INTERNATIONAL STANDARD

ISO 9219

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Aerospace — Bolts, thin hexagonal head, for pulleys, close tolerance shank, short thread, in alloy steel and cadmium plated or in titanium alloy and MoS_2 lubricated or in corrosion-resistant steel and passivated — Dimensions and masses

Aéronautique et espace — Vis à tête hexagonale basse, pour poulies, à fût normal, à tolérance serrée, à filetage court, en acier allié, cadmiées, ou en alliage de titane, lubrifiées au MoS_2, ou en acier résistant à la corrosion, passivées — Dimensions et masses

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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 9219 was prepared by Technical Committee ISO/TC 20, *Aircraft and space vehicles*.

Annex A forms a normative part of this International Standard.

Aerospace — Bolts, thin hexagonal head, for pulleys, close tolerance shank, short thread, in alloy steel and cadmium plated or in titanium alloy and MoS_2 lubricated or in corrosion-resistant steel and passivated — Dimensions and masses

1 Scope

This International Standard specifies the characteristics of bolts for pulleys with thin hexagonal head, close tolerance shank and short thread,

— in alloy steel and cadmium plated, classification 1 100MPa[1)]/235 °C[2)];

— in titanium alloy and MoS_2 lubricated, classification 1 100 MPa[1)]/315 °C[2)]; or

— in corrosion-resistant steel and passivated.

This International Standard is applicable to bolts used with ISO 9217 and ISO 9218 washers, ISO 9216 nuts and ISO 1234 split pins.

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 3353-1:2002, *Aerospace — Lead and runout threads — Part 1: Rolled external threads*

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

ISO 7689:1988, *Aerospace — Alloy steel bolts with strength classification 1 100 MPa and MJ threads — Procurement specification*

ISO 7913:1994, *Aerospace — Bolts and screws, metric — Tolerances of form and position*

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

ISO 9152:1998, *Aerospace — Bolts, with MJ threads, in titanium alloys, strength class 1 100 MPa — Procurement specification*

ISO 9216:2002, *Aerospace — Nuts, hexagonal, slotted (castellated), 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 and passivated 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 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*

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

EN 2133:1997[3)], *Aerospace series — Cadmium plating of steels with specified tensile strength $\leqslant$ 1 450 MPa, copper, copper alloys and nickel alloys*

prEN 2137:—[4)], *Aerospace series — Steel FE-PL75 — 1 100 MPa $\leqslant R_m \leqslant$ 1 250 MPa — Bars — $D_e \leqslant$ 100 mm*

prEN 2442:—[5)], *Aerospace series — Steel FE-PL711 — 1 100 MPa $\leqslant R_m \leqslant$ 1 300 MPa — Bars and wires — $D_e \leqslant$ 25 mm*

prEN 2446:—[4)], *Aerospace series — Steel FE-PL45 — 1 100 MPa $\leqslant R_m \leqslant$ 1 300 MPa — Bars — $D_e \leqslant$ 25 mm*

prEN 2475:—[6)], *Aerospace series — Steel FE-PL2106 (30CrNiMo8) — Air melted — Hardened and tempered — 1 100 MPa $\leqslant R_m \leqslant$ 1 300 MPa — Bar for machining — $D_e \leqslant$ 100 mm*

EN 2491:1997[3)], Aerospace series — Molybdenum disulphide dry lubricants — Coating methods

prEN 2532:—[7)], *Aerospace series — Titanium alloy TI-P68 — 1 100 MPa $\leqslant R_m \leqslant$ 1 280 MPa — Bar — $D_e \leqslant$ 25 mm*

prEN 2793:—[4)], *Aerospace series — Phosphate treatment of ferrous alloys*

prEN 2817:—[6)], *Aerospace series — Steel FE-PM1802 (X5CrNiCu15-5) — Consumable electrode — Solution treated and precipitation treated — $R_m \geqslant$ 1 070 MPa — Bar for machining — a or $D \leqslant$ 200 mm*

TR 3775:1999[8)], *Aerospace series — Bolts and pins — Materials*

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 Figures 1 and 2 and Table 1. Dimensions are expressed in millimetres and apply after surface treatment but before lubrication. Surface roughness values apply before surface treatment.

