BOLT, 100° COUNTERSUNK HEAD

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1.Scope

This standard specifies the dimensions, tolerances and required characteristics of a 100° countersunk head bolt.

2. Normative references

A/DET/0013	Specification for lubrication of bolts with cetyl alcohol
ANSI B46-1	Surface texture (surface roughness waviness and lay).
NAS618	Hole preparation
AMS 4967	Titanium alloy bars, wire forgings and rings 6.0AL-4.0V annealed heat treatable
AMS 4928	Titanium alloy bars, wire forgings and rings 6AL-4V anneled
BS TA 28	Titanium aluminium vanadium alloy forging stock and wire
MIL-S-5000	Steel, chrome-nickel-molybdenum (E4340) bars and reforging stock
MIL-S-5626	Steel, chrome-molybdenum (4140) bars, rods, and forging stock (for aircraft applications)
MIL-S-6049	Steel, chrome-nickel-molybdenum (8740) bars and reforging stock (aircraft quality)
MIL-S-8879	General specification for screw threads, controlled root radius with increased minor diameter.
MIL-H-6875	Heat treatment of steel, process for
QQ-P-416	Plating, cadmium (electrodeposited)
EN2424	Marking of aerospace products.

Manufacturers specification No 294
Manufacturers specification No 391

3. Required characteristics

3.1 Configuration - Dimensions - Tolerances

3.1.1 Configuration shall be in accordance with figure 1.
3.1.2 Roll-formed thread as per MIL-S-8879 except TD diameter
3.1.3 Dimensions and tolerances shall be in accordance with table 1 and table 2.
3.1.4 Concentricity tolerances between :

- Tapered surface of head with ØD : 0,127mm (TIR)
- Cylindrical part of head and ØD within the values of F (TIR) (see table 1).

3.2 Mechanical characteristics

3.2.1 Mechanical characteristics shall be in accordance with table 3.

3.3 General characteristics

3.3.1 Surface condition as per ANSI B46-1.
3.3.2 Thread rolling of steel bolts shall be carried out after heat treating.

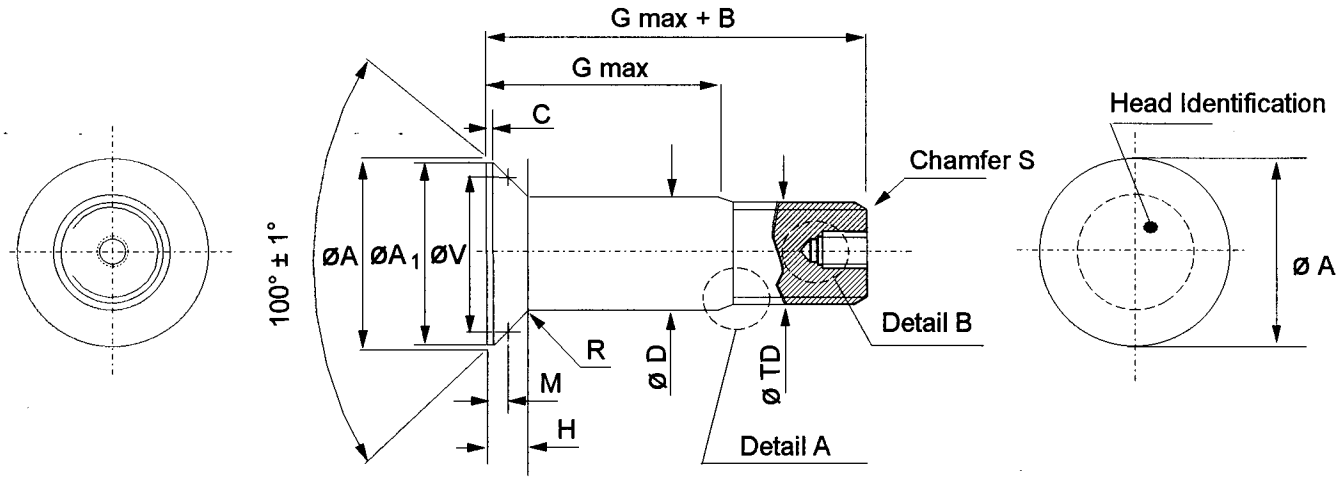
3.4 Material

3.4.1 Titanium alloy as per AMS 4967, AMS 4928 or BS TA 28 (Code V)
3.4.2 Alloy Steel per MIL-S-5000, MIL-S-5626 or MIL-H-6049 Rc min = 740MPa R = 1240 to 1380 MPa (MIL-H-6875) (No code)

