BRITISH STANDARD

BS EN
13397:2002

Industrial valves — Diaphragm valves made of metallic materials

The European Standard EN 13397:2001 has the status of a British Standard

ICS 23.060

National foreword

This British Standard is the official English language version of EN 13397:2001. It supersedes BS 5156:1985 which is withdrawn.

The UK participation in its preparation was entrusted by Technical Committee PSE/7, Valves, to Subcommittee PSE/7/15, Diaphragm valves, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;

— monitor related international and European developments and promulgate them in the UK.

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

Cross-references

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This British Standard, having been prepared under the direction of the Engineering Sector Policy and Strategy Committee, was published under the authority of the Standards Policy and Strategy Committee on 28 January 2002

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EUROPEAN STANDARD

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EN 13397

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English version

Industrial valves - Diaphragm valves made of metallic materials

Robinetterie industrielle - Robinets métalliques à membrane

Industriearmaturen - Membranarmaturen aus Metall

This European Standard was approved by CEN on 29 September 2001.

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

Management Centre: rue de Stassart, 36 B-1050 Brussels

Contents

Foreword

This European Standard 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of an identical text or by endorsement, at the latest by May 2002, and conflicting national standards shall be withdrawn at the latest by May 2002.

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

For relationship with EU Directive(s), see informative annex ZA, which is an integral part of this standard.

This standard contains an annex A that is normative and an annex B that is informative.

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

1 Scope

This European Standard specifies requirements for diaphragm valves with metallic shell materials.

The range of nominal sizes covered is :

— for flanged valves : sizes DN 10, DN 15, DN 20, DN 25, DN 32, DN 40, DN 50, DN 65, DN 80, DN 100, DN 125, DN 150, DN 200, DN 250 and DN 300 ;

— for screwed valves : sizes ¼, 3/8, ½, ¾, 1, 1¼, 1½, 2, 2½ and 3 ;

— for weld end valves : sizes DN 8, DN 10, DN 15, DN 20, DN 25, DN 32, DN 40, DN 50, DN 65, DN 80, DN 100, DN 125, DN 150, DN 200, DN 250 and DN 300.

The range of PN and Class designations covered is :

— PN 6, PN 10, PN 16 and PN 25 ;

— Class 150.

2 Normative references

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

EN 545, *Ductile iron pipes, fittings, accessories and their joints for water pipelines – Requirements and test methods.*

EN 558-1, *Industrial valves - Face-to-face and centre-to-face dimensions of metal valves for use in flanged pipe systems - Part 1: PN-designated valves.*

EN 558-2, *Industrial valves - Face-to-face and centre-to-face dimensions of metal valves for use in flanged pipe systems - Part 2: Class-designated valves.*

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

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

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

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

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

EN 1561, *Founding – Grey cast irons.*

EN 1562, *Founding – Malleable cast irons.*

EN 1563, *Founding – Spheroidal graphite cast irons.*

EN 1982, *Copper and copper alloys – Ingots and castings.*

EN 12420, *Copper and copper alloys – Forgings.*

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

EN 12627, *Industrial valves - Butt welding end profile.*

EN 12760, *Valves - Socket welding ends for steel valves.*

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

prEN 19[1)], *Industrial valves - Marking of metallic valves.*

prEN 1092-1[1)], *Flanges and their joints - Circular flanges for pipes, valves, fittings and accessories, PN designated - Part 1: Steel flanges.*

prEN 1092-3[1)], *Flanges and their joints - Circular flanges for pipes, valves, fittings and accessories, PN designated - Part 3: Copper alloy flanges.*

prEN 1759-1[1)], *Flanges and their joints - Circular flanges for pipes, valves, fittings and accessories, Class designated - Part 1: Steel flanges, NPS ½ to 24.*

prEN 1759-3[1)], *Flanges and their joints - Circular flanges for pipes, valves, fittings and accessories, Class designated - Part 3: Copper alloy and composite flanges.*

prEN 10226-1[1)], *Pipe threads where pressure tight joints are made on the threads - Part 1: Designation, dimensions and tolerances.*

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

prEN 12516-1[1)], *Industrial valves - Shell design strength - Part 1: Tabulation method for steel valve shells.*

prEN 12516-2[1)], *Industrial valves - Shell design strength - Part 2: Calculation methods for steel valve shells.*

prEN 12516-3[1)], *Valves - Shell design strength - Part 3: Experimental method.*

EN ISO 5210, *Industrial valves - Multi-turn valve actuator attachments (ISO 5210:1991).*

