

Flanges and their joints — Circular flanges for pipes, valves, fittings and accessories, PN designated

Part 2. Cast iron flanges

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British Standard

ICS 23.040.60

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- British Foundry Association
- British Iron and Steel Producers' Association
- British Malleable Tube Fittings Association
- British Plumbing Fittings Manufacturers' Association
- British Pump Manufacturers' Association
- British Valve and Actuator Manufacturers' Association
- Confederation of British Forgers
- Copper Development Association
- Energy Industries Council
- Engineering Equipment and Materials Users' Association
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National foreword

This Part of BS EN 1092 has been prepared by Technical Committee PSE/15, and is the English language version of EN 1092-2 : 1997 *Flanges and their joints — Circular flanges for pipes, valves, fittings and accessories, PN designated — Part 2: Cast iron flanges*, published by the European Committee for Standardization (CEN). It supersedes BS 4504 : Section 3.2 : 1989 which is withdrawn.

Cross-references

Publication referred to	Corresponding British Standard
EN 545 : 1994	BS EN 545 : 1995 <i>Ductile iron pipes, fittings, accessories and their joints for water pipelines. Requirements and test methods</i>
EN 1333 : 1996	BS EN 1333 : 1997 <i>Pipework components. Definition and selection of PN</i>
EN ISO 6708 : 1995	BS EN ISO 6708 : 1996 <i>Pipework components. Definition and selection of DN (nominal size)</i>
EN ISO 9002 : 1994	BS EN ISO 9002 : 1994 <i>Quality systems. Model for quality assurance in production, installation and servicing</i>

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN title page, pages 2 to 28, an inside back cover and a back cover.

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Descriptors: Industrial piping, pipe flanges, cast iron, spheroidal graphite cast iron, malleable cast iron, unalloyed cast iron, designation, dimensions, dimensional tolerances, specifications, surface condition, marking

English version

Flanges and their joints — Circular flanges for pipes, valves, fittings and accessories, PN designated — Part 2: Cast iron flanges

Brides et leurs assemblages — Brides circulaires pour tuyaux, appareil de robinetterie, raccords et accessoires, désignées PN —
Partie 2: Brides en fonte

Flansche und ihre Verbindungen — Runde Flansche für Rohre, Armaturen, Formstücke und Zubehörteile, nach PN bezeichnet —
Teil 2: Gußeisenflansche

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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 74, Flanges and their joints, the secretariat of which is held by DIN. EN 1092 will consist of the following six Parts:

- Part 1: *Steel flanges*
- Part 2: *Cast iron flanges*
- Part 3: *Copper alloy flanges*
- Part 4: *Aluminium alloy flanges*
- Part 5: *Flanges in other metallic materials*
- Part 6: *Non-metallic flanges*

This standard is related to ISO 7005-2 : 1988 and ISO 2531 : 1991 in respect of flanges having the same PN designation. The types of flanges and their mating dimensions are compatible with those flanges of the same DN and PN given in ISO 7005-2 : 1988 and ISO 2531 : 1991.

The mating dimensions of the flanges of this standard are compatible with those flanges of other materials in accordance with the other parts of EN 1092.

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 October 1997, and conflicting national standards shall be withdrawn at the latest by October 1997.

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.

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Introduction

The product which is in permanent or temporary contact with water intended for human consumption does not adversely affect the quality of the drinking water and does not contravene the EC Directives and EFTA Regulations on the quality of drinking water.

1 Scope

This standard specifies requirements for circular flanges made from ductile, grey and malleable cast iron for DN 10 to DN 4000 and PN 2,5 to PN 63. (See 4.1 and 4.2).

This standard specifies the types of flanges and their facings, dimensions and tolerances, bolt sizes, surface finish of jointing faces, marking, testing, quality assurance and materials together with associated pressure/temperature (p/T) ratings.

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.

