Hz to 100 Hz – acceleration ± 0.7 g.	a) duration in case of no resonance condition 90 minutes at 30 Hz; b) duration at each resonance frequency at which Qinutes at 30 Hz; in sub-clause c) during the vibration test, functional tests shall be carried out; d) tests to be carried out in three mutually perpendicular planes; e) Q should not exceed 5; f) where sweep test shall be carried out instead of the discrete frequency test and a number of resonant frequencies is detected close to each other duration of the test shall be 120 min. Sweep over a restricted frequency range between 0.8 and 1.2 times the critical frequencies can be used where appropriate. Note: Critical frequency is a frequency at which the equipment being tested may exhibit mechanical resonances with amplification greater than 10 will not be accepted g) confirm that storage battery has stable discharge current and normal voltage, and electrolyte shall not leak or splash.
4	swing endurance test	Publication IEC 60092-504	Static 22.5°	a) inclined to the vertical at an angle of at least 22.5° b) inclined to at least 22.5° on the other side of the vertical and in the same plane as in (a), c) inclined to the vertical at an angle of at least 22.5° in plane at right angles to that used in (a), d) inclined to at least 22.5° on the other side of the vertical and in the same plane as in (c).

				Note: The period of testing in each position should be sufficient to fully evaluate the behaviour of the equipment.
			Dynamic 22.5°	e) Using the directions defined in a) to d) above, the equipment shall be rolled to an angle of 22.5° each side of the vertical with a period of 10 seconds. The test in each direction shall be carried out for not less than 15 minutes f) On ships for the carriage of liquefied gases and chemicals, the emergency power supply shall remain operational with the ship flooded up to a maximum final athwart ship inclination of 30°. g) confirm that storage battery has stable discharge current and normal voltage, and electrolyte shall not leak or splash.
5	Inclination endurance	Publication IEC 60092-305	Static 40°	a) inclined to the vertical at an angle of 40° and kept in this position for 15min. b) restore to vertical and then inclined to 40° on the other side of the vertical and in the same plane as in (a) and kept in this position for 15min. c) inclined to the vertical at an angle of 40° in plane at right angles to that used in (a), d) restore to vertical and then inclined to 40° on the other side of the vertical and in the same plane as in (c) and kept in this position for 15min. e) confirm that electrolyte shall not leak or splash.

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NO.	TEST	PROCEDURE ACC. TO:*	TEST PARAMETERS	OTHER INFORMATION
6	Flame retardant	IEC 60092-101 or IEC 60695-11-5	Flame application: 5 times 15 s each. Interval between each application: 15s or 1 time 30s. Test criteria based upon application. The test is performed with the EUT or housing of the EUT applying needle-flame test method.	a) the burnt out or damaged part of the specimen by not more than 60 mm long. b) no flame, no incandescence or; c) in the event of a flame or incandescence being present, it shall extinguish itself within 30 s of the removal of the needle flame without full combustion of the test specimen. d) any dripping material shall extinguish itself in such a way as not to ignite a wrapping tissue. The drip height is 200 mm ± 5 mm.
7	Insulation resistance	Test voltage: 2Un min.24V Min. insulation resistance: 10MΩ		After filled with electrolyte, the surface of the storage battery shall be cleaned and dried. Put the battery on a metal plate and measure the insulation resistance between any battery terminal and the metal plate. The insulation resistance of the battery to earth shall not be less than 10MΩ.

End of Document

EU RO Mutual Recognition Technical Requirements

AIR PIPE AUTOMATIC CLOSING DEVICE	Version	0.4
	Adoption Date	1 January 2018
	Application Date	1 July 2018
	Tier	2
This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements ***** Uncontrolled if downloaded or printed *****		

1. PRODUCT DESCRIPTION

1.a General description of the product

These Technical Requirements apply to air pipe closing devices required by the Protocol 1988 relating to the Load Line convention 1966 and its adoptions Load Line convention, 1966 to be fitted with automatic closing devices.

1.b Application limitations†

Onboard ships with exceptions as per Article 5 of International Convention on Load Lines (ICLL).

† 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.

1.c Intended use

These technical requirements apply to automatic closing devices of air pipes intended for the water tank or oil tank except cargo tank extending above the freeboard or superstructure decks", as per Reg.20 of ICLL. Flame arresting function is excluded

from the scope of this TR. If the device is fitted with a flame screen, the flame screen is subject to separate approval by the individual RO classing the vessel.

1.d System context

The air pipe automatic closing device to prevent seawater and relieving the pressure of the tank is subject to the type approval of the individual EU RO classing that vessel.

2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a. i. Technical Requirements

Design

a) Air pipe automatic closing devices shall be designed so that they will withstand both ambient and working conditions, and be suitable for use at inclinations up to and including ±40°.
   - Strength requirements for the air pipe closing device within the forward 0.25L (L : Refer to the IACS UR S2);
   - For all ships of 80 m or over in length, where the height of the exposed desk in way of the closing device is less than 0.1L or 22m above the summer load waterline, which is the lesser, the pressure P, acting on air pipe closing devices may be calculated from:

$$P = 0.5\rho V^2 C_d C_s C_p \qquad \left[\frac{kN}{m^2}\right]$$

Where:

ρ = density of seawater, taken as 1.025 $\frac{t}{m^3}$

V = velocity of water over the fore deck, taken as 13.5 $\frac{m}{s}$

C_d = shape coefficient
= taken as 0.8 for head of cylindrical form with its axis in the vertical direction

C_s = slamming coefficient, taken as 3.2

C_p = protection coefficient

= 0.7 for air pipe closing device located immediately behind a breakwater or forecastle

= 1.0 elsewhere and immediately behind a bulwark

- Forces acting in the horizontal direction on closing device should be calculated from above formula using the largest projected area of each component;
- Air pipe closing devices shall be weather tight, as per IACS/UI/1966 ICLL Reg.20, LL49(1980 Rev.1 2008 .7)

b) Air pipe automatic closing devices shall be constructed to allow inspection of the closure and the inside of the casing as well as changing the seals;

c) Efficient ball or float seating arrangements shall be provided for the closures. Bars, cage or other devices shall be provided to prevent the ball or float from contacting the inner chamber in its normal state and made in such a way that the ball or float is not damaged when subjected to water impact due to a tank being overfilled;

d) Air pipe automatic closing devices shall be self-draining;

e) The clear area through an air pipe closing device in the opening position shall be at least equal to the area of the inlet;

f) An automatic closing device shall:
- Prevent the free entry of water into the tanks,
- Allow the passage of air or liquid to prevent excessive pressure or vacuum coming on the tank.

g) In the case of air pipe closing devices of the float type, suitable guides shall be provided to ensure unobstructed operation under all working conditions of heel and trim;

h) The maximum allowable tolerances for wall thickness of floats shall not exceed ±10% of the nominal thickness;

i) The inner and the outer chambers of an automatic air pipe head shall be of a minimum thickness of 6mm. Where side covers are provided and their function is integral to providing functions of the closing device as outlined in 2.a.i (f), they shall have a minimum wall thickness of 6 mm. If the air pipe

head can meet the tightness test in 2.b.i (c) without the side covers attached, then the side covers are not considered to be integral to the closing device, in which case a wall less than 6 mm can be acceptable for side covers;
Construction with form-closed seat of the seating/seating shall not be glued only.

Materials

j) Casings of air pipe closing devices shall be of approved metallic materials adequately protected against corrosion by sea water and the media intended to be carried in the tank. The traditional stainless steels, including types 304, 316 or 316L, are not considered suitable for use in seawater systems. For selection of suitable stainless steel material, the pitting resistance equivalent number (PREN) W = %Cr + 3.3 %Mo + 16 %N, shall not be less than 30;

k) For galvanised steel air pipe heads, the zinc coating shall be applied by the hot method and the thickness shall be 70 to 100 microns;

l) For areas of the head susceptible to erosion (e.g. those parts directly subjected to ballast water impact when the tank is being pressed up, for example the inner chamber area above the air pipe, plus an overlap of 10° or more either side) an additional harder coating should be applied. This shall be aluminium bearing epoxy, or other equivalent, coating, applied over the zinc;

m) Closures and seats made of non-metallic materials shall be compatible with the media intended to be carried in the tank and to sea water and suitable for operating at ambient temperatures between -25℃ and 85℃.

2.a.ii. Technical documents to be submitted

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

Following documents and information shall be submitted by the manufacturer:

a) Description of the product including calculation for free passage area; Detailed construction drawings of metallic enclosure if any;

b) Sectional drawings with materials and dimensions; External connection terminal drawings;

c) Type test program, performance test program and specification of test site(s) Type test plan;
d) diagram of differential pressure dependant on volume

2.b Type testing requirements

2.b.i. Testing of air pipe automatic closing device

Test specimens shall be taken from the production line or from stocks. Tests shall be carried out in presence of the EU RO Surveyor. In cases where the tests are conducted at Nationally Accredited Laboratories, the presence of the EU RO's surveyor may be omitted[1].

The prototype test plan to be submitted for approval by manufacturers and the minimum test requirements for each type and size of air pipe automatic closing device shall include the following:

a) Determination of the flow characteristics:
The flow characteristics of the air pipe closing device shall be determined. Measuring of the pressure drop versus rate of volume flow shall be carried out using water and with any intended flame or insect screens in place;

b) Testing of Vacuum capability (Discharge / Reverse flow test):
The air pipe shall allow the passage of air or liquid to prevent vacuum coming on to the tank. A reverse flow test shall be performed. A vacuum pump or another suitable device shall be connected to the opening of the air pipe leading to the tank. The flow velocity shall be applied gradually at a constant rate until the float gets sucked into the inlet of the air pipe and blocks the flow. The velocity at the point of blocking shall be recorded. 80% of the value recorded will be stated in the certificate.

c) Tightness test during immersion/emerging in water:

[1] *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).*

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	Adoption Date	1 January 2018
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	Tier	2
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An automatic closing device shall be subjected to a series of tightness tests involving not less than two (2) immersion cycles under each of the following conditions;

- The automatic closing device shall be submerged slightly below the water surface at a velocity of approximately 4m/min. and then returned to the original position immediately. The quantity of leakage shall be recorded.
- The automatic closing device shall be submerged to a point slightly below the surface of water. The submerging velocity shall be approximately 8m/min. and the air pipe vent head shall remain submerged for not less than 5 minutes. The quantity of leakage shall be recorded.
- Each of the above tightness tests shall be carried out in the normal position as well as at an inclination of 40 degree under the strictest conditions for the device. In cases where such strictest conditions are not clear, tests shall be carried out at an inclination of 40 degrees with the device opening facing in three different directions: upward, downward, sideways (left or right). See **Figures 1 to 4**:

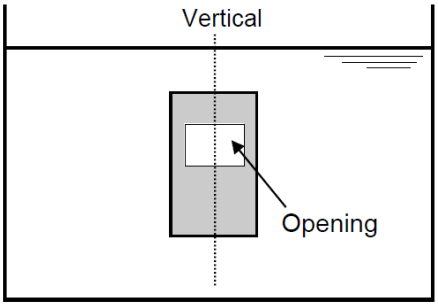

Fig 1: Example of normal position

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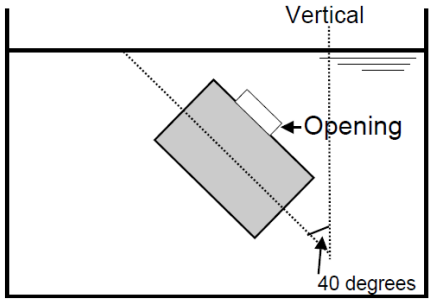

Fig 2: Example of inclination 40 degrees opening facing upward

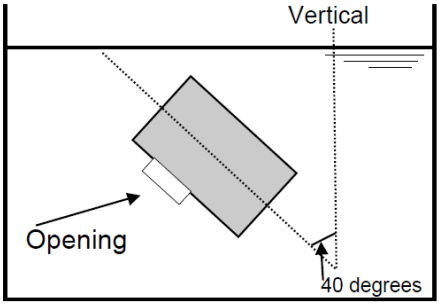

Fig 3: Example of inclination 40 degrees opening facing downward

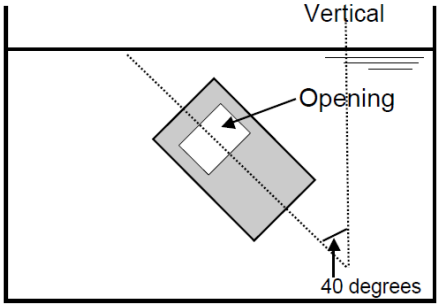

Fig 4: Example of inclination 40 degrees opening facing sideways

- Depth of Immerge water is not less than 200mm;
- The maximum allowable leakage per cycle shall not exceed 2 ml/mm of nominal diameter of inlet pipe.

2.b.ii. Testing of non-metallic floats

Impact and compression loading tests shall be carried out on the floats before and after pre-conditioning as follows:

Test condition \ Test temperature °C	-25	20	85
Dry	O	O	O
After immerging in water	O	O	O
After immerging in fuel oil		O	
The immering in water and fuel oil is to be for at least 48 hours. The total period of keeping the floats at the above specified temperatures before dry test is to be at least 24 hours.			

a) Impact test:

- The test should be conducted on a pendulum type testing machine. The floats shall be subjected to 5 impacts of 2.5Nm each and shall not suffer permanent deformation, cracking or surface deterioration at this impact loading;
- Subsequently the floats shall be subjected to 5 impacts of 25Nm each. At this impact energy level some localised surface damage at the impact point may occur. No permanent deformation or cracking of the floats shall appear.

b) Compression loading test:

- Compression tests shall be conducted with the floats mounted on a supporting ring of a diameter and bearing area corresponding to those of the float seating with which it is intended that float shall be used. For ball type float, loads shall be applied through a concave cap of the same internal radius as the test float and bearing on an area of the same diameter as the seating. For a disc type float, loads shall be applied through a disc of equal diameter as the float.
- A load of 350 kg shall be applied over one minute and maintained for 60 minutes. The deflection shall be measured at intervals of 10 minutes after attachment of the full load. The record of deflection against time

shall show no continuing increase in deflection and, after release of the load, there shall be no permanent deflection.

2.b.iii. Testing of metallic floats

Test shall be conducted in accordance with 2.b.ii.(a). The tests shall be carried out at room temperature and in the dry condition.

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).

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 logo Manufacturer's name;
b) Type designation;
c) Nominal Diameter;
d) Resistance coefficient;
e) Intended for the water tank or oil tank.

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 relevant EU RO MR Type Approval Certificate:

a) The dynamic coefficient resulting from the flow characteristic test in 2.b.i (a) for each type and size of air pipe automatic closing device
b) Additional conditions and remarks.

6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
2013-30-04	0.0	Accepted by Advisory Board
2014-01-31	0.1	CRF008 - Reference to EU RO Framework Document for the Mutual Recognition of Type Approval added.
2015-01-31	0.2	CRF018 – Revision to par. 2.a.ii - Test results to be in English; CRF020 – Revision to par. 5 - 'Type Approval Certificate Content'.
2016-04-01	0.3	CRF023 – 2.b.i b) - removal of requirements for 'Wear resistance and form constancy..' and 'Salt spray test for the casings' and replacement of 'IMO MSC/Circ.677 or EN 12874' by 'EN ISO 16852' CRF025 – Updated to new MR TR document format incl. par. 8; CRF026/026a – Witness testing & control of test specimen; CRF028 – addition of 6 month application clause.
2018-01-01	0.4	CRF037 - 2.a.i (i) is not in line with new IACS UR P3.2.9: P3.2.9 The inner and the outer chambers of an automatic air pipe head is to be of a minimum thickness of 6 mm. Where side covers are provided and their function is integral to providing functions of the closing device as outlined in P3.2.6, they shall have a minimum wall thickness of 6 mm. If the air pipe head can meet the tightness test in P3.4.1b without the side covers attached, then the side covers are not considered to be integral to the closing device, in which case a wall less than 6 mm can be acceptable for side covers.

7. BACKGROUND INFORMATION / REFERENCES

a) International Convention on Load Lines (ICLL), Reg. 20;
b) IACS UR P3(Rev.2 March 2004) "Air pipe closing device";
c) IACS UI LL49 (Rev.1 July 2008) for Reg.20 of 1966 ICLL;
d) IACS UR S2 (Rev. 1 may 2010) "Definition of Ship's Length *L* and Block Coefficient C_b";

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e) IACS UR S27 (Rev. 6 June 2013) "Strength Requirements for Fore Deck Fittings and Equipment";
f) 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.

- END -

EU RO Mutual Recognition Technical Requirements

CABLE TIES	Version	0.3
	Adoption Date	1 April 2016
	Application Date	1 October 2016
	Tier	2
This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements ***** Uncontrolled if downloaded or printed *****		

1. PRODUCT DESCRIPTION

1.a General description of the product

Cable ties are fixing devices for bundling or tying groups of cables together. They may be of metallic, non-metallic or of composite design.

1.b Application limitations

Cable ties are used for bundling or tying groups of cables within the specified environmental conditions. Cable ties may have installation limitations, for instance, where used for cables not laid on top of horizontal cable trays or similar, non-metallic cable ties shall be supplemented by metal clips or straps at no more than 2 m intervals, in order to prevent the release of cable in case of fire. This requirement, however, cannot be checked/ tested during the process of product type approval. Applicable for all cable ties:

a) Ambient operation air temperature shall be considered from -25°C to +45°C for cable ties installed on open deck, in dry cargo holds, steering gear compartments, deckhouses, forecastle spaces and similar spaces not provided with space heating;
b) Cable ties used for fixing of single-core cables shall be dimensioned to withstand short circuit electro-dynamic forces;
c) Where cargo gases or vapours are liable to damage the cable ties, careful consideration shall be given to the characteristics of the materials selected;

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For non-metallic cable ties:

d) Cables placed on non-horizontal cable trays or supports, shall have additional fixing by metallic cable clips or saddles at regular distances (e.g. 1 to 2 m) in order to retain the cable during a fire;

e) Non-UV resistant cable ties shall not be used on open deck. Suitability for permanent use shall be indicated as well as in-door/outdoor application.

1.c Intended use

Cable ties are used for bundling or tying of groups of cables together or securing cables on cable ladders or equivalent supporting structures.

1.d System context

The product shall effectively support electrical cables and secure them to the vessel's structure.

2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a i. Technical Requirements

a) Dependent on the application, the operating temperature shall be - 40°C outside up to +150°C for ties holding silicon rubber cable, if not otherwise specified. Other specification in conjunction with application restrictions shall be documented;

b) Loop tensile strength min.130N for ties up to 200mm length, 360N for ties longer than 200mm. Loop tensile strength shall be given in certificate as declared and tested by manufacturer, IEC 62275 6.2;

c) Cable ties shall be robust and shall have a sufficient surface area and shape so that cables could remain tight without their coverings or sheathing being damaged. Type of connection between ends of cable tie shall prevent a cable tie from becoming loose;

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d) Cable ties shall be made of corrosion resistant material or suitably corrosion inhibited before erection;
e) Cable ties shall be made of flame retardant material;
f) Type 2 requirements as per IEC 62275:2006 chapter 6.2.2 are applicable. Requirements of EN 50146 may be applicable instead of IEC 62275 where more stringent and appropriate.

2.a.ii. Technical documents to be submitted

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

a) Data sheet: Details of data sheet need be specified, such as, construction, materials, size and information listed in IEC62275 sub-clause 7.3 , loop tensile strength, max / min operation and installation temperatures, fire integrity properties, UV-resistance etc.;
b) Records of tests shall be carried out by accredited laboratories.

2.b Type testing requirements

a) Detailed requirements of the type test shall be in accordance with IEC62275: 2006 "Cable management systems-cable ties for electrical installations";
b) After the review of technical documentation (with details of type of connection between ends of a cable tie) the EU RO may decide if a vibration test acc. to UR E10 shall be additionally carried out. This test shall be carried out after tying a group of cables;
c) Non-metallic cable ties shall be flame retardant in accordance with IEC 60092-101 or an alternative and relevant National or International Standard; An additional flammability test shall be carried out as stated in IACS UR E10 with reference to IEC 60695-11-5 with an exposure time of 30 seconds even if the sample has separated from the mandrel during the test;
d) A vibration test according to IACS UR E10 shall be carried out;
e) For non-metallic cable ties resistance against hydraulic fluids, seawater, UV radiation and fire extinguishing media and solvents shall be proven. The test method shall be specified;
f) Additional tests, such as coating adhesive test for metal cable tie, which deemed necessary by the EU RO may be required.

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g) Increase of weight shall not be more than 3% at 20°C +/- 2°C after tests;
h) Test specimens shall be taken from the production line or from stocks†.
i) Tests shall be carried out in Laboratories recognized by the EU RO or 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.a 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).

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) Manufacturers name or trademark;
b) An identification marking detailing type and size.

If this is not possible due to the small size of the cable tie, the packaging shall be marked with the required information. All markings shall be legible and durable.

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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 relevant EU RO MR Type Approval Certificate:

a) Range/restrictions of application;
b) Marking of product;
c) Remarks.

6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
2013-04-30	0.0	Accepted by Advisory Board
2014-01-31	0.1	CRF008 - Reference to EU RO Framework Document for the Mutual Recognition of Type Approval added.
2015-01-31	0.2	CRF018 – Revision to par. 2.a.ii - Test results to be 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; CRF026/026a – Witness testing & control of test specimen; CRF028 – addition of 6 month application clause.

7. BACKGROUND INFORMATION / REFERENCES

a) IEC 62275 6.2;
b) IEC 62275:2006 chapter 6.2.2;
c) EN 50146;
d) IEC 60092-101;
e) IACS UR E10;
f) IEC 60695-11-5;
g) EU RO Framework Document for the Mutual Recognition of Type Approval.

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Contribution to fire tests' as per IEC 62275 is limited to 30 seconds, but will be stopped if the cable tie breaks as is likely to occur in the case of smaller sized ties. The purpose of the additional flammability test required by IACS UR E10 (see 2.b above) shall test if the material of the ties is flammable.

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 -

EU RO Mutual Recognition Technical Requirements

CLASS III PIPES FITTINGS (DY≤500 mm)	Version	0.3
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	Application Date	1 October 2016
	Tier	2
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1. PRODUCT DESCRIPTION

1.a General description of the product

Fittings are pipelines formed components bends, elbows, tees, plugs, reducers, diameter change transition pieces, adapters, caps etc., and other elements of pipelines, intended for pipelines branching and changing of conveying medium direction.

1.b Application limitations

These Technical Requirements apply to Class III pipes fittings as defined by IACS UR P2.2 Rev. 4 November 2001.

These Technical Requirements are not applicable for:

a) fittings intended for toxic and corrosive media, ammonia, liquefied gases, flammable media heated above its flash point or having a flash point below 60°C;
b) cargo and venting lines for gas and chemical tankers, but can used in open ended piping (drains, overflows, vents, exhaust gas lines, boiler escape pipes) for another medias as indicated in note 6 UR P2.2 **table 1;**
c) fittings fitted on the ship's side and collision bulkhead;
d) plastic fittings.

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1.c Intended use

a) Piping system for steam with design pressure up to 0,7 MPa and design temperature up to 170°C. Limited to Class III piping systems as defined by IACS UR P2.2 Rev. 4 November 2001;
b) Piping system for thermal oil with design pressure up to 0,7 MPa and design temperature up to 150°C;
c) Piping system for fuel oil, lubricating oil and flammable hydraulic oil with design pressure up to 0,7 MPa and design temperature up to 60°C;
d) Piping system for water, air, non-flammable gases and hydraulic fluids with design pressure up to 1,6 MPa and design temperature up to 200°C;
e) For open-ended pipes (drains, overflows, vents, exhaust gas lines, boiler escape pipes) irrespective of design temperature;
f) For cargo oil pipes.

2. DESIGN EVALUATION

2.a Engineering evaluation requirements2.a i.

Technical Requirements

Design

a) Fittings in piping systems shall be compatible with the pipes to which they are attached and to be suitable for the medium and service for which they are intended. Permissible operating pressure and temperature of fittings shall be determined in accordance with national or international codes or standards and it should be guaranteed by the manufacturer of the fitting;

Materials

b) Fittings should be made from the following materials: carbon and carbon-manganese steel, special alloy steel, copper and copper alloy, nodular cast iron and grey cast iron. The materials to be used for the various fittings shall be suitable for the medium and service for which the piping is intended. Nodular iron castings for fittings in Class III piping systems shall be made in a grade having a specified minimum elongation not less than 12 per cent on a

CLASS III PIPES FITTINGS (DY≤500 mm)	Version	0.3
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	Tier	2
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gauge length of $5{,}65\sqrt{So}$, where S_o is the actual cross-sectional area of the test piece.

For the use in pipe class III piping systems a material approval according to recognized standards is required;

c) Grey cast iron shall not be used for the following pipe fittings:
   i. boiler blow-off systems;
   ii. pipelines for steam;
   iii. fire extinguishing;
   iv. bilge and ballast systems;
   v. fitted on the external walls of fuel oil tanks or lubrication oil tanks that are subjected to the static head of internal fluid;
   vi. mounted on shell plating or sea chest;
   vii. mounted onto collision bulkheads;
   viii. cargo oil piping systems with a design pressure over 1.6MPa;
   ix. provided at the ship/shore connection of a flammable liquid cargo line.

Types of connections

d) Butt welded, slip-on sleeve and socket welded joints shall be used in connection of pipes and fittings;

e) The dimensions of flanges and relative bolts shall be chosen in accordance with the national standards. Flange attachments shall be in accordance with national or international standards that are applicable to the piping system and shall recognize the boundary fluids, design pressure and temperature conditions, external or cyclic loading and location;

f) Slip-on threaded joints having pipe threads where pressure-tight joints are made on the threads with parallel or tapered threads, shall comply with requirements of a recognized national or international standard. Slip-on threaded joints may be used in piping system except for piping systems conveying toxic or flammable media or services where fatigue, severe erosion or crevice corrosion is expected to occur. Threaded joints fitting with tapered thread shall be allowed for pipes with outside diameter not more than 60.3 mm. Slip-on threaded joints with parallel threads (straight-thread joints) are only acceptable if with O-ring sealing for connection to hydraulic equipment, but shall not be used for joining sections of pipe.

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2.a.ii. *Technical documents to be submitted*

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

The following documentation shall be submitted by the Manufacturer before type testing:

a) Fitting dimensions;
b) Maximum internal and external working pressure;
c) Working temperature range;
d) Intended services and installation locations;
e) Intended fluids;
f) Details of marking;
g) All relevant design drawings, catalogues, data sheets, calculations and functional descriptions;
h) Certificates and reports of relevant tests previously carried out;
i) Details of relevant standards;
j) Fully detailed sectional assembly drawings showing fittings and pipe connections;
k) Details of fitting's materials.

2.b Type testing requirements

a) The request for type approval shall be submitted by the Manufacturer or by the Applicant, if authorized by the Manufacturer.
b) Type tests shall be in accordance with applicable standards. Test specimens shall be selected from production line or at random from stock†. Where there are various sizes from type of fittings requiring approval, minimum of three separate sizes representative of the range, from each type of joints shall be subject to the hydrostatic test at the following value of pressure:

PH = 1,5P
where PH = test pressure (bar),
P = design pressure (bar).

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†.

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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)

3. PRODUCTION REQUIREMENTS

3.a. 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.b. Special requirements

All fittings for steam pipes, feed pipes, compresses air pipes and fuel oil pipes having a design pressure greater than 3,5 (bar) shall be subject to a hydrostatic test at the following value of pressure:

PH = 1,5P

where PH = test pressure (bar), but in no case less than 4 bar,

P = design pressure (bar).

Hydrostatic test can be carrying out together with pipes after assembly or separate.

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 logo;

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b) Type designation;
c) Size;
d) Pressure ratings;
e) The design standards that the fitting is manufactured in accordance with;
f) The material of which the pipe or fitting is made;
g) Year/ serial number.

Where the size of the fitting precludes inclusion of all of the above, the manufacturer's name or logo and batch number shall be marked on the fitting whilst the other information can be provided on the product certificates.

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 relevant EU RO MR Type Approval Certificate:

a) Product descriptions – Product, Model, Pressure and Temperature Range, Description, Material Designation, Intended Service, Ratings, Restrictions.

6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
2013-04-30	0.0	Accepted by Advisory Board
2014-01-31	0.1	CRF008 - Reference to EU RO Framework Document for the Mutual Recognition of Type Approval added.
2015-01-31	0.2	CRF018 – Revision to par. 2.a.ii - Test results to be 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; CRF026/026a – Witness testing & control of test specimen; CRF028 – addition of 6 month application clause.

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7. BACKGROUND INFORMATION / REFERENCES

a) IACS UR P2
b) 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.

- END -

EU RO Mutual Recognition Technical Requirements

COMPUTERS AND PROGRAMMABLE LOGIC CONTROLLERS (PLCS)	Version	0.3
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1. PRODUCT DESCRIPTION

1.a General description of the product

Computers and programmable logic controllers (PLC) intended to be used in systems that provide control, monitoring, alarm and safety functions that are subject to classification requirements. Aids to navigation and loading instruments are excluded.

1.b Application limitations

a) The approval shall cover hardware only. This excludes firmware, application software, and hardware designed for specific applications subject to classification. Firmware, system software, and application software are subject to additional separate approval, according to UR E22 and the rules of the classing EU RO (FAT and on-board review / tests);

b) The term PLC is here meant to comprise of elements such as backplanes, power supplies, CPUs, I/O units and bus communication units when these are considered an integral part, or natural extension, of the PLC. Sensors and actuators typically connected to the PLC in a system are not considered part of the PLC and are excluded from the scope of this programme;

c) Hardware intended for use in radio- or navigational applications where testing according to IEC Publication 60945 is required is excluded from the scope of

this programme. E.g. use in systems covered by the Marine Equipment Directive.

1.c Intended use

Control, monitoring, alarm, and safety functions provided by computer / PLC based systems subject to classification requirements.

1.d System context

Application of the control, monitoring, alarm, and safety 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

Ambient Conditions

a) The ambient condition given in **Table 2.1** shall be applied to the design, selection and arrangement of electrical installations in order to ensure their proper operation;
b) Electrical equipment shall be suitable for operations up to 55°C, regardless of location;
c) Electrical equipment shall be designed to withstand any vibrations that occur under normal conditions;
d) Electrical equipment, or the installation of electrical equipment, shall be provided with a degree of protection appropriate to the location, as a minimum the requirements of IEC Publication 60092-504. Electrical equipment shall have a minimum degree of protection equivalent to IP20, regardless of location or installation.

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Voltage and Frequency

e) Electrical equipment supplied from main and emergency switchboards shall be designed and manufactured so that it is capable of operating satisfactorily under the normally occurring voltage and frequency fluctuations. Such electrical equipment shall operate satisfactorily under those fluctuations in voltage and frequency that are given in **Table 2.2**. Any special systems, e.g. electronic circuits, whose functions cannot operate satisfactorily, within the limits given in this table, shall be supplied by suitable means, i.e. through stabilized supply.

Construction, Materials, Installations, etc.

f) All electrical equipment shall be constructed and installed so as not to cause injury when handled and touched in a normal manner;
g) Insulating materials and insulated windings shall be resistant to moisture, sea air and oil vapours;
h) Bolts, nuts, pins, screws, terminals, studs, springs and such other small parts shall be made of corrosion resistant material or to be suitably protected against corrosion.

2.a.ii. Technical documents to be submitted:

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

a) Drawings, schematics and functional description necessary to describe all parts of the equipment. The functional description can be in the form of user manuals, installation manuals, etc. as relevant;
b) Drawings and product specification of physical/electrical and logical interfaces including signal format, converters, I/O-cards, protective circuitry, data protocol, cabling, and required configuration;
c) Hardware, firmware and system software information necessary to identify the equipment under test. (Application software shall not be reviewed in the framework of type approval of computers / PLC);
d) Functional tests that are required by tests according to **Table 2.3** have to be defined. The tests shall be suitable to monitor all types of signal interfaces, inputs and outputs reliably. The necessary application program, wiring and

description of the functional verification should be part of the submitted test program and test reports;

Note:

The Manufacturer may submit the draft test programmes to the RO for verification prior to the commencement of any environmental & performance type testing. A certificate of accreditation for the selected laboratory/ laboratories) is generally a demand.

End of Note

e) Environmental- and Performance type test reports;
f) Special operational limitations, if any;
g) Documentation about the Production quality assurance system;
h) Product marking.

2.b Type testing requirements

a) Tests shall be carried out in accordance with the testing condition and method of the latest revision of IACS UR E10 with modifications given in **Table 2.3** in the presence of the EU RO's surveyor, and they shall be proven to satisfy the criteria of the last revision of IACS UR E10 and **Table 2.3**.
b) 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†;
c) All type testing shall be documented in accordance with ISO/IEC 17025;
d) It is the manufacturers' responsibility to make sure that the type testing is performed in accordance with approved test programme so being acceptable to the EU RO;
e) Test specimens shall be taken from the production line or from stocks†.
f) All tests are normally to be carried out on the same unit. Using different units for the different type of tests is acceptable provided that all EMC tests are carried out on the same unit (1), and all environmental tests are carried out on the same unit (2).

† 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

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(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

Refer to EU RO "Product Quality Assurance (PQA)" procedure (Appendix VI of EU RO Framework Document for the Mutual Recognition of Type Approval).

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.

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 relevant EU RO MR Type Approval Certificate:

a) Hardware, firmware, system software names / versions.

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6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
2013-04-30	0.0	Accepted by Advisory Board
2014-01-31	0.1	CRF008 - Reference to EU RO Framework Document for the Mutual Recognition of Type Approval added.
2015-01-31	0.2	CRF018 – Revision to par. 2.a.ii - Test results to be 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; CRF026/026a – Witness testing & control of test specimen; CRF028 – addition of 6 month application clause.

7. BACKGROUND INFORMATION / REFERENCES

a) EU RO Framework Document for the Mutual Recognition of Type Approval;

b) IACS UR E10 "Test specification for type approval";
c) IEC 60092-504 "Electrical installations in ships – Special features, Control and instrumentation";
d) IEC 60945 "Maritime Navigation and Radio communication Equipment and Systems – General Requirements";
e) IEC 60533 "Electrical and electronic installations in ships – Electromagnetic compatibility";
f) IACS UR E22 "On Board Use and Application of Programmable Electronic Systems".

8. MAINTENANCE / CLARIFICATION OF TECHNICAL REQUIREMENTS

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Table 2.1 – Angles of Inclination

Static inclination	Dynamic inclination
22.5° (Note 1)	22.5° (Note 1)

Note 1: In ships carrying liquefied gases in bulk and ships carrying dangerous chemicals in bulk, emergency power supplies shall remain operable with the ship flooded to a final athwart ships inclination up to a maximum of 30°. In this case the test level has to be named on the certificate.

Table 2.2 – Voltage and Frequency Fluctuation

(a) Voltage and frequency fluctuations for a.c. distribution systems (Note 1)

Type of fluctuation	**Fluctuation (Note 4)**	
	Permanent	**Transient**
Voltage	±10%	±20% (1.5 s duration)
Frequency	±5%	±10% (5 s duration)

(b) Voltage fluctuations for d.c. distribution systems (Note 2)

Type of fluctuation	**Fluctuation (Note 4)**
Voltage fluctuation (Permanent)	±10%
Voltage cyclic fluctuation deviation	5%
Voltage ripple	10%

(c) Voltage fluctuations for battery systems

Systems	**Fluctuation (Note 4)**
Components connected to the battery during charging (Note 3)	+30%, -25%
Components not connected to the battery during charging	+20%, -25%
All components	25% (2 s duration)

Note 1: *A.C.* distribution systems mean *a.c.* generator circuits and *a.c.* power circuits produced by inverters.
Note 2: *D.C.* distribution systems mean *d.c.* generator circuits and *d.c.* power circuits produced by converters.
Note 3: Different voltage fluctuations as determined by charging and discharging characteristics, including voltage ripples from the charging devices, may be considered.
Note 4: The numerical values given in the table, excluding those values for time, mean percentages of rated values.

Table 2.3 – Modified testing condition and method of IACS UR E10

NO.	TEST	PROCEDURE ACC. TO:*	TEST PARAMETERS	OTHER INFORMATION
*Note: indicates the testing procedure which is normally to be applied. However, equivalent testing procedure may be accepted by the individual EU RO provided that the Unified Requirements stated in the other columns are fulfilled.				
1.	Visual inspection	-	-	– conformance to drawings, design data, marking of product – quality of workmanship and construction
2.	Performance test	Manufacturer performance test programme based upon specification and relevant Rule requirements.	- standard atmosphere conditions - temperature: 25°C ± 10°C - relative humidity: 60% ± 30% - air pressure: 96 kPa ± 10 kPa	- confirmation that operation is in accordance with the requirements specified for particular system or equipment; - checking of self-monitoring features; - checking of specified protection against an access to the memory; - checking against effect of unerroneous use of control elements in the case of computer systems.
3.	External power supply failure	-	- 3 interruptions during 5 minutes; - switching-off time 30 s each case	- the time of 5 minutes may be exceeded if the equipment under test needs a longer time for start up, e.g. booting sequence - for equipment which requires booting, one additional power supply interruption during booting to be performed Verification of: - equipment behaviour upon loss and restoration of supply; - possible corruption of programme or data held in programmable electronic systems, where applicable.
4.	Power supply variations	-	AC SUPPLY

Combination	Voltage variation permanent %	Frequency variation permanent %
1	+10	+5
2	+10	-5
3	-10	-5
4	-10	+5
	transient 1,5 s %	transient 5 s %
5	+20	+10
6	-20	-10

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NO.	TEST	PROCEDURE ACC. TO:*	TEST PARAMETERS	OTHER INFORMATION
			DC SUPPLY Voltage tolerance Continuous: ±10% Voltage cyclic Variation: 5% Voltage ripple: 10% Electric battery supply: - +30% to –25% for equipment connected to charging battery or as determined by the charging/discharging characteristics, including ripple voltage from the charging device; - +20% to –25% for equipment not connected to the battery during charging.	
5.	Dry heat	IEC Publication 60068-2-2	Temperature: 55° ± 2°C Duration: 16 hours or Temperature: 70°C ± 2°C Duration: 16 hours (see note 1)	- equipment operating during conditioning and testing; - performance test during the last hour at the test temperature. - for equipment specified for increased temperature the dry heat test shall be conducted at the agreed test temperature and duration.
6.	Damp heat	IEC Publication 60068-2-30 test Db	Temperature: 55°C Humidity: 95% Duration: 2 cycles 2 x (12 +12 hours) 2^{+3}_{0}	- measurement of insulation resistance before test; - the test shall start with 25°C±3°C and at least 95% humidity - equipment operating during the complete first cycle and switched off during second cycle except for performance test; - performance test during the first 2 hours of the first cycle at the test temperature and during the last 2 hours of the second cycle at the test temperature; - recovery at standard atmosphere conditions; - insulation resistance measurements and - performance test.

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NO.	TEST	PROCEDURE ACC. TO:*	TEST PARAMETERS	OTHER INFORMATION
7.	Vibration	IEC Publication 60068-2-6 Test Fc	Hz to 13.2 Hz – amplitude ±1mm 13.2 Hz to 100 Hz – acceleration ± 0.7 g. For severe vibration conditions such as, e.g. on diesel engines, air compressors, etc.: 2.0 Hz to 25 Hz – amplitude ±1.6 mm 25.0 Hz to 100 Hz – acceleration ± 4.0 g. Note: More severe conditions may exist for example on exhaust manifolds or fuel oil injection systems of diesel engines. For equipment specified for increased vibration levels the vibration test shall be conducted at the agreed vibration level, frequency range and duration. Values may be required to be in these cases 40 Hz to 2000 Hz - acceleration ± 10.0g at 600°C, duration 90 min.	- duration in case of no resonance condition 90 minutes at 30 Hz; - duration at each resonance frequency at which Q≥ 2 is recorded - 90 minutes; - during the vibration test, performance tests shall be carried out; - tests to be carried out in three mutually perpendicular planes; - Q should not exceed 5, - mechanical resonances with amplification greater than 10 will not be accepted. - where sweep test shall be carried out instead of the discrete frequency test and a number of resonant frequencies is detected close to each other, duration of the test shall be 120 min. Sweep over a restricted frequency range between 0.8 and 1.2 times the critical frequencies can be used where appropriate. Note: Critical frequency is a frequency at which the equipment being tested may exhibit: - malfunction and/or performance deterioration - mechanical resonances and/or other response effects occur, e.g. chatter

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<table>
<tr><th>NO.</th><th>TEST</th><th>PROCEDURE ACC. TO:*</th><th>TEST PARAMETERS</th><th>OTHER INFORMATION</th></tr>
<tr><td>8.</td><td>Inclination</td><td>Publication IEC 60092-504</td><td>Static 22.5°

Dynamic 22.5°</td><td>a) inclined to the vertical at an angle of at least 22.5°
b) inclined to at least 22.5° on the other side of the vertical and in the same plane as in (a),
c) inclined to the vertical at an angle of at least 22.5° in plane at right angles to that used in (a),
d) inclined to at least 22.5° on the other side of the vertical and in the same plane as in (c).
Note: The period of testing in each position should be sufficient to fully evaluate the behaviour of the equipment.

Using the directions defined in a) to d) above, the equipment shall be rolled to an angle of 22.5° each side of the vertical with a period of 10 seconds.
The test in each direction shall be carried out for not less than 15 minutes.
On ships for the carriage of liquified gases and chemicals, the emergency power supply shall remain operational with the ship flooded up to a maximum final athwart ship inclination of 30°.
Note: These inclination tests are normally not required for equipment with no moving parts.</td></tr>
<tr><td>9.</td><td>Insulation resistance</td><td></td><td><table><tr><th rowspan="2">Rated supply voltage Un (V)</th><th rowspan="2">Test voltage Un (V)</th><th colspan="2">Min. insulation resistance</th></tr><tr><th>before test M ohms</th><th>after test M ohms</th></tr><tr><td>Un ≤ 65</td><td>2 x Un min. 24V</td><td>10</td><td>1.0</td></tr><tr><td>Un > 65</td><td>500</td><td>100</td><td>10</td></tr></table></td><td>- for high voltage equipment, reference is made to UR E11.
- insulation resistance test shall be carried out before and after: damp heat test, cold test, salt mist test and high voltage test;
- between all phases and earth; and where appropriate, between the phases.
Note: Certain components e.g. for EMC protection may be required to be disconnected for this test.</td></tr>
</table>

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NO.	TEST	PROCEDURE ACC. TO:*	TEST PARAMETERS	OTHER INFORMATION
10.	High voltage		Rated voltage Un (V) / Test voltage (A.C. voltage 50 or 60Hz) (V): Up to 65: 2 x Un + 500 66 to 250: 1500 251 to 500: 2000 501 to 690: 2500	- for high voltage equipment, reference is made to UR E11. - separate circuits shall be tested against each other and all circuits connected with each other tested against earth; - printed circuits with electronic components may be removed during the test; - period of application of the test voltage: 1 minute
11.	Cold	IEC Publication 60068-2-1	Temperature: +5°C ± 3°C Duration: 2 hours or Temperature: –25°C ± 3°C Duration: 2 hours (see note 2)	- initial measurement of insulation resistance; - equipment not operating during conditioning and testing except for performance test; - performance test during the last hour at the test temperature; - insulation resistance measurement and the performance test after recovery
12.	Salt mist	IEC Publication 60068-2-52 Test Kb	Four spraying periods with a storage of 7 days after each	- initial measurement of insulation resistance and initial performance test; - equipment not operating during conditioning; - performance test on the 7th day of each storage period; - insulation resistance measurement and performance test 4 to 6h after recovery. (see Note 3) - on completion of exposure, the equipment shall be examined to verify that deterioration or corrosion (if any) is superficial in nature.
13.	Electrostatic discharge	IEC 61000-4-2	Contact discharge: 6kV Air discharge: 8kV Interval between single discharges: 1 sec. No. of pulses: 10 per polarity According to test level 3.	- to simulate electrostatic discharge as may occur when persons touch the appliance; - the test shall be confined to the points and surfaces that can normally be reached by the operator; - Performance Criterion B (See Note 4).

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NO.	TEST	PROCEDURE ACC. TO:*	TEST PARAMETERS	OTHER INFORMATION
14.	Electromagnetic field	IEC 61000-4-3	Frequency range: 80 MHz to 2 GHz Modulation**: 80% AM at 1000Hz Field strength: 10V/m Frequency sweep rate: ≤1.5 x 10^{-3} decades/s (or 1%/3 sec) According to test level 3.	- to simulate electromagnetic fields radiated by different transmitters; - the test shall be confined to the appliances exposed to direct radiation by transmitters at their place of installation. - Performance criterion A (See Note 5) **If for tests of equipment an input signal with a modulation frequency of 1000 Hz is necessary a modulation frequency of 400 Hz may be chosen.
15.	Conducted low Frequency		AC: Frequency range: rated frequency to 200th harmonic; Test voltage (rms): 10% of supply to 15th harmonic reducing to 1% at 100th harmonic and maintain this level to the 200th harmonic, min 3 V r.m.s, max 2 W. DC: Frequency range: 50 Hz - 10 kHz; Test voltage (rms): 10% of supply max. 2 W	- to stimulate distortions in the power supply system generated for instance, by electronic consumers and coupled in as harmonics; - performance criterion A (see Note 5). - See figure - “Test set-up”
16.	Conducted Radio Frequency	IEC 61000-4-6	AC, DC, I/O ports and signal/control lines: Frequency range: 150 kHz - 80 MHz Amplitude: 3 V rms (See Note 6) Modulation ***: 80% AM at 1000 Hz Frequency sweep range: ≤ 1.5 x 10-3 decades/s (or 1%/3sec.) According to test level 2	- equipment design and the choice of materials shall stimulate electromagnetic fields coupled as high frequency into the test specimen via the connecting lines. - performance criterion A (see Note 5). *** If for tests of equipment an input signal with a modulation frequency of 1000 Hz is necessary a modulation frequency of 400 Hz may be chosen.
17.	Burst/Fast Transients	IEC 61000-4-4	Single pulse rise time: 5 ns (between 10% and 90% value) Single pulse width: 50 ns (50% value) Amplitude (peak): 2kV line on power supply port/earth; 1kV on I/O data control and communication ports (coupling clamp) Pulse period: 300 ms; Burst duration: 15 ms; Duration/polarity: 5 min According to test level 3.	- arcs generated when actuating electrical contacts; - interface effect occurring on the power supply, as well as at the external wiring of the test specimen; - performance criterion B (see Note 4).

COMPUTERS AND PROGRAMMABLE LOGIC CONTROLLERS (PLCS)	Version	0.3
	Adoption Date	1 April 2016
	Application Date	1 October 2016
	Tier	2
This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements ***** Uncontrolled if downloaded or printed *****		

NO.	TEST	PROCEDURE ACC. TO:*	TEST PARAMETERS	OTHER INFORMATION
18.	Surge immunity	IEC 61000-4-5	Open-circuit voltage: Pulse rise time: 1.2 µs (front time) Pulse width: 50 µs (time to half value) Amplitude (peak): 1kV line/earth; 0.5kV line/line Short-circuit current: Pulse rise time: 8 µs (front time) Pulse width: 20 µs (time to half value) Repetition rate: ≥ 1 pulse/min No of pulses: 5 per polarity Application: continuous According to test level 2.	- interference generated for instance, by switching "ON" or "OFF" high power inductive consumers; - test procedure in accordance with figure 10 of the standard for equipment where power and signal lines are identical; - performance criterion B (see Note 4).
19.	Radiated Emission	CISPR 16-1, 16-2	For equipment installed in the bridge and deck zone. Frequency range: / Quasi limits: 0.15 - 0.3 MHz: 80 - 52 dBµV/m 0.3 - 30 MHz: 50 - 34 dBµV/m 30 - 2000 MHz: 54 dBµV/m except for: 156 -165 MHz: 24 dBµV/m For equipment installed in the general power distribution zone. Frequency range: / Quasi limits: 0.15 - 30 MHz: 80 - 50 dBµV/m 30 - 100 MHz: 60 - 54 dBµV/m 100 - 2000 MHz: 54 dBµV/m except for: 156 - 165 MHz: 24 dBµV/m	- procedure in accordance with the standard but distance 3 m between equipment and antenna - alternatively the radiation limit at a distance of 3 m from the enclosure port over the frequency 156 MHz to 165 MHz shall be 30 dBµV/m peak.

COMPUTERS AND PROGRAMMABLE LOGIC CONTROLLERS (PLCS)	Version	0.3
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NO.	TEST	PROCEDURE ACC. TO:*	TEST PARAMETERS	OTHER INFORMATION
20.	Conducted Emission	CISPR 16-1, 16-2	For equipment installed in the bridge and deck zone. Frequency range: / Limits: 10 - 150 kHz: 96 - 50 dBµV 150 - 350 kHz: 60 - 50 dBµV 350 kHz - 30 MHz: 50 dBµV For equipment installed in the general power distribution zone. Frequency range: / Limits: 10 - 150 kHz: 120 - 69 dBµV 150 - 500 kHz: 79 dBµV 0.5 - 30 MHz: 73 dBµV	
21.	Flame retardant	IEC 60092-101 or	Flame application: 5 times 15 s each. Interval between each application: 15s or 1 time 30s. Test criteria based upon application.	- the burnt out or damaged part of the specimen by not more than 60 mm long.
		IEC 60695-11-5	The test is performed with the EUT or housing of the EUT applying needle-flame test method.	- no flame, no incandescence or - in the event of a flame or incandescence being present, it shall extinguish itself within 30 s of the removal of the needle flame without full combustion of the test specimen.
22.	Compass safe distance measurement	IEC 60945		- the test is applied to equipment intended for installation on the navigation bridge
23.	Acoustic noise and signals measurement	IEC 60945		- the test is applied to equipment intended for installation on the navigation bridge

Notes:
1. Equipment to be mounted in consoles, housing etc. together with other equipment shall be tested with 70°C.
2. For equipment installed in non-weather protected locations or cold locations test shall be carried out at –25°C.
3. Salt mist test shall be carried out for equipment installed in weather exposed areas.
4. Performance Criterion B: (For transient phenomena): The EUT shall continue to operate as intended after the tests. No degradation of performance or loss of function is allowed as defined in the technical specification published by the manufacturer. During the test, degradation or loss of function or performance which is self recoverable is however allowed but no change of actual operating state or stored data is allowed.

5. Performance Criterion A: (For continuous phenomena): The Equipment Under Test shall continue to operate as intended during and after the test. No degradation of performance or loss of function is allowed as defined in relevant equipment standard and the technical specification published by the manufacturer.
6. For equipment installed on the bridge and deck zone, the test levels shall be increased to 10V rms for spot frequencies in accordance with IEC 60945 at 2, 3, 4, 6.2, 8.2, 12.6, 16.5, 18.8, 22, 25 MHz.

