

INTERNATIONAL STANDARD

ISO 4162

First edition
1990-05-15

Hexagon flange bolts — Small series

Vis à tête hexagonale à embase cylindro-tronconique — Série étroite

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Reference number
ISO 4162 : 1990 (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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 4162 was prepared by Technical Committee ISO/TC 2, *Fasteners*.

Annex A forms an integral part of this International Standard. Annex B is for information only.

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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 flange bolts (ISO 4162 and ISO 8102);
- e) hexagon flange screws;¹⁾
- f) hexagon flange nuts (ISO 4161, ISO 7043 and ISO 7044);
- g) structural bolting (ISO 4775, ISO 7411, ISO 7412, ISO 7413, ISO 7414 and ISO 7417).

1) These will form the subjects of future International Standards.

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Hexagon flange bolts — Small series

1 Scope

This International Standard gives specifications for hexagon flange bolts, small series, with threads from M5 up to and including M16 and property classes 8.8 to 10.9 and A2-70.

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, ISO 3506.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated

were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

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

ISO 261 : 1973, *ISO general purpose metric screw threads — General plan.*

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

ISO 898-1 : 1988, *Mechanical properties of fasteners — Part 1 : Bolts, screws and studs.*

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ISO 965-2 : 1980, *ISO general purpose metric screw threads — Tolerances — Part 2: Limits of sizes for general purpose bolt and nut threads — Medium quality.*

ISO 3269 : 1988, *Fasteners — Acceptance inspection.*

ISO 3506 : 1979, *Corrosion-resistant stainless steel fasteners — Specifications.*

ISO 4042 : 1989, *Threaded components — Electroplated coatings.*

ISO 4753 : 1983, *Fasteners — Ends of parts with external metric ISO thread.*

ISO 4759-1 : 1978, *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 6157-1 : 1988, *Fasteners — Surface discontinuities — Part 1: Bolts, screws and studs for general requirements.*

ISO 6157-3 : 1988, *Fasteners — Surface discontinuities — Part 3: Bolts, screws and studs for special requirements.*

