



**SLOVENSKI STANDARD**  
**SIST EN 16668:2016+A1:2018**  
**01-maj-2018**

**Nadomešča:**  
**SIST EN 16668:2016**

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**Industrijski ventili - Zahteve in preskušanje kovinskih ventilov kot tlačnega pribora**

Industrial valves - Requirements and testing for metallic valves as pressure accessories

Industriearmaturen - Anforderungen und Prüfungen für Metallarmaturen als drucktragende Ausrüstungsteile

Robinetterie industrielle - Exigences et essais pour appareils de robinetterie métalliques utilisés comme accessoires sous pression

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**ICS:**

23.060.01      Ventili na splošno                      Valves in general

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EUROPEAN STANDARD

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## Industrial valves - Requirements and testing for metallic valves as pressure accessories

Robinetterie industrielle - Exigences et essais pour appareils de robinetterie métalliques utilisés comme accessoires sous pression

Industriearmaturen - Anforderungen und Prüfungen für Metallarmaturen als drucktragende Ausrüstungsteile

This European Standard was approved by CEN on 23 January 2016 and includes Amendment 1 approved by CEN on 8 January 2018.

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EUROPEAN COMMITTEE FOR STANDARDIZATION  
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EN 16668:2016+A1:2018 (E)

## European foreword

This document (EN 16668:2016+A1:2018) 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of an identical text or by endorsement, at the latest by September 2018, and conflicting national standards shall be withdrawn at the latest by September 2018.

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 includes Amendment 1, approved by CEN on 8 January 2018.

This document supersedes A1 EN 16668:2016 A1.

The start and finish of text introduced or altered by amendment is indicated in the text by tags A1 A1.

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 document.

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, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

## Introduction

This European Standard is to be understood as an umbrella standard referencing European harmonized Standards for industrial metallic valves as pressure accessories for industrial applications and covers the relevant minimum requirements to meet the Essential Safety Requirements of the Pressure Equipment Directive.

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**EN 16668:2016+A1:2018 (E)****1 Scope**

This European standard applies to metallic valves as pressure accessories for industrial applications with a maximum allowable pressure PS greater than 0,5 bar in accordance with the  $\square_{A1}$  European legislation for pressure equipment  $\square_{A1}$  and specifies minimum requirements applicable to design, manufacture, testing, materials and documentation.

All relevant essential safety requirements of the  $\square_{A1}$  European legislation for pressure equipment  $\square_{A1}$  applicable to valves have been taken into consideration and are addressed in this standard.

This standard is not applicable to:

- safety valve and bursting disc (a safety accessory),
- sight glass with its frames (component of a pressure equipment) and
- measurement chambers.

For other exclusions refer to the  $\square_{A1}$  European legislation for pressure equipment  $\square_{A1}$  [32].

**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.

$\square_{A1}$  EN 19:2016  $\square_{A1}$ , *Industrial valves — Marking of metallic valves*

$\square_{A1}$  *deleted text*  $\square_{A1}$

EN 545:2010, *Ductile iron pipes, fittings, accessories and their joints for water pipelines — Requirements and test methods*

$\square_{A1}$  EN 593:2017, *Industrial valves — Metallic butterfly valves for general purposes*  $\square_{A1}$

$\square_{A1}$  EN 736-1:2017  $\square_{A1}$ , *Valves — Terminology — Part 1: Definition of types of valves*

$\square_{A1}$  EN 764-1:2015+A1:2016, *Pressure equipment — Part 1: Vocabulary*

EN 764-2:2012, *Pressure equipment — Part 2: Quantities, symbols and units*  $\square_{A1}$

EN 764-4:2014, *Pressure equipment — Part 4: Establishment of technical delivery conditions for metallic materials*

EN 764-5:2014, *Pressure equipment — Part 5: Inspection documentation of metallic materials and compliance with the material specification*

$\square_{A1}$  EN 764-7:2002, *Pressure equipment — Part 7: Safety systems for unfired pressure equipment*  $\square_{A1}$

