

Hexagon head bolts
Product grade C
(ISO 4016 : 1999)
English version of DIN EN ISO 4016

DIN
EN ISO 4016

ICS 21.060.10

Supersedes DIN EN 24016,
February 1992 edition.

Sechskantschrauben mit Schaft –
Produktklasse C (ISO 4016 : 1999)

European Standard EN ISO 4016 : 2000 has the status of a DIN Standard.

A comma is used as the decimal marker.

National foreword

This standard has been published in accordance with a decision taken by CEN/TC 185 to adopt, without alteration, International Standard ISO 4016 as a European Standard.

The responsible German body involved in its preparation was the *Normenausschuss Mechanische Verbindungselemente* (Fasteners Standards Committee), Technical Committee *Schrauben und Muttern mit Außenantrieb*.

The DIN Standards corresponding to the International Standards referred to in clause 2 and in the bibliography of the EN are as follows:

ISO Standard	DIN Standard
ISO 225	DIN EN 20225
ISO 724	DIN ISO 724
ISO 898-1	DIN EN ISO 898-1
ISO 3269	DIN EN ISO 3269
ISO 4018	DIN EN ISO 4018
ISO 4042	DIN EN ISO 4042
ISO/DIS 4759-1	DIN EN ISO 4759-1*)
ISO 8992	DIN ISO 8992

Amendments

DIN EN 24016, February 1992 edition, has been superseded by the specifications of EN ISO 4016, which is identical to ISO 4016.

*) Currently at draft stage.

Continued overleaf.
EN comprises 11 pages.

Previous editions

Supplement to DIN 556: 1926-10; DIN 556: 1923-02, 1925-04, 1936-04; Supplement 1 to DIN 601-1: 1942-11; DIN 601-1: 1941-01, 1951-09, 1963-03; DIN 602: 1925-07, 1936-07; DIN 601: 1925-07, 1934-07, 1967-12, 1970-11, 1983-12, 1984-06; DIN EN 24016: 1992-02.

National Annex NA

Standards referred to

(and not included in **Normative references** and **Bibliography**)

DIN EN 20225	Bolts, screws, studs and nuts – Symbols and designations for dimensioning (ISO 225 : 1983)
DIN EN ISO 898-1	Mechanical properties of fasteners made of carbon steel and alloy steel – Part 1: Bolts, screws and studs (ISO 898-1 : 1999)
DIN EN ISO 3269	Fasteners – Acceptance inspection (ISO 3269 : 2000)
DIN EN ISO 4018	Hexagon head screws – Product grade C (ISO 4018 : 1999)
DIN EN ISO 4042	Fasteners – Electroplated coatings (ISO 4042 : 1999)
DIN ISO 724	ISO general purpose metric screw threads – Basic dimensions (ISO 724 : 1993)

English version

Hexagon head bolts

Product grade C
(ISO 4016 : 1999)

Vis à tête hexagonale partiellement
filetées – Grade C (ISO 4016 : 1999)

Sechskantschrauben mit Schaft –
Produktklasse C (ISO 4016 : 1999)

This European Standard was approved by CEN on 2000-10-26.

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.

The European Standards exist 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.

CEN members are the national standards bodies of Austria, Belgium, the Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the United Kingdom.

CEN

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

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

Foreword

International Standard

ISO 4016 : 1999 Hexagon head bolts – Product grade C, which was prepared by ISO/TC 2 'Fasteners' of the International Organization for Standardization, has been adopted by Technical Committee CEN/TC 185 'Threaded and non-threaded mechanical fasteners and accessories', the Secretariat of which is held by DIN, as a European Standard.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, and conflicting national standards withdrawn, by May 2001 at the latest.

In accordance with the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard:

Austria, Belgium, the Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the United Kingdom.

Endorsement notice

The text of the International Standard ISO 4016 : 1999 was approved by CEN as a European Standard without any modification.

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).

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

ISO 888:1976, *Bolts, screws and studs — 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 4018:1999, *Hexagon head screws — Product grade C.*

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

ISO 4759-1:—²⁾, *Tolerances for fasteners — Part 1: Bolts, screws, studs and nuts — Product grades A, B and C.*

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

ISO 10683:—³⁾, *Fasteners — Non-electrolytically applied zinc flake coatings.*

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

²⁾ To be published. (Revision of ISO 4759-1:1978)

