
**Hexagon bolts with flange — Small
series — Product grade A with driving
feature of product grade B**

*Vis à tête hexagonale à embase cylindro-tronconique — Série étroite —
Grade A avec entraînement de grade B*



Reference number
ISO 4162:2012(E)

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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

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.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 4162 was prepared by Technical Committee ISO/TC 2, *Fasteners*, Subcommittee SC 11, *Fasteners with metric external thread*.

This second edition cancels and replaces the first edition (ISO 4162:1990), 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 bolts with flange — Small series — Product grade A with driving feature of product grade B

1 Scope

This International Standard specifies the characteristics of hexagon bolts with flanges, small series, of product grade A (except the driving feature which is according to product grade B), 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 can be selected from existing International Standards, for example ISO 261, ISO 888, ISO 898-1, ISO 965-2 and ISO 3506-1.

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

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 965-2, *ISO general purpose metric screw threads — Tolerances — Part 2: Limits of sizes for general purpose external and internal screw threads — Medium quality*

ISO 3269, *Fasteners — Acceptance inspection*

ISO 3506-1, *Mechanical properties of corrosion-resistant stainless steel fasteners — Part 1: Bolts, screws and studs*

ISO 4042, *Fasteners — Electroplated coatings*

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

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

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

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

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

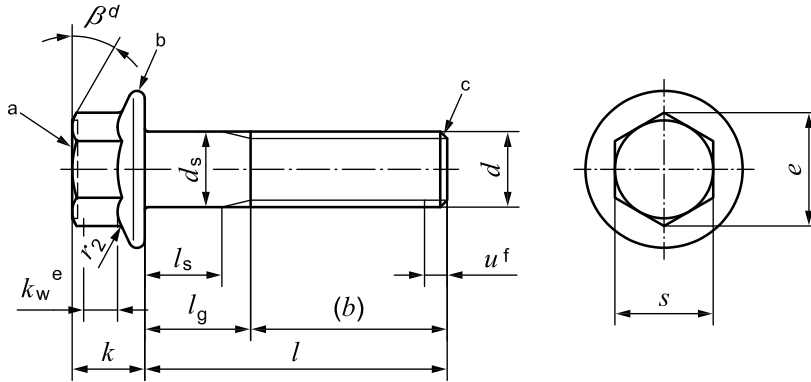
ISO 10683, *Fasteners — Non-electrolytically applied zinc flake coatings*

ISO 16048, *Passivation of corrosion-resistant stainless-steel fasteners*

3 Dimensions

See Figures 1 to 3 and Table 1.

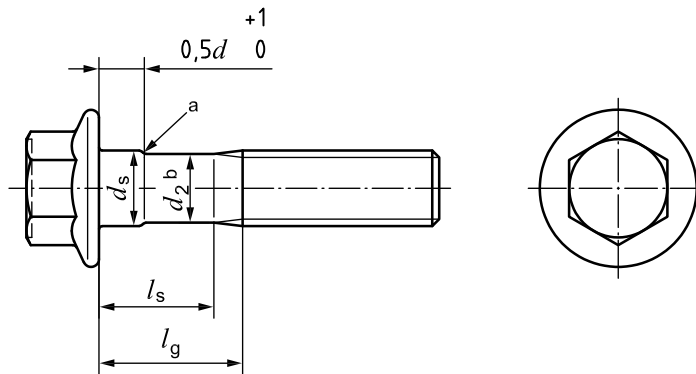
Symbols and descriptions of dimensions are specified in ISO 225.



- a Optional indentation. The top of the head shall be either full form or indented at the manufacturer's discretion 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.
- b Contour of the edge at the discretion of the manufacturer.
- c Chamfered end (as specified in ISO 4753).
- d $\beta = 15^\circ$ to 30° .
- e k_w is the wrenching height (see Note to Table 1)
- f Incomplete thread $u \leq 2P$.

