

EU RO Mutual Recognition Technical Requirements

AC SEMICONDUCTOR CONTROLLERS	Version	0.3
	Adoption Date:	1 January 2023
	Application Date:	1 July 2023
This document is subject to controlled issue and can be found here: http://www.euomr.org/technical-requirements *** Uncontrolled if downloaded or printed ***	Tier	5

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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.

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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;

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- 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;
- k) For products where the function of the product is based on software the quality management system of the manufacturer has to maintain procedures for the life cycle activities and the version control."

After completion of tests:

- l) 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;
- m) 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;
- n) 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 in accordance with IACS UR E10. Electromagnetic compatibility (EMC) to be tested in accordance with UR E10 (test item according to IEC 60533, and test parameters and performance criteria according to UR E10); or in accordance with IEC 60947-4-3 product standard (test parameters and performance criteria according to UR E10), plus additional test required by UR E10 (test item according to IEC 60533);
- d) All tests shall be performed on agreed test samples taken from the production line or from stocks†.

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- 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†.
- f) The version of each type of installed software at the time of testing is to be identified.

† 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

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

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⁽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;
- f) Firmware / Operational System Version: [major version. Minor version] if functionality is based upon SW

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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
2021-03-01	0.1	Harmonised EMC testing requirements (18042h)
2021-12-28	0.2	Software update (ref 18042g)
2022-12-02	0.3	Inclusion of para. 9 copyright (ref 21030_)

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

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@euomr.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.euomr.org/Guidance%20for%20Mutual%20Recognition>

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9. LEGAL PROVISIONS / COPYRIGHT

- a) Underlying legal provisions in accordance with EU RO Framework Document for the Mutual Recognition of Type Approval;
- b) Copyright © 2022. All EU RO MR Group rights reserved. For a list of EU RO MR Group members please see <https://www.euomr.org/about-us>.
(The year is either the year of the inclusion of the copyright notice, 2022 for existing TRS, or the year of the adoption of any new TR.)

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