



BS 4504 : Section 3.1 : 1989

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British Standard

Circular flanges for pipes, valves and fittings (PN designated)

Part 3. Steel, cast iron and copper alloy flanges

Section 3.1 Specification for steel flanges

Brides circulaires pour tuyaux, robinets et raccords (désignées par le PN)

Partie 3. Brides en acier, en fonte et en alliage de cuivre

Section 3.1 Brides en acier — Spécifications

Runde Flansche für Rohre, Armaturen und Formstücke (nach Nenndruckstufen)

Teil 3. Flansche aus Stahl, Gußeisen und Kupferlegierungen

Abschnitt 3.1 Stahlflansche

British Standards Institution

BS 4504 : Section 3.1 : 1989

Foreword

This Section of BS 4504 has been prepared under the direction of the Piping Systems Components Standards Policy Committee and constitutes the first revision of BS 4504 : Part 1 : 1969 in respect of the steel flanges contained in that standard which will be withdrawn 12 months after the publication of this standard and BS 4504 : Section 3.2 for cast iron flanges. For Class designated steel flanges, reference should be made to BS 1560 : Section 3.1.

It was originally intended that BS 4504 : Part 1 : 1969 would be superseded by British Standards technically equivalent to (or identical with) international standards for a single series of flanges when finalized by the International Organization for Standardization (ISO) technical committee ISO/TC 5/SC 10, Metallic flanges and their joints. However, the International Standard has not been finalized but this revision of BS 4504 : Part 1 : 1969 incorporates the principles of the international work.

To align with the format of the ISO Standard, ISO 7005* 'Metallic flanges', BS 4504 : Part 3 is published in three Sections:

Section 3.1 Steel flanges

Section 3.2 Cast iron flanges

Section 3.3 Copper alloy and composite flanges

The flanges specified in this Section of BS 4504 are intended to be interchangeable with, but not necessarily identical in every detail to, steel flanges manufactured to BS 4504 : Part 1 : 1969.

This Section of BS 4504 differs from BS 4504 : Part 1 : 1969 for the content covering the steel flange requirements in the following respects.

(a) Two new flange types are introduced, loose plate flange with weld-on plate collar and loose plate flange with weld-neck collar. These types of flanges are not necessarily manufactured in the UK at the time of publication of this Section of BS 4504 but they have been included because they will be specified in ISO 7005 to which this Section of BS 4504 should eventually align.

(b) To avoid possible confusion in giving descriptive names to flange types and flange faces, all flanges are designated by code numbers and flange facings by a letter which has been based on ISO 7005.

(c) Definitions for nominal size and nominal pressure are included and are in accordance with ISO 6708 and ISO 7268 respectively.

(d) The range of nominal pressure has been limited to PN 40 as agreed by the international committee ISO/TC 5/SC 10.

(e) The pressure/temperature ratings are in accordance with ISO 7005.

(f) Materials specified have been revised, new materials added (in particular for austenitic stainless steels and nickel steels) and reference is given to comparable ASTM† materials. In addition, reference is given to

DIN‡ materials from which flanges are sometimes made. Generally, the range of materials correspond to those given in the draft ISO 7005.

(g) The dimensions of flanges given in BS 4504 : Part 1 : 1969 were based on DIN standards current at the time of publication. The essential DIN dimensions have been retained in this Section of BS 4504 but new types of flanges have been added which have dimensions based on the proposed ISO work.

(h) Tolerances have been included for a greater number of dimensions than heretofore. However, cognizance has been taken of the proposed tolerances for the international work and, in certain instances, tolerances are wider than those given in BS 4504 : Part 1 : 1969.

(j) Requirements for the surface finish of flange faces have been given in greater detail.

(k) A greater range of flange facings is included in this Section of BS 4504 to align with the draft international standard. Flanges having the full range of facings are not necessarily manufactured in the UK at the time of publication of this Section of BS 4504.

(l) Spot facing or back facing is in accordance with ISO 7005.

(m) For threaded flanges, ANSI §/ASME ¶ B1.20.1 thread form is specified in addition to BS 21.

(n) The marking of flanges is basically in accordance with the principles of ISO 7005 but limitations on the methods are included.

(p) Appendix A is included which lists details of the information that should be supplied by the purchaser when ordering flanges.

(q) Guidance notes and recommendations contained in BS 4504 : Part 1 : 1969 have been included in an informative appendix to this Section of BS 4504. The appendix (B) is not intended to be exhaustive.

(r) Details of weld-end preparation are included for the first time (see appendix C).

(s) Details of minimum hub radius after back facing are given for the first time.

The various gasket types, dimensions, design characteristics and materials are outside the scope of this standard.

For dimensions of gaskets reference should be made to BS 4865 : Parts 1, 2, 3 and 4.

For comparison purposes the code numbers used in this Section of BS 4504 are compared with the type numbers given in BS 4504 : 1969 in appendix D.

Assessed capability. Users of this Section of BS 4504 are advised to consider the desirability of assessment and registration of a supplier's quality systems against the appropriate Part of BS 5750 by a third party certification body.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

*ISO 7006/1 is in preparation, ISO 7005/2 and ISO 7005/3 are published.

†American Society for Testing and Materials.

‡Deutsches Institut für Normung.

§American National Standards Institute.

¶American Society of Mechanical Engineers.

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Specification

1 Scope

This Section of BS 4504 specifies requirements for PN designated circular steel flanges in the ranges of nominal pressure PN 2.5 to PN 40 and nominal sizes up to DN 4000 of the types given in table 1.

Table 1. Types of steel flanges and ancillary components	
Code no.	Description
101	Plate flange for welding
102	Loose plate flange with weld-on plate collar or for lapped pipe end
104	Loose plate flange with weld-neck collar
105	Blank flange
111	Weld-neck flange
112	Hubbed slip-on flange for welding
113	Hubbed threaded flange
121	Integral flange
132	Weld-on plate collar
133	Lapped pipe end
134	Weld-neck collar

NOTE. Code numbers have been made non-consecutive to permit possible future additions.

Additionally, dimensional requirements are given for ancillary components code numbers 132 to 134 (see table 1) for use with code 102 and code 104 flanges.

This Section of BS 4504 specifies the types of steel flanges and their facings, dimensions, tolerances, threading, bolt sizes, flange face surface finish, marking, materials for bolting and flange materials together with associated pressure/temperature ratings.

Bolting materials for austenitic steel and nickel steel flanges (see 6.1), the weld end preparation of weld-neck (code 111) flanges and code 134 ancillary components (see 8.1) and the routine inspection and pressure testing of flanges are outside the scope of this standard but some guidance on maximum test pressure is given in appendix B (see B.5).

NOTE. The titles of the publications referred to in this standard are listed on the inside back cover.

2 Definitions

For the purposes of this Section of BS 4504 the following definitions apply.

2.1 nominal size (DN). A numerical designation of size which is common to all components in a piping system other than components designated by outside diameters or by thread size. It is a convenient round number for reference purposes and is only loosely related to manufacturing dimensions.

NOTE 1. Nominal size is designated by the letters DN followed by the appropriate number.

NOTE 2. This definition is identical to that given in ISO 6708.

2.2 nominal pressure (PN). A numerical designation which is a convenient round number for reference purposes.

All equipment of the same nominal size (DN) designated by the same PN number shall have compatible mating dimensions.

NOTE 1. The maximum allowable working pressure depends on materials, design and working temperatures, and should be selected from the tables of pressure/temperature ratings given in this standard.

NOTE 2. Nominal pressure is designated by the letters PN followed by the appropriate reference number.

NOTE 3. This definition is identical to that given in ISO 7268.

3 Ranges of nominal size (DN)

The ranges of nominal sizes from DN 10 to DN 4000 applicable to each flange type and for each PN designation shall be as given in table 2.

4 PN designations and pressure/temperature ratings

4.1 PN designations

The range of PN designations shall be PN 2.5, PN 6, PN 10, PN 16, PN 25 and PN 40.

4.2 Pressure/temperature ratings

The pressure/temperature ratings of the flanges manufactured from the materials specified in tables 3, 4 and 5 shall be as given in tables 15, 16 and 17 for the applicable materials, and shall be the maximum allowable non-shock working gauge pressure at the temperatures shown.

NOTE 1. Linear interpolation is permitted for intermediate temperatures.

NOTE 2. The relevant pressures and temperature are those of the fluid in the pipework system.

NOTE 3. The pressure/temperature ratings of flanges depend upon the properties of the materials specified in tables 3, 4 and 5, as appropriate. For austenitic stainless steels the pressure/temperature ratings have been calculated using values of yield strength of 205 N/mm² or the 0.2 % proof stress.

NOTE 4. The rating of flanges is not necessarily the rating of the whole pipework system. Gasket materials can also impose limitations on the pressure/temperature rating of a flanged joint and the gasket manufacturer should be consulted when selecting the material of the gasket.

4.3 Rating of flanged joints

If two flanges in a flanged joint do not have the same pressure/temperature rating, the maximum permissible working pressure of the joint at any temperature shall not exceed the lower of the two pressure ratings.

5 Materials

5.1 Flange materials

Flanges shall be manufactured from materials given in tables 3, 4 or 5 as appropriate except that codes 111, 112 and 113 flanges shall be manufactured from a forging or steel casting.

NOTE 1. The materials given in tables 3, 4 and 5 are tabulated in groups having common pressure/temperature ratings as given in tables 15, 16 and 17.

NOTE 2. The purchaser should state in the enquiry and/or order if a certificate is required for the flange material (see appendix A).

5.2 Requirements governing the use of ASTM materials

5.2.1 General. Flanges manufactured from materials conforming to ASTM specifications shall comply with the following additional requirements.

1

(a) For materials to ASTM A105

- (1) When specified, all forgings shall be normalized.
- (2) Sub-clauses 5.2.2.1, 5.2.2.2 and 5.2.2.3 shall apply.

1

(b) For materials to ASTM A182

- (1) The carbon content, by ladle analysis, of grades F304L and F316L shall not exceed 0.030 %.
- (2) Sub-clause 5.2.2.3 shall apply.

(c) For materials to ASTM A387

- (1) When specified, all flanges and flanged fittings shall be supplied in the normalized and tempered condition.
- (2) Sub-clause 5.2.2.3 shall apply.

NOTE. The purchaser should state any specific requirements for the heat treatment conditions on the enquiry and/or order (see appendix A).

5.2.2 Carbon manganese steels

5.2.2.1 The carbon content, by ladle analysis, of the materials specified in 5.2.1 shall not exceed 0.23 % for plate and 0.25 % for forgings.

5.2.2.2 The carbon equivalent (CE_1), by ladle analysis, of the materials specified in 5.2.1 shall not exceed 0.42 where

$$CE_1 = C + \frac{Mn}{6}$$

The manufacturer shall ensure on a basis of regular production checks that the carbon equivalent (CE_2), by ladle analysis, does not exceed 0.45 where

$$CE_2 = C + \frac{Mn}{6} + \frac{Cr + Mo + V}{5} + \frac{Cu + Ni}{15}$$

5.2.2.3 The actual tensile strength of the steel of any component shall not exceed the minimum required by the relevant ASTM specification by more than 150 N/mm².

5.2.3 Chromium-molybdenum steels (applicable to material groups A5 and A6). For chromium-molybdenum steels the contents of carbon and residual elements shall be restricted as follows:

(a) Carbon content

Steels with less than 2 % Cr (nominal):

- 0.17 % max. (plate)
- 0.20 % max. (forgings and castings)

Steels with more than 2 % Cr (nominal):

- 0.15 % max. (plate)
- 0.15 % max. (forgings and castings)

(b) Residual elements

- Copper 0.30 % max.
- Nickel 0.40 % max.
- Tungsten 0.10 % max.
- Tin 0.03 % max.

5.3 Non-metallic materials

For flanges which are lined, or otherwise coated, with non-metallic materials and if the non-metallic materials come, or are likely to come, into contact with potable water then these materials shall comply with BS 6920 : Part 1.

NOTE. Users should be aware that thread sealants or lubricants, for example, should also comply with BS 6920 : Part 1 if used in potable water applications.

6 Bolting

6.1 Materials, dimensions and finish for bolting of ferritic steel flanges shall be in accordance with BS 3692, BS 4190 or BS 4882 (metric series) selected in accordance with table 15(b).

Free cutting steel for bolts, studbolts and nuts shall be restricted to the temperature range -10 °C to 100 °C and be limited to pressure designations up to and including PN 16.

NOTE. The selection of materials for bolting of flanges other than ferritic steel, is the responsibility of the user and reference should be made to BS 4882.

6.2 Studbolts shall be of the forms shown in BS 4882 except that the form shown in figure 3(b) of BS 4882 : 1973 shall only apply to studbolts of other than alloy steel.

6.3 The mating surface of all bolt heads and nuts shall be full faced.

7 Repairs

Repairs by welding, unless prohibited by the applicable material standard, or product standard in the case of integral flanges, shall be in accordance with BS 2633, BS 5135 or BS 4570 as appropriate.

NOTE. The welding procedure should be such as to produce a weld having characteristics in accordance with the parent material. Flanges should be heat treated after repair by welding when the material specification requires such treatment.

8 Dimensions

8.1 Flange dimensions

Dimensions, except for the diameter of shoulder, G (see note 4), of each type of flange for each PN shall be as given in tables 8 to 13, and as qualified by clause 10 and the notes to tables 8 to 13, if appropriate.

NOTE 1. It is incumbent upon the purchaser to specify in the enquiry and/or order if dimensions of flanges are to be affected by clause 10 and/or the notes to tables 8 to 13.

NOTE 2. A summary of the various types of flanges specified showing the nominal sizes (DN) applicable to each type and to each PN is given in table 2.

NOTE 3. The details for the weld preparation for weld-neck flanges (code 111) and code 134 ancillary components are not a requirement of this standard but attention is drawn to appendix C which gives details of various weld-end preparations and it is incumbent upon the purchaser to specify a particular weld-end preparation, if required. The weld-end preparation shown in figures 12a or 12b is the preparation normally supplied.

NOTE 4. The centre portion of the face of a blank flange (code 105) need not be machined provided that the diameter of the unmachined portion does not exceed the recommended shoulder diameter, G , given in tables 8 to 13.

8.2 Hubs

The hubs of slip-on for welding (code 112) and threaded (code 113) flanges shall be either:

- (a) parallel; or
- (b) have a draft angle of not greater than 7° on the outside surface for forging or casting purposes.

8.3 Threaded flanges

8.3.1 The threads of hubbed threaded flanges (code 113) shall be taper or parallel in accordance with BS 21 or taper to ANSI/ASME B1.20.1.

NOTE. BS 21 parallel threads will be supplied unless the purchaser specifies otherwise (see appendix A).

8.3.2 The thread shall be concentric with the axis of the flange and misalignment shall not exceed 5 mm/m.

Flanges shall be manufactured without a counterbore but to protect the threads the threads shall be chamfered to the major diameter of the thread at the back of the flange at an angle between 40° 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.

8.3.3 Gauging shall be in accordance with BS 21 or ANSI/ASME B1.20.1 as appropriate.

8.4 Bolt holes

Bolt holes shall be equally spaced on the pitch circle diameter and in the case of integral flanges, shall be positioned off-centre.

9 Flange facings

9.1 Range of facings

The range of flange facings and flange face designations are given in figure 3. Dimensions of facings shall be as given in figure 4 and table 7.

For flange 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.

9.2 Lapped joints

For code 133 ancillary components for flanges the finished height of the facing shall be not less than the specified pipe thickness used. If a tongue or groove face is required the thickness of the lap remaining after machining the facing shall not be less than the specified thickness of the pipe used.

9.3 Facing finishes

9.3.1 All flange jointing faces shall be machine finished and when compared by visual or tactile means with reference specimens, shall be in accordance with the values given in table 6.

NOTE 1. It is not intended that instrument measurements be taken on the faces themselves and the R_1 and R_2 values as defined in BS 1134 relate to the reference specimens.

NOTE 2. Requirements for special coatings or finishes should be stated in the enquiry and/or order so that an appropriate allowance may be incorporated in the machining of any relevant mating dimensions (see appendix A).

9.3.2 Flat face, raised face and spigot/recess facings types A, B, E and F shall be machined to comply with the requirements of table 6.

9.3.3 For tongue and groove and O-ring groove facings types C, D, G and H the gasket contact surfaces shall be machined to produce a surface finish in accordance with the values given in table 6.

10 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 complying with BS 4320 for the metric bolt size being fitted. The bearing surfaces for the bolting shall be parallel to the flange face within the limits given in table 14.

When a flange is back faced a minimum fillet radius at the hub, R_{\min} (see figure 11), shall be maintained as given in table 18.

11 Tolerances

Tolerances on dimensions of flanges shall be as given in table 14.

12 Marking

12.1 Other than integral flanges

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

- (a) Number of this British Standard, i.e. BS 4504*.
- (b) Flange code number, e.g. 112.
- (c) Nominal pressure (PN), e.g. PN 40.
- (d) Nominal size (DN), e.g. DN 150.
- (e) Material designation. The material group or identification symbols given in tables 3, 4 and 5 shall be used, as appropriate.
- (f) Manufacturer's name or trade mark.
- (g) Cast number or melt identification or suitable quality control number traceable to the cast number.
- (h) Thread identification (see 12.2).

Example: BS 4504/111-PN 16 - DN 400 - A2 - XXX - 12345

NOTE 1. Additionally, the type of flange face may be specified using the designations given in figure 4.

Example: BS 4504/111/B - PN 16 - DN 400 - A2 - XXX - 12345

NOTE 2. 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.

12.2 Internal thread identification

Threaded flanges shall be marked to indicate the type of thread used.

