



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

## **Part 2. Cast iron flanges**

The European Standard EN 1092-2 : 1997 has the status of a  
British Standard

ICS 23.040.60

# Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee PSE/15, Flanges, upon which the following bodies were represented:

- British Compressed Gases Association
- 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
- GAMBICA (BEAMA Ltd.)
- Power Generation Contractors Association (PGCA (BEAMA Ltd.))

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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 It supersedes BS 4504 : Section 3.2 : 1989 which is withdrawn.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>

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

### 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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ICS 23.040.60

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

This European Standard was approved by CEN on 1996-12-29. CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

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**CEN**

European Committee for Standardization  
Comité Européen de Normalisation  
Europäisches Komitee für Normung

**Central Secretariat: rue de Stassart 36, B-1050 Brussels**

## 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.

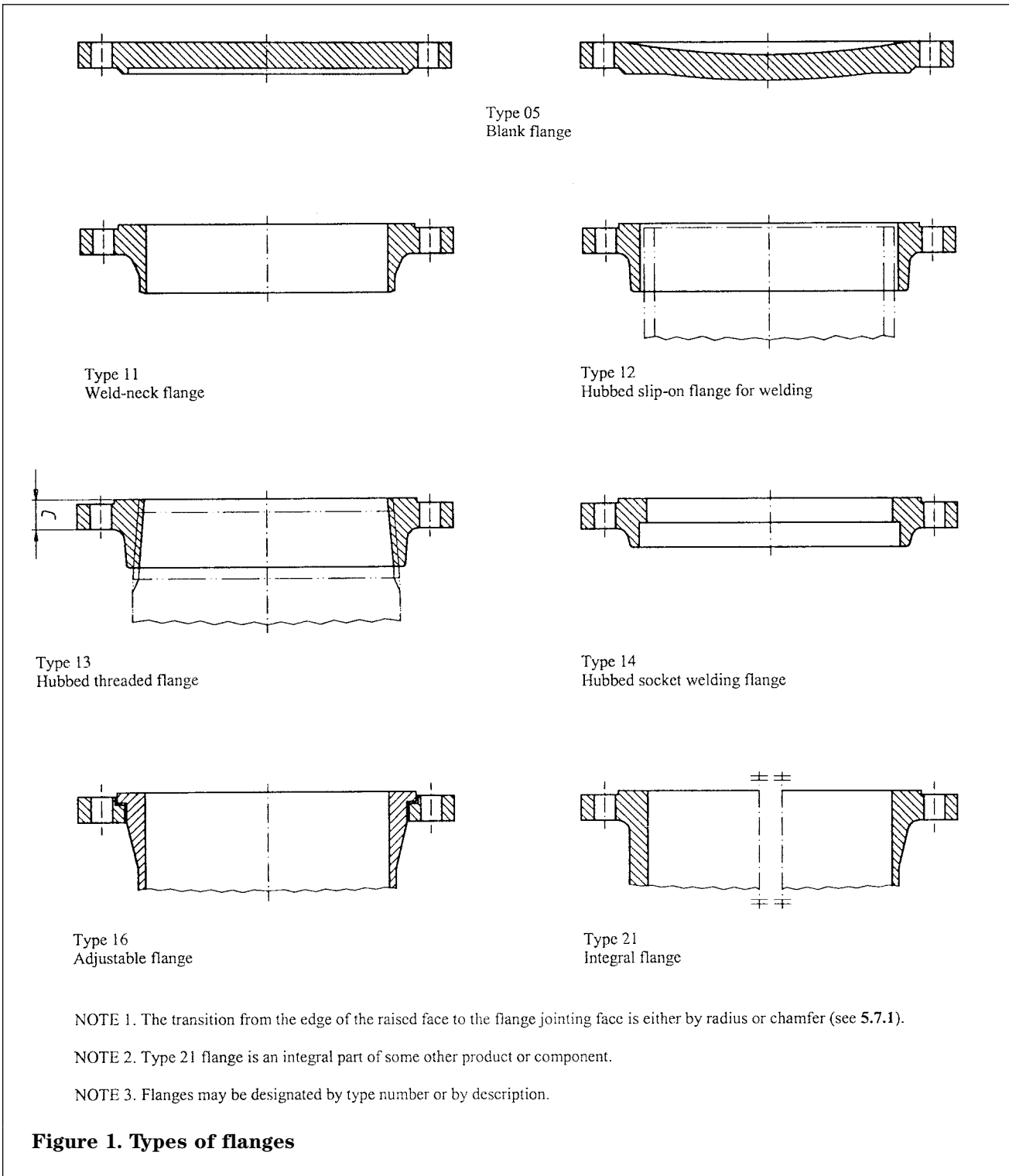
## 4 Designation and types

### 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.





**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

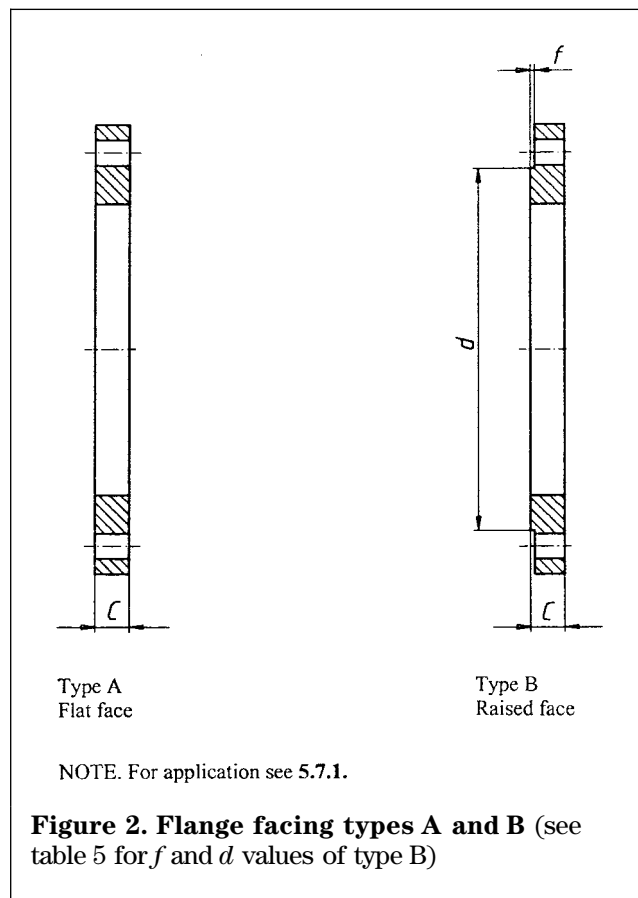
Figure 1 illustrates flanges identified according to type:

- 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/mm<sup>2</sup> 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 <sup>1)</sup>	3,2 to 12,5	12,5 to 50
Other machining processes <sup>2)</sup>	3,2 to 6,3	12,5 to 25
As cast <sup>3)</sup>	3,2 to 25	—

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

<sup>2)</sup> 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.

<sup>3)</sup> '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.



