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English version

Industrial valves - Testing of valves - Part 2: Tests, test procedures and acceptance criteria - Supplementary requirements

Robinetterie industrielle - Essais des appareils de robinetterie - Partie 2: Essais, procédures d'essai et critères d'acceptation - Prescriptions complémentaires

Industriearmaturen - Prüfung von Armaturen - Teil 2: Prüfungen, Prüfverfahren und Annahmekriterien - Ergänzende Anforderungen

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Foreword

This document EN 12266-2:2002 has been prepared by Technical Committee CEN /TC 69 "Industrial valves", the secretariat of which is held by AENOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by May 2003, and conflicting national standards shall be withdrawn at the latest by May 2003.

EN 12266 consists of two parts, which can be used separately under the general title, *Industrial valves — Testing of valves* :

- Part 1: *Pressure tests, test procedures and acceptance criteria — Mandatory requirements*
- Part 2: *Tests, test procedures and acceptance criteria — Supplementary requirements*

Part 1 was drawn up on the basis of International Standard ISO 5208 and Part 2 contains supplementary testing requirements for tests, test procedures and acceptance criteria of valves.

Special requirements, which are specific to one product or one performance standard only, are not included in this standard. Details should be included in the appropriate standard.

Annexes A and B are normative.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard : Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Introduction

The purpose of this European Standard is to establish certain basic requirements for supplementary testing of industrial valves in order to ensure uniform tests and test procedures are adopted. The tests and procedures detailed may be used for production tests and also, when required, for type tests and acceptance tests.

1 Scope

This European Standard specifies supplementary requirements for tests, test procedures and acceptance criteria of industrial valves.

The specified tests may be used as type tests, production tests or acceptance tests. The application of these tests will be specified in the appropriate product or performance standards.

When specified as a normative reference in a valve product or performance standard, it is essential to consider this standard in conjunction with the specific requirements of that valve product or performance standard. Where requirements in a product or performance standard differ from those given in this standard, the requirements of the product or performance standard apply.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 736-1, *Valves — Terminology — Part 1: Definition of types of valves.*

EN 736-2, *Valves — Terminology — Part 2: Definition of components of valves.*

EN 736-3, *Valves — Terminology — Part 3: Definition of terms.*

EN 1267, *Valves — Test of flow resistance using water as test fluid.*

ISO 10497, *Testing of valves - Fire type testing requirements.*

prEN 12266-1¹⁾, *Industrial valves — Testing of valves — Part 1: Pressure tests, test procedures and acceptance criteria — Mandatory requirements.*

3 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in EN 736-1, EN 736-2 and EN 736-3 apply.

1) To be published.

4 Test requirements

The product or performance standards shall specify which tests or inspections shall be applied to the valve from those listed in Table 1.

Test procedures and acceptance criteria shall be as given in annex A for pressure tests, in annex B for functional tests or in other specified standards, see Table 1.

Table 1 — Requirements for tests, test procedures and acceptance criteria

Test		Purpose	Test procedure and acceptance criteria
Title	Test reference		
Obturator strength	P20	To confirm the allowable differential pressure containing capability of the obturator in the closed position	see A.2
Back seat tightness	P21	To confirm the capacity of the back seat to conform to the specified leakage rate at the time of manufacture	see A.3
Operability	F20	To confirm the complete opening and closing capability of the valve and, where applicable, the correct operation of the position indicators or other auxiliary devices	see B.1
Anti-static design at 12 V	F21	To confirm electrical conductivity between the obturator and the body of the valve	see B.2.2.2
Anti-static design at 100 V	F22	To confirm electrical conductivity between the obturator and the body of the valve	see B.2.2.3
Fire tested design	F23	To confirm the pressure containing capability of the valve under pressure during and after specified fire conditions	ISO 10497
Flow resistance	F24	To confirm the specified flow coefficient or flow resistance coefficient	EN 1267

5 Designation

Tests in accordance with this standard shall be designated by the following elements:

- title of test, test reference;
- EN 12266-2.

EXAMPLE Operability, Test F20 — EN 12266-2

Annex A **(normative)**

Pressure tests – Test procedures and acceptance criteria

A.1 General requirements

A.1.1 Purpose

These general requirements shall be applied to all the test procedures defined in this annex.

Safety aspects of valve testing are not covered in this standard. The users of this standard should analyse the hazard resulting from the pressure and take proper safety precautions.