EN 545	<i>Ductile iron pipes, fittings, accessories and their joints for water pipelines — Requirements and test methods</i>
prEN 1092-1 : 1994	<i>Flanges and their joints — Circular flanges for pipes, valves, fittings and accessories, PN designated — Part 1: Steel flanges</i>
EN 1333 : 1996	<i>Pipework components — Definition and selection of PN</i>
EN ISO 6708 : 1995	<i>Pipework components — Definition and selection of DN (nominal size) (ISO 6708 : 1995)</i>
EN ISO 9002 : 1994	<i>Quality systems — Model for quality assurance in production, installations and servicing (ISO 9002 : 1994)</i>
ISO 185 : 1988	<i>Classification of grey cast iron</i>
ISO 468 : 1982	<i>Surface roughness — Parameters, their values and general rules specifying requirements</i>
ISO 887 : 1983	<i>Plain washers for metric bolts, screws and nuts — General plan</i>
ISO 2531 : 1991	<i>Ductile iron pipes, fittings and accessories for pressure pipelines</i>

ISO 2632-3 : 1979	<i>Roughness comparison specimens</i>
ISO 5458 : 1987	<i>Technical drawings — Geometrical tolerancing — Positional tolerancing</i>
ISO 5922 : 1981	<i>Malleable cast iron</i>
ISO 7005-2 : 1988	<i>Cast iron flanges</i>

3 Definitions

For the purposes of this standard, the following definitions apply:

3.1 flange

Flat circular end of a pipe component extending perpendicular to its axis, with bolt holes equally spaced on a circle (see figure 1).

NOTE. A flange may be fixed (i.e. integrally cast, screwed or welded on) or adjustable; an adjustable flange comprises a ring, in one or several parts assembled together, which bears on an end joint hub and can be freely rotated around the pipe axis before jointing.

3.2 DN (nominal size)

See EN ISO 6708 : 1995.

NOTE. A numerical designation of size which is common to all components in a piping system. It is a convenient round-number for reference purposes and is only loosely related to manufacturing dimensions.

3.3 PN

See EN 1333 : 1996.

NOTE. A numerical designation of flanged components which is a convenient round-number for reference purposes. All components of the same nominal size DN designated by the same PN have compatible mating dimensions.

3.4 ductile iron

A cast iron in which graphite is present substantially in spheroidal form.

3.5 grey iron

A cast iron in which graphite is present substantially in lamellar form.

3.6 malleable iron

A cast iron in which graphite is present substantially in nodular form (temper carbon), and can be partially or wholly decarburized.

3.7 joint

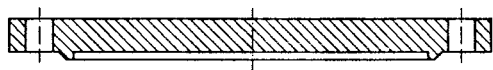
A connection between the flanged ends of piping systems components in which a gasket is used to effect a seal.

4 Designation and types

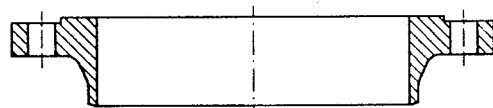
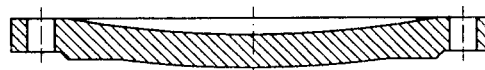
4.1 Range of DN

DN 10 – DN 15 – DN 20 – DN 25 – DN 32 – DN 40 – DN 50 – DN 60 – DN 65 – DN 80 – DN 100 – DN 125 – DN 150 – DN 200 – DN 250 – DN 300 – DN 350 – DN 400 – DN 450 – DN 500 – DN 600 – DN 700 – DN 800 – DN 900 – DN 1000 – DN 1100 – DN 1200 – DN 1400 – DN 1500 – DN 1600 – DN 1800 – DN 2000 – DN 2200 – DN 2400 – DN 2600 – DN 2800 – DN 3000 – DN 3200 – DN 3400 – DN 3600 – DN 3800 – DN 4000.