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

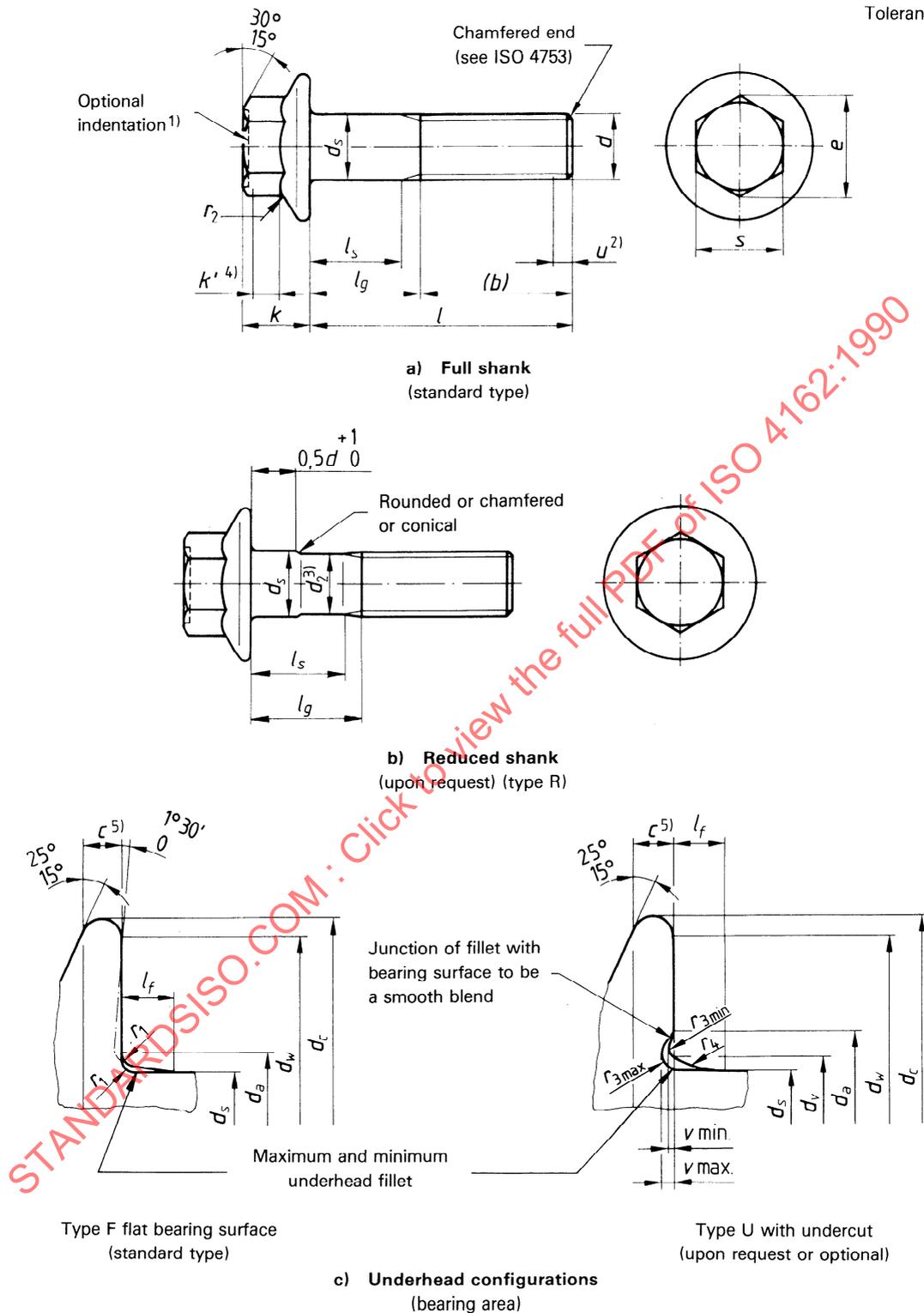
3 Dimensions

See figure 1 and table 1.

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

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Tolerances in millimetres



- 1) The top of the head shall be either full form or indented at the manufacturer's option and shall be either chamfered or rounded. The minimum diameter of the chamfer circle or start of rounding shall be the maximum width across flats minus 15 %. If the top of the head is indented, the periphery may be rounded.
- 2) Incomplete thread $u \leq 2 P$.
- 3) d_2 is approximately equal to the pitch diameter (rolling diameter).
- 4) k' is the minimum wrenching height; see the note to table 1.
- 5) c is measured at $d_{w \min}$.

Figure 1

Table 1

Dimensions in millimetres

Thread (<i>d</i>)		M5	M6	M8	M10	M12	(M14) ¹⁾	M16	
<i>p</i> ²⁾		0,8	1	1,25	1,5	1,75	2	2	
<i>b</i> ref.	3)	16	18	22	26	30	34	38	
	4)	—	—	28	32	36	40	44	
	5)	—	—	—	—	—	—	57	
<i>c</i>	min.	1	1,1	1,2	1,5	1,8	2,1	2,4	
<i>d_a</i>	Types F U	max.	5,7	6,8	9,2	11,2	13,7	15,7	17,7
			6,2	7,5	10	12,5	15,2	17,7	20,5
<i>d_c</i>	max.	11,4	13,6	17	20,8	24,7	28,6	32,8	
<i>d_s</i>	max.	5,00	6,00	8,00	10,00	12,00	14,00	16,00	
	min.	4,82	5,82	7,78	9,78	11,73	13,73	15,73	
<i>d_v</i>	max.	5,5	6,6	8,8	10,8	12,8	14,8	17,2	
<i>d_w</i>	min.	9,4	11,6	14,9	18,7	22,5	26,4	30,6	
<i>e</i>	min.	7,44	8,56	10,8	14,08	16,32	19,68	22,58	
<i>k</i>	max.	5,6	6,8	8,5	9,7	11,9	12,9	15,1	
<i>k'</i>	min.	2,3	2,9	3,8	4,3	5,4	5,6	6,7	
<i>l_f</i>	max.	1,4	1,6	2,1	2,1	2,1	2,1	3,2	
<i>r₁</i>	min.	0,2	0,25	0,4	0,4	0,6	0,6	0,6	
<i>r₂</i> ⁶⁾	max.	0,3	0,4	0,5	0,6	0,7	0,9	1	
		0,25	0,26	0,36	0,45	0,54	0,63	0,72	
<i>r₃</i>	min.	0,10	0,11	0,16	0,20	0,24	0,28	0,32	
		4	4,4	5,7	5,7	5,7	5,7	8,8	
<i>r₄</i>	ref.	4	4,4	5,7	5,7	5,7	5,7	8,8	
		7,00	8,00	10,00	13,00	15,00	18,00	21,00	
<i>s</i>	max.	7,00	8,00	10,00	13,00	15,00	18,00	21,00	
	min.	6,64	7,64	9,64	12,57	14,57	17,57	20,16	
<i>v</i>	max.	0,15	0,20	0,25	0,30	0,35	0,45	0,50	
	min.	0,05	0,05	0,10	0,15	0,15	0,20	0,25	

