

**Bolt – Hexagon Head, Close Tolerance
6AL-4V Titanium Alloy**

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1 Scope

This standard specifies the dimensions, required characteristics and mass of a hex, bolt head for use in aerospace applications.

2 Normative References

AMS 4928	Titanium Alloy Bars, Wire, forgings , and Rings 6Al – 4V Annealed (UNS R56400)
AMS 4967	Titanium Alloy Bars, Wire, forgings , and Rings 6.0Al – 4.0V Annealed, Heat Treatable (UNS R56400)
MIL-DTL-83488	Coating, Aluminium, Ion Vapour Deposition
AS8879	Screw threads, controlled radius root with increased minor diameter.
NAS 4004	Fasteners, 6AL-4V Titanium alloy, externally threaded, 160 KSI Ftu, 95 KSI Ftu, 450 degrees F.
ASME B46.1	Surface texture (surface roughness, waviness, and lay.)
EN6118	Process specification – Aluminium base protection for fasteners
EN6117	Specification for lubrication of bolts with cetyl alcohol
ISO 8080	Aerospace – Anodic treatment of titanium and titanium alloys - Sulfuric acid process.

3 Required Characteristics

3.1 Configuration - Dimensions - Tolerances

- 3.1.1 Configuration, dimensions, tolerances shall be in accordance with the figure and table 1.
- 3.1.2 Roll formed thread as per AS8879
- 3.1.3 Unassigned Intermediate or longer grip lengths not included in table 2 may be specified by the use of whole dash numbers only
- 3.1.4 Grip dimensions equals grip dash number times 0.0625" (1,588mm). Length dimensions equals grip plus thread.
- 3.1.5 Grip length of bolts shall be measured from the underside of head to the end of the full cylindrical portion of the shank
- 3.1.6 Oversize dimensions shall be in accordance with table 4
- 3.1.7 Reference dimensions are for design purposes only, not an inspection requirement.
- 3.1.8 Concentricity: "D" diameter to thread pitch diameter within "AA" values. Concentricity between "D" and "E" diameters within "CC" values TIR
- 3.1.9 Cotter pin hole centre line: within 0.010" (0,25mm) and normal within 2° of bolt centre line
- 3.1.10 Surface texture: on shank, under surface of head, radius R thread flanks and thread root $\sqrt{32}$ microinch (0.8 microns) ; other surfaces $\sqrt{125}$ microinch (3.2 microns).
- 3.1.11 Shank straightness: within "BB" values TIR per inch of length.
- 3.1.12 Bearing surface squareness: within 0.003" (0,08mm) TIR of shank diameter.
- 3.1.13 Washer face diameter: Max. not to exceed actual width across flats, Min as tabulated
- 3.1.14 Head marking: Basic number plus grip dash number plus "D", "H", or "DH" when applicable, plus manufacturers symbol raised or depressed 0.010" (0,25mm) max. Arrangement optional.

