Aerospace series

Bolt - Self aligning head (slope 5° max), Pull type – For fatigue applications

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

Contents

1 Scope

This standard specifies the dimensions, tolerances, required characteristics and the mass of a bolt, self aligning head (slope 5° max.), pull type, for fatigue applications.

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.

EN2424	Aerospace series - Marking of aerospace products. [1]
EN4473	Aerospace series - Aluminium pigmented coatings - Technical specification. [1]
EN6116	Aerospace series - Threaded bolts, light weight - Inch series - Technical specification. [1]
EN6117	Aerospace series - Specification for lubrication of bolts with cethyl alcohol. [1]
AMS4928	Titanium alloys bars, wire, forgings, and rings 6Al-4V annealed. [2]
AMS4967	Titanium alloys bars, wire, forgings, and rings 6Al-4V annealed, heat treatable. [2]
AMS5662	Nickel alloy, corrosion and heat resistant, bars, forgings, rings 52.5 Ni - 19 Cr - 3.0Mo - 5.1Cb - 0.90Ti - 0.50Al - 18Fe, consumable electrode or vacuum induction melted, 1775 °F (968 °C), solution heat tread, precipitation hardenable. [2]
AMS5962	Alloy bars, forgings and rings, corrosion and heat resistant. [2]
ANSI/ASME-B46-1	Surface texture (Surface roughness, waviness and lay).
ASNA2531	Nut - Self-locking, with a spherical joint and a self-alignment.
ASNA2532	Nut - Hexagonal, self-locking, steel.
SAE AS8879	Screw threads, controlled radius root with increased minor diameter. [3]

3 Requirements

3.1 Configuration, dimensions, tolerances and mass

The configuration, dimensions and tolerances shall be in accordance with figure 1, table 1 and table 2.
Dimensions are expressed after surface treatment.
Surface texture: Ra : 1,6 max. as per ANSI-B46-1 before coating.
Drill center dimple in top of head 0,889 mm (.035 inch) max. dia., 0,254 mm (.010 inch) max. depth and concentric to "A" within 0,203 mm (.008 inch).

[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

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 1.

Mass of the smooth part:

Multiply the value of the 2nd mass column of table 1 (value according to the diameter code No.) by the length code No. of the bolt.

EXAMPLES :

