

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

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Printed in Japan

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 $A \times B$, 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/cm ² }
Vapor, air and gas of 300 °C or under	0.20{2}
Pulsating water or oil of 120 °C or under	
Steady flow water of 120 °C 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 °C.

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/mm²{40.8 kgf/mm²} or over in tensile strength and S25C shall be that of 440 N/mm²{44.9 kgf/mm²} 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)

Nom- inal pres- sure (sym- bol)	Material (1)	Conditions of fluid and maximum working pressure											Hydraulic test pres- sure (in- formative reference) (5)
		Conditions of fluid											
		W 120 °C max.	G ₁ 220 °C max.	G ₂ 300 °C	G ₃ 350 °C	H ₁ 400 °C	H ₂ 425 °C	H ₃ 450 °C	H ₄ 475 °C	H ₅ 490 °C	H ₆ 500 °C	H ₇ 510 °C	
2K	SS400, SF390A (2), S20C (2), SC410	0.29 { 3 }	0.20 { 2 }	—	—	—	—	—	—	—	—	—	0.39 { 4 }
5K	SS400, SF390A (2), SFVCL, S20C (2), SC410, SCPH1	0.69 { 7 }	0.59 { 6 }	0.49 { 5 }	—	—	—	—	—	—	—	—	0.98 { 10 }
10K	SS400, SF390A (2), SFVCL, S20C (2), SC410, SCPH1	1.37 { 14 }	1.18 { 12 }	0.98 { 10 }	—	—	—	—	—	—	—	—	1.96 { 20 }
16K	SF440A (2), SFVC2A, S25C (2), SC480 (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 (2), SFVC2A, S25C (2), SC480 (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 (2), SFVC2A, S25C (2), SC480 (4), SCPH2	5.00 { 51 }	4.51 { 46 }	4.22 { 43 }	3.82 { 39 }	3.33 { 34 }	2.94 { 30 }	—	—	—	—	—	7.35 { 75 }
40K	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 })	—	—	—	9.81 { 100 }
	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 })	—	—	
	SF440A (2), SFVC2A, S25C (2), SC480 (4), SCPH2	6.67 { 68 }	6.08 { 62 }	5.59 { 57 }	5.10 { 52 }	4.51 { 46 }	3.92 { 40 }	—	—	—	—	—	
	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 })	—	—	—	
63K	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 })	15.69 { 160 }
	SF440A (2), SFVC2A, S25C (2), SC480 (4), SCPH2	10.49 { 107 }	9.51 { 97 }	8.83 { 90 }	7.94 { 81 }	7.06 { 72 }	6.18 { 63 }	—	—	—	—	—	
	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
SFVCL, 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

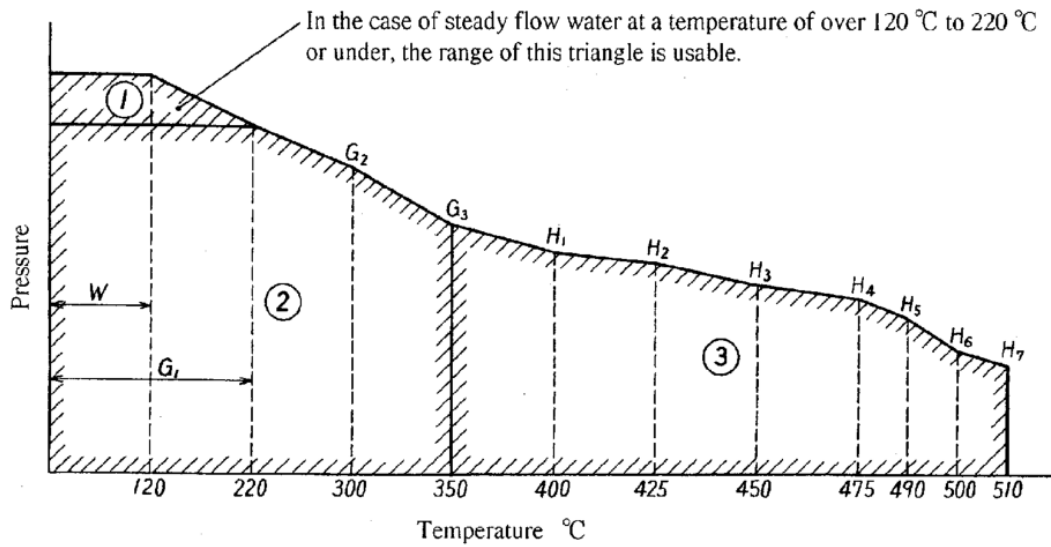
(2) These are subjected to inspection in accordance with JIS G 0303, and S20C shall be that of 400 N/mm^2 {40.8 kgf/mm²} or over in tensile strength and S25C shall be that of 440 N/mm^2 {44.9 kgf/mm²} or over in tensile strength.

