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Fire protection — Automatic sprinkler systems —

Part 8: Requirements and test methods for pre-action dry alarm valves

Protection contre l'incendie — Systèmes d'extinction automatique du type sprinkler —
Partie 8: Exigences et méthodes d'essai des postes de préalarme sous air

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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. 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. www.iso.org/patents.

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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 6182-8:2006), which has been technically revised.

The main changes compared to the previous edition are as follows:

— clearances on a reciprocating type clapper has been modified.

A list of all 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 8: Requirements and test methods for pre-action dry alarm valves

1 Scope

This document specifies performance requirements, methods of test and marking requirements for pre-action dry alarm valves, valve sets and manufacturers' specified relevant trim used in non-interlock pre-action automatic fire protection systems. Performance and test requirements for other auxiliary components or attachments to pre-action dry valves are not covered by 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.

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:

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

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

3.1
alarm device
mechanical or electrical device to sound an alarm upon operation of the valve

3.2
anti-reseat latch
mechanical device that prevents the sealing assembly from returning to its closed position after operation

3.3
automatic drain valve
normally open device that vents the intermediate chamber of a valve to the atmosphere when the valve is in the ready position, and limits water flow from the chamber after the valve has tripped

3.4
clapper
type of sealing element

Note 1 to entry: See 3.16.

3.5
corrosion-resistant material
bronze, brass, Monel®[1)] metal, austenitic stainless steel, or equivalent, or plastic material conforming with the requirements of this document

3.6
differential
ratio of service pressure to system air pressure (expressed as gauge pressures) at the trip point

Note 1 to entry: See 3.20.

3.7
differential-type valve
type of valve in which air pressure in the system acts directly and/or indirectly on the sealing assembly to maintain it in the closed position

Note 1 to entry: The air seat of the sealing assembly is of equal or larger diameter than the diameter of the water seat of the sealing assembly, with the two separated by an intermediate chamber maintained at atmospheric pressure.

3.8
flow velocity
speed of water flow through a valve, expressed as the equivalent water velocity through a pipe of the same nominal size as the valve

3.9
intermediate chamber
part of a valve which separates the air and/or water sealing assembly seating surfaces and is at atmospheric pressure when the valve is in the ready condition

3.10
mechanical-type valve
type of valve in which the air pressure in the system acts on the sealing assembly and linking mechanism to maintain it in the closed position

3.11
non-interlock pre-action system
automatic fire protection system in which water is admitted to the system upon either activation of a supplemental detection system or loss of system pressure in combination with failure of the detection system

3.12
pre-action valve set
pre-action alarm valve or valve combination which holds air in a closed sprinkler system and which is opened by combination of sprinkler release and/or release system activation

3.12.1
pre-action valve Type A – non-interlocked
valve assembly which, under normal operating conditions, opens when either the release system or a sprinkler operates

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1) Monel® is a trademark of Special Metals Corporation and is an example of a suitable product available commercially. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO of this product. Equivalent products may be used if they can be shown to lead to the same results.

3.12.2
pre-action valve Type B1 – single-interlocked with fail safe
valve assembly which, under normal operating conditions, opens only on the activation of a release system

Note 1 to entry: Type B1 valves operate as a dry system in the event that the release system fails.

3.12.3
pre-action valve Type B2 – single-interlocked without fail safe
valve assembly, which under normal operating conditions, opens only on the activation of a release system

Note 1 to entry: Type B2 valves can only be manually operated in the event that the release system fails.

3.12.4
pre-action valve Type C1 – double-interlocked with fail safe
valve assembly, which under normal operating conditions, opens when both the release system and a sprinkler have operated

Note 1 to entry: Type C1 valves operate as a dry system in the event that the release system fails.

3.12.5
pre-action valve Type C2 – double-interlocked without fail safe
valve assembly, which under normal operating conditions, opens when both the release system and a sprinkler have operated

Note 1 to entry: Type C2 valves do not operate as a dry system and can only be manually operated in the event that the release system fails.