**Table 3. Synoptic table for grey iron flanges**

Type No	Table	DN		PN																																								
		PN	DN	2,5	6	10	16	25	40	50	60	65	80	100	125	150	175	200	250	300	350	400																						
05	6	2,5	6	10	16	25	40	50	60	65	80	100	125	150	175	200	250	300	350	400	450	500	600	700	800	900	1000	1100	1200	1400	1500	1600	1800	2000	2200	2400	2600	2800	3000	3200	3400	3600	3800	4000
	7	6	10	16	25	40	50	60	65	80	100	125	150	175	200	250	300	350	400	450	500	600	700	800	900	1000	1100	1200	1400	1500	1600	1800	2000	2200	2400	2600	2800	3000	3200	3400	3600	3800	4000	
	8	10	16	25	40	50	60	65	80	100	125	150	175	200	250	300	350	400	450	500	600	700	800	900	1000	1100	1200	1400	1500	1600	1800	2000	2200	2400	2600	2800	3000	3200	3400	3600	3800	4000		
	9	16	25	40	50	60	65	80	100	125	150	175	200	250	300	350	400	450	500	600	700	800	900	1000	1100	1200	1400	1500	1600	1800	2000	2200	2400	2600	2800	3000	3200	3400	3600	3800	4000			
	10	25	40	50	60	65	80	100	125	150	175	200	250	300	350	400	450	500	600	700	800	900	1000	1100	1200	1400	1500	1600	1800	2000	2200	2400	2600	2800	3000	3200	3400	3600	3800	4000				
	11	40	50	60	65	80	100	125	150	175	200	250	300	350	400	450	500	600	700	800	900	1000	1100	1200	1400	1500	1600	1800	2000	2200	2400	2600	2800	3000	3200	3400	3600	3800	4000					
13	6	2,5	6	10	16	25	40	50	60	65	80	100	125	150	175	200	250	300	350	400	450	500	600	700	800	900	1000	1100	1200	1400	1500	1600	1800	2000	2200	2400	2600	2800	3000	3200	3400	3600	3800	4000
	7	6	10	16	25	40	50	60	65	80	100	125	150	175	200	250	300	350	400	450	500	600	700	800	900	1000	1100	1200	1400	1500	1600	1800	2000	2200	2400	2600	2800	3000	3200	3400	3600	3800	4000	
	8	10	16	25	40	50	60	65	80	100	125	150	175	200	250	300	350	400	450	500	600	700	800	900	1000	1100	1200	1400	1500	1600	1800	2000	2200	2400	2600	2800	3000	3200	3400	3600	3800	4000		
	9	16	25	40	50	60	65	80	100	125	150	175	200	250	300	350	400	450	500	600	700	800	900	1000	1100	1200	1400	1500	1600	1800	2000	2200	2400	2600	2800	3000	3200	3400	3600	3800	4000			
	10	25	40	50	60	65	80	100	125	150	175	200	250	300	350	400	450	500	600	700	800	900	1000	1100	1200	1400	1500	1600	1800	2000	2200	2400	2600	2800	3000	3200	3400	3600	3800	4000				
	11	40	50	60	65	80	100	125	150	175	200	250	300	350	400	450	500	600	700	800	900	1000	1100	1200	1400	1500	1600	1800	2000	2200	2400	2600	2800	3000	3200	3400	3600	3800	4000					
21	6	2,5	6	10	16	25	40	50	60	65	80	100	125	150	175	200	250	300	350	400	450	500	600	700	800	900	1000	1100	1200	1400	1500	1600	1800	2000	2200	2400	2600	2800	3000	3200	3400	3600	3800	4000
	7	6	10	16	25	40	50	60	65	80	100	125	150	175	200	250	300	350	400	450	500	600	700	800	900	1000	1100	1200	1400	1500	1600	1800	2000	2200	2400	2600	2800	3000	3200	3400	3600	3800	4000	
	8	10	16	25	40	50	60	65	80	100	125	150	175	200	250	300	350	400	450	500	600	700	800	900	1000	1100	1200	1400	1500	1600	1800	2000	2200	2400	2600	2800	3000	3200	3400	3600	3800	4000		
	9	16	25	40	50	60	65	80	100	125	150	175	200	250	300	350	400	450	500	600	700	800	900	1000	1100	1200	1400	1500	1600	1800	2000	2200	2400	2600	2800	3000	3200	3400	3600	3800	4000			
	10	25	40	50	60	65	80	100	125	150	175	200	250	300	350	400	450	500	600	700	800	900	1000	1100	1200	1400	1500	1600	1800	2000	2200	2400	2600	2800	3000	3200	3400	3600	3800	4000				
	11	40	50	60	65	80	100	125	150	175	200	250	300	350	400	450	500	600	700	800	900	1000	1100	1200	1400	1500	1600	1800	2000	2200	2400	2600	2800	3000	3200	3400	3600	3800	4000					

NOTE. A horizontal line of 'X' indicates the range of DN in which flanges of a particular type and PN may be ordered to this standard.



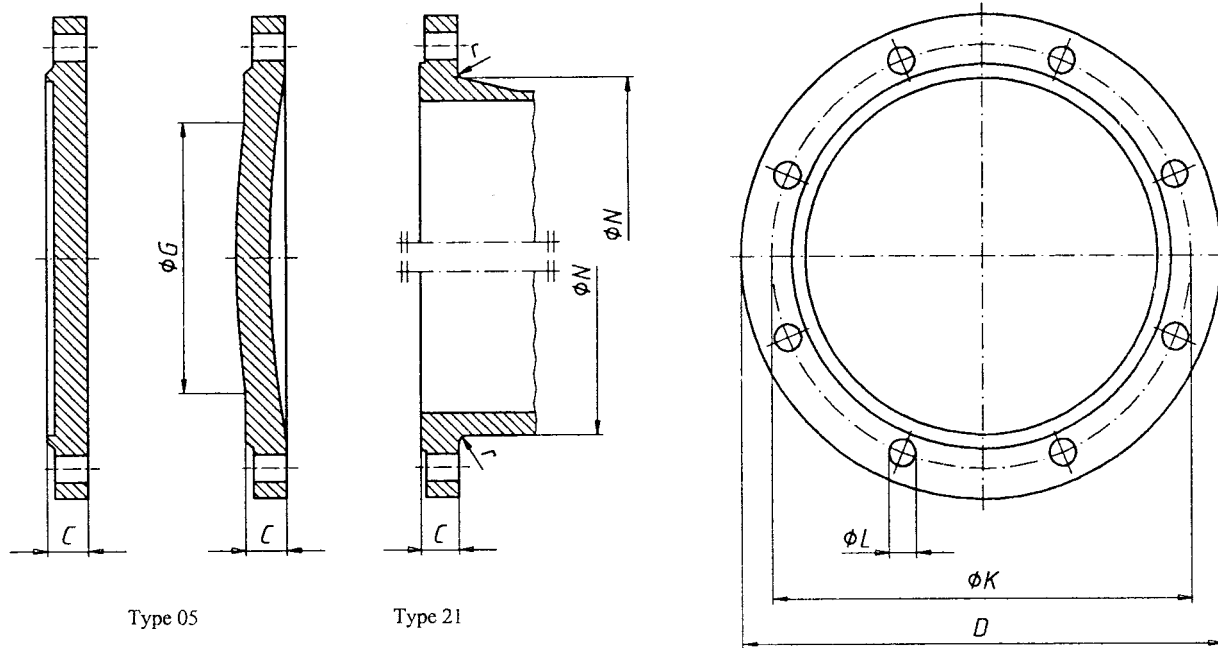
**Table 5. Dimensions for type B flange facings** (see figure 2)

Dimensions in millimetres								
DN	<i>f</i>	<i>d</i>						
		PN 2,5	PN 6	PN 10	PN 16	PN 25	PN 40	PN 63
10	2	33	33	41	41	41	41	—
15	2	38	38	46	46	46	46	—
20	2	48	48	56	56	56	56	—
25	3	58	58	65	65	65	65	—
32	3	69	69	76	76	76	76	—
40	3	78	78	84	84	84	84	84
50	3	88	88	99	99	99	99	99
60	3	98	98	108	108	108	108	108
65	3	108	108	118	118	118	118	118
80	3	124	124	132	132	132	132	132
100	3	144	144	156	156	156	156	156
125	3	174	174	184	184	184	184	184
150	3	199	199	211	211	211	211	211
200	3	254	254	266	266	274	284	284
250	3	309	309	319	319	330	345	345
300	4	363	363	370	370	389	409	409
350	4	413	413	429	429	448	465	465
400	4	463	463	480	480	503	535	535
450	4	518	518	530	548	548	560	—
500	4	568	568	582	609	609	615	—
600	5	667	667	682	720	720	735	—
700	5	772	772	794	794	820	—	—
800	5	878	878	901	901	928	—	—
900	5	978	978	1001	1001	1028	—	—
1000	5	1078	1078	1112	1112	1140	—	—
1100	5	—	—	1218	1218	1240	—	—
1200	5	1280	1295	1328	1328	1350	—	—
1400	5	1480	1510	1530	1530	1560	—	—
1500	5	—	—	1640	1640	1678	—	—
1600	5	1690	1710	1750	1750	1780	—	—
1800	5	1890	1918	1950	1950	1985	—	—
2000	5	2090	2125	2150	2150	2210	—	—
2200	6	2295	2335	—	—	—	—	—
2400	6	2495	2545	—	—	—	—	—
2600	6	2695	2750	—	—	—	—	—
2800	6	2910	2960	—	—	—	—	—
3000	6	3110	3160	—	—	—	—	—
3200	6	3310	3370	—	—	—	—	—
3400	6	3510	3580	—	—	—	—	—
3600	6	3720	3790	—	—	—	—	—
3800	6	3920	—	—	—	—	—	—
4000	6	4120	—	—	—	—	—	—

NOTE. For flanges type 16, *d* of PN 10 applies for PN 10 to 40 and *d* of DN 65 is the same as DN 60.



