UDC 621.882.211 : 621.882.31

October 1989

Hexagon head bolts for structural steel bolting for supply with nut

DIN 7990

Sechskantschrauben mit Sechskantmuttern für Stahlkonstruktionen

Supersedes January 1971 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.

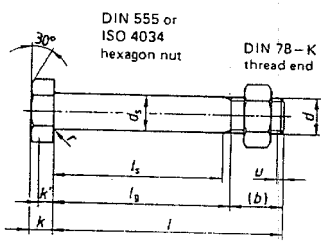
The new widths across flats 18 mm and 34 mm as specified in ISO 272 should be used instead of the previous widths across flats 19 mm and 32 mm for thread sizes M12 and M22. It is intended to omit the obsolescent widths across flats by 1 November 1994 at the latest.

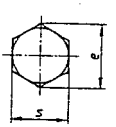
Dimensions in mm

1 Scope and field of application

This standard specifies requirements for M12 to M30 hexagon head bolts for supply with hexagon nut, assigned to product grade C, for use in structural steel bolting. These bolts shall always be used together with A type washers as specified in DIN 7989 (see clause 6).

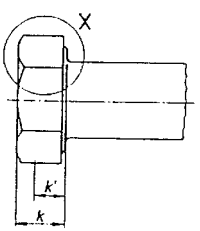
2 Dimensions



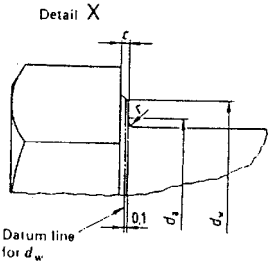


$u = 2P$ maximum; incomplete thread.

Bearing face design optional.



Detail X



Continued on pages 2 to 6

Table.

Thread size (d)		M 12		M 16	M 20	M 22		M 24	M 27	M 30
P [1]		1,75		2	2,5	2,5		3	3	3,5
b (auxiliary dimension)		17,75		21	23,5	25,5		26	29	30,5
c	max.	0,6		0,8	0,8	0,8		0,8	0,8	0,8
d_a	max.	14,7		18,7	24,4	26,4		28,4	32,4	35,4
d_s	Nominal size	12		16	20	22		24	27	30
	min.	11,3		15,3	19,16	21,16		23,16	26,16	29,16
	max.	12,7		16,7	20,84	22,84		24,84	27,84	27,84
d_w	min.	16,4	17,2	22	27,7	31,4	29,5	33,2	38	42,7
e	min.	19,85	20,88	26,17	32,95	37,29	35,03	39,55	45,20	50,85
k	Nominal size	8		10	13	14		15	17	19
	min.	7,55		9,25	12,1	13,1		14,1	16,1	17,95
	max.	8,45		10,75	13,9	14,9		15,9	17,9	20,05
k'	min.	5,28		6,47	8,47	9,17		9,87	11,27	12,56
r	min.	0,6		0,6	0,8	0,8		0,8	1	1
s	max. = nominal size	18 [2]	19	24	30	34 [2]	32	36	41	46
	min.	17,57	18,48	23,16	29,16	33	31	35	40	45

