BS EN 14141:2013

BSI Standards Publication

Valves for natural gas transportation in pipelines — Performance requirements and tests

bsi.

...making excellence a habit.™

National foreword

This British Standard is the UK implementation of EN 14141:2013. It supersedes BS EN 14141:2003 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee PSE/18/1, Industrial valves, steam traps, actuators and safety devices against excessive pressure - Valves - Basic standards.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

ISBN 978 0 580 75759 4

ICS 23.060.01; 75.200

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 30 June 2013.

Amendments issued since publication

Date	Text affected

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 14141

June 2013

ICS 23.060.01; 75.200

Supersedes EN 14141:2003

English Version

Valves for natural gas transportation in pipelines - Performance requirements and tests

Robinetterie pour le transport de gaz naturel par des pipelines - Exigences de performance et essais

Armaturen für den Transport von Erdgas in Fernleitungen - Anforderungen an die Gebrauchstauglichkeit und deren Prüfung

This European Standard was approved by CEN on 18 April 2013.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of 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 United Kingdom.

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

Management Centre: Avenue Marnix 17, B-1000 Brussels

Ref. No. EN 14141:2013: E

Contents

Page

Foreword

This document (EN 14141:2013) 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 December 2013, and conflicting national standards shall be withdrawn at the latest by December 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 14141:2003.

The main changes compared to the previous edition are listed below:

— the scope was adjusted and revised;

— Clause 5 was specified and revised;

— Clause 10 was added;

— Annexes B, F and G were added;

— entire document was editorially revised and adjusted.

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, 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.

Introduction

CEN/TC 69/WG 9 has been responsible for the development of a European performance standard of valves for use in pipelines for transportation of natural gas in accordance with EN 1594.

The significant properties of valves designed for a special application are defined by performance requirements accompanied by the description of tests to be carried out:

— by the manufacturer on the product during the manufacture; and

— by an independent accepted body on test samples for certification purposes;

to give proof that the valve meets the performance requirements of this European Standard.

A type test is included in this European Standard to satisfy the requirements of EN 1594.

1 Scope

This European Standard applies to all valves (plug, ball, gate and check valves) used in onshore transmission pipelines for transport of natural gas in accordance with EN 1594, but with a differing temperature range according to the following three classes in accordance with EN 682:

1) - 10 °C to 60 °C;

2) - 20 °C to 60 °C;

3) the range stated by the purchaser for special design.

This European Standard comprises all valves which are components of the pipeline.

This European Standard specifies valves for pipelines with a maximum operating pressure (MOP) over 16 bar.

Control valves and safety valves are excluded from the scope of this European Standard.

This European Standard specifies requirements and appropriate verification tests carried out during production and for certification purposes to verify that the valves conform to the requirements. A summary of the product and type tests is given in Annex G.

This European Standard makes reference to EN 13942. All the requirements of EN 13942 should be met unless otherwise stated. Paragraphs marked with a dot [•] indicate requirements which are identical to EN 13942.

Additional national requirements and tests in accordance with individual national legal regulations not yet harmonised may be necessary and are to be advised in the purchase order.

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 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 571-1, *Non destructive testing - Penetrant testing - Part 1: General principles*

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 1369:2012, *Founding - Magnetic particle testing*

EN 1371-1:2011, *Founding - Liquid penetrant testing- Part 1: Sand, gravity die and low pressure die castings*

EN 1435:1997, *Non-destructive examination of welds — Radiographic examination of welded joints*

EN 1503-1, *Valves - Materials for bodies, bonnets and covers - Part 1: Steels specified in European Standards*

EN 1503-2, *Valves - Materials for bodies, bonnets and covers - Part 2: Steels other than those specified in European Standards*

EN 1515-1, *Flanges and their joints - Bolting - Part 1: Selection of bolting*

EN 1515-2, *Flanges and their joints - Bolting - Part 2: Classification of bolt materials for steel flanges, PN designated*

EN 1594, *Gas supply systems - Pipelines for maximum operating pressure over 16 bar - Functional requirements*

EN 10204:2004, *Metallic products - Types of inspection documents*

EN 10228-1:1999, *Non-destructive testing of steel forgings - Part 1: Magnetic particle inspection*

EN 10228-2:1998, *Non-destructive testing of steel forgings - Part 2: Penetrant testing*

EN 10228-3:1998, *Non-destructive testing of steel forgings - Part 3: Ultrasonic testing of ferritic or martensitic steel forgings*

EN 10228-4, *Non-destructive testing of steel forgings - Part 4: Ultrasonic testing of austenitic and austenitic-ferritic stainless steel forgings*

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 12517-1:2006, *Non-destructive testing of welds - Part 1: Evaluation of welded joints in steel, nickel, titanium and their alloys by radiography - Acceptance levels*

EN 12627:1999, *Industrial valves - Butt welding ends for steel valves*

EN 12681, *Founding - Radiographic examination*

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

EN 13942:2009, *Petroleum and natural gas industries - Pipeline transportation systems - Pipeline valves (ISO 14313:2007 modified)*

EN ISO 148-1, *Metallic materials - Charpy pendulum impact test - Part 1: Test method (ISO 148-1)*

EN ISO 5210, *Industrial valves - Multi-turn valve actuator attachments (ISO 5210)*

EN ISO 5211, *Industrial valves - Part-turn actuator attachments (ISO 5211)*

EN ISO 9712:2012, *Non-destructive testing - Qualification and certification of NDT personnel (ISO 9712:2012)*

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

EN ISO 11666:2010, *Non-destructive testing of welds - Ultrasonic testing - Acceptance levels (ISO 11666:2010)*

EN ISO 17637, *Non-destructive testing of welds - Visual testing of fusion-welded joints (ISO 17637)*

EN ISO 17638, *Non-destructive testing of welds - Magnetic particle testing (ISO 17638)*

EN ISO 17640:2010, *Non-destructive testing of welds - Ultrasonic testing - Techniques, testing levels, and assessment (ISO 17640:2010)*

EN ISO 23277:2009, *Non-destructive testing of welds - Penetrant testing of welds - Acceptance levels (ISO 23277:2006)*

EN ISO 23278:2009, *Non-destructive testing of welds — Magnetic particle testing of welds — Acceptance levels (ISO 23278:2006)*

MSS-SP-55-2006[1)], *Quality standard for steel castings for valves, flanges and fittings and other piping components (visual method for evaluation of surface irregularities)*

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 13942:2009 and the following apply.

