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Chemical Industry Standard
of the People's Republic of China

HG

HG/T 20592-2009

Replacing HG 20592~20605-1997

Steel Pipe Flanges (PN designated)

钢制管法兰

(PN 系列)

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Illustration 2: nominal dimension DN300×400, nominal pressure PN25, male face slip on neck steel jacket flange assorted with English system pipe, material is 20 steel, it is marked as:	
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1. General provisions

1.0.1 This national standard specifies the basic technical requirements of steel pipe flanges (PN designated), including nominal dimension, nominal pressure, material, pressure-temperature rating, flange type, dimension, seal contact face, tolerance and marking.

1.0.2 This Standard is applicable to steel pipe flanges and blind flanges in nominal pressure of PN2.5~PN160. The nominal flange pressure grades are denoted by PN, including the following nine grades: PN2.5, PN6, PN10, PN16, PN25, PN40, PN63, PN100 and PN160.

1.0.3 Nominal dimension and outside diameter of the steel pipe

Outside diameter of the steel pipe applicable to this Standard includes two series: A and B, where A designs for the international purposes (it is commonly referred to as "John Guest"), while B designs for the domestic adopting series (it is commonly referred to as "metric pipe"). Its nominal dimension DN and outside diameter of the steel pipe are in accordance with those specified in Table 1.0.3.

The flanges adopting B series steel pipe shall be marked with "B" at the back of the number of nominal dimension DN for differentiation. However, the flange adopting A series steel pipe must not be marked with "A" at the back of the number of nominal dimension DN, for more details, see Chapter 13 and Chapter 14 of this Standard.

Table 1.0.3 Nominal Dimension and Outside Diameter of the Steel Pipe (mm)

Nominal dimension DN		10	15	20	25	32		40	50	65	80
Outside diameter of the steel pipe	A	17.2	21.3	26.9	33.7	42.4		48.3	60.3	76.1	88.9
	B	14	18	25	32	38		45	57	76	89
Nominal dimension DN		100	125	150	200	250	300	350	400	450	500
Outside diameter of the steel pipe	A	114.3	139.7	168.3	219.1	273	323.9	355.6	406.4	457	508
	B	108	133	159	219	273	325	377	426	480	530
Nominal dimension DN		600	700	800	900	1000	1200	1400	1600	1800	2000
Outside diameter of the steel pipe	A	610	711	813	914	1016	1219	1422	1626	1829	2032
	B	630	720	820	920	1020	1220	1420	1620	1820	2020

1.0.4 This Standard is also applicable to valve, pump, chemical engineering machinery, pipeline fittings and equipment spares with flange being used as its coupling mode.

1.0.5 This Standard excludes selection principle for materials under particular fluid operating conditions.

2. Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. For dated reference, subsequent amendments (excluding content of corrigenda) to, or revisions of, any of these publications do not apply. However, Parties to agreements based on this Code are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. For undated references, the latest edition of the normative document referred to applies.

"Pipework Components--Definition and Selection of DN (Nominal Dimension)" GB/T 1047

"Pipework Components--Definition and Selection of PN (Nominal Pressure)" GB/T 1048

"Steel Pressure Vessels" GB 150

"Fasteners-Clearance Holes and Counterbores" GB/T 152.1~152.4

"Carbon Structural Steels" GB/T 700

"Hot-rolled Quality Carbon Structural Steel Plates and Wide Strips" GB/T 711

"Steel Plates for Boiler and Pressure Vessels" GB 713

"Hot-rolled Plates and Strips of Carbon Structural Steels and High Strength Low Alloy Structural Steels" GB/T 3274

"Low Alloy Steel Plates for Low Temperature Pressure Vessels" GB 3531

"Hot Rolled Stainless Steel Plate Sheet and Strip" GB/T 4237

"Pipe Threads with 55 Degree Thread Angle where Pressure-tight Joints are Made on the Threads--Part 2: Taper Internal and External Threads" GB/T 7306.2

"General Purpose Industrial Valves-Specification of Carbon Steel Forgings" GB/T 12228

"General Purpose Industrial Valves-Specification of Carbon Steel Castings" GB/T 12229

"General Purpose Industrial Valve—Specification of Stainless Steel Castings" GB/T 12230