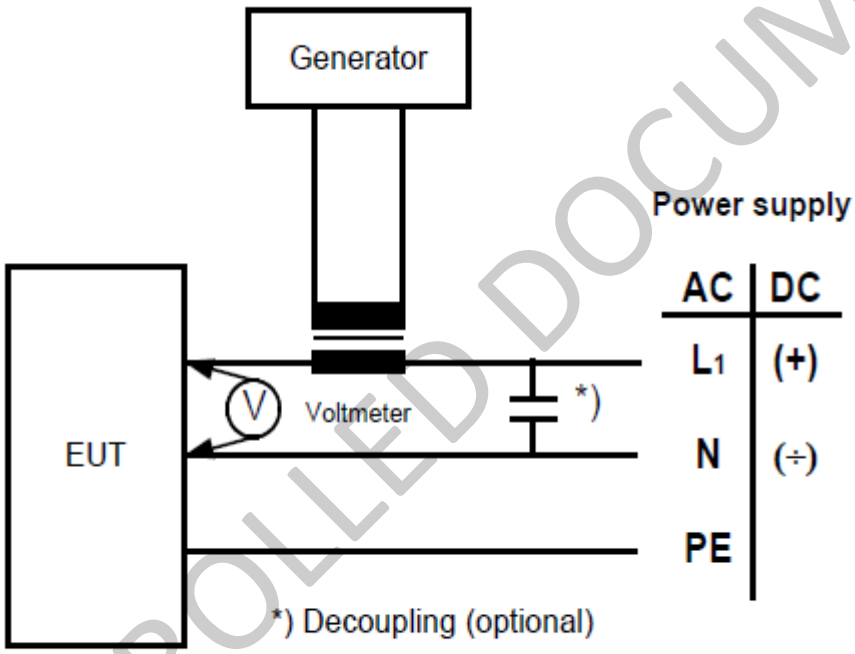

Figure - Test Set-up – Conducted Low Frequency Test

End of Document

EU RO Mutual Recognition Technical Requirements

ELECTRICAL/ELECTRONIC RELAYS	Version	0.4
	Adoption Date	1 July 2018
	Application Date	1 January 2019
	Tier	2
This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements ***** Uncontrolled if downloaded or printed *****		

1. PRODUCT DESCRIPTION

1.a General description of the product

Relays means:

a) devices designed to produce sudden, predetermined changes in one or more electrical output circuits when certain conditions are fulfilled in the electrical input circuit controlling the device;
b) thermal electrical relays which protect equipment from electrical thermal damage by the measurement of current flowing in the protection equipment;
c) measuring relays (including time relays) and protection equipment including any combination of devices for power system protection such as control, monitoring and process interface equipment.

1.b Application limitations†

a) Restricted to LV relays according to IEC 60947-5-1 and IEC 60255 installed onboard ships with exceptions as per SOLAS Ch. I, Reg. 3;
b) Installation on board ships within locations with climatic, biological, chemically active, mechanically active and mechanical environmental conditions not exceeding those for which performance has been proved according to IEC 60721-3-6 (1987) + A2 (1997);
c) The requirements are not applicable for relays to be installed in areas where explosive gases or vapor atmospheres may occur.

ELECTRICAL/ELECTRONIC RELAYS	Version	0.4
	Adoption Date	1 July 2018
	Application Date	1 January 2019
	Tier	2
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† 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.

1.c Intended use

a) Power supply system characteristics as per IEC 60092-101; 2.8;
b) Environment category 6K4, 6B2, 6C2, 6S2 and 6M3 according to IEC 60721-3-6 or conditions specified in IEC 60947-1 Annex Q.

1.d System context

See 1.c

2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a i. Technical Requirements

Type, ratings and characteristics of relays for intended applications shall be evaluated. In general, IEC 60947 and IEC 60255 series shall be observed.

2.a.ii. Technical documents to be submitted

Prior to tests:

a) Proposed test program and test schedule;
b) Description of test specimens and explanation of the selected test sample(s) providing evidence that the selected sample meets the most rigorous and demanding requirements;
c) Product descriptions, manuals, data sheets, assembly drawings, dimension drawings, etc. clearly identifying the product;
d) Complete accreditation certificate of the Test laboratory;
e) Details of production sites;
f) Product specification;
g) Application, working area;

h) Instructions on fitting, assembly and operation;
i) QM-certificate according to ISO 9001or equivalent by an accredited certifying body.

After completion of tests:
On completion of tests, a report shall be issued, identified by number and date, which accurately, clearly and unambiguously presents the test results and all other relevant information.

Test report(s) shall include the following information:

j) Type of product, with type number / serial number(s) and quantity tested;
k) Test specification for the product identified by number, revision and date;
l) Details of test equipment and measuring instruments stating serial numbers and calibration certificates;
m) Names of the test engineer and the engineer approving the report;
n) Ambient environmental conditions during the test;
o) The test results with a description of any failures encountered;
p) Conclusion.

Test report(s) shall be signed by the test personnel and verified by an EU RO or the agreed independent representative witnessing the tests.

The complete product test report(s) shall be submitted to the Type Approval Centre.

2.b Type testing requirements

The following tests specified in IACS UR E10 or IEC 60947-1 shall be performed:

a) Visual Inspection;
b) Performance test (acc. to IEC 60947-1 or IEC 60255 and IEC 60947-4-1 for thermal relays);
c) External power supply failure;
d) Power supply variations;
e) Dry heat;
f) Damp heat;
g) Vibration;
h) Inclination;
i) Insulation resistance;
j) High Voltage;
k) Cold;

l) Flammability;
m) Salt mist for relays installed on weather exposed areas. EMC tests are required in case of digital relays;
n) Test specimens shall be taken from the production line or from stocks†;
o) 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.euromr.org/technical-requirements).

3. PRODUCTION REQUIREMENTS

3.a 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.b Special requirements

a) Routine test according to relevant IEC 60947 series or IEC 60255 series;
b) Production certification according to ISO 9001 or equivalent by an accredited certifying body;
c) QM/QS audit (annual) to be submitted to the EU RO for review (similar to MED);
d) Production of the equipment shall be limited to the facilities listed on EU RO certificate;
e) Production and environmental requirements according to EU directives (for the consideration of the technical steering group);
f) Changes to the product will invalidate the EU RO certification;
g) RO. shall be granted access to all manufacturing and testing facilities, and provided with all the information necessary to perform its duties;
h) General terms and conditions of EU RO shall be observed.

ELECTRICAL/ELECTRONIC RELAYS	Version	0.4
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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 i.e. IEC 60947 item 5.2 or IEC 60255-1 item 6.1.

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 relevant EU RO MR Type Approval Certificate:

a) Type designations and dimensions of enclosures/boxes;
b) Product description;
c) Environmental category (including additional tests where applicable);
d) Range of application;
e) Test standards with the date and/or No. of edition.

6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
2013-04-30	0.0	Accepted by Advisory Board
2014-01-31	0.1	CRF008 - Reference to EU RO Framework Document for the Mutual Recognition of Type Approval added.
2015-01-31	0.2	CRF018 – Revision to par. 2.a.ii - Test results to be in English; CRF020 – Revision to par. 5 - 'Type Approval Certificate Content'.
1 April 2016	0.3	CRF024 – Revision to par.1.b a) & 2.b b) by replacing referenced standards; CRF025 – Updated to new MR TR document format incl. par. 8; CRF026/026a – Witness testing & control of test specimen; CRF028 – Addition of 6-month application clause.
1 July 2018	0.4	CRF032 - Corrected reference to standard IEC 60721-3-6 (1987) + A2 (1997)

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7. BACKGROUND INFORMATION / REFERENCES

a) IEC 60947-1 Low-voltage switchgear and control gear - Part 1: General rules;
b) IEC 60947 item 5.2;
c) IEC 60255 series Measuring relays and protection equipment;
d) IEC 60255-1 item 6.1;
e) IEC 60721-3-6 (1987) + A2 (1997);
f) IACS UR E10 "Test specification for Type Approval'';
g) 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: https://www.euromr.org/technical-requirements.

- END -

EU RO Mutual Recognition Technical Requirements

ELECTRIC CABLES – HEATING CABLES	Version	0.3
	Adoption Date	1 April 2016
	Application Date	1 October 2016
	Tier	2
This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements ***** Uncontrolled if downloaded or printed *****		

1. PRODUCT DESCRIPTION

1.a General description of the product

Heating cables for electrical resistance trace heating systems.

1.b Application limitations

Heating cables used typically for direct and storage heating, snow melting and frost protection of pipes.

1.c Intended use

See 1.b

1.d System context

See 1.b.

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	Tier	2
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2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a i. Technical Requirements

a) Heating cables shall be constructed in accordance with IEC Publications: IEC 60800 or IEC 62395-1 and 2 for applications in non-explosive atmospheres, IEC 60079-30-1 and 2 for applications in explosive atmospheres;
b) The heating cables shall be at least of the flame-retardant type according to IEC Publication 60332-1.

2.a.ii. Technical documents to be submitted

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

Technical specifications and drawings describing:

a) The types and temperature range of heating cables for which approval is requested, to show compliance with the relevant requirements;
b) Explanations of the different heating cable type description;
c) IEC publications applied;
d) Material designations according to IEC standards.

Manufacturer shall submit the following information about heating cable design standard:

e) Voltage and temperature range;
f) Applied materials;
g) Drawing of heating cable construction.

2.b Type testing requirements

Heating cables shall be tested in accordance with IEC Publications:

a) IEC 60800 or IEC 62395-1 and 2 for applications in non-explosive atmospheres;
b) IEC 60079-30-1 and 2 for applications in explosive atmospheres;
c) IEC 60332-1 according to type;

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At the option of the manufacturer for the concerned type of heating cable, additional type tests shall be in accordance with:

d) IEC 60754-1/2 (halogen free);
e) IEC 61034-1/2 (low smoke);
f) IEC 60684-2 (fluorine content).

Test specimens shall be taken from the production line or from stocks†. 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.a. 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.b Special Requirements

Continuous in-process inspections as well as intermediate testing during production shall be carried out according to the applicable IEC standard for the concerned heating cable.

4. MARKING REQUIREMENTS

The heating cable shall be marked in compliance with the marking requirements of the applicable IEC standard for the concerned cable.

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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 relevant EU RO MR Type Approval Certificate:

(a) Description, specification, construction, range. Listing range of all approved heating cable variants in certificate;
(b) Applicable Standards with their date of issue, including those applied at the option of the manufacturer (halogen free, low smoke, fluorine content etc.);
(c) Test reports;
(d) Limitations.

6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
2013-04-30	0.0	Accepted by Advisory Board
2014-01-31	0.1	Removed word 'Shall' from 2.b (c) (CRF010) Reference to EU RO Framework Document for the Mutual Recognition of Type Approval added.
2015-01-31	0.2	CRF018 – Revision to par. 2.a.ii - Test results to be 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; CRF026/026a – Witness testing & control of test specimen; CRF028 – addition of 6 month application clause.

ELECTRIC CABLES – HEATING CABLES	Version	0.3
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This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements ***** Uncontrolled if downloaded or printed *****		

7. BACKGROUND INFORMATION / REFERENCES

a) IEC 60800 or IEC 62395-1 and 2 for applications in non-explosive atmospheres;
b) IEC 60079-30-1 and 2 for applications in explosive atmospheres;
c) IEC 60332-1 according to type;
d) IEC 60754-1/2 (halogen free);
e) IEC 61034-1/2 (low smoke);
f) IEC 60684-2 (fluorine content);
g) 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.

- END -

EU RO Mutual Recognition Technical Requirements

EXPANSION JOINTS	Version	0.3
	Adoption Date	1 April 2016
	Application Date	1 October 2016
	Tier	2
This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements ***** Uncontrolled if downloaded or printed *****		

1. PRODUCT DESCRIPTION

1.a General description of the product

a) Expansion joints made of composite construction, utilizing metallic material (e.g. steel, stainless steel, or equivalent material wire braid) with rubberized/elastomeric coatings inside and/or outside or similar arrangements;
b) External fire-resistant sleeves may be accepted, if needed, to ensure fire-resistant characteristics;
c) Full-metal bellow-type expansion joints are covered by a different set of Rules and therefore cannot be considered within this specific technical requirement.

1.b Application limitations

These rules are intended for use in Class III oil piping systems only. Not to be used on chemical or liquefied gas cargo systems

1.c Intended use

Primarily intended for use in fuel, lubricating and hydraulic oil piping systems. Other services (e.g. exhaust gas or water systems) might be considered in connection with different requirements regarding *inter alia* fire resistance.

1.d System context

Oil or other piping systems

2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a.i. Technical Requirements

a) Materials (with particular regard to non-metallic ones) shall be suitable for the intended medium and service. The Manufacturer shall specify qualification tests for cover ozone resistance, cover wear behaviour, liner resistance to intended fluids;
b) Pressure-Temperature rating, as well as allowable movement range, shall be suitable for the intended service;
c) Hydrostatic burst pressure shall be minimum 4 times the Maximum Allowable Working Pressure;
d) To be fire-resistant type when used for flammable fluid service (regardless of flashpoint), and for sea water/bilge service where failure may result in flooding.

2.a.ii. Technical documents to be submitted

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

a) Technical specifications, drawings, installation sheets and type test reports, describing the type and range of expansion joints for which approval is requested, and showing compliance with the relevant requirements;
b) Copy of ISO 9001 certificate or industry equivalent for production place.

2.b Type testing requirements

a) Test specimens shall be taken from the production line or from stocks†.
b) 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†.
c) Visual inspection;
d) Pressure test to 1.5 times the intended MAWP, 5 min holding time (test procedure in substantial agreement with IACS UR P2.11.5.5.1.a);
e) Hydrostatic burst test to 4 times the intended MAWP;

f) Fire test as per ISO 15540 and ISO 15541 (minimum pressure 10 bar);

g) Elastic deformation test as follows: the samples, complete with all the accessories as in the operating conditions, shall be hydrostatically tested at a pressure twice the maximum design pressure, and no appreciable permanent deformation shall occur.

Note:

For a given range of joints of same design and rating, burst-, elastic deformation- and fire-tests shall be satisfactorily carried out on at least 3 specimens, one of which to be the smallest size in the range, one the largest, and one of an intermediate size (possibly close to mid-range size.

End of Note

h) Endurance test as follows.

- The rubber compensator shall be installed in a rig where the following conditions apply:
- The temperature shall be maintained at +75°C ± 5°C;
- One end of the flexible pipe assembly or bellow shall be rigidly fixed to the rig;
- The other end shall be fixed to a device producing sinusoidal vibration;
- The flange bolts shall be tightened to the manufacturer's recommended torque;
- Pressurise the bellow with test fluid to the design pressure. The vibration shall act along an angle 90° on the centreline of the bellow. The vibration shall impart lateral movement to the bellow. The amplitude shall be ± 1.25 mm around the bellow's centreline with a frequency of 3000 cycles per minute for 10^7 cycles. No leakage or other defects are allowed at the end of the test.

i) Oil resistance test as follows:

- The materials in the inner tube and the cover of bellow to be type approved for hydrocarbons or mineral oil based hydraulic fluids shall be subject to an oil absorption test. At least 3 test samples from each type of rubber (3from the inner tube material and 3 from the cover material if different materials are used) shall be prepared for this test. The test specimens shall be rectangular blocks with dimensions (length × width × thickness) = 50 mm × 25 mm × 1.6 mm. The test samples

shall be immersed in ASTM oil no. 3 or equivalent at the hose maximum design temperature for 70 hours. The average volume change of all 6 test samples shall be between 0% and 60%. Test procedure according to ISO 1817;

j) The following documentation shall be submitted:
   - documentation of the said prototype testing ;
   - an assembly and detail drawing of all parts vital for the integrity of the product (3 copies);
   - catalogue;
   - operational conditions (working temperature, pressure, medium etc.).

† 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

Every expansion joint shall be certified by the Manufacturer, subject to satisfactory performance of routine test(s) as per applicable standard or specification. Some EU ROs might request individual certificates.

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;
b) Month and year of manufacture;
c) Product designation, DN, pressure/temperature rating;
d) Inspection certificate (on flange) when so required by the EU RO.

EXPANSION JOINTS	Version	0.3
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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 relevant EU RO MR Type Approval Certificate:

a) Intended service;
b) Description, including basic details such as type of reinforcement and elastomer manufacturing process (e.g. hot vulcanizing, injection moulding, cast polymerization etc.);
c) Rating(s);
d) Comments and service restrictions.

6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
2013-04-30	0.0	Accepted by Advisory Board
2014-01-31	0.1	CRF008 - Reference to EU RO Framework Document for the Mutual Recognition of Type Approval added.
2015-01-31	0.2	CRF018 – Revision to par. 2.a.ii - Test results to be 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) ISO 9001;
b) IACS UR P2.11.5.5.1.a;
c) ISO 15540;
d) ISO 15541;
e) EU RO Framework Document for the Mutual Recognition of Type Approval.

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8. MAINTENANCE / CLARIFICATION OF TECHNICAL REQUIREMENTS

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- END -

EU RO Mutual Recognition Technical Requirements

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1. PRODUCT DESCRIPTION

1.a General description of the product

a) Description of product according to IEC IEV 845-10-07;

b) Luminaire (or lighting fixture) which satisfies the appropriate regulations applicable to equipment with explosion-proof enclosure, for use in situations where there is a risk of explosion and in vessel's environmental conditions as referred in Table 2.1, 2.2 and 2.3;

c) Specification according to requirements of IEC 60092-306 (which mainly refers to IEC 60079-1 for flameproof enclosure "d" luminaires, IEC 60598-1 General Requirements and tests for Luminaires).

1.b Application limitations

a) Flameproof lighting fixtures shall be used in low voltage circuits (100V to 250V 50/60Hz ac and 24V dc);

b) Performances shall be tested according to IEC60092-306;

c) Environmental conditions shall be tested according to IACS UR E10 as applicable.

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1.c Intended use

Illumination of areas where an explosive gas or flammable vapour may be present in the atmosphere (referred to as a hazardous area).

1.d System context

See 1.c

2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a i. Technical Requirements

General

Flameproof lighting fixtures shall be in accordance with IEC60079-1 E6.0 2007 "Explosive atmospheres - Part 1: Equipment protection by flameproof enclosures "d"" or the standard deemed appropriate by the Society or equivalent thereto and also to comply with the requirements in this 2.a.i.

Further to the above, light fixtures to be designed according to the following IEC standards as applicable:

a) IEC 60598-1 (2008-04) Luminaries Part 1: General Requirements and Tests;
b) IEC 60598-2-1 (1979-01) Part 2: Particular requirements. Section One: Fixed general purpose luminaries + am1 (1987-01);
c) IEC 60598-2-2 ed.3.0 (2011-11) Part 2: Particular requirements. Section 2: Recessed luminaries;
d) IEC 60598-2-4 (1997-04) Part 2: Particular requirements. Section 4: Portable general purpose luminaries;
e) IEC 60598-2-5 (1998-01) Part 2-5: Floodlights;
f) IEC 60598-2-6 (1994-06) Part 2: Particular requirements. Section 6: Luminaries with built-in transformers for filament lamps + am1 (1996-11);
g) IEC 60598-2-22 ed.3.2 (2008-04) Part 2-22: Particular requirements - Luminaries for emergency lighting;

h) IEC 60092-306 (2009-11) Part 306: Equipment - Luminaries and accessories;
i) IMO Resolution A.752 (18) Adopted on 4 Nov. 1993: Guidelines for the evaluation, testing and application of Low-Location lighting on passenger ships or ISO 15370 (2001) Ships and marine technology - Low-location lighting on passenger ships.

Materials

j) Materials for flameproof construction shall have an adequate electrical, mechanical, thermal and chemical resistance against the environmental condition and flammable gases or vapours (hereinafter referred to as “gases”) at the location of the electrical equipment concerned;
k) Enclosures and outer fittings of portable appliances shall be of materials which minimize the risk of spark by friction, or to have a non-metallic strong cover with hanging strap;
l) Insulating compounds and sealing compounds used for integral parts of a flameproof construction shall be such that no harmful expansion, contraction, softening or crack is found during in service. The insulating compounds applied to bare live-parts shall be flame-retardant;

Construction

m) The glazed ports of lighting fittings of flameproof type shall be provided with guards of robust material when the maker considers that the additional mechanical protection is necessary;
n) Where gaskets are considered necessary, they shall comply with the applicable requirements of IEC 60079-1 and IEC 60079-14;
o) Leading-in parts of cables shall be of a construction suitable for ship cables. Consideration shall be given so that the cables can be surely fixed at the cable gland, except where the cables are installed in steel conduits.

2.a.ii. Technical documents to be submitted

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

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a) Main drawings for assembled luminaires;
b) References to design standards, rules, specifications etc.;
c) Specification of applied material for enclosure and insulation;
d) Test results (from tests already carried out, if any). Only one copy;
e) Applicant's proposal to Product Sample Test and Routine Test;
f) Documentation of reliability and endurance on board ships and Mobile Offshore Units, if any;
g) Special operational limitations;
h) Field of Application;
i) List of Type designations for each variant;
j) Construction details:
   - Voltage
   - Power
   - Temperature class
   - Insulation class
   - Enclosure (IP) class
   - List of electrical parts and materials
   - Electric circuit diagrams
   - Explosion protection + certificate from recognised Test laboratory.
   - Special properties, if any.
k) Test programme, which as a minimum includes the elements for Type testing, Sec.2b. The test programme shall refer to the relevant IEC standards for each test.

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2.b Type testing requirements

Type test shall be based on general test for lighting fixtures as stated in the following IEC publications:

a) IEC 60598-1
b) IEC 60598-2-2
c) IEC 60598-2-5
d) IEC 60598-2-6
e) IEC 60598-2-22

Suitability for installation in ex-protected areas shall be tested as per:

f) IEC 60079-1alternatively certified or approved by a National or other appropriate authority;
g) IACS UR ER10 (see **table 2.3**).

Test specimens shall be taken from the production line or from stocks†. 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's 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

Refer to EU RO "Product Quality Assurance (PQA)" procedure (Appendix VI of EU RO Framework Document for the Mutual Recognition of Type Approval).

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4. MARKING REQUIREMENTS

The product shall be provided with visible marking, based on IEC 60079-0 and IEC 60598-1. As a minimum, the following information shall be provided:

a) Manufacturer's name or trade mark;
b) Type designation under which the product is type approved;
c) Temperature range of application;
d) Voltage;
e) Maximum current;
f) IP class;
g) Serial number and date of manufacture;
h) Caution and warning markings as applicable.

The marking shall be carried out in such a way that it is visible, legible and indelible throughout the anticipated life of the product, and that the marks can be traced back to the type approval certificate.

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 relevant EU RO MR Type Approval Certificate:

a) Environmental test items and test levels applied;
b) Approval conditions including limitations, if any;
c) Hardware, firmware, software name and revision, as applicable.

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6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
2013-04-30	0.0	Accepted by Advisory Board
2014-01-31	0.1	'IEC' to standards listed 2.b (b) to (e) (CRF007) and reference to EU RO Framework Document for the Mutual Recognition of Type Approval added.
2015-01-31	0.2	CRF018 – Revision to par. 2.a.ii - Test results to be 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; CRF026/026a – Witness testing & control of test specimen; CRF028 – addition of 6 month application clause.

7. BACKGROUND INFORMATION / REFERENCES

a) IEC60079-1 E6.0 2007 "Explosive atmospheres - Part 1: Equipment protection by flameproof enclosures "d"";
b) IEC 60598-1 (2008-04) Luminaries Part 1: General Requirements and Tests;
c) IEC 60598-2-1 (1979-01) Part 2: Particular requirements, Section One: Fixed general purpose luminaries + am1 (1987-01);
d) IEC 60598-2-2 (1997-09) Part 2: Particular requirements, Section 2: Recessed luminaries;
e) IEC 60598-2-4 (1997-04) Part 2: Particular requirements, Section 4: Portable general purpose luminaries;
f) IEC 60598-2-5 (1998-01) Part 2-5: Floodlights;
g) IEC 60598-2-6 (1994-06) Part 2: Particular requirements, Section 6: Luminaries with built-in transformers for filament lamps;
h) IEC 60598-2-22 (2008-04) Part 2-22: Particular requirements - Luminaries for emergency lighting + am1 (2008-01);
i) IEC 60092-306 (2009-11) Part 306: Equipment - Luminaries and accessories;
j) EU RO Framework Document for the Mutual Recognition of Type Approval.

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See tables 2.1 – 2.3 below:

Table 2.1 – Angles of Inclination

Static inclination	Dynamic inclination
22.5°(1)	22.5°(1)

Note:
In ships carrying liquefied gases in bulk and ships carrying dangerous chemicals in bulk, emergency power supplies shall remain operable with the ship flooded to a final athwart ships inclination up to a maximum of 30°. In this case the test level has to be named on the certificate.

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Table 2.2 - Voltage and Frequency Fluctuation

(a) Voltage and frequency fluctuations for a.c. distribution systems (Note 1)

Type of fluctuation	Fluctuation (Note 4)	
	Permanent	Transient
Voltage	±10%	± 20% (1.5s duration)
Frequency	± 5%	± 10% (5s duration)

(b) Voltage fluctuations for d.c. distribution systems (Note 2)

Type of fluctuation	Fluctuation (Note 4)
Voltage fluctuation (Permanent)	± 10%
Voltage cyclic fluctuation deviation	5%
Voltage ripple	10%

(c) Voltage fluctuations for battery systems

Systems	Fluctuation (Note 4)
Components connected to the battery during charging (Note 3)	+30%, -25%
Components not connected to the battery during charging	+20%, -25%
All components	± 25% (2s duration)

Notes

1: *A.C.* distribution systems mean *a.c.* generator circuits and *a.c.* power circuits produced by inverters.
2: *D.C.* distribution systems mean *d.c.* generator circuits and *d.c.* power circuits produced by converters.
3: Different voltage fluctuations as determined by charging and discharging characteristics, including voltage ripples from the charging devices, may be considered.
4: The numerical values given in the table, excluding those values for time, mean percentages of rated values.

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Table 2.3 – Testing condition and method

(Any changes made to IACS UR E10 in Revision 6.0 needs to be implemented in this test plan. Red text in the below table indicate requirements stricter than, or additional to, the ones defined in IACS UR E10 rev.5.)

NO.	TEST	PROCEDURE ACC. TO:*	TEST PARAMETERS	OTHER INFORMATION
* indicates the testing procedure which is normally to be applied. However, equivalent testing procedure may be accepted by the RO provided that the requirements stated in the other columns are fulfilled.				
1.	Visual inspection	-	-	• conformance to drawings, design data, marking of product
2.	Performance test	Manufacturer performance test programme based upon specification and relevant Rule requirements.	• standard atmosphere conditions • temperature: -25 to +70 centigrade • relative humidity: 60% ± 30% • air pressure: 96 KPa ± 10KPa	• confirmation that operation is in accordance with the requirements specified for particular system or equipment; • checking of self-monitoring features; • checking of specified protection against an access to the memory; • checking against effect of unerroneous use of control elements in the case of computer systems.

3.	External power supply failure	-	• 3 interruptions during 5 minutes;
			• switching-off time 60 s each case
				• The time of 5 minutes may be exceeded if the equipment under test needs a longer time for start up, e.g. booting sequence
				• For equipment which requires booting, one additional power supply interruption during booting to be performed
				• Verification of:
				  • equipment behaviour upon loss and restoration of supply;
				  • possible corruption of programme or data held in programmable electronic systems, where applicable.

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<table>
<tr>
<td>4.</td>
<td>Power supply variations
a) electric</td>
<td>-</td>
<td>AC SUPPLY
<table>
<tr><th>Combination</th><th>Voltage (%) variation permanent</th><th>Frequency (%) variation permanent</th></tr>
<tr><td>1</td><td>+6</td><td>+5</td></tr>
<tr><td>2</td><td>+6</td><td>-5</td></tr>
<tr><td>3</td><td>-10</td><td>-5</td></tr>
<tr><td>4</td><td>-10</td><td>+5</td></tr>
<tr><td></td><td>Voltage transient 1,5 s (%)</td><td>Frequency transient 5s (%)</td></tr>
<tr><td>5</td><td>+20</td><td>+10</td></tr>
<tr><td>6</td><td>-20</td><td>-10</td></tr>
</table>
DC SUPPLY
<table>
<tr><td>Voltage tolerance Continuous</td><td>± 10%</td></tr>
<tr><td>Voltage cyclic Variation</td><td>5%</td></tr>
<tr><td>Voltage ripple</td><td>10%</td></tr>
</table>
Electric battery supply:
• +30% to –25% for equipment connected to charging battery or as determined by the charging/discharging characteristics, including ripple voltage from the charging device;
• +20% to –25% for equipment not connected to the battery during charging.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) pneumatic and hydraulic</td>
<td></td>
<td>• Pressure: ±20%
• Duration: 15 minutes</td>
<td></td>
</tr>
</table>

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5.	Dry heat	IEC Publication 60068-2-2	• Temperature: 55° ± 2°C • Duration: 16 hours or • Temperature: 70°C ± 2°C • Duration: 16 hours (see note 1)	• equipment operating during conditioning and testing; • functional test during the last hour at the test temperature; • For equipment specified for increased temperature the dry heat test shall be conducted at the agreed test temperature and duration.
6	Damp heat	IEC Publication 60068-2-30 test Db	• Temperature: 55°C • Humidity: 95% • Duration: 2 cycles 2 x (12 + 12 hours)	• measurement of insulation resistance before test; • The test shall start with 20°C±3°C and at least 95% humidity • equipment operating during the complete first cycle and switched off during second cycle except for functional test; • functional test during the first 2 hours of the first cycle at the test temperature and during the last 2 hours of the second cycle at the test temperature; • recovery at standard atmosphere conditions; • insulation resistance measurements and performance test.

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7.	Vibration	IEC Publication 60068-2-6 Test Fc	• 2(+3, -0)Hz to 13.2 Hz – amplitude ±1mm • 13.2 Hz to 100 Hz – acceleration ± 0.7 g. For severe vibration conditions such as, e.g. on diesel engines, air compressors, etc.: • 2.0 Hz to 25 Hz – amplitude ±1.6 mm • 25.0 Hz to 100 Hz – acceleration ± 4.0 g. Note; More severe conditions may exist for example on exhaust manifolds or fuel oil injection systems of diesel engines. For equipment specified for increased vibration levels the vibration test shall be conducted at the agreed vibration level, frequency range and duration Values may be required to be in these cases 40 Hz to 2000 Hz – acceleration ± 10.0g at 600°C, duration 90 min.*	• duration in case of no resonance condition 90 minutes at 30 Hz; • duration at each resonance frequency at which Q≥ 2 is recorded – 90 minutes; • during the vibration test, functional tests shall be carried out; • tests to be carried out in three mutually perpendicular planes; • Q should not exceed 5; • where sweep test shall be carried out instead of the discrete frequency test and a number of resonant frequencies is detected close to each other duration of the test shall be 120 min. Sweep over a restricted frequency range between 0.8 and 1.2 times the critical frequencies can be used where appropriate. Note: Critical frequency is a frequency at which the equipment being tested may exhibit: • malfunction and/or performance deterioration • mechanical resonances and/or other response effects occur, e.g. chatter • mechanical resonances with amplification greater than 5 will not be accepted

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8.	Inclination	Publication IEC 60092-504	Static 22.5°	a) inclined to the vertical at an angle of at least 22.5° b) inclined to at least 22.5° on the other side of the vertical and in the same plane as in (a), c) inclined to the vertical at an angle of at least 22.5° in plane at right angles to that used in (a), d) inclined to at least 22.5° on the other side of the vertical and in the same plane as in (c). Note: The period of testing in each position should be sufficient to fully evaluate the behaviour of the equipment.
			Dynamic 22.5°	• using the directions defined in a) to d) above, the equipment shall be rolled to an angle of 22.5° each side of the vertical with a period of 10 seconds. The test in each direction shall be carried out for not less than 15 minutes • On ships for the carriage of liquefied gases and chemicals, the emergency power supply shall remain operational with the ship flooded up to a maximum final athwart ship inclination of 30°. Note: These inclination tests are normally not required for equipment with no moving parts.

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<table>
<tr>
<td>9.</td>
<td>Insulation resistance</td>
<td>-</td>
<td>
<table>
<tr><th rowspan="2">Rated supply voltage Un (V)</th><th rowspan="2">Test voltage Un (V)</th><th colspan="2">Min. insulation resistance</th></tr>
<tr><th>before test (M ohms)</th><th>after test (M ohms)</th></tr>
<tr><td>Un ≤ 65</td><td>2 x Un, min. 24V</td><td>10</td><td>1.0</td></tr>
<tr><td>Un > 65</td><td>500</td><td>100</td><td>10</td></tr>
</table>
</td>
<td>
• for high voltage equipment, reference is made to IACS UR E11.
• insulation resistance test shall be carried out before and after: damp heat test, cold test, salt mist test, and high voltage test;
• between all phases and earth; and where appropriate, between the phases.
Note: Certain components e.g. for EMC protection may be required to be disconnected for this test.
</td>
</tr>
<tr>
<td>10.</td>
<td>High voltage</td>
<td></td>
<td>
<table>
<tr><th>Rated voltage Un (V)</th><th>Test voltage (A.C. voltage 50 or 60 Hz) (V)</th></tr>
<tr><td>• Up to 60</td><td>• 1000</td></tr>
<tr><td>• 61 to 300</td><td>• 2000</td></tr>
<tr><td>• 301 to 690</td><td>• 2500</td></tr>
</table>
</td>
<td>
• for high voltage equipment, reference is made to IACS UR E11.
• separate circuits shall be tested against each other and all circuits connected with each other tested against earth;
• printed circuits with electronic components may be removed during the test;
• period of application of the test voltage: 1 minute
</td>
</tr>
<tr>
<td>11.</td>
<td>Cold</td>
<td>IEC Publication 60068-2-1</td>
<td>
• Temperature: +5°C ± 3°C
• Duration: 2 hours
• or
• Temperature: –25°C ± 2°C
• Duration: 16 hours
(see Note 2)
</td>
<td>
• initial measurement of insulation resistance;
• equipment not operating during conditioning and testing except for functional test;
• functional test during the last hour at the test temperature;
• insulation resistance measurement and the functional test after recovery
</td>
</tr>
</table>

12.	Salt mist	IEC Publication 60068-2-52 Test Kb	• Four spraying periods with a storage of 7 days after each.	• initial measurement of insulation resistance and initial functional test; • equipment not operating during conditioning; • functional test on the 7th day of each storage period; • insulation resistance measurement and performance test 4 to 6h after recovery (see Note 3) On completion of exposure, the equipment shall be examined to verify that deterioration or corrosion (if any) is superficial in nature.
13.	Electrostatic discharge	IEC 61000-4-2	• Contact discharge: 6kV • Air discharge: 8kV • Interval between single discharges: 1 sec. • No. of pulses: 10 per polarity • According to test level 3	• to simulate electrostatic discharge as may occur when persons touch the appliance; • the test shall be confined to the points and surfaces that can normally be reached by the operator; • Performance Criterion B (See Note 4).
14.	Electro-magnetic field	IEC 61000-4-3	• Frequency range: 80 MHz to 6 GHz • Modulation**: 80% AM at 1000Hz • Field strength: 10V/m • Frequency sweep rate: ≤1.5 x 10-3 decades/s (or 1%/3 sec) • According to test level 3	• to simulate electromagnetic fields radiated by different transmitters; • the test shall be confined to the appliances exposed to direct radiation by transmitters at their place of installation. • performance criterion A (See Note 5) ** If for tests of equipment an input signal with a modulation frequency of 1000 Hz is necessary a modulation frequency of 400 Hz may be chosen.

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15.	Conducted low frequency	IEC 60533	AC: • Frequency range :rated frequency to 200th harmonic; • Test voltage (rms) : 10% of supply to 15th harmonic reducing to 1% at 100th harmonic and maintain this level to the 200th harmonic, min 3 V r.m.s, max 2 W. DC: • Frequency range : 50 Hz - 10 kHz; • Test voltage (rms) :10% of supply max. 2 W	• to stimulate distortions in the power supply system generated for instance, by electronic consumers and coupled in as harmonics; • performance criterion A (see Note 5). • See figure – test set-up
16.	Conducted radio frequency	IEC 61000-4-6	AC, DC, I/O ports and signal/control lines: • Frequency range : 150 kHz-80 MHz • Amplitude : 3 V rms (See Note 6) • Modulation ***: 80% AM at 1000 Hz • Frequency sweep range: ≤ 1.5 x 10-3 decades/s (or 1%/3sec.) • According to test level 2. For bridge and deck mounted equipment (in accordance with IEC 60945): • Amplitude 10V rms; at Spot frequencies: 2, 3, 4, 6.2, 8.2, 12.6, 16.5 18.8, 22 and 25MHz • Modulation: 80% ±10% at 1000 Hz ±10%; or 400 Hz ±10% where an input signal at a modulation frequency of 1000 Hz is necessary.	• Equipment design and the choice of materials shall stimulate electromagnetic fields coupled as high frequency into the test specimen via the connecting lines. • performance criterion A (see Note 5) *** If for tests of equipment an input signal with a modulation frequency of 1000 Hz is necessary a modulation frequency of 400 Hz may be chosen.

17.	Burst/fast transients	IEC 61000-4-4	• Single pulse rise time: 5ns (between 10% and 90% value)
			• Single pulse width: 50 ns (50% value)
			• Amplitude (peak):
			  • 2kV line on power supply port/earth;
			  • 1kV on I/O data control and communication ports (coupling clamp)
			• Pulse period: 300 ms;
			• Burst duration: 15 ms;
			• Duration/polarity: 5 min
			• According to test level 3.
				• arcs generated when actuating electrical contacts;
				• interface effect occurring on the power supply, as well as at the external wiring of the test specimen;
				• performance criterion B (see Note 4)

18.	Surge/voltage	IEC 61000-4-5	Open-circuit voltage: • Pulse rise time: 1.2 µs (front time) • Pulse width: 50 µs (time to half value) • Amplitude (peak) : 1kV line/earth; 0.5kV line/line Short-circuit current: • Pulse rise time: 8 µs (front time) • Pulse width: 20 µs (time to half value) • Repetition rate: ≥ 1 pulse/min • No of pulses: 5 per polarity • Application: continuous • According to test level 2.	• interference generated for instance, by switching “ON” or “OFF” high power inductive consumers; • test procedure in accordance with figure 10 of the standard for equipment where power and signal lines are identical; • performance criterion B (see Note 4)

FLAMEPROOF LUMINAIRE (LIGHTING FIXTURE)	Version	0.3
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19.	Radiated emission (less than 1GHz)	CISPR 16-1, 16-2	For equipment installed in the bridge and deck zone.
			• Frequency range: quasi peak Limits :
			  • 0.15-0.3 MHz: 80-52dBµV/m
			  • 0.3-30 MHz: 52-34dBµV/m
			  • 30 - 1000MHz: 54dBµV/m
			except for:
			  • 156-165 MHz: 24 dBµV/m
			
			For equipment installed in the general power distribution zone.
			• Frequency range: quasi peak Limits:
			  • 0.15 - 30 MHz: 80 - 50 dBµV/m
			  • 30-100 MHz: 60-54 dBµV/m
			  • 100 - 1000 MHz: 54 dBµV/m
			except for:
			  • 156-165 MHz: 24 dBµV/m
				• procedure in accordance with the standard but distance 3 m between equipment and antenna
				• Alternatively the radiation limit at a distance of 3 m from the enclosure port over the frequency 156 MHz to 165 MHz shall be 30 dB micro-V/m peak.

20.	Radiated emission above 1GHz	CISPR 16-1, 16-2	• Frequency range: Limits:
			  • 1-3 GHz: 50dBµV/m average, 70dBµV/m peak
			  • 3-6 GHz: 54dBµV/m average, 74dBµV/m peak
			The limits of this test depends on the maximum used frequency within the EUT.
			• <108 MHz : not applicable
			• 108 MHz - 500 MHz: 2 GHz
			• 500 MHz – 1 GHz: 5 GHz
			• Above 1 GHz: 6 GHz
				• distance 3 m between equipment and antenna

21	Conducted emission	CISPR 16-1, 16-2	For equipment installed in the bridge and deck zone.
			• Frequency range: Limits:
			  • 10-150kHz: 96 - 50dBµV
			  • 150-350 kHz: 60 - 50 dBµV
			  • 350 kHz-30 MHz: 50 dBµV
			
			For equipment installed in the general power distribution zone.
				.

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			• Frequency range: Limits: • 10-150 kHz: 120 - 69 BµV • 150-500kHz: 79dBµV • 0.5 - 30 MHz: 73 dBµV	
22.	Flame retardant	IEC 60092-101 or IEC 60695-11-5	• Flame application: 5 times 15 s each. • Interval between each application: 15s or 1 time 30s. • Test criteria based upon application. The test is performed with the EUT or housing of the EUT applying needle-flame test method.	• the burnt out or damaged part of the specimen by not more than 60 mm long • no flame, no incandescence or • in the event of a flame or incandescence being present, it shall extinguish itself within 30 s of the removal of the needle flame without full combustion of the test specimen • any dripping material shall extinguish itself in such a way as not to ignite a wrapping tissue. The drip height is 200 mm ± 5 mm
23	Compass safe distance measurement	IEC 60945		• the test is applied to equipment intended for installation on the navigation bridge
24	Acoustic noise and signals measurement	IEC 60945		• the test is applied to equipment intended for installation on the navigation bridge
25	Enclosure Ingress Protection	IEC Publication 60529 "Degrees of protection provided by enclosures (IP code)" or an acceptable National Standard.	• minimum IP56 for open deck	

Notes:

1. Equipment to be mounted in consoles, housing etc. together with other equipment shall be tested with 70°C.
2. For equipment installed in non-weather protected locations or cold locations test shall be carried out at –25°C.
3. Salt mist test shall be carried out for equipment installed in weather exposed areas.

4. Performance Criterion B: (For transient phenomena): The EUT shall continue to operate as intended after the tests. No degradation of performance or loss of function is allowed as defined in the technical specification published by the manufacturer. During the test, degradation or loss of function or performance which is self-recoverable is however allowed but no change of actual operating state or stored data is allowed.

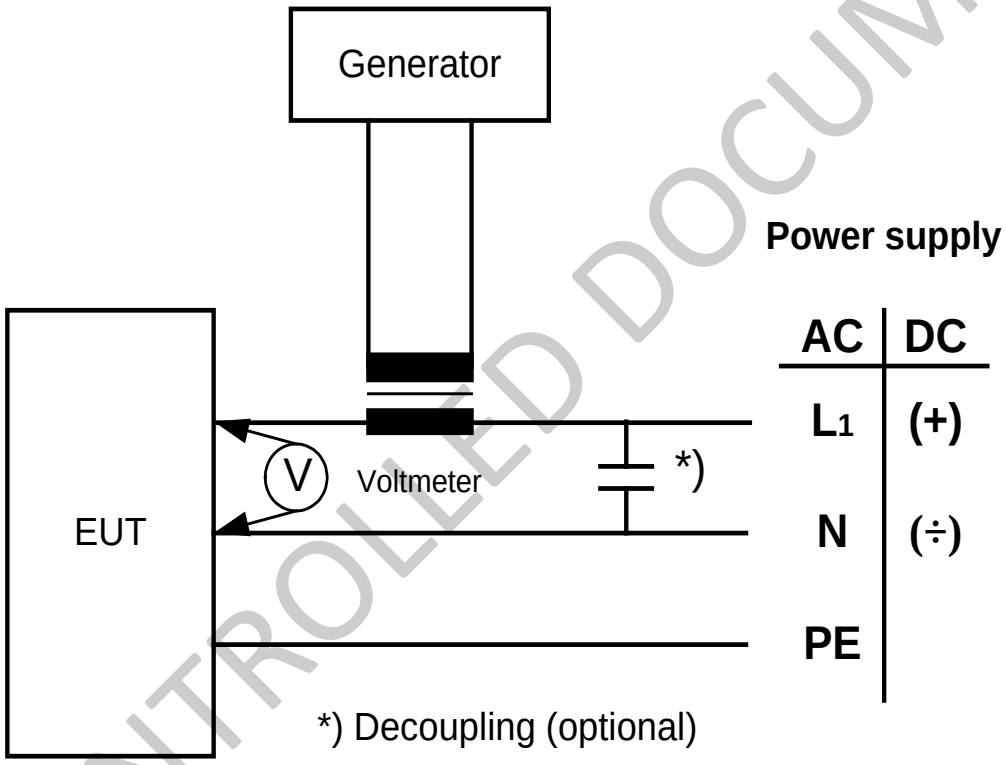

Figure - Test Set-up – Conducted Low Frequency Test

- END -

EU RO Mutual Recognition Technical Requirements

PLASTIC PIPING SYSTEMS (COMPONENTS)	Version	0.3
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1. PRODUCT DESCRIPTION

1.a General description of the product and definitions

a) Plastic(s) means both thermoplastic and thermosetting plastic materials with or without reinforcement, such as PVC and FRP (fiber reinforced plastics);
b) Plastic includes synthetic rubber and materials of similar thermo/mechanical properties;
c) Pipes/piping systems means those made of plastic and include the pipes, fittings, joints, and any internal or external liners, coverings and coatings required to comply with the performance criteria. Fittings include bends, elbows, fabricated branch pieces, etc. made of plastic materials;
d) Joint means joining pipes by adhesive bonding, laminating, welding, etc.;
e) Fittings include bends, elbows, fabricated branch pieces, etc. made of plastic materials;
f) Nominal pressure is the maximum permissible working pressure which shall be determined in accordance with 2.a.i.1.2 below;
g) Design pressure is the maximum working pressure which is expected under operation conditions or the highest set pressure of any safety valve or pressure relief device on the system, if fitted;
h) Fire endurance is the capability of the piping system to perform its intended function, i.e. maintain its strength and integrity, for some predicted period of time while exposed to fire.

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1.b Application limitations

a) These requirements are applicable to all piping systems with parts made of rigid plastic;
b) Piping systems made of thermoplastic materials, such as polyethylene (PE), polypropylene (PP), and polybutylene (PB), and intended for non-essential services shall meet the requirements of recognised standards as well as the following paragraphs of these Technical Requirements;
c) These requirements are not applicable to flexible pipes and hoses and mechanical couplings used in metallic piping systems.

1.c Intended use

a) Plastics may be used for piping systems belonging to class III according to IACS Unified Requirement P2;
b) The use of plastics for other systems or in other conditions will be given special consideration.

1.d Arrangement and installation

a) Plastic piping systems shall be installed in accordance with the manufacturer's guidelines;
b) Requirements relevant to the items listed below shall be in compliance with Rules of the EU RO classifying the ship:
   I. Supports;
   II. Expansion;
   III. External loads;
   IV. Strength of connections;
   V. Earthing;
   VI. Application of fire protection coatings;
   VII. Penetration of fire divisions and watertight bulkheads or decks;
   VIII. Systems connected to the hull.

Testing activities after installation on board shall be in compliance with Rules of the EU RO classifying the ship.

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2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a i. Technical Requirements

The specification of piping shall be in accordance with a recognised national or international standard acceptable to the EU RO. In addition, the following requirements apply.

2.a.i.1 General

a) The piping shall have sufficient strength to take account of the most severe concomitant conditions of pressure, temperature, the weight of the piping itself and any static and dynamic loads imposed by the design or environment;
b) The nominal pressure shall be specified with due regard for the maximum possible working temperature in accordance with manufacturer's recommendations;
c) The strength of fittings and joints shall be not less than that of the pipes.

2.a.i.2 Nominal pressure

Piping systems shall be designed for a nominal pressure determined from the following conditions:

a) **Internal pressure**
The nominal internal pressure shall not exceed the smaller of:

Psth/4*

Plth/2,5

where:
Psth: Short-term hydrostatic test failure pressure
Plth: Long-term hydrostatic test failure pressure (>100 000 hours)**.

*) Safety factor 4 is applicable to thermosetting plastic piping system whereas for thermoplastic pipes the safety factor specified in the relevant recognized standard applies.

**) Testing may be carried out over a reduced period of time using suitable standard, such as ASTM D2837 and D1598.

b) **External pressure** (to be considered for any installation subject to vacuum conditions inside the pipe or a head of liquid acting on the outside of the pipe).
The nominal external pressure shall not exceed Pcol/3, where:

Pcol: Collapse pressure

The external pressure is the sum of the vacuum inside the pipe and the static pressure head outside the pipe.

c) **The collapse pressure** shall not be less than 3 bar.

2.a.i.3 Permissible temperature

a) In general, plastic pipes shall not be used for media with a temperature above 60°C or below 0°C, unless satisfactory justification is provided to the EU RO;

b) The permissible working temperature range depends on the working pressure and shall be in accordance with manufacturer's recommendations;

c) The maximum permissible working temperature shall be at least 20°C lower than the minimum heat distortion temperature of the pipe material, determined according to ISO 75 method A or equivalent;

d) The minimum heat distortion temperature shall not be less than 80°C. In case of thermoplastic piping system the minimum heat distortion temperature shall be in compliance with the relevant standard;

e) Where it is proposed to use plastics piping in low temperature services, design strength testing shall be made at a temperature 10 degree C lower than the minimum working temperature.

2.a.i.4 Axial strength

a) The sum of the longitudinal stresses due to pressure, weight and other loads shall not exceed the allowable stress in the longitudinal direction.

b) In the case of fibre reinforced plastic pipes, the sum of the longitudinal stresses shall not exceed half of the nominal circumferential stress derived from the nominal internal pressure condition (see [2.a.i1.2]).

2.a.i.5 Impact Resistance

Plastic pipes and joints shall have a minimum resistance to impact in accordance with a recognised national or international standard.

2.a.i.6 Bonding of pipes and fittings

a) The procedure for making bonds shall be submitted to the EU RO for qualification. It shall include the following:

I. materials used;
II. tools and fixtures;
III. joint preparation requirements;
IV. cure temperature;
V. dimensional requirements and tolerances;
VI. acceptance criteria for the test of the completed assembly;
VII. environmental parameters (temperature, humidity, etc.).

b) When a change in the bonding procedure may affect the physical and mechanical properties of the joints, the procedure shall be re-qualified;
c) The person carrying out the bonding shall be qualified. Records shall be available to the EU RO Surveyor for each qualified person demonstrating the bonding procedure and performance qualification, together with dates and results of the qualification testing.

2.a.i.7 Technical Requirements depending on service and/or location

2.a.i.7.a Fire endurance

a) The requirements for fire endurance of plastic pipes and their associated fittings shall be in compliance with IMO Res. A.753(18) as amended by Res. MSC.313(88), for the various systems and locations where the pipes are used;

b) The required fire endurance level of the pipe shall be maintained in way of pipe supports, joints and fittings, including those between plastics and metallic pipes.

2.a.i.7.b Flame spread

a) All exposed plastic piping, except those fitted on open decks and within tanks, cofferdams, pipe tunnels and ducts, shall have low spread characteristics not exceeding average values listed in IMO Resolution A.653(16);

b) Surface flame characteristics shall be determined using the procedure given in IMO Res. A.653(16) with regard to the modifications due to the curvilinear pipe surfaces as listed in Appendix 3 of Res. A.753(18);

c) Surface flame spread characteristics may also be determined using the text procedures given in ASTM D635, or other national equivalent standards. When using ASTM D653, maximum burning rate of 60 mm/second applies. In case of adoption of other national equivalent standards, the relevant acceptance criteria shall be defined.

2.a.i.7.c Fire protection coating

Where a fire protective coating of pipes and fittings is necessary for achieving the fire endurance level required, it shall meet the following requirements:

a) The pipes are generally to be delivered from the manufacturer with the protective coating on;

b) The fire protection properties of the coating shall not be diminished when exposed to salt water, oil or bilge slops. It shall be demonstrated that the coating is resistant to products likely to come into contact with the piping;

c) In considering fire protection coatings, such characteristics as thermal expansion, resistance against vibrations and elasticity shall be taken into account. It is advisable that these characteristics are close to the same characteristics of pipes;

d) The fire protection coatings shall have sufficient resistance to impact to retain their integrity. It is advisable that these characteristics are close to the same characteristics of pipes;

e) Random samples shall be tested to determine the adhesion qualities of the coating to the pipe.

2.a.i.7.d Electrical conductivity

a) Piping systems conveying fluids capable of generating electrostatic charges, such as refined products and distillates, and in any case piping systems conveying fluids with a conductivity of less than 1000 pico-siemens per meter, shall be made of conductive pipes;

b) Regardless of the fluid to be conveyed, plastic pipes passing through hazardous areas shall be electrically conductive;

c) Where electrical conductivity shall be ensured, the resistance of the pipes and fittings shall not exceed: 1 x 10E5 Ohm/m;

d) It is preferred that pipes and fittings are homogeneously conductive. Where pipes and fittings are not homogeneously conductive, conductive layers shall be provided, suitably protected against the possibility of spark damage to the pipe wall;

e) Satisfactory earthing shall be provided;

f) Electrical continuity shall be maintained across joints and fittings and the system shall be earthed. The resistance to earth from any point in the piping system shall not exceed 1MOhm.