Threads to BS 21 shall be designated by the letter Rc or Rp as appropriate followed by the nominal size, e.g. Rc 3/4. Threads to ANSI/ASME B1.20.1 shall be designated by the nominal size, number of threads per inch and the letters NPT, e.g. 3/4-14NPT.

12.3 Stamping

Where steel stamps are used, the marking shall be positioned on the 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.

12.4 Omission of markings

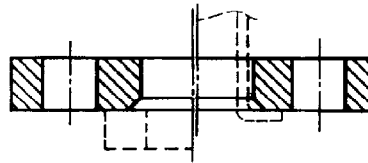
If a flange is too small to enable all the markings required in 12.1 to be marked on the flange, then some of the markings are permitted to be omitted. The order in which the markings are omitted shall be as follows.

- (a) Size.
- (b) Thread type and designation.
- (c) PN designation.
- (d) Manufacturer's name or trade mark.

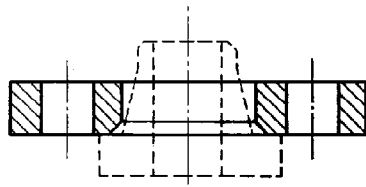
*Marking BS 4504, together with the flange code number, on or in relation to a product represents a manufacturer's declaration of conformity, i.e. a claim by or on behalf of the manufacturer that the product meets the requirements of this Section of BS 4504. The accuracy of the claim is therefore solely the responsibility of the person making the claim. Such a declaration is not to be confused with third party certification of conformity, which may also be desirable.



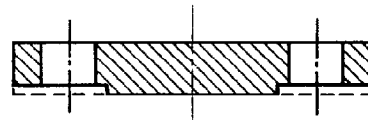
Code 101
Plate flange for welding



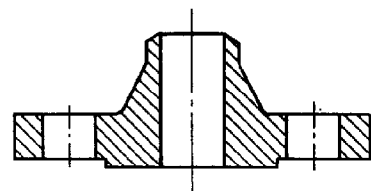
Code 102
Loose plate flange with weld-on
plate collar (see code 132) or
lapped pipe end (see code 133)



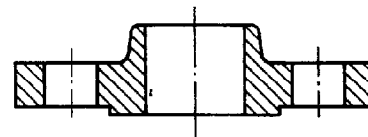
Code 104
Loose flange with welding
neck collar (see code 134)



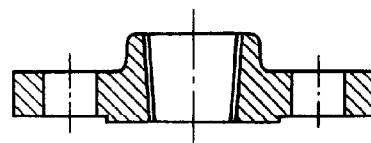
Code 105
Blank flange



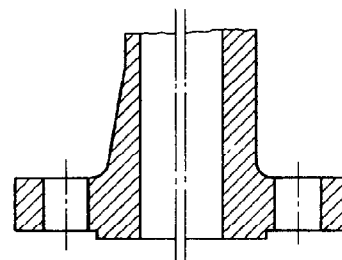
Code 111
Weld-neck flange



Code 112
Hubbed slip-on flange for welding



Code 113
Hubbed threaded flange



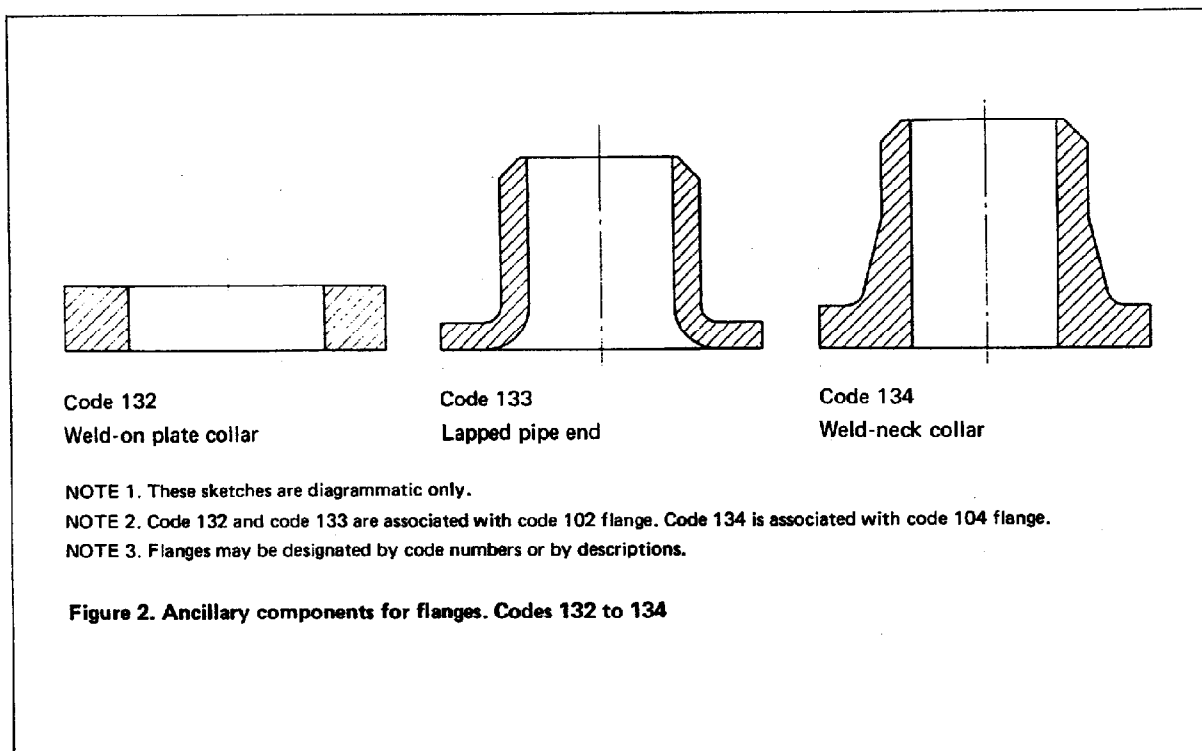
Code 121
Integral

NOTE 1. These sketches are diagrammatic only.

NOTE 2. Codes 101 to 105 inclusive comprise flanges that do not incorporate a hub or weld-neck. Codes 111 to 113 inclusive comprise flanges incorporating a hub or weld-neck manufactured from forgings or steel castings. Code 121 is an integral part of some other equipment or component.

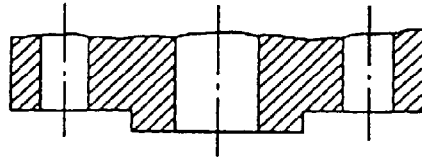
NOTE 3. Flanges may be designated by code numbers or by descriptions.

Figure 1. Flange codes

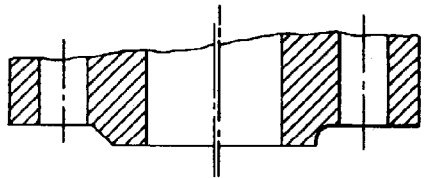




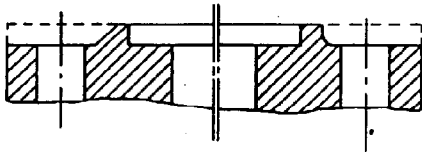
Type A
Flat face



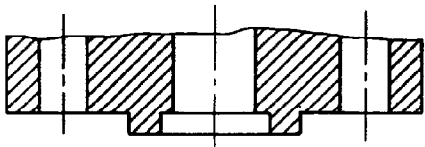
Type E
Spigot



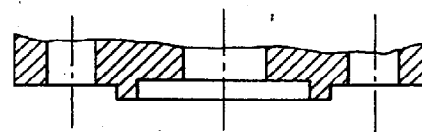
Type B
Raised face



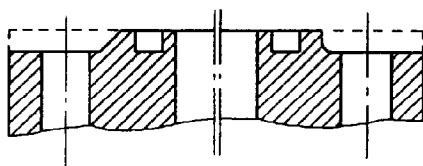
Type F
Recess



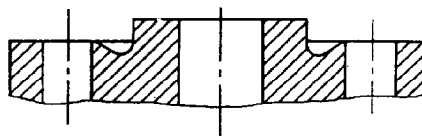
Type C
Tongue



Type G
O-ring recess



Type D
Groove



Type H
O-ring groove

NOTE 1. The transition from the edge of the raised face to the flange face may be by radius or chamfer (see 9.1).

NOTE 2. Sketches designated A to H inclusive illustrate the various types of flange facings which may be used in conjunction with the flanges or components given in figures 1 and 2.

NOTE 3. Facings may be designated by type letters or by descriptions.

Figure 3. Flange facings: types

Table 2. Synoptic table

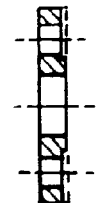
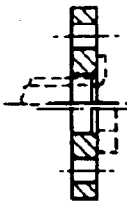
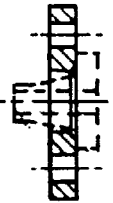
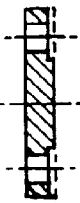
Flange and code no.	Table	DN	PN																				
			2.5	6	10	16	25	40	6	10	16	25	40	6	10	16	25	40	6	10	16	25	40
Plate 	8	2.5	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	9	6	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	10	10	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	11	16	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	12	25	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	13	40	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	9	6	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	10	10	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	11	16	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	12	25	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	13	40	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Loose plate with weld-on plate collar or lapped pipe and 	9	6	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		10	10	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
11		16	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
12		25	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
13		40	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Loose with weld-neck collar 	10	10	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
	11	16	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	12	25	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	13	40	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Blank 	8	2.5	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
	9	6	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	10	10	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	11	16	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	12	25	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Table 3. Materials: ferritic steels (group A)*

Materials	Plates		Forgings		Castings		Group No.†
	British Standard	Other standards‡	British Standard	Other standards‡	British Standard	Other standards‡	
Low grade carbon steel	BS 1501: Part 1 - 151 Grade 360 BS 4360 Grade 43A	ASTM A515 Grade 55 ASTM A283 Grade C DIN 17100 + R.St. 37.2	BS 970: Part 1 - 070M20	ASTM A181 Class 60 DIN 17100# R.St 37.2	—	—	A1
Carbon steel	BS 1501: Part 1 - 161 Grade 360 BS 1501: Part 1 - 151 Grade 430A	ASTM A515 Grade 55	BS 970: Part 1 - 070M20	—	—	—	A2
High grade carbon steel and carbon manganese steels	BS 1501: Part 1 - 164 Grade 360 BS 4360 - Grade 50B BS 1501: Part 1 - 224 Grade 400	ASTM A515 Grade 55 ASTM A283 Grade D ASTM A516 Grade 60	BS 1503 - 224 Grade 410 BS 1503 - 221 Grade 430 BS 1503 - 164 Grade 490	ASTM A350 Grade LF2 DIN 17243 - C22.8 ASTM A105	BS 1504 - 161 Grade 430 L140 BS 1504 - 161 Grade 480	ASTM A352 Grade LCB ASTM A216 Grade WCB	A3
Carbon molybdenum steel	BS 1501: Part 1 - 243§	ASTM A204 Grade A	BS 1503 - 245 Grade 420	ASTM A182 Grade F1	BS 1504 - 245	ASTM A217 Grade WC1	A4
1 % chromium ½ % molybdenum steel	BS 1501: Part 2 - 620	ASTM A387 Grade 12 Class 2	BS 1503 - 620 Grade 440	ASTM A182 Grade F12	—	—	A5
1½ % chromium ½ % molybdenum steel	BS 1501: Part 2 - 621	ASTM A387 Grade 11 Class 2	BS 1503 - 621 Grade 460	ASTM A182 Grade F11	BS 1504 - 621	ASTM A217 Grade WC6	A5
2¼ % chromium 1 % molybdenum steel	BS 1501: Part 2 - 622 - 515	ASTM A387 Grade 22 Class 2	BS 1503 - 622 Grade 490	ASTM A182 Grade F22	BS 1504 - 622	ASTM A217 Grade WC9	A6

*Group numbers relate to the pressure/temperature ratings given in table 15.
†Refer to BS 1560: Section 3.1 or ASTM specifications for limitations or recommendations in respect to ASTM materials.
‡The use of DIN 17100 R.St. 37.2 is limited to PN 16.
§BS 1501-243 material is not suitable for use above 400 °C.
NOTE. Where materials are used below 0 °C refer to the application code.

Materials		Plates			Forgings		Castings			Group No.*							
		British Standard	Comparable ASTM standard†	British Standard	Comparable ASTM standard†	British Standard	Comparable ASTM standard†	Group No.*									
Austenitic chromium-nickel (low carbon) steel	BS 1501: Part 3 - 304S12	ASTM A240 - 304L	BS 1503 - 304S11	ASTM A182 Grade F304L	BS 1504 - 304C12	ASTM A351 Grade CF3	B1										
										Austenitic chromium-nickel steel	BS 1501: Part 3 - 304S15	ASTM A240 - 304 ASTM A240 - 304H	BS 1503 - 304S31 BS 1503 - 304S51	ASTM A182 Grade F304 ASTM A182 Grade F304H	BS 1504 - 304C15	ASTM A351 Grade CF8	B2
Austenitic chromium-nickel (titanium stabilized) steel	BS 1501: Part 3 - 321S12 - 321S49	ASTM A240 - 321 ASTM A240 - 321H	BS 1503 - 321S31 BS 1503 - 321S51	ASTM A182 Grade F321 ASTM A182 Grade F321H	-	-	B3										
								Austenitic chromium-nickel-molybdenum (low carbon) steel	BS 1501: Part 3 - 316S12	ASTM A240 - 316L	BS 1503 - 316S11	ASTM A182 Grade F316L	BS 1504 - 316C12	ASTM A351 Grade CF3M	B4		
Austenitic chromium-nickel-molybdenum steel	BS 1501: Part 3 - 316S16	ASTM A240 - 316 ASTM A240 - 316H	BS 1503 - 316S31 BS 1503 - 316S51	ASTM A182 Grade F316 ASTM A182 Grade F316H	BS 1504 - 316C16	ASTM A351 Grade CF8M	B5										
								Austenitic 25% chromium - 20% nickel steel	BS 1501: Part 3 - 310S24	ASTM A240 - 310S	BS 1503 - 310S31	ASTM A182 Grade F310	BS 1504 - 310C40	ASTM A351 Grade HK40 ASTM A351 Grade CK20	B5		

*Group numbers relate to the pressure/temperature ratings given in table 16.

†Refer to BS 1560: Section 3.1 or ASTM specifications for limitations or recommendations in respect to ASTM materials.

NOTE: Where materials are used below 0 °C refer to the application code.

2

1

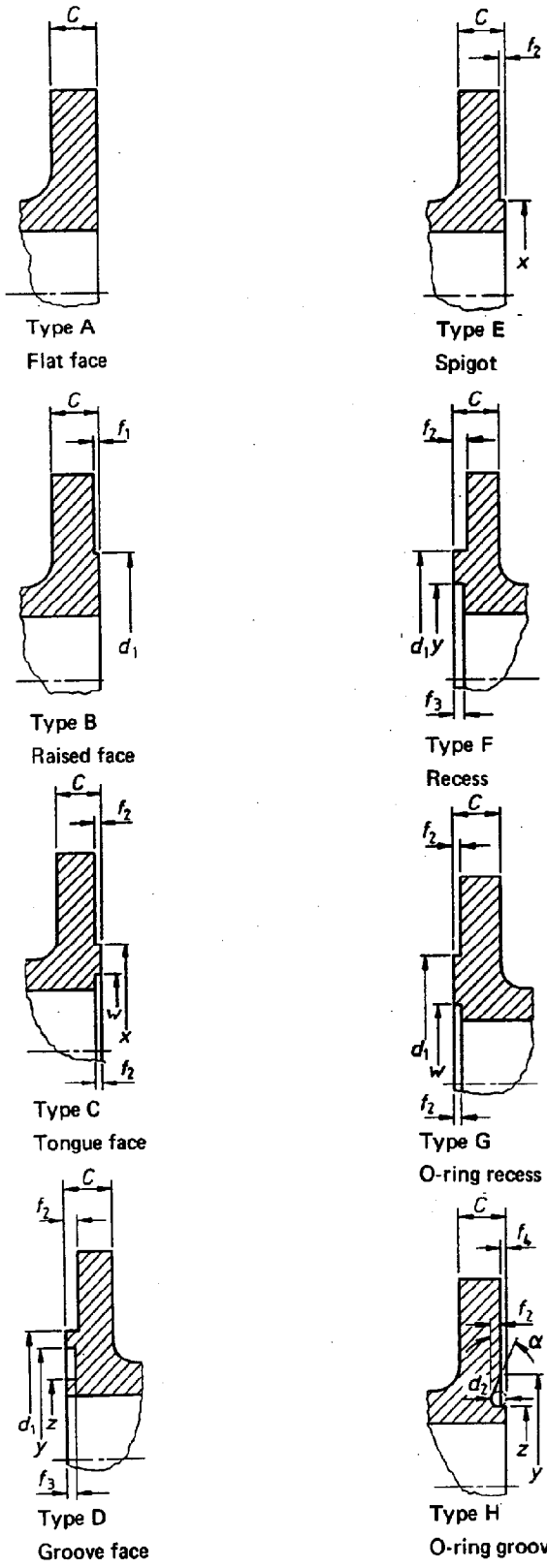
Materials	Plates		Forgings		Castings		Group No. *
	British Standard	Comparable ASTM standard†	British Standard	Comparable ASTM standard†	British Standard	Comparable ASTM standard†	
3% nickel steel	BS 1501 : Part 2 - 503	ASTM A203 Grade A	BS 1503 - 503 LT80	—	BS 1504 - 503 LT60	ASTM A352 Grade LC3	C1
9% nickel steel	BS 1501 : Part 2 - 510	ASTM A353 ASTM A553 Type 1	BS 1503 - 509 LT196 BS 1503 - 510 LT196	ASTM A522 type 1 ASTM A522 type 1	—	—	C2

*Group numbers relate to the pressure/temperature ratings given in table 17.
†Refer to ASTM specifications for limitations or recommendations in respect to ASTM materials.
NOTE. Where materials are used below 0 °C and/or above 120 °C refer to the application code.

