SLOVENSKI STANDARD
oSIST prEN 1591-1:2021

01-maj-2021

Prirobnice in prirobnični spoji - Pravila za konstruiranje prirobničnih spojev, sestavljenih iz okroglih prirobnic in tesnil - 1. del: Izračun

Flanges and their joints - Design rules for gasketed circular flange connections - Part 1: Calculation

Flansche und ihre Verbindungen - Regeln für die Auslegung von Flanschverbindungen mit runden Flanschen und Dichtung - Teil 1: Berechnung

Brides et leurs assemblages - Règles de calcul des assemblages à brides circulaires avec joint - Partie 1: Méthode de calcul

Ta slovenski standard je istoveten z: **prEN 1591-1**

ICS:

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

oSIST prEN 1591-1:2021 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

DRAFT
prEN 1591-1

April 2021

ICS 23.040.60

Will supersede EN 1591-1:2013

English Version

Flanges and their joints - Design rules for gasketed circular flange connections - Part 1: Calculation

Brides et leurs assemblages - Règles de calcul des assemblages à brides circulaires avec joint - Partie 1: Méthode de calcul

Flansche und ihre Verbindungen - Regeln für die Auslegung von Flanschverbindungen mit runden Flanschen und Dichtung - Teil 1: Berechnung

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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

Ref. No. prEN 1591-1:2021 E

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European foreword

This document (prEN 1591-1:2021) 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 1591-1:2013.

The major changes in comparison with the previous edition include:

— Removal of the possibility to handle gasket creep/relaxation behaviour through additional deflection. In this new revision, the gasket creep/relaxation behaviour is only treated using the P_{QR} factor;

— Correction of the lever arms considered for integral flange and collar load ratio calculation (127), (135);

— Introduction of a reduced maximum allowable value of load ratio for large integral flange and collar (128) (149);

— Possibility to check a bolted flange connection for a specified assembly bolt force value, previously treated in the body of the document is now defined in a new informative annex (Annex F);

— Update of the Flange/gasket friction factors in Annex E;

— Update of the Annex ZA in accordance with the Directive 2014/68/EU on Pressure Equipment.

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 2014/68/EU, see informative Annex ZA, which is an integral part of this document.

EN 1591 consists of several parts:

— EN 1591-1, *Flanges and their joints — Design rules for gasketed circular flange connections — Part 1: Calculation;*

— CEN/TR 1591-2, *Flanges and their joints — Design rules for gasketed circular flange connections — Part 2: Gasket parameters;*

— CEN/TS 1591-3, *Flanges and their joints — Design rules for gasketed circular flange connections — Part 3: Calculation method for metal to metal contact type flanged joint;*

— EN 1591-4, *Flanges and their joints — Part 4: Qualification of personnel competency in the assembly of the bolted connections of critical service pressurized systems;*

— CEN/TR 1591-5, *Flanges and their joints — Design rules for gasketed circular flange connections — Part 5: Calculation method for full face gasketed joints.*

The calculation method satisfies both leak tightness and strength criteria. The behaviour of the complete flanges-bolts-gasket system is considered. Parameters taken into account include not only basic ones such as:

— fluid pressure;

— material strength values of flanges, bolts and gaskets;

— gasket compression factors;

— nominal bolt load;

but also:

— possible scatter due to bolting up procedure;

— changes in gasket force due to deformation of all components of the joint;

— influence of connected shell or pipe;

— effect of external axial and lateral forces and torsion and bending moments;

— effect of temperature difference between bolts and flange ring.

The use of this calculation method is particularly useful for joints where the bolt load is monitored when bolting up. The greater the precision of this, the more benefit can be gained from application of the calculation method.

1 Scope

This document defines a calculation method for bolted, gasketed, circular flange joints. Its purpose is to ensure structural integrity and control of leak tightness. It uses gasket parameters based on definitions and test methods specified in EN 13555:2014.

The calculation method is not applicable to joints with a metallic contact out of the sealing face or to joints whose rigidity varies appreciably across gasket width. For gaskets in incompressible materials, which permit large deformations, the results given by the calculation method can be excessively conservative (i.e. required bolting load too high, allowable pressure of the fluid too low, required flange thickness too large, etc.).