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This diagram illustrates the arrangement but not necessarily the correct number of bolt holes; refer to table 6 for the actual number.

NOTE. For facing dimensions, see table 5.

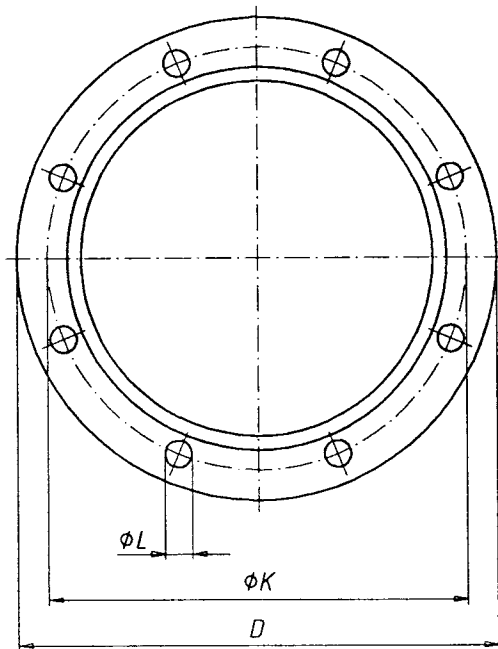
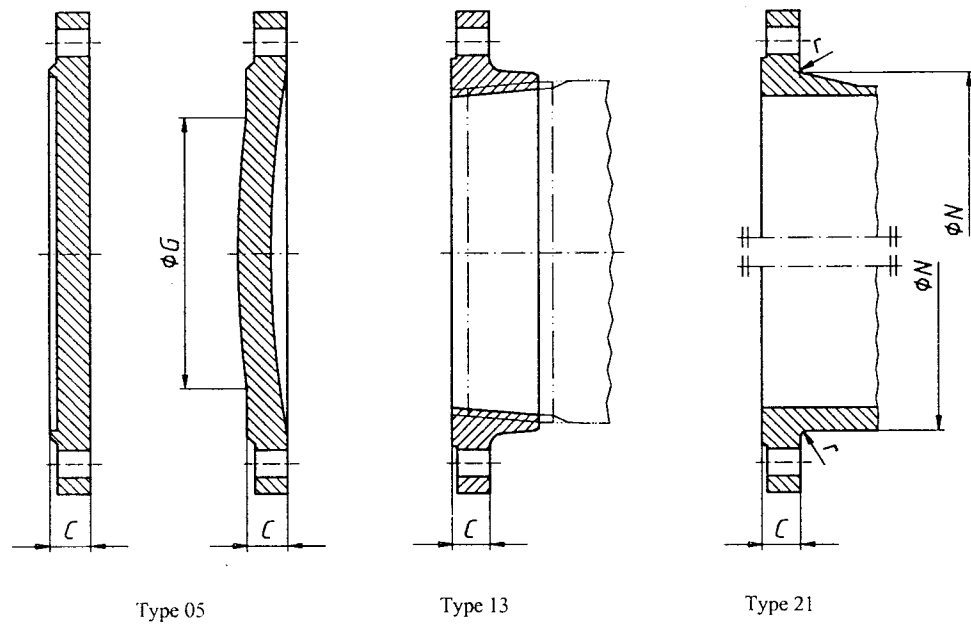
Figure 3. Dimensions of PN 2,5 flanges (see table 6)

Table 6. Dimensions of PN 2,5 flanges (see figure 3 and annex B)

Dimensions in millimetres									
DN	Mating dimensions					Flange thickness C GI <sup>1)2)</sup>	Maximum diameter of shoulder G	Neck diameter N	Corner radii r
	Outside diameter of flange D	Diameter of bolt circle K	Diameter of bolt hole L	Bolts					
				Number	Nominal size				
	<b>Flange type</b>								
	05/21					05/21	05	21	21
10 to 1000	Use PN6								
1200	1375	1320	31	32	M27	30	1185	1250	8
1400	1575	1520	31	36	M27	30	1385	1452	8
1600	1790	1730	31	40	M27	32	1585	1654	10
1800	1990	1930	31	44	M27	34	1785	1856	10
2000	2190	2130	31	48	M27	34	1985	2056	10
2200	2405	2340	34	52	M30	36	2185	2260	10
2400	2605	2540	34	56	M30	38	2385	2464	10
2600	2805	2740	34	60	M30	40	2585	2668	10
2800	3030	2960	37	64	M33	42	2785	2868	12
3000	3230	3160	37	68	M33	42	2985	3068	12
3200	3430	3360	37	72	M33	44	3185	3268	12
3400	3630	3560	37	76	M33	46	3385	3472	12
3600	3840	3770	37	80	M33	48	3585	3676	12
3800	4045	3970	41	80	M36	48	3785	3876	12
4000	4245	4170	41	84	M36	50	3985	4076	12

<sup>1)</sup> See table 14 for an explanation of the abbreviated iron designations.

<sup>2)</sup> These flange thicknesses are also valid for ductile iron flanges type 21-2.



This diagram illustrates the arrangement but not necessarily the correct number of bolt holes; refer to table 7 for the actual number.

NOTE. For facing dimensions, see table 5.

**Figure 4. Dimensions of PN 6 flanges** (see table 7)

Table 7. Dimensions of PN 6 flanges (see figure 4 and annex B)										
Dimensions in millimetres										
DN	Mating dimensions					Flange thickness		Maximum diameter of shoulder	Neck diameter	Corner radii
	Outside diameter of flange <i>D</i>	Diameter of bolt circle <i>K</i>	Diameter of bolt hole <i>L</i>	Bolts		GI <sup>1)2)</sup>	MI <sup>1)</sup>			
				Number	Nominal size	<i>C</i>	<i>C</i>	<i>G</i>	<i>N</i>	<i>r</i>
Flange type										
13/05/21						05/21	13/05/21	05	13/21	13/21
10	75	50	11	4	M10	12	12	—	20	3
15	80	55	11	4	M10	12	12	—	26	3
20	90	65	11	4	M10	14	14	—	34	4
25	100	75	11	4	M10	14	14	—	44	4
32	120	90	14	4	M12	16	16	—	54	5
40	130	100	14	4	M12	16	16	—	64	5
50	140	110	14	4	M12	16	16	—	74	5
60	150	120	14	4	M12	16	16	—	84	6
65	160	130	14	4	M12	16	16	—	94	6
80	190	150	19	4	M16	18	18	—	110	6
100	210	170	19	4	M16	18	18	—	130	6
125	240	200	19	8	M16	20	20	—	160	6
150	265	225	19	8	M16	20	20	—	182	8
200	320	280	19	8	M16	22	22	—	238	8
250	375	335	19	12	M16	24	24	—	284	10
300	440	395	23	12	M20	24	24	—	342	10
350	490	445	23	12	M20	26	—	335	392	10
400	540	495	23	16	M20	28	—	385	442	10
450	595	550	23	16	M20	28	—	435	494	12
500	645	600	23	20	M20	30	—	485	544	12
600	755	705	28	20	M24	30	—	585	642	12
700	860	810	28	24	M24	32	—	685	746	12
800	975	920	31	24	M27	34	—	785	850	12
900	1075	1020	31	24	M27	36	—	885	950	12
1000	1175	1120	31	28	M27	36	—	985	1050	12
1200	1405	1340	34	32	M30	40	—	1185	1264	12
1400	1630	1560	37	36	M33	44	—	1385	1480	12
1600	1830	1760	37	40	M33	48	—	1585	1680	12
1800	2045	1970	41	44	M36	50	—	1785	1878	15
2000	2265	2180	44	48	M39	54	—	1985	2082	15
2200	2475	2390	44	52	M39	60	—	—	3)	15
2400	2685	2600	44	56	M39	62	—	—	3)	15
2600	2905	2810	50	60	M45	64	—	—	3)	15
2800	3115	3020	50	64	M45	68	—	—	3)	15
3000	3315	3220	50	68	M45	70	—	—	3)	15
3200	3525	3430	50	72	M45	76	—	—	3)	15
3400	3735	3640	50	76	M45	80	—	—	3)	15
3600	3970	3860	57	80	M52	84	—	—	3)	15

<sup>1)</sup> See table 14 for an explanation of the abbreviated iron designations.  
<sup>2)</sup> These flange thicknesses are also valid for ductile iron flanges type 21-2.  
<sup>3)</sup> Manufacturer's option.