3.2 Material

Shall be in accordance with table 2

3.3 Surface treatment

Shall be in accordance with table 2

3.4 Tensile, Shear and Fatigue values

Shall be in accordance with table 3

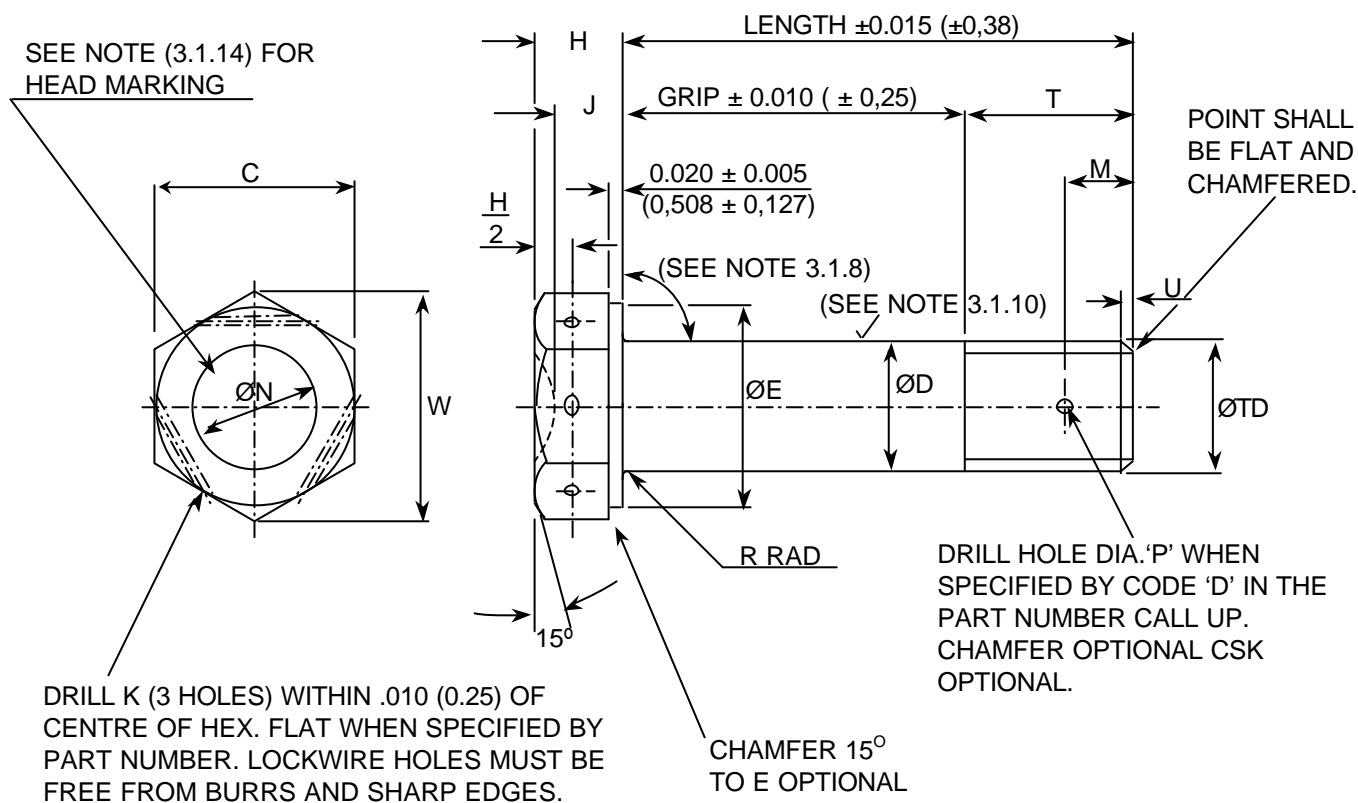


Table 1 Dimensions

Dimensions inch(mm)

Dia Dash No	Thread Size UNJF - 3A	C		ϕD		E Dia Min
		Max	Min	Max	Min	
3	0.1900 - 32	0.376 (9,550)	0.367 (9,322)	0.1895 (4,813)	0.1885 (4,788)	0.335 (8,509)
4	0.2500 - 28	0.439 (11,151)	0.429 (10,897)	0.2495 (6,337)	0.2485 (6,312)	0.398 (10,109)
5	0.3125 - 24	0.502 (12,751)	0.492 (12,497)	0.3120 (7,925)	0.3110 (7,899)	0.460 (11,684)
6	0.3750 - 24	0.564 (14,326)	0.554 (14,072)	0.3745 (9,512)	0.3735 (9,487)	0.523 (13,284)
7	0.4375 - 20	0.690 (17,526)	0.678 (17,221)	0.4370 (11,100)	0.4360 (11,074)	0.648 (16,459)
8	0.5000 - 20	0.752 (19,101)	0.741 (18,821)	0.4995 (12,687)	0.4985 (12,662)	0.710 (18,034)
9	0.5625 - 18	0.877 (22,276)	0.865 (21,971)	0.5615 (14,262)	0.5605 (14,237)	0.835 (21,209)
10	0.6250 - 18	0.940 (23,876)	0.928 (23,571)	0.6240 (15,850)	0.6230 (15,824)	0.898 (22,809)
12	0.7500 - 16	1.065 (27,051)	1.052 (26,721)	0.7490 (19,025)	0.7480 (18,999)	1.023 (25,984)

Table 1 Continued

Dimensions inch (mm)