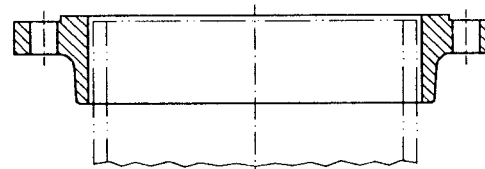
The range of DN applicable to each flange type and to each PN shall be as specified in tables 2 to 4 as appropriate.



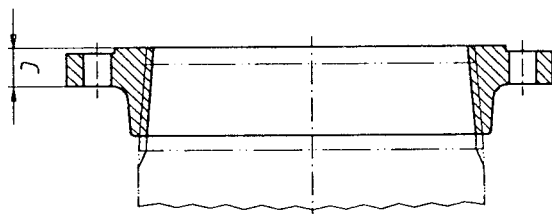
Type 05
Blank flange



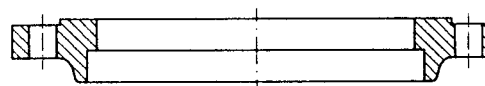
Type 11
Weld-neck flange



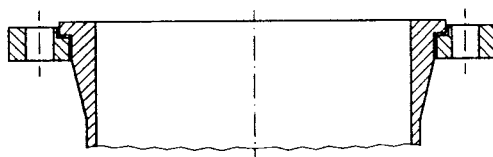
Type 12
Hubbed slip-on flange for welding



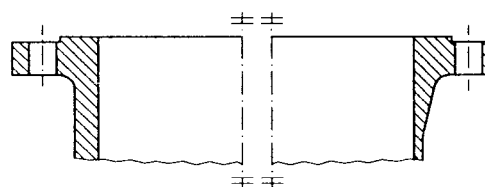
Type 13
Hubbed threaded flange



Type 14
Hubbed socket welding flange



Type 16
Adjustable flange



Type 21
Integral flange

NOTE 1. The transition from the edge of the raised face to the flange jointing face is either by radius or chamfer (see 5.7.1).

NOTE 2. Type 21 flange is an integral part of some other product or component.

NOTE 3. Flanges may be designated by type number or by description.

Figure 1. Types of flanges

4.2 Range of PN designations

PN 2,5 – PN 6 – PN 10 – PN 16 – PN 25 – PN 40 – PN 63.

4.3 Types of flanges

Figure 1 illustrates flanges identified according to type:

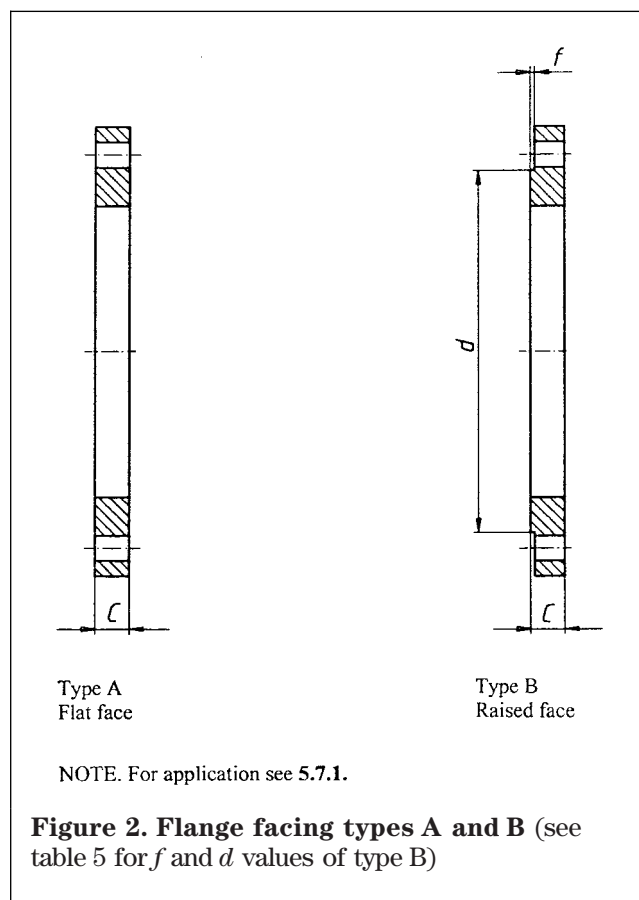
- 05 : blank flange
- 11 : weld-neck flange
- 12 : hubbed slip-on flange for welding
- 13 : hubbed threaded flange
- 14 : hubbed socket welding flange
- 16 : adjustable flange
- 21 : integral flange