A.1.2 Test equipment

The test equipment shall be of such a design, that it does not subject the valve to externally applied loads which may affect the results of the test.

NOTE The test equipment can apply external loads sufficient to react to the forces resulting from the test pressure.

When using test equipment and procedures different to that detailed in this standard, the manufacturer shall be able to demonstrate the equivalence of such test procedures and acceptance criteria with the requirements of this standard.

A.1.3 Measuring equipment

The measuring equipment shall be capable of measuring the fluid pressure with an accuracy of $\pm 5\%$ of the required test pressure.

A.1.4 Painted, coated or lined valves

Valves with liners, internal linings or internal coatings that form a design feature of the valve may be tested with the liner or after lining or coating.

If tests in the presence of a representative of the purchaser are specified, valves from stock can be retested.

A.1.5 Test fluid

The test fluid to be used, as specified in the relevant test procedures detailed in A.2.2.1 and A.3.2.1, shall be:

- either a liquid (water which may contain a corrosion inhibitor, or any other suitable liquid having a viscosity not greater than water);
- or a gas (air or other suitable gas).

The test fluid temperature shall be between 5 °C and 40 °C.

A.1.6 Test pressure

The test pressure shall be calculated based on the allowable pressure at room temperature $p_{s/RT}$. For valves for which the allowable pressure p_s is given only for an elevated temperature t , the allowable pressure at room temperature, $p_{s/RT}$, to be used to determine the test pressure shall be calculated from the following equation:

$$P_{s/RT} = P_{s/t} \times \frac{R_{p0,2 \text{ min}/RT}}{R_{p0,2 \text{ min}/t}}$$

where :

$R_{p0,2 \text{ min}/RT}$ is the 0,2 % proof strength at room temperature according to the relevant material standard;

$R_{p0,2 \text{ min}/t}$ is the 0,2 % proof strength at temperature t according to the relevant material standard;

$P_{s/t}$ is the allowable pressure at temperature t .

NOTE The term maximum allowable pressure, PS, defined in EU Directive 97/23/EC (PED) is equivalent to the term allowable pressure, p_s , defined in EN 736-3.

A.1.7 Equivalent DN numbers

For the purpose of calculating seat leakage rates and test duration times it is necessary to establish the equivalent DN number for those valves which are designated other than by DN.

The equivalent DN numbers of valves having flanged ends, threaded ends, weld ends, capillary or compression ends shall be as given in Table A.1.

Table A.1 — Equivalent DN numbers for different types of body ends

Equivalent DN numbers	Flanged, threaded or welding ends NPS	Capillary or compression ends for copper tube	Compression ends for plastic tube
		mm	mm
8	¼	8	—
10	—	10; 12	10; 12
15	½	14; 14,7; 15; 16; 18	14,7; 15; 16; 18
20	¾	21; 22	20; 21; 22
25	1	25; 27,4; 28	25; 27,4; 28
32	1 ¼	34; 35; 38	32; 34
40	1 ½	40; 40,5; 42	40; 40,5
50	2	53,6; 54	50; 53,6
65	2 ½	64; 66,7; 70	63
80	3	76,1; 80; 88,9	75; 90
100	4	108	110
125	5	—	—
150	6	—	—
200	8	—	—
250	10	—	—
300	12	—	—
350	14	—	—
400	16	—	—
450	18	—	—
500	20	—	—
600	24	—	—
650	26	—	—
700	28	—	—
750	30	—	—
800	32	—	—
900	36	—	—
1 000	42	—	—

A.2 Obturator strength, Test P20

A.2.1 Purpose

The test shall confirm the allowable differential pressure containing capability of the obturator in the closed position.

A.2.2 Test method

A.2.2.1 Test procedure

The test fluid shall be a liquid or gas. The choice of the test fluid is the responsibility of the manufacturer.

The test procedure to be used for the different types of valve shall be taken from Table A.2.

