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Fire protection — Foam fire extinguishing systems —

Part 3: Medium expansion foam equipment

Protection contre l'incendie — Systèmes d'extinction d'incendie à mousse —

Partie 3: Équipement pour mousse à moyen foisonnement

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

The committee responsible for this document is ISO/TC 21, *Equipment for fire protection and fire fighting*, Subcommittee SC 6, *Foam and powder media and firefighting systems using foam and powder*.

ISO 7076 consists of the following parts, under the general title *Fire protection — Foam fire extinguishing systems*:

— *Part 1: Foam proportioning equipment*

— *Part 2: Low expansion foam equipment*

— *Part 3: Medium expansion foam equipment*

— *Part 4: High expansion foam equipment*

— *Part 5: Fixed compressed air foam equipment*

— *Part 6: Vehicle mounted compressed air foam systems*

Fire protection — Foam fire extinguishing systems —

Part 3:
Medium expansion foam equipment

1 Scope

This part of ISO 7076 specifies requirements and test methods for medium expansion foam equipment of fixed-foam extinguishing systems for indoor or outdoor use or both.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 7-1, *Pipe threads where pressure-tight joints are made on the threads — Part 1: Dimensions, tolerances and designation*

ISO 37, *Rubber, vulcanized or thermoplastic — Determination of tensile stress-strain properties*

ISO 48, *Rubber, vulcanized or thermoplastic — Determination of hardness (hardness between 10 IRHD and 100 IRHD)*

ISO 175, *Plastics — Methods of test for the determination of the effects of immersion in liquid chemicals*

ISO 179-1, *Plastics — Determination of Charpy impact properties — Part 1: Non-instrumented impact test*

ISO 180, *Plastics — Determination of Izod impact strength*

ISO 188, *Rubber, vulcanized or thermoplastic — Accelerated ageing and heat resistance tests*

ISO 228-1, *Pipe threads where pressure-tight joints are not made on the threads — Part 1: Dimensions, tolerances and designation*

ISO 272, *Fasteners — Hexagon products — Widths across flats*

ISO 527-1, *Plastics — Determination of tensile properties — Part 1: General principles*

ISO 885, *General purpose bolts and screws — Metric series — Radii under the head*

ISO 898-1, *Mechanical properties of fasteners made of carbon steel and alloy steel — Part 1: Bolts, screws and studs with specified property classes — Coarse thread and fine pitch thread*

ISO 898-2, *Mechanical properties of fasteners made of carbon steel and alloy steel — Part 2: Nuts with specified property classes — Coarse thread and fine pitch thread*

ISO 1179-1, *Connections for general use and fluid power — Ports and stud ends with ISO 228-1 threads with elastomeric or metal-to-metal sealing — Part 1: Threaded ports*

ISO 1817, *Rubber, vulcanized or thermoplastic — Determination of the effect of liquids*

ISO 4759-1, *Tolerances for fasteners — Part 1: Bolts, screws, studs and nuts — Product grades A, B and C*

ISO 7005-1, *Pipe flanges — Part 1: Steel flanges for industrial and general service piping systems*

ISO 7005-2, *Metallic flanges — Part 2: Cast iron flanges*

ISO 7203-2:2011, *Fire extinguishing media — Foam concentrates — Part 2: Specification for medium- and high-expansion foam concentrates for top application to water-immiscible liquids*

ISO 9227, *Corrosion tests in artificial atmospheres — Salt spray tests*

ASTM D638, *Standard test method for tensile properties of plastics*

ASTM G155, *Standard practice for operating xenon arc light apparatus for exposure of non-metallic materials*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
medium expansion foam
foam with 21 to 200 expansion ratio range

4 Requirements

4.1 Connections

4.1.1 Permanent connections and joints

Permanent joints shall conform to ISO 7-1, ISO 228-1, ISO 1179-1, ISO 7005-1 or ISO 7005-2, as applicable, or shall conform to other technical specifications valid in the place of use where International Standards are not applicable.

4.1.2 Bolting of pressure-retaining parts

Bolts, nuts or studs or both used to fasten pressure-retaining parts shall conform to ISO 272, ISO 885 and ISO 4759-1 or shall conform to other technical specifications valid in the place of use where International Standards are not applicable.

4.2 Parts for removal during routine field maintenance

4.2.1 Removal

Parts intended for removal during routine field maintenance shall be accessible, removable and replaceable without damage using appropriate tools normally used by the trade or special tools recommended by the component manufacturer.

4.2.2 Re-assembly

The design and construction of any part intended for removal during routine field maintenance shall be such that it cannot be re-assembled in a manner other than as intended.

4.3 Corrosion resistance of metal parts

Parts of components that are exposed to foam concentrate or foam solution shall be resistant to corrosion from that exposure.

Parts of components that are intended to freely move during operation or bear against, rotate within, or slide on stationary parts shall be of a corrosion-resistant material.

NOTE Bronze is a typical material that has corrosion-resistant properties when exposed to foam concentrate or foam solution.

4.4 Elastomeric joint rings

4.4.1 General

Elastomeric joint rings shall have the following properties when tested in accordance with ISO 37 and ISO 48.

a) For as-received silicone rubber with basic constituent of poly-organo-siloxane, a minimum tensile strength of 3,4 MPa, a minimum ultimate elongation of 100 %, and a hardness within ±5 units of the manufacturer's specification.

b) For as-received fluoroelastomers, a minimum tensile of 6,9 MPa, a minimum ultimate elongation of 150 %, and a hardness within ±5 units of the manufacturer's specification.

c) For as-received natural rubber and as-received synthetic rubber other than silicone or fluoroelastomers, a minimum tensile of 8,3 MPa, a minimum ultimate elongation of 150 % and a hardness within ±5 units of the manufacturer's specification.

