EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 24 014

October 1991

UDC 621.882.211

Descriptors: Fasteners, bolts, hexagon head bolts, requirements, dimensions, designation.

English version

Hexagon head bolts

Product grades A and B
(ISO 4014 : 1988)

Boulons à tête hexagonale, grades A et B
(ISO 4014 : 1988)

Sechskantschrauben mit Schaft; Produktklassen A und B
(ISO 4014 : 1988)

This European Standard was approved by CEN on 1991-10-10 and is identical to the ISO Standard as referred to. CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart 36, B-1050 Brussels

Foreword

In 1990, ISO 4014 : 1988 was submitted to the CEN PO procedure. Following the positive result of the PO, CEN/BT agreed to submit ISO 4014 : 1988, with the following modifications, to Formal Vote.

In the French version, replace:

- 'boulon' by 'vis partiellement filetée',
- 'vis' by 'vis entièrement filetée'.

In accordance with the CEN/CENELEC Internal Regulations, the following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

Endorsement notice

The text of the International Standard ISO 4014 : 1988 was approved by CEN as a European Standard with agreed common modifications as given above.

0 Introduction

This International Standard is part of the complete ISO product standard series on hexagon drive fasteners. The series comprises:

a) hexagon head bolts (ISO 4014, ISO 4015, ISO 4016 and ISO 8765);

b) hexagon head screws (ISO 4017, ISO 4018 and ISO 8676);

c) hexagon nuts (ISO 4032, ISO 4033, ISO 4034, ISO 4035, ISO 4036, ISO 8673, ISO 8674 and ISO 8675);

d) hexagon flanged bolts (ISO 4162 and ISO 8102);

e) hexagon flanged screws;[1)]

f) hexagon flanged nuts (ISO 4161, ISO 7043 and ISO 7044);

g) structural bolting (ISO 4775, ISO 7411 to ISO 7414 and ISO 7417).

1 Scope and field of application

This International Standard gives specifications for hexagon head bolts with threads from M1,6 up to and including M64, of product grade A for threads M1,6 to M24 and nominal lengths up to and including 10 *d* or 150 mm, whichever is shorter and product grade B for threads over M24 or nominal lengths over 10 *d* or 150 mm, whichever is shorter.

If, in special cases, specifications other than those listed in this International Standard are required, they should be selected from existing International Standards, for example ISO 261, ISO 888, ISO 898-1, ISO 965-2, ISO 3506 and ISO 4759-1.

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1) These will form the subjects of future International Standards.

2 References

ISO 225, *Fasteners — Bolts, screws and nuts — Symbols and designations of dimensions.*

ISO 261, *ISO general purpose metric screw threads — General plan.*

ISO 888, *Bolts, screws and studs — Nominal lengths and thread lengths for general purpose bolts and screws.*

ISO 898-1, *Mechanical properties of fasteners — Part 1: Bolts, screws and studs.*

ISO 965-2, *ISO general purpose metric screw threads — Tolerances — Part 2: Limits of sizes for general purpose bolt and nut threads — Medium quality.*

ISO 3269, *Fasteners — Acceptance inspection.*

ISO 3506, *Corrosion-resistant stainless steel fasteners — Specifications.*

ISO 4042, *Threaded components — Electroplated coatings.*[1]

ISO 4753, *Fasteners — Ends of parts with external metric ISO thread.*

ISO 4759-1, *Tolerances for fasteners — Part 1: Bolts, screws and nuts with thread diameters* > 1,6 *and* < 150 mm *and product grades A, B and C.*

ISO 6157-1, *Fasteners — Surface discontinuities — Part 1: Bolts, screws and studs for general requirements.*[1]

ISO 6157-3, *Fasteners — Surface discontinuities — Part 3: Bolts, screws and studs for special requirements.*[1]

ISO 8839, *Mechanical properties of fasteners — Bolts, screws, studs and nuts made of non-ferrous metals.*

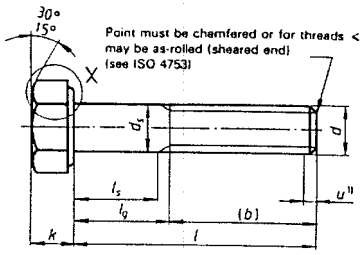
ISO 8992, *Fasteners — General requirements for bolts, screws and nuts.*

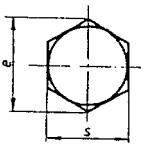
1) At present at the stage of draft.