3.1
full opening valve [•]
valve with an unobstructed opening capable of allowing a sphere or other internal devices of the same nominal size as the valve to pass

3.2
maximum pressure differential [•]
(MPD)
maximum difference between the upstream and downstream pressure across the obturator at which the obturator may be operated

3.3
reduced-opening valve [•]
valve with the opening through the obturator smaller than at the end connection(s)

3.4
seating surfaces [•]
contact surfaces of the obturator and seat which ensure valve sealing

3.5
stem [•]
part that connects the obturator to the operator and which may consist of one or more components

Note 1 to entry: This definition applies also for shafts.

3.6
test report

[1)] Developed and approved by the Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. 127 Park Street, NE, Vienna, Virginia 22180.

written statement comprising the results of the particular tests for the evaluation of the conformity of a range of valves to this European Standard

3.7
type test
test carried out on one or more valves representative of the design and the manufacturing process to confirm conformance of the manufactured valves with specified requirements

Note 1 to entry: A range may include valves of the same design, the same material group and the same manufacturing method but with different size designations and different allowable pressures.

3.8
type test certification
granting of a certificate by an independent accepted body to prove the conformity of a range of valves with a standard

3.9
piggability [•]
capability of a valve to permit the unrestricted passage of a pig

4 Functional requirements

4.1 Travel stops

[●] Travel stops shall be provided on the valve and/or operator and they shall locate the position of the obturator in the open and closed position. The travel stops shall not affect the sealing capability of the valve.

They shall not shift unintentionally. In case of lever operated valves, the travel stop shall be independent from the lever.

4.2 Position of the obturator

[●] Except for check valves, the position of the obturator shall not be altered by the dynamic forces of the passing flow or in the case of screw operated gate valves by forces generated from internal pressure.

4.3 Protection of exposed stems and shafts

[●] Extended and exposed stems and shafts of valves shall be protected against dust by a stem extension casing.

4.4 Piggability

Valves for transmission pipelines shall be piggable unless otherwise agreed and shall conform to the definition of the full opening valve (3.1). The dimensions for the smallest full opening valve diameter are given in EN 13942:2009, Table 1.

4.5 Lifting lugs

[●] Valves of size DN 200 (NPS 8) and larger shall be provided with lifting points, unless otherwise agreed. The manufacturer shall verify suitability of the lifting points. If the valve manufacturer is responsible for the supply of the valve and operator assembly, the valve manufacturer shall verify the suitability of the lifting points for the complete valve and operator assembly.

If the purchaser is responsible for the supply of the operator assembly, the purchaser shall provide adequate information to enable the manufacturer to verify the suitability of the lifting points for the complete assembly.

NOTE Regulatory requirements can specify special design, manufacturing and certification of lifting points.

4.6 Additional requirements

The purchaser may require additional requirements for special conditions, see Annex F.

5 Requirements and tests

5.1 Design

5.1.1 Shell

Requirement	Verification on product	Type test
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. Alternatively the requirements of other internationally recognised design codes or standards as per EN 13942 shall be met. NOTE The tabulation method according to 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 manufacturer shall document the design validation of the valve and shall make it available for evaluation and approval on request.	Design approval in accordance with A.4.3, respectively Annex E.

5.1.2 End-to-end dimensions

Requirement	Test on product	Type test
End-to-end dimensions of flanged and butt welding valves shall conform to EN 13942 or EN 558 or EN 12982. In case of EN 558 or EN 12982 the purchaser shall indicate the series to be supplied.	Dimensional check.	Test in accordance with A.4.3.

5.1.3 Butt welding ends

Requirement	Test on product	Type test
Weld end details and thickness shall be in accordance with EN 12627:1999, Figures 2, 3, 4 and 5. The length of the butt end shall be sufficient to allow welding without damage of the internal parts of the valve. The valve supplier shall specify the maximum acceptable welding temperature. Where this cannot be achieved, use extension of pipe section (minimum length 50 mm + 4 × s).	Dimensional check on drawing and product.	Drawing examination in accordance with A.4.3.

5.1.4 Anti-blow-out feature

Requirement	Test on product	Type test
[•] Valves shall be designed with a stem anti-blow out device to prevent stem ejection by internal pressure when the stem packing and/or retainer has been removed.	Drawing examination.	Drawing examination in accordance with A.4.3.

5.1.5 Sealant injection systems

Requirement	Test on product	Type test
The sealing injection system shall be provided for seats and/or stem if specified by the purchaser. If a sealant injection system is provided, it shall be equipped with: — a check valve located on the body at each injection point; — a universal giant button head fitting ø 22 mm to connect sealant injection gun.	Drawing examination.	Drawing examination.
The seat sealant injection system shall be capable of distributing sealant uniformly around the seats.		Type test is applicable only to ball valves. A trial sealant injection is performed and the valve inspected to confirm adequate delivery and even distribution of sealant. The test is conducted on a closed valve with 50 % maximum differential pressure applied using a sealant recommended by the manufacturer. The valve should be inspected to determine distribution. The sealant should form a continuous ring on the surface of the obturator.

5.1.6 Extended drain, vent and sealant lines

Requirement	Type test	Test on product
[●] 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 a part of valve shell test or as a test of the preassembled pipework The welded connection to the valve body shall be inspected according to 5.5.2.
[●] Drain and vent lines shall: 1) have a design pressure not		

Requirement	Type test	Test on product
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 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. Drain and vent connections on valves: 1) They shall be fitted with at least one isolating valve; 2) Connection to the valve body shall be welded; 3) Connection to the first valve shall be welded; 4) Minimum pipe size shall be as follows: — DN ≤ 100 – DN 15 (½") drain; — DN 150 + 200 – DN 20 (¾") drain; — DN ≥ 250 – DN 25 (1") drain. 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		

Requirement	Type test	Test on product
ø 22 mm. Prior to assembly the internal bores of sealant lines shall be chemically or mechanically cleaned.		

5.1.7 Vent, drain and sealant valves

Requirement	Test on product	Type test
[●] Drain and vent block valves shall be provided, if specified. They shall have a rated pressure not less than the valve on which they are installed and be suitable for blow-down operation. Block and check valves fitted to sealant injection lines shall be rated for the greater of the pipeline valve rated pressure and the injection pressure defined in 5.1.6.	No test required.	No test required.

5.1.8 Mechanical resistance against excessive actuating forces

Requirement	Test on product	Type test
[•] The design thrust or torque for all drive train calculations shall be at least two times the break away thrust or torque (see 5.2.4).	No test required	In accordance with Annex B.

