

M 1,6 to M 39 hexagon head bolts

Product grades A and B

DIN
931
Part 1

Sechskantschrauben mit Schaft; Gewinde M 1,6 bis M 39; Produktklassen A und B

This standard, together with DIN ISO 4014, September 1987 edition, supersedes the December 1982 edition.

This standard should be used together with ISO 4014. For details, see Explanatory notes. It is intended to withdraw the present standard by 1 July 1992 at the latest.

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

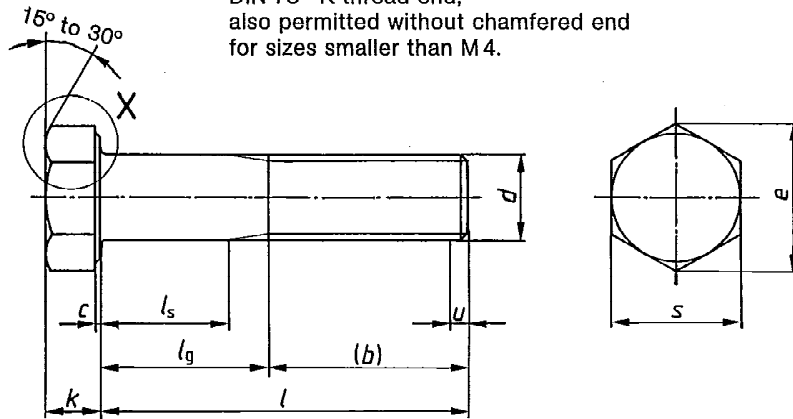
1 Field of application

This standard specifies requirements for M 1,6 to M 36 hexagon head bolts assigned to product grade A for thread sizes up to and including M 24 and lengths smaller than $10d$ or 150 mm, and assigned to product grade B for thread sizes above M 24 or lengths exceeding $10d$ or 150 mm.

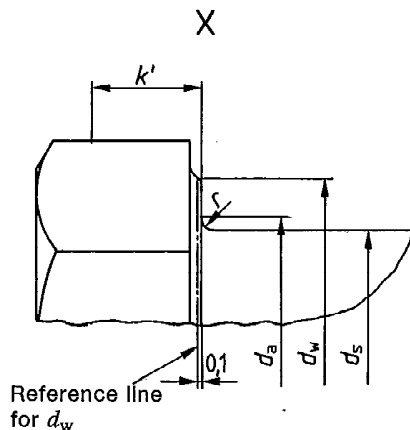
If, in special cases, bolts are to comply with specifications other than those given in this standard, e.g. regarding nominal lengths, these shall be selected in accordance with the appropriate standard.

2 Dimensions

DIN 78-K thread end, also permitted without chamfered end for sizes smaller than M 4.



u = maximum of $2P$ incomplete thread.



k' = minimum wrenching height (0,7 k min.).

Continued on pages 2 to 7

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Table.

Thread size	M 1,6		M 2		M 2,5		M 3		(M 3,5)		M 4		M 5		M 6	
	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
<i>P</i>	0,35	0,4	0,45	0,5	0,5	0,6	0,7	0,8	0,8	0,9	1,0	1,1	1,2	1,3	1,4	1,5
<i>b</i>	9	10	11	12	12	13	14	16	16	17	18	19	20	22	24	24
<i>c</i>	0,1	0,1	0,1	0,15	0,15	0,15	0,15	0,15	0,15	0,15	0,15	0,15	0,15	0,15	0,15	0,15
<i>d_a</i>	2	2,6	3,1	3,6	3,6	4,1	4,7	5,7	4,1	4,1	4,7	5,7	6,8	5,7	6,8	6,8
<i>d_s</i>	1,6	2	2,5	3	3	3,5	4	5	3,5	3,5	4	5	6	5	6	6
<i>d_w</i>	1,46	1,86	2,36	2,86	2,86	3,32	3,82	4,82	3,32	3,32	3,82	4,82	5,82	4,82	5,82	5,82
<i>e</i>	2,4	3,2	4,1	4,6	4,6	5,1	5,9	6,9	5,1	5,1	5,9	6,9	7,9	6,9	7,9	7,9
<i>k</i>	0,98	1,28	1,58	1,88	1,88	2,28	2,68	3,35	2,28	2,28	2,68	3,35	4,15	3,35	4,15	4,15
<i>k'</i>	0,7	0,9	1,1	1,3	1,3	1,6	1,9	2,28	1,6	1,6	1,9	2,28	2,63	2,28	2,63	2,63
<i>r</i>	0,1	0,1	0,1	0,1	0,1	0,1	0,2	0,25	0,1	0,1	0,2	0,25	0,25	0,2	0,25	0,25
<i>s</i>	3,02	3,82	4,82	5,32	5,32	5,82	6,78	7,78	5,82	5,82	6,78	7,78	8,78	7,78	8,78	8,78