3 Dimensions

NOTE – Symbols and descriptions of dimensions are specified in ISO 225.

Dimension in millimetres





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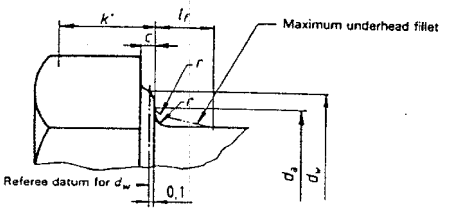


1) Incomplete thread $u < 2P$

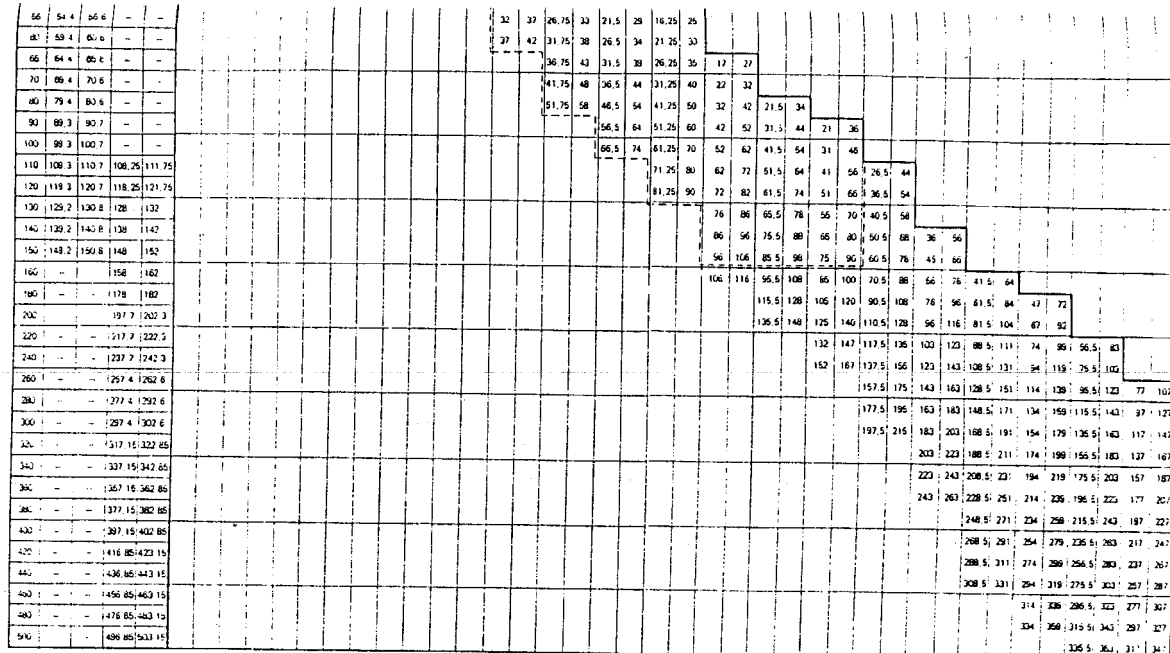
Table 1 — Preferred threads

Dimensions in millimetres

Thread, d		M1,6	M2	M2,5	M3	M4	M5	M6	M8	M10	M12	M16	M20	M24	M30	M36	M42	M48	M56	M64
P [1]		0,35	0,4	0,45	0,5	0,7	0,8	1	1,25	1,5	1,75	2	2,5	3	3,5	4	4,5	5	5,5	6
b ref	[2]	9	10	11	12	14	16	18	22	26	30	38	46	54	66	–	–	–	–	–
	[3]	–	–	–	–	–	–	–	–	–	–	44	52	60	72	84	96	108	–	–
	[4]	–	–	–	–	–	–	–	–	–	–	–	–	73	86	97	109	121	137	153
c	min.	0,1	0,1	0,1	0,15	0,15	0,15	0,15	0,15	0,15	0,15	0,2	0,2	0,2	0,2	0,2	0,3	0,3	0,3	0,3
	max	0,25	0,25	0,25	0,4	0,4	0,5	0,5	0,6	0,6	0,6	0,8	0,8	0,8	0,8	0,8	1	1	1	1
d_a	max	2	2,8	3,1	3,8	4,7	5,7	6,8	9,2	11,2	13,7	17,7	22,4	26,4	33,4	39,4	45,6	52,6	63	71
d_s	norm = max	1,6	2	2,5	3	4	5	6	8	10	12	16	20	24	30	36	42	48	56	64
	Product grade A min.	1,46	1,86	2,36	2,86	3,82	4,82	5,82	7,78	9,78	11,73	15,73	19,67	23,67	–	–	–	–	–	–
	Product grade B min.	–	–	–	–	–	–	–	–	–	–	15,57	19,48	23,48	29,48	35,38	41,38	47,38	55,26	63,26
d_w	Product grade A min.	2,27	3,07	4,07	4,57	5,88	6,88	8,88	11,63	14,63	16,63	22,48	28,19	33,61	–	–	–	–	–	–
	Product grade B min.	–	–	–	–	–	–	–	–	–	–	22	27,7	33,25	42,75	51,11	59,95	69,45	78,66	88,16
e	Product grade A min.	3,41	4,32	5,45	6,01	7,66	8,79	11,05	14,38	17,77	20,03	26,75	33,53	39,98	–	–	–	–	–	–
	Product grade B min.	–	–	–	–	–	–	–	–	–	–	26,17	32,95	39,55	50,85	60,79	71,3	82,6	93,56	104,86
l_f	max	0,6	0,8	1	1	1,2	1,2	1,4	2	2	3	3	4	4	5	5	8	10	12	13
k	norm	1,1	1,4	1,7	2	2,8	3,5	4	5,3	6,4	7,5	10	12,5	15	18,7	22,5	26	30	36	40
	Product grade A min.	0,975	1,275	1,575	1,875	2,675	3,35	3,85	5,15	6,22	7,32	9,82	12,285	14,785	–	–	–	–	–	–
