

English Version

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

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

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

This European Standard was approved by CEN on 16 December 2011.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: Avenue Marnix 17, B-1000 Brussels

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Foreword

This document (EN 12266-2:2012) has been prepared by Technical Committee CEN/TC 69 "Industrial valves", the secretariat of which is held by AFNOR.

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of an identical text or by endorsement, at the latest by August 2012, and conflicting national standards shall be withdrawn at the latest by August 2012.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 12266-2:2002.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

EN 12266, *Industrial valves — Testing of metallic valves* consists of the following parts:

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

EN 12266-1 was drawn up on the basis of International Standard ISO 5208:1993. EN 12266-2 contains supplementary testing requirements for tests, test procedures and acceptance criteria of valves.

The main changes compared to the previous edition are:

- a) Introduction was changed;
- b) Normative references were updated;
- c) Clause 4 Test requirements was updated;
- d) Sub-clauses A.1.4 and A.1.5 were changed;
- e) Sub-clause A.1.6 Test pressure was deleted;
- f) Clause A.2 Obturator strength, Test reference P20 was changed;
- g) Clause A.3 Back seat tightness, Test reference P21 was changed editorially;
- h) Clause B.1 was changed;
- i) Sub-clause B.2.3 was editorially changed into Clause B.3.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

The purpose of this European Standard is to establish certain basic requirements for supplementary production pressure testing of industrial valves in order to ensure uniform tests and test procedures. Tests and procedures given in this European Standard may be used for production tests and, where applicable, for type tests and acceptance tests.

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

1 Scope

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

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

When specified as a normative reference in a valve product or performance standard, this European Standard should be considered in conjunction with given specific requirements of the valve product or performance standard. Where requirements in a product or performance standard differ from those given in this European Standard, the requirements of the product or performance standard apply.

NOTE For testing of industrial valves of thermoplastic materials, ISO 9393-1 and ISO 9393-2 apply.

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.

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, *Industrial valves — Test of flow resistance using water as test fluid*

EN ISO 10497, *Testing of valves — Fire type-testing requirements (ISO 10497)*

3 Terms and definitions

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

4 Test requirements

The product or performance standard specifies which tests or inspections shall be applied to the valve 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 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	EN ISO 10497
Flow resistance	F24 ^a	To confirm the specified flow coefficient or flow resistance coefficient	EN 1267
^a F24 test does not apply to control valves.			

5 Designation

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

- title of test and 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 Annex A.

Safety aspects of valve testing are not covered in this European Standard.

NOTE Users of this European 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 European Standard, the manufacturer shall be able to demonstrate the equivalence of such test procedures and acceptance criteria with the requirements of this European Standard.

A.1.3 Measuring equipment

The measuring equipment shall be capable of measuring 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 forming a design feature of the valve may be tested with the liner, after lining or coating.

Attention shall be given that the internal linings or internal coatings are not damaged by the test procedure.

NOTE If tests in the presence of a representative of the purchaser are specified, painted or coated valves from stock may be retested without removal of painting or coating.

A.1.5 Test fluid

The test fluid to be used 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).

Relevant detailed test procedures are specified in A.2.2.1 and A.3.2.1.

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

A.1.6 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	40	—	—

A.2 Obturator strength, Test reference P20

A.2.1 Purpose

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

NOTE The test is applicable when a valve is used as single means of insulation between the content of an item of pressure equipment and the downstream equipment not designed to withstand the upstream pressure.

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 medium is the responsibility of the manufacturer.

WARNING — When the test medium is a gas, additional safety measures may be applied.

The test procedure to be used for the different types of valves 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	<ol style="list-style-type: none"> 1. Fill the 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. <p>See NOTES 1, 2 and 3.</p>
Globe valve	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 1. Fill the 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. <p>See NOTE 4.</p>
Butterfly valve	<ol style="list-style-type: none"> 1. Fill the 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 marked direction or 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. <p>See NOTE 4.</p>
Check valve	<ol style="list-style-type: none"> 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.
<p>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.</p> <p>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.</p> <p>NOTE 3 With plug valves relying on a sealing compound to effect a seal, it is allowed to charge with sealing compound prior to testing.</p> <p>NOTE 4 Valves with symmetrical seating may be tested in either direction.</p>	

Resistance pressure aptitude of the obturator shall be examined for leak tightness as follows:

- a) If the test fluid is a liquid, the complete downstream surface of the obturator shall be checked visually for leakage;

- b) 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 may not be adequate for closing the obturator against the test pressure or opening after the test. It is allowed to temporarily modify the operating device to provide additional operating torque if that is required.

