JIS

JAPANESE INDUSTRIAL STANDARD

Translated and Published by
Japanese Standards Association

JIS B 2238 : 1996

General rules for steel pipe flanges

ICS 23.040.60

Descriptors : flanges, steels, pipe fittings, pipework systems

Reference number : JIS B 2238 : 1996 (E)

B 2238 : 1996

This translation has been made based on the original Japanese Industrial Standard established by the Minister of International Trade and Industry through deliberations at Japanese Industrial Standards Committee in accordance with the Industrial Standardization Law:

Date of Establishment: 1996-01-01

Date of Public Notice in Official Gazette: 1996-01-04

Investigated by: Japanese Industrial Standards Committee
Divisional Council on Machine Elements

JIS B 2238:1996, First English edition published in 1997-10

Translated and published by: Japanese Standards Association
4-1-24, Akasaka, Minato-ku, Tokyo, 107 JAPAN

In the event of any doubts arising as to the contents, the original JIS is to be the final authority.

Printed in Japan

JAPANESE INDUSTRIAL STANDARD JIS B 2238 : 1996

General rules for steel pipe flanges

1 Scope This Japanese Industrial Standard specifies the types, relation between the conditions of fluid and the maximum working pressure, basic dimensions and materials of the steel pipe flanges (hereafter referred to as "flanges") connecting with the pipes, valves, etc. used in the general pipings of vapor, air, gas, water, oil and the like.

Remarks 1 The quality assurance of the flanges designed and manufactured on the basis of the requirements of this Standard shall be conducted on the responsibility between the manufacturer and purchaser.

2 The standards cited in this Standard are given in the following:

JIS B 1001 *Diameter of clearance holes and counterbores for bolts and screws*

JIS B 1180 *Hexagon head bolts and hexagon head screws*

JIS G 0303 *General rules for inspection of steel*

JIS G 3101 *Rolled steels for general structure*

JIS G 3201 *Carbon steel forgings for general use*

JIS G 3202 *Carbon steel forgings for pressure vessels*

JIS G 3203 *Alloy steel forgings for pressure vessels for high-temperature service*

JIS G 4051 *Carbon steels for machine structural use*

JIS G 5101 *Carbon steel castings*

JIS G 5151 *Steel castings for high temperature and high pressure service*

3 The International Standard corresponding to this Standard is as follows:

ISO 7005-1 : 1992 *Metallic flanges – Part 1 : Steel flanges*

4 Annex and Annexes A to G to this Standard have been prepared on the basis of the corresponding International Standard (ISO 7005-1) to this Standard.

5 In this Standard, the units and numerical values given in { } are based on the traditional units, and are appended for informative reference.

The respective pressures are expressed by the gauge pressures in this Standard.

2 Classification

2.1 Classification of flanges The flanges shall be classified by the nominal pressures. The nominal pressures shall be 2K, 5K, 10K, 16K, 20K, 30K, 40K and 63K. However, the nominal pressure 10K shall be classified into two types of the ordinary type flanges and thin type flanges.

2.2 Classification of facings The facings shall be classified into five types of flat face, large raised face, small raised face, spigot and recess type and tongue and groove type according to the shapes.

3 Relation between the fluid conditions and maximum working pressure The material of each nominal pressure and the relation between the fluid conditions and the maximum working pressure shall generally be in accordance with Attached Table 1. However, as to the nominal pressures 5K and 10K, the following shall be appended.

(1) The flange of 5K in nominal pressure, 10 and 15 in nominal size and two in number of bolt holes, and when the outside diameter of the flange is indicated by A × B, it shall be in accordance with Table 1.

Table 1 Relation between the fluid conditions and maximum working pressure

Condition of fluid	Maximum working pressure MPa{kgf/cm²}
Vapor, air and gas of 300 ℃ or under	0.20{2}
Pulsating water or oil of 120 ℃ or under	
Steady flow water of 120 ℃ or under	0.29{3}

(2) The thin type flange of nominal pressure 10K shall be used for the steady flow water of maximum working pressure 0.69 MPa{7 kgf/cm²} and maximum working temperature 120 ℃.

4 Basic dimensions The basic dimensions of the flanges shall be in accordance with Attached Tables 2 to 9. The shapes and dimensions of the facings shall be in accordance with Attached Tables 10 and 11.

In addition, the dimensional tolerances shall generally be in accordance with Attached Table 12.

Informative reference: The facing shall be selected according to the material of flange, pressure, temperature, connecting condition of pipe, properties and conditions of fluid, type of gasket etc. to be used, and criteria are given in the following for informative reference.

(1) The flat faces are used for the flanges of nominal pressure 16K or under in many cases.

(2) The large raised faces are used for the flanges of nominal pressure 63K or under.

(3) The small raised faces are suitable for the flanges of nominal pressure 16K or over and using comparably hard gaskets.

(4) The spigot and recess type is suitable for nominal pressure 16K or over and when more tightness than the small raised faces are required.

(5) The tongue and groove type is suitable for the piping system of nominal pressure 16K or over for dangerous fluid or when an extremely higher tightness is required.

5 Materials The materials of the flanges shall be as given in Table 2.

Table 2 Materials of flanges

Nominal pressure (symbol)	Type of material	Material
2K	Carbon steel	SS400 of **JIS G 3101** SF390A of **JIS G 3201** S20C of **JIS G 4051** SC410 of **JIS G 5101**
5K and 10K	Carbon steel	SS400 of **JIS G 3101** SF390A of **JIS G 3201** SFVC1 of **JIS G 3202** S20C of **JIS G 4051** SC410 of **JIS G 5101** SCPH1 of **JIS G 5151**
16K and 20K	Carbon steel	SF440A of **JIS G 3201** SFVC2A of **JIS G 3202** S25C of **JIS G 4051** SC480 of **JIS G 5101** SCPH2 of **JIS G 5151**
30K, 40K and 63K	Carbon steel	SF440A of **JIS G 3201** SFVC2A of **JIS G 3202** S25C of **JIS G 4051** SC480 of **JIS G 5101** SCPH2 of **JIS G 5151**
	Molybdenum steel	SFVAF1 of **JIS G 3203** SCPH11 of **JIS G 5151**
	Chrome molybdenum steel	SFVAF11A of **JIS G 3203** SCPH21 of **JIS G 5151**

Remarks 1 The materials shall be those of Table 2 as standard, and in the relevant standard of the respective material symbol, those of stronger in the tensile strength than the material taken as the standard may be used.

In addition, the materials other than those of Table 2 shall be subject to the agreement between the manufacturer and purchaser.

2 The carbon steel forgings of **JIS G 3201** shall be those of 0.35 % or under in carbon content.

3 The carbon steels for machine structural use of **JIS G 4051** shall be subjected to the inspection in accordance with **JIS G 0303**, and S20C shall be that of 400 N/mm^2{40.8 kgf/mm^2} or over in tensile strength and S25C shall be that of 440 N/mm^2{44.9 kgf/mm^2} or over in tensile strength.

Related standards:

JIS B 2001 *Nominal size and bore of valves*

JIS B 2220 *Steel welding pipe flanges*

JIS G 4107 *Alloy steel bolting materials for high temperature service*

ASTM A 194-82a *Carbon and alloy steel nuts for bolts for high-pressure and high-temperature service*

Attached Table 1 Relation between the conditions of fluid and the maximum working pressure

Unit: MPa{kgf/cm²}

Nominal pressure (symbol)	Material (1)	Conditions of fluid and maximum working pressure											Hydraulic test pressure (informative reference) (5)
		Conditions of fluid											
		W	G_1	G_2	G_3	H_1	H_2	H_3	H_4	H_5	H_6	H_7	
		120 ℃ max.	220 ℃ max.	300 ℃	350 ℃	400 ℃	425 ℃	450 ℃	475 ℃	490 ℃	500 ℃	510 ℃	
2K	SS400, SF390A (3), S20C (2), SC410	0.29 { 3}	0.20 { 2}	—	—	—	—	—	—	—	—	—	0.39 { 4}
5K	SS400, SF390A (3), SFVC1, S20C (2), SC410, SCPH1	0.69 { 7}	0.59 { 6}	0.49 { 5}	—	—	—	—	—	—	—	—	0.98 { 10}
10K	SS400, SF390A (3), SFVC1, S20C (2), SC410, SCPH1	1.37 { 14}	1.18 {12}	0.98 {10}	—	—	—	—	—	—	—	—	1.96 { 20}
16K	SF440A (3), SFVC2A, S25C (2), SC 480 (4), SCPH2	2.65 { 27}	2.45 {25}	2.26 {23}	2.06 {21}	1.77 {18}	1.57 {16}	—	—	—	—	—	3.92 { 40}
20K	SF440A (3), SFVC2A, S25C (2), SC 480 (4), SCPH2	3.33 { 34}	3.04 {31}	2.84 {29}	2.55 {26}	2.26 {23}	1.96 {20}	—	—	—	—	—	4.90 { 50}
30K	SF440A (3), SFVC2A, S25C (2), SC 480 (4), SCPH2	5.00 { 51}	4.51 {46}	4.22 {43}	3.82 {39}	3.33 {34}	2.94 {30}	—	—	—	—	—	7.35 { 75}
	SFVAF1, SCPH11	(5.00 { 51})	(4.51 {46})	(4.22 {43})	(3.82 {39})	3.73 {38}	3.53 {36}	3.33 {34}	2.94 {30}	—	—	—	
	SFVAF11A, SCPH21	(5.00 { 51})	(4.51 {46})	(4.22 {43})	(3.82 {39})	(3.73 {38})	(3.53 {36})	(3.33 {34})	3.14 {32}	2.94 {30}	—	—	
40K	SF440A (3), SFVC2A, S25C (2), SC 480 (4), SCPH2	6.67 { 68}	6.08 {62}	5.59 {57}	5.10 {52}	4.51 {46}	3.92 {40}	—	—	—	—	—	9.81 {100}
	SFVAF1, SCPH11	(6.67 { 68})	(6.08 {62})	(5.59 {57})	(5.10 {52})	5.00 {51}	4.71 {48}	4.41 {45}	3.92 {40}	—	—	—	
	SFVAF11A, SCPH21	(6.67 { 68})	(6.08 {62})	(5.59 {57})	(5.10 {52})	(5.00 {51})	(4.71 {48})	(4.41 {45})	4.12 {42}	3.92 {40}	3.73 {38}	3.53 {36}	
63K	SF440A (3), SFVC2A, S25C (3), SC 480 (4), SCPH2	10.49 {107}	9.51 {97}	8.83 {90}	7.94 {81}	7.06 {72}	6.18 {63}	—	—	—	—	—	15.69 {160}
	SFVAF1, SCPH11	(10.49 {107})	(9.51 {97})	(8.83 {90})	(7.94 {81})	7.85 {80}	7.45 {76}	6.96 {71}	6.18 {63}	—	—	—	
	SFVAF11A, SCPH21	(10.49 {107})	(9.51 {97})	(8.83 {90})	(7.94 {81})	(7.85 {80})	(7.45 {76})	(6.96 {71})	6.47 {66}	6.18 {63}	5.79 {59}	5.49 {56}	

Notes (1) The materials shall be those of Attached Table 1 as standard, and in the relevant standard of the respective material symbol, those of stronger in the tensile strength than the material taken as the standard may be used.

In addition, the materials other than given in Attached Table 1 are subject to the agreement between the manufacturer and purchaser.

Further, the material symbols in Attached Table 1 are in accordance with the following Table.

Symbol	Relevant standard
SS400	**JIS G 3101**
SF390A, SF440A	**JIS G 3201**
SFVC1, SFVC2A	**JIS G 3202**
SFVAF1, SFVAF11A	**JIS G 3203**
S20C, S25C	**JIS G 4051**
SC410, SC480	**JIS G 5101**
SCPH1, SCPH2, SCPH11, SCPH21	**JIS G 5151**

(2) These are subjected to inspection in accordance with **JIS G 0303**, and S20C shall be that of 400 N/mm^2{40.8 kgf/mm^2} or over in tensile strength and S25C shall be that of 440 N/mm^2{44.9 kgf/mm^2} or over in tensile strength.

(3) These shall be those of 0.35 % or under in carbon content.

(4) This shall be applicable to 350 ℃ or under in maximum working temperature.

(5) The hydraulic test pressure shows the test pressure as informative reference when a flange has been attached to a pipe, and otherwise specified, it may be exempt from application.

Remarks 1 The condition of fluid W applies only to the steady flow water (having smaller pressure variation) of 120 ℃ or under.

2 The conditions of fluid G_1, G_2 and G_3 apply respectively to the vapor, air, gas, oil or pulsating water (having pressure variation), etc. at the temperature of Attached Table 1.

3 The condition of fluid H_1 applies to the cases of vapor, air, gas, oil, etc. at 400 ℃.

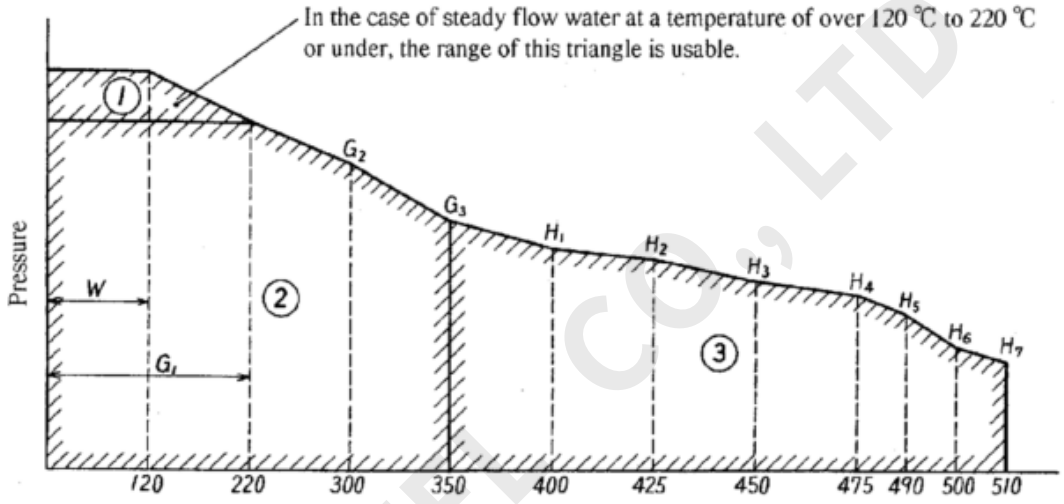
4 The conditions of fluid H_2 to H_7 apply to the vapor, air, gas, oil, etc. at 425 ℃ up to 510 ℃, when the creep of material due to high temperature is anticipated.

5 When the temperature or pressure stands in the intermediate range of the values in Attached Table 1, the maximum working pressure or temperature may be determined by the interpolation (see Attached Fig. 1).

6 When the special conditions of impact, corrosion, and the like are accompanied, the maximum working pressure corresponding to the temperature of higher level shall be applied or that of nominal pressure of higher level shall be applied.

7 Those given in parentheses are not generally be used, but are given as informative reference to design.

8 When the conditions of fluid are required to express by symbols, W to H_7 shall be used.



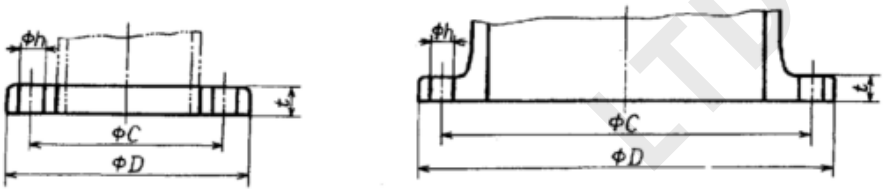
① The usable range only for the steady flow water

② The usable range for vapor, air, gas, oil or pulsating water or the like

③ The usable range for vapor, air, gas, oil or the like

Attached Fig. 1 Interpolation when the temperature or pressure stands in the intermediate range of the values in Attached Table 1

Attached Table 2 Basic dimensions of nominal pressure 2K flanges



Unit: mm

Nominal size	Outside diameter of steel pipe to be applied	Outside diameter of flange D	Thickness of flange t	Bolt holes			Bolt size
				Diameter of bolt circle C	Number	Diameter h	
450	457.2	605	22	555	16	23	M20
500	508.0	655	22	605	20	23	M20
(550)	558.8	720	24	665	20	25	M22
600	609.6	770	24	715	20	25	M22
(650)	660.4	825	24	770	24	25	M22
700	711.2	875	24	820	24	25	M22
(750)	762.0	945	24	880	24	27	M24
800	812.8	995	24	930	24	27	M24
(850)	863.6	1 045	24	980	24	27	M24
900	914.4	1 095	24	1 030	24	27	M24
1 000	1 016.0	1 195	26	1 130	28	27	M24
(1 100)	1 117.6	1 305	26	1 240	28	27	M24
1 200	1 219.2	1 420	26	1 350	32	27	M24
1 350	1 371.6	1 575	26	1 505	32	27	M24
1 500	1 524.0	1 730	28	1 660	36	27	M24

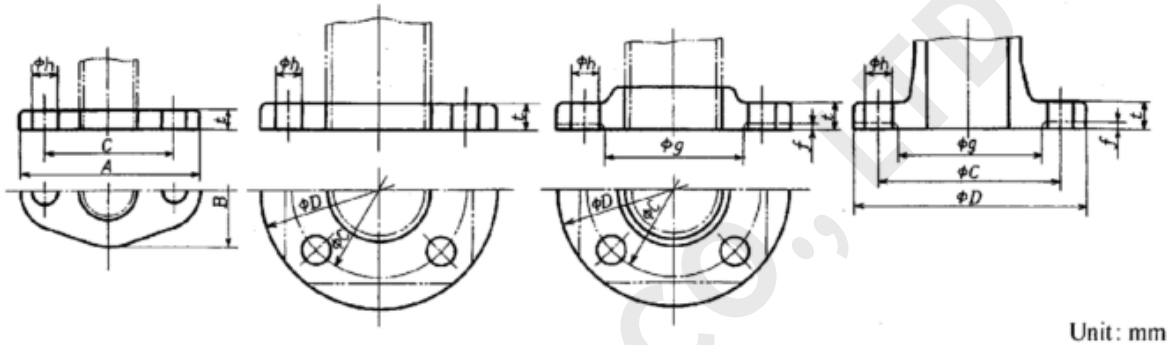
Remarks 1 For the basic dimensions for flanges of nominal size 400 or under, Attached Table 3 shall be applied.

2 Those of nominal size in parentheses should not preferably be used as far as possible.

3 The facings of flanges shall be in accordance with the nominal pressure 5K-flanges of Attached Table 10.

4 The bolt hole diameter (h) may also use the Grade 3 of **JIS B 1001**, subject to the agreement between the manufacturer and purchaser.

Attached Table 3 Basic dimensions of nominal pressure 5K flanges



Unit: mm

Nominal size	Outside diameter of steel pipe to be applied	Outside diameter of flange D ($A \times B$)	Dimensions for respective parts of flange			Bolt holes			Bolt size
			t	f	Diameter g	Diameter of bolt circle C	Number	Diameter h	
10	17.3	75 (75×45)	9	1	39	55	4 (2)	12	M10
15	21.7	80 (80×50)	9	1	44	60	4 (2)	12	M10
20	27.2	85	10	1	49	65	4	12	M10
25	34.0	95	10	1	59	75	4	12	M10
32	42.7	115	12	2	70	90	4	15	M12
40	48.6	120	12	2	75	95	4	15	M12
50	60.5	130	14	2	85	105	4	15	M12
65	76.3	155	14	2	110	130	4	15	M12
80	89.1	180	14	2	121	145	4	19	M16
(90)	101.6	190	14	2	131	155	4	19	M16
100	114.3	200	16	2	141	165	8	19	M16
125	139.8	235	16	2	176	200	8	19	M16
150	165.2	265	18	2	206	230	8	19	M16
(175)	190.7	300	18	2	232	260	8	23	M20
200	216.3	320	20	2	252	280	8	23	M20
(225)	241.8	345	20	2	277	305	12	23	M20
250	267.4	385	22	2	317	345	12	23	M20
300	318.5	430	22	3	360	390	12	23	M20
350	355.6	480	24	3	403	435	12	25	M22
400	406.4	540	24	3	463	495	16	25	M22
450	457.2	605	24	3	523	555	16	25	M22
500	508.0	655	24	3	573	605	20	25	M22
(550)	558.8	720	26	3	630	665	20	27	M24
600	609.6	770	26	3	680	715	20	27	M24
(650)	660.4	825	26	3	735	770	24	27	M24
700	711.2	875	26	3	785	820	24	27	M24
(750)	762.0	945	28	3	840	880	24	33	M30
800	812.8	995	28	3	890	930	24	33	M30
(850)	863.6	1 045	28	3	940	980	24	33	M30
900	914.4	1 095	30	3	990	1 030	24	33	M30
1 000	1 016.0	1 195	32	3	1 090	1 130	28	33	M30
(1 100)	1 117.6	1 305	32	3	1 200	1 240	28	33	M30
1 200	1 219.2	1 420	34	3	1 305	1 350	32	33	M30
1 350	1 371.6	1 575	34	3	1 460	1 505	32	33	M30
1 500	1 524.0	1 730	36	3	1 615	1 660	36	33	M30

Remarks 1 Those of nominal size in parentheses should not preferably be used as far as possible.

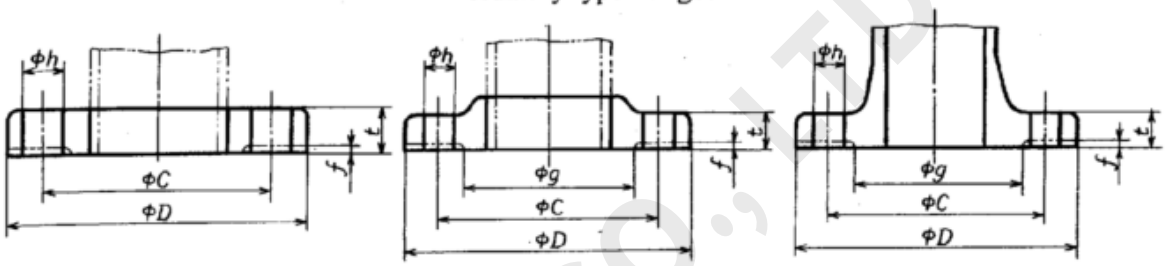
2 The facings of flanges shall be in accordance with Attached Tables 10 and 11. However, when required, the large raised face as shown by chain double-dashed lines may also be used.

3 For those of nominal size 50 or under, square shape as indicated by chain double-dashed lines may be used.

4 The bolt hole diameter (h), for the bolt size of M30, shall be that of in accordance with Grade 2 of **JIS B 1001**.

In the case where the bolt size is not smaller than M20, particularly when coarse bolt of **JIS B 1180** is used for pump for general use or the like, so that the diameter of bolt hole (h) in the Table can not be applicable, Grade 3 of **JIS B 1001** may be applied subject to the agreement between the manufacturer and purchaser.

Attached Table 4-1 Basic dimensions of nominal pressure 10K ordinary type flanges



Unit: mm

Nominal size	Outside diameter of steel pipe to be applied	Outside diameter of flange D	Dimensions for respective parts of flange			Bolt holes			Bolt size
			t	f	Diameter g	Diameter of bolt circle C	Number	Diameter h	
10	17.3	90	12	1	46	65	4	15	M12
15	21.7	95	12	1	51	70	4	15	M12
20	27.2	100	14	1	56	75	4	15	M12
25	34.0	125	14	1	67	90	4	19	M16
32	42.7	135	16	2	76	100	4	19	M16
40	48.6	140	16	2	81	105	4	19	M16
50	60.5	155	16	2	96	120	4	19	M16
65	76.3	175	18	2	116	140	4	19	M16
80	89.1	185	18	2	126	150	8	19	M16
(90)	101.6	195	18	2	136	160	8	19	M16
100	114.3	210	18	2	151	175	8	19	M16
125	139.8	250	20	2	182	210	8	23	M20
150	165.2	280	22	2	212	240	8	23	M20
(175)	190.7	305	22	2	237	265	12	23	M20
200	216.3	330	22	2	262	290	12	23	M20
(225)	241.8	350	22	2	282	310	12	23	M20
250	267.4	400	24	2	324	355	12	25	M22
300	318.5	445	24	3	368	400	16	25	M22
350	355.6	490	26	3	413	445	16	25	M22
400	406.4	560	28	3	475	510	16	27	M24
450	457.2	620	30	3	530	565	20	27	M24
500	508.0	675	30	3	585	620	20	27	M24
(550)	558.8	745	32	3	640	680	20	33	M30
600	609.6	795	32	3	690	730	24	33	M30
(650)	660.4	845	34	3	740	780	24	33	M30
700	711.2	905	34	3	800	840	24	33	M30
(750)	762.0	970	36	3	855	900	24	33	M30
800	812.8	1 020	36	3	905	950	28	33	M30
(850)	863.6	1 070	36	3	955	1 000	28	33	M30
900	914.4	1 120	38	3	1 005	1 050	28	33	M30
1 000	1 016.0	1 235	40	3	1 110	1 160	28	39	M36
(1 100)	1 117.6	1 345	42	3	1 220	1 270	28	39	M36
1 200	1 219.2	1 465	44	3	1 325	1 380	32	39	M36
1 350	1 371.6	1 630	48	3	1 480	1 540	36	45	M42
1 500	1 524.0	1 795	50	3	1 635	1 700	40	45	M42

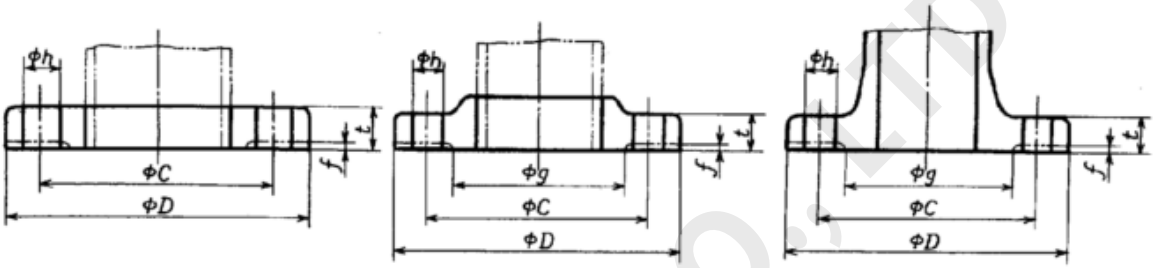
Remarks 1 Those of nominal size in parentheses should not preferably be used as far as possible.

2 The facings of flanges shall be in accordance with Attached Tables 10 and 11. However, when required, the large raised face as shown by chain double-dashed lines may also be used.

3 The bolt hole diameter (h), for the bolt size of M30 or larger, shall be that of in accordance with Grade 2 of **JIS B 1001**.

In the case where the bolt size is not smaller than M20, particularly when coarse bolt of **JIS B 1180** is used for pump for general use or the like, so that the diameter of bolt hole (h) in the Table can not be applicable, Grade 3 of **JIS B 1001** may be applied subject to the agreement between the manufacturer and purchaser.

Attached Table 4-2 Basic dimensions of nominal pressure 10K thin type flanges

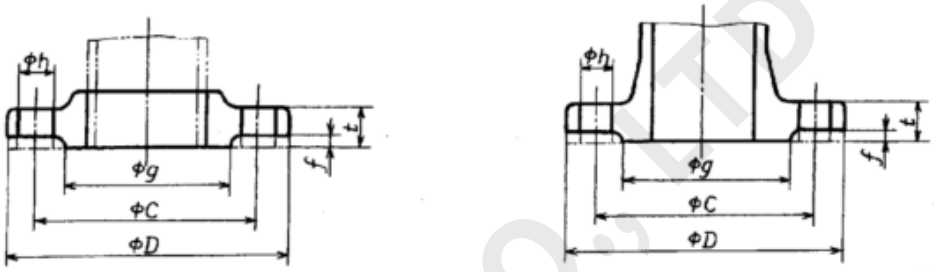


Unit: mm

Nominal size	Outside diameter of steel pipe to be applied	Outside diameter of flange D	Dimensions for respective parts of flange			Bolt holes			Bolt size
			t	f	Diameter g	Diameter of bolt circle C	Number	Diameter h	
10	17.3	90	9	1	46	65	4	12	M10
15	21.7	95	9	1	51	70	4	12	M10
20	27.2	100	10	1	56	75	4	12	M10
25	34.0	125	12	1	67	90	4	15	M12
32	42.7	135	12	2	76	100	4	15	M12
40	48.6	140	12	2	81	105	4	15	M12
50	60.5	155	14	2	96	120	4	15	M12
65	76.3	175	14	2	116	140	4	15	M12
80	89.1	185	14	2	126	150	8	15	M12
(90)	101.6	195	14	2	136	160	8	15	M12
100	114.3	210	16	2	151	175	8	15	M12
125	139.8	250	18	2	182	210	8	19	M16
150	165.2	280	18	2	212	240	8	19	M16
(175)	190.7	305	20	2	237	265	12	19	M16
200	216.3	330	20	2	262	290	12	19	M16
(225)	241.8	350	20	2	282	310	12	19	M16
250	267.4	400	22	2	324	355	12	23	M20
300	318.5	445	22	3	368	400	16	23	M20
350	355.6	490	24	3	413	445	16	23	M20
400	406.4	560	24	3	475	510	16	25	M22

Remarks: Refer to the Remarks of Attached Table 4-1.

Attached Table 5 Basic dimensions of nominal pressure 16K flanges



Unit: mm

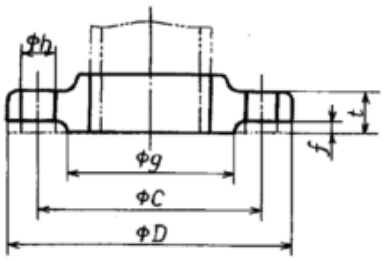
Nominal size	Outside diameter of steel pipe to be applied	Outside diameter of flange D	Dimensions for respective parts of flange			Bolt holes			Bolt size
			t	f	Diameter g	Diameter of bolt circle C	Number	Diameter h	
10	17.3	90	12	1	46	65	4	15	M12
15	21.7	95	12	1	51	70	4	15	M12
20	27.2	100	14	1	56	75	4	15	M12
25	34.0	125	14	1	67	90	4	19	M16
32	42.7	135	16	2	76	100	4	19	M16
40	48.6	140	16	2	81	105	4	19	M16
50	60.5	155	16	2	96	120	8	19	M16
65	76.3	175	18	2	116	140	8	19	M16
80	89.1	200	20	2	132	160	8	23	M20
(90)	101.6	210	20	2	145	170	8	23	M20
100	114.3	225	22	2	160	185	8	23	M20
125	139.8	270	22	2	195	225	8	25	M22
150	165.2	305	24	2	230	260	12	25	M22
200	216.3	350	26	2	275	305	12	25	M22
250	267.4	430	28	2	345	380	12	27	M24
300	318.5	480	30	3	395	430	16	27	M24
350	355.6	540	34	3	440	480	16	33	M30×3
400	406.4	605	38	3	495	540	16	33	M30×3
450	457.2	675	40	3	560	605	20	33	M30×3
500	508.0	730	42	3	615	660	20	33	M30×3
(550)	558.8	795	44	3	670	720	20	39	M36×3
600	609.6	845	46	3	720	770	24	39	M36×3
(650)	660.4	895	48	5	770	820	24	39	M36×3
700	711.2	960	50	5	820	875	24	42	M39×3
(750)	762.0	1 020	52	5	880	935	24	42	M39×3
800	812.8	1 085	54	5	930	990	24	48	M45×3
(850)	863.6	1 135	56	5	980	1 040	24	48	M45×3
900	914.4	1 185	58	5	1 030	1 090	28	48	M45×3
1 000	1 016.0	1 320	62	5	1 140	1 210	28	56	M52×3
(1 100)	1 117.6	1 420	66	5	1 240	1 310	32	56	M52×3
1 200	1 219.2	1 530	70	5	1 350	1 420	32	56	M52×3
(1 300)	1 320.8	1 645	74	5	1 450	1 530	32	62	M56×3
1 350	1 371.6	1 700	76	5	1 510	1 590	32	62	M56×3
(1 400)	1 422.4	1 755	78	5	1 560	1 640	36	62	M56×3
1 500	1 524.0	1 865	80	5	1 670	1 750	36	62	M56×3

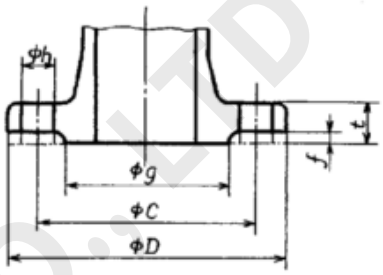
Remarks 1 Those of nominal size in parentheses should not preferably be used as far as possible.

2 The facings of flanges shall be in accordance with Attached Tables 10 and 11. However, in the case of nominal size 600 or under, the flat face as shown by chain double-dashed lines may also be employed, as required.

3 The bolt hole diameters (*h*), in the case of bolt size M30 × 3 or over, shall be in accordance with Grade 2 of **JIS B 1001**.

Attached Table 6 Basic dimensions of nominal pressure 20K flanges





Unit : mm

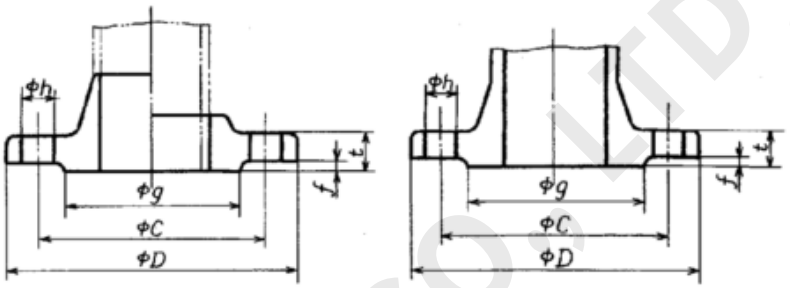
Nominal size	Outside diameter of steel pipe to be applied	Outside diameter of flange *D*	Dimensions for respective parts of flange			Bolt holes			Bolt size
			t	*f*	Diameter *g*	Diameter of bolt circle *C*	Number	Diameter *h*	
10	17.3	90	14	1	46	65	4	15	M12
15	21.7	95	14	1	51	70	4	15	M12
20	27.2	100	16	1	56	75	4	15	M12
25	34.0	125	16	1	67	90	4	19	M16
32	42.7	135	18	2	76	100	4	19	M16
40	48.6	140	18	2	81	105	4	19	M16
50	60.5	155	18	2	96	120	8	19	M16
65	76.3	175	20	2	116	140	8	19	M16
80	89.1	200	22	2	132	160	8	23	M20
(90)	101.6	210	24	2	145	170	8	23	M20
100	114.3	225	24	2	160	185	8	23	M20
125	139.8	270	26	2	195	225	8	25	M22
150	165.2	305	28	2	230	260	12	25	M22
200	216.3	350	30	2	275	305	12	25	M22
250	267.4	430	34	2	345	380	12	27	M24
300	318.5	480	36	3	395	430	16	27	M24
350	355.6	540	40	3	440	480	16	33	M30×3
400	406.4	605	46	3	495	540	16	33	M30×3
450	457.2	675	48	3	560	605	20	33	M30×3
500	508.0	730	50	3	615	660	20	33	M30×3
(550)	558.8	795	52	3	670	720	20	39	M36×3
600	609.6	845	54	3	720	770	24	39	M36×3
(650)	660.4	945	60	5	790	850	24	48	M45×3
700	711.2	995	64	5	840	900	24	48	M45×3
(750)	762.0	1 080	68	5	900	970	24	56	M52×3
800	812.8	1 140	72	5	960	1 030	24	56	M52×3
(850)	863.6	1 200	74	5	1 020	1 090	24	56	M52×3
900	914.4	1 250	76	5	1 070	1 140	28	56	M52×3

Remarks 1 Those of nominal size in parentheses should not preferably be used as far as possible.

2 The facings of flanges shall be in accordance with Attached Tables 10 and 11. However, in the case of nominal size 600 or under, the flat face as shown by chain double-dashed lines may also be employed, as required.

3 The bolt hole diameters (*h*), in the case of bolt size M30 × 3 or over, shall be in accordance with Grade 2 of **JIS B 1001**.

Attached Table 7 Basic dimensions of nominal pressure 30K flanges



Unit: mm

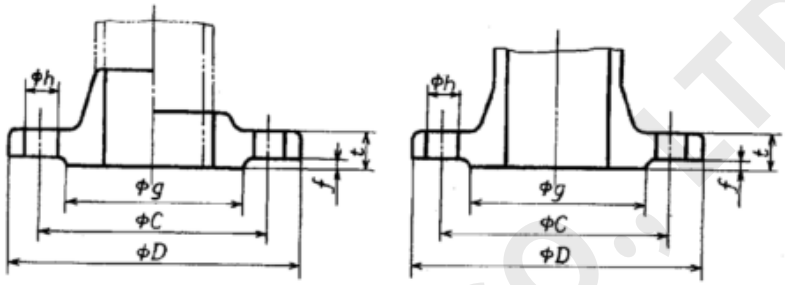
Nominal size	Outside diameter of steel pipe to be applied	Outside diameter of flange *D*	Dimensions for respective parts of flange			Bolt holes			Bolt size
			t	*f*	Diameter *g*	Diameter of bolt circle *C*	Number	Diameter *h*	
10	17.3	110	16	1	52	75	4	19	M16
15	21.7	115	18	1	55	80	4	19	M16
20	27.2	120	18	1	60	85	4	19	M16
25	34.0	130	20	1	70	95	4	19	M16
32	42.7	140	22	2	80	105	4	19	M16
40	48.6	160	22	2	90	120	4	23	M20
50	60.5	165	22	2	105	130	8	19	M16
65	76.3	200	26	2	130	160	8	23	M20
80	89.1	210	28	2	140	170	8	23	M20
(90)	101.6	230	30	2	150	185	8	25	M22
100	114.3	240	32	2	160	195	8	25	M22
125	139.8	275	36	2	195	230	8	25	M22
150	165.2	325	38	2	235	275	12	27	M24
200	216.3	370	42	2	280	320	12	27	M24
250	267.4	450	48	2	345	390	12	33	M30×3
300	318.5	515	52	3	405	450	16	33	M30×3
350	355.6	560	54	3	450	495	16	33	M30×3
400	406.4	630	60	3	510	560	16	39	M36×3

Remarks 1 Those of nominal size in parentheses should not preferably be used as far as possible.

2 The facings of flanges shall be in accordance with Attached Tables 10 and 11. Further, *g* indicates the case of the large raised face of Attached Table 10.

3 The bolt hole diameters (*h*), in the case of bolt size M30×3 or over, shall be in accordance with Grade 2 of **JIS B 1001**.

Attached Table 8 Basic dimensions of nominal pressure 40K flanges



Unit : mm

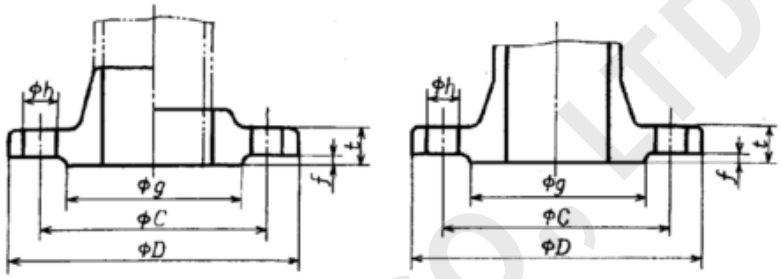
Nominal size	Outside diameter of steel pipe to be applied	Outside diameter of flange D	Dimensions for respective parts of flange			Bolt holes			Bolt size
			t	f	Diameter g	Diameter of bolt circle C	Number	Diameter h	
10	17.3	110	18	1	52	75	4	19	M16
15	21.7	115	20	1	55	80	4	19	M16
20	27.2	120	20	1	60	85	4	19	M16
25	34.0	130	22	1	70	95	4	19	M16
32	42.7	140	24	2	80	105	4	19	M16
40	48.6	160	24	2	90	120	4	23	M20
50	60.5	165	26	2	105	130	8	19	M16
65	76.3	200	30	2	130	160	8	23	M20
80	89.1	210	32	2	140	170	8	23	M20
(90)	101.6	230	34	2	150	185	8	25	M22
100	114.3	250	36	2	165	205	8	25	M22
125	139.8	300	40	2	200	250	8	27	M24
150	165.2	355	44	2	240	295	12	33	M30×3
200	216.3	405	50	2	290	345	12	33	M30×3
250	267.4	475	56	2	355	410	12	33	M30×3
300	318.5	540	60	3	410	470	16	39	M36×3
350	355.6	585	64	3	455	515	16	39	M36×3
400	406.4	645	70	3	515	570	16	39	M36×3

Remarks 1 Those of nominal size in parentheses should not preferably be used as far as possible.

2 The facings of flanges shall be in accordance with Attached Tables 10 and 11. Further, g indicates the case of the large raised face of Attached Table 10.

3 The bolt hole diameters (h), in the case of bolt size M30×3 or over, shall be in accordance with Grade 2 of **JIS B 1001**.

