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HG

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Replacing HG 20613-1997

Bolting for Use with Steel Pipe Flanges (PN designated)

钢制管法兰用紧固件

(PN 系列)

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1. Scope

This standard specifies pattern, dimension, material, marking, technical requirement and service provisions of bolting for use with steel pipe flanges (PN designated).

This Standard is applicable to HG/T 20592 Bolting for use with Steel Pipe Flange, including hex bolt, double end studs (clamping type), full thread stud and nut.

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.

- "Fasteners--Ends of Parts with External Thread" GB/T 2
- "Fasteners--Acceptance Inspection" GB/T 90.1
- "Fasteners--Marking and Packaging" GB/T 90.2
- "General Purpose Metric Screw Threads—Basic Dimensions" GB/T 196
- "General Purpose Metric Screw Threads—Tolerances" GB/T 197
- "Double End Studs (Clamping Type)-Product Grade B" GB/T 901
- "Stainless Steel Bars" GB/T 1220
- "Alloy Structure Steels" GB/T 3077
- "Mechanical Properties of Fasteners--Bolts, Screws and Studs" GB/T 3098.1
- "Mechanical Properties of Fasteners--Nuts--Coarse Thread" GB/T 3098.2
- "Mechanical Properties of Corrosion-resistant Stainless-steel Fasteners-Part 1: Bolts, Screws and Studs" GB/T 3098.6
- "Mechanical Properties of Fasteners-Nuts made of Stainless-steel" GB/T 3098.15
- "Tolerances for Fasteners--Bolts, Screws, Studs and Nuts" GB/T 3103.1
- "Laminated Rods" GB/T 5133
- "Hexagon Head Bolts" GB/T 5782
- "Hexagon Head Bolts with Fine Pitch Thread" GB/T 5785
- "Hexagon Nuts, Style I" GB/T 6170
- "Hexagon Nuts, Style I with Fine Pitch Thread" GB/T 6171
- "Hexagon Nuts, Style II" GB/T 6175
- "Hexagon Nuts, Style II with Fine Pitch Thread" GB/T 6176
- "Fasteners-Surface Discontinuities-Bolts, Screws and Studs for General Requirements" GB/T 5779.1
- "Fasteners-Surface Discontinuities-Nuts" GB/T 5779.2
- "Fasteners-Surface Discontinuities-Bolts, Screws and Studs for Special Requirements"

Table 4.0.1 Classification of Bolting Materials for Pipe Flanges

Bolting materials		
High strength	Medium strength	Low strength
GB/T 3098.1, 8.8	GB/T 3098.6, A2-70	GB/T 1220, 0Cr17Ni12Mo2(316)
GB/T 3077, 35CrMo	A4-70	0Cr18Ni9(304)
25Cr2MoV	ASTM A193, B8-2	GB/T 3098.1, 5.6
DL/T 439, 42CrMo	B8M-2	GB/T 3098.6, A4-50
ASTM A320, 17	ASTM A453, 660	A2-50

Note: The low strength bolting materials are only applicable to flanges and non-metallic flat gaskets with pressure grade of less than or equal to PN40.

4.0.2 The working pressure and temperature range of bolting materials are in accordance with those specified in Table 5.0.4 of this Standard.

4.0.3 The materials and mechanical properties of the commercial grade bolting shall comply with the requirements of GB/T 3098.1, GB/T 3098.2, GB/T 3098.6 and GB/T 3098.15.

4.0.4 The chemical composition, heat treating regime and mechanical property of special grade bolting shall be in accordance with those specified in Table 4.0.4. The test specimen for mechanical property shall be cut along the rolling direction from the roughcast with specified heat treatment, and the cutting position of the test specimen is:

1 The specimen with roughcast diameter of less than or equal to 40mm shall be sampling from the center.

2 The one with roughcast diameter of more than 40mm shall be sampling from 1/4 of the diameter.

4.0.5 The roughcast of the full thread stud shall be made with mechanical property test by batches. Roughcast of hexagonal nut (style II) shall be made with hardness testing by batches.

3 Matched with non-metallic flat gasket

5.0.2 The service conditions of commercial grade double end studs and hexagonal nut (style I) shall be in accordance with the following requirements:

1 The nominal pressure grade is less than or equal to PN40.

2 Non-toxic, non-flammable medium and non-violent cycle occasions

5.0.3 Unless otherwise specified in Article 5.0.1 and Article 5.0.2, special grade full thread stud and hexagonal nut (style II) shall be adopted.

5.0.4 The working conditions and temperature range of bolting shall be in accordance with those specified in Table 5.0.4.