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 13555:2014[1)], *Flanges and their joints — Gasket parameters and test procedures relevant to the design rules for gasketed circular flange connections*

3 Terms and definitions, subscripts, special marks and symbols

For the purposes of this document, the following terms and definitions, subscripts, special marks and symbols 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 Terms and definitions

NOTE Figure 1 to Figure 14 illustrate the notation corresponding to the geometric parameters. They only show principles and are not intended to be practical designs. They do not illustrate all possible flange types for which the calculation method is valid.

For standard flange types, e.g as shown in EN 1092 or EN 1759, the relevant figures are the following:

Type 01	Figure 10
Type 02	Figure 12
Type 04	Figure 12
Type 05	Figure 11
Type 07	Figure 12
Type 11	Figure 6

1) Under revision.

Type 12	Figure 13
Type 13	Figure 14
Type 21	Figures 6 to 9

3.1.1
flanges

3.1.1.1
integral flange
flange attached to the shell either by welding (e.g. neck weld, see Figure 6 to Figure 9, or slip on weld, see Figure 10 and Figure 13) or cast onto the envelope (integrally cast flanges, type 21)

3.1.1.2
blank or blind flange
flat closure (see Figure 11)

3.1.1.3
loose flange
separate flange ring abutting a collar (see Figure 12)

3.1.1.4
hub
axial extension of flange ring, usually connecting flange ring to shell (see Figure 6 and Figure 7)

3.1.1.5
collar or stub
abutment for a loose flange (see Figure 12)

3.1.2
loading

3.1.2.1
external loads
forces and/or moments applied to the joint by attached equipment, e.g. weight and thermal expansion of pipes

3.1.3
load conditions

3.1.3.1
load condition
state with set of applied simultaneous loads; designated by I

3.1.3.2
assembly condition
load condition due to initial tightening of bolts (bolting up), designated by I = 0

3.1.3.3
subsequent condition
load condition subsequent to assembly condition, e.g. test condition, operating condition, conditions arising during start-up and shut-down; designated by I = 1, 2, 3 ...

3.1.4
compliances

3.1.4.1
compliance
inverse stiffness (axial), symbol Y, [mm/N]

3.1.4.2
flexibility modulus:
inverse stiffness modulus, excluding elastic constants of material:

— axial: symbol X, [1/mm]

— rotational: symbol Z, [1/mm³]