Attached Table 9 Basic dimensions of nominal pressure 63K flanges



Unit: mm

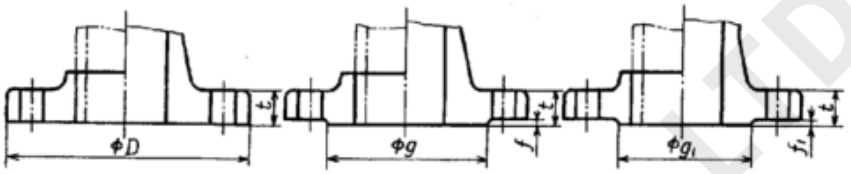
Nominal size	Outside diameter of steel pipe to be applied	Outside diameter of flange D	Dimensions for respective parts of flange			Bolt holes			Bolt size
			t	f	Diameter g	Diameter of bolt circle C	Number	Diameter h	
10	17.3	115	23	1	52	80	4	19	M16
15	21.7	120	23	1	55	85	4	19	M16
20	27.2	135	25	1	60	95	4	23	M20
25	34.0	140	27	1	70	100	4	23	M20
32	42.7	150	30	2	80	110	4	23	M20
40	48.6	175	32	2	90	130	4	25	M22
50	60.5	185	34	2	105	145	8	23	M20
65	76.3	220	38	2	130	175	8	25	M22
80	89.1	230	40	2	140	185	8	25	M22
(90)	101.6	255	42	2	150	205	8	27	M24
100	114.3	270	44	2	165	220	8	27	M24
125	139.8	325	50	2	200	265	8	33	M30×3
150	165.2	365	54	2	240	305	12	33	M30×3
200	216.3	425	60	2	290	360	12	33	M30×3
250	267.4	500	68	2	355	430	12	39	M36×3
300	318.5	560	77	3	410	485	16	39	M36×3
350	355.6	615	81	3	455	530	16	46	M42×3
400	406.4	680	89	3	515	590	16	46	M42×3

Remarks 1 Those of nominal size in parentheses should not preferably be used as far as possible.

2 The facings of flanges shall be in accordance with Attached Tables 10 and 11. Further, g indicates the case of the large raised face of Attached Table 10.

3 The bolt hole diameters (h), when the bolt size M30×3 or over and M36×3 or under, shall be in accordance with Grade 2 of **JIS B 1001**.

Attached Table 10 Facings (1)



Flat face Large raised face Small raised face

Unit: mm

Nominal size	Large raised face												Small raised face	
	Nominal pressure 5K		Nominal pressure 10K		Nominal pressure 16K		Nominal pressure 20K		Nominal pressure 30K		Nominal pressure 40K and 63K		g_1	f_1
	g	f	g	f	g	f	g	f	g	f	g	f		
10	39	1	46	1	46	1	46	1	52	1	52	1	35	1
15	44	1	51	1	51	1	51	1	55	1	55	1	42	1
20	49	1	56	1	56	1	56	1	60	1	60	1	50	1
25	59	1	67	1	67	1	67	1	70	1	70	1	60	1
32	70	2	76	2	76	2	76	2	80	2	80	2	68	2
40	75	2	81	2	81	2	81	2	90	2	90	2	75	2
50	85	2	96	2	96	2	96	2	105	2	105	2	90	2
65	110	2	116	2	116	2	116	2	130	2	130	2	105	2
80	121	2	126	2	132	2	132	2	140	2	140	2	120	2
90	131	2	136	2	145	2	145	2	150	2	150	2	130	2
100	141	2	151	2	160	2	160	2	160	2	165	2	145	2
125	176	2	182	2	195	2	195	2	195	2	200	2	170	2
150	206	2	212	2	230	2	230	2	235	2	240	2	205	2
175	232	2	237	2	—	—	—	—	—	—	—	—	—	—
200	252	2	262	2	275	2	275	2	280	2	290	2	260	2
225	277	2	282	2	—	—	—	—	—	—	—	—	—	—
250	317	2	324	2	345	2	345	2	345	2	355	2	315	2
300	360	3	368	3	395	3	395	3	405	3	410	3	375	3
350	403	3	413	3	440	3	440	3	450	3	455	3	415	3
400	463	3	475	3	495	3	495	3	510	3	515	3	465	3
450	523	3	530	3	560	3	560	3	—	—	—	—	—	—
500	573	3	585	3	615	3	615	3	—	—	—	—	—	—
550	630	3	640	3	670	3	670	3	—	—	—	—	—	—
600	680	3	690	3	720	3	720	3	—	—	—	—	—	—
650	735	3	740	3	770	5	790	5	—	—	—	—	—	—
700	785	3	800	3	820	5	840	5	—	—	—	—	—	—
750	840	3	855	3	880	5	900	5	—	—	—	—	—	—
800	890	3	905	3	930	5	960	5	—	—	—	—	—	—
850	940	3	955	3	980	5	1 020	5	—	—	—	—	—	—
900	990	3	1 005	3	1 030	5	1 070	5	—	—	—	—	—	—
1 000	1 090	3	1 110	3	1 140	5	—	—	—	—	—	—	—	—
1 100	1 200	3	1 220	3	1 240	5	—	—	—	—	—	—	—	—
1 200	1 305	3	1 325	3	1 350	5	—	—	—	—	—	—	—	—
1 300	—	—	—	—	1 450	5	—	—	—	—	—	—	—	—
1 350	1 460	3	1 480	3	1 510	5	—	—	—	—	—	—	—	—
1 400	—	—	—	—	1 560	5	—	—	—	—	—	—	—	—
1 500	1 615	3	1 635	3	1 670	5	—	—	—	—	—	—	—	—

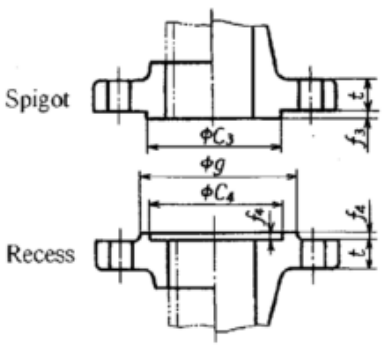
Remarks 1 The facing dimensions of flat face shall be the outside diameter D of the flange.

2 The thickness t of the flange shall be in accordance with Attached Tables 2 to 9.

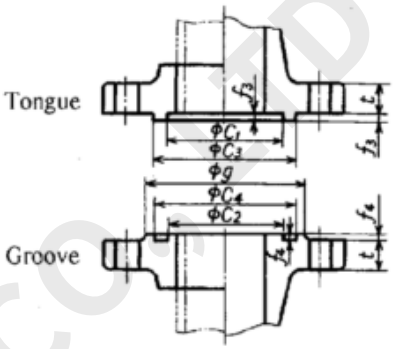
3 The dimensions g and f of the large raised face shall coincide with those of Attached Tables 2 to 9.

4 The dimensional tolerances of the facings shall be in accordance with Attached Table 12.

Attached Table 11 Facings (2)



Spigot and recess type



Tongue and groove type

Unit: mm

Nominal size	Spigot and recess type				Tongue and groove type					
	C_3	C_4	f_3	f_4	C_1	C_3	f_3	C_2	C_4	f_4
10	38	39	6	5	28	38	6	27	39	5
15	42	43	6	5	32	42	6	31	43	5
20	50	51	6	5	38	50	6	37	51	5
25	60	61	6	5	45	60	6	44	61	5
32	70	71	6	5	55	70	6	54	71	5
40	75	76	6	5	60	75	6	59	76	5
50	90	91	6	5	70	90	6	69	91	5
65	110	111	6	5	90	110	6	89	111	5
80	120	121	6	5	100	120	6	99	121	5
90	130	131	6	5	110	130	6	109	131	5
100	145	146	6	5	125	145	6	124	146	5
125	175	176	6	5	150	175	6	149	176	5
150	215	216	6	5	190	215	6	189	216	5
200	260	261	6	5	230	260	6	229	261	5
250	325	326	6	5	295	325	6	294	326	5
300	375	376	6	5	340	375	6	339	376	5
350	415	416	6	5	380	415	6	379	416	5
400	475	476	6	5	440	475	6	439	476	5
450	523	524	6	5	483	523	6	482	524	5
500	575	576	6	5	535	575	6	534	576	5
550	625	626	6	5	585	625	6	584	626	5
600	675	676	6	5	635	675	6	634	676	5
650	727	728	6	5	682	727	6	681	728	5
700	777	778	6	5	732	777	6	731	778	5
750	832	833	6	5	787	832	6	786	833	5
800	882	883	6	5	837	882	6	836	883	5
850	934	935	6	5	889	934	6	888	935	5
900	987	988	6	5	937	987	6	936	988	5
1 000	1 092	1 094	6	5	1 042	1 092	6	1 040	1 094	5
1 100	1 192	1 194	6	5	1 142	1 192	6	1 140	1 194	5
1 200	1 292	1 294	6	5	1 237	1 292	6	1 235	1 294	5
1 300	1 392	1 394	6	5	1 337	1 392	6	1 335	1 394	5
1 350	1 442	1 444	6	5	1 387	1 442	6	1 385	1 444	5
1 400	1 492	1 494	6	5	1 437	1 492	6	1 435	1 494	5
1 500	1 592	1 594	6	5	1 537	1 592	6	1 535	1 594	5

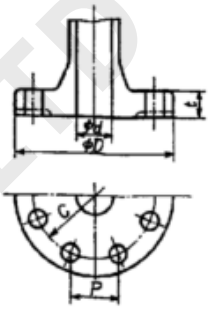
Remarks 1 The thickness t of the flange shall be in accordance with Attached Tables 6 to 9.

2 The dimensions of f_3 and f_4 may be made a little larger according to the types of gasket.

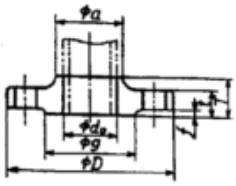
3 The dimensions g of spigot and recess type and tongue and groove type shall be in accordance with the g dimension of large raised face of respective nominal pressures in Attached Table 10.

4 The dimensional tolerances of facing shall be in accordance with Attached Table 12.

Attached Tabl



Flat face



Large raised face

Flanged part		Surface condition	Dimensional division	Dimensional tolerance
Outside diameter D	Integral flanges	Surface as forged (*)	300 or under	+not specified −2
			Over 300 to 600 or under	
			Over 600 to 1 000 or under	
			Over 1 000 to 1 500 or under	+not specified −3
			Over 1 500	
	Flanges other than integral flange	Finish	300 or under	±1
			Over 300 to 600 or under	±1.5
			Over 600 to 1 000 or under	±2
			Over 1 000 to 1 500 or under	±2.5
			Over 1 500	±3
Bore diameter	Integral flanges d (7)	Surface as forged (*)	16 or under	±1
			Over 16 to 63 or under	±1.5
			Over 63 to 125 or under	±2
			Over 125 to 250 or under	±2.5
			Over 250 to 500 or under	±3
			Over 500 to 1 000 or under	±4
			Over 1 000	±5
	Slip-on welding type flanges d_0	Finish	100 or under	+0.5 0
			Over 100 to 400 or under	+1 0
			Over 400 to 600 or under	+1.5 0
			Over 600 to 800 or under	+2 0
			Over 800 to 1 000 or under	+2.5 0
			Over 1 000	+3 0

Flanged part		Surface condit
Bore diameter	Welding neck flanges d	Finish
Bolt hole	Diameter of bolt circle C	–
	Pitch of hole P	Drill hole proc
Hub diameter	Slip-on welding type flange a and welding neck flange d_1	Surface as forged
		Finish

Notes (6) When processed with cutting, as required, these dimensional tolerances shall also appl

(7) This dimension d has been specified for the case where the bore diameter part is of cyl

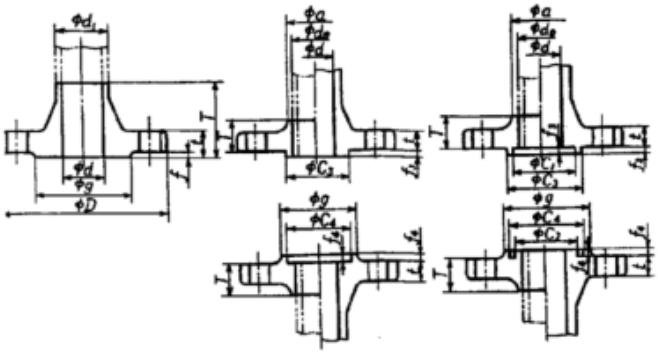
Remarks 1 As for the bore diameter d of the integral flanges of valve, pump and the like with su shall not be influential to the required wall thickness.

2 The thickness of the flange of valve or the like, of which face to face dimension ha above up to 100 %.

3 In the case of spot-facing with single face finish, the thickness of the spot-facing port

Previous page is blank

12 Dimensional tolerances



Small raised face Spigot and recess type Tongue and groove type

Unit: mm

Dimensional division	Dimensional tolerance	Flanged part		Surface condition	Dimensional division	Dimensional tolerance
100 or under	$^{0}_{-0.5}$	Facing	C_1, C_2 C_3, C_4	Finish	500 or under	±0.3
Over 100 to 400 or under	$^{0}_{-1}$				Over 500 to 1 000 or under	±0.35
Over 400 to 600 or under	$^{0}_{-1.5}$				Over 1 000 to 1 500 or under	±0.4
Over 600 to 800 or under	$^{0}_{-2}$				Over 1 500	±0.5
Over 800 to 1 000 or under	$^{0}_{-2.5}$		f_3, f_4	Finish	8 or under	±0.2
Over 1 000	$^{0}_{-3}$				Over 8	±0.25
250 or under	±0.5		g	Finish	220 or under	±0.8
Over 250 to 550 or under	±0.6				Over 220 to 650 or under	±0.9
Over 550 to 950 or under	±0.8				Over 650 to 1 000 or under	±1
Over 950 to 1 350 or under	±1				Over 1 000	±1.2
Over 1 350	±1.5	Thickness	t of flat face, spigot and recess type and tongue and groove type, as well as t-f of large raised face and small raised face	Single face finish	20 or under	$^{+1.5}_{0}$
—	±0.5				Over 20 to 50 or under	$^{+2}_{0}$
220 or under	$^{+2}_{0}$				Over 50 to 100 or under	$^{+3}_{0}$
Over 220 to 450 or under	$^{+3}_{0}$			Both face finish	20 or under	$^{+1}_{0}$
Over 450 to 650 or under	$^{+4}_{0}$				Over 20 to 50 or under	$^{+1.5}_{0}$
Over 650 to 850 or under	$^{+6}_{0}$				Over 50 to 100 or under	$^{+2}_{0}$
Over 850 to 1 000 or under	$^{+7}_{0}$	Height of hub T	Slip-on flange	Finish	50 or under	±1
Over 1 000	$^{+8}_{0}$				Over 50 to 100 or under	±1.5
220 or under	$^{+1}_{0}$				Over 100 to 200 or under	±2
Over 220 to 450 or under	$^{+1.5}_{0}$		Butt jointing flange	Finish	200 or under	$^{+2}_{0}$
Over 450 to 650 or under	$^{+2}_{0}$				Over 200 to 300 or under	$^{+3}_{0}$
Over 650 to 850 or under	$^{+2.5}_{0}$	Parallelism of flange face in respect to bolting surface		—	—	1° or under
Over 850 to 1 000 or under	$^{+3}_{0}$					
Over 1 000	$^{+3.5}_{0}$					

rical shape.

e as casted, increase of the above-mentioned tolerance up to 100 % may be permissible, as required. However, it

een restricted to a limit, may be permissible to increase the tolerances in the column of thicknesses mentioned

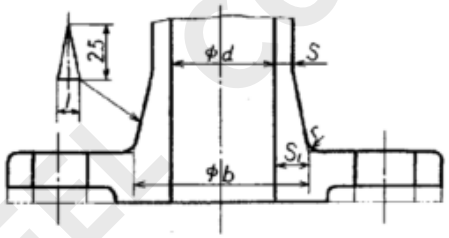
may be permissible on (−) side up to 70 % the tolerances in the column of thickness mentioned above.

Informative reference 1 Dimensions of integral flanges

This Informative reference 1 supplements the matters related to the specification in the text of this Standard, however, does not constitute any part of the specification.

The dimensions of the bore diameter and neck part of the integral flange are shown in Informative reference 1 Tables 1 to 5.

Informative reference 1 Table 1 Dimensions of integral flanges of nominal pressure 16K



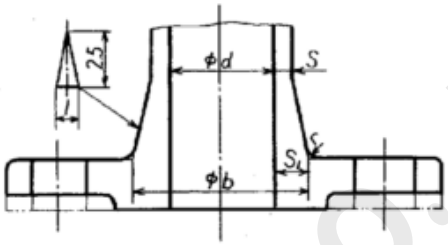
Unit: mm

Nominal size	Bore diameter d	In case of material SCPH2 or SC480			
		S	S_1	b	r
10	10	6	10	30	5
15	15	7	11	37	5
20	20	7	11	42	5
25	25	7	12	49	5
32	32	7	13	58	5
40	40	8	14	68	5
50	50	8	14	78	6
65	65	8	15	95	6
80	80	9	16	112	6
(90)	90	9	16	122	6
100	100	10	17	134	6
125	125	11	19	163	8
150	150	12	21	192	8
200	200	13	23	246	8
250	250	15	26	302	10
300	300	16	28	356	10
350	335	17	31	397	12
400	380	18	33	446	12
450	430	20	35	500	12
500	480	21	36	552	12
(550)	530	22	38	606	12
600	580	23	40	660	12
(650)	630	24	48	726	15
700	680	25	48	776	15
(750)	730	26	51	832	15
800	780	27	52,5	885	18
(850)	830	28	53	936	18
900	880	29	53	986	18
1 000	980	30	59	1 098	20
(1 100)	1 080	31	60	1 200	20
1 200	1 180	32	61	1 302	20
(1 300)	1 280	33	66	1 412	20
1 350	1 320	34	71	1 462	25
(1 400)	1 370	35	72	1 514	25
1 500	1 470	36	77	1 624	25

Remarks 1 Those of nominal size in parentheses should not preferably be used as far as possible.

2 The bore diameter (d) shall be in accordance with **JIS B 2001**.

Informative reference 1 Table 2 Dimensions of integral flanges of nominal pressure 20K

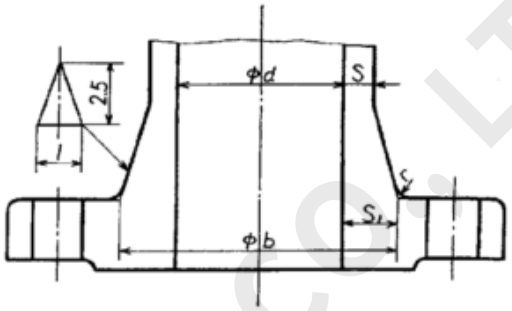


Unit: mm

Nominal size	Bore diameter d	In case of material SCPH2 or SC480			
		S	S_1	b	r
10	10	6	10	30	5
15	15	7	11	37	5
20	20	7	11	42	5
25	25	7	12	49	5
32	32	7	13	58	5
40	40	8	14	68	5
50	50	8	14	78	6
65	65	8	15	95	6
80	80	9	16	112	6
(90)	90	9	16	122	6
100	100	10	17	134	6
125	125	11	20	165	8
150	150	12	23	196	8
200	200	13	24	248	8
250	250	15	28	306	10
300	300	16	29	358	10
350	335	18	34	403	12
400	380	20	38	456	12
450	430	21	39	508	12
500	480	22	41	562	12
(550)	530	24	43	616	12
600	580	25	45	670	12
(650)	630	26	57	744	15
700	680	27	58	796	15
(750)	730	28	62	854	15
800	780	30	64	908	18
(850)	830	31	67	964	18
900	880	32	67	1 014	18

Remarks: Refer to Remarks 1 and 2 of Informative reference 1 Table 1.

Informative reference 1 Table 3 Dimensions of integral flanges of nominal pressure 30K

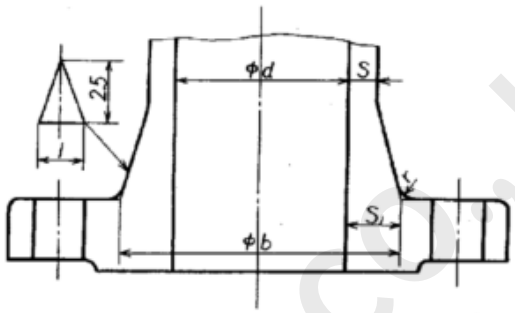


Unit: mm

Nominal size	Bore diameter d	In case of material SCPH2			
		S	S_1	b	r
15	15	7	14	43	5
20	20	8	15	50	5
25	25	8	15	55	6
32	32	8	15	62	6
40	40	9	16	72	6
50	50	9	18	86	6
65	65	10	21	107	6
80	80	10	21	122	6
(90)	90	11	22	134	6
100	100	11	22	144	8
125	125	12	25	175	8
150	150	13	28	206	10
200	200	16	31	262	10
250	250	18	33	316	12
300	300	20	36	372	12
350	335	22	41	417	15
400	380	24	45	470	15

Remarks: Refer to Remarks 1 and 2 of Informative reference 1 Table 1.

Informative reference 1 Table 4 Dimensions of integral flanges of nominal pressure 40K

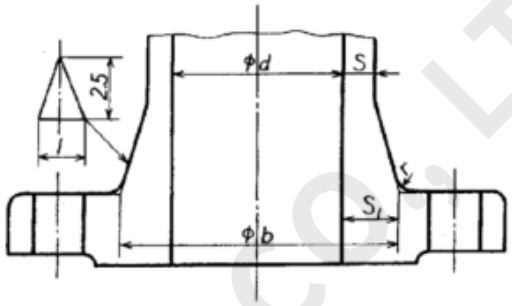


Unit: mm

Nominal size	Bore diameter d	In case of material SCPH2			
		S	S_1	b	r
15	15	8	14	43	5
20	20	9	15	50	5
25	25	9	16	57	5
32	32	9	17	66	6
40	38	10	18	74	6
50	50	10	20	90	6
65	62	11	23	108	6
80	75	12	24	123	6
(90)	85	12	24	133	6
100	100	13	26	152	6
125	120	14	30	180	8
150	150	16	35	220	8
200	200	18	38	276	10
250	245	21	43	331	10
300	295	23	45	385	12
350	325	25	48	421	12
400	375	28	54	483	12

Remarks: Refer to Remarks 1 and 2 of Informative reference 1 Table 1.

Informative reference 1 Table 5 Dimensions of integral flanges of nominal pressure 63K



Unit: mm

Nominal size	Bore diameter d	In case of material SCPH2			
		S	S_1	b	r
15	12	9	16	44	6
20	17	9	16	49	6
25	22	9	16	54	6
32	29	10	17	63	6
40	35	11	20	75	6
50	48	12	23	94	6
65	57	13	26	109	8
80	73	14	27	127	8
(90)	*85	14	29	143	8
100	98	15	31	160	8
125	120	17	35	190	10
150	146	19	39	224	10
200	190	22	44	278	12
250	238	26	52	342	12
300	283	30	56	395	15
350	310	32	60	430	15
400	355	34	64	483	15

Remarks: Refer to Remarks 1 and 2 of Informative reference 1 Table 1.
Those of bore diameter (d) with * (asterisk) are not specified in **JIS B 2001**.

Informative reference 2 Bolts and nuts for fastening flanges

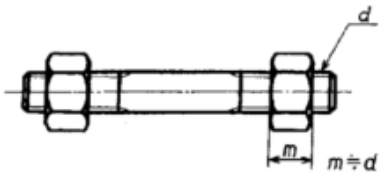
This Informative reference 2 supplements the matters related to the specification in the text of this Standard, however, does not constitute any part of the specification.

The strength class of mechanical property, materials and shapes of bolts and nuts used for fastening flanges made of materials (Table 2 in the text) as standard in dimensional specification are shown in Informative reference 2 Tables 1 and 2, and Figs. 1 to 3.

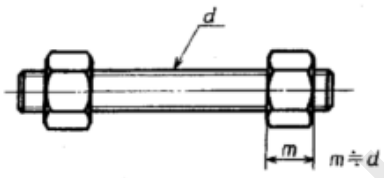
As to bolts and nuts for fastening flanges made of materials other than those of Table 2 in the text shall be subject to the agreement between the manufacturer and purchaser.

Informative reference 2 Table 1 Operating condition and materials of bolts and nuts

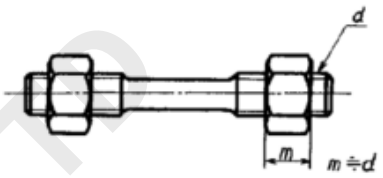
Nominal pressure (symbol)	Operating condition		Bolt		Nut		Shape
			Strength class	Material	Strength class	Material	
2K, 5K, 10K	220 ℃ or under		–	SS400 of **JIS G 3101**	–	SS400 of **JIS G 3101**	–
	In case of exceeding 220 ℃		–	SS490 of **JIS G 3101**	–		
16K, 20K	220 ℃ or under	M39 or smaller	4.6	–	4	–	–
		M42 or larger	–	SS400 of **JIS G 3101**	–	SS400 of **JIS G 3101**	
	Over 220 ℃ to 350 ℃ or under		–	S35C of **JIS G 4051**	–	S25C of **JIS G 4051**	
	Over 350 ℃ to 425 ℃ or under		–	SNB7 of **JIS G 4107**	–	S45C of **JIS G 4051**	
30K, 40K, 63K	350 ℃ or under		–	S35C (H) of **JIS G 4051**	–	S25C (N) of **JIS G 4051**	Informative reference 2 Fig. 1, Fig. 2 or Fig. 3
	Over 350 ℃ to 450 ℃ or under		–	SNB7 of **JIS G 4107**	–	S45C (H) of **JIS G 4051**	Informative reference 2 Fig. 2 or Fig. 3
	Over 450 ℃ to 510 ℃ or under		–	SNB16 of **JIS G 4107**	–	Molybdenum steel (material corresponding to Gr. 4 of **ASTM A 194**)	



Informative reference 2 Fig. 1
Shape of bolts and nuts



Informative reference 2 Fig. 2
Shape of bolts and nuts



Informative reference 2 Fig. 3
Shape of bolts and nuts

Remarks 1 In the case of exceeding 350 ℃, the shape of bolt should preferably be in accordance with Informative reference 2 Fig. 2 or 3.

2 In the case of being used for pipe series exceeding 350 ℃, the pitch diameter of threaded portion of bolt shall be made smaller in some extent.

3 In the case of not exceeding 350 ℃, alloy steel bolt shall be used for alloy steel flange.

4 Mechanical property for the material of **JIS G 4051** specified in Informative reference 2 Table 1 shall be as shown in Informative reference 2 Table 2.

5 Specification of **ASTM** (chemical composition and mechanical property) shall be shown in Informative reference 2 Table 3.

Informative reference 2 Table 2 Mechanical properties

Symbol	Heat treatment ℃			Tensile test				Impact test	Hardness test
	Normalizing (N)	Quenching (H)	Tempering	Yield point N/mm² {kgf/mm²}	Tensile strength N/mm²{kgf/mm²}	Elongation %	Reduction of area %	Impact value (Charpy) J/cm²{kgf・m/cm²}	Hardness HB
S25C (N)	860 to 910 Air cooling	–	–	–	–	–	–	–	123 to 183
S35C (H)	–	840 to 890 Water cooling	550 to 650 Rapid cooling	392{40} min.	569{58} min.	22 min.	55 min.	98.1{10} min.	–
S45C (H)	–	820 to 870 Water cooling	550 to 650 Rapid cooling	–	–	–	–	–	201 to 269

Informative reference 2 Table 3 Chemical composition and mechanical properties

Unit : %

Material	C	Mn	P	S	Si	Cr	Mo	Hardness HB
Gr. 4 of **ASTM A 194**	0.40 to 0.50	0.70 to 0.90	0.035 max.	0.040 max.	0.15 to 0.35	–	0.20 to 0.30	248 to 352

Informative reference 3 Gasket dimensions of pipe flanges

This Informative reference 3 supplements the matters related to the specification in the text of this Standard, however, does not constitute any part of the specification.

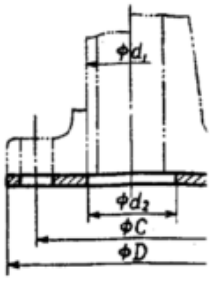
The gasket dimensions of the pipe flanges are given for informative reference.

1 The shapes and dimensions of the gaskets are given in Informative reference 3 Table 1 and Informative reference 3 Table 2.

2 The gaskets are generally be non-metallic gaskets.

3 These gaskets are to have been cut out mainly from the sheet gasketings.

Informative reference 3 Table

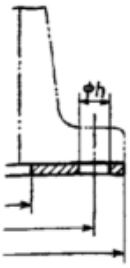


Nominal size of gasket	Outside diameter of steel pipe d_1	Inside diameter of gasket d_2	For nominal pressure 2K flanges				For nominal pressure 5K flange		
			Outside diameter of gasket D	Diameter of bolt circle C	Diameter of bolt hole h	Number of bolt holes	Outside diameter of gasket D	Diameter of bolt circle C	Diameter of bolt hole h
10	17.3	18	—	—	—	—	75	55	12
15	21.7	22	—	—	—	—	80	60	12
20	27.2	28	—	—	—	—	85	65	12
25	34.0	35	—	—	—	—	95	75	12
32	42.7	43	—	—	—	—	115	90	15
40	48.6	49	—	—	—	—	120	95	15
50	60.5	61	—	—	—	—	130	105	15
65	76.3	77	—	—	—	—	155	130	15
80	89.1	90	—	—	—	—	180	145	19
90	101.6	102	—	—	—	—	190	155	19
100	114.3	115	—	—	—	—	200	165	19
125	139.8	141	—	—	—	—	235	200	19
150	165.2	167	—	—	—	—	265	230	19
175	190.7	192	—	—	—	—	300	260	23
200	216.3	218	—	—	—	—	320	280	23
225	241.8	244	—	—	—	—	345	305	23
250	267.4	270	—	—	—	—	385	345	23
300	318.5	321	—	—	—	—	430	390	23
350	355.6	359	—	—	—	—	480	435	25
400	406.4	410	—	—	—	—	540	495	25
450	457.2	460	605	555	23	16	605	555	25
500	508.0	513	655	605	23	20	655	605	25
550	558.8	564	720	665	25	20	720	665	27
600	609.6	615	770	715	25	20	770	715	27
650	660.4	667	825	770	25	24	825	770	27
700	711.2	718	875	820	25	24	875	820	27
750	762.0	770	945	880	27	24	945	880	33
800	812.8	820	995	930	27	24	995	930	33
850	863.6	872	1 045	980	27	24	1 045	980	33
900	914.4	923	1 095	1 030	27	24	1 095	1 030	33
1 000	1 016.0	1 025	1 195	1 130	27	28	1 195	1 130	33
1 100	1 117.6	1 130	1 305	1 240	27	28	1 305	1 240	33
1 200	1 219.2	1 230	1 420	1 350	27	32	1 420	1 350	33
1 350	1 371.6	1 385	1 575	1 505	27	32	1 575	1 505	33
1 500	1 524.0	1 540	1 730	1 660	27	36	1 730	1 660	33

Remarks: The nominal sizes of gaskets correspond with those of flanges.

Previous page is blank

able 1 Full-face gasket

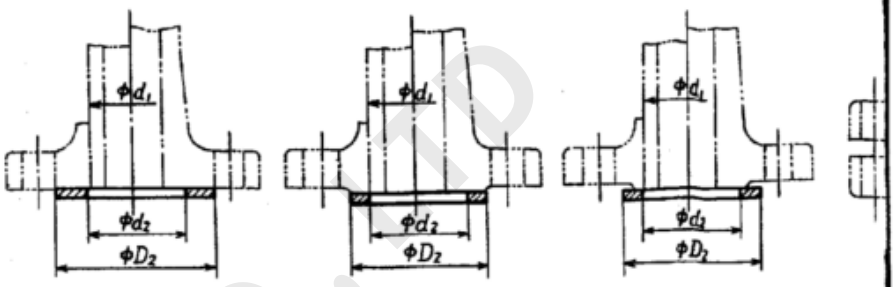


Unit: mm

flanges		For nominal pressure 10K flanges				For nominal pressure 16K flanges			
r of	Number of bolt holes	Outside diameter of gasket D	Diameter of bolt circle C	Diameter of bolt hole h	Number of bolt holes	Outside diameter of gasket D	Diameter of bolt circle C	Diameter of bolt hole h	Number of bolt holes
	4	90	65	15	4	90	65	15	4
	4	95	70	15	4	95	70	15	4
	4	100	75	15	4	100	75	15	4
	4	125	90	19	4	125	90	19	4
	4	135	100	19	4	135	100	19	4
	4	140	105	19	4	140	105	19	4
	4	155	120	19	4	155	120	19	8
	4	175	140	19	4	175	140	19	8
	4	185	150	19	8	200	160	23	8
	4	195	160	19	8	210	170	23	8
	8	210	175	19	8	225	185	23	8
	8	250	210	23	8	270	225	25	8
	8	280	240	23	8	305	260	25	12
	8	305	265	23	12	—	—	—	—
	8	330	290	23	12	350	305	25	12
	12	350	310	23	12	—	—	—	—
	12	400	355	25	12	430	380	27	12
	12	445	400	25	16	480	430	27	16
	12	490	445	25	16	540	480	33	16
	16	560	510	27	16	605	540	33	16
	16	620	565	27	20	675	605	33	20
	20	675	620	27	20	730	660	33	20
	20	745	680	33	20	795	720	39	20
	20	795	730	33	24	845	770	39	24
	24	845	780	33	24	—	—	—	—
	24	905	840	33	24	—	—	—	—
	24	970	900	33	24	—	—	—	—
	24	1 020	950	33	28	—	—	—	—
	24	1 070	1 000	33	28	—	—	—	—
	24	1 120	1 050	33	28	—	—	—	—
	28	1 235	1 160	39	28	—	—	—	—
	28	1 345	1 270	39	28	—	—	—	—
	32	1 465	1 380	39	32	—	—	—	—
	32	1 630	1 540	45	36	—	—	—	—
	36	1 795	1 700	45	40	—	—	—	—

STD·JIS B 2238-ENGL 1996 ■ 4933608 0547218 609 ■

Informative reference 3 Table 2 R

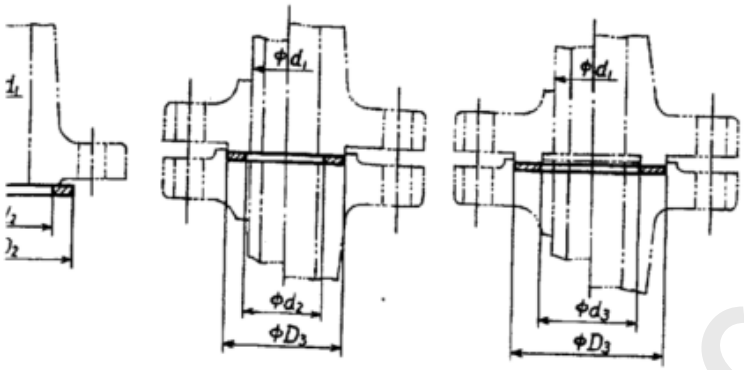


For flat face flange | For large raised face flange | For small raised face flange

Nominal size of gasket	Outside diameter of steel pipe d_1	Inside diameter of gasket d_2	For flanges of flat face, large raised face and small raise						
			Gasket outside diameters D_2						
			Nominal pressure 2K	Nominal pressure 5K	Nominal pressure 10K	Nominal pressure of thin type flange 10K	Nominal pressure 16K	Nominal pressure 20K	
10	17.3	18	—	45	53	55	53	53	
15	21.7	22	—	50	58	60	58	58	
20	27.2	28	—	55	63	65	63	63	
25	34.0	35	—	65	74	78	74	74	
32	42.7	43	—	78	84	88	84	84	
40	48.6	49	—	83	89	93	89	89	
50	60.5	61	—	93	104	108	104	104	
65	76.3	77	—	118	124	128	124	124	
80	89.1	90	—	129	134	138	140	140	
90	101.6	102	—	139	144	148	150	150	
100	114.3	115	—	149	159	163	165	165	
125	139.8	141	—	184	190	194	203	203	
150	165.2	167	—	214	220	224	238	238	
175	190.7	192	—	240	245	249	—	—	
200	216.3	218	—	260	270	274	283	283	
225	241.8	244	—	285	290	294	—	—	
250	267.4	270	—	325	333	335	356	356	
300	318.5	321	—	370	378	380	406	406	
350	355.6	359	—	413	423	425	450	450	
400	406.4	410	—	473	486	488	510	510	
450	457.2	460	535	533	541	—	575	575	
500	508.0	513	585	583	596	—	630	630	
550	558.8	564	643	641	650	—	684	684	
600	609.6	615	693	691	700	—	734	734	
650	660.4	667	748	746	750	—	784	805	
700	711.2	718	798	796	810	—	836	855	
750	762.0	770	856	850	870	—	896	918	
800	812.8	820	906	900	920	—	945	978	
850	863.6	872	956	950	970	—	995	1 038	
900	914.4	923	1 006	1 000	1 020	—	1 045	1 088	
1 000	1 016.0	1 025	1 106	1 100	1 124	—	1 158	—	
1 100	1 117.6	1 130	1 216	1 210	1 234	—	1 258	—	
1 200	1 219.2	1 230	1 326	1 320	1 344	—	1 368	—	
1 300	1 320.8	1 335	—	—	—	—	1 474	—	
1 350	1 371.6	1 385	1 481	1 475	1 498	—	1 534	—	
1 400	1 422.4	1 435	—	—	—	—	1 584	—	
1 500	1 524.0	1 540	1 636	1 630	1 658	—	1 694	—	

Remarks: The nominal sizes of gaskets correspond with those of flanges.

ce 3 Table 2 Ring gaskets



aised face — For spigot and recess type flange — For tongue and groove type flange

Unit: mm

ace and small raised face				For spigot and recess type flange		For tongue and groove type flange	
eters D_2				Inside diameter of gasket d_2	Outside diameter of gasket D_3	Inside diameter of gasket d_3	Outside diameter of gasket D_3
Nominal pressure 20K	Nominal pressure 30K	Nominal pressure 40K	Nominal pressure 63K				
53	59	59	64	18	38	28	38
58	64	64	69	22	42	32	42
63	69	69	75	28	50	38	50
74	79	79	80	35	60	45	60
84	89	89	90	43	70	55	70
89	100	100	108	49	75	60	75
104	114	114	125	61	90	70	90
124	140	140	153	77	110	90	110
140	150	150	163	90	120	100	120
150	163	163	181	102	130	110	130
165	173	183	196	115	145	125	145
203	208	226	235	141	175	150	175
238	251	265	275	167	215	190	215
—	—	—	—	—	—	—	—
283	296	315	330	218	260	230	260
—	—	—	—	—	—	—	—
356	360	380	394	270	325	295	325
406	420	434	449	321	375	340	375
450	465	479	488	359	415	380	415
510	524	534	548	410	475	440	475
575	—	—	—	460	523	483	523
630	—	—	—	513	575	535	575
684	—	—	—	564	625	585	625
734	—	—	—	615	675	635	675
805	—	—	—	667	727	682	727
855	—	—	—	718	777	732	777
918	—	—	—	770	832	787	832
978	—	—	—	820	882	837	882
1 038	—	—	—	872	934	889	934
1 088	—	—	—	923	987	937	987
—	—	—	—	1 025	1 092	1 042	1 092
—	—	—	—	1 130	1 192	1 142	1 192
—	—	—	—	1 230	1 292	1 237	1 292
—	—	—	—	1 335	1 392	1 337	1 392
—	—	—	—	1 385	1 442	1 387	1 442
—	—	—	—	1 435	1 492	1 437	1 492
—	—	—	—	1 540	1 592	1 537	1 592

Annex
Metallic flanges – Part 1 : Steel flanges

Foreword for Annex to Japanese Industrial Standard

These Annex and Annex A to Annex G have been prepared on the basis of the first edition of **ISO 7005-1**, *Metallic flanges – Part 1 : Steel flanges* published in 1992, without any modification in technical contents and style thereof.

"Informative references" dotted underlines in these Annex and Annex A to Annex G are the matters not included in the original International Standard.

It should be taken into account that the flanges based on these Annex and Annex A to Annex G are intended to be installed on the pipes based on ISO in the different dimensional series from the body of this Standard.

0 Introduction Various flange systems based on differing design criteria have been in use throughout the world for many years. Recognizing the increasing difficulties arising from such a situation, representatives of **ISO/TC 5**, **ISO/TC 67**, and **ISO/TC 153**, established principles for the preparation of an International Standard for a single series of flanges.

This Annex is based on the American and European steel flange systems combined with some changes to the dimensions specified in the two systems. PN20, PN50, PN110, PN150, PN260 and PN420 steel flanges are designed to be interchangeable with flanges to American standards **ANSI/ASME B16.5** and **MSS SP44**; they are not identical but are deemed to comply with dimensions specified in **ANSI/ASME B16.5** and **MSS SP44** as appropriate.

This Annex takes into account unpublished work of the European Committee for Standardization **CEN/TC 74**, *Flanges*, up to 1972 and the amendments that would have been necessary to **ISO 2229** arising from the revision of **ANSI/ASME B16.5** up to 1988 and **MSS SP44** : 1985, plus amendments due to the changes in pressure designation. In the American system, flanges are designated by a Class rating, but these ratings have now been converted to nominal pressure (PN) designations. The equivalent PN designations are as follows:

Class 150: PN20
Class 300: PN50
Class 600: PN110
Class 900: PN150
Class 1500: PN260
Class 2500: PN420

This Annex does not specify materials or pressure/temperature ratings of flanges, but guidance is given in Annexes D (informative) and E (informative) on selected materials and pressure/temperature ratings of flanges (see Notes to Tables 8, 9, 10, 11, 13 and 14, page 82) using the materials listed. Annex D (informative) lists German (DIN) steels on which the European flange system is based and American (ASTM) steels on which the American flange system is based, together with international (ISO) steels given in published and draft International Standards. Users of this Annex may wish to use steels specified in national standards in preference to those given in Annex D (informative). Annex E (informative) gives the pressure/temperature ratings for certain flanges made using the materials given in Annex D (informative). [See E. 1 (informative) and Tables E. 1 to E. 4 for restrictions on the applicability of pressure/temperature ratings to flanges.]

Ultimately it is the intention that only ISO materials and pressure/temperature ratings of flanges made using ISO materials will be specified in this Annex; this will be achieved in a revision and when work on standardizing the ISO materials and their elevated temperature properties has been completed.

Flange details in this Annex, Annexes to **JIS B 2239** and **JIS B 2240** and in **ISO 7005 -4** are such as that flanges having the same PN designations and nominal size (DN) designations and compatible flange facings will mate together.