ISO 7-1, *Pipe threads where pressure-tight joints are not made on the threads - Part 1: Dimensions, tolerances and designation.*

ISO 228-1, *Pipe threads where pressure-tight joints are made on the threads - Part 1: Dimensions, tolerances and designation.*

ISO 1043-1, *Plastics - Symbols - Part 1: Basic polymers and their basic characteristics.*

ISO 1629, *Rubbers and lattices – Nomenclature.*

ISO 10422, *Petroleum and natural gas industries - Threading, gaging and thread inspection of casing, tubing and line pipe threads – Specifications.*

ANSI/ASME B1.20.1, *Pipe threads, General purpose.*

NOTE This European Standard supports some of the Essential Requirements of the Pressure Equipment Directive 97/32/EC. The essential requirements covered are listed in annex ZA (informative). It should be noted that this standard is not self sufficient and should be used with the normative references listed herein. Reference should also be made to the annex ZA in the relevant normative reference.

[1)] To be published.

3 Terms and definitions

For the purpose of this European Standard the terms and definitions listed in EN 736-1, EN 736-2 and EN 736-3 apply, together with the following :

3.1
weir type diaphragm valve
diaphragm valve in which closure is attained by compression of the diaphragm onto a raised weir formed in the body shape

3.2
straight through type diaphragm valve
diaphragm valve in which closure is attained by compression of the diaphragm onto the valve body wall, the body maintaining a largely straight-through bore configuration

3.3
diaphragm
flexible component, generally of either elastomeric or polymeric material, which does not form part of the pressure bearing shell but acts as the valve obturator, whilst also isolating the valve mechanism from the line fluid

3.4
compressor
component of the diaphragm valve assembly which affords compression to the diaphragm to effect closure against the valve body

4 Requirements

4.1 Design

4.1.1 Materials

4.1.1.1 Shell

Shell materials shall be selected from the following :

— steels : in accordance with prEN 12516-1 ;

— cast irons : in accordance with Table A.1 ;

— copper alloys : in accordance with Table A.2.

4.1.1.2 Diaphragm

Diaphragm materials shall be agreed between the manufacturer and the purchaser.

4.1.1.3 **Body lining** (if applicable)

The body lining shall cover the wetted surface and any sealing areas necessary for the functioning of the valve.

Body lining materials shall be agreed between the manufacturer and the purchaser.

4.1.2 Pressure/temperature ratings

The pressure temperature rating of the body and bonnet shall be as specified for flanges in prEN 1092-1, EN 1092-2, prEN 1092-3, prEN 1759-1, prEN 1759-3, for the respective materials and pressure designations.

The pressure temperature rating of the valve may be restricted due to the body lining material and/or the diaphragm material (see manufacturer's recommendations). However, all valves shall be suitable for use within a temperature range of -5 °C to +50 °C, at the allowable pressure of the valve.

4.1.3 Dimensions

4.1.3.1 Face-to-face, centre-to-face and end-to-end dimensions

Face-to-face dimensions for straight pattern flanged valves shall be in accordance with EN 558-1 or EN 558-2 series 1 or series 7.

NOTE In accordance with EN 558-1 and EN 558-2 the dimensions of lined valves to series 7 can exclude the thickness of the lining.

Centre-to-face dimensions for angle pattern flanged valves shall be in accordance with EN 558-1 or EN 558-2 series 8.

End-to-end dimensions for weld end valves of sizes DN 65 and above shall be in accordance with EN 12982 series 1 or series 7.

4.1.3.2 Body flange dimensions

Body end flanges shall be in accordance with prEN 1092-1, EN 1092-2 or prEN 1092-3 for PN designated flanges or to prEN 1759-1 or prEN 1759-3 for Class designated flanges.

4.1.3.3 Threaded body ends

Threaded body ends shall have internal threads selected from:

- parallel threads :
  - in accordance with prEN 10226-1 ;
  - in accordance with ISO 228-1.
- taper threads :
  - type Rc in accordance with ISO 7-1 ;
  - in accordance with ANSI/ASME B1.20.1 ;
  - in accordance with ISO 10422.

4.1.3.4 Welding ends

Welding ends shall be either butt weld or socket weld in accordance with EN 12627 and EN 12760 respectively.

4.1.3.5 Other types of ends

Other types of ends, different to those specified in the preceding sub-clauses, may be used provided their suitability for the purpose is proven.