Table 5.0.7-2 Length and Approximate Mass (Plate-type Flat Welding Flange) of Hexagon Head Bolts and Studs for PN2.5 Flanges

Nominal dimension DN	Screw thread	Quantity n	Hexagon head bolts and studs			
			L _{SR} (mm)	Mass (kg)	L _{ZR} (mm)	Mass (kg)
10	M10	4	40	37	55	33
15	M10	4	40	37	55	33
20	M10	4	45	40	60	36
25	M10	4	45	40	60	36
32	M12	4	50	60	70	56
40	M12	4	50	60	70	56
50	M12	4	50	60	70	56
65	M12	4	50	60	70	56
80	M16	4	60	141	85	136
100	M16	4	60	141	85	136
125	M16	8	65	149	90	144
150	M16	8	65	149	90	144
200	M16	8	70	157	95	152
250	M16	12	75	165	95	152
300	M20	12	80	282	105	252
350	M20	12	80	282	110	264
400	M20	16	85	294	115	276
450	M20	16	90	306	120	288
500	M20	20	90	306	120	288
600	M24	20	100	518	135	486
700	M24	24	105	536	140	504
800	M27	24	115	756	150	690
900	M27	24	120	779	155	713
1000	M27	28	120	779	160	736
1200	M27	32	125	802	165	759
1400	M27	36	135	848	170	782
1600	M27	40	140	871	180	828
1800	M27	44	145	894	185	851
2000	M27	48	155	940	190	874

Note: 1 The bolting mass is the approximate total mass of every 1000 pieces ones.

2 The bolting length excludes the thickness of the gasket.

**Table 5.0.7-4 Length and Mass (Plate-type Flat Welding Flange) of Hexagon Head Bolts and Studs for PN10
Flanges**

Nominal dimension DN	Screw thread	Quantity n	Hexagon head bolts and studs			
			L _{SR} (mm)	Mass (kg)	L _{ZR} (mm)	Mass (kg)
10	M12	4	50	60	65	52
15	M12	4	50	60	65	52
20	M12	4	50	60	70	56
25	M12	4	50	60	70	56
32	M16	4	60	141	85	136
40	M16	4	60	141	85	136
50	M16	4	65	149	85	136
65	M16	8	65	149	90	144
80	M16	8	65	149	90	144
100	M16	8	70	157	95	152
125	M16	8	70	157	95	152
150	M20	8	80	282	105	252
200	M20	8	80	282	105	252
250	M20	12	80	282	110	264
300	M20	12	80	282	110	264
350	M20	16	85	294	115	276
400	M24	16	100	518	135	486
450	M24	20	105	536	140	504
500	M24	20	110	554	145	522
600	M27	20	120	779	160	736

Note: 1 The bolting mass is the approximate total mass of every 1000 pieces ones.

2 The bolting length excludes the thickness of the gasket.

Table 5.0.7-9 Length and Mass (Plate-type Flat Welding Flange) of Hexagon Head Bolts and Studs for PN10 Flanges

(Slip On Neck Flange, Weld Neck Flange, Thread Flange and Socket Welding Flange)

Nominal dimension DN	Screw thread	Quantity n	Hexagon head bolts and studs			
			L _{SR} (mm)	Mass (kg)	L _{ZR} (mm)	Mass (kg)
10	M12	4	50	60	70	56
15	M12	4	50	60	70	56
20	M12	4	55	64	75	60
25	M12	4	55	64	75	60
32	M16	4	60	141	85	136
40	M16	4	60	141	85	136
50	M16	4	60	141	85	136
65	M16	8	60	141	85	136
80	M16	8	65	149	90	144
100	M16	8	65	149	90	144
125	M16	8	70	157	95	152
150	M20	8	75	270	105	252
200	M20	8	80	282	105	252
250	M20	12	80	282	110	264
300	M20	12	80	282	110	264
350	M20	16	80	282	110	264
400	M24	16	85	464	120	432
450	M24	20	90	482	125	450
500	M24	20	90	482	125	450
600	M27	20	95	664	130	598
700	M27	24	100	687	135	621
800	M30	24	105	883	145	812
900	M30	28	110	911	150	840
1000	M33	28	115	1184	155	1054
1200	M36×3	32	125	1514	165	1320
1400	M39×3	36	135	1942	185	1739
1600	M45×3	40	145	2665	210	2604
1800	M45×3	44	155	2789	215	2666
2000	M45×3	48	160	2851	225	2790

Note: 1 The bolting mass is the approximate total mass of every 1000 pieces ones.

