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Edition 1

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SOUTH AFRICAN NATIONAL STANDARD

Valves for gas distribution systems with maximum operating pressure less than or equal to 16 bar — Performance requirements

This national standard is the identical implementation of EN 13774:2013, and is adopted with the permission of CEN Avenue Marnix 17, B-1000 Brussels.

WARNING
This document references other documents normatively.

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Edition 1
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Table of changes

Change No.	Date	Scope

National foreword

This South African standard was prepared by National Committee SABS/TC 1019, *Gas supply, handling and control (fuel, industrial and medical gases)*, in accordance with procedures of the South African Bureau of Standards, in compliance with annex 3 of the WTO/TBT agreement.

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Compliance with this document cannot confer immunity from legal obligations.

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English Version

Valves for gas distribution systems with maximum operating pressure less than or equal to 16 bar - Performance requirements

Appareils de robinetterie pour les systèmes de distribution du gaz avec une pression maximale de service inférieure ou égale à 16 bar - Exigences de performance

Armaturen für Gasverteilungssysteme mit zulässigen Betriebsdrücken kleiner oder gleich 16 bar - Anforderungen an die Gebrauchstauglichkeit

This European Standard was approved by CEN on 28 December 2012.

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Foreword

This document (EN 13774:2013) 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of an identical text or by endorsement, at the latest by August 2013, and conflicting national standards shall be withdrawn at the latest by August 2013.

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 13774:2003.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association.

The following is a list of the main changes compared to the previous edition:

a) the Scope has been modified;

b) the Normative References (Clause 2) have been updated;

c) requirements of type tests and production tests (Clause 5) have been completely revised, in particular:

    1) requirements for “strength design” (5.3.2), for “extended drain, vent and sealant lines” (5.3.8), for “end-to-end dimensions” (5.4.3), for “mechanical resistance against excessive actuating forces” (5.7) have been added;

    2) requirements for “resistance to wear” (5.12) and for “reference flow rate” (5.13) became optional;

    3) requirements for “bending resistance” and for “resistance to liquid agents” have been deleted;

d) the annex on analysis of the technical file and recording of the initial conditions has been deleted;

e) the annex on test methods for valves (Annex A) has been updated;

f) the annex on additional characteristics on request from the purchaser has been deleted;

g) the annex on resistance to bending moment applied via the stem or the shaft has been deleted;

h) the annex providing the European Standards for valves (Annex B) has been updated;

i) the annex giving a summary of tests on product and type tests (Annex C) has been added;

j) the Bibliography has been updated.

According to the CEN/CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, 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.

1 Scope

This European Standard deals with metal isolating valves used for gas distribution systems with maximum operating pressure up to 16 bar, and which operate with fuel gases of the first, the second and the third family, in accordance with EN 437.

The types of isolating valves to be considered are: plug and ball valves, gate valves, globe valves and butterfly valves.

This standard does not apply to:

— valves for domestic installations;

— safety type pressure relief valves;

— wellhead valves.

In the case of power operated valves, the requirements for the power source are not covered by this European Standard.

The valves covered in this European Standard operate in the following classes of temperature:

— - 10 °C to 60 °C;

— - 20 °C to 60 °C;

— the range is stated by the purchaser for special design.

This European Standard gives additional requirements to the relevant products standards. (See Annex B.)

In case of contradictions between the standards mentioned in Annex B and this European Standard, EN 13774 prevails.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 19, *Industrial valves — Marking of metallic valves*

EN 377, *Lubricants for applications in appliances and associated controls using combustible gases except those designed for use in industrial processes*

EN 549, *Rubber materials for seals and diaphragms for gas appliances and gas equipment*

EN 558, *Industrial valves — Face-to-face and centre-to-face dimensions of metal valves for use in flanged pipe systems — PN and Class designated valves*

EN 682, *Elastomeric Seals — Materials requirements for seals used in pipes and fittings carrying gas and hydrocarbon fluids*

EN 736-1:1995, *Valves — Terminology — Part 1: Definition of types of valves*

EN 736-2:1997, *Valves — Terminology — Part 2: Definition of components of valves*

EN 736-3:2008, *Valves — Terminology — Part 3: Definition of terms*

EN 764-1:2004, *Pressure equipment — Part 1: Terminology — Pressure, temperature, volume, nominal size*

EN 1092-1, *Flanges and their joints — Circular flanges for pipes, valves, fittings and accessories, PN designated — Part 1: Steel flanges*

EN 1092-2, *Flanges and their joints — Circular flanges for pipes, valves, fittings and accessories, PN designated — Part 2: Cast iron flanges*

EN 1092-3, *Flanges and their joints — Circular flanges for pipes, valves, fittings and accessories, PN designated — Part 3: Copper alloy flanges*

EN 1555-1, *Plastics piping systems for the supply of gaseous fuels — Polyethylene (PE) — Part 1: General*