4.1.4 Operation

4.1.4.1 Operating device

All valves shall be capable of being operated by either a handwheel, a lever or an actuator.

4.1.4.1.1 Handwheel or lever

Handwheels and levers shall be fitted in a manner that will allow removal and replacement if necessary.

4.1.4.1.2 Actuators

If an actuator is not an integral part of the valve, the dimensions of the valve to actuator flange or yoke shall comply with EN ISO 5210.

4.1.4.2 Operating direction

Valves shall be clockwise closing.

4.1.4.3 Operational capability

Valves shall be suitable for use as the following valve types :

— isolating ;

— regulating ;

— isolating and regulating ;

— control.

4.1.5 Construction

4.1.5.1 Types of valves

Valves shall be either weir type, (see Figure 1), or straight through type, (see Figure 2).

4.1.5.2 Body

Bodies shall be :

— straight pattern or 90° angle pattern ;

— lined or unlined.

4.1.5.3 Bonnet

Bonnets shall be stem sealed or non-stem sealed. Valves with stem sealed bonnets shall have a seal between the stem and the bonnet neck to contain the line pressure or vacuum without leakage and may be designed such that a means of checking diaphragm failure could be supplied.

4.1.5.4 Stem, stem nut and other working parts

The stem, stem nut and other working parts shall be isolated from the line fluid by means of the diaphragm.

4.1.5.5 Bolting

Bolting shall be in accordance with EN 1515-1.

4.1.5.6 Diaphragm

The diaphragm shall be replaceable.

4.1.5.7 Indication

Valves shall be fitted with a visible means of indicating the open and shut positions.

4.2 Functional characteristics

4.2.1 Shell design strength

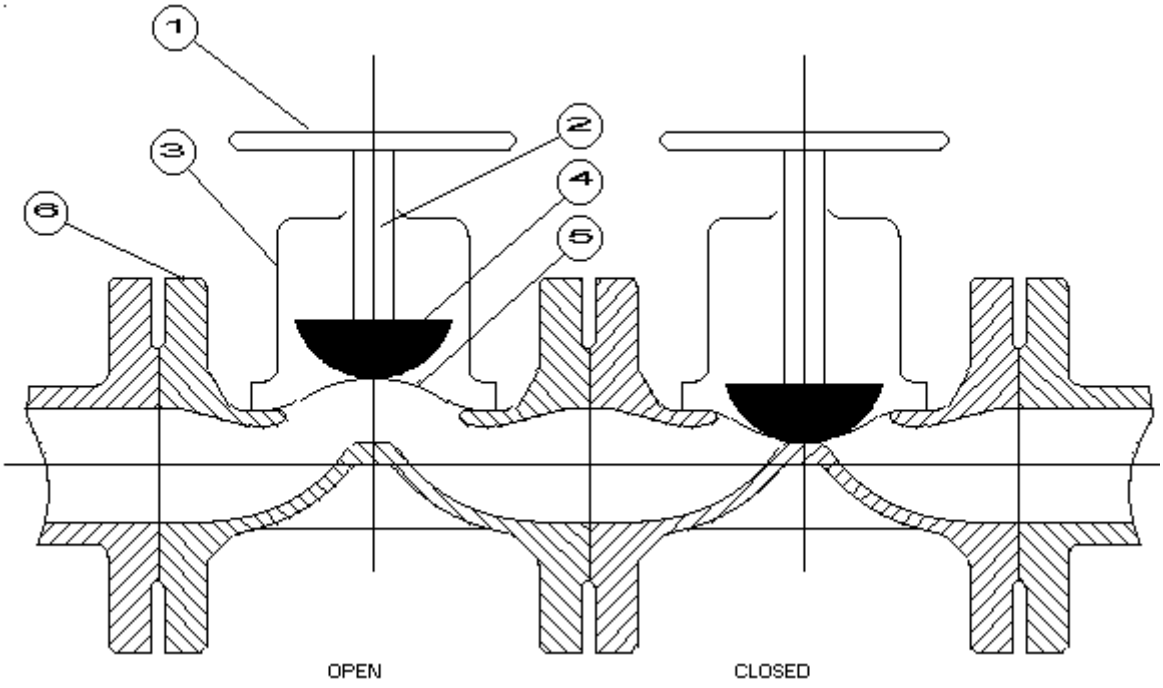
Methods for determination of valve shell design strength shall be as prEN 12516-1, prEN 12516-2 or prEN 12516-3.