Figure 1 — Hexagon bolt with flange — Full shank — Standard type

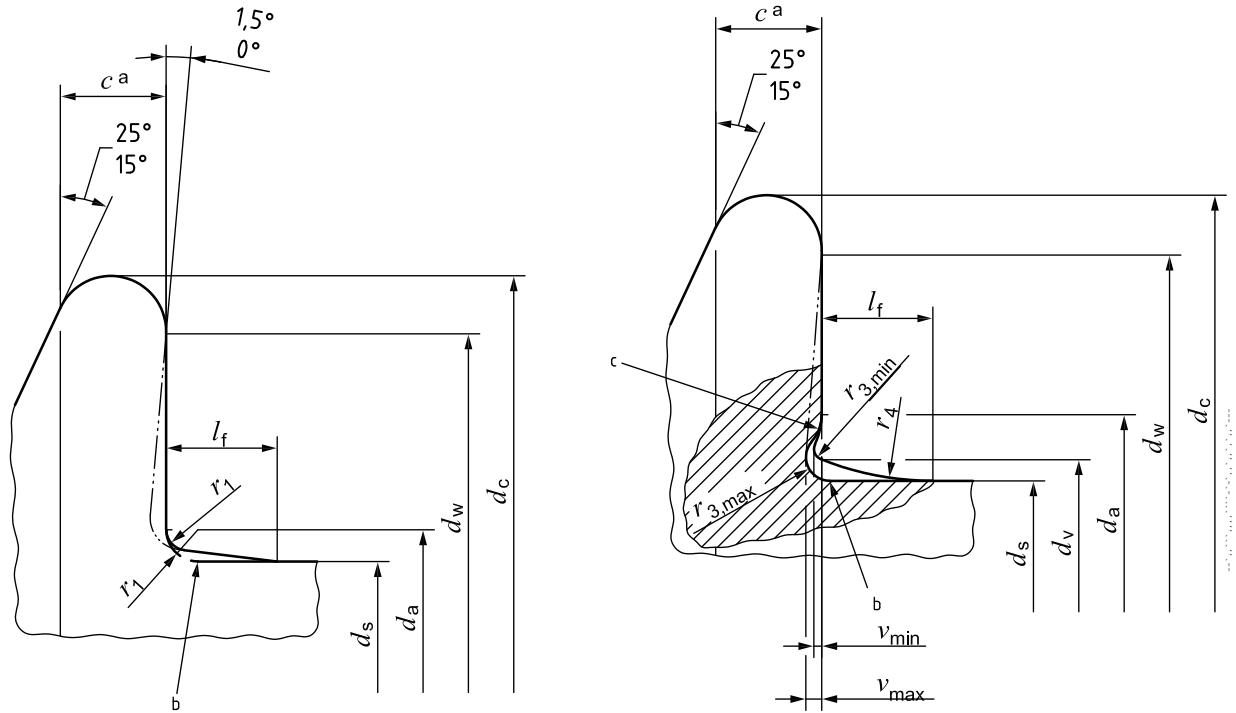
Tolerances in millimetres



NOTE For other dimensions, see Figure 1.

- a Rounded or chamfered or conical.
- b d_2 is approximately equal to the pitch diameter (rolling diameter).

Figure 2 — Hexagon bolt with flange — Reduced shank — Type R (upon request)



a) Type F flat bearing surface — Standard type

b) Type U with undercut (upon request or optional)

- a c is measured at $d_{w,min}$.
- b Maximum and minimum underhead fillet.
- c Junction of fillet with bearing surface to be a smooth blend.

Figure 3— Hexagon bolt with flange — Underhead configurations (bearing area)

Table 1 — Dimensions

Dimensions in millimetres

Thread		M5	M6	M8	M10	M12	(M14) ^a	M16
p^b		0,8	1	1,25	1,5	1,75	2	2
b ref.	c	16	18	22	26	30	34	38
	d	—	—	28	32	36	40	44
	e	—	—	—	—	—	—	57
c	min.	1,0	1,1	1,2	1,5	1,8	2,1	2,4
d_a	Types $\frac{F}{U}$ max.	5,7	6,8	9,2	11,2	13,7	15,7	17,7
		6,2	7,5	10,0	12,5	15,2	17,7	20,5
d_c	max.	11,4	13,6	17,0	20,8	24,7	28,6	32,8
d_s	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
d_v	max.	5,5	6,6	8,8	10,8	12,8	14,8	17,2
d_w	min.	9,4	11,6	14,9	18,7	22,5	26,4	30,6
e	min.	7,44	8,56	10,80	14,08	16,32	19,68	22,58
k	max.	5,6	6,8	8,5	9,7	11,9	12,9	15,1
k_w	min.	2,3	2,9	3,8	4,3	5,4	5,6	6,7
l_f	max.	1,4	1,6	2,1	2,1	2,1	2,1	3,2
r_1	min.	0,2	0,25	0,4	0,4	0,6	0,6	0,6
r_2^f	max.	0,3	0,4	0,5	0,6	0,7	0,9	1,0
r_3	max.	0,25	0,26	0,36	0,45	0,54	0,63	0,72
	min.	0,10	0,11	0,16	0,20	0,24	0,28	0,32
r_4	ref.	4,0	4,4	5,7	5,7	5,7	5,7	8,8
s	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
v	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

