BS EN 13565-1:2019

BSI Standards Publication

Fixed firefighting systems – Foam systems

Part 1: Requirements and test methods for components

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National foreword

This British Standard is the UK implementation of EN 13565-1:2019. It supersedes BS EN 13565-1:2003+A1:2007, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee FSH/18/7, Foam/Media Systems.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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This European Standard was approved by CEN on 8 February 2019.

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European foreword

This document (EN 13565-1:2019) has been prepared by Technical Committee CEN/TC 191, "Fixed firefighting systems" the secretariat of which is held by BSI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by November 2019, and conflicting national standards shall be withdrawn at the latest by November 2019.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document will supersede EN 13565-1:2003+A1:2007.

Compared to the previous edition, the following changes have been made:

1) the foreword has been updated;
2) normative references have been updated;
3) 4.1 revised;
4) 4.4 revised;
5) 4.5 revised;
6) 4.6 revised;
7) 4.9 replaces Clause 8;
8) 4.10 replaces Clause 9;
9) 4.11 replaces Clause 10;
10) Clause 5 changed to 'performance characteristics of foam components';
11) Clause 6, new clause 'documentation';
12) Clause 7 replaces Clause 11;
13) Clause 8 replaces Clause 12;
14) Annex A revised;
15) Annex E requirements clause reference added;
16) Annex F requirements clause reference added.
17) Annex G revised;
18) Annex H revised;
19) Annex I revised;
20) Annex J revised;
21) Annexes K, L, M, N added.

EN 13565, *Fixed firefighting systems — Foam systems*, is currently composed with the following parts:

— *Part 1: Requirements and test methods for components*;

— *Part 2: Design, construction and maintenance*.

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1 Scope

The requirements of this document set out the materials, construction, and performance of components intended for use in fixed foam fire fighting systems, and using foam concentrates conforming to EN 1568-1 to EN 1568-4. The components covered are: proportioners, sprayers, semi-subsurface hose units, branchpipes, low/medium expansion foam generators, high expansion foam generators, foam chambers, tanks and pressure vessels. Methods of test are given in Annex A to Annex K.

Requirements are also given for the provision of the characteristic data needed for correct application of components.

NOTE 1 Unless otherwise stated pressures are gauge pressures expressed in bar.

The requirements of this document do not cover, except where stated, the use of combinations of components to form part, or the whole, of a fire fighting system.

NOTE 2 Components conforming to this document are not necessarily compatible one with another.

Requirements for pumps, motors and the functioning of mechanical components (i.e. remote control turrets) are outside the scope of this document.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 1568-1:2018, *Fire extinguishing media — Foam concentrates — Part 1: Specification for medium expansion foam concentrates for surface application to water-immiscible liquids*

EN 1568-2:2018, *Fire extinguishing media — Foam concentrates — Part 2: Specification for high expansion foam concentrates for surface application to water-immiscible liquids*

EN 1568-3:2018, *Fire extinguishing media — Foam concentrates — Part 3 Specification for low expansion foam concentrates for surface application to water-immiscible liquids*

EN 1568-4:2018, *Fire extinguishing media — Foam concentrates — Part 4: Specification for low expansion foam concentrates for surface application to water-miscible liquids*

EN 12259-1:1999+A1:2001, *Fixed fire fighting systems — Components for sprinkler and water spray systems — Part 1: Sprinklers*

EN 1092-1, *Flanges and their joints — Circular flanges for pipes, valves, fittings and accessories, PN designated — Part 1: Steel flanges*

EN 12542, *LPG equipment and accessories — Static welded steel cylindrical tanks, serially produced for the storage of Liquefied Petroleum Gas (LPG) having a volume not greater than 13 m^3 — Design and manufacture*

EN ISO 225, *Fasteners — Bolts, screws, studs and nuts — Symbols, designations and dimensions (ISO 225)*

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

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

EN ISO 180, *Plastics — Determination of Izod impact strength (ISO 180)*

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

EN 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 898-1)*

EN 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 898-2)*

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

ISO 888, *Fasteners — Bolts, screws and studs — Nominal lengths and thread lengths*

ISO 4633, *Rubber seals — Joint rings for water supply, drainage and sewerage pipelines — Specification for materials*

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

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

3.1
component
item or piece of equipment intended for use in a fixed foam fire extinguishing system

3.2
aspirating component
component within which air and foam solution are mixed to make foam

3.3
non-aspirating component
components which discharge a spray of foam solution so that mixing with air and formation of foam takes place outside the component

3.4
proportioning component
component which controls the mixing of foam concentrate into a water flow, at a predetermined ratio, to produce a foam solution

NOTE Proportioning components are variously described as inline, bypass and round the pump inductors, injectors, eductors, proportioners, venturis, constant and variable flow valves, orifice plates, water powered foam pumps and displacement proportioners.

3.5
single orifice component
component in which liquid flows through a single flow controlling orifice

3.6
multiple orifice component
component in which liquid flows simultaneously through more than one flow controlling orifice

3.7
branchpipe
component which projects foam in the form of a jet or spray

3.8
foam chamber
component that incorporates a vapour seal, a foam expansion chamber, and which delivers foam into a flammable or combustible liquid storage tank

NOTE A foam generator can be connected to the foam chamber inlet.