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

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

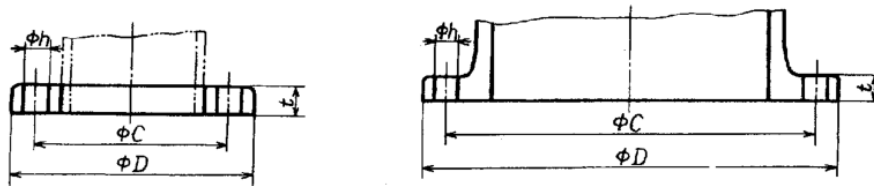
(5) The hydraulic test pressure shows the test pressure as informative reference when a flange has been attached to a pipe, and otherwise specified, it may be exempt from application.

- Remarks 1 The condition of fluid W applies only to the steady flow water (having smaller pressure variation) of 120 °C 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 °C.
- 4 The conditions of fluid H_2 to H_7 apply to the vapor, air, gas, oil, etc. at 425 °C up to 510 °C, 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.



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

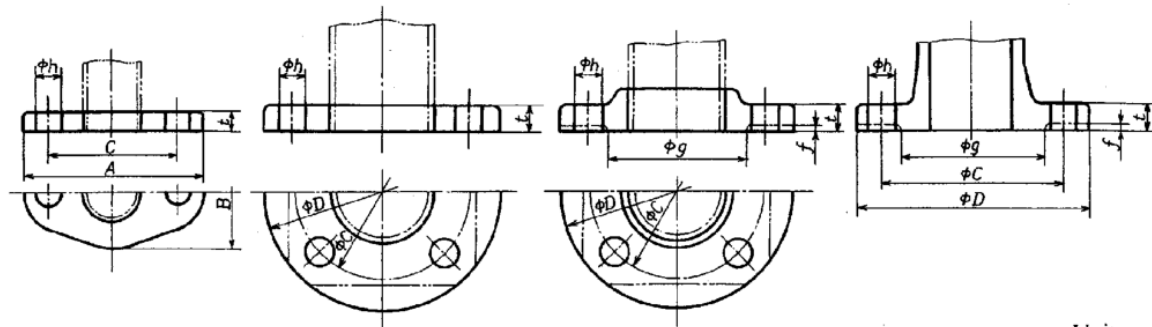


Unit: mm

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.

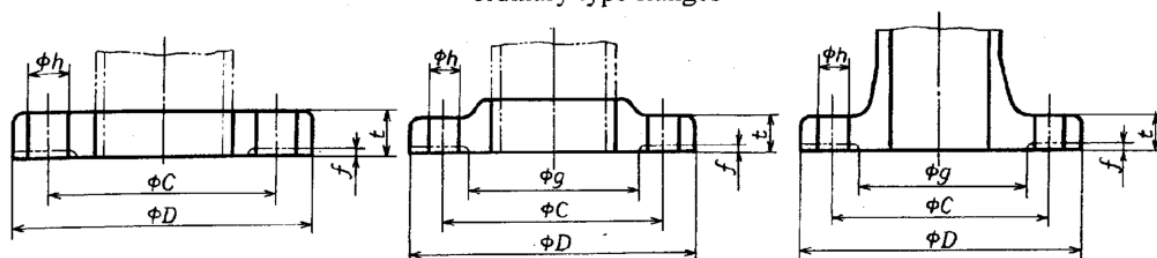
2 The facings of flanges shall be in accordance with Attached Tables 10 and 11. However, when required, the large raised face as shown by chain double-dashed lines may also be used.

