INTERNATIONAL STANDARD

ISO 8765

Second edition
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Hexagon head bolts with metric fine pitch thread — Product grades A and B

Vis à tête hexagonale, à filetage métrique à pas fin partiellement filetées — Grades A et B

Reference number
ISO 8765:1999(E)

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 8765 was prepared by Technical Committee ISO/TC 2, *Fasteners*.

This second edition cancels and replaces the first edition (ISO 8765:1988) which has been technically revised.

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Introduction

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

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

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

c) hexagon nuts (ISO 4032 to ISO 4036, ISO 8673 to ISO 8675);

d) hexagon bolts with flange (ISO 4162 and ISO 15071);

e) hexagon nuts with flange (ISO 4161 and ISO 10663);

f) structural bolts and nuts (ISO 4775, ISO 7411 to ISO 7414 and ISO 7417).

Hexagon head bolts with metric fine pitch thread — Product grades A and B

1 Scope

This International Standard specifies the characteristics of hexagon head bolts with metric fine pitch thread with nominal thread diameters d from 8 mm to 64 mm, of product grade A for nominal thread diameters d from 8 mm to 24 mm and nominal lengths, l, up to and including $10d$ or 150 mm, whichever is shorter, and of product grade B for nominal thread diameters d over 24 mm or nominal lengths, l, over $10d$ 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 724, ISO 888, ISO 898-1, ISO 965-1, ISO 3506-1, ISO 4753 and ISO 4759-1.

Coarse thread bolts according to ISO 4014 should be first choice.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 225:1983, *Fasteners — Bolts, screws, studs and nuts — Symbols and designations of dimensions.*

ISO 261:1998, *ISO general-purpose metric screw threads — General plan.*

ISO 724:1993, *ISO general-purpose metric screw threads — Basic dimensions.*

ISO 888:1976, *Bolts, screws and nuts — Nominal lengths, and thread lengths for general purpose bolts.*

ISO 898-1:1999, *Mechanical properties of fasteners made of carbon steel and alloy steel — Part 1: Bolts screws and studs.*

ISO 965-1:1998, *ISO general purpose metric screw threads — Tolerances — Part 1: Principles and basic data.*

ISO 3269:—[1)], *Fasteners — Acceptance inspection.*

ISO 3506-1:1997, *Mechanical properties of corrosion-resistant stainless-steel fasteners — Part 1: Bolts screws and studs.*

ISO 4042:1999, *Fasteners — Electroplated coatings.*

ISO 4753:—[2)] *Fasteners — Ends of parts with external metric ISO thread.*

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1) To be published. (Revision of ISO 3269:1988)

2) To be published. (Revision of ISO 4753:1983)

ISO 4759-1:—[3], *Tolerances for fasteners — Part 1: Bolts, screws, studs and nuts — Product grades A, B and C.*

ISO 6157-1:1988, *Fasteners — Surface discontinuities — Part 1: Bolts, screws and studs for general requirements.*

ISO 8839:1986, *Mechanical properties of fasteners — Bolts, screws, studs and nuts made of non-ferrous metals.*

ISO 8992:1986, *Fasteners — General requirements for bolts, screws, studs and nuts.*