3.9
foam generator
component which introduces air into the foam solution stream for delivery against a low back pressure, i.e. discharging against atmospheric pressure

3.10
high back pressure foam generator
component which introduces air into the foam solution stream for delivery against a high back pressure, for example, as is found in tank sub-surface injection

3.11
monitor
component consisting of a branchpipe or jet/fog nozzle and turret

NOTE This standard is considering the mechanical properties and foam discharge performance only. Different types of operation (electrically, hydraulically, water motor oscillating) are not subject of this standard.

3.12
foam pourer (foam discharge outlet)
component which discharges foam gently and indirectly onto the fuel surface

NOTE Some pourers are designed to discharge the foam tangentially in order to create a circular motion, and thus promote foam distribution.

3.13
semi-subsurface hose unit
component which delivers foam below the surface of a flammable liquid so that it rises to the liquid surface within a flexible hose and spreads over the liquid surface

3.14
turret
device on which a foam branchpipe is mounted to allow rotation and elevation

NOTE The requirements for the testing of turrets are outside the scope of this standard.

3.15
vapour seal
frangible component designed to prevent tank contents vapours entering the foam pipework system while allowing foam to flow into the tank during system operation

3.16
sprayer
open nozzle which discharges a spray of foam or foam solution

NOTE The terms sprayer and nozzle are regarded as interchangeable.

3.17
low expansion foam
foam which has an expansion ratio not greater than 20

[SOURCE: EN 1568-4:2018, 3.3]

3.18
medium expansion foam
foam which has an expansion ratio greater than 20 but not greater than 200

[SOURCE: EN 1568-4:2018, 3.4]

3.19
high expansion foam
foam which has an expansion ratio greater than 200

[SOURCE: EN 1568-4:2018, 3.5]

3.20
working pressure
pressure at which the component is used in the system

3.21
discharge characteristic
pressure vs. flow relationship for components

3.22
discharge coefficient (K factor)
K factor for the formula $Q = \mathrm{K}\sqrt{dP}$ where Q is the flow rate through the component in l/min and dP is the inlet pressure in bar

3.23
expansion ratio
ratio of the volume of foam to the volume of foam solution from which it is made

4 General construction requirements

4.1 Connections

4.1.1 Permanent connections and joints

Permanent joints on components for connection to pipework or other components shall conform to ISO 7-1, or EN 1092-1. Other technical specifications valid in the place of use of the component may be acceptable.

4.1.2 Bolting of pressure retaining parts

Bolts, nuts and/or studs used to fasten pressure retaining parts shall conform to EN ISO 898-1 and EN ISO 898-2.

The calculated load on any bolt or stud excluding the force required to compress the gasket shall not exceed the minimum tensile strength specified in EN 225, ISO 888 or EN ISO 898-1 when the component is pressurized to four times the rated working pressure.

The area of the application of pressure shall be calculated using the following assumptions:

— If a full-face gasket is used, the assumed area of pressure application extends out to the centre line of the bolts.

— If an 'O' ring seal or ring gasket is used, the assumed area of pressure application extends out to the centre of the 'O' ring or gasket.

4.2 Parts intended 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 so as to cause malfunction of the component, without an external visible indication.

4.3 Hydrostatic strength

4.3.1 Leak test

The pressure retaining parts of components (including the connection joints), except atmospheric storage tanks and pressure vessels, shall withstand for 10 min without leakage an internal hydrostatic pressure of 1,5 times the working pressure specified by the manufacturer $^{+1}_{0}$ bar, when tested in accordance with Annex A.

4.3.2 Mechanical strength

The component housing shall withstand for 10 min without rupture a pressure of three times the design working pressure $^{+1}_{0}$ bar without rupture when tested in accordance with Annex A.

4.4 Castings

Castings shall not be plugged or filled.

Castings should be free from adhering sand and scale.

4.5 Corrosion resistance of metal parts

4.5.1 Salt spray corrosion resistance of metal parts

All mechanical components shall conform to the following after being tested in accordance with Annex L:

a) shall function in accordance with the manufacturer's performance parameters;

b) any corrosion resistant coating (such as paint) shall remain intact and shall adhere to the surface so as not to be removable (when removal exposes a material subject to corrosion) by such action as washing or rubbing with a fingernail;

c) dissimilar metals in contact or close proximity with one another shall show no signs of galvanic corrosion;

d) the sample shall show no destruction of metal surfaces having no protective coating or paint.

Equipment constructed of metallic materials other than brass, bronze or ferrous metals shall conform to the requirements specified in 4.5.1 except that the salt spray exposure shall be 720 hrs.

4.5.2 Copper alloy components stress corrosion test

If copper alloy components are used the components shall conform to the following after being tested in accordance with Annex M:

a) shall function in accordance with the manufacturer's performance parameters;

b) shall show no signs of cracking when examined under 25 × magnification;

c) comply with the hydrostatic strength test under 4.3.1.

For large non-moving parts and non-pressure components the test may be carried out using representative material samples e.g. where the large component comprises a cast and machined component the test piece shall be similarly cast and machined. Sub-assemblies of moving parts may be tested.