EN 1555-2, *Plastics piping systems for the supply of gaseous fuels — Polyethylene (PE) — Part 2: Pipes*

EN 1555-3, *Plastics piping systems for the supply of gaseous fuels — Polyethylene (PE) — Part 3: Fittings*

EN 1759-1, *Flanges and their joint — Circular flanges for pipes, valves, fittings and accessories, Class designated — Part 1: Steel flanges, NPS 1/2 to 24*

EN 1759-3, *Flanges and their joints — Circular flanges for pipes, valves, fittings and accessories, Class designated — Part 3: Copper alloy flanges*

EN 10204, *Metallic products — Types of inspection documents*

EN 10226-1, *Pipe threads where pressure tight joints are made on the threads — Part 1: Taper external threads and parallel internal threads — Dimensions, tolerances and designation*

EN 12117, *Plastics piping systems — Fittings, valves and ancillaries — Determination of gaseous flow rate/pressure drop relationships*

EN 12266-1:2012, *Industrial valves — Testing of metallic valves — Part 1: Pressure tests, test procedures and acceptance criteria — Mandatory requirements*

EN 12516-1, *Industrial valves — Shell design strength — Part 1: Tabulation method for steel valve shells*

EN 12516-2, *Industrial valves — Shell design strength — Part 2: Calculation method for steel valve shells*

EN 12516-3, *Valves — Shell design strength — Part 3: Experimental method*

EN 12516-4, *Industrial valves — Shell design strength — Part 4: Calculation method for valve shells manufactured in metallic materials other than steel*

EN 12570, *Industrial valves — Method for sizing the operating element*

EN 12627, *Industrial valves — Butt welding ends for steel valves*

EN 12982, *Industrial valves — End-to-end and centre-to-end dimensions for butt welding end valves*

EN 13942, *Petroleum and natural gas industries — Pipeline transportation systems — Pipeline valves (ISO 14313:2007 modified)*

EN ISO 228-1, *Pipe threads where pressure-tight joints are not made on the threads — Part 1: Dimensions, tolerances and designation (ISO 228-1)*

EN ISO 8434-1, *Metallic tube connections for fluid power and general use — Part 1: 24 degree cone connectors (ISO 8434-1)*

ISO 272, *Fasteners — Hexagon products — Widths across flats*

ASME B1.20.1, *Pipe Threads, General Purpose (Inch)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 736-1:1995, EN 736-2:1997, EN 736-3:2008 and EN 764-1:2004 and the following apply.

3.1
gas distribution system
pipeline system including piping above and below ground and all other equipment necessary to supply the gas to the consumers

3.2
external tightness
shell tightness
tightness of the gas-containing envelope with respect to the atmosphere

3.3
internal tightness
seat tightness
tightness ensured between the valve inlet and outlet by the closure device in the closed position

3.4
volume rate of flow
volume of fluid discharged by the valve per time unit

3.5
reference flow rate
rate of the air flow in cubic metres per hour, as measured at 0 °C at the absolute pressure of 1 013 mbar, discharged by the valve and creating therein a specified pressure drop, at a specified air pressure upstream of the valve

3.6
maximum allowable pressure
p_{max}
maximum pressure at which any part of a valve continuously operates at a specified operating temperature

3.7
maximum operating pressure
MOP
maximum pressure in a system operated continuously under normal operating conditions

Note 1 to entry: "Normal operating conditions" means no malfunctioning of the equipment or disruption to the gas flow.

3.8
maximum strength torque
maximum torque applied to the stem or the shaft, with the obturator either totally open or totally closed, which causes no alteration to the functional capability of the valve

3.9
maximum operating torque
maximum torque applied on the stem or shaft of a valve to ensure its operation under the maximal allowable pressure (p_{max}) and at any operating temperature

3.10
operating cycle
full operating from the closed position to the opened position and back to the closed position

3.11
block and bleed facility
equipment put together with the valve as to assume two functions: isolation and bleed

3.12
double-isolation-and-bleed valve
DIB
single valve with two seating surfaces, each of which, in the closed position, provides a seal against pressure from a single source, with a means of venting/bleeding the cavity between the seating surfaces

Note 1 to entry: This feature can be provided in one direction or in both directions.

4 Symbols and abbreviations

t_a : mean ambient temperature (+ 20 °C ± 5 °C);

t_{max} : maximum value of use temperature (+ 60 °C);

t_{min} : minimum value of use temperature;

p_{max} : maximum allowable pressure.

5 Requirements, type tests and production tests

5.1 Type testing

5.1.1 Test samples

Qualification of the range shall be achieved by testing the smallest valve, the largest valve limited by DN 500 and one chosen in the middle of the range. For valves greater than DN 500, the DN 500 qualifies the range up to DN 1 000. This applies only where the materials, design and construction does not change within the range.