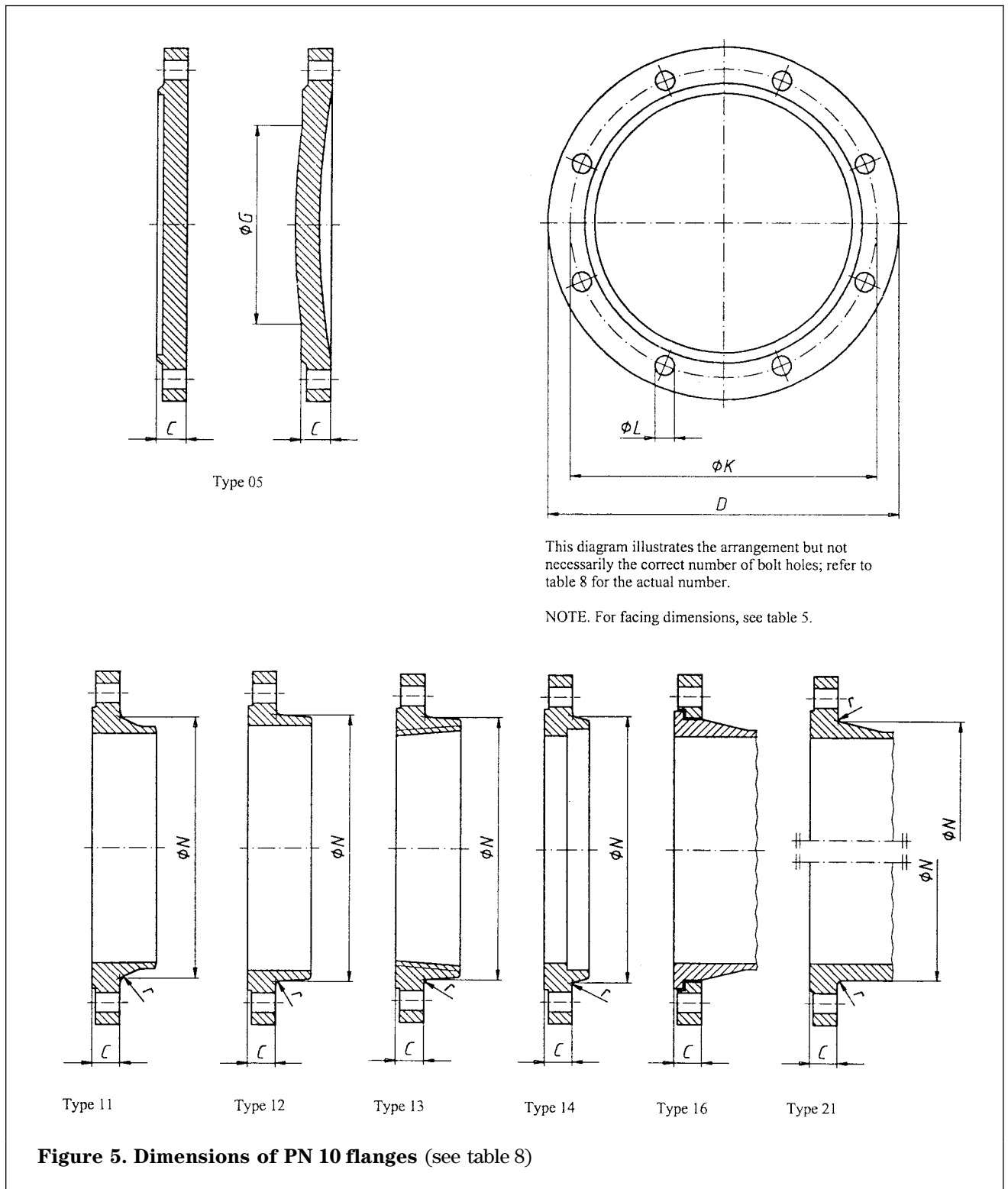


Table 8. Dimensions of PN 10 flanges (see figure 5 and annex B)												
Dimensions in millimetres												
DN	Mating dimensions					Flange thickness			Maximum diameter of shoulder <i>G</i>	Neck diameter <i>N</i>	Corner radii <i>r</i>	
	Outside diameter of flange <i>D</i>	Diameter of bolt circle <i>K</i>	Diameter of bolt hole <i>L</i>	Bolts		DI <sup>1)3)</sup> <i>C</i>	GI <sup>1)4)</sup> <i>C</i>	MI <sup>1)</sup> <i>C</i>				
				Number	Nominal size							
Flange type						05/11	16	05/13	05/13	05	11/12	11/12
05/11/12/13/14/16/21						12/13		21	21		13/14	13/14
						14/21					21	21
10	Use PN 16 dimensions											
15												
20												
25												
32												
40												
50												
60												
65												
80												
100	340	295	23	8	M20	20	29	26	24	—	246	8
125	395 <sup>2)</sup>	350	23	12	M20	22	32	28	26	—	298	10
150	445 <sup>2)</sup>	400	23	12	M20	24,5	36	28	26	—	348	10
200	505	460	23	16	M20	24,5	39	30	—	335	408	10
250	565	515	28	16	M24	24,5	42	32	—	385	456	10
300	615	565	28	20	M24	25,5	45	32	—	435	502	12
350	670	620	28	20	M24	26,5	48	34	—	485	559	12
400	780	725	31	20	M27	30	55	36	—	585	658	12
450	895	840	31	24	M27	32,5	—	40	—	685	772	12
500	1015	950	34	24	M30	35	—	44	—	785	876	12
600	1115	1050	34	28	M30	37,5	—	46	—	885	976	12
700	1230	1160	37	28	M33	40	—	50	—	985	1080	12
800	1340	1270	37	32	M33	42,5	—	53	—	1085	1186	12
900	1455	1380	41	32	M36	45	—	56	—	1185	1292	12
1000	1675	1590	44	36	M39	46	—	62	—	1385	1496	12
1100	1785	1700	44	36	M39	47,5	—	65	—	1485	1605	12
1200	1915	1820	50	40	M45	49	—	68	—	1585	1712	12
1400	2115	2020	50	44	M45	52	—	70	—	1785	1910	15
1600	2325	2230	50	48	M45	55	—	74	—	1985	2120	15

<sup>1)</sup> See table 14 for an explanation of the abbreviated iron designations.

<sup>2)</sup> For ductile iron pipes and fittings the outside diameters for the following flanges shall be:  
 - for DN 250 *D* = 400 mm  
 - for DN 300 *D* = 455 mm.

<sup>3)</sup> PN 10 ductile iron flanges may be used on socket pipelines up to pressures of approximately 15 bar.

<sup>4)</sup> These flange thicknesses are also valid for ductile iron flanges type 21-2.