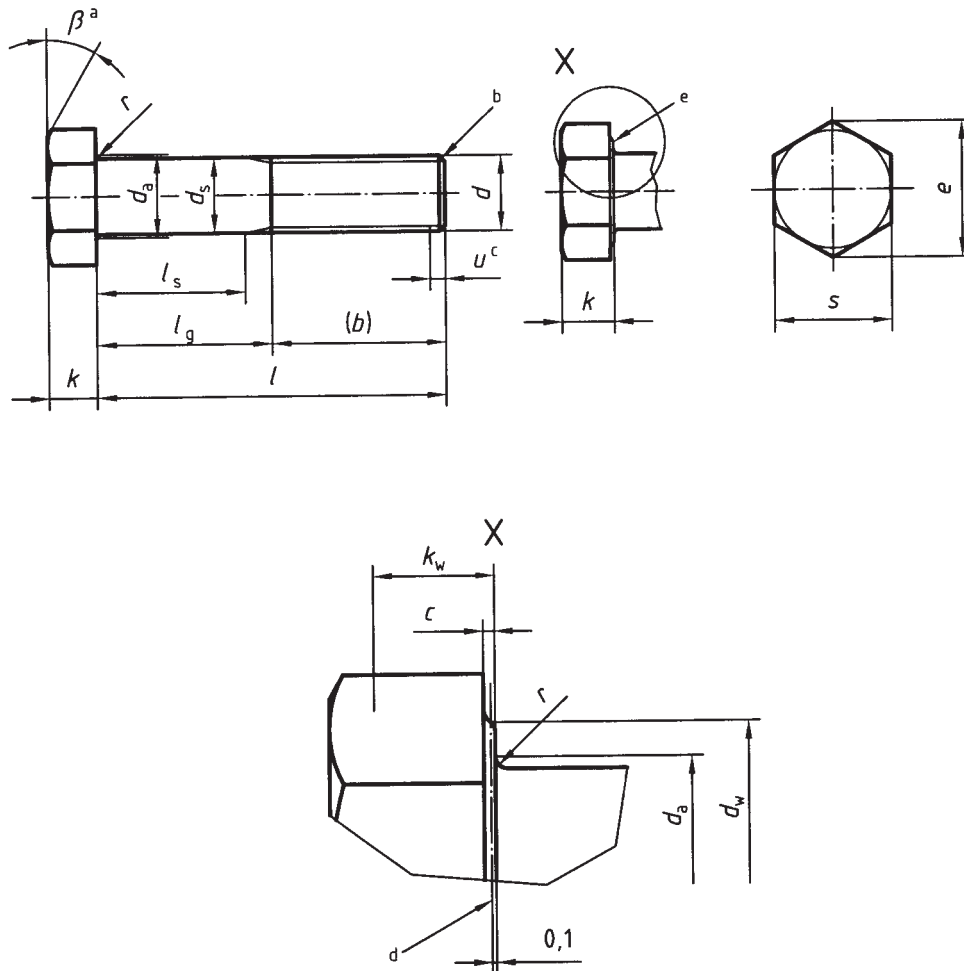
³⁾ To be published.

3 Dimensions

See Figure 1 and Tables 1 and 2.

Symbols and designations of dimensions are defined in ISO 225.

Dimensions in millimetres



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

Figure 1

Table 1 (continued)

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		l_s and $l_g^f g$														
		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.	
nom.	min.	max.														
25	23,95	26,05														
30	28,95	31,05	For sizes above the solid, boldface stepped line, ISO 4018 is recommended													
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
NOTE popular lengths are defined in terms of l_s and l_g																
^a P is the pitch of the thread.								^e $k_w, \min = 0,7 k_{\min}$								
^b For lengths $l_{\text{nom}} \leq 125$ mm.								^f $l_g, \max = l_{\text{nom}} - b$								
^c For lengths $125 \text{ mm} < l_{\text{nom}} \leq 200$ mm.								^g $l_s, \min = l_g, \max - 5P$								
^d For lengths $l_{\text{nom}} > 200$ mm.								^g l_g is the minimum grip length.								

Table 2 (continued)

Thread (<i>d</i>)			M39	M45	M52	M60					
<i>p</i> ^a			4	4,5	5	5,5					
<i>b</i> ref.	b	—	—	—	—	—					
	c	90	102	116	—	—					
	d	103	115	129	145	—					
<i>c</i>	max.	1	1	1	1	—					
<i>d</i> _a	max.	45,4	52,6	62,6	71	—					
<i>d</i> _s	max.	40	46	53,2	61,2	—					
	min.	38	44	50,8	58,8	—					
<i>d</i> _w	min.	55,86	64,7	74,2	83,41	—					
<i>e</i>	min.	66,44	76,95	88,25	99,21	—					
<i>k</i>	nom.	25	28	33	38	—					
	min.	23,95	26,95	31,75	36,75	—					
	max.	26,05	29,05	34,25	39,25	—					
<i>k</i> _w ^e	min.	16,77	18,87	22,23	25,73	—					
<i>r</i>	min.	1	1,2	1,6	2	—					
<i>s</i>	nom. = max.	60,0	70,0	80,0	90,0	—					
	min.	58,8	68,1	78,1	87,8	—					
<i>l</i>			<i>l</i> _s and <i>l</i> _g ^{f,g}								
			<i>l</i> _s min.	<i>l</i> _g max.	<i>l</i> _s min.	<i>l</i> _g max.	<i>l</i> _s min.	<i>l</i> _g max.	<i>l</i> _s min.	<i>l</i> _g max.	
nom.	min.	max.	For sizes above the solid, boldface stepped line ISO 4018 is recommended								
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									
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 popular lengths are defined in terms of <i>l</i> _s and <i>l</i> _g											
^a <i>p</i> is the pitch of the thread.			^e <i>k</i> _{w, min} = 0,7 <i>k</i> _{min}								
^b For lengths <i>l</i> _{nom} ≤ 125 mm.			^f <i>l</i> _{g, max} = <i>l</i> _{nom} - <i>b</i>								
^c For lengths 125 mm < <i>l</i> _{nom} ≤ 200 mm.			ⁱ <i>l</i> _{s, min} = <i>l</i> _{g, max} - 5 <i>P</i>								
^d For lengths <i>l</i> _{nom} > 200 mm.			^g <i>l</i> _g is the minimum grip length.								