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Table 1 (concluded)

Dimensions in millimetres

Thread (d)			M5		M6		M8		M10		M12		(M14) ¹⁾		M16	
(7), 8)			<i>l_s and l_g</i> ⁹⁾													
nom.	min.	max.	<i>l_s</i> min.	<i>l_g</i> max.	<i>l_s</i> min.	<i>l_g</i> max.	<i>l_s</i> min.	<i>l_g</i> max.	<i>l_s</i> min.	<i>l_g</i> max.	<i>l_s</i> min.	<i>l_g</i> max.	<i>l_s</i> min.	<i>l_g</i> max.	<i>l_s</i> min.	<i>l_g</i> max.
10	9,71	10,29	—	—	—	—	—	—	—	—	—	—	—	—	—	—
12	11,65	12,35	—	—	—	—	—	—	—	—	—	—	—	—	—	—
16	15,65	16,35	—	—	—	—	—	—	—	—	—	—	—	—	—	—
20	19,58	20,42	—	—	—	—	—	—	—	—	—	—	—	—	—	—
25	24,58	25,42	5	9	—	—	—	—	—	—	—	—	—	—	—	—
30	29,58	30,42	10	14	7	12	—	—	—	—	—	—	—	—	—	—
35	34,5	35,5	15	19	12	17	6,75	13	—	—	—	—	—	—	—	—
40	39,5	40,5	20	24	17	22	11,75	18	6,5	14	—	—	—	—	—	—
45	44,5	45,5	25	29	22	27	16,75	23	11,5	19	6,25	15	—	—	—	—
50	49,5	50,5	30	34	27	32	21,75	28	16,5	24	11,25	20	6	16	—	—
55	54,4	55,6	—	—	32	37	26,75	33	21,5	29	16,25	25	11	21	7	17
60	59,4	60,6	—	—	37	42	31,75	38	26,5	34	21,25	30	16	26	12	22
65	64,4	65,6	—	—	—	—	36,75	43	31,5	39	26,25	35	21	31	17	27
70	69,4	70,6	—	—	—	—	41,75	48	36,5	44	31,25	40	26	36	22	32
80	79,4	80,6	—	—	—	—	51,75	58	46,5	54	41,25	50	36	46	32	42
90	89,3	90,7	—	—	—	—	—	—	56,5	64	51,25	60	46	56	42	52
100	99,3	100,7	—	—	—	—	—	—	66,5	74	61,25	70	56	66	52	62
110	109,3	110,7	—	—	—	—	—	—	—	—	71,25	80	66	76	62	72
120	119,3	120,7	—	—	—	—	—	—	—	—	81,25	90	76	86	72	82
130	129,2	130,8	—	—	—	—	—	—	—	—	—	—	80	90	76	86
140	139,2	140,8	—	—	—	—	—	—	—	—	—	—	90	100	86	96
150	149,2	150,8	—	—	—	—	—	—	—	—	—	—	—	—	96	106
160	159,2	160,8	—	—	—	—	—	—	—	—	—	—	—	—	106	116

- 1) The size in parentheses should be avoided if possible.
- 2) *P* – pitch of the thread.
- 3) For lengths $l_{nom} \leq 125$ mm.
- 4) For lengths $125 \text{ mm} < l_{nom} \leq 200$ mm.
- 5) For lengths $l_{nom} > 200$ mm.
- 6) Radius r_2 applies both at the corners and at the flats of the hexagon.
- 7) Screws with lengths shown above the continuous thick line are threaded to head.
- 8) Reduced shank type (type R) only below the dashed thick line.
- 9) l_g is the minimum grip length.