Informative reference: The whole of Annex to **JIS B 2239**, *General rules for cast iron pipe flanges* corresponds to **ISO 7005-2**, *Metallic flanges—Part 2: Cast iron flanges*, and the whole of Annex to **JIS B 2240**, *General rules for copper alloy pipe flanges* corresponds to **ISO 7005-3**, *Metallic flanges—Part 3: Copper alloy and composite flanges*.

Besides, **ISO 7005-4**, *Aluminium and aluminium alloy flanges* is under planning and not established yet.

The method of specifying tolerances has been to combine the existing DIN and ANSI specified tolerances into one table (Annex Table 20).

To avoid possible confusion in giving descriptive names to flanges, all flanges are designated by a type number and flange facings by a letter.

Users of this Annex should satisfy themselves that the flanges comply with any statutory requirements.

It should be noted that, in general, flanges previously manufactured to **ISO 2084**, **ISO 2229** and **ISO 2441** will mate with flanges manufactured to this Annex.

1 General

1.1 Scope This Annex for a single system of flanges specifies requirements for circular steel flanges in the following PN designations:

Series 1*)	Series 2*)
PN10	PN2,5
PN16	PN6
PN20	PN25
PN50	PN40
PN110	
PN150	
PN260	
PN420	

Note *) Series 1 flanges are the basic flanges; series 2 flanges may have a limited application in the future.

It specifies the types of steel flanges and their facings, dimensions, tolerances, threading, bolt sizes, flange face surface finish, marking, testing and inspection.

It does not specify pressure/temperature ratings or materials for steel flanges. However, Annex D (informative) gives guidance on selected materials and Annex E (informative) gives guidance on the pressure/temperature ratings for some flanges made from the materials listed in Annex D (informative).

This Annex does not apply to flanges made from bar stock by turning.

Nor does it apply to flanges of types 11, 12, 13, 14 and 15 made from plate material.

The various gasket types, dimensions, design characteristics and materials used are not within the scope of this Annex.

Note: Dimensions of gaskets are given in **ISO 7483**.

1.2 Normative references The following standards contain provisions which, through reference in this Annex, constitute provisions of this Annex. At the time of publication of **ISO 7005-1**, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this Annex are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

ISO 7-1 : 1982 *Pipe threads where pressure-tight joints are made on the threads — Part 1 : Designation, dimensions and tolerances*

ISO 7-2 : 1982 *Pipe threads where pressure-tight joints are made on the threads — Part 2 : Verification by means of limit gauges*

ISO 261 : 1973 *ISO general purpose metric screw threads — General plan*

ISO 887 : (to be published, revision of ISO 887 : 1983.) *Plain washers for metric bolts, screws and nuts for general purposes — General plan*

ISO 6708 : 1980 *Pipe components — Definition of nominal size*

ISO 7268 : 1983 *Pipe components — Definition of nominal pressure*

ISO 7483 : 1991 *Dimensions of gaskets for use with flanges to ISO 7005*

ANSI/ASME B1.20.1 : 1983 *Pipe threads, general purpose (inch)*

1.3 Definitions For the purposes of this Annex, the definitions of nominal size (DN) as given in **ISO 6708**, and nominal pressure (PN) as given in **ISO 7268** and the following definition apply.

1.3.1 pipeline: Cross-country fluid transmission line, e.g. for oil or gas.

1.4 Designation of types, components and facings Annex Figs. 1 to 4 illustrate flanges and flanged components grouped according to type and Annex Fig. 5 illustrates facing types.

Annex Fig. 1: Flanges—Types 01 to 05 inclusive, comprising flanges generally manufactured from plate materials.

Note: Types 02 and 03 are identical; it is their ancillary components which differ (see Annex Fig. 4).

Annex Fig. 2: Flanges—Types 11 to 15 inclusive, comprising flanges generally manufactured from forgings or castings.

Annex Fig. 3: Flange—Type 21 integral flange, as part of some other equipment or component.

Annex Fig. 4: Ancillary components for flanges—Types 32 to 34 inclusive, comprising parts or components for use with flange types 02, 03 and 04.

Annex Fig. 5: Facings—Types A to J inclusive, comprising the various types of flange facings which may be used where applicable in conjunction with the groups of flanges or flanged components in Annex Figs. 1 to 4.

Note: Type numbers are not consecutive to permit possible future additions to any particular group.

2 General requirements

2.1 Pressure/temperature ratings Guidance on pressure/temperature ratings of flanges forming the subject of this Annex is given in Annex E (informative) for some flanges made from the materials listed in Annex D (informative).

2.2 Materials and bolting

2.2.1 Range of materials Guidance on selected materials is given in Annex D (informative).

2.2.2 Gaskets See the Note in **1.1**.

2.2.3 Bolting The material of the bolting should be chosen by the user according to the pressure, temperature, flange material and the selected gasket so that the flanged joint remains tight under the expected operating conditions.

For PN20, PN50, PN110, PN150, PN260 and PN420 flanges up to and including bolt size M45, coarse series bolts to **ISO 261** shall be used; from bolt size M48 upwards, the fine series having a uniform 4 mm pitch shall be used.

2.3 Repairs

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

2.3.2 Any filler rod used for weld repairs shall be such as to produce a weld having characteristics similar to those of the parent metal. Flanges shall be heat treated after repair welding when the material specification requires such treatment.

2.4 Dimensions

2.4.1 Range of nominal sizes The range of nominal sizes applicable to each flange type and each nominal pressure shall be as specified in Annex Table 3.

2.4.2 Tables giving dimensions Dimensions of flanges shall be in accordance with the following tables, as appropriate.

Annex Tables 4, 5, 6 and 7: Dimensions of flange facings

Series 1 flanges

Annex Table 10: Dimensions of PN10 flanges
Annex Table 11: Dimensions of PN16 flanges
Annex Table 12: Dimensions of PN20 flanges
Annex Table 15: Dimensions of PN50 flanges
Annex Table 16: Dimensions of PN110 flanges
Annex Table 17: Dimensions of PN150 flanges
Annex Table 18: Dimensions of PN260 flanges
Annex Table 19: Dimensions of PN420 flanges

Series 2 flanges

Annex Table 8: Dimensions of PN2,5 flanges
Annex Table 9: Dimensions of PN6 flanges
Annex Table 13: Dimensions of PN25 flanges
Annex Table 14: Dimensions of PN40 flanges

2.4.3 Threads for threaded flanges

2.4.3.1 The threads shall be taper or parallel threads in accordance with **ISO 7-1** or taper threads in accordance with **ANSI/ASME B1.20.1** as appropriate.

Note: Unless otherwise specified, parallel threads in accordance with **ISO 7-1** will be supplied for flanges PN2,5, PN6, PN10, PN16, PN25 and PN40 and taper threads in accordance with **ANSI/ASME B1.20.1** for flanges PN20, PN50, PN110, PN150, PN260 and PN420.

2.4.3.2 The threads shall be concentric with the axes of the flanges and variations in alignment shall not exceed 5 mm/m. Flanges up to and including PN40 shall be manufactured without a counterbore. The threads shall be chamfered approximately to the major diameter of the threads at the back of the flanges at an angle of approximately 45° with the axes of the threads. The chamfers shall be concentric with the threads and permitted to be included in the measurement of the thread lengths provided that the chamfers do not exceed one pitch in length.

Flanges PN50 and above shall be provided with a counterbore at the back. The threads shall be chamfered to the diameters of the counterbores at an angle of approximately 45° with the axes of the threads. The counterbores and chamfers shall be concentric with the threads.

2.4.3.3 Gauging shall be in accordance with **ISO 7-2** or **ANSI/ASME B1.20.1** as appropriate.

2.4.4 Hubs—General applications

2.4.4.1 The hub of threaded (type 13), slip-on (type 12), socket weld (type 14) and lapped (type 15) flanges shall be cylindrical or alternatively shall have a draft of not more than 7° on the outside surface for forging or casting purposes. For the limiting profile of weld neck hubs, see Annex A (normative).

2.4.4.2 The hub dimensions of threaded (type 13) and slip-on (type 12) flanges having a reduced bore shall be at least as large as those of the standard flange of the size to which the reduction is being made. For welding neck (type 11) flanges having a reduced bore, the hub dimensions shall be the same as those of the standard flange of the size to which the reduction is being made.

2.4.5 Hubs—Pipeline applications

2.4.5.1 The hub diameter and wall thickness at the welding end shall be determined as specified in **2.4.5.1.1** to **2.4.5.1.3** as appropriate.

2.4.5.1.1 When the minimum yield strength of the hub portion of any flange or its representative test specimen is the same as that of the mating pipe, the minimum thickness at the welding end shall be the same as that of the mating pipe.

2.4.5.1.2 When the minimum yield strength of the hub portion of any flange or its representative test specimen is less than that specified for the pipe to be matched, the minimum thickness of the hub at the welding end shall be such that the product of its thickness times its yield strength (at the welding end) shall at least equal the product of the specified wall thickness and the minimum specified yield strength of the pipe to be matched.

2.4.5.1.3 When the hub thickness at the welding end is greater than the wall thickness of the adjoining pipe, the joint design shall be as shown in any of the three sketches in Annex Fig. B.1 of Annex B (normative).

2.4.5.2 The minimum hub outside diameter at the point of weld shall be determined by adding twice the minimum wall thickness determined in **2.4.5.1.1** or **2.4.5.1.2** to the bore specified by the customer.

2.4.5.3 For sizes DN300 to DN600, when the mechanical (minimum yield strength) properties of all sections of the flanges are equal to or higher than those of the pipe to be matched, the hub dimensions are permitted to be the same as those of the general flanges as indicated in Annex A (normative).

2.4.6 Welding end preparation For welding type 11 flanges to pipe, the typical end preparation of the flange shall be as shown in Annex A (normative). When PN20, PN50, PN110 and PN150 flanges are used in pipeline applications the typical welding end preparations are as shown in Annex C (informative).

Note: Other welding end preparations agreed between manufacturer and purchaser do not invalidate compliance with this Standard.

2.5 Facings

2.5.1 Range of facings The range of flange facings and flange face designations shall be as given in Annex Fig. 5. Dimensions of facings according to the PN designation shall be in accordance with Annex Figs. 6 and 7 and Annex Tables 4, 5, 6 and 7, as appropriate.

Notes 1 For types B (as shown in Annex Fig. 6 only), D, F, G and J the transition from the raised face diameter to the flange face is at the option of the manufacturer.

2 For PN20 and PN50 to PN420 there are large and small versions of C, D, E and F types of facing. In such cases two sets of dimensions have been given in the related tables. For small male and female joints care should be taken to ensure that the inside diameter of the pipe is small enough to permit sufficient bearing surface.

3 The type B raised face on steel flanges may be removed when bolted to cast iron or copper alloy flanges for designations up to and including PN50 in order to provide full-face gasketing if such be required. On a flanged component or fitting this will reduce the thickness and the overall length accordingly.

2.5.2 Facing height/depth For PN2,5, PN6, PN10, PN16, PN25 and PN40 flanges all facing heights shall be included in the minimum flange thickness and are measured from the face of the flange. The same requirement applies for PN20 and PN50 flanges when they have the (type B1) raised face. For PN20, PN50, PN110, PN150, PN260 and PN420 flanges with other facings, e.g. type B2, spigot and recess, tongue and groove, the height or depth shall be added to the minimum flange thickness. For PN110 to PN420 flanges all facings shall be added to the minimum flange thickness. Special requirements apply to ring-joint facings (see **2.5.3**).

Informative reference: Refer to f_1 and f_2 of Annex Fig. 6 and f_1 and f_2 of Annex Fig. 7.

2.5.3 Ring-joint facings The bottom of the ring-joint groove shall not encroach below the plane of the flange edge of the appropriate minimum thickness flange. Where the depth of the ring-type joint groove would violate this requirement, sufficient metal shall be added to the flange thickness or raised face height so that the bottom of the groove shall be in the same plane as the flange edge of a minimum thickness flange.

2.5.4 Lapped joints For type 33 ancillary components for flanges, the finished height of the facing shall be not less than the pipe thickness used. If a tongue, groove or ring-joint 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.

2.5.5 Surface finish of flanges

2.5.5.1 All flange jointing faces shall be finished in accordance with Annex Table 1 or Annex Table 2, as appropriate. The surface finishes of the faces shall be compared by visual or tactile means with reference specimens which conform to the R_a and R_z values given in Annex Tables 1 and 2.

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

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

Annex Table 1 Surface finish for facings types A, B and E/F (large)

Method of machining	Approximate depth of serration mm	Approximate radius of tool nose mm	Approximate pitch of serration mm	R_z [1] μm		R_a [1] μm	
				min.	max.	min.	max.
Turning [2]	0,05	1,6	0,8	12,5	50,0	3,2	12,5
Other than turning	–	–	–	12,5	25,0	3,2	6,3

[1] R_a and R_z are defined in **ISO 468**.
[2] The term "turning" includes any method of machine operation producing either serrated concentric or serrated spiral grooves.

Note: For certain applications, e.g. for searching media such as low temperature gases, and for flanges of PN150 and above, it may be necessary to stipulate closer control on the surface finish.

2.5.5.2 The dimensions given for facings (particularly tongue and groove types) in this Annex apply to flanges in the condition as delivered.

Informative reference: The dimensions of the facings specified in this Annex mean those being at the time of delivery of the products after the specific surface treatment has been made.

When special coatings or finishes are required this should be stated in the order so that an appropriate allowance may be incorporated in the machining of any relevant mating dimensions.

2.5.5.3 Flat face, raised face and large spigot/recess facings [i.e. types A, B and E/F (large)] shall be turned. Turning shall be carried out with a round-nosed tool in accordance with Annex Table 1.

2.5.5.4 For tongue/groove, small spigot/recess, "O"-ring recess/groove and ring-joint facings [i.e. types C/D, E/F (small), G/H and J] the gasket surfaces shall be machined in accordance with the values shown in Annex Table 2.

Annex Table 2 Surface finish values for facings types C/D, E/F (small), G/H and J

Facing type	R_z [1] µm		R_a [1] µm	
	min.	max.	min.	max.
Tongue/groove (C/D) and small spigot/recess (E/F)	3,2	12,5	0,8	3,2
Ring-joint (J) (including side walls) and "O"-ring recess/groove (G/H)	1,6	6,3	0,4	1,6

[1] R_a and R_z are defined in **ISO 468**.

2.6 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 ISO washers complying with **ISO 887** for the metric 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 the limits shown in Annex Table 20.

Informative reference: The flange face stated here is interpreted to mean joint facing. Refer to Annex Table 20.

When a flange is back-faced a minimum fillet radius at the hub, R_{min} (see Annex Fig. 8), shall be maintained as given in Annex Table 21.

2.7 Tolerances Flange dimensions shall comply with the tolerances specified in Annex Table 20.

2.8 Marking

2.8.1 Flanges other than integral flanges Flanges other than integral flanges shall be marked with the following information:

a) the letters of "ISO";

b) the nominal size (DN) and the PN designation;

c) the material designation (see **2.8.2**);

d) the manufacturer's name or trade-mark;

e) the thread identification where appropriate (see **2.8.3**);

f) the heat (cast) number or suitable quality control number traceable to the heat number.

Notes 1 Additionally, flange facing designations may be given (see also **2.8.4**).

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.

2.8.2 Material designation The material designation shall be as specified in **2.8.2.1**, **2.8.2.2** and **2.8.2.3**, as appropriate.

2.8.2.1 The material designation shall be the minimum information required to identify the material, e.g. the grade identification, preceded by the specification (standard) number where necessary.

Examples [for materials in Annex Tables D. 1 and D. 2 of Annex D (informative)]:

a) 16Mo3

b) C26－52H

c) X7 CrNiNb 18 10

2.8.2.2 For flanges of nominal size DN300 and greater, manufactured specifically for pipeline applications, the material designation shall be the material group and grade identification number in accordance with Annex Table D. 3 of Annex D (informative).

Example : 4.A.250

2.8.2.3 For flanges manufactured in accordance with **2.4.5.1.2**, the material designation shall comprise the material group and grade identification number for the flange and the strength grade of the pipe for which the flange has been made, presented as shown in the following example.

Example : 4.A.290/ × × ×

where × × × is the strength grade of the pipe, taken from the appropriate steel tube standard.

2.8.3 Identification of internally threaded flanges Internally threaded flanges shall be marked to indicate the type of thread used.

Threads to **ISO 7-1** shall be designated by the letter symbols R_c or R_p, as appropriate, in accordance with **ISO 7-1** followed by the nominal size, e.g. R_c 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.

2.8.4 Groove number Flanges grooved for standard ring-joints shall be marked with the letter "R" and the corresponding ring number.

2.8.5 Stamping Where steel stamps are used, the marking shall be applied to the rim of the flange.

2.9 Inspection and test

Notes 1 The PN20, PN50, PN110, PN150, PN260 and PN420 flanges specified are designed to be interchangeable with Class rated flanges to **ANSI/ASME B16.5** and **MSS SP44**, but they are not identical in all respects; for inspection purposes, it is recommended that the dimensions of PN20, PN50, PN110, PN150, PN260 and PN420 flanges are deemed to comply with the dimensions specified in **ANSI/ASME B16.5** or **MSS SP44** as appropriate.

2 This Annex does not make provision for routine inspection or pressure testing of separate flanges. However, flanges may be required to be pressure 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 manufactured. Any test pressures should not exceed 1,5 times the maximum allowable working pressure at 20 ℃ rounded off to the next higher 1 bar [1] increment.

[1] 1 bar=10^5 Pa

2.10 Information to be supplied by the purchaser The following information should be supplied by the purchaser in the enquiry and/or order:

a) **ISO 7005-1**;

b) the nominal size − DN followed by the appropriate number (see **1.3**);

c) the PN designation − PN followed by the appropriate number (see **1.3**);

d) the flange type number (see **1.4**), together with reference to the ancillary component type number if appropriate;

e) the facing type letter (see **1.4**);

f) the material designation by reference to a national standard or International Standard and grade of steel (see **2.8.2**), if appropriate;

g) the internal thread designation (see **2.4.3**);

h) the external diameter and thickness of pipe;

i) material certification requirements;

j) details of special coatings (see **2.5.5.2**);

k) the neck thickness *S* where appropriate;

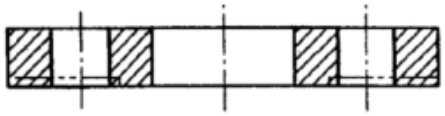
i) the bore diameter *B* where appropriate;

m) the bore diameter for welding neck (type 11) or socket weld (type 14) flanges, if different from those specified in this Standard.

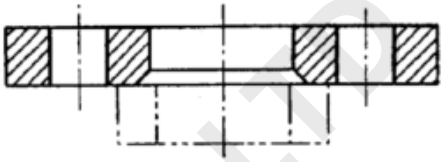
Informative reference: As to k), l) and m), refer to Notes to Annex Tables 8, 9, 10, 11, 13 and 14 on p. 82, and Notes to Annex Tables 12, 15, 16, 17, 18 and 19 on p. 83.

n) for pipeline flanges, the mating pipe wall thickness and yield strength (see **2.4.5.1.3**) and weld preparation [see Annex B (normative)];

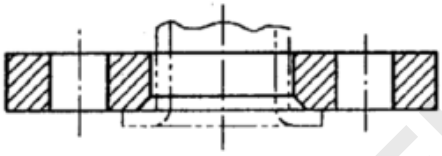
o) the bolting material when bolts are ordered with the flange(s).



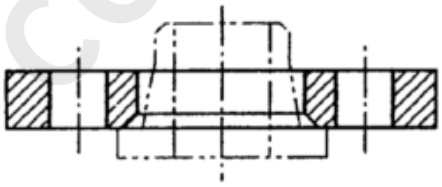
Type 01
Plate flange for welding



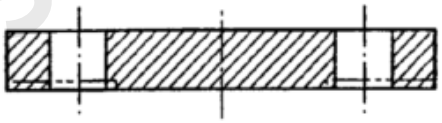
Type 02
Loose plate flange with weld-on plate collar
(see type 32)



Type 03
Loose plate flange with lapped pipe end
(see type 33)



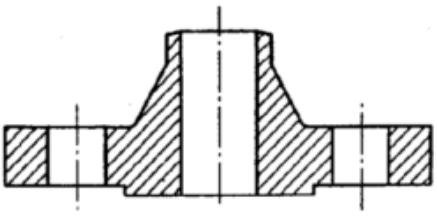
Type 04
Loose flange with welding neck collar
(see type 34)



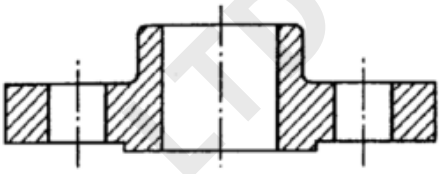
Type 05
Blank flange

Note: These sketches are diagrammatic only.

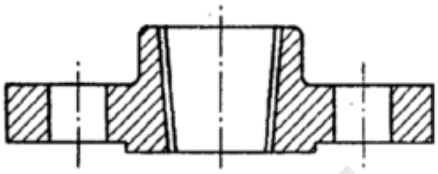
Annex Fig. 1 Flanges—Types 01 to 05



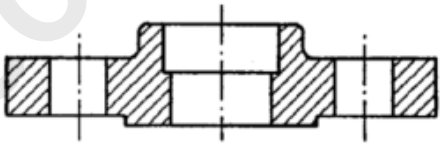
Type 11
Welding neck flange



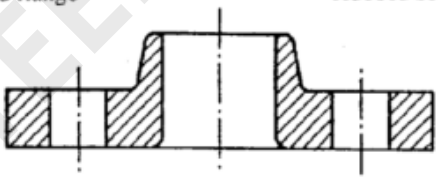
Type 12
Hubbed slip-on flange for welding



Type 13
Hubbed threaded flange



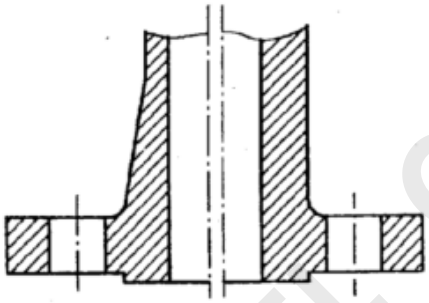
Type 14
Hubbed socket welding flange



Type 15
Loose hubbed flange for lapped pipe end

Note : These sketches are diagrammatic only.

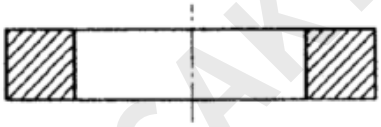
Annex Fig. 2 Flanges – Types 11 to 15



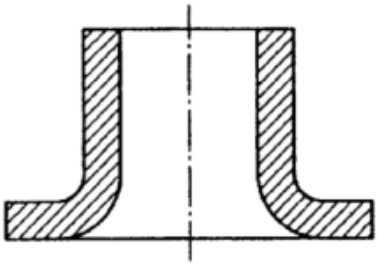
Type 21
integral flange, showing alternative forms

Note : This sketch is diagrammatic only.

Annex Fig. 3 Flange – Type 21

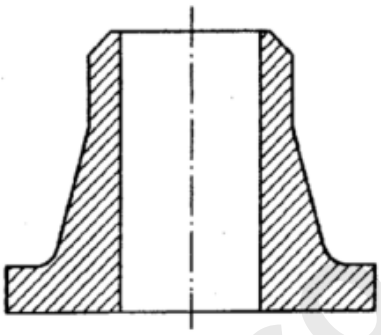


Type 32[1)]
Weld-on plate collar



Type 33[2)]
Lapped pipe end

Annex Fig. 4 Ancillary components for flanges – Types 32 to 34

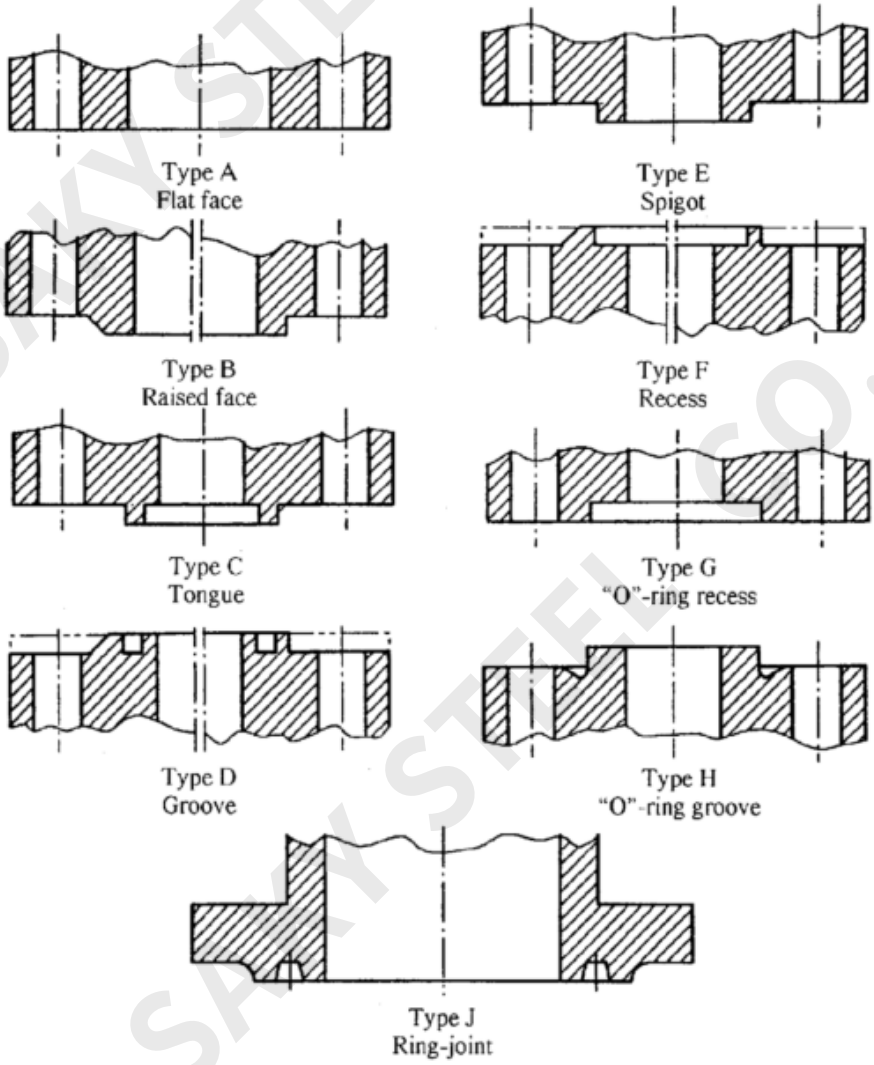


Type 34[3]
Welding neck collar

Note: These sketches are diagrammatic only.

[1] Type 32 corresponds to type 02 flange.
[2] Type 33 corresponds to type 03 flange.
[3] Type 34 corresponds to type 04 flange.

Annex Fig. 4 (concluded)



Note: These sketches are diagrammatic only.

Annex Fig. 5 Illustration of flange facings (types A to J)

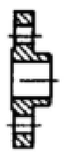
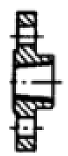
3 Dimensions

Annex Table 3 Synoptic table

Type No.	Annex Table	PN \ DN	10	15	20	25	32	40	50	65	80	100	125	150	200	250	300	350	400	450	500	550	600	700	800	900	1 000	1 200	1 400	1 500	1 600	1 800	2 000	2 200	2 400	2 600	2 800	3 000	3 200	3 400	3 600	3 800	4 000
01	8	2.5												Use PN6																													
	9	6																																									
	10	10												Use PN16																													
	11	16													Use PN40																													
	12	20																																									
	13	25														Use PN40																												
	14	40																																									
02 03 04	9 [1]	6																																									
	10	10																																									
	11	16																																									
	13	25																																									
	14	40																																									
05	8	2.5																																									
	9	6																																									
	10	10																																									
	11	16																																									
	12	20																																									
	13	25																																									
	14	40																																									
	15	50																																									
	16	110																																									
	17	150													Use PN260																												
	18	260																																									
	19	420																																									

[1] Not applicable to type 04.

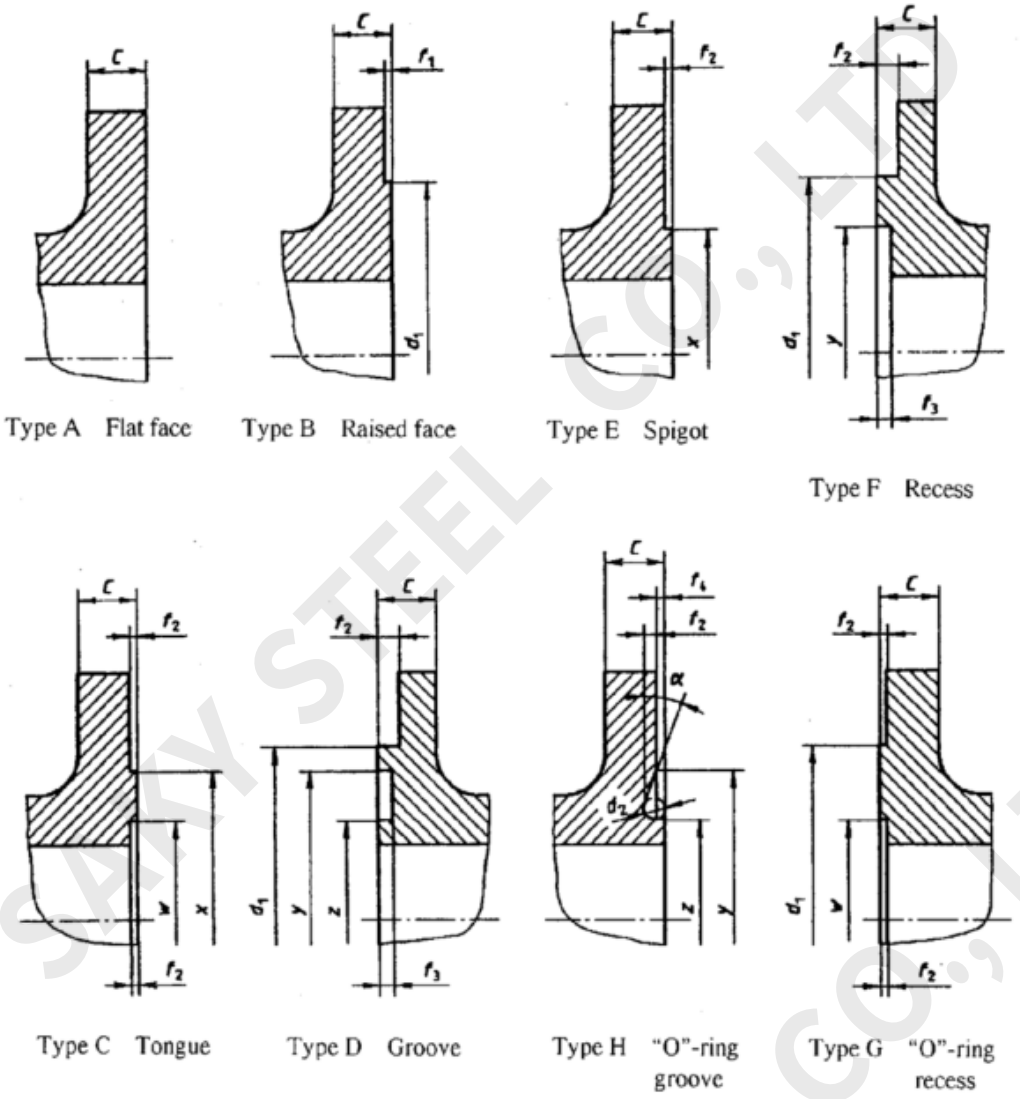
Annex Table 3 (continued)

Type No.	Annex Table	PN \ DN	10	15	20	25	32	40	50	65	80	100	125	150	200	250	300	350	400	450	500	550	600
 11	8	2,5	← Use PN6 →																				
	9	6	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x
	10	10	← Use PN40 →								← Use PN16 →				x	x	x	x	x	x	x		x
	11	16	← Use PN40 →							x	x	x	x	x	x	x	x	x	x	x	x		x
	12	20		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	13	25	← Use PN40 →												x	x	x	x	x	x	x		x
	14	40	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x
	15	50	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	16	110		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	17	150		← Use PN260 →							x	x	x	x	x	x	x	x	x	x	x		x
	18	260		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x
	19	420		x	x	x	x	x	x	x	x	x	x	x	x	x	x						
 12	9	6	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x						
	10	10	← Use PN40 →								← Use PN16 →				x	x	x	x	x	x	x		x
	11	16	← Use PN40 →								x	x	x	x	x	x	x	x	x	x	x		x
	12	20		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x
	13	25	← Use PN40 →												x	x	x	x	x	x	x		x
	14	40	x	x	x	x	x	x	x	x	x	x	x	x									
	15	50		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x
	16	110		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x
	17	150		← Use PN260 →							x	x	x	x	x	x	x	x	x	x	x		x
	18	260		x	x	x	x	x	x	x													
 13	9	6	x	x	x	x	x	x	x	x	x	x	x	x									
	10	10	← Use PN16 →																				
	11	16	x	x	x	x	x	x	x	x	x	x	x	x									
	12	20		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x
	13	25	← Use PN40 →																				
	14	40	x	x	x	x	x	x	x	x	x	x	x	x									
	15	50		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x
	16	110		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x
	17	150		← Use PN260 →							x	x	x	x	x	x	x	x	x	x	x		x
	18	260		x	x	x	x	x	x	x	x	x	x	x	x	x	x						
	19	420		x	x	x	x	x	x	x	x	x	x	x	x	x	x						

Type No.	Annex Table	PN \ DN	700	800	900	1 000	1 200	1 400	1 500	1 600	1 800	2 000	2 200	2 400	2 600	2 800	3 000	3 200	3 400	3 600	3 800	4 000
11	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		
	10	10	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										
	12	20	x	x	x	x	x	x	x													
	13	25	x	x	x	x																
	14	40																				
	15	50	x	x	x	x	x	x	x													
	16	110	x	x	x	x	x	x	x													
	17	150	x	x	x	x	x															
	18	260																				
	19	420																				
12	9–18	6–260																				
13	9–19	6–420																				

Annex Table 3 (concluded)

Type No.	Annex Table	DN / PN	10	15	20	25	32	40	50	65	80	100	125	150	200	250	300	350	400	450	500	550	600	700	800	900	1 000	1 200	1 400	1 500	1 600	1 800	2 000	2 200	2 400	2 600	2 800	3 000	3 200	3 400	3 600	3 800	4 000
14	14	20		×	×	×	×	×	×	×	×																																
	15	50		×	×	×	×	×	×	×	×																																
	16	110		×	×	×	×	×	×	×	×																																
	18	260		×	×	×	×	×	×	×																																	
15	12	20		×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
	15	50		×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
	16	110		×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
	17	150		×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
	18	260			×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
	19	420			×	×	×	×	×	×	×	×	×	×	×	×	×	×																									
21	9	6	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
	10	10		×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
	11	16		×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
	12	20		×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
	13	25		×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
	14	40		×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
	15	50			×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
	16	110			×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
	17	150			×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
	18	260				×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
	19	420				×	×	×	×	×	×	×	×	×	×	×	×	×																									

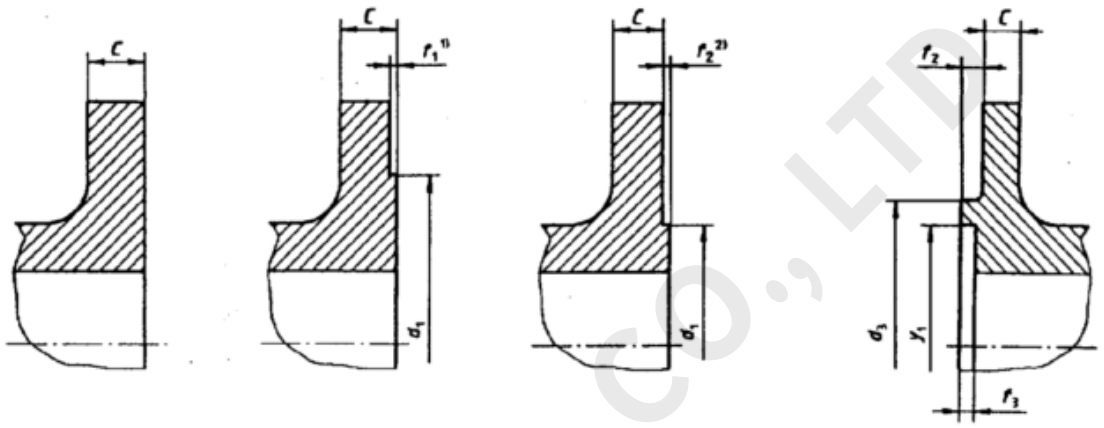


Annex Fig. 6 PN2,5, PN6, PN10, PN16, PN25 and PN40 flange facing dimensions

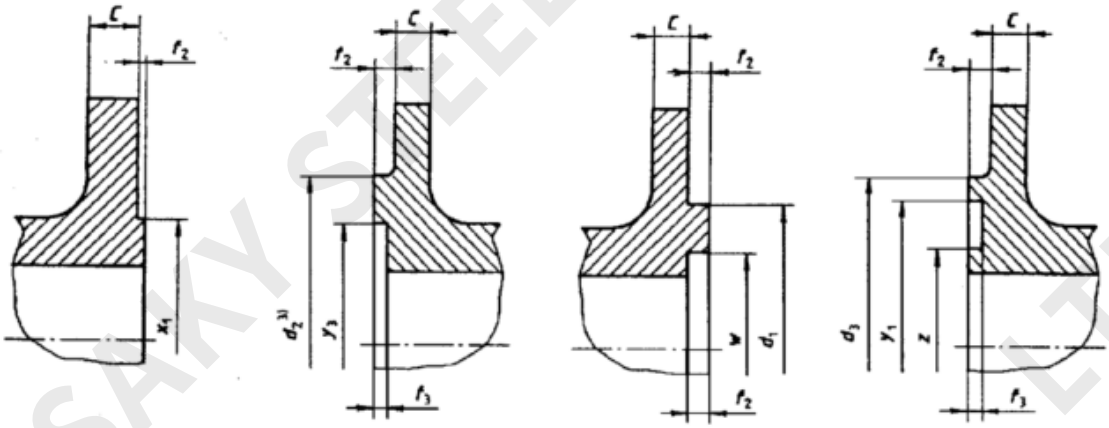
Annex Table 4 Dimensions of flange facings for PN2,5, PN6, PN10, PN16, PN25 and PN40 (see Annex Fig. 6)

Unit: mm

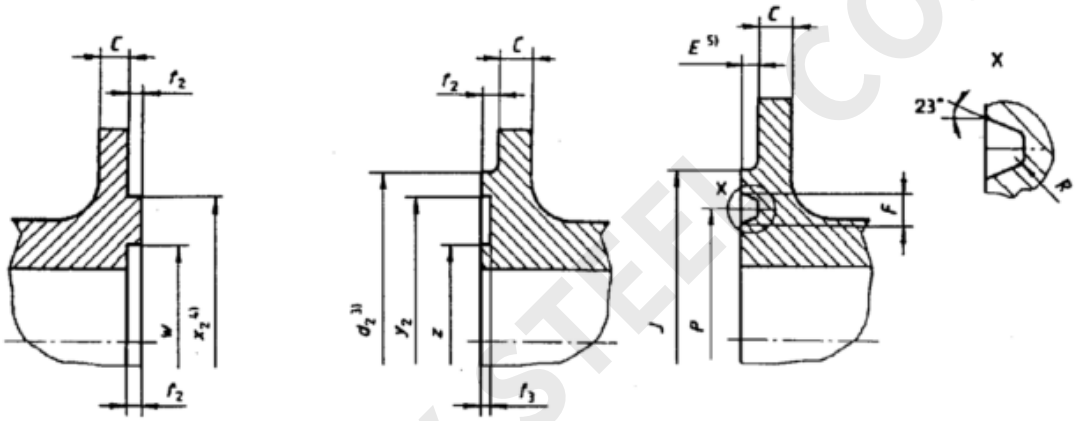
Nominal size DN	d_1						f_1	f_2	f_3	f_4	w	x	y	z	α	d_2
	PN 2,5	PN 6	PN 10	PN 16	PN 25	PN 40										
10		33				41					24	34	35	23	–	
15		38				46					29	39	40	28		
20		48				56					36	50	51	35		
25		58				65					43	57	58	42		5
32		69				76		4	3	2	51	65	66	50		
40		78	Use PN 40			84					61	75	76	60	41°16′	
50		88				99					73	87	88	72		
65		108				118					95	109	110	94		
80		124				132					106	120	121	105		
100		144				156	2				129	149	150	128		
125		174				184					155	175	176	154		
150		199				211		4,5	3,5	2,5	183	203	204	182	32°15′	6
200	Use PN 6	254	266	266	274	284					239	259	260	238		
250		309	319	319	330	345					292	312	313	291		
300		363	370	370	389	409					343	363	364	342		
350		413	429	429	448	465					395	421	422	394		
400		463	480	480	503	535					447	473	474	446		
450		518	530	548	548	560					497	523	524	496		
500		568	582	609	609	615		5	4	3	549	575	576	548	27°24′	7
600		667	682	720	720	735					649	675	676	648		
700		772	794	794	820	–					751	777	778	750		
800		878	901	901	928	–					856	882	883	855		
900		978	1 001	1 001	1 028	–					961	987	988	960		
1 000		1 078	1 112	1 112	1 140	–					1 062	1 092	1 094	1 060		
1 200		1 295	1 328	1 328	1 350	–	5				1 262	1 292	1 294	1 260		
1 400		1 510	1 530	1 530	1 560	–					1 462	1 492	1 494	1 460		
1 600		1 710	1 750	1 750	1 780	–		6	5	4	1 662	1 692	1 694	1 660	28°39′	8
1 800		1 918	1 950	1 950	1 985	–					1 862	1 892	1 894	1 860		
2 000		2 125	2 150	2 150	2 210	–					2 062	2 092	2 094	2 060		
2 200	2 295	2 335	2 370	–	–	–										
2 400	2 495	2 545	2 570	–	–	–										
2 600	2 695	2 750	2 780	–	–	–										
2 800	2 910	2 960	3 000	–	–	–										
3 000	3 110	3 160	3 210	–	–	–										
3 200	3 310	3 370	–	–	–	–	6	–	–	–	–	–	–	–	–	–
3 400	3 510	3 580	–	–	–	–										
3 600	3 720	3 790	–	–	–	–										
3 800	3 920	–	–	–	–	–										
4 000	4 120	–	–	–	–	–										



Type A Flat face (PN20 and PN50 only) | Type B1 Raised face (PN20 and PN50 only) | Type B2 Raised face Type E1 Large spigot | Type F1 Large recess



Type E2 Small spigot | Type F2 Small recess | Type C1 Large tongue | Type D1 Large groove



Type C2 Small tongue | Type D2 Small groove | Type J Ring-joint

1) f_1 applies to PN20 and PN50 and is included in flange thickness C.
2) f_2 applies to PN110, PN150, PN260 and PN420, and is additional to flange thickness C.
3) d_2 is larger than d_1 for DN15, DN20, DN25 and DN32; otherwise is d_2 equal to d_1.
4) x_2 is equal to d_1 for DN15 and DN20.
5) Height of raised portion E is equal to groove depth E but is not subject to tolerance (see 2.5.3).