$\square_{A1}$  EN 1171:2015  $\square_{A1}$ , *Industrial valves — Cast iron gate valves*

EN 1349:2009, *Industrial process control valves*

EN 1515-4:2009, *Flanges and their joints — Bolting — Part 4: Selection of bolting for equipment subject to the Pressure Equipment Directive 97/23/EC*



EN 1561:2011, *Founding — Grey cast irons*

EN 1982:2008, *Copper and copper alloys — Ingots and castings*

EN 1983:2013 <sup>A1</sup>, *Industrial valves — Steel ball valves*

EN 1984:2010 <sup>A1</sup>, *Industrial valves — Steel gate valves*

EN 10025-1:2004, *Hot rolled products of structural steels — Part 1: General technical delivery conditions* <sup>A1</sup>

EN 10025-2:2004, *Hot rolled products of structural steels — Part 2: Technical delivery conditions for non-alloy structural steels*

EN 10028-2:2017, *Flat products made of steels for pressure purposes — Part 2: Non-alloy and alloy steels with specified elevated temperature properties*

EN 10028-3:2017, *Flat products made of steels for pressure purposes — Part 3: Weldable fine grain steels, normalized*

EN 10028-4:2017, *Flat products made of steels for pressure purposes — Part 4: Nickel alloy steels with specified low temperature properties*

EN 10028-7:2016, *Flat products made of steels for pressure purposes — Part 7: Stainless steels*

EN 10213:2007+A1:2016, *Steel castings for pressure purposes* <sup>A1</sup>

EN 10222-2:1999, *Steel forgings for pressure purposes — Part 2: Ferritic and martensitic steels with specified elevated temperature properties*

EN 10222-3:2017, *Steel forgings for pressure purposes — Part 3: Nickel steels with specified low temperature properties*

EN 10222-4:2017, *Steel forgings for pressure purposes — Part 4: Weldable fine grain steels with high proof strength*

EN 10222-5:2017, *Steel forgings for pressure purposes — Part 5: Martensitic, austenitic and austenitic-ferritic stainless steels* <sup>A1</sup>

EN 10269:2013, *Steels and nickel alloys for fasteners with specified elevated and/or low temperature properties*

EN 12163:2011, *Copper and copper alloys — Rod for general purposes*

EN 12164:2011, *Copper and copper alloys — Rod for free machining purposes*

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

EN 12266-2:2012, *Industrial valves — Testing of metallic valves — Part 2: Tests, test procedures and acceptance criteria — Supplementary requirements*

EN 12288:2010 <sup>A1</sup>, *Industrial valves — Copper alloy gate valves*

<sup>A1</sup> *deleted text* <sup>A1</sup>

EN 12449:2012, *Copper and copper alloys — Seamless, round tubes for general purposes*

**EN 16668:2016+A1:2018 (E)**

EN 12516-1:2014, *Industrial valves — Shell design strength — Part 1: Tabulation method for steel valve shells*

EN 12516-2:2014, *Industrial valves — Shell design strength — Part 2: Calculation method for steel valve shells*

EN 12516-3:2002, *Valves — Shell design strength — Part 3: Experimental method*

EN 12516-4:2014, *Industrial valves — Shell design strength — Part 4: Calculation method for valve shells manufactured in metallic materials other than steel*

EN 13397:2001 <sup>A1</sup>, *Industrial valves — Diaphragm valves made of metallic materials*

EN 13445-2:2014, *Unfired pressure vessels — Part 2: Materials*

EN 13445-4:2014, *Unfired pressure vessels — Part 4: Fabrication*

EN 13445-5:2014, *Unfired pressure vessels — Part 5: Inspection and testing*

EN 13480-2:2012, *Metallic industrial piping — Part 2: Materials*

EN 13547:2013, *Industrial valves — Copper alloy ball valves* <sup>A1</sup>

EN 13709:2010 <sup>A1</sup>, *Industrial valves — Steel globe and globe stop and check valves*