5.1.9 Body/bonnet connection

Requirement	Test on product	Type test
Bonnet seals shall be anti-blow-out design. The connection shall be frost proof, i.e. shall be tight against moisture penetrating from the outside and protected from corrosion.	Visual check of drawing.	Visual check of drawing.

5.1.10 Interface of valves to actuators of gears

Requirement	Test on product	Type test
Interface of valve to actuator/gear shall have the interface dimension of: — EN ISO 5211 for quarter turn valves — EN ISO 5210 for multi-turn valves	Dimensional check.	Drawing examination.

5.1.11 Stem extensions

Requirement	Test on product	Type test
Stem extension shall be provided generally on the valve to be laid underground so that to manoeuvre the valve above ground or for similar situation. The length of the stem extension shall be indicated by the purchaser. The stem extension is composed by an extension for the manoeuvre and by a casing (housing) for the protection of stem extension the support of actuator/gear and for giving contrast to the forces generated by the manoeuvre. The stem extension shall be designed to resist the same torque/trust of the drive train (see 5.1.8) The connection of the stem extension casing to the valve end to the actuator/gear shall have the same interface of valve to actuator given in 5.1.10. The stem extension casing shall be equipped with a device to release pressure in case of leakage from the stem sealing system. ot agreed in different way, the length of the stem extension is defined to be the distance between the horizontal axis of the passage and the axis of the wheel of the gear or of the lever.	Dimensional check.	Drawing examination.

5.2 Operation

5.2.1 Handwheels and wrenches - Levers

Requirement	Test on product	Type test
[•] Wrenches for valves shall either be of an integral design or consist of a head which fits on the stem and is designed to take an extended handle. The head design shall allow permanent attachment of the extended section if specified by the purchaser. The maximum force required at the handwheel or wrench to apply the breakaway torque or thrust shall not exceed 360 N (80 lbf). Wrenches of integral design (not loose) shall not be longer than twice the face-to-face or end-to-end dimension, unless otherwise agreed. NOTE Loose wrenches are not considered part of the valve and are not required to meet the maximum length requirements. Handwheel diameter(s) shall not exceed the face-to-face or end-to-end length of the valve or 1 000 mm, whichever is smaller, unless otherwise agreed. Except for valve sizes DN 40 (NPS 1½) and smaller, spokes shall not extend beyond the perimeter of the handwheel unless otherwise agreed. If specified by the purchaser, the handwheel of the gearbox input shaft shall be provided with a torque-limiting device, such as a shear pin, to prevent damage to the drive train. Direction of closing shall be clockwise, unless otherwise specified.	For each unique size pressure rating, material, operator combination, the following test shall be performed on 10 % (minimum of 1) of the production: — dimensional check of handwheel/lever; — determination of the handwheel/lever force to apply break away torque or thrust.	No test required.

5.2.2 Protection against rapidly moving external components

Requirement	Test on product	Type test
Rapidly moving external components, e.g. rising stems, piston rods or levers on check valves, shall be fitted with protective devices (e.g. protective tubes or protective screens), for personal protection.	Visual inspection.	No test required.

5.2.3 Manual override devices

Requirement	Test on product	Type test
Manual override devices, e.g. handwheels of electric actuators, shall be normally disengaged and shall automatically disengage when the actuator is operated.	Visual inspection.	No test required.

5.2.4 Torque/thrust testing

Requirement	Test on product	Type test
The torque values shall be measured and documented. Measured operating torques/thrust shall not exceed the agreed values.	Torque/thrust shall be measured and recorded. — EN 13942:2009, B.6 shall be applied. — The test shall be conducted with liquid or gas in accordance with seat test in 5.8.1.	A soft seated valve shall be left in the closed position with the rated differential pressure applied for 12 h after which the operating torque/thrust shall be measured and shall not exceed the agreed values.

5.3 Materials

5.3.1 Material compatibility

Requirement	Test on product	Type test
All metallic and non-metallic parts in contact with natural gas and accessory materials, as well as lubricants and sealants, shall be suitable for the service conditions specified by the purchaser and compatible with the fluids used in service and maintenance. Non-metallic parts of valves to be used at pressure of PN 100 (Class 600) and above shall be resistant to explosive decompression. Materials shall be compatible with each other and with the fluids, to avoid galvanic action and galling.	No test required.	Examination of documentation produced to demonstrate the compatibility of the seal.

5.3.2 Shell materials

5.3.2.1 General

Requirement	Test on product	Type test
Shell materials shall be selected from steels in accordance with EN 1503-1, EN 1503-2 and EN 13942. Other steels not listed in these standards may be used when their suitability and allowable operating pressure and temperatures have been approved.	Certificate in accordance with EN 10204:2004, 3.1[a].	Certificates in accordance with EN 10204:2004, 3.2
[a] Purchaser may request superior certificates.		

5.3.2.2 Impact values

Requirement	Test on product	Type test
All ferritic and duplex materials for pressure containing parts and welds shall have impact values as specified in EN 1594. The test temperature shall correspond to the minimum design temperature or –10 °C whichever is lower.	All ferritic and duplex materials for pressure containing parts shall be tested in accordance with the impact test provisions of EN ISO 148-1. Each heat of the material shall be in the final heat treated condition. Test coupons shall be cut from separate or attached block, taken from the same heat and where applicable given the same heat treatment as the product materials they represent. Certificate in accordance with EN 10204:2004, 3.1.	Same as for test on product.

5.3.2.3 Welding ends for on-site welding

Requirement	Test on product	Type test
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. $CEV_{max} = C\% + \frac{Mn\%}{6} + \frac{Cr\% + Mo\% + V\%}{5} + \frac{Cu\% + Ni\%}{15}$ 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 %.	Certificate in accordance with EN 10204:2004, 3.1[a].	Same as for test on product.

[a] Certificate according to EN 10204:2004, 3.2 where required by national regulation or by the purchaser.

5.3.3 Obturator

Requirement	Test on product	Type test
Obturator materials shall be selected from EN 1503-1 or EN 1503-2 and EN 13942 unless otherwise agreed.	Certificate in accordance with EN 10204:2004, 3.1.	Same as for test on product.

5.3.4 Body/bonnet connection, bolting materials

Requirement	Test on product	Type test
Materials for body/bonnet connecting parts — bolts and nuts — shall meet the requirements of EN 13942 and may be selected from EN 1515-1 and EN 1515-2 and shall be compatible with the minimum service temperature. The bolting and nut materials shall be compatible with the shell material for the avoidance of galvanic corrosion. Other steels not listed in these standards may also be used when their suitability and allowable operating pressure and temperatures have been approved.	Certificate in accordance with EN 10204:2004, 3.1[a].	Same as for test on product.