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.

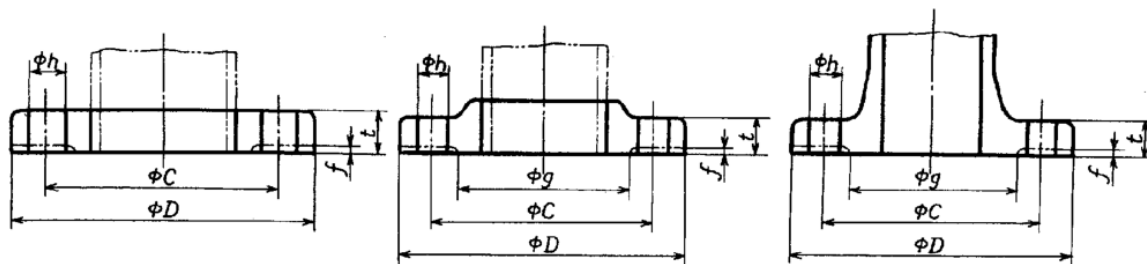
2 The facings of flanges shall be in accordance with Attached Tables 10 and 11. However, when required, the large raised face as shown by chain double-dashed lines may also be used.

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.

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

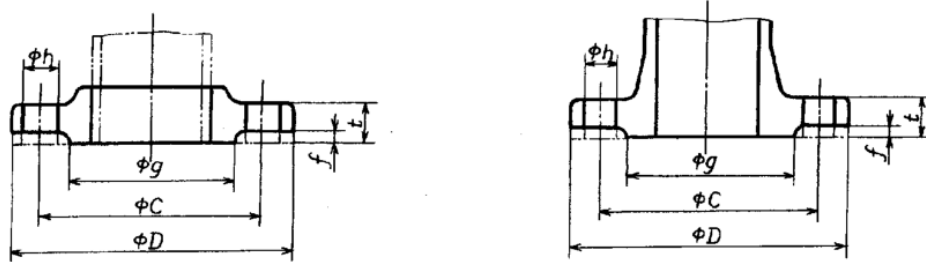


Unit: mm

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

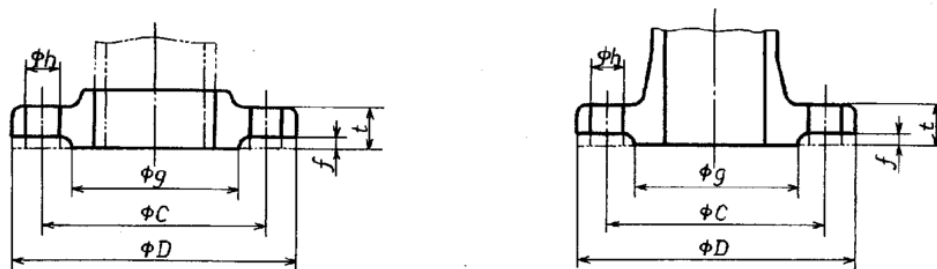
Nominal size	Outside diameter of steel pipe to be applied	Outside diameter of flange D	Dimensions for respective parts of flange			Bolt holes			Bolt size
			t	f	Diameter g	Diameter of bolt circle C	Number	Diameter h	
10	17.3	90	12	1	46	65	4	15	M12
15	21.7	95	12	1	51	70	4	15	M12
20	27.2	100	14	1	56	75	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