For resistance to wear, qualification shall be achieved by testing only the smallest of the range.

For each valve to be tested, one sample should be provided, and tested in accordance with the qualification test program.

5.1.2 Test documents

The manufacturer shall produce a technical file containing the following documents:

a) detailed drawings, including dimensions, tolerances, surface conditions and relevant calculations for pressure containing parts and principle parts;

b) detailed drawings of the isolating valve with sectional drawings of all important parts;

c) general arrangement drawings showing relative positions and sizes of vents/drains, gearboxes, and other external parts, together with overall dimensions;

d) manufacturing details including welding and testing procedures;

e) installation, operating and maintenance procedures;

f) description of the isolating valve with details on type, construction, materials, surface treatment and marking; detailed sectional arrangement drawings showing all parts with reference numbers and materials identified to published standards including reference to the elastomers and to the suppliers;

g) details of technical characteristics including performance details. The manufacturer shall state the reference flow rate at full opening;

h) material certificates in accordance with EN 10204 shall be supplied with the samples:

1) Type 3.1 for the body and obturator,

2) Type 2.2 for the stem or shaft.

5.1.3 Certification body

All tests shall be certified by an independent accepted body.

5.2 Materials

5.2.1 Shell

Requirements	Type tests	Production tests
5.2.1.1 General Materials in accordance with EN 12516-1, EN 12516-2 or EN 12516-4 shall be used, except grey cast iron, taking into account the relevant standards for shell design strength. Other metallic materials may only be used if their mechanical characteristics, temperature stability and resistance to corrosion are at least equal to those specified in the above cited standards. **5.2.1.2 Steel weldings ends** For welding ends of valves, the maximum carbon equivalent CEV_{max} shall not exceed: CEV_{max} = 0,45 for grades with specified minimum yield strength not exceeding 360 N/mm^2; CEV_{max} = 0,48 for grades with specified minimum yield strength above 360 N/mm^2; unless otherwise agreed between purchaser and manufacturer. $CEV_{max} = C\% + \frac{Mn\%}{6} + \frac{Cr\% + Mo\% + V\%}{5}$	The technical data concerning the materials used shall be available from the valve manufacturer.	–

Requirements	Type tests	Production tests
$+\frac{Cu\%+Ni\%}{15}$ where % is the percentage by weight of the ladle content of: C Carbon; Mn Manganese; Cr Chromium; Mo Molybdenum; V Vanadium; Cu Copper; Ni Nickel. Unless otherwise agreed between manufacturer and purchaser, the carbon content shall not exceed 0,21 %. The sulphur content shall not exceed 0,030 %, and the phosphorus content shall not exceed 0,035 %. The sum of sulphur and phosphorus as a total of the ladle analysis shall be smaller than or equal to 0,050 %.		
5.2.1.3 PE ends Materials in accordance with EN 1555-1 shall be used.		

5.2.2 Obturator

Requirements	Type tests	Production tests
Materials in accordance with EN 12516-1, EN 12516-2 or EN 12516-4 shall be used.	The technical data concerning the materials used shall be available from the valve manufacturer.	–

5.2.3 Stem or shaft

Requirements	Type tests	Production tests
Stem or shaft shall be made from metallic materials and shall be corrosion resistant or permanently protected against corrosion.	The technical data concerning the materials used shall be available from the valve manufacturer.	–

5.2.4 Springs

Requirements	Type tests	Production tests
Springs necessary for operation and leak tightness shall be made of corrosion resistant materials or their permanent resistance to corrosion shall be made by means of design. Protection of the surface is not permissible.	The technical data concerning the materials used shall be available from the valve manufacturer.	–

5.2.5 Seals

Requirements	Type tests	Production tests
Seals made of elastomers shall meet the requirements of EN 682 or EN 549. When seals made of thermo plastic materials, e.g. PTFE, PA are used, the part in contact with the flow shall be of non-regenerated material. When seals made of thermoplastic materials are used, the sealing system shall be designed in such a way to compensate a possible creep of the seal. Reinforcement with carbon or fibreglass is allowed.	The technical data concerning the materials used shall be available from the valve manufacturer.	–

5.2.6 Lubricants

Requirements	Type tests	Production tests
Lubricants used in gas containing parts shall meet the specifications of EN 377.	The technical data concerning the materials used shall be available from the valve manufacturer.	–

5.3 Design

5.3.1 General

Requirements	Type tests	Production tests
Isolating valves shall be free from sharp edges.	A visual inspection shall be carried out to verify conformance to the requirements.	The requirement is to be verified through a visual inspection of each valve.