3.13
priming water
water used to seal a sealing assembly and prevent cementation of working parts

3.14
rated working pressure
maximum service pressure at which a valve is intended to operate

3.15
ready condition
state of a valve with the sealing assembly in the closed and set position with service and system pressure applied

3.16
sealing assembly
main movable sealing element (such as clapper or diaphragm) of the valve which prevents the reverse flow of air and which maintains air pressure in the system piping

3.17
sealing assembly seat ring
main fixed sealing element of a valve which prevents the reverse flow of water and which maintains air pressure in the system piping

3.18
service pressure
static water pressure at the inlet to a valve when the valve is in the ready condition

3.19
system pressure
pressure at the main outlet of a valve when the valve is in the ready condition

3.20
system air pressure
static air pressure in the system piping when the valve is in the ready condition

3.21
trim
external equipment and pipework, excluding the main installation pipework, fitted to valve installation assembly

3.22
trip point
point at which a valve operates, admitting water into the system, measured in terms of the system air pressure at a given service pressure

3.23
water-motor alarm
hydraulically actuated device which provides a local audible alarm as a result of a flow through a valve

4 Requirements

4.1 Nominal sizes

The nominal size of a pre-action alarm valve set shall be the nominal diameter of the inlet and outlet connections, i.e. the pipe size for which the connections are intended. The sizes shall be 40 mm, 50 mm, 65 mm, 80 mm, 100 mm, 125 mm, 150 mm, 200 mm, 250 mm, or 300 mm. The diameter of the waterway through the sealing assembly seat ring(s) may be less than the nominal size.

4.2 Connections

4.2.1 All connections shall be designed for use at the rated working pressure of the pre-action alarm valve set.

4.2.2 The dimensions of all connections shall conform to the applicable requirements of International Standards. If International Standards are not applicable, national standards may be used.

4.2.3 An opening with a nominal diameter not smaller than 15 mm shall be provided for an alarm line connection.

4.2.4 If priming water is required to seal the downstream side of the sealing assembly, internal or external means shall be provided to allow the introduction of the priming water.

4.2.5 Means shall be provided to prevent water columning and to check the level of priming water (if required).

4.2.6 Suitable means shall be provided to facilitate testing of alarms without tripping the valve.

4.2.7 For differential-type pre-action alarm valve sets, suitable means shall be provided to vent water from the intermediate chamber and to prevent a partial vacuum between the upstream and downstream sealing elements of the sealing assembly.

4.3 Rated working pressure

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

4.3.2 Inlet and outlet connections may be machined for lower working pressures to match installation equipment provided the valve is marked with the lower working pressure. See 7.3 f).

4.4 Body and cover

4.4.1 The body and cover shall be made of a material having corrosion resistance at least equivalent to cast iron.

4.4.2 Cover fasteners shall be made of steel, stainless steel, titanium, or other materials with equivalent physical and mechanical properties.

4.4.3 Non-metallic materials other than gaskets, diaphragms and seals or metals with a melting point less than 800 °C shall not form part of the valve body or cover.

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

4.5 Strength

4.5.1 An assembled pre-action alarm valve set, with the sealing assembly blocked open, shall withstand, without rupture, an internal hydrostatic pressure of four times the rated working pressure for a period of 5 min when tested as specified in 6.8.

4.5.2 If the test in accordance with 6.8 is not done with production fasteners, the supplier shall provide documentation showing that the calculated design load of any 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 valve 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-face gasket is used, the area of application of pressure 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 application of force is that extending out to the centreline of the "O"-ring or gasket.

4.6 Access for maintenance

Means shall be provided to permit access to working parts and removal of the sealing assembly. Any method adopted should permit ready maintenance by one person.

4.7 Components

4.7.1 Any component that is normally disassembled during servicing shall be designed so that it cannot be reassembled improperly without providing an external visual indication when the valve is returned to service.