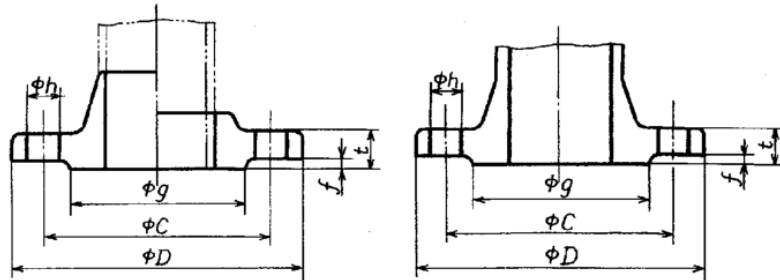
Nominal size	Outside diameter of steel pipe to be applied	Outside diameter of flange D	Dimensions for respective parts of flange			Bolt holes			Bolt size
			t	f	Diameter g	Diameter of bolt circle C	Number	Diameter h	
10	17.3	90	14	1	46	65	4	15	M12
15	21.7	95	14	1	51	70	4	15	M12
20	27.2	100	16	1	56	75	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.

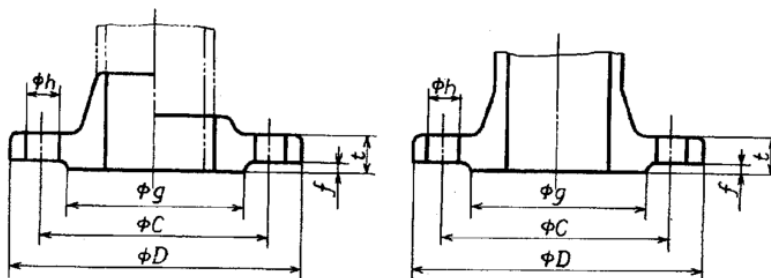
Attached Table 7 Basic dimensions of nominal pressure 30K flanges



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.

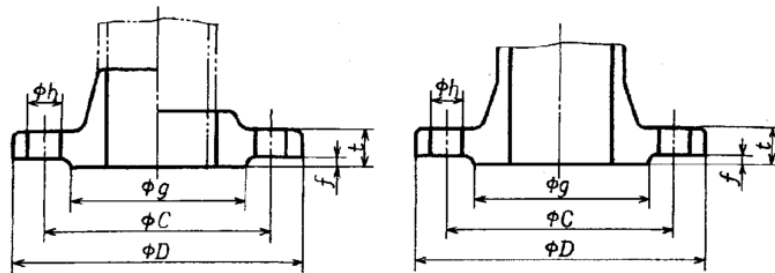
Attached Table 8 Basic dimensions of nominal pressure 40K flanges

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

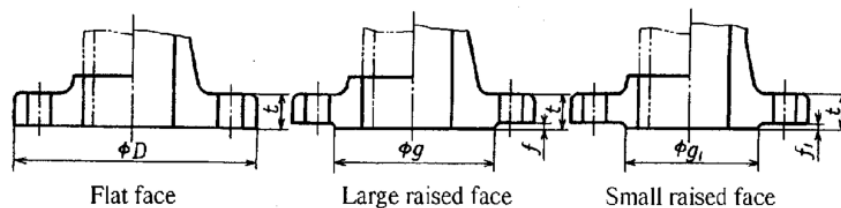


Unit: mm

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)

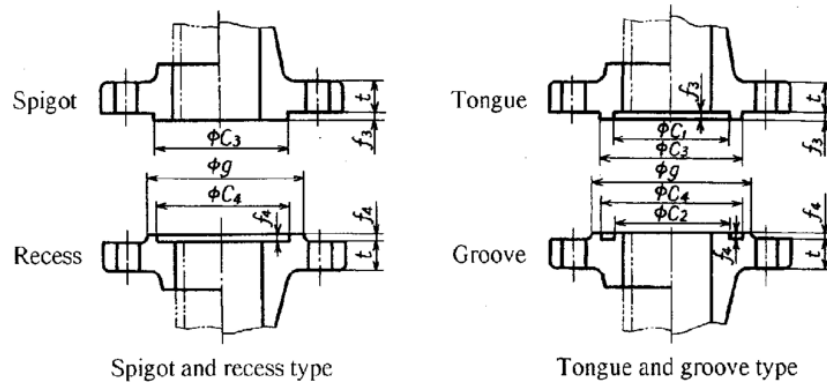


Unit: mm

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)