Facing types	Method of machining	R_a *		R_z *	
		min.	max.	min.	max.
A, B	Turning†	μm 3.2	μm 12.5	μm 12.5	μm 50
E, F	Other than turning	μm 3.2	μm 6.3	μm 12.5	μm 25
C, D G, H	—	μm 0.8	μm 3.2	μm 3.2	μm 12.5

* R_a and R_z are defined in BS 1134.
†The term 'turning' includes any method of machine operation producing either serrated concentric or serrated spiral grooves.
NOTE. For certain applications, e.g. low temperature gases, it may be necessary to stipulate closer control of the surface finish.

BS 4504 : Section 3.1 : 1989



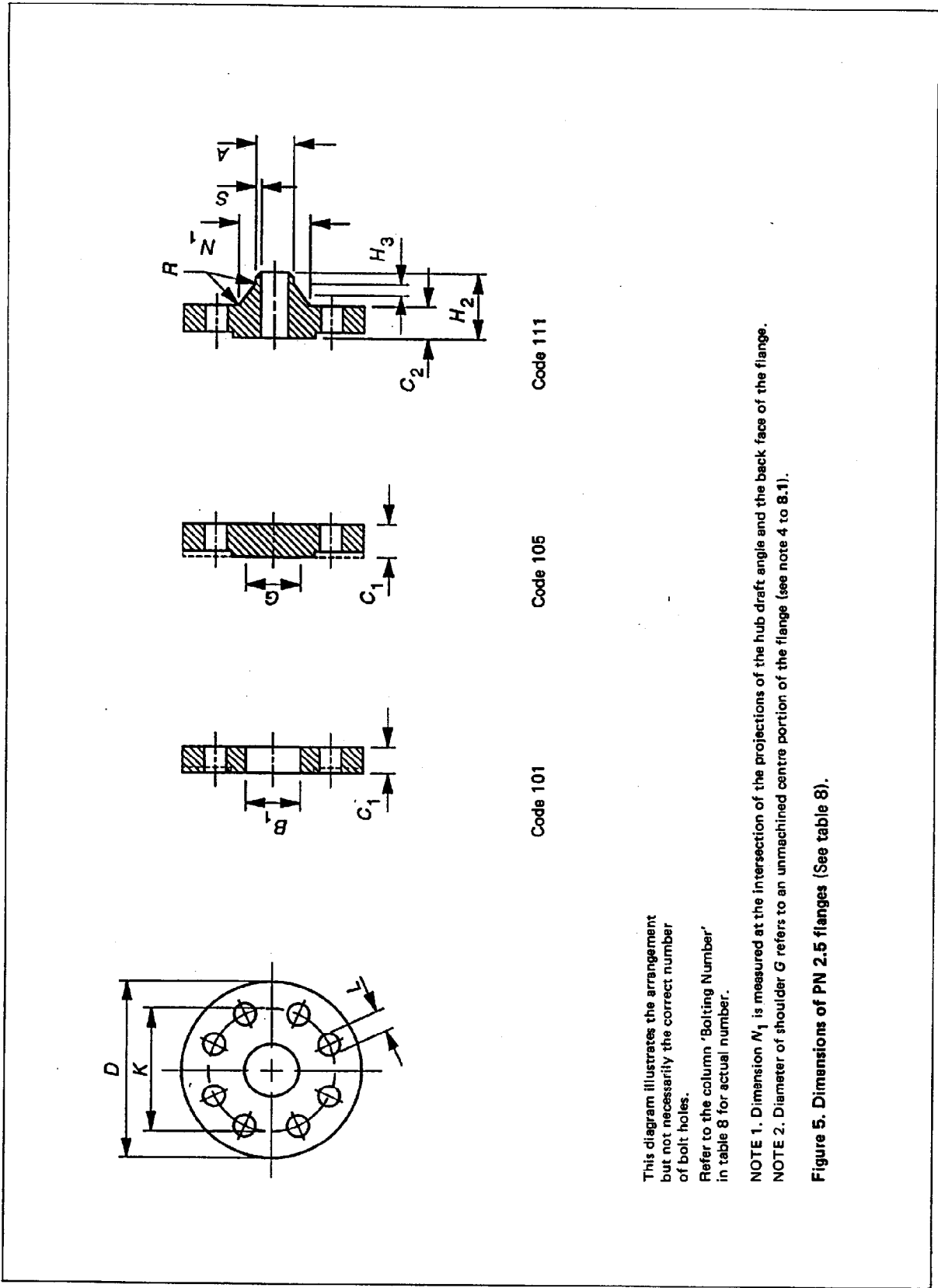
NOTE. Dimension C includes the raised face thickness (see tables 8 to 13).

Figure 4. Flange facings: dimensions (See table 7).

Table 7. Dimensions of flange faces

Nominal size DN	d ₁					f ₁	f ₂	f ₃	f ₄	w	x	y	z	α	d ₂
	PN 2.5	PN 6	PN 10	PN 16	PN 25										
	mm	mm	mm	mm	mm										
10	Use PN 6 dimensions	35	158	158	162	2			24	34	35	23		5	
15		40	188	188	188	3			29	39	40	28	41° 16'		
20		50	212	212	218					36	50	51		35	
25		60	268	268	278	4	4	2	43	57	58	42			
32		70	320	320	335					51	65	66	50		
40		80	370	378	395	5	5	3	61	75	76	60			
50		90	430	438	450							73	87	88	72
65		110	482	490	505	6	6	4	95	109	110	94			
80		128	532	550	565							106	120	121	105
100		148	585	610	615	7	5	3	129	149	150	128		6	
125		178	685	725	720							155	175		176
150		202	775	800	820	8	6	4	183	203	204	182		7	
200		258	880	900	930							239	259		260
250		312	980	1000	1030	9	5	4	292	312	313	291		8	
300		365	1080	1110	1140							343	363		364
350		415	1110	1115	1140	10	6	5	395	421	422	394		9	
400		465	1280	1295	1330							447	473		474
450		520	1480	1510	1560	11	7	4	497	523	524	496		10	
500		570	1690	1710	1760							549	575		576
600		670	1890	1920	1985	12	8	5	649	675	676	648		11	
700		775	2170	2150	2210							751	777		778
800		880	2370	2370	2495	13	9	6	856	882	883	855		12	
900		980	2570	2570	2780							961	987		988
1000		1080	2780	2780	2960	14	10	5	1062	1092	1094	1060		13	
1200		1295	3160	3160	3210							1262	1292		1294
1400		1510	3370	3370	3510	15	11	6	1462	1492	1494	1460		14	
1600		1690	3580	3580	3720							1662	1692		1694
1800		1920	3790	3790	3920	16	12	7	1862	1892	1894	1860		15	
2000		2125	4120	4120	4200							2062	2092		2094
2200		2295	—	—	—	17	13	8	—	—	—	—		16	
2400		2495	—	—	—							—	—		—
2600		2695	—	—	—	18	14	9	—	—	—	—		17	
2800		2910	—	—	—							—	—		—
3000		3110	—	—	—	19	15	10	—	—	—	—		18	
3200		3310	—	—	—							—	—		—
3400		3510	—	—	—	20	16	11	—	—	—	—		19	
3600		3720	—	—	—							—	—		—
3800		3920	—	—	—	21	17	12	—	—	—	—		20	
4000		4120	—	—	—							—	—		—

3



This diagram illustrates the arrangement but not necessarily the correct number of bolt holes.

Refer to the column 'Bolting Number' in table 8 for actual number.

NOTE 1. Dimension N_1 is measured at the intersection of the projections of the hub draft angle and the back face of the flange.

NOTE 2. Diameter of shoulder G refers to an unmachined centre portion of the flange (see note 4 to 8.1).

Figure 5. Dimensions of PN 2.5 flanges (See table 8).

Table 8. Dimensions of PN 2.5 flanges (See figure 5).																
Nominal size	Mating dimensions															
	Outside diameter of bolt circle	Diameter of bolt hole	Diameter of bolt	Bolting		Outside diameter of neck	Bore diameter	Flange thickness		Diameter of shoulder	Lengths		Neck diameter	Corner radii	Neck thickness	Nominal size
DN	D	K	L	Number	Size	A	θ_1	C_1	C_2	G	H_2	H_3	N_1	R	S	DN
Codes affected	101, 105, 111													111	111	111
10 to 600	Use PN 6 rating (dimensions for these sizes are identical)															
700	860	810	26	24	M24	711	To be specified by the purchaser	36	24	—	70	16	740	12	To be specified by the purchaser	700
800	975	920	30	24	M27	813	To be specified by the purchaser	38	26	—	70	16	842	12	To be specified by the purchaser	800
900	1075	1020	30	24	M27	914	To be specified by the purchaser	40	26	—	70	16	942	12	To be specified by the purchaser	900
1000	1175	1120	30	28	M27	1016	To be specified by the purchaser	42	26	—	70	16	1045	12	To be specified by the purchaser	1000
1200	1375	1320	30	32	M27	1220	To be specified by the purchaser	44	26	—	70	16	1245	16	To be specified by the purchaser	1200
1400	1575	1520	30	36	M27	1420	To be specified by the purchaser	48	26	—	70	16	1445	16	To be specified by the purchaser	1400
1600	1790	1730	30	40	M27	1620	To be specified by the purchaser	51	26	—	80	20	1645	16	To be specified by the purchaser	1600
1800	1990	1930	30	44	M27	1820	To be specified by the purchaser	54	26	—	80	20	1845	16	To be specified by the purchaser	1800
2000	2190	2130	30	48	M27	2020	To be specified by the purchaser	58	26	—	80	22	2045	16	To be specified by the purchaser	2000
2200	2405	2340	33	52	M30	2220	To be specified by the purchaser	—	28	—	90	25	2248	18	To be specified by the purchaser	2200
2400	2605	2540	33	56	M30	2420	To be specified by the purchaser	—	28	—	90	25	2448	18	To be specified by the purchaser	2400
2600	2805	2740	33	60	M30	2620	To be specified by the purchaser	—	28	—	90	25	2648	18	To be specified by the purchaser	2600
2800	3030	2960	36	64	M33	2820	To be specified by the purchaser	—	30	—	90	25	2848	18	To be specified by the purchaser	2800
3000	3230	3160	36	68	M33	3020	To be specified by the purchaser	—	30	—	90	25	3050	18	To be specified by the purchaser	3000
3200	3430	3360	36	72	M33	3220	To be specified by the purchaser	—	30	—	90	25	3250	20	To be specified by the purchaser	3200
3400	3630	3560	36	76	M33	3420	To be specified by the purchaser	—	32	—	95	28	3450	20	To be specified by the purchaser	3400
3600	3840	3770	36	80	M33	3620	To be specified by the purchaser	—	32	—	100	28	3652	20	To be specified by the purchaser	3600
3800	4045	3970	39	80	M36	3820	To be specified by the purchaser	—	34	—	100	28	3852	20	To be specified by the purchaser	3800
4000	4245	4170	39	84	M36	4020	To be specified by the purchaser	—	34	—	100	28	4052	20	To be specified by the purchaser	4000

NOTE 1. For facing dimensions see table 7.

NOTE 2. See notes following table 13.

1

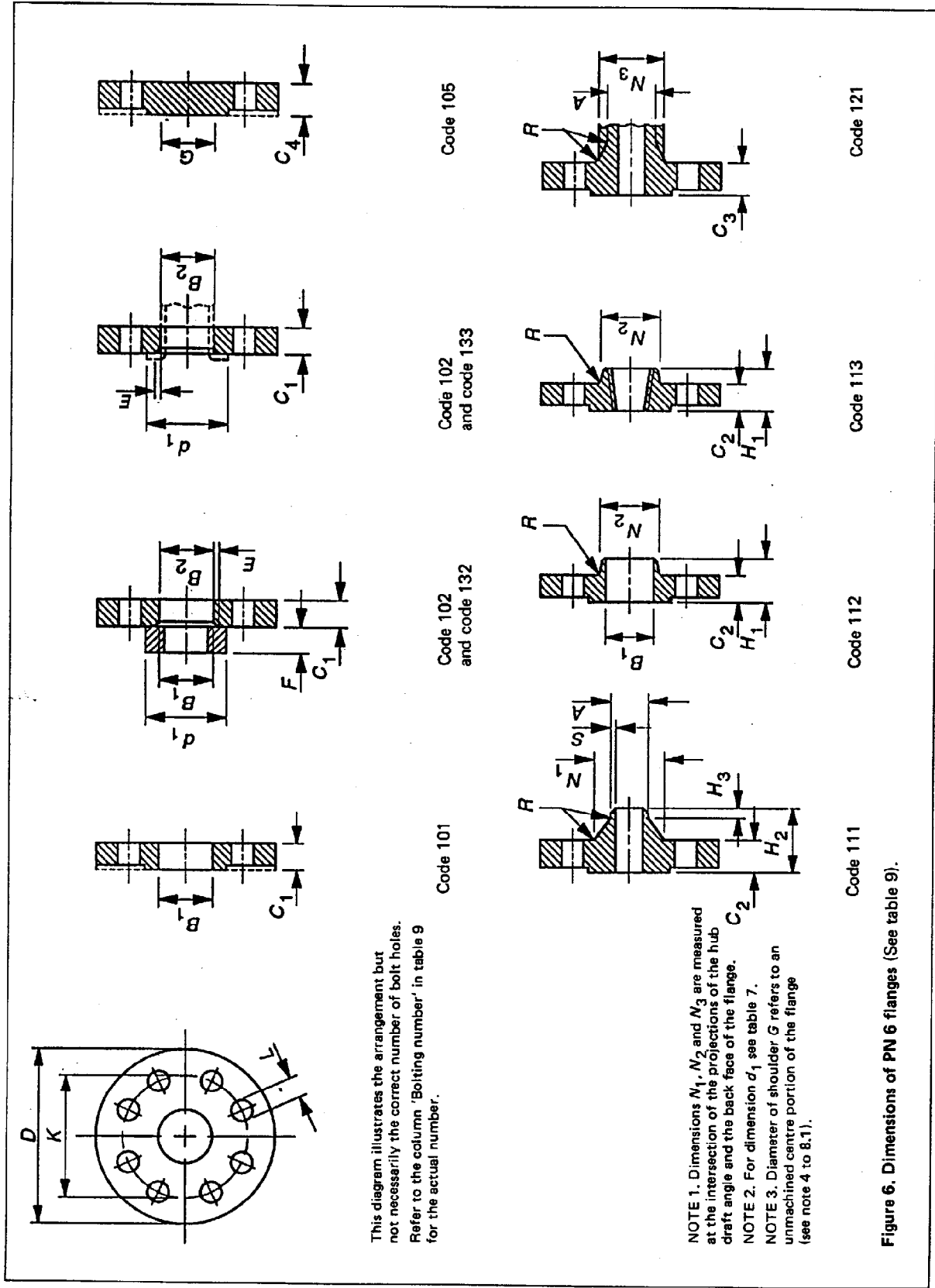
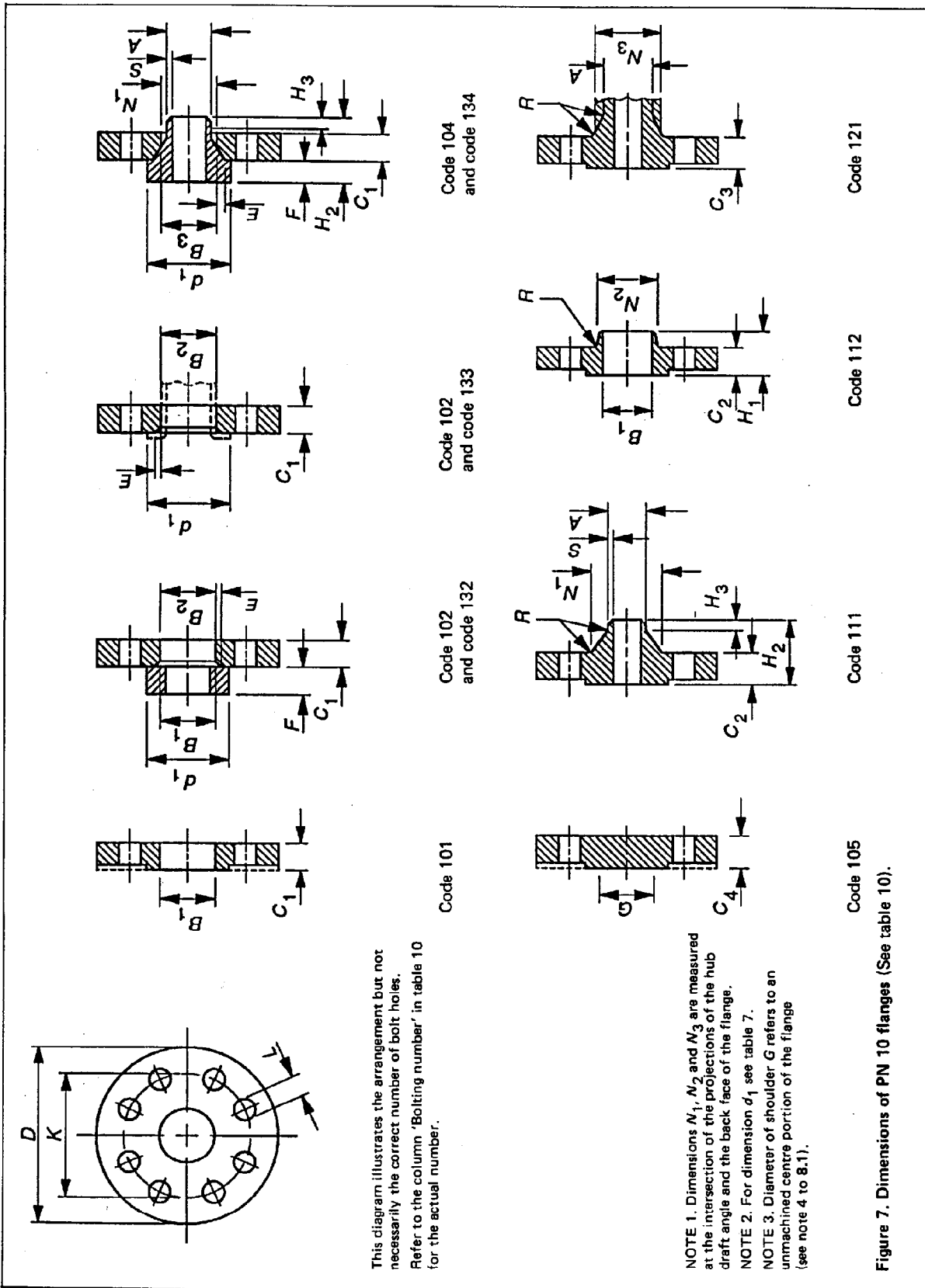


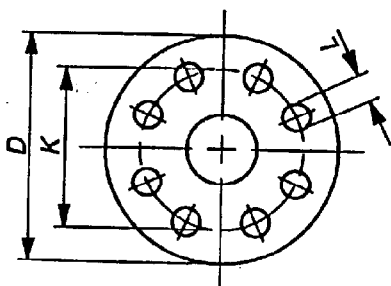
Figure 6. Dimensions of PN 6 flanges (See table 9).

