
International Standard



4775

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

Hexagon nuts for high-strength structural bolting with large width across flats — Product grade B — Property classes 8 and 10

Écrous hexagonaux à serrage contrôlé pour constructions métalliques, à surplats série large — Grade B — Classes de qualité 8 et 10

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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.

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 4775 was prepared by Technical Committee ISO/TC 2, *Fasteners*.

Hexagon nuts for high-strength structural bolting with large width across flats — Product grade B — Property classes 8 and 10

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 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;¹⁾
- e) hexagon flanged screws;¹⁾
- f) hexagon flanged nuts (ISO 4161);
- g) structural bolting (ISO 4775 and ISO 7411 to ISO 7417).

1 Scope and field of application

This International Standard gives specifications for large series hexagon, high-strength structural nuts with metric dimensions in property classes 8 and 10 and thread sizes from M12 up to and including M36 for use with high-strength structural bolts of property classes 8.8 and 10.9.

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

Nuts to this International Standard when matched with the appropriate bolt to either ISO 7411 or ISO 7412 have been designed to provide an assembly with a high level of assurance against failure by thread stripping on overtightening. This applies to all property classes and finishes, except hot-dip galvanized nuts which have threads of tolerance class 6H after galvanizing and which may be adopted by agreement between the purchaser and the supplier. These latter nuts must be matched with hot-dip galvanized bolts 8.8S U²⁾ or 10.9S U²⁾, and the resulting assembly may show failure by thread stripping on overtightening.

NOTE — Attention is drawn to the importance of ensuring that the nuts are correctly used if satisfactory results are to be obtained. For recommendations concerning proper application, reference should be made to an appropriate bolting code.

2 References

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

ISO 898, *Mechanical properties of fasteners.*

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

ISO 1461, *Metallic coatings — Hot-dip galvanized coatings on fabricated ferrous products — Requirements.*

ISO 3269, *Fasteners — Acceptance inspection.*

ISO 4759/1, *Tolerances for fasteners — Part 1: Bolts, screws and nuts, with thread diameters $\geq 1,6$ and ≤ 150 mm and product grades A, B and C.*

1) These will form the subject of a future International Standard.

2) See clause 8.

3 Dimensions

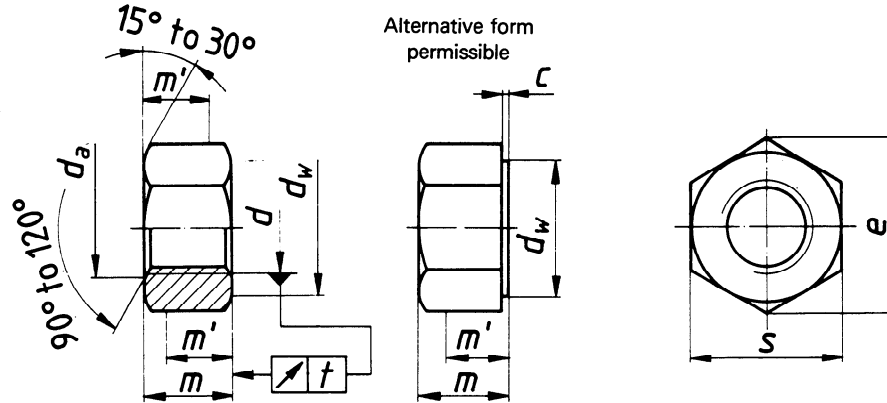


Table 1 – General dimensions¹⁾

Dimensions in millimetres

Thread size, <i>d</i>		M12 ²⁾	M16	M20	(M22) ³⁾	M24	(M27) ³⁾	M30	M36
<i>P</i> ⁴⁾		1,75	2	2,5	2,5	3	3	3,5	4
<i>d_a</i>	max.	13	17,3	21,6	23,8	25,9	28,2	32,4	38,9
	min.	12	16	20	22	24	27	30	36
<i>d_w</i>	max.	5)	5)	5)	5)	5)	5)	5)	5)
	min.	19,2	24,9	31,4	33,3	38,0	42,8	46,5	55,9
<i>e</i>	min.	22,78	29,56	37,29	39,55	45,20	50,85	55,37	66,44
<i>m</i>	max.	12,3	17,1	20,7	23,6	24,2	27,6	30,7	36,6
	min.	11,9	16,4	19,4	22,3	22,9	26,3	29,1	35,0
<i>m'</i>	min.	9,5	13,1	15,5	17,8	18,3	21,0	23,3	28,0
<i>c</i>	max.	0,8	0,8	0,8	0,8	0,8	0,8	0,8	0,8
	min.	0,4	0,4	0,4	0,4	0,4	0,4	0,4	0,4
<i>s</i>	max.	21	27	34	36	41	46	50	60
	min.	20,16	26,16	33	35	40	45	49	58,8
<i>t</i>		0,38	0,47	0,58	0,63	0,72	0,80	0,87	1,05

