UDC 621.882.211

February 1992

Hexagon head bolts
Product grade C
(ISO 4016 : 1988)
English version of DIN EN 24 016

DIN
EN 24 016

This standard incorporates the English version of ISO 4016.

Sechskantschrauben mit Schaft; Produktklasse C (ISO 4016 : 1988)

Supersedes DIN 601, September 1987 edition, and DIN ISO 4016, October 1989 edition

European Standard EN 24 016 : 1991 has the status of a DIN Standard.

A comma is used as the decimal marker.

National foreword

The publication of this standard is in keeping with a decision made by CEN/TC 185 to adopt, without alteration, a series of ISO Standards covering hexagon head bolts and nuts as European Standards. The responsible German body involved in their publication is the *Normenausschuß Mechanische Verbindungselemente* (Fasteners Standards Committee).

As a consequence, all DIN ISO Standards covering hexagon head bolts and nuts have been superseded by the corresponding DIN EN Standards (see table overleaf), with no alteration having been made to the former ISO designation.

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

ISO 225	DIN EN 20 225
ISO 898-1	DIN EN 20 898 Part 1
ISO 3269	DIN ISO 3269 (at present at the stage of draft)
ISO 4042	DIN ISO 4042 (at present at the stage of draft)
ISO 4759-1	DIN ISO 4759 Part 1
ISO 8992	DIN ISO 8992 (at present at the stage of draft)

Continued overleaf.

EN comprises 10 pages.

DIN EN Standard	Title	Previous DIN ISO Standard	Withdrawn DIN Standard
24 014	Hexagon head bolts; product grades A and B	4014	931 Part 1
24 016	Hexagon head bolts; product grade C	4016	601
24 017	Hexagon head screws; product grades A and B	4017	933
24 018	Hexagon head screws; product grade C	4018	558
24 032	Hexagon nuts, style 1; product grades A and B	4032	934
24 034	Hexagon nuts; product grade C	4034	555
24 035	Hexagon thin nuts (chamfered); product grades A and B	4035	439 Part 2
24 036	Hexagon thin nuts; product grade B (unchamfered)	4036	439 Part 1
28 673	Hexagon nuts, style 1, with metric fine pitch thread; product grades A and B	8673	971 Part 1 934
28 674	Hexagon nuts, style 2, with metric fine pitch thread; product grades A and B	8674	971 Part 2
28 675	Hexagon thin nuts with metric fine pitch thread; product grades A and B	8675	439 Part 2
28 676	Hexagon head screws with metric fine pitch thread; product grades A and B	8676	961
28 765	Hexagon head bolts with metric fine pitch thread; product grades A and B	8765	960

Standards referred to

See clauses 0 and 2.

Other relevant document

Supplement 2 to DIN 918 Fasteners; synopsis of available ISO Standards and DIN Standards

Previous editions

Supplement to DIN 556: 10.26; DIN 556: 02.23, 04.25, 04.36; DIN 601: 07.25, 07.34, 12.67, 11.70, 12.83, 06.84, 09.87; Supplement 1 to DIN 601 Part 1: 11.42; DIN 601 Part 1: 01.41, 09.51, 03.63; DIN 602: 07.25, 07.36; DIN ISO 4016: 09.87, 10.89.

Amendments

In comparison with the September 1987 edition of DIN 601 and the October 1989 edition of DIN ISO 4016, the following amendments have been made

a) The thread sizes specified have been extended to include size M 64.

b) Thread sizes M 14, M 18 and M 22 have been included for the first time

c) The range of nominal lengths specified has been extended to include 500 mm.

d) The widths across flats specified in ISO 272 have been adopted for thread sizes M 10 and M 12

e) Property class 4.8 is now permitted for bolts up to size M 39

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 24 016

October 1991

UDC 621.882.211

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

English version

Hexagon head bolts

Product grade C
(ISO 4016 : 1988)

Boulons à tête hexagonale, grade C
(ISO 4016 : 1988)

Sechskantschrauben mit Schaft; Produktklasse C
(ISO 4016 : 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.

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

In 1990, ISO 4016 : 1988 was submitted to the CEN PQ procedure. Following the positive result of the PQ, CEN/BT agreed to submit ISO 4016 : 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 4016 : 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 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 261, ISO 888, ISO 898-1, ISO 965-2 and ISO 4759-1.