[a] Certificate according to EN 10204:2004, 3.2 where required by national regulation or by the purchaser.

5.3.5 Seals

Requirement	Test on product	Type test
Seals made of elastomers shall meet the requirements of EN 682 or EN 549. When seals made of thermoplastic 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 design in such a way to compensate a possible creep of the seal. Reinforcement with carbon or fibreglass is allowed. Seals made by one or more junctions with adhesives are not admitted.	The technical data concerning the materials used shall be available from the valve manufacturer.	–

5.4 Repair

Requirement	Test on product	Type test
— Weld repair of forgings is not permitted. Repair of castings and weldments shall conform to the following requirements. — Repair shall be performed in accordance with a written procedure specifying requirements for defect removal,	— After removal of defects the surface shall be subject to magnetic particle or liquid penetrant testing. This shall demonstrate complete defect removal. — The repair shall be subject to non-destructive testing as specified for the original material. — As a minimum the repair shall be subject to magnetic particle or liquid penetrant testing.	Same as for test on product.

welding, heat treatment, non-destructive testing and reporting. — The heat treatment of repairs shall be in accordance with the original material standard. — Repairs to weldments shall be limited to no more than 15 % of the total length of the weld seam and shall have a maximum length of 50 mm. — Repair of defects which extend through the entire wall thickness is not permitted. — Minor defects may be removed by grinding without weld repair provided that there is a smooth transition between the ground area and the original contour and minimum wall thickness requirements are not affected.		

5.5 Non-destructive testing

5.5.1 Qualification of testing personnel

Non-destructive testing personnel shall be qualified in accordance with EN ISO 9712:2012, level 2.

5.5.2 Welding

Requirement	Test on product	Type test
All welds joining pressure containing parts shall be non-destructively tested.	All welds shall be 100 % visual inspected in accordance with EN ISO 17637. < DN 200: — penetrant testing in accordance with EN 571-1 (acceptance level 2X of EN ISO 23277:2009) or to EN 13942:2009, A.14; or — magnetic particle testing in accordance with EN ISO 17638 (acceptance level 2X of EN ISO 23278:2009) or to EN 13942:2009, A.13. ≥ DN 200: — ultrasonic testing in accordance with EN ISO 17640:2010, testing level B, and acceptance level 2 in accordance with EN ISO 11666:2010; or — radiographic testing in accordance with EN 1435:1997, radiographic technique B, acceptance level 1 of EN 12517-1:2006 or to EN 13942:2009, A.11. Where ultrasonic or radiographic examination is not possible welds shall be examined at least by: — penetrant testing in accordance with	Same as for test on product.

	EN 571 1 (acceptance level 2X of EN ISO 23277:2009) or to EN 13942:2009, A.14; or — magnetic particle testing in accordance with EN ISO 17638 (acceptance level 2X of EN ISO 23278:2009) or to EN 13942:2009, A.13. mpliance with the requirements has to be confirmed according to EN 10204:2004, 3.1.	

5.5.3 Castings

Requirement	Test on product	Type test
All pressure containing castings shall be non-destructively tested.	All castings shall be 100 % visually inspected in accordance with MSS-SP-55. All valves shall be subject to 100 % surface examination on all accessible internal and external areas by magnetic particle technique in accordance with EN 1369:2012 (severity level 1) or by penetrant testing in accordance with EN 1371-1:2011 (severity level 1). For all valves DN ≥ 200, critical areas shall be examined by radiography technique in accordance with EN 12681 or in accordance with EN 13942:2009, A.3 with acceptance standards in accordance with EN 13942:2009, A.3. The position and the number of radiographs shall be defined by agreement between manufacturer and purchaser. Compliance with the requirements shall be confirmed according to EN 10204:2004, 3.1.	Same as for test on product.

5.5.4 Forgings

Requirement	Test on product	Type test
Requirements for forgings shall be subject to agreement between purchaser and supplier.	When required, magnetic particle testing shall be in accordance with EN 10228-1:1999, Class 4 or penetrant testing shall be in accordance with EN 10228-2:1998, Class 4. Alternatively EN 13942:2009, A.9 shall apply. Ultrasonic testing shall be in accordance with EN 10228-3:1998, Class 3 and EN 10228-4 (as applicable). Compliance with the requirements shall be confirmed according to EN 10204:2004, 3.1.	No test required.

5.5.5 Welding ends for on-site welding

Requirement	Test on product	Type test
Weld ends shall have no defects liable to impair welding. Dimensions and volumetric examination shall be performed for a minimum length equal to the welding	For all the valves, welding ends shall be subjected to 100 % surface examination by: — for cast welding ends, magnetic particle technique according to EN 1369:2012 (severity level 2) or penetrant testing	Same as for test on product.

Requirement	Test on product	Type test
end thickness or 50 mm whichever is greater. Surface examination shall be performed on the machined end of the bevel.	according to EN 1371-1:2011 (severity level 3); — for forged or rolled welding ends, magnetic particle technique according to EN 10228-1:1999, Class 4 or penetrant testing according to EN 10228-2:1998, Class 4. For valves DN ≥ 200, welding ends shall be subjected to 100 % volumetric examination by: — for cast welding ends, radiographic examination according to EN 12681 or EN 13942:2009, A.3 with acceptance level in accordance with EN 13942:2009, A.3; — for forged or rolled welding ends, ultrasonic examination according to EN 10228-3:1998, Class 3 and EN 10228-4 as applicable. Compliance with the requirements shall be confirmed according to EN 10204:2004, 3.1.	

5.6 Shell test

Requirement	Test on product	Type test
The valves shall be submitted to a shell tightness and a shell strength test. The test applies also to the extended drain, vent and sealant lines.	[●] In accordance with EN 13942:2009, 11.3. Minimum test duration shall be in accordance with EN 13942:2009, Table 10 At the request of the purchaser an additional leak test with gas (air/N_2) shall be carried out after the hydraulic test at 1,1 times rated pressure in accordance with EN 12266-1:2012, Test P11.	Same as for test on product with minimum test duration of 10 min[a].
[a] This test meets the requirements of EN 12266-1:2012, Test P10.		

5.7 External tightness

5.7.1 Stem/shaft sealing

Requirement	Test on product	Type test
Where the user specifies the requirement to change the packing of the stuffing box of a gate valve under pressure, the stem shall be designed with a back seat face, it being possible to check the back seat for tightness by means of bore with bleed connection.	Test in accordance with EN 13942:2009, 11.2	Same as for test on product.