ISO 10683:—[4], *Fasteners — Non-electrolytically applied zinc flake coatings.*

3 Dimensions

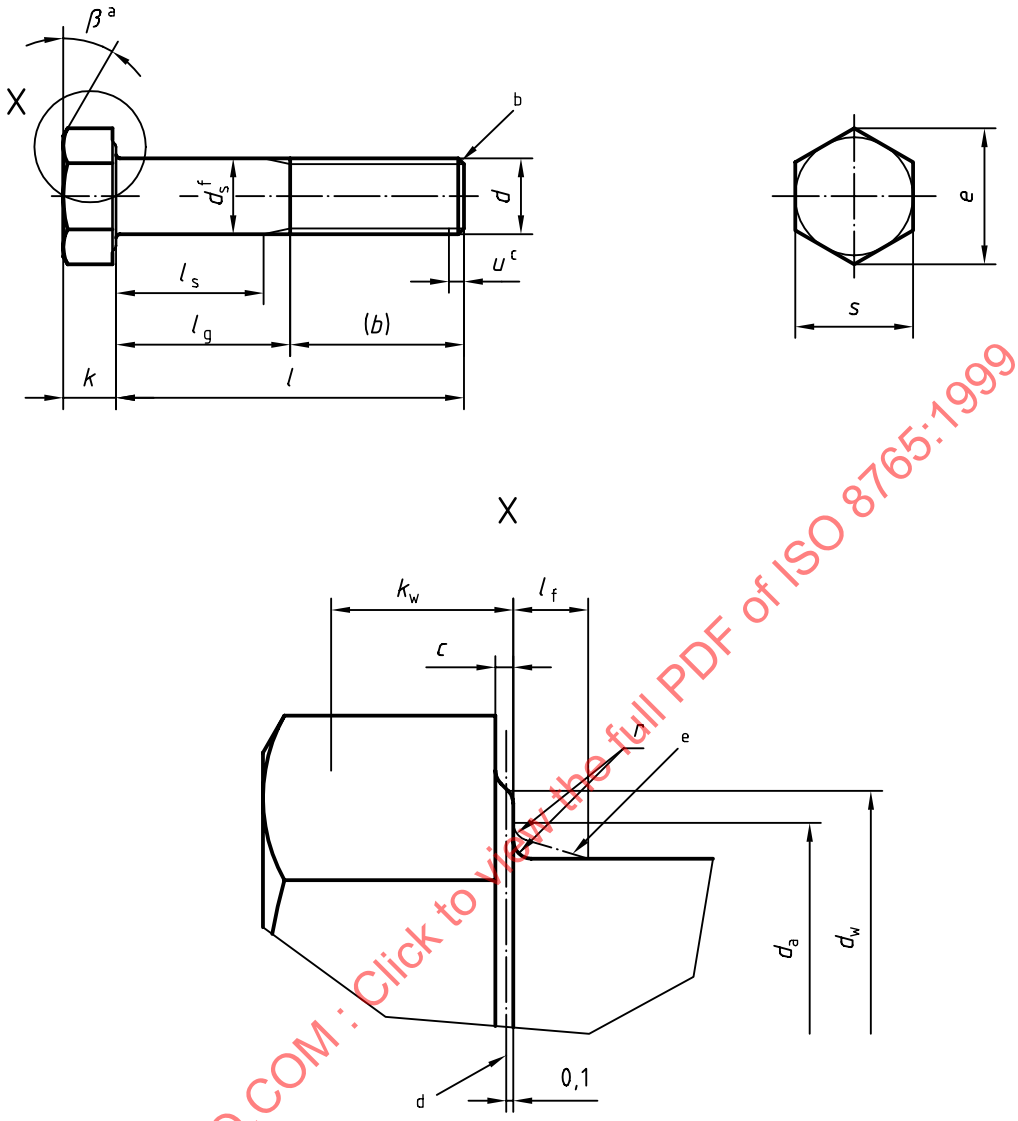
See Figure 1 and Tables 1 and 2.

Symbols and descriptions of dimensions are defined in ISO 225.

[3] To be published. (Revision of ISO 4759-1:1978)

[4] To be published.

Dimensions in millimetres



a $\beta = 15° \text{ to } 30°$

b Point shall be chamfered (see ISO 4753)

c Incomplete thread $u \leqslant 2P$

d Reference datum for d_w

e Maximum underhead fillet

f d_s applies if values of $l_{s\,min}$ are specified.