	Product grade A max.	1,225	1,525	1,825	2,125	2,925	3,65	4,15	5,45	6,58	7,68	10,18	12,715	15,215	–	–	–	–	–	–
	Product grade B min.	–	–	–	–	–	–	–	–	–	–	9,71	12,15	14,65	18,28	22,08	25,58	29,58	34,5	39,5
	Product grade B max.	–	–	–	–	–	–	–	–	–	–	10,29	12,85	15,35	19,12	22,92	26,42	30,42	35,5	40,5
k_s [5]	Product grade A min.	0,58	0,89	1,1	1,31	1,87	2,35	2,7	3,61	4,35	5,12	6,87	8,6	10,35	–	–	–	–	–	–
	Product grade B min.	–	–	–	–	–	–	–	–	–	–	6,8	8,51	10,26	12,8	15,46	17,91	20,71	24,15	27,65
r	min	0,1	0,1	0,1	0,1	0,2	0,2	0,25	0,4	0,4	0,6	0,6	0,8	0,8	1	1	1,2	1,5	2	2
s	norm = max.	3,2	4	5	5,5	7	8	10	13	16	18	24	30	36	46	55	65	75	85	95
	Product grade A min.	3,02	3,82	4,82	5,32	6,78	7,78	9,78	12,73	15,73	17,73	23,67	29,67	35,38	–	–	–	–	–	–
	Product grade B min.	–	–	–	–	–	–	–	–	–	–	23,16	29,16	35	45	53,8	63,1	73,1	82,8	92,8

Product grade		l		l_1	l_2	l_3	l_4	l_5	l_6	l_7	l_8	l_9	l_{10}	l_{11}	l_{12}	l_{13}	l_{14}	l_{15}	l_{16}	l_{17}	l_{18}	l_{19}	l_{20}	l_{21}	l_{22}	l_{23}	l_{24}	l_{25}	l_{26}	l_{27}	l_{28}	l_{29}	l_{30}	l_{31}	l_{32}	l_{33}	l_{34}	l_{35}	l_{36}	l_{37}	l_{38}
A	B	nom.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	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																																	
		16	15,65	16,35	–	–	5,2	7	4	6	2,75	5																													
		20	19,58	20,42	–	–			8	10	6,75	9	5,5	8																											
		25	24,58	25,42	–	–					11,75	14	10,5	13	7,5	11	5	9																							
		30	29,58	30,42	–	–							15,5	19	12,5	18	10	14	7	12																					
		35	34,5	35,5	–	–									17,5	21	15	19	12	17																					
		40	39,5	40,5	–	–											22,5	26	20	24	17	22	11,75	18																	
		45	44,5	45,5	–	–													25	29	22	27	16,75	23	11,5	19															
		50	49,5	50,5	–	–													30	34	27	32	21,75	28	16,5	24	11,25	20													

For sizes above the stepped line, marked thus ———, ISO 4017 is recommended.