Annex Fig. 7 PN20, PN50, PN110, PN150, PN260 and PN420 flange facing dimensions

Annex Table 5 Dimensions of flange facings up to nominal size DN900 for PN20, PN50, PN110, PN150, PN260 and PN420 (see Annex Fig. 7)

Unit: mm

Nominal size	Outside diameter			Inside diameter of large and small tongue	Outside diameter			Inside diameter of large and small groove	Height			Depth of groove or recess	Minimum outside diameter of raised portion	
	Raised face, Large spigot[1], Large tongue[1]	Small spigot	Small tongue		Large recess[1], Large groove[1]	Small recess	Small groove		Raised face		Large and small spigot and tongue			
DN	d_1	x_1	x_2	w	y_1	y_3	y_2	z	f_1[2]	f_2[3]	f_2	f_3	d_2	d_3[1]
15	35	18,5	35	25,6	36,5	20	36,5	24	2	7	7	5	44	46
20	43	24	43	33,5	44,5	25,5	44,5	32	2	7	7	5	52	54
25	51	30,5	48	38	52,5	32	49,5	36,5	2	7	7	5	57	62
32	63,5	38	57	47,5	65	39,5	58,5	46	2	7	7	5	67	73
40	73	44,5	63,5	54	74,5	46	65	52,5	2	7	7	5	73	84
50	92	57,5	82,5	73	93,5	59	84	71,5	2	7	7	5	92	103
65	105	68,5	95,5	85,5	106,5	70	97	84	2	7	7	5	105	116
80	127	84	117,5	106	128,5	85,5	119	106,5	2	7	7	5	127	138
100	157,5	109,5	144,5	132	159	111	146	130,5	2	7	7	5	157,5	168
125	186	136,5	173	160,5	187,5	138	174,5	159	2	7	7	5	186	197
150	216	162	203,5	190,5	217,5	163,5	205	189	2	7	7	5	216	227
200	270	213	254	238	271,5	214,5	255,5	236,5	2	7	7	5	270	281
250	324	267	305	286	325,5	268,5	306,5	284,5	2	7	7	5	324	335
300	381	317,5	362	343	382,5	319	363,5	341,5	2	7	7	5	381	392
350	413	349,5	394	374,5	414,5	351	395,5	373	2	7	7	5	413	424
400	470	400	447,5	425,5	471,5	401,5	449	424	2	7	7	5	470	481
450	533,5	451	511,5	489	535	452,5	513	487,5	2	7	7	5	533,5	544
500	584,5	501,5	559	533,5	586	503	560,5	532	2	7	7	5	584,5	595
550	641								2	7				
600	692,5	603	667	641,5	694	605	668,5	640	2	7	7	5	692,5	703,5
650	749								2	7				
700	800								2	7				
750	857								2	7				
800	914								2	7				
850	965								2	7				
900	1 022								2	7				

[1] Large spigot and recess faces and large tongue and groove are not applicable to PN20 because of potential dimensional conflicts.
[2] f_1 applies to PN20 and PN50, and is included in the minimum flange thickness.
[3] f_2 applies to PN110, PN150, PN260 and PN420, and is additional to the minimum flange thickness.

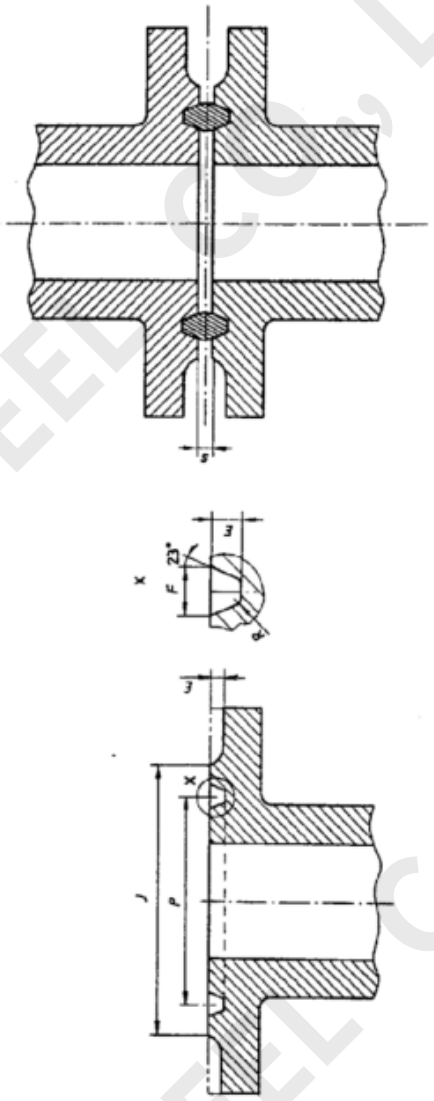
Note: For small spigot and recess joints care should be taken in the use of these dimensions to ensure that the inside diameter of the fitting or pipe is small enough to ensure sufficient bearing surfaces.

Annex Table 6 Dimensions of flange facings for nominal sizes DN950 to DN1500 for PN20, PN50, PN110 and PN150

Unit: mm

Nominal size	Outside diameter of raised face d_1				Height of raised face	
DN	PN 20	PN 50	PN 110	PN 150	f_1[1]	f_2[2]
950	1 073	1 029	1 054	1 099	2	7
1 000	1 124	1 086	1 111	1 162	2	7
1 050	1 194	1 137	1 168	1 213	2	7
1 100	1 245	1 194	1 226	1 270	2	7
1 150	1 295	1 245	1 276	1 334	2	7
1 200	1 359	1 308	1 334	1 384	2	7
1 250	1 410	1 359	1 384		2	7
1 300	1 460	1 410	1 435		2	7
1 350	1 511	1 467	1 492		2	7
1 400	1 575	1 518	1 543		2	7
1 450	1 626	1 575	1 600		2	7
1 500	1 676	1 625	1 657		2	7

[1] f_1 applies to PN20 and PN50.
[2] f_2 applies to PN110 and PN150.



Annex Table 7 Dimensions of ring-joint facings[1), 2), 3), 4)]

Unit: mm

Pipe nominal size DN						Groove number	Groove dimensions				Diameter of raised portion J min.					Approximate distance between flanges s					
PN 20	PN 50	PN 110	PN 150[5)]	PN 260	PN 420		Pitch diameter P ± 0,13	Depth[6)] E $^{+0,4}_{0}$	Width F ± 0,2	Radius at bottom R max.	PN 20	PN 50 and PN 110	PN 150	PN 260	PN 420	PN 20	PN 50	PN 110	PN 150	PN 260	PN 420
—	15	15	—	—	—	R11	34,14	5,56	7,14	0,8	—	51	—	—	—	—	3	3	—	—	—
—	—	—	—	15	—	R12	39,67	6,35	8,74	0,8	—	—	—	60,5	—	—	—	—	—	4	—
—	20	20	—	—	15	R13	42,88	6,35	8,74	0,8	—	63,5	—	—	65	—	4	4	—	—	4
—	—	—	—	20	—	R14	44,45	6,35	8,74	0,8	—	—	—	66,5	—	—	—	—	—	4	—
25	—	—	—	—	—	R15	47,62	6,35	8,74	0,8	63,5	—	—	—	—	4	—	—	—	—	—
—	25	25	—	25	20	R16	50,8	6,35	8,74	0,8	—	70	—	71,5	73	—	4	4	—	4	4
32	—	—	—	—	—	R17	57,15	6,35	8,74	0,8	73	—	—	—	—	4	—	—	—	—	—
—	32	32	—	32	25	R18	60,32	6,35	8,74	0,8	—	79,5	—	81	82,5	—	4	4	—	4	4
40	—	—	—	—	—	R19	65,07	6,35	8,74	0,8	82,5	—	—	—	—	4	—	—	—	—	—
—	40	40	—	40	—	R20	68,28	6,35	8,74	0,8	—	90,5	—	92	—	—	4	4	—	4	—
—	—	—	—	—	32	R21	72,24	7,92	11,91	0,8	—	—	—	—	102	—	—	—	—	—	3
50	—	—	—	—	—	R22	82,55	6,35	8,74	0,8	102	—	—	—	—	4	—	—	—	—	—
—	50	50	—	—	40	R23	82,55	7,92	11,91	0,8	—	108	—	—	114	—	6	5	—	—	3
—	—	—	—	50	—	R24	95,25	7,92	11,91	0,8	—	—	—	124	—	—	—	—	—	3	—
65	—	—	—	—	—	R25	101,6	6,35	8,74	0,8	121	—	—	—	—	4	—	—	—	—	—
—	65	65	—	—	50	R26	101,6	7,92	11,91	0,8	—	127	—	—	133	—	6	5	—	—	3
—	—	—	—	65	—	R27	107,95	7,92	11,91	0,8	—	—	—	137	—	—	—	—	—	3	—
—	—	—	—	—	65	R28	111,12	9,52	13,49	1,5	—	—	—	—	149	—	—	—	—	—	3
80	—	—	—	—	—	R29	114,3	6,35	8,74	0,8	133	—	—	—	—	4	—	—	—	—	—
—	—	—	—	—	—	R30	117,48	7,92	11,91	0,8	—	—	—	—	—	—	—	—	—	—	—
—	80[7)]	80[7)]	80	—	—	R31	123,82	7,92	11,91	0,8	—	146	156	—	—	—	6	5	4	—	—
—	—	—	—	—	80	R32	127	9,52	13,49	1,5	—	—	—	—	168	—	—	—	—	—	3
—	—	—	—	—	—	R33	131,78	6,35	8,74	0,8	154	—	—	—	—	4	—	—	—	—	—
—	—	—	—	—	—	R34	131,78	7,92	11,91	0,8	—	159	—	—	—	—	6	5	—	—	—
—	—	—	—	80	—	R35	136,52	7,92	11,91	0,8	—	—	—	168	—	—	—	—	—	3	—
100	—	—	—	—	—	R36	149,22	6,35	8,74	0,8	171	—	—	—	—	4	—	—	—	—	—
—	100	100	100	—	—	R37	149,22	7,92	11,91	0,8	—	175	181	—	—	—	6	5	4	—	—
—	—	—	—	—	100	R38	157,18	11,13	16,66	1,5	—	—	—	—	203	—	—	—	—	—	4
—	—	—	—	100	—	R39	161,92	7,92	11,91	0,8	—	—	—	194	—	—	—	—	—	3	—
125	—	—	—	—	—	R40	171,45	6,35	8,74	0,8	194	—	—	—	—	4	—	—	—	—	—
—	125	125	125	—	—	R41	180,98	7,92	11,91	0,8	—	210	216	—	—	—	6	5	4	—	—
—	—	—	—	—	125	R42	190,5	12,7	19,84	1,5	—	—	—	—	241	—	—	—	—	—	4
150	—	—	—	—	—	R43	193,68	6,35	8,74	0,8	219	—	—	—	—	4	—	—	—	—	—
—	—	—	—	125	—	R44	193,68	7,92	11,91	0,8	—	—	—	229	—	—	—	—	—	3	—
—	150	150	150	—	—	R45	211,12	7,92	11,91	0,8	—	241	241	—	—	—	6	5	4	—	—

Annex Table 7 (continued)

Unit: mm

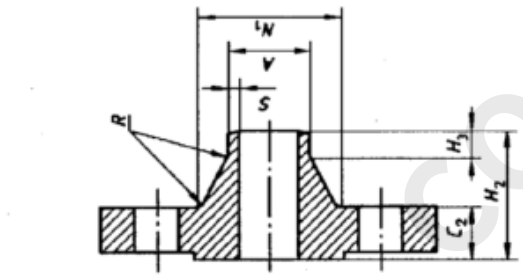
Pipe nominal size DN						Groove number	Groove dimensions				Diameter of raised portion J min.					Approximate distance between flanges s					
PN 20	PN 50	PN 110	PN 150[5]	PN 260	PN 420		Pitch diameter P ± 0,13	Depth[6] E $^{+0,4}_{0}$	Width F ± 0,2	Radius at bottom R max.	PN 20	PN 50 and PN 110	PN 150	PN 260	PN 420	PN 20	PN 50	PN 110	PN 150	PN 260	PN 420
—	—	—	—	150	—	R46	211,12	9,52	13,49	1,5	—	—	—	248	—	—	—	—	—	3	—
—	—	—	—	—	150	R47	228,6	12,7	19,84	1,5	—	—	—	—	279	—	—	—	—	—	4
200	—	—	—	—	—	R48	247,65	6,35	8,74	0,8	273	—	—	—	—	4	—	—	—	—	—
—	200	200	200	—	—	R49	269,88	7,92	11,91	0,8	—	302	308	—	—	—	6	5	4	—	—
—	—	—	—	200	—	R50	269,88	11,13	16,66	1,5	—	—	—	318	—	—	—	—	—	4	—
—	—	—	—	—	200	R51	279,4	14,27	23,01	1,5	—	—	—	—	340	—	—	—	—	—	5
250	—	—	—	—	—	R52	304,8	6,35	8,74	0,8	330	—	—	—	—	4	—	—	—	—	—
—	250	250	250	—	—	R53	323,85	7,92	11,91	0,8	—	356	362	—	—	—	6	5	4	—	—
—	—	—	—	250	—	R54	323,85	11,13	16,66	1,5	—	—	—	371	—	—	—	—	—	4	—
—	—	—	—	—	250	R55	342,9	17,48	30,18	2,4	—	—	—	—	425	—	—	—	—	—	6
300	—	—	—	—	—	R56	381	6,35	8,74	0,8	406	—	—	—	—	4	—	—	—	—	—
—	300	300	300	—	—	R57	381	7,92	11,91	0,8	—	413	419	—	—	—	6	5	4	—	—
—	—	—	—	300	—	R58	381	14,27	23,01	1,5	—	—	—	438	—	—	—	—	—	5	—
350	—	—	—	—	—	R59	396,88	6,35	8,74	0,8	425	—	—	—	—	3	—	—	—	—	—
—	—	—	—	—	300	R60	406,4	17,48	33,32	2,4	—	—	—	—	495	—	—	—	—	—	8
—	350	350	—	—	—	R61	419,1	7,92	11,91	0,8	—	457	—	—	—	—	6	5	—	—	—
—	—	—	350	—	—	R62	419,1	11,13	16,66	1,5	—	—	467	—	—	—	—	—	4	—	—
—	—	—	—	350	—	R63	419,1	15,88	26,97	2,4	—	—	—	489	—	—	—	—	—	6	—
400	—	—	—	—	—	R64	454,02	6,35	8,74	0,8	483	—	—	—	—	3	—	—	—	—	—
—	400	400	—	—	—	R65	469,9	7,92	11,91	0,8	—	508	—	—	—	—	6	5	—	—	—
—	—	—	400	—	—	R66	469,9	11,13	16,66	1,5	—	—	524	—	—	—	—	—	4	—	—
—	—	—	—	400	—	R67	469,9	17,48	30,18	2,4	—	—	—	546	—	—	—	—	—	8	—
450	—	—	—	—	—	R68	517,52	6,35	8,74	0,8	546	—	—	—	—	3	—	—	—	—	—
—	450	450	—	—	—	R69	533,4	7,92	11,91	0,8	—	575	—	—	—	—	6	5	—	—	—
—	—	—	450	—	—	R70	533,4	12,7	19,84	1,5	—	—	594	—	—	—	—	—	5	—	—
—	—	—	—	450	—	R71	533,4	17,48	30,18	2,4	—	—	—	613	—	—	—	—	—	8	—
500	—	—	—	—	—	R72	558,8	6,35	8,74	0,8	597	—	—	—	—	3	—	—	—	—	—
—	500	500	—	—	—	R73	584,2	9,52	13,49	1,5	—	635	—	—	—	—	6	5	—	—	—
—	—	—	500	—	—	R74	584,2	12,7	19,84	1,5	—	—	648	—	—	—	—	—	5	—	—
—	—	—	—	500	—	R75	584,2	17,48	33,32	2,4	—	—	—	673	—	—	—	—	—	10	—
600	—	—	—	—	—	R76	673,1	6,35	8,74	0,8	711	—	—	—	—	3	—	—	—	—	—
—	600	600	—	—	—	R77	692,15	11,13	16,66	1,5	—	749	—	—	—	—	6	6	—	—	—
—	—	—	600	—	—	R78	692,15	15,88	26,97	2,4	—	—	772	—	—	—	—	—	6	—	—
—	—	—	—	600	—	R79	692,15	20,62	36,53	2,4	—	—	—	794	—	—	—	—	—	11	—

Annex Table 7 (concluded)

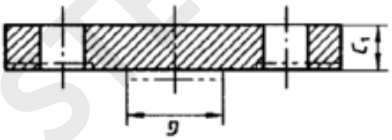
Unit: mm

Pipe nominal size **DN**						Groove number	Groove dimensions				Diameter of raised portion J min.					Approximate distance between flanges s					
PN 20	PN 50	PN 110	PN 150[5]	PN 260	PN 420		Pitch diameter P ± 0,13	Depth[6] E +0,4 0	Width F ± 0,2	Radius at bottom R max.	PN 20	PN 50 and PN 110	PN 150	PN 260	PN 420	PN 20	PN 50	PN 110	PN 150	PN 260	PN 420
–	650	–	–	–	–	R93	749,3	12,7	19,85	2	810	–	–	–	–	–	6	–	–	–	–
–	–	650	–	–	–	R93	749,3	12,7	19,85	2	810	–	–	–	–	–	–	5	–	–	–
–	–	–	650	–	–	R100	749,3	17,46	30,16	2	–	832	–	–	–	–	–	–	8	–	–
–	700	–	–	–	–	R94	800,1	12,7	19,85	2	860	–	–	–	–	–	6	–	–	–	–
–	–	700	–	–	–	R94	800,1	12,7	19,85	2	860	–	–	–	–	–	–	5	–	–	–
–	–	–	700	–	–	R101	800,1	17,46	33,34	2	–	889	–	–	–	–	–	–	10	–	–
–	750	–	–	–	–	R95	857,25	12,7	19,85	2	918	–	–	–	–	–	6	–	–	–	–
–	–	750	–	–	–	R95	857,25	12,7	19,85	2	918	–	–	–	–	–	–	5	–	–	–
–	–	–	750	–	–	R102	857,25	17,46	33,34	2	–	946	–	–	–	–	–	–	10	–	–
–	800	–	–	–	–	R96	914,4	14,3	23	2	984	–	–	–	–	–	7	–	–	–	–
–	–	800	–	–	–	R96	914,4	14,3	23	2	984	–	–	–	–	–	–	6	–	–	–
–	–	–	800	–	–	R103	914,4	17,46	33,34	2	–	1003	–	–	–	–	–	–	10	–	–
–	850	–	–	–	–	R97	965,2	14,3	23	2	1035	–	–	–	–	–	7	–	–	–	–
–	–	850	–	–	–	R97	965,2	14,3	23	2	1035	–	–	–	–	–	–	6	–	–	–
–	–	–	850	–	–	R104	965,2	20,64	36,51	2	–	1067	–	–	–	–	–	–	11	–	–
–	900	–	–	–	–	R98	1022,35	14,3	23	2	1092	–	–	–	–	–	7	–	–	–	–
–	–	900	–	–	–	R98	1022,35	14,3	23	2	1092	–	–	–	–	–	–	6	–	–	–
–	–	–	900	–	–	R105	1022,35	20,64	36,51	2	–	1124	–	–	–	–	–	–	11	–	–

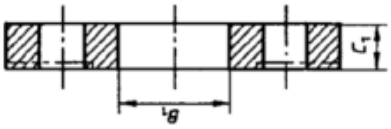
[1] For facing requirements for flanges and flanged fittings, see Annex Fig. 6.
[2] For facing requirements for lapped joints, see **2.5.4** and Annex Fig. 6.
[3] For ring dimensions, see **ISO 7483**.
[4] See **2.8** for marking requirements.
[5] Use PN260 in sizes DN15 to DN65 for PN150.
[6] Height of raised portion is equal to the depth of groove E but is not subject to the tolerance for E. The former full-face contour may be used.
[7] For ring joints with lapped flanges in PN50 and PN110, ring and groove number R30 are used instead of R31.



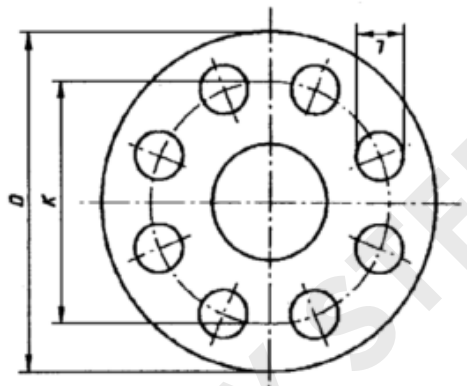
Type 11



Type 05



Type 01



This diagram illustrates the arrangement but not necessarily the correct number of bolt holes.
Refer to the column "number of bolts" in Annex Table 8 for the actual number.

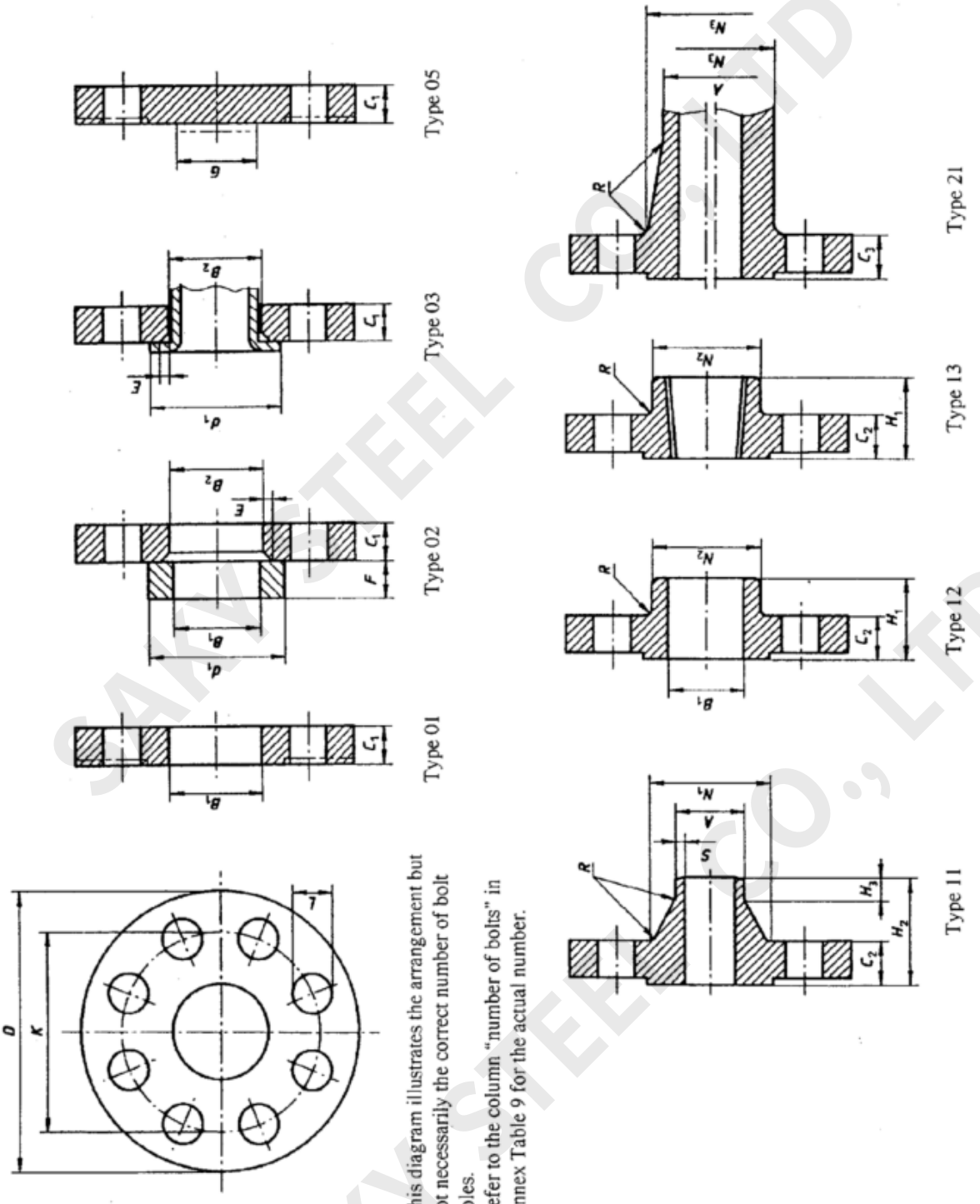
Annex Table 8 Dimensions of PN2,5 flanges

(See p. 82, Notes to Annex Tables 8, 9, 10, 11, 13 and 14.)

Unit: mm

Nominal size DN	Mating dimensions: Outside diameter of flange D	Mating dimensions: Diameter of bolt circle K	Mating dimensions: Diameter of bolt holes L	Bolts: Number	Bolts: Nominal size	Outside diameter of neck A	Bore diameter B_1	Flange thickness C_1	Flange thickness C_2	Shoulder diameter G	Length of hub H_2	Length of hub H_3	Neck diameter N_1	Corner radius R	Neck thickness (see Note 6) S	Nominal size DN
	Flange type															
	01, 05, 11					11	01	01, 05	11	05	11		11	11	11	
10 to 600	Use PN6															10 to 600
700	860	810	26	24	M24	711	To be specified by the purchaser	36	26	–	70	16	740	12	Use PN16	700
800	975	920	29,5	24	M27	813		38	26	–	70	16	842	12		800
900	1 075	1 020	29,5	24	M27	914		40	26	–	70	16	942	12		900
1 000	1 175	1 120	29,5	28	M27	1 016		42	26	–	70	16	1 045	12		1 000
1 200	1 375	1 320	29,5	32	M27	1 220		44	26	–	70	16	1 245	16		1 200
1 400	1 575	1 520	29,5	36	M27	1 420		48	26	–	70	16	1 445	16		1 400
1 600	1 790	1 730	29,5	40	M27	1 620		51	26	–	80	20	1 645	16		1 600
1 800	1 990	1 930	29,5	44	M27	1 820		54	26	–	80	20	1 845	16		1 800
2 000	2 190	2 130	29,5	48	M27	2 020		58	26	–	80	22	2 045	16		2 000
2 200	2 405	2 340	32,5	52	M30	2 220		–	28	–	90	25	2 248	18		2 200
2 400	2 605	2 540	32,5	56	M30	2 420		–	28	–	90	25	2 448	18		2 400
2 600	2 805	2 740	32,5	60	M30	2 620		–	28	–	90	25	2 648	18		2 600
2 800	3 030	2 960	35,5	64	M33	2 820		–	30	–	90	25	2 848	18		2 800
3 000	3 230	3 160	35,5	68	M33	3 020		–	30	–	90	25	3 050	18		3 000
3 200	3 430	3 360	35,5	72	M33	3 220		–	30	–	90	25	3 250	20		3 200
3 400	3 630	3 560	35,5	76	M33	3 420		–	32	–	95	28	3 450	20		3 400
3 600	3 840	3 770	35,5	80	M33	3 620		–	32	–	100	28	3 652	20		3 600
3 800	4 045	3 970	39	80	M36	3 820		–	34	–	100	28	3 852	20		3 800
4 000	4 245	4 170	39	84	M36	4 020		–	34	–	100	28	4 052	20		4 000

Note: For facing dimensions, see Annex Table 4.



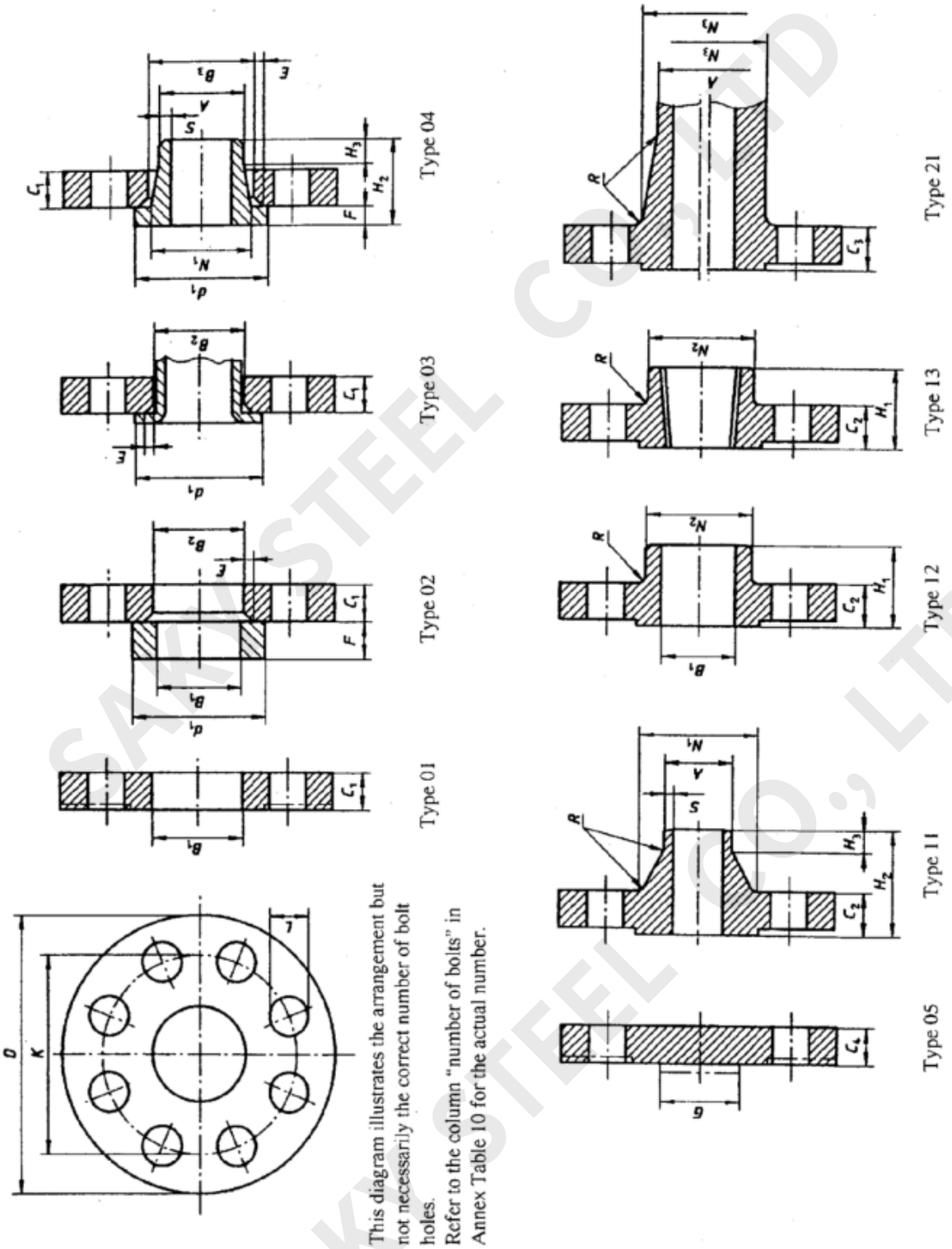
Annex Table 9 Dimensions of PN6 flanges
(See p. 82, Notes to Annex Tables 8, 9, 10, 11, 13 and 14.)

Unit: mm

Nominal size	Mating dimensions					Outside diameter of neck	Bore diameter		Flange thickness			Chamfer	Collar thickness	Shoulder diameter	Length of hub			Neck diameter			Corner radius	Neck thickness (see Note 6)	Nominal size
	Outside diameter of flange	Diameter of bolt circle	Diameter of bolt holes	Bolts: Number	Bolts: Nominal size																		
DN	D	K	L			A	B_1	B_2	C_1	C_1	C_2, C_3	E	F	G	H_1	H_2	H_3	N_1	N_2	N_3	R	S	DN
Flange type	01, 02, 03, 05, 11, 12, 13, 21					11, 21	01, 02, 12	02, 03	01, 02, 03	05	11, 12, 13 / 21	02, 03	02	05	12, 13	11	11	11	12, 13	21	11, 12, 13, 21	11	
10	75	50	11	4	M10	17,2	18	21	12		12	3	10	—	20	28	6	26	25	20	3	1,6	10
15	80	55	11	4	M10	21,3	22	25	12		12	3	10	—	20	30	6	30	30	26	3	1,8	15
20	90	65	11	4	M10	26,9	27,5	31	14		14	4	10	—	24	32	6	38	40	34	4	1,8	20
25	100	75	11	4	M10	33,7	34,5	38	14		14	4	10	—	24	35	6	42	50	44	4	2	25
32	120	90	14	4	M12	42,4	43,5	46	16		16	5	10	—	26	35	6	55	60	54	5	2,3	32
40	130	100	14	4	M12	48,3	49,5	53	16		16	5	10	—	26	38	7	62	70	64	5	2,3	40
50	140	110	14	4	M12	60,3	61,5	65	16		16	5	12	—	28	38	8	74	80	74	5	2,3	50
65	160	130	14	4	M12	76,1	77,5	81	16		16	6	12	56	32	38	9	88	100	94	6	2,6	65
80	190	150	18	4	M16	88,9	90,5	94	18		18	6	12	70	34	42	10	102	110	110	6	2,9	80
100	210	170	18	4	M16	114,3	116	120	18		18	6	14	90	40	45	10	130	130	130	6	3,2	100
125	240	200	18	8	M16	139,7	141,5	145	20		18	6	14	115	44	48	10	155	160	160	6	3,6	125
150	265	225	18	8	M16	168,3	170,5	174	20		20	6	14	140	44	48	12	184	185	182	8	4	150
200	320	280	18	8	M16	219,1	221,5	226	22		22	6	16	190	—	55	15	236	240	238	8	4,5	200
250	375	335	18	12	M16	273	276,5	281	24		24	8	18	235	—	60	15	290	295	284	10	5	250
300	440	395	22	12	M20	323,9	327,5	333	24		24	8	18	285	—	62	15	342	355	342	10	5,6	300
350	490	445	22	12	M20	355,6	359,5	365	26	24	24	8	18	325	—	62	15	385	—	392	10	5,6	350
400	540	495	22	16	M20	406,4	411	416	28	24	24	8	20	375	—	65	15	438	—	442	10	6,3	400
450	595	550	22	16	M20	457	462	467	30	24	24	8	20	425	—	65	15	492	—	494	12	6,3	450
500	645	600	22	20	M20	508	513,5	519	32	26	26	8	22	475	—	68	15	538	—	544	12	6,3	500
600	755	705	26	20	M24	610	616,5	622	36	30	30	8	22	575	—	70	16	640	—	642	12	6,3	600
700	860	810	26	24	M24	711	—	—	40 1)	40	26	—	—	—	—	70	16	740	—	746	12	—	700
800	975	920	29,5	24	M27	813	—	—	44 1)	44	26	—	—	—	—	70	16	842	—	850	12	—	800
900	1 075	1 020	29,5	24	M27	914	—	—	48 1)	48	26	—	—	—	—	70	16	942	—	950	12	—	900
1 000	1 175	1 120	29,5	28	M27	1 016	—	—	52 1)	52	26	—	—	—	—	70	16	1 045	—	1 050	12	—	1 000
1 200	1 405	1 340	32,5	32	M30	1 220	—	—	60 1)	60	28	—	—	—	—	90	20	1 248	—	1 264	12	—	1 200
1 400	1 630	1 560	35,5	36	M33	1 420	—	—	68 1)	68	32	—	—	—	—	90	20	1 452	—	1 480	12	—	1 400
1 600	1 830	1 760	35,5	40	M33	1 620	—	—	76 1)	76	34	—	—	—	—	90	20	1 655	—	1 680	12	—	1 600
1 800	2 045	1 970	39	44	M36	1 820	—	—	84 1)	84	36	—	—	—	—	100	20	1 855	—	1 878	15	—	1 800
2 000	2 265	2 180	42	48	M39	2 020	—	—	92 1)	92	38	—	—	—	—	110	25	2 058	—	2 082	15	—	2 000
2 200	2 475	2 390	42	52	M39	2 220	—	—	—		42	—	—	—	—	115	25	2 260	—	—	15	—	2 200
2 400	2 685	2 600	42	56	M39	2 420	—	—	—		44	—	—	—	—	125	25	2 462	—	—	15	—	2 400
2 600	2 905	2 810	48	60	M45	2 620	—	—	—		46	—	—	—	—	130	25	2 665	—	—	15	—	2 600
2 800	3 115	3 020	48	64	M45	2 820	—	—	—		48	—	—	—	—	135	30	2 865	—	—	15	—	2 800
3 000	3 315	3 220	48	68	M45	3 020	—	—	—		50	—	—	—	—	140	30	3 068	—	—	15	—	3 000
3 200	3 525	3 430	48	72	M45	3 220	—	—	—		54	—	—	—	—	150	30	3 272	—	—	15	—	3 200
3 400	3 735	3 640	48	76	M45	3 420	—	—	—		56	—	—	—	—	160	35	3 475	—	—	15	—	3 400
3 600	3 970	3 860	55	80	M52	3 620	—	—	—		60	—	—	—	—	165	35	3 678	—	—	15	—	3 600

1) For type 01 flanges only.

Note: For d_1 and facing dimensions, see Annex Table 4.

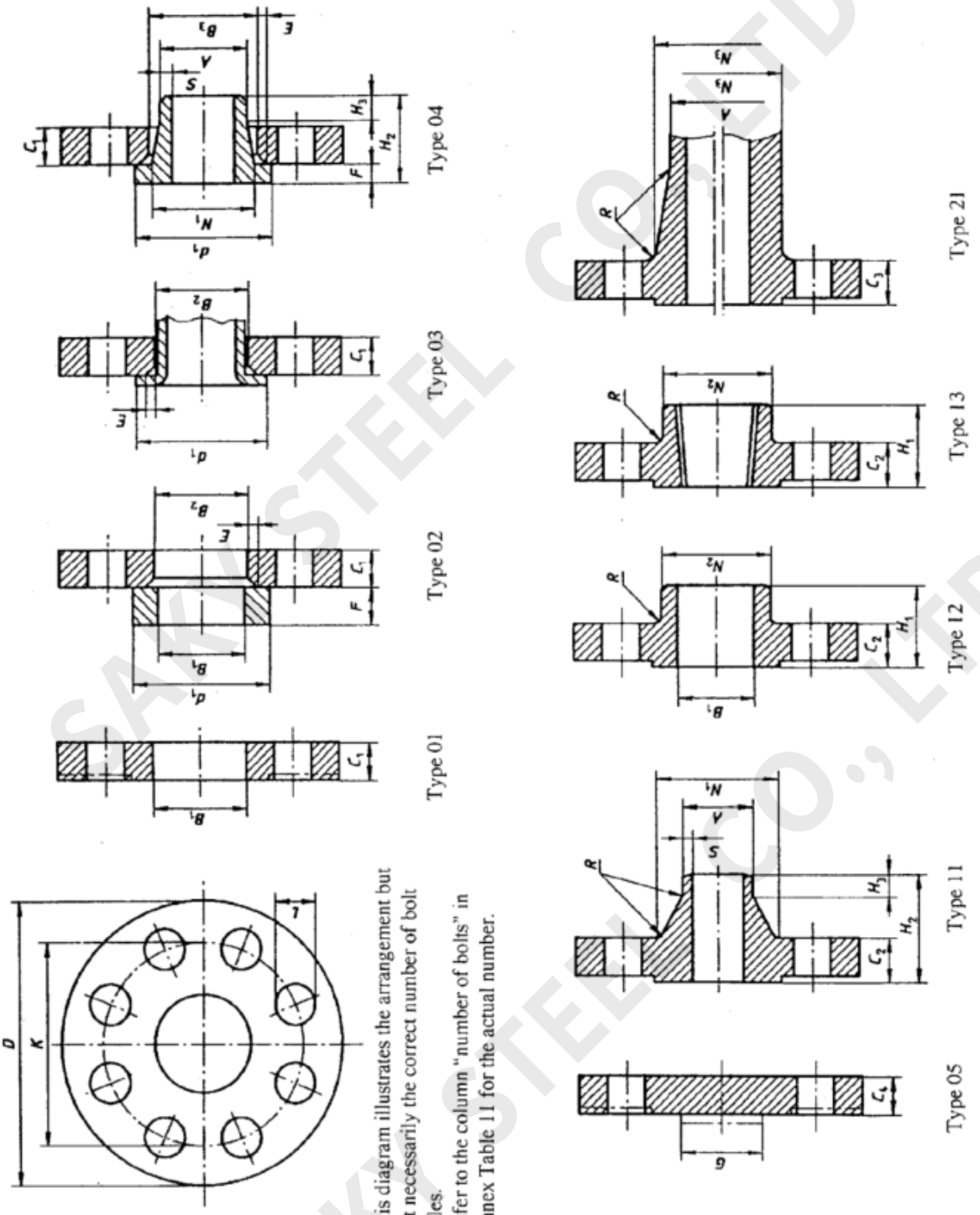


Annex Table 10 Dimensions of PN10 flanges
(See p. 82, Notes to Annex Tables 8, 9, 10, 11, 13 and 14.)

