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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: Prescriptions 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

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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.

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.

International Standard ISO 6182-2 was prepared by Technical Committee ISO/TC 21, *Equipment for fire protection and fire fighting*, Sub-Committee SC 5, *Fixed fire extinguishing systems*.

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*

Annex A of this part of ISO 6182 is for information only.

Introduction

ISO 6182 comprises several parts prepared by ISO/TC 21 covering components for automatic sprinkler systems.

ISO 6182 is included in a series of International Standards planned to cover:

— carbon dioxide systems (ISO 6183);

— explosion protection systems (ISO 6184);

— foam systems (ISO 7076).

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 gives performance and other requirements, recommendations and tests for wet alarm valves, retard chambers, water motor alarms and relevant trim as specified by the manufacturers, used in wet pipe automatic sprinkler systems for fire protection service.

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

All pressure data in this part of ISO 6182 are given as gauge pressure in bar[1].

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 6182. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 6182 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 37:1977, *Rubber, vulcanized — Determination of tensile stress-strain properties.*

ISO 898-1:1988, *Mechanical properties of fasteners — Part 1: Bolts, screws and studs.*

ISO 898-2:1992, *Mechanical properties of fasteners — Part 2: Nuts with specified proof load values — Coarse thread.*

3 Definitions

For the purposes of this part of ISO 6182, the following definitions apply.

3.1 clapper: A type of sealing assembly (see 3.10).

3.2 compensator: External or internal device such as an auxiliary valve which minimizes false alarms caused by a small increase of service pressure.

3.3 corrosion-resistant material: Corrosion-resistant materials shall be either:

— metallics of bronze, brass, Monel metal, austenitic stainless steel, or equivalent; or

— plastics conforming with, as appropriate, 4.9.1, 4.9.2, 5.7.3, 5.7.4 and 6.1.2.

3.4 flow velocity: The rate of water flow through a wet alarm valve expressed as the equivalent water velocity through a pipe of the same nominal size as the wet alarm valve.

3.5 rated working pressure: Maximum service pressure at which a wet alarm valve or retard chamber is intended to operate.

3.6 ready condition: State of a wet alarm valve installed in a piping system and filled with water from a water supply of stable pressure, when there is no

1) 1 bar = 10^5 Pa = 0,1 MPa

water flow from any outlet of the system downstream from the alarm valve sealing assembly.

3.7 reinforced elastomeric element: Element of clapper, clapper assembly or seat seals in a composite of an elastomeric compound with one or more other components that increase the tensile strength of the combination to a least twice that of the elastomeric material alone.

3.8 retard chamber: Volumetric device designed to minimize false alarms caused by surges and fluctuations in sprinkler system water supplies.

3.9 retard time: Difference in time taken for actuation of alarm devices, measured from the passage of water through the wet alarm valve port, with and without the retard chamber.

3.10 sealing assembly: Main movable sealing element (such as a clapper) of the valve which prevents the reverse flow of water.

3.11 sealing assembly seat ring: Main fixed sealing element of a wet alarm valve which prevents the reverse flow of water.

3.12 sensitivity: Minimum rate of flow from a system outlet which will open the wet alarm valve, as indicated by satisfactory operation of alarms (see 4.12).

3.13 service pressure: Static water pressure at the inlet to a wet alarm valve when the valve is in the ready condition.

3.14 system pressure: Static water pressure at the main outlet of a wet alarm valve when the valve is in the ready condition.

3.15 trim: External equipment and pipework, excluding the main installation pipework, fitted to a wet alarm valve installation assembly.

3.16 waste of water: Discharge of any water from the alarm port of a wet alarm valve that is in the ready condition.

3.17 water motor alarm: Hydraulically actuated device which provides a local audible alarm as a result of flow through a wet alarm valve.

3.18 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.

4 Wet alarm valve requirements

4.1 Nominal sizes

The nominal size of a wet alarm 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.

NOTE 1 The diameter of the waterway through the sealing assembly seat ring may be less than the nominal size.

4.2 Connections

All connections shall be suitable for use at the rated working pressure of the wet alarm valve.

NOTE 2 The dimensions of all connections should conform to International Standards, where these exist. National standards may be used where International Standards are not appropriate.

