

EU RO Mutual Recognition Technical Requirements

CIRCUIT BREAKERS WITH ELECTRONIC DEVICES	Version	0.4
	Adoption Date	1 January 2022
	Application Date	1 July 2022
	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†

- 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.;
- On board ships with exceptions as per SOLAS Ch. I, Reg. 3;
- 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);
- 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.

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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.
- j) 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:

- 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;

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- 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 UR E10 (test item according to IEC 60533, and test parameters and performance criteria according to UR E10); or in accordance with IEC 60947-2 product standard Annex J and Annex N (test parameters and performance criteria according to UR E10), plus additional test required by UR E10 (test item according to IEC 60533);
- 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) The version of each type of installed software at the time of testing is to be identified;
- 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>).

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2.c Type testing requirements 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); 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).

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5. TYPE APPROVAL CERTIFICATE CONTENT

The EU RO MR Type Approval Certificate shall contain the minimum information as defined in the “EU RO Framework Document for the Mutual Recognition of Type Approval” - see *Appendix I EU RO MR Type Approval Certificate Information*.

The following information is specifically applicable to products relevant to this technical requirement and shall be included on the EU RO MR Type Approval Certificate:

- a) Technical data according to IEC marking;
- b) Software version, [major version.minor version], if applicable;
- c) Reference to approved technical documents;
- d) Application and limitations.

6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
31 January 2015	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)
1 March 2021	0.3	Harmonised EMC testing requirements (18042h)
28 December 2021	0.4	Software update (ref 18042g)

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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@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: <https://www.euomr.org/technical-requirements>

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TABLE 1 - ENVIRONMENTAL CATEGORIES

Environmental Category	Environmental Conditions						Test Conditions					
	Closed Area			Open Deck Area			Temperature		Climate			Vibrations
	Temperature	Relative Humidity	Vibrations	Temperature	Relative Humidity	Vibrations	Dry Heat	Cold	Temperature	Relative Humidity	Salt mist	
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
EMC 1	IEC 60533 6.2.1											
EMC 2	IEC 60533 6.2.2											

*) Ref. IEC 60947-1. Annex 'Q', Cat F

- END -