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Fire protection — Automatic sprinkler systems —

Part 4: Requirements and test methods for quick opening devices

Protection contre l'incendie — Systèmes d'extinction automatique du type sprinkler —
Partie 4: Exigences et méthodes d'essai des dispostifs a ouverture rapide

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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 of the voluntary nature of standards, 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 www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 21, *Equipment for fire protection and fire fighting*, Subcommittee SC 5, *Fixed firefighting systems using water*.

This second edition cancels and replaces the first edition (ISO 6182-4:1993), which has been technically revised.

A list of all the parts in the ISO 6182 series, can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Fire protection — Automatic sprinkler systems —

Part 4: Requirements and test methods for quick opening devices

1 Scope

This document specifies the performance and testing requirements for accelerators used with dry pipe valves in fire protection systems to hasten the operation of the valves when one or more sprinklers operate.

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.

ISO 49, *Malleable cast iron fittings threaded to ISO 7-1*

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*

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
accelerator
quick-opening device which hastens the operation of a dry pipe valve using mechanical means other than by reducing installation pipework pressure

Note 1 to entry: For the purposes of this document, the term accelerator refers to an accelerator and any (internal or external) *antiflooding device* (3.2).

3.2
antiflooding device
device intended to prohibit excessive water or other foreign matter from entering any relevant part or parts of the accelerator where this might prevent subsequent operation

3.3
corrosion-resistant material
metallic material of bronze, brass, copper-nickel alloys metal, austenitic stainless steel, or equivalent, or plastic material conforming with the requirements of this document

3.4
rated working pressures
maximum service pressure at which an accelerator is intended to operate

3.5
service pressure
static water pressure at the inlet to a dry pipe valve when the accelerator and the dry pipe valve are in the ready condition

3.6
holding chamber
chamber pressurized with system air pressure which actuates an accelerator upon a sufficient rate of loss of system air pressure

4 Requirements

4.1 Rated working pressure

The rated working pressure shall be not less than 1,2 MPa (12 bar).

4.2 Leakage test (see 6.4)

4.2.1 There shall be no leakage of an accelerator when a pneumatic pressure of 0,7 MPa (7 bar) is applied for 1 min in accordance with 6.4.1.

4.2.2 There shall be no leakage of an accelerator when an internal hydrostatic pressure of twice the rated working pressure is applied for 5 min when tested in accordance with 6.4.2.

4.3 Bodies and covers

4.3.1 Accelerator bodies and covers shall be made of a material having a corrosion resistance at least equivalent to cast iron.

4.3.2 The dimension of all connections shall conform with the applicable requirements of international standards. If international standards are not applicable, national standards shall be permitted to be used.

4.3.3 Non-metallic materials, other than gaskets and pipe seals, or metals with a melting point of less than 650 °C (other than for pipe jointing purposes) shall not form part of the body of accelerators.

4.3.4 It shall not be possible to assemble the accelerator with any cover plate in a position which either improperly indicates flow direction or prevents proper operation of the device.

4.4 Strength test (see 6.5)

4.4.1 All parts of an accelerator shall withstand a hydrostatic pressure of four times the rated working pressure for 5 min, without permanent distortion when tested in accordance with 6.5.

4.4.2 If the test in accordance with 6.5 is not done with standard production fasteners, documentation shall be provided to demonstrate that the calculated design load of any standard production fastener, neglecting the force required to compress the gasket, does not exceed the minimum tensile strength

specified in ISO 898-1 and ISO 898-2 when the accelerator is pressurized to four times the rated working pressure. The area of the application of pressure shall be calculated as follows:

a) if a full gasket is used, the area of force application is that extending out to a line defined by the inner edge of the bolts;

b) if an "O"-ring seal or ring gasket is used, the area of force application is that extending out to the centerline of the "O"-ring or gasket.

4.5 Components

4.5.1 It shall be possible to disassemble and reassemble all parts intended for field replacement.

4.5.2 Springs and diaphragms shall not fracture or rupture during 5 000 cycles of normal operation, when tested in accordance with 6.2.

4.5.3 There shall be no sign of damage on visual examination of the sealing element after testing for the operational requirements of 4.10.

4.5.4 If malleable cast iron fittings are used, they shall conform to the appropriate requirements of ISO 49.

4.5.5 Where rotation or sliding motion is required, the part and its bearing shall be made of corrosion-resistant material. Materials lacking corrosion resistance may be used provided that they are fitted with bushings, inserts, or other parts made of corrosion-resistant materials at those points where freedom of movement is required.

4.6 Non-metallic components (excluding gaskets, diaphragms and seals)

Non-metallic components that may affect proper function of the accelerator as defined in this document shall be subjected to the applicable ageing of its non-metallic parts, as described in 6.3.1 and/or 6.3.2, using separate sets of samples, as applicable. After aging, an accelerator shall meet the requirements of 4.2 (leakage) and 4.10 (operation).

4.7 Clearances

A minimum clearance of 3,0 mm shall be provided between moving parts and between stationary and moving parts not constructed of corrosion-resistant materials.