4.3 Rated working pressures

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

Inlet and outlet connections may be machined for lower working pressure to match installation equipment of a lower working pressure, in which case the valve shall be marked with the lower pressure [see 9.2 f)].

4.4 Bodies and covers

4.4.1 If non-metallic materials (other than gasket and seals) or metals with a melting point of less than 800 °C form part of the wet alarm valve body or cover, the assembled valve, after subjection to the fire exposure test of 8.11, shall withstand a hydrostatic pressure test (see 4.14.3) without permanent deformation or failure and the sealing assembly shall open freely and fully.

4.4.2 The body and cover shall be made of a material with corrosion resistance at least equivalent to that of cast iron. For extreme corrosion conditions, other materials can be necessary.

4.4.3 It shall not be possible to assemble the wet alarm valve with the cover plate in a position which improperly indicates flow direction or so affects the operation of the valve that it does not meet the requirements of this part of ISO 6182 [also see 9.2 d) and 9.2 h)].

4.5 Strength

4.5.1 The assembled wet alarm valve with the sealing assembly open shall withstand, without rupture, an internal hydrostatic pressure of four times the rated working pressure, for a period of 5 min when tested in accordance with 8.7.

4.5.2 The calculated design load of any fastener, neglecting the force required to compress the gasket, shall not exceed the minimum tensile strength specified in ISO 898-1 and ISO 898-2 when the wet alarm 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 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 is that extending out to the centre-line of the "O"-ring or gasket.

4.6 Drain

The wet alarm valve shall be provided with a tapped opening to drain water from the valve body when the valve is installed in any position specified or recommended by the manufacturer. The minimum opening size shall be 20 mm nominal.

NOTE 3 If the drain opening on the valve is to be used for draining pipework, then the size of the opening should comply with any national standard which may be applicable (see 4.2).

4.7 Access for maintenance

Means shall be provided to permit access to working parts and to allow removal of the sealing assembly.

NOTE 4 Any method adopted should permit ready maintenance by one person with a minimum of down time.

4.8 Components

4.8.1 Where practicable, the design of any component which may normally be disassembled during servicing shall be such that it cannot be reassembled wrongly, without providing an external visual indication when the wet alarm valve is returned to service.

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

4.8.2 The sealing assembly shall fall towards the seat when water flow ceases.

NOTE 5 Springs may be used to ensure full and proper seating.

4.8.3 Springs and diaphragms shall not fracture or rupture during 50 000 cycles of normal operation, when tested in accordance with 8.1.

4.8.4 There shall be no sign, on visual examination, of damage to the sealing elements of the wet alarm valve after testing for the operational requirements of 4.12 in accordance with 8.8.

4.8.5 When wide open, the clapper or clapper assembly shall bear against a definite stop. The point of contact shall be located so that impact or the reaction of the water will not permanently twist, bend or fracture the parts after testing for the operational requirements of 4.12 in accordance with 8.8.

4.8.6 Seat rings not made of bronze shall have corrosion resistance at least equivalent to that of bronze. In addition, any part and its bearing, where rotation or sliding motion is required, shall either be made of a corrosion-resistant material or shall be fitted with brushings, inserts, or other parts made of corrosion-resistant materials, at those points where freedom of movement is required.

4.9 Non-metallic components (excluding gaskets and seals)

4.9.1 After ageing of its non-metallic parts as described in 8.2 and 8.3 (using separate samples), a wet alarm valve shall meet the requirements of 4.12 and 4.14 when tested in accordance with 8.6 and 8.8.

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

4.10 Sealing assembly elements

4.10.1 Sealing surfaces shall prevent leakage of water when the wet alarm valve is tested in accordance with 8.8.3.

Valve sealing surfaces shall be able to withstand ordinary wear and tear, rough usage, compression stresses and damage due to pipe scale or foreign matter carried by the water.

4.10.2 A seal made of elastomeric or other resilient materials shall not adhere to the mating surface when tested in accordance with 8.4.

NOTE 6 Where the same design of seat is used for more than one size of wet alarm valve, only a sample of the size

with the highest stress on the seating surface need be tested.

4.10.3 Any non-reinforced elastomer forming the seal shall have the following properties when tested in accordance with 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; and

b) either:

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

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

and after exposure to oxygen for 96 h at (70 ± 1,5) °C and 20 bar (2,0 MPa):

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 oxygen, and any change in hardness shall not be greater than 5 type A durometer units,

and after immersion in distilled water at (97,25 ± 1,5) °C for 70 h:

d) 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 of volume of the specimens shall not be greater than 20 %.