4.2.2 Seat leakage

When valves are tested according to clause 5, the acceptable seat leakage shall be Rate A according to prEN 12266-1.

4.2.3 Operating element

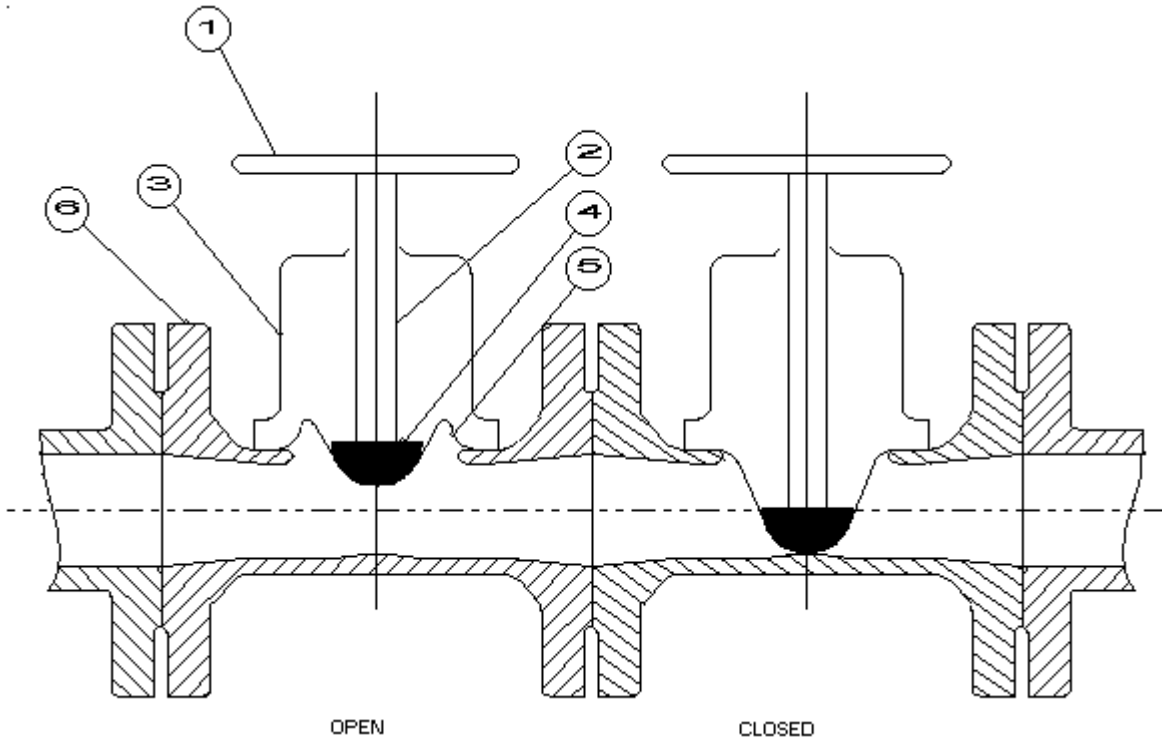
The size of the operating element shall be determined in accordance with EN 12570.



Key

1 Handwheel
2 Stem with indicator
3 Bonnet
4 Compressor
5 Diaphragm
6 Body

Figure 1 - Weir type valve



Key

1 Handwheel
2 Stem with indicator
3 Bonnet
4 Compressor
5 Diaphragm
6 Body

Figure 2 - Straight through type valve

5 Test methods

All fully assembled valves shall be pressure tested according to prEN 12266-1, except that lined valves shall be tested after lining.

NOTE Due to the design features of this type of valve the bonnet is indirectly subjected, during each test, to the forces generated by the test pressure through the fasteners and the stem.

6 Inspection

All valves shall be inspected by the manufacturer prior to despatch to ensure compliance with the order.

7 Designation

Due to the variety of shell and diaphragm materials possible, no universal designation system is recommended in this standard. When specifying a valve in the enquiry or order, however, the purchaser should provide the information given in annex B.

8 Marking, preparation for storage and transportation

8.1 Marking

8.1.1 General

Valves shall be clearly marked with the information in accordance to prEN 19.

8.1.2 Additional markings

8.1.2.1 Valve

The material abbreviation, as typically given in ISO 1043-1 or ISO 1629, and/or the manufacturers' identification grade for both the diaphragm and the body lining shall be marked on the assembled valve in a visible position.

If the allowable pressure of the valve is restricted due to the body lining material and/or diaphragm material, this shall be marked on an identification plate.