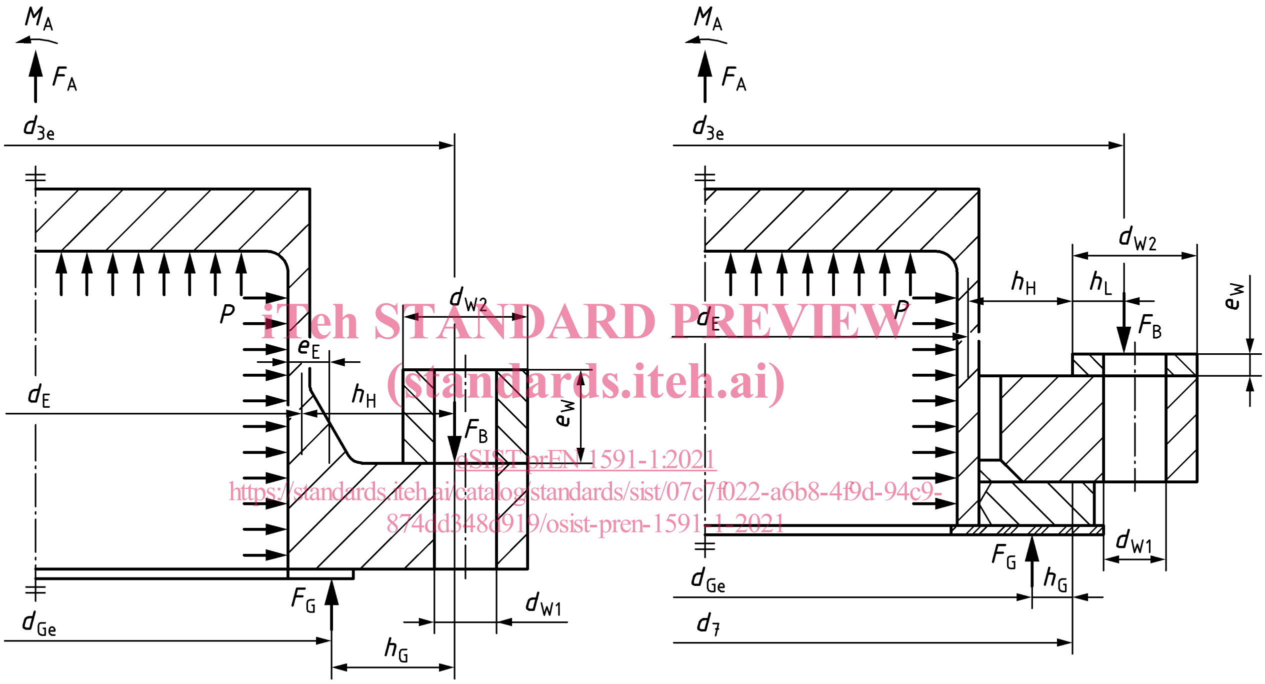


Figure 1 — Loads and lever arms

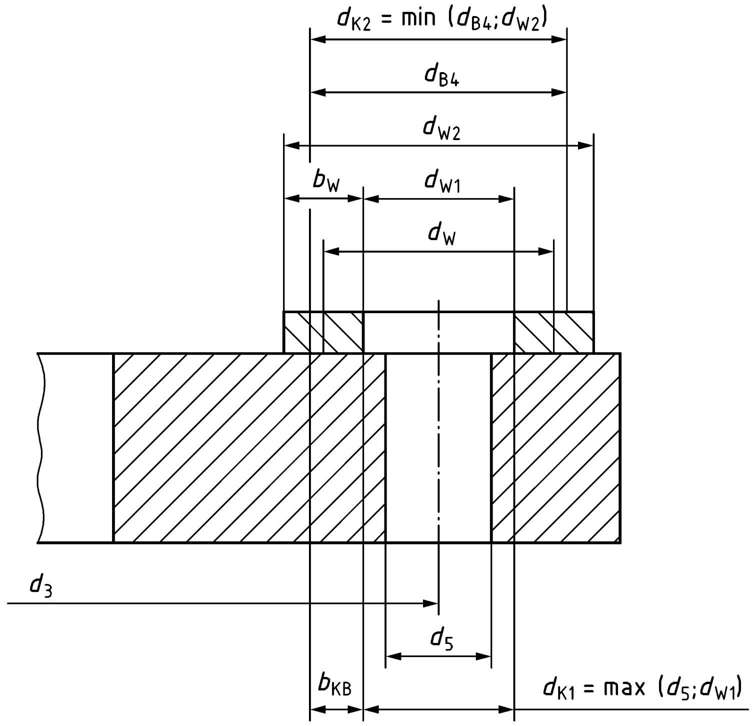
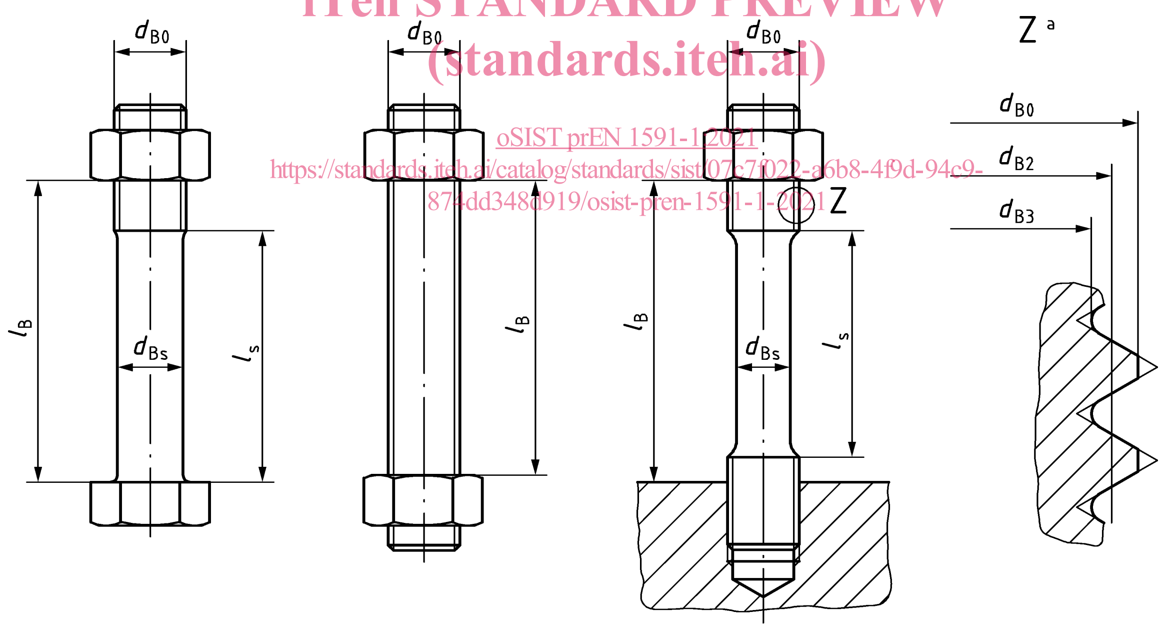