Figure 1

Table 1 — Preferred threads

Dimensions in millimetres

Thread ($d \times P$)				M8 × 1	M10 × 1	M12 × 1,5	M16 × 1,5	M20 × 1,5	M24 × 2	M30 × 2	M36 × 3	M42 × 3	M48 × 3	M56 × 4	M64 × 4
b ref.			a	22	26	30	38	46	54	66	—	—	—	—	—
			b	28	32	36	44	52	60	72	84	96	108	–	–
			c	41	45	49	57	65	73	85	97	109	121	137	153
c			max.	0,60	0,60	0,60	0,8	0,8	0,8	0,8	0,8	1,0	1,0	1,0	1,0
			min.	0,15	0,15	0,15	0,2	0,2	0,2	0,2	0,2	0,3	0,3	0,3	0,3
d_a			max.	9,2	11,2	13,7	17,7	22,4	26,4	33,4	39,4	45,6	52,6	63	71
d_s			nom. = max.	8,00	10,00	12,00	16,00	20,00	24,00	30,00	36,00	42,00	48,00	56,00	64,00
	Product grade	A	min.	7,78	9,78	11,73	15,73	19,67	23,67	—	—	—	—	—	—
		B		7,64	9,64	11,57	15,57	19,48	23,48	29,48	35,38	41,38	47,38	55,26	63,26
d_w	Product grade	A	min.	11,63	14,63	16,63	22,49	28,19	33,61	—	—	—	—	—	—
		B		11,47	14,47	16,47	22	27,7	33,25	42,75	51,11	59,95	69,45	78,66	88,16
e	Product grade	A	min.	14,38	17,77	20,03	26,75	33,53	39,98	—	—	—	—	—	—
		B		14,2	17,59	19,85	26,17	32,95	39,55	50,85	60,79	71,3	82,6	93,56	104,86
l_f			max.	2	2	3	3	4	4	6	6	8	10	12	13
k			nom.	5,3	6,4	7,5	10	12,5	15	18,7	22,5	26	30	35	40
	Product grade A		max.	5,45	6,58	7,68	10,18	12,715	15,215	—	—	—	—	—	—
			min.	5,15	6,22	7,32	9,82	12,285	14,785	—	—	—	—	—	—
	Product grade B		max.	5,54	6,69	7,79	10,29	12,85	15,35	19,12	22,92	26,42	30,42	35,5	40,5
			min.	5,06	6,11	7,21	9,71	12,15	14,65	18,28	22,08	25,58	29,58	34,5	39,5
k_w[d]	Product grade	A	min.	3,61	4,35	5,12	6,87	8,6	10,35	—	—	—	—	—	—
		B		3,54	4,28	5,05	6,8	8,51	10,26	12,8	15,46	17,91	20,71	24,15	27,65
r			min.	0,4	0,4	0,6	0,6	0,8	0,8	1	1	1,2	1,6	2	2
s			nom. = max.	13,00	16,00	18,00	24,00	30,00	36,00	46	55,0	65,0	75,0	85,0	95,0
	Product grade	A	min.	12,73	15,73	17,73	23,67	29,67	35,38	—	—	—	—	—	—
		B		12,57	15,57	17,57	23,16	29,16	35	45	53,8	63,1	73,1	82,8	92,8