Table 9. Dimensions of PN 6 flanges (See figure 9).

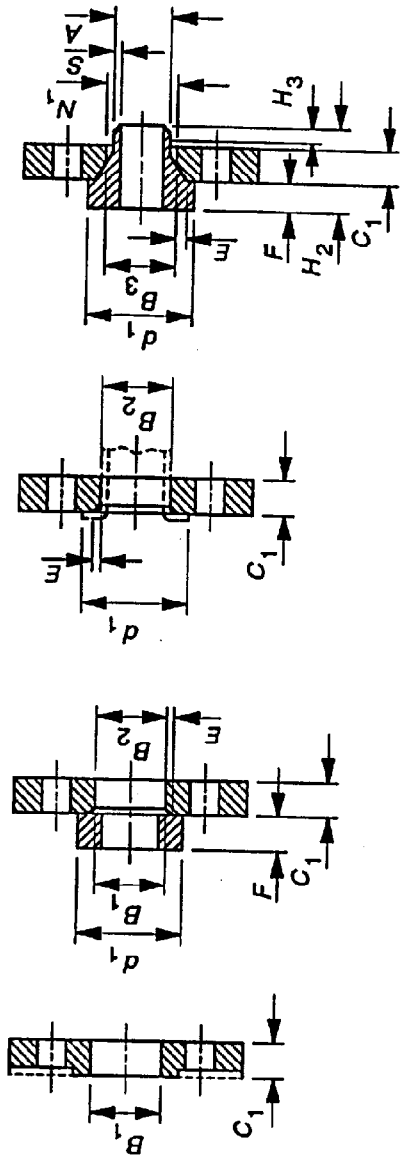
Nominal size DN	Mating dimensions			Outside diameter of neck	Bore diameters		Flange thickness			Chamfer	Collar thickness	Diameter of shoulder	Lengths			Neck diameters			Corner radii	Neck thickness	Nominal size DN	
	Outside diameter	Diameter of bolt circle	Diameter of bolt hole		B ₁	B ₂	C ₁	C ₂	C ₃				C ₄	E	F	G	H ₁	H ₂				H ₃
Codes affected	101, 102, 105, 111, 112, 113, 121			111 121	101 112 132	102	101 102 102 121	105	102	132	105	105	111 113 121	111	111	111	111	112 113	121	111 112 113 121	111	
10	75	50	11	17.2	18.0	21	12	12	3	10	—	—	20	28	6	26	25	20	3	1.8	10	
15	80	55	11	21.3	22.0	25	12	12	3	10	—	—	20	30	6	30	30	26	3	2.0	15	
20	90	65	11	26.9	27.5	31	14	14	4	10	—	—	24	32	6	38	40	34	4	2.3	20	
25	100	75	11	33.7	34.5	38	14	14	4	10	—	—	24	35	6	42	50	44	4	2.6	25	
32	120	90	14	42.4	43.5	46	16	14	5	10	—	—	26	35	6	55	60	54	5	2.6	32	
40	130	100	14	48.3	49.5	53	16	14	5	10	—	—	26	38	7	62	70	64	5	2.6	40	
50	140	110	14	60.3	61.5	65	16	14	5	12	—	—	28	38	8	74	80	74	5	2.9	50	
65	160	130	14	76.1	77.5	81	16	14	6	12	55	—	32	38	9	88	100	94	6	2.9	65	
80	190	160	18	88.9	90.5	94	16	16	6	12	70	—	34	42	10	102	110	110	6	3.2	80	
100	210	170	18	114.3	116.0	120	18	16	6	14	90	—	40	45	10	130	130	130	6	3.6	100	
125	240	200	18	139.7	141.5	145	20	18	6	14	115	—	44	48	10	155	160	160	6	4.0	125	
150	265	225	18	168.3	170.5	174	20	18	6	14	140	—	44	48	12	184	185	182	8	4.5	150	
200	320	280	18	219.1	221.5	226	22	20	6	16	190	—	44	55	15	236	240	238	8	5.6	200	
250	375	335	18	273.0	276.5	281	24	22	8	18	235	—	44	60	15	290	295	284	10	6.3	250	
300	440	395	22	323.9	327.5	333	24	22	8	18	285	—	44	62	15	342	355	342	10	7.1	300	
350	490	445	22	355.6	359.5	365	26	22	8	18	325	—	—	62	15	385	392	392	10	7.1	350	
400	540	495	22	406.4	411.0	416	28	22	8	20	375	—	—	65	15	438	442	442	10	7.1	400	
450	595	550	22	457.0	462.0	467	30	24	8	20	425	—	—	65	15	492	—	494	12	7.1	450	
500	645	600	22	508.0	513.5	519	30	24	8	22	475	—	—	68	15	538	—	544	12	7.1	500	
600	755	705	26	610.0	616.5	622	32	24	8	22	575	—	—	70	16	640	—	642	12	7.1	600	
700	860	810	26	711.0	—	—	40*	24	38	—	—	—	—	70	16	740	—	746	12	7.1	700	
800	975	920	30	813.0	—	—	44*	24	42	—	—	—	—	70	16	842	—	850	12	7.1	800	
900	1075	1020	30	914.0	—	—	48*	26	46	—	—	—	—	70	16	942	—	950	12	7.1	900	
1000	1175	1120	30	1016.0	—	—	52*	26	52	—	—	—	—	70	16	1045	—	1050	12	7.1	1000	
1200	1405	1340	33	1220.0	—	—	60*	28	60	—	—	—	—	90	20	1248	—	1264	12	8.0	1200	
1400	1630	1560	36	1420.0	—	—	68	32	68	—	—	—	—	90	20	1452	—	1480	12	8.0	1400	
1600	1830	1760	36	1620.0	—	—	76*	34	76	—	—	—	—	90	20	1655	—	1680	12	9.0	1600	
1800	2045	1970	39	1820.0	—	—	84*	36	84	—	—	—	—	100	20	1855	—	1878	15	10.0	1800	
2000	2265	2180	42	2020.0	—	—	92*	38	92	—	—	—	—	110	25	2058	—	2082	15	11.0	2000	
2200	2475	2390	42	2220.0	—	—	—	42	—	—	—	—	—	115	25	2260	—	—	15	—	2200	
2400	2685	2600	42	2420.0	—	—	—	44	—	—	—	—	—	125	25	2462	—	—	15	—	2400	
2600	2905	2810	48	2620.0	—	—	—	46	—	—	—	—	—	130	25	2665	—	—	15	—	2600	
2800	3115	3020	48	2820.0	—	—	—	48	—	—	—	—	—	135	30	2865	—	—	15	—	2800	
3000	3315	3220	48	3020.0	—	—	—	50	—	—	—	—	—	140	30	3068	—	—	15	—	3000	
3200	3525	3430	48	3220.0	—	—	—	54	—	—	—	—	—	150	30	3272	—	—	15	—	3200	
3400	3735	3640	48	3420.0	—	—	—	56	—	—	—	—	—	160	35	3475	—	—	15	—	3400	
3600	3970	3860	56	3620.0	—	—	—	60	—	—	—	—	—	165	35	3678	—	—	15	—	3600	

*For code 101 flanges only.
NOTE 1. For facing dimensions see table 7.
NOTE 2. See notes following table 13.

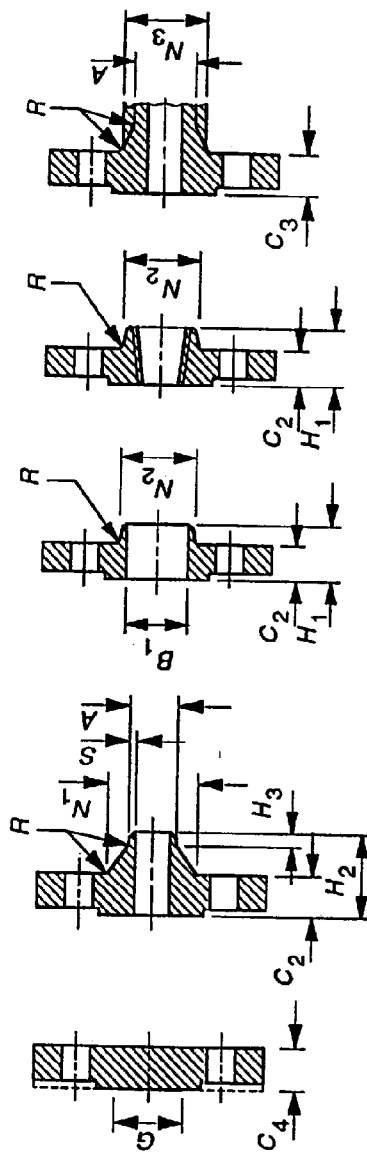




This diagram illustrates the arrangement but not necessarily the correct number of bolt holes. Refer to the column 'Bolting number' in table 11 for the actual number.



Code 101
Code 102 and code 132
Code 102 and code 133
Code 104 and code 134



Code 105
Code 111
Code 112
Code 113
Code 121

NOTE 1. Dimensions N_1 , N_2 and N_3 are measured at the intersection of the projections of the hub draft: angle and the back face of the flange.
NOTE 2. For dimension d_1 see table 7.
NOTE 3. Diameter of shoulder G refers to an unmachined centre portion of the flange (see note 4 to 8.1).

Figure 8. Dimensions of PN 16 flanges (See table 11).

Table 11. Dimensions of PN 16 flanges (See figure 8).

Nominal size DN	Mating dimensions				Outside diameter of neck A	Bore diameters			Flange thickness			Chamfer E	Collar thickness F	Diameter of shoulder G	Lengths			Neck diameters			Radius R	Neck thickness S	Nominal size DN		
	Outside diameter D	Diameter of bolt circle K	Diameter of bolt hole L	Bolting Number		Size	B ₁	B ₂	B ₃	C ₁	C ₂				C ₃	C ₄	H ₁	H ₂	H ₃	N ₁				N ₂	N ₃
Codes affected	101, 102, 104, 105, 111, 112, 113, 121					101 112 132	102	104	101 102 104	111 112 113	121	105	132 134	105	111 134	111 134	111 134	112 113	121	111 112 113 121	111 112 113 121	111 134			
10	90	60	14	4	M12	18.0	21	31	14	14	14	3	12	—	20	35	6	28	30	28	3	1.8	10		
15	95	65	14	4	M12	22.0	25	35	14	14	14	3	12	—	20	35	6	32	35	32	3	2.0	15		
20	105	75	14	4	M12	27.5	31	42	16	16	16	4	14	—	24	38	6	39	45	40	4	2.3	20		
25	115	85	14	4	M12	34.5	38	49	16	16	16	4	14	—	24	38	6	46	52	50	4	2.6	25		
32	140	100	18	4	M16	43.5	47	59	18	16	16	5	14	—	26	40	6	56	60	60	5	2.6	32		
40	150	110	18	4	M16	49.5	53	67	18	16	16	5	14	—	26	42	7	64	70	70	5	2.6	40		
50	165	125	18	4	M16	61.5	65	77	20	18	18	5	16	—	28	45	8	74	84	84	5	2.9	50		
65	185	145	18	4	M16	76.1	81	96	20	18	18	6	16	—	32	45	10	92	104	104	6	2.9	65		
80	200	160	18	8	M18	90.5	94	114	20	20	20	6	16	—	34	50	10	110	118	120	6	3.2	80		
100	220	180	18	8	M18	114.3	120	134	22	20	20	6	18	—	40	52	12	130	140	140	6	3.6	100		
125	250	210	18	8	M18	139.7	145	162	22	22	22	6	18	—	44	55	12	158	168	170	6	4.0	125		
150	285	240	22	8	M20	170.5	174	188	24	22	22	6	20	—	44	55	12	184	195	190	8	4.5	150		
200	340	295	22	12	M20	221.5	226	240	26	24	24	6	20	—	44	62	16	234	246	246	8	5.8	200		
250	405	355	26	12	M24	276.5	281	294	29	26	26	8	22	—	46	70	16	288	298	296	10	6.3	250		
300	460	410	26	12	M24	327.5	333	348	32	28	28	8	24	—	46	78	16	342	350	350	10	7.1	300		
350	520	470	26	16	M24	359.0	365	400	35	30	30	8	26	—	57	82	16	390	400	410	10	8.0	350		
400	580	525	30	16	M27	411.0	416	454	38	32	32	8	28	—	63	85	16	444	456	458	10	8.0	400		
450	640	585	30	20	M27	462.0	467	500	42	34	34	8	30	—	68	87	16	490	502	516	12	8.0	450		
500	715	650	33	20	M30	513.5	510	556	46	34	36	8	32	—	73	90	16	546	558	576	12	8.0	500		
600	840	770	36	20	M33	610.0	616.5	622	52	36	40	8	32	—	83	95	18	650	658	690	12	8.8	600		
700	910	840	36	24	M33	711.0	—	—	60*	36	42	48	—	—	83	100	18	750	760	760	12	8.8	700		
800	1025	950	39	24	M36	813.0	—	—	68*	38	42	52	—	—	90	105	20	848	864	862	12	10.0	800		
900	1125	1050	39	28	M36	914.0	—	—	76*	40	44	58	—	—	94	110	20	948	968	952	12	10.0	900		
1000	1255	1170	42	28	M39	1016.0	—	—	84*	42	46	64	—	—	100	120	22	1056	1072	1076	12	10.0	1000		
1200	1485	1390	48	32	M45	1220.0	—	—	98*	48	52	76	—	—	—	—	—	—	—	—	—	—	12.5	1200	
1400	1685	1590	48	36	M45	1420.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	14.2	1400	
1600	1930	1820	56	40	M52	1620.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	16.0	1600	
1800	2130	2020	56	44	M52	1820.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	17.5	1800	
2000	2345	2230	62	48	M56	2020.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	20.0	2000	

*For code 101 flanges only.

†Flanges of nominal size DN 65 can be supplied with 8 bolt holes upon special request by the purchaser.

NOTE 1. For facing dimensions see table 7.

NOTE 2. See notes following table 13.