Nominal size	Product grade A		Product grade B		Shank length, <i>l_s</i> , and grip length, <i>l_g</i> *		<i>l_s</i>		<i>l_g</i>		<i>l_s</i>		<i>l_g</i>		<i>l_s</i>		<i>l_g</i>	
	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
12	11,65	12,35	-	-	1,2	3	-	-	-	-	-	-	-	-	-	-	-	-
(14)	13,65	14,35	-	-	3,2	5	-	-	-	-	-	-	-	-	-	-	-	-
16	15,65	16,35	-	-	5,2	7	-	-	-	-	-	-	-	-	-	-	-	-
(18)	17,65	18,35	-	-	-	-	4	6	2,75	5	-	-	-	-	-	-	-	-
20	19,58	20,42	-	-	-	-	6	8	4,75	7	-	-	-	-	-	-	-	-
(22)	21,58	22,42	-	-	-	-	8	10	6,75	9	-	-	-	-	-	-	-	-
25	24,58	25,42	-	-	-	-	-	-	8,75	11	-	-	-	-	-	-	-	-
(28)	27,58	28,42	-	-	-	-	-	-	11,75	14	-	-	-	-	-	-	-	-
30	29,58	30,42	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
35	34,5	35,5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
40	39,5	40,5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
45	44,5	45,5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
50	49,5	50,5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
55	54,4	55,6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
60	59,4	60,6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

* $l_g \text{ max.} = l \text{ (nominal size)} - b$
 $l_s \text{ min.} = l_g \text{ max.} - 5P$
 Note: Values of mass have been included in Supplement 1 to DIN 931.

For commercial sizes, shank lengths have been specified. Use of values given in brackets should be avoided where possible.
 Product grade A has been given above, product grade B below the stepped line.
 For *) to 4), see page 5.

Table. (continued)

Nominal size	Thread size		(M 7)		M 8		M 10		M 12		(M 14)		M 16		(M 18)		M 20	
	min.	max.	l_s min.	l_g max.	l_s min.	l_g max.	l_s min.	l_g max.	l_s min.	l_g max.	l_s min.	l_g max.	l_s min.	l_g max.	l_s min.	l_g max.	l_s min.	l_g max.
30	29,58	30,42	5	10	6,75	13	6,5	14										
35	35,5	35,5	10	15	11,75	18												
40	39,5	40,5	15	20	16,75	23	11,5	19	6,25	15								
45	44,5	45,5	20	25	21,75	28	16,5	24	11,25	20	16							
50	49,5	50,5	25	30	26,75	33	21,5	29	16,25	25	21							
55	54,4	55,6	30	35	31,75	38	26,5	34	21,25	30	26							
60	59,4	60,6	35	40	36,75	43	31,5	39	26,25	35	31							
65	64,4	65,6	40	45	41,75	48	36,5	44	31,25	40	36							
70	69,4	70,6	45	50	46,75	53	41,5	49	36,25	45	41							
(75)	74,4	75,6			51,75	58	46,5	54	41,25	50	46							
80	79,4	80,6					51,5	59	46,25	55	51							
(85)	84,3	85,7																
90	89,3	90,7					56,5	64	51,25	60	56							
(95)	94,3	95,7					61,5	69	56,25	65	61							
100	99,3	100,7					66,5	74	61,25	70	66							
110	109,3	110,7							71,25	80	76							
120	119,3	120,7							81,25	90	86							
130	129,2	130,8																
140	139,2	140,8																
150	149,2	150,8																
160	159,2	160,8	158	162							90	100						
(170)	169,2	170,8	168	172							96	106						
180	179,2	180,8	178	182							106	116						
(190)	189,08	190,92	187,7	192,3														
200	199,08	200,92	197,7	202,3														

Shank length, l_s , and grip length, l_g *)

For 1) to 4), see page 5. Product grade A has been given above, product grade B below the stepped line.