2.a.ii. Technical documents to be submitted

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

The request for type approval shall be submitted to EU RO by the Manufacturer or by the Applicant, if authorised by the Manufacturer, and shall include:

a) General information:

I. Pipe and fitting dimensions
II. Maximum internal and external working pressure
III. Permissible temperature range
IV. Intended services and installation locations
V. The level of fire endurance
VI. Electrical conductivity
VII. Intended fluids
VIII. Limits on flow rates
IX. Serviceable life
X. Installation instructions
XI. Details of marking

b) Drawings and supporting documentation:

I. Certificates and reports of relevant tests previously carried out
II. Details of relevant standards
III. All relevant design drawings, catalogues, data sheets, calculations and functional descriptions
IV. Fully detailed sectional assembly drawings showing pipe, fittings and pipe connections
V. Specification of any internal or external liners, coverings and coatings

c) Materials

I. The resin type
II. Catalyst and accelerator types, and concentration employed in the case of reinforced polyester resin pipes or hardeners where epoxide resins are employed
III. A statement of all reinforcements employed; where the reference number does not identify the mass per unit area or the tex number of a roving used in a filament winding process, these shall be detailed

IV. Full information regarding the type of gel-coat or thermoplastic liner employed during construction, as appropriate
V. Cure/post-cure conditions. The cure and post-cure temperatures and times
VI. Resin/reinforcement ratio employed
VII. Winding angle and orientation.

d) Physical properties:

I. Strength of pipe against bending and twisting
II. Strength of bonded section against abrasions by sand, sludge, etc.
III. Types of joints and relevant joint procedures
IV. Data of bending strength and fatigue strength for standard types of bends and joints, if available.

2.b Type testing requirements

2.b.i. General

a) Test specimens shall be taken from the production line or from stocks†.
b) 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†.
c) The type tests shall demonstrate compliance of the pipes, fittings, joints, any internal or external liners, coverings and coatings for which Type Approval is sought with the requirements in paragraph. 2.a. above in respect of:

I. short-term and long-term design strength collapse (external pressure strength);
II. impact resistance; After the test the specimen shall be subjected to hydrostatic pressure equal to 2.5 times the design pressure for at least 1 hour;
III. fire endurance (**see Note 1**);
IV. low flame spread characteristics (**see Note 1**);
V. electrical resistance (for electrically conductive pipes) (**see Note 1**).

Note 1: If not carried out, the range of approved application will be limited.

d) For the above tests, representative samples of pipes and fittings shall be selected to the satisfaction of EU RO;
e) In special cases, at EU RO's discretion, the required tests will be considered on a case-by-case basis;
f) Alternatively, hydrostatic test failure pressure and collapse pressure may be determined by a combination of tests and calculations, subject to the agreement with EU RO;
g) EU RO reserves the right to require additional tests, if considered necessary to ensure the intended reliability;
h) For bonding qualification tests, see para. 2.b.ii.

† 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.b.ii. Test methods

a) Pipes, fittings, joints, any internal or external liners, coverings and coatings shall be tested for compliance with the requirements of standards acceptable to EURO. **Table 1** and paragraph 2.b.ii.1 indicate, in addition to the compulsory test procedures given in para. 2.a above, examples of acceptable standards. In any case, the strength of pipes shall be determined by means of a hydrostatic test on pipe samples subjected to increasing pressure up to failure, the pressure being increased at a rate giving burst after 60-70 seconds. Such test shall be carried out under the standard conditions:

   - atmospheric pressure equal to 100kPa
   - relative humidity 30%

– environmental and fluid temperature 25°C.

a) After the impact resistance test, the specimen shall be subjected to hydrostatic pressure equal to 2,5 times the design pressure for at least 1 hour;
b) Internal pressure test and fire endurance tests shall be carried out on pipe spools applying the appropriate bonding procedures applicable whereas all the other tests may be carried out on straight pipes or material samples as specified in the appropriate test standard.

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Table 1 - Typical additional standards for all systems

	Test	Typical Standard	Notes
1	Internal pressure **(1)**	ASTM D 1599, ASTM D 2992 ISO 15493 or equivalent	Top, Middle, Bottom (of range). Tests are to be carried out on pipe spools made of different pipe sizes, fittings and pipe connections.
2	External pressure **(1)**	ISO 15493 or equivalent	As above, for straight pipes only.
3	Load deformation	ASTM D 2412 or equivalent ASTM D 2924	Top, Middle, Bottom (of each pressure range)
4	Temperature limitations	GRP piping system: HDT test on each type of resin according to ISO 75 method A Thermoplastic piping systems: ISO 306 (Plastics - Thermoplastic materials - Determination of Vicat softening temperature (VST)). VICAT test according to ISO 2507	Each type of resin and thermoplastic material, e.g. PP, PVC, PE
5	Impact resistance **(1)**	ISO 9854: 1994, ISO 9653: 1991 ISO 15493 ASTM D 2444, or equivalent	Representative sample of each type of construction
6	Ageing	Manufacturer's standard; ISO 9142:1990	Each type of construction
7	Fatigue	Manufacturer's standard or service experience	Each type of construction
8	Fluid absorption	ISO 8361:1991	
9	Material compatibility **(2)**	ASTM C581; Manufacturer's standard	

(1) Test to be witnessed by the EU RO
(2) If applicable

2.b.ii.1 Typical additional standards depending on service and/or locations of piping

a) Fire endurance test on representative samples of each type of construction and type of pipe connection;
b) The requirements for fire endurance of plastic pipes and their associated fittings shall be in compliance with IMO Res. A.753(18) as amended by Res. MSC.313(88).

2.b.ii.2 Flame spread on representative samples of each type of construction.

a) All pipes, except those fitted on open decks and within tanks, cofferdams, pipe tunnels and ducts, shall have low spread characteristics not exceeding average values listed in IMO Resolution A.653(16);
b) Surface flame characteristics shall be determined using the procedure given in IMO Res. A.653(16) with regard to the modifications due to the curvilinear pipe surfaces as listed in Appendix 3 of Res. A.753(18);
c) Surface flame spread characteristics may also be determined using the text procedures given in ASTM D635, or other national equivalent standards;
d) Electrical conductivity on representative samples of each type of construction according to ASTM F1173-95 or ASTM, D 257, NS 6126 para. 11.2 or equivalent;
e) Smoke generation and toxicity test according to Res. MSC.307(88), IMO FTP Code, Part 2 item 2.6.1.4 and 2.6.2 on one diameter sample.

2.b.ii.3 Bonding qualification test

a) A test assembly shall be fabricated in accordance with the procedure to be qualified. It shall consist of at least one pipe-to-pipe joint and one pipe-to-fitting joint;
b) When the test assembly has been cured, it shall be subjected to a hydrostatic test pressure at a safety factor of 2,5 times the design pressure of the test assembly, for not less than one hour. No leakage or separation of joints is allowed. The test shall be conducted so that the joint is loaded in both longitudinal and circumferential directions;

c) Selection of the pipes used for the test assembly shall be in accordance with the following:

- when the largest size to be joined is 200 mm nominal outside diameter or smaller, the test assembly shall be the largest piping size to be joined.
- when the largest size to be joined is greater than 200 mm nominal outside diameter, the size of the test assembly shall be either 200 mm or 50 % of the largest piping size to be joined, whichever is the greater.

d) When conducting performance qualification, each bonder and each bonding operator shall make up test assemblies, the size and number of which shall be as required above.

3. PRODUCTION REQUIREMENTS

a) Each pipe and fitting shall be tested by the manufacturer at a hydrostatic pressure not less than 1,5 times the nominal pressure;
b) Alternatively, for pipes and fittings not employing hand layup techniques, the hydrostatic pressure test may be carried out in accordance with the hydrostatic testing requirements stipulated in the recognised national or international standard to which the pipes or fittings are manufactured;
c) Refer to EU RO “Product Quality Assurance (PQA)" procedure (Appendix VI of EU RO Framework Document for the Mutual Recognition of Type Approval).

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 logo;
b) Type designation;
c) Size;
d) Pressure ratings;

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e) The design standards that the pipe or fitting is manufactured in accordance with the material of which the pipe or fitting is made;
f) Date of fabrication/ serial number.

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.

6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
2013-04-30	0.0	Accepted by Advisory Board
2014-01-31	0.1	Added reference to EU RO Framework Document for the Mutual Recognition of Type Approval.
2015-01-31	0.2	CRF018 – Revision to par. 2.a.ii - Test results to be 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; CRF026/026a – Witness testing & control of test specimen; CRF028 – addition of 6 month application clause.

7. BACKGROUND INFORMATION / REFERENCES

a) IACS UR P2
b) IACS UR P4;
c) ASTM C581
d) ASTM D257;
e) ASTM D635;
f) ASTM D653;
g) ASTM D1212;
h) ASTM D1598;
i) ASTM D1599;

j) ASTM D2444;
k) ASTM D2837;
l) ASTM D2924;
m) ASTM D2992;
n) ASTM F1173-95;
o) ASTM NS6126;
p) ISO 75 method A;
q) ISO 0306;
r) ISO 15493;
s) ISO 2507;
t) ISO 8361:1991;
u) ISO 9142:1990;
v) ISO 9653:1991;
w) ISO 9854:1994;
x) IMO Res. A.753(18) as amended by Res. MSC.313(88);
y) IMO Res. A.653 (16);
z) IMO FTP Code;
aa) Res. MSC 307.88;
bb) 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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1. PRODUCT DESCRIPTION

1.a General description of the product

These Technical Requirements apply to devices, commonly known as spark arresters, which prevent the emission of sparks by diesel engines, boilers and equipment containing sources of ignition and which could lead to the ignition of flammable materials.

1.b Application limitations

a) Limiting engine ratings shall be defined at type approval stage and not to be exceeded;
b) Where an exhaust system also includes other features which significantly restrict the flow of gases, e.g. flame traps, restrictive silencers, etc., or the engine manufacturer specifies an unusually low back pressure limit, or where specific noise reduction levels are specified, the type and size of the spark arrester shall be chosen according to manufacturer's instructions;
c) Manufacturer's installation guidelines shall be followed to the EU RO. All the above limitations shall be recorded in the Type Approval Certificate.

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1.c Intended use

Spark arrester intended for use in the exhaust line of diesel engines, boilers and equipment containing sources of ignition installed onboard ships or offshore units.

1.d System context

Exhaust systems for diesel engines, boilers and equipment containing sources of ignition, onboard ships or offshore units.

2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a i. Technical Requirements

The spark arrester shall comply with the requirements defined by one of the standards below in agreement with the Manufacturer:

a) European Norm EN 1834-1;
b) SAE standards J350, J342 and J997;
c) Other standards assessed to be equivalent with standards a) and b).

2.a.ii. Technical documents to be submitted

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

The following documentation shall be submitted by the Manufacturer before type testing:

a) Technical data and characteristics including limiting engine ratings;
b) Identification of different variants of sub-types;
c) Construction drawings;
d) Dimensions and tolerances;
e) Instructions on fitting and assembly;
f) Materials specification;
g) Proposed test program and test schedule as per one of the standards and norms defined in **2.a.i**;

h) Description of the test specimen(s) including serial numbers;
i) Relevant information on the testing facility;
j) Installation manual and maintenance requirements.

The following documentation shall be submitted by the Manufacturer after the completion of type testing:

a) Reports of tests as per one of the standards and norms defined in **2.a.i**, including details of test laboratory, place and date of tests;
b) Builder installation manual and guidelines for maintenance.

2.b Type testing requirements

a) The spark arrester shall be tested as required in standards and norms mentioned in **2.a.i**.
b) Test specimens shall be taken from the production line or from stocks†;
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's 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

Refer to EU RO "Product Quality Assurance (PQA)" procedure (Appendix VI of EU RO Framework Document for the Mutual Recognition of Type Approval.

SPARK ARRESTERS	Version	0.3
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	Tier	2
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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 trade mark;
b) type number;
c) serial number.

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.

6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
30 April 2013	0.0	Accepted by Advisory Board
31 January 2014	0.1	Reference to EU RO Framework Document for the Mutual Recognition of Type Approval.
31 January 2015	0.2	CRF018 – Revision to par. 2.a.ii - Test results to be 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; CRF026/026a – Witness testing & control of test specimen; CRF028 – addition of 6 month application clause.

7. BACKGROUND INFORMATION / REFERENCES

a) European Norm EN 1834-1;
b) SAE standard J342 Spark Arrester Test Procedure for Large Size Engines;
c) SAE standard J350 Spark Arrester Test Procedure for Medium Size Engines;
d) SAE standard J997 Spark Arrester Test Carbon;

e) European Norm EN1834-1 Reciprocating internal combustion engines. Safety requirements for design and construction of engines for use in potentially explosive atmospheres. Group II engines for use in flammable gas and vapour atmospheres.
f) 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.

- END -

EU RO Mutual Recognition Technical Requirements

ADJUSTABLE STEEL CHOCK	Version	0.2
	Adoption Date	1 April 2016
	Application Date	1 October 2016
	Tier	3
This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements ***** Uncontrolled if downloaded or printed *****		

1. PRODUCT DESCRIPTION

1.a General description of the product

Adjustable steel chocks are foundation chocks for rigid seatings of heavy machinery and equipment, which require precise alignment and adjustment. These Technical Requirements apply to metal chocks with adjustable height setting by an internal screw connection combined with the capability of self-levelling, thus called 'Adjustable Steel Chocks'. The material used for the adjustable steel chocks includes non-alloy as well as alloyed steel, including stainless steel.

1.b Application limitations

The on-board application of adjustable steel chocks, type approved hereunder, shall be in compliance with the EU RO's specific installation requirements for the vessel. Each specific installation, using adjustable steel chocks, shall be carried out in compliance with approved installation drawings, supplied exclusively by the chock manufacturer.

Such specific approval shall take into account, as a minimum, the following:

a) Total deadweight of supported machinery;
b) Number, size, type, arrangement of chocks and bolts and nuts, material of foundation bolts and nuts, installation height, completed with relevant calculations and detailed (dimensioned) drawings;
c) Maximum element load;

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d) Foundation bolts preload, torque and elongation, completed with details of tightening procedure;
e) Locking arrangement for foundation bolts and calculation of foundation bolts elongation for bolt connecting securing;
f) Longitudinal and lateral stopping device;
g) Manufacturer's instructions.

1.c Intended use

a) Adjustable steel chocks that can be applied for seating of rotating and oscillating engines as well as statically loaded machinery e.g. main and auxiliary diesel engines, turbines, gearboxes, shaft bearings, shaft generators, generators, steering gears, windlasses, etc. They may be used at initial machinery installation or after repair or replacement always taking into account the relevant application range (as a function of the specific product, e.g. ranges of application, installation height, maximum element load, foundation bolt size, foundation bolt torque etc.);
b) They are used as an alternative to metal chocks, which have to be machined individually, as well as to cast resin chocks;
c) The purpose is for safe seating of propulsion and auxiliary machinery with self-regulating adjustment to the foundation level and manual height setting at site;
d) The adjustable steel chock elements are self-locking (due to friction in the internal screw connection) after the foundation bolts are tightened.

1.d System context

Type approved Adjustable Steel Chocks for propulsion and auxiliary machinery seating, requiring installation approval on a case-by-case basis, see paragraph 1b above.

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2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a i. Technical Requirements:

a) **Type of material:** non-alloy or alloyed steel including stainless steel. The evidence of compliance with material quality standards for the base material (mechanical and chemical properties) shall be the manufacturer's inspection certificate(s) (e.g. 3.1 certificate in accordance with EN 10204);
b) **Tensile strength:** in accordance with the manufacturer's specification;
c) **Compressive strength:** in accordance with the manufacturer's specification;
d) **Ultimate load:** in accordance with data in the manufacturer's specification;
e) **Deformation under load:** in accordance with the manufacturer's specification;
f) **Yield strength**: in accordance with the manufacturer's specification;
g) **Shear stress:** in accordance with the manufacturer's specification;
h) **Foundation bolt sizes, minimum & maximum:** in accordance with the manufacturer's specification;
(i) **Foundation bolt torque:** in accordance with the manufacturer's specification;
i) **Type of element's screw thread**: in accordance with the manufacturer's specification;
j) **Surface finish quality**: in accordance with the manufacturer's specification.

2.a.ii. Technical documents to be submitted

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

a) Drawings and calculations of the main components as well as data sheets/specifications (including all data as per paragraph 2.a.i. above);
b) Test reports, see paragraph 2.b below;
c) Manufacturer's instructions and recommendations for installation and application, including:
   - Description of the product;
   - Typical sectional drawings with all dimensions necessary for evaluation of seating design (see consecutive data (I) through (XIII) below);

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- Specification of materials used for all components of the assembly (see also 2.a.i. above);
- The type approval may comprise different sizes of the same type.

d) Documents containing information on:

I. Foundation bolt size;
II. Foundation bolt's tightening Torque;
III. Maximum element Load;
IV. Maximum element load exerted by the weight of supported equipment;
V. Minimum installation height;
VI. Nominal Installation height;
VII. Maximum installation height;
VIII. Bolt hole;
IX. Diameter of the element;
X. Element's thread;
XI. Foundation bolt's elongation;
XII. Element's material;
XIII. Foundation bolt's material.

2.b Type testing requirements

The test shall be performed using at least 3 test specimens each. Where the type comprises of more than one size, the test specimen shall be of different size taking into account maximum permissible loads, if applicable. If one test specimen fails, the test shall be repeated with two additional test specimen of the same size as the failed one. If one test specimen does not pass the subsequent test, the type approval test shall be considered void. In such cases, the reason for the failure must be identified and corrective actions taken before a new test series may be agreed to.

Tests:

I. Visual inspection:

a) Before first machining, an ultrasonic test of the raw material shall be carried out;

b) After final machining a general visual inspection by checking the finishing quality and checking the dimensions shall be executed, as well as Ultrasonic Test (UT) and/or a Magnetic Particle Inspection (MPI) of all elements.

II. Ultimate load test:

c) The elements shall be subjected to a compressive axial static load, depending on the applicable data for the element type. Specimens shall be tested at maximum adjustment range (100% of height);

d) The static load shall be increased smoothly up to the load where the element collapses;

e) The element shall not fail at a load below the required test load, thus indicating the manufacturer's design data has been met;

f) The minimum safety factor shall be at least 3;

g) The maximum load at which the element collapses shall be measured and recorded;

h) After the test, the elements shall be dismantled and the parts shall be checked for damage and deformations.

III. Static stiffness tests:

i) The test shall determine the static stiffness of the elements under 100% load conditions. Each element size shall be measured at 50% and 100% of the maximum adjustment range (maximum height);

j) The element shall not fail at a load below the required test load thus indicating that the manufacturer's design data has been met;

k) The static stiffness of the element has to be calculated as a result of maximum allowed element load divided by measured height decrease at maximum load.
The elastically compression of the element shall be < 1.0 % of the maximum element height under the elements maximum design load;

IV. **Fatigue tests:**

l) The fatigue tests shall be executed in a suitable fatigue testing machine which is able to apply a static load and a dynamic load to the elements;

m) The elements shall be subject to a straight axial dynamic load, depending on the data of the element type;

n) The test shall be executed with the element unscrewed to its maximum allowed height position;

o) That height of the element shall be measured accurately by a suitable device.
During the test, no rotation of the elements should occur in order to prevent any loss of pre-tension in the bolts. Therefore, before starting the testing, marks shall be placed on the element that no rotation has occurred;

p) A pre-load shall be applied to the element using a bolt. The pre-load shall be measured in a suitable way;
After that, an additional necessary static load shall be applied to the element. The total static load shall be approximately 100 % of the maximum element load of the specified nominal capacity;

q) An additional dynamic load with ca. 30% of the maximum element load (frequency < 30 Hz) and a load change of at least 2*106 shall be applied;

r) After the test, the fixing bolt shall be checked for firm seating;

s) A general visual inspection by checking the finishing quality and checking the dimensions shall be executed, as well as Ultrasonic Test (UT) and/or a Magnetic Particle Inspection (MPI) of all elements after the test. No indications of flaws or cracking should be visible.

Test specimens shall be taken from the production line or from stocks†. 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 EO RO surveyor may be omitted †.

Equivalent tests, in accordance with adequate standards, may be acceptable subject to authorization by the EU RO in charge of the Type Approval.

† 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)

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3. PRODUCTION REQUIREMENTS

a) Refer to EU RO "Product Quality Assurance (PQA)" procedure (Appendix VI of EU RO Framework Document for the Mutual Recognition of Type Approval;
b) In case of failure of seating elements due to material and/or construction reasons, the EU RO in charge of the Type Approval shall be informed immediately. Corrective actions shall be proposed and approved. The approving EU RO reserves the right to withdraw the Type Approval Certificate.

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 trade mark;
b) Type No. or symbol;
c) Serial No. and date of manufacture, year of production;
d) Particulars or ratings.

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) Application and installation procedure.

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6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
31 January 2014	0.0	Accepted by Advisory Board
31 January 2015	0.1	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	0.2	CRF025 – Updated to new MR TR document format incl. par. 8; CRF026/026a – Witness testing & control of test specimen; CRF028 – addition of 6 month application clause.

7. BACKGROUND INFORMATION / REFERENCES

Standards referred to in this document including;

a) EN 10204;
b) 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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EU RO Mutual Recognition Technical Requirements

AIR COMPRESSOR	Version	0.2
	Adoption Date	1 April 2016
	Application Date	1 October 2016
	Tier	3
This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements ***** Uncontrolled if downloaded or printed *****		

1. PRODUCT DESCRIPTION

1.a General description of the product

These technical requirements apply to air compressors of reciprocating and rotary displacement type.

Compressor unit consists of the device for compressing the medium along with its unit internal piping for air medium as well as the necessary system for cooling and lubrication.

1.b Application limitations

These technical requirements do not apply to:

a) Air compressors supporting vessels main functions (hereunder; starting air and control air):
b) Safety functions;
c) Compressors subject to statutory requirements;
d) Compressors delivering air at a pressure of more than 40 bar.

1.c Intended use

These technical requirements apply to air compressors intended for general purpose use.

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1.d System context

General service air system.

2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a i. Technical Requirements

Arrangement

a) The compressor shall be protected from overload by a safety relief valve with capacity to discharge the compressor capacity without pressure increase above 1,1 times the relief valve set point. The safety relief valve design shall preclude any possibility of an accidental change of setting;
b) Each separate compression stage shall be provided with safety relief valve as indicated in a) above;
c) Cooling water jacket, where a leakage of compressed air may result in an undue pressure rise, shall be protected by relief valve or equivalent solution;
d) Air intake shall be protected by a strainer and arranged so as to prevent intake of water and oil;
e) Each compression stage shall be arranged to drain condensate;
f) Compressed air temperature shall be limited to maximum 90°C. Cooling arrangements shall be provided if necessary;
g) Crank case (if applicable) shall be protected by a relief valve if the crank case volume exceeds 0,5m^3.

Construction:

h) The compressor unit shall be designed in accordance with a relevant recognised standard. Strength of main load carrying parts shall be documented (see 2.a.ii. “Technical documents to be submitted” below);

The following local indicators shall be provided;

i) Each separate compression stage shall be equipped with pressure gauge;

j) Temperature reading of discharge air shall be provided;
k) Lubrication: Pressure gauge (forced lubrication) or Level indicator (splash lubrication) shall be provided.

2.a.ii. Technical documents to be submitted

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

a) Specification of compressor type, power rating and rotational speed, capacities and design pressure;
b) Compressor unit arrangement drawing and cross section;
c) Schematic arrangement drawing for compressed air;
d) Schematic arrangement drawing for forced lubrication (if applicable);
e) Schematic arrangement drawing for cooling medium (if applicable);
f) Strength calculation of main load carrying parts, including reference to the applied calculation standard. The following is considered as main components:
   - Crankshaft (reciprocating compressor)
   - Rotor shaft (rotary displacement compressor)
   - Pressure casing (rotary displacement compressor)
   - High pressure piping for air.

2.b Type testing requirements

a) All pressure loaded parts shall be hydrostatically tested to 1,5 times the design pressure;
b) Safety relief valve capacity shall be documented by test;
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 the EO 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

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

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).

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 trade mark;
b) Type designation under which the product is type approved;
c) Rated power;
d) RPM;
e) Design pressure;
f) Free Air Delivery (FAD), if appropriate;
g) Maximum ambient air 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.

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6. APPROVAL DATE AND REVISION NUMBER

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31 January 2014	0.0	Accepted by Advisory Board
31 January 2015	0.1	CRF018 – Revision to par. 2.a.ii - Technical documents to be submitted in English; CRF019 – Revision to par. 4 - 'Marking Requirements' - Free Air Delivery (FAD),; CRF020 – Revision to par. 5 - 'Type Approval Certificate Content'
1 April 2016	0.2	CRF022 – Change of text in 2.a.i.a relating to adjustment of the safety relief valve; CRF025 – Updated to new MR TR document format incl. par. 8; CRF026/026a – Witness testing & control of test specimen; CRF028 – addition of 6 month application clause.

7. BACKGROUND INFORMATION / REFERENCES

a) 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.

- END -

EU RO Mutual Recognition Technical Requirements

BATTERY CHARGERS	Version	0.3
	Adoption Date	1 July 2018
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	Tier	3
This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements ***** Uncontrolled if downloaded or printed *****		

1. PRODUCT DESCRIPTION

1.a General description of the product

a) A battery charger is a device used to put energy into a secondary cell or rechargeable battery by forcing an electric current through it;
b) Charger equipment shall be suitable for the type of storage batteries, the required charging characteristic, and the selected connection.

Note 1: Consideration is to be given to the temperature variation of the batteries.

1.b Application limitations†

a) Restricted to Battery Chargers according to IEC 60947-1 and IEC 60255 installed onboard ships with exceptions as per SOLAS Ch. I Reg.3;
b) Installation on board ships within locations with climatic, biological, chemically active, mechanically active and mechanical environmental conditions not exceeding those for which performance has been proved according to IEC 60721-3-6 (1987) + A2 (1997);
c) This technical requirement is not applicable for chargers with a charging power above 2 kW and used for essential services [1];

[1] Definition of essential services as per IACS UI SC134.

d) This technical requirement is not applicable for battery chargers for use in propulsion and navigation and radio communication equipment and systems;
e) Battery chargers for Li-ion and Ni-OH batteries etc. shall be excluded from the covered items.

† 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.

1.c Intended use

a) Power supply system characteristics as per IEC 60092-101;
b) Environment category 6K4, 6B2, 6C2, 6S2 and 6M3 according to conditions specified in IEC 60947-1 Annex Q.

1.d System context

See 1.c above.

2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a i. Technical Requirements

a) In the absence of indications regarding its operation, the battery charger shall be such that the fully discharged battery can be recharged to 100% capacity (e.g. output voltage) within a period of 10hours, without exceeding the maximum permissible charging current;
b) Battery charger units shall be constructed in accordance with IEC 62040 Series or equivalent;

c) A charging rate other than (a) above (e.g. fully charged within 6 hours for batteries for starting of motors) is required in relation to the use of the battery;

d) For floating service or for any other conditions, where the load is connected to the battery while it is on charge, the maximum battery voltage shall not exceed the safe value of any connected apparatus. A voltage regulator with dropper or other means of voltage control shall be provided for this purpose;

e) The battery charger shall be designed so that the charging current is set within the maximum current permitted by the manufacturer when the battery is discharged and the floating current to keep the battery fully charged;

f) Trickle charging to neutralize internal losses shall be provided. An indication is to be provided to indicate a charging voltage being present at the charging unit;

g) Battery charging facilities by means of D.C. generator and series resistor shall be provided with protection against reversal of current when the charging voltage is 20 % of the line voltage or higher. This applies even if the battery is inserted with the wrong polarity;

h) Battery chargers shall be constructed to simplify maintenance operation. Indications are to be provided to visualize the proper operation of the charger and for troubleshooting purposes;

i) If consumers are simultaneously supplied during charging, the maximum charging voltage shall not exceed the rated voltage described in Type testing requirements 2.b. d) below;

j) The power demand of the consumers shall be considered for the selection of the chargers;

k) Battery chargers shall be provided with reverse current protection;

l) Monitoring and audible/visual alarm features shall be provided for the following (in a manned location):

- power supply failure (V and f) to the connected load;
- earth fault;
- operation of battery protective device;
- bypass operation (in UPS units).

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2.a.ii. Technical documents to be submitted

a) Type test reports, product descriptions, operation manuals, assembly drawings, dimension drawings, etc.:

b) Following charger's characteristics are needed to be submitted.
- Recharging time until the battery is ready for next discharge;
- Recharging current;
- Float voltage and current, e.g. under normal load conditions;
- Accuracy of D.C. voltage control and stability under variation of 0 ~100% of nominal current and A.C. input full range variation;
- D.C. output voltage regulation between 0~100% of full load output;
- A.C. input voltage range;
- D.C. ripple of current and voltage;
- harmonics, e.g. line, and through the battery.

c) Prior to tests:
- Proposed test program and test schedule;
- Description of test specimens and explanation of the selected test sample(s) providing evidence that the selected sample meets the most rigorous and demanding requirements;
- Product descriptions, manuals, data sheets, assembly drawings, dimension drawings, etc. clearly identifying the product;
- Complete accreditation certificate of the Test laboratory;
- Details of production sites;
- Product specification;
- Application, working area;
- Instructions on fitting, assembly and operation;
- QM-certificate according to ISO 9001 or equivalent by an accredited certifying body.

On completion of tests, a report shall be issued, identified by number and date, which accurately, clearly and unambiguously presents the test results and all other relevant information.

d) Test report(s) shall include the following information:
- Type of product, with type number / serial number(s) and quantity tested;

- Test specification for the product identified by number, revision and date;
- Details of test equipment and measuring instruments stating serial numbers and calibration certificates;
- Names of the test engineer and the engineer approving the report;
- Ambient environmental conditions during the test;
- The test results with a description of any failures encountered;
- Conclusion.

Test report(s) shall be signed by the test personnel and verified by the EU RO or the agreed independent representative witnessing the tests.

2.b Type testing requirements

The following tests specified in IACS UR E10, IEC 60529 or IEC60947-1 shall be performed in the presence of an EU RO surveyor. In cases where the tests are conducted at Nationally Accredited Laboratories, the presence of the EU RO's surveyor may be omitted†. Test specimens shall be taken from the production line or from stocks†:

a) Visual Inspection (IACS UR E 10);
b) Performance test (current and voltage regulation, quick, slow, floating charge, alarms and ventilation rate) (IACS UR E10);
c) Temperature rise measurement;
d) Electrical Power supply variation test (IACS UR E10);
e) Dry heat (IACS UR E10);
f) Damp heat (IACS UR E10);
g) Vibration (IACS UR E10);
h) Insulation resistance (dielectric strength test and insulation resistance measurement) (IACS UR E10);
i) High voltage (IACS UR E10);
j) Cold (IACS UR E10);
k) Electrostatic discharge immunity (IACS UR E10);
l) Radiated radio frequency immunity (IACS UR E10);
m) Conducted low frequency immunity (IACS UR E10);
n) Conducted high frequency immunity (IACS UR E10);
o) Burst/Fast transient immunity (IACS UR E10);

p) Surge immunity (IACS UR E10);
q) IP test (IEC60529);
r) Shock test (IEC 60947-1).

† 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.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.

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 designation under which the product is type approved;
c) Rated Voltage;
d) Rated current;
e) Rated frequency;
f) Operating temperature range;
g) Charge voltage 'absorption' (VDC);
h) Charge voltage 'float' (VDC);
i) Battery capacity;
j) Humidity;
k) IP class.

BATTERY CHARGERS	Version	0.3
	Adoption Date	1 July 2018
	Application Date	1 January 2019
	Tier	3
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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) Input voltage;
b) Frequency;
c) Maximum input current;
d) Recommended battery capacity [Ah];
e) Boost charge voltage;
f) Float charge voltage;
g) Output voltage range;
h) Maximum output current;
i) IP grade;
j) List of approval documents.

6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
31 January 2014	0.0	Approved by the Advisory Board
31 January 2015	0.1	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	0.2	CRF025 – Updated to new MR TR document format incl. par. 8; CRF026/026a – Witness testing & control of test specimen; CRF028 – addition of 6-month application clause.
1 July 2018	0.3	CRF032 - Corrected reference to standard IEC 60721-3-6 (1987) + A2 (1997)

BATTERY CHARGERS	Version	0.3
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7. BACKGROUND INFORMATION / REFERENCES

a) IACS UR E10 “Test Specification for Type Approval”;
b) IEC60529 “Degrees of protection provided by enclosures (IP Code)”;
c) IEC61000-3-2 “Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current ≤16 A per phase)”;
d) IEC61000-3-3 “Electromagnetic compatibility (EMC) - Part 3-3: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤16 A per phase and not subject to conditional connection”;
e) IEC60721-3-6 “Classification of environmental conditions. Part 3: Classification of groups of environmental parameters and their severities. Ship environment”;
f) IEC60947-1 “Low-voltage switchgear and control-gear - Part 1: General rules”
g) IEC60092-101 “Electrical installations in ships - Part 101: Definitions and general requirements”;
h) IEC62040-1 “Uninterruptible power systems (UPS) - Part 1: General and safety requirements for UPS”;
i) IEC62040-2 “Uninterruptible power systems (UPS) - Part 2: Electromagnetic compatibility (EMC) requirements”;
j) IEC62040-3 “Uninterruptible power systems (UPS) - Part 3: Method of specifying the performance and test requirements”;
k) IEC62040-4 “Uninterruptible power systems (UPS) - Part 4: Environmental aspects - Requirements and reporting”;
l) EN 45510-2-3 “Guide for procurement of power station equipment - Part 2-3: Electrical equipment - Stationary batteries and chargers”;
m) EU RO Framework Document for the Mutual Recognition of Type Approval.

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	Tier	3
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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: https://www.euromr.org/technical-requirements.

- END -

EU RO Mutual Recognition Technical Requirements

BOILER REMOTE LEVEL INDICATOR	Version	0.2
	Adoption Date	1 April 2016
	Application Date	1 October 2016
	Tier	3
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1. PRODUCT DESCRIPTION

1.a General description of the product

a) Remote indicators of steam boiler water level, of the "indirect reading design" type. They can be based on different working principles and technologies, such as, for example:
   - Conductivity Probes
   - Differential Pressure Transmitters
   - Magnetic Float Indicators
   - Guided Wave Radar Level Indicators

b) Regardless of technology, their basic configuration includes:
   - one or more sensing devices, appropriately connected to the boiler drum (either directly or through an externally located measuring vessel, such as a water column); the sensing devices can be totally or partly immersed in the steam-water space;
   - a transmitter (usually converting the original signal into the 4-20 mA analogic format);
   - a remote level display.

c) Regardless of technology, the devices normally include some means for correction of density error, generated by difference of temperature between the water in the drum and that contained within a measuring vessel located externally at the boiler drum (e.g. the water column), due to sub-cooling of water in the measuring vessel.

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d) The pressure vessels containing the sensor(s) (e.g. externally located measuring vessels, water column or equivalent) are outside the scope of the present Technical Requirement.
e) Level indicators of the direct reading type (such as reflex gauges, flat glass gauges, ported gauges and similar devices) are outside the scope of the present Technical Requirement.
f) The equipment for control of the boiler (e.g. water level control, pressure control, temperature control) is subject to individual EU RO approval and is outside the scope of this Technical Requirement.

1.b Application limitations

a) Applicable for installation on ships as defined by Art. 2 of EU Regulation (EC) No. 391/2009, for the purposes of Art. 10 of the same.
b) Can be used to provide both level measurement and high-low level alarms; to be independent of the required devices providing low-low level alarm and automatic boiler shutoff command.
c) The installation of the remote level indicator is subject to the individual EU RO's approval on a case-by-case basis.
d) The pressure casing of the level indicator sensor, including connection arrangements to the boiler drum or its externally located measuring vessel, is subject to individual EU RO's approval on a case-by-case basis.

1.c Intended use

Primarily intended for remote water level indicating and monitoring, in addition to local direct reading gauge glass. Can also provide local reading as well.

1.d System context

Boilers located in Engine Rooms and Machinery Spaces of Category A above floor plates, in close proximity of hot surfaces.

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2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a.i. Technical Requirements

a) Materials shall be suitable for the intended service;
b) Minimum degree of protection for all components located on boiler and those within the machinery space: IP44;
c) Minimum degree of protection for all components located in control rooms: IP22;
d) Requirements for electrical/electronic level sensors and transmitters: see EU RO MR technical requirement for "SENSORS";
e) Requirements for level display monitors: see EU RO MR technical requirement for "DISPLAY MONITORS".

2.a.ii. Technical documents to be submitted

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

a) Technical specifications, drawings, installation sheets and type test reports, describing the type and working principles of remote level indicator for which approval is requested, and showing compliance with the relevant requirements;
b) Documents to be submitted for electrical/electronic level sensor and transmitter: see EU RO MR technical requirement for "SENSORS";
c) Documents to be submitted for level display monitor: see EU RO MR technical requirement for "DISPLAY MONITORS".

2.b Type testing requirements

a) Type Testing Requirements for electrical/electronic level sensor and transmitter: see EU RO MR technical requirement for "SENSORS";
b) Type Testing Requirements for level display monitor: see EU RO MR technical requirement for "DISPLAY MONITORS".
c) Test specimens shall be taken from the production line or from stocks†.

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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 the EO 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

a) Every remote level indicator shall be certified by the Manufacturer, subject to satisfactory performance of routine test(s) as per applicable standard or specification;

b) Refer to EU RO "Product Quality Assurance (PQA)" procedure (Appendix VI of EU RO Framework Document for the Mutual Recognition of Type Approval).

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;
b) Model Name / Type / Version;
c) Serial Number;
d) Degree of Protection;
e) Rating (rated voltage, current and frequency of required power supply, rated pressure and temperature of sensing device, rated measurement range);
f) Date of manufacture.

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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.

6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
31 January 2014	0.0	Accepted by Advisory Board
31 January 2015	0.1	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	0.2	CRF025 – Updated to new MR TR document format incl. par. 8; CRF026/026a – Witness testing & control of test specimen; CRF028 – addition of 6 month application clause.

7. BACKGROUND INFORMATION / REFERENCES

a) IACS UR E10 "Test Specification for Type Approval";
b) IEC 60092-504 "Electrical Installations in Ships - Special Features, Control and Instrumentation";
c) IEC 60533 "Electrical and Electronic Installations in Ships - Electromagnetic Compatibility";
d) EU RO MR Technical Requirements for SENSORS and DISPLAY MONITORS;
e) EU RO Framework Document for the Mutual Recognition of Type Approval.

8. MAINTENANCE / CLARIFICATION OF TECHNICAL REQUIREMENTS

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- END -

EU RO Mutual Recognition Technical Requirements

CABLE TRAYS & DUCTS (GLASS REINFORCED PLASTIC /GRP)	Version	0.2
	Adoption Date	1 April 2016
	Application Date	1 October 2016
	Tier	3
This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements ***** Uncontrolled if downloaded or printed *****		

1. PRODUCT DESCRIPTION

1.a General description of the product

Cable Trays and ducts (glass reinforced plastic) used on board ships.

1.b Application limitations

a) The load on the cable trays/protective casings shall be within the Safe Working Load (SWL). The support spacing shall not be greater than the Manufacturer's recommendation nor in excess of spacing at the SWL test. In general, the spacing shall not exceed 2 meters;

Note: The selection and spacing of cable tray/protective casing supports shall take into account the following:

- cable trays/protective casings' dimensions;
- mechanical and physical properties of their material;
- mass of cable trays/protective casings;
- loads due to weight of cables, external forces, thrust forces and vibrations;
- maximum accelerations to which the system may be subjected;
- combination of loads.

b) The sum of the cables' total cross-sectional area, based on the cables' external diameter shall not exceed 40% of the protective casing's internal cross-sectional area. This does not apply to a single cable in a protective casing;

c) Cable trays/protective casings made of plastic materials shall be supplemented by metallic fixing and straps;
d) When plastics cable trays/protective casings are used on open deck, they are additionally to be protected against UV light;
e) Penetrations through fire class divisions are out of the scope of this technical requirement.

1.c Intended use

Cable trays intended for the support and accommodation of cables and possibly other electrical equipment in electrical and/or communication systems installations on board ships.

1.d System context

See 1.a. and 1.b. above.

2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a i. Technical Requirements

a) Each type of cable trays/protective casings shall be assigned a Safe Working Load and is to be designed accordingly;
b) Cable trays/protective casings are to be designed to the following ambient temperatures:

- **-25°C to 90°C for outdoor use**
- **+5°C to 90°C for indoor use.**

Note:
Impact test temperature: lowest range of outdoor/indoor ambient (as applicable).
End of Note

CABLE TRAYS & DUCTS (GLASS REINFORCED PLASTIC /GRP)	Version	0.2
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2.a.ii. Technical documents to be submitted

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

The technical specifications and drawings, describing the types for which approval is requested, shall show compliance with the relevant requirements.

2.b Type testing requirements

a) Type tests are to be carried out in accordance with the test requirements as per IEC 61537 as shown in **table 1** below.

b) The test method of impact resistance shall be according to chapter 2.1 of Rec. 73.The test is to be performed according to IEC 60068-2-75 (Impact Resistance):

- i) The test is to be carried out on test samples of cable tray lengths or cable ladder lengths of 250 mm ± 5 mm long. Test samples of ladder are to consist of two side-members with one rung positioned centrally. Test sample of mesh trays is to be prepared in such a way that there will be a wire in the centre;
- ii) Before the test, plastic components are to be aged at a temperature of 90°C ± 2°C for 240 hours continuously;
- iii) The test sample is to be mounted on wooden fibreboard of thickness 20 mm ± 2 mm;
- iv) The test sample to be tested is to be placed in a refrigerator, the temperature within which is maintained at the test temperature with a tolerance of ±2°C;
- v) After 2 hours, the test sample is to be removed from the refrigerator and immediately placed in the test apparatus;
- vi) At 10 s ± 1 s after removal of each test sample from the refrigerator, the hammer is to be allowed to fall with impact energy, the mass of the hammer and the fall height;
  - Approximate Energy 10 J;
  - Mass of Hammer 5,0 kg;
  - Fall Height 200 ± 2 mm;
- vii) The impact is to be applied to the base or the rung in the first test sample, to one of the side members in the second test sample, and to the other side

member in the third test sample. In each case, the impact is to be applied to the centre of the face being tested;

- viii) After the test, the test sample is to show no signs of disintegration and/or deformation that will impair safety;

c) IACS UR E10, Test 21 (Flame Retardant);

d) IMO Resolution MSC.307(88) (FTP Code 2010) Part 2 (Smoke and toxicity test).

Test specimens shall be taken from the production line or from stocks†. 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)

Table 1

IEC 61537 Test reference subclause	Description	Notes
	Dimensions	
8	Information about the product	Inspection
	Construction	
9.1	Surface does not damage the cables	Visual and manual inspection
9.2	When the manufacturer does not declare the use of gloves during installation	Visual and manual inspection

9.3.1	Screw thread test repeatability	Manual test
9.3.2	Reusable mechanical connections repeatability	Manual test
9.3.3	Non-reusable mechanical connection	Visual and manual inspection
9.4	Apparatus mounting device	Visual inspection
9.5	Regular perforations over base	Visual inspection and measurement
9.6	Regular rung pattern over base	Visual inspection and measurement
	Mechanical properties	
10.2	SWL test procedure The SWL test procedure is described in IACS Rec No.73 (2002) item 2.2. -SWL test to be performed on smallest and largest size of cable tray or ladder lengths, having same material, joint and topological shape. -SWL test temperature to be either max & min only, or max only if there is documentation showing that structural properties decrease when temperature increases, or at any temperature within the range if there is documentation showing that the structural properties do not differ by more than 5% of the average within the range. - Max deflection under SWL not to exceed L/100, and no defect at 1,7xSWL (L=distance between supports) -All loads are to be uniformly distributed over the length and width of the test samples, as shown in 4-8-4A1/Figure 1. -The loads are to be applied in such a way that a uniform distribution is ensured even in the case of extreme deformation of the test samples. -To allow for settlement of the test samples, a pre-load of 10% of SWL, unless otherwise specified, is to be applied and held for at least five (5) min, after which the measurement apparatus is to be calibrated to zero. -Then, the load is to be gradually increased evenly, longitudinally and transversely up to the SWL continuously. When a continuous increase is impractical, the load may be increased by increments. These increments are not to exceed about a quarter of the SWL. The load increments are to be distributed through the load plates longitudinally and transversely as evenly as is practical. -After loading, the deflection is to be measured at the points specified to give a practical mid-span deflection -The test sample with load is to be left and the deflections measured every five (5) minutes until the difference between two consecutive sets of readings becomes less than 2% of the first set of the two readings.	Required

	The maximum deflection for the purpose of 4-8-4A1/5.3i) is the first set of the readings measured at this point under the test load. -When subject to SWL, the test sample, their joints and internal fixing devices are to show no damage or crack visible to normal view or corrected vision without magnification. -Then, the load is to be increased to 1.7 times SWL -The test sample with the load are to be left and the deflections measured every five (5) min until the difference between two consecutive sets of readings becomes less than 2% of the first set of the two readings. The test sample is to sustain the increased loading without collapsing. However, buckling and deformation of the test sample are allowable at this excess loading	
10.8.1	Tests for SWL of cantilever brackets	Required
	Electrical properties	
11.2	Electrical non-conductivity Cable tray system components shall be deemed electrically non-conductive if having surface resistivity values of 106 Ω. Note: Cable trays/protective casings passing through a hazardous area should be electrically conductive.	Required

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).

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.

CABLE TRAYS & DUCTS (GLASS REINFORCED PLASTIC /GRP)	Version	0.2
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5. TYPE APPROVAL CERTIFICATE CONTENT

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6. APPROVAL DATE AND REVISION NUMBER

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1 April 2016	0.2	CRF025 – Updated to new MR TR document format incl. par. 8; CRF026/026a – Witness testing & control of test specimen; CRF028 – addition of 6 month application clause.

7. BACKGROUND AND REFERENCE DOCUMENTS

a) IACS UR E16;
b) IACS Recommendation 73;
c) EU RO Framework Document for the Mutual Recognition of Type Approval.

8. MAINTENANCE / CLARIFICATION OF TECHNICAL REQUIREMENTS

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- END -

EU RO Mutual Recognition Technical Requirements

CABLE TRAYS & DUCTS (METALLIC)	Version	0.2
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This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements ***** Uncontrolled if downloaded or printed *****		

1. PRODUCT DESCRIPTION

1.a General description of the product

Metallic cable trays and ducts suitable for marine use.

1.b Application limitations

a) Applicable for marine ships as defined in Mutual Recognition provisions Article 10 Regulation on Common Rules and Standards for Ship Inspection and Survey Organisations.

b) This standard does not cover penetration through class fire divisions.

1.c Intended use

Cable trays and ducts intended to be used in ships' cabling systems necessary for the applications mentioned in 1.b above.

1.d System context

Refer to the item 1.c above.

2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a i. Technical Requirements

a) Cable trays and ducts shall be designed and constructed so that in normal use, when installed according to the manufacturer's instructions, they ensure reliable support to the cables contained within. They shall not present any unreasonable hazard to the user or the cables;
b) Metallic cable trays, ducts, and their accessories shall be robust and shall be of materials that are corrosion-resistant or suitably treated to resist corrosion;
c) The components shall be designed to withstand the stresses likely to occur during recommended transport and storage;
d) Cable trays and ducts shall provide adequate mechanical strength';
e) Cable trays and ducts intended to be used on open decks shall be resistant against environmental forces, such as sea waves, snow, ice-cap loading and others;
f) The inside of the trays and ducts shall be smooth, and their ends shaped in a suitable manner so as to avoid damage to the cable sheath;
g) Cable casings shall be supplemented by metallic fixing and strap.

2.a.ii. Technical documents to be submitted

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

Prior to tests:

a) Proposed test program and test schedule;
b) Description of test specimens and explanation of the selected test sample(s) providing evidence that the selected sample meets the most rigorous and demanding requirements;
c) Product descriptions, manuals, data sheets, assembly drawings, dimension drawings, etc. clearly identifying the product;
d) Complete accreditation certificate of the Test laboratory;
e) Details of production sites;
f) Product specification;

g) Application, working area;
h) Instructions on fitting, assembly and operation;
i) QM-certificate according to ISO 9001.

2.b Type testing requirements

Tests to be carried out:

a) Dimensions shall be checked according to the product information;
b) Visual inspection that construction surfaces and edges do not damage the cables;
c) Safe working load (SWL) test according to IEC 61537;
d) Salt spray test according to ISO 9227 or salt mist test according to IACS UR E10;
e) Hammer tests according to IEC 60068-2-75;
f) Test report(s) shall include the following information:
   - Type of product, with type number / serial number(s) and quantity tested;
   - Test specification for the product identified by number, revision and date;
   - Details of test equipment and measuring instruments stating serial numbers and calibration certificates;
   - Names of the test engineer and the engineer approving the report;
   - Ambient environmental conditions during the test;
   - The test results with a description of any failures encountered;
   - Conclusion.

Test specimens shall be selected from production line or at random from stock†. 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)

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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).

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.

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.

6. APPROVAL DATE AND REVISION NUMBER

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7. BACKGROUND INFORMATION / REFERENCES

a) IEC 61537 Cable management - Cable tray systems and cable ladder systems;
b) ISO 9227 Corrosion tests in artificial atmospheres - Salt spray tests;
c) IACS UR E10 Test Specification for Type Approval;
d) IEC 60068-2-75 Environmental testing - Part 2-75: Tests - Test Eh: Hammer tests.
e) EU RO Framework Document for the Mutual Recognition of Type Approval.

8. MAINTENANCE / CLARIFICATION OF TECHNICAL REQUIREMENTS

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- END -

EU RO Mutual Recognition Technical Requirements

CONNECTING SYSTEMS FOR CABLE REPAIR (CABLE SPLICES)	Version	0.2
	Adoption Date	1 April 2016
	Application Date	1 October 2016
	Tier	3
This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements ***** Uncontrolled if downloaded or printed *****		

1. PRODUCT DESCRIPTION

1.a General description of the product

a) Cable splices shall consist of a conductor connector, replacement insulation, replacement cable sheath, and where applicable, replacement of armour and shielding;
b) Heat-shrinkable tubing shall mean tubing that will reduce in diameter from an expanded size to a predetermined size by the application of heat.

1.b Application limitations

a) These rules shall apply only to cable splices using heat-shrinkable tubing. Other types of cable splices, e.g., cold shrink, moulding compounds and tape shall not be considered within this specific product.
b) These technical requirements are not applicable to cable splices used for propulsion units, high voltage circuits or used in dangerous spaces, e.g., Zone 0, Zone 1 and Zone 2 dangerous spaces, except for intrinsically safe circuits;
c) Cable splices shall have the original electrical, mechanical, flame-retardant and, where necessary, fire resistant properties of the cables.

1.c Intended use

Cable splices approved using these technical requirements are intended for use under the following conditions:

a) Joint of cables installed in structural sub-assemblies;
b) Joint of cable circuits extended or shortened by modifying cable arrangement;

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c) To replace damaged section of cables;
d) Joint of special type cable, e.g. submersible cable, and shipboard cable.

1.d System context

See 1.c above.