"Pipe Threads with the Thread Angle of 60 Degrees where Pressure-tight Joints are made on the Threads" GB/T 12716

"Steel Castings for Pressure Purposes" GB/T 16253

"Dimension Selection Series of Seamless and Welded Steel Pipe for Chemical Industry Piping" HG/T 20553

"Non-metallic Flat Gaskets for use with Steel Pipe Flanges (PN designated)" HG/T 20606

"PTFE Envelope Gaskets for use with Steel Pipe Flanges (PN designated)" HG/T 20607

"Metal Jacketed Gaskets for use with Steel Pipe Flanges (PN designated)" HG/T 20609

"Spiral Wound Gaskets for use with Steel Pipe Flanges (PN designated)" HG/T 20610

Note: 1 The radial projection dimension of the defect is the difference between the maximum radius and minimum radius of the defect away from the flange hole center.

2 h is the groove depth of serrate concentric circle or helical tooth of the flange seal contact face.

3.2.4 Supporting surface of the bolt

1 The supporting surface of the bolt shall be made with machine work or counter boring (fisheye hole). Counter boring dimension is in accordance with those specified in GB/T 152.4, and the parallelism between the supporting surface of the bolt and the seal contact face shall be in accordance with those specified in Table 10.0.1 of this Standard.

2 After the machine work or counter boring on the supporting surface of the bolt, flange thickness shall be ensured to be in accordance with the requirements of dimension tolerance specified in Table 10.0.1 of this Standard.

3 The following flanges adopting B series outside diameter of the steel pipe shall be on the bolt supporting surface of the flange, based on the center of bolt hole, and counter boring face with diameter similar to that listed in Table 3.2.4, so as to be applicable to the bolting assembling. The counter boring face shall be flush with the bolt supporting surface of the flange, and the face is allowed to be intersected with the big end diameter N or the corner R at the flange neck.

- 1) DN350~DN600 flat neck steel pipe flange;
- 2) DN350~DN900 welding neck steel pipe flange

Table 3.2.4 Bolt Counter Boring (mm)

Bolt dimension	Diameter of bolt hole l	Counter boring face diameter
M20	22	40
M24	26	48
M27	30	53
M30	33	61
M33	36	66
M36	39	71
M39	42	76
M45	48	89

3.2.5 Dimension of seal contact face

1 The dimension of seal contact face of the raised face, female face, male face, tongue face or groove face flange complies with the requirements of Figure 3.2.5-1 and Table 3.2.5-1.

2 The dimension of seal contact face of the ring joint face flange complies with the requirements of Figure 3.2.5-2 and Table 3.2.5-2.

3 The dimensions f1 and f2 of seal contact face of raised face, female face or male face, tongue face or groove flange include flange thickness C (see Figure 3.2.5-1), the height E of projecting platform of ring joint face flange is exempted from the flange thickness C (see Figure 3.2.5-2).

4.0.2 The grades and technical requirements of the forging for pipe flange (including forging rolling piece) (refer to JB 4726, JB 4727 and JB 4728) shall be in accordance with the following requirements.

1 The one with one of the following conditions being met shall comply with the requirements of III-level or above forging;

- 1) The forging with nominal pressure of more than or equal to PN100;
- 2) Chrome molybdenum steel forging with nominal pressure of more than PN40;
- 3) Ferrite steel forging with nominal pressure of more than PN16, and with working temperature of less than or equal to -20℃.

2 Unless otherwise specified above, the forging with nominal pressure of no more than PN63 shall comply with the requirements of II-level or above forging.

4.0.3 Neck flange shall be made of forging (or forging rolling technology) and casting (steel) piece, but shall not be made by such technologies as steel plate, tailor-welding or coiled sheet. The plate-type ring flange like blind flange may be made of steel plate or steel plate tailor-welding, and it shall meet the following requirement:

- 1 The steel plate shall be ultrasonic inspected and without delaminating defect.
- 2 Incise the steel plate along its rolling direction into strip shape, bending and butt welding, form a circular ring, so as to make the steel products surface form the up-and-down surface of the ring.
- 3 The butt weld shall be complete-penetration welding.
- 4 The butt weld shall be made with post-weld heat treatment, 100% ray or ultrasonic inspection, where the ray testing shall comply with requirements of II-level of JB/T 4730, and the ultrasonic detection shall meet the requirements of I-level of JB/T 4730.

