INTERNATIONAL STANDARD

ISO

4016

Fourth edition
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Hexagon head bolts — Product grade C

Vis à tête hexagonale partiellement filetées — Grade C

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Foreword

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The main task of technical committees is to prepare International Standards. 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.

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ISO 4016 was prepared by Technical Committee ISO/TC 2, *Fasteners*, Subcommittee SC 10, *Product standards for fasteners*.

This fourth edition cancels and replaces the third edition (ISO 4016:1999), of which it constitutes a minor revision.

Introduction

This International Standard belongs to a complete group of product standards developed by ISO on external hexagon drive fasteners. It comprises the following:

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 7040, ISO 7041, ISO 7042, ISO 7719, ISO 7720, ISO 8673, ISO 8674, ISO 8675, ISO 10511, ISO 10512 and ISO 10513);

d)   hexagon bolts with flange (ISO 4162, ISO 15071 and ISO 15072);

e)   hexagon nuts with flange (ISO 4161, ISO 7043, ISO 7044, ISO 10663, ISO 12125, ISO 12126 and ISO 21670).

Hexagon head bolts — Product grade C

1 Scope

This International Standard specifies the characteristics of hexagon head bolts with threads from M5 up to and including M64, of product grade C.

If, in special cases, specifications other than those listed in this International Standard are required, they can be selected from existing International Standards, for example ISO 724, ISO 888, ISO 898-1, ISO 965-1 and ISO 4759-1.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 225, *Fasteners — Bolts, screws, studs and nuts — Symbols and descriptions of dimensions*

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

ISO 898-1, *Mechanical properties of fasteners made of carbon steel and alloy steel — Part 1: Bolts, screws and studs with specified property classes — Coarse thread and fine pitch thread*

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

ISO 3269, *Fasteners — Acceptance inspection*

ISO 4018, *Hexagon head screws — Product grade C*

ISO 4042, *Fasteners — Electroplated coatings*

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

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

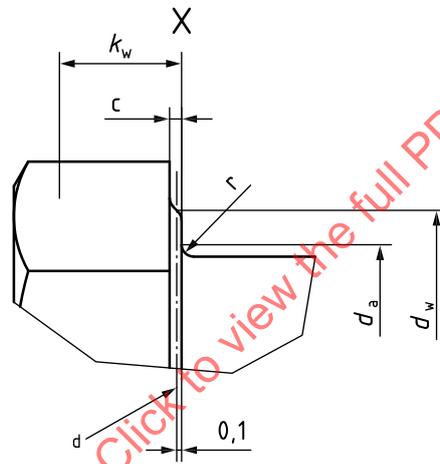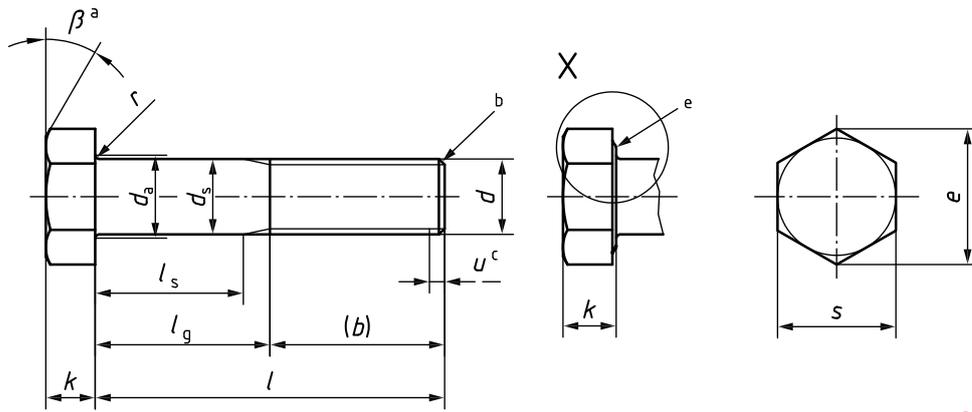ISO 10683, *Fasteners — Non-electrolytically applied zinc flake coatings*

3 Dimensions

See Figure 1 and Tables 1 and 2.

Symbols and descriptions of dimensions are specified in ISO 225.

Dimensions in millimetres

a $\beta = 15°$ to $30°$.
b   End without special requirements.
c   Incomplete thread $u \leqslant 2P$.
d   Reference datum for d_w.
e   Washer face permissible.