2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a i. Technical Requirements

a) Cable splices shall be in accordance with IEC60092-352, ASTM F1835-97 and ASTM D2671-09;
b) The Conductors shall be connected using a compression type butt connector. In such case, a one-cycle compression tool and proper dies shall be used. Long barrel butt connectors with conductor stops shall be used for conductor sizes of 6mm2 or larger;
c) The cable splices for multi conductor cables shall be staggered in such a way that the connectors for each conductor shall not be contiguous to the connector of an adjacent conductor. In addition, the conductor insulation shall be removed no more than necessary to accept the connector;
d) For screened cables, replacement screenings shall be provided and such screenings shall be secured by a method that does not exert more pressure than necessary to establish an adequate electrical contact. Screened cables shall have at least a 13mm overlap between any replacement shielding material and the original screening material;
e) Replacement cable sheath materials shall have physical properties that are the same as, or equivalent to, the cable length. Replacement cable sheaths shall be centred over the splices and shall overlap the existing cable sheaths by at least 51mm. Replacement cable sheaths shall be installed so that a watertight seal with the existing cable sheath(s) is created.

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2.a.ii. Technical documents to be submitted

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

a) The types and temperature range of heat-shrinkable tubing for which approval is requested;
b) Data sheet or specification of heat-shrinkable tubing;
c) Instruction manual how to repair the cables;

2.b Type testing requirements

The following tests shall be carried out for cable splices in accordance with ASTM D2671-09 in the presence of an EU RO surveyor. In cases where the tests are conducted at Nationally Accredited Laboratories, the presence of the EU RO surveyor may be omitted†. Test specimens shall be selected from production line or at random from stock†:

a) Dimensions;
b) Restricted Shrinkage;
c) Dielectric Breakdown Voltage and Dielectric Strength:
d) Heat Shock;
e) Storage Life;
f) Low-Temperature Properties;
g) Tensile Strength and Ultimate Elongation;
h) Heat Resistance;
i) Colour;
j) Colour Stability;
k) Fluid Resistance;
l) Flammability;
m) Volume Restivity;
n) Water Absorption;
o) Secant Modulus;
p) Stress Modulus;
q) Corrosion Testing;
r) Thermal Endurance;
s) Adhesive Peel Strength;
t) Melting Point.

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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)

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).

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.

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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6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
31 January 2014	0.0	Accepted by Advisory Board
31 January 2015	0.1	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	0.2	CRF025 – Updated to new MR TR document format incl. par. 8; CRF026/026a – Witness testing & control of test specimen; CRF028 – addition of 6 month application clause.

7. BACKGROUND INFORMATION / REFERENCES

a) IEC60092-352 "Choice and installation of electrical cables";
b) ASTM F1835-97 "Standard Guide for Cable Splicing Installations";
c) ASTM D2671-09 "Standard Test Methods for Heat-Shrinkable Tubing for Electrical Use";
d) EU RO Framework Document for the Mutual Recognition of Type Approval.

8. MAINTENANCE / CLARIFICATION OF TECHNICAL REQUIREMENTS

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EU RO Mutual Recognition Technical Requirements

ELECTRICAL ACTUATOR FOR VALVES	Version	0.2
	Adoption Date	1 April 2016
	Application Date	1 October 2016
	Tier	3
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1. PRODUCT DESCRIPTION

1.1 General description of the product

Electrical valve actuator is an electromechanical device used for on-off and control valves.

1.2 Application limitations

a) For the purpose of this technical requirement, the part-turn, multi-turn and linear actuators shall be considered;
b) This technical requirement is not applicable for solenoid actuators, electro-hydraulic actuators and electric actuators ,which are integral in the design of valves;
c) This technical requirement applies to the electric valves actuator`s hardware only. Firmware, application software is subject to EU RO requirements as well compliance with UR E22.

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1.3 Intended use

To drive the valves through their fully open to the fully closed position, to drive the valves occasionally, frequently or continuously to any position between fully open and fully closed at the following systems:

a) Remotely controlled ballast and bilge systems;
b) Remotely controlled heel and trim systems;
c) Remotely controlled cargo systems.

Other systems, at the EU ROs request, associated with provision of the basic functionality and safety of the ships.

1.4 System context

Refer to the item 1.3 above.

2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a.i. Technical Requirements

The electric valve actuators design depends on the sea service condition, duty and action as detailed below:

a) Part turn actuator shall be designed to transmit torque to the valve for less than one revolution. It does not have to be capable of withstanding thrust;
b) Multi- turn actuator shall be designed to transmit torque to the valve or gearbox for at least one revolution. It may be capable of withstanding thrust. Linear actuator is designed to transmit thrust to the valve for a defined linear stroke;
c) On loss of external power, the actuator should remain in the position achieved before loss of power or to be able to operate the valve to a predefined safe position;
d) As a general rule, actuators shall be furnished with a manual override to open or close the valve in the event of loss of electric power, due-to safety reasons and for operational purposes (if required);

e) The manual override shall have priority over remote control. Fail safe direction shall be clearly and permanently indicated at the actuator housing. Unless otherwise specified, the manual operating element shall be rotated clockwise to close the valve;

f) Electric valve actuator shall be provided with indicators for the fully open and fully closed positions;

g) Electrical valve actuators shall be capable of being tested during normal operation;

h) Setting components of electric valve actuators shall be protected against spontaneous changes of setting. Such protection shall not preclude the possibility of adjustment;

i) The electrical valve actuators shall be equipped with a torque overload measurement/ limiting device, travel limiting device and overheating device;

j) The electrical actuators shall include the means of de-energizing the motor in case of reaching set open and close position;

k) When required, part-turn and liner electrical actuators shall be supplied with two integral mechanical end stops, typically one for each end position;

l) Reliable operation of electrical valve actuators 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 temperatures up to +70 °C.**

m) Reliable operation of electrical valve actuators shall be ensured at relative air humidity up to 100%;

n) - Reliable operation of electrical valve actuators 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, for severe vibration conditions such as, e.g. on diesel engines, air compressors, etc. the following requirements should be applied: with shift amplitude of ± 1.6 mm where the vibration frequency is between 2.0 to 25Hz, and with an acceleration of ±4,0 g where the vibration frequency is between 25.0 and 100Hz. More severe conditions may exist for example on exhaust manifolds of diesel engines

especially for medium and high speed engines. Values may be required to be in these case 40Hz to 2000Hz - acceleration ± 10.0g at 600 ℃, duration 90min.

o) Reliable operation electrical valve actuators shall be ensured at long-term heel up to 22,5° and at motions of 22,5° with a period of (8 ± 1) s: **See Table 2.1:**

Table 2.1 - Angles of Inclination

Static inclination	Dynamic inclination
22.5°(1)	22.5°(1)

Note 1: In ships carrying liquefied gases in bulk and ships carrying dangerous chemicals in bulk, emergency power supplies are to remain operable with the ship flooded to a final athwartships inclination up to a maximum of 30°. In this case the test level has to be named on the certificate.

p) The protective enclosure of electrical valve actuators shall be chosen in accordance with IEC 60529 and has to be at least IP 65. For open deck installation the requirements of UR E 10 refer salt mist test should be applied and the IP66 or higher is required;

q) Electrical valve actuators shall operate reliably in case of deviation of the power parameters from nominal values: **See Table 2.2.**

Table 2.2 Voltage and frequency Fluctuation

(a) Voltage and frequency fluctuations for a.c. distribution systems (Note 1)

ype of fluctuation	Fluctuation (Note 4)	
	Permanent	Transient
Voltage	+10% , -10%	±20% (1.5 s duration)
Frequency	± 5%	± 10% (5 s duration)

(b) Voltage fluctuations for d.c. distribution systems (Note 2)

Type of fluctuation	Fluctuation (Note 4)
Voltage fluctuation (Permanent)	± 10%
Voltage cyclic fluctuation deviation	5%
Voltage ripple	10%

(c) Voltage fluctuations for battery systems

Systems	Fluctuation (Note 4)
Components connected to the battery during charging (Note 3)	+30%, -25%
Components not connected to the battery during charging	+20%, -25%
All components	±25% (2 s duration)

Note 1: A.C. distribution systems mean a.c. generator circuits and a.c. power circuits produced by inverters.
Note 2: D.C. distribution systems mean d.c. generator circuits and d.c. power circuits produced by converters.
Note 3: Different voltage fluctuations as determined by charging and discharging characteristics, including voltage ripples from the charging devices, may be considered.
Note 4: The numerical values given in the table, excluding those values for time, mean percentages of rated values.

r) Electrical valve actuators 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.**

s) Provision shall be made to ensure the electromagnetic compatibility of the electrical valve actuators is in order to comply with requirements of IACS UR E10: **See Table 2.3.**

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Table 2.3 - Testing condition and method IACS UR E10 rev.5

NO.	TEST	PROCEDURE ACC. TO[1]:	TEST PARAMETERS	OTHER INFORMATION
* indicates the testing procedure which is normally to be applied. However, equivalent testing procedure may be accepted by the RO provided that the requirements stated in the other columns are fulfilled.				
1.	Visual inspection	-	-	conformance to drawings, design data.
2.	Performance test	Manufacturer performance test programme based upon specification and relevant Rule requirements.	- standard atmosphere conditions - temperature: 25°C ± 10°C - relative humidity: 60% ± 30% - air pressure: 96 KPa ± 10KPa	– confirmation that operation is in accordance with the requirements specified for particular system or equipment; - checking of self-monitoring features; - checking of specified protection against an access to the memory; - checking against effect of unerroneous use of control elements in the case of computer systems.
3.	External power supply failure	-	– 3 interruptions during 5 minutes; – switching-off time 30 s each case	– The time of 5 minutes may be exceeded if the equipment under test needs a longer time for start up, e.g. booting sequence – For equipment which requires booting, one additional power supply interruption during booting to be performed Verification of:

[1] Note: indicates the testing procedure which is normally to be applied. However, equivalent testing procedure may be accepted by the individual Society provided that the Unified Requirements stated in the other columns are fulfilled.

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<table>
<tr><th>NO.</th><th>TEST</th><th>PROCEDURE ACC. TO[1]:</th><th>TEST PARAMETERS</th><th>OTHER INFORMATION</th></tr>
<tr><td>4.</td><td>Power supply variations
a) electric

b) pneumatic and hydraulic</td><td>-</td><td>AC SUPPLY
<table>
<tr><th>Combination</th><th>Voltage variation permanent %</th><th>Frequency variation permanent %</th></tr>
<tr><td>1
2
3
4</td><td>+6
+6
-10
-10</td><td>+5
-5
-5
+5</td></tr>
<tr><td></td><td>voltage transient 1,5 s %</td><td>frequency transient 5s %</td></tr>
<tr><td>5
6</td><td>+20
-20</td><td>+10
-10</td></tr>
</table>
DC SUPPLY
<table>
<tr><td>Voltage tolerance Continuous</td><td>± 10%</td></tr>
<tr><td>Voltage cyclic variation</td><td>5%</td></tr>
<tr><td>Voltage ripple</td><td>10%</td></tr>
</table>
Electric battery supply:
– +30% to –25% for equipment connected to charging battery or as determined by the charging/discharging characteristics, including ripple voltage from the charging device;
– +20% to –25% for equipment not connected to the battery during charging.
Pressure: ±20%
Duration: 15 minutes</td><td>– equipment behavior upon loss and restoration of supply;
– possible corruption of programme or data held in programmable electronic systems, where applicable</td></tr>
</table>

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NO.	TEST	PROCEDURE ACC. TO[1]:	TEST PARAMETERS	OTHER INFORMATION
5.	Dry heat	IEC Publication 60068-2-2	Temperature: 55° ± 2°C Duration: 16 hours or Temperature: 70°C ± 2°C Duration: 2 hours (see note 1)	– equipment operating during conditioning and testing; – functional test during the last hour at the test temperature; – For equipment specified for increased temperature the dry heat test is to be conducted at the agreed test temperature and duration.
6.	Damp heat	IEC Publication 60068-2-30 test Db	Temperature: 55°C Humidity: 95% Duration: 2 cycles 2 x (12 + 12 hours)	– measurement of insulation resistance before test; – The test shall start with 25°C±3°C and at least 95% humidity ☐ equipment operating during the complete first cycle and switched off during second cycle except for functional test; ☐ functional test during the first 2 hours of the first cycle at the test temperature and during the last 2 hours of the second cycle at the test temperature; ☐ recovery at standard atmosphere conditions; ☐ insulation resistance measurements and performance test.

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NO.	TEST	PROCEDURE ACC. TO[1]:	TEST PARAMETERS	OTHER INFORMATION
7.	Vibration	IEC Publication 60068-2-6 Test Fc	2^{2}_{-0} Hz to 13.2 Hz – amplitude ±1mm 13.2 Hz to 100 Hz – acceleration±0.7g For severe vibration conditions such as, e.g. on diesel engines, air compressors, etc.: 2.0 Hz to 25 Hz – amplitude ±1.6 mm 25.0 Hz to 100 Hz – acceleration±4.0g Note: More severe conditions may exist for example on exhaust manifolds or fuel oil injection systems of diesel engines. For equipment specified for increased vibration levels the vibration test is to be conducted at the agreed vibration level, frequency range and duration Values may be required to be in these cases 40 Hz to 2000 Hz – acceleration ± 10.0g at 600°C, duration 90 min.	– duration in case of no resonance condition 90 minutes at 30 Hz; – duration at each resonance frequency at which Q≥ 2 is recorded – 90 minutes; – during the vibration test, functional tests are to be carried out; – tests to be carried out in three mutually perpendicular planes; ☐ where sweep test is to be carried out instead of the discrete frequency test and a number of resonant frequencies is detected close to each other duration of the test is to be 120 min. Sweep over a restricted frequency range between 0.8 and 1.2 times the critical frequencies can be used where appropriate. Note: Critical frequency is a frequency at which the equipment being tested may exhibit: - malfunction and/or performance deterioration; - mechanical resonances and/or other response effects occur, e.g. chatter

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NO.	TEST	PROCEDURE ACC. TO[1]:	TEST PARAMETERS	OTHER INFORMATION
8.	Inclination	Publication IEC 60092-504	Static 22.5°	a) inclined to the vertical at an angle of at least 22.5° b) inclined to at least 22.5° on the other side of the vertical and in the same plane as in (a), c) inclined to the vertical at an angle of at least 22.5° in plane at right angles to that used in (a), d) inclined to at least 22.5° on the other side of the vertical and in the same plane as in (c). Note: The period of testing in each position should be sufficient to fully evaluate the behaviour of the equipment.
			Dynamic 22.5°	Using the directions defined in a) to d) above, the equipment is to be rolled to an angle of 22.5° each side of the vertical with a period of 10 seconds. The test in each direction is to be carried out for not less than 15 minutes On ships for the carriage of liquefied gases and chemicals, the emergency power supply is to remain operational with the ship flooded up to a maximum final athwart ship inclination of 30°. Note: These inclination tests are normally not required for

<table>
<tr><th>NO.</th><th>TEST</th><th>PROCEDURE ACC. TO[1]:</th><th>TEST PARAMETERS</th><th>OTHER INFORMATION</th></tr>
<tr><td></td><td></td><td></td><td></td><td>equipment with no moving parts.</td></tr>
<tr><td>9.</td><td>Insulation resistance</td><td></td><td>
<table>
<tr><th rowspan="2">Rated supply voltage Un (V)</th><th rowspan="2">Test voltage Un (V)</th><th colspan="2">Min. insulation resistance</th></tr>
<tr><th>before test
M ohms</th><th>after test
M ohms</th></tr>
<tr><td>Un ≤ 65</td><td>2 x Un
min. 24V</td><td>10</td><td>1</td></tr>
<tr><td>Un > 65</td><td>500</td><td>100</td><td>10</td></tr>
</table>
</td><td>– For high voltage equipment, reference is made to IACS UR E11.
– insulation resistance test is to be carried out before and after: damp heat test, cold test, salt mist test, and high voltage test;
– between all phases and earth; and where appropriate, between the phases.

Note: Certain components e.g. for EMC protection may be required to be disconnected for this test.</td></tr>
</table>

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<table>
<tr><th>NO.</th><th>TEST</th><th>PROCEDURE ACC. TO[1]:</th><th>TEST PARAMETERS</th><th>OTHER INFORMATION</th></tr>
<tr><td>10.</td><td>High voltage</td><td colspan="2"><table><tr><th>Rated voltage Un (V)</th><th>Test voltage (A.C. voltage 50 or 60 Hz) (V)</th></tr><tr><td>Up to 65</td><td>2 x Un + 500</td></tr><tr><td>66 to 250</td><td>1500</td></tr><tr><td>251 to 500</td><td>2000</td></tr><tr><td>501 to 690</td><td>2500</td></tr></table></td><td>– For high voltage equipment, reference is made to IACS UR E11.
– separate circuits are to be tested against each other and all circuits connected with each other tested against earth;
– printed circuits with electronic components may be removed during the test;
– period of application of the test voltage: 1 minute</td></tr>
<tr><td>11.</td><td>Cold</td><td>IEC Publication 60068-2-1</td><td>Temperature: +5°C ± 3°C
Duration: 2 hours
or
Temperature: –25°C ± 3°C
Duration: 2 hours
(see note 2)</td><td>– initial measurement of insulation resistance;
– equipment not operating during conditioning and testing except for functional test;
– functional test during the last hour at the test temperature;
– insulation resistance measurement and the functional test after recovery</td></tr>
</table>

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NO.	TEST	PROCEDURE ACC. TO[1]:	TEST PARAMETERS	OTHER INFORMATION
12.	Salt mist	IEC Publication 60068-2-52 Test Kb	Four spraying periods with a storage of 7 days after each.	– initial measurement of insulation resistance and initial functional test; – equipment not operating during conditioning; – functional test on the 7th day of each storage period; – insulation resistance measurement and performance test 4 to 6h after recovery. (see Note 3) On completion of exposure, the equipment shall be examined to verify that deterioration or corrosion (if any) is superficial in nature.
13.	Electrostatic discharge	IEC 61000-4-2	Contact discharge: 6kV Air discharge: 8kV Interval between single discharges: 1 sec. No. of pulses: 10 per polarity According to level 3 severity standard.	– to simulate electrostatic discharge as may occur when persons touch the appliance; – the test is to be confined to the points and surfaces that can normally be reached by the operator; – Performance Criterion B (See Note 4).
14.	Electromagnetic field	IEC 61000-4-3	Frequency range: 80 MHz to 2 GHz Modulation**: 80% AM at 1000Hz Field strength: 10V/m Frequency sweep rate: ≤1.5 x 10-3 decades/s (or 1%/3 sec) According to level 3 severity standard	- to simulate electromagnetic fields radiated by different transmitters; - the test is to be confined to the appliances exposed to direct radiation by transmitters at their place of installation.

NO.	TEST	PROCEDURE ACC. TO[1]:	TEST PARAMETERS	OTHER INFORMATION
				- Performance criterion A (See Note 5) ** If for tests of equipment an input signal with a modulation frequency of 1000 Hz is necessary a modulation frequency of 400 Hz may be chosen.
15.	Conducted low frequency		AC: Frequency range :rated frequency to 200th harmonic; Test voltage (rms) : 10% of supply to 15th harmonic reducing to 1% at 100th harmonic and maintain this level to the 200th harmonic, min 3 V r.m.s, max 2 W DC: Frequency range : 50 Hz - 10 kHz; Test voltage (rms) :10% of supply max. 2 W	- to stimulate distortions in the power supply system generated for instance, by electronic consumers and coupled in as harmonics; - performance criterion A (see Note 5). - See figure – "test set-up"
16.	Conducted radio frequency	IEC 61000-4-6	AC, DC, I/O ports and signal/control lines: Frequency range : 150 kHz-80 MHz Amplitude : 3 V rms (See Note 6) Modulation ***: 80% AM at 1000 Hz Frequency sweep range: ≤ 1.5 x 10 -3 decades/s (or 1%/3sec.) According to level 2 severity standard	- Equipment design and the choice of materials is to stimulate electromagnetic fields coupled as high frequency into the test specimen via the connecting lines. - performance criterion A (see Note 5). *** If for tests of equipment an input signal with a modulation frequency of 1000 Hz is necessary a modulation frequency of 400 Hz may be chosen.

NO.	TEST	PROCEDURE ACC. TO[1]:	TEST PARAMETERS	OTHER INFORMATION
17.	Burst/fast transients	IEC 61000-4-4	Single pulse rise time: 5ns (between 10% and 90% value) Single pulse width: 50 ns (50% value) Amplitude (peak): 2kV line on power supply port/earth; 1kV on I/O data control and communication ports (coupling clamp) Pulse period: 300 ms; Burst duration: 15 ms; Duration/polarity: 5 min According to level 3 severity standard	- arcs generated when actuating electrical contacts; - interface effect occurring on the power supply, as well as at the external wiring of the test specimen; - performance criterion B (see Note 4).
18.	Surge/voltage	IEC 61000-4-5	Open-circuit voltage: Pulse rise time: 1.2 µs (front time) Pulse width: 50 µs (time to half value) Amplitude (peak) : 1kV line/earth; 0.5kV line/line Short-circuit current: Pulse rise time: 8 µs (front time) Pulse width: 20 µs (time to half value) Repetition rate: ≥ 1 pulse/min No of pulses: 5 per polarity Application: continuous According to level 2 severity standard	- interference generated for instance, by switching “ON” or “OFF” high power inductive consumers; - test procedure in accordance with figure 10 of the standard for equipment where power and signal lines are identical; - performance criterion B (see Note 4).
19.	Radiated emission (less than 1GHz)	CISPR 16-1, 16-2	For equipment installed in the bridge and deck zone. Frequency range: / Quasi peak Limits : 0.15-0.3 MHz: 80-52 dBµV/m 0.3-30 MHz: 52-34 dBµV/m 30-2000 MHz: 54 dBµV/m	- procedure in accordance with the standard but distance 3 m between equipment and antenna

NO.	TEST	PROCEDURE ACC. TO[1]:	TEST PARAMETERS	OTHER INFORMATION
			except for: 156-165 MHz: 24 dBµV/m For equipment installed in the general power distribution zone. Frequency range: Quasi peak Limits : 0.15-30 MHz: 80-50 dBµV/m 30-100 MHz: 60-54 dBµV/m 100-2000 MHz: 54 dBµV/m except for: 156-165 MHz: 24 dBµV/m	

<table>
<tr><th>NO.</th><th>TEST</th><th>PROCEDURE ACC. TO[1]:</th><th>TEST PARAMETERS</th><th>OTHER INFORMATION</th></tr>
<tr><td>20.</td><td>Conducted emission</td><td>CISPR 16-1, 16-2</td><td>For equipment installed in the bridge and deck zone.
<table><tr><td>Frequency range:</td><td>Quasi peak Limits :</td></tr><tr><td>10-150 kHz</td><td>96-50 dBµV/m</td></tr><tr><td>150-350 kHz</td><td>60-50 dBµV/m</td></tr><tr><td>350kHz-30 MHz</td><td>50 dBµV/m</td></tr></table>For equipment installed in the general power distribution zone
<table><tr><td>Frequency range:</td><td>Quasi peak Limits :</td></tr><tr><td>10-150 kHz</td><td>120-69 dBµV/m</td></tr><tr><td>150-500 kHz</td><td>79 dBµV/m</td></tr><tr><td>0,5-30 MHz</td><td>73 dBµV/m</td></tr></table></td><td></td></tr>
<tr><td>21.</td><td>Flame retardant</td><td>IEC 60092-101
Or
IEC 60695-11-5</td><td>Flame application: 5 times 15 s each. Interval between each application: 15s or 1 time 30s.

Test criteria based upon application.

The test is performed with the EUT or housing of the EUT applying needle-flame test method.</td><td>- the burnt out or damaged part of the specimen by not more than 60 mm long.
- no flame, no incandescence or
- in the event of a flame or incandescence being present, it shall extinguish itself within 30 s of the removal of the needle flame without full combustion of the test specimen.
- any dripping material shall extinguish itself in such a way as not to ignite a wrapping</td></tr>
</table>

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NO.	TEST	PROCEDURE ACC. TO[1]:	TEST PARAMETERS	OTHER INFORMATION
				tissue. The drip height is 200 mm ± 5 mm

Table 2.3 Notes:

1. Equipment to be mounted in consoles, housing etc. together with other equipment are to be tested with 70°C.
2. For equipment installed in non-weather protected locations or cold locations test is to be carried out at –25°C.
3. Salt mist test is to be carried out for equipment installed in weather exposed areas.
4. Performance Criterion B: (For transient phenomena): The EUT shall continue to operate as intended after the tests. No degradation of performance or loss of function is allowed as defined in the technical specification published by the manufacturer. During the test, degradation or loss of function or performance which is self-recoverable is however allowed but no change of actual operating state or stored data is allowed.
5. Performance Criterion A: (For continuous phenomena) : The Equipment Under Test shall continue to operate as intended during and after the test. No degradation of performance or loss of function is allowed as defined in relevant equipment standard and the technical specification published by the manufacturer.
6. For equipment installed on the bridge and deck zone, the test levels shall be increased to 10V rms for spot frequencies in accordance with IEC 60945 at 2, 3, 4, 6.2, 8.2, 12.6, 16.5, 18.8, 22, 25 MHz.

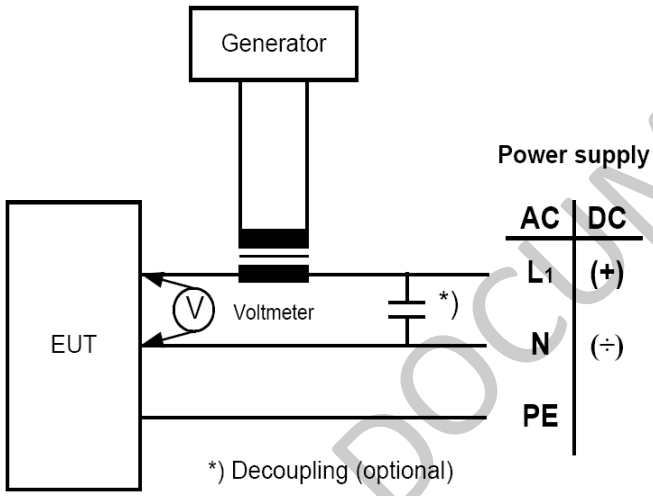

Figure - Test Set-up – Conducted Low Frequency Test

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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 electrical valve actuator;
b) Specification with indication of the devices and appliances used and the technical characteristics thereof;
c) General view drawings, dimensional drawings;
d) Circuit diagram of the electrical and electronic devices incorporated in to actuator with input and output signals, etc.;
e) QM - certificate according to ISO 9001;
f) In case when explosion-proof electric valve actuators 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, 2.3;
h) Test program and standards.

2.b Type testing requirements

The requirements of UR E 10 shall be applied depending on electric valves actuators design, power supply used, installation area intended. Also, specimen(s) shall be tested in order to define functionality as indicated in manufacturer`s technical documentation and to satisfy the requirements of present standard. **See Table 2.3 and Table 2.4.**

Test specimens shall be taken from the production line or from stocks†. 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)

Table 2.4

Nos	Test	Normative document	Test parameters and conditions	Test purpose, performance criteria
	Additional Tests		The additional tests of the automation equipment specimens shall be carried out in cases when it is necessary to document suitability of special characteristics of the articles indicated in the technical documentation.	
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, :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^{o}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;

4		(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;

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).

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) Rated torque
e) Ambient temperature
f) Rated voltage
g) Rated frequency
h) Rated power/current
i) IP class
j) Explosion-proof marking (if applicable).

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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 relevant EU RO MR Type Approval Certificate:

a) model type;
b) duty and cyclic duration factor;
c) voltage, current type and frequency;
d) nominal motor power (kW);
e) nominal motor current (A);
f) actuator rated torque (Nm)
g) motor insulation class;
h) enclosure protection (IP designation);
i) hazardous protection (when applicable);
j) ambient temperature range;
k) gear case lubrication type.

6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
31 January 2014	0.0	Accepted by Advisory Board
31 January 2015	0.1	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	0.2	CRF025 – Updated to new MR TR document format incl. par. 8; CRF026/026a – Witness testing & control of test specimen; CRF028 – addition of 6 month application clause.

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7. BACKGROUND INFORMATION / REFERENCES

a) International Electro-technical Commission (IEC) standards mentioned above;
b) Unified requirements (UR) E10 of the International Association of Classification Societies (IACS);
c) BS EN 15714-2:2009 Industrial valves-Actuators BRITISH STANDARD;
d) EN 15714-2:2009 Industrial Valves Actuators Part 2: Electric actuators for industrial valves — Basic requirements (European Standard).
e) 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.

-END-

EU RO Mutual Recognition Technical Requirements

INSULATION PANELS FOR PROVISION ROOMS & CHAMBERS	Version	0.2
	Adoption Date	1 April 2016
	Application Date	1 October 2016
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1. PRODUCT DESCRIPTION

1.a General description of the product

These technical requirements apply to rigid polyurethane foam panels used to insulate refrigerated provision chambers. Panels can be of the built-up (fabricated in place) or composite design.

1.b Application limitations

The application is limited to provision rooms and food preparation chambers. Other areas such as accommodation and service spaces, machinery spaces and cargo holds are outside the scope of this Technical Requirement.

1.c Intended use

The insulation being used to form; deep frozen, chilled and ambient storage rooms and handling areas used for the storage and preparation of ship's provisions.

1.d System context

Provision storage chambers, temperature controlled by mechanical refrigeration, need to have resistance to heat flow. Deep frozen chamber (minus 18°C) also need to be hermetically sealed to reduce water vapour penetration. The thickness and density of the insulation being governed by the internal/external temperature differential, panel height and roof span.

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2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a i. Technical Requirements

a) Panels shall be of a design that, when erected, adjacent panels can be butted along their edges and at corner and ceiling intersections, with a means of joining having sufficient mechanical strength;
b) Where no external fixtures are used the panels shall have sufficient inherent strength to form and maintain a self-supporting structure;
c) Panels shall be of a design such that, when erected, continuity of the insulation envelope is maintained without any gaps thus forming and maintain a vapour barrier at the external face;
d) Internal or external surfaces of insulating panels shall not to be used to support auxiliary services such as electrical cables, fire-extinguishers, etc., unless due regard has been given to the supported weights and to maintaining the integrity of the vapour barrier;
e) Materials suitably resistant to fire, lining suitably resistant to flame spread, effective protection against penetration of water vapour;
f) Self-contained chambers and rooms operating at chill and cold temperature shall be fitted with pressure equalising valves to stop the deformation of panels and formation of gaps during defrost cycles**;**
g) Electrical equipment and wiring shall effectively isolate from organic foam materials by steel sheet or conduit as appropriate, and there shall be an adequate space between the foam and the protective sheet or conduit.

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2.a.ii. Technical documents to be submitted

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

a) Details of the proposed insulation envelope system, including insulating and lining materials. The physical, thermal and fire properties of the built-up or composite panel system;
b) Details of all materials to be used in the manufacture of insulation, including blowing agent utilised;
c) Plans of the panels and intended method of installation of adjoining wall panels and installation of roof panels.

2.b Type testing requirements

The following type tests shall be conducted in accordance with the indicated standard (or recognised equivalent standard) to verify arrangement and design:-

a) Closed Cell Content, ISO 4590;
b) Fire behaviour (burning characteristics), DIN 4102 - Part 1;
c) Flame spread characteristics, ISO 5658-2;
d) Density, ISO 845;
e) Water vapour penetration, ISO 1663;
f) Compressive strength, ISO 844;
g) Bending strength, ISO 1209.
h) Thermal resistance, ISO 8301;

Test specimens shall be selected from production line or at random from stock†. 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)

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3. PRODUCTION REQUIREMENTS

a) The manufacturer must have in place a suitable quality system, such as ISO 9001;
b) The lining material and floor finishes shall be suitable for the application;
c) Panels shall be suitably wrapped prior to leaving the works to alleviate the effect of the panels being stored in open conditions;
d) Details of the foam type, polyisocyanurate or polyurethane, the producer of the raw materials, their designation, the nominal density of the insulation and the blowing agent material should be provided;
e) Refer to EU RO "Product Quality Assurance (PQA)" procedure (Appendix VI of EU RO Framework Document for the Mutual Recognition of Type Approval).

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 trade mark;
b) Type designation under which the product is type approved.

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.

6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
31 January 2013	0.0	Approved by the Advisory Board
31 January 2015	0.1	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	0.2	CRF025 – Updated to new MR TR document format incl. par. 8; CRF026/026a – Witness testing & control of test specimen; CRF028 – addition of 6 month application clause.

INSULATION PANELS FOR PROVISION ROOMS & CHAMBERS	Version	0.2
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7. BACKGROUND AND REFERENCE DOCUMENTS

a) Details of the codes and standards used to determine the products thermal, physical and fire properties;
b) Copy of the panel system erection handbook or its installation manual;
c) Regional Legislation: European Union Regulation (EC) No. 842/2006
d) EU RO Framework Document for the Mutual Recognition of Type Approval.

8. MAINTENANCE / CLARIFICATION OF TECHNICAL REQUIREMENTS

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EU RO Mutual Recognition Technical Requirements

PNEUMATIC ACTUATORS FOR VALVES	Version	0.2
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This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements ***** Uncontrolled if downloaded or printed *****		

1. PRODUCT DESCRIPTION

1.a General description of the product

A pneumatic actuator for valves is a component which directly converts air pressure into mechanical action, opening and closing the operated valve.

1.b Application limitations

a) The technical requirement only applies to mass-produced pneumatic actuators having design pressure $p \leq 1$ MPa and product $p \cdot V \leq 150$ (V being the internal volume in dm^3 of the pressure vessel/cylinder).
b) Pneumatic actuators shall not be used inside cargo tanks.

1.c Intended use

Pneumatic actuators intended for remote and local operation of valves.

1.d System context

Piping systems.

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2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a.i. Technical Requirements

Materials:

a) All parts of pneumatic actuators subject to internal pressure are to be of metallic materials;
b) Grey cast iron is not to be used for pressure vessels with design pressure p > 0,7MPa;
c) Where a specific standard is used for the design, the materials are to be selected among those allowed by that standard.

Safety Valve:

d) Piping systems where the pneumatic actuators are installed shall be provided with safety devices ensuring protection of pressure vessels in normal service;
e) These safety devices shall be set at no more than the maximum working pressure of pneumatic actuators and sized to prevent the pressure from rising more than 10% above MAWP.

Design:

f) Pneumatic actuators shall be designed according to recognised standards for pneumatic actuators (e.g.: EN 15714-3:2009) and/or pneumatic cylinders, in particular with regard to the safety factors for dimensioning of pressurised enclosures;
g) All valve pneumatic actuators provided with remote control shall be designed to permit local manual operation of valve;
h) The remote control system and means of local operation shall be independent;
i) Opening and/or closing of the valve by local manual means shall not render the remote control system inoperable;
j) Power failure of the remote control system shall not cause an undesired change of the valve position.

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Position indication:

k) The actuator shall be equipped with a local indicator to clearly show if the valve is open or shut.

2.a.ii. Technical documents to be submitted

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

a) General arrangement plan including nozzles and fittings;
b) Material specifications (including yield point, tensile strength, impact strength, heat treatment);
c) Welding details as applicable, including at least:
   - Typical weld joint design;
   - Welding procedure specifications;
   - Post weld heat treatments;
d) Constructional details of all pressure parts, such as shells, headers, nozzles;
e) Design data, including design pressure and temperature;
f) Internal volume of the pressure vessel/cylinder;
g) Maximum torque on the stem of the valve.

2.b Type testing requirements

a) Burst pressure test is to be carried out at 4 times the design pressure;
b) Functional test to be carried out both by remote control and local manual operation.

Test specimens shall be selected from production line or at random from stocks†. 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)

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3. PRODUCTION REQUIREMENTS

a) Refer to EU RO "Product Quality Assurance (PQA)" procedure (Appendix VI of EU RO Framework Document for the Mutual Recognition of Type Approval);
b) Materials, including welding consumables, for the construction of parts of actuators subject to pressure are to be certified by the material manufacturer in accordance with the appropriate material specification
c) A hydrostatic pressure test is to be carried out by the manufacturer at 1.5 times the design pressure
d) Functional tests are to be carried out by both remote control and local manual operation.

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.

Each pneumatic actuator is to be fitted with a permanently attached plate made of non-corrosive metal, with indication of the following information, in addition to the identification marks (name of manufacturer, year and serial number):

e) Design pressure;
f) Design temperature (optional);
g) Test pressure and the date of the test.

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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6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
31 January 2014	0.0	Accepted by EU RO MR Advisory Board.
31 January 2015	0.1	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	0.2	CRF025 – Updated to new MR TR document format incl. par. 8; CRF026/026a – Witness testing & control of test specimen; CRF028 – addition of 6 month application clause.

7. BACKGROUND INFORMATION / REFERENCES

a) EN 15714-3:2009 (Industrial Valves - Actuators - Part 3: Pneumatic part-turn actuators for industrials valves - Basic requirements);
b) EU RO Framework Document for the Mutual Recognition of Type Approval.

8. MAINTENANCE / CLARIFICATION OF TECHNICAL REQUIREMENTS

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- END -

EU RO Mutual Recognition Technical Requirements

SOLENOID VALVE ASSEMBLY	Version	0.2
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	Application Date	1 October 2016
	Tier	3
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1. PRODUCT DESCRIPTION

1.a General description of the product

a) Solenoid valve assembly is a type of directional remote control valve which is controlled by an electric solenoid. It is composed of a solenoid component and actuator of valve, intended for controlling medium conveying on-off or changing of conveying medium direction in hydraulic fluid system and pneumatic fluid system on board ships;

b) The move of the (pilot) valve core is pushed by the iron core of solenoid, and reset is usually controlled by spring force.

1.b Application limitations

a) This Technical Requirement applies to directional control valves of hydraulic control system and pneumatic control system on board ships;

b) This Technical Requirement is not applicable for:
- Proportional valves;
- Servo-valves;
- Digital solenoid valves;
- Electrically modulated hydraulic control valves;

c) The approval is applicable to the mechanical parts and electric hardware of the solenoid valve only. This excludes solid-state and programmable electronics as well as firmware, application software, and hardware designed for specific applications subject to classification. Firmware, system software, and application software shall be subject to additional separate approval,

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according to UR E22 and the rules of the classing RO (FAT and on-board review / tests).

1.c Intended use

a) Hydraulic fluid system on board ships;
b) Pneumatic fluid system on board ships;
c) Medium: Including air, vapour and gas, water, hydraulic oil, lubricating oil, fuel oil etc.

1.d System context

See 1.c above

2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a i. Technical Requirements

Design

a) The solenoid valve assembly shall be suitable for the effective operation at the rated pressure and flow they will experience in service. Rated pressure, flow and temperature of valve to be in accordance with a recognized standard for valves, and it should be guaranteed by the manufacturer of valves. Selected material to be among those contemplated by that standard. Geometrical parameters of pressure retaining parts shall comply with that standard.
b) Type, ratings and characteristics of solenoid valve assembly for intended applications shall be evaluated. The performance of the valve assembly, include:
   - action;
   - pressure differential / flow characteristics;
   - rated flow;
   - leakage;
   - response time;
   - medium flow direction;

- reversing time;
- changing-over frequency;
- control pressure etc.,

The above shall be as per relevant national or international standards.

c) Solenoid valve assembly shall be operated satisfactory in both vertical and level position. Special requirements for installation position limitation shall be cautioned.

d) The temperature rise of solenoids at windings shall not exceed the values given in the **Table 2.1** below during continuous operation, and the ambient air temperature is based on 45℃, and the voltage of the electric power supply is at the highest permissible value.

Table 2.1

Insulation level of solenoid	Limit of temperature rise(K) windings
Class A insulation	55
Class E insulation	70
Class B insulation	75
Class F insulation	95
Class H insulation	120

e) Unless otherwise stated in international standards, solenoid valve assembly shall operate satisfactorily within the variations in voltage and frequency from the rated value shown in **Table 2.2** below (measured at input terminals of the assembly). Power failure of the remote control system is not to cause an undesired change of the valve position:

Table 2.2

Power Supply	Parameters	Permanent (%)	Transient (%)
AC	Voltage	±10	±20 (within 1.5 sec)
	Frequency	±5	±10 (within 5 sec)
DC	Voltage	+30 ~ -25	-

f) Life time of solenoid valve assembly should be not less than following **Table 2.3** below requirements or according to the relevant acceptable standards:

Table 2.3

DN (mm)	Medium	
	Liquids/Vapour	Air/Gas
⩽ 25	100000 times	500000 times
32~65	50000 times	300000 times
80~150	30000 times	150000 times
200~300	10000 times	30000 times

Materials

g) The materials to be used for the solenoid valve assembly shall be compatible with the medium and service for which the piping systems are intended;

h) The use of asbestos is prohibited;

i) The material used to make solenoid shall comply with the following requirements:

- It is, in general, to be durable, flame-retardant, moisture resistant unless it is adequately protected against the atmospheric environment and temperatures to which it is likely to be exposed;
- Insulating materials and insulated windings shall be resistant to moisture, sea air and oil vapour unless special precautions are taken to protect them;
- The current carrying parts of electrical equipment are, in general, to be made of copper or copper alloys;
- Metal parts of electrical equipment shall be covered with proper protective coating against corrosion unless they are made of

satisfactory corrosion-resistant material. (Note: Salt spray test may be necessary. Please reference to ISO9227 NSS Test).

Types of connections

j) Types of connections and dimensions of solenoid valve assembly shall be determined in accordance with national or international standards;

k) The relative bolts shall be chosen in accordance with the national or international standards.

Ambient conditions:

l) Temperatures: –25℃ to +55℃;

m) Relative humidity: 100%;

n) Solenoid valve assembly shall operate satisfactorily under the vibration conditions listed in following **Table 2.4:**

Table 2.4

Location of installation	Parameters of vibration	
General space	2.0 ~ 13.2 Hz Amplitude ±1 mm	13.2 ~ 100 Hz Acceleration ±0.7 g
On reciprocating engines (e.g. diesel engines, air compressors) and other similar spaces	2.0 ~ 25 Hz Amplitude ±1.6 mm	25 ~ 100 Hz Acceleration ±4.0 g
Other special locations, e.g. exhaust pipes for (particularly medium or high speed) diesel engines	40 ~ 2,000 Hz Acceleration ±10.0 g (temperature 600℃)	

o) Solenoid valve assembly shall be suitable for the normal conditions encountered on board ships, e.g. salt air, oil-laden atmosphere, mold and dust.

Constructions

p) The valve assembly shall be so designed, constructed and installed as to ensure safe operation and facilitate inspection and repair;

q) The distance between live parts of different potential and between live parts and earthed metal, whether across surfaces or in air, shall be adequate for the working voltage, having regard to the nature of the insulating material and the conditions of service. Insulation resistance and high voltage test shall be carried out according to Table 2.5 below;

r) All nuts and screws used for the connection and fastening of the valve assembly shall be provided with means to ensure that they cannot work loose by vibration and shock;

s) In the event of failure of the electric power supply, the valve assembly shall be capable of being local manually operated without using any other tools for safety purposes. Opening and/or closing of the valve by local means shall not render the remote control system inoperable;

t) Indicators shall be provided to show the condition of the solenoid, unless this can be observed in some other ways;

u) Insulation resistance between windings and shell shall be not less than 20MΩ.

v) The type of protective enclosures selected for the solenoid shall be appropriate to the condition of the location at which such assembly is installed (Ref. IEC 60092-504). Degrees of protection (IP Code) of solenoid usually shall be no less than IP54;

w) Where the assembly is installed in areas where explosive gas or vapour atmospheres may be present, it shall be of a certified explosion protection safe type complying with the following requirements:

- The construction and type testing of the safe type electrical equipment is to be in accordance with the relevant acceptable standards;
- The explosion protection safe type of assembly, if applicable, shall be certified by a competent testing authority approved by EU RO.

2.a.ii. Technical documents to be submitted

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

a) The following documentation shall be submitted by the Manufacturer before type testing:

- The request for type approval shall be submitted by the Manufacturer or by the Applicant, if authorized by the Manufacturer;

- Product descriptions (including intended services, installation locations, intended fluids, working medium temperature range, certificates and reports of relevant tests previously carried out), instructions on operation, data sheets or specification;
- Details of relevant standards;
- All relevant design drawings, catalogues, Assembly drawings, dimension drawings, external connection terminal drawings, nameplate etc. clearly identifying the product;
- Drawings of main parts/components including body of valve, cores, springs, electromagnetic wire, etc.;
- Proposed test program and test schedule;
- Description of test specimens and explanation of the selected test sample(s) providing evidence that the selected sample meets the most rigorous and demanding requirements;
- Complete accreditation certificate of the Test laboratory;
- Details of production sites and working area;
- QM-certificate according to ISO 9001 or equivalent by an accredited certifying body.

b) On completion of proto type tests, a report shall be issued, identified by number and date, which accurately, clearly and unambiguously presents the test results and all other relevant information;

c) Test report(s) shall include the following information:
   - Type of product, with type number / serial number(s) and quantity tested;
   - Test specification for the product identified by number, revision and date;
   - Details of test equipment and measuring instruments stating serial numbers and calibration certificates;
   - Names of the test engineer and the engineer approving the report.
   - Ambient environmental conditions during the test;
   - The test results with a description of any failures encountered.
   - Conclusion.

   Test report(s) shall be signed by the test personnel and verified by the EU RO or the agreed independent representative witnessing the tests.

d) The complete product test report(s) shall be submitted to the EU RO.

2.b Type testing requirements

General:

a) Type tests shall be in accordance with applicable standards, such as IEC 60068-2 series;
b) Test specimens shall be selected from production line or 'at random' from stock†. Where there are various sizes from type of solenoid valve assembly requiring approval, the maximum size for each kind of solenoid with the same rated pressure shall be the representative of the range;
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 EO RO surveyor may be omitted †.
d) The explosion protection safe type, if applicable, is to be certified by a competent testing authority approved by the EU RO;
e) Unless otherwise specified, such as IEC 60068-1, all tests shall be carried out under the following atmospheric conditions:
   - Ambient temperature between +15℃ and +35℃;
   - Relative humidity：between 25％RH and 75％RH;
   - Air pressure：86～106 kPa.

† 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)

Testing items:

f) Hydrostatic & burst/pressure test:

Each type of solenoid valve assembly shall be subject to the hydrostatic pressure test at the following value of pressure:

P_H = 1.5P (holding pressure time 5min.)
where P_H = Hydraulic test pressure (bar), but in no case less than 4 bar,
P = Rated pressure (bar)

Each type of solenoid valve actuator housing, subject to internal pressure, shall be subject to the burst test at the following value of pressure:

P_b = 4P (holding pressure time 2min.)
where P_b = Burst test pressure (bar),
P = Rated pressure (bar)

g) Measurement of temperature rise(Clause 2.a.i of this technical requirement);

Notes:

- *For solenoid subject to temperature rise test, the high voltage test shall be carried out immediately after the temperature rise test.*
- *The high voltage test is in general not to be repeated, but if it is necessary, one additional test is permitted to be carried out with a test voltage equal to 75% of the voltage at the first test.*

End of Notes

h) Degrees of protection (IP Code) test: according to IEC 60529;
i) Leakage test: conformance to drawings, design data;
j) Life test (clause 2.a.i of this technical requirement);
k) The tests listed in **Table 2.5** specified in IACS UR E10 shall be performed:

Table 2.5

Test items	Requirements	Test method
1. Visual Inspection	conformance to drawings, design data	IACS UR E10 Table E10.1 Item 1
2. Performance test	conformance to design data;	IACS UR E10 Table E10.1 Item 2;

	Clause 2.a.i of this part	ISO 4411;
3. External power supply failure/Emergency operation	Clause 2.a.i of this part	Clause 2.a.i of this part
4. Power supply variations	Clause 2.a.i of this part	IACS UR E10 Table E10.1 Item 4
5. Dry heat	IACS UR E10	IACS UR E10 Table E10.1 Item 5
6. Damp heat	IACS UR E10	IACS UR E10 Table E10.1 Item 6
7. Vibration	Clause 2.a.i of this part	IACS UR E10 Table E10.1 Item 7
8. Inclination	Clause 2.a.i of this part; IACS UR E10	Clause 2.a.i of this part; IACS UR E10 Table E10.1 Item 8
9. High Voltage	IACS UR E10	IACS UR E10 Table E10.1 Item 10
10. Insulation resistance	IACS UR E10 Clause 2.a.i of this part	IACS UR E10 Table E10.1 Item 9
11. Cold	IACS UR E10	IACS UR E10 Table E10.1 Item 11
12. Salt mist	IACS UR E10	IACS UR E10 Table E10.1 Item 12
13. Flame retardant	IACS UR E10	IACS UR E10 Table E10.1 Item 21

3. PRODUCTION REQUIREMENTS

3.a General requirements

a) The manufacturer shall ensure that the solenoid valve assemblies comply with the drawings and technical documents approved by the RO;

b) A Quality Management System meeting the requirements of EU RO Product Quality Assurance (Appendix VI of EU RO Framework Document for the Mutual Recognition of Type Approval) shall be implemented effectively by the manufacturer.

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3.b Special requirements

Routine tests.

The tests indicated below shall be carried out by manufacturer:

a) Visual Inspection;
b) Hydrostatic/pressure test at the following value of pressure:

$$P_H = 1.5P$$

where P_H = test pressure (bar), but in no case less than 4 bar,
P = Rated pressure (bar)

c) Performance test (including action, leakage, medium flow direction);
d) High Voltage test;
e) Insulation resistance test;
f) Emergency operation test.

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) Each solenoid valve assembly shall be provided with clear symbols or marks according to recognised standards. Hydraulic solenoid valve assembly ports and solenoids shall be permanently marked with identification as per ISO 9461;
b) A clear earth mark shall be provided near the earth terminal. (If applicable);
c) Rating plate fitted to the assembly;
d) Each solenoid valve assembly shall be provided with a rating plate of weatherproof material, fitted in a visible position, showing the items indicated as below. The plate shall be indelibly marked (that is, by etching, engraving, stamping or by a photo-chemical process):
   - Manufacturer's name or trade mark;
   - Type designation under which the product is type approved;
   - Power supply: Rated voltage, Rated frequency (AC machines, if applicable), Rated power or Rated current;

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- Insulation class, Degree of protection, Explosion protection type (if applicable);
- Rated pressure, medium;
- Data of manufacture;
- Manufacturer's serial number.

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.

6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
31 January 2014	0.0	Accepted by Advisory Board
31 January 2015	0.1	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	0.2	CRF025 – Updated to new MR TR document format incl. par. 8; CRF026/026a – Witness testing & control of test specimen; CRF028 – addition of 6 month application clause.

7. BACKGROUND INFORMATION / REFERENCES

a) IACS UR E10 - "Test Specification for Type Approval'';
b) IACS UR P2 – "Rules for piping design, construction and testing";
c) IACS UR M40 – "Ambient conditions – Temperatures";
d) IEC 60529:2001 – "Degrees of protection provided by enclosures (IP Code)";
e) ISO 4401:2005 - "Hydraulic fluid power - Four-port directional control valves - Mounting surfaces";
f) ISO 4411:2008 - "Hydraulic fluid power - Valves - Determination of pressure differential / flow characteristics";

g) ISO 5783:1995 - "Hydraulic fluid power - Code for identification of valve mounting surfaces and cartridge valve cavities";
h) ISO 7368:1989 – "Hydraulic fluid power; two-port slip-in cartridge valves; cavities";
i) ISO 7789:2007 - "Hydraulic fluid power - Two-, three- and four-port screw-in cartridge valves – Cavities";
j) ISO 9461:1992 - "Hydraulic Fluid Power; Identification of Valve Ports, Sub-plates, Control Devices and Solenoids";
k) ISO 15218:2003 - "Pneumatic fluid power - 3/2 solenoid valves - Mounting interface surfaces";
l) IEC publication 60079: "Electrical Apparatus for Explosive Gas Atmospheres" or an equivalent national standard;
m) IEC 60092-504 Electrical installations in ships - Part 504: Special features - Control and instrumentation;
n) IEC 60068-1 Environmental testing - Part 1: General and guidance;
o) IEC 60068-2 Environmental testing - Part 2 Series;
p) EU RO Framework Document for the Mutual Recognition of Type Approval;
q) ISO9227 Corrosion test in artificial atmospheres-Salt spray tests.

