

Aerospace series
Bolt - Protruding tension head
Pull type - For fatigue applications

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**Published and distributed by :
AIRBUS S.A.S.
ENGINEERING DIRECTORATE
31707 BLAGNAC Cedex
FRANCE**

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1 Scope

This standard specifies the dimensions, tolerances, required characteristics and the mass of a protruding head bolt pull type intended to be installed with interference for fatigue applications only.

2 Normative references

This Airbus Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this Airbus Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 2424	Aerospace series - Marking of aerospace products. ¹
EN 4473	Aerospace series - Aluminium pigmented coatings - Technical specification. ¹
EN 6116	Aerospace series - Threaded bolts, light weight - Inch series - Technical specification. ¹
EN 6117	Aerospace series - Specification for lubrication of bolts with cetyl alcohol.
A/DET/0170	Electrical conductivity and lightning test procedure for fastened assemblies.
AMS 4928	Titanium alloy bars, wire, forgings, and rings 6Al-4V annealed. ²
AMS 4967	Titanium alloy bars, forgings, and rings 6.0Al - 4.0V annealed, heat treatable. ²
AMS 5662	Alloy bars, forgings and rings, corrosion and heat resistant. ²
AMS 5962	Alloy bars, forgings and rings, corrosion and heat resistant. ²
ANSI/ASME-B46-1	Surface texture (surface roughness waviness, and lay).
AS 8879	Aerospace – UNJ threads - General requirements and limit dimensions.

3 Requirements

3.1 Configuration, dimensions, tolerances and mass

The configuration, dimensions, tolerances and mass shall conform with Figure 1, Table 2 and Table 3.

Dimensions to be met after finish.

Roll-formed thread as per AS 8879 except TD diameter.

Lead radius must be tangent to Ø D within K distance and be continuous within this area.

Concentricity tolerances between Ø A and Ø D within the values of .01 inch (0,254 mm) (TIR).

Drill centre dimple in top of head .035 inch (0,889 mm) max. dia., .010 inch (0,254 mm) max. depth and concentric to "A" within .008 inch (0,203 mm).

Surface condition as per ANSI-B46-1.

Dimensions are expressed in inch (millimetres).

Mechanical characteristics shall be in accordance with Table 4.

Oversizes shall be in accordance with Table 5, Table 6 and Table 7.

¹ Published as AECMA Standard at the date of publication of this standard

² Published by : Society of Automotive Engineers (SAE), 400 Commonwealth Drive, Warrendale, PA 15096-0001, USA

3.2 Mass

The calculation of the mass of a bolt shall be provided as per indications hereafter:

CALCULATION OF THE MASS OF A BOLT

Add the mass of the head and threaded part (invariable mass) to the mass of the smooth part (variable mass).

Total mass of the head and threaded part:

1st mass column of Table 2.

Mass of the smooth part:

Multiply the value of the 2nd mass column of Table 2 (value according to the diameter code No.) by the length code No. of the bolt.

EXAMPLES:

BOLT ABS0876K9-18

Invariable mass	19,98	
Variable mass	$1,12 \times 18 = 20,16$	

Total mass		40,14 g

BOLT ABS0876L9-18

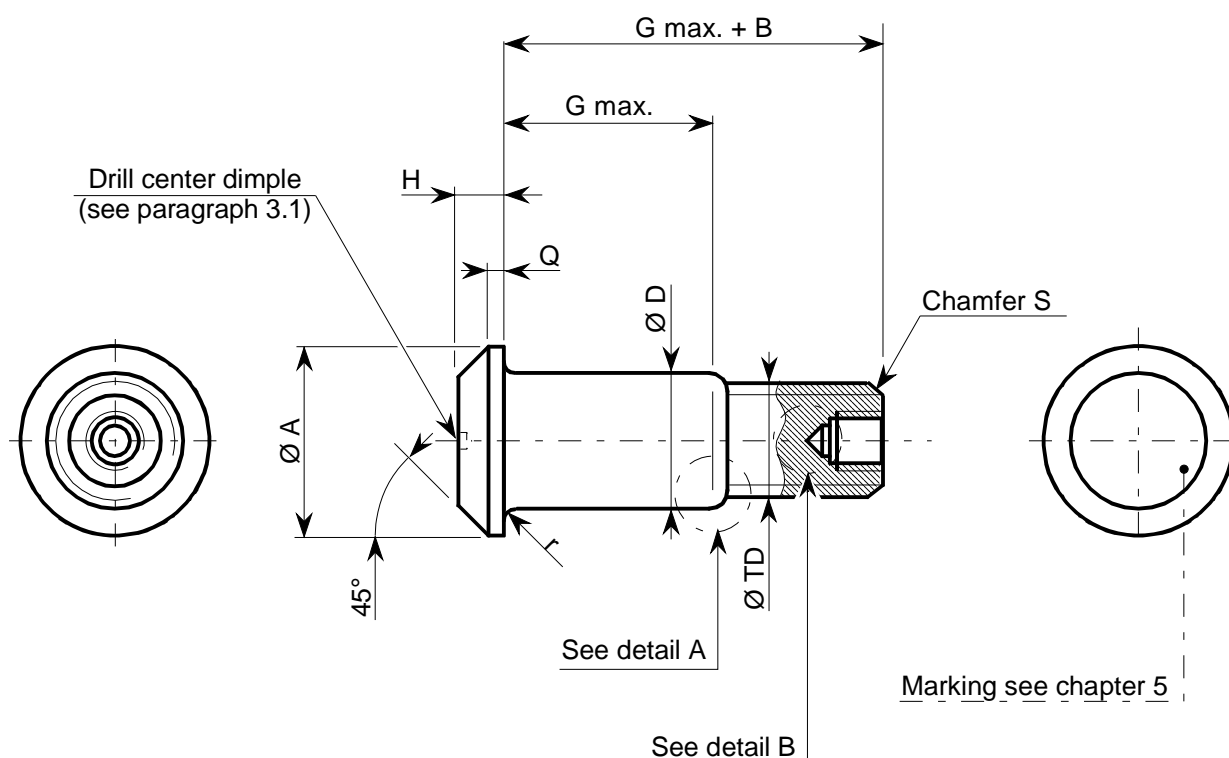
Invariable mass	37,08	
Variable mass	$2,09 \times 18 = 37,62$	

Total mass		74,70 g

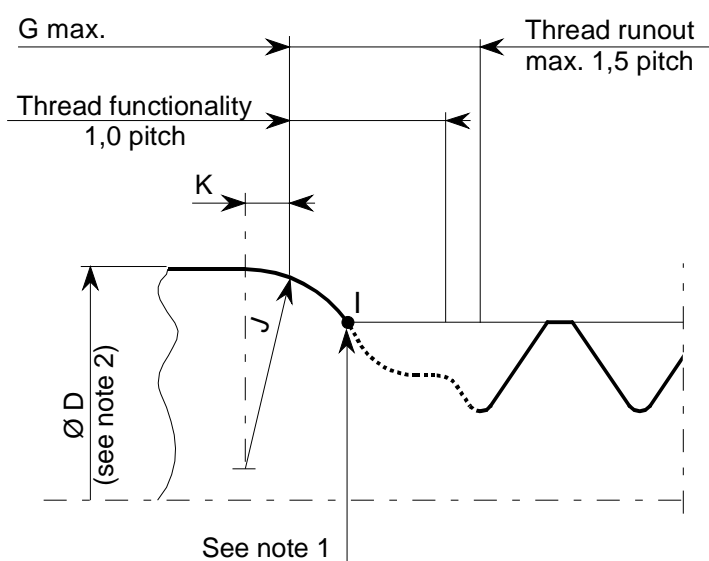
3.3 Material and surface treatment

Table 1 : Materials, finishes and lubrications

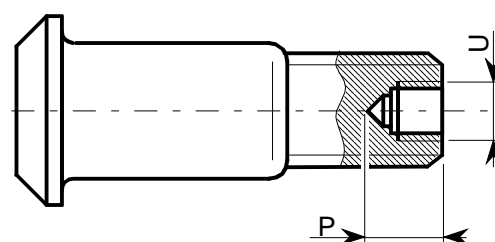
Material and finish code	Material	Finish	Lubrication	Bolt identification
K	Titanium alloy 6Al-4V as per AMS 4928 or AMS 4967. Rc min. = 650 MPa	Aluminium coating as per specification EN 4473	Cetyl alcohol as per EN 6117	A white paint identification at thread end
L	Inconel 718 as per AMS 5962 or AMS 5662 + cold working. R = 1 510 MPa			A blue paint identification at thread end



