Aerospace series

Bolt, titanium alloy countersunk head, break stem

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Contents

1 Scope

This standard specifies the dimensions, tolerances required characteristics and mass of a countersunk intermediate head short thread, break stem titanium alloy bolt.

2 Normative references

This Airbus Standard incorporates by dated or undated reference provisions from other publications. All normative references cited at the appropriate places in the text are listed hereafter. For dated references, subsequent amendments to or revisions of any these publications apply to this Airbus Standard only when incorporated in it by amendment of revision. For undated references, the latest issue of the publication referred to shall be applied.

ISO3161	Aerospace – UNJ threads - General requirements and limit dimensions.
EN2424	Aerospace series - Marking of aerospace products. [1]
EN4473	Aerospace series - Aluminium pigmented coatings - Technical specification. [1]
EN6116	Aerospace series – Threaded bolts, lightweight – Inch series – Technical specification. [1]
EN6117	Aerospace series - Specification for lubrication of bolts with cethyl alcohol. [1]
AMS4928	Titanium alloy bars, wire, forgings, and rings 6Al-4V annealed. [2]
AMS4967	Titanium alloy bars, forgings, and rings 6.0Al - 4.0V annealed, heat treatable. [2]
ANSI/ASME-B46-1	Surface texture (surface roughness waviness, and lay).
SAE AS8879	Screw threads – UNJ profile, inch - Controlled radius root with increased minor diameter. [3]

3 Requirements

3.1 Configuration, dimensions and tolerances

The configuration, dimensions and tolerances shall be in accordance with figure 1 and tables 1 to 3.

Dimensions are to be met after finish.

Roll formed thread as per AS8879 except TD diameter.

Concentricity tolerances between the tapered surface of the head and Ø D shall be .005 inch (0,127 mm) (TIR).

Concentricity tolerances between the cylindrical part of the head and Ø D shall be within the values of F (TIR) (see table 1).

For diameter codes -6 (9,52 mm), -7 (11,1 mm) and –8 (12,7 mm) only, drill centre dimple in the top of the head to a maximum diameter of .035 inch (0,889 mm) and a maximum depth of .010 inch (0,254 mm).

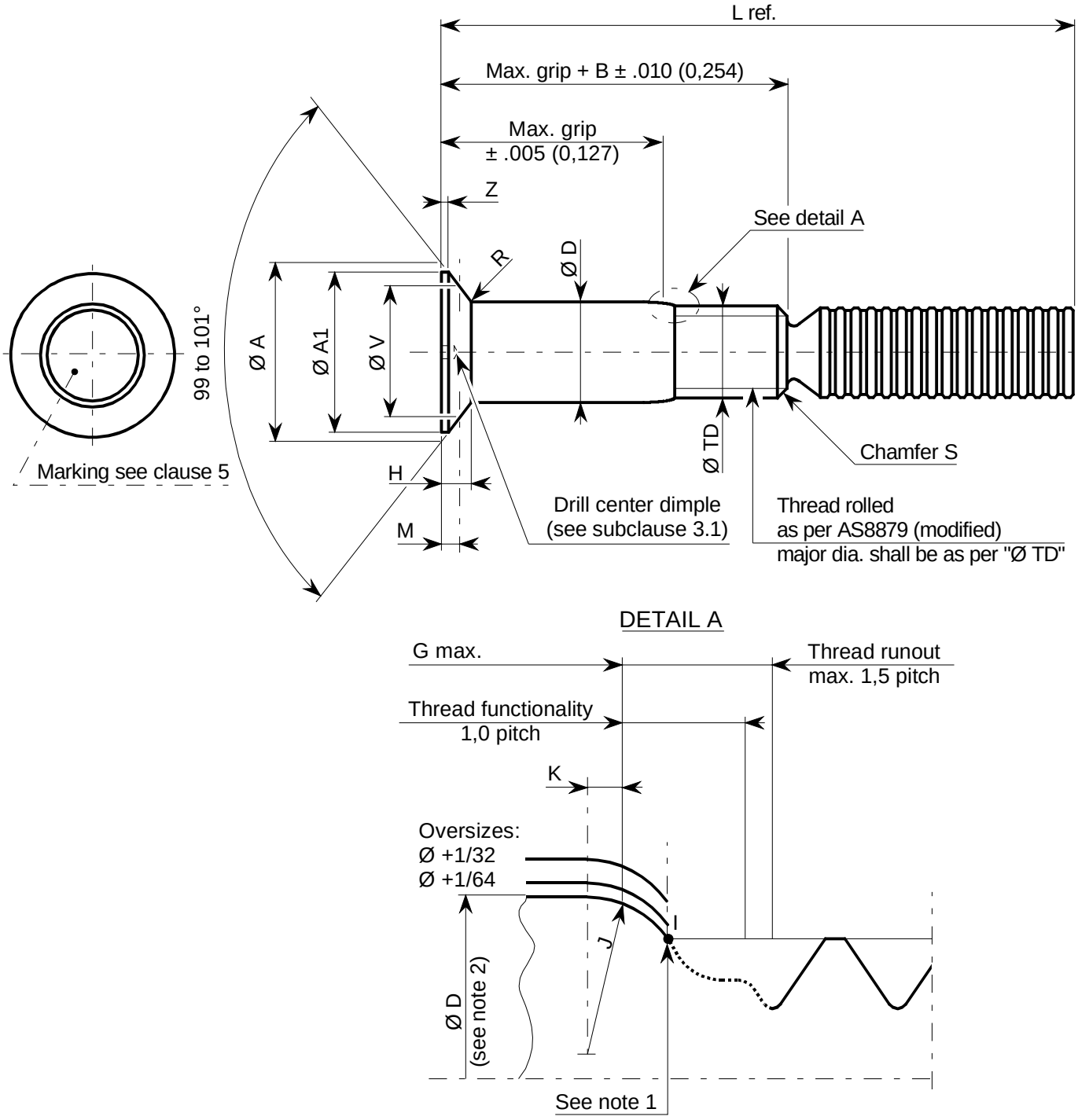
Dimple shall be concentric to “A” within .008 inch (0,203 mm).