Form and position tolerances shall be in accordance with ISO 7913.

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3) AECMA Standard.

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

5) AECMA Standard. It has been declassified and will be replaced, at publication, by prEN 3514, *Aerospace series — Steel FE-PL711 — Hardened and tempered — 1 100 MPa $\leqslant R_m \leqslant$ 1 300 MPa — Bar and wire for bolts — $D_e \leqslant$ 25 mm*.

6) AECMA Prestandard.

7) AECMA Standard. It has been declassified and will be replaced, at publication, by prEN 3466, *Aerospace series — Titanium alloy TI-P63001 — Solution treated and aged — Bar for machining — $D \leqslant$ 150 mm*.

8) AECMA Technical Report.

Table 1 — Dimensions and masses

Dimensions in millimetres

Diameter code	Thread[a]	D_1			D_2	D_3	D_4	D_5	E		F	H
		nom.	tolerance						nom.	tol. class	min.	$^{0}_{-0,3}$
			code A	code B	$\pm$ 0,5	H13	min.	H13				
050	MJ5 × 0,8 – 4h6h	5	$^{-0,010}_{-0,035}$	f7	3,4	—	7,4	1,5	8	h12	8,7	2,5
060	MJ6 × 1 – 4h6h	6			4,2		9,4		10	h13	10,9	
080	MJ6 × 1 – 4h6h	8	$^{-0,013}_{-0,038}$									
100	MJ8 × 1 – 4h6h	10			6,2		12,3	1,9	13		14,3	3
120	MJ10 × 1,25 – 4h6h	12	$^{-0,016}_{-0,041}$		7,9		16,3	2,4	17		18,9	3,5
150	MJ12 × 1,25 – 4h6h	15			9,8	8	18,3		19		21,1	4
170	MJ14 × 1,5 – 4h6h	17			11,5	9	21,3	3	22		24,5	
200	MJ16 × 1,5 – 4h6h	20	$^{-0,020}_{-0,045}$		13,5	10	23,3		24		26,8	5
220	MJ18 × 1,5 – 4h6h	22			15,5	11	26,3	3,8	27		30,2	
250	MJ20 × 1,5 – 4h6h	25			17,5	12	29,3		30		33,6	

Diameter code	L_1[b] $\pm$ 0,2		L_2	L_3	R_1	R_2	Mass[c] $\approx$ kg/1 000 pieces			
							Code A		Code B	
	length code	nom.		$\pm$ 0,3	$^{0}_{-0,2}$	$^{+0,2}_{0}$	for first L_3	for 1 mm of L_3	for first L_3	for 1 mm of L_3
050	005 to 050	5 to 50	$L_1 + 6$	$L_1 + 9$	0,4	—	2,76	0,15	1,56	0,09
060	006 to 060	6 to 60	$L_1 + 7$	$L_1 + 10$			4,47	0,22	2,53	0,12
080	007 to 080	7 to 80				0,25	5,85	0,39	3,31	0,22
100			$L_1 + 7{,}5$	$L_1 + 11{,}5$		0,4	10,97	0,62	6,21	0,35
120			$L_1 + 9$	$L_1 + 14{,}5$			19,52	0,89	11,06	0,5
150			$L_1 + 10$	$L_1 + 16$	0,6	0,6	27,39	0,99	15,52	0,56
170			$L_1 + 12$	$L_1 + 19$			39,36	1,28	22,31	0,73
200			$L_1 + 13$	$L_1 + 20{,}5$	0,9	0,8	57,8	1,85	32,76	1,05
220			$L_1 + 14{,}5$	$L_1 + 22{,}5$			76,17	2,24	43,17	1,27
250			$L_1 + 15$	$L_1 + 24{,}5$			100,79	2,97	57,13	1,68

[a] In accordance with ISO 5855-2, except for the maximum major diameter d of bolts of diameter codes 050 and 060 which shall be equal to $D_{1\,\min} - 0{,}025$.

[b] Increment:

1 for $L_1 \leqslant 30$

2 for $L_1 > 30$

If greater lengths are necessary, they shall be chosen using these steps.

The length code corresponds to the length L_1, completed by one or two zeros to the left, where necessary to obtain a three digit code.