4.0.4 Stainless steel lining blind flange (BL<S>)

1 The backing layer and blind flange shall be compacted tightly and welding according to the requirements of Figure 4.0.4 and JB/T 4709. The welding material on the fillet weld and plug welding hole bottom layer is adopted according to transition layer welding rod, while the facing welding material is adopted according to welding rod on the capping layer. The plug welding is in accordance with those specified in Table 4.0.4.

Table 4.0.4 Plug Welding Requirement

Welding material	Low-carbon stainless steel lining	Extra-low-carbon stainless steel lining
Welding rod on the transition layer	Fillet weld and plug welding hole bottom layer weld	Welding of parent metal plug welding hole
Welding rod on the capping layer	Welding of the plug welding hole facing	Welding of backing layer plug welding hole

4 The Blind Flange (BL) shall be opened with a M6 ventilating hole and gauged orifice, while their positions are set by themselves. After plug welding, let in compressed air with pressure of no greater than 0.1MPa for leak hunting, or gauged orifices with other dimensions may be opened according to the conditions of the manufactory.

5 The thickness tolerance of backing layer thickness t is -1mm.

4.0.5 Unless otherwise specified in this Standard, the materials for pipe flange shall also comply with the requirements of relevant standards and codes.

5. Gaskets and bolting for flange

5.0.1 The gasket shall comply with the sealing property of flange joint under working conditions. Acting by pretension load of bolt, gasket stress under pretension and working conditions shall be ensured, and no deleterious deformation or crush can be generated.

5.0.2 The gasket complies with the requirements of HG/T 20606~HG/T 20612.

5.0.3 The bolting includes hex bolt, double end studs (tamping type), full thread stud and nut, the applied bolt quantity and specification are in accordance with the requirements of Table 8.1.1 shown in this Standard.

5.0.4 The bolting is classified into high strength, medium strength and low strength. The bolting materials shall be adopted according to the gasket, pressure, temperature, flange and sealing face mode, so as to meet the requirements of the sealing property and bearing strength of flange joint under pretension and working conditions.

5.0.5 The bolting complies with the requirements of HG/T 20613.

6. Fitting of flange joint

The fitting between the flange and gasket or bolting complies with the requirements of HG/T 20614.

7. Pressure-temperature rating

7.0.1 For the steel pipe flange and blind flange with nominal pressure grade of PN2.5~PN160, the maximum allowable working pressure under working temperature complies with the requirements of Table 7.0.1-1~Table 7.0.1-9. The medium temperature may be determined by interpolation method.

7.0.2 The sorts of pipe flange materials listed in Table 7.0.1-1~Table 7.0.1-9 comply with the requirements of Table 4.0.1 of this Standard.

7.0.3 The maximum allowable working pressure under nominal pressure and different temperatures of lining blind flange is determined according to its material sorts. While the upper limit for the service temperature of the stainless steel lining blind flange is no greater

than 350°C.

7.0.4 The working temperature refers to the temperature of flange metal under pressure effect. When the working temperature is lower than 20°C, the maximum allowable working pressure of the flange is identical to that when the temperature is 20°C. When the working temperature is higher than the upper temperature limit listed in the table, the maximum allowable working pressure may be determined by the designer proper according to the service experience or calculation.

7.0.5 If the two flanges on the same flange joint have different pressure rated value, the maximum allowable working pressure of the joint fitting is based on the smaller value, moreover, the torsion moment of the pillar bolt shall be controlled when installing, so as to prevent high strung.

7.0.6 When determining the pressure-temperature rating of flange joint, it shall consider the impact of external force and external force moment in the piping system under high temperature or low temperature on the sealing property of the flange joint.

7.0.7 The flange joint in the elevated temperature creep scope or that bear larger temperature gradient shall prevent bolt looseness by measures, such as regular tightening. The materials shall be ensured with adequate tenacity under low-temperature operating conditions.

7.0.8 When the materials not listed in Table 4.0.1 of this Standard are adopted, the maximum allowable working pressure of the flange may be determined according to the equivalent principle of material mechanical strength (room temperature/high temperature) on the basis of the materials listed in the Table, but it shall not be more than the amount of corresponding materials listed in the table.

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