DETAIL A



DETAIL B
Internal thread recess



Notes :

- 1) The diameter measured at point I shall be less than or equal to maximum diameter TD.
- 2) When installation is at maximum interference and diameter TD is at maximum diameter, TD must not contact the hole during installation even with maximum eccentricity between diameter D and diameter TD.
- 3) The maximum thread run-out and functionality for first and second over sizes is incremented by 0,25 mm, 0,5 mm for third over size.

Figure 1 : Configuration and dimensions

Table 2 : Dimensions, tolerances and mass

(Continued)

DIA. CODE No.	NOMINAL SHANK DIAMETER	THREAD UNJF-3A modified	Ø A		B Ref.	Ø D		Ø TD	
			Max.	Min.		Max.	Min.	Max.	Min.
9	.5625 (14,29)	.5625-18	.877 (22,28)	.842 (21,39)	.844 (21,45)	.5615 (14,262)	.5605 (14,237)	.5537 (14,065)	.5500 (13,970)
10	.6250 (15,88)	.6250-18	.953 (24,21)	.918 (23,32)	.935 (23,75)	.6240 (15,850)	.6230 (15,824)	.6165 (15,659)	.6120 (15,545)
12	.7500 (19,05)	.7500-16	1.150 (29,21)	1.110 (28,19)	1.125 (28,58)	.7490 (19,025)	.7480 (18,999)	.7415 (18,834)	.7370 (18,720)
14	.8750 (22,23)	.8750-14	1.330 (33,782)	1.290 (32,766)	1.315 (33,40)	.8740 (22,200)	.8730 (22,174)	.8663 (22,003)	.8610 (21,870)
16	1.000 (25,40)	1.0000-12	1.510 (38,354)	1.470 (37,338)	1.500 (38,10)	.9990 (25,375)	.9980 (25,349)	.9923 (25,178)	.9860 (25,045)

(continued)

DIA. CODE No.	NOMINAL SHANK DIAMETER	THREAD UNJF-3A modified	H		Q Ref.	r		S ^{a)} Ref.
			Max.	Min.		Max.	Min.	
9	.5625 (14,29)	.5625-18	.210 (5,33)	.200 (5,08)	.125 (3,18)	.040 (1,02)	.025 (0,64)	.0625 (1,59)
10	.6250 (15,88)	.6250-18	.238 (6,05)	.228 (5,79)	.140 (3,56)			
12	.7500 (19,05)	.7500-16	.335 (8,51)	.320 (8,13)	.200 (5,08)			
14	.8750 (22,23)	.8750-14	.385 (9,779)	.370 (9,398)	.250 (6,35)	.050 (1,270)	.035 (0,889)	.07812 (1,984)
16	1.000 (25,40)	1.0000-12	.435 (11,049)	.420 (10,668)	.300 (7,62)	.060 (1,524)	.045 (1,143)	

a) 37° for Titanium material, 45° for Inconel material

Table 2 : Dimensions, tolerances and mass (concluded)

DIA. CODE No.	NOMINAL SHANK DIAMETER	THREAD UNJF-3A modified	INTERNAL THREAD LEFT HAND		DETAIL A			MASS ref. (g)			
								Titanium		Inconel	
			P max.	U THREAD UNJF-2B	J		K Max.	Head and thread	Smooth part	Head and thread	Smooth part
9	.5625 (14,29)	.5625-18	.4650 (11,810)	.3125-SP	.380 (9,65)	.370 (9,40)	.039 (0,991)	19,98	1,12	37,08	2,09
10	.6250 (15,88)	.6250-18	.5201 (13,210)	.3750-SP	.390 (9,91)	.380 (9,65)	.041 (1,041)	27,45	1,39	50,94	2,58
12	.7500 (19,05)	.7500-16	.6252 (15,880)	.4375-SP	.400 (10,16)		.044 (1,12)	50,77	2,00	94,21	3,71
14	.8750 (22,23)	.8750-14	.7252 (18,420)	.5000-SP	.405 (10,29)	.385 (9,78)	.045 (1,14)	80,57	2,73	149,50	5,06
16	1.000 (25,40)	1.0000-12	.8299 (21,080)	.5625-SP	.435 (11,05)	.415 (10,54)	.045 (1,14)	120,51	3,56	223,60	6,61