Table. (concluded)

Nominal size	Thread size		(M 22)		M 24		(M 27)		M 30		(M 33)		M 36		(M 39)	
	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
<i>P</i>	1)		2,5	3	3	3,5	4									
<i>b</i>	2)		50	54	60	66	72									
	3)		56	60	66	72	78									
	4)		69	73	79	85	91									
			min.	0,2	0,2	0,2	0,2	0,2								
		max.	0,8	0,8	0,8	0,8	0,8									
<i>d_g</i>	max. = nominal size		24,4	26,4	30,4	33,4	36,4									
	min.		22	24	27	30	33									
<i>d_s</i>	A		21,67	23,67												
	B		21,48	23,48	26,48	29,48	32,38									
<i>d_w</i>	A		30	33,6												
	B		29,5	33,2	38	42,7	46,6									
<i>e</i>	A		35,72	39,98												
	B		35,03	39,55	45,2	50,85	55,37									
<i>k</i>	min.		14	15	17	18,7	21									
	max.		13,78	14,78												
<i>k'</i>	A		14,22	15,22												
	B		13,65	14,65	16,65	18,28	20,68									
<i>r</i>	min.		9,6	10,3	11,7	12,8	14,4									
	max. = nominal size		0,8	0,8	1	1	1									
<i>s</i>	A		31,61	35,38												
	B		31	35	40	45	49									

Nominal size	Product grade		<i>l_s</i>		<i>l_g</i>		<i>l_s</i>		<i>l_g</i>		<i>l_s</i>		<i>l_g</i>		<i>l_s</i>		<i>l_g</i>	
	A min.	B max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
70	69,4	70,6	7,5	20														
(75)	74,4	75,6	12,5	25														
80	79,4	80,6	17,5	30	11	26												
(85)	84,3	85,7	22,5	35	16	31												
90	89,3	90,7	27,5	40	21	36	15	15	6,5	24								
(95)	94,3	95,7	32,5	45	26	41	20	20	11,5	29								
100	99,3	100,7	37,5	50	31	46	25	25	16,5	34								
110	109,3	110,7	47,5	60	41	56	35	35	26,5	44								
120	119,3	120,7	57,5	70	51	66	45	45	36,5	54								
130	129,2	130,8	61,5	74	55	70	49	49	40,5	58								
140	139,2	140,8	71,5	84	65	80	59	59	50,5	68								
150	149,2	150,8	81,5	94	75	90	69	69	60,5	78								
160	-	-	91,5	104	85	100	79	79	70,5	88								
(170)	-	-	101,5	114	95	110	89	89	80,5	98								
180	-	-	111,5	124	105	120	99	99	90,5	108								
(190)	-	-	121,5	134	115	130	109	109	100,5	118								
200	-	-	131,5	144	125	140	119	119	110,5	128								
220	-	-	138,5	151	132	147	126	126	117,5	135								
240	-	-	-	-	152	167	146	146	137,5	155								
260	-	-	-	-	-	-	166	166	157,5	175								
280	-	-	-	-	-	-	-	-	177,5	195								
300	-	-	-	-	-	-	-	-	197,5	215								

Shank length, *l_s*, and grip length, *l_g**

For 1) to 4), see page 5.

Product grade A has been given above, product grade B below the stepped line.

3 Technical delivery conditions

Material		Steel	Stainless steel	Non-ferrous metal
General requirements		As specified in DIN 267 Part 1.		
Thread	Tolerance	6g		
	Standard	DIN 13 Parts 12 and 15.		
Mechanical properties	Property class (material)	5.6, 8.8, 10.9	\leq M20: A2-70, A4-70 $>$ M20: A2-50, A4-50 C3, C4	Subject to agreement.
	Standard	ISO 898 Part 1	DIN 267 Part 11	DIN 267 Part 18
Limit deviations, geometrical tolerances	Product grade	A for products up to size M 24 and $l \leq 10d$ or 150 mm ¹⁾ . B for products exceeding size M 24 or $l > 10d$ or 150 mm ¹⁾ .		
	Standard	ISO 4759 Part 1		
Surface finish		As processed. Property class 8.8 and above: (thermally or chemically) blackened.	Bright.	Bright.
		DIN 267 Part 2 shall apply with regard to surface roughness. DIN 267 Part 19 shall apply with regard to permissible surface discontinuities. 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.		
1) Whichever is shorter (see stepped line in the dimension table).				

