SLOVENSKI STANDARD
SIST EN 1759-1:2005

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Prirobnice in prirobnični spoji - Okrogle prirobnice za cevi, ventile, fitinge in pribor z oznako Class - 1. del: Jeklene prirobnice NPS1/2 do 24

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

Flansche und ihre Verbindungen - Runde Flansche für Rohre, Armaturen, Formstücke und Zubehörteile, nach Class bezeichnet - Teil 1: Stahlflansche, NPS 1/2 bis 24

Brides et leurs assemblages - Brides circulaires pour tubes, appareils de robinetterie, raccords et accessoires, désignées Class - Partie 1 : Brides en acier NPS 1/2 a 24

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ICS:

23.040.60	Prirobnice, oglavki in spojni elementi	Flanges, couplings and joints

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

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This European Standard was approved by CEN on 30 September 2004.

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

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

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Foreword

This document (EN 1759-1:2004) has been prepared by Technical Committee CEN/TC 74 "Flanges and their joints" the secretariat of which is held by DIN.

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of an identical text or by endorsement, at the latest by May 2005, and conflicting national standards shall be withdrawn at the latest by May 2005.

EN 1759 consists of the following parts:

— Part 1: Steel flanges;

— Part 3: Copper alloy flanges[1];

— Part 4: Aluminium alloy flanges[1].

This document includes a Bibliography.

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

[1] To be published

Introduction

When Technical Committee, CEN/TC 74, commenced its work of producing this European standard it took as its basis, the International Standard, ISO 7005-1, Steel flanges.

In taking this decision, CEN/TC 74, agreed that this standard would differ significantly from the ISO standard in respect of the following:

a) Whereas ISO 7005-1 included in its scope both the original DIN based flanges and also the original ANSI/ASME based flanges, EN 1759-1 contains only the flanges with ANSI/ASME origin (ASME B16.5). CEN/TC 74 has produced a separate series of standards, EN 1092 Parts 1, 2, 3 and 4, dealing with the DIN based flanges in PN designations;

b) In this standard, the flanges are Class designated (not PN designated as in the ISO standard) and those dimensions taken from ASME B16.5 are hard metricated.

Consequently, whilst the mating dimensions, the flange and facing types and designations are compatible with those given in ISO 7005-1, it is important to take account of the following differences which exist in EN 1759-1:

1) The use of inch bolting requires the use of suitable gaskets, not necessarily compatible with the gaskets used with ISO 7005-1 flanges (for metric bolts).

2) This standard specifies grades of ASTM steels similar to those specified in ISO 7005-1, but in addition permits the use of grades of European steels according to EN 1092-1;

1 Scope

This European Standard for a single system of flanges specifies requirements for circular steel flanges in Class designations Class 150 to Class 2 500 and nominal sizes from NPS ½ to NPS 24.

NOTE The relationship between nominal size (DN) and nominal size (NPS) is given for reference purposes in Tables 9 to 14.

This standard specifies the flange types and their facings, dimensions, tolerances, threading, bolt sizes, flange jointing face surface finish, marking, materials and pressure/temperature ratings.

This standard does not apply to flanges made from bar stock by turning, or to flanges of types 11, 12, 13, 14 and 15 made from plate material.

2 Normative references

The following referenced documents are indispensable for the application 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 1515-1, *Flanges and their joints — Bolting — Part 1: Selection of bolting*

prEN 1515-3, *Flanges and their joints — Bolting — Part 3: Classification of bolt materials for steel flanges, class designated*

EN 10025, *Hot rolled products of non-alloy structural steels — Technical delivery conditions*

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

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

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

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

EN 10213-2, *Technical delivery conditions for steel castings for pressure purposes — Part 2: Steel grades for use at room temperature and elevated temperatures*

EN 10213-3, *Technical delivery conditions for steel castings for pressure purposes — Part 3: Steel grades for use at low temperatures*

EN 10213-4, *Technical delivery conditions for steel castings for pressure purposes — Part 4: Austenitic and austenitic-ferritic steel grades*