4.5.3 Internal corrosion

Other than the exception below, those parts of components which are exposed to foam concentrate, foam solution, other specific liquids, or to unusual atmospheric conditions shall be resistant to that exposure when tested in accordance with Annex N.

The test may be carried out either using the complete component or a sub-assembly comprising the complete water/foam passageways.

At the conclusion of the test, check that the mechanical operation of all working parts is unimpaired and that there are no significant corrosion effects inside or outside. Significant corrosion defects are pits, cracks and blisters.

The foam concentrate manufacturer should always be consulted on the suitability of containers and their linings and external paint finish, valves, fittings and pipework, for long-term storage of concentrate or solution.

This requirement does not apply to components that are exposed to the corrosive media (i.e. foam concentrate or foam solution) during the limited period of foam discharge.

4.6 Elastomers

Elastomeric joint rings shall conform to the requirements of Type #W of ISO 4633. Manufacturer's shall provide evidence that any elastomers used are compatible with the media in which they are in contact.

4.7 Plastics and reinforced resin materials

4.7.1 General

Plastics, thermoplastics or thermosets; or reinforced resin components, which are essential to the operation or safety of the product, shall meet the relevant requirements of 4.7.2 and 4.7.3.

4.7.2 Resistance to ageing

After ageing in accordance with Annex B, specimens of plastics and reinforced resin materials (other than elastomeric joint rings covered in 4.6) used for components shall:

a) have a tensile strength changed by no more than 50 % of the value before exposure,

b) have an elongation at break of not less than 50 % of the value before exposure or;

c) have an impact strength not 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),

d) show no signs of cracking.

4.7.3 Resistance to exposure to liquids

Plastics, thermoplastics or thermosets; and reinforced resin materials which come into contact with foam concentrate, foam solution or water after exposure to the particular liquid in accordance with Annex C shall have:

a) a tensile strength not changed by more than 50 % of the value before exposure,

b) an elongation at break of not less than 50 % of the value before exposure, or;

c) an impact strength not changed by more 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),

d) no signs of cracking.

4.8 Heat and fire resistance

4.8.1 Sprayers and nozzles

Sprayers and nozzles, when tested in accordance with the heat resistance test in EN 12259-1:1999+A1:2001, Annex O, shall not show significant deformation or breakage.

4.8.2 Foam generators

Foam generators intended to be located entirely within the protected (fire) area (i.e. generators that draw air/smoke from the protected area) shall meet the requirements of 5.1 and 5.2 after testing in accordance with Annex D.

4.9 Components for low expansion foam systems

4.9.1 Foam branchpipes

The range of discharge shall be not less than the manufacturer's stated values when tested in accordance with Annex H.

4.9.2 Foam sprayers

4.9.2.1 Strainers

Sprayers, which do not allow a 6,0 mm sphere to pass through the waterway, shall be protected by a strainer. Where the sprayers are mounted on only corrosion resistant pipework (i.e. stainless steel and cupro nickel) the strainer may be fitted at the inlet to the pipework. Where the sprayers are mounted on steel pipework they shall each be fitted with a strainer.

The free area of the strainer shall be not less than three times the cross-sectional area of the nozzle bore(s), the aperture size shall be no greater than 80 % of the smallest orifice.

4.9.2.2 Area coverage

The area coverage of foam sprayers when tested in accordance with the method in Annex I shall be that area coverage in which the amount of collected water in the measuring containers (each representing 0,25 m^2) corresponds to a water density of at least 5 mm/min in average and with no more than 10 % of containers having less than 2,5 mm. It shall be within ± 10 % of the manufacturer's stated limits at the stated pressures, flows and mounting heights.

4.9.3 Foam pourers and foam chambers

The passageway flow capacity shall be sufficient to pass foam at the maximum rate provided by the largest foam maker recommended by the manufacturer for use with the pourer or chamber when tested in accordance with Annex J.

4.9.4 Vapour seals

4.9.4.1 Upstream pressure — Non rupture

A vapour seal shall not rupture when a positive pressure difference of $0,1^{+0,1}_{0}$ bar is applied to the upstream (foam inlet side) face when tested in accordance with Annex J.

4.9.4.2 Upstream pressure — Rupture

A vapour seal shall rupture when a positive pressure difference of $0,25^{+0,1}_{0}$ bar is applied to the upstream (foam inlet side) face when tested in accordance with Annex J.

4.9.4.3 Downstream pressure — Non rupture

A vapour seal shall not rupture when a positive pressure difference $0,1^{+0,1}_{0}$ bar is applied to the downstream (tank side) face when tested in accordance with Annex J.

4.9.5 Low back pressure and high back pressure foam generators

These units shall generate foam within the manufacturer's performance figures at their minimum claimed differential pressure when tested in accordance with Annex J.

4.9.6 Semi-subsurface hose units

These units shall discharge foam within the manufacturer's stated performance figures at their minimum inlet pressure when tested in accordance with Annex J, and shall insert and deploy the hose in accordance with Annex K, ready to distribute foam into a tank when tested in accordance with Annex F.

Hoses shall be suitable for use in potentially explosive atmospheres.

