INTERNATIONAL STANDARD

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Fire protection — Automatic sprinkler systems —

Part 2: Requirements and test methods for wet alarm valves, retard chambers and water motor alarms

Protection contre l'incendie — Systèmes d'extinction automatiques du type sprinkler —

Partie 2: Exigences et méthodes d'essai des soupapes d'alarme hydrauliques, des limiteurs de surpression et des dispositifs d'alarme à moteur hydraulique

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Contents

Page

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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 6182-2 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 6182-2:1993) which has been technically revised.

ISO 6182 consists of the following parts, under the general title *Fire protection — Automatic sprinkler systems*:

— *Part 1: Requirements and test methods for sprinklers*

— *Part 2: Requirements and test methods for wet alarm valves, retard chambers and water motor alarms*

— *Part 3: Requirements and test methods for dry pipe valves*

— *Part 4: Requirements and test methods for quick-opening devices*

— *Part 5: Requirements and test methods for deluge valves*

— *Part 6: Requirements and test methods for check valves*

— *Part 7: Requirements and test methods for early suppression fast response (ESFR) sprinklers*

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

— *Part 9: Requirements and test methods for water mist nozzles*

— *Part 10: Requirements and test methods for domestic sprinklers*

— *Part 11: Requirements and test methods for pipe hangers*

— *Part 12: Requirements and test methods for grooved end pipe couplings*

— *Part 13: Requirements and test methods for extended coverage sprinklers*

Introduction

This part of ISO 6182 is one of a number of ISO International Standards prepared by ISO/TC 21 covering components for automatic sprinkler systems, including the following:

a) carbon dioxide systems (ISO 6183);

b) explosion suppression systems (ISO 6184);

An International Standard covering foam systems is planned.

Fire protection — Automatic sprinkler systems —

Part 2: Requirements and test methods for wet alarm valves, retard chambers and water motor alarms

1 Scope

This part of ISO 6182 specifies performance, requirements, methods of test and marking requirements, for wet alarm valves, retard chambers, water motor alarms and manufacturers' specified relevant trim used in wet pipe automatic fire protection systems.

Performance and test requirements for other auxiliary components or attachments to alarm valves are not covered by this part of ISO 6182.

2 Normative references

The following referenced documents are indispensable for the application 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 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 188, *Rubber, vulcanized or thermoplastic — Accelerated aging and heat resistance tests*

ISO 898-1, *Mechanical properties of fasteners made of carbon steel and alloy steel — Part 1: Bolts, screws and studs*

ISO 898-2, *Mechanical properties of fasteners — Part 2: Nuts with specified proof load values — Coarse thread*

3 Terms and definitions

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

3.1
alarm device
mechanical or electrical device which sounds an alarm upon operation of the valve

3.2
clapper
type of sealing assembly

NOTE See also 3.12.

3.3
compensator
external or internal device such as an auxiliary valve that minimizes false alarms caused by a small increase of service pressure

3.4
corrosion-resistant material
bronze, brass, Monel [1] metal, austenitic stainless steel, or equivalent metallic or plastic material conforming with the requirements of this document

3.5
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

3.6
rated working pressure
maximum service pressure at which a valve or retard chamber intended to operate

3.7
ready (set) condition
state of a valve with the sealing assembly in the closed or set position with service and system pressure applied

3.8
reinforced elastomeric element
element of clapper, clapper assembly or seat seals in a composite of an elastomeric compound with one or more other components

3.9
retard chamber
volumetric type of retard device designed to minimize false alarms caused by surges and fluctuations in sprinkler system water supplies

3.10
retard device
pneumatic, hydraulic or electric timer designed to minimize false alarms caused by surges and fluctuations in sprinkler system water supplies

3.11
retard time
difference in time for actuation of alarm devices, measured from the passage of water through the wet alarm valve port, with and without the retard chamber

3.12
sealing assembly
main movable sealing element (such as a clapper) of the valve which prevents the reverse flow of water

3.13
sealing assembly seat ring
main fixed sealing element of a valve which prevents the reverse flow of water

3.14
sensitivity
minimum rate of flow from a system outlet which will open the wet alarm valve, as indicated by satisfactory operation of alarms

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1) Monel is an example of a suitable product available commercially. This information is given for the convenience of users of this part of ISO 6182 and does not constitute an endorsement by ISO of this product.