[c] For information only; calculated on the basis of:

7,85 kg/dm^3 for code A bolts;

4,45 kg/dm^3 for code B bolts.

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 $\geqslant$ 1 100 MPa[a]	In accordance with annex A	External surfaces: cadmium plating thickness 6 μm to 10 μm[b]	In accordance with annex A
			Diameter hole D_3: phosphating	In accordance with annex A
B	Titanium alloy, strength classification $\geqslant$ 1 100 MPa[a]		MoS_2 lubrication thickness 5 μm to 10 μm[b]	
C	Corrosion-resistant steel		Passivation	ISO 8075

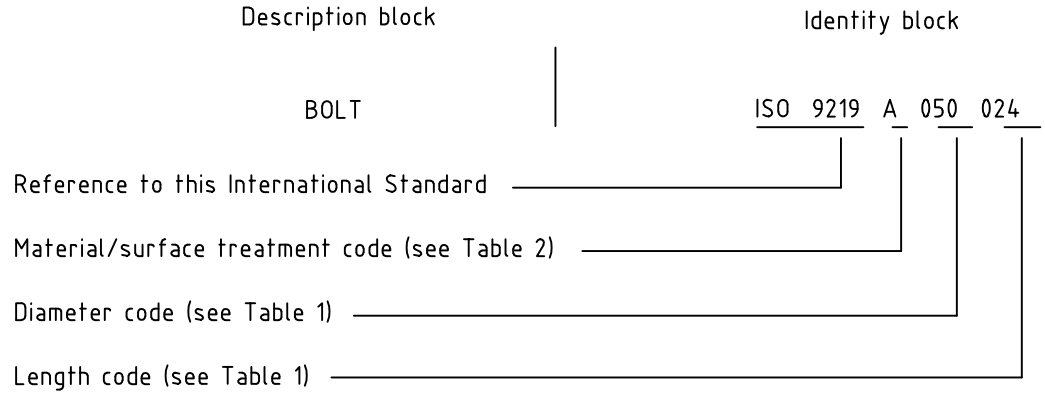
[a] Minimum tensile strength of the material at ambient temperature.

[b] On all surfaces which can be contacted by a 20 mm diameter ball. On all other surfaces, a continuous deposit shall be present, but no value is specified.

4 Designation

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

EXAMPLE



5 Marking

The marking position shall be in accordance with Figure 2. In addition to the manufacturer's own marking, each bolt in accordance with this International Standard shall be marked with the identity block specified in clause 4.

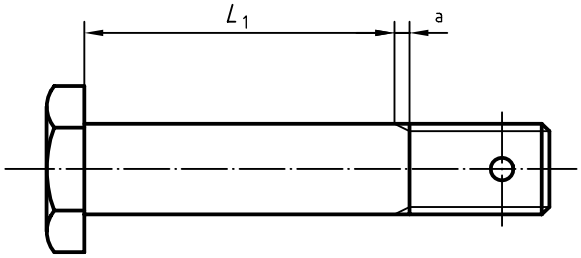
6 Technical specification

6.1 Bolts, code A

In accordance with ISO 7689.

6.2 Bolts, code B

In accordance with ISO 9152.

