SLOVENSKI STANDARD
oSIST prEN 1515-4:2019

01-november-2019

Prirobnice in prirobnični spoji - Vijaki in matice - 4. del: Izbira vijakov in matic za opremo, ki je v skladu z Direktivo o tlačni opremi 2014/68/EU

Flanges and their joints - Bolting - Part 4: Selection of bolting for equipment subject to the Pressure Equipment Directive 2014/68/EU

Flansche und ihre Verbindungen - Schrauben und Muttern - Teil 4: Auswahl von Schrauben und Muttern zur Anwendung im Gültigkeitsbereich der Druckgeräterichtlinie 2014/68/EU

Brides et leurs assemblages - Boulonnerie - Partie 4 : Sélection de la boulonnerie pour équipments relevant de la Directive Equipments sous pression 2014/68/EU

Ta slovenski standard je istoveten z: **prEN 1515-4**

ICS:

21.060.10	Sorniki, vijaki, stebelni vijaki	Bolts, screws, studs
21.060.20	Matice	Nuts
23.040.60	Prirobnice, oglavki in spojni elementi	Flanges, couplings and joints

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EUROPEAN STANDARD

NORME EUROPÉENNE

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ICS 21.060.10; 21.060.20; 23.040.60

Will supersede EN 1515-4:2009

English Version

Flanges and their joints - Bolting - Part 4: Selection of bolting for equipment subject to the Pressure Equipment Directive 2014/68/EU

Brides et leurs assemblages - Boulonnerie - Partie 4 : Sélection de la boulonnerie pour équipments relevant de la Directive Equipments sous pression 2014/68/EU

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This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 74.

If this draft becomes a European Standard, 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.

This draft European Standard was established by CEN 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.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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

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European foreword

This document (prEN 1515-4:2019) has been prepared by Technical Committee CEN/TC 74 “Flanges and their joints”, the secretariat of which is held by DIN.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 1515-4:2009

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.

EN 1515 series, *Flanges and their joints — Bolting*, consists of the following parts:

— *Part 1: Selection of bolting*

— *Part 2: Classification of bolt materials for steel flanges, PN designated*

— *Part 3: Classification of bolt materials for steel flanges, class designated*

— *Part 4: Selection of bolting for equipment subject to the Pressure Equipment Directive 2014/68/EU*

— Part 1 to become a summary on selection of bolting.

— Part 2 to remain as the standard for PN designated flanges and be updated.

— Part 3 to remain as the standard for Steel Class designated flanges and be updated.

— Part 4 to consideration of other standards which will use parts 1 to 4 was given and although there is an argument that the parts could be merged, in order to minimize impact on other standards parts 1 to 4 will all be reviewed and revised.

1 Scope

This document is applicable to the selection of bolting for flanged joints on equipment subject to the Pressure Equipment Directive 2014/68/EU.

It specifies standards and additional requirements for dimensions, material properties and technical conditions of delivery for bolting.

NOTE 1 Washers are not within the scope of this document.

The selection is based on commonly used bolting. It covers common temperature ranges of the general service of flanges.

When selecting bolting according to this document, it is essential to take into account environmental conditions and other parameters including type of fluids, corrosion hazards, sour service, low temperature brittle failure and relaxation at elevated temperatures.

The purpose of this document is to provide a selection of most commonly used bolting types and bolting material combinations as well a tool for easy selection of suitable bolting for equipment.

It is not the intention to specify all possible applications but to give guidance on the most common applications. For example, application limits for material in the creep range are not explicitly covered in this document. Where material standard provides mechanical properties for the creep range, respective reference is made in Table 3.