	Product grade				l_s and l_g ef																							
	A		B																									
	l				l_s	l_g	l_s	l_g	l_s	l_g	l_s	l_g	l_s	l_g	l_s	l_g	l_s	l_g	l_s	l_g	l_s	l_g	l_s	l_g	l_s	l_g	l_s	l_g
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.
35	34,5	35,5	—	—																								
40	39,5	40,5	—	—	11,75	18																						
45	44,5	45,5	—	—	16,75	23	11,5	19																				
50	49,5	50,5	—	—	21,75	28	16,5	24	11,25	20																		
55	54,4	55,6	—	—	26,75	33	21,5	29	16,25	25																		
60	59,4	60,6	—	—	31,75	38	26,5	34	21,25	30																		
65	64,4	65,6	—	—	36,75	43	31,5	39	26,25	35	17	27																
70	69,4	70,6	—	—	41,75	48	36,5	44	31,25	40	22	32																
80	79,4	80,6	—	—	51,75	58	46,5	54	41,25	50	32	42	21,5	34														
90	89,3	90,7	88,25	91,75			56,5	64	51,25	60	42	52	31,5	44														
100	99,3	100,7	98,25	101,75			66,5	74	61,25	70	52	62	41,5	54	31	46												
110	109,3	110,7	108,25	111,75					71,25	80	62	72	51,5	64	41	56												
120	119,3	120,7	118,25	121,75					81,25	90	72	82	61,5	74	51	66	36,5	54										
130	129,2	130,8	128	132							76	86	65,5	78	55	70	40,5	58										
140	139,2	140,8	138	142							86	96	75,5	88	65	80	50,5	68	36	56								
150	149,2	150,8	148	152							96	106	85,5	98	75	90	60,5	78	46	66								
160	—	—	158	162							106	116	95,5	108	85	100	70,5	88	56	76	41,5	64						
180	—	—	178	182									115,5	128	105	120	90,5	108	76	96	61,5	84						
200	—	—	197,7	202,3									135,5	148	125	140	110,5	128	96	116	81,5	104	67	92				
220	—	—	217,7	222,3											132	147	117,5	135	103	123	88,5	111	74	99	55,5	83		
240	—	—	237,7	242,3											152	167	137,5	155	123	143	108,5	131	94	119	75,5	103		
260	—	—	257,4	262,6													157,5	175	143	163	128,5	151	114	139	95,5	123	77	107
280	—	—	277,4	282,6													177,5	195	163	183	148,5	171	134	159	115,5	143	97	127
300	—	—	297,4	302,6													197,5	215	183	203	168,5	191	154	179	135,5	163	117	147
320	—	—	317,15	322,85															203	223	188,5	211	174	199	155,5	183	137	167
340	—	—	337,15	342,85															223	243	208,5	231	194	219	175,5	203	157	187

For sizes above the solid, stepped line see ISO 8676

Table 1 *(continued)*

Thread ($d \times P$)					M8 × 1		M10 × 1		M12 × 1,5		M16 × 1,5		M20 × 1,5		M24 × 2		M30 × 2		M36 × 3		M42 × 3		M48 × 3		M56 × 4		M64 × 4	
	Product grade				l_s and l_g^{ef}																							
	A		B																									
	l				l_s	l_g	l_s	l_g	l_s	l_g	l_s	l_g	l_s	l_g	l_s	l_g	l_s	l_g	l_s	l_g	l_s	l_g	l_s	l_g	l_s	l_g	l_s	l_g
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.
360	—	—	357,15	362,85															243	263	228,5	251	214	239	195,5	223	177	207
380	—	—	377,15	382,85																	248,5	271	234	259	215,5	243	197	227
400	—	—	397,15	402,85																	268,5	291	254	279	235,5	263	217	247
420	—	—	416,85	423,15																	288,5	311	274	299	255,5	283	237	267
440	—	—	436,85	443,15																	308,5	331	294	319	275,5	303	257	287
460	—	—	456,85	463,15																			314	339	295,5	323	277	307
480	—	—	476,85	483,15																			334	359	315,5	343	297	327
500	—	—	496,85	503,15																					335,5	363	317	347

NOTE Popular lengths are defined in terms of l_s and l_g:

— for product grade A, above the dashed, stepped line;

— for product grade B, below this stepped line.

[a] For lengths $l_{nom} \leqslant 125$ mm.

[b] For lengths 125 mm $< l_{nom} \leqslant 200$ mm.

[c] For lengths $l_{nom} > 200$ mm.

[d] $k_{w,\,min} = 0{,}7\ k_{min}$

[e] $l_{g,\,max} = l_{nom} - b$

$l_{s,\,min} = l_{g,\,max} - 5P$

P is the pitch of the coarse thread, specified in ISO 261.

[f] l_g is the minimum grip length.