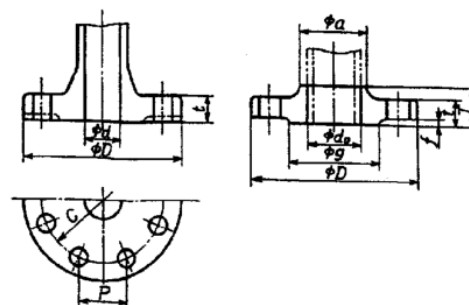
Unit: mm

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 Table



Flat face

Large raised face

Flanged part		Surface condition	Dimensional division	Dimensional tolerance	Flanged part	Surface condition	
Outside diameter D	Integral flanges	Surface as forged (*)	300 or under	+ not specified -2	Bore diameter	Welding neck flanges d	Finish
			Over 300 to 600 or under				
			Over 600 to 1 000 or under	+ not specified -3			
			Over 1 000 to 1 500 or under				
			Over 1 500				
	Flanges other than integral flange	Finish	300 or under	± 1	Bolt hole	Diameter of bolt circle C	—
			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 (*)	Surface as forged (*)	16 or under	± 1	Hub diameter	Slip-on welding type flange a and welding neck flange d_1	Surface as forged
			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	Pitch of hole P	Drill hole processing	
			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			

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

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

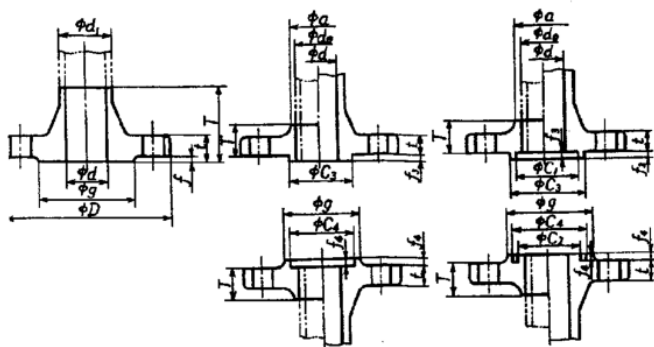
Remarks 1 As for the bore diameter d of the integral flanges of valve, pump and the like with surface finish, the surface finish shall not be influential to the required wall thickness.

2 The thickness of the flange of valve or the like, of which face to face dimension has been specified, shall be above up to 100 %.

3 In the case of spot-facing with single face finish, the thickness of the spot-facing part shall be above up to 100 %.

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12 Dimensional tolerances



Small raised face Spigot and recess type Tongue and groove type

Unit: mm

1	Dimensional division	Dimensional tolerance	Flanged part	Surface condition	Dimensional division	Dimensional tolerance	
1	100 or under	0 -0.5	Facing	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		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	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		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

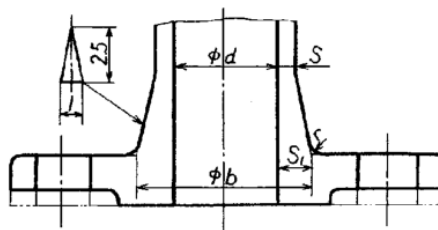
may be permissible on (-) side up to 70 % the tolerances in the column of thickness mentioned above.

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

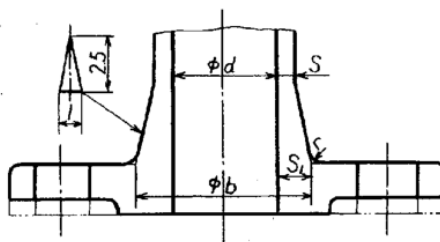


Unit: mm

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.