Unit: mm

Nominal size DN	Mating dimensions: Outside diameter of flange D	Diameter of bolt circle K	Diameter of bolt holes L	Bolts: Number	Bolts: Nominal size	Outside diameter of neck A	Bore diameter B_1	Bore diameter B_2	Bore diameter B_3	Flange thickness C_1	Flange thickness C_2	Flange thickness C_3	Flange thickness C_4	Chamfer E	Collar thickness F	Shoulder diameter G	Length of hub H_1	Length of hub H_2	Length of hub H_3	Neck diameter N_1	Neck diameter N_2	Neck diameter N_3	Corner radius R	Neck thickness (see Note 6) S	Nominal size DN
	Flange type																								
	01, 02, 03, 04, 05, 11, 12, 13, 21					04, 11, 21	01, 02, 12	02, 03	04	01, 02, 03, 04	11, 12, 13	21	05	02, 03, 04	02, 04	05	12, 13	04, 11	04, 11	04, 11	12, 13	21	11, 12, 13, 21	04, 11	
10 15 20	Use PN40																								10 15 20
25 32 40																									25 32 40
50 65 80	Use PN16																								50 65 80
100 125 150																									100 125 150
200	340	295	22	8	M20	219,1	221,5	226	240	24	24	24	6	20	190	44	62	16	234	246	246	8	6,3	200
250	395	350	22	12	M20	273	276,5	281	294	26	26	26	8	22	235	46	68	16	288	298	298	10	6,3	250
300	445	400	22	12	M20	323,9	327,5	333	348	28	26	26	8	22	285	46	68	16	342	350	348	10	7,1	300
350	505	460	22	16	M20	355,6	359,5	365	400	30	26	26	8	22	325	53	68	16	390	400	408	10	8	350
400	565	515	26	16	M24	406,4	411	416	450	32	26	28	8	24	375	57	72	16	440	456	456	10	8,8	400
450	615	565	26	20	M24	457	462	467	498	35	28	28	8	24	425	63	72	16	488	502	502	12	10	450
500	670	620	26	20	M24	508	513,5	519	550	38	28	28	8	26	475	67	75	16	540	559	559	12	11	500
600	780	725	29,5	20	M27	610	616,5	622	650	42	34	34	8	26	575	75	80	18	640	658	658	12	12,5	600
700	895	840	29,5	24	M27	711	–	–	–	–	30	34	38	–	–	670	–	80	18	746	–	772	12		700
800	1 015	950	32,5	24	M30	813	–	–	–	–	32	36	42	–	–	770	–	90	18	848	–	876	12		800
900	1 115	1 050	32,5	28	M30	914	–	–	–	–	34	38	46	–	–	860	–	95	20	948	–	976	12		900
1 000	1 230	1 160	35,5	28	M33	1 016	–	–	–	–	34	38	52	–	–	960	–	95	20	1 050	–	1 080	12		1 000
1 200	1 455	1 380	39	32	M36	1 220	–	–	–	–	38	44	60	–	–	1 160	–	115	25	1 256	–	1 292	12		1 200
1 400	1 675	1 590	42	36	M39	1 420	–	–	–	–	42	48	–	–	–	–	–	120	25	1 460	–	1 496	12	See	1 400
1 600	1 915	1 820	48	40	M45	1 620	–	–	–	–	46	52	–	–	–	–	–	130	25	1 666	–	1 712	12	Note 6	1 600
1 800	2 115	2 020	48	44	M45	1 820	–	–	–	–	50	56	–	–	–	–	–	140	30	1 866	–	1 910	15		1 800
2 000	2 325	2 230	48	48	M45	2 020	–	–	–	–	54	60	–	–	–	–	–	150	30	2 070	–	2 120	15		2 000
2 200	2 550	2 440	55	52	M52	2 220	–	–	–	–	58	–	–	–	–	–	–	160	35	2 275	–	–	18		2 200
2 400	2 760	2 650	55	56	M52	2 420	–	–	–	–	62	–	–	–	–	–	–	170	35	2 478	–	–	18		2 400
2 600	2 960	2 850	55	60	M52	2 620	–	–	–	–	66	–	–	–	–	–	–	180	40	2 680	–	–	18		2 600
2 800	3 180	3 070	55	64	M52	2 820	–	–	–	–	70	–	–	–	–	–	–	190	40	2 882	–	–	18		2 800
3 000	3 405	3 290	60	68	M56	3 020	–	–	–	–	75	–	–	–	–	–	–	200	45	3 085	–	–	18		3 000

Note: For d_1 and facing dimensions, see Annex Table 4.



Annex Table 11 Dimensions of PN16 flanges

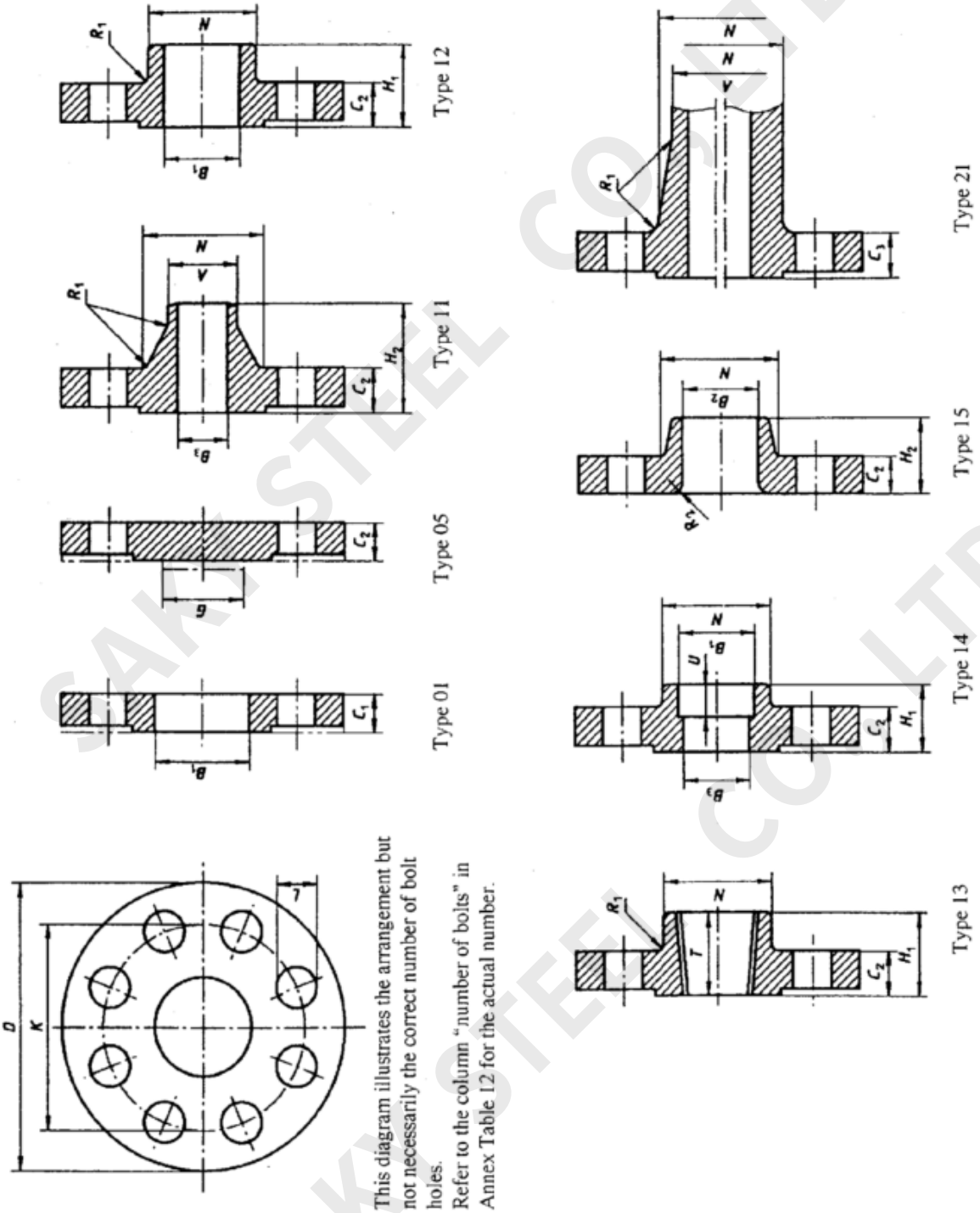
(See p. 82, Notes to Annex Tables 8, 9, 10, 11, 13 and 14.)

Unit: mm

Nominal size DN	Mating dimensions: Outside diameter of flange D	Diameter of bolt circle K	Diameter of bolt holes L	Bolts: Number	Bolts: Nominal size	Outside diameter of neck A	Bore diameter B_1	Bore diameter B_2	Bore diameter B_3	Flange thickness C_1	Flange thickness C_2	Flange thickness C_3	Flange thickness C_4	Chamfer E	Collar thickness F	Shoulder diameter G	Length of hub H_1	Length of hub H_2	Length of hub H_3	Neck diameter N_1	Neck diameter N_2	Neck diameter N_3	Corner radius R	Neck thickness (see Note 6) S	Nominal size DN
	Flange type																								
	01, 02, 03, 04, 05, 11, 12, 13, 21					04, 11, 21	01, 02, 12	02, 03	04	01, 02, 03, 04	11, 12, 13	21	05	02, 03, 04	02, 04	05	12, 13	04, 11	04, 11	04, 11	12, 13	21	11, 12, 13, 21	04, 11	
10 15 20	Use PN40																								10 15 20
25 32 40																									25 32 40
50																									50
65	185	145	18	8	M16	76,1	77,5	81	96	20	20	20	6	16	55	32	45	10	92	104	104	6	2,9	65
80	200	160	18	8	M16	88,9	90,5	94	114	20	20	20	6	16	70	34	50	10	110	118	120	6	3,2	80
100	220	180	18	8	M16	114,3	116	120	134	22	22	22	6	18	90	40	52	12	130	140	140	6	3,6	100
125	250	210	18	8	M16	139,7	141,5	145	162	22	22	22	6	18	115	44	55	12	158	168	170	6	4	125
150	285	240	22	8	M20	168,3	170,5	174	188	24	24	24	6	20	140	44	55	12	184	195	190	8	4,5	150
200	340	295	22	12	M20	219,1	221,5	226	240	26	24	24	6	20	190	44	62	16	234	246	246	8	6,3	200
250	405	355	26	12	M24	273	276,5	281	294	28	26	26	8	22	235	46	70	16	288	298	296	10	6,3	250
300	460	410	26	12	M24	323,9	327,5	333	348	32	28	28	8	24	285	53	78	16	342	350	350	10	7,1	300
350	520	470	26	16	M24	355,6	359	365	400	35	30	30	8	26	325	57	82	16	390	400	410	10	8	350
400	580	525	29,5	16	M27	406,4	411	416	454	38	32	32	8	28	375	63	85	16	444	456	458	10	8,8	400
450	640	585	29,5	20	M27	457	462	467	500	42	40	40	8	30	425	68	87	16	490	502	516	12	10	450
500	715	650	32,5	20	M30	508	513,5	510	556	46	44	44	8	32	475	73	90	16	546	559	576	12	11	500
600	840	770	35,5	20	M33	610	616,5	622	660	52	54	54	8	32	575	83	95	18	650	658	690	12	12,5	600
700	910	840	35,5	24	M33	711	–	–	–	60[1]	38	40	48	–	–	670	–	100	18	750	–	760	12	–	700
800	1 025	950	39	24	M36	813	–	–	–	68[1]	38	42	52	–	–	770	–	105	20	848	–	862	12	–	800
900	1 125	1 050	39	28	M36	914	–	–	–	76[1]	40	44	58	–	–	860	–	110	20	948	–	962	12	–	900
1 000	1 255	1 170	42	28	M39	1 016	–	–	–	84[1]	42	46	64	–	–	960	–	120	22	1 056	–	1 076	12	–	1 000
1 200	1 485	1 390	48	32	M45	1 220	–	–	–	98[1]	48	52	76	–	–	1 160	–	130	30	1 260	–	1 282	12	–	1 200
1 400	1 685	1 590	48	36	M45	1 420	–	–	–	–	52	58	–	–	–	–	–	145	30	1 465	–	1 482	12	–	1 400
1 600	1 930	1 820	55	40	M52	1 620	–	–	–	–	58	64	–	–	–	–	–	160	35	1 668	–	1 696	12	–	1 600
1 800	2 130	2 020	55	44	M52	1 820	–	–	–	–	62	68	–	–	–	–	–	170	35	1 870	–	1 896	15	–	1 800
2 000	2 345	2 230	60	48	M56	2 020	–	–	–	–	66	70	–	–	–	–	–	190	40	2 072	–	2 100	15	–	2 000

[1] For type 01 flanges only.

Note: For d_1 and facing dimensions, see Annex Table 4.



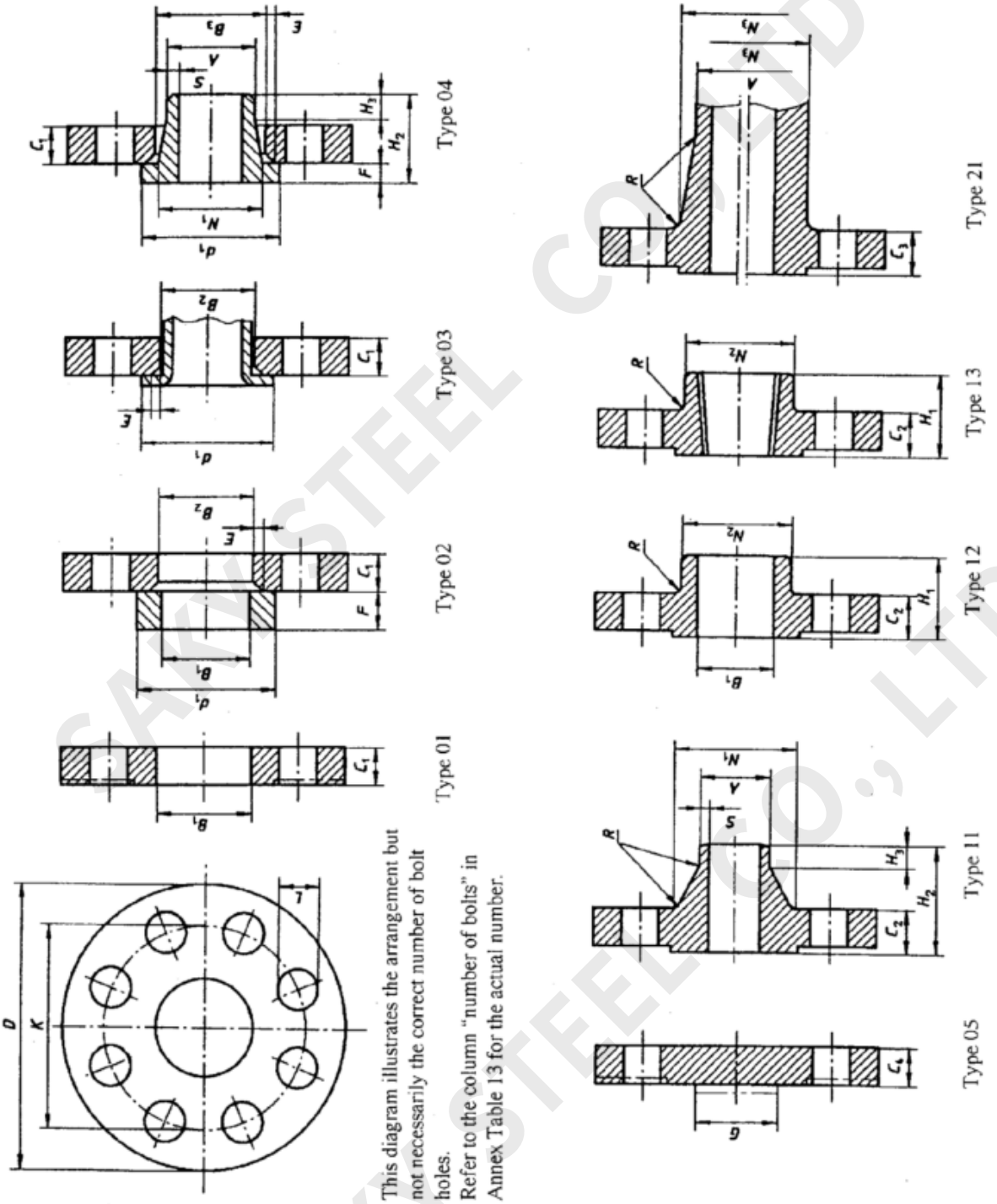
Annex Table 12 Dimensions of PN20 flanges

(See p. 83, Notes to Annex Tables 12, 15, 16, 17, 18 and 19.)

Unit: mm

Nominal size	Mating dimensions					Outside diameter of neck (see Note 7)	Bore diameter (see Note 8)			Flange thickness (see Note 9)			Shoulder diameter	Length of hub		Neck diameter	Corner radius		Minimum thread length of threaded flange (see Note 5)	Depth of socket	Nominal size
	Outside diameter of flange	Diameter of bolt circle	Diameter of bolt holes	Bolts													Fillet radius (at hub end)	Lap radius (at pipe end)			
				Number	Nominal size																
DN	D	K	L			A	B_1	B_2	B_3	C_1	C_2	C_3	G	H_1	H_2	N	R_1	R_2	T	U	DN
	Flange type																				
	01, 05, 11, 12, 13, 14, 15, 21					11, 21	01, 12, 14	15	11, 14	01	05, 11, 12, 13, 14, 15	21	05	12, 13, 14	15	11	11, 12, 13, 14, 15, 21	11, 12, 13, 21	15	13	14	
15	90	60,5	16	4	M14	21,5	22	23	16	12	11,5	—	—	16	16	48	30	—	3	16	10	15
20	100	70	16	4	M14	26,5	28	28	21	14	13	—	—	16	16	52	38	—	3	16	11	20
25	110	79,5	16	4	M14	33,5	34,5	35	26,5	16	14,5	11,5	—	17	17	56	49	—	3	17	13	25
32	120	89	16	4	M14	42	43,5	43,5	35	18	16	13	—	21	21	57	59	—	5	21	14	32
40	130	98,5	16	4	M14	48,5	49,5	50	41	19	17,5	14,5	—	22	22	62	65	—	6	22	16	40
50	150	120,5	18	4	M16	60,5	62	62,5	52,5	21	19,5	16	—	25	25	64	78	—	8	25	17	50
65	180	139,5	18	4	M16	73	74,5	75,5	62,5	24	22,5	17,5	38	29	29	70	90	—	8	29	19	65
80	190	152,5	18	4	M16	89	90,5	91,5	78	26	24	19,5	51	30	30	70	108	—	10	30	21	80
100	230	190,5	18	8	M16	114,5	116	117	102,5	27	24	24	76	33	33	76	135	—	11	33	—	100
125	255	216	22	8	M20	141,5	143,5	144,5	128	28	24	24	102	36	36	89	164	—	11	36	—	125
150	280	241,5	22	8	M20	168,5	170,5	171,5	154	31	25,5	25,5	127	40	40	89	192	—	13	40	—	150
200	345	298,5	22	8	M20	219	221,5	222	202,5	34	29	29	200	44	45	102	246	—	13	44	—	200
250	405	362	26	12	M24	273	276	277,5	254,5	38	30,5	30,5	225	49	49	102	305	—	13	49	—	250
300	485	432	26	12	M24	324	327	328	305	42	32	32	279	56	56	114	365	10	13	56	—	300
350	535	476	29,5	12	M27	355,5	359	360	—	43	35	35	311	57	79	127	400	10	13	57	—	350
400	600	540	29,5	16	M27	406,5	410,5	411	—	48	37	37	362	64	87	127	457	10	13	64	—	400
450	635	578	32,5	16	M30	457	462	462,5	—	52	40	40	413	68	97	140	505	10	13	68	—	450
500	700	635	32,5	20	M30	508	513	514,5	—	56	43	43	463	73	103	145	559	10	13	73	—	500
550	750	692	35,5	20	M33	—	—	—	—	—	46	—	—	—	—	149	610	10	—	—	—	550
600	815	749,5	35,5	20	M33	609,5	616	616	—	62	48	48	565	83	111	152	664	10	13	83	—	600
Flange types affected for DN650 and above are types 05 and 11 only.																					
650	870	806	35,5	24	M33	—	—	—	—	—	68,5	—	—	—	—	121	675	10	—	—	—	650
700	925	863	35,5	28	M33	—	—	—	—	—	71,5	—	—	—	—	125	725	11	—	—	—	700
750	985	914	35,5	28	M33	—	—	—	—	—	74,5	—	—	—	—	137	780	11	—	—	—	750
800	1 060	978	42	28	M39	—	—	—	—	—	81	—	—	—	—	144	830	11	—	—	—	800
850	1 110	1 029	42	32	M39	—	—	—	—	—	82,5	—	—	—	—	149	880	13	—	—	—	850
900	1 170	1 088	42	32	M39	—	—	—	—	—	90,5	—	—	—	—	157	935	13	—	—	—	900
950	1 240	1 150	42	32	M39	—	—	—	—	—	87,5	—	—	—	—	157	990	13	—	—	—	950
1 000	1 290	1 200	42	36	M39	—	—	—	—	—	90,5	—	—	—	—	164	1 040	13	—	—	—	1 000
1 050	1 345	1 257	42	36	M39	—	—	—	—	—	97,5	—	—	—	—	171	1 090	13	—	—	—	1 050
1 100	1 405	1 314	42	40	M39	—	—	—	—	—	102	—	—	—	—	178	1 145	13	—	—	—	1 100
1 150	1 455	1 365	42	40	M39	—	—	—	—	—	103	—	—	—	—	186	1 195	13	—	—	—	1 150
1 200	1 510	1 422	42	44	M39	—	—	—	—	—	108	—	—	—	—	192	1 250	13	—	—	—	1 200
1 250	1 570	1 480	48	44	M45	—	—	—	—	—	111	—	—	—	—	203	1 300	13	—	—	—	1 250
1 300	1 625	1 537	48	44	M45	—	—	—	—	—	116	—	—	—	—	210	1 355	13	—	—	—	1 300
1 350	1 685	1 594	48	44	M45	—	—	—	—	—	121	—	—	—	—	216	1 405	13	—	—	—	1 350
1 400	1 745	1 651	48	48	M45	—	—	—	—	—	124	—	—	—	—	229	1 455	13	—	—	—	1 400
1 450	1 805	1 708	48	48	M45	—	—	—	—	—	129	—	—	—	—	235	1 510	13	—	—	—	1 450
1 500	1 855	1 759	48	52	M45	—	—	—	—	—	132	—	—	—	—	240	1 560	13	—	—	—	1 500

Note: For facing dimensions, see Annex Tables 5, 6 and 7.



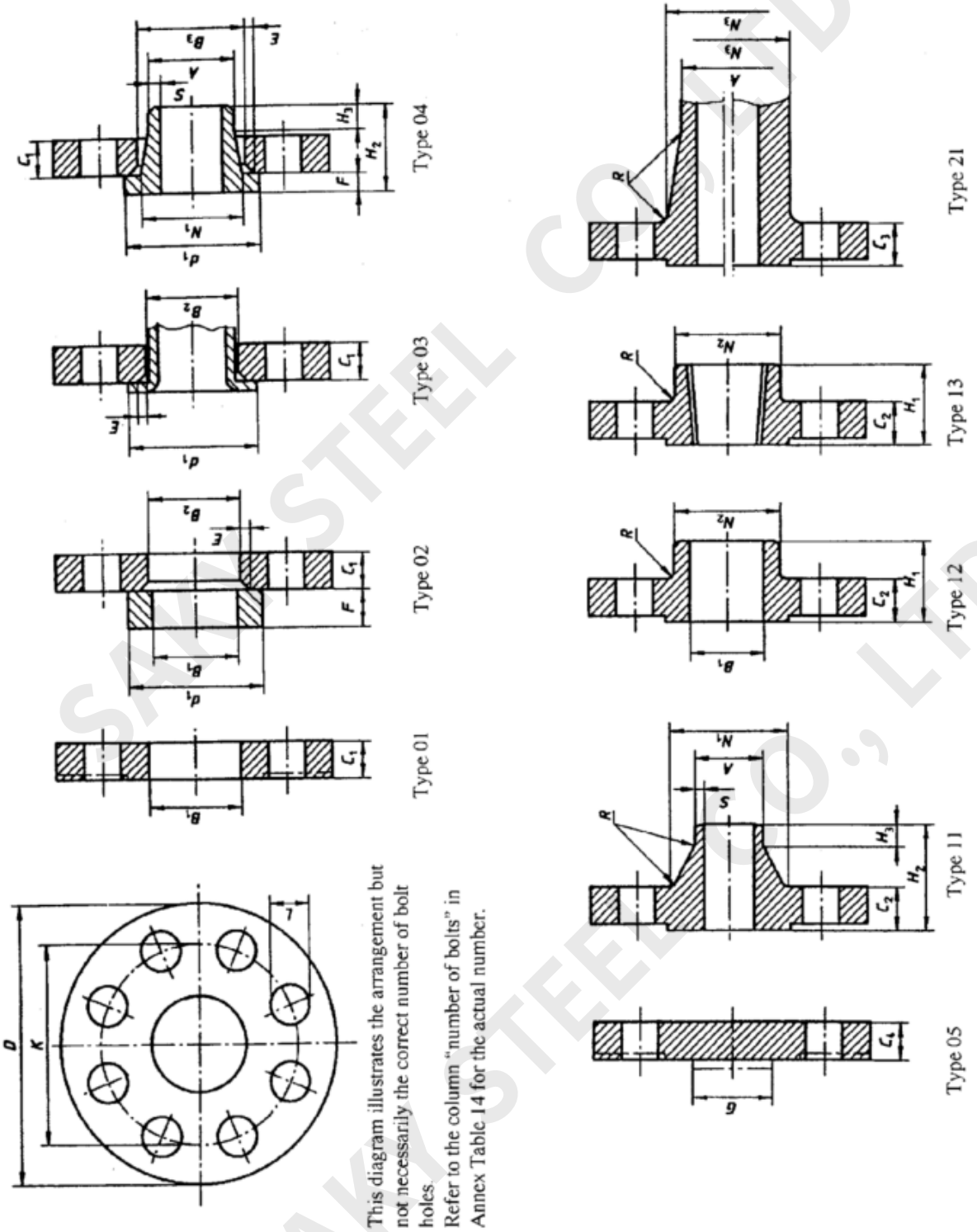
Annex Table 13 Dimensions of PN25 flanges

(See p. 82, Notes to Annex Tables 8, 9, 10, 11, 13 and 14.)

Unit: mm

Nominal size DN	Mating dimensions: Outside diameter of flange D	Mating dimensions: Diameter of bolt circle K	Mating dimensions: Diameter of bolt holes L	Mating dimensions: Bolts: Number	Mating dimensions: Bolts: Nominal size	Outside diameter of neck A	Bore diameter: B_1	Bore diameter: B_2	Bore diameter: B_3	Flange thickness: C_1	Flange thickness: C_2	Flange thickness: C_3	Flange thickness: C_4	Chamfer E	Collar thickness F	Shoulder diameter G	Length of hub: H_1	Length of hub: H_2	Length of hub: H_3	Neck diameter: N_1	Neck diameter: N_2	Neck diameter: N_3	Corner radius R	Neck thickness (see Note 6) S	Nominal size DN
	Flange type																								
	01, 02, 03, 04, 05, 11, 12, 13, 21					04, 11, 21	01, 02 12	02, 03	04	01, 02, 03, 04	11, 12, 13	21	05	02, 03, 04	02, 04	05	12, 13	04, 11	04, 11	04, 11	12, 13	21	11, 12, 13, 21	04, 11	
10 15 20	Use PN40																								10 15 20
25 32 40																									25 32 40
50 65 80																									50 65 80
100 125 150																									100 125 150
200	360	310	26	12	M24	219,1	221,5	226	250	32	30	30		6	26	190	52	80	16	244	256	252	8	6,3	200
250	425	370	29,5	12	M27	273	276,5	281	302	35	32	32		8	26	235	60	88	18	296	310	304	10	6,3	250
300	485	430	29,5	16	M27	323,9	327,5	333	356	38	34	34		8	28	285	67	92	18	350	364	364	10	7,1	300
350	555	490	32,5	16	M30	355,6	359,5	365	408	42	38	38		8	32	325	72	100	20	398	418	418	10	8	350
400	620	550	35,5	16	M33	406,4	411	416	462	46	40	40		8	34	375	78	110	20	452	472	472	10	8,8	400
450	670	600	35,5	20	M33	457	462	467	510	50	46	46		8	36	425	84	110	20	500	520	520	12	10	450
500	730	660	35,5	20	M33	508	513,5	519	568	56	48	48		8	38	475	90	125	20	558	580	580	12	11	500
600	845	770	39	20	M36	610	616,5	622	670	68	58	58		8	40	575	100	125	20	660	684	684	12	12,5	600
700	960	875	42	24	M39	711	–	–	–	–	46	50	–	–	–	–	–	125	20	760	–	780	12	–	700
800	1 085	990	48	24	M45	813	–	–	–	–	50	54	–	–	–	–	–	135	22	864	–	882	12	–	800
900	1 185	1 090	48	28	M45	914	–	–	–	–	54	58	–	–	–	–	–	145	24	968	–	982	12	–	900
1 000	1 320	1 210	55	28	M52	1 016	–	–	–	–	58	62	–	–	–	–	–	155	24	1 070	–	1 086	12	–	1 000
1 200	1 530	1 420	55	32	M52	1 220	–	–	–	–	–	70	–	–	–	–	–	–	–	–	–	1 296	12	–	1 200
1 400	1 755	1 640	60	36	M56	1 420	–	–	–	–	–	76	–	–	–	–	–	–	–	–	–	1 508	12	–	1 400
1 600	1 975	1 860	60	40	M56	1 620	–	–	–	–	–	84	–	–	–	–	–	–	–	–	–	1 726	12	–	1 600
1 800	2 195	2 070	68	44	M64	1 820	–	–	–	–	–	90	–	–	–	–	–	–	–	–	–	1 920	15	–	1 800
2 000	2 425	2 300	68	48	M64	2 020	–	–	–	–	–	96	–	–	–	–	–	–	–	–	–	2 150	15	–	2 000

Note: For d_1 and facing dimensions, see Annex Table 4.



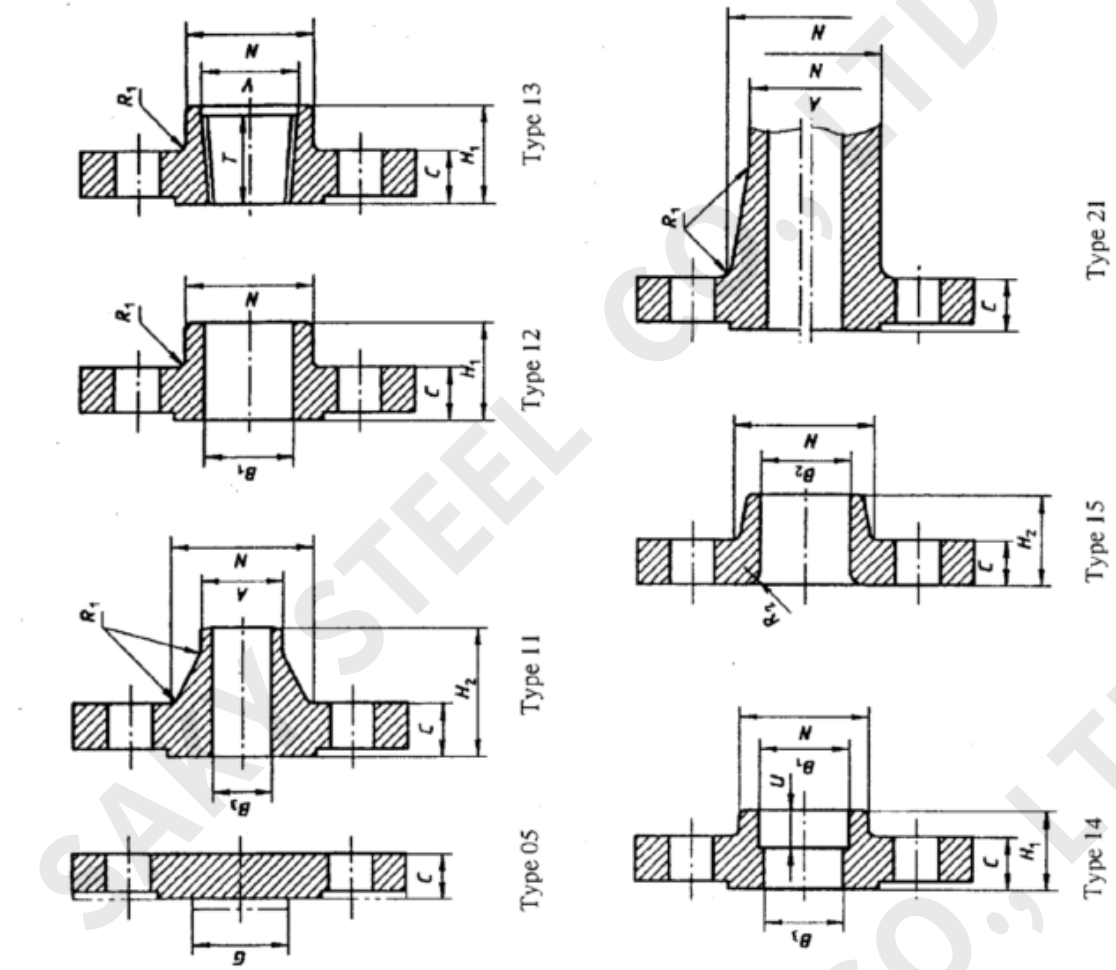
Annex Table 14 Dimensions of PN40 flanges

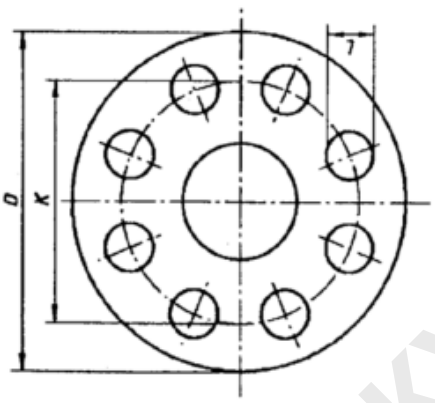
(See p. 82, Notes to Annex Tables 8, 9, 10, 11, 13 and 14.)

Unit: mm

Nominal size DN	Mating dimensions: Outside diameter of flange D	Bolts: Diameter of bolt circle K	Bolts: Diameter of bolt holes L	Bolts: Number	Bolts: Nominal size	Outside diameter of neck A	Bore diameter B_1	Bore diameter B_2	Bore diameter B_3	Flange thickness C_1	Flange thickness C_2	Flange thickness C_3	Flange thickness C_4	Chamfer E	Collar thickness F	Shoulder diameter G	Length of hub H_1	Length of hub H_2	Length of hub H_3	Neck diameter N_1	Neck diameter N_2	Neck diameter N_3	Corner radius R	Neck thickness (see Note 6) S	Nominal size DN
	Flange type																								
	01, 02, 03, 04, 05, 11, 12, 13, 21					04, 11, 21	01, 02, 12	02, 03	04	01, 02, 03, 04	11, 12, 13	21	05	02, 03, 04	02, 04	05	12, 13	04, 11	04, 11	04, 11	12, 13	21	11, 12, 13, 21	04, 11	
10	90	60	14	4	M12	17,2	18	21	31	14	14			3	12	—	22	35	6	28	30	28	3	2,3	10
15	95	65	14	4	M12	21,3	22	25	35	14	14			3	12	—	22	38	6	32	35	32	3	3,2	15
20	105	75	14	4	M12	26,9	27,5	31	42	16	16			4	14	—	26	40	6	40	45	40	4	3,2	20
25	115	85	14	4	M12	33,7	34,5	38	49	16	16			4	14	—	28	40	6	46	52	50	4	3,2	25
32	140	100	18	4	M16	42,4	43,5	47	59	18	18			5	14	—	30	42	6	56	60	60	5	3,6	32
40	150	110	18	4	M16	48,3	49,5	53	67	18	18			5	14	—	32	45	7	64	70	70	5	3,6	40
50	165	125	18	4	M16	60,3	61,5	65	77	20	20			5	16	—	34	48	8	74	84	84	5	4	50
65	185	145	18	8	M16	76,1	77,5	81	96	22	22			6	16	55	38	52	10	92	104	104	6	5	65
80	200	160	18	8	M16	88,9	90,5	94	114	24	24			6	18	70	40	58	12	110	118	120	6	5,6	80
100	235	190	22	8	M20	114,3	116	120	138	26	24			6	20	90	44	65	12	134	145	142	6	6,3	100
125	270	220	26	8	M24	139,7	141,5	145	166	28	26			6	22	115	48	68	12	162	170	162	6	6,3	125
150	300	250	26	8	M24	168,3	170,5	174	194	30	28			6	24	140	52	75	12	190	200	192	8	7,1	150
200	375	320	29,5	12	M27	219,1	221,5	226	250	36	34			6	28	190	—	88	16	244	—	254	8	8	200
250	450	385	32,5	12	M30	273	276,5	281	312	42	38			8	30	235	—	105	18	306	—	312	10	10	250
300	515	450	32,5	16	M30	323,9	327,5	333	368	48	42			8	34	285	—	115	18	362	—	378	10	10	300
350	580	510	35,5	16	M33	355,6	359,5	365	418	55	46			8	36	325	—	125	20	408	—	432	10	11	350
400	660	585	39	16	M36	406,4	411	416	472	60	50			8	42	375	—	135	20	462	—	498	10	12,5	400
450	685	610	39	20	M36	457	462	467	510	66	57			8	46	425	—	135	20	500	—	522	12	14,2	450
500	755	670	42	20	M39	508	513,5	519	572	72	57			8	50	475	—	140	20	562	—	576	12	16	500
600	890	795	48	20	M45	610	616,5	622	676	84	72			8	54	575	—	150	20	666	—	686	12	17,5	600

Note: For d_1 and facing dimensions, see Annex Table 4.





This diagram illustrates the arrangement but not necessarily the correct number of bolt holes.
Refer to the column "number of bolts" in Annex Table 15 for the actual number.

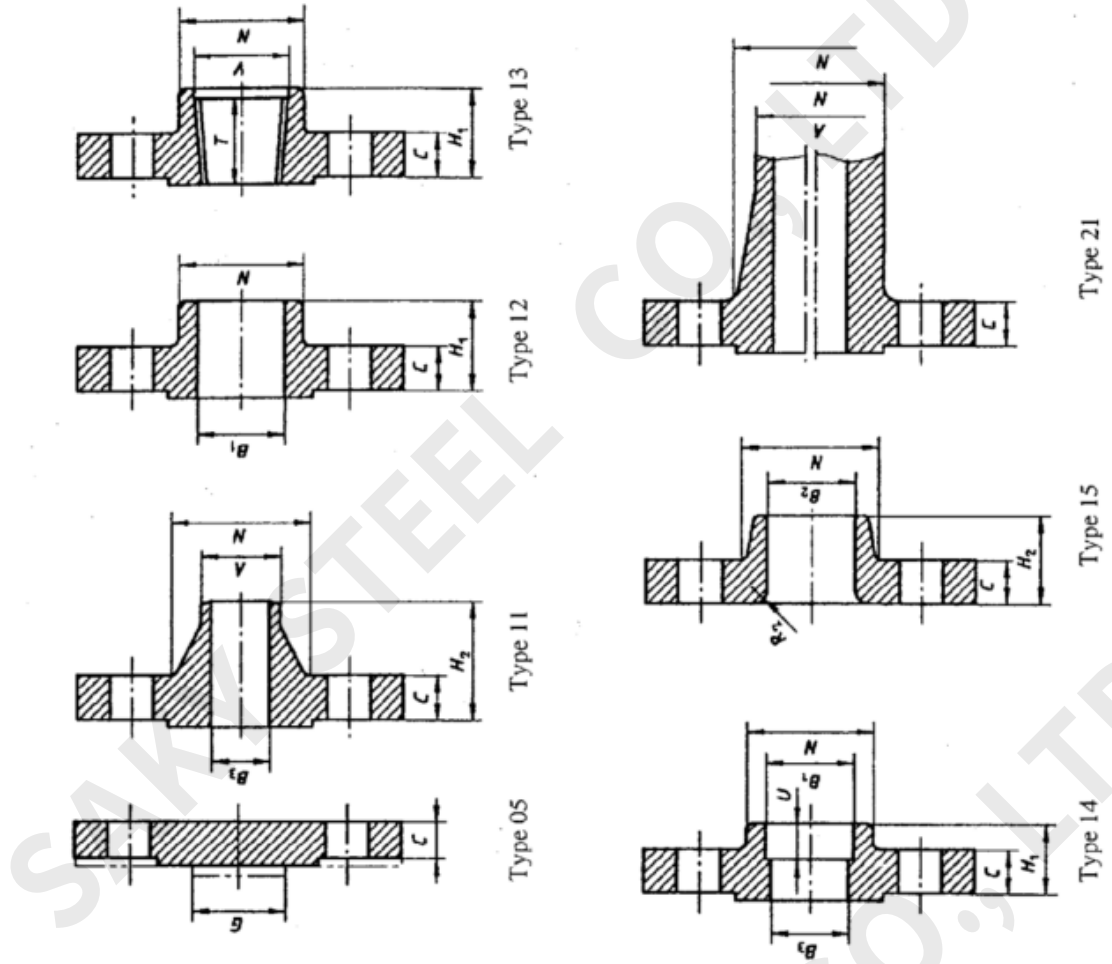
Annex Table 15 Dimensions of PN50 flanges

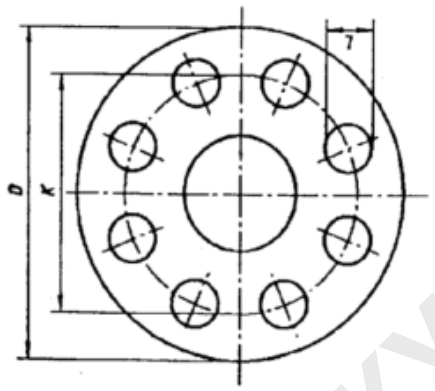
(See p. 83, Notes to Annex Tables 12, 15, 16, 17, 18 and 19.)