4.10 Components for medium and high expansion foam systems

4.10.1 Nozzles and sprayers

Sprayers, which do not allow a 6,0 mm sphere to pass through the waterway, shall be protected by a strainer. Where the sprayers are mounted on only corrosion resistant pipework (i.e. stainless steel and cupro nickel) the strainer may be fitted at the inlet to the pipework. Where the sprayers are mounted on steel pipework they shall each be fitted with a strainer.

The free area of the strainer shall be not less than three times the cross-sectional area of the nozzle bore(s), the aperture size shall be no greater than 80 % of the smallest orifice.

4.10.2 High expansion foam generators

Nozzles of high expansion generators, which will not allow a 6,0 mm sphere to pass through the waterway, shall be protected by a strainer. Where the high expansion generators are mounted on only corrosion resistant pipework (i.e. stainless steel and cupro nickel) the strainer may be fitted at the inlet to the pipework. Where the high expansion generators are mounted on steel pipework they shall each be fitted with a strainer.

The free area of the strainer shall be not less than three times the cross-sectional area of the nozzle bore(s), the aperture size shall be no greater than 80 % of the smallest orifice.

4.11 Tanks and pressure vessels for foam concentrates or solutions

4.11.1 General

4.11.1.1 Foam concentrate tank sediment pockets

For foam concentrate storage tanks for protein based foams and/or constructed using unlined carbon steel the outlet from the storage tank shall be raised above the base to provide sediment pocket. The capacities of sediment pockets shall be excluded in assessing the quantity of foam concentrate or premix in the tank. The capacity of the sediment pockets shall be sized to contain 2 % of the tank contents.

This requirement does not apply to bladder tanks.

4.11.1.2 Storage tank connections

Storage tanks shall be provided with:

a) a means of measuring the contents;

b) outlet, filling, draining and sampling connections;

c) means of access for inspection and cleaning of internal surfaces.

4.11.2 Tanks at atmospheric pressure

Storage tanks at atmospheric pressure shall be provided with a means of accommodating thermal expansion of the contents.

For storage tanks at atmospheric pressure thermal expansion may be accommodated by means of a closed vertical riser/expansion dome with a pressure vacuum vent valve. Where storage tanks are vented to atmosphere, the air/liquid interface should be of the minimum practicable area in order to minimize the possibility of internal corrosion of the tank or formation of sludge. The foam concentrate manufacturer should always be consulted to ensure that foam storage longevity requirements are met.

4.11.3 Pressure vessels

Pressure vessels for foam concentrate, foam solution or water shall conform to the requirements of EN 12542 for carbon steel tanks. Pressure vessels for other substances that are constructed in accordance with other technical specifications valid in the place of use of the product are also permitted. Vessels constructed from other suitable materials may also be used.

5 Performance Characteristics of Foam Components

5.1 Discharge coefficients and characteristics of branchpipes, sprayers and low and high back pressure foam generators

5.1.1 Single orifice components

The discharge coefficient or pressure/flow characteristic shall be within ± 5 % of the value stated by the manufacturer when measured in accordance with Annex E.

NOTE This effectively requires the flow rate to be within ± 5 % of that claimed by the manufacturer.

5.1.2 Multiple orifice components

The discharge coefficient or pressure/flow characteristic shall be within ± 10 % of the value stated by the manufacturer when measured in accordance with Annex E.

NOTE This effectively requires the flow rate to be within ± 10 % of that claimed by the manufacturer.

Where such components may be used in combination with venturi type proportioning components (i.e. injectors, eductors and inductors) the discharge coefficient or characteristic tolerance shall be compatible with that of the proportioning component.

5.2 Quality of foam from aspirating components

5.2.1 Low and medium expansion components

The expansion and drainage time of foam produced by an aspirating component in conjunction with any stated associated equipment, using a foam concentrate recommended by the manufacturer and conforming to EN 1568-1 to EN 1568-4 shall conform to the manufacturer stated values when tested in accordance with Annex F.

The expansion and drainage time of non-aspirated foam may be difficult to measure and therefore there are no corresponding requirements for non-aspirating components.

5.2.2 High expansion components

The generator shall be of sufficient capacity to produce foam at the maximum rate specified by the manufacturer when tested in accordance with Annex G.

Foam shall be produced by high expansion foam aspirating components in conjunction with any associated equipment, using a foam concentrate recommended by the manufacturer and conforming to EN 1568-2. The foam produced shall conform to manufacturer stated values for foam production capacity and expansion when tested in accordance with Annex G.

5.3 Accuracy of proportioning components

The flow/pressure loss characteristic and foam solution concentration produced by a proportioning component shall be within the working range as stated by the manufacturer, and shall be within the following criteria when tested in accordance with section 2 of Nordtest Method NT Fire 042:

a) not less than the rated concentration;

b) not more than 30 % above the rated concentration or 1 % point above the rated concentration (whichever is less).

Other methods may be used provided correlating results can be shown.

Foam concentrate substitutes, with the equivalent viscosity characteristics, may be used when testing proportioning components.

6 Documentation

6.1 Preparation and maintenance

The manufacturer shall prepare and maintain documentation.