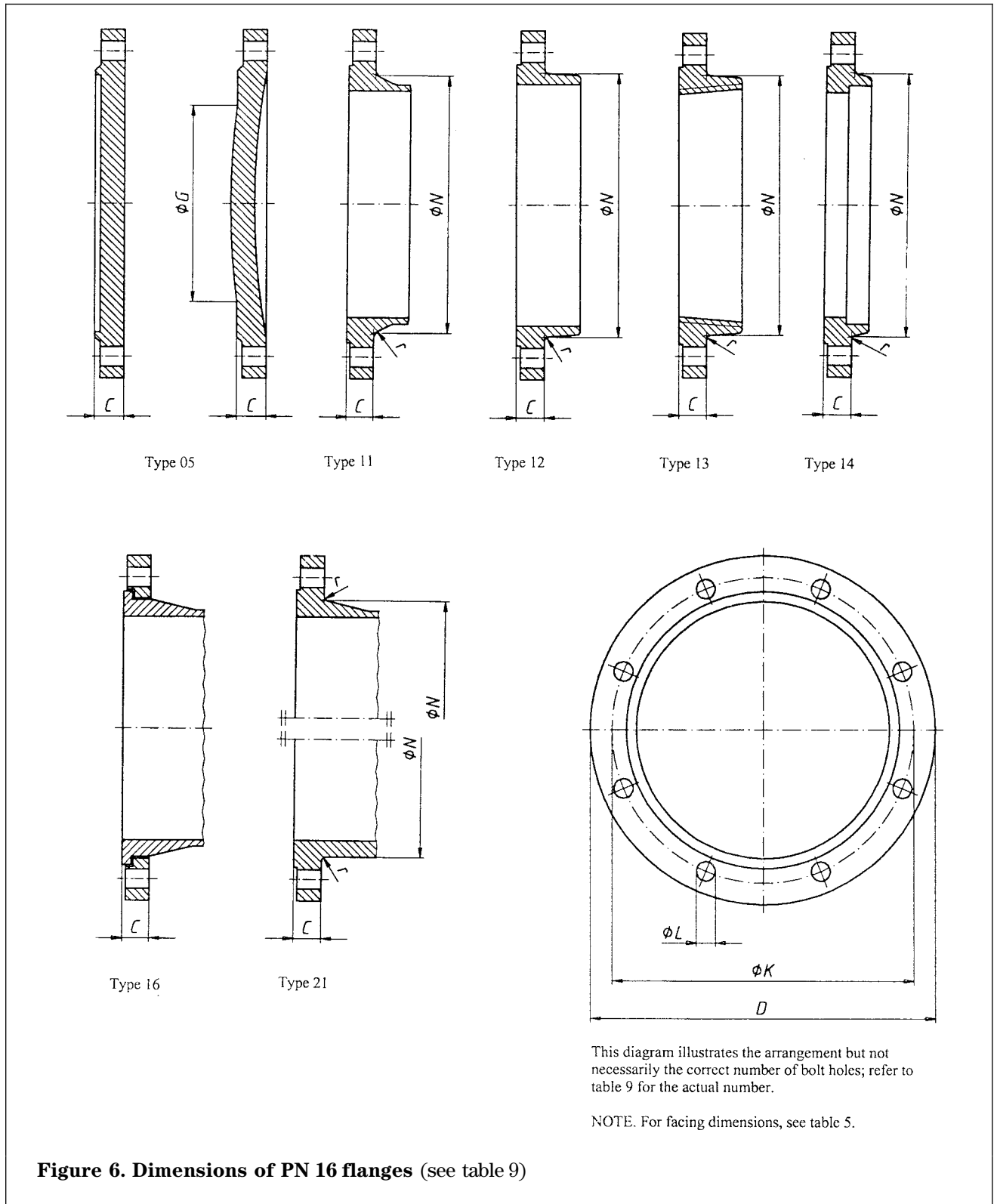


Figure 6. Dimensions of PN 16 flanges (see table 9)

Table 9. Dimensions of PN 16 flanges (see figure 6 and annex B)																		
Dimensions in millimetres																		
DN	Mating dimensions					Flange thickness			Maximum diameter of shoulder <i>G</i>	Neck diameter <i>N</i>	Corner radii <i>r</i>							
	Outside diameter of flange <i>D</i>	Diameter of bolt circle <i>K</i>	Diameter of bolt hole <i>L</i>	Bolts		DI <sup>1)2)</sup> <i>C</i>	GI <sup>1)3)</sup> <i>C</i>	MI <sup>1)</sup> <i>C</i>										
				Number	Nominal size													
Flange type						05/11	12/13	14/21	16	05/13	05/13	05	11/12	13/14	11/12			
05/11/12/13/14/16/21						12/13	14/21	16	05/13	05/13	05	11/12	13/14	13/14	21	21		
10	Use PN 40 dimensions					14	—	14	14	—	—	28	3					
15						14	—	14	14	—	—	32	3					
20						16	—	16	16	—	—	40	4					
25						16	—	16	16	—	—	50	4					
32						18	—	18	18	—	—	60	5					
40						19	22	18	18	—	—	70	5					
50						19	22	20	20	—	—	84	5					
60						175	135	19	4	M16	19	22	20	20	—	—	94	6
65						185	145	19	4 <sup>4)</sup>	M16	19	22	20	20	—	—	104	6
80						200	160	19	8	M16	19	22	22	20	—	—	120	6
100	220	180	19	8	M16	19	23	24	22	—	—	140	6					
125	250	210	19	8	M16	19	24,5	26	22	—	—	170	6					
150	285	240	23	8	M20	19	26	26	24	—	—	190	8					
200	340	295	23	12	M20	20	29	30	24	—	—	246	8					
250	405 <sup>2)</sup>	355	28	12	M24	22	32	32	26	—	—	296	10					
300	460 <sup>2)</sup>	410	28	12	M24	24,5	36	32	28	—	—	350	10					
350	520	470	28	16	M24	26,5	39	36	—	335	—	410	10					
400	580	525	31	16	M27	28	42	38	—	385	—	458	10					
450	640	585	31	20	M27	30	45	40	—	435	—	516	12					
500	715	650	34	20	M30	31,5	48	42	—	485	—	576	12					
600	840	770	37	20	M33	36	55	48	—	585	—	690	12					
700	910	840	37	24	M33	39,5	—	54	—	685	—	760	12					
800	1025	950	41	24	M36	43	—	58	—	785	—	862	12					
900	1125	1050	41	28	M36	46,5	—	62	—	885	—	962	12					
1000	1255	1170	44	28	M39	50	—	66	—	985	—	1076	12					
1100	1355	1270	44	32	M39	53,5	—	—	—	1085	—	1176	12					
1200	1485	1390	50	32	M45	57	—	—	—	1185	—	1282	12					
1400	1685	1590	50	36	M45	60	—	—	—	1385	—	1482	12					
1500	1820	1710	57	36	M52	62,5	—	—	—	1485	—	1586	12					
1600	1930	1820	57	40	M52	65	—	—	—	1585	—	1696	12					
1800	2130	2020	57	44	M52	70	—	—	—	1785	—	1896	15					
2000	2345	2230	62	48	M56	75	—	—	—	1985	—	2100	15					

<sup>1)</sup> See table 14 for an explanation of the abbreviated iron designations.

<sup>2)</sup> For ductile iron pipes and fittings the outside diameters for the following flanges shall be:

- for DN 250 *D* = 400 mm
- for DN 300 *D* = 455 mm.

<sup>3)</sup> These flange thicknesses are also valid for ductile iron flanges type 21-2.

<sup>4)</sup> According to prEN 1092-1, steel flanges in this DN and PN may be supplied with 8 holes. For compliance with these, equivalent cast iron flanges may be supplied with eight holes, as special order and after agreement between manufacturer and customer.