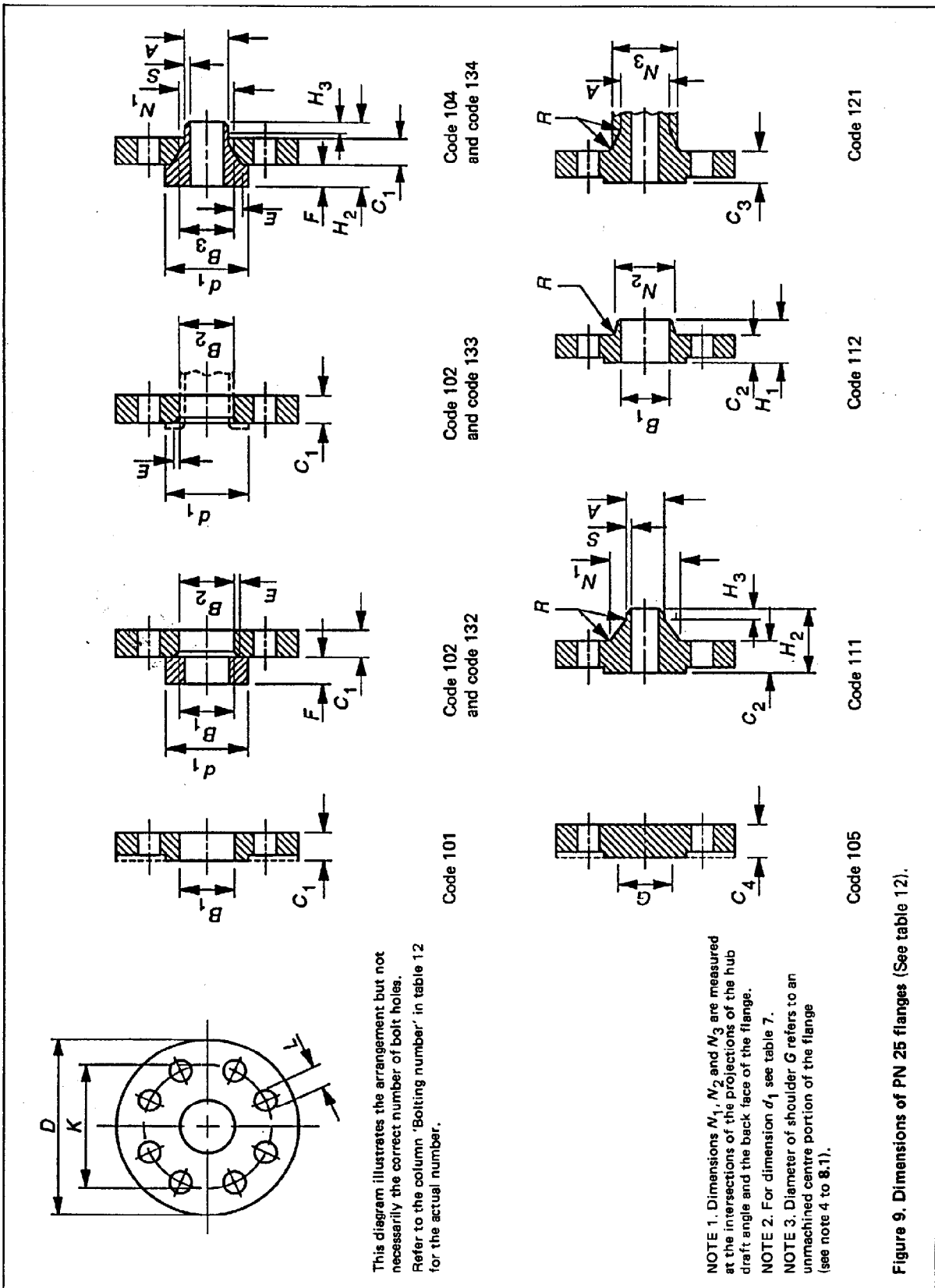
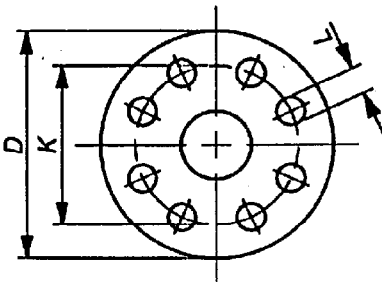


Figure 9. Dimensions of PN 25 flanges (See table 12).

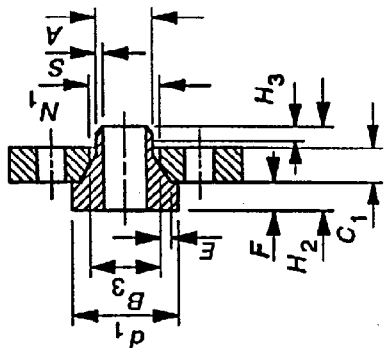
Table 12. Dimensions of PN 25 flanges (See figure 9).

Nomi- nal size	Mating dimensions					Outside diameter of neck A	Bore diameters			Flange thickness				Cham- fer E	Codes thick- ness F	Diameter of shoulder G	Lengths			Neck diameters				Corner radii R	Neck thick- ness S	Nomi- nal size DN								
	Outside Diameter D	Diameter of bolt circle K	Diameter of bolt hole L	Bolting			E ₁	E ₂	E ₃	C ₁	C ₂	C ₃	C ₄				H ₁	H ₂	H ₃	N ₁	N ₂	N ₃												
				Num-	Size																													
Codes affect- ed	101, 102, 104, 105, 111, 112, 121 134					111, 121, 134	101 102 132	104 104	101 102 104	111 112 132	121 112	105 104 104	102 104 132 134	105	112 111 134	111 134	111 134 134	112 121	111 112 121	111 112 134	111 134	111 134	111 134	111 134	111 134	111 134	111 134	111 134	111 134	111 134	111 134			
10 15 20 25 32 40 50 65 80 100 125 150																																		
Use PN 40 dimensions																																		
200 250 300 350 400 450 500 600 700 800 900 1000 1200 1400 1600 1800 2000	360 425 485 555 620 670 730 845 960 1085 1185 1320 1530 1755 1975 2185 2425	310 370 430 490 550 600 660 770 875 990 1090 1210 1420 1640 1860 2070 2300	26 30 30 33 36 36 36 39 42 48 48 56 56 62 62 70 70	12 16	M24 M27	219.1 273.0 323.9	221.5 276.5 327.5	226 281 333	250 302 356	32 35 38	30 32 34	30 32 34	30 32 34	30 32 34	30 32 34	30 32 34	30 32 34	30 32 34	30 32 34	30 32 34	30 32 34	30 32 34	30 32 34	30 32 34	30 32 34	30 32 34	30 32 34	30 32 34	30 32 34	30 32 34	30 32 34	30 32 34		
500 600 700 800 900 1000 1200 1400 1600 1800 2000	730 845 960 1085 1185 1320 1530 1755 1975 2185 2425	660 770 875 990 1090 1210 1420 1640 1860 2070 2300	36 39 42 48 48 56 56 62 62 70 70	20 24	M33 M39	508.0 610.0 711.0	513.5 616.5	519 622	568 670	56 68	44 46	44 46	44 46	44 46	44 46	44 46	44 46	44 46	44 46	44 46	44 46	44 46	44 46	44 46	44 46	44 46	44 46	44 46	44 46	44 46	44 46	44 46	44 46	
200 250 300 350 400 450 500 600 700 800 900 1000 1200 1400 1600 1800 2000	360 425 485 555 620 670 730 845 960 1085 1185 1320 1530 1755 1975 2185 2425	310 370 430 490 550 600 660 770 875 990 1090 1210 1420 1640 1860 2070 2300	26 30 30 33 36 36 36 39 42 48 48 56 56 62 62 70 70	12 16	M24 M27	219.1 273.0 323.9	221.5 276.5 327.5	226 281 333	250 302 356	32 35 38	30 32 34	30 32 34	30 32 34	30 32 34	30 32 34	30 32 34	30 32 34	30 32 34	30 32 34	30 32 34	30 32 34	30 32 34	30 32 34	30 32 34	30 32 34	30 32 34	30 32 34	30 32 34	30 32 34	30 32 34	30 32 34	30 32 34	30 32 34	
500 600 700 800 900 1000 1200 1400 1600 1800 2000	730 845 960 1085 1185 1320 1530 1755 1975 2185 2425	660 770 875 990 1090 1210 1420 1640 1860 2070 2300	36 39 42 48 48 56 56 62 62 70 70	20 24	M33 M39	508.0 610.0 711.0	513.5 616.5	519 622	568 670	56 68	44 46	44 46	44 46	44 46	44 46	44 46	44 46	44 46	44 46	44 46	44 46	44 46	44 46	44 46	44 46	44 46	44 46	44 46	44 46	44 46	44 46	44 46	44 46	44 46
NOTE 1. For facing dimensions see table 7. NOTE 2. See notes following table 13.																																		

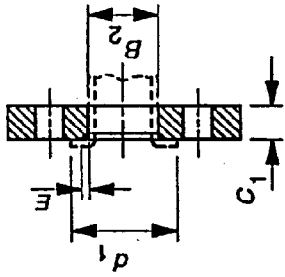




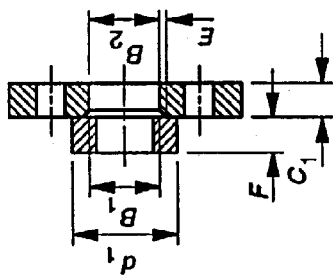
This diagram illustrates the arrangement but not necessarily the correct number of bolt holes. Refer to the column 'Bolting number' in table 13 for the actual number.



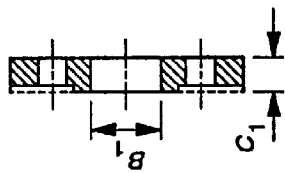
Code 104 and code 134



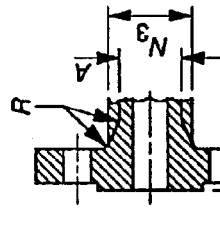
Code 102 and code 133



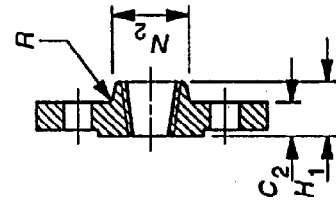
Code 102 and code 132



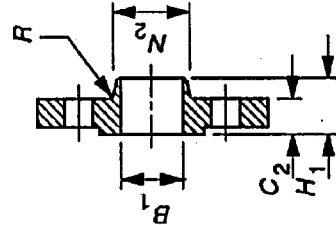
Code 101



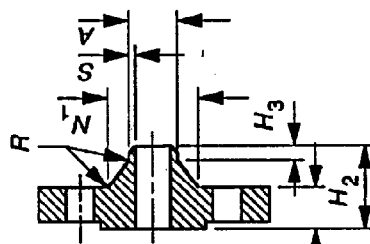
Code 121



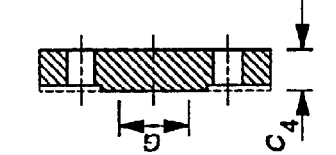
Code 113



Code 112



Code 111



Code 105

NOTE 1. Dimensions M_1 , M_2 and M_3 are measured at the intersections of the projections of the hub draft angle and the back face of the flange.

NOTE 2. For dimension d_1 see table 7.

NOTE 3. Diameter of shoulder G refers to an unmachined centre portion of the flange (see note 4 to 8.1).

Figure 10. Dimensions of PN 40 flanges (See table 13).

Table 13. Dimensions of PN 40 flanges (See figure 10).

Nominal size DN	Mating dimensions				Outside diameter of neck		Bore diameters			Flange thickness				Chamfer and stud thickness F	Diameter of shoulder G	Lengths			Neck diameters			Radius	Neck thickness S	Nominal size DN
	Outside diameter D	Diameter of bolt circle K	Diameter of bolt hole L	Bolting Num-ber	A	B ₁	B ₂	B ₃	C ₁	C ₂	C ₃	C ₄	E			H ₁	H ₂	H ₃	N ₁	N ₂	N ₃			
														Codes affected	mm							mm	mm	mm
10	90	60	14	4	M12	18.0	21	31	14	16	16	16	102	112	111	111	111	111	112	121	111	111	111	10
15	95	65	14	4	M12	22.0	25	35	14	16	16	16	104	112	111	111	111	111	112	113	112	112	112	15
20	105	75	14	4	M12	27.5	31	42	16	18	18	18	104	113	113	134	134	134	113	113	113	113	113	20
25	115	85	14	4	M12	34.5	38	49	16	18	18	18	105	121	105	102	104	102	104	105	105	105	105	25
32	140	100	18	4	M16	42.4	43.5	47	18	18	18	18	105	121	105	102	104	102	104	105	105	105	105	32
40	150	110	18	4	M16	48.3	49.5	53	18	18	18	18	105	121	105	102	104	102	104	105	105	105	105	40
50	165	125	18	4	M16	60.3	61.5	65	20	20	20	20	105	121	105	102	104	102	104	105	105	105	105	50
65	185	145	18	8	M16	76.1	77.5	81	22	22	22	22	105	121	105	102	104	102	104	105	105	105	105	65
80	200	160	18	8	M16	88.9	90.5	94	24	24	24	24	105	121	105	102	104	102	104	105	105	105	105	80
100	235	190	22	8	M20	114.3	116.0	120	26	26	26	26	105	121	105	102	104	102	104	105	105	105	105	100
125	270	220	26	8	M24	139.7	141.5	145	28	28	28	28	105	121	105	102	104	102	104	105	105	105	105	125
150	300	250	26	8	M24	168.3	170.5	174	30	30	30	30	105	121	105	102	104	102	104	105	105	105	105	150
200	375	320	30	12	M27	219.1	221.5	226	36	36	36	36	105	121	105	102	104	102	104	105	105	105	105	200
250	450	385	33	12	M30	273.0	276.5	281	42	42	42	42	105	121	105	102	104	102	104	105	105	105	105	250
300	515	450	33	16	M30	323.9	327.5	333	48	48	48	48	105	121	105	102	104	102	104	105	105	105	105	300
350	580	510	36	16	M33	355.6	359.5	365	54	54	54	54	105	121	105	102	104	102	104	105	105	105	105	350
400	660	585	39	16	M36	406.4	411.0	416	60	60	60	60	105	121	105	102	104	102	104	105	105	105	105	400
450	685	610	39	20	M36	457.0	462.0	467	66	66	66	66	105	121	105	102	104	102	104	105	105	105	105	450
500	755	670	42	20	M39	508.0	513.5	519	72	72	72	72	105	121	105	102	104	102	104	105	105	105	105	500
600	890	795	48	20	M45	610.0	616.5	622	84	84	84	84	105	121	105	102	104	102	104	105	105	105	105	600

NOTE 1. For facing dimensions see table 7.

NOTE 2. See notes following this table.



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Notes to tables 8 to 13

NOTE 1. For tolerances see clause 11 and table 14.

NOTE 2. For facings see clause 9, figures 3 and 4.

NOTE 3. For spot facing or back facing see clause 10.

NOTE 4. For threads in threaded flanges see 8.3.

NOTE 5. Neck diameter N_1 , N_2 and N_3 is the theoretical maximum which will permit the use of ring spanners or the fitting if required of the normal series of washers to BS 4320* without some form of additional machining such as spot facing (see clause 11).

NOTE 6. The bore diameter B_1 , B_2 and B_3 in sizes above DN 600 should be specified by the purchaser.

NOTE 7. The minimum neck thickness (dimension S) has been selected from the pipe thickness given in BS 3600 in accordance with one of the preferred series from ISO 4200 : 1980 as follows:

(a) PN 2.5 and 6 Series D;

(b) PN 10 and 16 Series E;

(c) PN 25 and 40 Series F.

NOTE 8. The neck thickness S for weld-neck (code 11) flanges should be specified by the purchaser if different from the dimension listed in the tables (see appendix A).

NOTE 9. The outside diameter of the neck is approximately equal to the outside diameter of the pipe complying with BS 3600.

NOTE 10. The external diameter and thickness of the pipe to be joined to the flange should be specified by the purchaser where these dimensions affect the bore of the flange (see appendix A).

NOTE 11. The bore sizes of code 121 flanges are usually equal to the nominal size of the pipe, valve or fitting to which they form a part and the actual bore sizes are usually given in the appropriate standard(s) for the component.

NOTE 12. In respect of threaded flanges the outside diameters of the following pipes are as given below:

Nominal size	Threaded to BS 21	Threaded to ANSI/ASME B1.20.1
DN 65	mm 76.1	mm 73.0
DN 125	139.1	141.3
DN 150	165.1	168.3

In respect of other types of flanges which are to be connected to pipes complying with American standards the outside diameters of the following pipes will be:

(a) DN 65 73.0 mm;

(b) DN 125 141.3 mm.

*The washer may theoretically overlap slightly the corner radius but in practice it is deemed that there is sufficient space to fit the washer satisfactorily.