4.8 Protection of orifices

Orifices and other passages of an accelerator for water or air flow less than 3 mm shall be protected from clogging by installation of a strainer/filter. The maximum dimension of any opening in the strainer/filter shall not exceed 70 % of the smallest opening to be protected. The total area of the openings in the strainer/filter shall be at least twenty times the area of the openings to be protected.

4.9 Gauge connection

A connection shall be provided to the holding chamber of an accelerator for a suitable pressure gauge which will facilitate the detection of a clogged pressure-equalizing orifice.

4.10 Operation (see 6.6)

An accelerator shall not trip a specific dry pipe valve type when tested in accordance with 6.6.1.

An accelerator shall operate a specific dry pipe valve type in accordance with 6.6.2. When the rate of system air pressure decay exceeds a specific rate as a result of the operation of one or more sprinklers with a k factor of 80.

4.11 Equilibrium time (see 6.7)

The equilibrium time shall not exceed 3 min when tested in accordance with 6.7.

5 Production testing and quality control

5.1 It shall be the responsibility of the manufacturer to implement a quality control programme to ensure that production continuously meets the requirements of this document.

5.2 Every accelerator manufactured shall pass an aerostatic pressure test in accordance with 4.2.1.

5.3 Every accelerator manufactured shall pass a test of operation which verifies correct function.

6 Performance tests

6.1 General

Representative samples of each accelerator type shall be subjected to the tests described in these requirements.

6.2 Metallic materials, components (see 4.5.2)

Samples of a spring and diaphragm employed in an accelerator shall be subjected to 5 000 cycles of normal operation. The tests shall be conducted at a rate not exceeding 6 cycles per min.

6.3 Non-metallic components (see 4.6)

6.3.1 Air-oven ageing for non-metallic components (excluding gaskets, diaphragms, and seals) normally exposed to air

Four untested samples of each component shall be aged in an air oven at 120 °C ± 2 °C for 180 days. The samples shall be tested in contact with the mating materials under stresses comparable to the intended use at rated working pressure. The components shall be supported so that they do not touch each other or the sides of the oven.

If a material cannot withstand the temperature indicated without excessive softening, distortion or deterioration, an air ageing test shall be conducted at a lower temperature, but not less than 70 °C, for a longer period of time.

The duration of exposure shall be calculated from Formula (1):

$$t = 737\,000\ \mathrm{e} - 0{,}069\,3\ T \qquad (1)$$

where

t is the exposure duration, expressed in days;

e is the base of natural logarithms (= 2,718 3);

T is the test temperature, expressed in degrees Celsius.

NOTE This formula is based on the 10 °C rule, i.e. for every 10 °C rise, the rate of a chemical reaction is approximately doubled. When applied to plastic ageing, it is assumed that the life at a temperature, T, in °C is half the life at (T − 10) °C.

The samples shall be removed from the oven and shall be allowed to cool to room temperature for at least 24 h. All post-exposure tests shall be conducted within 72 h.

The components shall be examined for cracking, warping, creep, or other signs of deterioration which would preclude the proper operation of the device. The parts are then to be assembled into valves and comply with the requirements of 4.2 and 4.10 when tested in accordance with 6.4.

6.3.2 Warm water ageing for non-metallic components (excluding gaskets, diaphragms, and seals) normally exposed to water

Four untested samples of each component shall be immersed in tap water at 87 °C ± 2 °C for 180 days. If a material cannot withstand the temperature indicated without excessive softening, distortion, or deterioration, a water-ageing test shall be conducted at a lower temperature, but not less than 70 °C, for a longer period of time. The duration of exposure shall be calculated from Formula (2):

$$t = 74\,857\ \mathrm{e} - 0{,}069\,3\ T \qquad (2)$$

where

- t is the exposure duration, expressed in days;
- e is the base of natural logarithms (= 2,718 3);
- T is the test temperature, expressed in degrees Celsius.

NOTE This formula is based on the 10 °C rule, i.e. for every 10 °C rise, the rate of a chemical reaction is approximately doubled. When applied to plastic ageing, it is assumed that the life at a temperature, T, in °C is half the life at (T − 10) °C.

The samples shall be removed from the water and shall be allowed to cool to room temperature for a minimum of 24 h. The components shall be examined for cracking, warping, creep, or other signs of deterioration which would preclude the proper operation of the device. The parts are then to be assembled into valves and shall comply with the requirements of 4.2 and 4.10 when tested in accordance with 6.4.

6.4 Leakage test (see 4.2)

6.4.1 The accelerator device shall be pressurized pneumatically at 0,7 MPa (7 bar) for 1 min. The device shall be assessed in accordance with 4.2.1.

6.4.2 There shall be a connection for hydrostatically pressurizing the downstream connection and the means of venting the air and pressurizing fluid. The device shall by hydrostatically pressurized internally to two times the rated working pressure, but not less than 2,4 MPa (24 bar) for a period of 5 min. The device shall be assessed in accordance with 4.2.2.

6.5 Strength test (see 4.4)

There shall be a connection for hydrostatically pressurizing the downstream connection and the means of venting the air and pressurizing fluid. The device shall by hydrostatically pressurized internally to four times the rated working pressure, but not less than 2,4 MPa (24 bar) for a period of 5 min. The device shall be assessed in accordance with 4.4.1.