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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EU RO Mutual Recognition Technical Requirements

STATIONARY LIGHTING FIXTURES/ FLOOD LIGHT PROJECTORS	Version	0.2
	Adoption Date	1 April 2016
	Application Date	1 October 2016
	Tier	3
This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements ***** Uncontrolled if downloaded or printed *****		

1. PRODUCT DESCRIPTION

1.a General description of the product

a) Complete lighting units, designated as light fixture, light fitting or luminaries, and hereinafter referred as luminaries, are electrical devices used to create artificial light, by the use of one or more lamps (bulbs or tubes that emit light), along with the socket and other parts that protect and hold the lamp in place;
b) Luminaries have a fixture body and may have a reflector that helps to direct and distribute the light. Luminaries are mostly ceiling or wall-mounted fixtures. Generic name of luminaries also includes floodlights as a specific type.

1.b Application limitations

a) Luminaries shall be used in low voltage AC or DC circuits;
b) Supplementary lighting is not covered by this technical requirement;
c) LED luminaries are not covered by this technical requirement;
d) Luminaries required as per statutory requirements, such as emergency lighting, searchlights, rescue lights, daylight signalling lamps, luminaries installed in bridge deck, low location lighting and navigation lights, are not covered by this technical requirement.

1.c Intended use

Luminaries are intended for general illumination of, on board spaces (indoor or outdoor) with no special classification (hazardous areas).

1.d System context

See item 1.c above.

2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a i. Technical Requirements

General

a) Luminaries shall comply with the requirements of IEC 60598 and IEC 60092-306. Luminaries complying with other equivalent standards will be considered by the EU RO.

Construction

b) The temperature of terminals for the connection of supplying cables shall not exceed the maximum conductor temperature permitted for the cable, in order to prevent damage of the cable;
c) Synthetic resin enclosures which support current-carrying parts shall be flame retardant;
d) Lighting fixtures installed in engine room or similar spaces which are exposed to the risk of mechanical damage shall be provided with suitable grilled metallic guards to protect their lamps and glass globes against such damage;
e) Luminaries shall be fitted with terminal boxes which are to be thermally insulated from the light source, where necessary;
f) Wires used for internal connections, shall be of a temperature class corresponding to the maximum temperature within the luminaries. Such wires shall also be able to withstand UV light within the luminaries;
g) The temperature rise of parts of luminaries, which are in contact with the support, shall not exceed 50°C.The rise shall not exceed 40°C for parts in contact with flammable materials;

h) The temperature rise of surface parts which can easily be touched in service shall not exceed 15°C.
i) High power luminaries with higher surface temperatures than those specified above shall be adequately protected against accidental contact.

2.a.ii. Technical documents to be submitted

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

a) Drawings of detailed sectional assembly and layout of components;
b) Specification of applied materials for the enclosure and insulation;
c) List of electrical components and materials;
d) Field of application and operational limitations;
e) Details of construction, namely:
   - Power.
   - Voltage.
   - Cos. phi.
   - Temperature class.
   - Insulation class.
   - Degree of protection (IP).
f) Design standards, specifications, others as required.

2.b Type testing requirements

Prior to tests the manufacturer shall submit, in compliance with the requirements of IEC 60598, as applicable, the following documentation:

a) Proposed test program and test schedule.
b) Description of the test specimens and explanation of the selected test sample(s).
c) Complete accreditation certificate of the test laboratory.

Environmental and electrical tests are to be in accordance with **Table 1**. Type test shall be carried out on (1) equipment out of (100) of each type, with minimum of (5) units.

Test specimens shall be taken from the production line or from stocks†. Test shall be performed in the presence of an EU RO surveyor. In case the tests are conducted at

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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)

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Table 1 – environmental and electrical tests

Environmental tests		
1	Vibration test	IEC 60092-306 par. 7.2.1, IEC 60068-2-6
2	Electrical shock exposure	IEC 60092-306 par. 7.2.2, IEC 60068-2-27
3	Climatic exposure, operation cold	IEC 60092-306 par. 7.2.3, IEC 60068-2-1
4	Climatic exposure, operation dry heat	IEC 60092-306 par. 7.2.3, IEC 60068-2-2
5	Climatic exposure, operation damp heat	IEC 60092-306 par. 7.2.3, IEC 60068-2-78 *applicable only for indoor luminaires*
6	Climatic exposure, operation salt mist	IEC 60092-306 par. 7.2.3, IEC 60068-2-52 *applicable only for outdoor luminaires*
7	Climatic exposure, storage cold	IEC 60092-306 par. 7.2.4, IEC 60068-2-1
8	Climatic exposure, storage dry heat	IEC 60092-306 par. 7.2.4, IEC 60068-2-2
9	Climatic exposure, storage damp heat	IEC 60092-306 par. 7.2.4, IEC 60068-2-78
10	Uv resistance	IEC 60092-306 par. 7.2.5, ISO 4892-3 or ISO 4892-2
11	Resistance to heat, fire	IEC 60092-306 par. 7.2.5, IEC 60695-2-11
Electrical tests		
12	General	IEC 60092-306 par. 4.1,4.7, 4.9, 8, IEC 60598-1
13	Electromagnetic compatibility	IEC 60092-306 par. 4.3.3, IEC 60533, IACS UR E10
14	High voltage test before and after each environmental test	IEC 60092-306 par. 7.3.1, IEC 60598-1
15	Insulation resistance test before and after each environmental test	IEC 60092-306 par. 7.3.2, IEC 60598-1

After completion of tests the manufacturer shall submit:

a) The test report with an identification number containing all relevant data and test results including place and date of the tests;
b) Type references and serial numbers of the products tested.

Test reports and test records must be signed by the personnel members in charge of the test and shall be confirmed by the EU RO by signing and marking the test report.

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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).

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 reference or designation of the product;
c) Serial number;
d) Voltage; max. power/current;
e) Degree of protection (IP);
f) Other as required.

The marking provided in the luminaries shall allow the trace back to the type approval certificate of the product.

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.

Manufacturer's documentation included on The EU RO MR Type Approval Certificate shall include particular information for the product or series:

a) Manufacturer type designation;
b) Power;
c) Type of current (ac; dc; both);
d) Voltage;
e) Cos. phi,
f) Temperature class;
g) Insulation class;
h) Degree of protection (IP).

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6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
31 January 2014	0.0	Approved by the Advisory Board
31 January 2015	0.1	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	0.2	CRF025 – Updated to new MR TR document format incl. par. 8; CRF026/026a – Witness testing & control of test specimen; CRF028 – addition of 6 month application clause.

7. BACKGROUND INFORMATION / REFERENCES

a) IEC 60598 – "Luminaires";
b) IEC 60695 – "Fire hazard testing";
c) IEC 60092-306 – "Electrical installations in ships - Part 306: Equipment - Luminaires and lighting accessories";
d) IEC 60533 – "Electrical and electronic Installations in ships - Electromagnetic compatibility";
e) IEC 60068 – "Environmental testing";
f) ISO 4892 – "Plastics-Methods of exposure to laboratory light sources";
g) IACS UR E10 - "Test Specification for Type Approval";
h) 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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EU RO Mutual Recognition Technical Requirements

CIRCUIT BREAKERS WITH ELECTRONIC DEVICES	Version	0.2
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	Tier	4
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1. PRODUCT DESCRIPTION

1.a General description of the product

Description of product according to IEC IEV 441-14-20:
Circuit breaker: A mechanical switching device, capable of making, carrying and breaking currents under normal circuit conditions and also making and carrying currents for a specified time under specified abnormal circuit conditions, and breaking currents under specified abnormal circuit conditions such as those of short circuit.

1.b Application limitations†

a) Restricted to LV air circuit-breakers (ACBs) and moulded-case circuit-breaker (MCCBs) according to IEC 60947-2 where the rated voltage does not exceed 1000V a.c. (50/60 Hz) or 1500 V d.c.;
b) On board ships with exceptions as per SOLAS Ch. I, Reg. 3;
c) Installation on board ships within locations with climatic, biological, chemically active, mechanically active and mechanical environmental conditions not exceeding those for which performance has been proved according to IEC 60721-3-6 (1987) + A2 (1997);
d) Electronic or computerised protection devices for generators and consumers shall be designed in such way that the function of the protection equipment can be tested on board and that settings and adjustments are identifiable.

† 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

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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.

1.c Intended use

a) Power supply system characteristics as per IEC 60092-101, 2.8;
b) For equipment tested according to their respective environmental categories I-IV (see **7. Background information/ References**);
c) Circuit breaker shall have their energy for the tripping operation stored prior to the completion of the closing operation;
d) Circuit breakers shall be of the trip-free type and be fitted with anti-pumping control;
e) Circuit breakers shall be equipped with independent manual closing as per IEC 60947-2 Sub-clause 7.2.1.;
f) Circuit breaker with integrated protection functions shall be type tested according to relevant parts of IEC 60255 and IEC 60068, as applicable;
g) Circuit breakers shall be equipped with independent manual opening and closing circuits.

1.d System context

See 1.c.

2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a i. Technical Requirements

a) Type, ratings and characteristics of circuit breakers for intended applications shall be evaluated;
b) In general, the IEC 60947 series and IEC 60255 series apply;
c) Dependency of external control power shall be evaluated.

2.a.ii. Technical documents to be submitted

Prior to tests:

a) Proposed test program and test schedule;
b) Description of the test specimens and explanation of the selected test sample(s) providing evidence that the selected sample meets the most rigorous and demanding requirements;
c) Product descriptions, manuals, data sheets, assembly drawings, dimension drawings etc. clearly identifying the product;
d) Complete accreditation certificate of the Test laboratory (prior the first test only; changes in the scope of accreditation shall also be advised);
e) Details of production sites;
f) Product specification;
g) Application, working area;
h) Instructions on fitting, assembly and operation;
i) QM-certificate according to ISO 9001.

After completion of tests:

j) The test report with an identification number shall contain all relevant data and test results including place and date of the tests, the names of the responsible personnel carrying out the test;
k) Type references and serial numbers of the products tested;
l) Test reports and test records shall be signed by the personnel members in charge of the test and are to be confirmed by the EU RO by signing and marking the test report.

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) Environmental tests should be carried out in accordance with last revision of IACS UR E10 (applicable items) or in accordance with IEC 60947-2 and IEC 60947-1 Annex Q - Category D, with the severity conditions set by the IACS UR E10 as a minimum, notably for the resulting recovery times;
f) Electromagnetic compatibility (EMC) to be tested in accordance with the procedures indicated in the IACS UR E10 or in accordance with IEC 60947-2 Annex J and Annex N, with the severity conditions set by the IACS UR E10 as a minimum;
g) IEC 60947-2 Annex H, Test sequence for circuit-breakers for IT systems;
h) All tests to be performed on agreed test samples. Test specimens shall be selected from production line or at random from stocks†;
i) 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.euromr.org/technical-requirements).

3. PRODUCTION REQUIREMENTS

a) Refer to EU RO “Product Quality Assurance (PQA)" procedure (Appendix VI of EU RO Framework Document for the Mutual Recognition of Type Approval); Routine test according to IEC 60947-2 sub-clause 8.4;
b) Production certification according to ISO 9001 by accredited certification bodies;
c) QM/QS audit (annual) shall be submitted to EU RO for review;

d) Production of the equipment is limited to those facilities listed on the EU RO certificate;
e) Changes to the product, or its embedded software (firmware), 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 of change;
f) The EU RO shall be granted access to all manufacturing and testing facilities, and to be provided with all the information necessary to perform its duties;
g) General terms and conditions of the EU RO shall be observed.

4. MARKING REQUIREMENTS

Marking as required by IEC 60947-2 (sub-clause 5.2).

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 data according to IEC marking;
b) Software version, if applicable;
c) Reference to approved technical documents;
d) Application and limitations.

CIRCUIT BREAKERS WITH ELECTRONIC DEVICES	Version	0.2
	Adoption Date	1 July 2018
	Application Date	1 January 2019
	Tier	4
This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements ***** Uncontrolled if downloaded or printed *****		

6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
2015-01-31	0.0	Accepted by EU RO MR Advisory Board
1 April 2016	0.1	CRF025 – Updated to new MR TR document format incl. par. 8; CRF026/026a – Witness testing & control of test specimen; CRF028 – addition of 6-month application clause.
1 July 2018	0.2	CRF032 / CRF035 - Revision of par. 2.b – Type testing requirements (Alignment of Electrical TRs) Corrected reference to standard IEC 60721-3-6 (1987) + A2 (1997)

7. BACKGROUND INFORMATION / REFERENCES

a) EU RO Framework Document for the Mutual Recognition of Type Approval;
b) IEC IEV 441-14-20;
c) IEC 60947;
d) SOLAS Ch. I, Reg. 3;
e) IEC 60721-3-6 (1987) + A2 (1997);
f) IEC 60092;
g) IEC 60255;
h) ISO 9001;
i) ISO 17025;
j) Environmental categories (**Table 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

CIRCUIT BREAKERS WITH ELECTRONIC DEVICES	Version	0.2
	Adoption Date	1 July 2018
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	Tier	4
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TABLE 1 - ENVIRONMENTAL CATEGORIES

Environmental Category	Environmental Conditions						Test Conditions					
	Closed Area			Open Deck Area			Temperature		Climate			
	Temperature	Relative Humidity	Vibrations	Temperature	Relative Humidity	Vibrations	Dry Heat	Cold	Temperature	Relative Humidity	Salt mist	Vibrations
I	0°C to 45°C	up to 100%	0,7g				55°C	5°C	55°C	95%	–	0,7g
II	0°C to 45°C	up to 100%	4g				55°C	5°C	55°C	95%	–	4g
III	0°C to 55°C	up to 100%	0,7g				70°C	5°C	55°C	95%	–	0,7g
IV	0°C to 55°C	up to 100%	4g				70°C	5°C	55°C	95%	–	4g
EMC 1	IEC 60533 6.2.1											
EMC2	IEC 60533 6.2.2											

*) Ref. IEC 60947-1. Annex 'Q', Cat F

- END -

EU RO Mutual Recognition Technical Requirements

CONTACTORS WITH ELECTRONIC DEVICES	Version	0.2
	Adoption Date	1 July 2018
	Application Date	1 January 2019
	Tier	4
This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements ***** Uncontrolled if downloaded or printed *****		

1. PRODUCT DESCRIPTION

1.a General description of the product

The description of the product is used according to IEC IEV 441-14-33.
Contactor: A mechanical switching device having only one position of rest, operated other than by hand, capable of making, carrying and breaking currents under normal circuit conditions including operating overload conditions.

1.b Application limitations†

a) Restricted to LV electromechanical contactors according to IEC 60947-4-1 where the rated voltage does not exceed 1000V a.c. or 1500V d.c.;
b) On board ships with exceptions as per SOLAS Ch. I, Reg. 3;
c) Installation on board ships within locations with climatic, biological, chemically active, mechanically active and mechanical environmental conditions not exceeding those for which performance has been proved according to IEC 60721-3-6 (1987) + A2 (1997).

† 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.

1.c Intended use

a) Power supply system characteristics as per IEC 60092-101, 2.8;
b) For equipment tested according to their respective environmental categories I-IV see **7. Background information/ References**).

1.d System context

See 1.c.

2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a i. Technical Requirements

a) Type, ratings and characteristics of contactors for intended applications shall be evaluated;
b) In general, the IEC 60947 series applies.

2.a.ii. Technical documents to be submitted

Prior to tests:

a) Proposed test program and test schedule;
b) Description of the test specimens and explanation of the selected test sample(s) providing evidence that the selected sample meets the most rigorous and demanding requirements.;
c) Product descriptions, manuals, data sheets, assembly drawings, dimension drawings, etc., clearly identifying the product;
d) Complete accreditation certificate of the Test laboratory (prior to the first test only; changes in the scope of accreditation shall also be advised);
e) Details of production sites;
f) Product specification;
g) Application, working area;
h) Instructions on fitting, assembly and operation;
i) QM-certificate according to ISO 9001.

After completion of tests:

j) The test report with an identification number shall contain all relevant data and test results including place and date of the tests, the names of the responsible personnel carrying out the test;

k) Type references and serial numbers of the products tested;

l) Test reports and test records shall be signed by the personnel members in charge of the test and are to be confirmed by the EU RO through the signing and marking of the test report.

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) Environmental tests should be carried out in accordance with last revision of IACS UR E10 (applicable items) or in accordance with IEC 60947-4-1 sub-clause 9.1.5.2 and IEC 60947-1 Annex Q - Category D, with the severity conditions set by the IACS UR E10 as a minimum, notably for the resulting recovery times;

f) Electromagnetic compatibility (EMC) to be tested in accordance with the procedures indicated in the IACS UR E10 or in accordance with IEC 60947-4-1 sub-clause 8.3, with the severity conditions set by the IACS UR E10 as a minimum;

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

h) 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.euromr.org/technical-requirements).

3. PRODUCTION REQUIREMENTS

3.a. 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.b Special Requirements

a) Routine test according to IEC 60947-4-1 sub-clause 9.1.3;
b) Production certification according to ISO 9001 by accredited certification bodies;
c) QM/QS audit (annual) shall be submitted to the EU RO for review;
d) Production of the equipment is limited to those facilities listed on EU RO's certificate;
e) Changes to the product, or its embedded software (firmware), will void the EU RO's certification;
f) The EU RO shall be granted access to all manufacturing and testing facilities, and to be provided with all the information necessary to perform its duties;
g) General terms and conditions of EU RO shall be observed.

4. MARKING REQUIREMENTS

Marking as required by IEC 60947-4-1 (sub-clause 6.2).

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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	Application Date	1 January 2019
	Tier	4
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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) Approval conditions including limitations;
b) Hardware, software, firmware name and version;
c) Technical data according to IEC marking;
d) Application and limitations.

6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
2015-01-31	0.0	Accepted by EU RO MR Advisory Board
1 April 2016	0.1	CRF025 – Updated to new MR TR document format incl. par. 8; CRF026/026a – Witness testing & control of test specimen; CRF028 – addition of 6-month application clause.
1 July 2018	0.2	CRF032 / CRF035 - Revision of par. 2.b – Type testing requirements (Alignment of Electrical TRs) Corrected reference to standard IEC 60721-3-6 (1987) + A2 (1997)

7. BACKGROUND INFORMATION / REFERENCES

a) EU RO Framework Document for the Mutual Recognition of Type Approval;
b) IEC IEV 441-14-33;
c) IEC 60947;
d) SOLAS Ch. I, Reg. 3;
e) IEC 60721-3-6 (1987) + A2 (1997);
f) IEC 60092;
g) ISO 9001;
h) IMO Resolution A.813(19):1995;
i) IEC 60533;
j) IEC 60945;
k) Environmental categories (see **Table 1**).

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8. MAINTENANCE / CLARIFICATION OF TECHNICAL REQUIREMENTS

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TABLE 1 - ENVIRONMENTAL CATEGORIES

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	Temperature	Relative Humidity	Vibrations	Temperature	Relative Humidity	Vibrations	Dry Heat	Cold	Temperature	Relative Humidity	Salt mist	Vibrations
I	0°C to 45°C	up to 100%	0,7g				55°C	5°C	55°C	95%	–	0,7g
II	0°C to 45°C	up to 100%	4g				55°C	5°C	55°C	95%	–	4g
III	0°C to 55°C	up to 100%	0,7g				70°C	5°C	55°C	95%	–	0,7g
IV	0°C to 55°C	up to 100%	4g				70°C	5°C	55°C	95%	–	4g
EMC 1	IEC 60533 6.2.1											
EMC2	IEC 60533 6.2.2											

- END -

EU RO Mutual Recognition Technical Requirements

TACHOMETER	Version	0.1
	Adoption Date	1 April 2016
	Application Date	1 October 2016
	Tier	4
This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements ***** Uncontrolled if downloaded or printed *****		

1. PRODUCT DESCRIPTION

1.a General description of the product

Rotational speed indicator of marine diesel engines, steam and gas turbines, which indicate revolutions per minute and rotating direction.

a) Mechanical (Centrifugal, Electromagnetic) tachometer

The types by drive system are shown below:

- Direct drive;
- Flexible shaft drive;
- Belt drive;

b) Electric tachometer

The types of revolution detectors by drive system are shown below:

- Non-contact type (Detecting system: Frequency);
- Direct type (Detecting system: Frequency, AC voltage or DC voltage);
- Flexible shaft type (Detecting system: AC voltage).

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Generally composed of:

- Non-contact type detector (Revolution detector);
- Signal converter; and
- Receiver.

Or:

- Driving unit;
- Direct type/Flexible shaft type detector (Transmitting device);
- Junction box; and
- Receiver.

1.b Application limitations

a) This technical requirement shall not be applied to propeller revolution indicators required by SOLAS Chapter V;
b) Applicable for installation on ships as defined by Art. 2 of EU Regulation (EC) No. 391/2009, for the purposes of Art. 10 of the same.

1.c Intended use

Local/Remote indicating and monitoring systems.

1.d System context

See 1.c.

2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a.i. Technical Requirements

1) For mechanical tachometers, the tolerable deviations shall be ±1% of the maximum graduation, and the pointer run-out shall be within 1% of the maximum graduation;

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	Application Date	1 October 2016
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2) For electric tachometers:
   a) The enclosures of the transmitting device, signal converter and the receiver are subject to individual ROs' requirements for the degree of protection of enclosure and shall be rigid and of such construction that adjustments and maintenance can be easily carried out;
   b) The receivers with illumination lamps, those dimmer switches and signal converters in case of non-contact type shall be provided with an earthing terminal or shall be of such construction so as to be capable of earthing;
   c) **Driving unit:**
      - The driving unit shall smoothly transmit the revolutions to the transmitting device without any slip;
      - The clutch mechanism shall be provided so as to stop or drive the transmitting device optionally during the shaft running;
      - The coupling between driving unit and shaft shall be of gear type;
      - The driving gear shall be fitted easily and securely on the shaft;
   d) **Transmitting device:**
      - The transmitting device shall have a generator, which is driven by the shaft through the driving unit and transmits the revolutions per minute and direction of revolution of the shaft;
      - The transmitting device shall have sufficient capacity to operate all receivers simultaneously according to the number of connected receivers. When the generator is designed to supply a power necessary for the automation equipment and instrumentation, the capacity for them shall be taken into consideration;
   e) **The junction box** shall be capable of connecting the number of receivers required and shall be equipped with a compensator which prevents an error of each receiver from arising even when the number of receivers changes;
   f) **The revolution detector** shall be of such a construction that pulses can be securely detected using the turning gear of engine or a disc with slits.
   g) **Receiver:**
      - The receiver shall be electrically connected to the transmitting device and shall be capable of indicating the rational speed (in the number of revolutions per minute) and the direction of rotation;

- The receiver shall be capable of adjusting the indications and zero position by an adequate method;
- The receiver shall be of such construction as to be capable of providing easy and clear reading;
- The illumination device should be of an EL plate or a LED type, and it shall be arranged so that it does not hinder an operator's vision at night and makes a scale, a pointer and letters as evenly legible as possible, even in the dark and low light conditions;

h) When the receiver is tilted up to an angle of 30 degrees, in any direction from the normal fitting condition without current, the deviation of pointer from zero point shall be within ±1% of the sum of the maximum scale of both ahead and astern directions for 150 mm and upwards size of dial diameter, and within ±2% for less than 150 mm size of dial diameter;

i) When the pointer of receiver is moved slowly from zero point to the maximum scale and vice versa for both ahead and astern directions by inducing a variable voltage on the receiver, and the reading at a corresponding voltage to each revolution of 0%, 25%, 75% and 100% of the maximum scale shall be measured. The difference between readings of going and returning shall be within ±0.5% of the sum of the maximum scale of both directions for 150 mm and upwards size of dial diameter, and within ±1% for less than 150 mm size of dial diameter;

j) When the reading at each corresponding revolution to 0%, 25%, 50%, 75% and 100% of the maximum graduation of receiver is measured, the error of each reading in terms of 20˚C shall be within ±0.5% of the sum of the maximum graduation of both directions for 150 mm and upwards size of dial diameter, and within ±1% for less than 150 mm size of dial diameter;

k) When a current corresponding to half of the maximum scale is suddenly applied to the receiver, the pointer shall not over-run the position of 2/3 of the maximum scale;

l) When a voltage correspondence to the maximum scale is induced on the receiver for 30 minutes and then the voltage is changed to zero, the deviation of reading from zero position immediately after changed to zero with a light tap at outer case, shall be within ±0.25% of the sum of the maximum scale of

both directions for 150 mm and upwards size of dial diameter, and within ±0.5% for less than 150 mm size of dial diameter;

m) **Signal converter:**
- The accuracy of the output voltage shall be within 0.2% in terms of the percentage to the output voltage corresponding to the maximum graduation of the receiver;
- When the number of input pulses per second to the signal converter is suddenly switched from that corresponding to half of the maximum rational speed to that corresponding to the maximum rational speed, the time required for the output voltage to reach voltage corresponding to the maximum rational speed shall be 1 second or less;

n) See also EU RO MR technical Requirement for "SENSORS" (tier 1).

2.a.ii. Technical documents to be submitted

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

a) Technical specifications, drawings, installation sheets and type test reports, describing the type and working principles of tachometer for which approval is requested, and showing compliance with the relevant requirements;

b) Documents shall be submitted for electric tachometer: see also EU RO MR technical requirements for "SENSORS".

2.b Type testing requirements

1) **For the mechanical tachometers**:

a) **Visual inspection**
Conformity with drawings, design data, etc.;

b) **Performance test**
Confirmation that operation is in accordance with this technical requirement;

c) **Vibration test**
See EU RO MR technical requirements for “SENSORS” for the test procedure, test parameter and other information;

d) **Durability test**

When continuously operated at the maximum rational speed graduated on the scale for 10 hours, the tachometers shall satisfy the performance specified in item 2.a.i. paragraph 1).

2) For electric tachometers:

a) See EU RO MR technical requirement for "SENSORS". The following performances shall be verified:

- Balancing (See 2.a.i.1)h));
- Friction error (See 2.a.i.1)i));
- Calibration accuracy (See 2.a.i.1)j));
- Damping efficiency (See 2.a.i.1)k));
- Zero position (See 2.a.i.1)l));
- Response speed of signal converter (See 2.a.i.1) m));

Test specimens shall be selected from production line or at random from stocks†. 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

a) Refer to EU RO "Product Quality Assurance (PQA)" procedure (Appendix VI of EU RO Framework Document for the Mutual Recognition of Type Approval;

b) Every tachometer shall be certified by the Manufacturer, subject to satisfactory performance of routine test(s) as per applicable standard or specification.

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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;
b) Model Name / Type / Version;
c) Serial Number;
d) Rating (rated voltage, current and frequency of required power supply, rated pressure and temperature of sensing device, rated measurement range);
e) Date of manufacture.

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.*

6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
2015-01-31	0.0	Accepted by EU RO MR Advisory Board
1 April 2016	0.1	CRF025 – Updated to new MR TR document format incl. par. 8; CRF026/026a – Witness testing & control of test specimen; CRF028 – addition of 6 month application clause.

TACHOMETER	Version	0.1
	Adoption Date	1 April 2016
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	Tier	4
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7. BACKGROUND INFORMATION / REFERENCES

a) IACS UR E10 “Test Specification for Type Approval”;
b) IEC 60092-504 "Electrical Installations in Ships - Special Features, Control and Instrumentation";
c) IEC 60533 "Electrical and Electronic Installations in Ships - Electromagnetic Compatibility";
d) ISO 22554:2007 Ships and marine technology - Propeller shaft revolution indicators - Electric type and electronic type;
e) EU RO MR Technical Requirements for SENSORS (Tier 1);
f) 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.

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- END -

EU RO Mutual Recognition Technical Requirements

TEMPERATURE GAUGES AND TRANSMITTERS	Version	0.1
	Adoption Date	1 April 2016
	Application Date	1 October 2016
	Tier	4
This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements ***** Uncontrolled if downloaded or printed *****		

1. PRODUCT DESCRIPTION

1.a General description of the product

Temperature gauges, temperature sensors and transmitters.
Gauges and 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.

1.b Application limitations

When used for measurement of fluid temperature in piping systems or pressure vessels, thermometers, temperature transmitters or other temperature sensing devices shall be installed within thermowells so that the devices can be removed without impairing the integrity of the pressurized equipment.

1.c Intended use

Direct or indirect measurement of 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.

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2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a i. Technical Requirements

a) The materials of temperature gauges, sensors and transmitters, likely to come in to contact with the fluid whose temperature they are intended to measure, shall be compatible with the fluid itself;
b) 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;
c) Temperature gauges and sensors shall comply with a suitable recognized standard for such devices (e.g. IEC 584 for thermocouples; EN 13190 for GE, LE and BM thermometers; ASTM E 1137-97, ASTM E 644-98, IEC 751 and DIN 43760 for thermoresistors, etc.);
d) Electrical and electronic temperature sensors and transmitters shall be in compliance with EU RO MR technical requirements for "SENSORS" (Tier 1). See par. 2.1.1 of the same for relevant technical requirements.

2.a.ii. Technical documents to be submitted

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

a) Technical specifications, data sheets, drawings, installation sheets and type test reports, describing the type and working principles of the temperature gauge or transmitter for which approval is requested, and showing compliance with the relevant technical requirements as per above point 2.a.i;
b) Documents shall be submitted for electrical/electronic level sensor and transmitter: see the EU RO MR technical Requirement for "SENSORS" (Tier 1).

2.b Type testing requirements

a) Type tests shall be carried out as per selected suitable recognized standard;

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b) For electrical/electronic temperature sensors (transmitters/transducers), type testing shall be carried out as per the EU RO MR technical requirement for "SENSORS" (Tier 1) par. 2.2.;
c) Test specimens shall be taken from the production line or from stocks†. 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 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

Refer to EU RO "Product Quality Assurance (PQA)" procedure (Appendix VI of EU RO Framework Document for the Mutual Recognition of Type Approval).

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 IP grade and class of accuracy.

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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) Environmental test items and test levels applied, if any;
b) Approval conditions including limitations, if any;
c) Hardware, firmware, software name and revision, if and as applicable.

6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
2015-01-31	0.0	Accepted by EU RO MR Advisory Board
1 April 2016	0.1	CRF025 – Updated to new MR TR document format incl. par. 8; CRF026/026a – Witness testing & control of test specimen; CRF028 – addition of 6 month application clause.

7. BACKGROUND INFORMATION / REFERENCES

a) EU RO Framework Document for the Mutual Recognition of Type Approval;
b) IEC 584 for thermocouples;
c) EN 13190 for GE, LE and BM thermometers;
d) ASTM E 1137-97, ASTM E 644-98, IEC 751 and DIN 43760 for thermo-resistors, etc.;
e) EU RO MR Technical Requirement for "SENSORS" (Tier 1).

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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.

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EU RO Mutual Recognition Technical Requirements

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	Adoption Date	1 April 2016
	Application Date	1 October 2016
	Tier	4
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1. PRODUCT DESCRIPTION

1.a General description of the product

These technical requirements apply to thermal insulation of organic foams (hereinafter referred to as 'insulation') used for piping and ventilation ducts penetrating the cargo spaces, mail rooms, baggage rooms and refrigerated compartments of service spaces, as well as for pipe fittings for cold service systems (refrigeration systems and chilled water piping for air-conditioning systems). Insulation can be of the built-up (fabricated in place) or composite design.

1.b Application limitations

a) The application being limited to piping and ventilation ducts penetrating the cargo spaces, mail rooms, baggage rooms, refrigerated compartments of service spaces and insulation of pipe fittings for cold service systems;

b) Insulation of piping and ventilation ducts penetrating other areas such as accommodation, service spaces and machinery spaces and insulation of piping for hot and cold sanitary water is outside the scope of the Technical Requirement.

1.c Intended use

The insulation intended to be used in the applications mentioned in 1.b.

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1.d System context

Refer to the item 1.c

2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a i. Technical Requirements

a) Insulation of refrigerating pipes shall be protected against absorption of moisture or to be moisture-resistant;
b) Materials suitably resistant to flame spread, effective protection against penetration of water vapour;
c) Exposed surfaces of vapour barriers and adhesives used in conjunction with insulation shall have low flame-spread characteristics;
d) Insulation materials containing asbestos are prohibited.

2.a.ii. Technical documents to be submitted

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

a) Details of the proposed insulating and lining materials. The physical, thermal and fire properties of the built-up or composite system;
b) Details of all materials to be used in the manufacture of insulation, including blowing agent utilised.

2.b Type testing requirements

The following type tests shall be conducted in accordance with the indicated standard (or recognised equivalent standard) to verify arrangement and design:

a) Thermal resistance, ISO 8301;
b) Closed Cell Content, ISO 4590;
c) Flame spread characteristics, FTP Code 2010 Annex 1 Part 5;
d) Smoke and toxicity, FTP Code 2010 Annex 1 Part 2;
e) Maximum calorific value, ISO 1716;
f) Density, ISO 845;

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g) Water vapour penetration, EN 12086.

Test specimens shall be selected from production line or at random from stocks†. Tests shall be carried out in the presence of the EU RO Surveyor. In cases where the tests are conducted by Nationally Accredited Laboratories, 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 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

Refer to EU RO "Product Quality Assurance (PQA)" procedure (Appendix VI of EU RO Framework Document for the Mutual Recognition of Type Approval).

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 trade mark;
b) Type designation under which the product is type approved.

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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*.

6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
2015-01-31	0.0	Accepted by EU RO MR Advisory Board
1 April 2016	0.1	CRF025 – Updated to new MR TR document format incl. par. 8; CRF026/026a – Witness testing & control of test specimen; CRF028 – addition of 6 month application clause.

7. BACKGROUND INFORMATION / REFERENCES

a) EU RO Framework Document for the Mutual Recognition of Type Approval;
b) European Union Regulation (EC) No. 842/2006;
c) ISO 8301;
d) ISO 4590;
e) FTP Code 2010;
f) ISO 1716;
g) ISO 845;
h) EN 12086.

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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EU RO Mutual Recognition Technical Requirements

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This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements ***** Uncontrolled if downloaded or printed *****		

1. PRODUCT DESCRIPTION

1.a General description of the product

Valves for bilge systems of Class III piping as defined by IACS UR P2.2 Rev.4 intended to stop or modify bilge water flow.

1.b Application limitations

a) These Technical Requirements apply to valves dedicated to bilge systems of Class III with design pressures up to 1.6 MPa, design temperatures up to 200 °C and a diameter up to 100 mm.

b) These technical requirements are not applicable to:
   - valves intended to be fitted on the ship's side and to valves intended to be fitted on the ship's collision bulkhead;
   - hydraulically, electrically or pneumatically controlled devices for valves;
   - plastic valves.

1.c Intended use

Piping systems for bilge water with a design pressure up to 1.6 MPa and a design temperature up to 200 °C (only for class III).

1.d System context

As per item 1.c

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2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a i. Technical Requirements

Design:

a) Valves in piping systems shall be compatible with the pipes to which they are attached in respect of their strength and are to be suitable for effective operation at the maximum working pressure and rated flow that they will experience in service;

b) Valves shall be designed and manufactured in accordance with recognized standards such as ISO standards, API specifications, etc.;

c) Valves and accessories shall be designed so as to prevent the loosening of covers and glands when they are in use;

d) Valves shall be designed so as to shut with a right-hand (clockwise) motion of the wheels;

e) Valves shall be provided with local indicators showing whether they are open or shut unless this is readily apparent. When the valves are designed for one way flow, the direction of flow shall be clearly and legibly marked on the valve. The direction may be cast into the valve housing, such as for screw-down and other non-return valves;

f) Valves and cocks shall be fitted with nameplates to indicate their purpose(s). The casing of non-return valves shall be permanently marked with flow direction;

g) Suitable positive means of securing the spindle shall be provided on valves where the spindle is turned between fully open and fully closed position. Manually operated butterfly valves, which are designed for throttling service, shall be equipped with a locking arrangement that holds the disc in any relevant position.

Materials:

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h) Carbon, carbon-manganese steel, bronze and stainless steel (excluding austenitic stainless steel) may be used in bilge systems. Spheroidal graphite cast iron may be used, provided that the minimum elongation is not less than 12% on a gauge length of 5.65 x S ^ 0.5, where S is the actual cross-sectional area of the test piece;

i) The use of asbestos is prohibited;

j) Austenitic stainless steel is not permitted for use in valves for bilge systems;

k) Aluminium and aluminium alloys are not permitted for use in bilge valves intended for boiler or machinery spaces or installation in spaces containing fuel oil tanks or pumping units;

l) Grey cast iron is not permitted for use in bilge systems.

Type of connections:

m) Butt welded, slip-on sleeve and socket welding joints shall be used in the connecting of valves;

n) Threaded joints with tapered thread may be permitted for an outside diameter not more than 60.3 mm. Threaded joints with parallel thread may be permitted for an outside diameter not more than 60.3 mm;

o) Metallic flange connections are permitted. Flange connection type as shown in **Figure 1** shall be permitted for design temperatures less than 150°C;

p) The dimensions of flanges and relative bolts shall be chosen in accordance with the relevant national standards. Flange attachments shall be in accordance with national or international standards that are relevant to the piping system and are to recognize the applicable boundary fluids, design pressure and temperature conditions, external or cyclic loading and location.

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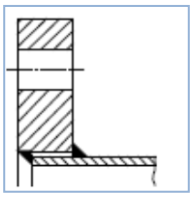

Figure 1

2.a.ii. Technical documents to be submitted

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

a) The standard used by the manufacturer shall be clearly identified in the documentation submitted;
b) Assembly drawings showing dimensions, internal parts (valve body and coupling flange, valve disc and rod, valve seat.), materials, type of connections shall be submitted for RO review;
c) Product descriptions including intended services, installation locations, intended fluids, working medium, rated flow, temperature range, certificates and reports of relevant tests previously carried out, instructions on operation, performance specification shall be submitted for RO review.

2.b Type testing requirements

a) Type tests shall be carried out as per referenced standard;
b) The maximum turning torque of spindle shall be checked for remote control against the applicable design requirements;
c) Test specimens shall be selected from the production line or 'at random' from stocks†;
d) Where there are various sizes of the type of valve requiring approval, a minimum of three separate sizes representative of the range from each type of joints shall be subject to the hydrostatic test at the following value of pressure:

PH = 1.5 P, but not less 0.2 MPa;

where PH = test pressure (MPa), P = design pressure (MPa), or the pressure indicated by the referenced standard for valves, whichever is the largest.

e) Hydrostatic tests shall be carried out in both the open and close position of valve;

f) Tests shall be carried out in the presence of a 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

a) Refer to EU RO "Product Quality Assurance (PQA)" procedure (Appendix VI of EU RO Framework Document for the Mutual Recognition of Type Approval);

b) All valve bodies having a design pressure greater than 0.1 MPa shall be subject to a hydrostatic test at the following value of pressure:

PH = 1.5P, but not less 0.2 MPa
where PH = test pressure (MPa), P = design pressure (MPa)

c) After assembly, the valves shall be checked for leakage by a hydraulic pressure equal to 1.1 times the design pressure.

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:

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a) Manufacturer's name or equivalent;
b) Type No. or symbol;
c) Serial No. and date of manufacture;
d) Particulars or ratings;
e) When the valves are designated for one way flow, the direction of flow shall be clearly and legibly marked on the valve. The direction may be cast into the valve housing.

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.*

6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
2015-01-31	0.0	Acceptance by EU RO MR Advisory Board
1 April 2016	0.1	CRF025 – Updated to new MR TR document format incl. par. 8; CRF026/026a – Witness testing & control of test specimen; CRF028 – addition of 6 month application clause.

7. BACKGROUND INFORMATION / REFERENCES

a) EU RO Framework Document for the Mutual Recognition of Type Approval;
b) IACS UR P2 (Rev.2 Nov 2001)"Rules for piping design, construction and testing";
c) ISO 5208-2008 "Industrial valves-Pressure testing";
d) ISO 5209-1977 "General purpose industrial valves-marking".

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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 -

EU RO Mutual Recognition Technical Requirements

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This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements ***** Uncontrolled if downloaded or printed *****		

1. 1. PRODUCT DESCRIPTION

1.a General description of the product

Valves for freshwater systems of Class III piping as defined by IACS UR P2.2 Rev.4 intended to stop or modify freshwater flow.

1.b Application limitations

a) These Technical Requirements apply to valves dedicated to freshwater systems of Class III with design pressure up to 1.6MPa, design temperature up to 200℃ and diameter up to 100mm;

b) These technical requirements are not applicable to:
   - valves intended to be fitted on the ship's side and valves intended to be fitted on the ship's collision bulkhead;
   - hydraulically, electrically or pneumatically controlled devices for valves;
   - plastic valves.

1.c Intended use

Piping systems for fresh water with design pressure up to 1,6 MPa and design temperature up to 200 °C (only for class III).

1.d System context

As per item 1.c

VALVES FOR FRESHWATER SYSTEMS	Version	0.1
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2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a i. Technical Requirements

Design

a) Valves in piping systems shall be compatible with the pipes to which they are attached in respect of their strength and shall be suitable for effective operation at the maximum working pressure and rated flow that they will experience in service;

b) Valves shall be designed and manufactured in accordance with recognized standards such as ISO standards, API specifications, etc.;

c) Valves and accessories shall be designed so as to prevent the loosening of covers and glands when they are in use;

d) Valves shall be designed so as to shut with a right-hand (clockwise) motion of the wheels;

e) Valves shall be provided with local indicators showing whether they are open or shut, unless this is readily apparent. When the valves are designed for one way flow, the direction of flow shall be clearly and legibly marked on the valve. The direction may be cast into the valve housing, such as for Screw-down and other non-return valves;

f) Valves and cocks shall be fitted with nameplates to indicate their purpose(s). The casing of non-return valves shall be permanently marked with flow direction;

g) Suitable positive means of securing the spindle shall be provided on valves where the spindle is turned between fully open and fully closed position. Manually operated butterfly valves, which are designed for throttling service, shall be equipped with a locking arrangement that holds the disc in any relevant position.

Materials:

h) Carbon, carbon-manganese steel, bronze and stainless steel may be used in freshwater systems. Spheroidal graphite cast iron may be used, provided that the minimum elongation is not less than 12% on a gauge length of 5,65 x S ^ 0,5, where S is the actual cross-sectional area of the test piece;

i) The use of asbestos is prohibited;

j) Aluminium and aluminium alloys are not permitted for use in freshwater valves intended for boiler or machinery spaces or installation in spaces containing fuel oil tanks or pumping units;

k) Content such as lead, cadmium in valve, and its coating material in drinking water system shall meet the requirements of the relevant authorities.

Type of connections:

l) Butt welded, slip-on sleeve and socket welding joints shall be used in the connecting of valves;

m) Threaded joints with tapered thread may be permitted for an outside diameter not more than 60.3 mm. Threaded joints with parallel thread may be permitted for an outside diameter not more than 60.3 mm;

n) Metallic flange connections are permitted. Flange connection type, as shown in **Figure 1,** is permitted for design temperatures less than 150°C;

o) The dimensions of flanges and relative bolts shall be chosen in accordance with the relevant national standards. Flange attachments shall be in accordance with national or international standards that are relevant to the piping system and are to recognize the applicable boundary fluids, design pressure and temperature conditions, external or cyclic loading and location.

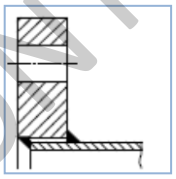

Fig. 1

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2.a.ii. Technical documents to be submitted

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

a) The standard used by the manufacturer shall be clearly identified in the documentation submitted;
b) Assembly drawings showing dimensions, internal parts (valve body and coupling flange, valve disc and rod, valve seat.), materials, type of connections shall be submitted for RO review;
c) Product descriptions including intended services, installation locations, intended fluids, working medium, rated flow, temperature range, certificates and reports of relevant tests previously carried out, instructions on operation, performance specification shall be submitted for RO review.

2.b Type testing requirements

a) Type tests shall be carried out as per the referenced standard;
b) The maximum turning torque of spindle shall be checked for remote control against the applicable design requirements;
c) Test specimens shall be selected from the production line or 'at random' from stocks†;
d) Where there are various sizes of the type of valve requiring approval, a minimum of three separate sizes representative of the range from each type of joints shall be subject to the hydrostatic test at the following value of pressure:

PH = 1,5P, but not less 0,2 MPa
where PH = test pressure (MPa), P = design pressure (MPa) or the pressure indicated by the referenced standard for valves, whichever is the largest.

e) Hydrostatic tests shall be carried out in both the closed and open position of the valve;
f) Tests shall be carried out in the presence of a RO surveyor. In cases where the tests are conducted at Nationally Accredited Laboratories, the presence of the EU RO surveyor may be omitted†.

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3. PRODUCTION REQUIREMENTS

a) Refer to EU RO "Product Quality Assurance (PQA)" procedure (Appendix VI of EU RO Framework Document for the Mutual Recognition of Type Approval);
b) All valve bodies having a design pressure greater than 0.1 MPa shall be subject to a hydrostatic test at the following value of pressure:

PH = 1,5P, but not less 0,2 MPa;
where PH = test pressure (MPa), P = design pressure (MPa).

c) After assembly, the valves shall be checked for leakage by a hydraulic pressure equal to 1.1 times the design pressure.

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;
e) When the valves are designated for one way flow, the direction of flow shall be clearly and legibly marked on the valve. The direction may be cast into the valve housing.

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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.*

6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
2015-01-31	0.0	Accepted by EU RO MR Advisory Board
1 April 2016	0.1	CRF025 – Updated to new MR TR document format incl. par. 8; CRF026/026a – Witness testing & control of test specimen; CRF028 – addition of 6 month application clause.

7. BACKGROUND INFORMATION / REFERENCES

a) EU RO Framework Document for the Mutual Recognition of Type Approval;
b) IACS UR P2 (Rev.2 Nov 2001)"Rules for piping design, construction and testing";
c) ISO 5208-2008 "Industrial valves-Pressure testing";
d) ISO 5209-1977 "General purpose industrial valves-marking".

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 -

EU RO Mutual Recognition Technical Requirements

VALVES FOR LUBRICATING OIL & HYDRAULIC OIL SYSTEMS	Version	0.1
	Adoption Date	1 April 2016
	Application Date	1 October 2016
	Tier	4
This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements ***** Uncontrolled if downloaded or printed *****		

1. PRODUCT DESCRIPTION

1.a General description of the product

Valves for lubrication oil and hydraulic systems of Class III piping as defined by IACS UR P2.2 Rev.4 intended to stop or modify lubrication oil flow.

1.b Application limitations

a) These Technical Requirements apply to valves dedicated to lubrication oil and hydraulic systems of Class III with design pressure up to 0,7 MPa, design temperature up to 60°C and diameter up to 100mm.

b) These technical requirements are not applicable to:
   - valves intended to be fitted on the ship's side and to valves intended to be fitted on the ship's collision bulkhead;
   - hydraulically, electrically or pneumatically controlled devices for valves;
   - plastic valves.

1.c Intended use

Piping systems for lubricating oil and hydraulic oil with a design pressure up to 0,7 MPa and design temperature up to 60°C (only for class III).

1.d System context

As per item 1.c

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2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a i. Technical Requirements

Design

a) Valves in piping systems shall be compatible with the pipes to which they are attached, in respect of their strength, and shall be suitable for effective operation at the maximum working pressure and rated flow that they will experience in service;
b) Valves shall be designed and manufactured in accordance with recognized standards such as ISO standards, API specifications, etc.;
c) Valves and accessories shall be designed so as to prevent the loosening of covers and glands when they are in use;;
d) Valves shall be so designed as to shut with a right-hand (clockwise) motion of the wheels;
e) Valves shall be provided with local indicators showing whether they are open or shut unless this is readily apparent;
f) Where the valves are designed for one way flow, the direction of flow shall be clearly and legibly marked on the valve. The direction may be cast into the valve housing, such as for Screw-down and other non-return valves;
g) Valves and cocks shall be fitted with nameplates to indicate their purpose(s). The casing of non-return valves shall be permanently marked with flow direction;
h) Suitable positive means of securing the spindle shall be provided on valves where the spindle is turned between fully open and fully closed position.. Manually operated butterfly valves, which are designed for throttling service, shall be equipped with a locking arrangement that holds the disc in any relevant position.

Materials

i) Carbon, carbon-manganese steel, bronze and stainless steel (may be used in lubricating and hydraulic system. Spheroidal graphite cast iron may be used,

provided that the minimum elongation is not less than 12% on a gauge length of 5,65 x S ^ 0,5, where S is the actual cross-sectional area of the test piece;

j) The use of asbestos is prohibited;

k) Aluminum and aluminum alloys are not permitted for use in lubrication valves intended for boiler or machinery spaces or installation in spaces containing fuel oil tanks or pumping units;

l) Grey cast iron is not permitted for use in piping which is subject to pressure shock, vibrations, and valves fitted to lubricating oil tanks under static pressure head;

m) The materials to be used for the other component parts of the valves shall be suitable for the working medium and service for which the piping is intended;

n) Non-metallic material of gaskets or seals shall be approved in accordance with the recognized standards for the use with oils.

Type of connections

o) Butt welded, slip-on sleeve and socket welding joints shall be used in the connecting of valves;

p) Threaded joints with tapered thread may be permitted for an outside diameter not more than 60.3mm. Threaded joints with parallel thread may be permitted for an outside diameter not more than 60.3 mm;

q) Metallic flange connections are permitted. The flange connection type as shown in **Figure 1** is permitted for design temperatures less than 150°C;

r) The dimensions of flanges and relative bolts shall be chosen in accordance with the relevant national standards. Flange attachments shall be in accordance with national or international standards that are relevant to the piping system and are to recognize the applicable boundary fluids, design pressure and temperature conditions, external or cyclic loading and location.

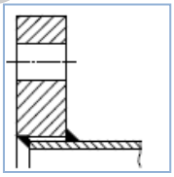

Figure 1

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2.a.ii. Technical documents to be submitted

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

a) The standard used by the manufacturer shall be clearly identified in the documentation submitted;
b) Assembly drawings showing dimensions, internal parts (valve body and coupling flange, valve disc and rod, valve seat.), materials, type of connections shall be submitted for RO review;
c) Product descriptions including intended services, installation locations, intended fluids, working medium, rated flow, temperature range, certificates and reports of relevant tests previously carried out, instructions on operation, performance specification shall be submitted for RO review.

2.b Type testing requirements

a) Type tests shall be carried out as per the referenced standard;
b) The maximum turning torque of spindle shall be checked for remote control against the applicable design requirements;
c) Test specimens shall be selected from the production line or 'at random' from stocks†;
d) Where there are various sizes of the type of valve requiring approval, a minimum of three separate sizes representative of the range from each type of joints shall be subject to the hydrostatic test at the following value of pressure:

PH = 1,5P, but not less 0,2 MPa;

where PH = test pressure (MPa), P = design pressure (MPa),

or the pressure indicated by the reference standard for valves, whichever is the largest.

e) Hydrostatic tests shall be carried out in both the closed and open position of valve;

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f) Tests shall be carried out in the presence of a 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

a) Refer to EU RO "Product Quality Assurance (PQA)" procedure (Appendix VI of EU RO Framework Document for the Mutual Recognition of Type Approval);
b) All valve bodies shall be subject to a hydrostatic test at the following value of pressure:

PH = 1,5P, but not less 0,2 MPa;

where PH = test pressure , P = design pressure (MPa)

c) After assembly, the valves shall be checked for leakage by a hydraulic pressure equal to 1.1 times the design pressure.

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.

When the valves are designed for one way flow, the direction of flow shall be clearly and legibly marked on the valve. The direction may be cast into the valve housing.

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.

