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Third edition
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Fire protection — Automatic sprinkler systems —

Part 5: Requirements and test methods for deluge valves

Protection contre l'incendie — Systèmes d'extinction automatiques de type sprinkler —
Partie 5: Exigences et méthodes d'essai des postes déluges

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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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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.

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 6182-5 was prepared by Technical Committee ISO/TC 21, *Equipment for fire protection and fire fighting*, Subcommittee SC 5, *Fixed firefighting systems using water*.

This third edition cancels and replaces the second edition (ISO 6182-5:2006), 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 components for steel pipe systems*

Fire protection — Automatic sprinkler systems —

Part 5:
Requirements and test methods for deluge valves

1 Scope

This part of ISO 6182 specifies performance requirements, methods of test and marking requirements for deluge valves and manufacturer's specified relevant trim used in deluge and pre-action automatic fire protection systems. Deluge valves covered by these requirements can be operated by hydraulic, pneumatic, electric, mechanical, manual, or thermal means, or combinations thereof.

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

This part of ISO 6182 does not cover thermally operated valves released by heat acting directly on the valve. This type of valve utilizes a thermal device, such as the link-and-lever arrangement or glass bulb of a sprinkler, to hold the valve closed. Operation of the thermal device allows the valve to open.

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 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.

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

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

3.3
automatic drain
normally open device that automatically drains water from and 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
auxiliary pressure
pressure acting against an auxiliary diaphragm or piston, taken from either the service pressure or an external source

3.5
clapper
type of sealing element

NOTE See 3.20.

3.6
corrosion-resistant material
metallic material of bronze, brass, Monel®[1)] metal, austenitic stainless steel, or equivalent, or plastic material conforming with the requirements of this part of ISO 6182

3.7
deluge system
automatic fire protection system using a deluge valve which is operated by an auxiliary means to admit water into a system of non-automatic (open) sprinklers or nozzles

3.8
deluge valve
automatic water-supply control valve intended to be operated by an auxiliary means to admit water into a system of open piping for a deluge system, or system of closed piping for a pre-action system

NOTE The auxiliary means of operating a deluge valve can be mechanical, electrical, hydraulic, pneumatic, thermal, manual or a combination of these.

3.8.1
hydraulically operated deluge valve
deluge valve that is maintained in the set position by service hydraulic pressure acting against a diaphragm or piston that holds the sealing assembly closed

NOTE A change in pressure against the diaphragm or piston allows the valve to open. The pressure is changed by operation of a manual control, an electrical device such as solenoid valve, or hydraulically, thermally, or pneumatically operated device.

3.8.1.1
pressure-loss operated deluge valve
type of hydraulically operated deluge valve in which the valve is released from the set position by reducing the pressure acting against an auxiliary diaphragm or piston

3.8.1.2
supply-pressure operated deluge valve
type of hydraulically-operated deluge valve that is maintained in the set position by a spring or other means and is hydraulically operated by the application of service pressure to an auxiliary diaphragm or piston

3.8.2
mechanically operated deluge valve
deluge valve that is maintained in the set position by mechanical means

NOTE It is released mechanically, for example, by the action of a release weight.

3.9
dry pilot actuator
differential-type valve that, upon loss of pneumatic pressure from a dry pilot line, permits the operation of a hydraulically operated deluge valve

3.10
dry pilot line
pneumatic detection and actuation piping system fitted with heat responsive devices, usually sprinklers, which, when subjected to an abnormal source of heat, operates to release pressure from the piping system and dry pilot actuator, causing the automatic operation of a deluge valve

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.

3.11
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

3.12
intermediate chamber
that 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

3.13
leak point
system air pressure for a specific service pressure at which water begins to flow from the intermediate chamber, automatic drain valve or alarm connection

3.14
minimum opening pressure
minimum pressure when water begins to pass through the valve

3.15
pre-action system
automatic fire protection system using a deluge valve that is operated by an auxiliary means to admit water into a system of automatic sprinklers or other automatic spraying devices

3.16
priming water
water used to seal a sealing assembly and prevent cementation of working parts

3.17
rated working pressure
maximum service pressure at which a valve or retard chamber is intended to operate

3.18
ready (set) condition
state of a valve with the sealing assembly in the closed and set position with service and system pressure applied

3.19
reinforced elastomeric element
element of clapper, clapper assembly or seat seals in a composite of an elastomeric compound with one or more other components

3.20
sealing assembly
main movable sealing element of the valve, which prevents the flow of water through the valve when in the closed position

3.21
sealing assembly seat ring
main fixed sealing element of a valve that prevents the flow of water through the valve when in the closed position

3.22
service pressure
static water pressure at the inlet to a valve when the valve is in the ready condition

3.23
trim
external equipment and pipework, excluding the main installation pipework, fitted to valve installation assembly

3.24
trip point
pressure at which a valve operates, admitting water into the system

3.25
water-motor alarm
hydraulically actuated device which provides a local audible alarm as a result of a flow through a valve

3.26
wet pilot line
hydraulic detection and actuation piping system fitted with heat responsive devices, usually automatic sprinklers, which, when subjected to heat from a fire, operate to release pressure from the piping system causing the automatic operation of a deluge valve

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. 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 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 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.