4.11 Clearances

NOTE 7 Clearances are necessary between moving parts and between moving and stationary parts so that corrosion or deposits of foreign matter within an assembly will not render a wet alarm valve sluggish in action or inoperative.

4.11.1 The radial clearance [see figure 1 a)] between a hinged sealing assembly and the inside walls in every position except the wide-open position, shall be not less than 12 mm for cast iron bodies and not less than 6 mm if the body and sealing assembly are of non-ferrous material, stainless steel or a combination.

4.11.2 There shall be a diametrical clearance [see figure 1 b)] 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 wet alarm valve is in the closed position.

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

4.11.4 The diametrical clearance [see figure 1 b)] between pins and their bearings shall be not less than 0,125 mm.

4.11.5 The total axial clearance, $l_2 - l_1$ [see figure 1 c)], between the clapper hinge and the adjacent wet alarm valve body bearing surfaces shall be not less than 0,25 mm.

4.11.6 Any reciprocating guide components in the main wet alarm valve body, the operation of which is essential to allow a wet alarm 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 position.

4.11.7 Clapper-guide bushings or hinge-pin bearings shall project a sufficient axial distance to maintain not less than 3 mm clearance between ferrous metal parts, see dimensions A in figure 1 c).

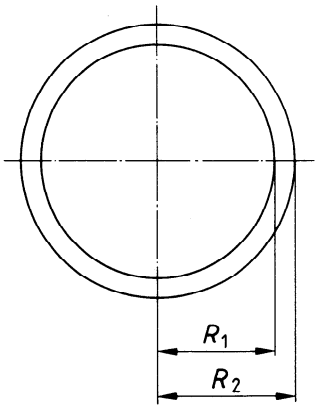
If provided, a compensator shall be such that deposits or sediment will not readily accumulate to an extent sufficient to interfere with its proper operation, and there should be sufficient clearances between the working parts to allow proper seating of the main and any auxiliary valves.

4.12 Operational performance

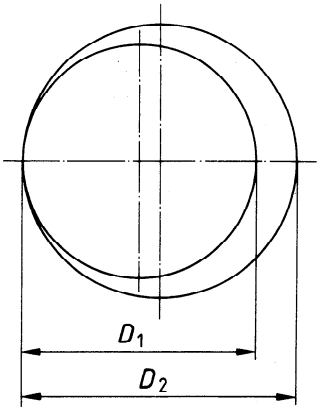
4.12.1 An assembled wet alarm valve shall withstand, without leakage, excessive permanent distortion or structural failure, an internal hydrostatic pressure of twice the rated working pressure for a period of 5 min applied at the downstream end with the sealing assembly closed and the upstream end vented when tested in accordance with 8.6.1.

The wet alarm valve shall meet the requirements of 4.12.2 and 4.12.3 when tested for sensitivity in accordance with 8.8.3 before and after the hydrostatic pressure test.

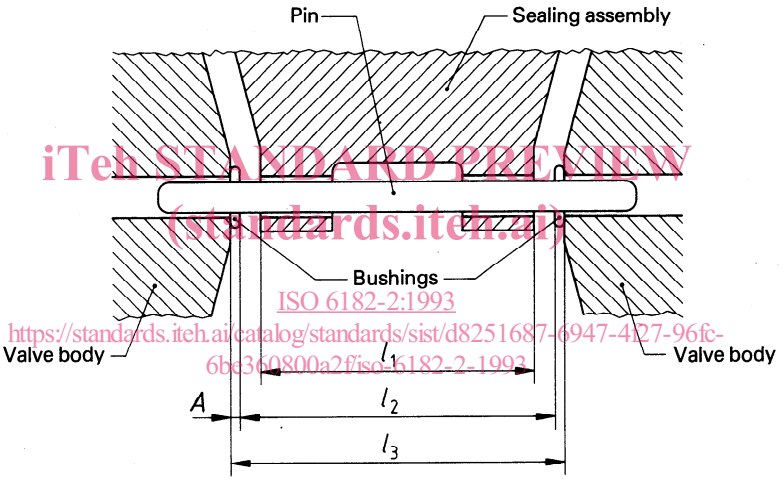
4.12.2 The wet alarm valve with associated trim shall not signal an alarm when discharge takes place downstream from the wet alarm valve at a flow rate of 15 l/min with a service pressure of 1,4 bar (0,14 MPa) when tested in accordance with 8.8.3.