5.3.2 Strength design

Requirements	Type tests	Production tests
The design and dimensions of the valves shall be such as to withstand safely all stresses occurring under operating conditions. The shell design shall meet the requirements of EN 12516-1 or EN 12516-2 or EN 12516-3 or EN 12516-4. Alternatively, by agreement, the requirements of EN 13942 shall be met. NOTE The tabulation method, EN 12516-1, is similar in approach to ASME B16.34 in that the designer can look up the required minimum wall thickness dimension of the valve body from a table.	The calculations or the elevated pressure test report shall be included in the technical file the manufacturer shall produce. See 5.1.2.	–

5.3.3 Stems or shafts

Requirements	Type tests	Production tests
Stems or shafts shall be of anti-blow out design. The stem seal fasteners shall not be considered as being the sole anti-blow out method. The stem shall be protected against water and dust ingress.	A visual inspection shall be carried out to verify conformance to the requirements.	The requirement is to be checked through a visual inspection of each valve.

5.3.4 Shell tappings

Requirements	Type tests	Production tests
Shell tappings on pressurised cavities for direct ventilation shall have: — cylindrical threads according to EN ISO 228-1; or — conical threads according to ASME B1.20.1 NPT; or — metric fine thread made tight by metallic or metal reinforced seals or seals with metallic thrust rings. They shall be provided with a relief bore and shall be able to be safely loosened for at least two revolutions under MOP. The materials used for the connections to the shell tappings shall be of a similar material as the shell.	A visual inspection shall be carried out to verify conformance to the requirements. Test under pressure of relief bore shall be carried out.	–

5.3.5 Bolt holes for assembly purposes

Requirements	Type tests	Production tests
Bore holes for bolts and studs used for valve assembly purposes shall not intrude into gas containing cavities.	A drawing examination as well as a visual inspection shall be carried out to verify conformance to the requirements.	–

5.3.6 Manufacturing apertures

Requirements	Type tests	Production tests
Apertures for manufacturing reasons shall be made gas tight and permanently sealed.	To be verified during external leak tightness test according to 5.10.	To be verified during external leak tightness test according to 5.10.

5.3.7 Sealing systems

Requirements	Type tests	Production tests
Sealing systems for obturators and stems or shafts shall not be adjustable by hand or commercial tools.	A visual inspection shall be carried out to verify conformance to the requirements.	–

5.3.8 Extended drain, vent and sealant lines

Requirements	Type tests	Production tests
Drain, vent and sealant lines shall be provided if specified and shall be extended by means of rigid pipework, if necessary. The lines shall be fastened to the valve and/or extensions and terminate close to the stem extension top works, by agreement.	Drawing examination.	Drawing examination. Hydraulic pressure test at 1,5 times the rated pressure of the valve. The test may be conducted as part of valve shell test or as a test of the preassembled pipe work.
Drain and vent lines shall: 1) have a design pressure not less than the rated pressure of the valve on which they are installed; 2) be capable of withstanding the hydrostatic shell test pressure of the valve; 3) be designed in accordance with a recognised design code; 4) be suitable for blow-down operation, where applicable. Sealant lines shall have a design pressure not less than the greater of the pipeline valve	Drawing examination.	Drawing examination. Hydraulic pressure test at 1,5 times the rated pressure of the valve. The test may be conducted as part of valve shell test or as a test of the preassembled pipework, provided that the final

Requirements	Type tests	Production tests
rated pressure and the injection pressure. The purchaser should specify the injection pressure or the pipe for use. If not specified by the purchaser, the manufacturer shall advise the maximum injection pressure for the system. The size of the sealant lines shall be by agreement. Prior to assembly, the internal bores of sealant lines shall be clean and free from rust and any foreign particles.		connections to the valve are leak tested at a pressure agreed with the purchaser. No leakage is permitted.
Drain and vent connections on valves: a) they shall be fitted with at least one isolating valve; b) connection to the valve body shall be welded; c) connection to the first valve shall be welded; d) minimum pipe size shall be as follows: 1) ≤ DN 150; DN 15 drain; 2) ≥ DN 200; minimum DN 25 drain unless otherwise specified; Each sealant injection line: — shall be welded to the valve body; — shall incorporate a check valve at the point of connection to the valve body; — shall incorporate an isolating valve; — shall terminate in a giant button head fitting ∅ 22 mm. Prior to assembly the internal bores of sealant lines shall be chemically or mechanically cleaned.		

5.4 Dimensions

5.4.1 Threaded ends

Requirements	Type tests	Production tests
Isolating valves with threaded ends shall have key flats in accordance with ISO 272.	Dimensions shall be checked, to ensure conformance to the requirements.	Dimensions shall be checked, to ensure conformance to the requirements.