Dia Dash No	Thread Size UNJF – 3A	H		J		K Dia	
		Max	Min	Max	Min	Max	Min
3	0.1900 – 32	0.125 (3,175)	0.110 (2,794)	0.088 (2,235)	0.073 (1,854)	0.056 (1,422)	0.046 (1,168)
4	0.2500 - 28	0.140 (3,556)	0.125 (3,175)	0.098 (2,489)	0.083 (2,108)	0.056 (1,422)	0.046 (1,168)
5	0.3125 - 24	0.171 (4,343)	0.156 (3,962)	0.119 (3,023)	0.104 (2,642)	0.080 (2,032)	0.070 (1,778)
6	0.3750 - 24	0.203 (5,156)	0.188 (4,775)	0.140 (3,556)	0.125 (3,175)	0.080 (2,032)	0.070 (1,778)
7	0.4375 - 20	0.234 (5,944)	0.219 (5,563)	0.161 (4,089)	0.146 (3,708)	0.080 (2,032)	0.070 (1,778)
8	0.5000 - 20	0.265 (6,731)	0.250 (6,350)	0.182 (4,623)	0.167 (4,242)	0.080 (2,032)	0.070 (1,778)
9	0.5625 - 18	0.296 (7,518)	0.281 (7,137)	0.203 (5,156)	0.188 (4,775)	0.080 (2,032)	0.070 (1,778)
10	0.6250 - 18	0.327 (8,306)	0.312 (7,925)	0.223 (5,664)	0.208 (5,283)	0.080 (2,032)	0.070 (1,778)
12	0.7500 - 16	0.390 (9,906)	0.375 (9,525)	0.265 (6,731)	0.250 (6,350)	0.080 (2,032)	0.070 (1,778)

Table 1 Continued

Dimensions inch (mm)

Dia Dash No.	Thread Size UNJF – 3A	M		N		P		R	
		Max	Min	Max	Min	Max	Min	Max	Min
3	0.1900 - 32	0.174 (4,420)	0.154 (3,912)	0.20 (5,00)	0.18 (4,57)	0.080 (2,032)	0.070 (1,778)	0.020 (0,508)	0.010 (0,254)
4	0.2500 - 28	0.180 (4,572)	0.160 (4,064)	0.26 (6,60)	0.24 (6,10)	0.086 (2,184)	0.076 (1,930)	0.020 (0,508)	0.010 (0,254)
5	0.3125-24	0.192 (4,877)	0.172 (4,369)	0.32 (8,13)	0.30 (7,62)	0.086 (2,184)	0.076 (1,930)	0.020 (0,508)	0.010 (0,254)
6	0.3750-24	0.193 (4,902)	0.173 (4,394)	0.39 (9,91)	0.37 (9,40)	0.116 (2,946)	0.106 (2,692)	0.025 (0,635)	0.015 (0,381)
7	0.4375 - 20	0.209 (5,309)	0.189 (4,801)	0.45 (11,43)	0.43 (10,92)	0.116 (2,946)	0.106 (2,692)	0.025 (0,635)	0.015 (0,381)
8	0.5000 - 20	0.208 (5,283)	0.188 (4,775)	0.51 (12,95)	0.49 (12,45)	0.116 (2,946)	0.106 (2,692)	0.030 (0,762)	0.020 (0,508)
9	0.5625 - 18	0.217 (5,512)	0.197 (5,004)	0.57 (14,48)	0.55 (13,97)	0.151 (3,835)	0.141 (3,581)	0.035 (0,889)	0.020 (0,508)
10	0.6250 - 18	0.217 (5,512)	0.197 (5,004)	0.63 (16,00)	0.61 (15,49)	0.151 (3,835)	0.141 (3,581)	0.040 (1,016)	0.025 (0,635)
12	0.7500 - 16	0.232 (5,893)	0.212 (5,385)	0.76 (19,30)	0.74 (18,80)	0.151 (3,835)	0.141 (3,581)	0.045 (1,143)	0.030 (0,762)

Table 1 Concluded

Dimensions inch (mm)

