

# EU RO Mutual Recognition Technical Requirements

<b>AIR PIPE AUTOMATIC CLOSING DEVICE</b>	Version	0.5
	Adoption Date	1 January 2023
	Application Date	1 July 2023
	Tier	2
This document is subject to controlled issue and can be found here: <a href="http://www.euromr.org/technical-requirements">http://www.euromr.org/technical-requirements</a> <b>*** Uncontrolled if downloaded or printed ***</b>		

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## 1. PRODUCT DESCRIPTION

### 1.a General description of the product

These Technical Requirements apply to air pipe closing devices required by the Protocol 1988 relating to the Load Line convention 1966 and its adoptions Load Line convention, 1966 to be fitted with automatic closing devices.

### 1.b Application limitations†

Onboard ships with exceptions as per Article 5 of International Convention on Load Lines (ICLL).

† 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

These technical requirements apply to automatic closing devices of air pipes intended for the water tank or oil tank except cargo tank extending above the freeboard or superstructure decks”, as per Reg.20 of ICLL. Flame arresting function is excluded from the scope of this TR. If the device is fitted with a flame screen, the flame screen is subject to separate approval by the individual RO classing the vessel.

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## 1.d System context

The air pipe automatic closing device to prevent seawater and relieving the pressure of the tank is subject to the type approval of the individual EU RO classing that vessel.

## 2. DESIGN EVALUATION

### 2.a Engineering evaluation requirements

#### 2.a. i. Technical Requirements

##### Design

- a) Air pipe automatic closing devices shall be designed so that they will withstand both ambient and working conditions, and be suitable for use at inclinations up to and including  $\pm 40^\circ$ .
- Strength requirements for the air pipe closing device within the forward 0.25L (L : Refer to the IACS UR S2);
  - For all ships of 80 m or over in length, where the height of the exposed deck in way of the closing device is less than 0.1L or 22m above the summer load waterline, which is the lesser, the pressure P, acting on air pipe closing devices may be calculated from:

$$P = 0.5\rho V^2 C_d C_s C_p \quad \left[ \frac{\text{kN}}{\text{m}^2} \right]$$

Where:

- $\rho$  = density of seawater, taken as  $1.025 \frac{\text{t}}{\text{m}^3}$
- $V$  = velocity of water over the fore deck, taken as  $13.5 \frac{\text{m}}{\text{s}}$
- $C_d$  = shape coefficient  
= taken as 0.8 for head of cylindrical form with its axis in the vertical direction
- $C_s$  = slamming coefficient, taken as 3.2
- $C_p$  = protection coefficient  
= 0.7 for air pipe closing device located immediately behind a breakwater or forecastle

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= 1.0 elsewhere and immediately behind a bulwark

- Forces acting in the horizontal direction on closing device should be calculated from above formula using the largest projected area of each component;
- Air pipe closing devices shall be weather tight, as per IACS/UI/1966 ICLL Reg.20, LL49(1980 Rev.1 2008 .7)
- b) Air pipe automatic closing devices shall be constructed to allow inspection of the closure and the inside of the casing as well as changing the seals;
- c) Efficient ball or float seating arrangements shall be provided for the closures. Bars, cage or other devices shall be provided to prevent the ball or float from contacting the inner chamber in its normal state and made in such a way that the ball or float is not damaged when subjected to water impact due to a tank being overfilled;
- d) Air pipe automatic closing devices shall be self-draining;
- e) The clear area through an air pipe closing device in the opening position shall be at least equal to the area of the inlet;
- f) An automatic closing device shall:
  - Prevent the free entry of water into the tanks,
  - Allow the passage of air or liquid to prevent excessive pressure or vacuum coming on the tank.
- g) In the case of air pipe closing devices of the float type, suitable guides shall be provided to ensure unobstructed operation under all working conditions of heel and trim;
- h) The maximum allowable tolerances for wall thickness of floats shall not exceed  $\pm 10\%$  of the nominal thickness;
- i) The inner and the outer chambers of an automatic air pipe head shall be of a minimum thickness of 6mm. Where side covers are provided and their function is integral to providing functions of the closing device as outlined in 2.a.i (f), they shall have a minimum wall thickness of 6 mm. If the air pipe head can meet the tightness test in 2.b.i (c) without the side covers attached, then the side covers are not considered to be integral to the closing device, in which case a wall less than 6 mm can be acceptable for side covers;

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Construction with form-closed seat of the seating/seating shall not be glued only.