4 Specifications and reference standards

See Table 3.

Table 3 — Specifications and reference standards

Material		Steel
General requirements	International Standard	ISO 8992
Thread	Tolerance	8g
	International Standards	ISO 724, ISO 965-1
Mechanical properties	Property class ^a	$d \leq 39$ mm: 3.6, 4.6, 4.8 $d > 39$ mm: as agreed
	International Standard	$d \leq 39$ mm: ISO 898-1 $d > 39$ mm: as agreed
Tolerances	Product grade	C
	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. If different electroplating requirements are desired or if requirements are needed for other finishes, they should be agreed between customer and supplier.
Acceptability		For acceptance procedure, see ISO 3269.
^a For other property classes see 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 × 80 - 4.6

Bibliography

- [1] ISO 4014:1999, *Hexagon head bolts — Product grades A and B.*
- [2] ISO 4015:1979, *Hexagon head bolts — Product grade B — Reduced shank (shank diameter approximately equal to pitch diameter).*
- [3] ISO 4017:1999, *Hexagon head screws — Product grades A and B.*
- [4] ISO 4018:1999, *Hexagon head screws — Product grade C.*
- [5] ISO 4032:1999, *Hexagon nuts, style 1 — Product grades A and B.*
- [6] ISO 4033:1999, *Hexagon nuts, style 2 — Product grades A and B.*
- [7] ISO 4034:1999, *Hexagon nuts — Product grade C.*
- [8] ISO 4035:1999, *Hexagon thin nuts (chamfered) — Product grades A and B.*
- [9] ISO 4036:1999, *Hexagon thin nuts (unchamfered) — Product grade B.*
- [10] ISO 4161:1999, *Hexagon nuts with flange — Coarse thread.*
- [11] ISO 4162:—⁴⁾, *Hexagon bolts with flange — Small series — Product grade combination A/B.*
- [12] ISO 4775:1984, *Hexagon nuts for high-strength structural bolting with large width across flats — Product grade B — Property classes 8 and 10.*
- [13] ISO 7411:1984, *Hexagon bolts for high-strength structural bolting with large width across flats (thread lengths according to ISO 888) — Product grade C — Property classes 8.8 and 10.9.*
- [14] ISO 7412:1984, *Hexagon bolts for high-strength structural bolting with large width across flats (short thread length) — Product grade C — Property classes 8.8 and 10.9.*
- [15] ISO 7413:1984, *Hexagon nuts for structural bolting, style 1, hot-dip galvanize (oversize tapped) — Product grades A and B — Property classes 5, 6 and 8.*
- [16] ISO 7414:1984, *Hexagon nuts for structural bolting with large width across flats, style 1 — Product grade B — Property class 10.*
- [17] ISO 7417:1984, *Hexagon nuts for structural bolting, style 2, hot-dip galvanize (oversize tapped) — Product grade A — Property class 9.*
- [18] ISO 8673:1999, *Hexagon nuts, style 1, with metric fine pitch thread — Product grades A and B.*
- [19] ISO 8674:1999, *Hexagon nuts, style 2, with metric fine pitch thread — Product grades A and B.*
- [20] ISO 8675:1999, *Hexagon thin nuts (chamfered) with metric fine pitch thread — Product grades A and B.*
- [21] ISO 8676:1999, *Hexagon head screws with metric fine pitch thread — Product grades A and B.*
- [22] ISO 8765:1999, *Hexagon head bolts with metric fine pitch thread — Product grades A and B.*

⁴⁾ To be published. (Revision of ISO 4162:1990)

[23] ISO 10663:1999, *Hexagon nuts with flange — Fine pitch thread.*

[24] ISO 15071:1999, *Hexagon bolts with flange — Small series — Product grade A.*