EN 13789:2010 <sup>A1</sup>, *Industrial valves — Cast iron globe valves*

EN <sup>A1</sup> *deleted text* <sup>A1</sup>

EN 16767:2016, *Industrial valves — Steel and cast iron check valves* <sup>A1</sup>

EN ISO 5817:2014, *Welding — Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded) — Quality levels for imperfections (ISO 5817:2014)*

EN ISO 9606-1:2017, *Qualification testing of welders — Fusion welding — Part 1: Steels (ISO 9606-1:2012 including Cor 1:2012 and Cor 2:2013)*

EN ISO 9606-2:2004, *Qualification test of welders — Fusion welding — Part 2: Aluminium and aluminium alloys (ISO 9606-2:2004)*

EN ISO 9606-3:1999, *Approval testing of welders — Fusion welding — Part 3: Copper and copper alloys (ISO 9606-3:1999)*

EN ISO 9606-4:1999, *Approval testing of welders — Fusion welding — Part 4: Nickel and nickel alloys (ISO 9606-4:1999)*

EN ISO 9606-5:2000, *Approval testing of welders — Fusion welding — Part 5: Titanium and titanium alloys, zirconium and zirconium alloys (ISO 9606-5:2000)* <sup>A1</sup>

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

EN ISO 14732:2013, *Welding personnel — Qualification testing of welding operators and weld setters for mechanized and automatic welding of metallic materials (ISO 14732:2013)*

EN ISO 15609-1:2004, *Specification and qualification of welding procedures for metallic materials — Welding procedure specification — Part 1: Arc welding (ISO 15609-1:2004)*

EN ISO 15613:2004, *Specification and qualification of welding procedures for metallic materials — Qualification based on pre-production welding test (ISO 15613:2004)*

EN ISO 15614-1:2004, *Specification and qualification of welding procedures for metallic materials — Welding procedure test — Part 1: Arc and gas welding of steels and arc welding of nickel and nickel alloys (ISO 15614-1:2004)*

EN ISO 15614-2:2005, *Specification and qualification of welding procedures for metallic materials — Welding procedure test — Part 2: Arc welding of aluminium and its alloys (ISO 15614-2:2005)*

EN ISO 15614-5:2004, *Specification and qualification of welding procedures for metallic materials — Welding procedure test — Part 5: Arc welding of titanium, zirconium and their alloys (ISO 15614-5:2004)*

EN ISO 15614-6:2006, *Specification and qualification of welding procedures for metallic materials — Welding procedure test — Part 6: Arc and gas welding of copper and its alloys (ISO 15614-6:2006)*

EN ISO 17635:2010, *Non-destructive testing of welds — General rules for metallic materials (ISO 17635:2010)*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 736-1, EN 764 (all parts) and the following apply.

#### 3.1

##### valve

piping component which influences the fluid flow by opening, closing or partially obstructing the passage of the fluid flow or by diverting or mixing the fluid flow

Note 1 to entry Typical valves are gate valves, globe valves, control valves, check valves, diaphragm valves, butterfly valves, plug and ball valves as well as non-standard valves either manual or actuator operated and steam traps, usually covered by a product standard.

[SOURCE: EN 736-1:1995, modified — The Note 1 to entry was added here.]

#### 3.2

##### production welding

welding carried out during manufacturing before final delivery to the purchaser including joint welding and finishing welding

##### 3.2.1

##### joint welding

welding used to weld components in order to obtain an integral unit

##### 3.2.2

##### finishing welding

welding carried out in order to ensure the agreed quality of the casting

[SOURCE: EN ISO 11970:2007, 3.1.2]

**EN 16668:2016+A1:2018 (E)****3.3****repair welding**

welding carried out after delivery to the end user, i.e. after the casting has been in service

[SOURCE: EN ISO 11970:2007, 3.2, modified — The article "any" was deleted at the beginning of the definition.]

**3.4****sample**

set of one or more units taken from a batch and intended to provide information on the batch

Note 1 to entry: This definition is based on ISO 2859-1.