Table 14. Tolerances			
Dimension	Flange code	Tolerance	Size
Outside diameter of neck <i>A</i>	111, 121, 134	mm +3.0 -0	≤ DN 125
		+4.5 -0	> DN 125 ≤ DN 1200
		+6.0 -0	> DN 1200
Bore diameter <i>B</i> ₁ , <i>B</i> ₂ , <i>B</i> ₃	101, 102, 104, 112, 132,	+0.5 -0	≤ DN 100
		+1.0 -0	> DN 100 ≤ DN 400
		+1.5 -0	> DN 400 ≤ DN 600
		+3.0 -0	> DN 600
Outside diameter <i>D</i>	121	±4.0	≤ DN 250
		±5.0	> DN 250 ≤ DN 500
		±6.0	> DN 500 ≤ DN 800
		±7.0	> DN 800 ≤ DN 1200
		±8.0	> DN 1200 ≤ DN 1600
		±10.0	> DN 1600 ≤ DN 2000
	All other codes	±12.0	> DN 2000
		±2.0	≤ DN 150
		±3.0	> DN 150 ≤ DN 500
		±5.0	> DN 500 ≤ DN 1200
		±7.0	> DN 1200 ≤ DN 1800
		±10.0	> DN 1800
Length through hub <i>H</i> ₁ , <i>H</i> ₂ , <i>H</i> ₃	111, 112, 113, 134	±1.5	≤ DN 80
		±2.0	> DN 80 ≤ DN 250
		±3.0	> DN 250
Neck diameter <i>N</i> ₁ , <i>N</i> ₂ , <i>N</i> ₃	111, 121, 134	+0 -2.0	≤ DN 50
		+0 -4.0	> DN 50 ≤ DN 150
		+0 -6.0	> DN 150 ≤ DN 300
		+0 -8.0	> DN 300 ≤ DN 600
		+0 -10.0	> DN 600 ≤ DN 1200
	112, 113	+1.0 -0	≤ DN 50
		+2.0 -0	> DN 50 ≤ DN 150
		+4.0 -0	> DN 150 ≤ DN 300
		+8.0 -0	> DN 300 ≤ DN 600
		+12.0 -0	> DN 600 ≤ DN 1200
		+16.0 -0	> DN 1200 ≤ DN 1800
		+20.0 -0	> DN 1800

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Table 14 (concluded)			
Dimensions	Flange code	Tolerance	Size
Flange thickness C_1 , C_2 , C_3 , C_4	All codes (machined on both faces)	mm	
		± 1.0	≤ 18 mm thickness
		± 1.5	> 18 mm ≤ 50 mm thickness
	All codes (machined on front face only)	± 2.0	> 50 mm thickness
		$+2.0$ -1.3	≤ 18 mm thickness
		$+4.0$ -1.5	> 18 mm ≤ 50 mm thickness
		$+7.0$ -2.0	> 50 mm thickness
Facing diameter d_1	All codes	$+2.0$ -1.0	\leq DN 250
		$+3.0$ -1.0	$>$ DN 250
Facing height f_1	All codes (facing type B)	$+0$ -1.0	2 mm
		$+0$ -2.0	3 mm
		$+0$ -3.0	4 mm
		$+0$ -4.0	5 mm
		$+0$ -5.0	6 mm
Facing height f_2	All codes (facing types C and E)	$+0.5$ -0	All sizes
	(facing type G)	$+0$ -0.5	
	(facing type H)	$+0.2$ -0	
Facing height f_3	All codes (facing types D and F)	$+0$ -0.5	All sizes
Facing height f_4	All codes (facing type H)	$+0.5$ -0	All sizes
Facing	All codes	$+0.5$ -0	All sizes
		$+0$ -0.5	
		$+0.5$ -0	
		$+0$ -0.5	
Diameter of bolt circle K	All codes	± 0.9	Bolt sizes M10 to M24
		± 1.4	Bolt sizes M27 to M45
Centre-to-centre of adjacent bolt holes	All codes	± 0.45	Bolt sizes M10 to M24
		± 0.7	Bolt sizes M27 to M45
Eccentricity of machined facing diameters	All codes	1.0	\leq DN 100
		2.0	$>$ DN 100
Parallelism between bolting bearing surfaces and flange jointing faces	All codes (machined surfaces)	1°	All sizes
	All codes (unmachined surfaces)	2°	

Table 15. Pressure/temperature ratings and bolting materials for group A ferritic steel flanges															
(a) Pressure/temperature ratings															
PN	Material group	Temperature													
		Up to 120 °C	150 °C	200 °C	250 °C	300 °C	350 °C	400 °C	425 °C	450 °C	475 °C	500 °C	510 °C	520 °C	530 °C
		Maximum non-shock working gauge pressure													
		bar*	bar	bar	bar	bar	bar	bar	bar	bar	bar	bar	bar	bar	
2.5	A1	2.5	2.3	2.0	1.8	1.5	—	—	—	—	—	—	—	—	
	A2	2.5	2.3	2.0	1.8	1.5	1.3	0.9	—	—	—	—	—	—	
	A3	2.5	2.5	2.5	2.0	1.8	1.4	1.2	—	—	—	—	—	—	
6	A1	6.0	5.4	4.8	4.2	3.6	—	—	—	—	—	—	—	—	
	A2	6.0	5.4	4.8	4.2	3.6	3.0	2.1	—	—	—	—	—	—	
	A3	6.0	5.9	5.7	5.4	4.8	4.2	3.3	2.7	—	—	—	—	—	
10	A1	10.0	9.0	8.0	7.0	6.0	—	—	—	—	—	—	—	—	
	A2	10.0	9.0	8.0	7.0	6.0	5.0	3.5	—	—	—	—	—	—	
	A3	10.0	9.8	9.5	9.0	8.0	7.0	5.5	4.5	—	—	—	—	—	
	A4	10.0	10.0	10.0	10.0	8.7	7.8	7.4	7.2	7.0	—	—	—	—	
16	A1	16.0	14.4	12.8	11.2	9.6	—	—	—	—	—	—	—	—	
	A2	16.0	14.4	12.8	11.2	9.6	8.0	5.6	—	—	—	—	—	—	
	A3	16.0	15.7	15.2	14.4	12.8	11.2	8.8	7.2	—	—	—	—	—	
	A4	16.0	16.0	16.0	16.0	13.9	12.5	11.8	11.5	11.2	—	—	—	—	
	A5	16.0	16.0	16.0	16.0	16.0	15.2	14.6	14.2	13.9	13.1	11.8	9.9	7.8	6.1
25	A1	25.0	22.5	20.0	17.5	15.0	—	—	—	—	—	—	—	—	
	A2	25.0	22.5	20.0	17.5	15.0	12.5	8.8	—	—	—	—	—	—	
	A3	25.0	24.5	23.8	22.5	20.0	17.5	13.8	11.3	—	—	—	—	—	
	A4	25.0	25.0	25.0	25.0	21.8	19.5	18.5	18.0	17.5	—	—	—	—	
	A5	25.0	25.0	25.0	25.0	25.0	23.8	22.8	22.3	21.8	20.5	18.5	15.5	12.3	9.5
	A6	25.0	25.0	25.0	25.0	25.0	25.0	22.8	22.3	21.8	20.0	13.8	12.5	11.0	9.5
40	A1	40.0	36.0	32.0	28.0	24.0	—	—	—	—	—	—	—	—	
	A2	40.0	36.0	32.0	28.0	24.0	20.0	14.0	—	—	—	—	—	—	
	A3	40.0	39.0	38.0	36.0	32.0	28.0	22.0	18.0	—	—	—	—	—	
	A4	40.0	40.0	40.0	40.0	34.8	31.2	29.6	28.8	28.0	—	—	—	—	
	A5	40.0	40.0	40.0	40.0	40.0	38.0	36.4	35.6	34.8	32.8	29.6	24.8	19.6	15.2
	A6	40.0	40.0	40.0	40.0	40.0	40.0	36.4	35.6	34.8	32.0	22.0	20.0	17.6	15.2

*1 bar = 10^5 N/m² = 10^5 Pa.

(b) Materials for bolting			
British Standard	Grade/product	For use with flange material groups	Limiting temperature °C
BS 4190	4.6 bolts 4 nuts	A1, A2 and A3	For use at temperatures not exceeding 300 °C
BS 3692	4.6 bolts 4 nuts		
BS 3692	8.8 bolts 8 nuts	A3, A4, A5 and A6	
BS 4882	B7M, B7AM, B16M Stud bolts	A3, A4, A5 and A6	For use at temperatures up to 530 °C
	2HM, 4M nuts		

NOTE. For bolting also see clause 6.

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Table 16. Pressure/temperature ratings for group B austenitic steel flanges on a basis of 0.2 % proof stress											
PN	Material group	Temperature									
		Up to 50 °C	100 °C	150 °C	200 °C	250 °C	300 °C	350 °C	400 °C	450 °C	500 °C
Maximum non-shock working gauge pressure											
2.5	B1	2.2	1.8	1.6	1.5	1.4	1.3	1.2	1.1	1.1	1.0
	B2	2.3	1.9	1.8	1.6	1.5	1.4	1.3	1.2	1.2	1.2
	B3	2.4	2.2	2.1	1.9	1.8	1.7	1.6	1.6	1.5	1.5
	B4	2.4	2.1	1.9	1.7	1.6	1.5	1.4	1.4	1.3	1.3
	B5	2.5	2.2	2.0	1.8	1.7	1.6	1.5	1.4	1.4	1.4
6	B1	5.1	4.2	3.8	3.5	3.2	2.9	2.8	2.6	2.5	2.4
	B2	5.4	4.5	4.1	3.7	3.5	3.2	3.0	2.9	2.8	2.7
	B3	5.7	5.2	4.8	4.5	4.2	4.0	3.8	3.7	3.5	3.5
	B4	5.7	4.8	4.4	4.0	3.7	3.5	3.3	3.2	3.0	2.9
	B5	6.0	5.1	4.6	4.2	4.0	3.7	3.5	3.4	3.3	3.2
10	B1	8.5	7.1	6.3	5.8	5.3	4.9	4.6	4.3	4.2	4.0
	B2	9.0	7.6	6.8	6.2	5.8	5.4	5.1	4.8	4.6	4.5
	B3	9.5	8.6	8.1	7.6	7.1	6.6	6.3	6.1	5.9	5.8
	B4	9.5	8.1	7.3	6.7	6.2	5.8	5.5	5.3	5.0	4.9
	B5	10.0	8.5	7.7	7.1	6.6	6.2	5.9	5.6	5.5	5.4
16	B1	13.7	11.3	10.1	9.2	8.4	7.8	7.3	6.9	6.6	6.3
	B2	14.4	12.1	10.9	9.9	9.2	8.6	8.1	7.7	7.4	7.2
	B3	15.2	13.7	12.9	12.1	11.3	10.6	10.1	9.8	9.4	9.3
	B4	15.2	12.9	11.7	10.7	9.9	9.3	8.8	8.4	8.0	7.8
	B5	16.0	13.7	12.3	11.3	10.5	9.9	9.4	9.0	8.7	8.6
25	B1	21.4	17.7	15.9	14.4	13.2	12.2	11.5	10.9	10.4	9.9
	B2	22.6	18.9	17.1	15.5	14.4	13.4	12.7	12.0	11.6	11.2
	B3	23.8	21.5	20.1	18.9	17.7	16.6	15.9	15.3	14.8	14.5
	B4	23.8	20.1	18.3	16.7	15.5	14.5	13.8	13.2	12.6	12.2
	B5	25.0	21.4	19.3	17.7	16.5	15.5	14.6	14.0	13.7	13.4
40	B1	34.2	28.3	25.4	23.0	21.1	19.5	18.4	17.4	16.6	15.8
	B2	36.1	30.2	27.3	24.8	23.0	21.5	20.3	19.1	18.5	18.0
	B3	38.0	34.4	32.2	30.2	28.3	26.5	25.4	24.4	23.6	23.2
	B4	38.0	32.2	29.3	26.7	24.8	23.2	22.0	21.1	20.1	19.5
	B5	40.0	34.2	30.8	28.3	26.4	24.8	23.4	22.4	21.8	21.5

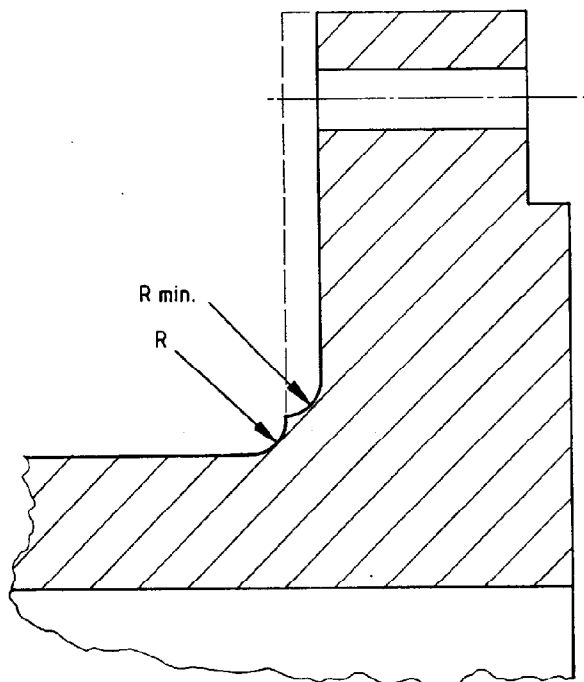
NOTE. The selection of bolting materials for use with austenitic steel flanges is the responsibility of the user and reference should be made to BS 4882.

Table 17. Pressure/temperature ratings for group C nickel steel flanges		
PN	Material group	Temperature
		Up to 120 °C
		Maximum non-shock working gauge pressure
2.5	C1	bar
	C2	2.5
6	C1	2.5
	C2	6.0
10	C1	6.0
	C2	10.0
16	C1	10.0
	C2	16.0
25	C1	16.0
	C2	25.0
40	C1	25.0
	C2	40.0

NOTE. The selection of bolting materials for use with nickel steel flanges is the responsibility of the user and reference should be made to BS 4882.

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Table 18. Minimum hub radius after back facing	
Flange size	R_{min}
	mm
Up to and including DN 50	2
Over DN 50 and up to and including DN 200	3
Over DN 200	5



NOTE. For dimensions of R see tables 8 to 13.

Figure 11. Minimum hub radius after back facing

Appendices

Appendix A. Information to be supplied by purchaser

The following information should be supplied by the purchaser in his enquiry and/or order.

- (a) Number and Section of this British Standard, i.e. BS 4504 : Section 3.1.
- (b) Nominal size: DN followed by the appropriate number (see clause 3).
- (c) Nominal pressure: PN followed by the appropriate number (see clause 4).
- (d) Flange type by code number or description (see clause 1)*.
- (e) Facing type letter (see figure 3).
- (f) Material and if any heat treatment is required (see 5.2.1).
- (g) Whether bolting, made using free cutting steel, can be supplied (see 6.1).
- (h) Weld end preparation required (see note 3 to 8.1).
- (j) Internal thread designation if other than BS 21 parallel thread form (see 8.3.1).
- (k) External diameter and thickness of pipe (see notes to tables of flange dimensions).
- (l) Material certificate, if required (see 5.1).
- (m) Details of special coatings, if required (see 9.3.1).
- (n) Dimension *S* where appropriate (see tables 8 to 13).
- (p) Bore diameter *B* when appropriate (i.e. above DN 600) (see notes to tables of flange dimensions following table 13).
- (q) The bore for weld-neck (code 111) and hubbed slip-on (code 112) flanges, if different from those specified in this standard (see notes to tables of flange dimensions).

Appendix B. Application and installation

NOTE. The information in this appendix is advisory only and it is not intended to be exhaustive.

B.1 In applying the ratings to flanged joints the effects of the following should be considered.

- (a) The risk of leakage due to forces and moments developed in the connecting pipework.
- (b) At temperatures in the creep range gradual relaxation of flanged joints due to creep in the bolts may progressively reduce bolt loads.
- (c) At low temperatures some of the materials listed in the rating tables undergo a sufficient decrease in impact resistance such that they cannot safely sustain sudden changes of stress or temperature.
- (d) Due to the nature of any thread sealant used additional limitations may be placed on the range of application of a threaded flange.

B.2 When the type B raised face is removed from a steel flange which is to be bolted to a flat face cast iron or copper alloy flange in order to provide full face gasketing if such is required this will reduce the pressure/temperature rating to that of the mating cast iron or copper alloy flange.

B.3 The pressure/temperature ratings specified may also be applied to installations subject to moderate shock such as may occur in well designed and efficiently operated boiler feed mains. When a system may be subject to severe shock the purchaser should make a suitable allowance when stating the design pressure.

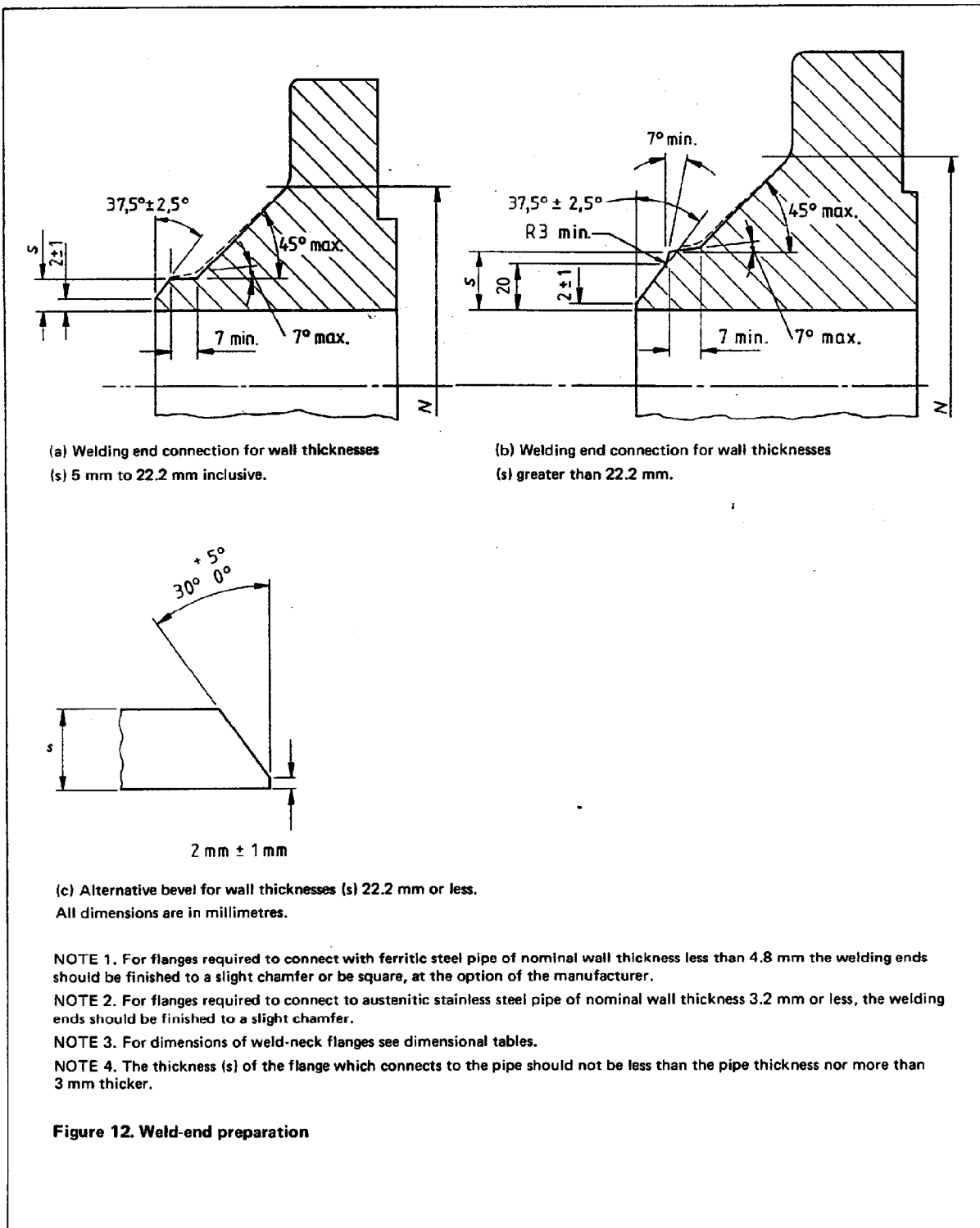
B.4 Where there is an appropriate application standard, the purchaser should ensure that the materials comply with the requirements of that standard. Attention is drawn to BS 759 and BS 806.