Dia – Dash No.	T Ref	TD		U Max	W Min	AA (3.1.8)	BB (3.1.11)	CC (3.1.8)
		Max	Min					
3	0.323 (8,204)	0.1840 (4,674)	0.1810 (4,597)	0.039 (0,991)	0.410 (10,414)	0.0045 (0,114)	0.0040 (0,1016)	0.005 (0,127)
4	0.370 (9,398)	0.2440 (6,198)	0.2410 (6,121)	0.045 (1,143)	0.480 (12,192)	0.0045 (0,114)	0.0030 (0,0762)	0.006 (0,152)
5	0.438 (11,125)	0.3060 (7,772)	0.3020 (7,671)	0.052 (1,321)	0.552 (14,021)	0.0045 (0,114)	0.0030 (0,0762)	0.008 (0,203)
6	0.454 (11,532)	0.3680 (9,347)	0.3640 (9,246)	0.052 (1,321)	0.623 (15,824)	0.0045 (0,114)	0.0025 (0,0635)	0.009 (0,229)
7	0.528 (13,411)	0.4310 (10,947)	0.4260 (10,820)	0.062 (1,575)	0.764 (19,406)	0.0060 (0,152)	0.0025 (0,0635)	0.010 (0,254)
8	0.528 (13,411)	0.4930 (12,522)	0.4880 (12,395)	0.062 (1,575)	0.836 (21,234)	0.0060 (0,152)	0.0020 (0,0508)	0.011 (0,279)
9	0.594 (15,088)	0.5550 (14,097)	0.5500 (13,970)	0.068 (1,727)	0.978 (24,841)	0.0060 (0,152)	0.0020 (0,0508)	0.012 (0,305)
10	0.626 (15,900)	0.6180 (15,697)	0.6120 (15,545)	0.068 (1,727)	1.050 (26,670)	0.0060 (0,152)	0.0020 (0,0508)	0.015 (0,381)
12	0.666 (16,916)	0.7430 (18,873)	0.7370 (18,720)	0.078 (1,981)	1.191 (30,251)	0.0060 (0,152)	0.0020 (0,0508)	0.018 (0,457)

Table 2 Material / Finish

Call up Code	Material	Protection	Lubrication	Colour Identification
-	Titanium 6AL-4V Alloy per AMS4928 or AMS4967	Aluminium coating To MIL-DTL-83488 Type II Class 3	None	Blue Dye on Bolt end and Chamfer
V		Aluminium coating as per EN6118	As per EN6117	Yellow All Over
T		Sulfuric-acid anodizing as per ISO 8080	As per EN6117	Blue All Over

Heat treat to 160 to 180 K.S.I (1100 to 1240 N/mm²)

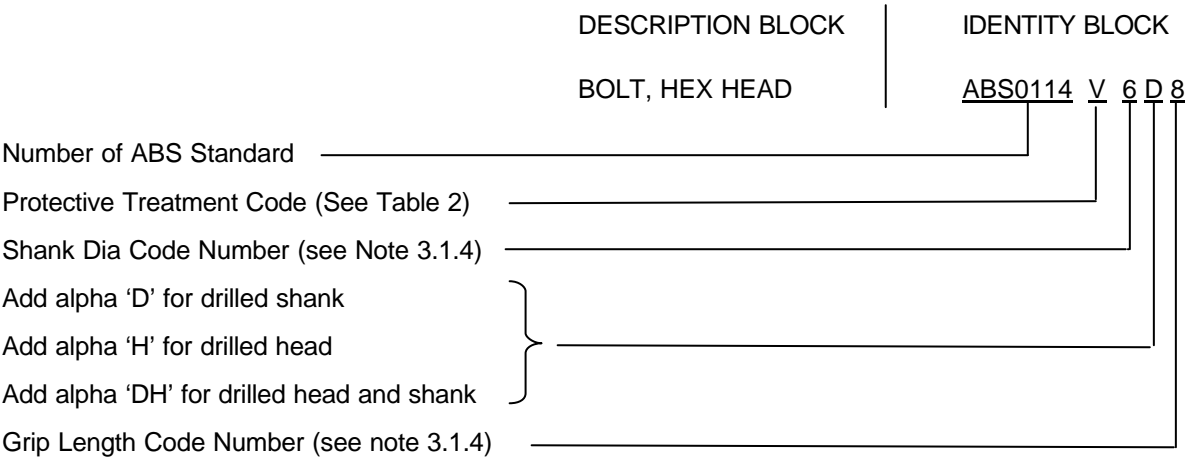
Ultimate Tensile Strength 95 K.S.I (655 N/mm²) min shear.

Table 3 Mechanical Characteristics

Dia Dash No	Ultimate Tensile Min lbs	Shear Min lbs		Tension Fatigue Load lbs	
		Double Shear	Single Shear	High Load	Low Load
3	3180	5380	2690	1060	106
4	5820	9300	4650	1940	194
5	9260	14600	7300	3080	308
6	14000	21000	10500	4660	466
7	19000	28600	14300	6330	633
8	25600	37300	18650	8530	853
9	32400	47200	23600	10800	1080
10	40900	58300	29150	13620	1362
12	56900	83900	41950	18950	1985

4 **Designation**

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



5 **Technical specification**

NAS 4004 Except for protective treatment and lubrication

RESTRICTED USAGE FOR REPAIR WORK ONLY

0.0156"(0,396mm) and 0.0312" (0,792mm) oversize shank for replacement of bolts shown on Page 3.

