
**Aerospace — Nuts, hexagonal, slotted
(castellated), for pulleys, in alloy steel and
cadmium plated or in corrosion-resistant
steel and passivated — Dimensions and
masses**

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*Aéronautique et espace — Écrous hexagonaux à créneaux (dégagés), pour
poulies, en acier allié, cadmiés, ou en acier résistant à la corrosion,
passivés — Dimensions et masses*

ISO 9216:2002

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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 3.

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 International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 9216 was prepared by Technical Committee ISO/TC 20, *Aircraft and space vehicles*.

Annex A forms a normative part of this International Standard.

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Aerospace — Nuts, hexagonal, slotted (castellated), for pulleys, in alloy steel and cadmium plated or in corrosion-resistant steel and passivated — Dimensions and masses

1 Scope

This International Standard specifies the characteristics of hexagonal, slotted/castellated nuts, of reduced height and reduced width across flats

- in alloy steel and cadmium-plated, classification 900 MPa¹⁾/235 °C²⁾; or
- in corrosion-resistant steel and passivated, classification 900 MPa¹⁾/450 °C²⁾.

This International Standard is applicable to nuts used with ISO 9219 bolts, ISO 9217 and ISO 9218 washers and ISO 1234 split pins in the assembly of ISO 7939 pulleys.

It is also applicable to nuts used in the assembly of airframe rolling bearings or spherical bearings.

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2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 1234:1997, *Split pins*

ISO 5855-2:1999, *Aerospace — MJ threads — Part 2: Limit dimensions for bolts and nuts*

ISO 7939:1988, *Aircraft — Non-metallic pulleys with ball bearings for control cables — Dimensions and loads*

ISO 8075:1985, *Aerospace — Surface treatment of hardenable stainless steel parts*

ISO 8788:2000, *Aerospace — Nuts, metric — Tolerances of form and position*

ISO 9139:1998, *Aerospace — Nuts, plain or slotted (castellated) — Procurement specification*

ISO 9217:2002, *Aerospace — Washers, chamfered, with counterbore, for pulleys, in alloy steel and cadmium plated or in corrosion-resistant steel and passivated — Dimensions and masses*

ISO 9218:2002, *Aerospace — Washers, flat, for pulleys, in alloy steel and cadmium plated or in corrosion-resistant steel and passivated — Dimensions and masses*

1) Minimum tensile strength of the material at ambient temperature.

2) Maximum temperature, determined by the surface treatment, that the bolt can withstand without continuous change in its original characteristics after return to ambient temperature.

ISO 9216:2002(E)

ISO 9219:2002, *Aerospace — Bolts, thin hexagonal head, for pulleys, close tolerance shank, short thread, in alloy steel and cadmium plated or in titanium alloy and MoS₂ lubricated or in corrosion-resistant steel and passivated — Dimensions and masses*

ISO 13715:2000, *Technical drawings — Edges of undefined shape — Vocabulary and indications*

EN 2133:1997³⁾, *Aerospace series — Cadmium plating of steels with specified tensile strength $\leq 1\,450$ MPa, copper, copper alloys and nickel alloys*

prEN 2136:—⁴⁾, *Aerospace series — Steel FE-PM42 — $900\text{ MPa} \leq R_m \leq 1\,100\text{ MPa}$ — Bars — $D_e \leq 100\text{ mm}$*

prEN 2205:—⁵⁾, *Aerospace series — Steel FE-PL43S — $900\text{ MPa} \leq R_m \leq 1\,100\text{ MPa}$ — Bars — $D_e \leq 40\text{ mm}$*

prEN 2438:—⁵⁾, *Aerospace series — Steel FE-PL62 — $900\text{ MPa} \leq R_m \leq 1\,100\text{ MPa}$ — Bars — $D_e \leq 40\text{ mm}$*

prEN 2444:—⁶⁾, *Aerospace series — Steel FE-PL711 — $900\text{ MPa} \leq R_m \leq 1\,100\text{ MPa}$ — Bars and wires — $D_e \leq 45\text{ mm}$*

AMS-QQ-P-416A:2002, *Plating, cadmium (electrodeposited)*

3 Requirements

3.1 Configuration, dimensions and masses

Configuration, dimensions and masses shall be in accordance with Figure 1 and Table 1. Dimensions are expressed in millimetres and apply after surface treatment.