6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
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1 April 2016	0.1	CRF025 – Updated to new MR TR document format incl. par. 8; CRF026/026a – Witness testing & control of test specimen; CRF028 – addition of 6 month application clause.

7. BACKGROUND INFORMATION / REFERENCES

a) EU RO Framework Document for the Mutual Recognition of Type Approval;
b) IACS UR P2 (Rev.2 Nov 2001)"Rules for piping design, construction and testing";
c) ISO 5208-2008"Industrial valves-Pressure testing";
d) ISO 5209-1977"General purpose industrial valves-marking'.

8. MAINTENANCE / CLARIFICATION OF TECHNICAL REQUIREMENTS

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- END -

EU RO Mutual Recognition Technical Requirements

VALVES FOR SANITARY SYSTEMS	Version	0.1
	Adoption Date	1 April 2016
	Application Date	1 October 2016
	Tier	4
This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements ***** Uncontrolled if downloaded or printed *****		

1. PRODUCT DESCRIPTION

1.a General description of the product

Valves for sanitary systems of Class III piping as defined by IACS UR P2.2 Rev.4 intended to stop or modify a sanitary flow

1.b Application limitations

a) These Technical Requirements apply to valves dedicated to sanitary systems of Class III with design pressure up to 1.6MPa, design temperature up to 200°C and a diameter up to 100mm

b) These technical requirements are not applicable to:
   - valves intended to be fitted on the ship's side; and valves intended to be fitted on the ship's collision bulkhead;
   - hydraulically, electrically or pneumatically controlled devices for valves;
   - plastic valves.

1.c Intended use

Piping systems for sanitary with design pressure up to 1,6 MPa and design temperatures up to 200 °C (only for Class III).

1.d System context

As per item 1.c

2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a i. Technical Requirements

Design:

a) Valves in piping systems shall be compatible with the pipes to which they are attached in respect of their strength and are to be suitable for effective operation at the maximum working pressure and rated flow that they will experience in service;
b) Valves shall be designed and manufactured in accordance with recognized standards such as ISO standards, API specifications, etc.;
c) Valves and accessories shall be designed so as to prevent the loosening of covers and glands when they are in use;
d) Valves shall be designed so as to shut with a right-hand (clockwise) motion of the wheels;
e) Valves shall be provided with local indicators showing whether they are open or shut, unless this is readily apparent. When the valves are designed for one way flow, the direction of flow shall be clearly and legibly marked on the valve. The direction may be cast into the valve housing, such as for screw-down and other non-return valves;
f) Valves and cocks shall be fitted with nameplates to indicate their purpose(s). The casing of non-return valves shall be permanently marked with flow direction;
g) Suitable positive means of securing the spindle shall be provided on valves where the spindle is turned between fully open and fully closed position. Manually operated butterfly valves, which are designed for throttling service, shall be equipped with a locking arrangement that holds the disc in any relevant position.

Materials:

h) Carbon, carbon-manganese steel, bronze and other ductile materials may be used with sanitary systems, provided that they have a specified minimum

elongation not less than 12%. Spheroidal cast iron of the ferritic type may be accepted;

i) The use of asbestos is prohibited;

j) Austenitic stainless steel is not permitted for use in valves for sanitary systems;

k) Aluminium and aluminium alloys are not permitted for use in sanitary valves intended for boiler or machinery spaces or installation in spaces containing fuel oil tanks or pumping units.

Type of connections:

l) Butt welded, slip-on sleeve and socket welding joints shall be used in the connecting of valves;

m) Threaded joints with tapered thread may be permitted for an outside diameter not more than 60.3 mm. Threaded joints with parallel thread may be permitted for an outside diameter not more than 60.3 mm;

n) Metallic flange connections are permitted. Flange connection type, as shown in **Figure 1,** shall be permitted for design temperatures less than 150°C.;

o) The dimensions of flanges and relative bolts shall be chosen in accordance with the relevant national standards. Flange attachments shall be in accordance with national or international standards that are relevant to the piping system and are to recognize the applicable boundary fluids, design pressure and temperature conditions, external or cyclic loading and location.

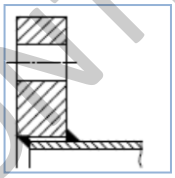

Fig. 1

2.a.ii. Technical documents to be submitted

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

a) The standard used by the manufacturer shall be clearly identified in the documentation submitted;
b) Assembly drawings showing dimensions, internal parts (valve body and coupling flange, valve disc and rod, valve seat.), materials, type of connections shall be submitted for RO review;
c) Product descriptions including intended services, installation locations, intended fluids, working medium, rated flow, temperature range, certificates and reports of relevant tests previously carried out, instructions on operation, performance specification shall be submitted for RO review.

2.b Type testing requirements

a) Type tests shall be carried out as per referenced standard;
b) The maximum turning torque of spindle shall be checked for remote control against the applicable design requirements;
c) Test specimens shall be selected from the production line or 'at random' from stocks†;
d) Where there are various sizes of the type of valve requiring approval, a minimum of three separate sizes representative of the range from each type of joints shall be subject to the hydrostatic test at the following value of pressure:

PH = 1,5P, but not less 0,2 MPa

where PH = test pressure (MPa), P = design pressure (MPa), or the pressure indicated by the referenced standard for valves, whichever is the largest.

e) Hydrostatic tests shall be carried out in both the closed and open positions of the valve;

f) Tests shall be carried out in the presence of a 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

a) Refer to EU RO "Product Quality Assurance (PQA)" procedure (Appendix VI of EU RO Framework Document for the Mutual Recognition of Type Approval);
b) All valve bodies having a design pressure greater than 0.1 MPa shall be subject to a hydrostatic test at the following value of pressure:

PH = 1,5P, but not less 0,2 MPa
where PH = test pressure (MPa), P = design pressure (MPa)

c) After assembly, the valves shall be checked for leakage by a hydraulic pressure equal to 1.1 times the design pressure.

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;

e) When the valves are designated for one way flow, the direction of flow shall be clearly and legibly marked on the valve. The direction may be cast into the valve housing.

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.

6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
2015-01-31	0.0	Accepted by EU RO MR Advisory Board
1 April 2016	0.1	CRF025 – Updated to new MR TR document format incl. par. 8; CRF026/026a – Witness testing & control of test specimen; CRF028 – addition of 6 month application clause.

7. BACKGROUND INFORMATION / REFERENCES

a) EU RO Framework Document for the Mutual Recognition of Type Approval;
b) IACS UR P2 (Rev.2 Nov 2001)"Rules for piping design, construction and testing";
c) ISO 5208-2008"Industrial valves-Pressure testing";
d) ISO 5209-1977"General purpose industrial valves-marking".

8. MAINTENANCE / CLARIFICATION OF TECHNICAL REQUIREMENTS

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EU RO Mutual Recognition Technical Requirements

VALVES FOR SEAWATER SYSTEMS	Version	0.1
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	Tier	4
This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements ***** Uncontrolled if downloaded or printed *****		

1. PRODUCT DESCRIPTION

1.a General description of the product

Valves for seawater systems of Class III piping as defined by IACS UR P2.2 Rev.4 intended to stop or modify a seawater flow.

1.b Application limitations

a) These Technical Requirements apply to valves dedicated to seawater systems of Class III with design pressure up to 1.6MPa, design temperature up to 200°C and diameter up to 100mm;

b) These technical requirements are not applicable to:
   - valves intended to be fitted on the ship's side; and valves intended to be fitted on the ship's collision bulkhead;
   - hydraulically, electrically or pneumatically controlled devices for valves;
   - plastic valves.

1.c Intended use

Piping systems for seawater with design pressure up to 1,6 MPa and design temperatures up to 200 °C (only for Class III).

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1.d System context

As per item 1.c

2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a i. Technical Requirements

Design:

a) Valves in piping systems shall be compatible with the pipes to which they are attached in respect of their strength and shall be suitable for effective operation at the maximum working pressure and rated flow that they will experience in service;

b) Valves shall be designed and manufactured in accordance with recognized standards such as ISO standards, API specifications, etc.;

c) Valves and accessories shall be designed so as to prevent the loosening of covers and glands when they are in use;

d) Valves shall be designed so as to shut with a right-hand (clockwise) motion of the wheels;

e) Valves shall be provided with local indicators showing whether they are open or shut, unless this is readily apparent. When the valves are designed for one way flow, the direction of flow shall be clearly and legibly marked on the valve. The direction may be cast into the valve housing, such as for screw-down and other non-return valves;

f) Valves and cocks shall be fitted with nameplates to indicate their purpose(s). The casing of non-return valves shall be permanently marked with flow direction;

g) Suitable positive means of securing the spindle shall be provided on valves where the spindle is turned between fully open and fully closed position. Manually operated butterfly valves, which are designed for throttling service, shall be equipped with a locking arrangement that holds the disc in any relevant position.

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Materials:

h) Carbon, carbon-manganese steel, bronze and stainless steel (excluding austenitic stainless steel) may be used for seawater systems. Spheroidal cast iron of the ferritic type may be accepted. Spheroidal graphite cast iron may be used, provided that the minimum elongation is not less than 12% on a gauge length of 5,65 x S ^ 0,5, where S is the actual cross-sectional area of the test piece;

i) The use of asbestos is prohibited;

j) Austenitic stainless steel is not permitted for use in valves for seawater systems;

k) Aluminium and aluminium alloys are not permitted for use in seawater valves intended for boiler or machinery spaces or installation in spaces containing fuel oil tanks or pumping units.

Type of connections:

l) Butt welded, slip-on sleeve and socket welding joints shall be used in the connecting of valves;

m) Threaded joints with tapered thread are permitted for an outside diameter not more than 60.3 mm. Threaded joints with parallel thread are permitted for an outside diameter not more than 60.3 mm;

n) Metallic flange connections are permitted. Flange connection type as shown in **Figure 1** shall be permitted for design temperatures less than 150°C;

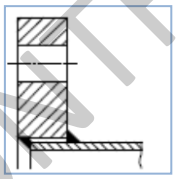

Fig. 1

o) The dimensions of flanges and relative bolts shall be chosen in accordance with the relevant national standards. Flange attachments shall be in accordance with national or international standards that are relevant to the piping system and are to recognize the applicable boundary fluids, design pressure and temperature conditions, external or cyclic loading and location

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

a) The standard used by the manufacturer shall be clearly identified in the documentation submitted;
b) Assembly drawings showing dimensions, internal parts (valve body and coupling flange, valve disc and rod, valve seat.), materials, type of connections shall be submitted for RO review;
c) Product descriptions including intended services, installation locations, intended fluids, working medium, rated flow, temperature range, certificates and reports of relevant tests previously carried out, instructions on operation, performance specification shall be submitted for RO review.

2.b Type testing requirements

a) Type tests shall be carried out as per referenced standard;
b) The maximum turning torque of spindle shall be checked for remote control against the applicable design requirements;
c) Test specimens are to be selected from production line or at random from stocks†;
d) Where there are various sizes of the type of valve requiring approval, a minimum of three separate sizes representative of the range from each type of joints shall be subject to the hydrostatic test at the following value of pressure:

PH = 1,5P, but not less 0,2 MPa

where PH = test pressure (MPa), P = design pressure (MPa) or the pressure indicated by the referenced standard for valves, whichever is the largest.

e) Hydrostatic tests shall be carried out in both the closed and open position of valve;

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f) Tests shall be carried out in the presence of a RO surveyor. In cases where the tests are conducted at Nationally Accredited Laboratories, the presence of the EU RO surveyor may be omitted†.

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3. PRODUCTION REQUIREMENTS

a) Refer to EU RO "Product Quality Assurance (PQA)" procedure (Appendix VI of EU RO Framework Document for the Mutual Recognition of Type Approval);
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PH = 1,5P, but not less 0,2 MPa
where PH = test pressure (MPa), P = design pressure (MPa)

c) After assembly, the valves shall be checked for leakage by a hydraulic pressure equal to 1.1 times the design pressure.

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;

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e) When the valves are designated for one way flow, the direction of flow shall be clearly and legibly marked on the valve. The direction may be cast into the valve housing.

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8. MAINTENANCE / CLARIFICATION OF TECHNICAL REQUIREMENTS

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- END -

EU RO Mutual Recognition Technical Requirements

AC SEMICONDUCTOR CONTROLLERS	Version	0.0
	Adoption Date:	1 July 2016
	Application Date:	1 January 2017
This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements ***** Uncontrolled if downloaded or printed *****	Tier	5

1. PRODUCT DESCRIPTION

1.a General description of the product

Description of product according to IEC 60947-4-3:
"*Low-voltage a.c. semiconductor controllers are semiconductor switching devices that provide a switching function for an a.c. electrical load (non-motor load) between the ON-state and the OFF-state.*"

1.b Application limitations

These Mutual Recognition Technical Requirements (MR TRs) are restricted to low-voltage a.c. semiconductor non-motor load controllers according to IEC 60947-4-3, intended for non-essential and essential services, where the rated voltage does not exceed 1000 V a.c. and the rated power is less than 50 kVA. Emergency services are excluded.

1.c Intended use

These MR TRs apply to low-voltage a.c. semiconductor non-motor load controllers intended for non-continuous services only; performing electrical operations by changing the state of a.c. electric circuits between the ON-state and the OFF-state.
Intended for installation on board ships within locations with climatic, biological, chemically active, mechanically active and mechanical environmental conditions not exceeding those for which performance has been proved according to IEC 60721-3-6 (1987) + A2 (1996). The utilization categories are according to IEC 60947-4-3.

1.d System context

See 1.b

2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a i. Technical Requirements

a) Semiconductor controllers shall be built according to IEC 60947-4-3;
b) Semiconductor controllers shall be protected against short-circuits by means of devices suitable for the point of installation in the network;
c) The permissible limit of temperature rise of the enclosure of the semiconductors shall be assessed on the basis of an ambient air temperature of 45°C or sea water temperature of 32°C for water-cooled elements, taking into account its specified maximum permissible temperature value;

In addition, the following values shall be stated by the manufacturer:

d) The maximum permissible temperature of the elements at the point where this can be measured (point of reference);
e) The mean rated current of the semiconductor element.

2.a.ii. Technical documents to be submitted

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

Prior to tests:

a) Proposed test program and test schedule;
b) Description of the test specimens and explanation of the selected test sample(s) providing evidence that the selected sample meets the most rigorous and demanding requirements;
c) For the chosen test specimen a complete product information in accordance with IEC 60947-4-3 clause 6.1 shall be provided;
d) Product descriptions, manuals, data sheets, assembly drawings, dimension drawings, etc., clearly identifying the product;
e) Complete accreditation certificate of the Test laboratory (prior the first test only; changes in the scope of accreditation shall also be advised);
f) Details of production sites;
g) Product specification;
h) Application, working area;

i) Instructions on fitting, assembly and operation;
j) QM-certificate according to ISO 9001.

After completion of tests:

k) The test report with an identification number shall contain all relevant data and test results including place and date of the tests, the names of the responsible personnel carrying out the test;
l) The test report shall give information on the construction, type, serial number and all technical data relevant to the convertor, as well as the results of the tests required;
m) Test reports and test records shall be signed by the personnel members in charge of the test and are to be confirmed by the EU RO by signing and marking the test report.

2.b Type testing requirements

a) In general, IEC 60947-4-3 sub-clause 9.1.2 (*Type tests*) applies;
b) Test sequence in accordance with IEC 60947-4-3 sub-clause 9.3.1 (*Test sequences*);
c) Environmental tests and EMC tests in accordance with IACS UR E10.
d) All tests shall be performed on agreed test samples 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 http://www.euromr.org/Guidance%20for%20Mutual%20Recognition)

3. PRODUCTION REQUIREMENTS

a) 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).

b) In general IEC 60947-4-3 shall apply. Each semiconductor controller shall pass routine tests in accordance with IEC 60947-4-3 sub-clause 9.1.3.
c) In addition to the routine tests required by the reference standard (operation and operating limits, dielectric tests), the following tests shall be carried out by the manufacturer [(1)]:
    i. Visual inspection including check of earth continuity.

[(1)] *The certificates of convertors' routine tested shall contain the manufacturer's serial number of the convertor which has been type tested and the test result.*

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 (IEC 60947-4-3 sub-clause 6.2 *Marking*). In addition, and as a minimum, the following items to be marked at the suitable place:

a) Manufacturer's name or equivalent;
b) Type designation;
c) Serial No., date and place of manufacture

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:

a) Technical data according to IEC marking;
b) Reference to approved technical documents;
c) Reference to testing standards and relevant test reports;
d) Environmental conditions;

e) Application and limitations.

6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
2016-07-01	0.0	Approved by EU RO MR Advisory Board

7. BACKGROUND INFORMATION / REFERENCES

a) EU RO Framework Document for the Mutual Recognition of Type Approval;
b) IEC 60947-4-3;
c) IEC 60947-1;
d) SOLAS Ch. I, Reg. 3;
e) IEC 60721-3-6 (1987) + A2 (1996);
f) IEC 60533;
g) IEC 60945;
h) IMO Resolution A.813(19);
i) IACS UR E10.

8. MAINTENANCE & CLARIFICATION OF TECHNICAL REQUIREMENTS

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- END -

EU RO Mutual Recognition Technical Requirements

CONTROL AND PROTECTIVE SWITCHING DEVICES	Version	0.0
	Adoption Date:	1 July 2016
	Application Date:	1 January 2017
	Tier	5
This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements ***** Uncontrolled if downloaded or printed *****		

1. PRODUCT DESCRIPTION

1.a General description of the product

A switching device (or equipment) capable of operation other than by hand, but with or without local manual operating means. It is to be capable of making, carrying and breaking currents under normal conditions, including specified operating overload conditions and making, carrying for a specified time and breaking currents under abnormal conditions such as those of short circuits.

A Control and Protective Switching Device (CPS) has overload and short circuit protection, these functions being associated and coordinated so as to permit continuity of service at all currents up to its rated service short circuit breaking capacity. A CPS may or may not consist of a single device but is always rated as a unit.

1.b Application limitations

a) Restricted to devices where the main contacts of which are intended to be connected to circuits of rated voltage not exceeding 1000V a.c or 1500V d.c.

b) Restricted to devices where the main contacts of which are intended to be connected to circuits of rated voltage not exceeding 100V a.c or 1500V d.c. and with rated current less than 25 A.

c) Installation on board ships within locations with climatic, biological, chemically active , mechanically active and mechanical environmental conditions not exceeding those for which performance has been approved according to IEC 60721-3-6 (1987) + A2 (1996).

1.c Intended use

- Motor control units, characteristics as per IEC 60947-6-2.
- Power supply system Characteristics as per IEC 60092-101; 2.8.

1.d System context

See 1c.

2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a i. Technical Requirements

a) Type, rating and characteristics of CPS for intended applications shall be evaluated;
b) In general, IEC 60947 shall be observed.

2.a.ii. Technical documents to be submitted

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

a) All production drawings, operational manuals, assembly drawings shall be submitted to the EU RO for review;
b) Proposed test program and test schedule, description of the test specimens and an explanation of the selected test sample(s) providing evidence that the selected sample meets the most rigorous and demanding requirements;
c) Production descriptions, manuals, data sheets, assembly drawings, dimension drawings that clearly identify the product;
d) Accreditation certificate of the selected test laboratory. Any changes to the scope of the test shall be included in the test reports;
e) Details of the production site(s), production facility inspection report, production specifications and a valid QM certificate according to ISO 9001;
f) After the completion of the testing, the report shall contain:
   - an identification number;
   - all relevant data and test results including the place, date and names of personnel responsible for conducting the test;
   - type, batch and serial numbers of the tested products;

- details of the test equipment used including the calibration certificates and serial numbers.

g) Test reports shall be signed and dated by the person(s) responsible for conducting the test and by the attending EU RO witnessing the test.

2.b Type testing requirements

a) Tests according to IACS Unified Requirement E10, Rev. 5 or IEC 60947-1 shall be performed;
b) Test specimens shall be taken from the production line or from stocks†;
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

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)

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.

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:

a) Technical data according to the relevant IEC marking;
b) Software version (if applicable);
c) Validity according to the EU RO 'Product Quality Assurance (PQA)' procedure (Appendix VI of EU RO Framework Document for the Mutual Recognition of Type Approval);
d) Reference to approved technical documents;
e) Application and limitations.

6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
2016-07-01	0.0	Approved by EU RO MR Advisory Board

7. BACKGROUND INFORMATION / REFERENCES

a) EU RO Framework Document for the Mutual Recognition of Type Approval;
b) IACS UR E10, Rev. 5, 'Test Specification for Type Approval'
c) IEC 60721-3-6 AMD 2 'Classification of Environmental Conditions – Part 3: Classification of Groups of Environmental Parameters and Their Severities Section 6: Ship Environment
d) IEC 60947-1 'Low-voltage switchgear and control-gear - Part 1: General rules'
e) IEC 60092-101 'Electrical Installations in Ships – Part 101: Definitions and General Requirements'

CONTROL AND PROTECTIVE SWITCHING DEVICES	Version	0.0
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	Tier	5
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8. MAINTENANCE & CLARIFICATION OF TECHNICAL REQUIREMENTS

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- END -

EU RO Mutual Recognition Technical Requirements

ELECTRONIC POWER UNITS FOR VALVE CONTROL	Version	0.0
	Adoption Date:	1 July 2016
	Application Date:	1 January 2017
	Tier	5
This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements ***** Uncontrolled if downloaded or printed *****		

1. PRODUCT DESCRIPTION

1.a General description of the product

Electronic power unit for valve control means an integrated unit that includes an electronic control module and a power module to drive the valve.

1.b Application limitations

Only applicable for systems used for non-essential services not related to essential services as defined in IACS UI SC134.

1.c Intended use

Electronic power unit for valve control is typically used for applications where remote control of the valve is preferred.

Electronic power unit for valve control may be configured to perform a wide range of functions, such as; pressure management, pressure reducing, pressure sustaining, rate of flow control, level control or valve position.

1.d System context

Refer to the item 1.c above

2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a i. Technical Requirements

The design of electronic power unit for valve control shall comply with the following requirements:

a) Failure of the electronic power unit for valve control shall not permit a valve to move to an unsafe condition;
b) The electric power units shall be provided with an output terminal or device for remote open/close indication;
c) Reliable operation of electronic power unit for valve control 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 temperatures up to +70°C.
d) Reliable operation of electronic power unit for valve control shall be ensured at relative air humidity up to 95% to 45°C;
e) 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 ±0.7g where the vibration frequency is between 13.2 and 100 Hz;
f) Reliable operation of electrical and electronic parts mounted upon vibration sources e.g. engines (internal combustion 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 m 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;
g) For more severe conditions which may exist, for example on exhaust manifolds of high speed internal combustion engines (ICE), 40 Hz to 2000 Hz – acceleration ± 10.0 g at 600 °C;
h) Reliable operation electrical valve actuators shall be ensured at long-term heel up to 22,5° and at motions of 22,5° with a period of (8 ± 1) s. Reference is made to IACS UR E10 Rev.6 under item N°8;
i) The protective enclosure of electronic power unit for valve control shall be given by the manufacturer and evidenced in accordance with IEC 60529;

j) Provision shall be made to ensure the electromagnetic compatibility of the electronic power unit for valve control is in order to comply with requirements of IACS UR E10 Rev. 6.

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 electronic power unit for valve control;
b) List of type designation for each variant;
c) Specification with indication of the devices and appliances used and the technical characteristics thereof, including firmware and software version;
d) General view drawings, dimensional drawings, datasheets with construction details (incl. voltage, power, enclosure IP class);
e) Circuit diagram of the electrical and electronic devices incorporated with input and output signals, etc.;
f) In case of explosion-proof electronic power unit, certificates issued by recognized competent authorities in accordance with requirements of EN/IEC 60079 series shall be provided;
g) The technical documentation must make it possible to assess the product's compliance with the agreed technical requirements, as described in 2.a.i.;
h) Test program and standards.

2.b TYPE TESTING REQUIREMENTS

a) In accordance with IACS UR E10 Rev.6 and additional tests for confirmation of special features as applicable;
b) Test specimens shall be taken from the production line or from stocks†;
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†. The scope of accreditation must cover the relevant applicable standards.

† 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

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).

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 IP grade;
e) Ex marking if any.

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:

a) Technical specifications, ratings;
b) List of approval documents;
c) Rules / standards applied;
d) Environmental test items and test levels applied;
e) Approval conditions including limitations (if any);
f) Hardware, firmware, software name and revision, as applicable.

ELECTRONIC POWER UNITS FOR VALVE CONTROL	Version	0.0
	Adoption Date:	1 July 2016
	Application Date:	1 January 2017
	Tier	5
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6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
2016-07-01	0.0	Approved by EU RO MR Advisory Board

7. BACKGROUND INFORMATION / REFERENCES

a) EU RO Framework Document for the Mutual Recognition of Type Approval;
b) IACS UR E10 Revision 6 “Test specification for Type Approval”;
c) IACS UI SC134;
d) IEC 60529;
e) EN/IEC 60079.

8. MAINTENANCE / CLARIFICATION OF TECHNICAL REQUIREMENTS

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- END -

EU RO Mutual Recognition Technical Requirements

ELECTRO-PNEUMATIC LEVEL TRANSMITTERS (EPLT)	Version	0.0
	Adoption Date:	1 July 2016
	Application Date:	1 January 2017
	Tier	5
This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements ***** Uncontrolled if downloaded or printed *****		

1. PRODUCT DESCRIPTION

1.a General description of the product

Electro-pneumatic level transmitters (EPLT), usually consisting of:

- **a pneumatic unit**, supplied by an external source of compressed air (instrument air quality – Class III piping system, P≤16 bar, T≤200°C), incorporating filtering device(s), non-return valve(s), a safety valve, an air pressure regulator, and a connection to a sounding/bubbling pipe (immersed in tank from tank top and terminating with an open end close to the bottom);
- **an air pressure sensing device;**
- **an electric transmitter**.

The pressure sensing device and the electric transmitter, together, can be identified as a "pressure transducer".
The level measurement is obtained indirectly, through measurement of the air backpressure needed for bubbling of air through the liquid content of the tank: such pressure is in direct proportion with the height and the specific gravity of the liquid above the sounding pipe lower termination, plus (in case of inerted tanks) the pressure of the inert gas itself.

1.b Application limitations

Intended for use in fuel, lube oil, hydraulic oil, water and liquid cargo tanks.
Not to be used in cargo tanks of Liquefied Gas Carriers.

When installed in hazardous areas (e.g. in cargo area of tankers), the electrical apparatus shall be certified safe for the intended hazardous area, according to IEC 60079 series of standards. Relevant safety certificate shall be issued by a recognised competent body.

1.c Intended use

Indirect measurement of liquid level inside atmospheric or slightly pressurized tanks.

1.d System context

Atmospheric or slightly pressurized fuel, lube oil, hydraulic oil, water and liquid cargo (excluding liquefied gas cargo) tanks.

2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a i. Technical Requirements

a) The materials of the various EPLT components, likely to get in contact with the fluid whose level they are intended to measure, shall be compatible with the fluid itself;
b) Minimum degree of protection as applicable, to be in accordance with the requirements set forth by the Recognized Organization in charge of the vessel's classification as a function of the intended location;
c) Pressure transducers shall comply with a suitable recognized standard for such devices (e.g. ASTM F2070);
d) For the specific requirements relating to electrical and electronic pressure sensors and transmitters (transducers), refer to the separate EU RO MR Technical Requirements for "Sensors" (Tier 1) paragraph2.1.1, and "Pressure gauges/transmitters" (Tier 5), paragraph 2.a.i;'
e) Non return valves, safety valves, stop valves, pressure regulators, fittings, filters and other piping components in air system shall be in compliance with a recognized standard for the appropriate pressure rating;
f) In case of installation in hazardous areas (e.g. in cargo area of tankers), the electrical apparatus shall be certified safe for the intended hazardous area, according to IEC 60079 series of standards.

2.a.ii. Technical documents to be submitted

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

a) Technical specifications, data sheets, drawings, installation sheets and type test reports, describing the type and working principles of the electro-pneumatic level transmitter for which approval is requested, and showing compliance with the relevant technical requirements as per above point 2.a.i;
b) Documents shall be submitted for electrical/electronic pressure sensor and transmitter - for reference purposes see EU MR TR "SENSORS" (Tier 1) par. 2.1.2. and "PRESSURE GAUGES /TRANSMITTERS" (Tier 5) par. 2.a.ii;
c) For equipment intended for installation in hazardous areas, safety certificates according to IEC 60079 series of standards issued by a competent Body.

2.b Type testing requirements

a) Type tests shall be carried out as per the selected suitable recognized standard. In particular, testing according to IACS UR E10 (latest revision) should be documented for all electronic/electric parts (e.g. electronic pressure regulators);
b) For electrical/electronic pressure sensors and transmitters (transducers), type testing shall be carried out as per EU RO MR Technical Requirements for "SENSORS" (Tier 1) par. 2.2 or according to "PRESSURE GAUGES /TRANSMITTERS" (Tier 5) par. 2.b;
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 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.

† 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

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)

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 IP grade and class of accuracy
e) Date of Manufacture

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:

a) Environmental test items and test levels applied, if any;
b) Approval conditions including limitations, if any;
c) Hardware, firmware, software name and revision, if and as applicable

6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
2016-07-01	0.0	Approved by EU RO MR Advisory Board

ELECTRO-PNEUMATIC LEVEL TRANSMITTERS (EPLT)	Version	0.0
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	Tier	5
This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements ***** Uncontrolled if downloaded or printed *****		

7. BACKGROUND INFORMATION / REFERENCES

a) EU RO Framework Document for the Mutual Recognition of Type Approval;
b) IEC 60079;
c) ASTM F2070;
d) EU RO MR Technical Requirements for "SENSORS" (Tier 1) par. 2.1.2;
e) EU RO MR Technical Requirements for "PRESSURE GAUGES /TRANSMITTERS" (Tier 5) par. 2.a.ii;
f) IACS UR E10 Revision 6 “Test specification for Type Approval”.

8. MAINTENANCE & CLARIFICATION OF TECHNICAL REQUIREMENTS

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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 -

EU RO Mutual Recognition Technical Requirements

FLOW GAUGES/TRANSMITTERS	Version	0.0
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	Tier	5
This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements ***** Uncontrolled if downloaded or printed *****		

1. PRODUCT DESCRIPTION

1.a General description of the product

Liquid flow meters used in continuous metering applications.

- **Principle of operation:** mechanical flow meters (e.g. positive displacement meter), pressure-based flow meters (e.g. differential pressure), optical flow meters, thermal mass flow meters.
- **Power supply of electronic components (e.g. pulse transmitters**): external or internal (batteries).

1.b Application limitations

Application (medium): fuel, lubricating oil, hydraulic oil, water, liquids transported in cargo holds.

'Ex' certification and fuel consumption monitoring are not within the scope of these Technical Requirements.

1.c Intended use

Measuring of liquids flow within:

- piping installations;
- machinery appliances;
- pressure vessels;
- tanks
- cargo holds;
- enclosed or open spaces;
- machinery components.

Counters are provided for indication of flow. Additional components like pulse transmitters give possibility for external measurement of flow.

1.d System context

Piping installations, machinery appliances, 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) Flange connections requirements - see IACS P2.7.2;

b) Materials used for construction of meters shall be in compliance with Standards EN-GJS-400-15 and NEN-EN-1563 (or equivalent). Other possible materials (relevant Standards are to be applied): cast steel, stainless steel, bronze;

c) Indication units shall provide proper view of measurement, taking into account visibility in space / area;

d) Transmitters (additional components added to meters) shall be installed in a box made from material resistant to mechanical damages and oils, or other typical marine influences, of proper IP degree (enclosure protection) and resistant to fire (see also ***2.b. Type Testing Requirements***);

e) Transmitters shall be independent of alarm systems and safety system circuits/sensors and their failure shall not have an influence on the operation of these systems;

f) Transmitters shall operate properly in ambient temperature up to +45°C (+55°C in case of electronic equipment) and humidity up to 100 %;

2.a.ii. Technical documents to be submitted

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

a) Dimensional and sectional views/drawings, material specifications;

b) Technical description of operation including additional transmitters' operation details;

c) Technical data/specification for transmitters;

d) Electrical/electronic diagrams, connections (power supply, terminals, etc.), PCBs views/layout, views, dimensions, Test Reports (testing scope - **see 2.b. below**).

2.b Type testing requirements

a) Flow meters (piping/flange/machinery components, additional transmitters or any electrical/electronic elements): acc. to IACS P2.11 - fire endurance test, pressure test, tightness test; acc. to IACS UR E10 – Inclination;

b) Transmitters and any electrical/electronic elements - according to IACS UR E10 all presented tests;

NOTE: *Power supply variations and Power supply failure only if external power supply is provided - see power supply details in a.m. 1.a.*

c) The accuracy of the equipment shall be documented before and after the pressure test;

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

FLOW GAUGES/TRANSMITTERS	Version	0.0
	Adoption Date:	1 July 2016
	Application Date:	1 January 2017
	Tier	5
This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements ***** Uncontrolled if downloaded or printed *****		

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).

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 IP degree 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:

a) List of EMC/environmental test levels applied;
b) Hardware, firmware, software name and revision, as applicable.

6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
2016-07-01	0.0	Approved by EU RO MR Advisory Board

FLOW GAUGES/TRANSMITTERS	Version	0.0
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	Tier	5
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7. BACKGROUND INFORMATION / REFERENCES

a) EU RO Framework Document for the Mutual Recognition of Type Approval;
b) IACS P2.7.2;
c) EN-GJS-400-15;
d) NEN-EN-1563;
e) IACS P2.11;
f) IACS UR E10.

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 -

EU RO Mutual Recognition Technical Requirements

LEVEL GAUGES/TRANSMITTERS	Version	0.0
	Adoption Date:	1 July 2016
	Application Date:	1 January 2017
	Tier	5
This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements ***** Uncontrolled if downloaded or printed *****		

1. PRODUCT DESCRIPTION

1.a General description of the product

a) These technical requirements (TR) are meant to cover mechanical and electronic level gauges/transmitters for non-essential systems on board classed vessels.

b) Measuring principles may typically be:
- Microwave radar level transmitter;
- Guided wave radar level transmitter;
- Ultrasonic level transmitter;
- Capacitive (rod) level transmitter;
- Float level gauge/transmitter;
- Magnetic float level gauge/transmitter.

c) These MR technical requirements (MR TRs) do not cover:
- Control, monitoring and safety functions for primary- or secondary essential services, as defined by IACS Unified Interpretations SC134;
- Glass level gauges, magnetic glass level gauges, self-powered gauges with diaphragm and capillary tube or other mechanical gauging principles that penetrate the tank where testing according to IACS UR P2 (Rules for piping design, construction and testing) typically is required;
- Boiler remote level indicator - see separate MR TR for 'BOILER REMOTE LEVEL INDICATOR' (Tier 3);
- Electro-pneumatic level transmitters - see separate MR TR for 'ELECTRO-PNEUMATIC LEVEL TRANSMITTERS (EPLT)' (Tier 5);

– Pressure gauges/transmitters see separate MR TR for 'PRESSURE GAUGES/ TRANSMITTERS' (Tier 5);

1.b Application limitations

These technical requirements apply to Level Gauges/Transmitters intended for marine use.

1.c Intended use

Level gauging applications for non-essential systems that provide control, monitoring, alarm or safety functions.

1.d System context

The equipment may for example be used to provide gauging for use in a ballast water system.

2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a i. Technical Requirements

a) Materials shall be suitable for the intended service and location;
b) Degree of protection (IP Code) shall be documented according to IEC 60529;
c) For the specific requirements relating to electrical and electronic level sensors and transmitters refer to the separate EU RO MR Technical Requirements for "SENSORS" (Tier 1);
d) The unit shall be designed for the pressure specification of the intended application.

2.a.ii. Technical documents to be submitted

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

a) Drawings, PCB layouts, schematics, material specifications and principle of operation/functional description necessary to describe all parts of the equipment. The functional description may be in the form of user manuals, installation manuals, etc., as relevant;

b) Drawings and product specification of physical/electrical and logical interfaces including signal format, converters, protective circuitry, data protocol, cabling, and required configuration;
c) Hardware and firmware name and version, as applicable, necessary to identify the equipment under test;
d) Functional tests that are required according to **Table 1** (see page 7) have to be defined. The tests shall be suitable to monitor gauge/transmitter function/output reliably.

Note:

The Manufacturer may submit the draft test programmes to the EU RO for verification prior to the commencement of any environmental and performance type testing. A certificate of accreditation for the selected laboratory/laboratories is generally required in these circumstances.

End of Note

e) Environmental- and Performance type test reports;
f) Special operational limitations, if any;
g) Documentation about the Production quality assurance system.
h) Product marking.

2.b Type testing requirements

a) Tests shall be carried out in accordance with the testing condition and method of the latest revision of IACS UR E10 with modifications given in **Table 1** in the presence of the EU RO's surveyor, and they shall be proven to satisfy the criteria of the latest revision of IACS UR E10 and **Table 1**;
b) Test specimens shall be taken from the production line or from stocks†.
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†;
d) "Visual inspection" and "Performance test" as described by items 1 and 2 of **Table 1** shall always be witnessed by the EU RO's surveyor as this is outside the scope of the laboratory accreditation;
e) All type testing shall be documented in accordance with ISO/IEC 17025;

f) It is the manufacturers' responsibility to make sure that the type testing is performed in accordance with an approved test programme that is acceptable for the EU RO;
g) All tests defined in **Table 1** are normally to be carried out on the same unit. Using different units for the different type of tests is acceptable provided that all EMC tests are carried out on one unit (EUT 1), and all environmental tests are carried out on another unit (EUT 2);
h) Depending on the equipment type and application, some of the tests may not be relevant. Any omission of type tests are subject to the EU RO's acceptance and the technical justification for omitting tests shall be recorded.

† 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

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)

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 IP code and class of accuracy;
e) Date of Manufacture.

LEVEL GAUGES/TRANSMITTERS	Version	0.0
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	Tier	5
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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 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:

a) Technical characteristics which adequately express the basic article's features assuring its functional usage;
b) Other important characteristics specified by this MR Technical Requirement, including the power supply parameter;
c) Name and version/revision of hardware, firmware and software (as applicable).

6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
2016-07-01	0.0	Approved by EU RO MR Advisory Board

7. BACKGROUND INFORMATION / REFERENCES

a) EU RO Framework Document for the Mutual Recognition of Type Approval;
b) IACS Unified Interpretations SC134;
c) IACS Unified Requirements E10;
d) IACS UR P2 (Rules for piping design, construction and testing);
e) MR TR for 'SENSORS" (Tier 1);
f) MR TR for 'BOILER REMOTE LEVEL INDICATOR' (Tier 3);
g) MR TR for 'ELECTRO-PNEUMATIC LEVEL TRANSMITTERS (EPLT)' (Tier 5);
h) MR TR for 'PRESSURE GAUGES/TRANSMITTERS' (Tier 5);
i) IEC 60529;
j) ISO/IEC 17025.

LEVEL GAUGES/TRANSMITTERS	Version	0.0
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8. MAINTENANCE & CLARIFICATION OF TECHNICAL REQUIREMENTS

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Table 1: Testing condition and method

(Any changes made to IACS UR E10 in Revision 6.0 needs to be implemented in this test plan.)

NO.	TEST	PROCEDURE ACC. TO:*	TEST PARAMETERS	OTHER INFORMATION
* indicates the testing procedure which is normally to be applied. However, equivalent testing procedure may be accepted by the RO provided that the requirements stated in the other columns are fulfilled.				
1.	Visual inspection	-	-	– conformance to drawings, design data, marking of product

2.	Performance test	Manufacturer performance test programme based upon specification and relevant Rule requirements.	– standard atmosphere conditions – temperature: 25°C ± 10°C – relative humidity: 60% ± 30% – air pressure: 96 KPa ± 10KPa	– confirmation that operation is in accordance with the requirements specified for particular system or equipment; – checking of self-monitoring features; – checking of specified protection against an access to the memory; – checking against effect of erroneous use of control elements in the case of computer systems.

3.	External power supply failure	-	– 3 interruptions during 5 minutes; – switching-off time 30 s each case	– The time of 5 minutes may be exceeded if the equipment under test needs a longer time for start-up, e.g. booting sequence – For equipment which requires booting, one additional power supply interruption during booting to be performed – Verification of: – equipment behaviour upon loss and restoration of supply; – possible corruption of programme or data held in programmable electronic systems, where applicable.

4.	Power supply variations a) electric	-	AC SUPPLY			
			Combination	Voltage(%) variation permanent	Frequency(%) variation permanent	
			1 2 3 4	+10 +10 -10 -10	+5 -5 -5 +5	
				voltage transient 1,5 s %	frequency transient 5s %	
			5 6	+20 -20	+10 -10	
			DC SUPPLY			
			Voltage tolerance Continuous	± 10%		

	b) pneumatic and hydraulic		Voltage cyclic variation: 5% Voltage ripple: 10% Electric battery supply: – +30% to –25% for equipment connected to charging battery or as determined by the charging/discharging characteristics, including ripple voltage from the charging device; – +20% to –25% for equipment not connected to the battery during charging. Pressure: ±20% Duration: 15 minutes	

5.	Dry heat	IEC Publication 60068-2-2	Temperature: 55° ± 2°C Duration: 16 hours or Temperature: 70°C ± 2°C Duration: 16 hours (see note 1)	– equipment operating during conditioning and testing; – functional test during the last hour at the test temperature; – For equipment specified for increased temperature the dry heat test is to be conducted at the agreed test temperature and duration.
6.	Damp heat	IEC Publication 60068-2-30 test Db	Temperature: 55°C Humidity: 95% Duration: 2 cycles 2 x (12 + 12 hours)	– measurement of insulation resistance before test; – The test shall start with 25°C±3°C and at least 95% humidity; – equipment operating during the complete first cycle and switched off during second cycle except for functional test;

				– functional test during the first 2 hours of the first cycle at the test temperature and during the last 2 hours of the second cycle at the test temperature; – recovery at standard atmosphere conditions; – insulation resistance measurements and performance test.
7.	Vibration	IEC Publication	2^{+3}_{-0} Hz to 13.2 Hz – amplitude ±1mm	– duration in case of no resonance condition 90 minutes at 30 Hz;
		60068-2-6 Test Fc	13.2 Hz to 100 Hz – acceleration ± 0.7 g.	– duration at each resonance frequency at which Q≥ 2 is recorded – 90 minutes;
			For severe vibration conditions such as, e.g. on diesel engines, air compressors, etc.:	– during the vibration test, functional tests are to be carried out;

			2.0 Hz to 25 Hz – amplitude ±1.6 mm	– tests to be carried out in three mutually perpendicular planes;
			25.0 Hz to 100 Hz – acceleration ± 4.0 g.	- Q should not exceed 5;
				- where sweep test is to be carried out instead of the discrete frequency test and a number of resonant frequencies is detected close to each other duration of the test is to be 120 min. Sweep over a restricted frequency range between 0.8 and 1.2 times the critical frequencies can be used where appropriate. Note: Critical frequency is a frequency at which the equipment being tested may exhibit:
			Note;	- malfunction and/or performance deterioration
			More severe conditions may exist for example on exhaust manifolds or fuel oil injection systems of diesel engines. For	- mechanical resonances and/or other response effects occur, e.g. chatter

			equipment specified for increased vibration levels the vibration test is to be conducted at the agreed vibration level, frequency range and duration Values may be required to be in these cases 40 Hz to 2000 Hz – acceleration ± 10.0g at 600°C, duration 90 min.*	
				- mechanical resonances with amplification greater than 10 will not be accepted

Continued..

	Vibration	IEC Publication 60068-2-6 Test Fc - -	2^{+3}_{-0} Hz to 13.2 Hz – amplitude ±1mm 13.2 Hz to 100 Hz – acceleration ± 0.7 g. For severe vibration conditions such as, e.g. on diesel engines, air compressors, etc.: 2.0 Hz to 25 Hz – amplitude ±1.6 mm 25.0 Hz to 100 Hz – acceleration ± 4.0 g.	– duration in case of no resonance condition 90 minutes at 30 Hz; – duration at each resonance frequency at which Q≥ 2 is recorded – 90 minutes; – during the vibration test, functional tests are to be carried out; – tests to be carried out in three mutually perpendicular planes; ☐ Q should not exceed 5;

		Note;	☐ where sweep test is to be carried out instead of the discrete frequency test and a number of resonant frequencies is detected close to each other duration of the test is to be 120 min. Sweep over a restricted frequency range between 0.8 and 1.2 times the critical frequencies can be used where appropriate. Note: Critical frequency is a frequency at which the equipment being tested may exhibit: - malfunction and/or performance deterioration

		-	More severe conditions may exist for example on exhaust manifolds or fuel oil injection systems of diesel engines. For equipment specified for increased vibration levels the vibration test is to be conducted at the agreed vibration level, frequency range and duration Values may be required to be in these cases 40 Hz to 2000 Hz – acceleration ± 10.0g at 600°C, duration 90 min.*	- mechanical resonances and/or other response effects occur, e.g. chatter - mechanical resonances with amplification greater than 10 will not be accepted

Continued..

8.	Inclination	Publication IEC 60092-504	Static 22.5°	a) inclined to the vertical at an angle of at least 22.5° b) inclined to at least 22.5° on the other side of the vertical and in the same plane as in (a), c) inclined to the vertical at an angle of at least 22.5° in plane at right angles to that used in (a), d) inclined to at least 22.5° on the other side of the vertical and in the same plane as in (c). Note: The period of testing in each position should be sufficient to fully evaluate the behaviour of the equipment.

			Dynamic 22.5°	Using the directions defined in a) to d) above, the equipment is to be rolled to an angle of 22.5° each side of the vertical with a period of 10 seconds. The test in each direction is to be carried out for not less than 15 minutes On ships for the carriage of liquefied gases and chemicals, the emergency power supply is to remain operational with the ship flooded up to a maximum final athwart ship inclination of 30°. Note: These inclination tests are normally not required for equipment with no moving parts.

<table>
<tr>
<td>9.</td>
<td>Insulation resistance</td>
<td>
-
<table>
<tr><td rowspan="2">Rated supply voltage Un

(V)</td><td rowspan="2">Test

voltage Un

(V)</td><td colspan="2">Min. insulation resistance</td></tr>
<tr><td>before test
M ohms</td><td>after test
M ohms</td></tr>
<tr><td>Un ≤ 65</td><td>2 x Un
min. 24V</td><td>10</td><td>1,0</td></tr>
<tr><td>Un > 65</td><td>500</td><td>100</td><td>10</td></tr>
</table>
</td>
<td>– For high voltage equipment, reference is made to IACS UR E11.
– insulation resistance test is to be carried out before and after: damp heat test, cold test, salt mist test, and high voltage test;
– between all phases and earth; and where appropriate, between the phases.

Note: Certain components e.g. for EMC protection may be required to be disconnected for this test.</td>
</tr>
</table>

Continued..

10.	High voltage	<table><tr><th>Rated voltage Un (V)</th><th>Test voltage (A.C. voltage 50 or 60 Hz) (V)</th></tr><tr><td>Up to 65</td><td>2 x Un + 500</td></tr><tr><td>66 to 250</td><td>1500</td></tr><tr><td>251 to 500</td><td>2000</td></tr><tr><td>501 to 690</td><td>2500</td></tr></table>	– For high voltage equipment, reference is made to IACS UR E11. – separate circuits are to be tested against each other and all circuits connected with each other tested against earth; – printed circuits with electronic components may be removed during the test; – period of application of the test voltage: 1 minute

11.	Cold	IEC Publication 60068-2-1	Temperature: +5°C ± 3°C Duration: 2 hours or Temperature: –25°C ± 3°C Duration: 2 hours (see note 2)	– initial measurement of insulation resistance; – equipment not operating during conditioning and testing except for functional test; – functional test during the last hour at the test temperature; – insulation resistance measurement and the functional test after recovery

12.	Salt mist	IEC Publication 60068-2-52 Test Kb	Four spraying periods with a storage of 7 days after each.	– initial measurement of insulation resistance and initial functional test; – equipment not operating during conditioning; – functional test on the 7th day of each storage period; – insulation resistance measurement and performance test 4 to 6h after recovery. (see Note 3) On completion of exposure, the equipment shall be examined to verify that deterioration or corrosion (if any) is superficial in nature.

Continued..

13.	Electrostatic discharge	IEC 61000-4-2	Contact discharge: 6kV Air discharge: 8kV Interval between single discharges: 1 sec. No. of pulses: 10 per polarity According to test level 3.	– to simulate electrostatic discharge as may occur when persons touch the appliance; – the test is to be confined to the points and surfaces that can normally be reached by the operator; – Performance Criterion B (See Note 4).
14.	Electromagnetic field	IEC 61000-4-3	Frequency range: 80 MHz to 6 GHz Modulation**: 80% AM at 1000Hz	- to simulate electromagnetic fields radiated by different transmitters; - the test is to be confined to the appliances exposed to direct radiation by transmitters at their place of installation. - Performance criterion A (See Note 5)

			Field strength: 10V/m Frequency sweep rate: ≤1.5 x 10-3 decades/s (or 1%/3 sec) According to test level 3	** If for tests of equipment an input signal with a modulation frequency of 1000 Hz is necessary a modulation frequency of 400 Hz may be chosen.
15.	Conducted low frequency		AC: Frequency range :rated frequency to 200th harmonic; Test voltage (rms) : 10% of supply to 15th harmonic reducing to 1% at 100th harmonic and maintain this level to the 200th harmonic, min 3 V r.m.s, max 2 W. DC:	- to stimulate distortions in the power supply system generated for instance, by electronic consumers and coupled in as harmonics; - performance criterion A (see Note 5). - See figure – test set-up

			Frequency range : 50 Hz - 10 kHz; Test voltage (rms) :10% of supply max. 2 W	
16.	Conducted radio frequency	IEC 61000-4-6	AC, DC, I/O ports and signal/control lines: Frequency range : 150 kHz-80 MHz Amplitude : 3 V rms (See Note 6) Modulation ***: 80% AM at 1000 Hz Frequency sweep range: ≤ 1.5 x 10 -3 decades/s (or 1%/3sec.) According to test level 2.	- Equipment design and the choice of materials is to stimulate electromagnetic fields coupled as high frequency into the test specimen via the connecting lines. - performance criterion A (see Note 5). *** If for tests of equipment an input signal with a modulation frequency of 1000 Hz is necessary a modulation frequency of 400 Hz may be chosen.

17.	Burst/fast transients	IEC 61000-4-4	Single pulse rise time: 5ns (between 10% and 90% value) Single pulse width: 50 ns (50% value) Amplitude (peak): 2kV line on power supply port/earth; 1kV on I/O data control and communication ports (coupling clamp) Pulse period: 300 ms; Burst duration: 15 ms; Duration/polarity: 5 min According to test level 3.	- arcs generated when actuating electrical contacts; - interface effect occurring on the power supply, as well as at the external wiring of the test specimen; - performance criterion B (see Note 4).

18.	Surge/voltage	IEC 61000-4-5	Open-circuit voltage: Pulse rise time: 1.2 µs (front time) Pulse width: 50 µs (time to half value) Amplitude (peak) : 1kV line/earth; 0.5kV line/line Short-circuit current: Pulse rise time: 8 µs (front time) Pulse width: 20 µs (time to half value) Repetition rate: ≥ 1 pulse/min No of pulses: 5 per polarity Application: continuous According to test level 2.	- interference generated for instance, by switching “ON” or “OFF” high power inductive consumers; - test procedure in accordance with figure 10 of the standard for equipment where power and signal lines are identical; - performance criterion B (see Note 4).