1) These will form the subject 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 4042, *Threaded components – Electroplated coatings.* [1]

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.*

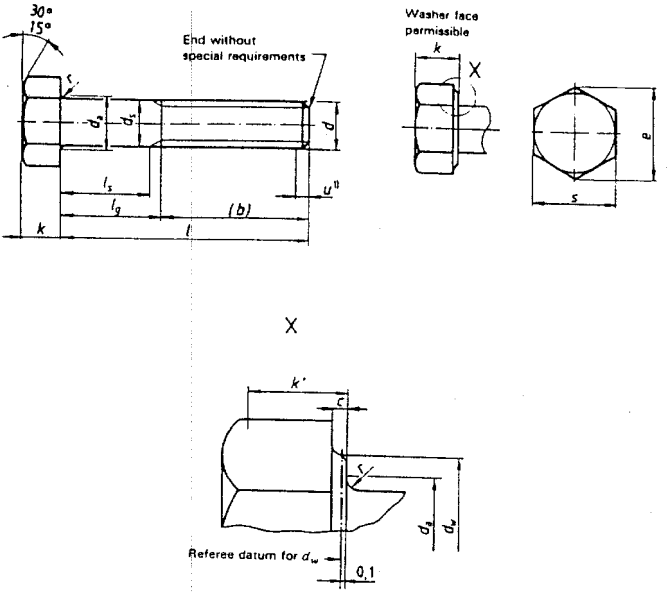
ISO 8992, *Fasteners – General requirements for bolts, screws, studs and nuts.* [1]

1) At present at the stage of draft

3 Dimensions

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

Dimensions in millimetres



1) Incomplete thread $u \leq 2P$.

Table 1 — Preferred threads

Dimensions in millimetres

Thread (d)		M5	M6	M8	M10	M12	M16	M20	M24	M30	M36	M42	M48	M56	M64
p [1]		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]	16	18	22	26	30	38	46	54	66	—	—	—	—	—
	3]	—	—	—	—	—	44	52	60	72	84	96	108	—	—
	4]	—	—	—	—	—	—	—	73	85	97	109	121	137	153
c	max.	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.	6	7,2	10,2	12,2	14,7	18,7	24,4	28,4	35,4	42,4	48,6	56,6	67	75
d_s	max.	5,48	6,48	8,58	10,58	12,7	16,7	20,84	24,84	30,84	37	43	49	57,2	65,2
	min.	4,52	5,52	7,42	9,42	11,3	15,3	19,16	23,16	29,16	35	41	47	54,8	62,8
d_w	min.	6,74	8,74	11,47	14,47	16,47	22	27,7	33,25	42,75	51,11	59,95	69,45	78,66	88,16
e	min.	8,63	10,89	14,2	17,59	19,85	26,17	32,95	39,55	50,85	60,79	71,3	82,6	93,56	104,86
k	nom.	3,5	4	5,3	6,4	7,5	10	12,5	15	18,7	22,5	26	30	35	40
	min.	3,125	3,625	4,925	5,95	7,05	9,25	11,6	14,1	17,65	21,45	24,95	28,95	33,75	38,75
	max.	3,875	4,375	5,675	6,85	7,95	10,75	13,4	15,9	19,75	23,55	27,05	31,05	36,25	41,25
k [5]	min.	2,19	2,54	3,45	4,17	4,94	6,48	8,12	9,87	12,36	15,02	17,47	20,27	23,63	27,13
r	min.	0,2	0,25	0,4	0,4	0,6	0,6	0,8	0,8	1	1	1,2	1,6	2	2
s	nom. = max.	8	10	13	16	18	24	30	36	46	55	65	75	85	95
	min.	7,64	9,64	12,57	15,57	17,57	23,16	29,16	35	45	53,8	63,1	73,1	82,8	92,8

l			l_s and l_g [6], [7]																											
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.	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.	l_s min.	l_g max.
25	23,95	26,05	5	9																										
30	28,95	31,05	10	14	7	12					For sizes above the stepped line, marked thus ———, ISO 4018 is recommended.																			
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	31	46												
110	108,25	111,75									71,25	80	62	72	51,5	64	41	56												
120	118,25	121,75									81,25	90	72	82	61,5	74	51	66	36,5	54										

130	128	132												76	86	65,5	78	55	70	40,5	58													
140	138	142												86	96	75,5	88	65	80	50,5	68	36	56											
150	148	152												96	106	85,5	98	75	90	60,5	78	46	66											
160	156	164												106	116	95,5	108	85	100	70,5	88	56	76											
180	176	184														115,5	128	105	120	90,5	108	76	96	61,5	84									
200	195,4	204,6														135,5	148	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			

1) P = pitch of the 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 marked by the shank lengths.