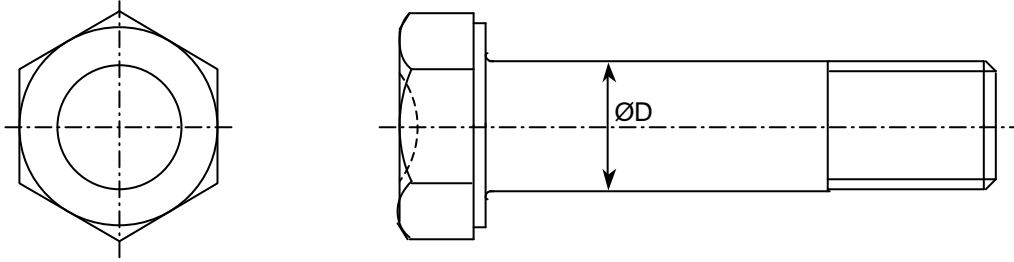
Head Marking: Same as given on page 3

Plus identification for oversize, as applicable, to be included in the second sector.

Identify 0.0156" (0,396mm) oversize by "X".

Identify 0.0312" (0,792mm) oversize by "Y"

See pages 3 to 5 for dimensions not shown.



Major diameter of threads may conform to "TD" on page 5 or to AS 8879.

* Grip Dash Number in 0.0625" (1,588mm) increments.

For material, finish and procurement information, see table 2 page 5

Examples of part number:

0.0156" (0,396mm) oversize = ABS0114 – 10 - **X

0.0312" (0,792mm) oversize = ABS0114 – 10 - **Y

Grip Length _____

For table of dimensions see pages 3 to 5

Table 4 Oversize Dimensions

Thread Size UNJF – 3A	0.0156(0,396) Oversize Shank		0.0312(0,792) Oversize Shank	
	Part Number	ØD After Coating	Part Number	ØD After Coating
0.1900-32	ABS 0114 – 3 - **X	0.2026 (5,146) 0.2016 (5,121)	ABS 0114 – 3 - **Y	0.2182 (5,542) 0.2172 (5,517)
0.2500-28	ABS 0114 – 4 - **X	0.2651 (6,734) 0.2641 (6,708)	ABS 0114 – 4 - **Y	0.2807 (7,130) 0.2797 (7,104)
0.3125-24	ABS 0114 – 5 - **X	0.3276 (8,321) 0.3266 (8,296)	ABS 0114 – 5 - **Y	0.3432 (8,717) 0.3422 (8,692)
0.3750-24	ABS 0114 – 6 - **X	0.3901 (9,909) 0.3891 (9,883)	ABS 0114 – 6 - **Y	0.4057 (10,305) 0.4047 (10,279)
0.4375-20	ABS 0114 – 7 - **X	0.4526 (11,496) 0.4516 (11,471)	ABS 0114 – 7 - **Y	0.4682 (11,892) 0.4672 (11,867)
0.5000-20	ABS 0114 – 8 - **X	0.5151 (13,084) 0.5141 (13,058)	ABS 0114 – 8 - **Y	0.5307 (13,480) 0.5297 (13,454)
0.5625-18	ABS 0114 – 9 - **X	0.5771 (14,658) 0.5761 (14,633)	ABS 0114 – 9 - **Y	0.5927 (15,055) 0.5917 (15,029)
0.6250-18	ABS 0114 – 10 - **X	0.6396 (16,246) 0.6386 (16,220)	ABS 0114 – 10 - **Y	0.6552 (16,642) 0.6542 (16,617)
0.7500-16	ABS 0114 – 12 - **X	0.7646 (19,421) 0.7636 (19,396)	ABS 0114 – 12 - **Y	0.7802 (19,817) 0.7792 (19,792)

RECORD OF REVISIONS

Issue	Clause modified	Description of modification
3 03/03		Tensile and shear values added
4 09/04		Column "ØD without coating" deleted. Tensile & fatigue strength modified.