5.4.2 End connections

Requirements	Type tests	Production tests
The following end connections are accepted: — compression fittings in accordance with EN ISO 8434-1; — flanges in accordance with EN 1092-1, EN 1092-2, EN 1092-3 or EN 1759-1, EN 1759-3; — butt welding ends in accordance with EN 12627; the thickness of matching pipe shall be indicated by the purchaser; — wafer type ends suitable for flanges in accordance with EN 1092-1, EN 1092-2, EN 1092-3, EN 1759-1 or EN 1759-3; — polyethylene pipe ends in accordance with EN 1555-2 and EN 1555-3 for polyethylene gas distribution system; — threaded ends in accordance with EN 10226-1 or ASME B1.20.1.	Dimensions shall be checked, to ensure conformance to the requirements.	Dimensions shall be checked, to ensure conformance to the requirements.

5.4.3 End-to-end dimensions

Requirements	Type tests	Production tests
End-to-end dimensions of flanged and butt welding valves shall conform to EN 558 or EN 12982 or EN 13942. In case of EN 558 or EN 12982 the purchaser shall indicate the series to be supplied.	Dimensional check.	–

5.5 Operability and endurance

Requirements	Type tests	Production tests
5.5.1 Operability When operating the valve, the closure direction of the operating element shall be clockwise. The maximum measured operating torque shall be less than the operating torque specified by the manufacturer. The manual forces to be applied to the operating element, as specified in EN 12570, shall be the assumed manual force which one person is capable of applying, even if the valve is power operated. The diameter of handwheel shall be less or equal to 600 mm.	– The test, which is achieved as to assume that the requirements are fulfilled, shall be carried out in accordance with test method 1 of Annex A (see A.2.2).	–

5.5.2 Endurance Materials of the operating mechanism and stops shall be chosen such that 200 operating cycles can be applied without affecting the leak tightness and operability.	The endurance test shall be carried out in accordance with test method 1 of Annex A (see A.2.3).	–

5.6 Strength of stops

Requirements	Type tests	Production tests
The stops shall be designed to resist to a maximum strength torque of at least twice the operating torque specified by the manufacturer in the fully open and fully closed position of the valve.	Requirements shall be verified in accordance with test method 2 of Annex A (see A.3).	–

5.7 Mechanical resistance against excessive actuating forces

Requirements	Type tests	Production tests
The design thrust or torque for all drive train calculations shall be at least two times the break away thrust or torque	Requirements shall be verified in accordance with test method 6 of Annex A (see A.7).	–

5.8 Resistance of the obturator to static differential pressure

Requirements	Type tests	Production tests
The obturator, when in the closed position, shall not permanently deform when a differential pressure of 1,5 x p_{max} is applied across the valve, but not exceeding p_{max} + 5 bar. After the test, internal and external leak tightness tests shall be performed successfully.	Requirements shall be verified in accordance with test method 3 of Annex A (see A.4).	–

5.9 Shell strength

Requirements	Type tests	Production tests
The shell of the valve shall withstand a minimum internal hydraulic pressure of 1,5 times the p_{max} value. No permanent deformation or external leakage, including stem leakage, shall be permitted.	This test shall be carried out before any other pressure test. This test shall be carried out according to A.2 of EN 12266-1:2012.	This test shall be carried out before any other pressure test. It shall be carried out on each valve. This test shall be carried out according to A.2 of EN 12266-1:2012.

5.10 External leak tightness

Requirements	Type tests	Production tests
The valve shall be leak tight in accordance with A.3 of EN 12266-1:2012 during the test period specified under a test pressure of 1,1 x p_{max}.	The test shall be carried out in accordance with A.3 of EN 12266-1:2012, with air or inert gas, at a pressure of 1,1 x p_{max}, at the temperatures t_a, t_{max} and t_{min}.	This test shall be carried out on each valve. The test method is described in A.3 of EN 12266-1:2012 at the pressure of 1,1 x p_{max} and at temperature t_a.

5.11 Internal leak tightness

Requirements	Type tests	Production tests
The valve shall be leak tight in accordance with leakage rate A of A.4.3 of EN 12266-1:2012 during the test period specified, at the pressures of 6 mbar and 1,1 x $p_{max,}$ the valve being in the closed position.	The test shall be carried out in accordance with A.4 of EN 12266-1:2012, with air or inert gas at the pressures of 6 mbar and 1,1 x p_{max} and at the temperatures t_a, t_{max} and t_{min}. For DIB valves the requirements shall be verified using the test method 5 described in A.6. For bi-directional valve, the test shall be carried out in both sides. NOTE For butterfly valve with concentric design, the low pressure test is not required.	This test shall be carried out on each valve. The test method is described in A.4 of EN 12266-1:2012 at the pressure of 1,1 x p_{max} and at the temperature t_a.