**3.5****material manufacturer**

person or organization (like founder, forge-, welding shop) which provides material to the responsible valve manufacturer

**4 Category of valves**

**A1** A classification under the use of DN and PS and fluid groups 1 and 2 leads to maximum category III. For respective results, see Annex A.

Valves classified in Article 4 (3) of the European legislation for pressure equipment, are excluded from conformance to requirements of this standard but shall meet the "sound engineering practice" by conformity to the relevant product standard. **A1**

**5 Requirements****5.1 Design**

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**5.1.1 General**

Valves shall meet the design requirements of this standard and the ones referenced in Annex ZA of their relevant European harmonized standards.

NOTE Annex D contains a summary of European harmonized Standard for valves.

The manufacturer shall conduct a hazard analysis for the intended use and for the reasonably foreseeable conditions.

It is recommended to have this hazard analysis documented.

If the manufacturer identifies hazards which apply to the valve the manufacturer shall take account of his analysis by appropriate measures in order to reduce or eliminate the hazard identified.

**5.1.2 Shell design strength**

The shell design strength shall be determined by the following:

- a) for steel valves designed by the tabulation method: according to EN 12516-1:2014;
- b) for steel valves designed by calculation: according to EN 12516-2:2014;
- c) for copper alloy, aluminium and cast iron valves: according to EN 12516-4:2014;
- d) if the shell strength resistance is validated by an experimental method: according to EN 12516-3:2002.

Appropriate calculation methods other than those specified in the relevant European harmonized standards giving same level of safety may be applied.

NOTE The valve obturator normally is no part of the shell – except if an “end of line service” is agreed between valve manufacturer and customer – in this case, **A1** all requirements related to the European legislation for pressure equipment **A1** apply to the obturator as well.

**A1** **WARNING** — Basis of design shall comply with the requirements of the European legislation for pressure equipment relative to the design for adequate strength using calculation methods validated, if necessary, by an experimental method. The use of experimental design methods without calculation is limited. **A1**

### 5.1.3 Protection against exceeding the allowable limits

If the hazard analysis identifies the allowable limits under reasonably foreseeable conditions could be exceeded, manufacturer shall fit the valve with a suitable protective device.

## 5.2 Materials

### 5.2.1 General requirements

Shell materials shall be selected in EN 12516-1:2014, EN 12516-4:2014 or EN 13445-2:2014. Other metallic shell materials may be used providing they are covered by an EAM or PMA.

The inspection documents of material shall be in accordance with EN 764-5:2014.

**A1** NOTE EAM or PMA is not required for valves classified in Article 4 (3) of the European legislation for pressure equipment. **A1**

Where relevant the requirements given in EN 764-4:2014 should be considered.

### 5.2.2 European harmonized standards

<https://standards.iteh.ai/catalog/standards/sist/1034f7a3-dea2-413d-a0a5-8e2b8f3189c/sist-16668-2016-a1-2018>

A summary of Harmonized European Material Standards for shell parts is given in Annex B.

### 5.2.3 European approval of materials (EAM)

EAM for materials are intended for repeated use. They are established in accordance with EN 764-4:2014 and apply to materials or treatment condition and product forms or dimensions not covered in a European Harmonized Standard.

Annex C contains a link to OJEU Website for European approval of materials (EAM).

### 5.2.4 Particular Material Appraisal (PMA)

If no material according to a harmonized European material standard is available the manufacturer is obliged to perform or obtain the required particular material appraisal (PMA).

**A1** For valves in categories III or IV, a specific assessment of the PMA shall be performed by the notified body in charge of conformity assessment procedures for the valves. **A1**

PMA apply also as follows:

- a material or a product form or a thickness not covered by a European material Standard or EAM;
- a material specified in a European material Standard or EAM for materials for pressure equipment is intended in an exceptional case for service conditions outside its specified range of application.

Table 1 shows a selection of EN material standards covering materials for which it is required to obtain a PMA when used as shell material.