2 The bolting length excludes the thickness of the gasket.

**Table 5.0.7-10 Length and Mass (Plate-type Flat Welding Flange) of Hexagon Head Bolts and Studs for
PN16 Flanges**

(Slip On Neck Flange, Weld Neck Flange, Thread Flange and Socket Welding Flange)

Nominal dimension DN	Screw thread	Quantity n	Hexagon head bolts and studs			
			L _{SR} (mm)	Mass (kg)	L _{ZR} (mm)	Mass (kg)
10	M12	4	50	60	70	56
15	M12	4	50	60	70	56
20	M12	4	55	64	75	60
25	M12	4	55	64	75	60
32	M16	4	60	141	85	136
40	M16	4	60	141	85	136
50	M16	4	60	141	85	136
65	M16	8	60	141	85	136
80	M16	8	65	149	90	144
100	M16	8	65	149	90	144
125	M16	8	70	157	95	152
150	M20	8	75	270	105	252
200	M20	12	80	282	105	252
250	M24	12	85	464	120	432
300	M24	12	90	482	125	450
350	M24	16	95	500	130	468
400	M27	16	100	687	140	644
450	M27	20	120	779	155	713
500	M30	20	130	1023	170	952
600	M33	20	155	1456	200	1360
700	M33	24	115	1184	160	1088
800	M36×3	24	125	1514	170	1360
900	M36×3	28	130	1554	170	1360
1000	M39×3	28	135	1942	185	1739
1200	M45×3	32	150	2727	215	2666
1400	M45×3	36	160	2851	220	2728
1600	M52×4	40	175	4190	245	4067
1800	M52×4	44	185	4360	255	4233
2000	M56×4	48	195	5015	270	5238

Note: 1 The bolting mass is the approximate total mass of every 1000 pieces ones.

2 The bolting length excludes the thickness of the gasket.

**Table 5.0.7-14 Length and Mass (Plate-type Flat Welding Flange) of Hexagon Head Bolts and Studs for
PN100 Flanges**

(Weld Neck Flange and Socket Welding Flange)

Nominal dimension DN	Screw thread	Quantity n	Hexagon head bolts and studs			
			L_{ZR} (mm)	Mass (kg)	L_{ZI} (mm)	Mass (kg)
10	M12	4	75	60	90	72
15	M12	4	75	60	90	72
20	M16	4	95	152	105	168
25	M16	4	95	152	110	176
32	M20	4	105	252	120	288
40	M20	4	110	264	125	300
50	M24	4	125	450	145	522
65	M24	8	130	468	150	540
80	M24	8	135	486	155	558
100	M27	8	145	667	165	759
125	M30	8	160	896	180	1008
150	M30	12	170	952	190	1064
200	M33	12	195	1326	215	1462
250	M36×3	12	210	1680	230	1840
300	M39×3	16	240	2256	260	2444
350	M45×3	16	265	3286	290	3596

Note: 1 The bolting mass is the approximate total mass of every 1000 pieces ones.

2 The bolting length excludes the thickness of the gasket.

Table 5.0.7-18 Length and Mass (Integral Type Flange) of Hexagon Head Bolts and Studs for PN16 Flanges

Nominal dimension DN	Screw thread	Quantity n	Hexagon head bolts and studs			
			L _{SR} (mm)	Mass (kg)	L _{ZR} (mm)	Mass (kg)
10	M12	4	50	60	70	56
15	M12	4	50	60	70	56
20	M12	4	55	64	75	60
25	M12	4	55	64	75	60
32	M16	4	60	141	85	136
40	M16	4	60	141	85	136
50	M16	4	60	141	85	136
65	M16	8	60	141	85	136
80	M16	8	65	149	90	144
100	M16	8	65	149	90	144
125	M16	8	70	157	95	152
150	M20	8	75	270	105	252
200	M20	12	80	282	105	252
250	M24	12	85	464	120	432
300	M24	12	90	482	125	450
350	M24	16	95	500	130	468
400	M27	16	100	687	140	644
450	M27	20	120	779	155	713
500	M30	20	130	1023	170	952
600	M33	20	155	1456	195	1326
700	M33	24	130	1286	175	1190
800	M36×3	24	130	1554	175	1400
900	M39×3	28	140	1989	190	1786
1000	M39×3	28	140	1989	195	1833
1200	M45×3	32	160	2851	220	2728
1400	M45×3	36	170	2975	235	2914
1600	M52×4	40	190	4445	260	4316
1800	M52×4	44	200	4615	265	4399
2000	M56×4	48	205	5500	280	5432

Note: 1 The bolting mass is the approximate total mass of every 1000 pieces ones.