Table 1 (continued)

Dimensions in millimetres

Thread			M5		M6		M8		M10		M12		(M14) ^a		M16	
<i>g,h</i>			<i>l_s and l_gⁱ</i>													
			<i>l_s</i>	<i>l_g</i>	<i>l_s</i>	<i>l_g</i>	<i>l_s</i>	<i>l_g</i>	<i>l_s</i>	<i>l_g</i>	<i>l_s</i>	<i>l_g</i>	<i>l_s</i>	<i>l_g</i>	<i>l_s</i>	<i>l_g</i>
nom.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	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

NOTE If the product passes the gauging in Annex A, the requirements for dimensions *e* and *k_w* are satisfied.

- a The size in parentheses should be avoided, if possible.
- b *P* is the pitch of the thread.
- c For $l_{nom} \leq 125$ mm.
- d For $125 \text{ mm} < l_{nom} \leq 200$ mm.
- e For $l_{nom} > 200$ mm.
- f Radius r_2 is applicable both at the corners and at the flats of the hexagon.
- g Screws with non-specified dimensions l_s and l_g , given as “—”, shown above the solid, bold, stepped line, are threaded to head.
- h Reduced shank type (type R) only below the dashed line.
- i $l_{g,max} = l_{nom} - b$
 $l_{s,min} = l_{g,max} - 5P$ (*P* is the pitch of the coarse thread, specified in ISO 261)

4 Specifications and reference standards

See Table 2.

Table 2 — Specifications and reference standards

Material		Steel	Stainless steel
General requirements	International Standard	ISO 8992	
	Tolerance class	6g	
Thread	International Standard	ISO 261, ISO 965-2	
	Property class	8.8, 9.8, 10.9	A2-70
Mechanical properties	International Standard	ISO 898-1	ISO 3506-1
	Product grade	A, except dimensions <i>e</i> and <i>s</i> : B	
Tolerances	International Standard	ISO 4759-1	
	Finish — Coating	<p>As processed</p> <p>Requirements for electroplating are specified in ISO 4042.</p> <p>Requirements for non-electrolytically applied zinc flake coatings are specified in ISO 10683.</p> <p>Additional requirements or other finishes or coatings shall be agreed between the supplier and the purchaser.</p>	<p>As processed</p> <p>A method for passivation is specified in ISO 16048.</p>
Surface integrity		Limits for surface discontinuities are specified in ISO 6157-1 and ISO 6157-3.	
Acceptability		Acceptance inspection is specified in ISO 3269.	

5 Designation

EXAMPLE 1 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, is designated as follows:

Hexagon flange bolt ISO 4162 - M12 × 80 - 8.8

EXAMPLE 2 A hexagon flange bolt, small series, with thread M12, nominal length $l = 80$ mm, type F, and property class 8.8, is designated as follows:

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

EXAMPLE 3 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)

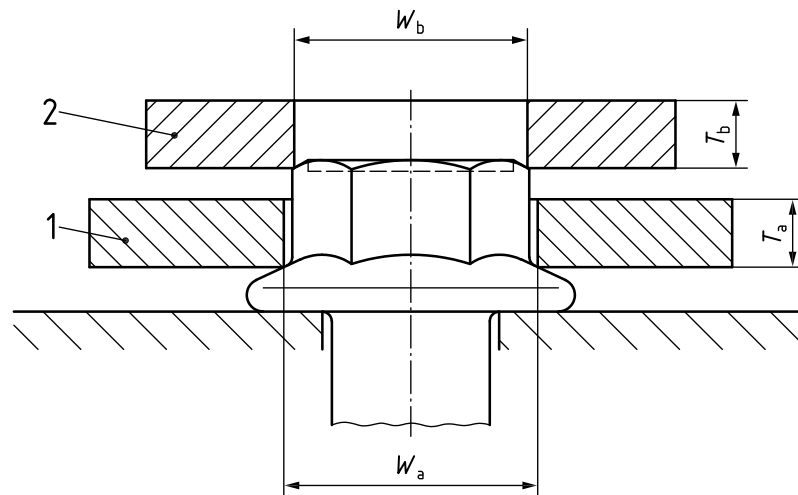
Gauging of hexagon flange heads

See Figure A.1 and Table A.1.