6.2 Installation and user documentation

The manufacturer shall prepare installation and user documentation, which shall be submitted to the testing authority together with the sample(s). This documentation shall comprise at least the following:

a) a general description of the component, including a list of its features and functions;

b) a technical specification including:

   1) the information mentioned in 4.1;

   2) sufficient information to permit an assessment of the compatibility with other components of the system (if applicable e.g. mechanical, electrical or software compatibility);

c) installation instructions including mounting instructions;

d) operating instructions.

6.3 Design documentation

The manufacturer shall prepare design documentation, which shall be submitted to the testing authority together with the sample(s). This documentation shall include drawings, parts lists, block diagrams (if applicable), circuit diagrams (if applicable) and a functional description to such an extent that compliance with this document can be checked and that a general assessment of the design is possible.

7 Marking

The marking shall be non-detachable, non-flammable, permanent and legible.

The components shall be marked with:

a) name or trademark of the manufacturer;

b) model designation (type);

c) some mark(s) or code(s) (e.g. serial number or batch number), by which, or at least, the date or batch and place of manufacture (if several places of manufacture) can be identified by the manufacturer;

d) working pressure(s) if relevant;

e) direction of flow if relevant;

f) nominal flow rate in l/min if relevant;

g) percentage induction rate if relevant.

8 Evaluation of conformity — Initial type testing

8.1 Conformity

Initial type testing shall be performed to demonstrate conformity with this standard.

All characteristics, applicable to each product, given in Clauses 4 to 7 shall be subject to this initial type testing, except as described in 8.3 to 8.5.

The order of tests is given in Table 1.

8.2 Modification

In the case of modification of the component or of the method of production (where these may affect the stated properties), initial type testing shall be performed. All characteristics, applicable to each product, given in Clauses 4 to 7, and which may be changed by the modification, shall be subject to this initial type testing, except as described in 8.3 to 8.5.

8.3 Prior testing

Tests previously performed in accordance with the provisions of this standard may be taken into account providing that they were made to the same or a more rigorous test method under the same system of attestation of conformity on the same component or components of similar design, construction and functionality, such that the results are applicable to the component in question.

8.4 Grouping

Components may be grouped into families where one or more characteristics are the same for all components within that family or the test results are representative of all components within that family. In this case not all components of the family have to be tested for the purposes of the initial type testing.

8.5 Related components

This standard may by reference to special supporting standards identify characteristics of the related components, e.g. required special characteristics of subparts of the components, for which proof delivered by the manufacturer is considered to be sufficient. If these characteristics have previously been demonstrated to be in accordance with the requirements of the supporting standards referred to, no further evaluation of the component, in respect of these characteristics, is required to show conformity with this standard.

8.6 Normal production

Test samples shall be representative of the normal production. If the test samples are prototypes, they shall be representative of the intended future production and shall be selected by the manufacturer.

8.7 Reference samples

If the technical documentation of the test samples does not give a sufficient basis for later compliance checks, a reference sample (identified and marked) shall remain available for this purpose.

8.8 Test sequence

Any initial type testing and its results shall be documented in a test report.

Table 1 — Recommended test sequence for components

Test	Proportion-ers	Sprayer	Semi-sub-surface hose unit	Branch-pipe	Low/Medium expansion foam genera-tors and high back pres-sure genera-tors	High expan-sion foam generators	Foam chamber
Leak test	6		6				
Mechanical test	7		7	8	7	7	8
Corrosion	5	7	5	6	5	3	6

Visual examination	2	2	2	2	2	2	2
Documentation	1	1	1	1	1	1	1
Heat and fire resistance		6			6	6 [a]	
Discharge coefficient/ characteristic	3	3	3	3	3	3	
Foam quality		5		4	4	5	4
Accuracy of proportioning	4						
Range				5			
Area coverage		4					
Capacity							5
Vapour seals							3
Foam generation			4				
[a] Only for generators subjected to fire exposure.							

Annex A
(normative)

Hydrostatic test

A.1 General

NOTE 1 Attention is drawn to the possible hazards caused by breakage of pressurized components during testing.

NOTE 2 See 4.3.

A.2 Leak test

Blank off or plug all orifices, leaving one connection for pressurization and an outlet fitted with a suitable valve for venting air. Fill the component with water, close the air vent and pressurize at a rate not exceeding 2 bar/s to not less than the pressure specified in 4.3.1 and maintain this for a minimum of 10 min.

During this test, bolts and gaskets employed within castings or parts of a large area may be reinforced by using high tensile bolts and clamps, and for regularly employed gaskets and seals, other materials capable of withstanding the test pressure may be substituted.

Examine for and report any leakage or rupture.

A.3 Mechanical strength

Blank off or plug all orifices, leaving one connection for pressurization and an outlet fitted with a suitable valve for venting air. Fill the component with water, close the air vent and pressurize at a rate not exceeding 2 bar/s to not less than the pressure specified in 4.3.2 and maintain this for a minimum of 10 min.

During this test, bolts and gaskets employed within castings or parts of a large area may be reinforced by using high tensile bolts and clamps, and for regularly employed gaskets and seals, other materials capable of withstanding the test pressure may be substituted.

Examine for and report any rupture.

