

EU RO Mutual Recognition Technical Requirements

ADJUSTABLE STEEL CHOCK	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

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;

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- c) Maximum element load;
- 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;

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- Typical sectional drawings with all dimensions necessary for evaluation of seating design (see consecutive data (I) through (XIII) below);
- 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:**

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- 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:

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- 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 $2 \cdot 10^6$ 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.

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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) 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.

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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) Application and installation procedure.

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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