)OC 621.882.211 : 624.9 (.14 : 693.814.26

December 1983

High strength hexagon fit bolts
with large widths across flats
for structural steel bolting

DIN 7999

Sechskant-Passschrauben, hochfest, mit grossen Schlüsselweiten für Stahlkonstruktionen

Supersedes
March 1982 edition

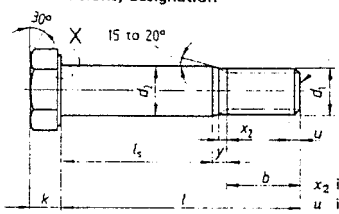
In keeping with current practice in standards published by the International Organization for Standardization (ISO), a comma has been used throughout as the decimal marker.

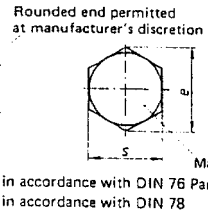
Dimensions in mm

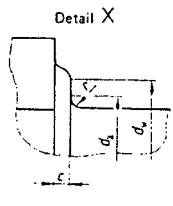
1 Field of application

This standard specifies high strength hexagon fit bolts with large widths across flats. Fit bolts are intended for use in structural steel bolting (GVP bolting or SLP bolting). They may only be used together with hexagon nuts complying with DIN 6915 and with washers complying with DIN 6916, DIN 6917 or DIN 6918.

2 Dimensions, designation







x_2 in accordance with DIN 76 Part 1
u in accordance with DIN 78

Designation of a high tensile strength hexagon fit bolt with large width across flats, with thread d_1 = M 20 and nominal length l = 100 mm:

Fit bolt DIN 7999 – M 20 × 100

Table 1.

Thread size d_1		M 12 [2]	M 16	M 20 [2]	M 22	M 24	M 27	M 30
d_2	b11	13	17	21	23	25	28	31
b		18,5	22	26	28	29,5	32,5	35
c	min.	0,4	0,4	0,4	0,4	0,4	0,4	0,4
	max.	0,6	0,6	0,8	0,8	0,8	0,8	0,8
d_a	max.	15,2	19,2	24	26	28	32	35
d_w [1]	min.	19	25	32	34	39	43,5	47,5
e	min.	22,78	29,56	37,29	39,55	45,2	50,85	55,37
k		8	10	13	14	15	17	19
r	min.	0,8	0,8	1,2	1,2	1,2	1,5	1,5
s		21	27	34	36	41	46	50
y	max.	6,5	7,5	8,5	8,5	10	10	11,5
Nominal length l	Perm. dev. *)	Useful shank length l_s ± 1						
40	± 1,25	15						
45		20	15,5					
50		25	20,5	15,5				

The bolts are usually manufactured in the sizes for which a shank length is specified.

*) Permissible deviation.

[1] The maximum dimension d_w shall not exceed the actual dimension of the width across flats s.

[2] Subject to agreement, sizes M 12 and M 20 can also be supplied with the previously usual widths across flats 22 and 32 mm (instead of 21 and 34 mm). However, it is recommended that the new widths across flats 21 and 34 mm be used for all new designs, since, in the future, only these sizes are to be used (see DIN ISO 272). d_w min. = 20 and 30 mm, e min. = 23,91 and 35,03 mm shall apply for widths across flats 22 and 32 mm.

Continued on pages 2 to 5

Table 1. (continued)