Unit: mm

Nominal size	Mating dimensions: Outside diameter of flange	Mating dimensions: Diameter of bolt circle	Mating dimensions: Diameter of bolt holes	Mating dimensions: Bolts: Number	Mating dimensions: Bolts: Nominal size	Outside diameter of neck (see Note 7)	Bore diameter (see Note 8)			Flange thickness (see Note 9)	Shoulder diameter	Length of hub		Neck diameter	Corner radius: Fillet radius (at hub end)	Corner radius: Lap radius (at pipe end)	Minimum thread length of threaded flange (see Note 5)	Depth of socket	Minimum diameter of counterbore threaded flange	Nominal size
DN	D	K	L			A	B_1	B_2	B_3	C	G	H_1	H_2	N	R_1	R_2	T	U	V	DN
	Flange type																			
	05, 11, 12, 13, 14, 15, 21					11, 21	12, 14	15	11, 14	05, 11, 12, 13, 14, 15, 21	05	12, 13, 14	15	11	11, 12, 13, 14, 15, 21	11, 12, 13, 21	15	13	14	13	
15	95	66,5	16	4	M14	21,5	22	23	16	14,5	—	22	22	52	38	—	3	16	10	24	15
20	120	82,5	18	4	M16	26,5	28	28	21	16	—	25	25	57	48	—	3	16	11	29	20
25	125	89	18	4	M16	33,5	34,5	35	26,5	17,5	—	27	27	62	54	—	3	18	13	36	25
32	135	98,5	18	4	M16	42	43,5	43,5	35	19,5	—	27	27	65	64	—	5	21	14	45	32
40	155	114,5	22	4	M20	48,5	49,5	50	41	21	—	30	30	68	70	—	6	22	16	51	40
50	165	127	18	8	M16	60,5	62	62,5	52,5	22,5	—	33	33	70	84	—	8	29	17	64	50
65	190	149	22	8	M20	73	74,5	75,5	62,5	25,5	38	38	38	76	100	—	8	32	19	76	65
80	210	168,5	22	8	M20	89	90,5	91,5	78	29	51	43	43	79	118	—	10	32	21	92	80
100	255	200	22	8	M20	114,5	116	117	102,5	32	76	48	48	86	146	—	11	37	—	118	100
125	280	235	22	8	M20	141,5	143,5	144,5	128	35	102	51	51	98	178	—	11	43	—	146,5	125
150	320	270	22	12	M20	168,5	170,5	171,5	154	37	127	52	52	98	206	—	13	46	—	171,5	150
200	380	330	26	12	M24	219	221,5	222	202,5	41,5	200	62	62	111	260	—	13	51	—	222,5	200
250	445	387,5	29,5	16	M27	273	276	277,5	254,5	48	225	67	95	117	321	—	13	56	—	276,5	250
300	520	451	32,5	16	M30	324	327	328	305	51	279	73	102	130	375	10	13	61	—	329	300
350	585	514,5	32,5	20	M30	355,5	359	360	—	54	311	76	111	143	426	10	13	64	—	360,5	350
400	650	571,5	35,5	20	M33	406,5	410,5	411	—	57,5	362	83	121	146	483	10	13	68	—	411	400
450	710	628,5	35,5	24	M33	457	462	462,5	—	60,5	406	89	130	159	533	10	13	70	—	462	450
500	775	686	35,5	24	M33	508	513	514,5	—	63,5	457	95	140	162	587	10	13	73	—	513	500
550	840	743	42	24	M39	559	—	—	—	66,5	—	—	—	165	640	10	—	—	—	—	550
600	915	813	42	24	M39	609,5	616	616	—	70	559	104	152	168	702	10	13	83	—	614,5	600
	Flange types affected for DN650 and above are types 05 and 11 only.																			
650	970	876	45	28	M42	—	—	—	—	84 / 79,5	—	—	—	184	720	10	—	—	—	—	650
700	1 035	940	45	28	M42	—	—	—	—	90,5 / 85,5	—	—	—	197	775	11	—	—	—	—	700
750	1 090	997	48	28	M45	—	—	—	—	95 / 92	—	—	—	210	825	11	—	—	—	—	750
800	1 150	1 054	51	28	M48	—	—	—	—	100 / 98,5	—	—	—	222	880	11	—	—	—	—	800
850	1 205	1 105	51	28	M48	—	—	—	—	105 / 102	—	—	—	232	935	13	—	—	—	—	850
900	1 270	1 168	55	32	M52	—	—	—	—	111 / 105	—	—	—	241	990	13	—	—	—	—	900
950	1 170	1 092	42	32	M39	—	—	—	—	108	—	—	—	181	995	13	—	—	—	—	950
1 000	1 240	1 156	45	32	M42	—	—	—	—	114	—	—	—	194	1 050	13	—	—	—	—	1 000
1 050	1 290	1 206	45	32	M42	—	—	—	—	119	—	—	—	200	1 100	13	—	—	—	—	1 050
1 100	1 355	1 264	48	32	M45	—	—	—	—	124	—	—	—	206	1 150	13	—	—	—	—	1 100
1 150	1 415	1 321	51	28	M48	—	—	—	—	129	—	—	—	216	1 205	13	—	—	—	—	1 150
1 200	1 465	1 372	51	32	M48	—	—	—	—	133	—	—	—	224	1 255	13	—	—	—	—	1 200
1 250	1 530	1 429	55	32	M52	—	—	—	—	140	—	—	—	232	1 305	13	—	—	—	—	1 250
1 300	1 580	1 480	55	32	M52	—	—	—	—	144	—	—	—	238	1 355	13	—	—	—	—	1 300
1 350	1 660	1 549	60	28	M56	—	—	—	—	152	—	—	—	252	1 410	13	—	—	—	—	1 350
1 400	1 710	1 600	60	28	M56	—	—	—	—	154	—	—	—	260	1 465	13	—	—	—	—	1 400
1 450	1 760	1 651	60	32	M56	—	—	—	—	159	—	—	—	267	1 515	13	—	—	—	—	1 450
1 500	1 810	1 702	60	32	M56	—	—	—	—	164	—	—	—	273	1 565	13	—	—	—	—	1 500

Note: For facing dimensions, see Annex Tables 5, 6 and 7.





This diagram illustrates the arrangement but not necessarily the correct number of bolt holes.
Refer to the column "number of bolts" in Annex Table 16 for the actual number.

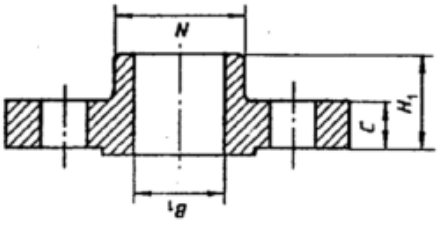
Annex Table 16 Dimensions of PN110 flanges

(See p. 83, Notes to Annex Tables 12, 15, 16, 17, 18 and 19.)

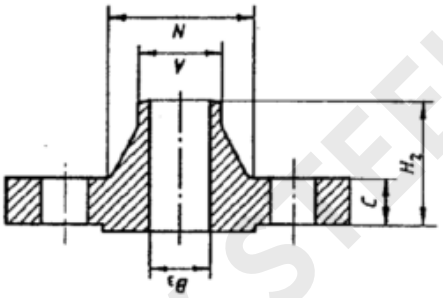
Unit: mm

Nominal size DN	Mating dimensions					Outside diameter of neck (see Note 7)	Bore diameter (see Note 8)			Flange thickness	Shoulder diameter	Length of hub			Neck diameter (see Note 9)	Lap radius (at pipe end)	Minimum thread length of threaded flange (see Note 5)	Depth of socket	Minimum diameter of counterbore threaded flange	Nominal size DN
	Outside diameter of flange	Diameter of bolt circle	Diameter of bolt holes	Bolts																
				Number	Nominal size															
	D	K	L			A	B_1	B_2	B_3	C	G	H_1	H_2		N	R_2	T	U	V	
	Flange type																			
	05, 11, 12, 13, 14, 15, 21					11, 21	12, 14	15	11, 14	06, 11, 12, 13, 14, 15, 21	05	12, 13, 14	15	11	11, 12, 13, 14, 15, 21	15	13	14	13	
15	95	66,5	16	4	M14	21,5	22	23	—	14,5	—	22	22	52	38	3	16	10	24	15
20	120	82,5	18	4	M16	26,5	28	28	—	16	—	25	25	57	48	3	16	11	29	20
25	125	89	18	4	M16	36,5	34,5	35	—	17,5	—	27	27	62	54	3	18	13	36	25
32	135	98,5	18	4	M16	42	43,5	43,5	—	21	—	29	29	67	64	5	21	14	45	32
40	155	114,5	22	4	M20	48,5	49,5	50	—	22,5	—	32	32	70	70	6	22	16	51	40
50	165	127	18	8	M16	60,5	62	62,5	—	25,5	—	37	37	73	84	8	29	17	64	50
65	190	149	22	8	M20	73	74,5	75,5	—	29	38	41	41	79	100	8	32	19	76,5	65
80	210	168,5	22	8	M20	89	90,5	91,5	—	32	51	46	46	83	117	10	35	21	92,5	80
100	275	216	26	8	M24	114,5	116	117	—	38,5	76	54	54	102	152	11	41	—	118	100
125	330	267	29,5	8	M27	141,5	143,5	145	—	44,5	102	60	60	114	189	11	48	—	145	125
150	355	292	29,5	12	M27	168,5	171	171,5	—	48	127	67	67	117	222	13	51	—	171,5	150
200	420	349	32,5	12	M30	219	221,5	222	—	55,5	175	76	74	133	273	13	57	—	222,5	200
250	510	432	36,5	16	M33	273	276	277,5	—	63,5	222	86	111	152	343	13	65	—	276,5	250
300	560	489	35,5	20	M33	324	327	328	—	67	273	92	117	156	400	13	70	—	329	300
350	605	527	39	20	M36	355,5	359	360	—	70	302	94	127	165	432	13	73	—	360,5	350
400	685	603	42	20	M39	406,5	410,5	411	—	76,5	349	106	140	178	495	13	78	—	411,5	400
450	745	654	45	20	M42	457	462	462,5	—	83	394	117	152	184	546	13	79	—	462,5	450
500	815	724	45	24	M42	508	513	514,5	—	89	438	127	165	190	610	13	82	—	513	500
550	870	778	48	24	M45	559	—	—	—	95	—	—	—	197	665	—	—	—	—	550
600	940	838	51	24	M48	609,5	616	616	—	102	533	140	184	203	718	13	92	—	614,5	600
	Flange types affected for DN650 and above are types 05 and 11 only.																			
650	1 015	914	51	28	M48	—	—	—	—	125	108	—	—	222	750	—	—	—	—	650
700	1 075	965	55	28	M52	—	—	—	—	132	111	—	—	235	805	—	—	—	—	700
750	1 130	1 022	55	28	M52	—	—	—	—	140	114	—	—	248	860	—	—	—	—	750
800	1 195	1 080	60	28	M56	—	—	—	—	148	117	—	—	260	920	—	—	—	—	800
850	1 245	1 130	60	28	M56	—	—	—	—	154	121	—	—	270	975	—	—	—	—	850
900	1 315	1 194	68	28	M64	—	—	—	—	162	124	—	—	283	1 030	—	—	—	—	900
950	1 270	1 162	60	28	M56	—	—	—	—	156	152	—	—	254	1 020	—	—	—	—	950
1 000	1 320	1 213	60	32	M56	—	—	—	—	162	159	—	—	264	1 075	—	—	—	—	1 000
1 050	1 405	1 283	68	28	M64	—	—	—	—	171	168	—	—	279	1 125	—	—	—	—	1 050
1 100	1 455	1 334	68	32	M64	—	—	—	—	178	173	—	—	289	1 180	—	—	—	—	1 100
1 150	1 510	1 391	68	32	M64	—	—	—	—	186	179	—	—	300	1 235	—	—	—	—	1 150
1 200	1 595	1 460	74	32	M70	—	—	—	—	195	189	—	—	316	1 290	—	—	—	—	1 200
1 250	1 670	1 524	80	28	M76	—	—	—	—	203	197	—	—	329	1 345	—	—	—	—	1 250
1 300	1 720	1 575	80	32	M76	—	—	—	—	210	203	—	—	337	1 395	—	—	—	—	1 300
1 350	1 780	1 632	80	32	M76	—	—	—	—	217	210	—	—	349	1 450	—	—	—	—	1 350
1 400	1 855	1 695	86	32	M82	—	—	—	—	225	217	—	—	362	1 500	—	—	—	—	1 400
1 450	1 905	1 746	86	32	M82	—	—	—	—	232	222	—	—	370	1 555	—	—	—	—	1 450
1 500	1 995	1 822	94	28	M90	—	—	—	—	243	233	—	—	389	1 610	—	—	—	—	1 500

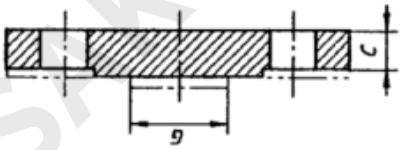
Note: For facing dimensions, see Annex Tables 5, 6 and 7.



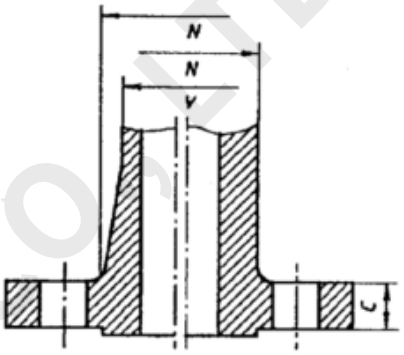
Type 12



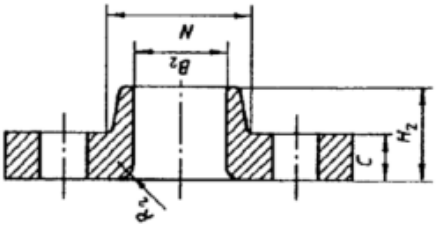
Type 11



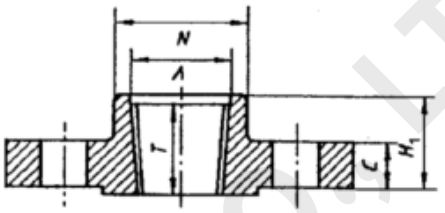
Type 05



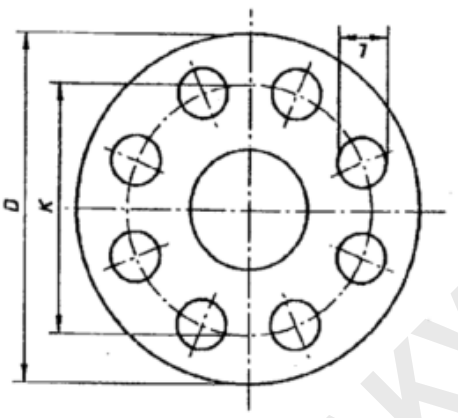
Type 21



Type 15



Type 13



This diagram illustrates the arrangement but not necessarily the correct number of bolt holes.
Refer to the column "number of bolts" in Annex Table 17 for the actual number.

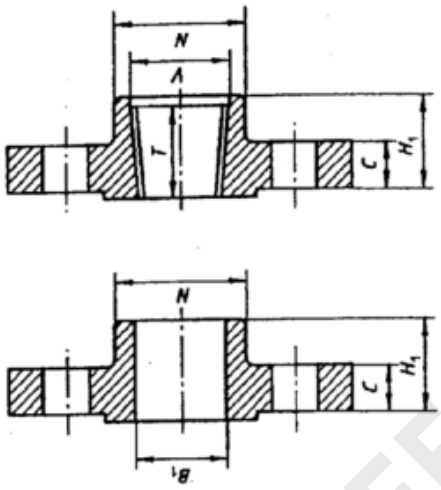
Annex Table 17 Dimensions of PN150 flanges

(See p. 83, Notes to Annex Tables 12, 15, 16, 17, 18 and 19.)

Unit: mm

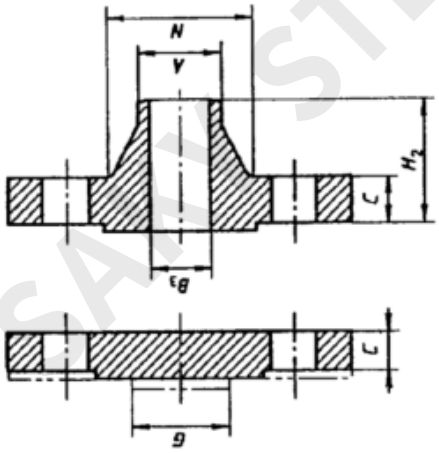
Nominal size	Mating dimensions					Outside diameter of neck (see Note 7)	Bore diameter (see Note 8)			Flange thickness	Shoulder diameter	Length of hub			Neck diameter	Lap radius (at pipe end)	Minimum thread length of threaded flange (see Note 5)	Minimum diameter of counterbore threaded flange	Nominal size
	Outside diameter of flange	Diameter of bolt circle	Diameter of bolt holes	Bolts															
				Number	Nominal size														
DN	D	K	L			A	B_1	B_2	B_3	C	G	H_1	H_2		N	R_2	T	V	DN
	Flange type																		
	05, 11, 12, 13, 15, 21					11, 21	12	15	11	05, 11, 12, 13, 15, 21	05	12, 13	15	11	11, 12, 13, 15, 21	15	13	13	
15	Use PN260																		15
20																			20
25																			25
32																			32
40																			40
50																			50
65																			65
80	240	190,5	26	8	M24	89	90,5	91,5	–	38,5	48	54	54	102	127	10	42	92	80
100	290	235	32,5	8	M30	114,5	116	117	–	44,5	73	70	70	114	159	11	48	118	100
125	350	279,5	35,5	8	M33	141,5	143,5	144,5	–	51	95	79	79	127	190	11	54	144,5	125
150	380	317,5	32,5	12	M30	168,5	170,5	171,5	–	56	121	86	86	140	235	13	57	171,5	150
200	470	393,5	39	12	M36	219	221,5	222,5	–	63,5	165	102	114	162	298	13	64	222,5	200
250	545	470	39	16	M36	273	276	277,5	–	70	213	108	127	184	368	13	71	276,5	250
300	610	533,5	39	20	M36	324	327	328	–	79,5	257	117	143	200	419	13	76	329	300
350	640	559	42	20	M39	355,5	359	360	–	86	286	130	156	213	451	13	83	360,5	350
400	705	616	45	20	M42	406,5	410,5	411	–	89	381	133	165	216	508	13	86	411,5	400
450	785	686	51	20	M48	457	462	462,5	–	102	419	152	191	229	565	13	89	462	450
500	855	749,5	55	20	M52	508	513	514,5	–	108	451	159	210	248	672	13	92	513	500
600	1 040	901,5	68	20	M64	609,5	616	616	–	140	508	203	292	267	749	13	102	614,5	600
Flange types affected for DN650 and above are types 05 and 11 only.																			
650	1 085	952	74	20	M70	–	–	–	–	160	140	–	–	286	775	–	–	–	650
700	1 165	1 022	80	20	M76	–	–	–	–	171	143	–	–	298	830	–	–	–	700
750	1 230	1 086	80	20	M76	–	–	–	–	183	149	–	–	311	890	–	–	–	750
800	1 315	1 156	86	20	M82	–	–	–	–	194	159	–	–	330	945	–	–	–	800
850	1 395	1 226	86	20	M82	–	–	–	–	205	165	–	–	349	1 005	–	–	–	850
900	1 460	1 289	94	20	M90	–	–	–	–	214	171	–	–	362	1 065	–	–	–	900
950	1 460	1 289	94	20	M90	–	–	–	–	216	190	–	–	352	1 075	–	–	–	950
1 000	1 510	1 340	94	24	M90	–	–	–	–	224	197	–	–	364	1 125	–	–	–	1 000
1 050	1 560	1 391	94	24	M90	–	–	–	–	232	206	–	–	371	1 175	–	–	–	1 050
1 100	1 650	1 464	99	24	M95	–	–	–	–	243	214	–	–	391	1 235	–	–	–	1 100
1 150	1 735	1 537	105	24	M100	–	–	–	–	256	225	–	–	411	1 290	–	–	–	1 150
1 200	1 785	1 588	105	24	M100	–	–	–	–	264	233	–	–	419	1 345	–	–	–	1 200

Note: For facing dimensions, see Annex Tables 5, 6 and 7.



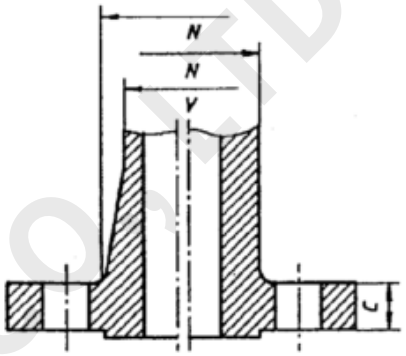
Type 13

Type 12

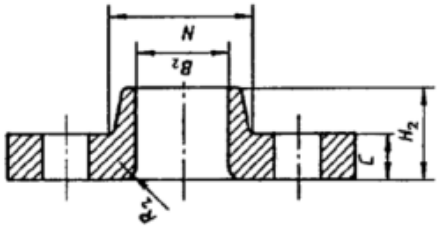


Type 11

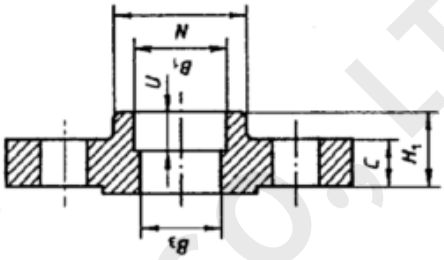
Type 05



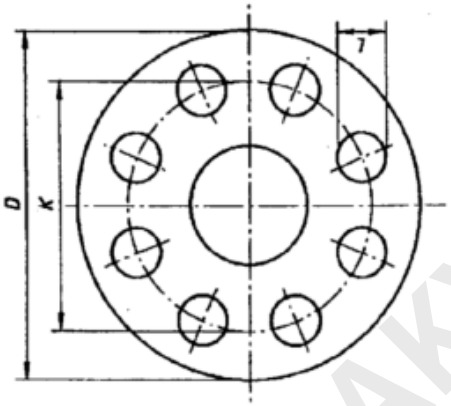
Type 21



Type 15



Type 14



This diagram illustrates the arrangement but not necessarily the correct number of bolt holes.
Refer to the column "number of bolts" in Annex Table 18 for the actual number.

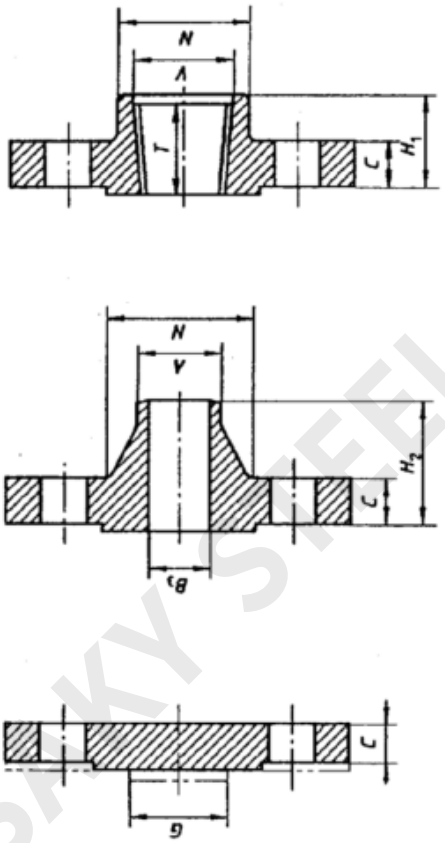
Annex Table 18 Dimensions of PN260 flanges

(See p. 83, Notes to Annex Tables 12, 15, 16, 17, 18 and 19.)

Unit: mm

Nominal size	Mating dimensions					Outside diameter of neck (see Note 7)	Bore diameter (see Note 8)			Flange thickness	Shoulder diameter	Length of hub			Neck diameter	Lap radius (at pipe end)	Minimum thread length of threaded flange (see Note 5)	Depth of socket	Minimum diameter of counterbore threaded flange	Nominal size
	Outside diameter of flange	Diameter of bolt circle	Diameter of bolt holes	Bolts																
				Number	Nominal size															
DN	D	K	L			A	B_1	B_2	B_3	C	G	H_1	H_2		N	R_2	T	U	V	DN
	Flange type																			
	05, 11, 12, 13, 14, 15, 21					11, 21	12, 14	15	11, 14	05, 11, 12, 13, 14, 15, 21	05	12, 13, 14	15	11	11, 12, 13, 14, 15, 21	15	13	14	13	
15	120	82,5	22	4	M20	21,5	22	23	–	22,5	–	32	32	60	38	3	23	10	24	15
20	130	89	22	4	M20	26,5	28	28	–	25,5	–	35	35	70	44	3	26	11	29	20
25	150	101,5	26	4	M24	33,5	34,5	35	–	29	–	41	41	73	52	3	29	13	36	25
32	160	111	26	4	M24	42	43,5	43,5	–	29	–	41	41	73	64	5	31	14	44,5	32
40	180	124	29,5	4	M27	48,5	49,5	50	–	32	–	44	44	83	70	6	32	16	50,5	40
50	215	165	26	8	M24	60,5	62	62,5	–	38,5	–	57	57	102	105	8	38	17	64	50
65	245	190,5	29,5	8	M27	73	74,5	75,5	–	41,5	32	64	64	105	124	8	48	19	76,5	65
80	265	203	32,5	8	M30	89	–	91,5	–	48	44	73	73	117	133	10	51	–	92,5	80
100	310	241,5	35,5	8	M33	114,5	–	117	–	54	66	90	90	124	162	11	57	–	118	100
125	375	292	42	8	M33	141,5	–	144,5	–	73,5	86	105	105	155	197	11	64	–	144,5	125
150	395	317,5	39	12	M36	168,5	–	171,5	–	83	111	119	119	171	229	13	70	–	171,5	150
200	485	393,5	45	12	M42	219	–	222	–	92	152	143	143	213	292	13	77	–	225,5	200
250	585	482,5	51	12	M48	273	–	277,5	–	108	197	159	178	254	368	13	84	–	276,5	250
300	675	571,5	55	16	M52	324	–	328	–	124	238	181	219	283	451	13	92	–	329	300
350	750	635	60	16	M56	355,5	–	360	–	133,5	263	–	241	298	495	13	–	–	–	350
400	825	705	68	16	M64	406,5	–	411	–	146,5	305	–	260	311	552	13	–	–	–	400
450	915	774,5	74	16	M70	457	–	462,5	–	162	346	–	276	327	597	13	–	–	–	450
500	985	832	80	16	M76	508	–	514,5	–	178	390	–	292	356	641	13	–	–	–	500
600	1 170	990,5	94	16	M90	609,5	–	616	–	203,5	473	–	330	406	762	13	–	–	–	600

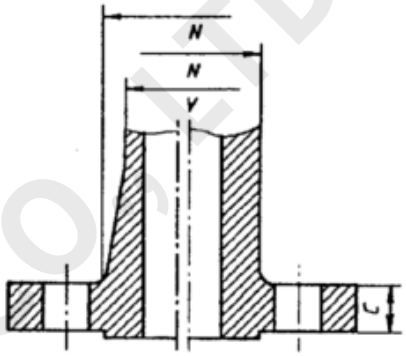
Note: For facing dimensions, see Annex Tables 5 and 7.



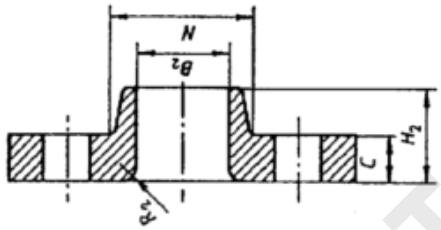
Type 13

Type 11

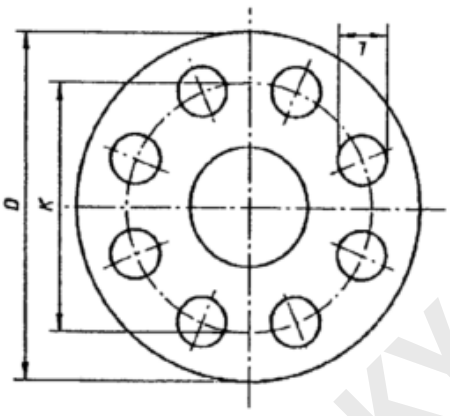
Type 05



Type 21



Type 15



This diagram illustrates the arrangement but not necessarily the correct number of bolt holes.
Refer to the column "number of bolts" in Annex Table 19 for the actual number.

Annex Table 19 Dimensions of PN420 flanges

(See p. 83, Notes to Annex Tables 12, 15, 16, 17, 18 and 19.)

Unit: mm

Nominal size	Mating dimensions					Outside diameter of neck (see Note 7)	Bore diameter (see Note 8)		Flange thickness	Shoulder diameter	Length of hub			Neck diameter	Lap radius (at pipe end)	Minimum thread length of threaded flange (see Note 5)	Minimum diameter of counterbore threaded flange	Nominal size
	Outside diameter of flange	Diameter of bolt circle	Diameter of bolt holes	Bolts														
				Number	Nominal size													
DN	D	K	L			A	B_2	B_3	C	G	H_1	H_2		N	R_2	T	V	DN
	Flange type																	
	05, 11, 13, 15, 21					11, 21	15	11	05, 11, 13, 15, 21	05	13	15	11	11, 13, 15, 21	15	13	13	
15	135	89	22	4	M20	21,5	23	–	30,5	–	40	40	73	43	3	29	24	15
20	140	95	22	4	M20	26,5	28,5	–	32	–	43	43	79	51	3	32	29	20
25	160	108	26	4	M24	33,5	35	–	35	–	48	48	89	57	3	35	36	25
32	185	130	29,5	4	M27	42	43,5	–	38,5	–	52	52	95	73	5	38	44,5	32
40	205	146	32,5	4	M30	48,5	50	–	44,5	–	60	60	111	79	6	44	50,5	40
50	235	171,5	29,5	8	M27	60,5	62,5	–	51	–	70	70	127	95	8	51	63,5	50
65	265	197	32,5	8	M30	73	75,5	–	57,5	22	79	79	143	114	8	57	76,5	65
80	305	228,5	35,5	8	M33	89	91,5	–	67	32	92	92	168	133	10	64	92,5	80
100	355	273	42	8	M39	114,5	117	–	76,5	48	108	108	190	165	11	70	118	100
125	420	324	48	8	M45	141,5	144,5	–	92,5	67	130	130	229	203	11	77	144,5	125
150	485	368,5	55	8	M52	168,5	171,5	–	108	86	152	152	273	235	13	83	171,5	150
200	550	438	55	12	M52	219	222	–	127	96	178	178	317	305	13	96	222,5	200
250	675	593,5	68	12	M64	273	277,5	–	165,5	159	229	229	419	375	13	108	276,5	250
300	760	619	74	12	M70	324	328	–	184,5	193	254	254	464	441	13	121	329,5	300

Note: For facing dimensions, see Annex Tables 5 and 7.

Notes to Annex Tables 8, 9, 10, 11, 13 and 14

1 For tolerances, see **2.7** and **4**.

2 For facings, see **2.5**, Annex Fig. 6 and Annex Table 4.

3 For spot-facing, see **2.6**.

4 For reducing threaded, slip-on and weld neck flanges, see **2.4.4.2**.

5 For threads in threaded flanges, see **2.4.3.**

6 The neck thickness dimension S is applicable to the majority of flanges, but for sizes above DN600 or for flanges to be used with other pipe wall thicknesses, the neck thickness is subject to agreement between the manufacturer and purchaser.

7 The neck diameter N_3 is the theoretical maximum which will permit the use of ISO ring spanners or the fitting, if required, of the normal series of ISO washers (**ISO 887**) without some form of additional machining such as spot-facing (see **2.6**). The washer, if used, may theoretically overlap slightly the corner radius but in practice it is deemed that there is sufficient space to fit the washer satisfactorily.

8 The bore diameter B in sizes generally above DN600 should be specified by the purchaser.

Informative reference: The bore diameters are shown with such symbols as B_1, B_2, B_3 in the respective tables.

The bore for a welding neck (type 11) or a socket weld (type 14) flange should be specified by the purchaser if required to differ from the dimensions given in Annex Tables 8 to 11, 13 and 14.

9 In respect of threaded flanges, the outside diameters of DN65, DN125 and DN150 pipes should be as shown in the following table.

Unit: mm

Nominal size DN	Outside diameter	
	threaded to **ISO 7-1**	threaded to **ANSI/ASME B1.20.1**
65	76,1	73
125	139,7	141,3
150	165,1	168,3

10 Up to and including nominal size DN600, the flanges have been recalculated recently according to the relevant German (DIN) calculation method. For this reason it was necessary to increase certain flange thicknesses. Above nominal size DN600, flange thicknesses remain as they were, but the previous pressure/temperature ratings are no longer applicable [see E.1 of Annex E (informative)].

Notes to Annex Tables 12, 15, 16, 17, 18 and 19

1 For tolerances, see **2.7** and **4**.

2 For facings, see **2.5**, Annex Fig. 7 and Annex Tables 5, 6 and 7.

3 For spot-facing, see **2.6**.

4 For reducing threaded, slip-on and weld neck flanges, see **2.4.4.2**.

5 For threads in threaded flanges, see **2.4.3**.

6 Blank flanges may be with or without hubs at the manufacturer's option.

7 For welding of unequal wall thicknesses, see the acceptable bevel designs in Annex B (informative).

8 Dimensions for B_3 correspond to the inside diameter of the pipe as given in **ANSI/ASME B36.10** for Standard Wall pipe. The thickness of Standard Wall is the same as Schedule 40 in sizes DN250 and smaller. Tolerances in Annex Table 20 apply.

9 When PN20 and PN50 flanges are required with flat face, either the full thickness or the thickness with the raised face removed may be furnished. Users are reminded that removing the raised face will make the length through the hub non-standard. See **2.5.2**.

10 The bore for a welding neck (type 11) or a socket weld (type 14) flange should be specified by the purchaser if required to differ from the dimensions given in Annex Tables 12 and 15 to 19.

11 In respect of threaded flanges, the outside diameters of DN65, DN125 and DN150 pipes should be as shown in the following table.

Unit: mm

Nominal size DN	Outside diameter	
	threaded to **ISO 7-1**	threaded to **ANSI/ASME B1.20.1**
65	76,1	73
125	139,7	141,3
150	165,1	168,3

12 Attention is drawn to D.4 of Annex D (informative) and Annex F (informative) for DN300 and above for pipeline applications.

13 The R_1 dimension only applies to DN300 and above for flanges used in pipeline applications.

14 Welding end diameters A given are for general application and not for pipeline applications.

4 Tolerances

Annex Table 20 Tolerances

Unit: mm

Dimension	PN	Flange type	Tolerance	Size range
Bore diameter B_1, B_2, B_3	All	11, 14[1], 33	+0.5 −1.0	≤ DN125
			+1.0 −1.5	DN150 up to and including DN300
			±2	≥ DN350
		Other than 11, 14[1] and 33	+1 0	≤ DN125
			+1.5 0	DN150 up to and including DN600
Flange thickness C_1, C_2, C_3	All	All (machined on both faces)	+2 0	thickness ≤ 18
			+3 0	18 < thickness ≤ 50
			+4 0	thickness > 50
		All (machined on front face only)	+3.5 0	thickness ≤ 18
			+5.5 0	18 < thickness ≤ 50
			+9 0	thickness > 50
Length through hub H	All	11	±1.5	≤ DN250
			±3	DN300 up to and including DN600
			±4.5	≥ DN650
Outside diameter of neck A	All	04, 11	+2.5 −1.0	≤ DN150
			+4 −1	DN200 up to and including DN600
			+5.5 −1.5	≥ DN650
Facing diameter d_1	2,5, 6, 10, 16, 25, 40	All	+2 −1	≤ DN250
			+3 −1	≥ DN300
	20, 50, 110, 150, 260, 420		$f_1 = 2$ / $f_1 = 7$	≤ DN600
			±1 / ±0.5	
			±2 / ±1	≥ DN650
Facing height f_1	All	All	1 min.	All
Facing diameters x_1, x_2, y_1, y_2, y_3	All	All	±0.5	≤ DN600
w, y	All	All	+0.5 0	≤ DN600
x, z	All	All	0 −0.5	≤ DN600
Diameter of bolt circle K	All	All	±1	bolt sizes M10 to M24
			±1.25	bolt sizes M27 to M33
			±1.5	bolt sizes M36 to M52
			±2	bolt sizes M56 to M95
			±2.5	bolt sizes M100

Annex Table 20 (concluded)

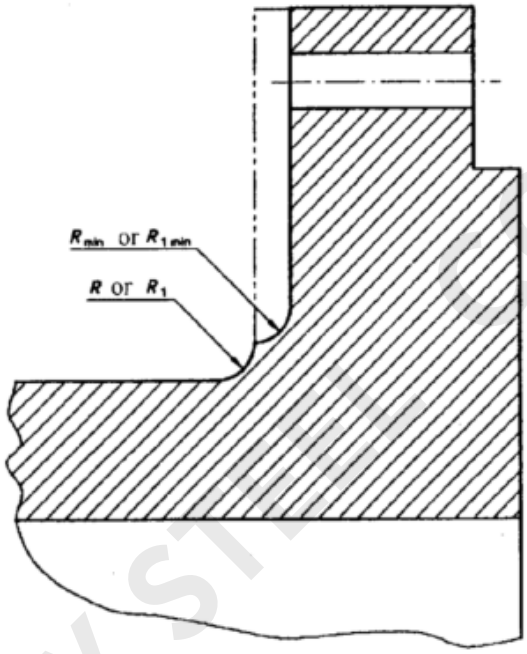
Unit: mm

Dimension	PN	Flange type	Tolerance	Size range
Centre-to-centre of adjacent bolt holes	All	All	±0,5	bolt sizes M14 to M24
			±0,625	bolt sizes M27 to M33
			±0,75	bolt sizes M36 to M52
			±1	bolt sizes M56 to M95
			±1,25	bolt sizes M100
Eccentricity of machined facing diameters	All	All	0,5	≤ DN65
			1	DN80 up to and including DN150
			2	DN200 up to and including DN500
			3	≥ DN600
Bolting bearing faces shall be parallel with the flange gasket surface within 1°.				
[1] Small bore only.				

Annex Table 21 Minimum hub radius after back-facing

Unit: mm

Flange nominal size	R_{min} and R_{1min}
Up to and including DN50	2
Over DN50 and up to and including DN200	3
Over DN200	5



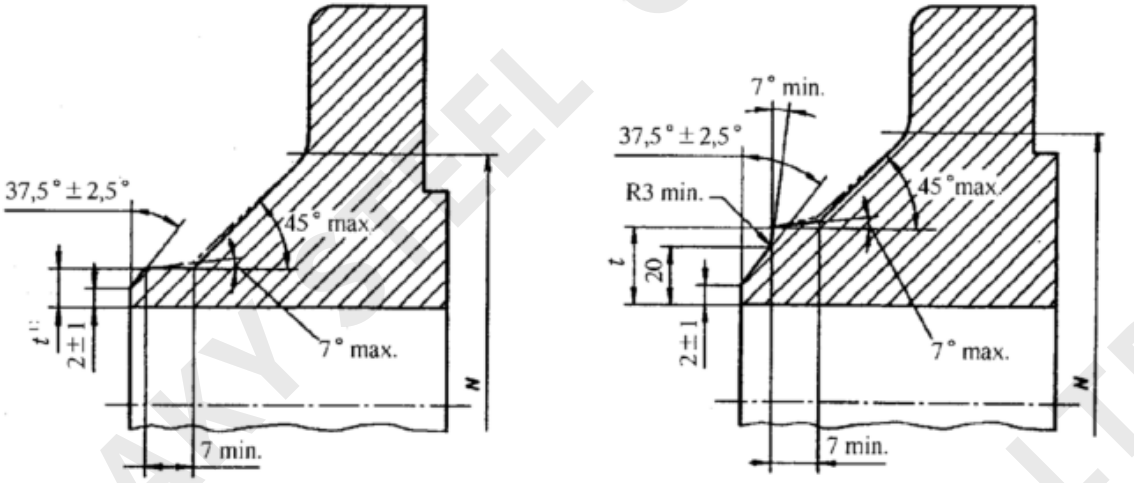
Note: For dimensions of R and R_1, see Annex Tables 8 to 19.

Annex Fig. 8 Minimum hub radius after back-facing

Annex A
(normative)

Bevel for specified wall thicknesses from 5 mm to 22 mm inclusive and greater than 22 mm

Unit: mm



1) t is the specified wall thickness of pipe, in millimetres.

a) t from 5 mm to 22 mm inclusive

b) t greater than 22 mm

Notes 1 See of **2.4.4.1**, **2.4.5.3** and **2.4.6** of Annex.

2 For flanges required to connect with ferritic steel pipe of nominal wall thickness less than 4,8 mm the welding ends shall be finished to a slight chamfer or shall be square, at the option of the manufacturer.

For flanges required to connect with austenitic stainless steel pipe of nominal wall thickness 3,2 mm or less, the welding ends shall be finished to a slight chamfer.