a) Radial clearance = $R_2 - R_1$



b) Diametrical clearance = $D_2 - D_1$



c) Total axial clearance = $l_2 - l_1$; clearance, $A = \frac{l_3 - l_2}{2}$

Figure 1 — Clearances

4.12.3 The wet alarm valve with associated fittings shall signal an alarm when continuous discharge takes place downstream from the wet alarm valve at flow rates of

a) 60 l/min at a service pressure of 1,4 bar (0,14 MPa);

b) 80 l/min at a service pressure of 7 bar (0,7 MPa);

c) 170 l/min at a service pressure of 12 bar (1,2 MPa).

Wet alarm valves without a retard chamber shall initiate continuous operation of mechanical and electrical alarm devices within 15 s from the time that the downstream valve is opened. Wet alarm valves with retard chambers shall initiate continuous operation of mechanical and electrical alarm devices between 5 s and 90 s after the wet alarm valve opens as indicated by water flow from the retard chamber drain when tested in accordance with 8.8.3.

4.12.4 The wet alarm valve shall operate correctly, without adjustement, at service pressures within the range of 1,4 bar (0,14 MPa) to 12 bar (1,2 MPa), and flow velocities up to 5 m/s when tested in accordance with 8.8.3.

4.12.5 The ratio of service pressure to system pressure shall not exceed 1,16:1 at service pressures of 1,4 bar (0,14 MPa), 7 bar (0,7 MPa) and 12 bar (1,2 MPa), as measured by the opening of the sealing assembly and pressure equalization up-

stream and downstream of the sealing assembly when tested in accordance with 8.8.2.

4.12.6 The wet alarm valve shall stop water flow to audible alarm devices on cessation of water flow downstream of the wet alarm valve when tested in accordance with 8.8.3.

4.12.7 The wet alarm valve shall transmit successive alarms without requiring resetting when tested in accordance with 8.8.3.

4.12.8 The wet alarm valve shall provide at least 0,5 bar (0,05 MPa) at its alarm port or at the top of the retard chamber, if provided, at service pressures of 1,4 bar (0,14 MPa), while actuating relevant water motor alarms and electric alarm devices when tested in accordance with 8.8.3.

4.12.9 Means shall be provided to automatically drain the piping between the wet alarm valve, or any alarm shut-off valve, and the water motor alarm, as shown by the visual examination described in 8.8.1.

4.13 Hydraulic friction loss

The maximum pressure loss across the wet alarm valve at the appropriate flow given in table 1 as tested in accordance with 8.5.1 shall not exceed 0,4 bar (0,04 MPa). If the pressure loss exceeds 0,2 bar (0,02 MPa) it shall be marked on the valve [see 9.2 k)] and the operating instructions shall include the pressure loss value (see clause 10).

Table 1 — Required flow rates for pressure drop determination

Nominal size mm	Flow rate l/min
40	400
50	600
65	800
80	1 300
100	2 200
125	3 500
150	5 000
200	8 700
250	14 000

4.14 Leakage

4.14.1 There shall be no evidence of leakage past the sealing assembly when an assembled wet alarm valve is subjected to a hydrostatic pressure on the downstream side of the sealing assembly of twice the rated working pressure for 5 min, when tested in accordance with 8.6.1.

4.14.2 A wet alarm valve shall withstand without leakage at the valve seat, an internal hydrostatic pressure equivalent to the head of a column of water, 1,5 m high, for a period of 16 h when tested in accordance with 8.6.2.

4.14.3 There shall be no leakage, permanent distortion or rupture of a wet alarm valve at an internal hydrostatic pressure of twice the rated working pressure for a period of 5 min when tested in accordance with 8.6.3.

4.15 Endurance test

NOTE 8 This test may be performed concurrently with the hydraulic friction loss test (see 8.5).

The wet alarm valve and its moving parts shall show no sign of distortion, cracks, loosening, separation, or other sign of failure, when the flow rate specified in table 1 is maintained for 30 min.