1) For hot-dip galvanized nuts the above dimensions apply before galvanizing.

2) Non-preferred for technical reasons.

3) Indicates second choice diameter.

4) *P* = pitch of thread.

5) $d_{w \max} = s_{\text{actual}}$.

4 Specifications and reference standards

Table 2 — Specifications and reference standards

Material		Steel
Thread	Tolerance	6H or 6AX ¹⁾ (see also annex A)
	International Standards	ISO 261, ISO 965
Mechanical properties	Class	8 ²⁾ or 10 ^{2), 3)}
	International Standard	ISO 898/2
Surface finish	normal	Black oxide ⁴⁾
	optional ⁵⁾	Zinc electroplated ³⁾ Cadmium electroplated ³⁾ Hot-dip galvanized to ISO 1461
Tolerances	Product grade	B except nut height <i>m</i> and <i>c</i>
	International Standard	ISO 4759/1 ⁶⁾
Acceptability		For acceptance procedure, see ISO 3269.
Associated bolts		ISO 7411 or ISO 7412
Associated washers		ISO 7415 or ISO 7416

1) The thread tolerances for oversize tapped hot-dip galvanized nuts to ISO 1461 have been temporarily designated 6AX; the thread limits are included in annex A on a provisional basis, pending the adoption of this thread class, when it is anticipated it will be included in ISO 965. Hot-dip galvanized nuts may also be supplied by agreement between the user and the manufacturer having, after hot-dip galvanizing, tolerance class 6H threads. These nuts are intended only for assembly with hot-dip galvanized bolts 8.8S U or 10.9S U in accordance with ISO 7411 or ISO 7412.

2) For proof load values, see clause 6.

3) Precautions to avoid hydrogen embrittlement may be necessary for property class 10. Reference should be made to the future International Standard dealing with electroplating of threaded components.

4) Black oxide means the normal finish resulting from manufacture with a light coating of oil.

5) Other coatings may be negotiated between the purchaser and the manufacturer provided they do not impair the mechanical properties.

6) Except tolerance on perpendicularity of bearing face.

5 Lubricant coating for zinc-coated fasteners

For fasteners with zinc electroplated or hot-dip galvanized coatings the manufacturer shall apply a suitable lubricant

coating on the nuts or on the mating bolts to ensure that seizure shall not take place in assembly. Information on a suitable test for the effectiveness of the lubricant coating is given in annex B.

6 Proof load values

Table 3 — Proof load values

Thread size <i>d</i>	Nominal stress area of standard test mandrel <i>A_s</i> mm ²	Property class		
		8		10
		tolerance class 6H	hot-dip galvanized tolerance class 6AX	
		Proof load (<i>A_s</i> × <i>S_p</i>), N		
M12	84,3	90 600	98 200	104 900
M16	157	168 900	182 900	195 500
M20	245	263 400	285 400	305 000
(M22)	303	325 700	353 000	377 200
M24	353	379 500	411 200	439 500
(M27)	459	493 400	534 700	571 500
M30	561	603 100	653 600	698 400
M36	817	878 300	951 800	1 017 200

NOTES

- 1 All other mechanical property requirements as ISO 898/2.
- 2 For methods of test, see ISO 898/2.
- 3 Based on the following proof load stresses:
 - for nuts of property class 8, tolerance class 6H: 1 075 N/mm²;
 - for nuts of property class 8, hot-dip galvanized tolerance class 6AX: 1 165 N/mm²;
 - for nuts of property class 10: 1 245 N/mm².
- 4 Where nuts must be accepted on the basis of hardness values, the only appropriate limits are:
 - 8 tolerance class 6H nuts: ISO 898/2, property class 8;
 - all 10 nuts: ISO 898/2, property class 10;
 - 8 tolerance class 6AX hot-dip galvanized nuts: 260 — 353 HV (24-36 HRC).