Surface condition shall be as per ANSI/ASME-B46-1 unless otherwise specified.

Oversize fastener dimensions shall be in accordance with table 4 and table 5.

Mass values shall be in accordance with table 8.

[1] Published as ASD Standard at the date of publication of this standard
[2] Superintendent of documents, US Government Printing House, Washington, D.C. 20402, USA
[3] Published by: Society of Automotive Engineers, Inc. (SAE), 400 Commonwealth Drive, Warrendale, PA 15096-0001, USA



Dimensions in inch (millimeters).

NOTE 1: The diameter measured at point I shall be less than or equal to the max. diameter TD for nominal diameter.
This requirement shall be incremented to 1/64 and 1/32 respectively for 1st and 2nd oversize.

NOTE 2: Check concentricity of diameters D (shank) and TD (thread) to avoid interference between the bolt thread and hole when using tight interference fits.

NOTE 3: The maximum thread run-out and functionality for first and second over-sizes is incremented by 0,25 mm.

Figure 1: Configuration, dimensions and tolerances

Table 1: Dimensions (continued)

Dimensions in inch (millimeters)

Size code	Nominal diameter shank	Thread UNJF-3A modified	Ø A	Ø A1	B ref.	Ø D		F (1)	H ref. (2)
						Max.	Min.		
3	3/16	.1900-32	.3277 (8,324)	.2963 (7,526)	.290 (7,37)	.1895 (4,813)	.1885 (4,788)	.005 (0,13)	.056 (1,42)
4	1/4	.2500-28	.4283 (10,879)	.3969 (10,081)	.320 (8,13)	.2495 (6,337)	.2485 (6,312)	.006 (0,15)	.074 (1,88)
5	5/16	.3125-24	.5361 (13,617)	.5047 (12,819)	.380 (9,65)	.3120 (7,925)	.3110 (7,899)	.007 (0,18)	.092 (2,34)
6	3/8	.3750-24	.6415 (16,294)	.6101 (15,497)	.420 (10,67)	.3745 (9,512)	.3735 (9,487)	.008 (0,20)	.110 (2,79)
7	7/16	.4375-20	.7425 (18,860)	.6941 (17,630)	.485 (12,32)	.4370 (11,100)	.4360 (11,074)	.009 (0,23)	.126 (3,20)
8	1/2	.5000-20	.8423 (21,394)	.7939 (20,165)	.525 (13,33)	.4995 (12,687)	.4985 (12,662)	.010 (0,25)	.142 (3,61)

(1) See subclause 3.1.
(2) Height H is based on maximum diameter of dimension Ø D.