5 Retard chamber requirements

5.1 Rated working pressure

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

5.2 Strength

A retard chamber shall withstand an internal hydrostatic pressure of twice the working pressure for 5 min without failure or leakage, when tested in accordance with 8.10.1.

5.3 Strainer

A strainer made of corrosion-resistant material shall be provided where water passages in retard chambers are 6 mm or less in diameter. The maximum dimension of a hole in the strainer shall not exceed two-thirds of the diameter of the smallest orifice to be protected by the strainer. The total area of the openings in the strainer shall be at least 20 times the area of the openings which the strainer is designed to protect.

5.4 Support

A retard chamber shall include means for its support. If piping is to be used for this support, the pipe size and the maximum length to be used shall be stated on the instruction charts provided with the wet alarm valve. (See clause 10.)

5.5 Connections

5.5.1 A tapped opening suitable for a pipe size not less than 20 mm shall be provided in a retard chamber for connection of alarm devices.

5.5.2 Any control valve fitted between a wet alarm valve and a retard chamber shall be of a type that can be locked or sealed in an open position. It shall have external means for visual indication of the open and closed positions.

5.6 Drain

A retard chamber shall be provided with means for automatic draining. The time for a retard chamber, including associated trim specified by the manufacturer, completely filled with water to drain to atmosphere shall not exceed 5 min when tested in accordance with 8.10.2.

5.7 Components

5.7.1 Springs and diaphragms shall not fracture or rupture during 50 000 cycles of normal operation, when tested in accordance with 8.1.

5.7.2 Where practicable, the design of any component which may normally be disassembled during servicing should be such that it cannot be reassembled wrongly.

NOTE 9 It should be possible to disassemble all parts (except the valve seat) intended for field replacement using only standard tools.

5.7.3 After ageing of the non-metallic parts as described in 8.2, a retard chamber shall meet the requirements of 4.12 when tested in accordance with 8.6 and 8.8.

5.7.4 After ageing of the non-metallic parts, as described in 8.3, a retard chamber shall meet the requirements of 4.12 when tested in accordance with 8.8.

6 Water motor alarm requirements

6.1 General

6.1.1 A water motor alarm shall be designed so that it can be readily installed and serviced without damage, using non-specialized tools.

Subassemblies intended to be assembled in the field as a unit shall be capable of being joined together without misalignment and without requiring any of the parts to be drilled, welded, or otherwise altered except for a part required to be cut to length and/or threaded.

6.1.2 After ageing of its non-metallic parts as described in 8.2 and 8.3, a water motor alarm shall show no cracking, warping, creep or other signs of deterioration which may preclude the proper operation of the water motor alarm.

Materials shall be resistant to the effects of temperature within the range of − 35 °C to + 60 °C and to the effects of sunlight excluding effects on colour.

6.1.3 Water motor alarm bearings shall be self-lubricating.

NOTE 10 All moving parts should require minimal maintenance.

6.1.4 Any water motor having a non-metallic bearing or pelten wheel shall be tested in an assembled condition in accordance with 8.9.4 following which it shall operate first at 0,5 bar (0,05 MPa) and then at 12 bar (1,2 MPa) for periods of 5 min each.

6.2 Connections

6.2.1 A water motor body shall have a threaded opening for the water supply connection of at least 20 mm nominal bore diameter. The water supply connection shall not leak or rupture when tested at 24 bar (2,4 MPa) in accordance with 8.9.3.

6.2.2 A water motor body shall have a threaded opening for the water drain connection of at least 50 times the area of water motor nozzle or jet.

6.3 Nozzles and strainers

Nozzles shall have a diameter of not less than 3 mm and shall be made of corrosion-resistant material. Sumps, strainers or other means of preventing foreign matter from entering the nozzle or jet shall be accessible for cleaning. Strainers shall be of corrosion-resistant material. The strainer shall have openings with a maximum dimension not exceeding two-thirds of the nozzle or port diameter. The total area of the openings in the strainer shall be at least 10 times the nozzle or port area.

6.4 Operation

A water motor and gong shall operate satisfactorily for the periods specified in table 2 when tested in accordance with 8.9.1.

Rotation of the striker shall commence at a pressure not greater than 0,35 bar (0,035 MPa) measured at the entrance to the nozzle.