B.5 Flanges may be required to be tested after attachment of a pipe or other equipment or when forming an integral part of such equipment. The test pressure is then dependent on the requirements of the appropriate standard or code of practice in accordance with which the equipment has been fabricated or manufactured. Any test pressure should not exceed 1.5 times the maximum permissible working pressure at 20 °C rounded off to the next higher 1 bar increment.

*Reference should be given to ancillary component for flanges where appropriate.

Appendix C. Weld-end preparations

Typical weld-end preparations are given in figure 12.



Appendix D. Comparison of steel flange descriptions and code numbers specified in BS 4504 : Section 3.1 : 1989 and BS 4504 : Part 1 : 1969

Table 19. Steel flange descriptions and code numbers specified in BS 4504 : Section 3.1 : 1989 and BS 4504 : Part 1 : 1969		
Description of flange type	Code number in BS 4504 : Part 3 : Section 3.1 : 1989	Type number superseded in BS 4504 : Part 1 : 1969
Plate flange for welding	101	3
Loose plate flange with weld-on plate collar	102 and 132	—
Loose plate flange with weld-on plate collar for lapped pipe end	102 and 133	6
Loose plate flange with weld-neck collar	104 and 134	—
Blank flange	105	8
Weld-neck flange	111	2
Hubbed slip-on flange for welding	112	5
Hubbed threaded flange	113	4
Integral	121	1

Publications referred to

- BS 21 Specification for pipe threads for tubes and fittings where pressure-tight joints are made on the threads (metric dimensions)
- BS 759 Valves, gauges and other safety fittings for application to boilers and to piping installations for and in connection with boilers
- BS 806 Specification for design and construction of ferrous piping installations for and in connection with land boilers
- BS 970 Specification for wrought steels for mechanical and allied engineering purposes
Part 1 General inspection and testing procedures and specific requirements for carbon, carbon manganese, alloy and stainless steels
- BS 1134 Method for the assessment of surface texture
- BS 1501 Steels for fired and unfired pressure vessels: plates
Part 1 Specification for carbon and carbon manganese steels
Part 2 Specification for alloy steels
Part 3 Corrosion and heat resisting steels. Imperial units
- BS 1503 Specification for steel forgings (including semi-finished forged products) for pressure purposes
- BS 1504 Specification for steel castings for pressure purposes
- BS 1560* Circular flanges for pipes, valves and fittings (Class designated)
Part 3 Steel, cast iron and copper alloy flanges
Section 3.1 Specification for steel flanges
- BS 2633 Specification for Class 1 arc welding of ferritic steel pipework for carrying fluids
- BS 3600 Specification for dimensions and masses per unit length of welded and seamless steel pipes and tubes for pressure purposes
- BS 3692 Specification for ISO metric precision hexagon bolts, screws and nuts. Metric units
- BS 3920 Derivation and verification of elevated temperature properties for steel products for pressure purposes
- BS 4190 Specification for ISO metric black hexagon bolts, screws and nuts
- BS 4320 Specification for metal washers for general engineering purposes. Metric series
- BS 4360 Specification for weldable structural steels
- BS 4439 Specification for screwed studs for general purposes. Metric series
- BS 4570 Specification for fusion welding of steel castings
- BS 4865 Dimensions of gaskets for flanges to BS 4504
Part 1 Specification for non-metallic flat gaskets
Part 2 Specification for metallic spiral-wound gaskets for use with steel flanges
Part 3 Specification for non-metallic envelope gaskets
Part 4 Specification for corrugated, flat or grooved metallic and filled metallic gaskets for use with steel flanges
- BS 4882 Specification for bolting for flanges and pressure containing purposes
- BS 5135 Specification for process of arc welding of carbon and carbon manganese steels
- BS 5500 Specification for unfired fusion welded pressure vessels
- BS 5750* Quality systems
- BS 6920 Suitability of non-metallic products for use in contact with water intended for human consumption with regard to their effect on the quality of the water
Part 1 Specification
- ISO 4200 Plain end steel tubes, welded and seamless — General tables of dimensions and masses per unit length
- ISO 6708 Pipe components — Definition of nominal size
- ISO 7005 Metallic flanges
Part 3 Copper alloy and composite flanges
- ISO 7268 Pipe components — Definition of nominal pressure
- ANSI/ASME B1.20.1 Pipe threads, general purpose (inch)
- ASTM A105 Specification for forgings, carbon steel, for piping components
- ASTM A181 Specification for forgings, carbon steel, for general-purpose piping
- ASTM A182 Specification for forged or rolled alloy-steel pipe flanges, forged fittings, and valves and parts for high-temperature service
- ASTM A203 Specification for pressure vessel plates, alloy steel, nickel
- ASTM A204 Pressure vessel plates, alloy steel, molybdenum
- ASTM A216 Specification for carbon-steel castings suitable for fusion welding for high-temperature service
- ASTM A217 Specification for martensitic stainless steel and alloy steel castings for pressure-containing parts suitable for high-temperature service
- ASTM A240 Heat resisting chromium and chromium-nickel stainless steel plate, sheet, and strip pressure vessels
- ASTM A283 Specification for low and intermediate tensile strength carbon steel plates, shapes and bars
- ASTM A350 Specification for forgings, carbon and low alloy steel, requiring notch toughness testing for piping components
- ASTM A351 Specification for austenitic steel castings for high-temperature service
- ASTM A352 Specification for ferritic and martensitic steel castings for pressure-containing parts suitable for low-temperature service
- ASTM A363 Specification for pressure vessel plates, alloy steel 9 % nickel, double-normalized and tempered
- ASTM A387 Specification for pressure vessel plates, chromium-molybdenum alloy steel
- ASTM A515 Specification for pressure vessel plates, carbon steel, for intermediate and higher-temperature service
- ASTM A516 Specification for pressure vessel plates, carbon steel, for moderate and lower-temperature service
- ASTM A522 Specification for forged or rolled 8 % and 9 % nickel alloy steel flanges, fittings, valves and parts for low-temperature service
- ASTM A553 Pressure vessel plates, alloy steel, quenched and tempered 8 and 9 percent nickel
- DIN 17100 Steels for general structural purposes; quality standard
- DIN 17243 Weldable steels for elevated temperatures in the form of forgings or hot rolled or forged bars; Technical delivery conditions

*Referred to in the foreword only.

BS 4504 : Section 3.1 : 1989

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Amendment No. 1
published and effective from 28 September 1990
to BS 4504 : Section 3.1 : 1989

Valves and fittings (PN designated)
Part 3. Steel, cast iron and copper alloy flanges
Section 3.1 Specification for steel flanges

Revised text

AMD 6610
September 1990

Clause 5.2.1 General

Delete '(a) For materials to ASTM 105' and substitute '(a) For materials to ASTM A105'.

Delete '(b) For materials to ASTM 182' and substitute '(b) For materials to ASTM A182'.

AMD 6610
September 1990

Table 3. Materials: ferritic steels (group A)*

In row 2 'Low grade carbon steel' of column 3 'Plates, Other Standards†', beneath 'ASTM A283 Grade C' insert 'DIN 17100 + R.St 37.2'

In row 5 'Carbon molybdenum steel' of column 2 'Plates, British Standard' delete 'BS 1501 : Part 1-240 §' and substitute 'BS 1501 : Part 1-243 §'.

In row 7 of column 1, 'Materials' delete '1½ % chromium ½ % molybdenum steel' and substitute '1¼ % chromium ½ % molybdenum steel'.

In row 8 of column 1, 'Materials' delete '2½ % chromium 1 % molybdenum steel' and substitute '2¼ % chromium 1 % molybdenum steel'.

Delete all of footnote § and substitute '§BS 1501-243 material is not suitable for use above 400 °C.'

AMD 6610
September 1990

Table 4. Materials: austenitic steels (group B)*

In row 5 'Austenitic chromium-nickel-molybdenum (low carbon) steel' of column 2 'Plates, British Standard' delete 'BS 1501 : Part 3-312S12' and 'BS 1501 : Part 3-312S49' and substitute 'BS 1501 : Part 3-321S12' and 'BS 1501 : Part 3-321S49' respectively.

AMD 6610
September 1990

Table 7. Dimensions of flange faces

Delete the entire table and substitute the new table 7 attached.

AMD 6610
September 1990

Table 8. Dimensions of PN 2.5 flanges

Against nominal size DN 700, in column C₂ delete '26' and substitute '24'.

AMD 6610
September 1990

Table 9. Dimensions of PN 6 flanges

Against the nominal sizes shown below delete the dimensions in the column headed C_4 and substitute the following:

DN	C_4
350	22
400	22
450	24
500	24
600	34
700	38
800	42
900	46

AMD 6610
September 1990

Table 13. Dimensions of PN 40 flanges

Against nominal size DN 200, in the column headed C_4 delete '36' and substitute '34'.



Amendment No. 2
published and effective from 31 January 1991
to BS 4504 : Section 3.1 : 1989

Circular flanges for pipes, valves
and fittings (PN designated)
Part 3. Steel, cast iron and copper alloy flanges
Section 3.1 Specification for steel flanges

NOTE. Amendment No. 1 to BS 4504 : Section 3.1 : 1989 included an incorrect instruction when amending table 4. To avoid any confusion, this amendment reproduces table 4 in full.

Correction

AMD 6334
January 1991

Table 4. Materials: austenitic steels (group B) (as amended by Amendment No. 1)

Delete the existing table and substitute the new table 4 attached.

Table 4. Materials: austenitic steels (group B)*										
Materials	Plates			Forgings			Castings			Group No.†
	British Standard	Comparable ASTM standard†	British Standard	Comparable ASTM standard†	British Standard	Comparable ASTM standard†	British Standard	Comparable ASTM standard†		
Austenitic chromium-nickel (low carbon) steel	BS 1501: Part 3 - 304S12	ASTM A240 - 304L	BS 1503 - 304S11	ASTM A182 Grade F304L	BS 1504 - 304C12	ASTM A351 Grade CF3			B1	
Austenitic chromium-nickel steel	BS 1501: Part 3 - 304S15	ASTM A240 - 304 ASTM A240 - 304H	BS 1503 - 304S31 BS 1503 - 304S51	ASTM A182 Grade F304 ASTM A182 Grade F304H	BS 1504 - 304C15	ASTM A351 Grade CF8			B2	
Austenitic chromium-nickel (nitrogen stabilised) steel	BS 1501: Part 3 - 347S17 BS 1501: Part 3 - 347S49	ASTM A240 - 347 ASTM A240 - 347H	BS 1503 - 347S31 BS 1503 - 347S51	ASTM A182 Grade F347 ASTM A182 Grade F347H	BS 1504 - 347C17	ASTM A351 Grade CF8C			B3	
Austenitic chromium-nickel (titanium stabilised) steel	BS 1501: Part 3 - 321S12 BS 1501: Part 3 - 321S49	ASTM A240 - 321 ASTM A240 - 321H	BS 1503 - 321S31 BS 1503 - 321S51	ASTM A182 Grade F321 ASTM A182 Grade F321H	—	—			B3	
Austenitic chromium-nickel-molybdenum (low carbon) steel	BS 1501: Part 3 - 316S12	ASTM A240 - 316L	BS 1503 - 316S11	ASTM A182 Grade F316L	BS 1504 - 316C12	ASTM A351 Grade CF3M			B4	
Austenitic chromium-nickel-molybdenum steel	BS 1501: Part 3 - 316S16	ASTM A240 - 316 ASTM A240 - 316H	BS 1503 - 316S31 BS 1503 - 316S51	ASTM A182 Grade F316 ASTM A182 Grade F316H	BS 1504 - 316C16	ASTM A351 Grade CF8M			B5	
Austenitic 25 % chromium - 20 % nickel steel	BS 1501: Part 3 - 310S24	ASTM A240 - 310S	BS 1503 - 310S31	ASTM A182 Grade F310	BS 1504 - 310C40	ASTM A351 Grade HK40 ASTM A351 Grade CK20			B5	

*Group numbers relate to the pressure/temperature ratings given in table 16.

†Refer to BS 1560: Section 3.1 or ASTM specifications for limitations or recommendations in respect to ASTM materials.

NOTE. Where materials are used below 0 °C refer to the application code.



AMD 7555

Amendment No. 3

published and effective from 15 June 1993
to BS 4504 : Section 3.1 : 1989

Circular flanges for pipes, valves and fittings
(PN designated)

Part 3. Steel, cast iron and copper alloy flanges
Section 3.1 Specification for steel flanges

Revised text

AMD 7555
June 1993

Table 7. Dimensions of flange faces (as amended by Amendment No. 1)

Delete the existing table and substitute the new table 7 attached.

AMD 7555
June 1993

Figure 5. Dimensions of PN 2.5 flanges

Delete the existing figure and substitute the new figure 5 attached.

AMD 7555
June 1993

Figure 6. Dimensions of PN 6 flanges

Delete the existing figure and substitute the new figure 6 attached.

AMD 7555
June 1993

Table 9. Dimensions of PN 6 flanges (as amended by Amendment No. 1)

In the column of flange thicknesses C_2 and C_3 for code 111, 112, 113 and 121 flanges, delete '22' and substitute '24' in the row for DN 450.

AMD 7555
June 1993

Figure 7. Dimensions of PN 10 flanges

Delete the existing figure and substitute the new figure 7 attached.

AMD 7555
June 1993

Figure 8. Dimensions of PN 16 flanges

Delete the existing figure and substitute the new figure 8 attached.

AMD 7555
June 1993

Table 11. Dimensions of PN 16 flanges

In the column of flange thickness C_4 for code 105 flanges, delete '36' and substitute '34' in the row for DN 450.

AMD 7555
June 1993

Figure 9. Dimensions of PN 25 flanges

Delete the existing figure and substitute the new figure 9 attached.

AMD 7555
June 1993

Table 12. Dimensions of PN 25 flanges

In the column of flange thickness C_4 for code 105 flanges, delete '44' and substitute '42' in the row for DN 450.

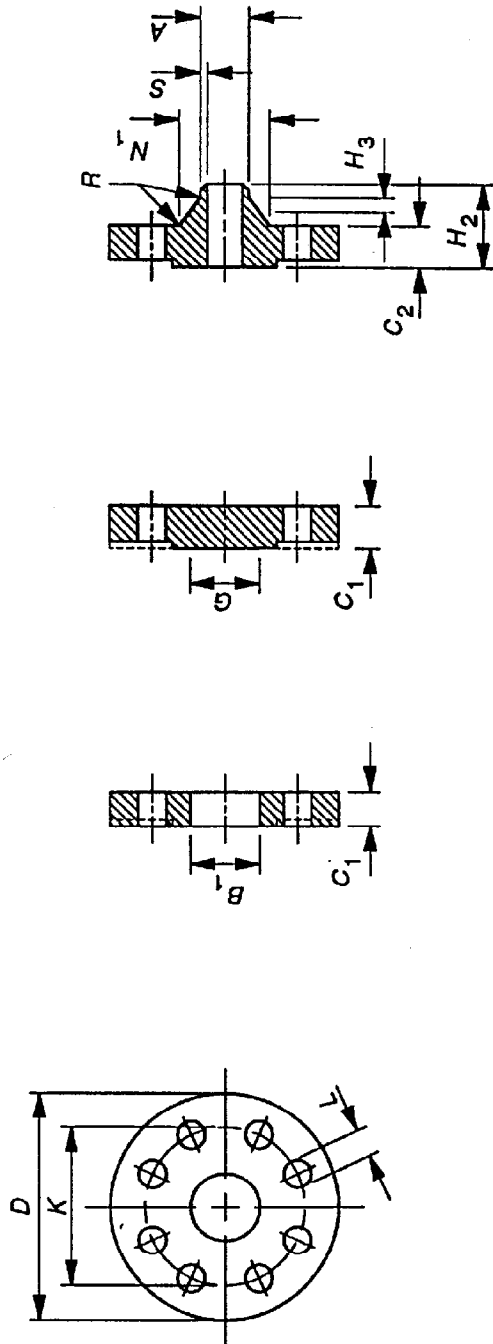
AMD 7555
June 1993

Figure 10. Dimensions of PN 40 flanges

Delete the existing figure and substitute the new figure 10 attached.