5.12 Resistance to wear (optional test)

Requirements	Type tests	Production tests
After a wear test, the valve functional requirements of external leak tightness and operability shall remain at the same values as the initial ones. For internal leak tightness, the valve shall be in accordance with leakage rate B of A.4.3 of EN 12266-1:2012 during the test period specified, at the pressure of 1,1 x p_{max}.	Requirements shall be verified using test method 4 of Annex A (see A.5).	-

5.13 Reference flow rate (optional test)

Requirements	Type tests	Production tests
The reference flow rate is defined in 3.5. Its value, specified by the manufacturer, shall be verified. The flow rate measurement shall achieve at least 95 % of the value indicated by the manufacturer under the conditions specified in the type tests. NOTE Not applicable to full bore valves.	The manufacturer's value shall be verified on a valve DN 50 in accordance with the test method specified in EN 12117 under the following conditions: — upstream pressure: 25 mbar; — pressure drop: 0,5 mbar.	–

5.14 Cleanliness

Requirements	Type tests	Production tests
Isolating valves shall be clean (e.g. free from swarfs, core-sand and burrs) in all parts.	A visual inspection shall be carried out to ensure conformance with the requirements.	The requirement shall be verified through a visual inspection of each valve.

5.15 Storage

Requirements	Type tests	Production tests
During storage, the valve shall be protected against corrosion and ingress of water and dust.	–	The requirement shall be verified through a visual inspection of each valve.

6 Marking

Marking shall be carried out in accordance with EN 19.

For all valves, items to be marked on the body of the valve shall be:

— DN;

— PN;

— manufacturer's name or trademark (possibly a symbol);

— arrow for direction of flow, if applicable.

If required in the specification order, the following indications should be marked on a label:

— traceability identification;

— material designation for pressure containing parts (with EN or ISO reference);

— anti-static design;

— coating information.

Annex A
(normative)

Test methods for valves

A.1 Accuracy of measurements and stability

All torques shall be measured with an accuracy of ± 1 % of the measured value.

All pressures shall be measured with an accuracy of ± 2 % of the measured value.

All leakages shall be measured with an accuracy of ± 5 % of the measured value.

All pressures shall be stabilised and maintained at a constant required value of ± 10 %, during the test period.

A.2 Test method 1: operability and operating forces test

A.2.1 General

The fluid used for testing is air or inert gas.

A.2.2 Operability test

This test is carried out successively at $t_{a,}$ t_{max} and t_{min}, which shall be stabilised within ± 1 % of the required value.

With the valve at the required temperature, it shall be opened and closed with zero internal pressure and an operating speed not exceeding 10/DN radian per second and the valve torque/force for the opening and closing cycle recorded. This shall be repeated five times.

The valve shall be closed and a differential pressure applied to one side of the valve, equal to p_{max}. The valve shall be opened and the torque recorded for the opening cycle. This shall be repeated with differential pressure applied from the other side.

Valves designed to seal in one direction shall only be tested from that direction.

An operating cycle under balanced pressure equal to the p_{max} shall be performed and the torque recorded.

The maximum operating torque is the maximum torque measured during all these tests. It shall be less than the operating torque declared by the manufacturer.

A.2.3 Endurance test

This test is carried out at t_a.

The valve shall then be tested at the specified number of cycles as given in 5.5 at a shell pressure of p_{max} and an operating speed not exceeding 10/DN radian per second.

After all tests the valve shall be subjected to an external leak tightness test and internal leak tightness test in accordance with 5.10 and 5.11 at t_a and an operability test in accordance with 5.5.

The results shall be compared with the requirements of 5.5, 5.10 and 5.11.

A.3 Test method 2: strength of stops

A.3.1 General

The purpose of this test is to ensure that the stops provided shall withstand, in the fully open and in the fully closed position, the maximum strength torque as required by 5.6.

A.3.2 Procedure

Apply a torque on the stem or shaft in order to close the obturator.

Increase the closing torque until it reaches the maximum strength torque required in 5.6.

Maintain the maximum strength torque for at least 10 min.

Open the obturator until it reaches the fully open position.

Increase the opening torque until it reaches the maximum strength torque required in 5.6.

Maintain the maximum strength torque for at least 10 min.

Mechanical failure shall be revealed by means of an internal and external leak tightness test in accordance with 5.10 and 5.11 at t_a.

A.4 Test method 3: resistance of the obturator to static differential pressure

The test is normally carried out with water.

The valve in the closed position is loaded at the inlet side such that the differential pressure defined in 5.8 results across the obturator. The test duration is at least 120 s. The test is performed at temperature t_a which shall be stabilised within ± 1 °C of the required value. During this test the valve is not operated. Any mechanical failure shall be revealed by means of an internal leak tightness test and external leak tightness test in accordance with 5.10 and 5.11 at t_a.

Valves designed to seal in two directions shall be tested from the two directions.

A.5 Test method 4: wear test

A.5.1 General

This method gives details of a wear test using dust-laden air.

The valve to be tested should be declared perfectly sound by the manufacturer and have been the subject of a descriptive study.