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

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

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

EN 10222-5, *Steel forgings for pressure purposes - Part 5: Martensitic, austenitic and austenitic-ferritic stainless steels*

EN ISO 887, *Plain washers for metric bolts, screws and nuts for general purposes - General plan (ISO 887:2000)*

EN ISO 6708, *Pipe components — Definition and selection of DN (nominal size) (ISO 6708:1995)*

ISO 4955, *Heat-resisting steels and alloys*

ISO 4991, *Steel castings for pressure purposes*

ISO 9327-1, *Steel forgings and rolled or forged bars for pressure purposes — Technical delivery conditions —Part 1: General requirements*

ISO 9327-2, *Steel forgings and rolled or forged bars for pressure purposes —Technical delivery conditions — Part 2: Non-alloy and alloy (Mo, Cr and CrMo) steels with specified elevated temperature properties*

ISO 9328-2, *Steel flat products for pressure purposes — Technical delivery conditions —Part 2: Non-alloy and alloy steels with specified elevated temperature properties*

ISO 9328-3, *Steel flat products for pressure purposes — Technical delivery conditions — Part 3: Weldable fine grain steels, normalized*

ISO 9328-5, *Steel flat products for pressure purposes — Technical delivery conditions — Part 5: Weldable fine grain steels, thermomechanically rolled*

ASME B16.5: 1996 *Pipe flanges and flanged fittings — NPS ½ through NPS 24*

ASME/ANSI B1.20.1, *Pipe threads, general purpose (inch)*

ASTM A105/A105M, *Forgings, Carbon Steel, for Piping Component*

ASTM A182/A182M, *Forged or Rolled Alloy-Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service*

ASTM A203/A203M, *Pressure Vessel Plates, Alloy Steel, Nickel*

ASTM A204/A204M, *Specification for pressure vessel plates, alloy steel, molybdenum*

ASTM A216/A216M, *Steel Castings, Carbon Suitable for Fusion Welding for High-Temperature Service*

ASTM A217/A217M, *Steel Castings, Martensitic Stainless and Alloy, for Pressure-Containing Parts Suitable for High-Temperature Service*

ASTM A240/A240M, *Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels*

ASTM A325, *High-Strength Bolts for Structural Steel Joints*

ASTM A350/A350M, *Forgings, Carbon and Low-Alloy Steel, Requiring Notch Toughness Testing for Piping Components*

ASTM A351/A351M, *Castings, Austenitic, Austenitic-Ferritic (Duplex) for Pressure-Containing Parts*

ASTM A352/A352M, *Steel Castings, Ferritic and Martensitic, for Pressure-Containing Parts Suitable for Low-Temperature Service*

ASTM A387/A387M, *Pressure Vessel Plates, Alloy Steel, Chromium-Molybdenum*

ASTM A515/A515M, *Pressure Vessel Plates, Carbon Steel, for Intermediate and Higher-Temperature Service*

ASTM A516/A516M, *Pressure Vessel Plates, Carbon Steel, for Moderate and Lower-Temperature Service*

ASTM A537/A537M, *Pressure Vessel Plates, Heat-Treated, Carbon-Manganese-Silicon Steel*

3 Terms and definitions

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

3.1
Class
alphanumeric designation used for reference purposes related to a combination of mechanical and dimensional characteristics of a component of a pipework system. It comprises the word Class followed by a dimensionless whole number

NOTE 1 The number following the word Class does not represent a measurable value and should not be used for calculation purposes except where specified in the relevant standard.

NOTE 2 The designation Class is not meaningful unless it is related to the relevant component standard number.

NOTE 3 It is intended that all components with the same Class and NPS (see below) designations should have the same mating dimensions for compatible flange types.

