UDC 621.882.21

December 1991

Hexagon head bolts with reduced shank
(shank diameter ≈ pitch diameter)
Product grade B (ISO 4015 : 1979)
English version of DIN EN 24 015

DIN
EN 24 015

This standard incorporates the English version of ISO 4015.

Sechskantschrauben mit Schaft, Dünnschaft
(Schaftdurchmesser ≈ Flankendurchmesser);
Produktklasse B (ISO 4015 : 1979)

European Standard EN 24 015 : 1991 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 4015 as a European Standard. The responsible German body involved in its publication is the *Normenausschuß Mechanische Verbindungselemente* (Fasteners Standards Committee). Products as specified in this standard have not hitherto been the subject of standardization in Germany.

There follow a number of necessary corrections and amendments which could not be incorporated in the main body of the standard owing to the obligation to adopt ISO 4105 : 1979 without alteration.

a) Correction of errors:

In the table on page 4, the value of $l_{g\,max}$ for M 20 threads with a nominal length of 130 mm should read 78 mm.

b) Amendments:

In clause 4, three ISO Standards are referred to as being in the course of preparation. These standards have since been published:

re 'non-ferrous metal': ISO 8839;

re 'surface protection by electroplating': ISO 4042;

re 'acceptance procedure': ISO 3269.

It is also to be noted that, for a number of the ISO Standards referred to in clause 2, revised editions have subsequently been published in which the ISO numbers and titles have been changed.

Thus ISO 898 has been superseded by ISO 898-2 and ISO 965 by ISO 965-2.

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

ISO Standard	DIN Standard
ISO 898-1	DIN ISO 20 898 Part 1
ISO 3269	DIN ISO 3269
ISO 3506	DIN ISO 3506
ISO 4042	DIN ISO 4042
ISO 4759-1	DIN ISO 4759 Part 1
ISO 8839	DIN EN 28 839

Continued overleaf.
EN comprises 7 pages.

Foreword

In 1990, ISO 4015 : 1979 was submitted to the CEN PQ procedure.

Following the positive result of the PQ, CEN/BT agreed to submit ISO 4015 : 1979 with the following modifications to Formal Vote.

In the French version, replace:

— 'boulon' by 'vis partiellement filetée',

— 'vis' by 'vis entièrement filetée',

— 'boulon, vis' by 'vis',

— 'classe de produit' by 'grade',

— 'classe de caractéristique' by 'classe de qualité'.

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 4015 : 1979 was approved by CEN as a European Standard with agreed common modifications as given above.

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 24 015

October 1991

UDC 621.882.211

Descriptors: Fasteners, bolts, hexagonal head screws, specifications, dimensions, designation.

English version

Hexagon head bolts — Product grade B — Reduced shank
(shank diameter ≈ pitch diameter)
(ISO 4015 : 1979)

Boulons à tête hexagonale; classe de produit B; tige réduite (diamètre de tige ≈ diamètre sur flanc de filet)
(ISO 4015 : 1979)

Sechskantschrauben mit Schaft, Dünnschaft (Schaftdurchmesser ≈ Flankendurchmesser); Produktklasse B
(ISO 4015 : 1979)

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

Standards referred to

(and not included in **References**)

ISO 898-1 : 1988	Mechanical properties of fasteners; bolts, screws and studs
ISO 965-2 : 1980	ISO general purpose metric screw threads; tolerances; limits of sizes for general purpose bolt and nut threads; medium quality
ISO 3269 : 1988	Fasteners; acceptance inspection
ISO 4042 : 1989	Threaded components; electroplated coatings
ISO 8839 : 1986	Mechanical properties of fasteners; bolts, screws, studs and nuts made of non-ferrous metals

Other relevant document

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

International Patent Classification

F 16 B 35/00

0 INTRODUCTION

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

a) Hexagon head bolts (ISO 4014, ISO 4015 and ISO 4016)

b) Hexagon head screws (ISO 4017 and ISO 4018)

c) Hexagon nuts (ISO 4032, ISO 4033, ISO 4034, ISO 4035 and ISO 4036)

d) Hexagon flanged bolts
e) Hexagon flanged screws
f) Hexagon flanged nuts
g) Structural bolting

(in preparation)

1 SCOPE AND FIELD OF APPLICATION

This International Standard gives specifications for hexagon head bolts with metric dimensions and thread diameters from 3 up to and including 20 mm, with reduced shank (shank diameter ≈ pitch diameter), of product grade B.