Table 2 — Non-preferred threads

Dimensions in millimetres

Thread (ref.)		M14	M18	M22	M27	M33	M39	M45	M52	M60
P [1]		2	2,5	2,5	3	3,5	4	4,5	5	5,5
h ref.	[2]	34	42	50	60	-	-	-	-	-
	[3]	40	48	56	66	78	90	102	116	-
	[4]	-	-	69	79	91	103	115	129	145
r	max.	0,6	0,8	0,8	0,8	0,8	1	1	1	1
d_d	max.	16,7	21,2	26,4	32,4	38,4	45,4	52,6	62,6	71
d_3	max.	14,7	18,7	22,84	27,84	34	40	46	53,2	61,2
	min.	13,3	17,3	21,16	26,16	32	38	44	50,8	58,8
d_w	min.	19,15	24,85	31,35	38	46,55	55,86	64,7	74,2	83,41
e	min.	22,78	29,56	37,29	45,2	55,37	66,44	76,95	88,25	99,21
k	nom.	8,8	11,5	14	17	21	25	28	33	38
	min.	8,35	10,6	13,1	16,1	19,95	23,95	26,95	31,75	35,75
	max.	9,25	12,4	14,9	17,9	22,05	26,05	29,05	34,25	39,25
k [5]	min.	5,85	7,42	9,17	11,27	13,97	16,77	18,87	22,23	25,73
r	min.	0,6	0,6	0,8	1	1	1	1,2	1,6	2
s	nom. = max.	21	27	34	41	50	60	70	80	90
	min.	20,16	26,16	33	40	49	58,8	68,1	78,1	87,8

l			l_s and l_g [6], [7]																	
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.	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																
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	40	60						
160	156	164			99,5	112	91,5	104	79	94	64,5	82	50	70						

For sizes above the stepped line, marked thus ——, ISO 4018 is recommended.

180	176	184			119,5	132	111,5	124	99	114	84,5	102	70	90	55,5	78					
200	195,4	204,6					131,5	144	119	134	104,5	122	90	110	75,5	98	59	84			
220	215,4	224,6					138,5	151	126	141	111,5	129	97	117	82,5	105	66	91			
240	235,4	244,6							146	161	131,5	149	117	137	102,5	125	86	111	67,5	95	
260	254,8	265,2							166	181	151,5	167	137	157	122,5	145	106	131	87,5	115	
280	274,8	285,2									171,5	189	157	177	142,5	166	126	151	107,5	135	
300	294,8	305,2									191,5	209	177	197	162,5	185	146	171	127,5	155	
320	314,3	325,7									211,5	229	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	

1) P = pitch of the 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) $l_{g\,max} = l_{nom} - b$
$l_{s\,min} = l_{g\,max} - 5\ P$

7) l_K is the minimum grip length.

NOTE – The popular lengths are marked by the shank lengths.

4 Specifications and reference standards

Table 3 — Specifications and reference standards

Material		Steel
General requirements	International Standard	ISO 8992
Thread	Tolerance	8g
	International Standards	ISO 261, ISO 965-2
Mechanical properties	Class [1]	d < 39 mm: 3.6, 4.6, 4.8 d > 39 mm: as agreed
	International Standards	d < 39 mm: ISO 898-1 d > 39 mm: as agreed
Tolerances	Product grade	C
	International Standard	ISO 4759-1
Finish		as processed 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		For acceptance procedure, see ISO 3269.

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

5 Designation

Example for the designation of a hexagon head bolt with thread M12, nominal length l = 80 mm and property class 4.6:

Hexagon head bolt ISO 4016 - M12 × 80 - 4.6