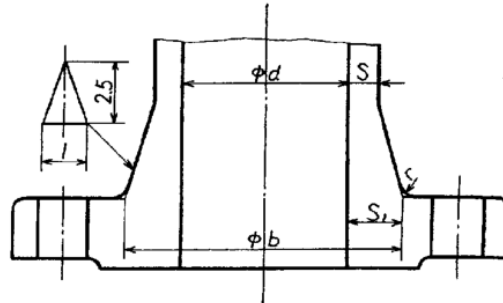
Informative reference 1 Table 2 Dimensions of integral flanges of nominal pressure 20K

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.

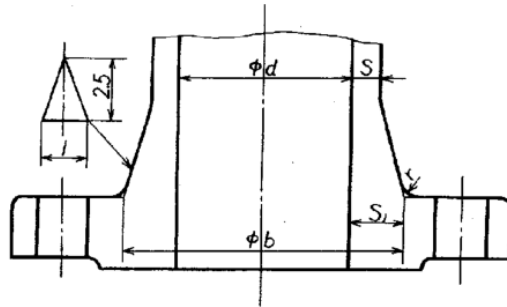
Informative reference 1 Table 3 Dimensions of integral flanges of nominal pressure 30K



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

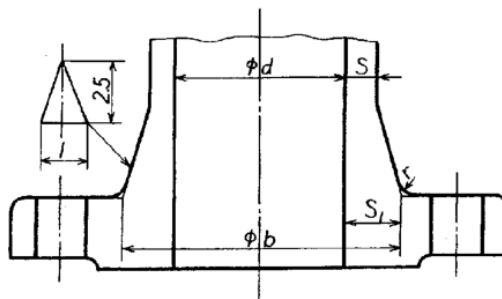
Remarks: Refer to Remarks 1 and 2 of Informative reference 1 Table 1.

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

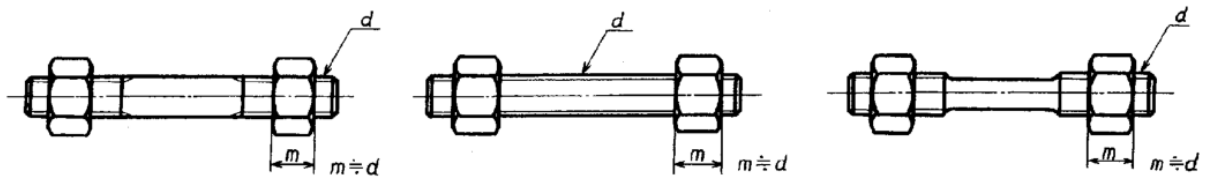
This Informative reference 2 supplements the matters related to the specification in the text of this Standard, however, does not constitute any part of the specification.

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 °C or under		—	SS400 of JIS G 3101	—	SS400 of JIS G 3101	—
	In case of exceeding 220 °C		—	SS490 of JIS G 3101	—		
16K, 20K	220 °C or under	M39 or smaller	4.6	—	4	—	—
		M42 or larger	—	SS400 of JIS G 3101	—	SS400 of JIS G 3101	
	Over 220 °C to 350 °C or under		—	S35C of JIS G 4051	—	S25C of JIS G 4051	
	Over 350 °C to 425 °C or under		—	SNB7 of JIS G 4107	—	S45C of JIS G 4051	
30K, 40K, 63K	350 °C 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 °C to 450 °C or under		—	SNB7 of JIS G 4107	—	S45C (H) of JIS G 4051	Informative reference 2 Fig. 2 or Fig. 3
	Over 450 °C to 510 °C 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 °C, 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 °C, the pitch diameter of threaded portion of bolt shall be made smaller in some extent.
- 3 In the case of not exceeding 350 °C, 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		°C	Tensile test				Impact test	Hardness test
	Normalizing (N)	Quenching		Tempering (H)	Yield point N/mm ² {kgf/mm ² }	Tensile strength N/mm ² {kgf/mm ² }	Elongation %	Reduction of area %	
S25C (N)	860 to 910 Air cooling	—	—	—	—	—	—	—	123 to 183
S35C (H)	—	840 to 890 Water cooling	550 to 650 Rapid cool- ing	—	392{40} min.	569{58} min.	22 min.	55 min.	—
S45C (H)	—	820 to 870 Water cooling	550 to 650 Rapid cool- ing	—	—	—	—	—	201 to 269