3.2
DN
see EN ISO 6708

3.3
NPS
alphanumeric designation of size for components of a pipework system, which is used for reference purposes. It comprises, for the purpose of Class designated flanges according to this standard, the letters NPS followed by a dimensionless number which is indirectly related to the physical size of the bore or outside diameter of the end connections

NOTE The number following the letters NPS does not represent a measurable value and should not be used for calculation purposes except where specified in the relevant standard.

3.4
maximum allowable pressure, PS
means the maximum pressure for which the equipment is designed, as specified by the equipment manufacturer

3.5
maximum allowable temperature, TS
means the maximum temperature for which the equipment is designed, as specified by the equipment manufacturer

4 Designation

4.1 General

Table 1 and Figure 1 show the flange types and their relevant type numbers. Flanges shall be denoted with "flange type" and "flange number".

Figure 2 shows flange facing types, which may be used with the flanges shown in Figure 1. Flange facings shall be denoted with "type" and the relevant symbol.

The range of NPS, applicable to each flange type and each Class designation shall be as given in Table 2.

4.2 Information to be supplied by the equipment manufacturer

The following information should be supplied by the equipment manufacturer in the enquiry and/or order.

Flanges and ancillary components in accordance with this standard shall be designated with the following:

a) Designation, e.g. flange, lapped or collar;

b) Number of this standard, EN 1759-1;

c) Flange type number (see Table 1);

d) Facing type number (see Figure 2);

e) Nominal size (NPS or DN);

f) Class designation followed by the appropriate number;

g) The bore for weld-neck (type 11) and hubbed slip-on (type 12) flanges, if different from those specified in this standard (see notes to Tables of flange dimensions).

h) Weld end preparation required (see Annex A);

i) Either the symbol or the number or the grade of the material (see 5.1 and Tables 3a and 3b);

j) Any heat treatment required

k) Material certificate, if required (see 5.1.1);

EXAMPLE 1

Designation of a flange type 01 with facing type A of nominal size DN 400 and Class number 150, made of material of group 1.1

Flange EN 1759-1 / 01 / A/DN 400 / Class 150 / material group 1.1

EXAMPLE 2

Designation of a flange type 05 with facing type C of nominal size NPS 6 and Class number 600, made of material ASTM A105 with certificate 3.1B

Flange EN 1759-1 / 05 / C / NPS 6 / Class 600 / A105 / 3.1B

EXAMPLE 3

Designation of a flange type 11 with facing type B of nominal size DN 300 and Class number 900, bore B3 = 298 mm, made of material of group 6E0

Flange EN 1759-1 / 11 / B / DN 300 / Class 900 / 298 / material group 6E0

5 General requirements

5.1 Flange materials

5.1.1 General

Flanges shall be manufactured from materials given in Tables 3a and 3b. Flanges type 11, 12, 13, 14, 15 and 21 shall be made from forgings. Flanges type 21 shall be made from forgings or steel castings.

NOTE The materials given in Tables 3a and 3b are tabulated in groups having common pressure/temperature ratings as given in Tables 16 to22.

The flange manufacturer shall provide documentation to ensure traceability of material. An equipment manufacturer may require a material certificate in accordance with EN 10204, which is suitable for the category of equipment to which the flange is fitted.

5.1.2 Non alloy steels

The carbon content by ladle analysis of the materials specified in Tables 3a and 3b shall not exceed 0,23 % for plate and for forgings and 0,25 % for castings.

The steel manufacturer shall ensure on a basis of regular production checks that the carbon equivalent (CEV) by cast analysis does not exceed 0,45 % where:

$$\mathrm{CEV} = C + \frac{\mathrm{Mn}}{6} + \frac{\mathrm{Cr} + \mathrm{Mo} + \mathrm{V}}{5} + \frac{\mathrm{Ni} + \mathrm{Cu}}{15}$$

NOTE The above carbon equivalents do not apply to flange types 01, 05 and 21 manufactured from plate material.

5.2 Repairs

No repair welding shall be permitted without prior approval of the equipment manufacturer and when prohibited by the applicable material standard.

Where permitted, repair welding shall be carried out by a proven method and shall be in accordance with a written procedure.