4.7.2 With the exception of valve seats, all parts intended for field replacement shall be capable of being disassembled and reassembled using tools normally employed by the trade.

4.7.3 All components shall be non-detachable during normal operation of the valve.

4.7.4 Failure of the sealing assembly diaphragms or seals shall not prevent the valve from opening.

4.7.5 Seat surfaces of sealing assemblies shall be made of a corrosion-resistant material and have sufficient width of surface contact to withstand ordinary wear and tear, rough usage, compression stresses and damage due to pipe scale or foreign matter carried by the water.

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

4.7.7 There shall be no sign, on visual examination, of damage to the sealing assembly after testing for the operational requirements of 4.14 in accordance with 6.10 and 6.12.

4.7.8 When wide open, the sealing assembly shall bear against a definite stop. The opening of the valve or reaction of the water shall not permanently twist, bend or fracture valve parts.

4.7.9 Where rotation or sliding motion is required, the part or its bearing shall be made of a corrosion-resistant material. Materials lacking corrosion resistance shall be fitted with bushings, inserts or other parts made of corrosion-resistant materials at those points where freedom of movement is required.

4.7.10 A valve having a differential ratio of the sealing assembly exceeding of 1,16-to-1 for a water service pressure range of 0,14 MPa (1,4 bar) or the minimum service pressure [see Clause 8 d)], whichever is greater, to the rated working pressure shall be provided with an anti-reseat latch that prevents the valve from resetting automatically. The valve shall require manual means to return the valve to the ready (set) condition.

4.7.11 A valve having a differential ratio of 1,16-to-1 or less over a water service pressure range of 0,14 MPa (1,4 bar) or the minimum service pressure [see Clause 8 d)], whichever is greater, to the rated working pressure (1,4 bar to 12 bar) shall be provided with means to prevent the valve from automatically returning to the ready (set) condition and to permit draining of the pipework after the valve has tripped. Manual means shall be provided to return the valve to the ready (set) condition.

4.8 Leakage

4.8.1 There shall be no leakage, permanent distortion or rupture of a valve when an internal pressure of twice the rated working pressure is applied for 5 min with the sealing assembly open when tested in accordance with 6.7.1.

4.8.2 No leakage shall be permitted across the sealing assembly into the intermediate chamber or into the alarm port when tested in accordance with 6.7.2. There shall be no leakage, permanent distortion or rupture of a valve at an internal pressure of twice the rated working pressure applied to the upstream side of the sealing assembly for 2 h with the downstream end pressurized in accordance with 6.7.2.

4.8.3 Mechanical type pre-action alarm valve sets shall show no signs of leakage, permanent distortion or structural failure when subjected to an internal hydrostatic pressure of twice the rated working pressure applied for a period of 2 h to the upstream end of the valve with the sealing assembly closed and the downstream end vented in accordance with 6.7.3. Following this test, the valve shall operate in accordance with 4.14 when tested once in accordance with 6.9.4.2 at a service pressure of 0,2 MPa (2 bar).

4.8.4 Mechanical type valves shall withstand, without leakage, permanent distortion or structural failure, an internal hydrostatic pressure of twice the maximum air pressure specified by the manufacturer for a period of 5 min applied to the downstream side of the valve with the sealing assembly closed in accordance with 6.7.4. Following this test, the valve shall operate in accordance with 4.14 when tested once in accordance with 6.9.4.2 at a service pressure of 0,2 MPa (2 bar).

4.8.5 Differential type valves shall withstand, without leakage, permanent distortion or structural failure, an internal hydrostatic pressure of twice the rated working pressure for a period of 5 min applied to the downstream side of the valve with the sealing assembly closed in accordance with 6.7.5. Following this test, the valve shall operate in accordance with 4.14 when tested once in accordance with 6.9.4.2 at a service pressure of 0,2 MPa (2 bar).