3.5. Finish

3.5.1 Titanium Alloy : Hi-Kote 1 Aluminium coating per manufacturers spec 294 and Cetyl alcohol lube per A/DET/0013 (Code HK)

3.5.2 Alloy steel : Cadmium plate per QQ-P-416 Type II., Class 2, with colour code Black on thread end, and Cetyl alcohol lube per A/DET/0013 (No code)



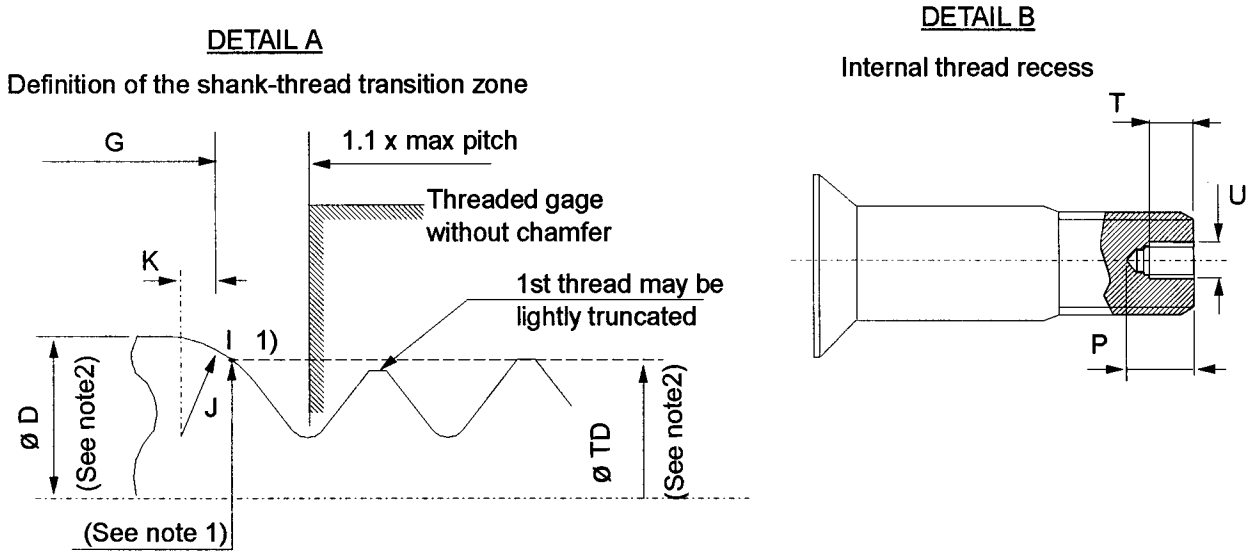


Figure 1: Configuration

1) The diameter at point I shall be less than or equal to the 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'

Table 1: Dimensions, Tolerances

Dimension in inch (mm)
Continued

DIA DASH NO	NOMINAL ø	øA MAX	øA1 MIN	B REF	C MAX	øD MAX	øD MIN	H REF	R (RAD) MAX	R (RAD) MIN
9	9/16"	0.930 (23,62)	0.881 (22,38)	0.600 (15,24)	0.022 (0.56)	0.5615 (14,262)	0.5605 (14,237)	0.153 (3,89)	0.050 (1,27)	0.040 (1,02)
10	5/8"	1.044 (26,52)	0.995 (25,27)	0.640 (16,26)	0.022 (0.56)	0.6240 (15,849)	0.6230 (15,824)	0.174 (4,42)	0.050 (1,27)	0.040 (1,02)
12	3/4"	1.300 (33,02)	1.251 (31,77)	0.895 (22,73)	0.022 (0.56)	0.7490 (19,025)	0.7480 (18,999)	0.229 (5,82)	0.050 (1,27)	0.040 (1,02)
14	7/8"	1.509 (38,33)	1.461 (37,11)	1.000 (25,40)	0.022 (0.56)	0.8740 (22,199)	0.8730 (22,174)	0.263 (6,68)	0.050 (1,27)	0.040 (1,02)
16	1"	1.720 (43,69)	1.671 (42,44)	1.160 (29,46)	0.022 (0.56)	0.9990 (25,375)	0.9980 (25,349)	0.298 (7,57)	0.050 (1,27)	0.040 (1,02)