NOTE 2 Special services and ambient conditions could require the application of coatings. It is the purchaser's option to decide on this. Depending on the coating used, a verification of the temperature ranges given in Table 3 and Table 4 could be required.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 1092-1:2018, *Flanges and their joints - Circular flanges for pipes, valves, fittings and accessories, PN designated - Part 1: Steel flanges*

EN 1759-1:2004, *Flanges and their joint - Circular flanges for pipes, valves, fittings and accessories, Class designated - Part 1: Steel flanges, NPS 1/2 to 24*

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

EN 13445-3:2014, *Unfired pressure vessels - Part 3: Design*

EN 13480-3:2017, *Metallic industrial piping - Part 3: Design and calculation*

EN ISO 898-1:2013, *Mechanical properties of fasteners made of carbon steel and alloy steel - Part 1: Bolts, screws and studs with specified property classes - Coarse thread and fine pitch thread (ISO 898-1:2013)*

EN ISO 898-2:2012, *Mechanical properties of fasteners made of carbon steel and alloy steel - Part 2: Nuts with specified property classes - Coarse thread and fine pitch thread (ISO 898-2:2012)*

EN ISO 3269:2000, *Fasteners - Acceptance inspection (ISO 3269:2000)*

EN ISO 3506-1:2009, *Mechanical properties of corrosion-resistant stainless steel fasteners - Part 1: Bolts, screws and studs (ISO 3506-1:2009)*

EN ISO 3506-2:2009, *Mechanical properties of corrosion-resistant stainless steel fasteners - Part 2: Nuts (ISO 3506-2:2009)*

EN ISO 4014:2011, *Hexagon head bolts - Product grades A and B (ISO 4014:2011)*

EN ISO 4017:2014, *Fasteners - Hexagon head screws - Product grades A and B (ISO 4017:2014)*

EN ISO 4032:2012, *Hexagon regular nuts (style 1) - Product grades A and B (ISO 4032:2012)*

EN ISO 4033:2012, *Hexagon high nuts (style 2) - Product grades A and B (ISO 4033:2012)*

EN ISO 16228:2018, *LIHSOASFLSFJ*

EN ISO 16426:2002, *Fasteners - Quality assurance system (ISO 16426:2002)*

ISO 261:1998, *ISO general purpose metric screw threads — General plan*

ISO 965-2:1998, *ISO general purpose metric screw threads — Tolerances — Part 2: Limits of sizes for general purpose external and internal screw threads — Medium quality*

ISO 10684:2004, *Fasteners — Hot dip galvanized coatings*

3 Terms and definitions, symbols and units

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1.1
bolting
type of fastener such as a bolt, screw, stud, tie-rod, reduced shank bolt (also named as necked-down bolt) or nuts

3.1.2
purchaser
person or organization that orders products in accordance with this document

Note 1 to entry: The purchaser is not necessarily, but may be, a manufacturer of equipment in accordance with the EU Directive listed in Annex ZA. Where a purchaser has responsibilities under this EU Directive, this document will provide a presumption of conformity with the essential requirements of the Directive so identified in Annex ZA.

3.1.3
bolting manufacturer
person or organization that is responsible for the compliance of the bolting with the requirements of this document and the referenced standards given for bolting and starting materials agreed with the purchaser

3.1.4
manufacturing lot
quantity of fasteners of a single designation including product grade, property class and sizes, manufactured from bar, wire, rod or flat product from a single cast, processed through the same or similar steps at the same time or over a continuous time period through the same heat treatment and/or coating, if any

Note 1 to entry: Same heat treatment or coating means:

— for a continuous process, the same treatment cycle without any setting modification;

— for a discontinuous process, the same treatment cycle for identical consecutive loads (batches).

Note 2 to entry: The manufacturing lot may be split into several manufacturing batches for processing purposes and then reassembled into the same manufacturing lot.

3.1.5
manufacturing lot number
unique number assigned by the bolting manufacturer and which allows full traceability from the finished product back through all previous steps of the manufacturing operations to a given cast number of the starting material of manufacture

3.1.6
starting material
material from which the bolt or nut is manufactured

Note 1 to entry: The chemical composition of the starting material shall meet the relevant material standard.

Note 2 to entry: The final heat treatment shall also meet the relevant material standard but can be performed on the starting material or on the finished bolting.