NOTE The hydrostatic pressure test for strength of body castings, flanges, covers and the like, is not to be considered a test for bolts, gaskets or seals.

Annex B
(normative)

Ageing test for plastics, thermoplastics or thermosets; and reinforced resin materials

B.1 General

NOTE 1 See 4.7.2.

Place five specimens of the material under test in an air tolerance oven at (100 ± 2) °C for 30 days. Allow to cool in air at (23 ± 3) °C for (24 ± 4) h before testing.

NOTE 2 Certain plastics require a lower oven temperature. In such cases, if the acceleration factors are unknown, it can be assumed that the lowering of the temperature by 10 °C implies a doubling of the ageing time (i.e. 90 °C for 60 days).

B.2 Tensile strength and elongation test

Test the samples using any suitable method described in EN ISO 527-1, and record the results.

B.3 Impact test

Test the samples using the methods described in EN ISO 179-1 (charpy) or EN ISO 180 (Izod).

Annex C
(normative)

Liquid exposure test

NOTE See 4.7.3.

Immerse five samples in each of the liquids with which the material comes into contact, in accordance with EN ISO 175, for (168 ± 4) h at (70 ± 2) °C. Use the test liquid, i.e. potable water, seawater or a foam concentrate or foam solution recommended by the manufacturer. After exposure immerse the samples in the same liquid for 30 min at (23 ± 2) °C. Measure the tensile strength, percentage elongation or impact resistance in accordance with Annex B.

Annex D
(normative)

Heat and fire resistance test for foam generators

NOTE See 4.8.2.

The generator complete with its foam solution piping and wiring, if electrically powered, shall be suspended (2 000 ± 100) mm above a (4,5 ± 0,1) m^2 fire test tray containing (180 ± 5) l of n-heptane fuel on a 90 l water layer which is shielded against wind and air draught to ensure flame impingement on the generator. After ignition of the fuel the generator shall be exposed to the flames for 5 min ± 10 s.

Annex E
(normative)

Flow tests

E.1 General

NOTE See 5.1.

Measure water flow rates at an air temperature of (15 ± 10) °C, and with a supply of water, suitable for use with the component, at temperatures within the ranges quoted by the component manufacturer using methods accurate to ± 2 %. Measure the inlet pressure to an accuracy of ± 2 %.

E.2 Discharge coefficient

Record flow rates at the nominal minimum, nominal medium and nominal maximum recommended inlet pressures. Calculate the discharge coefficient (K) as:

$$K = \frac{1}{3}\left(\frac{Q1}{P1^{1/2}} + \frac{Q2}{P2^{1/2}} + \frac{Q3}{P3^{1/2}}\right)$$

where

Q is the flow rate, in litres per minute;

P is the inlet pressure, in bar.

Suffixes 1, 2 and 3 relate to the minimum, nominal, and maximum.

E.3 Discharge characteristic

Record the flow rates at no less than five pressure increments across the operating range specified by the manufacturer. Present the results in the form of a graph of flow vs. inlet pressure.

Annex F
(normative)

Quality of foam from aspirating components

F.1 General

NOTE See 5.2.

To determine the expansion and drainage times of foams produced by aspirating components, the test procedures in EN 1568-1, and EN 1568-3, shall be used. For high expansion foams, the expansion ratio should be calculated based on the tests in Annex G.

F.2 Low expansion foams

The procedure in EN 1568-3:2018, Annex G shall be used with the exception that the foam making nozzle described in EN 1568-3:2018, G.1.3, Figure G.3 is replaced by the component being tested. The discharged foam shall be collected using the collector shown in EN 1568-3:2018, Figure G.2. Care shall be taken in locating the collector in relation to the component being tested to ensure that an adequate quantity and quality of foam is collected.

This test may be carried out in conjunction with Annex H of this standard for foam branchpipes.

Where high capacity branchpipes are being tested a foam collection duct and sample collecting shelter may be required.

F.3 Medium expansion foams

The procedure in EN 1568-1:2018, Annex G shall be used with the exception that the foam making nozzle described in EN 1568-1:2018, G.1.2, Figure G.2 is replaced by the component being tested. A separate foam collector is not required for this test. The discharged foam is collected in the vessel shown in EN 1568-1:2018, Figure G.1.

Annex G
(normative)

High expansion foam generator test

NOTE 1 See 5.2 and 4.10.2.

Carry out the test in a suitable enclosure (collection chamber) constructed with foam-tight walls and floor, with a wall height of (3 ± 0,1) m high and a volume sufficient for a discharge time of 60 s to 90 s and means of sufficient air displacement at an air temperature of (15 ± 10) °C with a water supply and foam concentrate suitable for use with the generator being tested.

Install the generator in the test facility in accordance with the manufacturer's instructions so that the lowest point of the outlet is at a height within 3,5 m to 4 m above the floor.

Wet the test walls and floor of the collection chamber and operate the generator at the manufacturer's stated minimum operating pressure. Start the test with the foam directed outside the collection chamber and when steady-state conditions are obtained, direct the foam into the collecting chamber and start the time measurement. Measure and record the foam solution flow rate and the pressure at the inlet to the generator, as described in Annex E in order to allow the calculation of foam production rate (m^3/min) and expansion ratio.