Table1: Dimensions, Tolerances

Dimension in inch (mm)
Continued

DIA DASH NO	NOMINAL ø	F MAX 2)	M MAX	M MIN	S REF 1)	ø TD MAX	ø TD MIN	THREAD UNJF-3A MODIFIED	V MAX	V MIN
9	9/16"	0.010 (0,254)	0.0533 (1,354)	0.0485 (1,232)	0.0625 (1,59)	0.5500 (13,970)	0.5550 (14,097)	0.5625-18	0.8012 (20,350)	0.8010 (20,345)
10	5/8"		0.0633 (1,608)	0.0589 (1,496)		0.6180 (15,697)	0.6120 (15,544)	0.6250-18	0.8902 (22,611)	0.8900 (22,606)
12	3/4"	0.012 (0,304)	0.0776 (1,971)	0.0716 (1,819)		0.7430 (18,872)	0.7370 (18,720)	0.7500-16	1.1124 (28,255)	1.1122 (28,250)
14	7/8"	0.013 (0,355)	0.0694 (1,763)	0.0622 (1,580)	0.078 (1,98)	0.8680 (22,047)	0.8610 (21,869)	0.8750-14	1.3440 (34,138)	1.3438 (34,133)
16	1"		0.0617 (1,567)	0.0536 (1,361)		0.9930 (25,222)	0.9860 (25,044)	1.000-12	1.5732 (39,959)	1.5730 (39,954)

Table 1: Dimensions, Tolerances

Dimension in inch (mm)
Concluded

DIA DASH NO	NOMINAL ø	INTERNAL THREAD LEFT HAND T MIN	P MAX	P MIN	U THREAD UNJF-2B	J MAX	J MIN	K
9	9/16"	0.240 (6,10)	0.340 (8,64)	0.320 (8,13)	0.2500-28	0.380 (9,65)	0.370 (9,40)	0.039 (0,99)
10	5/8"	0.240 (6,10)	0.340 (8,64)	0.320 (8,13)		0.390 (9,91)	0.380 (9,65)	0.041 (1,04)
12	3/4"	0.260 (6,60)	0.385 (9,78)	0.365 (9,27)	0.3750-24	0.400 (10,16)	0.380 (9,65)	0.044 (1,12)
14	7/8"	0.380 (9,65)	0.500 (12,70)	0.480 (12,19)		0.405 (10,29)	0.385 (9,78)	0.045 (1,14)
16	1"	0.450 (11,43)	0.575 (14,61)	0.555 (14,10)		0.435 (11,05)	0.415 (10,54)	

1) 37° for titanium bolts and 45° for steel bolts
2) See note 3.1.4

Table 2: Dimensions in inch (mm)

LENGTH CODE No	G ± 0.005 ± (0,13)	LENGTH G MAX + B ± 0.010 ± (0,25)				
		-9	-10	-12	-14	-16
5	0.313 (7,95)	0.913 (23,18)	--- ---	--- ---	--- ---	--- ---
6	0.375 (9,52)	0.975 (24,74)	1.015 (25,77)	--- ---	--- ---	--- ---
7	0.437 (11,11)	1.037 (26,35)	1.077 (27,36)	1.332 (33,84)	--- ---	--- ---
8	0.500 (12,70)	1.100 (27,94)	1.140 (28,95)	1.395 (35,43)	1.500 (38,10)	--- ---
9	0.563 (14,30)	1.163 (29,54)	1.203 (30,56)	1.458 (37,03)	1.563 (39,70)	1.723 (43,75)
10	0.625 (15,88)	1.225 (31,12)	1.265 (32,13)	1.520 (38,61)	1.625 (41,28)	1.785 (45,34)
11	0.687 (17,45)	1.287 (32,69)	1.327 (33,71)	1.582 (40,19)	1.687 (42,85)	1.847 (46,92)
12	0.750 (19,05)	1.350 (34,29)	1.390 (35,30)	1.645 (41,78)	1.750 (44,45)	1.910 (48,51)
13	0.813 (20,65)	1.413 (35,89)	1.453 (36,91)	1.708 (43,37)	1.812 (46,05)	1.973 (50,10)
14	0.875 (22,22)	1.475 (37,46)	1.515 (38,48)	1.770 (44,95)	1.875 (47,62)	2.035 (51,68)
15	0.937 (23,80)	1.537 (39,04)	1.577 (40,06)	1.832 (46,54)	1.937 (49,20)	2.097 (53,27)
16	1.000 (25,40)	1.600 (40,64)	1.640 (41,65)	1.895 (48,13)	2.000 (50,80)	2.160 (54,86)
17	1.063 (27,00)	1.663 (42,24)	1.703 (43,26)	1.958 (49,73)	2.063 (52,40)	2.223 (56,46)
18	1.125 (28,58)	1.725 (43,82)	1.765 (44,83)	2.020 (51,31)	2.125 (53,98)	2.285 (58,06)
19	1.188 (30,17)	1.788 (45,41)	1.828 (46,43)	2.083 (52,91)	2.188 (55,58)	2.348 (59,64)
20	1.250 (31,75)	1.850 (46,99)	1.890 (48,00)	2.145 (54,48)	2.250 (57,15)	2.410 (61,21)
21	1.313 (33,35)	1.913 (48,59)	1.953 (49,61)	2.208 (56,11)	2.313 (58,75)	2.473 (62,81)
22	1.375 (34,93)	1.975 (50,16)	2.015 (51,18)	2.270 (57,66)	2.375 (60,33)	2.535 (64,41)
23	1.438 (36,53)	2.038 (51,77)	2.078 (52,78)	2.333 (59,26)	2.438 (61,93)	2.598 (65,99)
24	1.500 (38,10)	2.100 (53,34)	2.140 (54,35)	2.395 (60,83)	2.500 (63,50)	2.660 (67,56)
25	1.563 (39,70)	2.163 (54,94)	2.203 (55,96)	2.458 (62,43)	2.563 (65,10)	2.723 (69,16)
26	1.625 (41,28)	2.225 (56,52)	2.265 (57,53)	2.520 (64,01)	2.625 (66,67)	2.785 (70,74)
27	1.687 (42,85)	2.287 (58,09)	2.327 (59,11)	2.582 (65,58)	2.687 (68,25)	2.847 (72,31)