Table 1: Dimensions (continued)

Size code	Nominal diameter shank	J		K	M Gauge protrusion		Ø TD	
		Max.	Min.		Max.	Min.	Max.	Min.
3	3/16	.100 (2,540)	.090 (2,286)	.0160 (0,406)	.0295 (0,749)	.0263 (0,668)	.1840 (4,674)	.1810 (4,597)
4	1/4	.140 (3,556)	.126 (3,202)	.0210 (0,533)	.0227 (0,577)	.0195 (0,495)	.2440 (6,198)	.2410 (6,121)
5	5/16	.170 (4,318)	.160 (4,064)	.0260 (0,660)	.0234 (0,594)	.0198 (0,503)	.3060 (7,772)	.3020 (7,671)
6	3/8	.230 (5,842)	.220 (5,588)	.0300 (0,762)	.0295 (0,749)	.0259 (0,657)	.3680 (9,347)	.3640 (9,246)
7	7/16	.300 (7,620)	.291 (7,386)	.0350 (0,889)	.0347 (0,881)	.0307 (0,779)	.4310 (10,947)	.4260 (10,820)
8	1/2	.355 (9,017)	.345 (8,763)	.0390 (0,991)	.0504 (1,280)	.0464 (1,178)	.4930 (12,522)	.4880 (12,395)

Table 1: Dimensions (concluded)

Size code	Nominal diameter shank	Ø V		R		Z max.	S chamfer ref. (3)
		Max.	Min.	Max.	Min.		
3	3/16	.2560 (6,502)	.2558 (6,497)	.030 (0,76)	.020 (0,51)	.015 (0,38)	.031 (0,79)
4	1/4	.3732 (9,479)	.3730 (9,474)	.030 (0,76)	.020 (0,51)	.015 (0,38)	.031 (0,79)
5	5/16	.4791 (12,169)	.4789 (12,164)	.040 (1,02)	.030 (0,76)	.015 (0,38)	.047 (1,19)
6	3/8	.5698 (14,473)	.5696 (14,468)	.040 (1,02)	.030 (0,76)	.015 (0,38)	.047 (1,19)
7	7/16	.6582 (16,718)	.6580 (16,713)	.050 (1,27)	.040 (1,02)	.022 (0,56)	.047 (1,19)
8	1/2	.7200 (18,288)	.7198 (18,283)	.050 (1,27)	.040 (1,02)	.022 (0,56)	.047 (1,19)

(3) 37° to 45°.

Table 2: Overall lengths

Dimensions in inch (millimeters)

Grip dash No.	Overall length (L ref.)					
	3	4	5	6	7	8
10	1.945 (49,40)	-	-	-	-	-
11	2.070 (52,58)	-	-	-	-	-
12	2.195 (55,75)	-	2.285 (58,04)	-	2.375 (60,32)	2.360 (59,94)
13	2.320 (58,93)	2.302 (58,47)	2.410 (61,21)	-	2.500 (63,50)	2.485 (63,12)
14	2.445 (62,10)	2.427 (61,65)	2.535 (64,39)	2.515 (63,88)	2.625 (66,67)	2.610 (66,29)
15	2.570 (65,28)	2.552 (64,82)	2.660 (67,56)	2.640 (67,06)	2.750 (69,85)	2.735 (69,47)
16	2.695 (68,45)	2.667 (67,74)	2.785 (70,74)	2.765 (70,23)	2.875 (73,03)	2.860 (72,64)
17	2.820 (71,63)	2.802 (71,17)	2.910 (73,91)	2.890 (73.41)	3.000 (76,20)	2.985 (75,82)
18	2.945 (74,80)	2.927 (74,35)	3.035 (77,09)	3.015 (76,58)	3.125 (79,38)	3.110 (78,99)
19	3.070 (77,98)	3.052 (77,52)	3.160 (80,26)	3.140 (79,76)	3.250 (82,55)	3.235 (82,17)
20	3.195 (81,15)	3.177 (80,70)	3.285 (83,44)	3.265 (82,93)	3.375 (85,73)	3.360 (85,34)
21	3.320 (84,33)	3.302 (83,87)	3.410 (86,61)	3.390 (86,11)	3.500 (88,90)	3.485 (88,52)
22	3.445 (87,50)	3.427 (87,05)	3.535 (89,79)	3.515 (89,28)	3.625 (92,08)	3.610 (91,69)
23	3.570 (90,68)	3.552 (90,22)	3.660 (92,96)	3.640 (92,46)	3.750 (95,25)	3.735 (94,87)
24	3.695 (93,85)	3.677 (93,40)	3.785 (96,14)	3.765 (95,63)	3.875 (98,42)	3.860 (98,04)
25	-	-	3.910 (99,31)	3.890 (98,81)	4.000 (101,60)	3.985 (101,22)
26	-	-	4.035 (102,49)	4.015 (101,98)	4.125 (104,78)	4.110 (104,39)
27	-	-	4.160 (105,66)	4.140 (105,16)	4.250 (107,95)	4.235 (107,57)
28	-	-	4.285 (108,84)	4.265 (108,33)	4.375 (111,12)	4.360 (110,74)
29	-	-	-	4.390 (111,51)	4.500 (114,30)	4.485 (113,92)
30	-	-	-	4.515 (114,68)	4.625 (117,48)	4.610 (117,09)
31	-	-	-	4.640 (117,86)	4.750 (120,65)	4.735 (120,27)
32	-	-	-	-	4.875 (123,82)	4.860 (123,44)
33	-	-	-	-	5.000 (127,00)	4.985 (126,62)
34	-	-	-	-	5.125 (130,18)	5.110 (129,79)
35	-	-	-	-	5.250 (133,35)	5.235 (132,97)
36	-	-	-	-	5.375 (136,53)	5.360 (136,14)