Allow the generator to fill the test facility to a height of approximately 3 m immediately in front of the outlet. Record the time taken.

Allow the depth of the foam layer to stabilize for 10 s to 15 s then measure and determine the average depth of the foam layer.

Calculate the volume of expanded foam generated per minute and the expansion ratio.

Repeat the test at the nominal and maximum stated pressures.

NOTE 2 This test is based on the assumption that the generator is mounted (or located) above the foam in a real installation.

Annex H
(normative)

Range tests for branchpipes

NOTE See 4.9.1.

Set up the aspirating component to discharge foam using water and foam concentrate at the manufacturer's specified concentration using a concentrate specified by the component manufacturer. Non-aspirating components shall be tested with water only.

Carry out the test at a wind speed of not more than 16 km/h (4,4 m/s). Direct the discharge downwind with the nozzle elevated at 30° to the horizontal. Allow the foam discharge to fall onto a hard surface at the same elevation as the component and visually estimate the maximum, minimum and the point of the ground pattern where the bulk of the foam falls. Record the distances from these points to the nozzle tip as the ranges at the minimum, median and maximum inlet pressures specified by the manufacturer. Record the wind speed and wind direction during each range measurement. The wind meter should be located at 4 m to 5 m height above ground level, not more than 10 m away from the foam branchpipe.

Test nozzles that have a variable discharge pattern at the settings that give maximum and minimum ranges.

Fixed branchpipes intended for covering diked areas shall be installed in accordance with the manufacturer's specifications.

Annex I
(normative)

Area coverage test for foam sprayers and nozzles

NOTE See 4.9.2.

Install, in a test chamber of dimensions shown in Figure I.1, four sprayer or nozzles of the same type, arranged in a square, on piping prepared for this purpose. Use the arrangement of the piping, sprayer or nozzles and containers shown in Figure I.1. Ensure the yoke arms of the sprayers/nozzles are parallel to the supply pipes. Pipes shall be sized to ensure minimal hydraulic pressure losses.

Distance between the ceiling and the deflector as specified by the manufacturer.

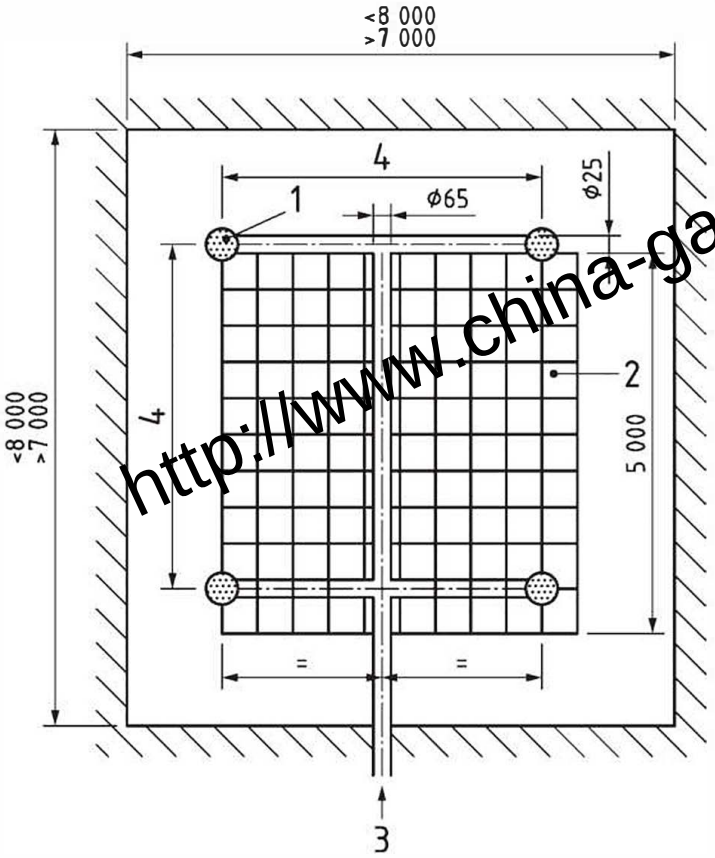
Fit the sprayers/nozzles directly into the horizontal pipework by means of “tee” or “elbow” fittings.

Position the square measuring containers, (with sides (500 ± 10) mm) centrally in the room beneath the four sprayers/nozzles with a distance of (2,7 ± 0,25) m between the ceiling and the upper edge of the measuring containers.

Discharge water through the sprayers/nozzles under test for at least 120 s at the nominal medium pressure and flowrate. Measure the volume of water in each measuring container and calculate the average coverage area in accordance with 4.9.2.2.

The test arrangement in EN 12259-1:1999+A1:2001, D.3 may be used.

Dimensions in millimetres



Key

1 sprinkler
2 measuring container
3 water flow
4 maximum spacing specified by the manufacturer

Figure I.1 — Layout of water distribution test chamber

Discharge water through the sprayers or nozzles under test for at least 120 s at the nominal pressure and flowrate. Measure the volume of water in the measuring containers.

Annex J
(normative)

Maximum flow and back pressure

J.1 General

NOTE See 4.9.3, 4.9.4, 4.9.5 and 4.9.6.