4 Designation

Designation of an M12 hexagon head bolt of nominal length, $l = 80$ mm, with material assigned to property class 8.8:

Hexagon head bolt DIN 931 – M12 × 80 – 8.8

If product grade A is required for sizes up to M 24 with lengths over 150 mm or with l greater than $10d$, or for sizes above M 24, then this shall be indicated in the designation by adding 'A', e.g.

Hexagon head bolt DIN 931 – M 30 × 100 – 8.8 – A

DIN 962 shall apply with regard to the designation of designs and types, with additional details to be given when ordering.

DIN 6900 shall apply with regard to the designation of types with captive components.

DIN 7500 Part 1 shall apply with regard to the designation of types with thread rolling properties.

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

Footnotes for the tables on pages 2 to 4:

- 1) P = pitch of thread (coarse pitch thread).
- 2) For $l \leq 125$ mm.
- 3) For $l > 125$ mm ≤ 200 mm.
- 4) For $l > 200$ mm.

Appendix A**Additional thread sizes for spare parts**

The previous thread sizes M 1,7, M 2,3 and M 2,6, which are not included in the international selection of screw threads for bolts, screws and nuts, shall no longer be used. In consideration of existing documents and of the demand for spare parts, they may, however, still be ordered in accordance with DIN 931, November 1970 edition*). The table below shall apply with regard to the dimensions of bolts (DIN 13 Parts 1 and 15 applying with regard to screw threads).

Thread size	M 1,7	M 2,3	M 2,6
<i>b</i>	9	11	11
<i>c</i>	—	—	—
<i>d_a</i> max.	2,1	2,9	3,2
<i>e</i> min.	3,82	4,95	5,51
<i>k</i> js14	1,2	1,6	1,8
<i>r</i> min.	0,1	0,1	0,1
<i>s</i> h13	3,5	4,5	5
<i>l</i> ± ½ IT 15	Mass (7,85 kg/dm ³) for 1000 units, in kg, approximately		
12	0,28		
14	0,315	0,61	0,79
16	0,35	0,675	0,87
18		0,74	0,95
20		0,805	1,03
22			1,11
25			1,24

Standards referred to and other documents

DIN 13 Part 1	ISO metric screw threads; 1 mm to 68 mm diameter coarse pitch threads; nominal sizes
DIN 13 Part 12	ISO metric screw threads; coarse and fine pitch threads with diameters from 1 to 300 mm; selection for 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 ends of projection of bolt ends for ISO metric threads in accordance with DIN 13
DIN 267 Part 1	Fasteners; technical delivery conditions; general requirements
DIN 267 Part 2	Fasteners; technical delivery conditions; finish and dimensional accuracy
DIN 267 Part 5	Fasteners; technical delivery conditions; acceptance inspection
DIN 267 Part 9	Fasteners; technical delivery conditions; electroplated components
DIN 267 Part 10	Fasteners; technical delivery conditions; hot-dip galvanized components
DIN 267 Part 11	Fasteners; technical delivery conditions, with addenda to ISO 3506; corrosion-resistant stainless steel components
DIN 267 Part 18	Fasteners; technical delivery conditions; non-ferrous metal components
DIN 267 Part 19	Fasteners; technical delivery conditions; surface discontinuities on bolts
Supplement 1 to DIN 931 Part 1	Hexagon head bolts with shank; masses
DIN 962	Bolts, screws, studs and nuts; designations; types and finishes
DIN 4000 Part 2	Tabular layout of article characteristics for bolts, screws and nuts
DIN 6900	Screw and washer assemblies
DIN 7500 Part 1	Thread rolling screws for ISO metric threads; dimensions, requirements, testing
ISO 898 Part 1	Mechanical properties of fasteners; bolts, screws and studs
ISO 4759 Part 1	Tolerances for fasteners; bolts, screws, and nuts with thread diameters ≥ 1,6 and ≤ 150 mm and product grades A, B and C

*) Withdrawn in 1982.