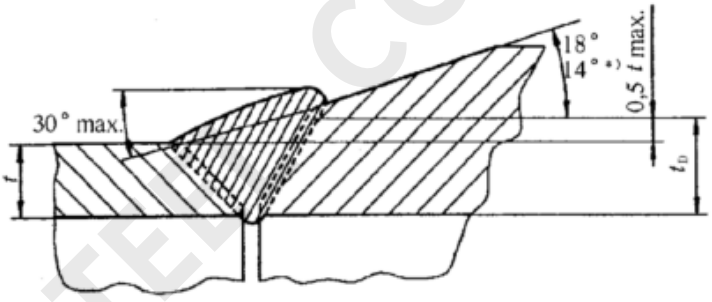
3 When flanges covered by this Annex are intended for service with light-wall high-strength pipe, the thickness of the hub at the bevel may be greater than that of the pipe to which the flange is joined. Under these conditions a single taper hub may be provided and the outside diameter of the hub at the base (dimension N) may be modified.

4 For dimensions of welding-neck thickness (type 11), see the Annex Tables in **3** of Annex.

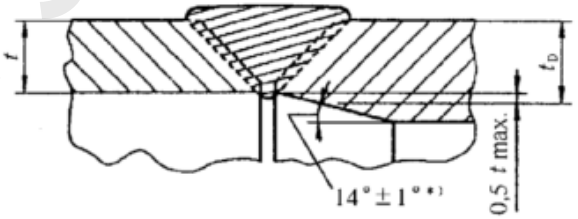
Annex Fig. A.1 Bevel for specified wall thicknesses t

Annex B
(normative)

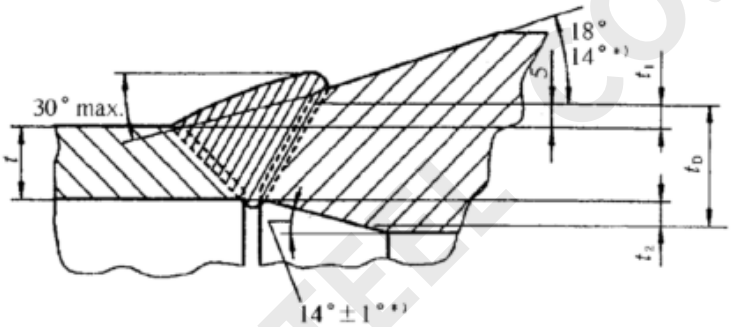
Acceptable bevel designs for unequal wall thicknesses
(pipeline applications)



Informative reference (a) For equal bore diameters



Informative reference (b) For equal outside diameters



*) No minimum when materials joined have equal yield strength.

Informative reference (c) For unequal both of bore and outside diameters

Note: None of the dimensions t_1, t_2, or t_1+t_2 shall exceed 0,5 t.

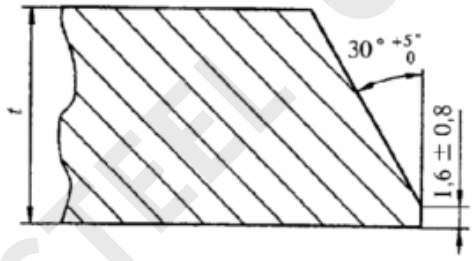
Annex Fig. B.1 Acceptable bevel designs for unequal wall thicknesses

When the minimum specified yield strengths of the sections to be joined are unequal, the deposited weld metal shall have mechanical properties at least equal to those of the section having the higher strength, and the minimum thickness t_D shall equal at least t times the ratio of the minimum specified yield strength of the pipe and of the flange, but shall not exceed 1,5 t.

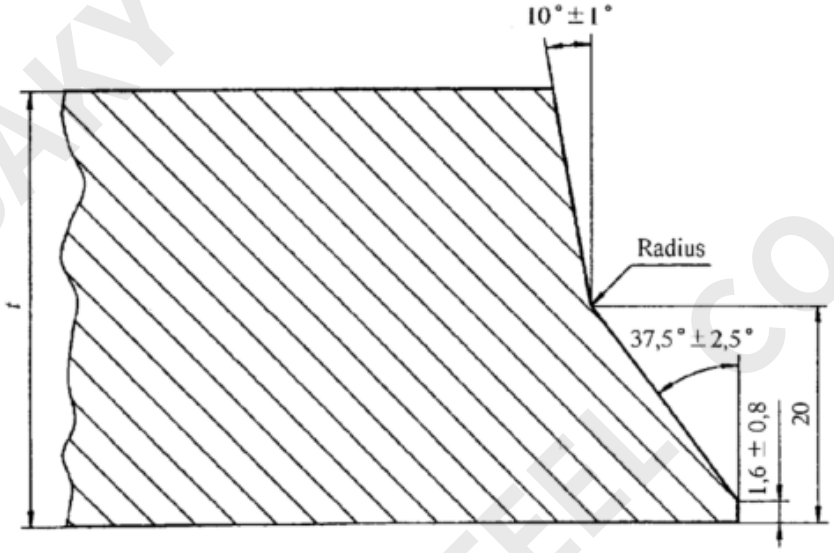
Annex C
(informative)

Recommended bevel for equal wall thicknesses t at the end of the flange hub from 5 mm to 22 mm inclusive and greater than 22 mm (pipeline applications)

Unit: mm



a) t from 5 mm to 22 mm inclusive (pipeline applications)



b) t greater than 22 mm (pipeline applications)

Annex Fig. C.1 Recommended bevel for equal wall thicknesses t at the end of the flange hub

Annex D
(informative)

Guidance on flange materials

D.1 General When work started on **ISO 7005-1** it was decided to refer to the German and American steels which were used for the manufacture of the European and American steel flanges on which this Annex is based. Since then a number of ISO standards have been published, or are in preparation, which specify steels suitable for the manufacture of flanges. However, the complete suite of ISO standards has yet to be published, and therefore the materials specified in this Annex are given for guidance only and users are entitled to select other steels from national standards in preference, as deemed necessary. Moreover, if specifying steels not given in this Annex, users of this Annex have the responsibility to ensure that the steels are suitable for the PN designations given. In a future edition of this Annex, steels from ISO standards only will be specified.

Guidance on pressure/temperature ratings for certain flanges made from the materials given in this Annex is given in Annex E (informative).

D.2 Range of materials Except for pipeline flanges, flanges specified in this annex may be manufactured from materials selected from Annex Tables D.1 and D.2.

Note: See also **1.1** of Annex.

When PN20, PN50, PN110 and PN150 flanges are specified for pipeline applications, materials may be selected from Annex Table D.3.

D.3 Material groupings Materials in this Annex are identified by a basic material reference.

Notes 1 Several materials have been placed in any one group with the provision that they give a compatible rating for the flanged joint (i.e. materials likely to be used together are capable of maintaining the same rating). In this respect the characteristics of any material in a given group are compatible with the rating for that group. Consequently, ratings for some materials are conservative [see also Annex E (informative)].

2 The specifications may not be equivalent in all details and therefore may not be equally suitable for all applications.

D.4 Materials for PN20, PN50, PN110 and PN150 flanges types 05 and 11 for nominal sizes DN300 and larger for pipeline applications The steel used in the manufacture of PN20, PN50, PN110 and PN150 flanges types 05 and 11 for nominal sizes DN300 and larger for pipeline applications given in Annex Table D.3 should be selected by the manufacturer to meet the following recommendations.

D.4.1 The 4.A.330 and higher grades of steel for PN110 and PN150 flanges should be killed steel.

D.4.2 The steel used should be suitable for field welding to other flanges, fittings or pipe manufactured to the appropriate International Standards.

D.4.3 The steel used should have a maximum carbon content of 0,35 % (*m*/*m*) and a carbon equivalent (C.E.) computed using the following equation:

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

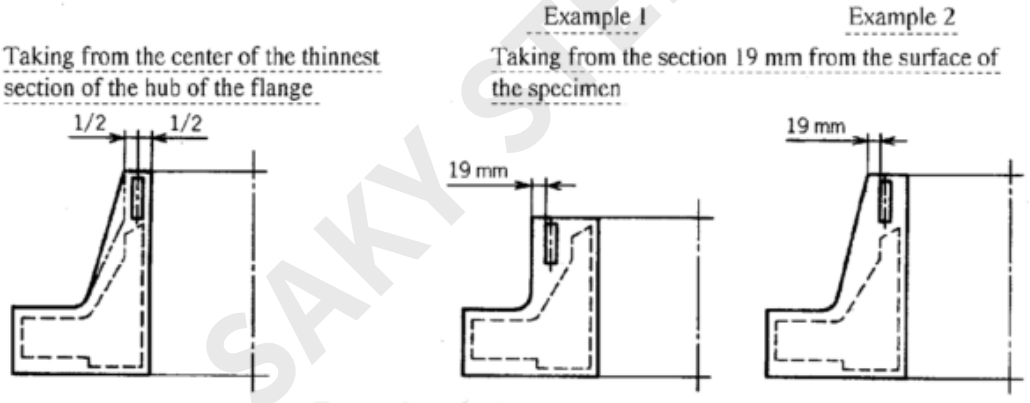
which should not exceed 0,50, based on check analysis. If the carbon equivalent exceeds 0,50, the acceptance of the flanges should be based on agreement between the purchaser and the manufacturer.

The choice and use of alloying elements, combined with the elements within the limits given above to give the required tensile properties prescribed in **D.4.4**, should be made by the flange manufacturer and included and reported in the ladle or check analyses to identify the type of steel.

D.4.4 The steel used should have tensile properties conforming to the requirements given in Annex Table D.3 and be capable of meeting the flange manufacturer's design conditions as given in Annex F (informative).

The test specimens should be taken from the forgings or, at the manufacturer's option, from the billets or forging bars used to manufacture the finished product, provided that such a test specimen has undergone substantially the same forming and the equivalent heat treatment as the finished flange. The dimensions of the test specimen should be such as to reflect adequately the heat treatment properties of the hub of the flange. Specimens should be obtained from the midwall of the thinnest section of the hub of the flange or 19 mm from the surface of the test specimen. The orientation of specimens taken from a flange should be longitudinal. If a separate test bar is used, it should be heat treated in a heat treat batch with the flanges it represents.

Informative reference: **MSS SP44** – 1991 describes other than the method that the test specimens are directly taken from forged flanges, another method that test bars of dimensions to adequately reflect the heat treatment properties of the hub of the flange are obtained, then after forming and heat-treating the test specimens are obtained from the portion 19 mm from the surface of the test bars.



Examples of taking test specimen

D.4.5 The 4.A.290 and higher grades of steel for PN20, PN50, PN110 and PN150 flanges and the 4.A.250 grade of steel for PN110 and PN150 flanges should be normalized or quenched and tempered.

Note: It is recognized that the cooling rate in a quenching operation may be slower in the thicker ring section of the flange than in the thinner hub section. Hence, the increase in yield strength due to the quenching operations may be less in the ring section than in the hub section. This factor is accounted for in **D.4.6**.

D.4.6 The flange ring should have sufficient pressure capacity for the service based on its strength in the normalized condition. This capacity should be substantiated by design calculations using the allowable design stresses as given in Annex F (informative).

Annex Table D.1 Basic properties and reference standards for materials used for PN2,5, PN6, PN10, PN16, PN25 and PN40 flanges

Description	Group	DIN steel		ISO steel		
		Limiting thickness mm	Original DIN standard and grade	Limiting thickness mm	ISO standard and grade	Service temperature[1] ℃
Casting	1E0	–	DIN 1681 GS-38,3	–	ISO 3755 200-400W	–
Forging		⩽16 >16⩽40 >40⩽63	DIN 17100 RSt 37-2	⩽63	ISO 2604-1 F8	− 10 to 300
Plate		⩽16 >16⩽40 >40⩽63	DIN 17100 RSt 37-2	⩽63	ISO 630 Fe 360B	− 10 to 300
Forging	2E0	60 – –	DIN 2528 C 16.8 C 21 C 22.3	–	ISO 2604-1 F9	− 10 to 360
Plate		⩽16 >16⩽40 >40⩽60	DIN 17155	⩽60	ISO 9328-2 PH 235	− 10 to 480
Casting	3E0	–	DIN 17245 GS-C25	–	ISO 4991 C23-45AH	–
Forging		⩽100	DIN 17243 C 22.8	⩽100	ISO 2604-1 F13	− 10 to 420
Plate		>16⩽40	DIN 17155 H11	⩽60	ISO 9328-2 PH 265	− 10 to 480
Casting	4E0	–	DIN 17245 GS-22 Mo 4	–	ISO 4991 C28H	–
Forging		⩽16 >16⩽40 >40⩽60	DIN 17175 15 Mo 3	⩽60	ISO 2604-1 F26	− 10 to 530
Plate		⩽16 >16⩽40 >40⩽60	DIN 17155 15 Mo 3	⩽60	ISO 9328-2 16 Mo 3	− 10 to 530
		–	DIN 2528 16 Mo 5	–	–	–

Annex Table D.1 (continued)

Description	Group	DIN steel		ISO steel		
		Limiting thickness mm	Original DIN standard and grade	Limiting thickness mm	ISO standard and grade	Service temperature[1] ℃
Casting	5E0	–	DIN 17245 GS-17 CrMo 5 5	–	ISO 4991 C32H	–
Forging		≤ 60	DIN 17243 13 CrMo 4 4	≤ 60	ISO 2604-1 F32	− 10 to 570
Plate		≤ 16 > 16 ≤ 40 > 40 ≤ 60	DIN 17155 13 CrMo 4 4	≤ 60	ISO 9328-2 14 CrMo 4 5	− 10 to 570
Casting	6E0	–	DIN 17245 GS-18 CrMo 9 10	–	ISO 4991 C34BH	–
Forging		–	DIN 17243 10 CrMo 9 10	–	ISO 2604-1 F34	− 10 to 600
Plate		≤ 16 > 16 ≤ 40 > 40 ≤ 60	DIN 17155 10 CrMo 9 10	–	ISO 9328-2 13 CrMo 9 10 T1	–
Casting	7E1	30	DIN 17245 GS-10 Ni 19	< 35	ISO 4991 C43L	–
	7E1	35	DIN 17245 GS-10 Ni 14			
Forging	7E1	–	DIN 17280 10 Ni 14	–	–	–
	7E0	–	DIN 17102 TStE 315	–	–	–
	7E0	–	DIN 17102 TStE 355	–	–	–
	7E1	–	DIN 17102 TStE 380	–	ISO 2604-1 F44	–
	7E1	–	DIN 17102 TStE 420	–	–	–
	7E2	–	DIN 17280 X 8 Ni 9	–	ISO 2604-1 F45	–
	7E1	–	DIN 17280 12 Ni 19	–	–	–
Plate	7E1	–	DIN 17280 10 Ni 14	–	–	–
	7E0	–	DIN 17102 TStE 315	–	ISO 9328-4 P 315 TN	–
	7E0	–	DIN 17102 TStE 355	–	ISO 9328-4 P 355 TN	–
	7E1	–	DIN 17102 TStE 380	–	ISO 9328-4 PL 390 TN	–
	7E1	–	DIN 17102 TStE 420	–	ISO 9328-4 PL 420 TN	–
	7E2	–	DIN 17280 X 8 Ni 9	–	ISO 9328-3 X 8 Ni 9	–
	7E1	–	DIN 17280 12 Ni 19	–	ISO 9328-3 12 Ni 14 G2	–

Annex Table D.1 (continued)

Description	Group	DIN steel		ISO steel		
		Limiting thickness mm	Original DIN standard and grade	Limiting thickness mm	ISO standard and grade	Service temperature[1] ℃
Forging			DIN 17102			
	8E0	–	WStE 255	–	–	–
	8E1	–	WStE 285	–	–	–
	8E2	–	WStE 315	–	–	–
	8E3	–	WStE 355	–	–	–
Plate			DIN 17102		ISO 9328-4	
	8E0	–	WStE 255	–	P 255 TN	–
	8E1	–	WStE 285	–	P 285 TN	–
	8E2	–	WStE 315	–	P 315 TN	–
	8E3	–	WStE 355	–	P 355 TN	–
Casting	9E0	–	DIN 17245 G-X 22 CrMoV 12 1	–	ISO 4991 C40H	–
Forging		≤ 16 > 16 ≤ 40 > 40 ≤ 60	DIN 17175 X 20 CrMoV 12 1	60	ISO 2604-1 F40	–
Casting	10E0	–	–	–	ISO 4991 C46	–
Forging			DIN 17440		ISO 2604-1	
		–	X 2 CrNi 19 11	–	F46	–
		–	X 2 CrNiN 18 10	–	–	–
Plate			DIN 17440			
		–	X 2 CrNi 19 11	–	–	–
		–	X 2 CrNiN 18 10	–	ISO 9328-5 X 2 CrNi 18 10	– 196 to 550
Casting	11E0	–	DIN 17445 G-X 6 CrNi 18 9	–	ISO 4991 C47	–
Forging		–	DIN 17440 X 5 CrNi 18 10	–	ISO 2604-1 F47	– 196 to 550
Plate		–	DIN 17440 X 5 CrNi 18 9	–	ISO 9328-5 X 5 CrNi 18 9	– 196 to 550
Casting	12E0	–	DIN 17445 G-X 5 CrNiNb 18 9	–	ISO 4991 C50	–
Forging		–	DIN 17440 X 6 CrNiTi 18 10	–	ISO 2604-1 F53	– 196 to 550
Plate			DIN 17440		ISO 2604-1	
		–	X 6 CrNiNb 18 10	–	F50	–
					ISO 9328-5	
		–	X 6 CrNiTi 18 10	–	X 6 CrNiTi 18 10	– 196 to 550
		–	X 6 CrNiNb 18 10	–	X 6 CrNiNb 18 10	–
Casting	13E0	–	DIN 17445 G-X 3 CrMoN 17 13 5	–	ISO 4991 C57	–
					C612C	–
Forging		–	DIN 17440 X 2 CrNiMo 17 13 2	–	ISO 2604-1 F59	– 60 to 550
	13E0					
	13E1	–				

Annex Table D.1 (concluded)

Description	Group	DIN steel		ISO steel		
		Limiting thickness mm	Original DIN standard and grade	Limiting thickness mm	ISO standard and grade	Service temperature[1] ℃
Plate	13E0	–	DIN 17440 X 2 CrNiMo 17 13 2	–	ISO 9328-5 X 2 CrNiMo 17 12	−60 to 550
	13E1	–	X 2 CrNiMoN 17 12 2	–	X 2 CrNiMoN 17 12	–
Casting	14E0	–	DIN 17445 G-X 6 CrNiMo 18 10	–	ISO 4991 C60 C61	– –
Forging		–	DIN 17440 X 5 CrNiMo 17 12 2	–	ISO 2604-1 F62	−60 to 550
Plate		–	DIN 17440 X 5 CrNiMo 17 12 2	–	ISO 9328-5 X 5 CrNiMo 17 12	−60 to 550
Casting	15E0	–	DIN 17445 G-X 5 CrNiMoNb 18 10	–	ISO 4991 C60Nb	–
Forging		– –	DIN 17440 X 6 CrNiMoTi 17 12 2 X 10 CrNi 18 10	– –	ISO 2604-1 F66 –	−60 to 550 –
Plate		– –	DIN 17440 X 6 CrNiMoTi 17 12 2 X 10 CrNiMoNb 18 10	– –	ISO 9328-5 X 6 CrNiMoTi 17 12 X 6 CrNiMoNb 17 12	– –
Forging	16E0	–	SEW 470 X 7 CrNi 23 14	–	ISO 4955 H14	–
Forging	17E0	– –	SEW 470 X 15 CrNiSi 25 20 X 12 CrNi 25 21	– –	ISO 4955 H15 H16	– –

[1] The upper limiting value indicates that prolonged use above the given temperature is not recommended.

Note: The mechanical properties given in the standards referred to should be regarded as the minimum values for which the pressure/temperature ratings given in Annex E (informative) are valid.

Annex Table D.2 Reference standards for materials used for PN20, PN50, PN110, PN150, PN260 and PN420 flanges

Material group	Description	ASTM specification and grade	Remarks	ISO standard and grade	Limiting thickness mm	Remarks
1A1	Casting	ASTM A216 WCB	1), 2)	ISO 4991 C26 − 52H	−	1), 2)
	Forging	ASTM A105 ASTM A350 LF2	1), 2) 3)	ISO 2604-1 F22 F13 F18	⩽ 63 ⩽ 63 > 63 ⩽ 250	1), 2) 3) 3)
	Plate	ASTM A515 70 ASTM A516 70 ASTM A537 CL1	1), 2) 1), 4) 3)	ISO 9328-2 PH290 PH315 PH355	⩽ 60 > 60 ⩽ 100 ⩽ 100	1), 4) 1), 4) 3)
1A2	Casting	ASTM A216 WCC ASTM A352 LC2 LC3 LCC	1), 2) 3) 3) 3)	ISO 4991 C26 − 52H, N (+T) C26 − 52L C43L	− − −	1), 2) 3) 3)
	Forging	ASTM A350 LF3	3)	ISO 2604-1 F44	⩽ 250	3)
	Plate	ASTM A203 B E	1), 2) 1), 2)	ISO 9328-3 12 Ni 14 G1	⩽ 50	1), 2)
1A3	Casting	ASTM A352 LCB	1)	ISO 4991 C23 − 46BL	−	1)
	Plate	ASTM A203 A D ASTM A515 65 ASTM A516 65	1), 2) 1), 2) 1), 2) 1), 4)	ISO 9328-2 PH290 PH315 ISO 9328-3 12 Ni 14 G1	⩽ 100 > 100 ⩽ 50	1), 4) 1), 4) 1), 2)
1A4	Forging	ASTM A350 LF1	3)	ISO 2604-1 F9	⩽ 250	3)
	Plate	ASTM A515 60 ASTM A516 60	1), 2) 1), 4)	ISO 9328-2 PH235 PH265 PH290	⩽ 40 > 40 ⩽ 60 > 60 ⩽ 150	1), 4) 1), 4) 1), 4)
1A5	Casting	ASTM A217 WC1 ASTM A325 LC1	2), 5) 3)	ISO 4991 C28H	−	2), 5)
	Forging	ASTM A182 F1	2), 5)	ISO 2604-1 F28	−	2), 5)
	Plate	ASTM A204 A B	2), 5) 2), 5)	ISO 9328-2 16 Mo 3	⩽ 60	2), 5)

Annex Table D.2 (continued)

Material group	Description	ASTM specification and grade	Remarks	ISO standard and grade	Limiting thickness mm	Remarks
1A7	Casting	ASTM A217 WC4 WC5	 2) 6)	–	–	–
	Forging	ASTM A182 F2	2)	–	–	–
	Plate	ASTM A204 C	4)	–	–	–
1A9	Casting	ASTM A217 WC6	7)	ISO 4991 C32H	–	7)
	Forging	ASTM A182 F11 F12	 8) 8)	–	–	–
	Plate	ASTM A387 11 CL2	8)	–	–	–
1A10	Casting	ASTM A217 WC9	7)	ISO 4991 C34AH	–	7)
	Forging	ASTM A182 F22	7)	ISO 2604-1 F34Q	–	8)
	Plate	ASTM A387 22 CL2	8)	ISO 9328-2 13 CrMo 9 10 T2	≤100	8)
1A13	Casting	ASTM A217 C5	–	ISO 4991 C37H	–	–
	Forging	ASTM A182 F5 F5a	 – –	ISO 2604-1 F37	–	–
1A14	Casting	ASTM A217 C12	–	ISO 4991 C38H	–	–
	Forging	ASTM A182 F9	–	–	–	–
2A1	Casting	ASTM A351 CF8 CF3	 – 9)	ISO 4991 C46 C47	 – –	 9) –
	Forging	ASTM A182 F304 F304H	 – –	ISO 2604-1 F49	–	–
	Plate	ASTM A240 304 304H	 – 9)	ISO 9328-5 X 5 CrNi 18 9	–	–
2A2	Casting	ASTM A351 CF8M CF3M	 – 4)	ISO 4991 C57 C61LC C60 C61	 – – – –	 4) 4) 4) 4)
	Forging	ASTM A182 F316 F316H	 – –	ISO 2604-1 F62 F64	 – –	 – –

Annex Table D.2 (concluded)

Material group	Description	ASTM specification and grade	Remarks	ISO standard and grade	Limiting thickness mm	Remarks
2A2	Plate	ASTM A240 316 317 316H	 – – 4)	ISO 9328-5 X 5 CrNiMo 17 12 – X 7 CrNiMo 17 12	 – – –	 – – 4)
2A3	Forging	ASTM A 182 F304L F316L	 9) 4)	ISO 2604-1 F46 F59	 – –	 – –
	Plate	ASTM A240 304L 316L	 9) 4)	ISO 9328-5 X 2 CrNi 18 10 X 2 CrNiMo 17 12 X 2 CrNiMo 17 13	 – – –	 9) 4) 4)
2A4	Forging	ASTM A182 F321 F321H	 2) –	ISO 2604-1 F53 F54B)	 – –	 2) –
	Plate	ASTM A240 321 321H	 2) –	ISO 9328-5 X 6 CrNiTi 18 10 X 7 CrNiTi 18 10	 – –	 2) –
2A5	Forging	ASTM A182 F347 F347H F348 F348H	 2) – 2) –	ISO 2604-1 F50 F51 – –	 – – – –	 2) – – –
	Plate	ASTM A240 347 347H 348 348H	 2) – 2) –	ISO 9328-5 X 6 CrNiNb 18 10 X 7 CrNiNb 18 10 – –	 – – – –	 7) – – –
2A6	Casting	ASTM A351 CH8 CH20	 – –	 – –	 – –	 – –
	Plate	ASTM A240 309S	–	ISO 4955 H14	–	–
2A7	Casting	ASTM A351 CK20	–	–	–	–
	Forging	ASTM A182 F310	10)	ISO 2604-1 F68	–	10)
	Plate	ASTM A240 310S	10)	ISO 4955 H15	–	10)

1) Permissible but not recommended for prolonged use above about 425 ℃.
2) Not to be used over 540 ℃.
3) Not to be used over 345 ℃.
4) Not to be used over 455 ℃.
5) Permissible but not recommended for prolonged use above about 455 ℃.
6) Not to be used over 565 ℃.
7) Not to be used over 590 ℃.
8) Permissible but not recommended for prolonged use above about 590 ℃.
9) Not to be used over 425 ℃.
10) For service temperature 565 ℃ and above, should be used only when assurance is provided that grain size is not finer than ASTM No. 6.

Annex Table D.3 Materials applicable to Annex Tables 12, 15, 16 and 17 covering PN20, PN50, PN110 and PN150 flanges types 05 and 11 in the size range DN300 and larger for pipeline applications[1)]

Material group and grade identification number	Yield point min. N/mm²	Tensile strength min. N/mm²	Minimum elongation on a length L_o of 50,8 mm %
4.A.250	250	410	20
4.A.290	290	410	20
4.A.315	315	410	20
4.A.330	330	430	20
4.A.345	345	440	20
4.A.360	360	460	20
4.A.385	385	470	20
4.A.415	415	520	20
4.A.450	450	530	18
4.A.485	485	550	18

1) See also **D.4**.

D. 5 Reference documents

ISO 630 : 1980 *Structural steels*

ISO 2604-1 : 1975 *Steel products for pressure purposes — Quality requirements — Part 1 : Forgings*

ISO 3755 : 1991 *Cast carbon steels for general engineering purposes*

ISO 4955 : 1983 *Heat-resisting steels and alloys*

ISO 4991 : (to be published) *Steel castings for pressure purposes*

ISO 9328-1 : 1991 *Steel plates and strips for pressure purposes — Technical delivery conditions — Part 1 : General requirements*

ISO 9328-2 : 1991 *Steel plates and strips for pressure purposes — Technical delivery conditions — Part 2 : Unalloyed and low-alloyed steels with specified room temperature and elevated temperature properties*

ISO 9328-3 : 1991 *Steel plates and strips for pressure purposes — Technical delivery conditions — Part 3 : Nickel-alloyed steels with specified low temperature properties*

ISO 9328-4 : 1991 *Steel plates and strips for pressure purposes — Technical delivery conditions — Part 4 : Weldable fine grain steels with high proof stress supplied in the normalized or quenched and tempered condition*

ISO 9328-5 : 1991 *Steel plates and strips for pressure purposes — Technical delivery conditions — Part 5 : Austenitic steels*

ASTM A 105/A105M-87a *Specification for Forgings, Carbon Steel, for Piping Components*

ASTM A 182/A182M-88 *Specification for Forged or Rolled Alloy-Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service*

ASTM A 203/A203M-82 (1988) *Specification for Pressure Vessel Plates, Alloy Steel, Nickel*

ASTM A 204/A204M-88 *Specification for Pressure Vessel Plates, Alloy Steel, Molybdenum*

ASTM A 216/A216M-84b *Specification for Steel Castings, Carbon Suitable for Fusion Welding for High-Temperature Service*

ASTM A 217/A217M-87 *Specification for Steel Castings, Martensitic Stainless and Alloy, for Pressure-Containing Parts Suitable for High-Temperature Service*

ASTM A 240-88a *Specification for Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels*

ASTM A 325-88a *Specification for High-Strength Bolts for Structural Steel Joints*

ASTM A 350/A350M-87a *Specification for Forgings, Carbon and Low-Alloy Steel, Requiring Notch Toughness Testing for Piping Components*

ASTM A 351/A351M-88 *Specification for Steel Castings, Austenitic, for High-Temperature Service*

ASTM A 352/A352M-88 *Specification for Steel Castings, Ferritic and Martensitic, for Pressure-Containing Parts Suitable for Low-Temperature Service*

ASTM A 387/A387M-88 *Specification for Pressure Vessel Plates, Alloy Steel, Chromium-Molybdenum*

ASTM A 515/A515M-82 (1987) *Specification for Pressure Vessel Plates, Carbon Steel, for Intermediate- and Higher-Temperature Service*

ASTM A 516/A516M-86 *Specification for Pressure Vessel Plates, Carbon Steel, for Moderate- and Lower-Temperature Service*

ASTM A 537/A537M-86 *Specification for Pressure Vessel Plates, Heat-treated, Carbon-Manganese-Silicon Steel*

DIN 1681 : 1985 *Cast steels for general engineering purposes*

DIN 2528 : 1987 *Flanges ; steel flanges ready for use ; materials*

DIN 17100 : 1980 *Steels for general structural purposes ; quality standard*

DIN 17102 : 1983 *Weldable normalized fine grain structural steels ; technical delivery conditions for plate strip, wide flats, sections and bars*

DIN 17155 : 1983 *Creep resistant steel plate and strip ; technical delivery conditions*

DIN 17175 : 1979 *Seamless tubes of heat-resistant steels ; technical conditions of delivery*

DIN 17243 : 1987 *Weldable heat resisting steel forgings and rolled or forged steel bars ; technical delivery conditions*

DIN 17245 : 1987 *Ferritic steel castings with elevated temperature properties; technical delivery conditions*

DIN 17280 : 1985 *Steels with low temperature toughness; technical delivery conditions for plate, sheet, strip, wide flats, sections, bars and forgings*

DIN 17440 : 1985 *Stainless steels; technical delivery conditions for plate and sheet, hot rolled strip, wire rod, drawn wire, steel bars, forgings and semi-finished products*

DIN 17445 : 1984 *Stainless steel castings; technical delivery conditions*

SEW 470 : 1976 *Heat resisting wrought steels*

Annex E
(informative)

Guidance on pressure/temperature ratings

E.1 General The pressure/temperature ratings given in this Annex apply only to certain flanges made using the materials listed in Annex D (informative).

Where given, the pressure/temperature ratings of the materials specified are maximum allowable non-shock working pressures (expressed as gauge pressure in bar) at the temperatures given in the respective tables for the applicable material. Linear interpolation is permitted for intermediate temperatures.

The ratings of the flange materials are given in the following tables.

Annex Tables E.1 to E.4 Pressure/temperature ratings for PN2,5, PN6, PN10, PN16, PN25 and PN40 for the material groups given in Annex Table D.1 (informative) and valid only for flanges of types 05, 11, 12, 13 and 21 in nominal sizes up to and including DN600.

For all flanges of types 01, 02, 03 and 04 and for types 05, 11, 12, 13 and 21 having nominal sizes greater than DN600, pressure/temperature ratings applied are the responsibility of the user.

For austenitic stainless steels, pressure/temperature ratings are based on a reference stress of 205 N/mm^2 for the 0,2 % proof stress and a reference stress of 225 N/mm^2 for the 1 % proof stress, the rating being given in Annex Tables E.3 and E.4 respectively. Two tables of pressure/temperature ratings for austenitic stainless steels are given because some codes of practice for the design of flanged equipment use the 0,2 % proof stress value and others use the 1 % proof stress value.

Annex Tables E.5 to E.21 Pressure/temperature ratings for PN20, PN50, PN110, PN150, PN260 and PN420 for the material groups given in Annex Table D.2 of Annex D (informative). The ratings are in accordance with the standard ratings for flanged and butt weld end fittings specified in **ANSI/ASME B16.5**.

Annex Table E.22 Pressure/temperature ratings for PN20, PN50, PN110 and PN150 for the material groups given in Annex Table D.3 of Annex D (informative) for use in pipeline applications in the size range DN300 and larger for types 05 and 11 only.

Note: There is not yet in existence a common internationally accepted procedure to evaluate pressure/temperature ratings for flanges. Before introducing Annex Tables E.1 to E.22 into national standards, it should be checked whether they comply with the relevant national codes and regulations.

E.2 Rating of flanged joints If two flanges in a flanged joint do not have the same pressure/temperature rating, the rating of the joint at any temperature should not exceed the lower of the two flange ratings at that temperature.

Notes 1 The temperature shown for a corresponding pressure rating is considered to be that of the contained fluid. The use of a pressure rating corresponding to a temperature other than that of the contained fluid is the responsibility of the user and is subject to the requirements of any applicable code or regulation.

2 Application of the ratings in this Annex to flanged joints should take into consideration the risk of leakage due to forces and moments developed in the connecting pipework.

3 At temperatures in the creep range, gradual relaxation of flanged joints may progressively reduce bolt loads and the tightness of the joint.

4 At low temperatures some of the materials listed in the rating tables undergo a sufficient decrease in impact resistance that they cannot safely sustain sudden changes in stress or temperature.

5 Owing to the nature of any thread sealant used, additional limitations may be placed on a threaded flange.

6 These notes on service conditions are not intended to be exhaustive.

Annex Table E.1 Pressure/temperature (P/T) ratings[1] for flanges made using material groups 1E0 to 6E0

PN	Material group	Temperature (℃)													
		0 to 120	150	200	250	300	350	400	425	450	475	500	510	520	530
		Maximum non-shock working pressure (bar)													
2,5	1E0	2,5	2,25	2	1,75	1,5									
	2E0	2,5	2,25	2	1,75	1,5	1,25	0,88							
	3E0	2,5	2,45	2,25	2	1,75	1,38	1,13							
6	1E0	6	5,4	4,8	4,2	3,6									
	2E0	6	5,4	4,8	4,2	3,6	3	2,1							
	3E0	6	5,9	5,7	5,4	4,8	4,2	3,3	2,7						
10	1E0	10	9	8	7	6									
	2E0	10	9	8	7	6	5	3,5							
	3E0	10	9,8	9,5	9	8	7	5,5	4,5						
	4E0	10	10	10	10	8,7	7,8	7,4	7,2	7					
16	1E0	16	14,4	12,8	11,2	9,6									
	2E0	16	14,4	12,8	11,2	9,6	8	5,6							
	3E0	16	15,7	15,2	14,4	12,8	11,2	8,8	7,2						
	4E0	16	16	16	16	13,9	12,5	11,8	11,5	11,2					
	5E0	16	16	16	16	16	15,2	14,6	14,2	13,9	13,1	11,8	9,9	7,8	6,1
25	1E0	25	22,5	20	17,5	15									
	2E0	25	22,5	20	17,5	15	12,5	8,8							
	3E0	25	24,5	23,8	22,5	20	17,5	13,8	11,3						
	4E0	25	25	25	25	21,8	19,5	18,5	18	17,5					
	5E0	25	25	25	25	25	23,8	22,8	22,3	21,8	20,5	18,5	15,5	12,3	9,5
	6E0	25	25	25	25	25	25	22,8	22,3	21,8	20	13,8	12,5	11	9,5
40	1E0	40	36	32	28	24									
	2E0	40	36	32	28	24	20	14							
	3E0	40	39,2	38	36	32	28	22	18						
	4E0	40	40	40	40	34,8	31,2	29,6	28,8	28					
	5E0	40	40	40	40	40	38	36,4	35,6	34,8	32,8	29,6	24,8	19,6	15,2
	6E0	40	40	40	40	40	40	36,4	35,6	34,8	32	22	20	17,6	15,2

[1] Pressure/temperature ratings of flanges PN2,5, PN6, PN10, PN16, PN25 and PN40 are valid only for flanges of types 05, 11, 12, 13 and 21 having nominal sizes up to and including DN600.

Annex Table E.2 Pressure/temperature (P/T) ratings[1] for flanges made using material groups 7E0 to 9E0

PN	Material group	Temperature (℃)										
		≤ 20	100	150	200	250	300	350	400	450	500	550
		Maximum non-shock working pressure (bar)										
2,5	7E0	3,5	2,44	2,27	2	1,82	1,56					
	7E1	3,94	2,72	2,5	2,28	2,11	1,89					
	7E2	5,44	4,11	3,91	3,72	3,5	3,33					
	8E0	2,39	2,18	1,97	1,86	1,63	1,31	1,09	0,98			
	8E1	2,72	2,51	2,29	2,07	1,86	1,52	1,31	1,09			
	8E2	3,06	2,72	2,51	2,29	2,07	1,74	1,52	1,31			
	8E3	3,5	3,06	2,83	2,61	2,4	2,18	1,97	1,63			
	9E0	5,44	5,12	4,94	4,78	4,61	4,33	4,22	4	3,67	2,87	1,48
6	7E0	8,4	5,9	5,4	4,8	4,4	3,8					
	7E1	9,5	6,5	6	5,5	5,1	4,5					
	7E2	13,1	9,9	9,4	8,9	8,4	8					
	8E0	5,7	5,2	4,7	4,5	3,9	3,1	2,6	2,3			
	8E1	6,5	6	5,5	5	4,5	3,7	3,1	2,6			
	8E2	7,3	6,5	6	5,5	5	4,2	3,7	3,1			
	8E3	8,4	7,3	6,8	6,3	5,8	5,2	4,7	3,9			
	9E0	13,1	12,3	11,9	11,5	11,1	10,4	10,1	9,6	8,8	6,9	3,5
10	7E0	14	9,8	9,1	8	7,3	6,3					
	7E1	15,8	10,9	10	9,1	8,4	7,6					
	7E2	21,8	16,4	15,6	14,9	14	13,3					
	8E0	9,6	8,7	7,9	7,4	6,5	5,2	4,4	3,9			
	8E1	10,9	10	9,2	8,3	7,4	6,1	5,2	4,4			
	8E2	12,2	10,9	10	9,2	8,3	7	6,1	5,2			
	8E3	14	12,2	11,3	10,4	9,6	8,7	7,9	6,5			
	9E0	21,8	20,5	19,8	19,1	18,4	17,3	16,9	16	14,7	11,5	5,9
16	7E0	22,4	15,6	14,5	12,8	11,7	10					
	7E1	25,2	17,4	16	14,6	13,5	12,1					
	7E2	34,8	26,3	25	23,8	22,4	21,3					
	8E0	15,3	13,9	12,6	11,9	10,5	8,4	7	6,3			
	8E1	17,4	16,1	14,6	13,2	11,9	9,7	8,4	7,			
	8E2	19,6	17,4	16,1	14,6	13,2	11,2	9,7	8,4			
	8E3	22,4	19,6	18,1	16,7	15,4	13,9	12,6	10,5			
	9E0	34,8	32,8	31,6	30,6	29,5	27,7	27	25,6	23,5	18,3	9,5
25	7E0	35	24,4	22,7	20	18,2	15,7					
	7E1	39,4	27,2	25	22,8	21,1	18,9					
	7E2	54,4	41,1	39,1	37,2	35	33,3					
	8E0	23,9	21,8	19,7	18,6	16,3	13,1	10,9	9,8			
	8E1	27,2	25,1	22,9	20,7	18,6	15,2	13,1	10,9			
	8E2	30,6	27,2	25,1	22,9	20,7	17,4	15,2	13,1			
	8E3	35	30,6	28,3	26,1	24	21,8	19,7	16,3			
	9E0	54,4	51,2	49,4	47,8	46,1	43,3	42,2	40	36,7	28,7	14,8
40	7E0	56	39,1	36,3	32	29,2	25,1					
	7E1	63,1	43,6	40	36,4	33,8	30,2					
	7E2	87,1	65,8	62,6	59,6	56,3	53,3					
	8E0	38,2	34,8	31,5	29,7	26,1	21	17,4	15,6			
	8E1	43,6	40,2	36,6	33,1	29,7	24,4	21	17,4			
	8E2	48,9	43,6	40,2	36,6	33,1	27,9	24,4	21			
	9E0	87,1	81,9	79,1	76,4	73,8	69,3	67,6	64	58,7	45,9	23,6

[1] Pressure/temperature ratings of flanges PN2,5, PN6, PN10, PN16, PN25 and PN40 are valid for flanges of types 05, 11, 12, 13 and 21 having nominal sizes up to and including DN600.