If, in special cases, specifications other than those listed in this International Standard are required, it is recommended that they should be selected from existing International Standards, for example ISO 261, ISO 888, ISO 898, ISO 965.

2 REFERENCES

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.*

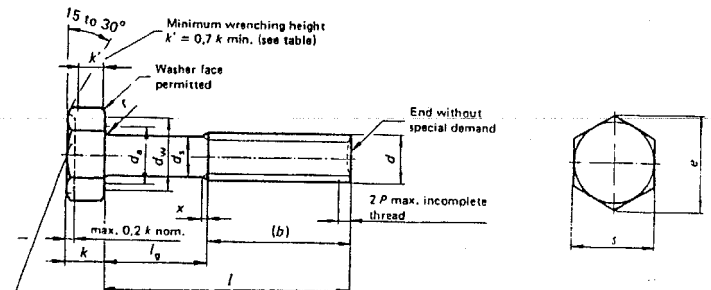
ISO 898, *Mechanical properties of fasteners.*

ISO 965, *ISO general purpose metric screw threads – Tolerances.*

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

ISO 4759/1, *Tolerances for fasteners – Part 1 : Bolts, screws and nuts with thread diameters* $\geqslant 1{,}6 \leqslant 150$ mm *and product grades A, B and C.*

3 DIMENSIONS



d_w min. = s min. – IT16 for width across flats < 21 mm
d_w min. = 0,95 s min. for width across flats > 21 mm
An increase of d_s up to d is permitted within a length of 0,5 d under the head.

Dimensions in millimetres

Thread size d		M3	M4	M5	M6	M8	M10	M12	(M14)	M16	M20
P	1)	0,5	0,7	0,8	1	1,25	1,5	1,75	2	2	2,5
b ref.	2)	12	14	16	18	22	26	30	34	38	46
	3)	–	–	–	–	28	32	36	40	44	52
d_a	max.	3,6	4,7	5,7	6,8	9,2	11,2	13,7	15,7	17,7	22,4
d_s	≈	2,6	3,5	4,4	5,3	7,1	8,9	10,7	12,5	14,5	18,2
d_w	min.	4,4	5,7	6,7	8,7	11,4	14,4	16,4	19,2	22	27,7
e	min.	5,98	7,50	8,63	10,89	14,20	17,59	19,85	22,78	26,17	32,95
k	nom.	2	2,8	3,5	4	5,3	6,4	7,5	8,8	10	12,5
	min.	1,80	2,60	3,26	3,76	5,06	6,11	7,21	8,51	9,71	12,15
	max.	2,20	3,00	3,74	4,24	5,54	6,69	7,79	9,09	10,29	12,85
k'	min.	1,3	1,8	2,3	2,6	3,5	4,3	5,1	6	6,8	8,5
r	min.	0,1	0,2	0,2	0,25	0,4	0,4	0,6	0,6	0,6	0,8
s	max.	5,5	7	8	10	13	16	18	21	24	30
	min.	5,20	6,64	7,64	9,64	12,57	15,57	17,57	20,16	23,16	29,16
x	max.	1,25	1,75	2	2,5	3,2	3,8	4,3	5	5	6,3

l			l_g		l_g		l_g		l_g		l_g		l_g		l_g		l_g		l_g		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
20	18,95	21,05	7	8	4,6	6																
25	23,95	26,05	12	13	9,6	11	7,4	9	5	7												
30	28,95	31,05	17	18	14,6	16	12,4	14	10	12	5,5	8										
35	33,75	36,25			19,6	21	17,4	19	15	17	10,5	13										
40	38,75	41,25			24,6	26	22,4	24	20	22	15,5	18	11	14								
45	43,75	46,25					27,4	29	25	27	20,5	23	16	19	11,5	15						
50	48,75	51,25					32,4	34	30	32	25,5	28	21	24	16,5	20	12	16				
55	53,5	56,5							35	37	30,5	33	26	29	21,5	25	17	21	13	17		
60	58,5	61,5							40	42	35,5	38	31	34	26,5	30	22	26	18	22		
65	63,5	66,5									40,5	43	36	39	31,5	35	27	31	23	27	14	19
70	68,5	71,5									45,5	48	41	44	36,5	40	32	36	28	32	19	24
80	78,5	81,5									55,5	58	51	54	46,5	50	42	46	38	42	29	34
90	88,25	91,75											61	64	56,5	60	52	56	48	52	39	44
100	98,25	101,75											71	74	66,5	70	62	66	58	62	49	54
110	108,25	111,75													76,5	80	72	76	68	72	59	64
120	118,25	121,75													86,5	90	82	86	78	82	69	74
130	128	132															86	90	82	86	73	70
140	138	142															96	100	92	96	83	88
150	148	152																	102	106	93	98