Table A.2 — Obturator strength test method

Type of valve	Test procedure
Gate valve Ball valve Plug valve	1. Fill the upstream valve cavity including, if appropriate, the bonnet cavity with the test fluid. 2. Move the obturator to the closed position with the other side open to atmosphere. 3. Apply the test pressure specified in A.2.2.2 and maintain the test pressure for the test duration specified in A.2.2.3. 4. Examine the obturator for leak tightness. 5. Repeat 3 and 4 inclusive for the other side of the valve. See NOTES 1, 2 and 3.
Globe valve	1. Fill the upstream valve cavity with the test fluid. 2. Move the obturator to the closed position. 3. Apply the test pressure specified in A.2.2.2 in the direction to unseat the obturator with the other side open to atmosphere and maintain the test pressure for the test duration specified in A.2.2.3. 4. Examine the obturator for leak tightness.
Diaphragm valve	1. Fill the upstream valve cavity with the test fluid. 2. Move the obturator to the closed position. 3. Apply the test pressure specified in A.2.2.2 in the direction in which the obturator is weaker with the other side open to atmosphere, and maintain the test pressure for the test duration specified in A.2.2.3. 4. Examine the obturator for leak tightness. See NOTE 4.
Butterfly valve	1. Fill the upstream valve cavity with the test fluid. 2. Move the obturator to the closed position. 3. Apply the test pressure specified in A.2.2.2 to the disc in the direction in which the obturator is weaker with the other side open to atmosphere, and maintain the test pressure for the test duration specified in A.2.2.3. Test double disc butterfly valves by introducing the test pressure between the discs via a shell tapping. 4. Examine the obturator for leak tightness. See NOTE 4.
Check valve	1. Fill the downstream valve cavity including, if appropriate, the cover cavity with the test fluid. 2. Apply the test pressure specified in A.2.2.2 in the direction tending to close the obturator with the other side open to atmosphere and maintain the test pressure for the test duration specified in A.2.2.3. 3. Examine the obturator for leak tightness.

NOTE 1 The procedure described may not ensure pressurisation of the integrate space of double seated valves and may not therefore permit verification of the leak tightness of the obturator. When such pressurisation is a requirement of the product or performance standard or is required by the purchaser, it may be necessary to carry out step 3, before step 2.

NOTE 2 Valves with independent double seating (such as two-piece obturator or double seated valves) may be tested by applying the test pressure between the seats and checking each side of the closed valve.

NOTE 3 With plug valves relying on a sealing compound to effect a seal, it is permitted to charge with sealing compound prior to testing.

NOTE 4 Valves with symmetrical seating may be tested in either direction.

The obturator shall be examined for leak tightness as follows:

- if the test fluid is a liquid, the complete downstream surface of the obturator shall be checked visually for leakage;
- if the test fluid is a gas, the valve shall be immersed in water with the downstream surface of the obturator not more than 50 mm below the surface of the water. A check shall be made for bubbles breaking the surface of the water.

Alternatively the complete downstream surface of the obturator shall be coated with a leak detection fluid and a check shall be made for the continuous formation of bubbles.

NOTE The normal operating device cannot be adequate for closing the obturator against the test pressure or opening after the test. It is permitted to temporarily modify the operating device to provide additional operating torque if that is required.

A.2.2.2 Test pressure

The test pressure (see A.1.6) shall be a minimum of 1,5 times the allowable differential pressure at room temperature.

A.2.2.3 Test duration

The test pressure shall be maintained for a test duration not less than specified in Table A.3.

Table A.3 — Minimum test duration for obturator strength test

Nominal size	Minimum test duration	
	Production test and acceptance test	Type test
	Liquid or gas	Liquid or gas
up to DN 50	15 s	10 min
DN 65 to DN 200	60 s	10 min
DN 250 and above	180 s	10 min

When the obturator is tested in a production line and the time of one production cycle is shorter than the production test time specified in Table A.3, the obturator shall be tested for the time of the production cycle. In that case statistical process control tests shall be carried out confirming that all valves are capable of meeting the requirements of A.2.3.

A.2.3 Acceptance criteria

The acceptance criteria shall be as follows:

- if the test fluid is a liquid, visually detectable leakage from the downstream surface of the obturator is not permitted;
- if the test fluid is a gas:
 - no bubbles from the downstream surface of the obturator are permitted breaking the surface of the water;
 - no continuous formation of bubbles is permitted when the downstream surface of the obturator is coated with a leak detection fluid.

Unless otherwise specified in the appropriate product standard, seat leakage is permitted at the obturator strength test pressure, provided that the seat tightness, Test P12 of prEN 12266-1, has been successfully carried out.

A.3 Back seat tightness, Test P21

A.3.1 Purpose

The test shall confirm the capability of the back seat to conform to the specified leakage rate at the time of manufacture.

A.3.2 Test method

A.3.2.1 Test procedure

The test fluid shall be a liquid or gas. The choice of the fluid is the responsibility of the manufacturer.