5.7.2 External pressure relief

Requirement	Test on product	Type test
Where fitted, external relief valves shall be provided with isolating valves to allow maintenance work	No test required.	No test required.

on the relief valve to be carried out. The isolating valve shall be included in the shell strength test.		

5.7.3 Fire test (optional if requested)

Requirement	Test on product	Type test
[•] If specified by the purchaser, fire resistance certification of the design shall be provided, in accordance with EN 13942:2009, D.5.	Document check.	In accordance with EN ISO 10497.

5.8 Internal tightness

5.8.1 Seat tightness

Requirement	Test on product	Type test
All valves shall be subject to a differential pressure test to verify seat tightness. Each seat shall be subject to a high pressure seat test and a low pressure seat test.	Hydraulic high pressure test in accordance with EN 13942:2009, 11.4 or if requested air test in accordance EN 13942, B.4 Low pressure gas test type 2 (0,55 MPa ± 0,07 MPa; 5,5 bar ± 0,7 bar) in accordance with EN 13942:2009, B.3, or on request type 1 (0,05 MPa to 0,1 MPa; 0,5 bar to 1,0 bar). Acceptance criteria: — valves using polymeric or elastomeric seat seals and lubricated plug valves shall meet leakage rate A in accordance with EN 12266-1, — metal-seated valves shall meet leakage rate D in accordance with EN 12266-1.	High pressure gas test in accordance with EN 13942, B.4. Low pressure gas test in accordance with EN 13942, B.3, type 2, or on request type 1. The manufacturer shall declare the type. Acceptance criteria: valves utilising polymeric or elastomeric seat seals and lubricated plug valves shall meet leakage rate A, metal seated valves shall meet leakage rate D in accordance with EN 12266-1.

5.8.2 Functional test on clean service (mandatory in some countries)

Requirement	Test on product	Type test
Valves shall be of sufficient resistance to erosion by clean gas under the determined operation conditions.	No test required.	Test method of Annex C.

5.8.3 Abrasion resistance test on dirty service (mandatory in some countries)

Requirement	Test on product	Type test
Valves shall be of sufficient resistance to erosion by solid particles under the determined operation conditions.	No test required.	Test method of Annex D.

6 Inspection

Inspection of products shall be in accordance with EN 10204:2004, 3.1 as a minimum. Type test shall be in accordance with EN 10204:2004, 3.2.

7 Quality

Requirement	Test on product	Type test
For design, production and testing the manufacturer shall implement a quality assurance system.	No test required.	Reference documents should be in accordance with the quality assurance system.

8 Type tests

Type tests shall be carried out in accordance with the procedure given in Annex A.

9 Functional and other qualification tests

These tests are as listed in Annex B, Annex C, Annex D and Annex E.

Purpose, range of qualification, testing body, assessment, test procedures and corrective actions on modified valve range are the following.

— **Purpose**: to provide proof of the conformity of a range of valves with this European Standard.

— **Range of qualification**: a range of valves qualified by the tests is stated in Annex B, Annex C, Annex D and Annex E.

— **Certification body**: all tests shall be certified by an independent accepted body.

— **Test procedure**: tests shall only be performed on valves which have passed all the specified tests on product successfully. All tests shall be carried out in accordance with a written procedure based on Annex B, Annex C, Annex D, Annex E and Annex F.

— **Modifications on tested valve range**: when a valve design is modified by the manufacturer then functional qualification tests in accordance with Annex B, Annex C, Annex D and Annex E, with modifications in accordance with Table 1, shall be reviewed by the independent accepted body.

Table 1 — Modifications on tested valve range

Modifications	B	C[a]	D[a]	E
Design of shell	X	X	X	X
Design of stem	X	–	–	–
Design of obturator/seat	X	X	X	–
Material of stem	X	–	–	–
Material of obturator/stem	X	X	X	–
Material and design stem seals	X	–	–	–
Material and design seat seals	X	X	X	–

[a] Optional.

10 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 or Class;

— manufacturer's name 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 ISO reference);

— anti-static design;

— coating information;

— the maximum torque/thrust to be applied on the drive train.

The marking plate shall be applied on the valve body and on the higher part of the stem extension if the valve is equipped with stem extension.

Annex A
(normative)

Type test on general design and production of pipeline valves

A.1 General

This annex applies to the type testing of pipeline valves in accordance with the requirements of this European Standard up to DN 1400 and Class 600. Applicable national legal requirements shall also be satisfied.

A.2 Purpose

A type test in accordance with this annex is a test on a representative sample of production.

A type test demonstrates that the manufacturer can produce one valve which:

— meets design requirements (size, rating, materials, design details);

— meets material requirements;

— meets test requirements (functional, performance).

In the case of valves, for which a type test has been conducted by an independent accepted body and a type mark granted, the design verification on qualified valves shall be dispensed with and the tests can be conducted by the manufacturer himself within the framework of the required acceptance test. The type mark is granted on the basis of a type test for a range of valves.

A.3 Type test qualification limits

A.3.1 Size range

A test of any valve type within the nominal size ranges (see Table A.1) qualifies any valves within the nominal size range.

A test of any pressure class shall qualify any valves having an equal or lower pressure class.

Table A.1 — Nominal size ranges

NPS	DN
≤ 6	≤ 150
8 to 18	200 to 450
20 to 28	500 to 700
≥ 30	≥ 750

A.3.2 Design

A type of valve covers valves with the same features with regard to the type of valve (ball, plug, gate, etc.), shell materials, product from (cast, forged, welded), bonnet or closure design, sealing system (seats, stems, closures, pressure etc.).

A.3.3 Material

A.3.3.1 Shell (body, bonnet)

Type approval covers all steel shell materials having mechanical properties equal to or superior to those of the test valve.

Changes of steel materials do not require a new type test provided that the requirement of A.3.3 is met.

A.3.3.2 Obturator/stem materials

Changes likely to reduce the performance of the valve (e.g. strength, galling) shall require a new test.

A.3.3.3 Sealing materials

Major change of sealing materials (e.g. metal to plastic or plastic to elastomer) shall require a new type test.

A.3.4 Type of manufacture

A distinction is made between the following types of manufacture of the valve body:

1) forged included welding construction;

2) cast steel included welding construction;

3) welded from plates or pipes.

A.4 Type test

A.4.1 Prerequisites for manufacturing

A.4.1.1 The manufacturer shall have suitable equipment and methods for production and testing to ensure that all valves meet the requirements of this European Standard.