3.15
service pressure
static water pressure at the inlet to a valve when the valve is in the ready condition

3.16
system pressure
static water pressure at the main outlet of a valve when the valve is in the ready condition

3.17
trim
external equipment and pipework, excluding the main installation pipework, fitted to the valve

3.18
waste of water
discharge of any water from the alarm port of a valve that is in the ready condition

3.19
water motor alarm
hydraulically actuated device which provides a local audible alarm as a result of a flow through an alarm valve

3.20
wet alarm valve
valve that permits flow of water into a wet sprinkler system, prevents the reverse flow of water and incorporates provision for actuation of an alarm under specified flow conditions

3.21
wet pipe system
an automatic fire protection system in which the piping contains water and is connected to a water supply so that water discharges upon operation of the sprinklers

4 Requirements

4.1 Nominal sizes

The nominal size of a valve shall be the nominal diameter of the inlet and outlet connections, i.e. the pipe size for which the connections are intended. Sizes shall be 40 mm, 50 mm, 65 mm, 80 mm, 100 mm, 125 mm, 150 mm, 200 mm or 250 mm. The diameter of the waterway through the sealing assembly seat ring shall be permitted to 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 valve.

4.2.2 The dimensions 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.

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

In the case of using pneumatic type retard device without water motor alarm, the connection may be a minimum of 8 mm.

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 shall be permitted to 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 Bodies and covers

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 If non-metallic materials other than gaskets and seals or metals with a melting point less than 800 °C form part of the body or cover, the valve assembly shall be subjected to a fire exposure test, as specified in 6.10. Following the fire exposure test, the sealing assembly shall open freely and fully and the valve shall withstand the body leakage test specified in 6.8.1 without permanent deformation or failure.

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 valve, 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 6.9.

4.5.2 If the test in accordance with 6.9 is not done with standard production fasteners, the supplier shall provide documentation showing that 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 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 centre line 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 shall permit ready maintenance by one person with a minimum of down time.

4.7 Components

4.7.1 Any component which is normally disassembled during servicing shall be designed so that it can not 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 Sealing surfaces of sealing assemblies shall have corrosion resistance equivalent to brass or bronze 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 50 000 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 6.11.

4.7.8 When wide open, the sealing assembly shall bear against a definite stop. The point of contact shall be located so that impact or reaction of the water flow will 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 The sealing assembly shall close towards the seat when water flow ceases. Springs shall be permitted to ensure full and proper seating.

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 in accordance with 6.8.1.

4.8.2 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 downstream side of the sealing assembly for 5 min with the upstream end vented in accordance with 6.8.2.1.

4.8.3 A valve shall not leak while being subjected to an internal hydrostatic pressure equivalent to a column of water 1,5 m high for 16 h in accordance with 6.8.2.2.

4.8.4 Sealing surfaces shall prevent leakage of water into the alarm port when the valve is tested in the ready position in accordance with 6.11.

4.9 Non-metallic components (excluding gaskets, seals and other elastomeric parts)

4.9.1 Non-metallic valve parts that affect proper valve function shall be subjected to the applicable ageing of its non-metallic parts, as described in 6.4 and 6.5, using separate sets of samples, as applicable. After aging, a valve shall meet the requirements of 4.8, 4.13 and 4.14.4 when tested in accordance with the applicable tests described in 6.6, 6.8 and 6.11.

4.9.2 There shall be no cracking, warping, creep or other signs of deterioration, which could preclude proper operation of the valve.

4.10 Sealing assembly elements

4.10.1 A seal made of elastomeric or other resilient materials shall not adhere to the mating surface when tested in accordance with 6.3.1. Where the same design of seat is used for more than one size of valve, it shall be permitted to only test the size with the highest stress on the seating surface.