The test shall be carried out either before installing the operating mechanism sealing or with the operating mechanism sealing ineffective.

The valve shall be operated such that the back seat is in the closed position.

The end connections of the shell shall be blanked off and all cavities filled with the test fluid.

The test pressure specified in A.3.2.2 shall be applied to the test fluid.

The test pressure shall be maintained for the test duration specified in A.3.2.3.

Determine the leakage rate.

A.3.2.2 Test pressure

The test pressure (see A.1.6) shall be as follows:

- if the test fluid is a liquid, the test pressure shall be a minimum of 1,1 times the allowable pressure at room temperature;
- if the test fluid is a gas, the test pressure shall be the lower of 1,1 times the allowable pressure at room temperature or (6 ± 1) bar.

A.3.2.3 Test duration

The test pressure shall be maintained for a test duration not less than specified in Table A.4.

Table A.4 — Minimum test duration for back seat tightness test

Nominal size	Minimum test duration	
	Production test and acceptance test	Type test
	Liquid or gas	Liquid or gas
up to DN 50	15 s	10 min
DN 65 to DN 200	15 s	10 min
DN 250 to DN 450	30 s	10 min
DN 500 and above	60 s	10 min

When the back seat tightness is tested in a production line and the time of one production cycle is shorter than the production test time specified in Table A.4, the back seat tightness shall be tested for the time of the production cycle. In that case statistical process control tests shall be carried out confirming that all valves meet the requirements of A.3.3.

A.3.3 Acceptance criteria

The leakage rates measured during the specified test duration shall not exceed the rate specified in the corresponding product or performance standards. Leakage rates are given in Table A.5.

Table A. 5 — Maximum allowable backseat leakage for each leakage rate in cubic millimetres per second

Test fluid	Rate A	Rate B	Rate C	Rate D	Rate E	Rate F	Rate G
Liquid	No visually detectable leakage for the duration of the test	$0,01 \times \text{DN}$	$0,03 \times \text{DN}$	$0,1 \times \text{DN}$	$0,3 \times \text{DN}$	$1,0 \times \text{DN}$	$2,0 \times \text{DN}$
Gas		$0,3 \times \text{DN}$	$3,0 \times \text{DN}$	$30 \times \text{DN}$	$300 \times \text{DN}$	$3\,000 \times \text{DN}$	$6\,000 \times \text{DN}$

NOTE 1 The leakage rates only apply when discharging to room temperature.

NOTE 2 Table A.1 should be used to establish the equivalent DN number for those valves which are designated other than by DN.

NOTE 3 "No visually detectable leakage" means no visible weeping or formation of drops or bubbles and is a lower leakage rate than Rate B.

Annex B **(normative)**

Functional tests — Test procedures and acceptance criteria

B.1 Operability, Test F20

B.1.1 Purpose

The test shall confirm the ability of the assembled valve to open and close fully and, as applicable, the correct operation of the position indicators and/or other auxiliary devices.

B.1.2 Test method

The test shall be carried out at atmospheric pressure and room temperature.

Valves designed to be operated by an operating device shall be tested using this device.

Check valves shall be tested using suitable devices for opening and closing the valve.

B.1.3 Acceptance criteria

The acceptance criteria shall be as follows:

- it shall be possible to move the obturator between the open and closed positions;
- the position indicators and/or auxiliary devices, as applicable, shall indicate the correct position of the obturator.

B.2 Anti-static design, Test F21 and Test F22

B.2.1 Purpose

The test shall confirm the electrical conductivity between the obturator and the body of the valve.

B.2.2 Test procedure

B.2.2.1 General

After carrying out the required pressure test and drying out the valve, the valve shall be operated at least five times and the electrical resistance of the obturator shall be determined for several intermediate positions in accordance with B.2.2.2 and B.2.2.3.

B.2.2.2 Test at 12 V dc

The electrical resistance between the metallic parts of the obturator and the body of the valve shall be measured using a power source not exceeding 12 V dc.

B.2.2.3 Test at 100 V dc

The electrical resistance between the metallic parts of the obturator and the body of the valve shall be measured using a power source of 100 V dc.

B.2.3 Acceptance criteria

B.2.3.1 All-metal construction

The electrical resistance shall not exceed 10 Ω .

B.2.3.2 Composite construction (plastics/metal)

The electrical resistance shall not exceed 10⁶ Ω .