4.2.4 If priming water is required to seal the downstream side of the sealing assembly, an external means shall be provided to introduce the priming water.

4.2.5 Means shall be provided to prevent or drain 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.

4.3 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 (see 6.8)

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 6.8.

4.5.2 If the test in accordance with 6.8 is not done with standard production fasteners, the supplier shall provide documentation showing 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 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 shall permit ready maintenance by one person with a minimum of down time.

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 have a 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 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 Means shall be provided 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 or external means shall be provided to return the valve to the ready (set) condition.

4.8 Leakage (see 6.7)

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 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 vented in accordance with 6.7.2.

4.9 Non-metallic components (excluding gaskets, diaphragms, seals and other elastomeric parts) (see 6.4 & 6.5)

Non-metallic valve parts that may affect proper valve function as defined in this International Standard 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 ageing, a valve shall meet the requirements of 4.8, 4.13 and 4.14 when tested in accordance with the applicable tests described in 6.9, 6.7 and 6.10.

4.10 Sealing assembly elements (see 6.3)

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 test only the size with the highest stress on the seating surface.

4.10.2 Sealing surfaces shall prevent leakage of water into the alarm port when the valve is tested in the ready position in accordance with 6.10.

4.11 Clearances

The requirements in 4.11 are applicable to hinged, clapper-type valves only.

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 [see Figure 1b)] between the inner edges of the seat ring and the metal parts of the sealing assembly when in the closed position (excluding any latching mechanisms) as follows:

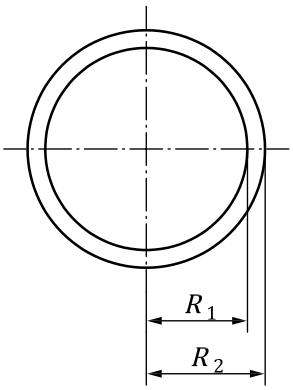
a) for compression snap-type sealing assemblies of corrosion resistant materials, the diametrical clearance shall be not less than 0,7 mm;

b) for other types of sealing assemblies, the diametrical clearance shall be not less than 3 mm.

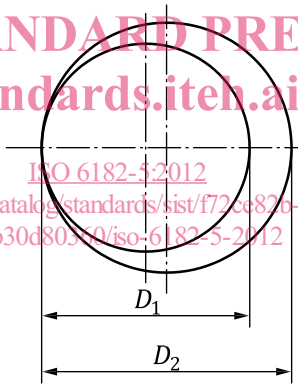
4.11.3 Any space in which the sealing assembly can trap debris beyond the seat shall be not less than 3 mm deep.

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).

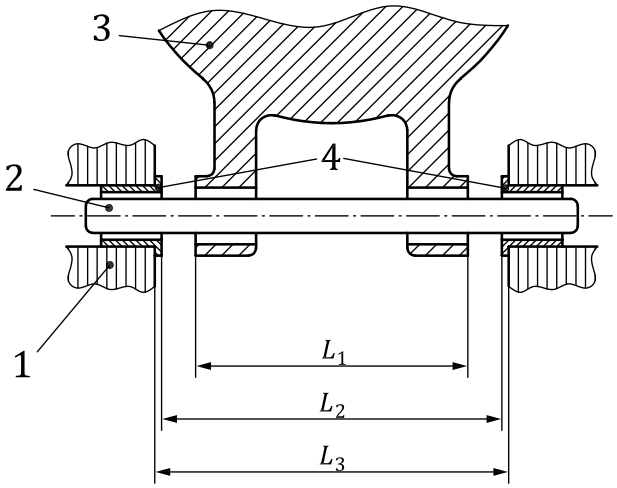
4.11.5 The total axial clearance between the clapper hinge and adjacent valve body bearing surfaces shall be not less than 0,25 mm. See Figure 1 c).



a) Radial clearance, $C_R = R_2 - R_1$



b) Diametrical clearance, $C_D = D_2 - D_1$



c) Total axial clearance, C_{TA} $C_{TA} = L_2 - t\ L_1$**; Bushing projection =** $(L_3\ t - L_2)/2$