1) P = pitch of thread.

2) For lengths $l_{nom} \leq 125$ mm

3) For lengths 125 mm $< l_{nom} \leq 200$ mm

4) For lengths $l_{nom} > 200$ mm

5) $k_{min} = 0.7\ k_{min}$

6) $l_{g\,max} = l_{nom} - b$
$l_{s\,min} = l_{g\,max} - 5P$

7) l_g is the minimum grip length.

NOTE – The popular lengths are defined in terms of lengths l_1 and l_2:

– product grade A above the stepped line, marked thus – – – –

– product grade B below the stepped line

Table 2 — Non-preferred threads

Dimensions in millimetres

Thread, d			M3,5	M14	M18	M22	M27	M33	M39	M45	M52	M60
p [1]			0,6	2	2,5	2,5	3	3,5	4	4,5	5	5,5
$b_{ref.}$		2)	13	34	42	50	60	–	–	–	–	–
		3)	–	40	48	56	66	78	90	102	116	–
		4)	–	–	–	69	79	91	103	115	129	145
c		min.	0,15	0,15	0,2	0,2	0,2	0,2	0,3	0,3	0,3	0,3
		max.	0,4	0,6	0,8	0,8	0,8	0,8	1	1	1	1
d_1		max.	4,1	15,7	20,2	24,4	30,4	36,4	42,4	48,6	56,6	67
d_3		nom. = max.	3,5	14	18	22	27	33	39	46	52	60
	Product grade $\frac{A}{B}$	min.	3,32	13,73	17,73	21,67	–	–	–	–	–	–
			–	–	17,57	21,48	26,48	32,38	38,38	44,38	51,26	59,26
d_w	Product grade $\frac{A}{B}$	min.	5,07	19,37	25,34	31,71	–	–	–	–	–	–
			–	–	24,85	31,35	38	46,56	55,86	64,7	74,2	83,41
e	Product grade $\frac{A}{B}$	min.	6,58	23,36	30,14	37,72	–	–	–	–	–	–
			–	–	29,56	37,29	45,2	55,37	66,44	76,95	88,25	99,21
l_f		max.	1	3	3	4	6	6	6	8	10	12
k		nom.	2,4	8,8	11,5	14	17	21	25	29	33	38
	Product grade A	min.	2,275	8,82	11,285	13,785	–	–	–	–	–	–
		max.	2,525	8,98	11,175	14,215	–	–	–	–	–	–
	Product grade B	min.	–	–	11,15	13,65	16,65	20,58	24,58	27,58	32,5	37,5
		max.	–	–	11,85	14,35	17,35	21,42	25,42	28,42	33,5	38,5
k' [5]	Product grade $\frac{A}{B}$	min.	1,59	6,03	7,9	9,65	–	–	–	–	–	–
			–	–	7,81	9,56	11,66	14,41	17,21	19,31	22,75	26,25
r		min.	0,1	0,6	0,6	0,8	1	1	1	1,2	1,6	2
s		nom. = max.	6	21	27	34	41	50	60	70	80	90
	Product grade $\frac{A}{B}$	min.	5,82	20,67	26,67	33,38	–	–	–	–	–	–
			–	–	26,16	33	40	49	58,8	68,1	78,1	87,8

Product grade		l			l_1 and l_2 [6], [7]																			
A	B				l_1	l_2	l_1	l_2	l_1	l_2	l_1	l_2	l_1	l_2	l_1	l_2	l_1	l_2	l_1	l_2	l_1	l_2	l_1	l_2
nom.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
10	19,58	20,42	–	–	4	7																		
15	24,58	25,42	–	–	9	12																		
20	29,58	30,42	–	–	14	17																		
25	34,5	35,5	–	–	19	22																		
30	39,5	40,5	–	–																				
35	44,5	45,5	–	–																				
40	49,5	50,5	–	–																				
45	54,4	55,6	–	–																				
50	59,4	60,6	–	–																				
							16	26																