Thread size d_1		M 12	M 16	M 20	M 22	M 24	M 27	M 30
Nominal length l	Per. dev.	Useful shank length $l_s \pm 1$						
55	± 1,5	30	25,5	20,5	18,5	15,5		
60		35	30,5	25,5	23,5	20,5	17,5	
65		40	35,5	30,5	28,5	25,5	22,5	18,5
70		45	40,5	35,5	33,5	30,5	27,5	23,5
75		50	45,5	40,5	38,5	35,5	32,5	28,5
80		55	50,5	45,5	43,5	40,5	37,5	33,5
85	± 1,75	60	55,5	50,5	48,5	45,5	42,5	38,5
90		65	60,5	55,5	53,5	50,5	47,5	43,5
95		70	65,5	60,5	58,5	55,5	52,5	48,5
100		75	70,5	65,5	63,5	60,5	57,5	53,5
105		80	75,5	70,5	68,5	65,5	62,5	58,5
110		85	80,5	75,5	73,5	70,5	67,5	63,5
115		90	85,5	80,5	78,5	75,5	72,5	68,5
120		95	90,5	85,5	83,5	80,5	77,5	73,5
125	± 2		95,5	90,5	88,5	85,5	82,5	78,5
130			100,5	95,5	93,5	90,5	87,5	83,5
135			105,5	100,5	98,5	95,5	92,5	88,5
140			110,5	105,5	103,5	100,5	97,5	93,5
145			115,5	110,5	108,5	105,5	102,5	98,5
150			120,5	115,5	113,5	110,5	107,5	103,5
155			125,5	120,5	118,5	115,5	112,5	108,5
160			130,5	125,5	123,5	120,5	117,5	113,5
165				130,5	128,5	125,5	122,5	118,5
170				135,5	133,5	130,5	127,5	123,5
175				140,5	138,5	135,5	132,5	128,5
180				145,5	143,5	140,5	137,5	133,5
185	± 2,3				148,5	145,5	142,5	138,5
190					153,5	150,5	147,5	143,5
195					158,5	155,5	152,5	148,5
200					163,5	160,5	157,5	153,5

The bolts are usually manufactured in the sizes for which a shank length is specified.

3 Technical delivery conditions

3.1 General requirements

As specified in DIN 267 Part 1.

3.2 Property class or material

Property class 10.9 as specified in DIN ISO 898 Part 1.

3.3 Product grade (finish)

Product grade C as specified in DIN ISO 4759 Part 1, but with thread tolerance 6g as specified in DIN 13 Part 15.

DIN 267 Part 2 (at present at the stage of draft) shall apply for the surface roughness.

R_z = 25 µm shall apply for the fit shank.

DIN 267 Part 19 shall apply for the permissible surface irregularities.

If a protective surface coating is desired, the designation shall be expanded in accordance with DIN 267 Part 9 or Part 10.

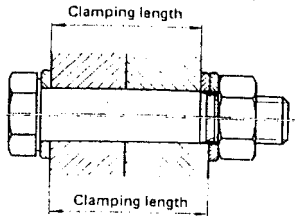
3.4 Marking

Fit bolts shall be marked in accordance with DIN ISO 898 Part 1 and shall additionally be marked with the type symbol HVP.

3.5 Testing and acceptance

In accordance with DIN 267 Part 5.

4 Clamping lengths



with hexagon nuts complying with DIN 6915 and washer or washers complying with DIN 6916

Table 2.