Material repaired by welding shall be marked with the letter W following the specification number.

NOTE For approval of welding procedures, see EN ISO 15607. For approval of welders, see EN 287-1.

5.3 Bolting

5.3.1 General

Flanges shall be suitable for use with the nominal size and number of bolts specified in Tables 9 to 14 as appropriate.

The bolting shall be chosen according to the pressure, temperature, flange material and gasket so that the flanged joint remains tight under the expected operating conditions.

5.3.2 Selection of bolting

For selection of bolting, see EN 1515-1, for classification of bolting materials see prEN 1515-3 and Annex B.

Bolting of other materials should be chosen according the parameters above.

NOTE For use of metric bolting see Annex C.

5.4 Gaskets

The various gasket types, dimensions, design characteristics and materials used are not within the scope of this standard. Dimensions of gaskets are given in EN 12560 Parts 1 to 7.

5.5 Pressure/temperature (p/T) ratings

The pressure/temperature ratings of the flanges manufactured from the materials specified in Tables 3a and 3b shall be as given in Tables 16, 17, 18, 19, 20, 21 and 22 for the applicable materials, and shall not exceed the value of the Class shown.

NOTE 1 Linear interpolation is permitted for intermediate temperatures.

NOTE 2 The pressure/temperature ratings of flanges depend upon the properties of the materials specified in Tables 3a and 3b.

For determination of p/T ratings for EN materials see Annex D.

5.6 Dimensions

5.6.1 Flanges

The dimensions of flanges shall be as given in Tables 9 to 14, and as qualified by 5.8 and the notes to Tables 9 to 14, if appropriate. The diameter of shoulder, dimension G, may be varied from the given value (see note 2), which is a maximum limit.

NOTE 1 The equipment manufacturer should specify in the enquiry and/or order if dimensions of flanges are to be affected by 5.8 and/or the notes to Tables 9 to 14.

NOTE 2 The centre portion of the face of a blank flange (type 05) need not be machined provided that the diameter of the unmachined portion does not exceed the recommended shoulder diameter, G, given in Tables 9 to 14.

NOTE 3 A summary of the various types of flanges specified showing the nominal sizes applicable to each type and to each class is given in Table 2.

5.6.2 Hubs

The hubs of slip-on for welding (type 12) and threaded (type 13) flanges shall be either:

a) parallel; or

b) have a draft angle of not exceeding 7° on the outside surface for forging or casting purposes.

For details of the weld preparation for weld-neck flanges (type 11) see Annex A.

5.6.3 Threaded flanges

5.6.3.1 The threads of hubbed threaded flanges (type 13) shall be taper according to ASME/ANSI B1.20.1.

5.6.3.2 The thread shall be concentric with the axis of the flange and misalignments shall not exceed 5 mm per metre.

Class 150 flanges shall be manufactured without a counterbore, but to protect the thread they shall be chamfered to the major diameter of the thread at the hubbed side of the flange, at an angle between 30° and 50° with the axis of the thread. The chamfer shall be concentric with the thread and shall be included in the measurement of the thread length provided that the chamfer does not exceed one pitch in length.

Class 300, 600, 900, 1 500 and 2 500 flanges shall be provided with a counterbore as indicated in Tables 10 to 14 and the thread shall be chamfered to an angle between 30° and 50° at the bottom of the counterbore. The chamfer shall be concentric with the thread and shall have a major diameter equal to that of the counterbore.

5.6.4 Bolt holes

Bolt holes shall be equally spaced on the pitch circle diameter. In the case of type 21 flanges they shall be positioned such that they are symmetrical to the principal axes and such that no holes fall on these axes i.e. positioned “off-centre”, see Figures 5 to 12.

5.7 Flange facings

5.7.1 Types of facings

The types of flange facings and flange face designations shall be as given in Figure 2. Dimensions of facings shall be as given in Figures 4, 5, 6, and 7 and Tables 5 and 6.