NOTE. By agreement between customer and manufacturer, an integral flange, modified as follows, can be supplied:

- a) bolt hole diameters and flange facing diameter in accordance with prEN 1092-1;
- b) for ductile iron, flange thickness to be as grey iron flanges.

Such flanges shall be designated as type 21-2.

Figure 2 illustrates facing types A and B, which are used where applicable in conjunction with flanges shown in figure 1 (see 5.7.1).



4.4 Standard designation

Flanges conforming to this standard shall be designated as follows:

- a) term: flange;
- b) number of this standard: EN 1092-2;
- c) DN (see 4.1);
- d) PN (see 4.2);
- e) number of flange type (see 4.3);
- f) material type and grade (see 5.1);
- g) flange facing type for malleable cast iron (see 5.7.1).

Example:

Designation of a weld-neck flange DN 100, PN 40, type 11, material type MI and grade B30-06 and facing type A:

Flange EN 1092-2/DN100/PN40/11/FM B30-06/A

4.5 Information to be supplied by the purchaser

The information to be supplied by the purchaser shall be as given in annex A.

5 General requirements

5.1 Flange materials

Flanges shall be manufactured from the materials specified in table 14.

5.2 Repairs by welding

Where not otherwise prohibited by the applicable material standard, repairs by welding are permitted when there is a proven method. All welding shall be carried out in accordance with a written procedure.

5.3 Bolting

The bolting shall be chosen by the user according to the pressure, temperature, flange material and gasket. For joints comprising at least one grey iron flange it is recommended that bolting having a yield strength not exceeding 240 N/mm² should be used.

5.4 Gaskets

The gaskets are not within the scope of this standard. For information on types, dimensions and types of gaskets see EN 1514.

5.5 Pressure/temperature (p/T) ratings

5.5.1 General

The pressure/temperature ratings of the flanges manufactured from the materials specified in table 14 shall be the allowable non-shock pressures at the temperatures given in tables 15 and 16 (ductile iron), 17 (grey iron) and 18 (malleable iron). Linear interpolation is permitted for intermediate temperatures.

NOTE. The p/T rating of a flange is not necessarily the p/T rating of the whole pipework system. Gasket materials can also impose limitation on the p/T rating of a flanged joint and the gasket manufacturer should be consulted when selecting the material of the gasket.

5.5.2 p/T rating of flanged joints

Where two flanges in a flanged joint do not have the same p/T rating, the p/T rating of the joint at any temperature shall not exceed the lower of the two flange ratings at that temperature.

NOTE 1. The temperature is that of the contained fluid. Use of a temperature other than that of the contained fluid is the responsibility of the user, subject to the requirements of any applicable code or regulation.

NOTE 2. Application of the p/T ratings given in this standard to flange joints, should take into consideration the risk of leakage due to forces and moments developed in the connecting pipework.

NOTE 3. Owing to the nature of any thread sealing method used, additional limitations can be placed on a threaded flange.

NOTE 4. These notes on service considerations are not intended to be exhaustive.

5.6 Dimensions

Dimensions of flanges shall be in accordance with the following tables and figures as appropriate:

- PN 2,5 flanges: table 6 and figure 3;
- PN 6 flanges: table 7 and figure 4;
- PN 10 flanges: table 8 and figure 5;
- PN 16 flanges: table 9 and figure 6;
- PN 25 flanges: table 10 and figure 7;
- PN 40 flanges: table 11 and figure 8;
- PN 63 flanges: table 12 and figure 9.