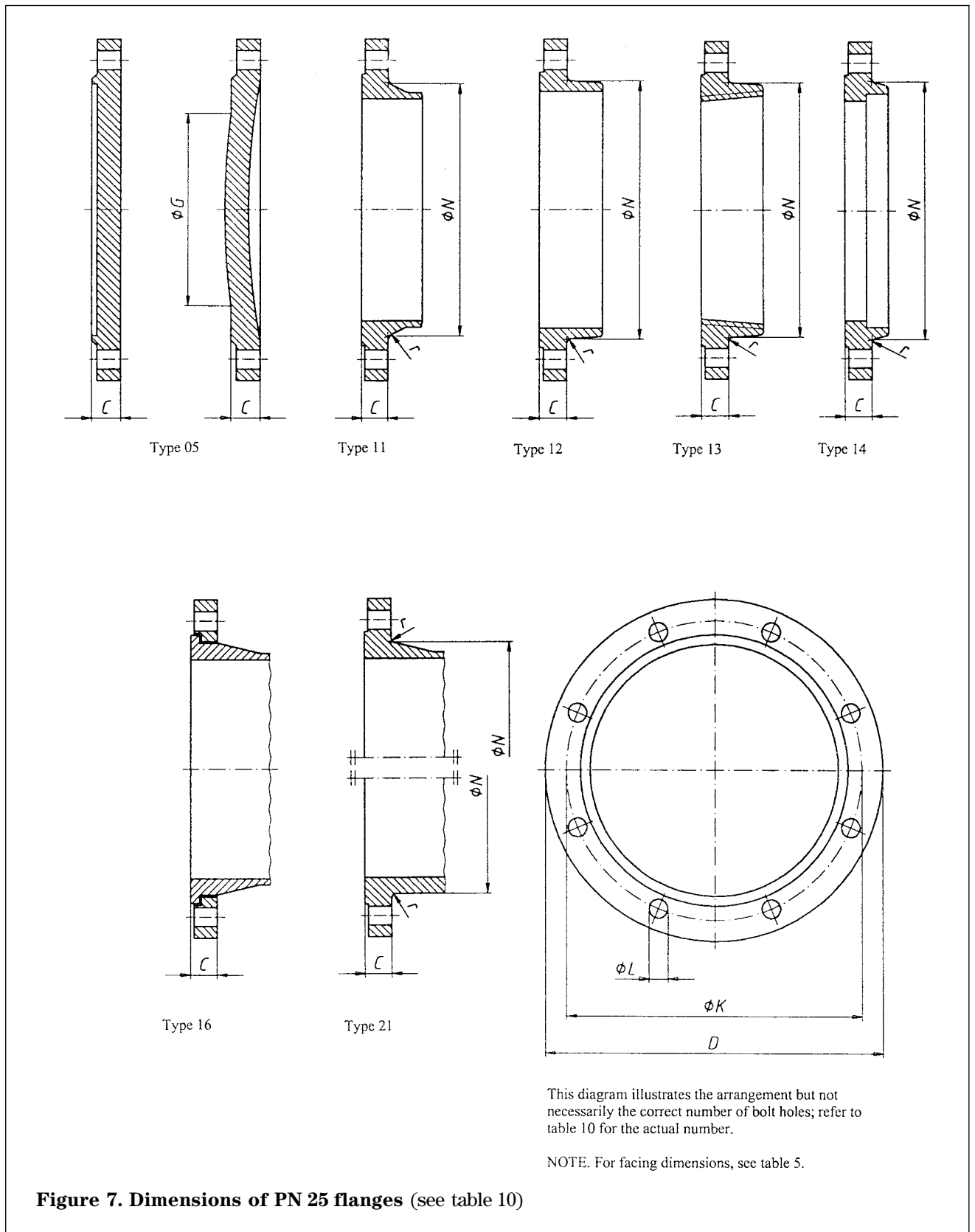


Figure 7. Dimensions of PN 25 flanges (see table 10)



Table 10. Dimensions of PN 25 flanges (see figure 7 and annex B)												
Dimensions in millimetres												
DN	Mating dimensions					Flange thickness			Maximum diameter of shoulder <i>G</i>	Neck diameter <i>N</i>	Corner radii <i>r</i>	
	Outside diameter of flange <i>D</i>	Diameter of bolt circle <i>K</i>	Diameter of bolt hole <i>L</i>	Bolts		DI <sup>1)</sup> <i>C</i>	GI <sup>1)2)</sup> <i>C</i>	MI <sup>1)</sup> <i>C</i>				
				Number	Nominal size							
Flange type						05/11	16	05	05/13	05	11/12	11/12
05/11/12/13/14/16/21						12/13		21	21		13/14	13/14
						14/21					21	21
0						14						
15						14						
20						16						
25						16						
32						18						
40						Use PN 40 dimensions						
50						Use PN 40 dimensions						
60						Use PN 40 dimensions						
65						Use PN 40 dimensions						
80						Use PN 40 dimensions						
100						Use PN 40 dimensions						
125	270	220	28	8	M24	19	24,5	30	26	—	162	6
150	300	250	28	8	M24	20	26	34	28	—	192	8
200	360	310	28	12	M24	22	29	34	30	—	252	8
250	425	370	31	12	M27	24,5	32	36	32	—	304	10
300	485	430	31	16	M27	27,5	36	40	34	—	364	10
350	555	490	34	16	M30	30	39	44	—	335	418	10
400	620	550	37	16	M33	32	42	48	—	385	472	10
450	670	600	37	20	M33	34,5	45	50	—	435	520	12
500	730	660	37	20	M33	36,5	48	52	—	485	580	12
600	845	770	41	20	M36	42	55	56	—	585	684	12
700	960	875	44	24	M39	46,5	—	—	—	685	780	12
800	1085	990	50	24	M45	51	—	—	—	785	882	12
900	1185	1090	50	28	M45	55,5	—	—	—	885	982	12
1000	1320	1210	57	28	M52	60	—	—	—	985	1086	12
1100	1420	1310	57	32	M52	64,5	—	—	—	1085	1186	12
1200	1530	1420	57	32	M52	69	—	—	—	1185	1296	12
1400	1755	1640	62	36	M56	74	—	—	—	1385	1508	12
1500	1865	1750	62	36	M56	77,5	—	—	—	1485	1617	12
1600	1975	1860	62	40	M56	81	—	—	—	1585	1726	12
1800	2195	2070	70	44	M64	88	—	—	—	1785	1920	15
2000	2425	2300	70	48	M64	95	—	—	—	1985	2150	15

<sup>1)</sup> See table 14 for an explanation of the abbreviated iron designations.

<sup>2)</sup> These flange thicknesses are also valid for ductile iron flanges type 21-2.