The valve manufacturer shall supply proof of this to the independent accepted body.

A.4.1.2 Responsible and suitably qualified inspectors independent of production shall be nominated in agreement with the independent accepted body for performance of the works tests on the valves in the course of continuous manufacture.

A.4.2 Stress evaluation and safety design check

All valves in a range shall be checked on the basis of drawings and other data for:

1) conformance with the design requirements of this European Standard;

2) use of permissible materials and suitable sealing materials. Sealing materials shall be suitable for the respective fluid;

proper processing of the materials.

A.4.3 Test on valves

In addition to the tests in accordance with this European Standard the independent accepted body shall conduct within the range the following tests on at least two valves, which are representative with regard to the nominal size and allowable operating pressure.

1) Inspect the valves to ensure that the dimensions and production conform to the drawings and other data checked in accordance with 5.1.1.

2) Check for proper processing.

3) Witness non-destructive tests.

4) Check on the mechanical properties of hot-formed and heat-treated components.

5) Check on conformity of the individual components with the required material verifications including marking.

A.4.4 Documentation

Certification requirements for material, non-destructive examination and production testing shall be in accordance with this European Standard and agreed with the independent accepted body.

A.5 Check of the production and testing by the independent accepted body

The valve manufacturer shall request the independent accepted body, usually once annually, to check the continuous manufacture and testing of valves, for which a type mark was granted. For the purpose of the check the independent accepted body shall be granted access to all production and test facilities at all times without previous notification.

If production is not continuous, the time shall be fixed by agreement between the valve manufacturer and the independent accepted body.

During the check the independent accepted body shall verify:

— by random tests the unchanged production and proper testing of the valves;

— a list of the valves bearing component marks and the records agreed in A.4.4;

— the continuing validity of the type test.

The report concerning the check by the independent accepted body shall be submitted to the manufacturer.

A.6 Modification of valves with type mark

A.6.1 Revisions of this European Standard

In the case of revisions of this European Standard the valve manufacturer shall adapt valves, for which a type mark has been granted, accordingly.

A.6.2 Notification of modifications

Modifications to the design, production or testing of valves as well as modification on the basis of adaptation to amended specifications, shall be notified by the valve manufacturer to the independent accepted body.

Such modifications might require a reconfirmation of the certification of the valve, e.g. by further type testing.

A.7 Procedure

A.7.1 Application for type test

A.7.1.1 Applications for a type test shall be submitted to the independent accepted body.

A.7.1.2 The following documentation in duplicate shall be enclosed with the application.

1) Details of the valves grouped in the range (type of construction, materials, manufacturing procedure, nominal sizes and maximum operating pressures).

2) Drawings and other data for stress evaluation and safety design check in accordance with A.4.2.

3) Details of the documentation in accordance with A.4.4.

4) Details of the proposed marking of the valves according to Clause 10 of this European Standard.

A.7.2 Test report

After completion of the type test by the independent accepted body the applicant receives a test report in one copy. A set of the documents delivered by the applicant and drawn up by the relevant independent accepted body shall be enclosed as an Annex. The report may be passed on or published by the applicant only in its unabridged form.

A.7.3 Type mark

A.7.3.1 The type mark is granted on the basis of the test report by the independent accepted body after the valve manufacturer has submitted a written declaration in accordance with A.8.3.

A.7.3.2 The type mark is granted for a period of five years. The period is extended on application, if the requirements of the regulations forming the basis of the component test have not been amended.

The type mark may be withdrawn before expiry of validity if:

— defects affecting safety result during use of the valves or if operating experience reveals that the requirements of this European Standard are not fulfilled;

— the check on manufacture by the independent accepted body in accordance with A.5 reveals that the conditions governing the granting of the type mark (see also the declaration of obligation in accordance with A.8.3) no longer exist.

A.7.3.3 The type mark is applied by the manufacturer to the valve and consists of the following details:

1) the mark of the independent accepted body;

2) the type approval number;

3) the year of type approval.

A.8 Notification of valves with type mark

A.8.1 Approvals

The independent accepted body shall keep and publish a list of all granted type approvals.

A.8.2 Expiry

The independent accepted body shall publish a list of expired or withdrawn type approvals.

A.8.3 Specimen of declaration of obligation

Declaration of obligation
We, (Name of company) _____
_____
declare to (Name of independent accepted body) ..... will meet the requirements of Annex A of EN 14141:2013.
— Type test procedure on general design and production of valves for pipelines.
In particular we undertake:
— to apply the type mark granted to the following valves
type, series:
drawing No.:
only to valves, which have been qualified by the type test
— to order the independent accepted body to check usually once annually that the production of the valves conforms to the drawings and that the required testing equipment is suitable and effective.
Furthermore, we undertake not to use the type mark, if
1) the validity period has expired;
or
2) the independent accepted body has revoked its issuing of the mark;
or
3) we become aware of defects to the valves which adversely affect their safety or realise from operating experience that the requirements of EN 14141 are not met.
_____ _____
(place, date) (authorised signatory)
Signed on behalf of company
Name:
Function:
Signature:
Date:
(The user of this form is allowed to copy this present form)

Annex B
(normative)

Strength test on torque/thrust

B.1 Purpose

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

B.2 Performance of test

The test is performed after the test in EN 13942:2009, B.6 as given in 5.2.4.

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 of 1 min.

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

B.3 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 C
(normative)

Functional test on clean gas (on option)

C.1 Purpose

The purpose of this test is to determine the ability to function under the influence of clean gas and appropriate operation. This means that the valve withstands several operation cycles under full differential pressure without damage.

C.2 Performance of test

The seat test shall be carried out in accordance with 5.8.1.

The test medium shall be air, nitrogen or natural gas.

The valve shall have been thoroughly dried before these tests are conducted.

In every duty cycle the valve shall open and close fully. The number of duty cycles shall be:

— < DN 100: 200 cycles;

— ≥ DN 100: 100 cycles at constant pressure (i.e. rated pressure); 50 cycles with differential pressure (i.e. MPD).

The test shall be performed at ambient temperature. The differential pressure shall be MPD.

The manufacturer's instructions on admissible duty cycle speeds and frequencies shall be observed.

A storage vessel capacity of $V_E = 4 \times (DN)^3$ in mm^3 shall be provided upstream the valve. There shall be no reduction of nominal size between the storage vessel and the valve.

With regard to the dimensions of the test facility and the reduction of noise emissions, the outlet cross-section or the outlet volume can be restricted, so that at least 90 % of the initial pressure differential is effective.