Continued

Table 2:

Dimensions in inch (mm)
Concluded

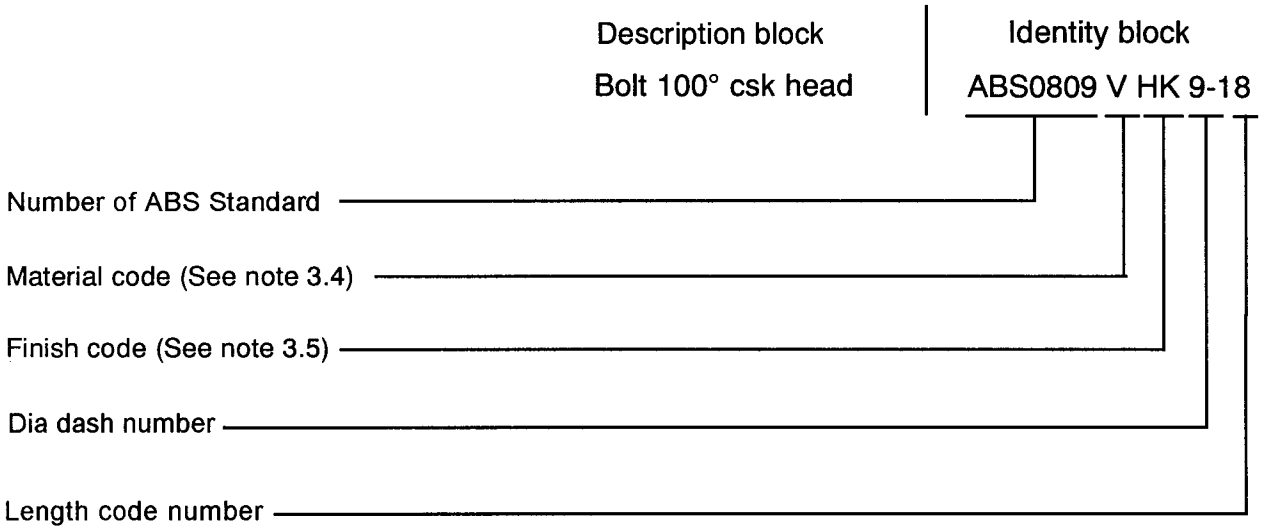
LENGTH CODE No	G ± 0.005 ± (0,13)	LENGTH G MAX + B ± 0.010 ± (0,25)				
		-9	-10	-12	-14	-16
28	1.750 (44,45)	2.350 (59,69)	2.390 (60,70)	2.645 (67,18)	2.750 (69,85)	2.910 (73,91)
29	1.813 (46,05)	2.413 (61,28)	2.453 (62,31)	2.708 (68,78)	2.813 (71,45)	2.973 (75,51)
30	1.875 (47,62)	2.475 (62,86)	2.515 (63,88)	2.770 (70,36)	2.875 (73,03)	3.035 (77,09)
31	1.937 (49,20)	2.537 (64,44)	2.577 (65,46)	2.832 (71,93)	2.937 (74,60)	3.097 (78,66)
32	2.000 (50,80)	2.600 (66,04)	2.640 (67,05)	2.895 (73,53)	3.000 (76,20)	3.160 (80,26)
34	2.125 (53,98)	2.725 (69,22)	2.765 (70,23)	3.020 (76,71)	3.125 (79,38)	3.285 (83,44)
36	2.250 (57,15)	2.850 (72,39)	2.890 (73,40)	3.145 (79,88)	3.250 (82,55)	3.410 (86,61)
38	2.375 (60,32)	2.975 (75,56)	3.015 (76,58)	3.270 (83,06)	3.375 (85,73)	3.535 (89,79)
40	2.500 (63,50)	3.100 (78,74)	3.140 (79,77)	3.395 (86,23)	3.500 (88,90)	3.660 (92,96)
42	2.625 (66,68)	3.225 (81,92)	3.265 (82,93)	3.520 (89,41)	3.625 (92,08)	3.785 (96,14)
44	2.750 (69,85)	3.350 (85,09)	3.390 (86,10)	3.645 (92,58)	3.750 (95,25)	3.910 (99,31)
46	2.875 (73,02)	3.475 (88,26)	3.515 (89,28)	3.770 (95,76)	3.875 (98,43)	4.035 (102,49)
48	3.000 (76,20)	3.600 (91,44)	3.640 (92,45)	3.895 (98,93)	4.000 (101,60)	4.160 (105,66)
50	3.125 (79,38)	3.725 (94,62)	3.765 (95,63)	4.020 (102,11)	4.125 (104,78)	4.285 (108,84)
52	3.250 (82,55)	3.850 (97,79)	3.890 (98,80)	4.145 (105,28)	4.250 (107,95)	4.410 (112.01)
54	3.375 (85,72)	3.975 (100,96)	4.015 (101,98)	4.270 (108,46)	4.375 (111.13)	4.535 (115,19)