A.5.2 Procedure

A.5.2.1 Dust loading

The valve shall be mounted on a dust-loading bench with a circulation of air or a gas, as defined in Clause 1, at a minimum speed of 20 m/s loaded with 30 mg/m³ of dust which characteristics are the following:

— it is made of iron oxide;

— its granulometry is prepared in such a way that 70 % of it has a diameter lower than or equal to 100 μm and no particle diameter does exceed 200 μm.

The test installation shall be provided with a bypass valve as to avoid accumulation of dust in front of tested valve.

This bypass valve shall be opened when the other one is closed.

The test valve shall be wear tested for a period of 50 operating cycles.

A.5.2.2 Verification

When the test is completed, the operability test shall be performed at t_a in accordance with test method 1 (A.2). Then the valve shall be subjected to an external leak tightness test and to an internal leak tightness test in accordance with 5.10 and 5.12.

A.6 Test method 5: internal leak tightness test for DIB valves

A.6.1 General

This method defines the conditions for internal leak testing concerning DIB valves.

A.6.2 Procedure

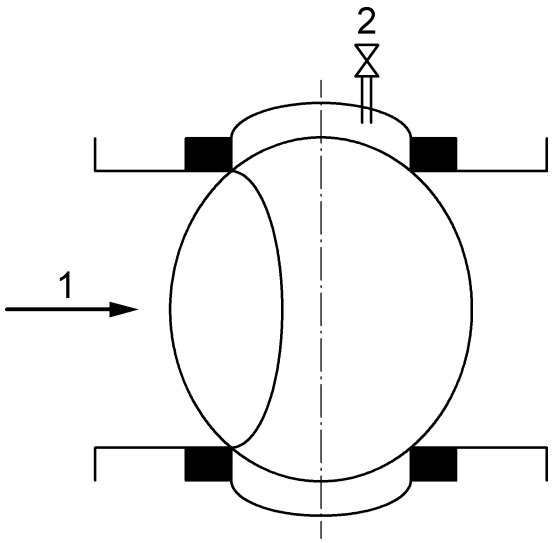
A.6.2.1 Test fluid

The fluid used for testing is air or inert gas.

A.6.2.2 Leak tightness on the upstream

The valve shell shall be equipped with a pressure tapping in the volume contained between both obturator seatings (see Figure A.1).

The pressure shall be applied to the upstream side of the obturator being kept in closed position. The leak tightness is checked in the volume contained between both obturator seatings and not submitted to the pressure.



Key

1 upstream side of the obturator

2 pressure tapping in the volume contained between both obturator seatings

Figure A.1— DIB Valve

A.6.2.3 Leak tightness on the downstream

The pressure shall be applied to the upstream side of the obturator being kept in closed position and to the volume contained between both obturator seatings. The leak tightness is checked in the downstream volume not submitted to the pressure.

Valves designed to seal in two directions shall be tested from the two directions.

A.6.3 Test conditions

The test shall be carried out at the pressures of 0,6 bar and 1,1 x p_{max} and at t_a, t_{max} and t_{min}.

A.7 Test method 6: strength test on torque/thrust

A.7.1 General

The purpose is to demonstrate the integrity of the drive train.

A.7.2 Measured breakaway torque/thrust

The maximum torque or thrust required to operate ball, gate or plug or butterfly valves shall be measured at the pressure specified by the purchaser for the following valve operations.

a) For ball, gate, plug valves:

   1) open to closed with the bore pressurised and the cavity at atmospheric pressure;

   2) closed to open with both sides of the obturator pressurised and the cavity at atmospheric pressure;

   3) closed to open with one side of the obturator pressurised and the cavity at atmospheric pressure;

4) as in 3) but with the other side of the obturator pressurised.

b) For butterfly valves:

1) closed to open with one side of the obturator pressurised;

2) closed to open with other side of the obturator pressurised;

3) open to closed without pressure.

Torque or thrust values shall be measured with seats free of sealant except where the sealant is the primary means of sealing. If necessary for assembly, a lubricant with a viscosity not exceeding that of SAE 10W motor oil or equivalent may be used.

Thrust and torque testing shall be performed following hydrostatic shell testing and, if specified, prior to any low-pressure gas seat testing.

The measured torque or thrust results shall be recorded and shall not exceed the manufacturer’s documented breakaway torque/thrust.

A.7.3 Performance of test

Apply the greater of twice the manufacturer's predicted break away torque/thrust or the measured break away torque/thrust with the obturator blocked for a minimum time of 1 min.

NOTE For gate valves thrust normally means the maximum tensile force.

A.7.4 Acceptance criteria

For ball and plug valves, the total torsional deflection of the extended drive train when delivering the design torque shall not exceed the overlap contact angle between the seat and obturator.

The test shall not cause any permanent visible deformation of the drive train.

Annex B
(informative)

European Standards for valves

Table B.1 gives European Standard references for valves types covered by this European Standard.