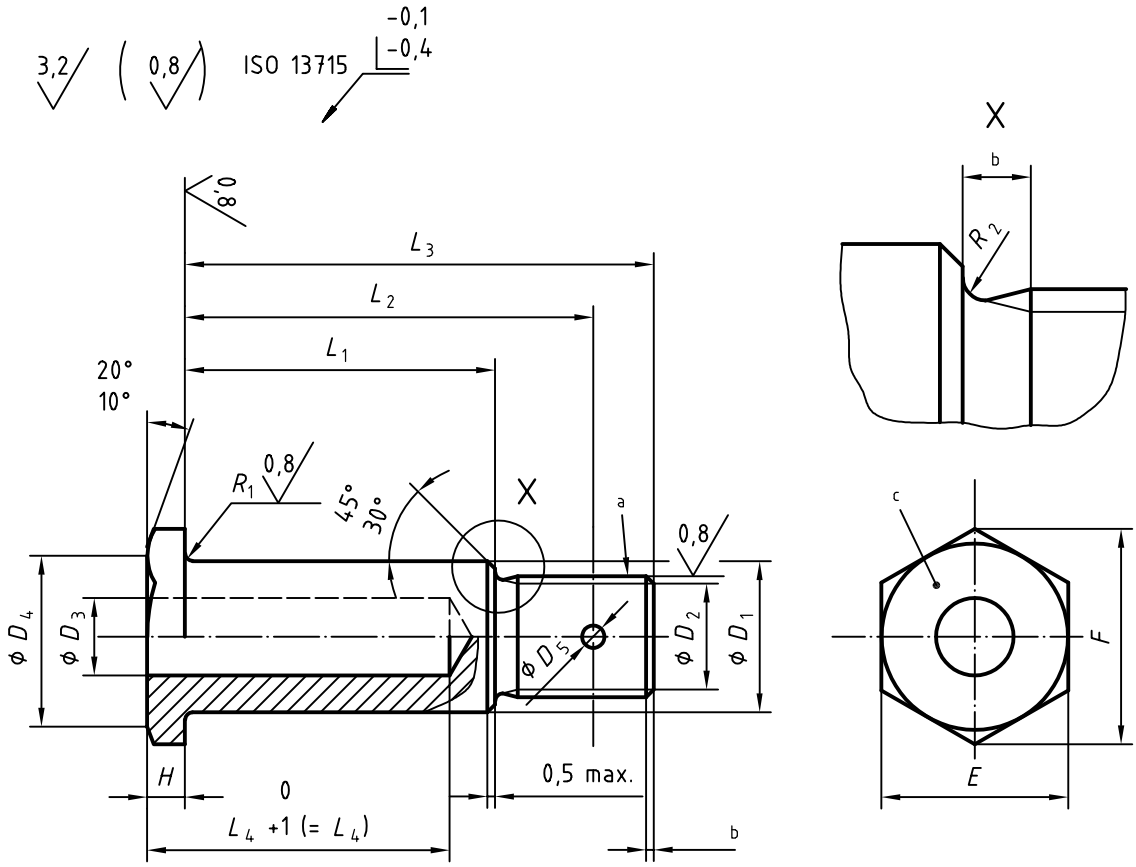


NOTE For other dimensions, see Figure 2.

[a] In accordance with ISO 3353-1.

Figure 1 — Configuration for diameter codes 050 and 060

Dimensions in millimetres
Surface roughness in micrometres



[a] Thread.

[b] In accordance with ISO 3353-1.

[c] Marking.

Figure 2 — Configuration for diameter codes 080 to 250

Annex A
(normative)

Correspondence between national standards

This annex estsblishes a correspondence between different materials and surface treatment standards from certain user countries. Other materials and surface treatment standards may be declared in this annex in future revisions of this International Standard.

Table A.1 — European Standards

Code	Material		Surface treatment	
	Family	Standard	Type	Standard
A	Alloy steel, strength classification $\geqslant$ 1 100 MPa[a]	prEN 2137 prEN 2442 prEN 2446 prEN 2475 TR 3775	External surfaces: cadmium plating	EN 2133
			Diameter hole D_3: phosphating	prEN 2793, class C
B	Titanium alloy, strength classification $\geqslant$ 1 100 MPa[a]	prEN 2532 TR 3775	MoS_2 lubrication	EN 2491
C	Corrosion-resistant steel	prEN 2817[b]	Passivation	ISO 8075

[a] Minimum tensile strength of the material at ambient temperature.

[b] Equivalent to the US-material according to AMS 5659 F-10.84, 15-5 PH, cond. H 1025.

Table A.2 — Standards from other user countries

Code	Material		Surface treatment	
	Family	Standard	Type	Standard
A	Alloy steel, strength classification $\geqslant$ 1 100 MPa[a]	—	External surfaces: cadmium plating	AMS-QQ-P-416A
			Diameter hole D_3: phosphating	—
B	Titanium alloy, strength classification $\geqslant$ 1 100 MPa[a]	—	MoS_2 lubrication	—
C	Corrosion-resistant steel	—	Passivation	ISO 8075

[a] Minimum tensile strength of the material at ambient temperature.

ICS 49.030.20

Price based on 6 pages