A.2.2.2 Test pressure

The test pressure shall be at least 1,5 times higher than the allowable differential pressure ΔPS_{RT} at room temperature for PN and Class designated valves.

$$P_{Test} = 1,5 \times \text{allowable differential pressure}$$

where

P_{Test} is the test pressure;

ΔPS_{RT} is the allowable differential pressure at room temperature;

RT is the room temperature.

For valves where the allowable differential pressure ΔPS_t is indicated only for an elevated temperature t , the higher value is to be applied as test pressure.

$$P_{Test} = 1,5 \times \Delta PS_t$$

or

$$P_{Test} = 1,25 \times \Delta PS_t \times \frac{f_{dRT}}{f_{dt}}$$

where

P_{Test} is the test pressure;

f_{dRT} is the maximum allowable stress at room temperature in MPa;

f_{dt} is the maximum allowable stress at temperature in MPa;

ΔPS_t is the maximum allowable differential pressure at temperature t ;

t is the design temperature.

NOTE The term maximum allowable pressure, PS , defined in EC Directive 97/23/EC (PED), is equivalent to the term allowable pressure, p_s , defined in EN 764-1.

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 Liquid or gas	Type test Liquid or gas
up to DN 50	15 s	10 min
DN 65 to DN 150	60 s	10 min
DN 200 to DN 300	120 s	10 min
DN 350 and above	300 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:

- a) if the test fluid is a liquid, visually detectable leakage from the downstream surface of the obturator is not permitted;
- b) if the test fluid is a gas:
 - 1) no bubbles from the downstream surface of the obturator are permitted breaking the surface of the water;
 - 2) 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 reference P12 of EN 12266-1, has been successfully carried out.

When visual examination of the downstream surface of the obturator is not possible, other means of verifying obturator strengths shall be used.

A.3 Back seat tightness, Test reference 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 medium is the responsibility of the manufacturer.

NOTE When the test medium is a gas, additional safety measures may be applied.

The test procedure is as follows:

- 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 shall be 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;
- the leakage rate shall be determined.

A.3.2.2 Test pressure

The test pressure shall be as follows:

- a) if the test fluid is a liquid, the test pressure shall be a minimum of 1,1 times the allowable pressure;
- b) if the test fluid is a gas, the test pressure shall be the lower of 1,1 times the allowable pressure 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 150	60 s	10 min
DN 200 to DN 300	60 s	10 min
DN 350 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 choice of the rate A to G is specified in the relevant valve product standards.

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 mm³/sUnits in mm³/s

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 × DN	0,03 × DN	0,1 × DN	0,3 × DN	1,0 × DN	2,0 × DN
Gas		0,3 × DN	3,0 × DN	30 × DN	300 × DN	3 000 × DN	6 000 × 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.

Annex B

(normative)

Functional tests — Test procedures and acceptance criteria

B.1 Operability, Test reference 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:

- a) it shall be possible to move the obturator between the open and closed positions, as specified within the specification – if any;
- b) the position indicators and/or auxiliary devices, as applicable, shall indicate the correct position of the obturator.

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

B.2.1 Purpose

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

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 d.c.

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

B.2.2.3 Test at 100 V d.c.

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

B.3 Acceptance criteria

B.3.1 All-metal construction

The electrical resistance shall not exceed 10 Ω .

B.3.2 Composite construction (plastics/metal)

The electrical resistance shall not exceed 10⁶ Ω .

Bibliography

- [1] ISO 5208, *Industrial valves — Pressure testing of metallic valves*
- [2] ISO 9393-1, *Thermoplastics valves for industrial applications — Pressure test methods and requirements — Part 1: General*
- [3] ISO 9393-2, *Thermoplastics valves for industrial applications — Pressure test methods and requirements — Part 2: Test conditions and basic requirements*
- [4] EN 764-1, *Pressure equipment — Part 1: Terminology — Pressure, temperature, volume, nominal size*
- [5] EN 12266-1, *Industrial valves — Testing of metallic valves — Part 1: Pressure tests, test procedures and acceptance criteria — Mandatory requirements*