Table 3 : Dimensions and tolerances

GRIP CODE No.	G ± .005 (± 0,127)	LENGTH (G max. + B ref.) ± .010 (± 0,254)				
		9	10	12	14	16
14	0.875 (22,22)	1.719 (43,67)	1.809 (45,97)	2.000 (50,80)	2.189 (55,62)	2.375 (60,32)
15	0.937 (23,81)	1.781 (45,26)	1.872 (47,56)	2.062 (52,39)	2.252 (57,21)	2.437 (61,91)
16	1.000 (25,40)	1.844 (46,85)	1.935 (49,15)	2.125 (53,98)	2.315 (58,80)	2.500 (63,50)
17	1.062 (26,99)	1.907 (48,44)	1.997 (50,74)	2.187 (55,57)	2.377 (60,39)	2.562 (65,09)
18	1.125 (28,58)	1.969 (50,03)	2.060 (52,33)	2.250 (57,16)	2.440 (61,98)	2.625 (66,68)
19	1.188 (30,16)	2.032 (51,61)	2.123 (53,91)	2.313 (58,74)	2.502 (63,56)	2.688 (68,26)
20	1.250 (31,75)	2.094 (53,20)	2.185 (55,50)	2.375 (60,33)	2.565 (65,15)	2.750 (69,85)
21	1.313 (33,34)	2.157 (54,79)	2.248 (57,09)	2.438 (61,92)	2.627 (66,74)	2.813 (71,44)
22	1.375 (34,93)	2.219 (56,38)	2.310 (58,68)	2.500 (63,51)	2.690 (68,33)	2.875 (73,03)
23	1.438 (36,51)	2.282 (57,96)	2.373 (60,26)	2.563 (65,09)	2.752 (69,91)	2.938 (74,61)
24	1.500 (38,10)	2.344 (59,55)	2.435 (61,85)	2.625 (66,68)	2.815 (71,50)	3.000 (76,20)
25	1.563 (39,69)	2.407 (61,14)	2.498 (63,44)	2.688 (68,27)	2.877 (73,09)	3.063 (77,79)
26	1.625 (41,28)	2.469 (62,73)	2.560 (65,03)	2.750 (69,86)	2.940 (74,68)	3.125 (79,38)
27	1.688 (42,86)	2.532 (64,31)	2.623 (66,61)	2.813 (71,44)	3.002 (76,26)	3.188 (80,96)
28	1.750 (44,45)	2.594 (65,90)	2.685 (68,20)	2.875 (73,03)	3.065 (77,85)	3.250 (82,55)
29	1.813 (46,04)	2.657 (67,49)	2.748 (69,79)	2.938 (74,62)	3.127 (79,44)	3.313 (84,14)
30	1.875 (47,63)	2.719 (69,08)	2.810 (71,38)	3.000 (76,21)	3.190 (81,03)	3.375 (85,73)
31	1.938 (49,21)	2.782 (70,66)	2.873 (72,96)	3.063 (77,79)	3.252 (82,61)	3.438 (87,31)
32	2.000 (50,80)	2.844 (72,25)	2.935 (74,55)	3.125 (79,38)	3.315 (84,20)	3.500 (88,90)
34	2.125 (53,98)	2.969 (75,43)	3.060 (77,73)	3.250 (82,56)	3.440 (87,38)	3.625 (92,08)
36	2.250 (57,15)	3.094 (78,60)	3.185 (80,90)	3.375 (85,73)	3.565 (90,55)	3.750 (95,25)