Annex Table E.3 Pressure/temperature (P/T) ratings[1] for flanges made using austenitic stainless steels (based on 0,2 % proof stress[2]), material groups 10E0 to 15E0

PN	Material group	Temperature (℃)										
		≤ 20	50	100	150	200	250	300	350	400	450	500
		Maximum non-shock working pressure (bar)										
2,5	10E0	2	1,8	1,63	1,47	1,31	1,2	1,11	1,04	0,99	0,94	0,9
	10E1	3	2,72	2,28	1,94	1,74	1,61	1,51	1,44	1,39	1,34	1,32
	11E0	2,17	1,97	1,74	1,58	1,41	1,31	1,22	1,16	1,09	1,06	1,02
	12E0	2,22	2,11	1,96	1,86	1,74	1,63	1,51	1,44	1,39	1,34	1,32
	13E0	2,11	2,02	1,84	1,69	1,52	1,41	1,31	1,26	1,2	1,14	1,11
	13E1	3,11	2,78	2,34	2,06	1,86	1,72	1,61	1,56	1,5	1,46	1,43
	14E0	2,28	2,18	1,97	1,8	1,63	1,52	1,41	1,33	1,28	1,24	1,22
	15E0	2,33	2,24	2,06	1,97	1,86	1,74	1,61	1,56	1,5	1,46	1,43
6	10E0	4,8	4,3	3,9	3,5	3,1	2,9	2,7	2,5	2,4	2,3	2,2
	10E1	7,2	6,5	5,5	4,7	4,2	3,9	3,6	3,5	3,3	3,2	3,2
	11E0	5,2	4,7	4,2	3,8	3,4	3,1	2,9	2,8	2,6	2,5	2,5
	12E0	5,3	5,1	4,7	4,5	4,2	3,9	3,6	3,5	3,3	3,2	3,2
	13E0	5,1	4,9	4,4	4,1	3,7	3,4	3,1	3	2,9	2,7	2,7
	13E1	7,5	6,7	5,6	4,9	4,5	4,1	3,9	3,7	3,6	3,5	3,4
	14E0	5,5	5,2	4,7	4,3	3,9	3,7	3,4	3,2	3,1	3	2,9
	15E0	5,6	5,4	4,9	4,7	4,5	4,2	3,9	3,7	3,6	3,5	3,4
10	10E0	8	7,2	6,5	5,9	5,2	4,8	4,4	4,2	4	3,8	3,6
	10E1	12	10,9	9,1	7,8	7	6,4	6	5,8	5,6	5,4	5,3
	11E0	8,7	7,9	7	6,3	5,6	5,2	4,9	4,6	4,4	4,2	4,1
	12E0	8,9	8,4	7,8	7,4	7	6,5	6	5,8	5,6	5,4	5,3
	13E0	8,4	8,1	7,4	6,8	6,1	5,6	5,2	5	4,8	4,6	4,4
	13E1	12,4	11,1	9,4	8,2	7,4	6,9	6,4	6,2	6	5,8	5,7
	14E0	9,1	8,7	7,9	7,2	6,5	6,1	5,6	5,3	5,1	5	4,9
	15E0	9,3	9	8,2	7,9	7,4	7	6,4	6,2	6	5,8	5,7
16	10E0	12,8	11,5	10,5	9,4	8,4	7,7	7,1	6,7	6,3	6	5,8
	10E1	19,2	17,4	14,6	12,4	11,2	10,3	9,7	9,2	8,9	8,6	8,5
	11E0	13,9	12,6	11,2	10,1	9	8,4	7,8	7,4	7	6,8	6,5
	12E0	14,2	13,5	12,5	11,9	11,2	10,5	9,7	9,2	8,9	8,6	8,5
	13E0	13,5	12,9	11,8	10,8	9,7	9	8,4	8	7,7	7,3	7,1
	13E1	19,9	17,8	15	13,2	11,9	11	10,3	10	9,6	9,3	9,2
	14E0	14,6	13,9	12,6	11,5	10,5	9,7	9	8,5	8,2	8	7,8
	15E0	14,9	14,4	13,2	12,6	11,9	11,2	10,3	10	9,6	9,3	9,2
25	10E0	20	18	16,3	14,7	13,1	12	11,1	10,4	9,9	9,4	9
	10E1	30	27,2	22,8	19,4	17,4	16,1	15,1	14,4	13,9	13,4	13,2
	11E0	21,7	19,7	17,4	15,8	14,1	13,1	12,2	11,6	10,9	10,6	10,2
	12E0	22,2	21,1	19,6	18,6	17,4	16,3	15,1	14,4	13,9	13,4	13,2
	13E0	21,1	20,2	18,4	16,9	15,2	14,1	13,1	12,6	12	11,4	11,1
	13E1	31,1	27,8	23,4	20,6	18,6	17,2	16,1	15,6	15	14,6	14,3
	14E0	22,8	21,8	19,7	18	16,3	15,2	14,1	13,3	12,8	12,4	12,2
	15E0	23,3	22,4	20,6	19,7	18,6	17,4	16,1	15,6	15	14,6	14,3
40	10E0	32	28,8	26,1	23,5	21	19,2	17,8	16,7	15,8	15	14,4
	10E1	48	43,6	36,4	31,1	27,9	25,8	24,2	23,1	22,2	21,5	21,2
	11E0	34,7	31,5	27,9	25,2	22,6	21	19,6	18,5	17,4	16,9	16,4
	12E0	35,6	33,8	31,3	29,7	27,9	26,1	24,2	23,1	22,2	21,5	21,2
	13E0	33,8	32,4	29,5	27	24,4	22,6	21	20,1	19,2	18,3	17,8
	13E1	49,8	44,4	37,5	32,9	29,7	27,6	25,8	24,9	24	32,3	22,9
	14E0	36,4	34,8	31,5	28,8	26,1	24,4	22,6	21,3	20,4	19,9	19,6
	15E0	37,3	35,9	32,9	31,5	29,7	27,9	25,8	24,9	24	23,3	22,9

[1] Pressure/temperature ratings of flanges PN2,5, PN6, PN10, PN16, PN25 and PN40 are valid only for flanges of types 05, 11, 12, 13 and 21 having nominal sizes up to and including DN600.

[2] Based on a reference stress of 205 N/mm².

Annex Table E.4 Pressure/temperature (P/T) ratings[1] for flanges made using austenitic stainless steels (based on 1 % proof stress[2]), material groups 10E0 to 15E0

PN	Material group	Temperature (℃)										
		≤ 20	50	100	150	200	250	300	350	400	450	500
		Maximum non-shock working pressure (bar)										
2,5	10E0	2,39	2,23	2,01	1,8	1,63	1,52	1,41	1,34	1,29	1,24	1,21
	10E1	3,39	3,11	2,67	2,33	2,08	1,94	1,85	1,79	1,73	1,69	1,66
	11E0	2,56	2,34	2,12	1,91	1,74	1,61	1,5	1,43	1,39	1,36	1,33
	12E0	2,61	2,47	2,31	2,17	2,06	1,94	1,86	1,79	1,73	1,69	1,66
	13E0	2,5	2,41	2,21	2,01	1,86	1,74	1,61	1,54	1,5	1,44	1,42
	13E1	3,5	3,16	2,73	2,42	2,2	2,03	1,94	1,88	1,82	1,78	1,76
	14E0	2,67	2,56	2,34	2,12	1,97	1,86	1,73	1,67	1,6	1,57	1,54
	15E0	2,72	2,6	2,42	2,29	2,18	2,07	1,94	1,88	1,82	1,78	1,76
6	10E0	5,7	5,4	4,8	4,3	3,9	3,7	3,4	3,2	3,1	3	2,9
	10E1	8,1	7,5	6,4	5,6	5	4,7	4,5	4,3	4,2	4,1	4
	11E0	6,1	5,6	5,1	4,6	4,2	3,9	3,6	3,4	3,3	3,3	3,2
	12E0	6,3	5,9	5,5	5,2	4,9	4,7	4,5	4,3	4,2	4,1	4
	13E0	6	5,8	5,3	4,8	4,5	4,2	3,9	3,7	3,6	3,5	3,4
	13E1	8,4	7,6	6,6	5,8	5,3	4,9	4,7	4,5	4,4	4,3	4,2
	14E0	6,4	6,1	5,6	5,1	4,7	4,5	4,2	4	3,8	3,8	3,7
	15E0	6,5	6,2	5,8	5,5	5,2	5	4,7	4,5	4,4	4,3	4,2
10	10E0	9,6	8,9	8	7,2	6,5	6,1	5,6	5,4	5,2	5	4,8
	10E1	13,6	12,4	10,7	9,3	8,3	7,8	7,4	7,2	6,9	6,8	6,6
	11E0	10,2	9,4	8,5	7,6	7	6,4	6	5,7	5,6	5,4	5,3
	12E0	10,4	9,9	9,2	8,7	8,2	7,8	7,4	7,2	6,9	6,8	6,6
	13E0	10	9,6	8,8	8	7,4	7	6,4	6,2	6	5,8	5,7
	13E1	14	12,6	10,9	9,7	8,8	8,1	7,8	7,5	7,3	7,1	7
	14E0	10,7	10,2	9,4	8,5	7,9	7,4	6,9	6,7	6,4	6,3	6,2
	15E0	10,9	10,4	9,7	9,2	8,7	8,3	7,8	7,5	7,3	7,1	7
16	10E0	15,3	14,3	12,9	11,5	10,5	9,7	9	8,6	8,2	8	7,8
	10E1	21,7	19,9	17,1	14,9	13,3	12,4	11,9	11,4	11,1	10,8	10,6
	11E0	16,4	15	13,6	12,2	11,2	10,3	9,6	9,2	8,9	8,7	8,5
	12E0	16,7	15,8	14,8	13,9	13,2	12,4	11,9	11,4	11,1	10,8	10,6
	13E0	16	15,4	14,2	12,9	11,9	11,2	10,3	9,9	9,6	9,2	9,1
	13E1	22,4	20,2	17,5	15,5	14,1	13	12,4	12	11,7	11,4	11,2
	14E0	17,1	16,4	15	13,6	12,6	11,9	11,1	10,7	10,2	10	9,9
	15E0	17,4	16,6	15,5	14,6	13,9	13,2	12,4	12	11,7	11,4	11,2
25	10E0	23,9	22,3	20,1	18	16,3	15,2	14,1	13,4	12,9	12,4	12,1
	10E1	33,9	31,1	26,7	23,3	20,8	19,4	18,5	17,9	17,3	16,9	16,6
	11E0	25,6	23,4	21,2	19,1	17,4	16,1	15	14,3	13,9	13,6	13,3
	12E0	26,1	24,7	23,1	21,7	20,6	19,4	18,6	17,9	17,3	16,9	16,6
	13E0	25	24,1	22,1	20,1	18,6	17,4	16,1	15,4	15	14,4	14,2
	13E1	35	31,6	27,3	24,2	22	20,3	19,4	18,8	18,2	17,8	17,6
	14E0	26,7	25,6	23,4	21,2	19,7	18,6	17,3	16,7	16	15,7	15,4
	15E0	27,2	26	24,2	22,9	21,8	20,7	19,4	18,8	18,2	17,8	17,6
40	10E0	38,2	35,7	32,2	28,8	26,1	24,4	22,6	21,5	20,6	19,9	19,4
	10E1	54,2	49,8	42,7	37,3	33,2	31,1	29,7	28,6	27,7	27	26,5
	11E0	40,9	37,5	34	30,6	27,9	25,8	24	22,9	22,2	21,7	21,3
	12E0	41,8	39,5	37	34,7	32,9	31,1	29,7	28,6	27,7	27	26,5
	13E0	40	38,6	35,4	32,2	29,7	27,9	25,8	24,7	24	23,1	22,8
	13E1	56	50,5	43,7	38,8	35,2	32,5	31,1	30	29,2	28,4	28,1
	14E0	42,7	40,9	37,5	34	31,5	29,7	27,7	26,7	25,6	25,1	24,7
	15E0	43,6	41,6	38,8	36,6	34,8	33,1	31,1	30	29,2	28,4	28,1

[1] Pressure/temperature ratings of flanges PN2,5, PN6, PN10, PN16, PN25 and PN40 are valid only for flanges of types 05, 11, 12, 13 and 21 having nominal sizes up to and including DN600.

[2] Based on a reference stress of 225 N/mm².

Annex Table E.5 Pressure/temperature (P/T) ratings for flanges made using group 1A1 materials

Temperature (℃)	Maximum non-shock working pressure (bar)					
	PN 20	PN 50	PN 110	PN 150	PN 260	PN 420
−29 to 38	19,6	51,1	102,1	153,2	255,3	425,5
50	19,2	50,1	100,2	150,2	250,4	417,3
100	17,7	46,4	92,8	139,1	231,9	386,5
150	15,8	45,2	90,5	135,7	226,1	376,9
200	14	43,8	87,6	131,5	219,1	365,2
250	12,1	41,7	83,4	125,2	208,6	347,7
300	10,2	38,7	77,5	116,2	193,7	322,8
350	8,4	37	73,9	110,9	184,8	308
375	7,4	36,5	72,9	109,4	182,3	303,9
400	6,5	34,5	69	103,5	172,5	287,5
425	5,6	28,8	57,5	86,3	143,8	239,6
450	4,7	20	40,1	60,1	100,2	166,9
475	3,7	13,5	27,1	40,6	67,7	112,9
500	2,8	8,8	17,6	26,4	44	73,3
525	1,9	5,2	10,4	15,5	25,9	43,2
540	1,3	3,3	6,5	9,8	16,3	27,2

Note: Consult Annex Table D.2 and the notes to Annex Table D.2 of Annex D (informative) for limitations on use.

Annex Table E.6 Pressure/temperature (P/T) ratings for flanges made using group 1A2 materials

Temperature (℃)	Maximum non-shock working pressure (bar)					
	PN 20	PN 50	PN 110	PN 150	PN 260	PN 420
−29 to 38	20	51,7	103,4	155,2	258,6	431
50	19,2	51,7	103,4	155,2	258,6	431
100	17,7	51,5	103,1	154,6	257,7	429,5
150	15,8	50,2	100,4	150,6	251	418,3
200	14	48,8	97,6	146,4	243,9	406,6
250	12,1	46,3	92,7	139	231,7	386,1
300	10,2	42,4	84,9	127,3	212,1	353,5
350	8,4	40,2	80,5	120,7	201,2	335,3
375	7,4	38,8	77,6	116,4	194	323,4
400	6,5	34,5	69	103,5	172,5	287,5
425	5,6	28,8	57,5	86,3	143,8	239,6
450	4,7	20	40,1	60,1	100,2	166,9
475	3,7	13,5	27,1	40,6	67,7	112,9
500	2,8	8,8	17,6	26,4	44	73,3
525	1,9	5,2	10,4	15,5	25,9	43,2
540	1,3	3,3	6,5	9,8	16,3	27,2

Note: Consult Annex Table D.2 and the notes to Annex Table D.2 of Annex D (informative) for limitations on use.

Annex Table E.7 Pressure/temperature (P/T) ratings for flanges made using group 1A3 materials

Temperature (℃)	Maximum non-shock working pressure (bar)					
	PN 20	PN 50	PN 110	PN 150	PN 260	PN 420
−29 to 38	18,4	47,9	95,7	143,6	239,4	398,9
50	18,1	47,3	94,6	141,9	236,5	394,2
100	17,3	45,1	90,2	135,3	225,5	375,9
150	15,8	44	87,9	131,9	219,8	366,3
200	14	42,7	85,4	128	213,4	355,6
250	12,1	40,6	81,2	121,8	202,9	338,2
300	10,2	37,7	75,4	113,1	188,5	314,2
350	8,4	36	71,9	107,9	179,8	299,7
375	7,4	35,3	70,6	105,9	176,6	294,3
400	6,5	32,4	64,8	97,2	162	270
425	5,6	27,3	54,6	81,9	136,5	227,5
450	4,7	19,8	39,6	59,4	99	165
475	3,7	13,5	27,1	40,6	67,7	112,9
500	2,8	8,8	17,6	26,4	44	73,3
525	1,9	5,2	10,4	15,5	25,9	43,2
540	1,3	3,3	6,5	9,8	16,3	27,2

Note: Consult Annex Table D.2 and the notes to Annex Table D.2 of Annex D (informative) for limitations on use.

Annex Table E.8 Pressure/temperature (P/T) ratings for flanges made using group 1A4 materials

Temperature (℃)	Maximum non-shock working pressure (bar)					
	PN 20	PN 50	PN 110	PN 150	PN 260	PN 420
−29 to 38	16,3	42,5	85,1	127,6	212,7	354,6
50	16	41,7	83,4	125,2	208,6	347,7
100	14,8	38,6	77,2	115,8	193,1	321,8
150	14,5	37,7	75,4	113,1	188,6	314,3
200	14	36,6	73,1	109,7	182,8	304,7
250	12,1	34,7	69,4	104,1	173,6	289,3
300	10,2	32,3	64,6	96,9	161,5	269,1
350	8,4	30,9	61,9	92,8	154,6	257,7
375	7,4	30,9	61,7	92,6	154,3	275,2
400	6,5	30,3	60,6	90,9	151,5	252,5
425	5,6	25,8	51,6	77,4	128,9	214,9
450	4,7	19,6	39,2	58,7	97,9	163,2
475	3,7	13,5	27,1	40,6	67,7	112,9
500	2,8	8,8	17,6	26,4	44	73,3
525	1,9	5,2	10,4	15,5	25,9	43,2
540	1,3	3,3	6,5	9,8	16,3	27,2

Note: Consult Annex Table D.2 and the notes to Annex Table D.2 of Annex D (informative) for limitations on use.

Annex Table E.9 Pressure/temperature (P/T) ratings for flanges made using group 1A5 materials

Temperature (℃)	Maximum non-shock working pressure (bar)					
	PN 20	PN 50	PN 110	PN 150	PN 260	PN 420
−29 to 38	18,4	47,9	95,8	143,6	239,4	399
50	18,3	47,6	95,3	142,9	238,2	397,1
100	17,7	46,6	93,2	139,8	233	388,3
150	15,8	45	89,9	134,9	224,8	374,6
200	14	44,2	88,4	132,6	221	368,3
250	12,1	43,1	86,2	129,2	215,4	359
300	10,2	42	84,1	126,1	210,1	350,2
350	8,4	40,2	80,5	120,7	201,2	335,3
375	7,4	38,8	77,6	116,4	194	323,4
400	6,5	36,6	73,2	109,8	182,9	304,9
425	5,6	35,1	70,2	105,3	175,5	292,5
450	4,7	33,8	67,6	101,4	169	218,7
475	3,7	31,7	63,3	95	158,3	263,8
500	2,8	24,1	48,1	72,2	120,3	200,6
525	1,9	15	30,1	45,1	75,2	125,4
540	1,3	10,7	21,4	32,1	53,5	89,2

Note: Consult Annex Table D.2 and the notes to Annex Table D.2 of Annex D (informative) for limitations on use.

Annex Table E.10 Pressure/temperature (P/T) ratings for flanges made using group 1A7 materials

Temperature (℃)	Maximum non-shock working pressure (bar)					
	PN 20	PN 50	PN 110	PN 150	PN 260	PN 420
−29 to 38	20	51,7	103,4	155,2	258,6	431
50	19,2	51,7	103,4	155,2	258,6	431
100	17,7	51,5	103,1	154,6	257,7	429,5
150	15,8	50,2	100,4	150,6	251	418,3
200	14	48,8	97,6	146,4	243,9	406,6
250	12,1	46,3	92,7	139	231,7	386,1
300	10,2	42,4	84,9	127,3	212,1	353,5
350	8,4	40,2	80,5	120,7	201,2	335,3
375	7,4	38,8	77,6	116,4	194	323,4
400	6,5	36,6	73,2	109,8	182,9	304,9
425	5,6	35,1	70,2	105,3	175,5	292,5
450	4,7	33,8	67,6	101,4	169	281,7
475	3,7	31,7	63,3	95	158,3	263,8
500	2,8	27,1	54,1	81,2	135,3	225,4
525	1,9	18,8	37,6	56,4	94	156,6
550	1,3[1]	13,9	27,9	41,8	69,7	116,1
575	–	12,4	24,9	37,3	62,2	103,7

[1] The maximum non-shock working pressure is 1,3 bar at 540 ℃ for PN20.

Note: Consult Annex Table D.2 and the notes to Annex Table D.2 of Annex D (informative) for limitations on use.

Annex Table E.11 Pressure/temperature (P/T) ratings for flanges made using group 1A9 materials

Temperature (℃)	Maximum non-shock working pressure (bar)					
	PN 20	PN 50	PN 110	PN 150	PN 260	PN 420
−29 to 38	20	51,7	103,4	155,2	258,6	431
50	19,2	51,1	102,3	153,4	255,7	426,2
100	17,7	48,8	97,5	146,3	243,8	406,4
150	15,8	46,4	92,7	139,1	231,9	386,4
200	14	45,5	91	136,4	227,4	379
250	12,1	44,5	88,9	133,4	222,3	370,6
300	10,2	42,4	84,9	127,3	212,1	353,5
350	8,4	40,2	80,5	120,7	201,2	335,3
375	7,4	38,8	77,6	116,4	194	323,4
400	6,5	36,6	73,2	109,8	182,9	304,9
425	5,6	35,1	70,2	105,3	175,5	292,5
450	4,7	33,8	67,6	101,4	169	281,7
475	3,7	31,7	63,3	95	158,3	263,8
500	2,8	27,8	55,6	83,4	139	231,6
525	1,9	20,3	40,5	60,8	101,3	168,9
550	1,3[1]	12,8	25,5	38,3	63,8	106,4
575	–	8,5	17	25,5	42,5	70,8
600	–	5,9	11,8	17,6	29,4	49
625	–	3,4	6,8	10,1	16,9	28,2
650	–	2,3	4,6	7	11,6	19,3

[1] The maximum non-shock working pressure is 1,3 bar at 540 ℃ for PN20.

Note: Consult Annex Table D.2 and the notes to Annex Table D.2 of Annex D (informative) for limitations on use.

Annex Table E.12 Pressure/temperature (P/T) ratings for flanges made using group 1A10 materials

Temperature (℃)	Maximum non-shock working pressure (bar)					
	PN 20	PN 50	PN 110	PN 150	PN 260	PN 420
−29 to 38	20	51,7	103,4	155,2	258,6	431
50	19,2	51,2	102,4	153,6	256	426,7
100	17,7	49	98,1	147,1	245,2	408,7
150	15,8	46,6	93,3	139,9	233,2	388,6
200	14	44,8	89,7	134,5	224,2	373,7
250	12,1	44,2	88,4	132,7	221,1	368,5
300	10,2	42,4	84,9	127,3	212,1	353,5
350	8,4	40,2	80,5	120,7	201,2	335,3
375	7,4	38,8	77,6	116,4	194	323,4
400	6,5	36,6	73,2	109,8	182,9	304,9
425	5,6	35,1	70,2	105,3	175,5	292,5
450	4,7	33,8	67,6	101,4	169	281,7
475	3,7	31,7	63,3	95	158,3	263,8
500	2,8	27,8	55,6	83,4	139	231,6
525	1,9	21,9	43,8	65,8	109,6	182,7
550	1,3[1]	16,4	32,7	49,1	81,8	136,4
575	–	11,7	23,4	35,1	58,5	97,5
600	–	7,6	15,3	22,9	38,2	63,6
625	–	6,6	13,3	19,9	33,2	55,3
650	–	3,7	7,3	11	18,3	30,4

[1] The maximum non-shock working pressure is 1,3 bar at 540 ℃ for PN20.

Annex Table E.13 Pressure/temperature (P/T) ratings for flanges made using group 1A13 materials

Temperature (℃)	Maximum non-shock working pressure (bar)					
	PN 20	PN 50	PN 110	PN 150	PN 260	PN 420
−29 to 38	20	51,7	103,4	155,2	258,6	431
50	19,2	51,7	103,4	155,2	258,6	431
100	17,7	51,5	103,1	154,6	257,7	429,5
150	15,8	50,2	100,4	150,6	251	418,3
200	14	48,8	97,6	146,4	243,9	406,6
250	12,1	46,3	92,7	139	231,7	386,1
300	10,2	42,4	84,9	127,3	212,1	353,5
350	8,4	40,2	80,5	120,7	201,2	335,3
375	7,4	38,8	77,6	116,4	194	323,4
400	6,5	36,6	73,2	109,8	182,9	304,9
425	5,6	34,5	69	103,5	172,5	287,5
450	4,7	30,9	61,8	92,7	154,5	257,6
475	3,7	25,9	51,8	77,7	129,5	215,8
500	2,8	20,3	40,5	60,8	101,3	168,9
525	1,9	15,4	30,8	46,3	77,1	128,5
550	1,3[1]	11,7	23,4	35	58,4	97,3
575	–	8,8	17,6	26,4	44,1	73,4
600	–	6,5	13,1	19,6	32,6	54,4
625	–	4,5	9	13,5	22,5	37,5
650	–	3	6	9	15	25,1

[1] The maximum non-shock working pressure is 1,3 bar at 540 ℃ for PN20.

Annex Table E.14 Pressure/temperature (P/T) ratings for flanges made using group 1A14 materials

Temperature (℃)	Maximum non-shock working pressure (bar)					
	PN 20	PN 50	PN 110	PN 150	PN 260	PN 420
−29 to 38	20	51,7	103,4	155,2	258,6	431
50	19,2	51,7	103,4	155,2	258,6	431
100	17,7	51,5	103,1	154,6	257,7	429,5
150	15,8	50,2	100,4	150,6	251	418,3
200	14	48,8	97,6	146,4	243,9	406,6
250	12,1	46,3	92,7	139	231,7	386,1
300	10,2	42,4	84,9	127,3	212,1	353,5
350	8,4	40,2	80,5	120,7	201,2	335,3
375	7,4	38,8	77,6	116,4	194	323,4
400	6,5	36,6	73,2	109,8	182,9	304,9
425	5,6	35,1	70,2	105,3	175,5	292,5
450	4,7	33,8	67,6	101,4	169	281,7
475	3,7	31,7	63,3	95	158,3	263,8
500	2,8	27,5	55	82,5	137,5	229,1
525	1,9	22,6	45,2	67,8	113	188,3
550	1,3[1]	17	34	50,9	84,9	141,5
575	–	11,2	22,5	33,7	56,2	93,6
600	–	7,2	14,4	21,5	35,9	59,8
625	–	5	9,9	14,9	24,9	41,4
650	–	3,5	7	10,4	17,4	29

[1] The maximum non-shock working pressure is 1,3 bar at 540 ℃ for PN20.

Note: Consult Annex Table D.2 and the notes to Annex Table D.2 of Annex D (informative) for limitations on use.

Annex Table E.15 Pressure/temperature (P/T) ratings for flanges made using group 2A1 materials

Temperature (℃)	Maximum non-shock working pressure (bar)					
	PN 20	PN 50	PN 110	PN 150	PN 260	PN 420
−29 to 38	19	49,6	99,3	148,9	248,2	413,6
50	18,4	47,8	95,7	143,5	239,2	398,6
100	15,7	40,9	81,8	122,6	204,4	340,7
150	13,9	36,3	72,7	109	181,7	302,8
200	12,6	32,8	65,5	98,3	163,8	273
250	11,7	30,5	61,1	91,6	152,7	254,5
300	10,2	29,1	58,1	87,2	145,3	242,1
350	8,4	28,1	56,1	84,2	140,3	233,8
375	7,4	27,8	55,5	83,3	138,8	231,3
400	6,5	27,5	54,9	82,4	137,3	228,9
425	5,6	27,2	54,3	81,5	135,8	226,4
450	4,7	26,9	53,7	80,6	134,3	223,9
475	3,7	26,6	53,1	79,7	132,8	221,4
500	2,8	26,1	52,1	78,2	130,3	217,2
525	1,9	23,9	47,8	71,6	119,4	199
550	1,3[1)]	21,8	43,6	65,4	109,1	181,8
575	–	20,1	40,1	60,2	100,4	167,3
600	–	16,7	33,4	50,1	83,6	139,3
625	–	13,1	26,2	39,2	65,4	109
650	–	10,5	21	31,6	52,6	87,6
675	–	7,8	15,5	23,3	38,8	64,6
700	–	6	12	17,9	29,9	49,8
725	–	4,6	9,3	13,9	23,1	38,5
750	–	3,7	7,3	11	18,3	30,4
775	–	2,8	5,6	8,4	14	23,3
800	–	2,1	4,1	6,2	10,3	17,1

1) The maximum non-shock working pressure is 1,3 bar at 540 ℃ for PN20.

Note: Consult Annex Table D.2 and the notes to Annex Table D.2 of Annex D (informative) for limitations on use.

Annex Table E.16 Pressure/temperature (P/T) ratings for flanges made using group 2A2 materials

Temperature (℃)	Maximum non-shock working pressure (bar)					
	PN 20	PN 50	PN 110	PN 150	PN 260	PN 420
−29 to 38	19	49,6	99,3	148,9	248,2	413,6
50	18,4	48,1	96,3	144,4	240,6	401
100	16,2	42,2	84,4	126,6	211	351,7
150	14,8	38,5	77	115,5	192,5	320,9
200	13,7	35,7	71,3	107	178,4	297,3
250	12,1	33,4	66,8	100,2	166,9	278,2
300	10,2	31,6	63,3	94,9	158,1	263,6
350	8,4	30,4	60,8	91,3	152,1	253,8
375	7,4	29,7	59,4	89,1	148,5	247,5
400	6,5	29,1	58,2	87,3	145,6	242,6
425	5,6	28,7	57,3	86	143,3	238,9
450	4,7	28,1	56,2	84,2	140,4	234
475	3,7	27,4	54,7	82,1	136,8	228
500	2,8	26,8	53,7	80,5	134,1	223,6
525	1,9	25,8	51,6	77,4	129	214,9
550	1,3[1)]	25	49,9	74,9	124,8	208
575	–	24,1	48,2	72,3	120,5	200,8
600	–	21,4	42,9	64,3	107,2	178,6
625	–	18,3	36,5	54,8	91,3	152,1
650	–	14,1	28,2	42,4	70,6	117,7
675	–	12,6	25,3	37,9	63,2	105,3
700	–	9,9	19,9	29,8	49,7	82,9
725	–	7,7	15,4	23,1	38,5	64,2
750	–	5,9	11	17,6	29,4	49
775	–	4,6	9,1	13,7	22,8	38
800	–	3,5	7	10,5	17,5	29,2

[1)] The maximum non-shock working pressure is 1,3 bar at 540 ℃ for PN20.

Note: Consult Annex Table D.2 (informative) and the notes to Annex Table D.2 for limitations on use.

Annex Table E.17 Pressure/temperature (P/T) ratings for flanges made using group 2A3 materials

Temperature (℃)	Maximum non-shock working pressure (bar)					
	PN 20	PN 50	PN 110	PN 150	PN 260	PN 420
−29 to 38	15,9	41,4	82,7	124,1	206,8	344,6
50	15,3	40	79,9	119,9	199,8	333
100	13,2	34,5	69	103,5	172,4	287,4
150	12	31,2	62,5	93,7	156,1	260,2
200	11	28,7	57,4	86,1	143,5	239,1
250	10,2	26,7	53,4	80,1	133,5	222,5
300	9,7	25,2	50,5	75,7	126,2	210,4
350	8,4	24	48,1	72,1	120,2	200,4
375	7,4	23,6	47,2	70,8	118	196,7
400	6,5	23,2	46,3	69,5	115,8	192,9
425	5,6	22,7	45,4	68,1	113,5	189,2
450	4,7	22,3	44,5	66,8	111,3	185,5

Note: Consult Annex Table D.2 and the notes to Annex Table D.2 of Annex D (informative) for limitations on use.

Annex Table E.18 Pressure/temperature (P/T) ratings for flanges made using group 2A4 materials

Temperature (℃)	Maximum non-shock working pressure (bar)					
	PN 20	PN 50	PN 110	PN 150	PN 260	PN 420
−29 to 38	19	49,6	99,3	148,9	248,2	413,6
50	18,4	48	96	143,9	239,9	399,8
100	15,9	41,5	83	124,5	207,5	345,9
150	14,4	37,5	75	112,5	187,5	312,5
200	13,2	34,4	68,7	103,1	171,9	286,5
250	12,1	32,1	64,1	96,2	160,3	267,2
300	10,2	30,5	61,1	91,6	152,7	254,5
350	8,4	29,3	58,7	88	146,7	244,5
375	7,4	28,9	57,8	86,8	144,6	241
400	6,5	28,6	57,3	85,9	143,1	238,6
425	5,6	28,5	57	85,4	142,4	237,3
450	4,7	28,2	56,4	84,6	141	234,9
475	3,7	28	56	84	140,1	233,5
500	2,8	27,8	55,6	83,4	139	231,6
525	1,9	25,8	51,6	77,4	129	214,9
550	1,3[1)]	25	49,9	74,9	124,8	208
575	–	22,8	45,6	68,4	113,9	189,9
600	–	19,8	39,6	59,4	99	165,1
625	–	15,8	31,6	47,4	79	131,6
650	–	12,5	25	37,4	62,4	104
675	–	9,8	19,7	29,5	49,2	81,9
700	–	7,7	15,4	23	38,4	64
725	–	6,2	12,4	18,6	31	51,6
750	–	4,8	9,6	14,4	24	40
775	–	3,8	7,5	11,3	18,8	31,3
800	–	3	6,1	9,1	15,2	25,2

1) The maximum non-shock working pressure is 1,3 bar at 540 ℃ for PN20.

Note: Consult Annex Table D.2 and the notes to Annex Table D.2 of Annex D (informative) for limitations on use.

Annex Table E.19 Pressure/temperature (P/T) ratings for flanges made using group 2A5 materials

Temperature (℃)	Maximum non-shock working pressure (bar)					
	PN 20	PN 50	PN 110	PN 150	PN 260	PN 420
−29 to 38	19	49,6	99,3	148,9	248,2	413,6
50	18,5	48,4	96,8	145,1	241,9	403,2
100	16,7	43,5	86,9	130,4	217,3	362,2
150	15,5	40,5	81	121,5	202,5	337,5
200	14	38,4	76,8	115,3	192,1	320,2
250	12,1	36,2	72,4	108,6	181	301,7
300	10,2	34,4	68,9	103,3	172,2	287
350	8,4	32,9	65,8	98,7	164,5	274,2
375	7,4	32,2	64,4	96,6	161	268,4
400	6,5	31,8	63,5	95,3	158,8	264,7
425	5,6	31,5	62,9	94,4	157,3	262,2
450	4,7	30,8	61,5	92,3	153,8	256,3
475	3,7	30	60	90	150	250,1
500	2,8	27,8	55,6	83,4	139	231,6
525	1,9	25,8	51,6	77,4	129	214,9
550	1,3[1]	25	49,9	74,9	124,8	208
575	–	24,1	48,2	72,3	120,5	200,8
600	–	21,4	42,9	64,3	107,2	178,6
625	–	17,8	35,6	53,4	89	148,3
650	–	11,6	23,2	34,7	57,9	96,5
675	–	8,7	17,3	26	43,3	72,1
700	–	6,7	13,5	20,2	33,7	56,1
725	–	5,3	10,5	15,8	26,4	43,9
750	–	4	8	12,1	20,1	33,5
775	–	3,2	6,3	9,5	15,8	26,4
800	–	2,6	5,2	7,5	13,1	21,9

[1] The maximum non-shock working pressure is 1,3 bar at 540 ℃ for PN20.

Note: Consult Annex Table D.2 and the notes to Annex Table D.2 of Annex D (informative) for limitations on use.

Annex Table E.20 Pressure/temperature (P/T) ratings for flanges made using group 2A6 materials

Temperature (℃)	Maximum non-shock working pressure (bar)					
	PN 20	PN 50	PN 110	PN 150	PN 260	PN 420
−29 to 38	17,8	46,3	92,7	139	231,6	386,1
50	17,4	45,3	90,7	136	226,9	377,7
100	15,9	41,4	82,8	124,2	207,1	345,1
150	15	39,2	78,4	117,5	195,9	326,5
200	14	36,9	73,9	110,8	184,7	307,9
250	12,1	35,1	70,2	105,3	175,6	292,6
300	10,2	33,4	66,9	100,3	167,2	278,7
350	8,4	32	63,9	95,9	159,8	266,3
375	7,4	31,4	62,7	94,1	156,8	261,3
400	6,5	30,8	61,5	92,3	153,8	256,3
425	5,6	30	60	90	150	250,1
450	4,7	29,4	58,8	88,2	147	245
475	3,7	28,8	57,6	86,4	144	240,1
500	2,8	27,8	55,6	83,4	139	231,6
525	1,9	25,4	50,8	76,1	126,9	211,5
550	1,3[1]	21,8	43,6	65,5	109,1	181,8
575	–	18,5	37	55,5	92,4	154,1
600	–	14,5	29	43,5	72,6	121
625	–	11,4	22,8	34,3	57,1	95,2
650	–	8	16	24	40	66,7
675	–	7	14	21	34,9	58,2
700	–	5,7	11,3	17	28,3	47,2
725	–	4,4	8,8	13,2	21,9	36,6
750	–	3,4	6,8	10,2	17,1	28,4
775	–	2,6	5,1	7,7	12,8	21,4
800	–	1,9	3,8	5,8	9,6	16

[1] The maximum non-shock working pressure is 1,3 bar at 540 ℃ for PN20.

Annex Table E.21 Pressure/temperature (P/T) ratings for flanges made using group 2A7 materials

Temperature (℃)	Maximum non-shock working pressure (bar)					
	PN 20	PN 50	PN 110	PN 150	PN 260	PN 420
−29 to 38	17,8	46,3	92,7	139	231,6	386,1
50	17,4	45,3	90,7	136	226,6	377,7
100	15,9	41,4	82,8	124,2	207,1	345,1
150	15	39,2	78,4	117,5	195,9	326,5
200	14	36,9	73,9	110,8	184,7	307,9
250	12,1	35,1	70,2	105,3	175,6	292,6
300	10,2	33,4	66,9	100,3	167,2	278,7
350	8,4	32	63,9	95,9	159,8	266,3
375	7,4	31,4	62,7	94,1	156,8	261,3
400	6,5	30,8	61,5	92,3	153,8	256,3
425	5,6	30	60	90	150	250,1
450	4,7	29,4	58,8	88,2	147	245
475	3,7	28,8	57,6	86,4	144	240,1
500	2,8	27,8	55,6	83,4	139	231,6
525	1,9	25,8	51,6	77,4	129	214,9
550	1,3[1]	23,6	47,2	70,8	118	196,7
575	—	22	43,9	65,9	109,9	183,1
600	—	19,4	38,7	58,1	96,8	161,3
625	—	16,6	33,3	49,9	83,1	138,6
650	—	14,1	28,1	42,2	70,3	117,2
675	—	11,3	22,6	33,9	56,5	94,1
700	—	8,7	17,5	26,2	43,6	72,7
725	—	6,2	12,4	18,5	30,9	51,5
750	—	4,4	8,8	13,1	21,9	36,5
775	—	3,1	6,3	9,4	15,7	26,2
800	—	2,2	4,4	6,6	10,9	18,2

[1] The maximum non-shock working pressure is 1,3 bar at 540 ℃ for PN20.

Annex Table E.22 Pressure/temperature (P/T) ratings for pipeline flanges

Temperature (℃)	Maximum non-shock working pressure [bar (gauge)]			
	PN 20	PN 50	PN 110	PN 150
−30 to 120	19,6	51,1	102,1	153,2
150	19	49,3	98,6	147,9
175	18,3	47,6	95,1	142,7
200	17,6	45,9	91,7	137,9
230	17	44,1	88,6	132,7

Annex F
(informative)

Design criteria (pipeline applications)

F.1 For PN50, PN110 and PN150 flanges, the slope and the outside diameter of the hub at the base are designed for welding ends having the same yield strength and thickness as those of the mating pipe. The wall thickness of the intended mating pipe was based on **API 5LX-52** with a 0,68 design factor for the DN650 to DN900 sizes, and **API 5LX-65** with a 0,72 design factor for the DN950 to DN1 500 sizes. When the manufacturer of the DN650 to DN900 sizes elects to utilize the alternative permitted in **2.4.5.1.2** of Annex or when the mating pipe has a minimum specified yield strength exceeding 448 N/mm^2, it will be necessary to recalculate the design in accordance with the requirements of **2.4.5.1.2** of Annex.

Informative reference: The wall thickness of the intended mating pipe is calculated by the following allowable stress values.

Nominal diameter	Standard of pipe	Minimum specified yield strength N/mm^2	Design factor	Allowable stress value N/mm^2
DN650 to DN900	**API 5LX-52**	358	0,68	243
DN950 to DN1 500	**API 5LX-65**	448	0,72	323

For the calculation of wall thickness of pipe, it is recommended to refer to **ASME B 31.4**-1989 Edition (*Liquid transportation systems for hydrocarbons, liquid petroleum gas, anhydrous ammonia, and alcohols*).

F.2 The design of the DN950 and larger sizes of the PN50 and higher class of welding neck flanges is based on the flange material having a minimum specified yield strength of at least 290 N/mm^2 in a ring section of the flange and a minimum yield strength at the welding end at least equal to that specified for the mating pipe. When the yield strength of the welding end of the flange is less than specified, compensation in accordance with **2.4.5.1.2** of Annex may be made, but the hub slope and diameter at the larger end have to be preserved.

F.3 The design of all sizes is based on the use of heat-treated carbon steel bolt studs for PN20 flanges and alloy steel bolt studs for PN50, PN110 and PN150 flanges.

Annex G
(informative)

Bibliography

(1) ISO 468: 1982 *Surface roughness — Parameters, their values and general rules for specifying requirements*

(2) ANSI/ASME B16.5: 1988 *Pipe flanges and flanged fittings*

(3) ANSI/ASME B36.10M: 1985 *Welded and seamless wrought steel pipe*

(4) API 5LX-52 *Specification for high-test line pipe*

(5) API 5LX-65 *Specification for high-test line pipe*

(6) MSS SP44 *Steel pipe line flanges*

SAKY STEEL CO., LTD

Errata for JIS (English edition) are printed in *Standardization Journal*, published monthly by the Japanese Standards Association, and also provided to subscribers of JIS (English edition) in *Monthly Information*.

Errata will be provided upon request, please contact:

Standardization Promotion Department, Japanese Standards Association
4-1-24, Akasaka, Minato-ku, Tokyo, 107 JAPAN
TEL. 03-3583-8002 FAX. 03-3583-0462