3.1.7
creep range
temperature range at which a material has time dependent mechanical properties

3.2 Symbols and units

The symbols and respective units used in this document are defined in Table 1.

Table 1 — Symbols and units

Symbol	Designation	Unit
KV	Impact rupture energy	J
T_{KV}	Material impact test temperature	°C
T_M	Minimum metal temperature of the bolting	°C

4 Selection of bolting types and materials

4.1 General

The selection of bolting types and bolting material combinations for a certain application shall consider in addition to the requirements covered by this document, the range of application of the equipment for which the bolting is intended to be used. The selection shall consider all service conditions including maximum/minimum allowable temperature, required bolt load, tightening method and resultant stresses, type of fluids, corrosion hazards and if applicable type and material of gasket.

Furthermore it shall be regarded that flanged joints shall remain tight under the expected operating conditions. Other properties like residual magnetism and relaxation properties shall be evaluated by the purchaser.

For selection of bolting types and bolting material combinations other than those listed in Table 2, Table 3 and Table 4 according to commonly used national standards, see Annex B.

Requirements for combination of bolting and flange materials as given in some European Standards such as EN 13480-3 or EN 13445-3 shall be observed by the user of this document.

The minimum yield strength, tensile strength, and creep of the bolting shall be suitable for the required bolt load determined for the application and tightening method. Where there is a requirement concerning the strength category for the bolting given in a flange standard, see EN 1092-1:2018, EN 1759-1:2004, EN 13480-3:2017, or EN 13445-3:2014, then this shall be observed by the user of this document.

4.2 Selection of bolting types

Selection of bolting types according to Table 2.

Table 2 — Types of bolting

Dimensional standard		Remarks
Bolts/Studs	Nuts	
EN ISO 4014	EN ISO 4032 EN ISO 4033[a]	Hexagon head bolt
EN ISO 4017	EN ISO 4032 EN ISO 4033[a]	Hexagon head bolt, threaded full length
Annex A	EN ISO 4032 EN ISO 4033[a]	Stud bolt, threaded full length

[a] The user shall determine whether EN ISO 4033 nuts are required for the application. For sizes ≥ M39 nuts with m = d are recommended.

4.3 Selection of bolting material

A selection of commonly used bolting material combinations and their suitable temperature ranges is shown in Tables 3 and 4. Combination of bolting materials other than the combinations shown may reduce the given temperature limits.

For guidance on determining conditions to determine the permissible minimum temperature, see 6.2.

Table 3 — Selection of bolting material acc. to EN 10269 with suitable temperatures ranges

Line No	PN Class	Suitable temperature range	Type of bolting and description of material groups		Steel designation name or property class Steel designation number Material standard	
	up to	°C	Bolts, screws, studs	Nuts	Bolts, screws, studs	Nuts
1	All	–10 to 300	0,25C-1Cr-Mo	C-St elev. temp.	25CrMo4 1.7218 EN 10269	C35E 1.1181 EN 10269
2	All	–10 to 300	0,42C-1Cr-Mo	C-St elev. temp.	42CrMo4 1.7225 EN 10269	C45E 1.1191 EN 10269
3	All	–60 to 500	0,25C-1Cr-Mo	0,25C-1Cr-Mo	25CrMo4[e] 1.7218 EN 10269	25CrMo4 1.7218 EN 10269
4	All	–40 to 400	0,25C-1Cr-Mo	0,42C-1Cr-Mo	25CrMo4[e] 1.7218 EN 10269	42CrMo4 1.7225 EN 10269
5	All	- 40 to 400	0,42C-1Cr-Mo	0,42C-1Cr-Mo	42CrMo4 1.7225 EN 10269	42CrMo4 1.7225 EN 10269
6	All	–10 to 500	0,42C-1,3Cr-0,6Mo	0,42C-1Cr-Mo	42CrMo5–6[e] 1.7233 EN 10269	42CrMo4 1.7225 EN 10269
7	All	–10 to 500	0,40C-1Cr-0,6Mo-V	0,42C-1Cr-Mo	40CrMoV4–6[e] 1.7711 EN 10269	42CrMo4 1.7225 EN 10269
8	All[c]	–10 to 500	0,21C-1,3Cr-0,7Mo-V	0,21C-1,3Cr-0,7Mo-V	21CrMoV5–7[e] 1.7709 EN 10269	21CrMoV5–7 1.7709 EN 10269
9	All	–10 to 500	0,2C-1Cr-1Mo-V-Ti-B	0,2C-1Cr-1Mo-V-Ti-B	20CrMoVTiB4–10[e] 1.7729 EN 10269	20CrMoVTiB4–10 1.7729 EN 10269
10	All[b]	–60[f] to 650	25Ni-15Cr-0,2Ti-Mo-V-B	25Ni-15Cr-0,2Ti-Mo-V-B	X6NiCrTiMoVB[e] 25–15–2 1.4980 EN 10269	X6NiCrTiMoVB 25–15–2 1.4980 EN 10269
13	All[b]	–10 to 500	12Cr-1Mo-V	12Cr-1Mo-V	X22CrMoV12–1 QT2 [e] 1.4923 EN 10269	X22CrMoV12–1 QT2 1.4923 EN 10269
11	All	–10 to 500	16Cr-16Ni-Mo-B-Nb	16Cr-16Ni-Mo-B-Nb	X7CrNiMoBNb16–16[e] 1.4986 EN 10269	X7CrNiMoBNb16–16 1.4986 EN 10269