Table 3: Grip lengths and tolerances

Dimensions in inch (millimeters)

Grip dash No	G ± 0,127	Length (G max. + B ref.) ± .010 (0,254)					
		3	4	5	6	7	8
10	.625 (15,88)	.915 (23,25)	-	-	-	-	-
11	.687 (17,46)	.978 (24,84)	-	-	-	-	-
12	.750 (19,05)	1.041 (26,43)	-	1.130 (28,70)	-	1.235 (31,37)	1.275 (32,38)
13	.813 (20,64)	1.103 (28,01)	1.133 (28,77)	1.193 (30,30)	-	1.298 (32,97)	1.337 (33,96)
14	.875 (22,22)	1.165 (29,60)	1.195 (30,36)	1.255 (31,87)	1.295 (32,89)	1.360 (34,54)	1.400 (35,56)
15	.937 (23,81)	1.228 (31,19)	1.258 (31,95)	1.317 (33,45)	1.358 (34,48)	1.422 (36,12)	1.462 (37,13)
16	1.000 (25,40)	1.291 (32,78)	1.320 (33,54)	1.380 (35,06)	1.420 (36,07)	1.485 (37,72)	1.525 (38,73)
17	1.063 (26,99)	1.353 (34,36)	1.383 (35,12)	1.443 (36,64)	1.483 (37,66)	1.548 (39,32)	1.587 (40,31)
18	1.125 (28,58)	1.415 (35,95)	1.445 (36,71)	1.505 (38,23)	1.545 (39,24)	1.610 (40,89)	1.650 (41,91)
19	1.187 (30,16)	1.478 (37,54)	1.508 (38,30)	1.568 (39,82)	1.608 (40,84)	1.672 (42,47)	1.712 (43,48)
20	1.250 (31,75)	1.541 (39,13)	1.570 (39,89)	1.630 (41,41)	1.670 (42,43)	1.735 (44,07)	1.775 (45,09)
21	1.313 (33,34)	1.603 (40,71)	1.633 (41,47)	1.693 (42,99)	1.733 (44,01)	1.798 (45,67)	1.837 (46,66)
22	1.375 (34,92)	1.665 (42,30)	1.695 (43,06)	1.755 (44,58)	1.795 (45,60)	1.860 (47,24)	1.900 (48,26)
23	1.437 (36,51)	1.728 (43,89)	1.758 (44,65)	1.818 (46,17)	1.858 (47,19)	1.922 (48,83)	1.962 (49,83)
24	1.500 (38,10)	1.791 (45,48)	1.820 (46,24)	1.880 (47,76)	1.920 (48,78)	1.985 (50,42)	2.025 (51,44)
25	1.563 (39,69)	-	-	1.943 (49,34)	1.983 (50,36)	2.048 (52,01)	2.087 (53,02)
26	1.625 (41,28)	-	-	2.005 (50,93)	2.045 (51,95)	2.110 (53,60)	2.150 (54,61)
27	1.687 (42,86)	-	-	2.068 (52,52)	2.108 (53,54)	2.172 (55,18)	2.212 (56,19)
28	1.750 (44,45)	-	-	2.130 (54,11)	2.170 (55,13)	2.235 (56,77)	2.275 (57,78)
29	1.813 (46,04)	-	-	-	2.233 (56,72)	2.298 (58,36)	2.337 (59,37)
30	1.875 (47,62)	-	-	-	2.295 (58,29)	2.360 (59,94)	2.400 (60,95)
31	1.937 (49,21)	-	-	-	2.358 (59,88)	2.422 (61,53)	2.462 (62,54)
32	2.000 (50,80)	-	-	-	-	2.485 (63,12)	2.525 (64,13)
33	2.063 (52,40)	-	-	-	-	2.548 (64,71)	2.588 (65,74)
34	2.125 (53,98)	-	-	-	-	2.610 (66,30)	2.650 (67,31)
35	2.187 (55,55)	-	-	-	-	2.672 (67,87)	2.712 (68,89)
36	2.250 (57,14)	-	-	-	-	2.735 (69,47)	2.775 (70,49)