19.	Radiated emission	CISPR 16-1, 16-2	For equipment installed in the bridge and deck zone. Frequency range: quasi peak Limits : 0.15-0.3 MHz 80-52dBµV/m 0.3-30 MHz 52-34dBµV/m 30 - 2000MHz 54dBµV/m except for: 156-165 MHz 24 dBµV/m For equipment installed in the general power distribution zone. Frequency range: quasi peak Limits: 0.15 - 30 MHz 80 - 50 dBµV/m 30-100 MHz 60-54 dBµV/m 100 - 2000 MHz 54 dBµV/m except for: 156-165 MHz 24 dBµV/m	- procedure in accordance with the standard but distance 3 m between equipment and antenna - Alternatively the radiation limit at a distance of 3 m from the enclosure port over the frequency 156 MHz to 165 MHz shall be 30 dB micro-V/m peak.

20.	Conducted emission	CISPR 16-1, 16-2	For equipment installed in the bridge and deck zone. Frequency range: Limits: 10-150kHz 96 - 50dBµV 150-350 kHz 60 - 50 dBµV 350 kHz-30 MHz 50 dBµV For equipment installed in the general power distribution zone. Frequency range: Limits: 10-150 kHz 120 - 69 BµV 150-500kHz 79dBµV 0.5 - 30 MHz 73 dBµV	.
21.	Flame retardant	IEC 60092-101 Or IEC 60695-11-5	Flame application: 5 times 15 s each. Interval between each application: 15s or 1 time 30s. The test is performed with the EUT or	- - - the burnt out or damaged part of the specimen by not more than 60 mm long. – no flame, no incandescence or

			housing of the EUT applying needle-flame test method.	– in the event of a flame or incandescence being present, it shall extinguish itself within 30 s of the removal of the needle flame without full combustion of the test specimen. – any dripping material shall extinguish itself in such a way as not to ignite a wrapping tissue. The drip height is 200 mm ± 5 mm.
22.	Compass safe distance measurement	IEC 60945		- the test is applied to equipment intended for installation on the navigation bridge
23.	Acoustic noise and signals measurement	IEC 60945		- the test is applied to equipment intended for installation on the navigation bridge

Notes:

1. Equipment to be mounted in consoles, housing etc. together with other equipment are to be tested with 70°C.
2. For equipment installed in non-weather protected locations or cold locations test is to be carried out at –25°C.
3. Salt mist test is to be carried out for equipment installed in weather exposed areas.

4. Performance Criterion B: (For transient phenomena): The EUT shall continue to operate as intended after the tests. No degradation of performance or loss of function is allowed as defined in the technical specification published by the manufacturer. During the test, degradation or loss of function or performance which is self-recoverable is however allowed but no change of actual operating state or stored data is allowed.
5. Performance Criterion A: (For continuous phenomena): The Equipment Under Test shall continue to operate as intended during and after the test. No degradation of performance or loss of function is allowed as defined in relevant equipment standard and the technical specification published by the manufacturer.
6. For equipment installed on the bridge and deck zone, the test levels shall be increased to 10V rms for spot frequencies in accordance with IEC 60945 at 2, 3, 4, 6.2, 8.2, 12.6, 16.5, 18.8, 22, 25 MHz.

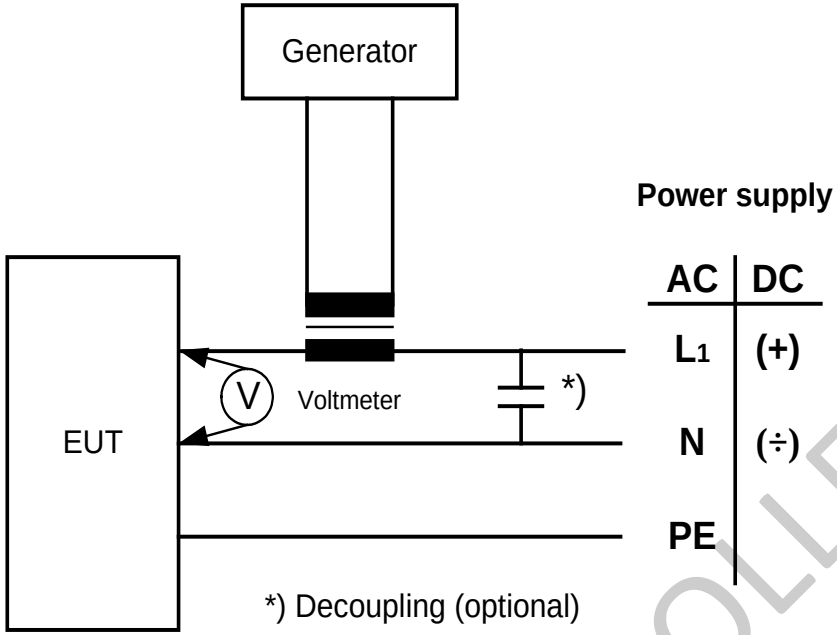

Figure - Test Set-up – Conducted Low Frequency Test

- END -

EU RO Mutual Recognition Technical Requirements

LV SOFT STARTERS	Version	0.0
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1. PRODUCT DESCRIPTION

1.a General description of the product

Soft starter is a special form of a.c. motor controller with suitable overload protection, rated as a unit and in which the starting function is limited to a voltage and/or current ramp that may include controlled acceleration, and where the additional control functions is limited to providing 'FULL-ON'.

1.b Application limitations

a) The rated voltage of LV soft starters does not exceed 1000V a.c. according IEC 60947-4-2 and rated power of controlled motor ≤ 20 kW, and not for essential systems;
b) Onboard ships with exceptions as per SOLAS Ch. I, Reg. 3;
c) Installation on board ships within locations with climatic, biological, chemically active, mechanically active, and mechanical environmental conditions not exceeding those for which performance has been proved according to IEC 60721-3-6 (1987) + A2(1996) or IEC 60947-1 Annex Q;
d) 'Ex' certification is not within the scope of these Technical Requirements.

1.c Intended use

a) Power supply system characteristics as per IEC 60092-101; 2.8;
b) Environment category 6K4, 6B2, 6C2, 6S2 and 6M3 according to IEC 60721-3-6 (1987) + A2 (1996) or IEC 60947-1 Annex Q.

1.d System context

See 1.c

2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a i. Technical Requirements

a) In general, IEC 60947 series shall be observed.

2.a.ii. Technical documents to be submitted

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

Prior to tests:

a) Proposed test program and test schedule;
b) Description of the test specimens and explanation of the selected test sample(s) providing evidence that the selected sample meets the most rigorous and demanding requirements;
c) Product descriptions, manuals, data sheets, assembly drawings, dimension drawings etc. clearly identifying the product;
d) Complete accreditation certificate of the Test laboratory if the tests are conducted by an Accredited Test Laboratory as per 2.b.a. (prior the first test only; changes in the scope of accreditation shall also be advised);
e) Details of production sites;
f) Product specification;
g) Application, working area;
h) Instructions on fitting, assembly and operation;
i) QM-certificate according to ISO 9001.

After completion of tests:

j) The test report with an identification number must contain all relevant data and test results including place and date of the tests, the names of the responsible personnel carrying out the test;
k) Type references and serial numbers of the products tested;
l) Test reports and test records must be signed by the personnel members in charge of the test and are to be confirmed by the EU RO by signing and marking the test report;

m) Certificate of conformity to IEC Standards issued by one of the Certification Body under the ILAC or LOVAG or IECEE mutual recognition agreement.

2.b Type testing requirements

a) 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†;
b) The test laboratory shall be accredited according to ISO 17025 for relevant IEC standards (incl. IEC 60947-4-2 sub - clause 9.1.2) by either a National Accreditation Body under the MLA regime of ILAC or one of the certification bodies under the LOVAG or IECEE Mutual Recognition Agreement. This applies to the Type Tests (including EMC) in compliance with the product standards;
c) Special tests in accordance with URE10 or IEC 60947-4-2 sub-clause 9.1.5.2 and IEC 60947-1 Annex Q, 'Special tests' (Category D or higher);
d) All tests to be performed on the agreed test samples taken from the production line or from stocks†;
e) IEC 60947-4-2 sub-clause 8.3 or URE10 Electromagnetic compatibility (EMC)

† 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.a. 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.b Special Requirements

a) Routine tests according to IEC 60947-4-2 sub - clause 9.1.3;
b) Production certification according to ISO 9001 by accredited certification bodies;
c) QM/QS audit (annual) shall be submitted to the EU RO for review;

d) Production of the equipment is limited to those facilities listed on EU RO's certificate;
e) Changes to the product, or its embedded software (firmware), will void the EU RO's Mutual Recognition certification;
f) The EU RO shall be granted access to all manufacturing and testing facilities, and to be provided with all the information necessary to perform its duties;
g) General terms and conditions of EU RO shall be observed.

4. MARKING REQUIREMENTS

a) Marking as required by IEC 60947-4-2 (sub-clause 6.2).

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:

a) Approval conditions including limitations;
b) Hardware, software, firmware name and version;
c) Technical data according to IEC marking;
d) Application and limitations.

6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
2016-07-01	0.0	Approved by EU RO MR Advisory Board

LV SOFT STARTERS	Version	0.0
	Adoption Date:	1 July 2016
	Application Date:	1 January 2017
	Tier	5
This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements *** Uncontrolled if downloaded or printed ***		

7. BACKGROUND INFORMATION / REFERENCES

a) EU RO Framework Document for the Mutual Recognition of Type Approval;
b) IEC 60947;
c) SOLAS Ch. I, Reg. 3;
d) IEC 60721-3-6 (1987) + A2 (1996);
e) IEC 60092;
f) ISO 9001;
g) IMO Resolution A.813(19):1995;
h) IEC 60533;
i) IEC 60945;
j) IACS UR E10;
k) ISO 17025.

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 -

EU RO Mutual Recognition Technical Requirements

PILOT DEVICES	Version	0.1
	Adoption Date:	1 July 2018
	Application Date:	1 January 2019
	Tier	5
This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements ***** Uncontrolled if downloaded or printed *****		

1. PRODUCT DESCRIPTION

1.a General description of the product

Pilot devices are devices which communicate between human operators and machines using the following control circuit devices and switching elements.

- manual control switches, e.g. push-buttons, rotary switches, joystick etc.;
- associated control circuit equipment, e.g. indicator lights, etc.

***Note1**: A control switch includes (a) switching element(s) and an actuating system.*
***Note2:** A switching element may be a contact element or a semiconductor element*

1.b Application limitations†

a) The rated voltage of pilot devices shall be up to 1000V a.c. (50/60 Hz) or 600V d.c. according to IEC60947-5-1;

b) The following devices, which are not relating to human operation, are excluded from these technical requirements:
   - **pilot switches**, for example pressure switches, temperature sensitive switches (thermostats), programmers, etc.;
   - **electromagnetically operated control switches**, either time-delayed or instantaneous, for example contactor relays
   - **position switches**, for example control switches operated by part of a machine or mechanism.

   ***Note:** pilot switches are non-manual control switches actuated in response to specified conditions of an actuating quantity. (IEV 441-14-48)*

† 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.

1.c Intended use

Pilot devices are used for marine applications, e.g. electric motor control gears, switchboards, distribution boards, control panels, etc.

1.d System context

See ***1.c*** above.

2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a i. Technical Requirements

a) Pilot devices shall be complied with the requirements of IEC 60947-5-1;
b) Emergency stop devices with mechanical latching function shall be complied with IEC60947-5-5;
c) Type, ratings and characteristics of pilot devices for intended applications shall be evaluated;
d) Dependency of external control power shall be evaluated.

2.a.ii. Technical documents to be submitted

Prior to tests:

a) Proposed test program and test schedule;
b) Description of the test specimens and explanation of the selected test sample(s) providing evidence that the selected sample meets the most rigorous and demanding requirements;
c) Product descriptions, data sheets, assembly drawings, dimension drawings etc. clearly identifying the product;

d) Complete accreditation certificate of the Test laboratory (prior the first test only; changes in the scope of accreditation shall also be advised);
e) Details of production sites;
f) Product specification;
g) Application, working area;
h) Instructions on fitting, assembly and operation;
i) QM-certificate according to ISO 9001.

After completion of tests:

j) The test report with an identification number shall contain all relevant data and test results including place and date of the tests, the names of the responsible personnel carrying out the test;
k) Type references and serial numbers of the products tested;
l) Test reports and test records shall be signed by the personnel members in charge of the test and are to be confirmed by the EU RO by signing and marking the test report.

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 test shall be carried out in accordance with IEC 60947-5-1 sub-clause 8.1.2 and, IEC 60947-5-5 sub-clause 7 for the emergency stop device with mechanical latching function;
f) Special tests shall be carried out in accordance with IEC 60947-5-1 sub-clause 8.1.5 and Annex C Special tests – Durability tests;

g) Compass safe distance test shall be carried out in accordance with IEC60945 sub-clause 11.2 when the pilot devices are to be installed in the vicinity of the ship's standard or steering compasses;

h) Electromagnetic compatibility (EMC) to be tested in accordance with the procedures indicated in the IACS UR E10 or in accordance with IEC 60947-4-1, with the severity conditions set by the IACS UR E10 as a minimum;

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

j) 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.euromr.org/technical-requirements).

3. PRODUCTION REQUIREMENTS

a) Refer to EU RO "Product Quality Assurance (PQA)" procedure (Appendix VI of EU RO Framework Document for the Mutual Recognition of Type Approval);

b) Routine test according to IEC 60947-5-1 sub-clause 8.1.3;

c) Production certification according to ISO 9001 by accredited certification bodies;

d) QM/QS audit (annual) shall be submitted to EU RO for review;

e) Production of the equipment is limited to those facilities listed on the EU RO certificate;

f) Changes to the product will void the EU RO certification. The EU RO shall be kept informed of all new version numbers including a description of change;

g) The EU RO shall be granted access to all manufacturing and testing facilities, and to be provided with all the information necessary to perform its duties;

h) General terms and conditions of the EU RO shall be observed.

PILOT DEVICES	Version	0.1
	Adoption Date:	1 July 2018
	Application Date:	1 January 2019
	Tier	5
This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements ***** Uncontrolled if downloaded or printed *****		

4. MARKING REQUIREMENTS

Marking as required by IEC 60947-5-1 sub-clause 5.2.

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:

a) Technical data according to IEC marking;
b) Reference to approved technical documents;
c) Application and limitations.

6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
1 July 2016	0.0	Accepted by EU RO MR Advisory Board
1 July 2018	0.1	CRF032 / CRF035 - Revision of par. 2.b – Type testing requirements (Alignment of Electrical TRs) Corrected reference to standard IEC 60721-3-6 (1987) + A2 (1997)

7. BACKGROUND INFORMATION / REFERENCES

a) EU RO Framework Document for the Mutual Recognition of Type Approval;
b) IEV 441-14-48;
c) IEC 60947-1;
d) IEC 60947-5-1;
e) IEC 60947-5-5;
f) IEC 60721-3-6 (1987) + A2 (1997);
g) ISO 9001;
h) ISO 17025.

PILOT DEVICES	Version	0.1
	Adoption Date:	1 July 2018
	Application Date:	1 January 2019
	Tier	5
This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements ***** Uncontrolled if downloaded or printed *****		

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 -

EU RO Mutual Recognition Technical Requirements

PRESSURE GAUGES – TRANSMITTERS	Version	0.0
	Adoption Date:	1 July 2016
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	Tier	5
This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements ***** Uncontrolled if downloaded or printed *****		

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 and wired into a Wheatstone bridge configuration. 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.

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 best 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 (Rev. 6) – Test Specification for Type Approval, in particular:

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 ±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 ± 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 sensors shall be chosen in accordance with IEC 60529;

h) Electrical and electronic sensors 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

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.

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.

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) 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 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.

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

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)

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;
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:

a) Technical data which adequately express the basic article's features assuring its functional usage;
b) Details of the EMC/environmental test levels applied;
c) Hardware, firmware, software name and revision, if and as applicable.

PRESSURE GAUGES – TRANSMITTERS	Version	0.0
	Adoption Date:	1 July 2016
	Application Date:	1 January 2017
	Tier	5
This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements *** Uncontrolled if downloaded or printed ***		

6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
2016-07-01	0.0	Approval by EU RO MR Advisory Board

7. BACKGROUND INFORMATION / REFERENCES

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

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.

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- END -

EU RO Mutual Recognition Technical Requirements

VALVES FOR CARGO SYSTEMS	Version	0.0
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	Tier	5
This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements ***** Uncontrolled if downloaded or printed *****		

1. PRODUCT DESCRIPTION

1.a General description of the product

Valves for cargo systems of Class III piping as defined by IACS UR P2.2 Rev.4 intended to stop or modify a cargo flow.

1.b Application limitations

a) These Technical Requirements apply to valves dedicated to cargo systems of crude oil or petroleum products having an absolute vapour pressure less than 0.28 MPa at 37.8°C or other liquid cargoes not toxic, not corrosive and less inflammable than that of crude oil and petroleum products or other flammable liquid cargoes not heated above the flash point;

b) These technical requirements are not applicable to:

- valves intended to be fitted on the ship's side; and valves intended to be fitted on the ship's collision bulkhead;
- hydraulically, electrically or pneumatically controlled devices for valves;
- plastic valves.

1.c Intended use

Piping systems for cargoes only belong to Class III.

1.d System context

As per item 1.c

2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a i. Technical Requirements

Design:

a) Valves in piping systems shall be compatible with the pipes to which they are attached in respect of their strength and are to be suitable for effective operation at the maximum working pressure and rated flow that they will experience in service;
b) Valves shall be designed and manufactured in accordance with recognized standards such as ISO standards, API specifications, etc.;
c) Valves and accessories shall be designed so as to prevent the loosening of covers and glands when they are in use;
d) Valves shall be designed so as to shut with a right-hand (clockwise) motion of the wheels;
e) Valves shall be provided with local indicators showing whether they are open or shut, unless this is readily apparent. When the valves are designed for one way flow, the direction of flow shall be clearly and legibly marked on the valve. The direction may be cast into the valve housing, such as for screw-down and other non-return valves;
f) Valves and cocks shall be fitted with nameplates to indicate their purpose(s). The casing of non-return valves shall be permanently marked with flow direction;
g) Suitable positive means of securing the spindle shall be provided on valves where the spindle is turned between fully open and fully closed position. Manually operated butterfly valves, which are designed for throttling service, shall be equipped with a locking arrangement that holds the disc in any relevant position.

Materials:

h) The materials to be used for the valves are to be suitable for the medium and service for which the piping is intended;

i) Carbon, carbon-manganese steel, bronze and other ductile materials may be used with cargo systems, provided that they have a specified minimum elongation not less than 12%. Spheroidal graphite cast iron may be used, provided that the minimum elongation is not less than 12% on a gauge length of $5,65 \times S^{0,5}$, where S is the actual cross-sectional area of the test piece;

j) The use of asbestos is prohibited.

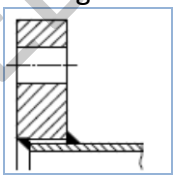
Type of connections:

k) Butt welded, slip-on sleeve and socket welding joints shall be used in the connecting of valves;

l) Metallic flange connections are permitted. Flange connection type, as shown in Figure 1, shall be permitted for design temperatures less than 150°C.;

m) The dimensions of flanges and relative bolts shall be chosen in accordance with the relevant national standards. Flange attachments shall be in accordance with national or international standards that are relevant to the piping system and are to recognize the applicable boundary fluids, design pressure and temperature conditions, external or cyclic loading and location.

Fig. 1



2.a.ii. Technical documents to be submitted

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

a) The standard used by the manufacturer shall be clearly identified in the documentation submitted;

b) Assembly drawings showing dimensions, internal parts (valve body and coupling flange, valve disc and rod, valve seat.), materials, type of connections shall be submitted for EU RO review;

c) Product descriptions including intended services, installation locations, intended fluids, working medium, rated flow, design pressure, temperature range, certificates and reports of relevant tests previously carried out, instructions on operation, performance specification shall be submitted for EU RO review;

d) Design calculations according to a recognised standard, or type test procedure according to a recognised standard.

2.b Type testing requirements

a) Type tests shall be carried out as per referenced standard;
b) The maximum turning torque of spindle shall be checked for remote control against the applicable design requirements;
c) Test specimens shall be selected from the production line or 'at random' from stocks†.
d) Where there are various sizes of the type of valve requiring approval, a minimum of three separate sizes representative of the range from each type of joints shall be subject to the hydrostatic test at the following value of pressure:

PH = 1,5P
Where PH = test pressure (MPa),
P = design pressure (MPa), or the pressure indicated by the referenced standard for valves, whichever is the largest but not less than 0.35 MPa.

e) Hydrostatic tests shall be carried out in both the closed and open positions of the valve;

f) Test for type approval shall be carried out in the presence of a 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

a) 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).
b) All valve bodies having a design pressure greater than 0.1 MPa shall be subject to a hydrostatic test at the following value of pressure:

PH = 1,5P
Where PH = test pressure (MPa), P = design pressure (MPa) but not less than 0.35 MPa.

c) After assembly, the valves shall be checked for leakage by a hydraulic pressure equal to 1.1 times the design pressure.

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;
e) Date of Manufacture;
f) When the valves are designated for one way flow, the direction of flow shall be clearly and legibly marked on the valve. The direction may be cast into the valve housing.

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.

6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
2016-07-01	0.0	Approved by EU RO MR Advisory Board

7. BACKGROUND INFORMATION / REFERENCES

a) EU RO Framework Document for the Mutual Recognition of Type Approval;
b) IACS UR P2 (Rev.2 Nov 2001) "Rules for piping design, construction and testing";

c) ISO 5208:2008 "Industrial valves-Pressure testing of metallic valves";
d) ISO 5209:1977 "General purpose industrial valves-marking".

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 -

EU RO Mutual Recognition Technical Requirements

VALVES FOR FUEL OIL SYSTEMS	Version	0.0
	Adoption Date:	1 July 2016
	Application Date:	1 January 2017
	Tier	5
This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements *** Uncontrolled if downloaded or printed ***		

1. PRODUCT DESCRIPTION

1.a General description of the product

Valves for fuel oil systems of Class III piping as defined by IACS UR P2.2 Rev.4 intended to stop or modify fuel oil flow.

1.b Application limitations

a) These Technical Requirements apply to valves dedicated to fuel oil systems of Class III with design pressure up to 0,7 MPa, design temperature up to 60°C and diameter up to 100mm.
b) These technical requirements are not applicable to:
   - hydraulically, electrically or pneumatically controlled devices for valves;
   - plastic valves.

1.c Intended use

Piping systems for fuel oil with a design pressure up to 0,7 MPa and design temperature up to 60°C (only for class III).

1.d System context

As per item 1.c

VALVES FOR FUEL OIL SYSTEMS	Version	0.0
	Adoption Date:	1 July 2016
	Application Date:	1 January 2017
	Tier	5
This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements *** Uncontrolled if downloaded or printed ***		

2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a i. Technical Requirements

Design

a) Valves in piping systems shall be compatible with the pipes to which they are attached, in respect of their strength, and shall be suitable for effective operation at the maximum working pressure and rated flow that they will experience in service;
b) Valves shall be designed and manufactured in accordance with recognized standards such as ISO standards, API specifications, etc.;
c) Valves and accessories shall be designed so as to prevent the loosening of covers and glands when they are in use;
d) Valves shall be so designed as to shut with a right-hand (clockwise) motion of the wheels;
e) Valves shall be provided with local indicators showing whether they are open or shut unless this is readily apparent;
f) When the valves are designed for one way flow, the direction of flow shall be clearly and legibly marked on the valve. The direction may be cast into the valve casing, such as for Screw-down and other non-return valves;
g) Valves and cocks shall be fitted with nameplates to indicate their purpose(s). The casing of non-return valves shall be permanently marked with flow direction;
h) Suitable positive means of securing the spindle shall be provided on valves where the spindle is turned between fully open and fully closed position. Manually operated butterfly valves, which are designed for throttling service, shall be equipped with a locking arrangement that holds the disc in any relevant position;
i) Butterfly and ball valves are not to be used as quick closing valves or stop valves on fuel oil tanks;
j) Minimum design pressure 0.35 MPa.

Materials

k) Carbon, carbon-manganese steel, bronze and stainless steel may be used in fuel system. Spheroidal graphite cast iron may be used, provided that the minimum elongation is not less than 12% on a gauge length of 5,65 x S ^ 0,5, where S is the actual cross-sectional area of the test piece. Grey cast iron may be used for

valve's casings if the ultimate strength of the grey cast iron is not less than 300 MPa;

l) The use of asbestos is prohibited;

m) Aluminium and aluminium alloys are not permitted for use for casing of fuel valves;

n) Grey cast iron is not permitted for use in piping which is subject to pressure shock, vibrations, and valves fitted to fuel oil tanks under static pressure head;

o) The materials to be used for the other component parts of the valves shall be suitable for the working medium and service for which the piping is intended. Non-metallic material of gaskets or seals shall be approved in accordance with the recognized standards for the use with fuel.

Type of connections

p) Butt welded, slip-on sleeve and socket welding joints shall be used in the connecting of valves;

q) Butt welded, slip-on sleeve and socket welding joints shall be used in the connecting of valves;

r) The dimensions of flanges and relative bolts shall be chosen in accordance with the relevant national standards. Flange attachments shall be in accordance with national or international standards that are relevant to the piping system and are to recognize the applicable boundary fluids, design pressure and temperature conditions, external or cyclic loading and location.

2.a.ii. Technical documents to be submitted

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

a) The standard used by the manufacturer shall be clearly identified in the documentation submitted.

b) Assembly drawings showing dimensions, internal parts (valve casing and coupling flange, valve disc and rod, valve seat.), materials, type of connections shall be submitted for EU RO review. Design calculations according to a recognised standard, or type test procedure according to a recognised standard.

c) Product descriptions including intended services, installation locations, intended fluids, working medium, rated flow, design pressure, temperature range, certificates and reports of relevant tests previously carried out, instructions on operation, performance specification shall be submitted for EU RO review.

2.b Type testing requirements

a) Type tests shall be carried out as per the referenced standard;
b) The maximum turning torque of spindle shall be checked for remote control against the applicable design requirements;
c) Test specimens shall be selected from the production line or 'at random' from stock†;
d) Where there are various sizes of the type of valve requiring approval, a minimum of three separate sizes representative of the range from each type of joints shall be subject to the hydrostatic test at the following value of pressure:

PH = 1,5P, but not less 0,5 MPa;
where PH = test pressure (MPa), P = design pressure (MPa),
or the pressure indicated by the reference standard for valves, whichever is the largest.

e)
f) Hydrostatic tests shall be carried out in both the closed and open position of valve;
g) Tests for type approval shall be carried out in the presence of a 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

a) 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).
b) All valve casings shall be subject to a hydrostatic test at the following value of pressure:

PH = 1,5P, but not less 0,5 MPa;
where PH = test pressure , P = design pressure (MPa).

c) After assembly, the valves shall be checked for leakage by a hydraulic pressure equal to 1.1 times the design pressure.

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.

When the valves are designed for one way flow, the direction of flow shall be clearly and legibly marked on the valve. The direction may be cast into the valve casing.

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.

6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
2016-07-01	0.0	Approved by EU RO MR Advisory Board

7. BACKGROUND INFORMATION / REFERENCES

a) EU RO Framework Document for the Mutual Recognition of Type Approval;
b) IACS UR P2 (Rev.2 Nov 2001)"Rules for piping design, construction and testing";
c) ISO 5208-2008"Industrial valves-Pressure testing";
d) ISO 5209-1977"General purpose industrial valves-marking'.

VALVES FOR FUEL OIL SYSTEMS	Version	0.0
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	Tier	5
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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 -

EU RO Mutual Recognition Technical Requirements

ANTI-ACID PAINTS (BATTERIES' STORAGE ROOMS)	Version	0.0
	Adoption Date:	1 January 2018
	Application Date:	1 July 2018
	Tier	6
This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements ***** Uncontrolled if downloaded or printed *****		

1. PRODUCT DESCRIPTION

1.a General description of the product

Anti-acid paints intended for protection of the interior of battery storage room against corrosion by electrolyte.

1.b Application limitations†

These Technical Requirements apply to the paints intended for protection of the interior of compartment or location to store battery using an acid electrolyte.

† 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.

1.c Intended use

Protective coating for the interior of battery storage rooms.

1.d System context

As per item 1.c.

ANTI-ACID PAINTS (BATTERIES' STORAGE ROOMS)	Version	0.0
	Adoption Date:	1 January 2018
	Application Date:	1 July 2018
	Tier	6
This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements *** Uncontrolled if downloaded or printed ***		

2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a i. Technical Requirements

Anti-acid paints intended for protection of the interior of battery storage room against corrosion by acid electrolyte shall be manufactured so that the type testing requirements indicated in the para. 2.b. are to be complied with.

2.a.ii. Technical documents to be submitted

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

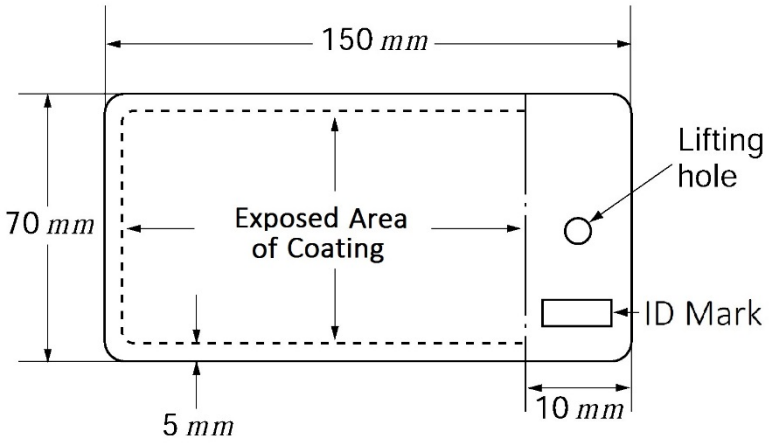
a) Compositions for every brand of products, including:
   i. Product name and identification mark and/or number;
   ii. Materials, components and composition of the coating system;
b) Manufacturer's instructions and recommendations for use, including:
   i. Surface preparations,
   ii. Mixing and agitation,
   iii. Minimum and maximum dry film thickness,
   iv. Method of application,
   v. Drying and overcoating method,
   vi. Limitations,
   vii. Storage.

2.b Type testing requirements

Test coupons

a) Four (4) test coupons made of glass or steel panel shall be prepared in standard shape of 2 mm thickness as shown in Fig. 1, unless otherwise specifically agreed.
b) The test panels shall be coated on both sides according to the coating method and drying condition specified by the manufacturer.
c) Three (3) test panels for immersion test are to be overcoated with paraffin or wax, etc., about 5 mm band in the edges.
d) A fourth test panel is to be used as a comparison sample.

Fig. 1



Test procedure

e) Three (3) glass bottles filled with the same acid solutions (5%, 7.5%, 10%, respectively) as the electrolyte solution used in the battery up to 150mm in depth shall be prepared as shown in Fig. 2.

f) Three (3) test panels shall be hung in immersion up to 120mm, and kept for 480 hours at normal room temperature.

g) In order to adjust immersion of the test panel, two strings of thread fixed to the test panel and penetrated through the gap between a hole in the glass plate and the cork should be used as shown in Fig. 2.

h) After 480 hours, the test panels shall be removed from the glass bottles and washed carefully with water at room temperature and then drained off.

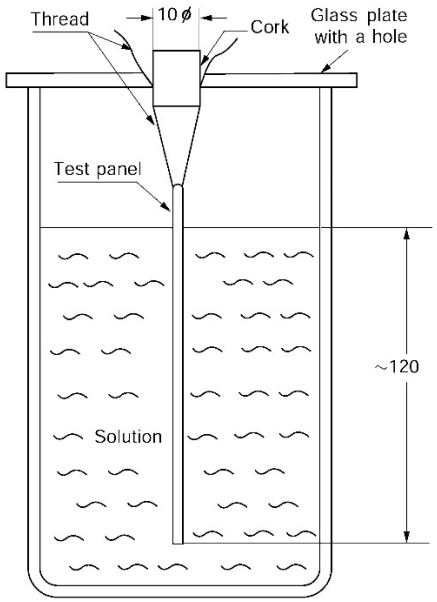
i) The test panels shall be placed perpendicularly at room temperature for two hours and the coating shall be examined. The edges of test panels and the coating within 10mm in width from the immersion level should not be examined.

j) At least two (2) test panels shall be examined with the test panel for comparison sample. No indications of crack, blister, peeling, pinhole, softening and elusion should be visible. There shall be no great change in colour and gloss.

k) Test specimens shall be selected from production line or at random from stocks.†

l) Test for type approval shall be carried out in the presence of a RO surveyor. In cases where the tests are conducted at Nationally Accredited Laboratories, the presence of the EU RO surveyor may be omitted.†

Fig.2



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

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).

ANTI-ACID PAINTS (BATTERIES' STORAGE ROOMS)	Version	0.0
	Adoption Date:	1 January 2018
	Application Date:	1 July 2018
	Tier	6
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4. MARKING REQUIREMENTS

Manufacturers of the approved product are, in principle, to mark the container before shipment for identification of approved product 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 designation,
c) Lot No. and date of manufacture,
d) Storage condition.

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.

6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
2018-01-01	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) ISO 2812-1 (Determination of resistance to liquids).

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.

ANTI-ACID PAINTS (BATTERIES' STORAGE ROOMS)	Version	0.0
	Adoption Date:	1 January 2018
	Application Date:	1 July 2018
	Tier	6
This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements ***** Uncontrolled if downloaded or printed *****		

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 -

EU RO Mutual Recognition Technical Requirements

ELECTRICAL INSULATION MATS	Version	0.0
	Adoption Date:	1 January 2018
	Application Date:	1 July 2018
	Tier	6
This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements ***** Uncontrolled if downloaded or printed *****		

1. PRODUCT DESCRIPTION

1.a General description of the product

Electrical insulation mats are made of elastomer for use as a floor covering for the electrical protection of ship crew.

1.b Application limitations†

These Technical Requirements can be applied to any electrical insulation mats installed in ship.

† 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.

1.c Intended use

Electrical insulation mats are installed on floor of switchboards, starter panels local control panels, etc.

1.d System context

Nil

ELECTRICAL INSULATION MATS	Version	0.0
	Adoption Date:	1 January 2018
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This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements *** Uncontrolled if downloaded or printed ***		

2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a i. Technical Requirements

Electrical insulation mats shall be complied with the requirements of IEC 61111.

2.a.ii. Technical documents to be submitted

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

Prior to tests:

a) Proposed test program and test schedule;
b) Description of the test specimens and explanation of the selected test sample(s) providing evidence that the selected sample meets the most rigorous and demanding requirements;
c) Product descriptions, data sheets, assembly drawings, dimension drawings, etc. clearly identifying the product;
d) Complete accreditation certificate of the test laboratory (prior to the first test only; changes in the scope of accreditation shall also be advised);
e) Detail of production sites;
f) Product specification;
g) Application, working area;
h) Instruction on fitting, assembly and operation;
i) QM-certificate according to ISO 9001.

After completion of tests:

j) The test report with an identification number shall contain all relevant data and test results including place and date of the tests, the names of the responsible personnel carrying out the test;
k) Type reference and serial number of the products tested;
l) Test reports and test records shall be signed by the personnel members in charge of the test and are to be confirmed by the EU RO by signing and marking the test report.

2.b Type testing requirements

a) Detailed requirements of the type test shall be in accordance with IEC 61111 "Live working - Electrical insulating matting";
b) All tests shall be performed on the agreed test samples selected from the production line or 'at random' from stocks†;
c) Tests shall be carried out in the presence of the EU RO Surveyor. In case 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

a) 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);
b) In general, IEC 61111 shall apply. Each electrical insulation mat shall pass visual inspection and measurements in accordance with IEC 61111 sub-clause 5.2.

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. and Serial No.;
c) Symbol: IEC60417-5216(2002-10);
d) Category if applicable;
e) Class designation;
f) Date of Manufacture.

ELECTRICAL INSULATION MATS	Version	0.0
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This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements ***** Uncontrolled if downloaded or printed *****		

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:

a) Technical data according to IEC marking;
b) Reference to approved technical documents;
c) Reference to testing standards and relevant test reports;
d) Environmental conditions;
e) Application and limitations.

6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
2018-01-01	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) IEC 61111;
c) IEC 60417-5216.

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.

ELECTRICAL INSULATION MATS	Version	0.0
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	Tier	6
This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements ***** Uncontrolled if downloaded or printed *****		

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 -

EU RO Mutual Recognition Technical Requirements

GASKETS AND SEALS FOR PIPING SYSTEMS	Version	0.0
	Adoption Date:	1 January 2018
	Application Date:	1 July 2018
	Tier	6
This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements ***** Uncontrolled if downloaded or printed *****		

1. PRODUCT DESCRIPTION

1.a General description of the product

Gaskets and seals of rubber and plastic materials for piping systems are intended for sealing pipe connections.

1.b Application limitations†

The application being limited to sealing steel pipe connections for piping systems, which are not required to having reaction-to-fire performance due to the media being conveyed and areas the pipeline pass.
Gaskets for piping systems penetrating areas such as accommodation, service spaces and machinery spaces being outside the scope of the Technical Requirement.

† 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.

GASKETS AND SEALS FOR PIPING SYSTEMS	Version	0.0
	Adoption Date:	1 January 2018
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	Tier	6
This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements ***** Uncontrolled if downloaded or printed *****		

1.c Intended use

The gaskets and seals intended to be used in piping systems necessary for the applications mentioned in 1.b.

1.d System context

Refer to the item 1c.

2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a i. Technical Requirements

The gaskets and seals intended for sealing in piping systems shall be manufactured so that the type testing requirements indicated in the para. 2.b are to be complied with.
Materials containing asbestos are prohibited for the manufacture of gaskets and seals.
Gasket and seals for piping systems shall be compatible with the pipes to which they are attached, in respect of their strength, and shall be suitable for effective operation at the maximum working pressure and rated flow that would be experienced in service;
Gasket and seals for piping systems shall be designed and manufactured in accordance with recognized standards such as ISO standards and API specifications.

2.a.ii. Technical documents to be submitted

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

a) Declaration of Performance including temperature rating, fluid compatibility and mechanical main parameters (e.g. gasket factor "m" and min. design seating stress "Y" values as per ASME VIII-1 Appendix 2, or equivalent);
b) Manufacturer's instructions and recommendations for use.

2.b Type testing requirements

The following type tests are to be conducted in accordance with the indicated standard to verify arrangement and design:

a) Effect of liquids, ISO 1817;
b) Accelerated ageing, ISO 188;
c) Compression set, ISO 815-1, ISO 815-2;

d) Test specimens shall be selected from the production line or 'at random' from stock;
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; †

Type tests shall be carried out as per the referenced standard.
†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

Refer to EU RO "Product Quality Assurance (PQA)" procedure (Appendix VI of EU RO Framework Document for the Mutual Recognition of Type Approval).

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) Material type;
e) Temperature rating.

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.

GASKETS AND SEALS FOR PIPING SYSTEMS	Version	0.0
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6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
2018-01-01	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.

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 -

EU RO Mutual Recognition Technical Requirements

NON-METALLIC GRATINGS	Version	0.0
	Adoption Date:	1 January 2018
	Application Date:	1 July 2018
	Tier	6
This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements ***** Uncontrolled if downloaded or printed *****		

1. PRODUCT DESCRIPTION

1.a General description of the product

Glass fiber reinforced plastic (GRP) gratings for use on board vessels and intended for personnel walkways, catwalks, grids used for detachable steps in stairs, ladders, platforms and access areas. Generally used in lieu of steel grids because of their light weight, low thermal conductivity and resistance to corrosion.

1.b Application limitations†

This TR applies to GRP gratings intended for transit of persons only.
This TR does not apply to:

a) Grating platforms intended for storage of goods;
b) Grating platforms to be installed in potentially explosive hazardous areas;
c) Open, semi-closed and closed spaces where fire integrity properties are required by the applicable national and /or international instruments (e.g.: performance criteria L1, L2 and L3, as defined in the Standard ASTM F3059 for walkways or areas which may be used for escape or access for firefighting, emergency operation or rescue).

† 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

GRP gratings for transit of persons installed on board ships in those locations where no fire integrity requirements are given by the applicable national and/or international instruments. Typical examples of locations where these gratings can be installed are: cofferdams, void spaces, double bottoms, pipe tunnels, etc., but also open decks or semi-enclosed areas which are not intended for firefighting, emergency operation or rescue.

1.d System context

As per item 1.c.

2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a.i Technical Requirements

Non-metallic gratings to be installed on board a ship where allowed (see 1.b and 1.c) shall be designed and manufactured so that all type testing requirements indicated in the following paragraph 2.b are satisfied.

2.a.ii Technical documents to be submitted

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

The following data shall be submitted by the Manufacturer to the EU RO in the form of technical sheet and drawings:

a) trade name of the product;
b) complete description of the product (design temperature, electrostatic property, serviceable life, installation instructions including precautions to be taken at work site, repair procedures and criteria for determining whether repairs are necessary or not, details of marking);
c) description of the production process;
d) conditions and limits of use (maximum allowed span, etc.);
e) dimensions of the grating panels;
f) dimensions of the load bearing elements of the gratings and their meshes;
g) schematic position and dimensions of the supporting frame and holding system;

h) materials (plastic resin type, reinforcement type, detailed information of all reinforcements employed in cases where a reference number for the filament winding process is not specified, full information regarding type of gel-coat or thermoplastic liner employed during construction, cure and post-cure conditions (including their temperature and times), resin / reinforcement ratio, winding angle and orientation, mass per area (kg/m^2));
i) design load for which approval is required;
j) technical specification of anti-aging properties of the used GRP material;
k) anti-slip surface treatment in relation to the conditions of use;
l) drawings and supporting documentation (certificates and reports for previously carried out relevant tests, details of all relevant standards, all relevant design drawings, catalogues, date sheets, calculations and functional descriptions, fully detailed sectional assembly drawings showing GPR);
m) historical record of the company (the manufacturer);
n) company background and brief description of the factory;
o) documents related to the quality control system of the company (the manufacturer), including custody of raw materials (place of storage, temperature control, humidity control, storage period, etc.), work process control (temperature and humidity in the premises of the plant), inspection system and organization of inspection department (inspection and test performed at the factory);
p) documents on the quality system of the company (the manufacturer);
q) storage means of finished products;
r) packing, packaging and marking methods;
s) documents on types of joints and working procedures;
t) documents on the bonding procedures including material used, tools and fixtures, joints and fixtures, cure temperature, dimensional requirements and tolerances, test acceptance criteria upon completion of the assembly;
u) other data and information deemed necessary.

2.b Type testing requirements

Type tests shall be carried out on at least one sample selected from the production line or 'at random' from stock for each type and size of grid panel for which type approval is required.†

2.b.i Fire test requirements

a) Self-extinguishing test

The material used to manufacture the gratings shall be tested according to the test method laid down in the ASTM Standard D635-14 "Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position".

The following acceptance criteria shall be used:

a) the test specimen does not burn with a flame after the ignition source is removed;

b) if the test specimens continue to burn with a flame after removal of the ignition source, the flame front does not pass the 100 mm mark;

c) if the flame front passes the 100 mm mark, it does not have a linear burning rate exceeding 60 mm/min.

b) Fire retardant test

The material used to manufacture the gratings shall be tested according to the test method laid down in the 2010 FTP Code (MSC.307(88)) Annex 1 Part 2 (*Smoke and toxicity test*) and Part 5 (*Test for surface flammability*). The criteria established for materials used for bulkheads, linings or ceilings are to be complied with.

Alternatively, the material shall be tested according to the ASTM E-84 "*Standard Test Method for Surface Burning Characteristics of Building Materials*", with a flame spread index not greater than 20 and a smoke developed index not greater than 450 (as per Level L0 according to Standard ASTM F3059).

2.b.ii Anti-slip requirements

The grating shall have a minimum anti-slip level equal to R13V10, determined in accordance with Standard DIN 51130:2014: "*Testing of floor coverings - Determination of the anti-slip properties - Workrooms and fields of activities with slip danger - Walking method - Ramp test*".

2.b.iii Strength test

A prototype of every kind of grating panel proposed, together with its supporting frame, shall be subjected to the load tests indicated below in order to verify the maximum deflection.

a) The grid panel shall be able to withstand the load of four adults, assuming average weight of 82.5 kg per person, standing in the most severe positions for the structure;
b) The grid panel shall be able to withstand a load of 1.5 kN applied in the most severe position for the structure concentrated on an area of 200 mm x 200 mm;
c) The grid panel shall be able to withstand a uniform distributed load of 2 kN/m^2.

The grid panel is deemed suitable if, when subjected to all the above test load conditions, the max deflection does not exceed 1/200th of the span, namely the distance between two consecutive supports of the panel.
For each different load position, it shall be recorded in the test report the associated degree of deflection.

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

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)

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;

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c) Serial No. and date of manufacture;
d) Particulars or ratings.

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:

a) Identification of the resin type;
b) Dimensions of grating panels, frames and type of holding systems for which approval is sought;
c) Mass per area (kg/m^2) including tolerances.

6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
2018-01-01	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) ASTM D635-14 "Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position";
c) DIN 51130:2014: “Testing of floor coverings - Determination of the anti-slip properties - Workrooms and fields of activities with slip danger - Walking method - Ramp test”;

d) ASTM E-84 "Standard Test Method for Surface Burning Characteristics of Building Materials";
e) 2010 FTP Code "International Code for Application of Fire Test Procedures";
f) ASTM F3059-15 "Standard Specification for Fibre-Reinforced Polymer (FRP) Gratings Used in Marine Construction and Shipbuilding".

8. MAINTENANCE & CLARIFICATION OF TECHNICAL REQUIREMENTS

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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 –

EU RO Mutual Recognition Technical Requirements

TOUCH SCREEN I.E. A DISPLAY MONITOR OR A VIDEO SCREEN THAT IS ALSO AN INPUT DEVICE	Version	0.0
	Adoption Date:	1 January 2018
	Application Date:	1 July 2018
	Tier	6
This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements ***** Uncontrolled if downloaded or printed *****		

1. PRODUCT DESCRIPTION

1.a General description of the product

Touch screen i.e. a display monitor or a video screen that is also an input device. The touch screens allow monitoring of and input to systems controlling machinery and equipment.

1.b Application limitations†

These technical requirements are applicable for touch screens for installation on board ships as defined by SOLAS Ch. I, with the following exceptions:

a) Touch screens installed on ships as per SOLAS Ch. I Reg.3;
b) Touch screens used for radio- or navigation equipment.
c) Touch screens used in systems for required safety functions;
d) Touch screens with CPU performing other control, monitoring or alarm functions;
e) Touch screens with CPU for applications other than listed in 1.a.

† 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.

TOUCH SCREEN I.E. A DISPLAY MONITOR OR A VIDEO SCREEN THAT IS ALSO AN INPUT DEVICE	Version	0.0
	Adoption Date:	1 January 2018
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1.c Intended use

In control, monitoring, and alarm systems subject to classification requirements.

1.d System context

The touch screen is type approved as a component, covering hardware and firmware for the touch sensing functionality.

Configuration of soft keys are not covered by the type approval.

2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a i. Technical Requirements

a) The EU RO MR Technical Requirements (TR) for Display Monitors, Video Screens, Terminals are applicable;
b) The touch functionality shall be designed for proper operation under the ambient conditions given by the TR for Display Monitors, Video Screens, Terminals and IACS UR E10, including, but not limited to, temperature, humidity, and vibration;
c) Touch screens, or the installation of touch screens, shall be provided with a degree of protection appropriate to the location, as a minimum the requirements of IEC Publication 60092-504. Touch screens shall have a minimum degree of protection equivalent to IP20, regardless of location or installation.
d) For touch screens with on screen soft keys or virtual keypads/keyboards included in the firmware, the soft keys are to be of a sufficient size for operation in areas where vibration occurs or gloves likely to be worn.

2.a.ii. Technical documents to be submitted

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

a) See EU RO MR Technical Requirements for Display Monitors, Video Screens, Terminals (Tier 1) paragraph 2.a.ii. The items below are additional for touch screens;
b) Brief description of touch screen technology and functionality;

TOUCH SCREEN I.E. A DISPLAY MONITOR OR A VIDEO SCREEN THAT IS ALSO AN INPUT DEVICE	Version	0.0
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c) Overview of touch screen hardware and software (firmware) including name(s) and version number(s).

2.b Type testing requirements

a) 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; †
b) See EU RO MR Technical Requirements for Display Monitors, Video Screens, Terminals (Tier 1) paragraph 2.b. The type testing requirement below are additional for touch screens;
c) The functional test during the environmental and EMC-test must also verify the touch functionality;
d) The touch screen must be tested with an application allowing detection and display of touch input so that it is possible to identify any false touch input that may occur during the EMC-/environmental tests. Alternatively, an external logging application may be used for identification of touch input. No false touch inputs will be accepted during the EMC-/environmental tests, including also transient phenomena tests assessed against Performance Criterion B;
e) Any interface that may be used in applications shall be tested with active traffic, which is monitored/verified. Service ports may be excluded from testing;
f) Test specimens shall be selected from the production line or 'at random' from stock; †

† 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

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)

TOUCH SCREEN I.E. A DISPLAY MONITOR OR A VIDEO SCREEN THAT IS ALSO AN INPUT DEVICE	Version	0.0
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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.

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:

a) Software name and version;
b) IP rating

6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
2018-01-01	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) EU RO MR Technical Requirements for Display Monitors, Video Screens, Terminals;

TOUCH SCREEN I.E. A DISPLAY MONITOR OR A VIDEO SCREEN THAT IS ALSO AN INPUT DEVICE	Version	0.0
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c) IACS Unified Requirements E10;
d) IEC 60092-504 “Electrical installations in ships – Special features, Control and instrumentation”;
e) IEC 60945 “Maritime Navigation and Radio Communication Equipment and Systems – General Requirements”;
f) IEC 60533 “Electrical and electronic installations in ships – Electromagnetic compatibility”.
g) IEC 62908-13-10 Touch and interactive displays - Part 13-10: Reliability test methods of touch displays - Environmental durability test methods - Edition 1.0.

8. MAINTENANCE & CLARIFICATION OF TECHNICAL REQUIREMENTS

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- END -

EU RO Mutual Recognition Technical Requirements

VALVES – BOILER WATER SYSTEMS (CLASS III)	Version	0.0
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This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements ***** Uncontrolled if downloaded or printed *****		

1. PRODUCT DESCRIPTION

1.a General description of the product

Valves for boiler water systems of Class III piping as defined by IACS UR P2.2 Rev.4 intended to stop or modify water flow in boiler water systems.

1.b Application limitations†

a) These Technical Requirements apply to valves dedicated to boiler water (feed water, condensate water, drain water) systems of Class III with design pressure up to 1.6 MPa and design temperature up to 200°C, and diameter up to 100 mm;

b) These Technical Requirements are not applicable to:
- valves intended to be fitted on the ship's side and valves intended to be fitted on the ship's collision bulkhead;
- hydraulically, electrically or pneumatically controlled devices for valves;
- plastic valves.

† 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.

1.c Intended use

Piping systems for boiler water (feed water, condensate water, drain water) with a design pressure up to 1.6 MPa and design temperature up to 200°C.

1.d System context

As per item 1c.

2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a i. Technical Requirements

Design:

a) Valves in piping systems shall be compatible with the pipes to which they are attached, in respect of their strength, and shall be suitable for effective operation at the maximum working pressure and rated flow that they will experience in service;
b) Valves shall be designed and manufactured in accordance with recognized standards such as ISO standards, API specifications, etc.;
c) Valves and accessories shall be designed so as to prevent the loosening of covers and glands when they are in use. Accessories means devices with an operational function which have pressure bearing housings;
d) Valves shall be so designed as to shut with a right-hand (clockwise) motion of the wheels;
e) Valves shall be provided with local indicators showing whether they are open or shut unless this is readily apparent;
f) When the valves are designed for one way flow, the direction of flow shall be clearly and legibly marked on the valve. The direction may be cast into the valve casing, such as for screw-down and other non-return valves;
g) Valves shall be fitted with nameplates to indicate their purpose(s);
h) Suitable positive means of securing the spindle shall be provided on valves where the spindle is turned between fully open and fully closed position. Manually operated butterfly valves, which are designed for throttling service, shall be equipped with a locking arrangement that holds the disc in any relevant position;
i) Minimum design pressure 0.35 MPa.

