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Industrial valves — Pressure testing of valves

Robinetterie industrielle — Essais sous pression pour les appareils de robinetterie

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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 5208 was prepared by Technical Committee ISO/TC 153, *Valves*, Sub-Committee SC 1, *Design, manufacture, marking and testing*.

This second edition cancels and replaces the first edition (ISO 5208:1982), of which it constitutes a technical revision.

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Introduction

The aim of this International Standard is to establish certain basic requirements for the production testing of industrial valves in order to ensure that uniform tests and methods are adopted. In general, this International Standard should be considered in conjunction with any specific requirements in the development of standards appropriate to the individual types of valves.

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Industrial valves — Pressure testing of valves

1 Scope

This International Standard specifies tests to confirm the pressure-containing capability of the shell of an industrial valve under pressure, and to verify the tightness and pressure-retaining adequacy of the valve seat and closure mechanism.

2 Definitions

For the purposes of this International Standard, the following definitions apply.

2.1 test pressure: Internal pressure, expressed in bar[1], to which the valve under test is subjected.

2.2 test fluid: At the discretion of the manufacturer, either 2.2.1 or 2.2.2.

2.2.1 liquid: Water which may contain a corrosion inhibitor, kerosene, or other suitable liquid having a viscosity not greater than that of water.

2.2.2 gas: Air or other suitable gas.

2.3 test fluid temperature: Unless specified otherwise, a temperature between 5 °C and 40 °C.

3 Test pressure

3.1 Shell test

A shell test using test fluid shall be performed at a minimum pressure of 1,5 times the maximum permissible working pressure at 20 °C except that for valves in sizes up to and including DN 50, at nominal pressures up to and including PN 50, a gas at a test pressure of 6 bar ± 1 bar (600 kPa ± 100 kPa) may be used.

3.2 Obturator tightness test

A closure test shall be performed in accordance with table 1.

Table 1 — Obturator tightness test pressures

Nominal valve size DN	Nominal pressure PN	Obturator tightness test
⩽ DN 80	All values	Either a) with a liquid at a pressure equal to 1,1 times the maximum permissible working pressure at 20 °C; or b) with a gas at a pressure of 6 bar ± 1 bar (600 kPa ± 100 kPa)
⩾ DN 100 ⩽ DN 200	⩽ PN 50	
	⩾ PN 110	With a fluid pressure equal to 1,1 times the maximum permissible working pressure at 20 °C.
⩾ DN 250	All values	

1) 1 bar = 10^5 Pa

3.3 Pressure differential limitations

Valves conforming to this International Standard in all respects, except that they are designed for operating conditions that have the pressure differential across the obturator limited to values less than the maximum permissible working pressure and have obturators and/or actuating devices (direct, mechanical, fluid or electrical) that would be subject to damage at high differential pressures, shall be tested as specified in 3.1 and 3.2 except that the obturator tightness test requirements may be reduced to 1,1 times the maximum specified closed-position differential pressure.

This exception may be exercised by agreement between the manufacturer and purchaser. The data on the manufacturer's nameplate shall include reference to any such limitations.

4 Tests

4.1 General considerations

4.1.1 The valve shall be essentially freed of air when testing with a liquid.

4.1.2 Valves shall not be painted or otherwise coated with materials capable of sealing against leakage before shell pressure tests are completed, except that internal linings and non-pressure sealing chemical corrosion protection treatments are permitted. Pressure-containing components shall not be impregnated for the purpose of preventing leakage.

If pressure tests in the presence of a representative of the purchaser are specified, painted valves from stock may be retested without removal of paint.

4.1.3 Test equipment shall not subject the valve to externally applied stresses which may affect the results of the tests.

4.1.4 When equipment such as volume-loss devices are used for testing, the manufacturer shall be able to demonstrate equivalence of the system with the requirements of this International Standard.

4.2 Shell test

4.2.1 The shell test shall be performed by applying the specified pressure (see clause 3) inside the assembled valve with the ends capped or plugged, the valve partially closed and the packing gland sufficiently tight to maintain the test pressure, thereby testing the packing chamber portion of the structure.

Packing leakage during the shell test shall not be cause for rejection provided that the manufacturer demonstrates that the valve will not leak at the rated pressure of the valve.

4.2.2 Visually detectable leakage through the pressure-containing walls is not permitted. Test durations shall not be less than specified in table 2.

4.3 Obturator tightness test

4.3.1 The obturator tightness test shall be carried out with the seating surfaces clean and free from oil. However, if necessary to prevent galling, the seating surfaces may be coated with a film of oil of viscosity not greater than that of kerosene. This requirement does not apply to a valve in which a lubricant provides the primary seal.

4.3.2 The valves shall be tested by closing the obturator in the normal manner.

The method of internal leakage testing must result in the application of the full differential test pressure (see clause 3) across the seat or seats in the direction for which they are designed. Tests for typical types of valves shall be as specified in table 3.

4.3.3 Any valve designed to be sold and marketed as a unidirectional flow valve shall be tested in the specified flow direction only.

4.3.4 The minimum duration for obturator tightness tests shall be in accordance with table 4 for metal-seated and elastomeric- or polymeric-seated valves.

4.3.5 At the time of manufacture, the maximum allowable obturator tightness test leakage rate shall be in accordance with table 5.

Table 2 — Minimum duration for shell tests

Nominal valve size DN	Minimum test duration s
⩽ DN 50	15
⩾ DN 65 ⩽DN 200	60
⩾ DN 250	180

Table 3 — Obturator tightness test methods

Type of valves	Test methods
Gate valves Ball valves Plug valves	The bonnet cavity shall be filled with the test fluid. Pressure shall be applied successively to each side of the closed valve and the valve shall be subsequently checked for leakage. Valves with independent double seating (such as two-piece obturator or double-seated valves) may be tested by applying pressure between the seats, and each side of the closed valve checked for leakage.
Globe valves	Pressure shall be applied to the obturator in the direction required to unseat the obturator.
Butterfly valves Diaphragm valves	Pressure shall be applied in the most adverse direction; valves with symmetrical seating may be tested in either direction.
Check valves	Pressure shall be applied in the direction tending to close the obturator and the opposite side shall be checked for leakage.

Table 4 — Minimum duration for obturator tightness tests

Nominal valve size DN	Minimum test duration s	
	Metal-seated valves	Elastomeric- or polymeric-seated valves
⩽ DN 50	15	15
⩾ DN 65 ⩽ DN 200	30	15
⩾ DN 250 ⩽ DN 450	60	30
⩾ DN 500	120	60

Table 5 — Maximum allowable obturator tightness test leakage rate

Obturator tightness test leakage rate[1) 2)]			
Rate A	**Rate B**	**Rate C**	**Rate D**
No visible leakage for the duration of the test (see 4.3.4)	0,01 mm^3/s × DN when testing with liquid	0,03 mm^3/s × DN when testing with liquid	0,1 mm^3/s × DN when testing with liquid
	0,3 $N^{3)}$ -mm^3/s × DN when testing with gas	3 $N^{3)}$-mm^3/s × DN when testing with gas	30 $N^{3)}$-mm^3/s × DN when testing with gas

1) The obturator tightness test leakage rate to be used for each valve type shall be as specified in the valve product standard.

2) These leakage rates only apply when discharging to the atmosphere.

3) N = standard test conditions.

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