Table 2 — Non-preferred threads

Dimensions in millimetres

Thread ($d \times P$)				M10 × 1,25	M12 × 1,25	M14 × 1,5	M18 × 1,5	M20 × 2	M22 × 1,5	M27 × 2	M33 × 2	M39 × 3	M45 × 3	M52 × 4	M60 × 4
b ref.			a	26	30	34	42	46	50	60	—	—	—	—	—
			b	32	36	40	48	52	56	66	78	90	102	116	—
			c	45	49	57	61	65	69	79	91	103	115	129	145
c			max.	0,60	0,60	0,60	0,8	0,8	0,8	0,8	0,8	1,0	1,0	1,0	1,0
			min.	0,15	0,15	0,15	0,2	0,2	0,2	0,2	0,2	0,3	0,3	0,3	0,3
d_a			max.	11,2	13,7	15,7	20,2	22,4	24,4	30,4	36,4	42,4	48,6	56,6	67
d_s			nom. = max.	10,00	12,00	14,00	18,00	20,00	22,00	27,00	33,00	39,00	45,00	52,00	60,00
	Product grade	A	min.	9,78	11,73	13,73	17,73	19,67	21,67	—	—	—	—	—	—
		B		9,64	11,57	13,54	17,57	19,48	21,48	26,48	32,38	38,38	44,38	51,26	59,26
d_w	Product grade	A	min.	14,63	16,63	19,64	25,34	28,19	31,71	—	—	—	—	—	—
		B		14,47	16,47	19,15	24,85	27,7	31,35	38	46,55	55,86	64,7	74,2	83,41
e	Product grade	A	min.	17,77	20,03	23,36	30,14	33,53	37,72	—	—	—	—	—	—
		B		17,59	19,85	22,78	29,56	32,95	37,29	45,2	55,37	66,44	76,95	88,25	99,21
l_f			max.	2	3	3	3	4	4	6	6	6	8	10	12
k			nom.	6,4	7,5	8,8	11,5	12,5	14	17	21	25	28	33	38
	Product grade A		max.	6,58	7,68	8,98	11,715	12,715	14,215	—	—	—	—	—	—
			min.	6,22	7,32	8,62	11,285	12,285	13,785	—	—	—	—	—	—
	Product grade B		max.	6,69	7,79	9,09	11,85	12,85	14,35	17,35	21,42	25,42	28,42	33,5	38,5
			min.	6,11	7,21	8,51	11,15	12,15	13,65	16,65	20,58	24,58	27,58	32,5	37,5
k_w[d]	Product grade	A	min.	4,35	5,12	6,03	7,9	8,6	9,65	—	—	—	—	—	—
		B		4,28	5,05	5,96	7,81	8,51	9,56	11,66	14,41	17,21	19,31	22,75	26,25
r			min.	0,4	0,6	0,6	0,6	0,8	0,8	1	1	1	1,2	1,6	2
s			nom. = max.	16,00	18,00	21,00	27,00	30,00	34,00	41	50	60,0	70,0	80,0	90,0
	Product grade	A	min.	15,73	17,73	20,67	26,67	29,67	33,38	—	—	—	—	—	—
		B		15,57	17,57	20,16	26,16	29,16	33,00	40	49	58,8	68,1	78,1	87,8

