# EU RO Mutual Recognition Technical Requirements

| COMPUTERS AND PROGRAMMABLE LOGIC CONTROLLERS (PLCS) | Version | 0.7 |
|---|---|---|
| | Adoption Date | 1 January 2022 |
| | Application Date | 1 July 2022 |
| | Tier | 2 |
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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) Computers or PLCs with integrated display, such as panel PCs, will additionally

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to the requirements in this TR be subjected to the relevant TR for the display. The TR for "DISPLAY MONITORS, VIDEO SCREENS, TERMINALS" or "TOUCH SCREEN I.E. A DISPLAY MONITOR OR A VIDEO SCREEN THAT IS ALSO AN INPUT DEVICE" will be applied, as relevant;

d) 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.

*†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*

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,

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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.

**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.

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

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) No mechanical amplification factor greater than 10 will normally be accepted for the IACS UR E10 vibration test. Additional documentation, subject to the

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RO's assessment and acceptance, confirming that the equipment is designed for the measured vibration level will be required in such cases;

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) All type testing shall be documented in accordance with ISO/IEC 17025;

e) 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;

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

† For further clarification of witnessing of tests and sampling the test specimen(s), refer to paragraphs 6, 7 and 8 of the EU RO "Design Evaluation Scheme" procedure (Appendix V of EU RO Framework Document for the Mutual Recognition of Type Approval found on http://www.euromr.org/Guidance%20for%20Mutual%20Recognition)

### *2.c Type testing requirement for certificate renewal*

a) The manufacturer is to notify the RO of any modification or changes to the manufacturing specifications that may affect the MR TA to be renewed.

b) If the specified standard(s) is(are) amended or revised, the product is to be re-approved prior to it being supplied to vessels to which the amended standards apply.

c) The Software history to be provided for review.

## 3. PRODUCTION REQUIREMENTS

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

## 4. MARKING REQUIREMENTS

Manufacturers of the approved equipment are, in principle, to mark the product

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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;<br>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;<br>CRF026/026a – Witness testing & control of test specimen; CRF028 – addition of 6 month application clause. |
| July 2019 | 0.4 | CRF041 -Revision to para 1.b.; c added<br>Generic sentence to 1b added |
| Sept 2019 | 0.5 | CRF045 - Added "and mechanical" in para 2.b f) |
| May2020 | 0.6 | CRF049 2.b f)deleted and included in Framework Document |
| 28 December 2021 | 0.7 | CRF051 update references (ref. 20039a)<br>Software update (ref 18042g) |

## 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".

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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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## 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<br>– quality of workmanship and construction |
| 2. | Power supply variations | - | AC SUPPLY<br>Combination 1: Voltage variation permanent +10 %, Frequency variation permanent +5 %<br>Combination 2: Voltage variation permanent +10 %, Frequency variation permanent -5 %<br>Combination 3: Voltage variation permanent -10 %, Frequency variation permanent -5 %<br>Combination 4: Voltage variation permanent -10 %, Frequency variation permanent +5 %<br>Voltage variation transient 1,5 s %, Frequency variation transient 5 s %<br>Combination 5: +20 %, +10 %<br>Combination 6: -20 %, -10 % | |
| 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 |

**- END -**