2 The bolting length excludes the thickness of the gasket.

Table 5.0.7-21 Length and Mass (Integral Type Flange) of Hexagon Head Bolts and Studs for PN63 Flanges

Nominal dimension DN	Screw thread	Quantity n	Hexagon head bolts and studs			
			L_{ZR} (mm)	Mass (kg)	L_{ZJ} (mm)	Mass (kg)
10	M12	4	75	60	90	72
15	M12	4	75	60	90	72
20	M16	4	95	152	105	168
25	M16	4	95	152	110	176
32	M20	4	110	264	125	300
40	M20	4	115	276	130	312
50	M20	4	110	264	130	312
65	M20	8	110	264	130	312
80	M20	8	115	276	135	324
100	M24	8	130	468	150	540
125	M27	8	145	667	160	736
150	M30	8	155	868	170	952
200	M33	12	170	1156	190	1292
250	M33	12	180	1224	200	1360
300	M33	16	195	1326	215	1462
350	M36×3	16	205	1640	225	1800
400	M39×3	16	220	2068	240	2256

Note: 1 The bolting mass is the approximate total mass of every 1000 pieces ones.

2 The bolting length excludes the thickness of the gasket.

Table 5.0.7-23 Length and Mass (Integral Type Flange) of Hexagon Head Bolts and Studs for PN160 Flanges

Nominal dimension DN	Screw thread	Quantity n	Hexagon head bolts and studs			
			L _{ZR} (mm)	Mass (kg)	L _{ZJ} (mm)	Mass (kg)
10	M12	4	75	60	90	72
15	M12	4	75	60	90	72
20	M16	4	95	152	110	176
25	M16	4	95	152	110	176
32	M20	4	110	264	125	300
40	M20	4	115	276	130	312
50	M24	4	130	468	150	540
65	M24	8	135	486	155	558
80	M24	8	140	504	160	576
100	M27	8	155	713	175	805
125	M30	8	170	980	190	1064
150	M30	12	180	1008	205	1148
200	M33	12	210	1428	235	1598
250	M39×3	12	240	2256	265	2491
300	M39×3	16	260	2444	290	2726

Note: 1 The bolting mass is the approximate total mass of every 1000 pieces ones.

2 The bolting length excludes the thickness of the gasket.

Table 5.0.8 Approximate Mass of Nut (kg)

Specification	M10	M12	M16	M20	M24	M27	M30	M33
Hexagonal nut, style I	7.94	11.93	29.0	51.55	88.8	132.4	184.4	242.8
Hexagonal nut, style II	15	23	50	101	177	251	322	429
Specification	M36×3	M39×3	M45×4	M48×4	M52×4	M56×4		
Hexagonal nut, style I	317	414.9	605.2	744.4	924.8	1091		
Hexagonal nut, style II	558	598	862	1064	1267	1530		

Note: The bolting mass is the approximate total mass of every 1000 pieces ones.

6. Dimension tolerance

6.0.1 Dimension tolerance and surface defect of commercial grade bolting shall all comply with the requirements of national standards on corresponding bolting.

6.0.2 Special grade bolting

1 The dimension tolerance of double end studs (clamping type) and full thread stud shall comply with the requirements of GB/T 3103.1, the dimension tolerance of the thread complies with the requirement for 6g of GB/T 197 and the surface defect shall comply with relevant requirements of GB/T 5779.1 and GB/T 5779.3.

2 The dimension tolerance of nuts specially-designated for pipe flange shall comply with the requirements of GB/T 3103.1, the dimension tolerance of the thread complies with the 6H requirement of GB/T GB/T197 and the surface defect shall comply with relevant requirements of GB/T 5779.2.

7. Surface treatment

Alloy steel bolting shall be bluing

8. Inspection

8.0.1 Delivery inspection of commercial grade bolting is made according to the requirements of corresponding national standard.

8.0.2 The delivery inspection of special grade bolting is based on the unit of batch. The maximum parcel of studs is 3000 pieces, and the maximum parcel of nuts is 5000.

Note: Each batch refers to products produced by the same furnace number, same pattern, same specification and same production process. When the bolt length is less than or equal to 100mm, the ones with length discrepancy of 25mm may be regarded as the same batch; when the stud length is more than or equal to 100mm, the ones with length discrepancy of 50mm may be regarded as one batch.

8.0.3 The special grade bolting shall be sampling inspected by batches after the heat treatment, and it shall be in accordance with the requirements of Table 4.0.4 of this Standard.

8.0.4 The full thread stud with nominal pressure of more than PN100 shall be made with magnetic particle inspection one by one on the basis of JB/T 4730, and it shall comply with the requirements of level II.

9. Acceptance, packaging and quality certificate

9.0.1 Dimension, appearance, performance checking, acceptance, and packaging of bolting

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