Figure 1

Table 1 — Preferred threads

Dimensions in millimetres

Thread, d			M5	M6	M8	M10	M12	M16	M20
P^a			0,8	1	1,25	1,5	1,75	2	2,5
b ref.		b	16	18	22	26	30	38	46
		c	22	24	28	32	36	44	52
		d	35	37	41	45	49	57	65
c		max.	0,5	0,5	0,6	0,6	0,6	0,8	0,8
d_a		max.	6	7,2	10,2	12,2	14,7	18,7	24,4
d_s		max.	5,48	6,48	8,58	10,58	12,7	16,7	20,84
		min.	4,52	5,52	7,42	9,42	11,3	15,3	19,16
d_w		min.	6,74	8,74	11,47	14,47	16,47	22	27,7
e		min.	8,63	10,89	14,2	17,59	19,85	26,17	32,95
k		nom.	3,5	4	5,3	6,4	7,5	10	12,5
		max.	3,875	4,375	5,675	6,85	7,95	10,75	13,4
		min.	3,125	3,625	4,925	5,95	7,05	9,25	11,6
$k_w{}^e$		min.	2,19	2,54	3,45	4,17	4,94	6,48	8,12
r		min.	0,2	0,25	0,4	0,4	0,6	0,6	0,8
s		nom. = max.	8,00	10,00	13,00	16,00	18,00	24,00	30,00
		min.	7,64	9,64	12,57	15,57	17,57	23,16	29,16

l			l_s and $l_g{}^f$												
			M5 l_s min.	M5 l_g max.	M6 l_s min.	M6 l_g max.	M8 l_s min.	M8 l_g max.	M10 l_s min.	M10 l_g max.	M12 l_s min.	M12 l_g max.	M16 l_s min.	M16 l_g max.	M20 l_s min.	M20 l_g max.
nom.	min.	max.														
25	23,95	26,05	5	9												
30	28,95	31,05	10	14	7	12										
35	33,75	36,25	15	19	12	17										
40	38,75	41,25	20	24	17	22	11,75	18								
45	43,75	46,25	25	29	22	27	16,75	23	11,5	19						
50	48,75	51,25	30	34	27	32	21,75	28	16,5	24						
55	53,5	56,5			32	37	26,75	33	21,5	29	16,25	25				
60	58,5	61,5			37	42	31,75	38	26,5	34	21,25	30				
65	63,5	66,5					36,75	43	31,5	39	26,25	35	17	27		
70	68,5	71,5					41,75	48	36,5	44	31,25	40	22	32		
80	78,5	81,5					51,75	58	46,5	54	41,25	50	32	42	21,5	34
90	88,25	91,75							56,5	64	51,25	60	42	52	31,5	44
100	98,25	101,75							66,5	74	61,25	70	52	62	41,5	54
110	108,25	111,75									71,25	80	62	72	51,5	64
120	118,25	121,75									81,25	90	72	82	61,5	74
130	128	132											76	86	65,5	78
140	138	142											86	96	75,5	88
150	148	152											96	106	85,5	98
160	156	164											106	116	95,5	108
180	176	184													115,5	128
200	195,4	204,6													135,5	148
220	215,4	224,6														
240	235,4	244,6														
260	254,8	265,2														
280	274,8	285,2														
300	294,8	305,2														
320	314,3	325,7														
340	334,3	345,7														
360	354,3	365,7														
380	374,3	385,7														
400	394,3	405,7														
420	413,7	426,3														
440	433,7	446,3														
460	453,7	466,3														
480	473,7	486,3														
500	493,7	506,3														

For sizes above the solid, bold, stepped line, ISO 4018 is recommended.

Table 1 (*continued*)

Dimensions in millimetres

Thread, d			M24	M30	M36	M42	M48	M56	M64
P [a]			3	3,5	4	4,5	5	5,5	6
b ref.		[b]	54	66	—	—	—	—	—
		[c]	60	72	84	96	108	—	—
		[d]	73	85	97	109	121	137	153
c		max.	0,8	0,8	0,8	1	1	1	1
d_a		max.	28,4	35,4	42,4	48,6	56,6	67	75
d_s		max.	24,84	30,84	37	43	49	57,2	65,2
		min.	23,16	29,16	35	41	47	54,8	62,8
d_w		min.	33,25	42,75	51,11	59,95	69,45	78,66	88,16
e		min.	39,55	50,85	60,79	71,3	82,6	93,56	104,86
k		nom.	15	18,7	22,5	26	30	35	40
		max.	15,9	19,75	23,55	27,05	31,05	36,25	41,25
		min.	14,1	17,65	21,45	24,95	28,95	33,75	38,75
k_w [e]		min.	9,87	12,36	15,02	17,47	20,27	23,63	27,13
r		min.	0,8	1	1	1,2	1,6	2	2
s		nom. = max.	36	46	55,0	65,0	75,0	85,0	95,0
		min.	35	45	53,8	63,1	73,1	82,8	92,8