7 Designation

Example for the designation of a high-strength structural hexagon nut with large width across flats, of thread size *d* = M20 and property class 8:

Hexagon nut ISO 4775 - M20 - 8

NOTE — If surface finishes other than normal are used, the specified surface shall be added to the designation.

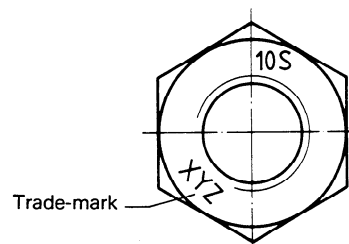
8 Marking

High-strength structural nuts shall be marked in the following manner:

- a) property class marking and the letter S to identify the nut as a large series hexagon structural nut;
- b) a mark to identify the manufacturer.

The marking shall be indented on either the top or bottom face of chamfered nuts and shall be either indented or embossed on the non-bearing face of washer faced nuts.

Example of marking (property class 10)



Annex A

Thread dimensions for hot-dip galvanized nuts of tolerance class 6AX

This annex gives information on screw thread limits for hot-dip galvanized nuts with a thread class 6AX. The limits given in table 4 apply after the hot-dip galvanized coating has been applied.

Table 4 — Screw thread limits for tolerance class 6AX

Dimensions in millimetres

Thread size <i>d</i>	Major diameter		Pitch diameter		Minor diameter	
	max.	min.	max.	min.	max.	min.
M12	12,676	12,476	11,413	11,213	10,791	10,455
M16	16,756	16,544	15,313	15,101	14,610	14,235
M20	20,804	20,580	19,000	18,776	18,144	17,694
(M22)	22,804	22,580	21,000	20,776	20,144	19,694
M24	24,931	24,666	22,766	22,501	21,702	21,202
(M27)	27,981	27,716	25,816	25,551	24,752	24,252
M30	31,083	30,803	28,557	28,277	27,321	26,761
M36	37,189	36,889	34,302	34,002	32,870	32,270

NOTES

- 1 Nuts are tapped oversize to the above dimensions after galvanizing.
- 2 Based on an allowance of:
 - 350 µm for M12;
 - 400 µm for M16, M20 and M22;
 - 450 µm for M24;
 - 500 µm for M27;
 - 550 µm for M30;
 - 600 µm for M36.

Annex B

Anti-seizing test for zinc electroplated and hot-dip galvanized fasteners

A method for testing the effectiveness of the lubricant coating applied to zinc electroplated and hot-dip galvanized assemblies is as follows:

a) The test shall be carried out on bolts and nuts in the condition as supplied by the manufacturer and shall be in accordance with, and include a lubricant coating as required by clause 5. There shall be no other lubricant applied for the purpose of this test. In cases where the two foregoing criteria cannot be met, then the anti-seizing test shall be by agreement between the manufacturer and the user, but a lubricant coating must still be applied. If the test is performed by the user it shall be carried out immediately after receipt of the bolts and nuts from the manufacturer.

b) The bolt with nut and washer selected for testing shall be placed with the washer directly under the nut in a steel joint with total thickness so that, where thread length permits, there are not less than six full bolt threads located between the bearing surface of the bolt head and nut. The diameter of the holes in the assembly shall be 1 to 2 mm larger than that of the bolt.

c) The nut shall be initially tightened to produce a load in the bolt not less than 10 % of the specified proof load. After this initial tightening, the bolt and the nut position shall be marked to provide the starting point for the rotational movement to be measured. During nut rotation the bolt head shall be restrained from turning, and the final tensioning shall be completed without stopping the motion of the nut. The nut shall be rotated in accordance with the requirements of table 5 from the initial tightening position without fracture of the bolt, or stripping of the bolt or nut thread.

This test may be replaced with an alternative test by agreement between the manufacturer and the user.

Table 5 — Nut rotation requirements

Bolt length (nominal)	Nut rotation (minimum)
$l < 2d$	180°
$2d < l < 3d$	240°
$3d < l < 4d$	300°
$4d < l < 8d$	360°
$l > 8d$	420°