For sizes above the stepped line, marked thus _____, ISO 4017 is recommended

65	64,4	65,6	–	–			21	31																						
70	69,4	70,6	–	–			26	36	15,5	28																				
80	79,4	80,6	–	–			36	46	25,5	38																				
90	89,3	90,7	–	–			46	56	35,5	48	27,5	40																		
100	99,3	100,7	98,25	101,75			56	66	45,5	58	37,5	50	25	40																
110	109,3	110,7	108,25	111,75			66	76	55,5	68	47,5	60	35	50																
120	119,3	120,7	118,25	121,75			76	86	65,5	78	57,5	70	45	60																
130	129,2	130,8	128	132			80	90	69,5	82	61,5	74	49	64	34,5	52														
140	139,2	140,8	138	142			90	100	79,5	92	71,5	84	59	74	44,5	62														
150	149,2	150,8	148	152					89,5	102	81,5	94	69	84	54,5	72	40	60												
160	–	–	158	162					99,5	112	91,5	104	79	94	64,5	82	50	70												
180	–	–	178	182					119,5	132	111,5	124	99	114	84,5	102	70	90	55,5	78										
200	–	–	197,7	202,3							131,5	144	119	134	104,5	122	90	110	75,5	98	59	84								
220	–	–	217,7	222,3							138,5	151	126	141	111,5	129	97	117	82,5	106	66	91								
240	–	–	237,7	242,3									146	161	131,5	149	117	137	102,5	125	86	111	67,5	96						
260	–	–	257,4	262,6									166	181	151,5	169	137	157	122,5	145	106	131	87,5	115						
280	–	–	277,4	282,6											171,5	189	157	177	142,5	166	126	151	107,5	135						
300	–	–	297,4	302,6											191,5	209	177	197	162,5	185	146	171	127,5	155						
320	–	–	317,15	322,85											211,5	229	197	217	182,5	206	166	191	147,5	175						
340	–	–	337,15	342,85													217	237	202,5	225	186	211	167,5	196						
360	–	–	357,15	362,85													237	257	222,5	245	206	231	187,5	215						
380	–	–	377,15	382,85													257	277	242,5	266	226	251	207,5	235						
400	–	–	397,15	402,85															262,5	285	246	271	227,5	255						
420	–	–	416,85	423,15															282,5	305	266	291	247,5	275						
440	–	–	436,85	443,15															302,5	325	286	311	267,5	296						
460	–	–	456,85	463,15																	306	331	287,5	315						
480	–	–	476,85	483,15																	326	351	307,5	335						
500	–	–	496,85	503,15																			327,5	355						

1) P = pitch of thread.

2) For lengths $l_{nom} \leq 125$ mm.

3) For lengths 125 mm $< l_{nom} \leq 200$ mm.

4) For lengths $l_{nom} > 200$ mm.

5) $k'_{min} = 0,7\ k_{min}$

6) $l_{f\,max} = l_{nom} - b$
$l_{s\,min} = l_{f\,max} - 5P$

7) l_g is the minimum grip length.

NOTE – The popular lengths are defined in terms of lengths l_i and l_g:
- product grade A above the stepped line, marked thus – – – –
- product grade B below this stepped line.

4 Specifications and reference standards

Table 3 — Specifications and reference standards

Material		Steel	Stainless steel	Non ferrous metal
General requirements	International Standard	ISO 8992		
Thread	Tolerance	6g		
	International Standards	ISO 261, ISO 965-2		
Mechanical properties	Class [1]	d < 3 mm: as agreed 3 mm < d < 39 mm: 5.6, 8.8, 10.9 d > 39 mm: as agreed	d < 20 mm: A2-70 20 mm < d < 39 mm: A2-50 d > 39 mm: as agreed	
	International Standards	3 mm < d < 39 mm: ISO 898-1 d < 3 mm and d > 39 mm: as agreed	d < 39 mm: ISO 3506 d > 39 mm: as agreed	ISO 8839
Tolerances	Product grade	For d < 24 mm and l < 10 d or 150 mm [2]: A For d > 24 mm or l > 10 d or 150 mm [2]: B		
	International Standard	ISO 4759-1		
Finish		as processed	plain	plain
		Requirements for electroplating are covered in ISO 4042. If different electroplating requirements are desired or if requirements are needed for other finishes, they should be agreed between customer and supplier.		
Acceptability		Limits for surface discontinuities are covered in ISO 6157-1 and ISO 6157-3. For acceptance procedure, see ISO 3269.		

1) The designation symbols for the property classes according to ISO 898-1 can also be used for threads above M39, provided that the finished product has all the properties assigned to the designation symbols in ISO 898-1.

2) Whichever is shorter.

5 Designation

Example for the designation of a hexagon head bolt with thread M12, nominal length l = 80 mm and property class 8.8:

Hexagon head bolt ISO 4014 - M12 × 80 - 8.8