The full pressure shall have built up upstream of the obturator before each opening motion.

With double sealing valves, the seat tightness test shall be repeated with reverse flow direction or the entire fatigue test shall be performed on another test specimen of the same nominal size, but with the reverse flow direction.

Before and after the test, the torque and the leakage tests in accordance with this European Standard shall be conducted.

C.3 Acceptance criteria

For external tightness, no visible leakage shall be allowed.

Soft seated valves and lubricated plug valves shall conform to rate B in accordance with EN 12266-1:2012, and metal seated valves to rate D in accordance with EN 12266-1:2012.

The increase in operating torque shall not exceed 15 %.

Annex D
(normative)

Functional test for abrasion resistance to dirty service of ball valves (on option)

D.1 Purpose

The purpose of this test is to determine the abrasion resistance to solid substances entrained in the gaseous transport medium. The following pipeline operations shall be simulated.

— During by-pass operation with the main valve closed, e.g. after the pipeline has been closed down, solid contaminants settle upstream of the closed obturator. When the main valve is opened, the sealing elements are impacted with the dirt which has collected.

— During a pigging operation, the branch valves are closed. Solid contaminants which are pushed forward in front of the pig enter the branches and impact the sealing elements when the valve is opened.

D.2 Performance of test

This type test covers all sizes and pressure ratings.

The test shall be performed on a single valve Class 600 with minimum diameter DN 300 and the largest diameter equal to the diameter of the test rig.

— 20 open-close cycles are carried out at a high transport rate in the presence of solid contaminants.

— A defined amount of contaminants[2)] is introduced into the system upstream 0,2 m of the closed test valve. The composition of the test contaminant should be reproducible. It may, for example, be the result of a physical analysis of the material collected during a pigging operation. Table D.1 contains a representative example.

— A certain amount of gas is passed through the by-pass. The amount of gas corresponds to a transport flow in the test valve of approximately 10 m/s in open position.

— The test valve is opened in accordance with pipeline operation practice in a duration of about 60 s. The mere throttling of the test valve causes the contaminant to start to move and impact the exposed part of the sealing element. Whilst opening the test valve, the by-pass is synchronously closed.

— After the first, third, 10^{th} and 20^{th} cycle a seat tightness test is performed.

Seat tightness shall be determined by measurement of leakage of the closed valve via overflow at the body cavity vent. Upstream and downstream pressure shall be monitored.

The initial break-away torque, continuous torque and valve position shall be measured.

D.3 Acceptance criteria

The test result is representative of the wear resistance of the test valve. Permissible leakage shall be:

2) 1 kg for DN 400; adaptation of quantity related to the squared diameter ratio in case of modified DN.

— permissible leakage rate < 5 m^3/h in each direction;

— permissible leakage rate < 10 m^3/h measured via overflow (drain or vent lines) at the cavity connection with pressure applied to both sides simultaneously.

Table D.1 —Composition of the contaminant mixture

Contaminant	**Particle sizes** ***s*** mm	**Share** **%**
Welding sinter	50 % 0,1 < *s* ≤ 1,0 50 % 0,1 < *s* ≤ 2,0	10
Welding pearls	1,5 < *s* ≤ 2,5	15
Coarse-grained sand	50 % 0,1 < *s* ≤ 1,0 50 % 0,1 < *s* ≤ 2,0	75
NOTE In addition, per litre of this mixture — 10 cm^3 of glass splinters; — three welding rods residue diameter 3,25 mm/length 20 mm.		

Annex E
(normative)

Wall thickness measurement

E.1 Purpose

The purpose of this test is to confirm that the wall thickness of the valve shell is in accordance with the design documents.

E.2 Description of test

Measure the wall thickness in at least four critical strength areas of the shell or on complete shell.

Castings shall be measured in opposite areas.

E.3 Test method

Measurements shall be carried out by measuring tool with suitable accuracy of reading calibrated to expected wall thickness.

E.4 Acceptance criteria

The minimum wall thickness at each measurement point shall be not less than the minimum value stated on the drawing.

Annex F
(informative)

Additional requirements

F.1 Bending strength

This European Standard assumes that forces and moments transmitted by the pipe are such that valve performance is not affected. Where unusual conditions apply, the purchaser should advise the manufacturer. A bending test may be required by the purchaser. In this case, the purchaser should specify a suitable testing procedure to be applied, including bending moments and acceptance criteria.

F.2 Protection against excessive torques

At the request of the purchaser the valve should be fitted with a protection against excessive torque transmitted from the operator (e.g. by a shear pin) placed outside the shell.

Annex G
(informative)

Summary of tests on product and type tests

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

Table G.1 — Summary of the mandatory or optional tests to be carried out in accordance with this European Standard

Requirement clause	Application	Test	Test method	Test on product	Type test
Design					
5.1.1	Shell design and dimension	Design approval	A.4.3, respectively Annex E	—	M
5.1.2	End-to-end dimensions	Dimensional check	A.4.3[a]	M	M
5.1.3	Butt welding ends	Dimensional check	A.4.3[a]	M	M
5.1.4	Anti-blow out feature	Drawing examination	A.4.3[a]	M	M
5.1.5	Sealant injection systems	Drawing examination	—	M	M
		Trial sealant injection	5.1.5	—	O
5.1.6	Extended drain, vent and sealant lines				
	— Securely fastened	Visual inspection	—	M	—
	— Design	Drawing examination	—	M	—
	— Pressure test	Hydraulic test[b]	—	M	—
5.1.8	Mechanical resistance against excessive actuating forces	Stem test on torque/thrust	Annex B	—	M
5.1.9	Body/bonnet connection	Visual check of drawing	—	M	M
5.1.10	Interface of valves to actuators of gears	Dimensional check	5.1.10	M	—
		Drawing examination		—	M
5.1.11	Stem extensions	Dimensional check	5.1.11	M	—
		Drawing examination		—	M
Operation					
5.2.1	Handwheels and levers, ease of operation	Measurement of torque/thrust and of handwheel/lever force	5.2.1	M	—
5.2.2	Protection against rapidly moving external components	Visual inspection	—	M	—