Table 4: First oversize

Dimensions in inch (millimeters)

Thread UNJF-3A modified (inch)	First oversize (1/64 inch) – Oversize code: X					
	Size code	Nom. dia.	B ref.	Ø D		H ref.
				Min.	Max.	
.1900-32	3	.203 (5,16)	.300 (7,62)	.2016 (5,121)	.2026 (5,146)	.052 (1,32)
.2500-28	4	.266 (6,75)	.330 (8,38)	.2641 (6,708)	.2651 (6,734)	.068 (1,73)
.3125-24	5	.328 (8,33)	.390 (9,91)	.3266 (8,296)	.3276 (8,321)	.087 (2,21)
.3750-24	6	.391 (9,92)	.430 (10,92)	.3891 (9,883)	.3901 (9,909)	.105 (2,67)
.4375-20	7	.453 (11,51)	.495 (12,57)	.4516 (11,471)	.4526 (11,496)	.120 (3,07)
.5000-20	8	.516 (13,10)	.535 (13,58)	.5141 (13,058)	.5151 (13,084)	.137 (3,48)

Table 5: Second oversize

Dimensions in inch (millimeters)

Thread UNJF-3A modified (inch)	Second oversize (1/32 inch) – Oversize code: Y					
	Size code	Nom. dia.	B ref.	Ø D		H ref.
				Min.	Max.	
.1900-32	3	.219 (5,56)	.300 (7,62)	.2172 (5,517)	.2182 (5,542)	.044 (1,12)
.2500-28	4	.281 (7,14)	.330 (8,38)	.2797 (7,104)	.2807 (7,130)	.060 (1,52)
.3125-24	5	.344 (8,73)	.390 (9,91)	.3422 (8,692)	.3432 (8,717)	.079 (2,01)
.3750-24	6	.406 (10,32)	.430 (10,92)	.4047 (10,279)	.4057 (10,305)	.096 (2,46)
.4375-20	7	.469 (11,91)	.495 (12,57)	.4672 (11,867)	.4682 (11,892)	.114 (2,90)
.5000-20	8	.531 (13,49)	.535 (13,59)	.5297 (13,454)	.5307 (13,480)	.128 (3,25)

3.2 Materials, surface treatment and lubrication

The material, surface treatment and lubrication shall be in accordance with table 6.

Table 6: Materials, surface treatment and lubrication

Material	Surface treatment code	Surface treatment	Lubrication
Titanium alloy 6Al-4V as per AMS4928 or AMS4967 Rc min. = 650 MPa	K	Aluminium coating as per specification EN4473	Cetyl alcohol as per EN6117

3.3 Mechanical characteristics

Mechanical characteristics shall be in accordance with table 7.

Table 7: Mechanical characteristics

Size code	Min. double shear strength (N)	Min. tensile strength (N)	Max. fatigue load (N)	Min. pull-stem capability (N)
	Titanium	Titanium	Titanium	Titanium
3	23 900	10 700	4 000	9 200
4	41 330	20 000	7 000	13 800
5	64 880	30 450	10 650	22 700
6	93 320	45 350	15 900	35 000
7	127 100	58 250	20 400	44 000
8	165 760	80 000	28 000	54 500

NOTE 1: Minimum fatigue loads are equal to 10% of maximum loads.