## Materials

- j) Casings of air pipe closing devices shall be of approved metallic materials adequately protected against corrosion by sea water and the media intended to be carried in the tank. The traditional stainless steels, including types 304, 316 or 316L, are not considered suitable for use in seawater systems. For selection of suitable stainless steel material, the pitting resistance equivalent number (PREN)  $W = \%Cr + 3.3 \%Mo + 16 \%N$ , shall not be less than 30;
- k) For galvanised steel air pipe heads, the zinc coating shall be applied by the hot method and the thickness shall be 70 to 100 microns;
- l) For areas of the head susceptible to erosion (e.g. those parts directly subjected to ballast water impact when the tank is being pressed up, for example the inner chamber area above the air pipe, plus an overlap of 10° or more either side) an additional harder coating should be applied. This shall be aluminium bearing epoxy, or other equivalent, coating, applied over the zinc;
- m) Closures and seats made of non-metallic materials shall be compatible with the media intended to be carried in the tank and to sea water and suitable for operating at ambient temperatures between -25°C and 85°C.

## 2.a.ii. Technical documents to be submitted

**IMPORTANT:** The English Language shall be used for all submitted documents.

Following documents and information shall be submitted by the manufacturer:

- a) Description of the product including calculation for free passage area; Detailed construction drawings of metallic enclosure if any;
- b) Sectional drawings with materials and dimensions; External connection terminal drawings;
- c) Type test program, performance test program and specification of test site(s) Type test plan;
- d) diagram of differential pressure dependant on volume

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## 2.b Type testing requirements

### 2.b.i. Testing of air pipe automatic closing device

Test specimens shall be taken from the production line or from stocks. Tests shall be carried out in presence of the EU RO Surveyor. In cases where the tests are conducted at Nationally Accredited Laboratories, the presence of the EU RO's surveyor may be omitted<sup>1</sup>.

The prototype test plan to be submitted for approval by manufacturers and the minimum test requirements for each type and size of air pipe automatic closing device shall include the following:

**a) Determination of the flow characteristics:**

The flow characteristics of the air pipe closing device shall be determined. Measuring of the pressure drop versus rate of volume flow shall be carried out using water and with any intended flame or insect screens in place;

**b) Testing of Vacuum capability (Discharge / Reverse flow test):**

The air pipe shall allow the passage of air or liquid to prevent vacuum coming on to the tank. A reverse flow test shall be performed. A vacuum pump or another suitable device shall be connected to the opening of the air pipe leading to the tank. The flow velocity shall be applied gradually at a constant rate until the float gets sucked into the inlet of the air pipe and blocks the flow. The velocity at the point of blocking shall be recorded. 80% of the value recorded will be stated in the certificate.

**c) Tightness test during immersion/emerging in water:**

An automatic closing device shall be subjected to a series of tightness tests involving not less than two (2) immersion cycles under each of the following conditions;

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<sup>1</sup> 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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- The automatic closing device shall be submerged slightly below the water surface at a velocity of approximately 4m/min. and then returned to the original position immediately. The quantity of leakage shall be recorded.
- The automatic closing device shall be submerged to a point slightly below the surface of water. The submerging velocity shall be approximately 8m/min. and the air pipe vent head shall remain submerged for not less than 5 minutes. The quantity of leakage shall be recorded.
- Each of the above tightness tests shall be carried out in the normal position as well as at an inclination of 40 degree under the strictest conditions for the device. In cases where such strictest conditions are not clear, tests shall be carried out at an inclination of 40 degrees with the device opening facing in three different directions: upward, downward, sideways (left or right). See **Figures 1 to 4**:

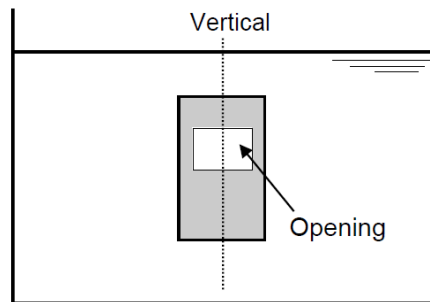


Fig 1: Example of normal position

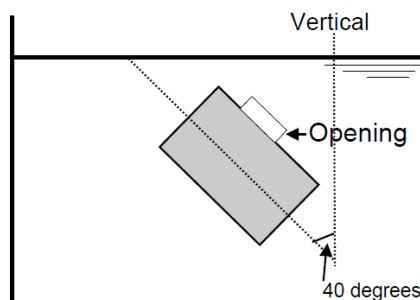


Fig 2: Example of inclination 40 degrees opening facing upward

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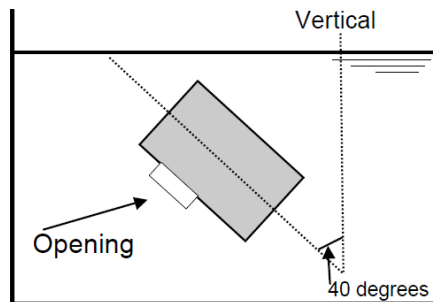