8.1.2.2 Diaphragm

The diaphragm shall be marked with the following :

— material abbreviation, as typically given in ISO 1043-1 or ISO 1629, and/or manufacturers' grade reference ;

— nominal size ;

— manufacturers' name or mark ;

— manufacturing date identification.

8.1.2.3 Handwheel

Handwheels shall be marked to show the direction of closing.

8.1.2.4 Sizes smaller than DN 50

Valves of sizes smaller than DN 50 shall be marked to the same requirements as specified for valves of sizes DN 50 and larger.

8.2 Preparation for storage and transportation

8.2.1 Corrosion

All valve external surfaces shall be protected against corrosion, as necessary.

After testing, each valve shall be drained of the test medium and cleared of any extraneous matter.

8.2.2 Ends

Valve ends shall be protected to prevent the ingress of foreign matter.

Annex A
(normative)

Cast iron and copper alloy shell materials

Table A.1 - Cast iron shell materials

Graphite structure	European Standard	Designation	
		Short name	Number
Grey cast iron	EN 1561	EN-GJL-200 EN-GJL-250 EN-GJL-300 EN-GJL-350	EN-JL1030 EN-JL1040 EN-JL1050 EN-JL1060
Spheroidal graphite cast iron	EN 1563	EN-GJS-350-22-LT EN-GJS-350-22-RT EN-GJS-400-18-LT EN-GJS-400-18-RT EN-GJS-400-15 EN-GJS-450-10 EN-GJS-500-7 EN-GJS-600-3	EN-JS1015 EN-JS1014 EN-JS1025 EN-JS1024 EN-JS1030 EN-JS1040 EN-JS1050 EN-JS1060
	EN 545	-	-
Malleable cast iron	EN 1562	EN-GJMW-350-4 EN-GJMW-400-5 EN-GJMB-300-6 EN-GJMB-320-12 EN-GJMB-350-10	EN-JM1010 EN-JM1030 EN-JM1110 EN-JM1120 EN-JM1130

Table A.2 - Copper alloy shell materials

Type of alloy	European Standard	Material designation	
		Symbol	Number
Copper – aluminium	EN 1982	CuAl10Fe2-C CuAl10Fe5Ni5-C	CC331G CC333G
Copper – tin	EN 1982	CuSn5Zn5Pb5-C CuSn7Zn2Pb3-C CuSn7Zn4Pb7-C CuSn6Zn4Pb2-C	CC491K CC492K CC493K CC498K
Copper – zinc - lead	EN 12420	CuZn36Pb2As CuZn39Pb3 CuZn40Pb2	CW602N CW614N CW617N
Complex copper - zinc	EN 12420	CuZn32Pb2AsFeSi	CW709R
	EN 1982	CuZn33Pb2Si-C CuZn39Pb1Al-C	CC751S CC754S

Annex B
(informative)

Information to be supplied by the purchaser

The following information should be supplied by the purchaser in his enquiry or order :

— number of this standard ;

— nominal size ;

— PN or Class designation ;

— type of valve, i.e. either weir type or straight through type (see 4.1.5.1) ;

— service conditions, e.g. nature of fluid conveyed, maximum and minimum operating pressures and temperatures (see 4.1.2) ;

— face-to-face, centre-to-face or end-to-end series of dimensions (see 4.1.3.1) ;

— details of body ends (see 4.1.3) ;

— whether a stem sealed bonnet with means of checking diaphragm failure is required (see 4.1.5.3) ;

— if actuator operation is required, type of actuator, maximum differential pressure of the valve and power source (see 4.1.4.1.2) ;

— materials required for the shell, body lining and diaphragm (see 4.1.1).

Annex ZA
(informative)

Clauses of this European Standard addressing essential requirements or other provisions of EU Directives

This European Standard has been prepared under a mandate given to CEN by the EU and EFTA and supports essential requirements of EU Directive 97/23/EC (PED).

WARNING: Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this standard.

The following clauses of this standard likely to support requirements of Directive 97/23/EC.

Table ZA.1 - Clauses of this European Standard addressing essential requirements of EU Directive 97/23/EC

Clause	Nature of requirement	Annex I of PED Essential Safety Requirements
4.1.2	General design	2.1
4.1.4	Safe operation	2.3
8.1	Traceability	3.1.5
8.1	Marking and labelling	3.3
annex A	Materials	4.1

Compliance with the clauses of this standard above provides one means of conforming with the specific essential requirements of the Directive concerned and associated EFTA regulations.

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