Surface roughness values apply before surface treatment and do not apply to threads, the surface texture of which shall be as achieved by normal methods of manufacture.

Form and position tolerances shall be in accordance with ISO 8788.

3) AECMA Standard.

4) AECMA Standard. It has been declassified and will be replaced, at publication, by prEN 3490, *Aerospace series — Steel FE-PM3901 (X15CrNi17-3) — Air melted — Hardened and tempered — $900\text{ MPa} \leq R_m \leq 1\,100\text{ MPa}$ — Bar for machining $D_e \leq 200\text{ mm}$.*

5) AECMA Standard to be published as a European Standard (CEN).

6) AECMA Standard. It has been declassified and will be replaced, at publication, by prEN 3513, *Aerospace series — Steel FE-PL711 — Hardened and tempered — $900\text{ MPa} \leq R_m \leq 1\,100\text{ MPa}$ — Bar and wire — $D_e \leq 45\text{ mm}$.*

Table 1 — Dimensions and masses

Dimensions in millimetres

Diameter code	Thread ^a	<i>E</i> min.	<i>F</i>		<i>G</i> ^b h14	<i>H</i> ± 0,25	<i>J</i> ± 0,25	<i>K</i> ^c H15
			nom.	tol. class				
050	MJ5 × 0,8 – 4H6H	8,7	8	h12	2,4	4,8	—	5
060	MJ6 × 1 – 4H6H	10,9	10	h13	3,0	5,4	9	6
080	MJ8 × 1 – 4H6H	13,2	12		3,2	6,0	11	—
100	MJ10 × 1,25 – 4H6H	15,5	14		4,0	7,6	12,5	—
120	MJ12 × 1,25 – 4H6H	18,9	17		4,8	8,4	14,5	—
140	MJ14 × 1,5 – 4H6H	21,1	19		5,6	10	17	—
160	MJ16 × 1,5 – 4H6H	24,5	22		6,4	10,8	19	—
180	MJ18 × 1,5 – 4H6H	26,8	24		7,2	12,4	22	—
200	MJ20 × 1,5 – 4H6H	30,2	27		8,0	13,2	24	—

Diameter code	<i>L</i> ^d		<i>M</i> ^e min.	<i>N</i>		<i>S</i> H14	Mass ^f ≈ kg/1 000 pieces	Split pin diameter ^g max.
	max.	min.		max.	min.			
050	5,8	5,2	7,4	0,5	0,2	H14	1,5	1,4
060	7,1	6,3	9,3			1,7	2,2	
080	9,1	8,3	11,2			2,1	4,4	1,8
100	11,1	10,3	13,2			2,6	6,3	2,3
120	13,1	12,3	16			2,6	11,0	
140	15,2	14,4	18			3,2	15,5	2,9
160	17,2	16,4	21				20,3	
180	19,2	18,4	23			4	23,3	3,7
200	21,2	20,4	26	30,3				

^a In accordance with ISO 5855-2.

^b Dimension *G* applies to:

- height below slot (diameter code 050 to 200);
- height of flats (diameter code 060 to 200);
- bottom of counterbore (diameter code 050 and 060).

^c Tool marks permissible within counterbore.

^d Dimensions also apply to upper chamfer.

^e Flats may be tangential, but shall not intrude on diameter *M*.

^f Calculated on the basis of 7,85 kg/dm³; given for information only.

^g For information; in accordance with ISO 1234.

3.2 Material and surface treatment

Material and surface treatment shall be in accordance with Table 2.

Table 2 — Material and surface treatment

Code	Material		Surface treatment	
	Family	Standard	Type	Standard
A	Alloy steel, strength classification $\geq 900 \text{ MPa}^a$	In accordance with annex A	Cadmium plated	In accordance with annex A
B	Corrosion-resistant steel, strength classification $\geq 900 \text{ MPa}^a$		Passivation	ISO 8075

^a Minimum tensile strength of the material at ambient temperature.

4 Designation

Nuts in accordance with this International Standard shall be designated as shown in the following example.