Figure 2 — Washer or spacer



$$l_e = l_B - l_s$$

Figure 3 — Bolts

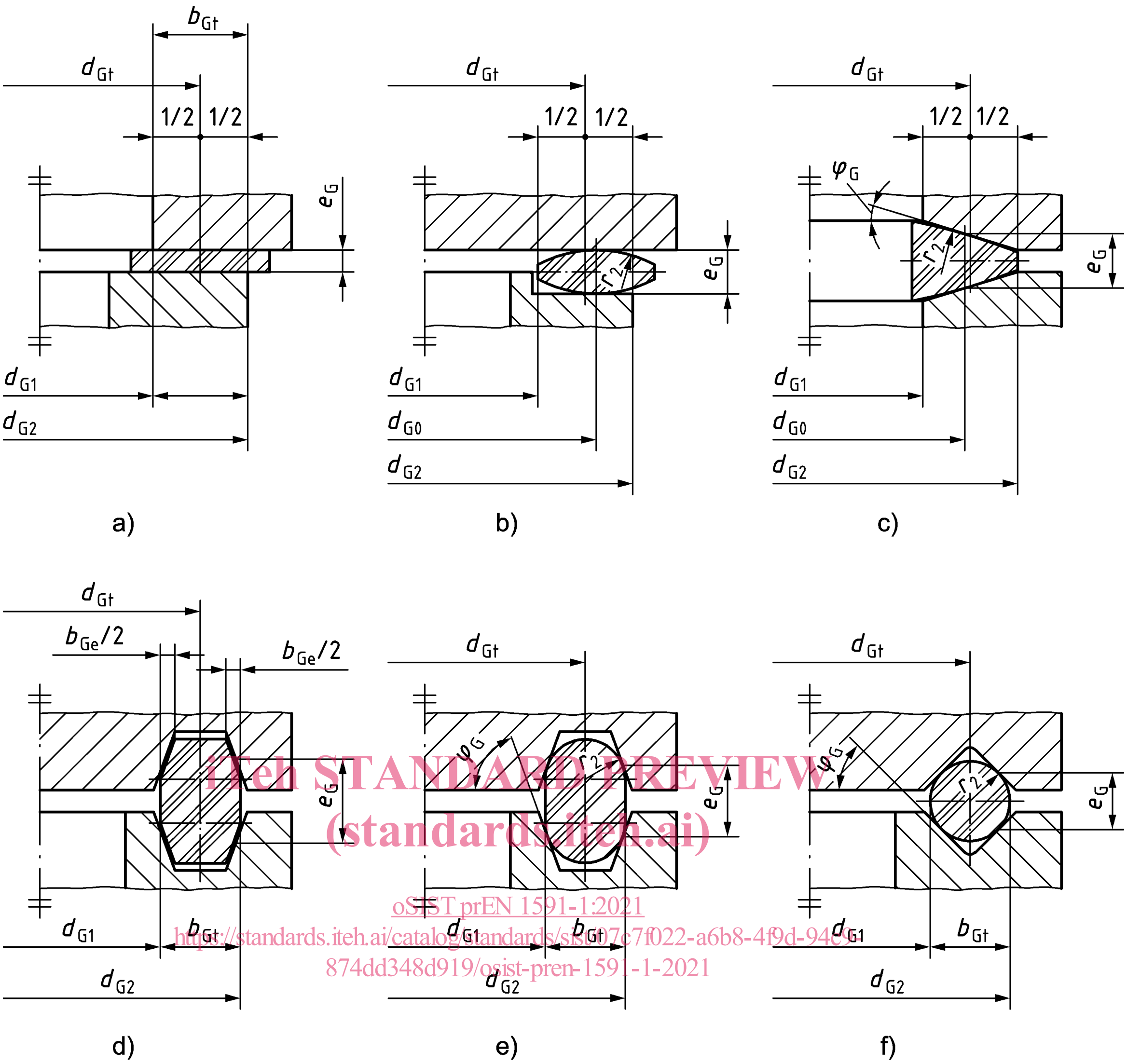
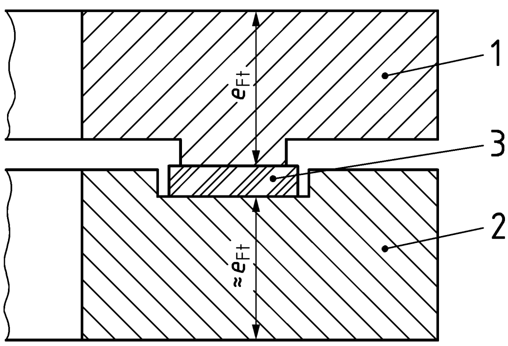