Table B.1 — European Standard for valves

Valve type	European Standard
Ball valve	EN 1983
Gate valve	EN 1984, EN 1171, EN 12288
Globe valve	EN 13709, EN 13789
Butterfly valve	EN 593

Annex C
(informative)

Summary of tests on product and type tests

Table C.1 gives a summary of the mandatory or optional tests to be carried out in accordance with this European Standard.

Table C.1 — Summary of the mandatory or optional tests to be carried out in accordance with this standard

Requirement clause	Application	Test	Test method	Type test	Production test
5.2	Material				
5.2.1	Shell	Material examination	EN 12516-1, -2, -4 – CE check – EN 1555-1	M	—
5.2.2	Obturator	Material examination	EN 12516-1, -2, -4	M	—
5.2.3	Stems or shafts	Material examination	—	M	—
5.2.4	Springs	Material examination	—	M	—
5.2.5	Seals	Material examination	EN 682 or EN 549	M	—
5.2.6	Lubricants	Material examination	EN 377	M	—
5.3	Design				
5.3.1	General – valves free of sharp edges	Visual inspection	—	M	M
5.3.2	Strength design	Calculation file or test report	EN 12516-1; -2; -3; -4 or EN 13942	M	—
5.3.3	Stems or shafts	Visual inspection	—	M	M
5.3.4	Shell tappings	Visual and pressure test	—	M	—
5.3.5	Bolt holes for assembly purposes	Drawing and visual examination	—	M	—
5.3.6	Manufacturing apertures	Hydraulic test	idem 5.10	M	M
5.3.7	Sealing systems	Visual inspection	—	M	—
5.3.8	Extended drain, vent and sealant lines (if fitted)	Drawing examination and hydraulic test on production	—	M	M
5.4	Dimensions				
5.4.1	Threaded ends	Dimensional check	—	M	M
5.4.2	End connections	Dimensional check	—	M	M
5.4.3	End-to-end dimensions	Dimensional check	—	M	—

Table C.1 — *(continued)*

Requirement clause	Application	Test	Test method	Type test	Production test
5.5	Operability and endurance	Mechanical test	Method 1 of Annex A (see A.2)	M	—
5.6	Strength of stops	Mechanical test	Method 2 of Annex A (see A.3)	M	—
5.7	Mechanical resistance against excessive actuating forces	Measurement of torque/thrust and test	Method 6 of Annex A (see A.7)	M	—
5.8	Resistance of the obturator to static differential pressure	Hydraulic test	Method 3 of Annex A (see A.4)	M	—
5.9	Shell strength	Hydraulic test	A.2 of EN 12266-1:2012	M	M
5.10	External leak tightness	Hydraulic test	A.3 of EN 12266-1:2012	M	M
5.11	Internal leak tightness (valves others than DIB valve)	Tightness test	A.4 of EN 12266-1:2012	M	M
	Internal leak tightness (DIB valves)	Tightness test	Method 5 of Annex A (see A.6)	M	—
		Tightness test	A.4 of EN 12266-1:2012	—	M
5.12	Resistance to wear	Non-destructive testing	Method 4 of Annex A (see A.5)	O	—
5.13	Reference flow rate	Measurement	EN 12117	O	—
5.14	Cleanliness	Visual inspection	—	M	M
5.15	Storage	Visual inspection	—	—	M

NOTE M = mandatory
O = optional

Bibliography

[1] EN 437, *Test gases — Test pressures — Appliance categories*

[2] EN 593, *Industrial valves — Metallic butterfly valves*

[3] EN 1171, *Industrial valves — Cast iron gate valves*

[4] EN 1555-4, *Plastics piping systems for the supply of gaseous fuels — Polyethylene (PE) — Part 4: Valves*

[5] EN 1775, *Gas supply — Gas pipework for buildings — Maximum operating pressure less than or equal to 5 bar — Functional recommendations*

[6] EN 1983, *Industrial valves — Steel ball valves*

[7] EN 1984, *Industrial valves — Steel gate valves*

[8] EN 12007-1, *Gas infrastructure — Pipelines for maximum operating pressure up to and including 16 bar — Part 1: General functional requirements*

[9] EN 12007-3, *Gas supply systems — Pipelines for maximum operating pressure up to and including 16 bar — Part 3: Specific functional recommendations for steel*

[10] EN 12266-2, *Industrial valves — Testing of metallic valves — Part 2: Tests, test procedures and acceptance criteria — Supplementary requirements*

[11] EN 12288, *Industrial valves — Copper alloy gate valves*

[12] EN 13709, *Industrial valves — Steel globe and globe stop and check valves*

[13] EN 13789, *Industrial valves — Cast iron globe valves*

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

[15] EN ISO 17292, *Metal ball valves for petroleum, petrochemical and allied industries (ISO 17292)*

[16] ASME B16.34, *Valves — Flanged, Threaded, and Welding End*