l_s and l_g [f]

l nom.	l min.	l max.	M24 l_s min.	M24 l_g max.	M30 l_s min.	M30 l_g max.	M36 l_s min.	M36 l_g max.	M42 l_s min.	M42 l_g max.	M48 l_s min.	M48 l_g max.	M56 l_s min.	M56 l_g max.	M64 l_s min.	M64 l_g max.
25	23,95	26,05														
30	28,95	31,05														
35	33,75	36,25														
40	38,75	41,25														
45	43,75	46,25														
50	48,75	51,25														
55	53,5	56,5														
60	58,5	61,5														
65	63,5	66,5														
70	68,5	71,5														
80	78,5	81,5														
90	88,25	91,75														
100	98,25	101,75	31	46												
110	108,25	111,75	41	56												
120	118,25	121,75	51	66	36,5	54										
130	128	132	55	70	40,5	58										
140	138	142	65	80	50,5	68	36	56								
150	148	152	75	90	60,5	78	46	66								
160	156	164	85	100	70,5	88	56	76								
180	176	184	105	120	90,5	108	76	96	61,5	84						
200	195,4	204,6	125	140	110,5	128	96	116	81,5	104	67	92				
220	215,4	224,6	132	147	117,5	135	103	123	88,5	111	74	99				
240	235,4	244,6	152	167	137,5	155	123	143	108,5	131	94	119	75,5	103		
260	254,8	265,2			157,5	175	143	163	128,5	151	114	139	95,5	123	77	107
280	274,8	285,2			177,5	195	163	183	148,5	171	134	159	115,5	143	97	127
300	294,8	305,2			197,5	215	183	203	168,5	191	154	179	135,5	163	117	147
320	314,3	325,7					203	223	188,5	211	174	199	155,5	183	137	167
340	334,3	345,7					223	243	208,5	231	194	219	175,5	203	157	187
360	354,3	365,7					243	263	228,5	251	214	239	195,5	223	177	207
380	374,3	385,7							248,5	271	234	259	215,5	243	197	227
400	394,3	405,7							268,5	291	254	279	235,5	263	217	247
420	413,7	426,3							288,5	311	274	299	255,5	283	237	267
440	433,7	446,3									294	319	275,5	303	257	287
460	453,7	466,3									314	339	295,5	323	277	307
480	473,7	486,3									334	359	315,5	343	297	327
500	493,7	506,3											335,5	363	317	347

For sizes above the solid, bold, stepped line, ISO 4018 is recommended.

NOTE   Preferred lengths are defined in terms of l_s and l_g.

[a] P is the pitch of the thread.

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

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

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

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

[f] $l_{g,max} = l_{nom} - b$.
$l_{s,min} = l_{g,max} - 5\ P$.

Table 2 — Non-preferred threads

Dimensions in millimetres

Thread, d			M14	M18	M22	M27	M33
P^a			2	2,5	2,5	3	3,5
b ref.		b	34	42	50	60	—
		c	40	48	56	66	78
		d	53	61	69	79	91
c		max.	0,6	0,8	0,8	0,8	0,8
d_a		max.	16,7	21,2	26,4	32,4	38,4
d_s		max.	14,7	18,7	22,84	27,84	34
		min.	13,3	17,3	21,16	26,16	32
d_w		min.	19,15	24,85	31,35	38	46,55
e		min.	22,78	29,56	37,29	45,2	55,37
k		nom.	8,8	11,5	14	17	21
		max.	9,25	12,4	14,9	17,9	22,05
		min.	8,35	10,6	13,1	16,1	19,95
$k_w{}^e$		min.	5,85	7,42	9,17	11,27	13,97
r		min.	0,6	0,6	0,8	1	1
s		nom. = max.	21,00	27,00	34	41	50
		min.	20,16	26,16	33	40	49