Figure 4 — Gaskets



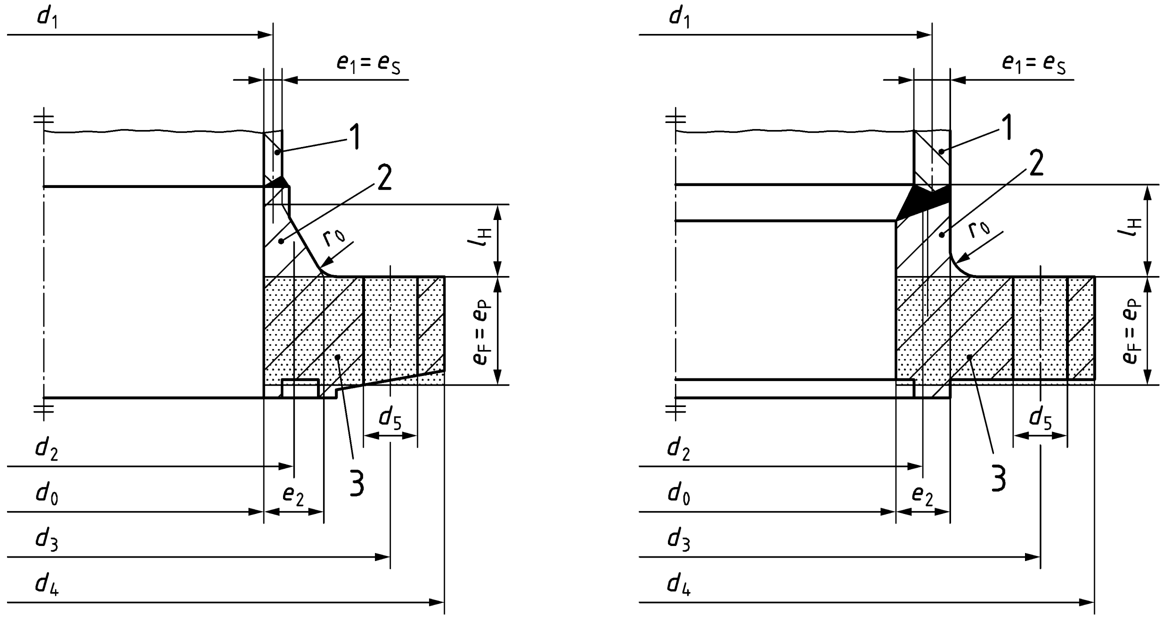
Key

1 male flange (tongue)