The popular lengths are between the stepped lines. The size M14 should be avoided if possible.

1) P = pitch of the thread.

2) For nominal lengths ≤ 125 mm.

3) For nominal lengths > 125 and ≤ 200 mm.

Formulae : l_g max. = l nom. − b ref.

l_g min. = l_g max. − 2P

4 SPECIFICATIONS AND REFERENCE STANDARDS

Material		Steel	Stainless steel	Non-ferrous metal
Thread	Tolerance	6 g		
	International Standards	ISO 261, ISO 965		
Mechanical properties	Classes	5.8 – 8.8	A2-70	.....
	International Standard	ISO 898/1	ISO 3506	ISO . . .[1]
Tolerances	Product grade	B		
	International Standard	ISO 4759/1		
Finish		as processed	plain	plain
		Requirements for electroplating are covered in ISO . . .[1]		
		If different electroplating requirements are desired or if requirements are needed for other finishes they should be negotiated between customer and supplier.		
Acceptability		For acceptance procedure see ISO . . .[1]		

1) In preparation.

5 DESIGNATION

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

Hexagon head bolt ISO 4015 M12 x 80-8.8

ANNEX

This annex is included for explanatory and informative purposes only and is not to be considered as part of this International Standard.

This International Standard incorporates some changes, primarily in width across flats, from the previous metric practice in a number of countries. These changes were made to achieve international agreement and to improve product design and utilization of material.

At its meeting in May 1977, ISO/TC 2 studied several technical reports analysing design considerations influencing determination of the best series of widths across flats for hexagon bolts, screws and nuts. A primary technical objective was to achieve a logical ratio between underhead bearing surface area (which determines the magnitude of the compressive stress on the bolted members) and the tensile stress area of the screw thread (which governs the clamping force which can be developed by tightening the fastener).

Table 1 lists the ratios for the sizes selected by ISO/TC 2 to be ISO standard (bold type) and in addition four sizes (light type) which currently are being produced and used in substantial quantities in many countries of the world.

The four sizes (widths across flats of 15, 17, 19 and 22 mm) will be phased out of production and use. During a transitional period, to assist designers and manufacturers, and in particular to give needed information for maintenance and repair requirements, the dimensions of the four sizes are given in table 2.

TABLE 1

Nominal thread diameter mm	Width across flats mm	Annular bearing area / Thread stress area *
5	8	1,08
6	10	1,44
8	13	1,23
10	15	0,90
	16	1,30
	17	1,73
12	18	0,91
	19	1,16
14	21	0,96
	22	1,24
16	24	1,02
20	30	0,95
24	36	0,86
30	46	1,02
36	55	1,04

* Calculation based on clearance holes ISO 273 (revised), medium series.

TABLE 2

Thread size d		M10		M12	M14
P	1)	1,5		1,75	2
$b \begin{smallmatrix}+2P\\0\end{smallmatrix}$	2)	26		30	34
	3)	32		36	40
d_a	max.	11,2		13,7	15,7
d_s	≈	8,9		10,7	12,5
d_w	min.	13,5	15,3	17,1	19,8
e	min.	16,46	18,72	20,88	23,91
k	nom.	6,4		7,5	8,8
	min.	6,11		7,21	8,51
	max.	6,69		7,79	9,09
k'	min.	4,3		5,1	6,0
r	min.	0,4		0,6	0,6
s	max.	15	17	19	22
	min.	14,57	16,57	18,48	21,16
x	max.	3,8		4,3	5

1) P = pitch of the thread.

2) For nominal lengths ≤ 125 mm

3) For nominal lengths > 125 mm and ≤ 200 mm.