Previous editions

DIN 932 Part 1 and Part 2: 01.26; DIN 600: 10.26x; DIN 532: 11.29x; DIN Kr 551: 11.35, 11.36;
DIN 931 Part 2: 01.26, 04.42; DIN 931: 12.67, 11.70; DIN 931 Part 1: 01.26, 04.42, 12.52, 03.63, 07.82.

Amendments

The following amendments have been made to the July 1982 edition.

- A note on the period of validity of this standard has been included.
- The specification regarding the underhead fillet has been deleted.
- For sizes M 10, M 12, M 14 and M 22, the widths across flats specified in ISO 272 have been deleted.
- A reference line for the determination of the bearing face diameter, d_w , has been included.

Explanatory notes

For more than 20 years efforts have been directed towards the achievement of the international interchangeability of fasteners by preparing international standards for the product concerned. ISO Standards have now been published for the most important types of fasteners (see ISO Standards Handbook 18).

However, international efforts only serve a useful purpose if national standards are adapted as far as possible to international standards, or, ideally, replaced by them. Current DIN Standards already agree in substance with the relevant ISO Standards, but still differ in some respects, as for instance in the widths across flats for hexagon products.

The Federal Republic of Germany adopted International Standard ISO 272 on widths across flats as national standard DIN ISO 272 in October 1979. Nevertheless, widths across flats deviating from DIN ISO 272 are still being used in Germany for nominal sizes M 10, M 12, M 14 and M 22. The table below compares the previous widths across flats with the new ones specified for the four nominal sizes referred to.

Thread size	M 10	M 12	M 14	M 22
Previous width across flats, in mm	17	19	22	32
New width across flats as in ISO 272, in mm	16	18	21	34

The manufacturers and users of hexagon products participating in the work of the *Normenausschuß Mechanische Verbindungselemente* (Fasteners Standards Committee), together with representatives of the dealers in fasteners, have decided to introduce the new widths across flats in all relevant product standards. Since experience has shown, that the introduction of the new widths across flats has not been advanced by their inclusion in DIN Standards merely as preferred alternatives to the previous widths across flats, the following decisions have been reached to accelerate the changeover procedure.

Supplementary to current DIN Standards specifying the previous widths across flats, DIN ISO Standards dealing with the same products will, wherever ISO Standards are

available, be published which, besides introducing a number of other minor amendments, will specify the new widths across flats conforming to ISO 272. In both DIN and DIN ISO Standards attention will be drawn to the fact that the relevant ISO Standards are to be preferred and that the DIN Standard is to be replaced after a transition period of 5 years.

If no relevant ISO Standard is available, the DIN Standard will contain a foreword stating that the previous width across flats specifications are to be withdrawn after a transition period of 5 years and replaced by those specified in ISO 272.

This sets a time limit for both manufacturer and user of hexagon products by which the changeover to the new widths across flats must be effected. The responsible committee is of the opinion, that it will still be possible after this period to obtain fasteners complying with the superseded specifications as spare parts.

In some cases, the replacement of the previous DIN Standards by the relevant ISO Standards will have further consequences, besides the changeover to the new widths across flats, attention being drawn to this circumstance in the national foreword of the relevant DIN ISO Standards. These consequences result from the fact that the ISO Standards have not yet reached the same level of completeness as the DIN Standards. Thus a number of nominal sizes, as well as several product specifications for fine pitch threads are not found in the ISO product standards. Furthermore, ISO Standards on technical delivery conditions are still in the initial stages, so that specific requirements are still subject to separate agreement when ordering products in accordance with ISO Standards, as they are not included in the designation for order purposes.

Besides these consequences, which are of importance when applying the new ISO Standards, the amendment of the widths across flats also have a number of consequences as regards the use of the new products which the designer must take into consideration. Besides the amended assembly sizes, this applies above all to the different surface pressure for the bearing area of the nut or the heads of the bolts. These difficulties are discussed in Recommendation VDA 262*) published by the *Verband der Automobilindustrie e.V.* (German Automobile Manufacturers Association).

International Patent Classification

F 16 B 35/00

*) Obtainable from: *Dokumentation Kraftfahrwesen e.V.*, Grönerstraße 5, D-7140 Ludwigsburg.