2 female flange (groove)

3 gasket

Figure 5 — Details for tongue and groove facing



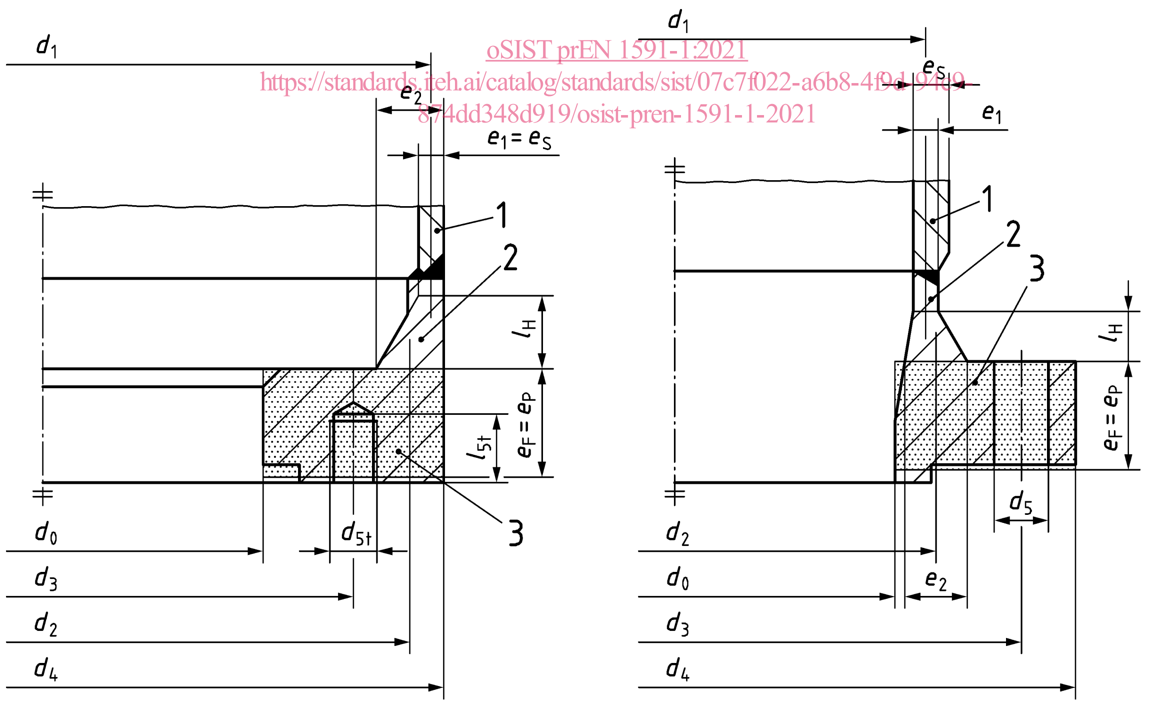
Key

1 shell

2 hub

3 ring

Figure 6 — Weld-neck flanges with cylindrical shells (example 1)