For facings types B, D and F the transition from the edge of the raised face to the flange face shall be by:

a) radius; or

b) chamfer.

5.7.2 Lapped type joints

Facings for lapped type joints (Figure 6) shall be one of the following types:

B, C, D, E, F and J.

The facings shall be in accordance with 5.7.1. The dimension t, indicated in Figure 6 shall be not less than the minimum thickness of the barrel of the stub-end, except that in the case of a spigot or tongue facing, the dimension t shall be not less than 6,4 mm.

5.7.3 Jointing face finish

5.7.3.1 All flange jointing faces shall be machine finished and shall have a surface finish in accordance with the values given in Tables 7 and 8 when compared with reference specimens by visual or tactile means.

NOTE It is not intended that instrument measurements be taken on the faces themselves: the R_a and R_z values as defined in EN ISO 4287 relate to the reference specimens.

5.7.3.2 For flanges with facing types A, B, E and F turning shall be carried out with a round-nosed tool in accordance with Table 7.

5.7.3.3 For tongue and groove and ring-joint facing types C, D and J the gasket contact surfaces shall be machined to produce a surface finish in accordance with Table 8.

5.8 Spot facing or back facing of flanges

Any spot facing or back facing shall not reduce the flange thickness to less than the thickness specified.

When spot facing is used, the diameter shall be large enough to accommodate the outside diameter of the equivalent normal series of washers in accordance with EN ISO 887 for the bolt size being fitted. The bearing surfaces for the bolting shall be parallel to the flange face within the limits given in Table 15.

When a flange is back faced a minimum fillet radius at the hub, R_2 (see Figure 14) in accordance with Table 23, shall be maintained.

5.9 Tolerances

Tolerances on dimensions of flanges shall be as specified in Table 15.

5.10 Marking

5.10.1 Other than integral flanges

All flanges, other than integral shall be marked as follows:

a) Flange manufacturer's name or trademark, e.g. X;

b) Number of this standard, i.e. EN 1759-1;

c) Flange type number, e.g. 11;

d) Nominal size (DN) or NPS, e.g. DN 150;

e) Class designation, e.g. Class 150;

f) Nominal size (DN) or NPS e.g. DN 150 or 6; Bore diameter B if necessary, e.g. 146 mm;

g) Either material symbol or material number or material group (see Tables 3a and 3b), e.g. A 105;

h) Cast number of melt identification or suitable quality control number traceable to the cast number, e.g. 12345;

i) Flanges grooved for standard ring type joints shall be marked with the letter "R" and the corresponding ring number;

EXAMPLE xxx/EN 1759-1/11/DN150//Class 150/146/A105/12345.

For material repaired by welding see 5.2.

5.10.2 Stamping

Where steel stamps are used, the marking shall be positioned on the outer rim of the flange.

NOTE Care should be taken to ensure that steel stamp markings are not liable to cause cracks in the flange material.

5.10.3 Omission of markings

If a flange is too small to enable all the markings required then the minimum marking required shall be:

a) Flange manufacturer's name or trademark;

b) Letters "EN";

c) Class designation;

d) Either the symbol or the number or the grade of the material or the material group;

e) Cast number or melt identification or suitable control number.

5.10.4 Declaration of compliance

Marking EN 1759-1, together with the flange manufacturer's name or trademark on or in relation to a product represents a flange manufacturer's declaration of compliance, i.e. a claim by or on behalf of the manufacturer that the product meets the requirements of this standard.

Table 1 — Types of flange

Type no.[a]	Description
01	Plate flange for welding
05	Blank flange
11	Weld-neck flange
12	Hubbed slip-on flange for welding
13	Hubbed threaded flange
14	Hubbed socket-weld flange
15	Loose hubbed flange for lapped pipe end [b]
21	Integral flange
NOTE Flanges and facings may be designated by type number and facing letter or by description as given in Figures 1 and 2 respectively.	
[a] Type numbers have been made non-consecutive to permit possible future additions. [b] Sometimes referred to in industry as lapped flange.	