Requirement clause	Application	Test	Test method	Test on product	Type test
5.2.3	Manual override devices	Visual inspection	—	M	—
5.2.4	Torque/thrust testing (agreed values)	Measurement of torque/thrust	EN 13942:2009, B.6	M	M
Materials					
5.3.1	Material compatibility	Examination of documents	—	—	M
5.3.2.1	Shell materials	Check of certificate	5.3.2.1	M	M
5.3.2.2	Impact values	Check of certificate	EN ISO 148-1	M	M
5.3.2.3	Welding ends for on-site welding	Check of certificate	5.3.2.3	M	M
5.3.3	Obturator	Check of certificate	5.3.3	M	M
5.3.4	Body/bonnet connection, bolting materials	Check of certificate	5.3.4	M	M
5.3.5	Seals	Check of technical data	5.3.5	M	—
Repair					
5.4	Repair welding	Non-destructive testing	5.5.2	M[C]	M[C]
Non-destructive testing					
5.5.2	Welds joining pressure containing parts				
	— < DN 200	Penetrant testing or	EN 571-1 or EN 13942:2009,A.14	M	M
		Magnetic particle testing	EN ISO 17638 or EN 13942:2009, A.13		
	— ≥ DN 200	Ultrasonic testing or	EN ISO 17640	M	M
		Radiographic testing or (if not suitable)	EN 1435 or EN 13942:2009, A.11		
		Penetrant testing or	EN 571-1 or EN 13942:2009,A.14		

Requirement clause	Application		Test	Test method	Test on product	Type test
			Magnetic particle testing	EN ISO 17638 or EN 13942:2009, A.13		
5.5.3	Pressure-containing castings		Visual inspection	MSS-SP-55	M	M
			Surface examination Magnetic particle testing or Penetrant testing	EN 1369 EN 1371-1	M	M
	— Valves DN ≥ 200		Critical areas radiographic examination	EN 12681 or EN 13942:2009, A.3	M	M
5.5.4	Forgings		Magnetic particle testing or Penetrant testing and (as applicable) Ultrasonic testing	EN 10228-1 or EN 13942:2009, A.9 EN 10228-2 or EN 13942:2009, A.9 EN 10228-3 and EN 10228-4	O	—
5.5.5	Welding ends for on-site welding					
	All valves	— Cast welding ends	Magnetic particle testing or Penetrant testing	EN 1369 EN 1371-1	M	M
		— Rolled or forged	Magnetic particle testing or Penetrant testing	EN 10228-1 EN 10228-2		
	Valves DN ≥200	— Cast welding ends	Radiographic examination	EN 12681 and EN 13942:2009, A.3	M	M
		— Rolled or forged	100 % ultrasonic examination	EN 10228-3 and EN 10228-4		
Shell test						
5.6	Tightness and strength of shell		Shell tightness and shell strength test	EN 13942:2009, 11.3	M	M

Requirement clause	Application	Test	Test method	Test on product	Type test
		Leak test with gas	EN 12266-1:2012, Test P11	O	M
External tightness					
5.7.1	Stem/shaft sealing	Stem backseat test	EN 13942:2009, 11.2	O	O
5.7.3	Fire test	Document check	—	O	—
		Fire test	EN ISO 10497	—	O
Internal tightness					
5.8.1	Seat tightness	High pressure test	EN 13942:2009, 11.4	M	M
		Low pressure gas test	EN 13942:2009, B.3	M	M
		Air test	EN 13942:2009, B.4	M	M
5.8.2	Functional test for clean service	Erosion test with clean gas	Annex C	—	O
5.8.3	Functional test for dirty service	Erosion test with solid contaminants	Annex D	—	O

NOTE M = mandatory
O = optional

[a] Only applicable for type test.

[b] Test is part of shell test specified in 5.6.

[c] If applicable.

Bibliography

[1] ASME B16.34-2004, *Valves Flanged, Threaded and Welding End*

[2] Norsok standard M-710 *Qualification of non-metallic sealing materials and manufacturers* (Norwegian Technology Centre Oscarsgt. 20, Postbox 7072 Majorstua, N-0306 Oslo, Norway).

This page deliberately left blank

This page deliberately left blank

British Standards Institution (BSI)

BSI is the national body responsible for preparing British Standards and other standards-related publications, information and services.

BSI is incorporated by Royal Charter. British Standards and other standardization products are published by BSI Standards Limited.

About us

We bring together business, industry, government, consumers, innovators and others to shape their combined experience and expertise into standards -based solutions.

The knowledge embodied in our standards has been carefully assembled in a dependable format and refined through our open consultation process. Organizations of all sizes and across all sectors choose standards to help them achieve their goals.

Information on standards

We can provide you with the knowledge that your organization needs to succeed. Find out more about British Standards by visiting our website at bsigroup.com/standards or contacting our Customer Services team or Knowledge Centre.

Buying standards

You can buy and download PDF versions of BSI publications, including British and adopted European and international standards, through our website at bsigroup.com/shop, where hard copies can also be purchased.

If you need international and foreign standards from other Standards Development Organizations, hard copies can be ordered from our Customer Services team.

Subscriptions

Our range of subscription services are designed to make using standards easier for you. For further information on our subscription products go to bsigroup.com/subscriptions.

With **British Standards Online (BSOL)** you'll have instant access to over 55,000 British and adopted European and international standards from your desktop. It's available 24/7 and is refreshed daily so you'll always be up to date.

You can keep in touch with standards developments and receive substantial discounts on the purchase price of standards, both in single copy and subscription format, by becoming a **BSI Subscribing Member**.

PLUS is an updating service exclusive to BSI Subscribing Members. You will automatically receive the latest hard copy of your standards when they're revised or replaced.

To find out more about becoming a BSI Subscribing Member and the benefits of membership, please visit bsigroup.com/shop.

With a **Multi-User Network Licence (MUNL)** you are able to host standards publications on your intranet. Licences can cover as few or as many users as you wish. With updates supplied as soon as they're available, you can be sure your documentation is current. For further information, email bsmusales@bsigroup.com.

BSI Group Headquarters

389 Chiswick High Road London W4 4AL UK

Revisions

Our British Standards and other publications are updated by amendment or revision.

We continually improve the quality of our products and services to benefit your business. If you find an inaccuracy or ambiguity within a British Standard or other BSI publication please inform the Knowledge Centre.

Copyright

Useful Contacts:

Customer Services
Tel: +44 845 086 9001
Email (orders): orders@bsigroup.com
Email (enquiries): cservices@bsigroup.com

Subscriptions
Tel: +44 845 086 9001
Email: subscriptions@bsigroup.com

Knowledge Centre
Tel: +44 20 8996 7004
Email: knowledgecentre@bsigroup.com

Copyright & Licensing
Tel: +44 20 8996 7070
Email: copyright@bsigroup.com

bsi.

...making excellence a habit.™