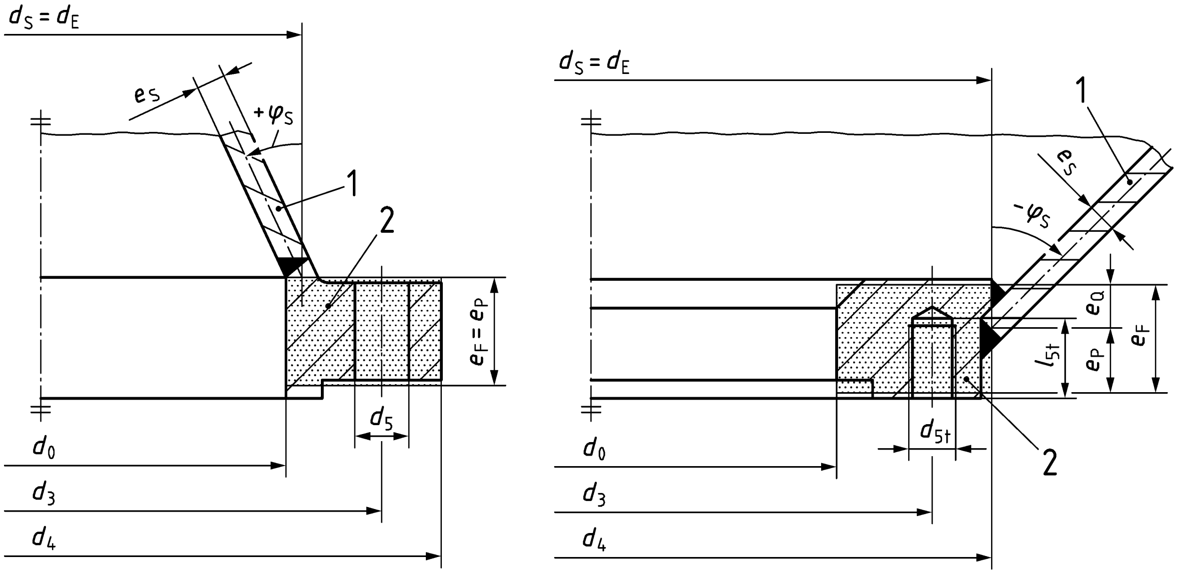
Key

1 shell

2 hub

3 ring

Figure 7 — Weld-neck flanges with cylindrical shells (example 2)

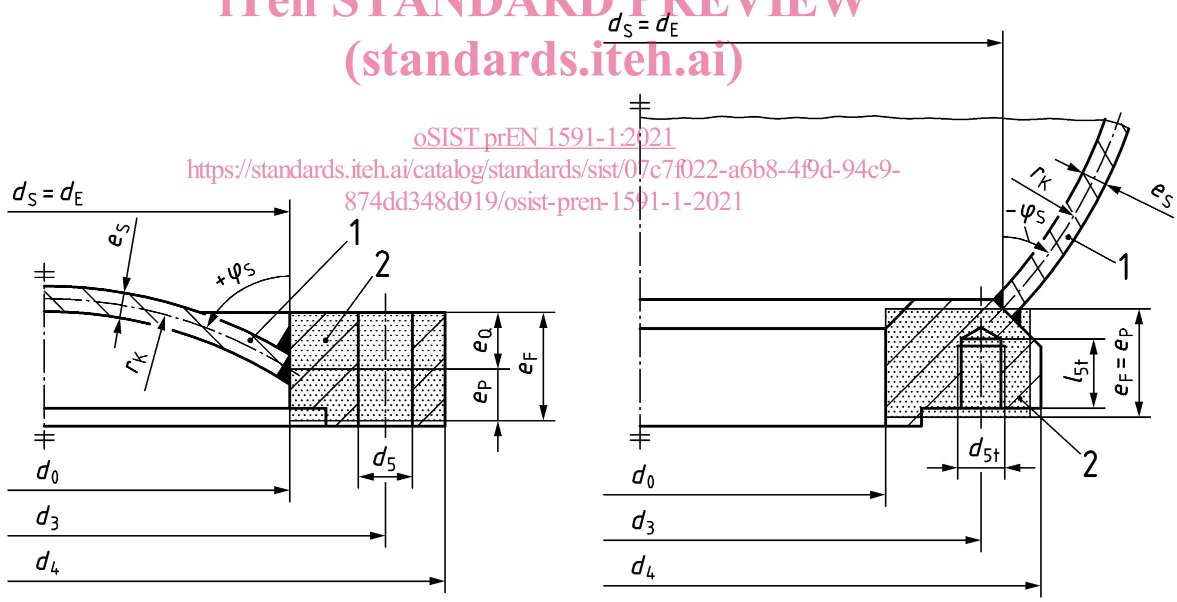


Key

1 shell

2 ring

Figure 8 — Flanges welded to conical shells



Key

1 shell

2 ring

Figure 9 — Flanges welded to spherical shells