Carry out the test at an air temperature of (15 ± 10) °C and with a supply of water, suitable for use with the component and foam concentrate.

J.2 Flow

Install the foam component under test in a simulated portion of a flammable liquid storage tank or other test set up. Use a foam proportioner of a capacity equal to the maximum capacity of the component under test as stated by the manufacturer. Pass foam through the foam component at the minimum and maximum rated flow specified by the manufacturer. Record the inlet pressure and outlet pressure (back pressure) of the unit under test.

For foam chambers, ensure that the foam chamber is installed with the maximum vertical distance between foam maker and foam chamber as specified by the manufacturer if split into two components. Ensure that the vapour seal breaks and does not cause obstruction.

J.3 Back pressure

Mount the foam generator in a pipe section feeding a suitably sized vertical pipe reaching to a height specified by the manufacturer. For testing high back pressure foam generators the pipes shall be filled with liquid and a full bore test connection incorporated in the low level pipe downstream of the foam generator.

Allow the manufacturer's recommended foam solution to flow through the generator at the maximum rate specified by the manufacturer. Collect the foam delivered. Measure and record the foam expansion produced. Record the pressure upstream and downstream of the foam generator. Check that all data are within the manufacturer's figures.

J.4 Vapour seals

J.4.1 Vapour seal — upstream (foam inlet side)

Mount the vapour seal according to the manufacturer's instruction in the foam chamber. Connect a transparent hose mounted vertically to a minimum height of 3 m above the level of the upstream side vapour seal. Fill the hose slowly from the top to increase the pressure to 0,1 bar (corresponding to 1 m water column above the vapour seal). Ensure that the vapour seal does not break during 1 min. Slowly increase the pressure again and record the pressure (water column height) when the seal breaks.

At least three vapour seals should be tested.

J.4.2 Vapour seal — downstream (tank side)

Mount the vapour seal according to the manufacturer's instruction in the foam chamber. Connect a transparent hose to the downstream face, mounted vertically to a minimum height of 3 m above the level

of the vapour seal. Fill the hose slowly from the top to increase the pressure to 0,1 bar (corresponding to 1 m water column above the vapour seal). Ensure that the vapour seal does not break during 1 min. Slowly increase the pressure again and record the pressure (water column height) when the seal breaks.

At least three vapour seals should be tested.

Annex K
(normative)

Insertion and deployment of semi-subsurface hose

NOTE See 4.9.6.

Mount the semi-subsurface hose unit in the base of a tank wall, or mock-up thereof, in accordance with the manufacturer's instructions. Fill the tank/ mock-up with liquid. Connect the inlet of the semi-subsurface hose unit to a pressurized water supply incorporating an isolating valve and pressure gauge downstream of the isolating valve in order to monitor the pressure entering the semi-subsurface hose unit.

Slowly open the isolating valve to admit water under pressure into the semi-subsurface hose unit. Allow the pressure to build up slowly in order to determine the pressure at which the semi-subsurface hose is released into the tank/ mock-up.

Check that the hose inserts into the tank and deploys to sufficient extent for foam to discharge. Record the pressure at which the hose inserts.

Annex L
(normative)

Salt spray corrosion test

NOTE See 4.5.1.

The sample shall be exposed to a salt spray within a fog chamber in accordance with ISO 9227. Inlet and outlet openings of the device shall be sealed except for one opening which should be fitted with an open bend to prevent direct influence of the salt spray to the component's interior.

The essential components and properties of the reagents and the test configuration are:

— Solution consists of NaCl in distilled water;

— pH Value: 6,5 to 7,5;

— concentration of the solution: (5 ± 1) %;

— spray pressure: 0,6 bar to 1,5 bar;

— spray volume: 1 ml/h to 2 ml/h on an area of 8 000 mm²;

— temperature in fog chamber ($35^{+1,0}_{-1,7}$) °C;

— position of the sample 15° from the vertical axis;

— spray time (240 ± 2) h;

— drying time (168 ± 5) h at s humidity of maximum 70 %.

For large, non-moving parts and none pressure components the test may be carried out using representative material samples. Sub-assemblies of moving parts may be tested.

Annex M
(normative)

Stress corrosion test

NOTE See 4.5.2.

Use a suitable container of known capacity fitted with a capillary tube vent. The aqueous ammonia solution shall have a specific mass of 0,94 kg/l ± 2 %. The container is fitted with (10 ± 0,5) ml of solution for each litre of container volume.

Degrease the sample for test and expose for (10^{+1}_{-0}) days to the moist atmosphere of ammonia and air, at a temperature of (34 ± 2) °C. The samples are positioned (40 ± 5) mm above the level of the liquid.

After testing, the sample is cleaned and dried and subjected to careful visual examination. To make cracking clearly visible, the liquid penetration method shall be used.

For large components the test may be carried out using representative material samples e.g. where the large component comprises a cast and machined component the test piece shall be similarly cast and machined.

Annex N
(normative)

Internal corrosion test

NOTE See 4.5.3.

Fully fill the passageways from the inlet of the device with a 1 % m/m solution of sodium chloride in demineralized water. Store for 3 months ± 5 days at a temperature of (20 ± 5) °C.

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