4.4.2 Resistance to aging

When tested in accordance with ISO 188, the physical properties of elastomeric joint rings after oven ageing at 100 °C ±2 °C for 70 h shall be at least 60 % of the as-received tensile strength and elongation values. Any change in the hardness shall not exceed 5 % of the as-received value.

4.4.3 Resistance to exposure to liquids

Elastomeric joint rings shall have the following properties when tested in accordance with ISO 1817.

a) The physical properties of a material in continuous contact with foam liquid concentrate, after exposure to the foam liquid concentrate at 70 °C ±2 °C for 60 d shall be at least 60 % of the as-received tensile strength and elongation values.

b) The physical properties of a material in continuous contact with the foam solution, after exposure to the foam solution at 70 °C ±2 °C for 60 d shall be at least 60 % of the as-received tensile strength and elongation values.

NOTE For a material that is in continuous contact with either foam liquid concentrate or foam solution, compliance with 4.4.3 a) is considered representative of 4.4.3 b).

4.5 Plastics and reinforced resin materials

4.5.1 General

Plastic or reinforced resin components, which are essential to the operation or safety of the product, shall meet the relevant requirements of 4.5.2 and 4.5.3.

4.5.2 Resistance to ageing

After ageing in accordance with 5.2 and the appropriate sections of ISO 527-1, ISO 179-1 and ISO 180, specimens of plastics and reinforced resin materials used for components shall

a) have a tensile strength of no less than 50 % of the value before exposure,

b) have an elongation at break of no less than 50 % of the value before exposure, or

c) have an impact strength of no less than 50 % of the value before exposure (this method is relevant to stiff plastics, i.e. flexible plastics shall be evaluated using the tensile test), and

d) show no signs of cracking.

4.5.3 Resistance to exposure to liquids

Plastics and reinforced resin materials which come into contact with foam concentrate, foam solution after exposure to the particular liquid in accordance with 5.3 and the appropriate sections of ISO 527-1, ISO 179-1 and ISO 180, shall

a) have a tensile strength of no less than 50 % of the value before exposure,

b) have an elongation at break of no less than 50 % of the value before exposure, or

c) have an impact strength of no less than 50 % of the value before exposure (this method is relevant to stiff plastics, i.e. flexible plastics shall be evaluated using the tensile test), and

d) show no signs of cracking.

4.6 Strength

4.6.1 The pressure-retaining equipment shall withstand, without rupture, an internal hydrostatic pressure of four times the maximum working pressure for a period of 5 min when tested as specified in 5.4. The test in 5.4 is a laboratory test that chooses one sample from 100 or less manufactured.

4.6.2 The calculated design load of any fastener, neglecting the force required to compress the gasket, shall not exceed the minimum tensile strength specified in ISO 898-1 and ISO 898-2 when the equipment is pressurized to four times the maximum working pressure. The area of the application of pressure shall be calculated as follows:

a) If a full-face gasket is used, the area of application of pressure is that extending out to a line defined by the centre line of the bolts.

b) If an “O”-ring seal or ring gasket is used, the area of application of force is that extending out to the centre line of the “O”-ring or gasket.

4.7 Leak resistance

The pressure-retaining equipment, shall withstand, for 5 min without leakage, an internal hydrostatic pressure of 1,5 times the maximum working pressure specified by the manufacturer, when tested in accordance with 5.5.

4.8 Discharge coefficient (K factor)

The discharge coefficient (K factor) shall be within ±5 % of the value stated by the manufacturer when determined in accordance with 5.6.

4.9 Foam quality

The expansion and drainage time of foam produced by medium expansion foam equipment, using the foam concentrate recommended by the manufacturer, shall conform to the values stated by the equipment manufacturer when tested in accordance with 5.7.

4.10 Water flow

The medium expansion foam equipment shall show no loose parts or leakage when tested in accordance with 5.8.

4.11 Operation reliability

The spring, slider and other movable parts of medium expansion foam equipment shall be tested individually in accordance with 5.9. After testing, the movable parts shall be reinstalled in the medium expansion foam equipment, and the equipment shall operate properly.

4.12 Stress corrosion

After being subjected to the conditions described in 5.10, a brass part containing greater than 15 % zinc shall comply with the following requirements:

a) show no evidence of cracking when examined using 25× magnification;

b) if there is evidence of cracking of pressure-retaining equipment, comply with 4.6 at 2 times the maximum working pressure rather than 4 times the maximum working pressure;

c) if there is evidence of cracking of equipment that is not pressure-retaining, comply with 4.10.

4.13 Salt-spray corrosion

After being subjected to the condition described in 5.11, equipment constructed from metallic parts using combinations of brass, bronze or ferrous metals shall show no destruction or damage which impairs function.

4.14 Light and water exposure

Following light and water exposure for 720 h, as specified in 5.12, an exterior polymeric or fibreglass component part or samples prepared from the same exterior polymeric or fibreglass component material shall comply with the following requirements:

a) shall show no evidence of cracking;

b) a component part that needs not be cut or altered in order to be subjected to the exposure shall function as intended when operated at its maximum inlet pressure and maximum flow rate for 2 min;

c) a component part that needs to be cut or altered in order to be subjected to the exposure shall have physical properties not less than 60 % of the original as-received physical properties when subjected to tensile tests described in ASTM D638.

4.15 Heat and fire resistance

After being subjected to the condition described in 5.13, foam discharge devices intended to be installed in the area of fire shall

a) show no destruction or damage which impairs function, and

b) meet the requirements of 4.8 and 4.9.

5 Test methods

5.1 General

The following tests shall be carried out for each type of medium expansion foam equipment.