Fig 3: Example of inclination 40 degrees opening facing downward

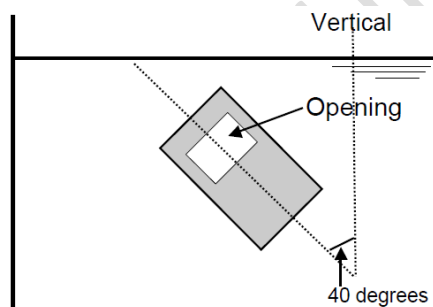


Fig 4: Example of inclination 40 degrees opening facing sideways

- Depth of Immerge water is not less than 200mm;
- The maximum allowable leakage per cycle shall not exceed 2 ml/mm of nominal diameter of inlet pipe.

## 2.b.ii. Testing of non-metallic floats

Impact and compression loading tests shall be carried out on the floats before and after pre-conditioning as follows:

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Test temperature °C	-25	20	85
Test condition			
Dry	○	○	○
After immersing in water	○	○	○
After immersing in fuel oil		○	
The immersing in water and fuel oil is to be for at least 48 hours. The total period of keeping the floats at the above specified temperatures before dry test is to be at least 24 hours.			

## a) Impact test:

- The test should be conducted on a pendulum type testing machine. The floats shall be subjected to 5 impacts of 2.5Nm each and shall not suffer permanent deformation, cracking or surface deterioration at this impact loading;
- Subsequently the floats shall be subjected to 5 impacts of 25Nm each. At this impact energy level some localised surface damage at the impact point may occur. No permanent deformation or cracking of the floats shall appear.

## b) Compression loading test:

- Compression tests shall be conducted with the floats mounted on a supporting ring of a diameter and bearing area corresponding to those of the float seating with which it is intended that float shall be used. For ball type float, loads shall be applied through a concave cap of the same internal radius as the test float and bearing on an area of the same diameter as the seating. For a disc type float, loads shall be applied through a disc of equal diameter as the float.
- A load of 350 kg shall be applied over one minute and maintained for 60 minutes. The deflection shall be measured at intervals of 10 minutes after attachment of the full load. The record of deflection against time shall show no continuing increase in deflection and, after release of the load, there shall be no permanent deflection.

### 2.b.iii. Testing of metallic floats

Test shall be conducted in accordance with 2.b.ii.(a). The tests shall be carried out at room temperature and in the dry condition.



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

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**

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 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 logo
- b) Type designation;
- c) Nominal Diameter;
- d) Resistance coefficient;
- e) Intended for the water tank or oil tank.

## **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) The dynamic coefficient resulting from the flow characteristic test in 2.b.i (a) for each type and size of air pipe automatic closing device
- b) Additional conditions and remarks.

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## 6. APPROVAL DATE AND REVISION NUMBER

Date	Revision	Comment
2013-30-04	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; CRF020 – Revision to par. 5 - 'Type Approval Certificate Content'.
2016-04-01	0.3	CRF023 – 2.b.i b) - removal of requirements for 'Wear resistance and form constancy..' and 'Salt spray test for the casings' and replacement of 'IMO MSC/Circ.677 or EN 12874' by 'EN ISO 16852' 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.
2018-01-01	0.4	CRF037 - 2.a.i (i) is not in line with new IACS UR P3.2.9: P3.2.9 The inner and the outer chambers of an automatic air pipe head is to be of a minimum thickness of 6 mm. Where side covers are provided and their function is integral to providing functions of the closing device as outlined in P3.2.6, they shall have a minimum wall thickness of 6 mm. If the air pipe head can meet the tightness test in P3.4.1b without the side covers attached, then the side covers are not considered to be integral to the closing device, in which case a wall less than 6 mm can be acceptable for side covers.
2023-01-01	0.5	Added para 2.c Added para 9 Copyright (ref 21030_)

## 7. BACKGROUND INFORMATION / REFERENCES

- a) International Convention on Load Lines (ICLL), Reg. 20;
- b) IACS UR P3(Rev.2 March 2004) "Air pipe closing device";
- c) IACS UI LL49 (Rev.1 July 2008) for Reg.20 of 1966 ICLL;
- d) IACS UR S2 (Rev. 1 may 2010) "Definition of Ship's Length  $L$  and Block Coefficient  $C_b$ ";
- e) IACS UR S27 (Rev. 6 June 2013) "Strength Requirements for Fore Deck Fittings and Equipment";
- f) EU RO Framework Document for the Mutual Recognition of Type Approval.

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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@euomr.org](mailto: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;
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