Nominal size	l min.	l max.	Lengths l_s*) and l_g**) l_s min.	l_s max.	l_g min.	l_g max.	l_s min.	l_s max.	l_g min.	l_g max.	l_s min.	l_s max.	l_g min.	l_g max.	l_s min.	l_s max.	l_g min.	l_g max.
30	28,95	31,05	7	12,25														
35	33,75	36,25	12	17,25	8	14												
40	38,75	41,25	17	22,25	13	19	9	16,5	7	14,5								
45	43,75	46,25	22	27,25	18	24	14	21,5	12	19,5	10	19						
50	48,75	51,25	27	32,25	23	29	19	26,5	17	24,5	15	24						
55	53,5	56,5	32	37,25	28	34	24	31,5	22	29,5	20	29						
60	58,5	61,5	37	42,25	33	39	29	36,5	27	34,5	25	34	22	31				
65	63,5	66,5	42	47,25	38	44	34	41,5	32	39,5	30	39	27	36				
70	68,5	71,5	47	52,25	43	49	39	46,5	37	44,5	35	44	32	41				
75	73,5	76,5	52	57,25	48	54	44	51,5	42	49,5	40	49	37	46				
80	78,5	81,5	57	62,25	53	59	49	56,5	47	54,5	45	54	42	51	39	49,5		
85	83,25	86,75	62	67,25	58	64	54	61,5	52	59,5	50	59	47	56	44	54,5		
90	88,25	91,75	67	72,25	63	69	59	66,5	57	64,5	55	64	52	61	49	59,5		
95	93,25	96,75	72	77,25	68	74	64	71,5	62	69,5	60	69	57	66	54	64,5		
100	98,25	101,75	77	82,25	73	79	69	76,5	67	74,5	65	74	62	71	59	69,5		
105	103,25	106,75	82	87,25	78	84	74	81,5	72	79,5	70	79	67	76	64	74,5		
110	108,25	111,75	87	92,25	83	89	79	86,5	77	84,5	75	84	72	81	69	79,5		
115	113,25	116,75	92	97,25	88	94	84	91,5	82	89,5	80	89	77	86	74	84,5		
120	118,25	121,75	97	102,25	93	99	89	96,5	87	94,5	85	94	82	91	79	89,5		
125	123	127			98	104	94	101,5	92	99,5	90	99	87	96	84	94,5		
130	128	132			103	109	99	106,5	97	104,5	95	104	92	101	89	99,5		
135	133	137			108	114	104	111,5	102	109,5	100	109	97	106	94	104,5		
140	138	142			113	119	109	116,5	107	114,5	105	114	102	111	99	109,5		
145	143	147			118	124	114	121,5	112	119,5	110	119	107	116	104	114,5		
150	148	152			123	129	119	126,5	117	124,5	115	124	112	121	109	119,5		
155	151	159					124	131,5	122	129,5	120	129	117	126	114	124,5		
160	156	164					129	136,5	127	134,5	125	134	122	131	119	129,5		
165	161	169					134	141,5	132	139,5	130	139	127	136	124	134,5		
170	166	174					139	146,5	137	144,5	135	144	132	141	129	139,5		
175	171	179					144	151,5	142	149,5	140	149	137	146	134	144,5		
180	176	184							147	154,5	145	154	142	151	139	149,5		
185	180,4	189,6							152	159,5	150	159	147	156	144	154,5		
190	185,4	194,6							157	164,5	155	164	152	161	149	159,5		
195	190,4	199,6							162	169,5	160	169	157	166	154	164,5		
200	195,4	204,6							167	174,5	165	174	163	172	159	169,5		

Commercial sizes of hexagon bolts are those for which lengths l_s and l_g have been specified.

*) $l_{s\,min} = l_{g\,max} - 3P$.

**) $l_{g\,max} = l_{nominal\,size} - b$.

1) P = pitch of thread.

2) Where bolts with nuts are ordered, the nuts to be supplied shall comply with ISO 4034 (see foreword on page 1).

3 Technical delivery conditions

Material		Steel
General requirements		As specified in DIN 267 Part 1.
Thread	Tolerance	8 g
	As specified in	DIN 13 Parts 12 and 15.
Mechanical properties	Property class	4.6, 5.6
	As specified in	ISO 898 Part 1.
Limit deviations and geometrical tolerances	Product grade	C
	As specified in	ISO 4759 Part 1.
Surface finish		As processed. DIN 267 Part 9 shall apply with regard to electroplating. DIN 267 Part 10 shall apply with regard to hot dip galvanizing.
Acceptance inspection		DIN 267 Part 5 shall apply with regard to acceptance inspection.

4 Designation

Designation for an M 16 hexagon head bolt of nominal length, l = 50 mm, for supply with hexagon nut (Mu)[1], of property class 4.6:

Hexagon head bolt DIN 7990 – M 16 X 50 – Mu – 4.6

The designation signifies that the widths across flats for sizes M 12 and M 22 are those hitherto specified, i.e. 19 mm and 32 mm. If bolts are to be supplied with a new width across flats as specified in ISO 272 (18 mm or 34 mm), the width across flats (SW) shall be included in the designation, e.g.