Informative reference 2 Table 3 Chemical composition and mechanical properties

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

Unit: %

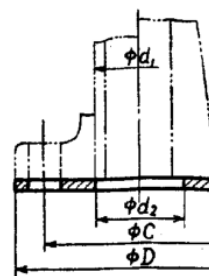
Informative reference 3 Gasket dimensions of pipe flanges

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

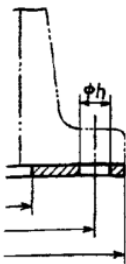


Nominal size of gasket	Outside diameter of steel pipe d_1	Inside diameter of gasket d_2	For nominal pressure 2K flanges				For nominal pressure 5K flanges		
			Outside diameter of gasket D	Diameter of bolt circle C	Diameter of bolt hole h	Number of bolt holes	Outside diameter of gasket D	Diameter of 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.

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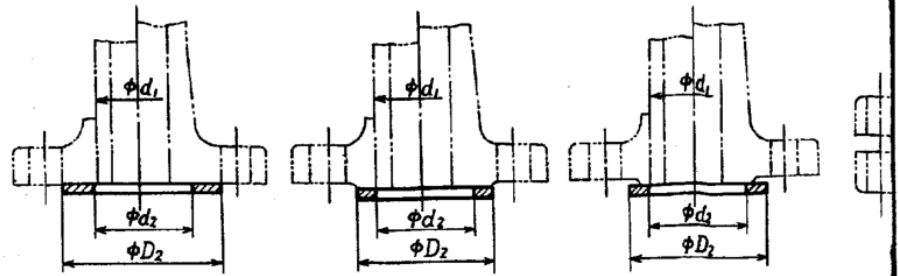
Table 1 Full-face gasket



Unit: mm

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

Informative reference 3 Table 2 R



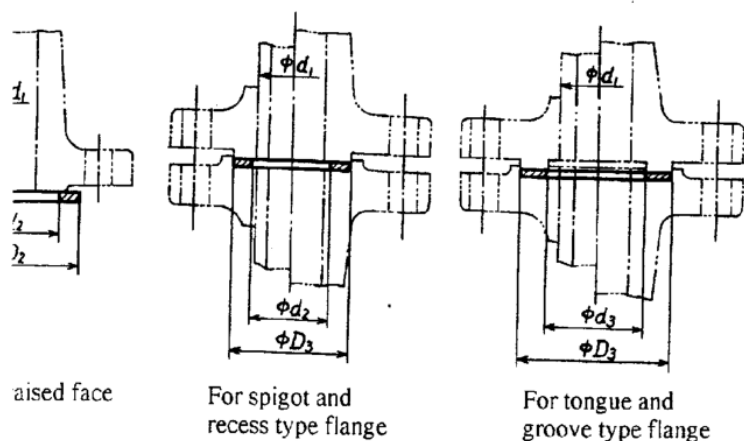
For flat face flange

For large raised face
flangeFor small raised face
flange

Nominal size of gasket	Outside diam- eter of steel pipe d_1	Inside diam- eter of gasket d_2	For flanges of flat face, large raised face and small raised face					
			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



Unit: mm

Face and small raised face				For spigot and recess type flange		For tongue and groove type flange	
Nominal pressure				Inside diam-	Outside diam-	Inside diam-	Outside diameter
20K	30K	40K	63K	eter of gasket	eter of gasket	eter of gasket	of gasket
D_2				d_2	D_3	d_3	D_3
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)*