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 sit 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.



Key

1 gauge A

2 gauge B

$$W_{a,\min} = e_{\text{theoretical}}$$

$$W_{b,\max} = e_{\min} - 0,01 \text{ mm}$$

$$T_{a,\max} = k_{w,\min}$$

Figure A.1

Table A.1

Dimensions in millimetres

Thread	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	

Bibliography

- [1] ISO 888, *Fasteners — Bolts, screws and studs — Nominal lengths and thread lengths*
- [2] ISO 4014, *Hexagon head bolts — Product grades A and B*
- [3] ISO 4015, *Hexagon head bolts — Product grade B — Reduced shank (shank diameter approximately equal to pitch diameter)*
- [4] ISO 4016, *Hexagon head bolts — Product grade C*
- [5] ISO 4017, *Hexagon head screws — Product grades A and B*
- [6] ISO 4018, *Hexagon head screws — Product grade C*
- [7] ISO 4032, *Hexagon nuts, style 1 — Product grades A and B*
- [8] ISO 4033, *Hexagon nuts, style 2 — Product grades A and B*
- [9] ISO 4034, *Hexagon nuts — Product grade C*
- [10] ISO 4035, *Hexagon thin nuts (chamfered) — Product grades A and B*
- [11] ISO 4036, *Hexagon thin nuts (unchamfered) — Product grade B*
- [12] ISO 4161, *Hexagon nuts with flange, style 2 — Coarse thread*
- [13] ISO 7040, *Prevailing torque type hexagon nuts (with non-metallic insert), style 1 — Property classes 5, 8 and 10*
- [14] ISO 7041, *Prevailing torque type hexagon nuts (with non-metallic insert), style 2 — Property classes 9 and 12*
- [15] ISO 7042, *Prevailing torque type all-metal hexagon nuts, style 2 — Property classes 5, 8, 10 and 12*
- [16] ISO 7043, *Prevailing torque type hexagon nuts with flange (with non-metallic insert) — Product grades A and B*
- [17] ISO 7044, *Prevailing torque type all-metal hexagon nuts with flange, style 2 — Product grades A and B*
- [18] ISO 7719, *Prevailing torque type all-metal hexagon nuts, style 1 — Property classes 5, 8 and 10*
- [19] ISO 7720, *Prevailing torque type all-metal hexagon nuts, style 2 — Property class 9*
- [20] ISO 8673, *Hexagon nuts, style 1, with metric fine pitch thread — Product grades A and B*
- [21] ISO 8674, *Hexagon nuts, style 2, with metric fine pitch thread — Product grades A and B*
- [22] ISO 8675, *Hexagon thin nuts (chamfered) with metric fine pitch thread — Product grades A and B*
- [23] ISO 8676, *Hexagon head screws with metric fine pitch thread — Product grades A and B*
- [24] ISO 8765, *Hexagon head bolts with metric fine pitch thread — Product grades A and B*
- [25] ISO 10511, *Prevailing torque type hexagon thin nuts (with non-metallic insert)*

- [26] ISO 10512, *Prevailing torque type hexagon nuts (with non-metallic insert), style 1, with metric fine pitch thread — Property classes 6, 8 and 10*
- [27] ISO 10513, *Prevailing torque type all-metal hexagon nuts, style 2, with metric fine pitch thread — Property classes 8, 10 and 12*
- [28] ISO 10663, *Hexagon nuts with flange, style 2 — Fine pitch thread*
- [29] ISO 12125, *Prevailing torque type hexagon nuts with flange (with non-metallic insert) with metric fine pitch thread, style 2 — Product grades A and B*
- [30] ISO 12126, *Prevailing torque type all-metal hexagon nuts with flange with metric fine pitch thread, style 2 — Product grades A and B*
- [31] ISO 15071, *Hexagon bolts with flange — Small series — Product grade A*
- [32] ISO 15072, *Hexagon bolts with flange with metric fine pitch thread — Small series — Product grade A*
- [33] ISO 21670, *Hexagon weld nuts with flange*

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