Hexagon head bolt DIN 7990 – M 12 X 50 – Mu – SW 18 – 4.6

The DIN 4000 – 2 – 1 tabular layout of article characteristics shall apply for bolts covered in this standard.

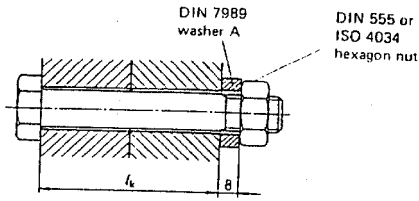
[1]) Where the bolts are supplied in given quantities, the nuts may accompany the consignment in bulk packaging.

5 Mass

The values given should be regarded as guideline values. For sizes M 12 and M 22, they apply to bolts with the previously used widths across flats 19 mm and 32 mm.

Thread size (d)	M 12	M 16	M 20	M 22	M 24	M 27	M 30
Length, l	Mass with nut (7,85 kg/dm³), in kg per 1000 units ≈						
30	58,8						
35	63,2	119					
40	67,6	127	240	284			
45	72	135	252	299	377		
50	76,4	143	264	314	395		
55	80,8	151	276	329	413		
60	85,2	159	288	344	431	595	
65	89,6	167	300	359	449	617	
70	94	175	312	374	467	639	
75	98,4	183	324	389	485	661	
80	102	191	336	404	503	683	902
85	106	199	348	419	521	705	930
90	110	207	360	434	539	727	958
95	114	215	372	449	557	749	986
100	118	223	384	464	575	771	1014
105	122	231	396	479	593	793	1042
110	126	239	408	494	611	815	1070
115	130	247	420	509	629	837	1098
120	134	255	432	524	647	859	1126
125		263	444	539	665	881	1154
130		271	456	554	683	903	1182
135		279	468	569	701	925	1210
140		287	480	584	719	947	1238
145		295	492	599	737	969	1266
150		303	504	614	755	991	1294
155			516	629	773	1013	1322
160			528	644	791	1035	1350
165			540	659	809	1057	1378
170			552	674	827	1079	1406
175			564	689	845	1101	1434
180				704	863	1123	1462
185				719	881	1145	1490
190				734	899	1167	1518
195				749	917	1189	1546
200				764	935	1211	1574
Mass of nuts, in kg per 1000 units, ≈	15,9	30,8	60,3	80,2	103	154	216

