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Part 17:
Requirements and test methods for pressure reducing valves

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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).

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.*

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 17: Requirements and test methods for pressure reducing valves

1 Scope

This document specifies performance requirements, methods of test and marking requirements for pressure reducing valves intended to reduce the downstream water pressure in the piping for water-based fire protection systems. Within the context of this document, pressure reducing valves include both pilot operated pressure reducing valves and direct acting pressure reducing valves. Performance and test requirements for other auxiliary components or attachments to pressure reducing valves are not within the scope of 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
corrosion-resistant material
bronze, brass, Monel®[1] metal, austenitic stainless steel, or equivalent, or plastic material conforming with the requirements of this document

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.

3.2
direct acting pressure reducing valve
pressure reducing valve utilizing a diaphragm or spring that responds directly to variations in downstream pressure to provide the necessary flow and pressure to a system

Note 1 to entry: Direct acting valves are subject to reduced pressure falloff where a decrease in downstream regulated pressure can occur when the flow increases.

3.3
main valve
part of the valve assembly that controls the flow of water

3.4
minimum opening pressure
pressure at which the valve is intended to start the flow of water

3.5
pilot valve
part of the valve assembly that controls the operating of the *main valve* (3.3)

3.6
pilot operated pressure reducing valve
hydraulically operated pressure reducing valve which reduces the water pressure in a fire protection system to a constant, specific value

Note 1 to entry: A pilot operated pressure reducing valve consists of a *main valve* (3.3) connected to a *pilot valve* (3.5) that is capable of changing the position of the closing mechanism in the valve in response to a change in the pre-set pressure.

3.7
pressure reducing valve
valve designed for the purpose of reducing the downstream water pressure under both flowing and nonflowing conditions

3.8
rated working pressure
maximum service pressure at which a valve is intended to operate

3.9
stuffing box
open area around the valve stem that is filled with the packing seal

4 Requirements

4.1 Nominal sizes and tolerances

4.1.1 The nominal size of a pressure reducing 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.

4.1.2 Unless otherwise noted in a specific clause or subclause of this document, tolerances shall be in accordance with Annex A.

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 relevant international standards. If international standards are not applicable, national standards may to be used.

For example, ISO 6182-12 contains requirements for grooved-end components. Where there is not an ISO standard developed, a national standard may be used for other connection types (i.e. threaded, flanged, or other suitable connections).

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 Connections may be machined for lower working pressures to match installation equipment provided the valve is marked with the lower working pressure, as per 7.3 f).

4.4 Body and cover

4.4.1 The body and cover shall be made of a material with 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 6.4.1)

4.5.1 Body (see 6.4.1)

An assembled pressure reducing 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 6.4.1.

If the test is not performed 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 centreline of the “O”-ring or gasket.

4.5.2 Diaphragm (see 6.4.2)

All diaphragms used in pressure reducing valves shall not leak, tear or rupture when tested in accordance with 6.4.2.

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.

4.7 Components

4.7.1 Any component of the pressure reducing valve and associated devices 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. The main valve servicing shall be possible in-line, without need of dismounting.

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 Springs and diaphragms shall not fracture or rupture when tested in accordance with 6.2.

4.7.6 There shall be no sign, on visual examination, of damage to the sealing assembly after testing for the operational requirements of 4.12 in accordance with 6.8.

4.7.7 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.

4.7.8 Where rotation or sliding motion is required, the part or its bearing shall be made of a corrosion-resistant materials. 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.

4.7.9 If an orifice with a diameter less than 5 mm is used in the trim or operation of a valve, a screen or strainer with corrosion resistance equivalent to brass shall be provided. The total area of openings in the screen or strainer shall be not less than 20 times the cross-sectional area of the opening of the screen or strainer it is intended to protect. The largest dimension of the screen or strainer openings shall not exceed 0,8 mm less than the diameter of the protected orifice.

4.7.10 Sealing surfaces of sealing assemblies, including the sealing assembly seat ring, 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.

4.7.11 Interior bolts or screws shall be made of stainless steel or other material with at least equivalent resistance to corrosion.

4.7.12 An internal spring shall be made of material with corrosion resistance at least equivalent to phosphor bronze.

4.7.13 The pilot trim line used in a pressure reducing valve shall not incorporate a manual shutoff valve that could affect the proper operation of the valve unless the shutoff valve has provisions to be locked in the open position.

4.7.14 A position indicator shall be provided to give visual indication of every position of the disc assembly, or equivalent component, from open to closed.

4.7.15 A means shall be provided for indicating the factory adjustment setting of the valve.

4.7.16 A means shall be provided to lock or seal the pressure reducing valve at the adjusted pressure setting.

4.8 Leakage and deformation (6.3)

4.8.1 There shall be no leakage, permanent distortion or rupture of a valve when tested in accordance with 6.3.1.

4.8.2 There shall be no leakage, permanent distortion or rupture of a valve or sealing assembly when tested in accordance with 6.3.2.

4.8.3 For a direct acting pressure reducing valve when tested as described in 6.3.3, leakage through the unpacked stuffing box or altered stem sealing device of a valve intended to be serviced in the field shall not interfere with the replacement of the packing or seal ring.

4.9 Non-metallic components (excluding gaskets, diaphragms, seals and other elastomeric parts) (see 6.5 and 6.6)

4.9.1 Non-metallic valve parts that affect proper valve function shall be subjected to the applicable ageing of their non-metallic parts as described in 6.5 and 6.6 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 6.3, 6.9 and 6.10.

4.9.2 There shall be no cracking, warping, creep, or other signs of deterioration that can prevent proper operation of the valve.

4.10 Sealing assembly elements (see 6.7)

A seal made of elastomeric or other resilient materials shall move off the seat without separation, tearing or permanent distortion when tested in accordance with 6.7. 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.

4.11 Clearances

4.11.1 The clearance between a valve disc or a part attached thereto and the inside walls of iron body castings in every position of the valve disc, except fully open, shall be not less than 12,7 mm. This clearance shall be not less than 6,4 mm for valves with bodies of bronze or equivalently corrosion-resistant materials.

4.11.2 For diaphragm operated valves the clearance shall not be less than 2 mm.

4.12 Operation (see 6.8)

A valve shall withstand without malfunction of any part and shall perform in accordance with the manufacturer's specifications when tested in accordance with 6.8. The valve is to be evaluated throughout the rated inlet pressure range, rated outlet pressure range and flow range of the valve during the test.