56	3.500 (88,90)	4.100 (104,14)	4.140 (105,15)	4.395 (111,63)	4.500 (114,30)	4.660 (118,36)
58	3.625 (92,08)	4.225 (107,32)	4.265 (108,33)	4.520 (114,81)	4.625 (117,48)	4.785 (121,54)
60	3.750 (95,25)	4.350 (110,49)	4.390 (111,50)	4.645 (117,98)	4.750 (120,65)	4.910 (124,71)

Table 3. Mechanical Characteristics Values in lbf (N)

DIA DASH NO	MIN DOUBLE SHEAR STRENGTH 1)		MIN TENSILE STRENGTH		MAX FATIGUE LOAD 2)		MAXIMUM INSTALLATION LOAD 3)	
	ALLOY STEEL	TITANIUM	ALLOY STEEL	TITANIUM	ALLOY STEEL	TITANIUM	ALLOY STEEL	TITANIUM
9	53700 (238869,4)	47200 (209956,0)	24600 (109426,2)	22500 (100084,9)	8600 (38254,7)	7875 (35029,7)	9450 (42035,6)	9450 (42035,6)
10	66300 (294917,0)	58300 (259331,2)	31000 (137894,8)	29200 (129888,2)	10850 (48263,2)	10200 (45371,8)	9450 (42035,6)	9450 (42035,6)
12	95400 (424360,2)	---	48000 (213514,6)	---	16800 (74730,1)	---	14175 (63053,5)	14175 (63053,5)
14	129000 (573820,4)	---	65000 (289134,3)	---	22750 (101197,0)	---	21600 (96081,5)	21600 (96081,5)
16	168500 (749525,1)	---	85000 (378098,7)	---	29750 (132334,5)	---	21600 (96081,5)	21600 (96081,5)

4.Designation

Each bolt shall be designated as in the following example:-



5. Marking

Marking shall be recessed to a maximum depth of 0,25 mm as per EN2424 category A.

6. Technical Specification

Manufacturers specification No 391.

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1) Values apply without lubrication.
2) Minimum fatigue loads are equal to 10% of the maximum fatigue loads.
3) The maximum allowable installation load must not exceed the maximum load values in table 3 or thread failure may occur.