l			l_s and $l_g{}^f$									
			M14		M18		M22		M27		M33	
nom.	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.
60	58,5	61,5	16	26								
65	63,5	66,5	21	31	For sizes above the solid, bold, stepped line, ISO 4018 is recommended.							
70	68,5	71,5	26	36								
80	78,5	81,5	36	46	25,5	38						
90	88,25	91,75	46	56	35,5	48	27,5	40				
100	98,25	101,75	56	66	45,5	58	37,5	50				
110	108,25	111,75	66	76	55,5	68	47,5	60	35	50		
120	118,25	121,75	76	86	65,5	78	57,5	70	45	60		
130	128	132	80	90	69,5	82	61,5	74	49	64	34,5	52
140	138	142	90	100	79,5	92	71,5	84	59	74	44,5	62
150	148	152			89,5	102	81,5	94	69	84	54,5	72
160	156	164			99,5	112	91,5	104	79	94	64,5	82
180	176	184			119,5	132	111,5	124	99	114	84,5	102
200	195,4	204,6					131,5	144	119	134	104,5	122
220	215,4	224,6					138,5	151	126	141	111,5	129
240	235,4	244,6							146	161	131,5	149
260	254,8	265,2							166	181	151,5	167
280	274,8	285,2									171,5	189
300	294,8	305,2									191,5	209
320	314,3	325,7									211,5	229
340	334,3	345,7										
360	354,3	365,7										
380	374,3	385,7										
400	394,3	405,7										
420	413,7	426,3										
440	433,7	446,3										
460	453,7	466,3										
480	473,7	486,3										
500	493,7	506,3										

Table 2 (*continued*)

Thread, d				M39		M45		M52		M60	
P[a]				4		4,5		5		5,5	
b ref.		b		—		—		—		—	
		c		90		102		116		—	
		d		103		115		129		145	
c			max.	1		1		1		1	
d_a			max.	45,4		52,6		62,6		71	
d_s			max.	40		46		53,2		61,2	
			min.	38		44		50,8		58,8	
d_w			min.	55,86		64,7		74,2		83,41	
e			min.	66,44		76,95		88,25		99,21	
k			nom.	25		28		33		38	
			max.	26,05		29,05		34,25		39,25	
			min.	23,95		26,95		31,75		36,75	
k_w[e]			min.	16,77		18,87		22,23		25,73	
r			min.	1		1,2		1,6		2	
s			nom. = max.	60,0		70,0		80,0		90,0	
			min.	58,8		68,1		78,1		87,8	

l			l_s and l_g[f]								
nom.	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.
60	58,5	61,5								
65	63,5	66,5								
70	68,5	71,5	For sizes above the solid, bold, stepped line, ISO 4018 is recommended.							
80	78,5	81,5								
90	88,25	91,75								
100	98,25	101,75								
110	108,25	111,75								
120	118,25	121,75								
130	128	132								
140	138	142								
150	148	152	40	60						
160	156	164	50	70						
180	176	184	70	90	55,5	78				
200	195,4	204,6	90	110	75,5	98	59	84		
220	215,4	224,6	97	117	82,5	105	66	91		
240	235,4	244,6	117	137	102,5	125	86	111	67,5	95
260	254,8	265,2	137	157	122,5	145	106	131	87,5	115
280	274,8	285,2	157	177	142,5	165	126	151	107,5	135
300	294,8	305,2	177	197	162,5	185	146	171	127,5	155
320	314,3	325,7	197	217	182,5	205	166	191	147,5	175
340	334,3	345,7	217	237	202,5	225	186	211	167,5	195
360	354,3	365,7	237	257	222,5	245	206	231	187,5	215
380	374,3	385,7	257	277	242,5	265	226	251	207,5	235
400	394,3	405,7	277	297	262,5	285	246	271	227,5	255
420	413,7	426,3			282,5	305	266	291	247,5	275
440	433,7	446,3			302,5	325	286	311	267,5	295
460	453,7	466,3					306	331	287,5	315
480	473,7	486,3					326	351	307,5	335
500	493,7	506,3					346	371	327,5	355

NOTE   Preferred lengths are defined in terms of l_s and l_g.

[a] P is the pitch of the thread.

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

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

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

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

[f] $l_{g,max} = l_{nom} - b$.

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

4 Specifications and reference International Standards

See Table 3.

Table 3 — Specifications and reference International Standards

Material		Steel
General requirements	International Standard	ISO 8992
Thread	Tolerance class	8g
	International Standard	ISO 724, ISO 965-1
Mechanical property	Property class[a]	$d \leqslant 39$ mm: 4.6, 4.8 $d > 39$ mm: as agreed
	International Standard	$d \leqslant 39$ mm: ISO 898-1 $d > 39$ mm: as agreed
Tolerance	Product grade	C
	International Standard	ISO 4759-1
Finish — Coating		As processed Requirements for electroplating are specified in ISO 4042. Requirements for non-electrolytically applied zinc flake coatings are specified in ISO 10683. Additional requirements or other finishes or coatings shall be agreed between the supplier and the purchaser.
Acceptability		Acceptance inspection is specified in ISO 3269.
[a] Other property classes are specified in ISO 898-1.		

5 Designation

EXAMPLE   A hexagon head bolt, product grade C, with thread M12, nominal length $l = 80$ mm and property class 4.6 is designated as follows:

Hexagon head bolt ISO 4016 - M12 $\times$ 80 - 4.6