

EU RO Mutual Recognition Technical Requirements

RESILIENT MOUNTINGS OF MACHINERY	Version	0.1
	Adoption Date:	1 January 2023
	Application Date:	1 July 2023
	Tier	9
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1. PRODUCT DESCRIPTION

1.a General description of the product

A resilient mounting is an item designed to incorporate rigid members for attachment and resilient elements for the purpose of isolating shock, noise, and vibrations of a continuous or intermittent origin and to serve as a foundation support for an item of equipment to be isolated.

1.b Application limitations[†]

Each specific installation of resilient mounting 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. Where it is to be ensured that the vibration levels of the mounts remain within the limits specified by the manufacturer for the following conditions:

- Maximum dynamic inclinations to be expected during service;
- Start-stop operation; and
- The natural frequencies of the system.

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

- Total deadweight of supported machinery;
- Number, size, type, arrangement of resilient mounts and bolts and nuts, material of foundation bolts and nuts, installation height, completed with relevant calculations and detailed (dimensioned) drawings;
- Maximum element load;
- maximum allowable deflections
- Foundation bolts preload, torque and elongation, completed with details of tightening procedure;
- Locking arrangement for foundation bolts and calculation of foundation bolts elongation for bolt connecting securing;

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- f) Longitudinal and lateral stopping device;
- g) Manufacturer's instructions

†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

To prevent the transmission of shock and vibration to the supporting structure to shipboard machinery.

1.d System context

Resilient or shock mountings for diesel engines and other machinery (reduction gearbox, turbine, generator, pump), for control cabins and living quarters within the specified operational limitation by the manufacturer, requiring installation approval on a case-by-case basis, see paragraph 1b above.

2. DESIGN EVALUATION

2.a Engineering evaluation requirements

2.a i. Technical Requirements

Resilient mountings are to be designed, manufactured and tested in accordance with a recognized standard. Tests to be carried out as per recognized standard, in accordance with the Manufacturer's specifications; limit values to be specified

- 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;

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- j) Hardness;
- k) Impact characteristics;
- l) Measurement of temperature (as applicable);
- m) Pulsating compressive strength;
- n) Resistance to oils;
- o) Resistance to water;
- p) Tensile strength;
- q) Thermal expansion;
- r) Clearance to be provided
- s) Adhesive strength between rubber with metal block not less than 3.9MPa, for rubber and metal block type of vibration isolator

2.a.ii. Technical documents to be submitted

- a) Assembly Drawing;
- b) Section drawings in the vicinity of various foundation bolts
- c) Document/Data Sheet including properties of equipment: materials, dimensions, weight, centre of gravity, moments and products of inertia, radii of gyration, principal axes of equipment, speed of machinery, exciting frequencies, limitations to be provided.
- d) Individual part drawings of foundation bolts
- e) Calculations for the requisite pre-loading forces and bolt elongations with details of the procedure for bolt tightening
- f) Description of the complete spring-mass system
- g) Designation, type, dimensions, shore hardness
- h) Spring stiffness for the horizontal and vertical loading directions (static and dynamic) damping coefficients
- i) Characteristic curves for the horizontal and vertical load direction with details concerning permissible continuous load
- j) Data concerning the time settling behaviour at ambient conditions
Calculation of the natural frequencies
- k) Calculation of the static displacements
- l) Calculation for the forced, damped vibrations
- m) Manufacturer's instructions and recommendations for installation and application.
The instructions to include following:
 - i. Rubber resilient element, of mountings should not be painted.

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- ii. The rubber elements of mountings should be protected from the effects of oil.
- iii. All welding or flame cutting of structures in way of mounting locations shall be performed prior to the installation of resilient mountings.
- iv. The installation of mountings and the alignment of mounting surfaces of equipment and foundations shall be such as to ensure that all load-carrying mountings with the same rated load capacity and stiffness have equal deflection under load. Holes for bolts for securing mountings to foundations and holes in the feet or subbases of equipment shall be aligned to prevent any distortion of the mountings.
- v. Some mountings are designed to be loaded in a specific direction. Care should be taken to ensure that all such mountings are installed so as to be loaded in the correct direction.
- vi. Mountings used as stabilizers are not to share the dead load of the equipment and should not be statically deflected after the equipment is installed.* Mountings in a stabilizer arrangement are not to be confused with braced-mounting arrangements. In the latter arrangement, all mountings share their design portion of the dead load.
- vii. Bolts designed to be stressed in shear shall be installed in holes with minimum clearance.
- viii. Bolt material should be specified
- ix. Sufficient clearances should be provided around equipment installed on mountings to prevent the equipment from striking ship structure or other fixed or resiliently mounted equipment.
- x. Electric ground straps shall be provided for all resiliently mounted equipment for the safety of personnel.

2.b Type testing requirements

The tests shall be conducted to verify design requirement as per application and the manufacturer's specified limits. The tests 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

- a) ASTM D 695 - ISO 604 (elastic modulus / compressive strength)

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- b) ASTM D412 and ISO 37 (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) ASTM D 635 - FTP Code, Annex 1, Part V (flammability of self-supporting plastics, low flame spread);
- j) DIN 50100 (pulsating compressive test);
- k) EN 1465 (tensile lap shear strength);
- l) ASTM D 732 (shear strength);
- m) DIN 53752 (coefficient of thermal expansion);
- n) ISO 175 (resistance to media of the application range);
- o) Coefficient of friction against steel, with machined or cast specimen, with or without separating agents (to be defined);
- p) ISO 814 (Adhesion test between rubber with metal)
- q) ISO 10846-1:2008
Acoustics and vibration — Laboratory measurement of vibro-acoustic transfer properties of resilient elements — Part 1: Principles and guidelines
- r) 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 †.
- s) 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 <https://www.euomr.org/technical-requirements>)

2.c Type testing requirements for certificate renewal

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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.

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

4. MARKING REQUIREMENTS

Manufacturers of the approved equipment are, in principle, to mark the product before shipment for identification of approved equipment and, in addition, at least 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) Application;
- e) Particulars or ratings;
- f) Rubber hardness
- g) 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) Certificate Heading;
- b) Certificate number;
- c) Company Information;
- d) Product Information;
- e) Term of Validity;
- f) Rules & Standards;
- g) Generic Sentence.

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6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
2021-07-01	0.0	Approved by EU RO MR Steering Committee
2023-01-01	0.1	Added para 9 Copyright (ref 21030_)

7. BACKGROUND INFORMATION / REFERENCES

- a) EU RO Framework Document for the Mutual Recognition of Type Approval;
- b) ASTM D 695
- c) ISO 604
- d) ASTM D 412
- e) ISO 37
- f) ASTM D 621
- g) ISO 75-2
- h) ASTM D 256
- i) ISO 180
- j) EN 59
- k) ASTM D 4065
- l) DIN 53445
- m) ISO 6721-1
- n) ASTM D 790
- o) ISO 178
- p) ISO 14125
- q) ASTM D 635
- r) FTP Code, Annex 1, Part V ;
- s) DIN 50100
- t) EN 1465
- u) ASTM D 732
- v) DIN 53752
- w) ISO 175
- x) ISO 814

8. MAINTENANCE & CLARIFICATION OF TECHNICAL REQUIREMENTS

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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>

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>.

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