Table 7. Dimensions of flange faces

Nominal size DN	d_1					f_1	f_2	f_3	f_4	w	x	y	z	α	d_2	
	PN 2.5	PN 6	PN 10	PN 16	PN 25											PN 40
	mm	mm	mm	mm	mm											mm
10		35	158			2			24	34	35	23				
15		40	188						29	39	40	28				
20		50	212						36	50	51	35				
25		60	268						43	57	58	42				
32		70	320						51	65	66	50				
40		80	370						61	75	76	60	41° 16'	5		
50		90	430						73	87	88	72				
65		110	482						95	109	110	94				
80		128	550			3			106	120	121	105				
100		148	610	158	162				129	149	150	128				
125		178	685	188	188				155	175	176	154				
150		202	775	212	218				183	203	204	182				
200		258	900	268	278				239	259	260	238				
250		312	1005	320	335				292	312	313	291				
300		365	1110	378	395				343	363	364	342				
350		415	1280	438	450				395	421	422	394				
400		465	1480	490	505				447	473	474	446				
450		520	1690	550	555				497	523	524	496				
500		570	1890	610	615				549	575	576	548				
600		670	2090	685	720				649	675	676	648				
700		775	2295	800	820				751	777	778	750				
800		880	2495	905	930				856	882	883	855				
900		980	2695	1005	1030				961	987	988	960				
1000		1080	2910	1110	1140				1062	1092	1094	1060				
1200	1280	1295	1330	1330	1350				1262	1292	1294	1260				
1400	1480	1510	1535	1530	1560				1462	1492	1494	1460				
1600	1690	1710	1760	1750	1780				1662	1692	1694	1660				
1800	1890	1920	1960	1950	1985				1862	1892	1894	1860				
2000	2090	2125	2170	2150	2210				2062	2092	2094	2060				
2200	2295	2335	2370	—	—				—	—	—	—				
2400	2495	2545	2570	—	—				—	—	—	—				
2600	2695	2750	2780	—	—				—	—	—	—				
2800	2910	2960	3000	—	—				—	—	—	—				
3000	3110	3160	3210	—	—				—	—	—	—				
3200	3310	3370	—	—	—				—	—	—	—				
3400	3510	3580	—	—	—				—	—	—	—				
3600	3720	3790	—	—	—				—	—	—	—				
3800	3920	—	—	—	—				—	—	—	—				
4000	4120	—	—	—	—				—	—	—	—				



Code 101

Code 105

Code 111

This diagram illustrates the arrangement but not necessarily the correct number of bolt holes.

Refer to the column 'Bolting Number' in table 8 for actual number.

NOTE 1. Dimension N_1 is measured at the intersection of the projections of the hub draft angle and the back face of the flange.

NOTE 2. Diameter of shoulder G refers to an unmachined centre portion of the flange (see note 4 to 8.1).

Figure 5. Dimensions of PN 2.5 flanges (See table 8).

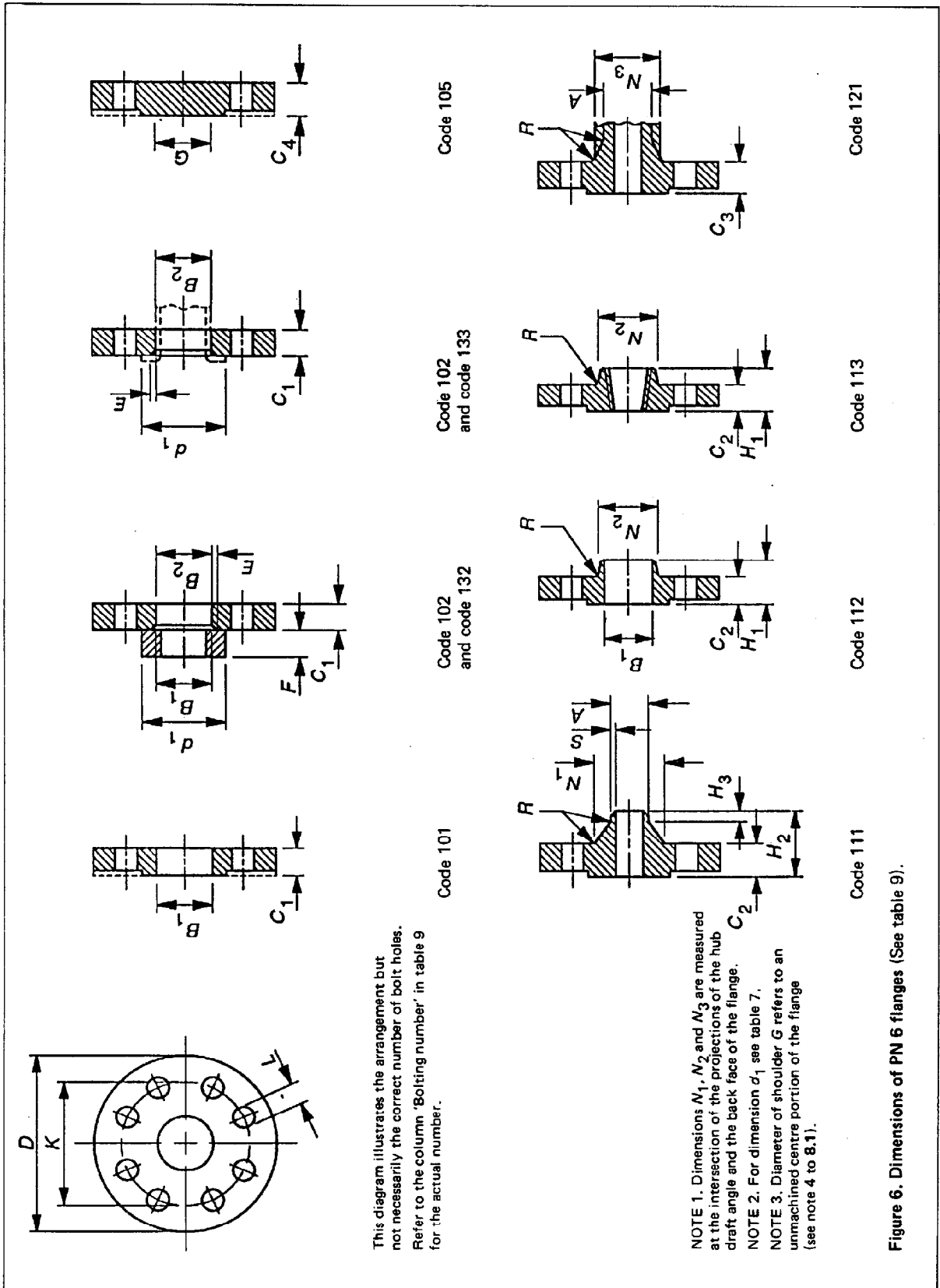


Figure 6. Dimensions of PN 6 flanges (See table 9).

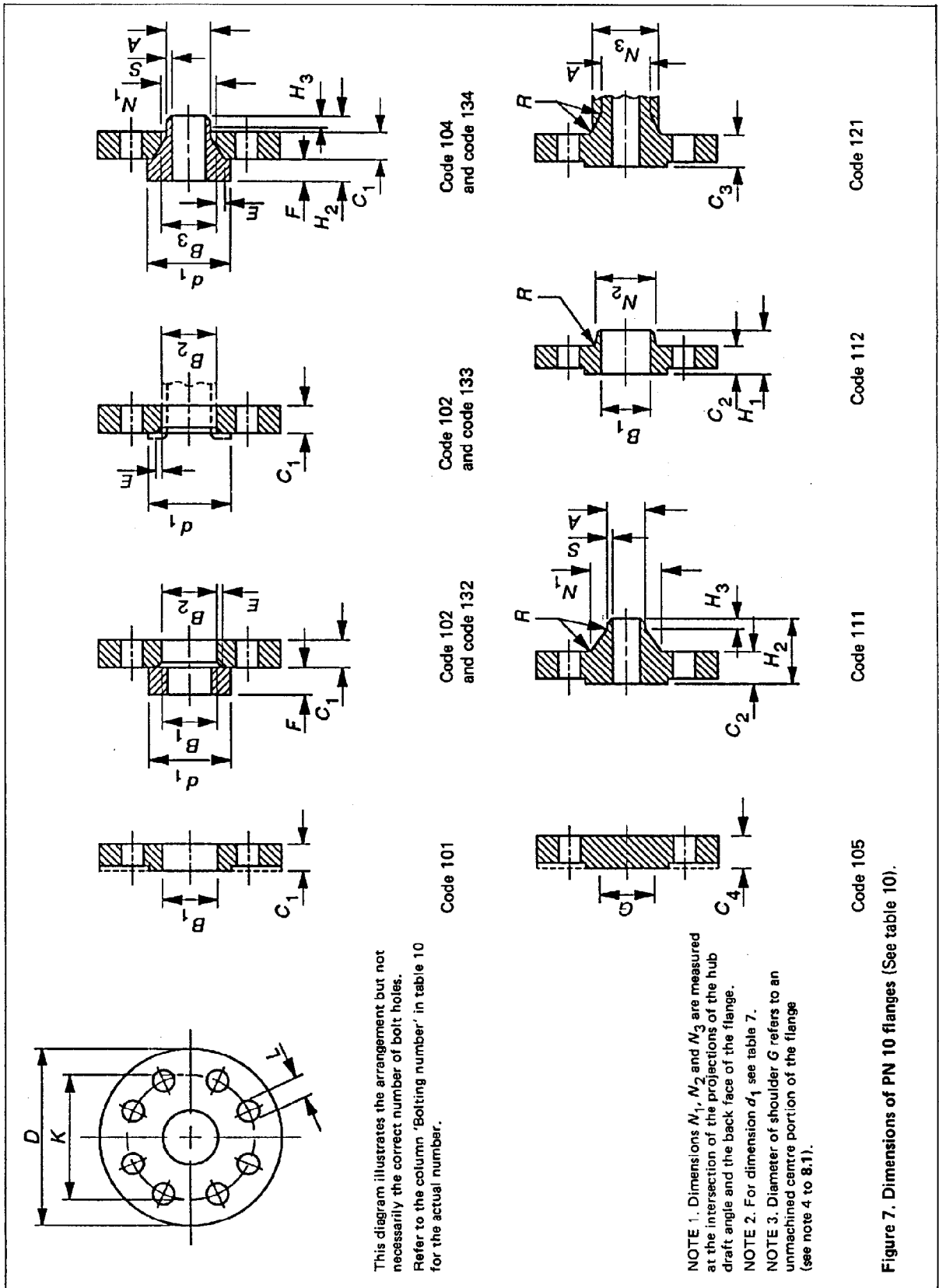


Figure 7. Dimensions of PN 10 flanges (See table 10).

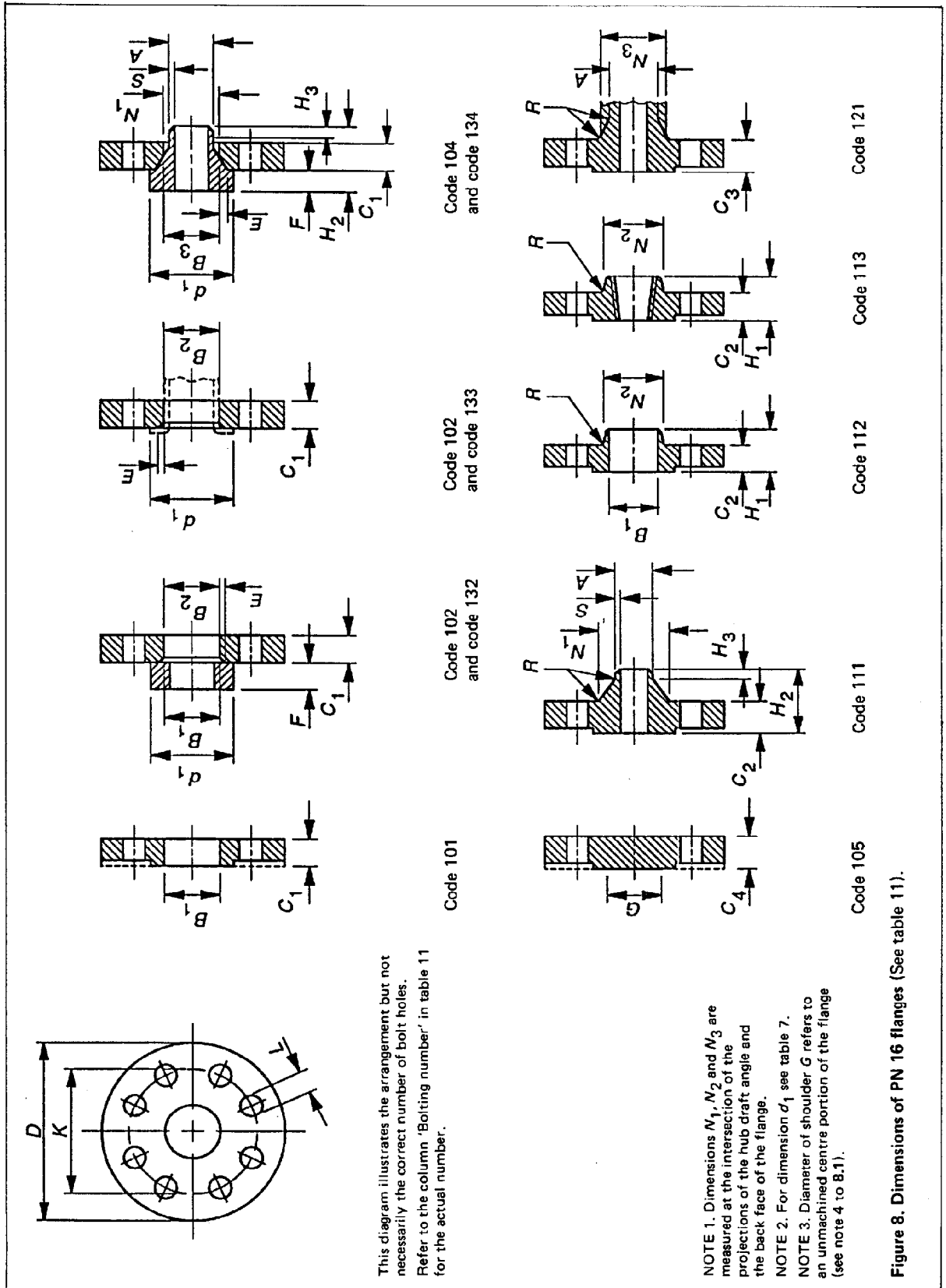


Figure 8. Dimensions of PN 16 flanges (See table 11).

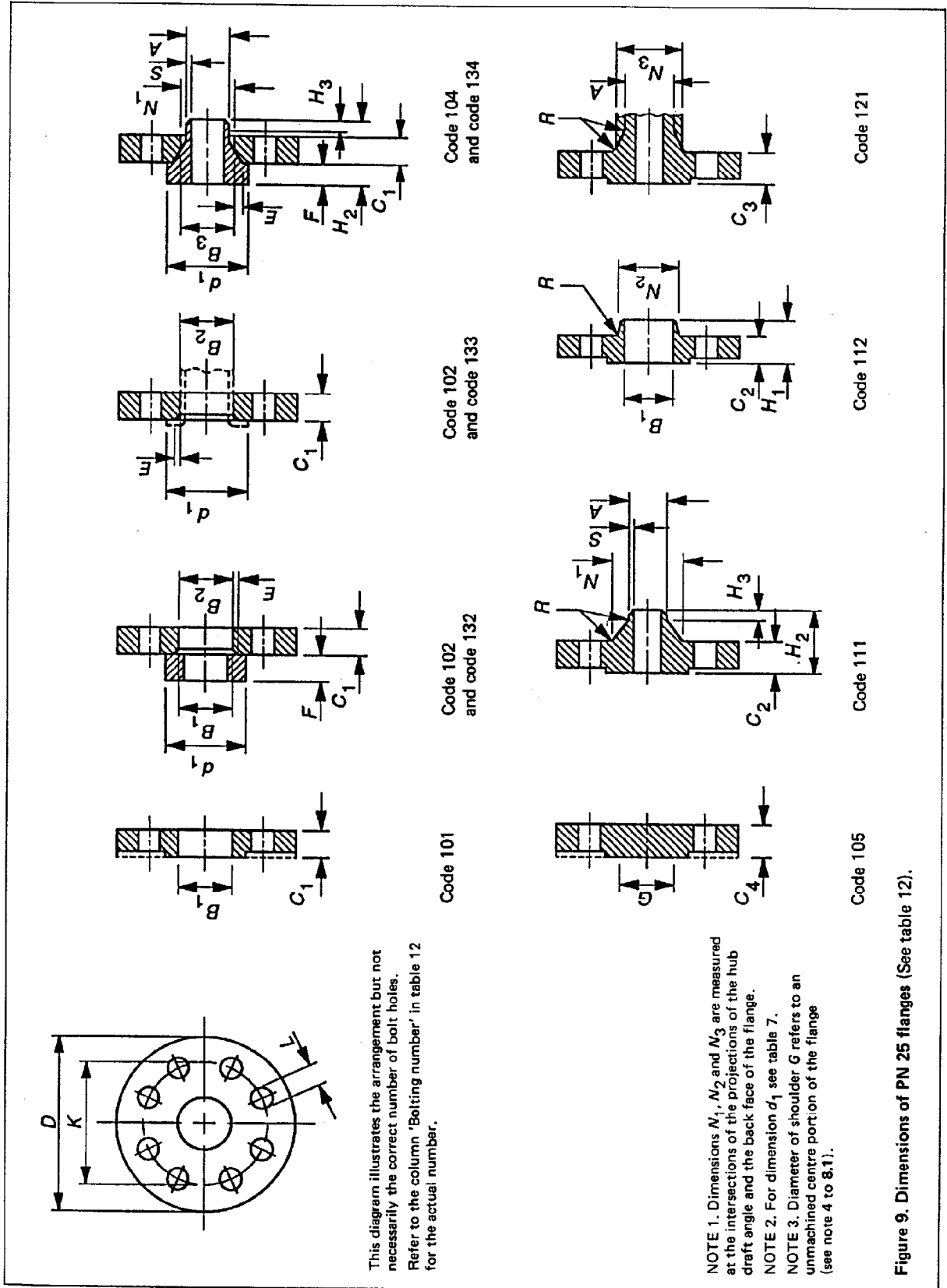


Figure 9. Dimensions of PN 25 flanges (See table 12).