Line No	PN Class	Suitable temperature range	Type of bolting and description of material groups		Steel designation name or property class Steel designation number Material standard	
	up to	°C	Bolts, screws, studs	Nuts	Bolts, screws, studs	Nuts
12	PN 40[c] Cl. 300	–196 to 550	17Cr-12Ni-2Mo	17Cr-12Ni-2Mo	X5CrNiMo17–12–2 AT 1.4401 EN 10269	X5CrNiMo17–12–2 1.4401 EN 10269
13	PN 100 Cl. 600	–196 to 200[a]	17Cr-12Ni-2Mo AT+C	17Cr-12Ni-2Mo	X5CrNiMo17–12–2 AT+C 1.4401 EN 10269	X5CrNiMo17–12–2 1.4401 EN 10269
14	PN 40[c] Cl. 300	–196 to 550	18Cr-10Ni	18Cr-10Ni	X5CrNi18–10 AT 1.4301 EN 10269	X5CrNi18–10 1.4301 EN 10269
15	PN 100 Cl. 600	–60[d] to 200[a]	18Cr-10Ni AT+C	18Cr-10Ni	X5CrNi18–10 AT+C 1.4301 EN 10269	X5CrNi18–10 1.4301 EN 10269

a Allowable stresses for elevated temperatures may be taken from the material in AT condition, as no stresses exist for the cold worked condition.

b Commonly used for PN 160 up to PN 400.

c Is limited to be used for max. PN 40/Cl. 300 (low strength bolting).

d –200 °C for studs or for bolts manufactured by machining from annealed rods or bars (AT) without work hardening except thread forming, if any

e May be used in the creep range. For maximum suitable temperature see EN 10269.

f When intended to be used down to –273 °C, for additional requirements see Table 5.

Table 4 — Selection of bolting materials not included in EN 10269

Line No	PN Class up to	Suitable temperature range	Type of bolting and description of material groups		Steel designation name or property class Material standard	
		°C	Bolts, screws, studs	Nuts	Bolts, screws, studs	Nuts
1	PN 40 [a] Cl.300	- 10 to 300[f]	C-St	C-St	5.6 - EN ISO 898-1	5[b] - EN ISO 898-2
2	PN 40 [a] Cl. 300	- 10 to 300[f]	C-St	C-St	8.8 - EN ISO 898-1	8 - EN ISO 898-2
3	PN 40[c] Cl. 300	–200 to 400	18Cr-9Ni	18Cr-9Ni	A2–50 — EN ISO 3506-1	A2–50, A2–70 [e] — EN ISO 3506-2