EXAMPLE



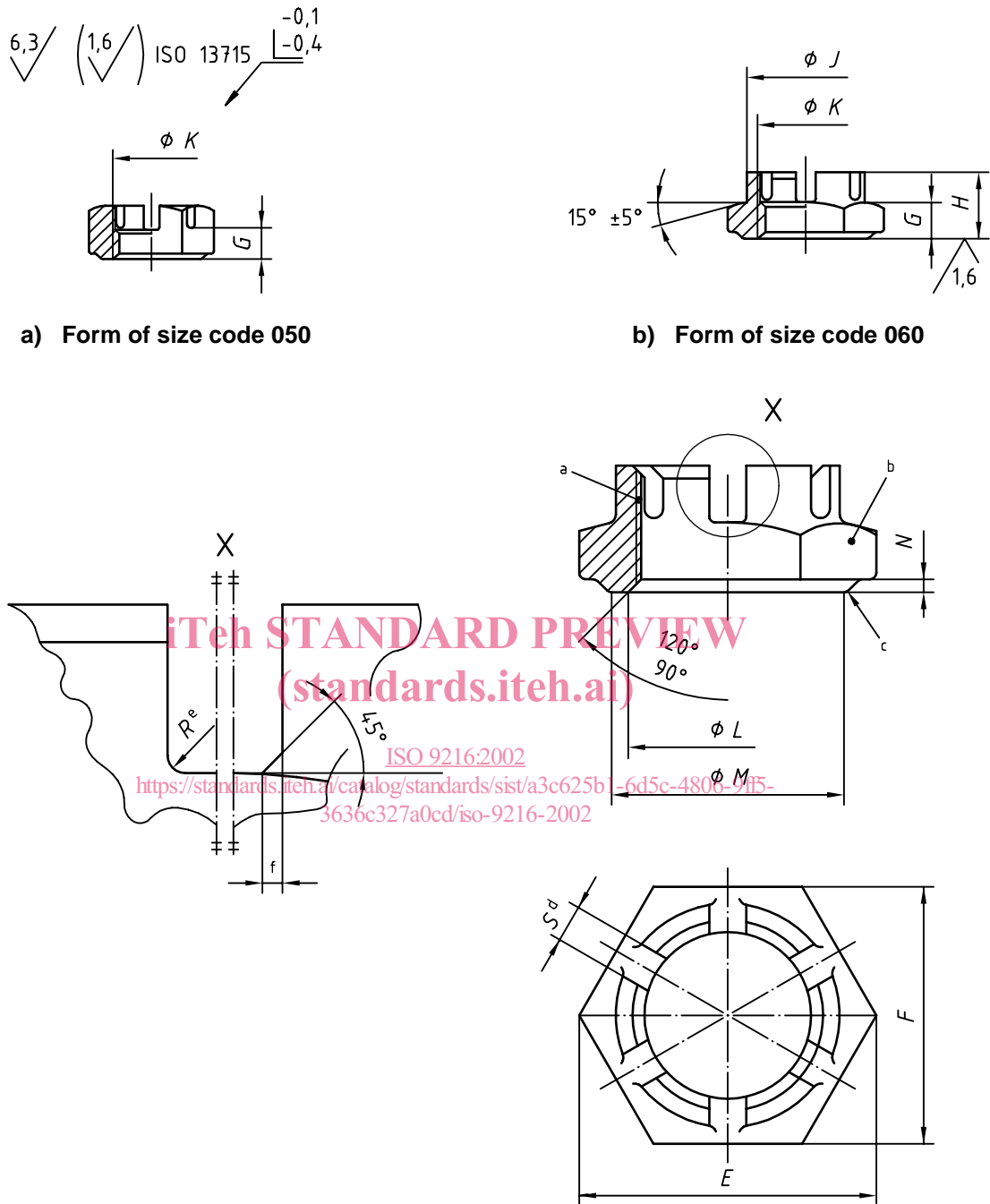
5 Marking

The marking position shall be as shown in Figure 1. In addition to the manufacturer's own marking, each nut in accordance with this International Standard shall be marked with the identity block specified in clause 4.

6 Procurement specification

The procurement specification shall be in accordance with ISO 9139.

Dimensions in millimetres
Surface roughness in micrometres



c) Form of size code 120

- a Thread
- b Part marking zone
- c Form of contour within limiting dimensions at manufacturer's option
- d $S/4$ to $S/10$
- e $R_{max} = \frac{S_{min}}{2}$; $R_{min} = \frac{S_{min}}{10}$
- f Form of base of slot at manufacturer's option

Figure 1 — Forms of size codes 050, 060 and 120