NOTE — If the product passes the gauging in annex A, the requirements for dimensions *e* and *k'* are satisfied.

4 Specifications and reference standards

See table 2.

Table 2

Material		Steel	Stainless steel
General requirements	International Standard	ISO 8992	
	Tolerance	6g	
Thread	International Standards	ISO 261, ISO 965-2	
	Class	8.8, 9.8, 10.9	A2-70
Mechanical properties	International Standards	ISO 898-1	ISO 3506
	Product grade	A 1)	
Tolerances	International Standard	ISO 4759-1	
	Finish	Black oxide (thermic or chemical)	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 and ISO 6157-3.	
Acceptability	For acceptance procedure, see ISO 3269.		
1) Dimensions <i>s</i> and <i>e</i> have tolerances to product grade B.			

5 Designation

Example for the designation of a hexagon flange bolt, small series, with thread M12, nominal length $l = 80$ mm, type F or U at the option of the manufacturer, and property class 8.8:

Hexagon flange bolt ISO 4162 - M12 × 80 - 8.8

Example for the designation of a hexagon flange bolt, small series, with thread M12, nominal length $l = 80$ mm, type F, and property class 8.8:

Hexagon flange bolt ISO 4162 - M12 × 80 - F - 8.8

If, in special cases, a hexagon flange bolt, small series, with reduced shank is required, the letter R shall be included in the designation:

Hexagon flange bolt ISO 4162 - M12 × 80 - R - 8.8

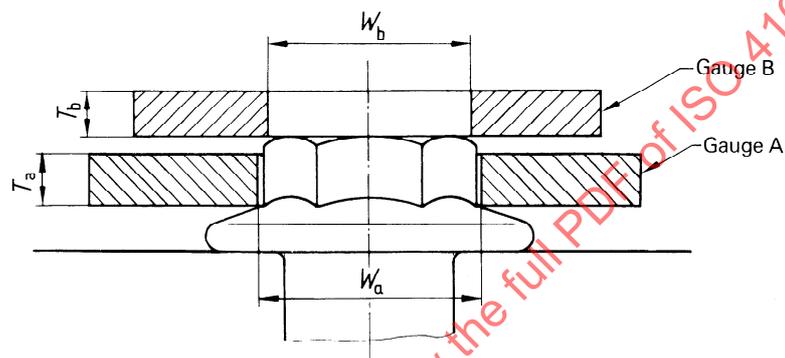
Annex A (normative)

Check on head and flange gauges

The head shall be gauged using two ring gauges, A and B, to demonstrate the coincidental acceptability of hexagon height, wrenching height, corner fill and width across corners.

Gauge A shall be placed over the head and shall seat on the flange.

Gauge B shall be placed on the top of the head normal to the bolt axis. The two gauges shall not be in contact.



NOTE $W_{a \text{ min}}$ = theoretical maximum width across corners
 $W_{b \text{ max}}$ = minimum width across corners minus 0,01 mm
 $T_{a \text{ max}}$ = minimum wrenching height k'

Figure A.1

Table A.1

Dimensions in millimetres

Thread (d)	Gauge A				Gauge B		
	W_a		T_a		W_b		T_b
	max.	min.	max.	min.	max.	min.	min.
M5	8,09	8,08	2,30	2,29	7,43	7,42	3
M6	9,25	9,24	2,90	2,89	8,55	8,54	3
M8	11,56	11,55	3,80	3,79	10,79	10,78	4
M10	15,02	15,01	4,30	4,29	14,07	14,06	4
M12	17,33	17,32	5,40	5,39	16,31	16,30	5
M14	20,79	20,78	5,60	5,59	19,67	19,66	5
M16	24,26	24,25	6,70	6,69	22,57	22,56	6