(continued)

Table 3 : Dimensions and tolerances (continued)

38	2.375 (60,33)	3.219 (81,78)	3.310 (84,08)	3.500 (88,91)	3.690 (93,73)	3.875 (98,43)
40	2.500 (63,50)	3.344 (84,95)	3.435 (87,25)	3.625 (92,08)	3.815 (96,90)	4.000 (101,60)
42	2.625 (66,68)	3.469 (88,13)	3.560 (90,43)	3.750 (95,26)	3.940 (100,08)	4.125 (104,78)
44	2.750 (69,85)	3.594 (91,30)	3.685 (93,60)	3.875 (98,43)	4.065 (103,25)	4.250 (107,95)
46	2.875 (73,03)	3.719 (94,48)	3.810 (96,78)	4.000 (101,61)	4.190 (106,43)	4.375 (111,13)
48	3.000 (76,20)	3.844 (97,65)	3.935 (99,95)	4.125 (104,78)	4.315 (109,60)	4.500 (114,30)
50	3.125 (79,38)	3.969 (100,83)	4.060 (103,13)	4.250 (107,96)	4.440 (112,78)	4.625 (117,48)
52	3.250 (82,55)	4.094 (104,00)	4.185 (106,30)	4.375 (111,13)	4.565 (115,95)	4.750 (120,65)
54	3.375 (85,73)	4.219 (107,18)	4.310 (109,48)	4.500 (114,31)	4.690 (119,13)	4.875 (123,83)
56	3.500 (88,90)	4.344 (110,35)	4.435 (112,65)	4.625 (117,48)	4.815 (122,30)	5.000 (127,00)
58	3.625 (92,08)	4.469 (113,53)	4.560 (115,83)	4.750 (120,66)	4.940 (125,48)	5.125 (130,18)
60	3.750 (95,25)	4.594 (116,70)	4.685 (119,00)	4.875 (123,83)	5.065 (128,65)	5.250 (133,35)
62	3.875 (98,43)	4.719 (119,88)	4.810 (122,18)	5.000 (127,01)	5.190 (131,83)	5.375 (136,53)
64	4.000 (101,60)	4.844 (123,05)	4.935 (125,35)	5.125 (130,18)	5.315 (135,00)	5.500 (139,70)
66	4.125 (104,78)	4.969 (126,23)	5.060 (128,53)	5.250 (133,36)	5.440 (138,18)	5.625 (142,88)
68	4.250 (107,95)	5.094 (129,40)	5.185 (131,70)	5.375 (136,53)	5.565 (141,35)	5.750 (146,05)
70	4.375 (111,13)	5.219 (132,58)	5.310 (134,88)	5.500 (139,71)	5.690 (144,53)	5.875 (149,23)
72	4.500 (114,30)	5.344 (135,75)	5.435 (138,05)	5.625 (142,88)	5.815 (147,70)	6.000 (152,40)
74	4.625 (117,48)	-	5.560 (141,23)	5.750 (146,06)	5.940 (150,88)	6.125 (155,58)
76	4.750 (120,65)	-	5.685 (144,40)	5.875 (149,23)	6.065 (154,05)	6.250 (158,75)
78	4.875 (123,83)	-	5.810 (147,58)	6.000 (152,41)	6.190 (157,23)	6.375 (161,93)
80	5.000 (127,00)	-	5.935 (150,75)	6.125 (155,58)	6.315 (160,40)	6.500 (165,10)
82	5.125 (130,18)	-	-	6.250 (158,76)	6.440 (163,58)	6.625 (168,28)

(continued)

Table 3 : Dimensions and tolerances (concluded)

84	5.250 (133,35)	-	-	6.375 (161,93)	6.565 (166,75)	6.750 (171,45)
86	5.375 (136,53)	-	-	6.500 (165,11)	6.690 (169,93)	6.875 (174,63)
88	5.500 (139,70)	-	-	6.625 (168,28)	6.815 (173,10)	7.000 (177,80)
90	5.625 (142,88)	-	-	6.750 (171,46)	6.940 (176,28)	7.125 (180,98)
92	5.750 (146,05)	-	-	6.875 (174,63)	7.065 (179,45)	7.250 (184,15)
94	5.875 (149,23)	-	-	7.000 (177,81)	7.190 (182,63)	7.375 (187,33)
96	6.000 (152,40)	-	-	7.125 (180,98)	7.315 (185,80)	7.500 (190,50)
98	6.125 (155,58)	-	-	-	7.440 (188,98)	7.625 (193,68)

Note : Intermediate grip lengths may be purchased in 1/16 inch (1,5875 mm) increment if necessary.