Table 2 *(continued)*

Thread ($d \times P$)					M10 × 1,25		M12 × 1,25		M14 × 1,5		M18 × 1,5		M20 × 2		M22 × 1,5		M27 × 2		M33 × 2		M39 × 3		M45 × 3		M52 × 4		M60 × 4	
	Product grade				l_s and l_g ef																							
	A		B																									
	l				l_s	l_g	l_s	l_g	l_s	l_g	l_s	l_g	l_s	l_g	l_s	l_g	l_s	l_g	l_s	l_g	l_s	l_g	l_s	l_g	l_s	l_g	l_s	l_g
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.
45	44,5	45,5	—	—	11,5	19																						
50	49,5	50,5	—	—	16,5	24	11,25	20																				
55	54,4	55,6	—	—	21,5	29	16,25	25																				
60	59,4	60,6	—	—	26,5	34	21,25	30	16	26																		
65	64,4	65,6	—	—	31,5	39	26,25	35	21	31																		
70	69,4	70,6	—	—	36,5	44	31,25	40	26	36	15,5	28																
80	79,4	80,6	—	—	46,5	54	41,25	50	36	46	25,5	38	21,5	34														
90	89,3	90,7	—	—	56,5	64	51,25	60	46	56	35,5	48	31,5	44	27,5	40												
100	99,3	100,7	—	—	66,5	74	61,25	70	56	66	45,5	58	41,5	54	37,5	50												
110	109,3	110,7	108,25	111,75			71,25	80	66	76	55,5	68	51,5	64	47,5	60	35	50										
120	119,3	120,7	118,25	121,75			81,25	90	76	86	65,5	78	61,5	74	57,5	70	45	60										
130	129,2	130,8	128	132					80	90	69,5	82	65,5	78	61,5	74	49	64	34,5	52								
140	139,2	140,8	138	142					90	100	79,5	92	75,5	88	71,5	84	59	74	44,5	62								
150	149,2	150,8	148	152							89,5	102	85,5	98	81,5	94	69	84	54,5	72	40	60						
160	—	—	158	162							99,5	112	95,5	108	91,5	104	79	94	64,5	82	50	70						
180	—	—	178	182							119,5	132	115,5	128	111,5	124	99	114	84,5	102	70	90	55,5	78				
200	—	—	197,7	202,3									135,5	148	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	105	66	91		
240	—	—	237,7	242,3													146	161	131,5	149	117	137	102,5	125	86	111	67,5	95
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	165	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	205	166	191	147,5	175
340	—	—	337,15	342,85																	217	237	202,5	225	186	211	167,5	195

For sizes above the solid, stepped line see ISO 8676

360	—	—	357,15	362,85										237	257	222,5	245	206	231	187,5	215			
380	—	—	377,15	382,85										257	277	242,5	265	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	295			
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			

NOTE popular lengths are defined in terms of l_s and l_g:

— for product grade A, above the dashed, stepped line;

— for product grade B, below this stepped line.

[a] For lengths $l_{nom} \leqslant 125$ mm.

[b] For lengths 125 mm $< l_{nom} \leqslant 200$ mm.

[c] For lengths $l_{nom} > 200$ mm.

[d] $k_{w,\,min} = 0{,}7\,k_{min}$

[e] $l_{g,\,max} = l_{nom} - b$

$l_{s,\,min} = l_{g,\,max} - 5P$

P is the pitch of the coarse thread, specified in ISO 261.

[f] l_g is the minimum grip length.

4 Specifications and reference standards

See Table 3.

Table 3 — Specification and reference standards

Material		Steel	Stainless steel	Non-ferrous metal
General requirements	International Standard	ISO 8992		
Thread	Tolerance	6g		
	International Standards	ISO 724, ISO 965-1		
Mechanical properties	Property class[a]	$d \leqslant 39$ mm: 5.6, 8.8, 10.9 $d > 39$ mm: as agreed	$d \leqslant 24$ mm: A2-70, A4-70 24 mm $< d \leqslant 39$ mm: A2-50, A4-50 $d > 39$ mm: as agreed	Materials specified in ISO 8839
	International Standards	$d \leqslant 39$ mm: ISO 898-1 $d > 39$ mm: as agreed	$d \leqslant 39$ mm: ISO 3506-1 $d > 39$ mm: as agreed	
Tolerances	Product grades	For $d \leqslant 24$ mm and $l \leqslant 10d$ or 150 mm[b]: A For $d > 24$ mm or $l > 10\ d$ or 150 mm[b]: B		
	International Standard	ISO 4759-1		
Finish and/or coating		As processed Requirements for electroplating are covered in ISO 4042 Requirements for non-electrolytically applied zinc flake coatings are covered in ISO 10683	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 negotiated between customer and supplier.		
		Limits for surface discontinuities are covered in ISO 6157-1		
Acceptability		For acceptance procedure, see ISO 3269.		

[a] For other property classes see ISO 898-1 for steel and ISO 3506-1 for stainless steel respectively.

[b] Whichever is shorter.

5 Designation

EXAMPLE

A hexagon head bolt with thread M12 × 1,5, nominal length l = 80 mm and property class 8.8 is designated as follows:

Hexagon head bolt ISO 8765 - M12 × 1,5 × 80 - 8.8