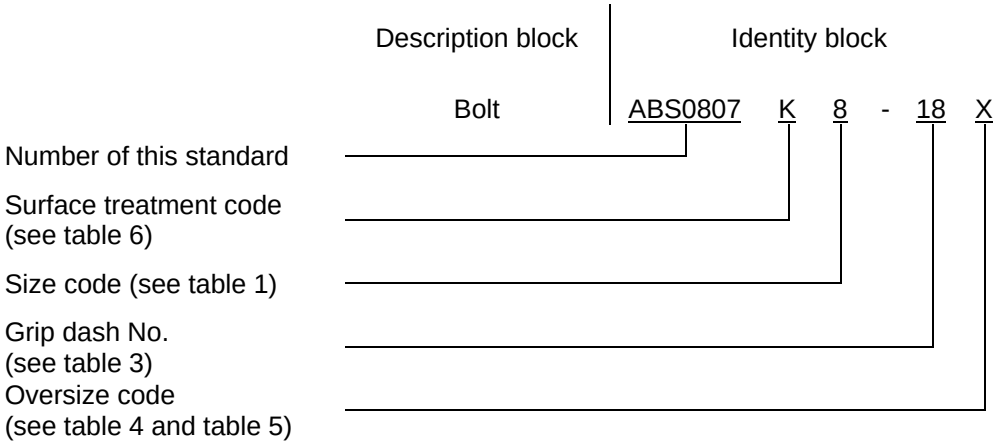
NOTE 2: Pull stem failure shall be achieved at a load that meets the minimum pull in capability requirement as defined in table 7 but which does not introduce damage or permanent distortion to the head or structure of the bolt.

Table 8 : Mass values

Length code	Diameter Grams					
	3	4	5	6	7	8
10	1,84	---	---	---	---	---
11	1,97	---	---	---	---	---
12	2,10	---	6.32	---	13,81	18,84
13	2,22	4,03	6.67	---	14,49	19,73
14	2,35	4,25	7.02	10.62	15,17	20,62
15	2,48	4,47	7.36	11,12	15,85	21,51
16	2,61	4,70	7,71	11,62	16,53	22,39
17	2,74	4,92	8,06	12,12	17,21	23,28
18	2,86	5,14	8,40	12,61	17,89	24,17
19	2,99	5,36	8,75	13,11	18,57	25,06
20	3,12	5,58	9,10	13,61	19,25	25,95
21	3,25	5,80	9,44	14,11	19,93	26,84
22	3,38	6,03	9,79	14,61	20,61	27,73
23	3,50	6,25	10,14	15,11	21,29	28,62
24	3,63	6,47	10,48	15,61	21,97	29,50
25	---	---	10,83	16,11	22,65	30,39
26	---	---	11,18	16,60	23,33	31,28
27	---	---	11,52	17,10	24,01	32,17
28	---	---	11,87	17,60	24,69	33,06
29	---	---	---	18,10	25,37	33,95
30	---	---	---	18,60	26,05	34,84
31	---	---	---	19,10	26,73	35,73
32	---	---	---	---	27,41	36,61
33	---	---	---	---	28,09	37,50
34	---	---	---	---	28,77	38,39
35	---	---	---	---	29,45	39,28
36	---	---	---	---	30.13	40.17

4 Designation

This type of Standard shall be designated according to the philosophy of the following example:



5 Marking

Parts shall be marked as per EN2424, style P.
Marking shall be recessed to a maximum depth of .01 inch (0,25 mm).

6 Technical specification

As per EN6116.

7 Example of installation

Not applicable.

RECORD OF REVISIONS

Issue	Clause modified	Description of modification
1 07/03		New Standard for A380 aircraft.
2 10/06	3.2 Table 4 Table 5 Tables 6 and 7	Note added regarding pull-stem failure requirements. Dimensions for -7 and -8 revised to ensure compatibility with EN6114. Minimum pull-stem capability added to table 5. First and second oversize dimensions added.
3 07/11	Tables 2 and 3	Grip dash Nos 16 to 21 added for size code 7. Grip dash Nos 17 to 24 added for size code 8. Grip dash Nos 12 to 15 added for size code 5
4 02/12	Tables 2 and 3 Table 8	Grip dash Nos 14, 29, 30 and 31 added for size code 6. Grip dash Nos 12 to 15 added for size code 7. Grip dash Nos 12 to 16 added for size code 8. Table 8 added Mass Values.