Thread size d_1	M 12	M 16	M 20	M 22	M 24	M 27	M 30
Nominal length l	Clamping length						
40	14 to 18						
45	19 to 23	12 to 16					
50	24 to 28	17 to 21	14 to 18				
55	29 to 33	22 to 26	19 to 23	17 to 21	15 to 19		
60	34 to 38	27 to 31	24 to 28	22 to 26	20 to 24	14 to 18	
65	39 to 43	32 to 41	29 to 33	27 to 31	25 to 29	19 to 23	17 to 21
70	44 to 48	37 to 41	34 to 38	32 to 36	30 to 34	24 to 28	22 to 26
75	49 to 53	42 to 46	39 to 43	37 to 41	35 to 39	29 to 33	27 to 31
80	54 to 58	47 to 51	44 to 48	42 to 46	40 to 44	34 to 38	32 to 36
85	59 to 63	52 to 56	49 to 53	47 to 51	45 to 49	39 to 43	37 to 41
90	64 to 68	57 to 61	54 to 58	52 to 56	50 to 54	44 to 48	42 to 46
95	69 to 73	62 to 66	59 to 63	57 to 61	55 to 59	49 to 53	47 to 51
100	74 to 78	67 to 71	64 to 68	62 to 66	60 to 64	54 to 58	52 to 56
105	79 to 83	72 to 76	69 to 73	67 to 71	65 to 69	59 to 63	57 to 61
110	84 to 88	77 to 81	74 to 78	72 to 76	70 to 74	64 to 68	62 to 66
115	89 to 93	82 to 86	79 to 83	77 to 81	75 to 79	69 to 73	67 to 71
120	94 to 98	87 to 91	84 to 88	82 to 86	80 to 84	74 to 78	72 to 76
125		92 to 96	89 to 93	87 to 91	85 to 89	79 to 83	77 to 81
130		97 to 101	94 to 98	92 to 96	90 to 94	84 to 88	82 to 86
135		102 to 106	99 to 103	97 to 101	95 to 99	89 to 93	87 to 91
140		107 to 111	104 to 108	102 to 106	100 to 104	94 to 98	92 to 96
145		112 to 116	109 to 113	107 to 111	105 to 109	99 to 103	97 to 101
150		117 to 121	114 to 118	112 to 116	110 to 114	104 to 108	102 to 106
155		122 to 126	119 to 123	117 to 121	115 to 119	109 to 113	107 to 111
160		127 to 131	124 to 128	122 to 126	120 to 124	114 to 118	112 to 116
165			129 to 133	127 to 131	125 to 129	119 to 123	117 to 121
170			134 to 138	132 to 136	130 to 134	124 to 128	122 to 126
175			139 to 143	137 to 141	135 to 139	129 to 133	127 to 131
180			144 to 148	142 to 146	140 to 144	134 to 138	132 to 136
185				147 to 151	145 to 149	139 to 143	137 to 141
190				152 to 156	150 to 154	144 to 148	142 to 146
195				157 to 161	155 to 159	149 to 153	147 to 151
200				162 to 166	160 to 164	154 to 158	152 to 156

5 Masses

The mass values given are only guidance values.

Table 3.

Thread size d_1	M 12	M 16	M 20	M 22	M 24	M 27	M 30
Nominal length l	Mass (7,85 kg/dm³) kg per 1000 units ≈						
40	58						
45	63	116					
50	68	124					
55	74	132					
60	78	141					
65	83	150	250				
70	89	159	263	325			
75	95	168	277	344	423		
80	100	176	290	363	442	585	
85	106	185	304	382	461	609	772
90	111	194	317	402	480	633	801
95	116	203	331	421	499	657	831
100	123	212	344	440	519	681	860
105	128	221	357	456	538	705	990
110	134	230	371	472	557	729	919
115	139	239	384	488	576	753	949
120	145	247	398	505	595	777	978
125		256	411	520	614	800	1000
130		265	424	536	632	823	1030
135		273	437	552	651	847	1060
140		282	451	568	670	871	1090
145		291	464	584	689	895	1120
150		300	478	601	708	919	1150
155		308	491	617	727	943	1180
160		317	505	633	747	968	1210
165			518	650	766	990	1240
170			532	666	785	1010	1270
175			546	682	804	1030	1300
180			560	698	824	1060	1330
185				714	842	1090	1360
190				730	861	1110	1390
195				746	880	1140	1420
200				763	900	1160	1450

Standards referred to

DIN 13 Part 15	ISO metric screw thread; fundamental deviations and tolerances for screw threads from 1 mm diameter
DIN 76 Part 1	Thread run-outs; undercuts for ISO metric screw threads as defined in DIN 13
DIN 78	Thread ends; lengths of projection of thread ends for ISO metric screw threads as defined in DIN 13
DIN 267 Part 1	Fasteners; technical delivery conditions, general requirements
DIN 267 Part 2	(at present at the stage of draft) Fasteners; technical delivery conditions, types of finishes and dimensional accuracy
DIN 267 Part 5	Fasteners; technical delivery conditions, acceptance testing
DIN 267 Part 9	Fasteners; technical delivery conditions, electroplated coatings