NOTE 1. Dimensions which are not given in this standard are determined by the manufacturer for his design of flange.

NOTE 2. Details of attachment for welded, threaded and adjustable flanges are not within the scope of this standard.

5.7 Flange facings

5.7.1 Types of facings

The flange facings specified (flat face type A and raised face type B) are illustrated in figure 2 and their raised face dimensions shall be as given in table 5.

Flanges made of ductile iron shall have raised faces;

Flanges made of grey iron shall have raised faces.

See 5.3 for the limitations on bolting due to this material.

Flanges made of malleable iron shall have either flat faces or raised faces.

NOTE. The transition from the outside diameter of the raised face to the flange face is at the option of the manufacturer (i.e. either a radius or chamfer may be used).

5.7.2 Jointing face finish

All flange jointing faces shall be finished in accordance with table 1. These faces shall be compared by visual or tactile means with reference specimens which conform with the R_a and R_z roughness values given in table 1.

NOTE 1. It is not intended that instrument measurements are taken on the flange jointing faces: the R_a and R_z values as defined in ISO 468 : 1982 relate to the reference specimens.

NOTE 2. Other finishes may be agreed between the manufacturer and purchaser.

Table 1. Numerical values of the surface finish parameters (R_a and R_z) of flange jointing faces

Values in micrometres		
Manufacturing process	R_a	R_z
Turning ¹⁾	3,2 to 12,5	12,5 to 50
Other machining processes ²⁾	3,2 to 6,3	12,5 to 25
As cast ³⁾	3,2 to 25	—

¹⁾ 'Turning' covers any method of machine operation producing either serrated concentric or serrated spiral grooves.

²⁾ Machining processes other than turning are permissible provided that they give a surface finish in compliance with the R_a and R_z values specified.

³⁾ 'As cast' covers surfaces produced by moulding processes where the resultant casting may or may not be subjected to shot or grit blast cleaning operations. Their roughness is assessed by comparison with reference specimens complying with ISO 2632-3 : 1979. As cast surfaces may have serrated concentric grooves to enhance gasket sealing efficiency. They are normally used for application where joints incorporate gaskets of readily deformable material, e.g. rubber, application for which the above surface characteristics may also apply to the other manufacturing processes.

5.8 Spot facing or back facing

Any spot facing or back facing required 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 complying with ISO 887 : 1983 for the bolt size being fitted. When a flange is back faced, it is permissible for the fillet radius to be reduced but it shall not be eliminated entirely. The bearing surfaces for the bolting shall be parallel to the flange face within 2°.

5.9 Tolerances

The tolerances or dimensions are as specified in table 13.

5.10 Marking and stamping

5.10.1 Marking

Blank flanges and flanges which are supplied not attached to pipeline components shall be marked as follows:

- a) DN (nominal size);
- b) PN designation;
- c) material identification;
- d) manufacturer's name or trade-mark.

Example: DN 300 PN 16 420-5 XXXX

NOTE. Where a flange is subsequently used to form an integral part of a component and the component has a lower pressure rating than that of the flange, the lower rating should be clearly marked on the component and the lower p/T rating applies.

5.10.2 Stamping

Where steel stamps are used, the marking shall be positioned on the rim of the flange. Low stress round nose stamps shall be used.

5.10.3 Omission of markings

If a flange is too small to enable all the markings required in **5.10.1** to be marked on the flange, then marking of nominal size may be omitted.

5.11 Quality assurance

5.11.1 General

The following quality assurance requirement applies to all types of flanges except for those delivered attached to a pipeline component. The quality assurance requirements for those flanges are given in the appropriate component standards.

5.11.2 Quality assurance system

The manufacturer shall operate a quality assurance system in accordance with EN ISO 9002 : 1994.