International Standard 7414

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

Hexagon nuts for structural bolting with large width across flats, style 1 — Product grade B — Property class 10

Écrous hexagonaux pour constructions métalliques à surplats série large, style 1 — Grade B — Classe de qualité 10

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Foreword

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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 7414 was prepared by Technical Committee ISO/TC 2, *Fasteners*.

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Hexagon nuts for structural bolting with large width across flats, style 1 — Product grade B — Property class 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 nuts, style 1, property class 10, with metric dimensions and thread sizes from M12 up to and including M36, for use with bolts of property class 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.

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 appropriate bolting codes.

These nuts if matched with the appropriate bolts to ISO 7412 may show failure by thread stripping when overtightened, particularly if hot-dip galvanized.

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 ≥ 1,6 and ≤ 150 mm and product grades A, B and C.*

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

3 Dimensions

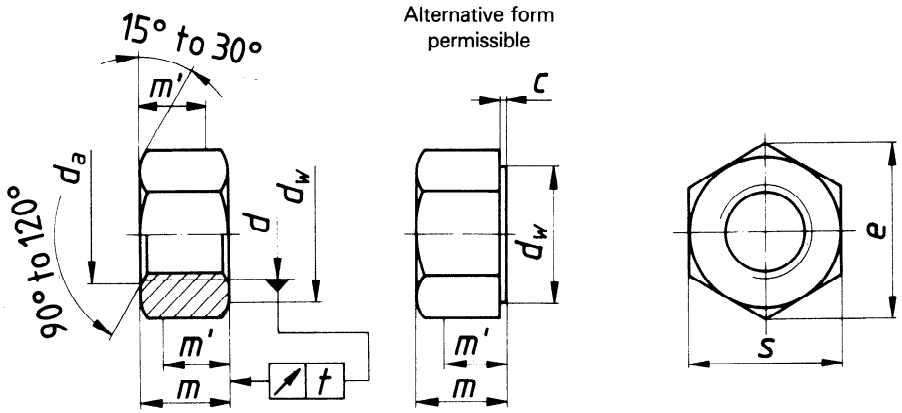


Table 1 — General dimensions [1]

Dimensions in millimetres

Thread size, d		M12[2]	M16	M20	(M22)[3]	M24	(M27)[3]	M30	M36
P[4]		1,75	2	2,5	2,5	3	3	3,5	4
d_a	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
d_w	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
e	min.	22,78	29,56	37,29	39,55	45,20	50,85	55,37	66,44
m	max.	10,8	14,8	18	19,4	21,5	23,8	25,6	31
	min.	10,37	14,1	16,9	18,1	20,2	22,5	24,3	29,4
m'	min.	8,3	11,28	13,52	14,48	16,16	18	19,44	23,52
c	max.	0,6	0,8	0,8	0,8	0,8	0,8	0,8	0,8
	min.	0,15	0,2	0,2	0,2	0,2	0,2	0,2	0,2
s	max.	21	27	34	36	41	46	50	60
	min.	20,16	26,16	33	35	40	45	49	58,8
t		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) $d_{w\,max} = s_{actual}$

4 Specifications and reference standards

Table 2 — Specifications and reference standards

Material		Steel
Thread	Tolerance	6H or 6AZ[1] (see also annex A)
	International Standard	ISO 261, ISO 965
Mechanical properties	Class	10[2]
	International Standard	ISO 898/2
Surface finish	normal	Black oxide[3]
	optional[4]	Zinc electroplated[5] Cadmium electroplated[5] Hot-dip galvanized to ISO 1461
Tolerances	Product grade	B
	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 with reduced oversize tapping allowances have been temporarily designated 6AZ and the thread limits are included 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 galvanizing, tolerance class 6H threads.

2) For proof load values, see clause 6.

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

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

5) 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.

6) Except tolerance of perpendicularity of bearing surface.

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 d	Nominal stress area of standard test mandrel A_s mm²	All nuts, tolerance classes 6H or 6AZ
		Proof load, N
M12	84,3	97 800
M16	157	182 100
M20	245	284 200
(M22)	303	351 500
M24	353	409 500
(M27)	459	532 400
M30	561	650 800
M36	817	947 700

NOTES

1 All other mechanical property requirements as ISO 898/2.

2 For methods of test, see ISO 898/2.

3 Based on the proof load stress of 1160 N/mm².

7 Designation

Example for the designation of a large series hexagon nut with a thread size d = M20 and property class 10:

Hexagon nut ISO 7414 - M20 - 10

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

8 Marking

Large series nuts shall be marked in the following manner:

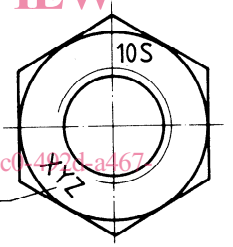
a) strength grade marking in accordance with ISO 898/2, i.e. 10;

b) the letter S to denote a nut with a large series hexagon;

c) 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

Deviations for internal threads of tolerance class 6AZ

This annex gives information on screw thread limits for a reduced size tapping allowance for hot-dip galvanized nuts, thread class 6AZ. The limits given in table 4 apply after the hot-dip galvanized coating has been applied.

The deviation AZ, in micrometres, is based on the following formula:

$$EI_{AZ} = +(300 + 20P)$$

Table 4 — Screw thread limits for tolerance class 6AZ

Dimensions in millimetres

Thread size d	Length of thread engagement		Major diameter	Pitch diameter		Minor diameter	
	over	up to and including	min.[1]	max.	min.	max.	min.
M12	6	18	12,335	11,398	11,198	10,776	10,441
M16	8	24	16,340	15,253	15,041	14,550	14,175
M20	10	30	20,350	18,950	18,726	18,094	17,644
(M22)	10	30	22,350	20,950	20,726	20,094	19,644
M24	12	36	24,360	22,676	22,411	21,612	21,112
(M27)	12	36	27,360	25,676	25,411	24,612	24,112
M30	15	45	30,370	28,377	28,097	27,141	26,581
M36	18	53	36,380	34,082	33,782	32,650	32,050

1) Refers to the imaginary coaxial cylinder through the points where the requirement with regard to straightness of flank ceases.

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)
$l \leqslant 2d$	180°
$2d < l \leqslant 3d$	240°
$3d < l \leqslant 4d$	300°
$4d < l \leqslant 8d$	360°
$l > 8d$	420°