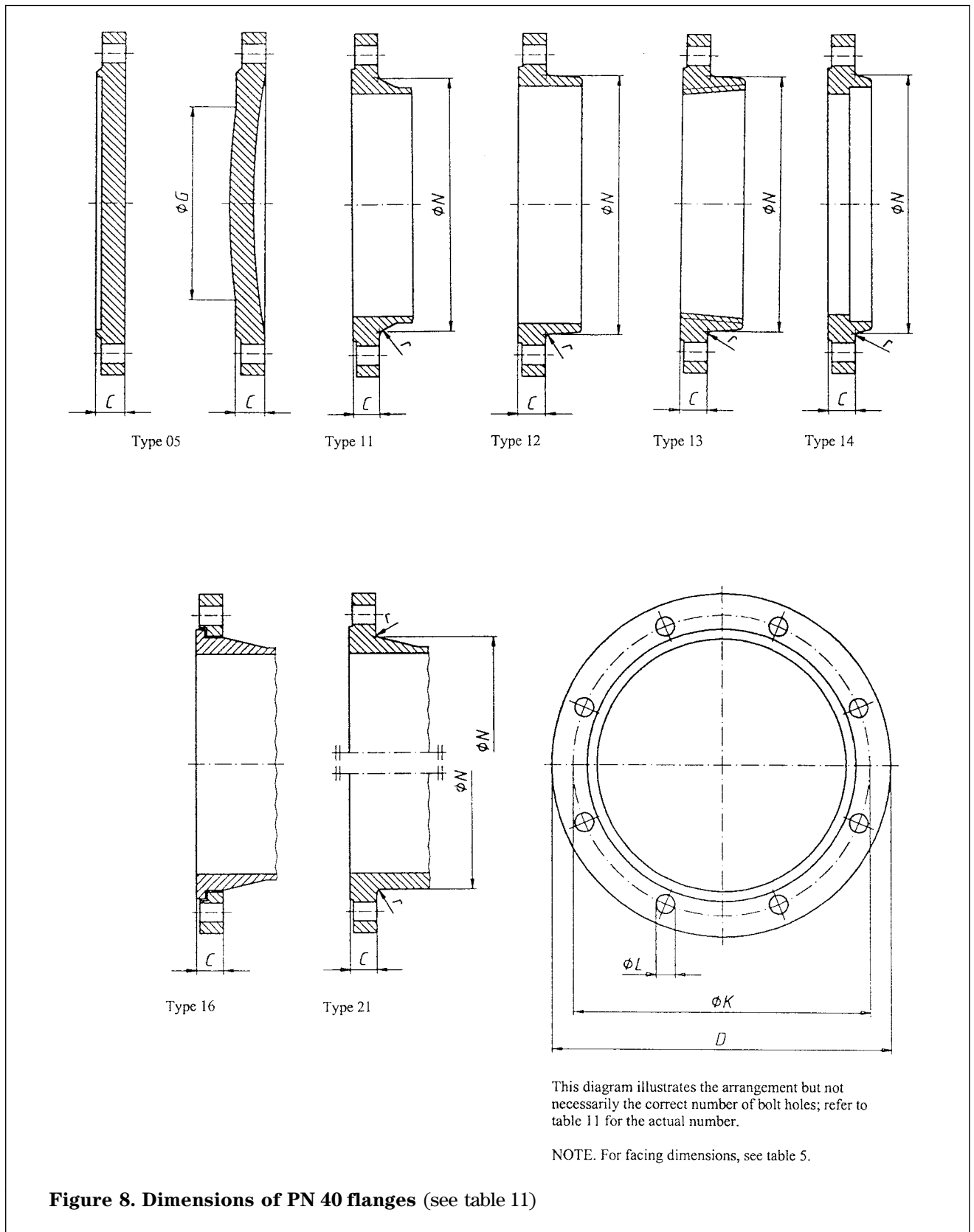


Table 11. Dimensions of PN 40 flanges (see figure 8 and annex B)																				
Dimensions in millimetres																				
DN	Mating dimensions					Flange thickness			Maximum diameter of shoulder <i>G</i>	Neck diameter <i>N</i>	Corner radii <i>r</i>									
	Outside diameter of flange <i>D</i>	Diameter of bolt circle <i>K</i>	Diameter of bolt hole <i>L</i>	Bolts		DI <sup>1)</sup> <i>C</i>	GI <sup>1)2)</sup> <i>C</i>	MI <sup>1)</sup> <i>C</i>												
				Number	Nominal size															
Flange type						05/11	12/13	14/21	16	05	21	05/13	21	05	11/12	13/14	21	11/12	13/14	21
10	90	60	14	4	M12	—	—	16	14	—	28	3								
15	95	65	14	4	M12	—	—	16	14	—	32	3								
20	105	75	14	4	M12	—	—	18	16	—	40	4								
25	115	85	14	4	M12	—	—	18	16	—	50	4								
32	140	100	19	4	M16	—	—	20	18	—	60	5								
40	150	110	19	4	M16	19	22	20	18	—	70	5								
50	165	125	19	4	M16	19	22	22	20	—	84	5								
60	175	135	19	8	M16	19	22	24	22	—	94	6								
65	185	145	19	8	M16	19	22	24	22	—	104	6								
80	200	160	19	8	M16	19	22	26	24	—	120	6								
100	235	190	23	8	M20	19	23	28	24	—	142	6								
125	270	220	28	8	M24	23,5	24,5	30	26	—	162	6								
150	300	250	28	8	M24	26	26	34	28	—	192	8								
200	375	320	31	12	M27	30	33	40	34	—	254	8								
250	450	385	34	12	M30	34,5	37	46	38	—	312	10								
300	515	450	34	16	M30	39,5	42	50	42	—	378	10								
350	580	510	37	16	M33	44	46	54	—	335	432	10								
400	660	585	41	16	M36	48	—	62	—	385	498	10								
450	685	610	41	20	M36	49	—	—	—	435	522	12								
500	755	670	44	20	M39	52	—	—	—	485	576	12								
600	890	795	50	20	M45	58	—	—	—	585	686	12								

<sup>1)</sup> See table 14 for an explanation of the abbreviated iron designations.

<sup>2)</sup> These flange thicknesses are also valid for ductile iron flanges type 21-2.

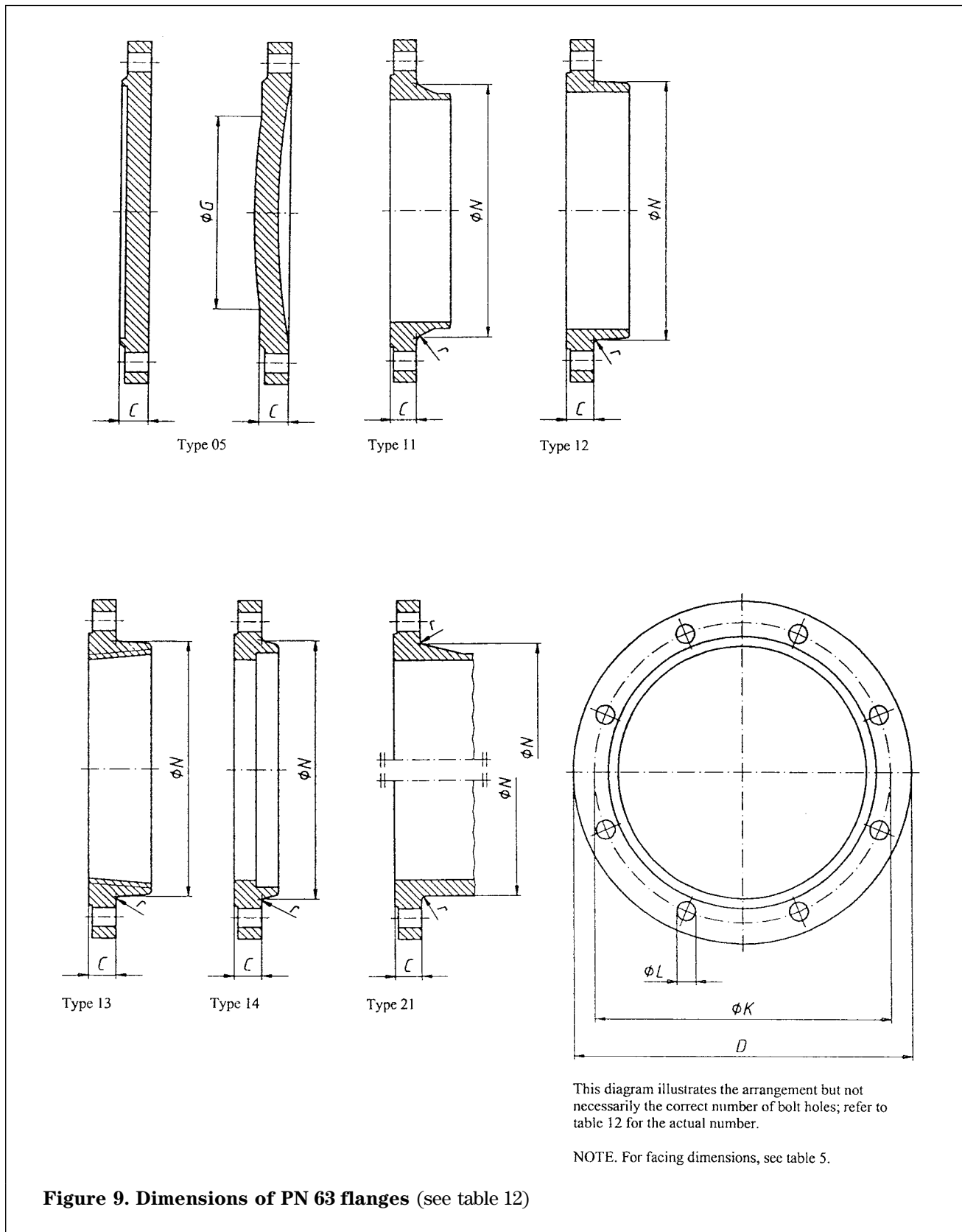
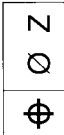


Figure 9. Dimensions of PN 63 flanges (see table 12)

Table 12. Dimensions of PN 63 flanges (see figure 9 and annex B)									
Dimensions in millimetres									
DN	Mating dimensions					Flange thickness DI <sup>1)</sup>	Maximum diameter of shoulder	Neck diameter	Corner radii
	Outside diameter of flange <i>D</i>	Diameter of bolt circle <i>K</i>	Diameter of bolt hole <i>L</i>	Bolts					
				Number	Nominal size	<i>C</i>	<i>G</i>	<i>N</i>	<i>r</i>
Flange type									
05/11/12/13/14/21						05/21	05	11/12/13/14/21	
40	170	125	23	4	M20	28	—	77	5
50	180	135	23	4	M20	28	—	87	5
60	190	145	23	8	M20	28	—	97	6
65	205	160	23	8	M20	28	—	112	6
80	215	170	23	8	M20	31	—	122	6
100	250	200	28	8	M24	33	—	142	6
125	295	240	31	8	M27	37	—	174	6
150	345	280	34	8	M30	39	—	208	8
200	415	345	37	12	M33	46	—	267	8
250	470	400	37	12	M33	50	—	322	10
300	530	460	37	16	M33	57	—	382	10
350	600	525	41	16	M36	61	335	438	10
400	670	585	44	16	M39	65	385	490	10

<sup>1)</sup> See table 14 for an explanation of the abbreviated iron designations.