Table 4 : Mechanical characteristics

DIA. CODE No.	Min. DOUBLE SHEAR STRENGTH (N)		Min. TENSILE STRENGTH (N)		TENSION - TENSION FATIGUE (N)		Min. PULL-IN CAPABILITY (N)
	Titanium	Inconel	Titanium	Inconel	Titanium	Inconel	
9	209 950	276 400	126 100	197 150 *	44 000	67 150 *	51 000
10	259 330	341 300	170 600	220 000	59 900	74 800	63 000
12	373 200	491 130	247 320	362 390	86 290	123 500	85 000
14	493 990	664 100	302 000	498 740	112 020	167 967	140 000
16	625 970	867 450	394 000	587 500	141 950	217 400	160 000

* To be confirmed.

Table 5 : First oversize

DIA. CODE No.	OVERSIZE CODE	D diameter .0156 oversize shank	
	First oversize	Max.	Min.
9	X	.5771 (14,658)	.5761 (14,633)
10	X	.6396 (16,246)	.6386 (16,220)
12	X	.7646 (19,421)	.7636 (19,395)
14	X	.8896 (22,596)	.8886 (22,570)
16	X	1.0146 (25,771)	1.0136 (25,745)

Table 6 : Second oversize

DIA. CODE No.	OVERSIZE CODE	A diameter		D diameter .0312 oversize shank	
	Second oversize	Max.	Min.	Max.	Min.
9	Y	.900 (22,86)	.865 (21,97)	.5927 (15,055)	.5917 (15,029)
10	Y	.970 (24,64)	.935 (23,75)	.6552 (16,642)	.6542 (16,617)
12	Y	1.185 (30,10)	1.145 (29,08)	.7802 (19,817)	.7792 (19,792)
14	Y	1.350 (34,29)	1.310 (33,27)	.9052 (22,992)	.9042 (22,967)
16	Y	1.530 (38,86)	1.490 (37,85)	1.0302 (26,167)	1.0292 (26,142)

Table 7: Third oversize

DIA. CODE No.	OVERSIZE CODE	A diameter		D diameter .0625 oversize shank	
	Third oversize	Max.	Min.	Max.	Min.
10	Z	.995 (25,270)	.960 (24,380)	.6865 (17,437)	.6855 (17,412)
12	Z	1.206 (30,630)	1.166 (29,610)	.8115 (20,612)	.8105 (20,587)
14	Z	1.372 (34,840)	1.331 (33,820)	.9365 (23,787)	.9355 (23,762)
16	Z	1.552 (39,420)	1.512 (38,410)	1.0615 (26,962)	1.0605 (26,937)

4 Designation

EXAMPLE:

	Description block	Identity block				
	Bolt	ABS0876	K	9	- 18	Y
Number of this standard	_____					
Material and finish code (see Table 1)	_____					
Dia. code No. (see Table 2)	_____					
Grip code No. (see Table 3)	_____					
Oversize code (see Table 5, Table 6 and Table 7)	_____					

5 Marking

Marking shall be recessed to a maximum depth of .01 inch (0,25mm) as per EN 2424, category P.

6 Technical specification

Technical specification EN 6116.

RECORD OF REVISIONS

Issue	Clause modified	Description of modification
1 11/02		New Standard.
2 07/05		Drill center dimple added. Third oversize added. Masses added. AMS 5962 added. Min. tensile strength and tension-tension fatigue modified in Table 4 for dia. code No. 10 (Inconel) : 249 690 N and 85 030 N changed to 220 000 N and 74 800 N.
3 08/10	Table 3	Grip length codes 14 to 17 added.