DIN 267 Part 10	Fasteners; technical delivery conditions, hot-dip galvanized parts
DIN 267 Part 19	Fasteners; technical delivery conditions, surface defects on bolts, screws and studs
DIN 6915	Hexagon nuts with large widths across flats for high strength structural steel bolting
DIN 6916	Washers, round, for high strength structural steel bolting
DIN 6917	Washers, square, for high strength structural steel bolting on I sections
DIN 6918	Washers, square, for high strength structural steel bolting on channels
DIN ISO 272	Fasteners; hexagon products, widths across flats
DIN ISO 898 Part 1	Mechanical properties of fasteners, bolts, screws and studs
DIN ISO 4759 Part 1	Tolerances for fasteners; bolts, screws and nuts with thread diameters $\geq$ 1,6 and $\leq$ 150 mm and product grades A, B and C

Further relevant standards and other documents

DIN 18 800 Part 1	Steel structures; dimensioning and design
DASt-Richtlinie (Guideline) 010	*Anwendung hochfester Schrauben im Stahlbau* (The use of high tensile strength bolts in steel construction), *Deutscher Ausschuss für Stahlbau* (German steel construction committee) (*Stahlbau-Verlags-GmbH*, Ebertplatz 1, D-5000 Köln 1)

Previous editions

DIN 7999: 03.82

Amendments

The following amendments have been made to the March 1982 edition:

a) Reference has been made to DIN 76 Part 1 and DIN 78 with regard to the thread run-out and the thread end.

b) The fillet radii *r* have been reduced for functional reasons.

c) The corner dimensions *e* min. for sizes M 12, M 20 and M 22 have been corrected.

d) In consideration of previous practice, a reference has been included to the effect that sizes M 12 and M 20 can, by agreement, also be supplied with the widths across flats 22 and 32 mm, but that the widths across flats 21 and 34 mm are recommended in all cases for new designs.

e) Reference has been made to DIN 267 Part 19 with regard to permissible surface irregularities.

Explanatory notes

DIN 6914 covers high strength bolts in prestressed and non-prestressed bolting in structural steel applications (GV bolting and SL bolting). It specifies hexagon bolts with large widths across flats which are mated with hexagon nuts complying with DIN 6915 and washers complying with DIN 6916 to DIN 6918. Steel construction also still uses high strength hexagon fit bolts in prestressed and non-prestressed bolting (GVP bolting and SLV bolting), these also have larger heads and short thread lengths similar to the bolts specified in DIN 6914. In accordance with DIN 7968, the shank diameter is 1 mm greater than the thread diameter. These bolts are also mated with nuts complying with DIN 6915 and washers complying with DIN 6916 to DIN 6918, in some circumstances it being necessary to use two washers complying with DIN 6916 (instead of one 8 mm thick washer as specified in DIN 7989) in order to equalize the clamping lengths and to overcome the steps in bolt lengths. Tolerance class b11 shall apply to the shank diameter, so that bolts with and without protective coatings may be used.

This standard bases its specifications closely on those of DIN 6914 and also specifies property class 10.9. The fit shank causes a modification to the shank and clamping lengths in comparison with DIN 6914.

The high strength fit bolts shall be marked HVP on the head in order that they can be unmistakeably recognized when assembled into a structure, and in order to differentiate them from bolts complying with DIN 6914 (these are identified by HV).

The widths across flats 21 mm (instead of 22 mm) for size M 12 and 34 mm (instead of 32 mm) for size M 20 have been specified in view of DIN ISO 272 and international standards on bolted connections at present in preparation; the previously usual widths across flats have not, however, been excluded.

It is intended to harmonize the existing DIN Standards on hexagon nuts and bolts for structural steel applications in this respect or to replace these standards by corresponding DIN ISO Standards, once international standardization work has been concluded.

International Patent Classification

F 16 B 35/00