Materials:

j) Valves bodies for boiler water systems are to be made of forged or cast steel, bronze or stainless steel. Nodular cast iron of the ferritic type may be used, provided that the minimum elongation is not less than 12% on a gauge length of 5,65 x S ^ 0,5, where S is the actual cross-sectional area of the test piece. Nodular cast iron of the ferritic type, with specified minimum elongation of 12%, may be used for minimum design temperature not less than 0°C. Nodular cast iron of the ferritic/pearlitic and pearlitic types shall not be used as the material of pressurized parts, unless maximum design temperature is less than 120°C. Grey cast iron may be used for casings of valves not intended to be installed on boilers, provided that the ultimate strength of the grey cast iron is not less than 200 MPa and the maximum design temperature is less than 120°C;

k) The use of asbestos is prohibited;

l) Aluminium and aluminium alloys are not permitted for use for casing of boiler water valves;

m) Grey cast iron is not permitted for use in piping which is subject to pressure shock, vibrations, or excessive strain (e.g. blow-off piping etc.);

n) The materials to be used for the other component parts of the valves (i.e. trim, stems, discs, disc faces, seats etc.) shall be corrosion resistant and suitable for the working medium and the intended service. Non-metallic material of gaskets or seals shall be approved in accordance with the recognized standards for the use with boiler water and for design temperatures not less than 200°C.

Type of connections:

o) Butt welded, slip-on sleeve and socket welding joints shall be used in the connecting of valves;

p) Threaded joints shall be permitted for an outside diameter not exceeding 60.3 mm;

q) Weld neck (butt-welded) flanges are permitted; slip-on flanges (see below Figure 1) are permitted for design temperatures up to 150°C and if double-fillet welded or equivalent; socket-welded flanges (one fillet only) are permitted up to 80 mm DN; loose-flanged ends (unattached) are not permitted;

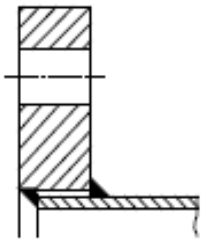

Fig. 1

r) The dimensions of flanges and relative bolts shall be chosen in accordance with the relevant national standards. Flange attachments shall be in accordance with national or international standards that are relevant to the piping system and are to recognize the applicable boundary fluids, design pressure and temperature conditions, external or cyclic loading and location.

2.a.ii. Technical documents to be submitted

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

a) The standard used by the manufacturer shall be clearly identified in the documentation submitted;
b) Assembly drawings showing dimensions, internal parts (valve body and coupling flange, valve disc and rod, valve seat), materials, internal seals/gaskets data sheet, type of connections shall be submitted for EU RO review;
c) Design analysis shall be submitted. Design analysis may be based on design by rule (according to a recognized standard) or based on experimental method (such as burst test according to a recognized standard);
d) Product descriptions including nominal diameter, intended services, installation locations, intended fluids, working medium, rated flow, design pressure, temperature range, maximum turning torque of spindle, certificates and reports of relevant tests previously carried out, instructions on operation, performance specification shall be submitted for EU RO review.

2.b Type testing requirements

a) Type tests shall be carried out as per the referenced standard;
b) The maximum turning torque of spindle shall be checked for remote control against the applicable design requirements;

c) Test specimens shall be selected from the production line or 'at random' from stock;†

d) Where there are various sizes of the type of valve requiring approval, a minimum of three separate sizes representative of the range from each type of joints (minimum, middle and maximum nominal diameter) shall be subject to the hydrostatic test at the following value of pressure:
PH = 1,5P, but not less than 0,5 MPa
where PH = test pressure (MPa), P = design pressure (MPa)
or the pressure indicated by the reference standard for valves, whichever is the largest;

e) Hydrostatic tests shall be carried out in both the closed and open position of the valve;

f) Tightness testing (hydrostatic seat leakage test) shall be carried out at the test pressure of 1,1 times the design pressure.

g) Burst test of the valve body according to a recognized standard is to be carried out on test specimens. Test pressure is to be 4 times the design pressure for cast steel and 5 times the design pressure for nodular cast iron and bronze.

h) Type tests for type approval shall be carried out in the presence of a 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

a) 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)

b) All valve bodies having a design pressure greater than 0.1 MPa shall be subject to a hydrostatic test at the following value of pressure:
PH = 1,5P, but not less than 0,5 MPa
where PH = test pressure (MPa), P = design pressure (MPa);

VALVES – BOILER WATER SYSTEMS (CLASS III)	Version	0.0
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	Tier	6
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c) After assembly, the valves shall be checked for leakage by a hydraulic pressure equal to 1.1 times the design pressure;
d) Certificate of test is to be delivered.

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.

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.

6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
2018-01-01	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 P2 (Rev.2 Nov 2001) "Rules for piping design, construction and testing";
c) ISO 5208-2015 "Industrial Valves-Pressure testing";
d) ISO 5209-1977 "General purpose industrial valves-marking'.

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8. MAINTENANCE & CLARIFICATION OF TECHNICAL REQUIREMENTS

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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 -

EU RO Mutual Recognition Technical Requirements

VALVES – STEAM SYSTEMS (CLASS III, NON-ESSENTIAL SYSTEMS)	Version	0.0
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This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements ***** Uncontrolled if downloaded or printed *****		

1. PRODUCT DESCRIPTION

1.a General description of the product

Valves for steam systems of Class III piping as defined by IACS UR P2.2 Rev.4, and for non-essential systems, intended to stop or modify steam flow in steam systems.

Essential system is a system which needs to be in continuous operation for maintaining the vessel's propulsion and steering.

1.b Application limitations†

a) These technical requirements apply to valves dedicated to steam systems of Class III with design pressure up to 0.7 MPa and design temperature up to 170°C, and diameter up to 100 mm;

b) These technical requirements are not applicable to:
- valves intended to be fitted on the ship's side and valves intended to be fitted on the ship's collision bulkhead;
- valves intended to be fitted on the sea chests for steam cleaning of inlet gratings;
- hydraulically, electrically or pneumatically controlled devices for valves;
- plastic valves.

† 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.

1.c Intended use

Piping systems for steam with design pressure up to 0,7 MPa and design temperature up to 170 °C.

1.d System context

As per item 1.c.

2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a i. Technical Requirements

Design:

a) Valves in piping systems shall be compatible with the pipes to which they are attached in respect of their strength and shall be suitable for effective operation at the maximum working pressure and rated flow that they will experience in service;
b) Valves shall be designed and manufactured in accordance with recognized standards such as ISO standards, API specifications, etc.;
c) Valves and accessories shall be designed so as to prevent the loosening of covers and glands when they are in use; Accessories means devices with an operational function which have pressure bearing housings.
d) Valves shall be designed so as to shut with a right-hand (clockwise) motion of the wheels;
e) Valves shall be provided with local indicators showing whether they are open or shut, unless this is readily apparent. When the valves are designed for one way flow, the direction of flow shall be clearly and legibly marked on the valve. The direction may be cast into the valve housing, such as for screw-down and other non-return valves;
f) Valves shall be fitted with nameplates to indicate their purpose(s);
g) Suitable positive means of securing the spindle shall be provided on valves where the spindle is turned between fully open and fully closed position. Manually operated butterfly valves, which are designed for throttling service, shall be equipped with a locking arrangement that holds the disc in any relevant position;

h) Temperature of the handwheel shall be less than 60°C;
i) Minimum design pressure is to be 0,35 MPa;

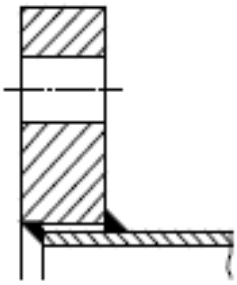
Materials:

j) Valve bodies for steam systems are to be made of forged or cast steel, bronze or stainless steel. Nodular cast iron of the ferritic type may be used, provided that the minimum elongation is not less than 12% on a gauge length of 5,65 x S ^0,5, where S is the actual cross-sectional area of the test piece. Nodular cast iron of the ferritic type, with specified minimum elongation of 12%, may be used for minimum design temperature not less than 0°C; Grey cast iron and nodular cast iron of the ferritic/pearlitic and pearlitic types shall not be used as the material of pressurized parts.
   If valve is attached directly to boiler, or by means of a distance piece, bronze material with min. ultimate tensile strength of 205 MPa and min. elongation in 50 mm of 15% may be used;
k) The use of asbestos is prohibited;
l) Aluminium and aluminium alloys are not permitted for use for casing of steam valves;
m) The materials to be used for the other component parts of the valves (i.e. trim, stems, discs, disc faces, seats etc.) shall be corrosion resistant and suitable for the working medium and the intended service.
   Non-metallic material of gaskets or seals shall be approved in accordance with the recognized standards for the use with steam and for design temperatures not less than 170°C;

Type of connections:

n) Butt welded, slip-on sleeve and socket welding joints shall be used in the connecting of valves;
o) Threaded joints shall be permitted for an outside diameter not exceeding 60.3 mm;
p) Weld neck (butt-welded) flanges are permitted; slip-on flanges (see below Figure 1) are permitted for design temperatures up to 150°C and if double-fillet welded or equivalent; socket-welded flanges (one fillet only) are permitted up to 80 mm DN; loose-flanged ends (unattached) are not permitted;

Fig. 1



q) The dimensions of flanges and relative bolts shall be chosen in accordance with the relevant national standards. Flange attachments shall be in accordance with national or international standards that are relevant to the piping system and are to recognize the applicable boundary fluids, design pressure and temperature conditions, external or cyclic loading and location.

2.a.ii. Technical documents to be submitted

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

a) The standard used by the manufacturer shall be clearly identified in the documentation submitted;
b) Assembly drawings showing dimensions, internal parts (valve body and coupling flange, valve disc and rod, valve seat), materials, internal seals/gaskets data sheet, type of connections shall be submitted for EU RO review;
c) Design analysis shall be submitted. Design analysis may be based on design by rule (according to a recognized standard) or based on experimental method (such as burst test according to a recognized standard);
d) Product descriptions including nominal diameter, intended services, installation locations, intended fluids, working medium, rated flow, design pressure, temperature range, maximum turning torque of spindle, certificates and reports of relevant tests previously carried out, instructions on operation, performance specification shall be submitted for EU RO review.

2.b Type testing requirements

a) Type tests shall be carried out as per the referenced standard;

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b) The maximum turning torque of spindle shall be checked for remote control against the applicable design requirements;
c) Temperature of the handwheel shall be measured under operating conditions;
d) Test specimens shall be selected from the production line or 'at random' from stock; †
e) Where there are various sizes of the type of valve requiring approval, a minimum of three separate sizes representative of the range from each type of joints (minimum, middle and maximum nominal diameter) shall be subject to the hydrostatic test at the following value of pressure:
PH = 1,5P, but not less than 0,5 MPa
where PH = test pressure (MPa), P = design pressure (MPa) or the pressure indicated by the referenced standard for valves, whichever is the largest;
f) Hydrostatic tests shall be carried out in both the closed and open position of the valve;
g) Tightness testing (hydrostatic seat leakage test) shall be carried out at the test pressure of 1,1 times the design pressure.
h) Burst test of the valve body according to a recognized standard is to be carried out on test specimens. Test pressure is to be 4 times the design pressure for cast steel and 5 times the design pressure for nodular cast iron and bronze.
i) Type tests shall be carried out in the presence of a 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

a) 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)

b) All valve bodies having a design pressure greater than 0.1 MPa shall be subject to a hydrostatic test at the following value of pressure:
PH = 1,5P, but not less than 0,5 MPa;

where PH = test pressure (MPa), P = design pressure (MPa);

c) After assembly, the valves shall be checked for leakage by a hydraulic pressure equal to 1.1 times the design pressure;
d) Certificate of test is to be delivered.

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.

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.

6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
2018-01-01	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 P2 (Rev.2 Nov 2001) "Rules for piping design, construction and testing";
c) ISO 5208-2015 "Industrial valves- Pressure testing";
d) ISO 5209-1977 "General purpose industrial valves- Marking".

VALVES – STEAM SYSTEMS (CLASS III, NON-ESSENTIAL SYSTEMS)	Version	0.0
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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 -

EU RO Mutual Recognition Technical Requirements

DIFFERENTIAL PRESSURE SWITCHES	Version	0.0
	Adoption Date:	1 January 2019
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	Tier	7
This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements ***** Uncontrolled if downloaded or printed *****		

1. PRODUCT DESCRIPTION

1.a General description of the product

Differential pressure switches are used in applications to signal that a predetermined pressure difference has been reached as a result of widening or narrowing difference between the two points within piping systems or machinery.

A conventional differential pressure switch is generally a simple electro-mechanical device that operates on the basic principles of lever and opposing forces connected with the diaphragm, metallic or elastomeric elements deformable due to pressure acting on the elements. The pressure difference creates a force which then overcomes that of a pre-tensioned spring and in the process, moves a balancing arm or mechanism to effect the minimal movement required to actuate the micro-switch of the switch.

Electronic differential pressure switches which are microprocessor-controlled differential pressure measurement devices with pressure sensors, such as piezo-electric pressure sensor, potentiometric pressure sensor, differential capacitance, etc. are also available.

1.b Application limitations†

a) These technical requirements are applicable to differential pressure switches for control, safety or alarm device of plant or system on board with rated voltage in electric circuit not exceeding 1000V a.c. or 1000V d.c.;
b) 'Ex' certification is not within the scope of these Technical Requirements.

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	Tier	7
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†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.

1.c Intended use

Switches functioning under the condition that a predetermined set point has been reached as a result of widening or narrowing difference between the two pressure sources within piping systems or machinery.

1.d System context

Refer to item 1c.

2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a i. Technical Requirements

Design:

a) The materials shall be suitable for intended service and location, and the wetted parts (the pressure connection and sensor) material shall be compatible with the process media;

b) Reliable operation shall be ensured under the following ambient temperatures:

- 0˚C to +55˚C in enclosed spaces,
- +5°C to +70°C close to combustion engines, boilers and similar,
- -25˚C to +45˚C on open deck.

No damage to electrical and electronic parts shall be caused by temperature up to +70˚C;

c) Reliable operation of electrical and electronic parts shall be ensured at relative air humidity of 100% with 55°C;

d) Reliable operation shall be ensured under the conditions of shocks having an acceleration of ±5,0 g and at a frequency of 40 to 80 shocks per minute;

e) The parts and the pressure connections shall comply with relevant recognized standards to the applicable extent;

f) Additional technical requirements in accordance with EU RO TRs for "SENSORS"(Tier 1) and "SWITCHES"(Tier 1) shall be fulfilled, as required to the extent of applicable functionalities.

2.a.ii. Technical documents to be submitted

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

a) General view drawings, structural units, appliances and instruments;
b) Technical description of working principle and operation;
c) Electrical/electronic diagrams and connections, etc.;
d) Relevant data and specifications, etc. in accordance with the requirements of EU RO TR for "SENSORS"(Tier 1), as required to the extent of applicable functionalities.

2.b Type testing requirements

a) Type tests shall be carried out in accordance with IACS UR E10;
b) Pressure test for pressure sensing parts at 150% of the design pressures with duration of 2 minutes is required;
c) The accuracy of the product should be documented before and after the static pressure test;
d) Impact test under the following conditions shall be carried out at working condition, in three mutually perpendicular planes. Sinusoidal shape of the impact momentum is recommended:
   - acceleration: -5g,
   - duration: 10 to 15 ms,
   - No. of impacts: 20,
   - frequency of impacts: 40 to 80 impacts /min.,

   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;
e) Additional tests in accordance with EU RO TRs for "SENSORS"(Tier 1) and "SWITCHES"(Tier 1) shall be carried out, as required to the extent of applicable functionalities;
f) Test specimens shall be taken from the production line or from stocks*;
g) Tests shall be carried out in the presence of the EU RO Surveyor. In case 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 http://www.euromr.org/Guidance%20for%20Mutual%20Recognition)

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)

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 IP grade.

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:

a) Environmental test items and test levels applied, if any;
b) Name and version/revision of hardware, firmware and software, as applicable;
c) Approval conditions including limitations, if any.

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6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
2019-01-01	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) IACS UR P2.7;
d) EU RO TR for "SENSORS" (Tier 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: http://www.euromr.org/Guidance%20for%20Mutual%20Recognition

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EU RO Mutual Recognition Technical Requirements

DUAL TEMPERATURE AND PRESSURE 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

Dual Temperature and Pressure Switches (hereinafter switches) have both temperature and pressure measurement capabilities with relevant output change-over and combined within the same device. 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.

Pressure sensors of different types of sensing elements can be used but they have one thing in common: they move in response to changes in the system pressure. Through their movement, they directly act on the opening and closing of an electrical switch (without requiring any power supply).

Electronic/solid state pressure sensors use the same technology found in analogue pressure transmitters to sense changes in pressure rather than harnessing the energy of the pressure changes to mechanically operate a switch (as with electromechanical pressure switches).

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Electronic/solid state pressure sensors electrically measure pressure change and internal electronic circuitry is used to activate one or more electronic switch outputs.

1.b Application limitations†

a) These technical requirements are applicable to dual temperature and pressure switches for control, safety or alarm device of plant or system on board with rated voltage in electric circuit not exceeding 1000V 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.

1.c Intended use

Switches intended to be used in all control, monitoring and instrumentation systems necessary for the applications mentioned in 1.b.

1.d System context

Refer to item 1c.

2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a.i. Technical Requirements

a) The materials shall be suitable for intended service and location, and the wetted parts (the pressure connection and sensor) material shall be compatible with the process media; Process media temperature should also be considered as each of the different wetted materials would have different operating properties
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 shall be ensured under the following ambient temperatures:
   - 0˚C to +55˚C in enclosed spaces,
   - +5°C to +70°C close to combustion engines, boilers and similar.
   - -25˚C to +45˚C on open deck.

   No damage to electrical and electronic parts shall be caused by temperature up to +70˚C;

c) Reliable operation of electrical and electronic parts shall be ensured at relative air humidity of 100% with 55°C;

d) Reliable operation shall be ensured under the conditions of shocks having an acceleration of ±5,0 g and at a frequency of 40 to 80 shocks per minute;

e) Pressure components and devices shall not be damaged by overloads due to a working medium pressure rise equal to 2,0 times of the maximum working pressure;

f) 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 ±0,7 g where the vibration frequency is between 13,2 and 100 Hz;

g) 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 ± 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;

h) 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;

i) R The protective enclosure of electrical and electronic sensors shall be chosen in accordance with IEC 60529.;

j) 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.) Frequency	+6…-10 ±5	±20 ±10	1,5 5
Voltage (d.c.)	±10	5 10	Cyclic deviation Ripple

Table 1

k) 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.

l) 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;

m) Switches shall be reliable at shocks having an acceleration of ±5,0 g and at a frequency of 40 to 80 shocks per minute;

n) 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;

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

p) S Provision shall be made to prevent incorrect connection of plug-in-sockets to the switches outputs;

q) The devices shall be capable of being tested during normal operation;

r) 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;

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s) 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;
t) Anti-loosing means shall be provided to pressure setting devices;
u) Switches used for measuring temperature of fire-hazardous, toxic liquids, vapors and gases, liquids, vapors and gases under pressure shall be isolated from the medium tested;
v) The damage of temperature measurement channel shall not influence ability to measure the pressure and vice versa.

2.a.ii. Technical documents to be submitted

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

a) Technical specifications, data sheets, drawings, installation sheets, description of working principles of the switches and showing compliance with the relevant technical requirements as per above point 2.a.i, proposed test programs and type test reports done previously if available.

2.b Type testing requirements

a) The tests shall be carried out in accordance with IACS UR E10 except those that are differ as well as additional tests for confirmation of special features of switches indicated in the technical documentation as per Table 2:

Test	Normative document, test parameters	Test conditions	Test purpose, performance criteria
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.
Impact	-Acceleration-5g, -Duration: 10-15ms, -No. of impacts: 20, -Frequency of impacts: 40-80 impacts/min	The tests shall be carried out in operating condition under effect of shock load in each of the three mutually perpendicular directions in relation to the item, inturn. The form of the shock pulse is recommended to be close to sine one.	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.
Exposure to solar radiation	-Temperature in the chamber: +55°C -Radiation intensity: 1120W/m2±10% (Including flux density of the ultra violet portion of spectrum with a wave length of 280-400nm shall be not less than 42 W/m^2) The switches are subjected to irradiation from infra-red and ultra-violet radiation sources during 120 h	The tests are carried out in a special chamber at an air temperature of 55 ± 2 °C in the chamber shade. The product or its part is subjected to irradiation from infra-red and ultra-violet radiation sources during 120 h. The radiation plant intensity shall provide the total heat-flux density not less than 1125 W/m^2, the flux density of the ultra-violet part of the spectrum with a wave length of 280 to 400 nm shall be at least 42W/m^2.	The equipment is considered to have passed the test, if: -No deformation, cracking, stratification, buckling, ungluing of plastic pieces and other materials has taken place -No degradation of readability of inscriptions and signs on the instrument scales has not been detected Parameters and resistance of insulation have remained normal.

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Test	Normative document, test parameters	Test conditions	Test purpose, performance criteria
Pressure test	200% of the switch max. working pressure. Duration 2 minutes.	The test shall be carried out under working condition.	During and after the pressure test the switches shall be in good working order.
Inclination test	Limiting inclination angle 22,5°. Motions period 7..9 seconds.	Conditioning of equipment sequentially in two mutually perpendicular positions at an angle of 22,5° to the horizontal and measurement of parameters. Duration of tests: any which is sufficient for measuring parameters, but not less than 15 min in each position. Parameters shall be read at least 3 times in each position.	During and after the test the switches shall be in good working order.
Cold test	As per UR E10 Cold test requirements except the duration. Duration is 16 hours.	As per UR E10 Cold test, but duration -16 hours	As per UR E10

Table 2

b) 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;
c) The type tests shall be conducted on the test specimen(s) selected from production line or at random from stock in the presence of an EU RO surveyor in accordance with the agreed type test program. *

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

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)

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) Particulars or ratings;
d) Date of Manufacture.

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
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DUAL TEMPERATURE AND PRESSURE SWITCHES	Version	0.0
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7. BACKGROUND INFORMATION / REFERENCES

a) EU RO Framework Document for the Mutual Recognition of Type Approval;
b) IEC 60529;
c) IACS UR E10 Rev.6;
d) Regulation (EC) No 391/2009 of the European Parliament and of the Council of 23 April 2009 "on common rules and standards for ship inspection and survey organizations".

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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EU RO Mutual Recognition Technical Requirements

FLOW SWITCHES	Version	0.0
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This document is subject to controlled issue and can be found here: http://www.euromr.org/technical-requirements ***** Uncontrolled if downloaded or printed *****		

1. PRODUCT DESCRIPTION

1.a General description of the product

Fluid flow switches are generally made of a casing containing the switch and a probe or other similar device projecting from the same and immersed in, or in other ways sensing the presence of, the fluid flow (set-in type). The device may include a short pipe fitting (flow-through type): in this case, the pipe fitting as well as any other component subject to internal pressure of fluid is not covered by the scope of the present Technical Requirement.

Based on the principle of operation, the following types are considered: mechanical flow switches (e.g. paddle-type, shuttle-type, piston-type) and pressure-based flow switches (e.g. differential pressure).

In general, flow switches are intended to open/close an electrical circuit (signal) upon reaching of a certain set point of flow, and are actuated by the energy conveyed by the fluid. Electronic components, when fitted, may be supplied by an external source of power or by internal batteries. Software based flow switches are not covered by the scope of this TR.

1.b Application limitations†

a) Application (medium): liquids (fuel, lubricating oil, hydraulic oil, water, liquids transported in cargo holds), gases (air, vapour, inert gas, vaporized cargo gas).
b) 'Ex' certification is not within the scope of these Technical Requirements;
c) Rated voltage not to exceed 1000 V AC (frequency not exceeding 1000 Hz) or 600 V DC In case of additional flow metering and/or transmitting functions, the specific TRs for flow gauges and transmitter apply.

†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.

1.c Intended use

Providing an on/off signal in absence/presence of fluid flow above a certain threshold or set point, within piping installations and machinery.

1.d System context

Piping installations, machinery appliances and components.

2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a i. Technical Requirements

a) Materials used for construction of body/casing of flow switches, exposed to fluid pressure, shall be nodular/spheroidal cast iron, stainless steel or bronze, in compliance with recognized Standards;

b) The electrical contacts shall be installed in a casing made from material resistant to mechanical damages and oils, or other typical marine influences, and of proper IP degree (enclosure protection); proper locking means (locktabs, lockwire etc.) shall be provided in order to prevent the flow setting devices from getting loose;

c) Flow switches shall operate properly in ambient air relevant humidity up to 100% (referred to at +55˚C) under the following ambient temperatures:

- 0˚C to +55˚C in enclosed spaces
- +5°C to +70°C close to combustion engines, boilers and similar
- -25˚C to +45˚C (+55°C for electronic equipment) on open deck

d) Flow switches shall operate reliably under shocks having an acceleration of ±5,0 g and at a frequency of 40 to 80 shocks per minute;

e) EU RO MR Technical Requirements for "Sensors" (Tier 1) shall be complied with.

2.a.ii. Technical documents to be submitted

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

a) Dimensional and sectional views/drawings, material specifications;
b) Technical description of working principle and operation; if intended for use within alarm systems, arrangements for testing during normal operation;
c) Technical data/specification;
d) Electrical/electronic diagrams and connections; if fitted, PCBs views/layout, views, dimensions, Test Reports (testing scope - see 2.b. below); parts list

2.b Type testing requirements

a) Electrical/electronic elements - according to IACS UR E10 all presented tests;
b) EU RO MR Technical Requirements for "Sensors" (Tier 1) to be complied with. **NOTE**: Power supply variations and Power supply failure only if external power supply is provided - see power supply details in a.m. 1.a.
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 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

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)

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:

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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 grade.

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) List of EMC/environmental test levels applied;
b) Hardware, firmware, software name and revision, as applicable.

6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
2019-01-01	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.

8. MAINTENANCE & CLARIFICATION OF TECHNICAL REQUIREMENTS

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EU RO Mutual Recognition Technical Requirements

LEVEL SWITCHES	Version	0.0
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1. PRODUCT DESCRIPTION

1.a General description of the product

Level switches are devices composed of an electrical switch operated by a sensor able to detect the presence of a liquid at given levels.

Depending on the type of sensor used for detecting the liquid level, the following level switches are considered:

a) Level switches based on floating principle;
b) Reed level switches operated by magnetic float;
c) Level switches based on capacitive sensor;
d) Level switches based on conductive sensor;
e) Level switches based on ultrasonic sensor;
f) Level switches based on radar sensor;
g) Level switches based on optical sensor;
h) Level switches based on vibrating fork sensor;
i) Level switches based on hydrostatic sensor.

1.b Application limitations†

These Technical Requirements are applicable to liquid level switches intended to be used in control and monitoring systems on board ships, with exceptions as per SOLAS Ch. I, Reg. 3.

Rated voltage not to exceed 1000 V a.c. (at a frequency not exceeding 1000 Hz) or 600 V d.c.

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The following types of level switches are not within the scope of these Technical Requirements:

a) Level switches for installations where 'Ex' certification is required;
b) Water level detectors subject to MED requirements;
c) Level switches intended for steam boilers;
d) Software based level switches.

†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.

1.c Intended use

Switches operated by a sensor able to detect the presence of a liquid at given levels.

1.d System context

See 1.b.

2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a i. Technical Requirements

a) Level switch body and wet parts (e.g. sensing elements) shall be made of materials resistant to the marine environment, suitable for the liquids to be detected, the intended design pressure and the design temperatures;
b) The minimum degree of protection (IP) shall be adequate to the intended installation and in accordance with the requirements set by the EU RO in charge for the classification of the ship;
c) Materials and dimensions of flange connections shall be in accordance with recognised standards and suitable for the intended application;
d) Switching element shall be designed in accordance with a recognised standard (e.g. IEC 60947-5-1);
e) Level switches shall operate reliably under shocks having an acceleration of ±5,0 g and at a frequency of 40 to 80 shocks per minute;

f) Level switches equipped with electronic type level sensors shall be able to provide failure signal;
g) If intended for use within alarm systems, level switches shall be provided with facility for testing during normal operation;
h) EU RO MR Technical Requirements for "Sensors" shall be complied with.

2.a.ii. Technical documents to be submitted

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

a) Product description including working principle and operation;
b) Technical specifications and data sheets;
c) Technical drawings showing dimensions, materials and relevant standards;
d) Complete list of process liquids which the level switches are intended for;
e) In case of welded connections, details of the welded joint preparation, WPS and NDT methods to be used;
f) Installation and operating manuals;
g) Proposed test program to be agreed with the EU RO;
h) Details of the production site(s), production facility inspection report, production specifications and a valid QM certificate according to ISO 9001.

2.b Type testing requirements

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.
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.
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 these Technical Requirements 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.
The following type tests shall be carried out:

a) Visual inspection to check conformance to relevant drawings and design data;
b) Performance type tests according to the Manufacturer's specification and the applicable International Standards;

c) Hydrostatic pressure test to twice the design pressure of parts in contact with process fluid and subject to pressure. Test pressure should be maintained for 2 minutes;
d) Level switches shall be subject to all the tests foreseen in IACS UR E10. Salt mist test shall be applied only for installations on open decks;
e) It shall be verified that level switches can reliably operate under shocks having an acceleration amplitude of ±5,0 g and at a frequency of 40 to 80 shocks per minute;
f) Switching element shall be tested and certified for compliance with the relevant standard (e.g. IEC 60947-5-1) by a Nationally Accredited Laboratory;
g) Degree of protection (IP Code) shall be tested according to IEC 60529;
h) EU RO MR Technical Requirements for "Sensors" shall be complied with.

All tests to be performed on agreed test samples. Test specimens shall be selected from production line or at random from stocks*.
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

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)

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 and ratings, including operating temperature and IP grade.

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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) List of process liquids for which certification is granted;
b) Application limitations and intended use;
c) List of EMC/environmental test levels applied, including IP rating.

6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
2019-01-01	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) IEC 60947-5-1 Low-voltage switchgear and controlgear - Part 5-1: Control circuit devices and switching elements - Electromechanical control circuit devices;
c) IEC 60529 Degrees of protection provided by enclosures (IP Code);
d) IACS UR E10.

8. MAINTENANCE & CLARIFICATION OF TECHNICAL REQUIREMENTS

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EU RO Mutual Recognition Technical Requirements

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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 600 V d.c. for positions switches, and not exceeding 250 V a.c. or 300 V d.c. for proximity switches, in line with the requirements of IEC 60947-5-1 and IEC 60947-5-2.;
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.

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†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.

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;

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

Prior to tests:

a) Proposed test program and test schedule;

b) Description of the test specimens and explanation of the selected test sample(s) providing evidence that the selected sample meets the most rigorous and demanding requirements;

c) Product descriptions, data sheets, assembly drawings, dimension drawings etc. clearly identifying the product;

d) Functional block diagrams of the article with indication of input and output

signals, feedbacks, self-monitoring system, etc.;
e) Complete accreditation certificate of the Test laboratory (prior the first test only; changes in the scope of accreditation shall also be advised);
f) Details of production sites;
g) Product specification;
h) Application, working area;
i) Instructions on fitting, assembly and operation;
j) QM-certificate according to ISO 9001.

After completion of tests:

k) The test report with an identification number shall contain all relevant data and test results including place and date of the tests, the names of the responsible personnel carrying out the test;
l) Type references and serial numbers of the products tested;
m) Test reports and test records shall be signed by the personnel members in charge of the test and are to be confirmed by the EU RO by signing and marking the test report.

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.
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) Electromagnetic compatibility (EMC) to be tested in accordance with the procedures indicated in the IACS UR E10;

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

h) 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

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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.

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
2019-07-01	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.

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8. MAINTENANCE & CLARIFICATION OF TECHNICAL REQUIREMENTS

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EU RO Mutual Recognition Technical Requirements

PRESSURE RELIEF VALVE IN CLASS III PIPING SYSTEM	Version	0.0
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1. PRODUCT DESCRIPTION

1.a General description of the product

Pressure relief valve in class III piping system as defined by IACS UR P2.2 Rev.4 intended to the valves in class III pipelines systems which automatically, without the assistance of any energy other than that of the fluid concerned, discharges a quantity of the fluid so as to prevent a settled safe pressure being exceeded, and which is designed to re-close and prevent further flow of fluid after normal pressure conditions of service have been restored.

1.b Application limitations†

a) These technical requirements apply to pressure relief valve dedicated to pipelines systems of Class III defined by IACS UR P2.2 Rev.4 having a flow diameter of 4 mm and above which are for use at set pressure of 0.01MPa(0.1bar) gauge and above;

b) These technical requirements are not applicable to:
- Pressure relief valve intended to be used on crankcase explosion relief valves
- Valves intended to be fitted on the ship's side and valves intended to be fitted on the ship's collision bulkhead
- Valves intended to be fitted on the sea chests for steam cleaning of inlet gratings
- Hydraulically, electrically or pneumatically controlled devices for valves
- Toxic and corrosive media
- Inflammable media heated above flash point or having flashpoint below 60°C

- Liquefied gases
- Plastic valves

†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.

1.c Intended use

Pipelines systems of Class III defined by IACS UR P2.2 Rev.4.

1.d System context

As per item 1c.

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) The design shall incorporate guiding arrangements necessary to ensure consistent operation and seat tightness;
b) The seat of a pressure relief valve, other than when it is an integral part of the valve shell, shall be fastened securely to prevent the seat becoming loose in service;
c) In the case of valves where the lift can be reduced to conform to the required discharge capacity, restriction of the lift shall not interfere with the operation of the valve. The lift restricting device shall be designed so that, if adjustable, the adjustable feature can be mechanically locked and access sealed. The lift restricting device shall be installed and sealed in according with the design of the manufacturer. Valve lift shall not be restricted to a value less than 30% of unrestricted lift or 1mm, whichever is the greater;
d) Means shall be provided to lock and/or to seal all external adjustments in such a manner so as to prevent or reveal unauthorized adjustments of the pressure relief

valve; Safety valves are to be so constructed that their setting may not be increased in service and their spring may not be expelled in the event of failure. Where safety valves are provided with means for regulating their relieving capacity, they are to be so fitted that their setting cannot be modified when the valves are removed for surveys;

e) Provision shall be made to prevent liquid collecting on the discharge side of the pressure relief valve shell. Unless additional discharge actions are taken, a relief connector is required at the lowest position in the pressure relief valve where liquids may accumulate. Drainage pipes where necessary at the relief valve's discharge side are to be of sufficient size (not less than 19 mm in bore recommended) to avoid blocking by any solid matter deposits (caused from the fluid's ingredients if applicable or any corrosion products within the discharge or vent pipe);

f) The stress in the pressure-retaining parts (calculated in the design conditions) shall not exceed that specified in the design standards;

g) Sealing elements which may adversely affect the operating characteristics by frictional forces are not permitted;

h) Pressure relief valve shall be constructed so that breakage of any part, or failure of any device, will not obstruct free and full discharge through the pressure relief valve;

i) The coefficient of discharge K_d is to be given by:

$$K_d = \frac{\sum_1^n \left(\frac{q'_m}{q_m}\right)}{n}$$

Where the theoretical flowing capacity is calculated in according with ISO 4126-7, as applicable, and, using this value together with the actual flowing capacity which recorded when testing at relieving pressure, the coefficient of discharge of the valve is calculated;

j) The aggregate cross-sectional area f, in mm², of safety valves shall not be less than:

for saturated steam

$$f = k\frac{G}{10.2p_W+1};$$

for superheated steam

$$f = k\frac{G}{10.2p_W+1}\sqrt{\frac{V_H}{V_S}},$$

Where G = design steaming capacity, kg/h;
p_W = working pressure, MPa;
V_H = specific volume of superheated steam at the appropriate working pressure and temperature, m^3/kg;
V_S = specific volume of saturated steam at the appropriate pressure, m^3/kg;
k = coefficient of hydraulic resistance is assumed to be equal to: d/h at $h/d \leqslant 0{,}25$; $1{,}25d/h$ at $h/d > 0{,}25$;
d = minimum valve diameter, mm;
h = height of valve lifting, mm.

Where safety valves are fitted on a common branch, the cross-sectional area of the branch shall not be less than 1,1 times the aggregate cross-sectional area of the valves installed. The cross-sectional area of the waste steam branch of the safety valve and of the pipe connected thereto, shall not be less than twice the aggregate cross-sectional area of the valves;

k) After being regulated and locked up, the valve disc is not to run out of the valve seat when the spring is broken;

l) The waste steam is not to come into direct contact with the loading springs;

Materials:

m) The materials for pressure relief valve should be applicable for the fluid media, adjacent parts and the operating environment. Only approved material shall be used for pressure-retaining shells, these materials and their temperature limitations shall be suitable for pressure-containing function; The springs of the safety valves shall be protected from direct exposure to steam and shall be manufactured from heat- and corrosion-resistant materials, as also are the sealing surfaces of seats and valves.

n) The materials for adjacent sliding surfaces such as guide(s) and disc/disc holder/spindle shall be selected to ensure corrosion resistance and to minimize wear and avoid galling; o) The materials for the seat and disc of pressure relief valves shall be selected to ensure resistance to metallic bonding between these

two surfaces in order to prevent an increase of set pressure, e.g. sticking or cold working;

o) The materials to be used for the other component parts of the valves (i.e. connecting flange, valve disc, plate, stem and seat, spring, etc.) shall be corrosion resistant and suitable for the working medium and the intended service. Non-metallic material of gaskets or seals shall be approved in accordance with the recognized standards for the use with boiler water and for design temperatures not less than 200°C;

p) The use of asbestos is prohibited;

Type of connections:

q) Butt welded, slip-on sleeve and socket welding joints shall be used in the connecting of valves;

r) Threaded joints (both tapered and parallel threads) may be permitted for an outside diameter not more than 60.3mm; In particular cases, sizes in excess of those mentioned above may be accepted if they satisfy the requirements of recognized international or national standards;

s) Metallic flange connections are permitted. Slip-on flanges as per below Figure are only permitted up to 150°C (see Figure 1a); Loose flanges as per bellow figure are not permitted for steam piping system (see Figure 1b);

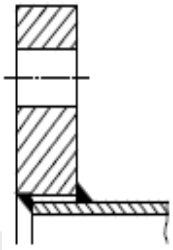

Figure 1a

Figure 1b

t) The inlet design of pressure relief valve end connections, whatever their type, shall be such that the internal area of the connecting piping or stub connection at the valve inlet is at least equal to that of the valve inlet connection, (see Figure 2a); The outlet design of pressure relief valve end connections, regardless of type, shall be such that the internal area of the external pipe connection at the valve

outlet is at least equal to that of the valve outlet, except for those valves with female threaded outlet connections., (see Figure 2b);

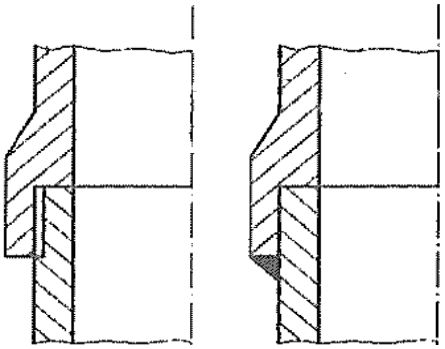

Figure 2a

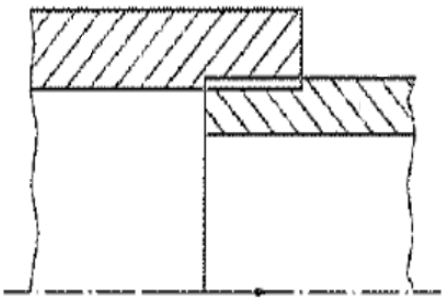

Figure 2b

2.a.ii. Technical documents to be submitted

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

a) The standard used by the manufacturer shall be clearly identified in the documentation submitted;
b) Assembly drawings showing dimensions, internal parts (valve body and connecting flange, valve disc, plate, stem and seat, spring, etc.), materials, internal seals/gaskets data sheet, type of connections shall be submitted for EU RO review;
c) Design analysis shall be submitted. Design analysis may be based on design by rule (according to a recognized standard) or based on experimental method (such as burst test according to a recognized standard);
d) Product descriptions including nominal diameter, intended services, installation locations, intended fluids, working medium, rated flow, discharge calculations, design pressure, temperature range, certificates and reports of relevant tests previously carried out, instructions on operation, performance specification shall be submitted for EU RO review.

2.b Type testing requirements

a) Type tests shall be carried out as per the referenced standard. The operating and flow characteristics of relief valves shall be determined. Valves for steam, air or other gas service shall be tested using steam, air or any other gas of known

characteristics. Valves for liquid service shall be tested using water or other liquid of known characteristics;

b) Inspection of structural dimension, appearance of main components and overall visual inspection should be carried out firstly; The performance tests, include Spring performance test, set/relieving/reseating pressure tests, mechanical characteristic, lift, and so on, should be determined in accordance with recognized standards such as ISO standards, API specifications, EU RO RULES, etc.;

c) Test specimens shall be selected from the production line or 'at random' from stock*;

d) Hydrostatic test. Where there are various sizes of the type of valve requiring approval, a minimum of three separate sizes representative of the range from each type of joints (minimum, middle and maximum nominal diameter) shall be subject to the hydrostatic test at the following value of pressure:

PH = 1,5P, but not less than 0.1 MPa
where PH = test pressure (MPa), P = design pressure (MPa)
or the pressure indicated by the reference standard for valves, whichever is the largest;

e) Pneumatic testing. Pressure testing with air or other suitable gas should be avoided but may be carried out in place of the standard shell hydrostatic test with the agreement of all parties involved in the cases that valves of such design and construction make it not practicable for them to be filled with liquid, valves that are to be used in service where even small traces of water cannot be tolerated. The pressure and duration of the test shall be specified as for hydrostatic test;

f) Tightness test. (hydrostatic seat leakage test) shall be carried out at the test leakage is found at the outlet through visual or audible inspection; For pressure relief valve with metallic sealing face for air or other gases, the bubble leakage rate per minute should be satisfied with the referenced standard; For pressure relief valve with non-metallic sealing face for air or other gases, no leakage is allowed; For pressure relief valve for water or other liquids, no drop of water is allowed on the sealing face with the valve maintained at the operating pressure for 2 min;

g) Relieving capacity test. Mount the safety valve to the test device and open the flow control valve; when the medium pressure reaches the set pressure, the safety valve will begin relieving continuously; when the pressure rises to the rated

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relieving pressure, measure and record the relieving capacity and calculate the coefficient of discharge K_d;

h) Type tests for type approval shall be carried out in the presence of a 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

a) 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)

b) All valve bodies shall be subject to a hydrostatic test (Pneumatic testing, if applicable) at the following value of pressure:
PH = 1,5P, but not less than 0.1 MPa (1bar) where PH = test pressure (MPa),
P = design pressure (MPa);

c) After assembly, the valves shall be checked for leakage by a hydraulic pressure equal to 1.1 times the design pressure; After adjustment of the set or cold differential test pressure, the valves shall be checked for leakage in accordance with recognized standard such as API 527;

d) Each relief valve shall be adjusted to its designated set or cold differential test pressure;

e) Certificate of test is to be delivered.

4. MARKING REQUIREMENTS

Marking on the shell of a pressure relief valve may be integral with the shell or on a plate securely fixed on the shell. The following minimum information shall be marked on all valves:

a) Size designation(inlet) DN;

b) Material designation of the shell;

c) Manufacturer 's name or trademark;

d) An arrow showing the direction of flow where the inlet and outlet connection have the same dimensions or the same pressure rating.

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The following information shall be given on an identification plate securely fixed to the valve:

e) Set pressure;
f) Manufacturer 's type reference;
g) Certified de-rated coefficient of discharge indicating reference fluid: G for gas, S for steam and L for liquid;
h) Flow area;
i) Minimum value of lift.

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.

6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
2019-01-01	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 P2 (Rev.2 Nov 2001) "Rules for piping design, construction and testing";
c) ISO 4126-1:2013+A1:2016 "Safety devices for protection against excessive pressure".

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 -

EU RO Mutual Recognition Technical Requirements

PRESSURE SWITCHES	Version	0.0
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	Tier	7
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1. PRODUCT DESCRIPTION

1.a General description of the product

A pressure switch is simply a device capable of detecting a pressure change and, at a predetermined pressure, opening or closing an electrical switch. There are two basic types of pressure switches: electromechanical and electronic/solid state. The electromechanical pressure switches are composed of a sensing element and an electrical switch. A number of different types of sensing elements can be used but they have one thing in common: they move in response to changes in the system pressure. Through their movement, they directly act on the opening and closing of an electrical switch (without requiring any power supply.

Electronic/solid state pressure switches use the same technology found in analogue pressure transmitters to sense changes in pressure. Rather than harnessing the energy of the pressure changes to mechanically operate a switch (as with electromechanical pressure switches), electronic/solid state pressure switches electrically measure pressure change and internal electronic circuitry is used to activate one or more electronic switch outputs. With electronic/solid state switches, an external power supply is necessary to power the electronic circuitry inside the switch.

1.b Application limitations†

a) These technical requirements are applicable to pressure switches for control, safety or alarm device of plant or system on board with rated voltage in electric circuit not exceeding 1000V a.c. or 1500V 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.

1.c Intended use

Pressure switches intended to be used in all control, alarm, and monitoring systems necessary for the applications mentioned in 1.b subject to classification.

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

a) The materials shall be suitable for intended service and location, and the wetted parts (the pressure connection and sensor) material shall be compatible with the process media. Process media temperature should also be considered as each of the different wetted materials would have different operating properties;
b) Reliable operation shall be ensured under the following ambient temperatures:
   - 0˚C to +55˚C in enclosed spaces,
   - +5°C to +70°C close to combustion engines, boilers and similar.
   - -25˚C to +45˚C on open deck.

   No damage to electrical and electronic parts shall be caused by temperature up to +70˚C;

c) Reliable operation of electrical and electronic parts shall be ensured at relative air humidity of 100% with 55°C;

d) Reliable operation shall be ensured under the conditions of shocks having an acceleration of ±5,0 g and at a frequency of 40 to 80 shocks per minute;

e) Pressure components and devices shall not be damaged by overloads due to a working medium pressure rise equal to 2,0 times of the maximum working pressure;

f) 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 ±0,7 g where the vibration frequency is between 13,2 and 100 Hz;

g) 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 ± 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;

h) 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;

i) The protective enclosure of electrical and electronic sensors shall be chosen in accordance with IEC 60529.

j) 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.) Frequency	+6…-10 ±5	±20 ±10	1,5 5
Voltage (d.c.)	±10	5 10	Cyclic deviation Ripple

Table 1

k) 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.

l) 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;

m) Switches shall be reliable at shocks having an acceleration of ±5,0 g and at a frequency of 40 to 80 shocks per minute;

n) 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;

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

p) S Provision shall be made to prevent incorrect connection of plug-in-sockets to the switches outputs;

q) The devices shall be capable of being tested during normal operation;

r) 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;

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s) 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;
t) Anti-loosing means shall be provided to pressure setting devices.

2.a.ii. Technical documents to be submitted

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

a) Proposed test program and test schedule;
b) Description of the test specimens and explanation of the selected test sample(s) providing evidence that the selected sample meets the most rigorous and demanding requirements;
c) Product descriptions, manuals, data sheets, assembly drawings, dimension drawings, etc. clearly identifying the product;
d) Documents shall be submitted for electronic/solid state pressure switch – for reference purposes see EU RO MR Technical Requirements for "Sensors" (Tier 1) paragraph 2.1.2, and "Pressure gauges/transmitters" (Tier 5), paragraph 2.a.ii;
e) Details of the production site(s), production facility inspection report, production specifications and a valid QM certificate according to ISO 9001;
f) After the completion of the testing, the report shall contain:
   - an identification number;
   - all relevant data and test results including the place, date and names of personnel responsible for conducting the test;
   - type references and serial numbers of the products tested;
   - details of the test equipment used including the calibration certificates and serial numbers;
g) Test reports shall be signed and dated by the person(s) responsible for conducting the test and by the attending EU RO witnessing the test.

2.b Type testing requirements

a) Type tests shall be carried out as per selected suitable recognized standard;
b) Pressure test at 150% of design pressure with duration of 2 minutes is required. The accuracy of the equipment should be documented before and after the static pressure test;
c) For Pressure switches type testing shall be carried out as per the EU RO MR Technical Requirements for "Switches" (Tier 1), paragraph 2.b;

d) For electronic/solid state pressure switches, type testing shall be carried out as per the EU RO MR Technical Requirements for "Sensors" (Tier 1) paragraph 2.2 or according to "Pressure gauges/transmitters" (Tier 5), paragraph 2.b;
e) Test specimens shall be taken from the production line or from stocks;
f) Tests shall be carried out in the presence of the EU RO Surveyor. In case 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 http://www.euromr.org/Guidance%20for%20Mutual%20Recognition)

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)

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 Max. Working Pressure (or rated pressure), operating temperature, IP grade 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 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:

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a) Technical data which adequately express the basic article's features assuring its functional usage;
b) Environmental test items and test levels applied, if any;
c) Details of the EMC test level applied (as applicable);
d) Name and version/revision of hardware, firmware and software (as applicable);
e) Approval conditions including limitations, if any.

6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
2019-01-01	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 – ''Test Specification for Type Approval'';
c) BS 6134: 1991 – ''Specification for Pressure and vacuum switches'';
d) MR TR for ''SWITCHES'' (Tier 1);
e) MR TR for ''SENSOR'' (Tier 1);
f) MR TR for ''PRESSURE GAUGES/TRANSMITTERS'' (Tier 5);
g) ISO 9001.

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.

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EU RO Mutual Recognition Technical Requirements

TEMPERATURE SWITCHES	Version	0.0
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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 1000V a.c. or 1500V 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.

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 shall be ensured under the following ambient temperatures:
- 0˚C to +55˚C in enclosed spaces,
- +5°C to +70°C close to combustion engines, boilers and similar,
- -25˚C to +45˚C on open deck.

No damage to electrical and electronic parts shall be caused by temperature up to +70˚C;

c) Reliable operation of electrical and electronic parts shall be ensured at relative air humidity of 100% with 55°C;

d) 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 ±0,7 g where the vibration frequency is between 13,2 and 100 Hz.

e) 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 ± 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.

f) 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.

g) The protective enclosure of electrical and electronic sensors shall be chosen in accordance with IEC 60529.

h) 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.) Frequency	+6…-10 ±5	±20 ±10	1,5 5
Voltage (d.c.)	±10	5 10	Cyclic deviation Ripple

Table 1

i) 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;

j) 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;

k) Switches shall be reliable at shocks having an acceleration of ±5,0 g and at a frequency of 40 to 80 shocks per minute;

l) 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;

m) Electrical and electronic sensors shall be made of materials resistant to the marine environment or shall be reliably protected from its harmful effects;
n) Provision shall be made to prevent incorrect connection of plug-in-sockets to the switches outputs;
o) The devices shall be capable of being tested during normal operation;
p) 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;
q) 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;
r) Switches used for measuring temperature of fire-hazardous, toxic liquids, vapors and gases, liquids, vapors and gases under pressure shall be isolated from the medium tested.

2.a.ii. Technical documents to be submitted

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

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 V of EU RO Framework Document for the Mutual Recognition of Type Approval found on http://www.euromr.org/Guidance%20for%20Mutual%20Recognition)

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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)

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
2019-01-01	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.

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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

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