6 Grip lengths



Thread size (d)	M12	M16	M20	M22	M24	M27	M30
Length, l	Grip length, l_k						
30	5 to 9						
35	10 to 14	6 to 10					
40	15 to 19	11 to 15	8 to 12	6 to 10			
45	20 to 24	16 to 20	13 to 17	11 to 15	9 to 13		
50	25 to 29	21 to 25	18 to 22	16 to 20	14 to 18		
55	30 to 34	26 to 30	23 to 27	21 to 25	19 to 23		
60	35 to 39	31 to 35	28 to 32	26 to 30	24 to 28	21 to 25	
65	40 to 44	36 to 40	33 to 37	31 to 35	29 to 33	26 to 30	
70	45 to 49	41 to 45	38 to 42	36 to 40	34 to 38	31 to 35	
75	50 to 54	46 to 50	43 to 47	41 to 45	39 to 43	36 to 40	
80	55 to 59	51 to 55	48 to 52	46 to 50	44 to 48	41 to 45	39 to 43
85	60 to 64	56 to 60	53 to 57	51 to 55	49 to 53	46 to 50	44 to 48
90	65 to 69	61 to 65	58 to 62	56 to 60	54 to 58	51 to 55	49 to 53
95	70 to 74	66 to 70	63 to 67	61 to 65	59 to 63	56 to 60	54 to 58
100	75 to 79	71 to 75	68 to 72	66 to 70	64 to 68	61 to 65	59 to 63
105	80 to 84	76 to 80	73 to 77	71 to 75	69 to 73	66 to 70	64 to 68
110	85 to 89	81 to 85	78 to 82	76 to 80	74 to 78	71 to 75	69 to 73
115	90 to 94	86 to 90	83 to 87	81 to 85	79 to 83	76 to 80	74 to 78
120	95 to 99	91 to 95	88 to 92	86 to 90	84 to 88	81 to 85	79 to 83
125		96 to 100	93 to 97	91 to 95	89 to 93	86 to 90	84 to 88
130		101 to 105	98 to 102	96 to 100	94 to 98	91 to 95	89 to 93
135		106 to 110	103 to 107	101 to 105	99 to 103	96 to 100	94 to 98
140		111 to 115	108 to 112	106 to 110	104 to 108	101 to 105	99 to 103
145		116 to 120	113 to 117	111 to 115	109 to 113	106 to 110	104 to 108
150		121 to 125	118 to 122	116 to 120	114 to 118	111 to 115	109 to 113
155			123 to 127	121 to 125	119 to 123	116 to 120	114 to 118
160			128 to 132	126 to 130	124 to 128	121 to 125	119 to 123
165			133 to 137	131 to 135	129 to 133	126 to 130	124 to 128
170			138 to 142	136 to 140	134 to 138	131 to 135	129 to 133
175			143 to 147	141 to 145	139 to 143	136 to 140	134 to 138
180				146 to 150	144 to 148	141 to 145	139 to 143
185				151 to 155	149 to 153	146 to 150	144 to 148
190				156 to 160	154 to 158	151 to 155	149 to 153
195				161 to 165	159 to 163	156 to 160	154 to 158
200				166 to 170	164 to 168	161 to 165	159 to 163

Standards referred to

DIN	13 Part 12	ISO metric screw threads; coarse and fine pitch threads from 1 to 300 mm diameter; selection of diameters and pitches
DIN	13 Part 15	ISO metric screw threads; fundamental deviations and tolerances for screw threads of 1 mm diameter and larger
DIN	78	Thread ends and lengths of projection of bolt ends for ISO metric threads as specified in DIN 13
DIN	267 Part 1	Fasteners; technical delivery conditions; general requirements
DIN	267 Part 5	Fasteners; technical delivery conditions; acceptance inspection (modified version of ISO 3269, 1984 edition)
DIN	267 Part 9	Fasteners; technical delivery conditions; electroplated components
DIN	267 Part 10	Fasteners; technical delivery conditions; hot dip galvanized components
DIN	555	M 5 to M 100 X 6 hexagon nuts; product grade C
DIN	4000 Part 2	Tabular layout of article characteristics for bolts, screws and nuts
DIN	7989	Washers for structural steel bolting
ISO	272	Fasteners; hexagon products; widths across flats
ISO	898 Part 1	Mechanical properties of fasteners; bolts, screws and studs
ISO	4034	Hexagon nuts; product grade C
ISO	4759 Part 1	Tolerances for fasteners; bolts, screws and nuts with thread diameters $\geq 1{,}6$ and ≤ 150 mm and product grades A, B and C

Previous editions

DIN 1050 Supplement 2: 12.43; DIN 7990: 10.56, 03.63, 01.71.

Amendments

The following amendments have been made to the January 1971 edition.

a) Widths across flats 18 mm and 34 mm as specified in ISO 272 have been adopted additionally for thread sizes M 12 and M 22.
b) A note on the use of obsolescent widths across flats has been included.
c) The scope of the standard has been extended to include hexagon nuts as specified in ISO 4034.
d) Nut height m is no longer specified.
e) Specifications for the bearing face design have been included.
f) Limits of size are now specified.
g) Lengths l_s and l_g are now specified.
h) Property class 3.6 is no longer specified.
j) Property class 5.6 has been adopted.
k) Hexagon bolts are now to be hot dip galvanized as specified in DIN 267 Part 10.
l) The standard designation has been amended by including the property class.
m) Dimension d_2 is no longer specified.
n) The standard has been editorially revised.

International Patent Classification

E 04 B 1/38
F 16 B 35/00
F 16 B 37/00
F 16 B 5/02
F 16 B 23/00