4.10.2 Any non-reinforced elastomer forming the seal shall have the following properties when tested in accordance with 6.3.2 and the appropriate sections of ISO 37:

a) maximum set of 5 mm when 25 mm long marks are stretched to 75 mm, held for 2 min and measured 2 min after release;

b) either:

   1) minimum tensile strength 10 MPa (100 bar) and minimum ultimate elongation 300 % (25 mm to 100 mm); or

   2) minimum tensile strength 15 MPa (150 bar) and minimum ultimate elongation 200 % (25 mm to 75 mm);

c) after exposure to oxygen for 96 h at (70 ± 1,5) °C and 2,0 MPa (20 bar), the tensile strength and ultimate elongation shall be not less than 70 % of the corresponding properties of specimens which have not been heated in oxygen, and any change in hardness shall not be greater than 5 type-A durometer units;

d) after immersion in distilled water for 70 h at (97,5 ± 2,5) °C, the tensile strength and ultimate elongation shall not be less than 70 % of the corresponding properties of specimens which have not been heated in water and the change in volume of the specimens shall be not greater than 20 %.

4.10.3 A reinforced elastomeric sealing element shall be capable of being flexed without cracking or breaking and shall have a change in volumetric expansion not greater than 20 % when tested in accordance with 6.3.2.

4.10.4 For a composite of an elastomeric compound with one or more other components, the tensile strength of the combination shall be at least twice that of the elastomeric material alone.

4.11 Clearances

4.11.1 The radial clearance between a hinged sealing assembly and the inside walls in every position, except wide open, shall not be less than 12 mm for cast iron bodies and shall not be less than 6 mm if the body and sealing assembly are of cast iron or steel with corrosion protective coatings tested in accordance with 6.14, non-ferrous material, stainless steel or materials having equivalent physical, mechanical and corrosion resistant properties. See Figure 1 a).

4.11.2 There shall be a diametrical clearance of not less than 6 mm between the inner edges of a seat ring and the metal parts of a hinged sealing assembly when the valve is in the closed position. See Figure 1 b).

4.11.3 Any space in which the sealing assembly can trap debris beyond the seat shall be not less than 3 mm deep.

4.11.4 The diametrical clearance ($D_2 - D_1$) between hinge pins and their bearings shall be not less than 0,125 mm. See Figure 1 b).

4.11.5 The total axial clearance between the clapper hinge and adjacent valve body bearing surfaces shall be not less than 0,25 mm. See Figure 1 c).

4.11.6 Any reciprocating guide components, which are essential to allow a valve to open, shall have a minimum diametrical clearance of not less than 0,7 mm in that portion over which the moving component enters the fixed component and of not less than 0,05 mm in that portion of the moving component continuously in contact with the fixed component in the ready (set) position.

4.11.7 Sealing assembly guide bushings or hinge-pin bearings shall project a sufficient axial distance to maintain not less than 1,5 mm (Clearance A) clearance between ferrous metal parts. See Figure 1. Clearance less than 1,5 mm shall be permitted where adjacent parts are of bronze, brass, Monel [1)] metal, austenitic stainless steel, titanium, or similar corrosion resistant materials. When corrosion resistance of steel parts is provided by a protective coating, the parts shall show no visible signs of deterioration of the coating such as blistering, delamination, flaking or increased resistance to movement when tested in accordance with 6.14.

4.11.8 If provided, a compensator shall be designed such that deposits or sediment will not readily accumulate to an extent sufficient to interfere with its proper operation. There shall be sufficient clearances between the working parts to allow proper sealing of the main and any auxiliary valves.

4.12 Hydraulic friction loss

The maximum pressure loss across the valve at the appropriate flow given in Table 1, as tested by the method of 6.7, shall not exceed 0,04 MPa (0,4 bar). If the pressure loss exceeds 0,02 MPa (0,2 bar), the pressure loss shall be marked on the valve. See 7.3 j).