Table 13. Tolerances on dimensions		Linear dimensions in millimetres					
Symbol	Designation	Tolerances					
<i>D</i>	Outside diameter	Not specified but the minimum shall provide a sufficient bearing area for standard hexagonal bolt					
<i>d</i>	For DN	≤ 100	125 to 300	350 to 600	700 to 1200	≥ 1400	
	Facing diameter	-4	-4,5	-5	-5,5	-6	
	Tolerance	Maximum diameter can be greater than the nominal value, but no plus tolerance is given in this standard					
<i>f</i>	Facing height	<i>f</i> = 1 mm minimum					
<i>b</i> (= <i>c</i> - <i>f</i> )	Thickness	≤ 35	36 to 45	46 to 60	61 to 75	> 76	
	Flange thickness	+4 -3	+4,5 -4	+5 -4	+6 -5	+7 -6	
<i>L</i>	Bolt hole diameter	≤ M33	M36 to M39	M45 to M52		> M52	
		+1,5 0	+2 0			+2,5 0	
		M10	M12	M14 to M20	M24 to M33	M36 to M52	>M52
	Position of bolt hole <sup>1)</sup> <sup>2)</sup> 	1	2	3	4	5	6
	Facing draught angle	≤ 2°					

<sup>1)</sup> The position of bolt holes takes into account the tolerances on bolt circle diameter and centre to centre.

<sup>2)</sup> For explanation see ISO 5458 : 1987.

Type	Material	Grade	PN <sup>1)</sup>						
	Reference standard		2,5	6	10	16	25	40	63
Ductile iron DI	ISO 1083 : 1987	350-22			×	×	×	×	×
	ISO 1083 : 1987	400-15			×	×	×	×	×
	ISO 1083 : 1987	400-18	2)	2)	×	×	×	×	×
	EN 545	420-5			×	×	×	×	×
	ISO 1083 : 1987	500-7			×	×	×	×	×
	ISO 1083 : 1987	600-3			×	×	×	×	×
Grey iron GI	ISO 185 : 1988	200	×	×	×	×			
	ISO 185 : 1988	250	×	×	×	×	×	×	
Malleable iron MI	ISO 5922 : 1981	B30-06		×	×	×			
	ISO 5922 : 1981	B32-12		×	×	×	×	×	
	ISO 5922 : 1981	B35-10		×	×	×	×	×	

<sup>1)</sup> × means that this grade may be used for this PN.  
<sup>2)</sup> Type 21-2 flanges in PN 2,5 and PN 6 are possible by agreement between manufacturer and purchaser (see notes to tables 6 and 7).

PN	Temperature °C					
	-10 to 120	150	200	250	300	350
	Allowable non-shock pressure <sup>2)</sup> in bar					
10	10 <sup>3)</sup>	9,5	9	8	7	5,5
16	16	15,2	14,4	12,8	11,2	8,8
25	25	23,8	22,5	20	17,5	13,8
40	40	38	36	32	28	22
63	63	60,8	57,6	51,2	44,8	35,2

<sup>1)</sup> Ductile iron grade 600-3 flanges are limited to applications up to a temperature of 120 °C.  
<sup>2)</sup> See also 5.5.  
<sup>3)</sup> See table 8.

PN	Temperature °C					
	-10 to 120	150	200	250	300	350
	Allowable non-shock pressure <sup>1)</sup> in bar					
10	10 <sup>2)</sup>	9,7	9,2	8,7	8	7
16	16	15,5	14,7	13,9	12,8	11,2
25	25	24,3	23	21,8	20	17,5
40	40	38,8	36,8	34,8	32	28
63	63	62	58,8	55,6	51,2	44,8

<sup>1)</sup> See also 5.5.  
<sup>2)</sup> See table 8.

**Table 17. Pressure/temperature ratings for grey iron flanges (ISO 185 : 1988 grades 200 and 250)**

PN	Temperature °C						
	-10 to 120	150	180	200	230	250	300
	Allowable non-shock pressure <sup>1)</sup> in bar						
2,5	2,5	2,3	2,1	2	1,9	1,8	1,5
6	6	5,4	5	4,8	4,4	4,2	3,6
10	10	9	8,4	8	7,4	7	6
16	16	14,4	13,4	12,8	11,8	11,2	9,6
25 <sup>2)</sup>	25	22,5	21	20	18,5	17,5	15
40 <sup>2)</sup>	40	36	33,6	32	29,6	28	24

<sup>1)</sup> See also 5.5.

<sup>2)</sup> PN 25 and PN 40 flanges manufactured in grey iron are limited to ISO 185 : 1988 grade 250.

**Table 18. Pressure/temperature ratings for malleable iron flanges (ISO 5922 : 1981 grades B30-06, B32-12 and B35-10)**

PN	Temperature °C					
	-10 to 120	150	200	250	300	350
	Allowable non-shock pressure <sup>1)</sup> in bar					
6	6	5,8	5,5	5,2	4,8	4,2
10	10	9,7	9,2	8,7	8	7
16	16	15,5	14,7	13,9	12,8	11,2
25	25	24,3	23	21,8	20	17,5
40	40	38,8	36,8	34,8	32	28

<sup>1)</sup> See also 5.5.



## Annex A (normative)

### Information to be supplied by the purchaser

When a purchaser orders separate flanges which are supplied not attached to a pipeline component in accordance with this standard, it shall state in his enquiry and/or order the following information:

- a) standard designation (see 4.4) and b) and c) if appropriate as follows;
- b) for flange types 11, 12 and 14, the external diameter and thickness of pipe to which the flange is to be attached (see note 3 in annex B) when supplied separate, i.e. not as a part of some other pipe line component;
- c) type of thread for threaded flanges (type 13) when supplied separate, i.e. not as a part of some other pipe line component.

NOTE. Where appropriate, information required for items b) and c) should be agreed between purchaser and manufacturer.

Example 1:

For flanges in malleable iron type 11, 12 or 14:

Flange/ EN 1092-2/ DN 100/ PN 40/ type 11/ MI B 30-06/ A/  $\varnothing 120 \times 5$

Example 2:

For flanges in malleable iron type 13:

Flange/ EN 1092-2/ DN 100/ PN 40/ type 13/ MI B 30-06/ A/  $\varnothing 118 \times 2$

Example 3:

For flanges in materials other than malleable iron:

Flange/ EN 1092-2/ DN 100/ PN 40/ type 11/ DI 400-15/ -/  $\varnothing 120 \times 5$

## Annex B (informative)

### Notes to tables 6 to 12

NOTE 1. All PNs : for dimensions  $d$  and  $f$ , see table 5.

NOTE 2. The origins of the flange thicknesses are:

For ductile iron those from ISO 2531 : 1991.

For grey and malleable irons those from ISO 7005-2 : 1988.

NOTE 3. Pipe dimensions affect the bore of the flange, and the external diameter and thickness of pipe which is to be joined to the flange should be specified where appropriate. The bore sizes of integral flanges (type 21) on valves, fittings or accessories to which they form a part may be given in the appropriate standard for the component.

NOTE 4.  $N$  is a reference dimension located at the intersection of the projection of the hub draft angle and the back face of the flange. For certain designs of flange e.g. flanges which are integral with pumps or valves, it may be impossible to use  $N$  and  $r$ .

NOTE 5. Dimension  $G$  is the limit of the shoulder at the intersection with the projection of the sealing face. It is intended to prevent any interference between this shoulder and the bore of the mating flange.

## Annex C (informative)

### Bibliography

- |               |   |
|---------------|---|
| ISO 13 : 1978 | <i>Cast iron pipes, fittings and accessories for pressure pipelines</i>                             |
| EN 1514       | <i>Flanges and their joints. Dimensions of gaskets for PN designated flanges (in several parts)</i> |

## List of references

See national foreword.

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