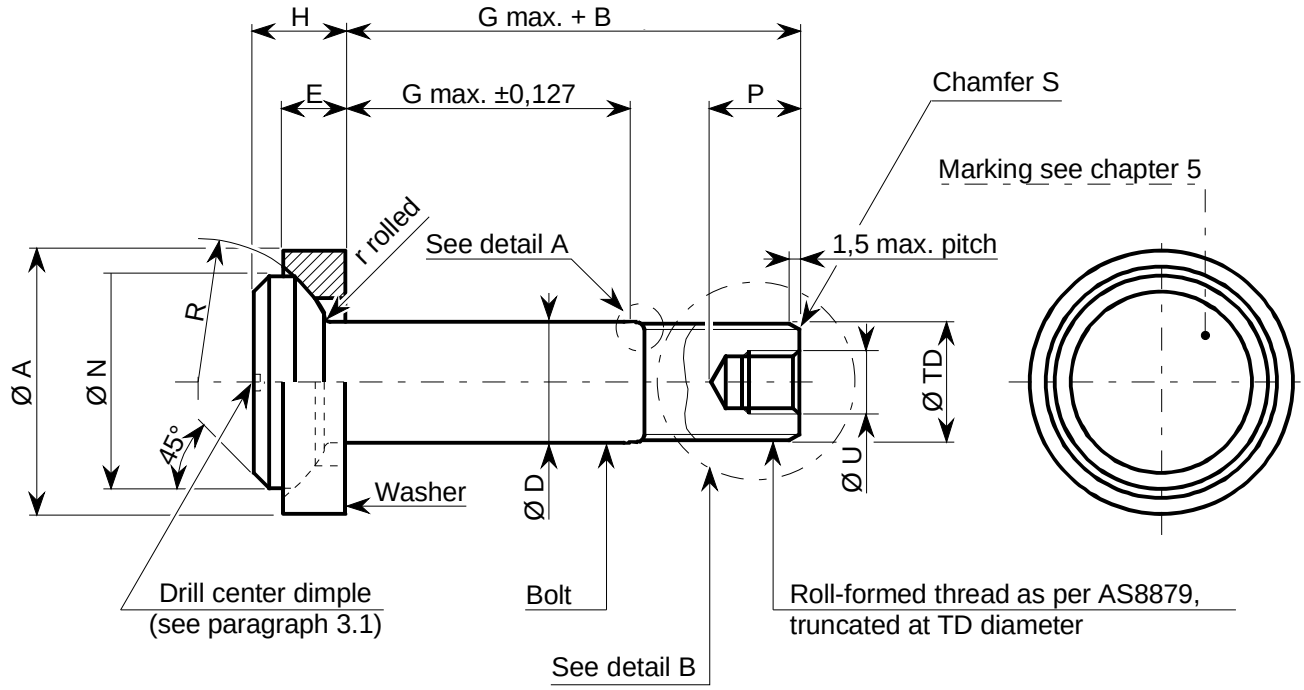
BOLT ABS0997K10-20

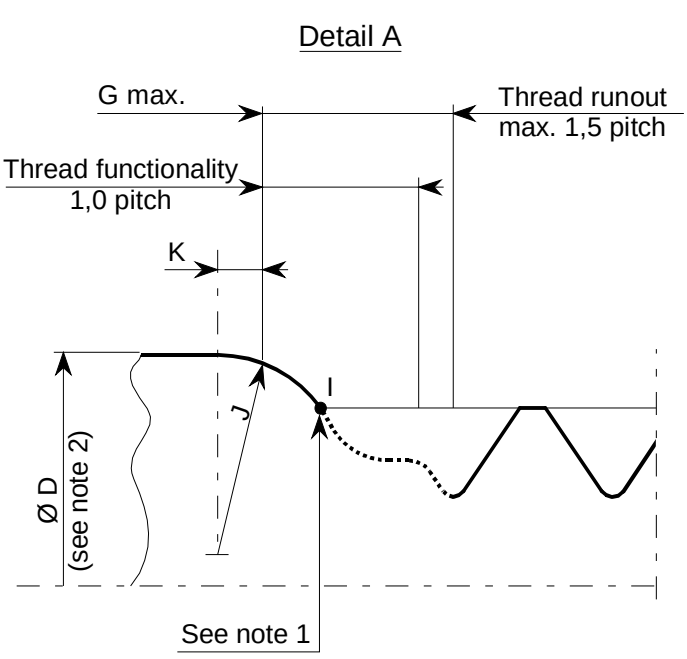
Invariable mass		55,17
Variable mass	1,39 x 20	=27,80
Total mass		82,97 g

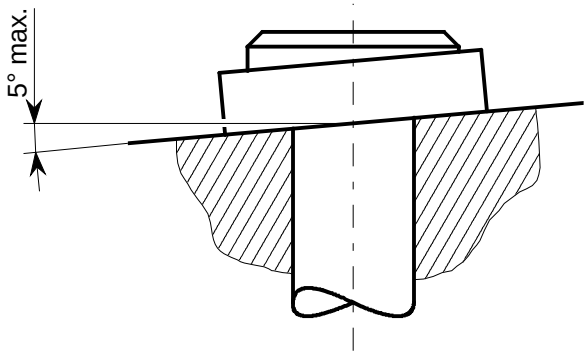
BOLT ABS0997L10-20

Invariable mass		87,45
Variable mass	2,58 x 20	=51,60
Total mass		139,05 g

Standard design: no code

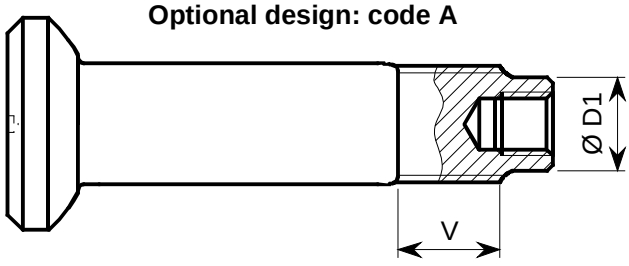






Detail B

Optional design: code A



Dimensions in millimeters.

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 oversizes is incremented by 0,25 mm, 0,5 mm for third oversize.

Figure 1: Configuration, dimensions and tolerances

Table 1 : Dimensions, tolerances and mass

Dimensions in millimeters.

Dia. code No.	Nominal shank diameter	Thread UNJF-3A modified	A ±0,2	B Ref.	Ø D	Ø D1 [a]		Ø TD	E Ref.	H max.	Ø N Ref.	R Ref.	r rolled	S [b] Ref.
						Max.	Min.							
9	14,29	.5625-18	33,0	21,46	14,262 14,237	12,15	12,10	14,065 13,970	7,70	9,70	26,70	17,46	1,01 0,64	1,590
10	15,88	.6250-18	36,3	23,75	15,850 15,824	13,75	13,70	15,659 15,545	8,10	10,30	28,70	19,05		
12	19,05	.7500-16	42,7	28,58	19,025 18,999	16,70	16,65	18,834 18,720	9,10	13,90	32,80	22,22	1,14 0,80	
14	22,23	.8750-14	48,6	33,40	22,200 22,174	19,60	19,55	22,003 21,870	9,90	16,10	36,80	25,40	1,27 0,89	1,984
16	25,40	1.0000-12	54,0	38,10	25,374 25,349	22,40	22,35	25,178 25,045	11,10	18,10	40,70	28,58	1,52 1,15	

[a] Code A only
[b] 37° for Titanium material, 45° for Inconel material.

(continued)

Table 1 : Dimensions, tolerances and mass (concluded)

Dimensions in millimeters.

Dia. code No.	Nominal shank diameter	Thread UNJF-3A modified	Internal thread left hand		DETAIL A			V [c] ±0,254	MASS (g)			
					J		K		Head and thread		Smooth part	
			P max.	Ø U THREAD UNJF-2B	Max.	Min.	Max.		Titanium	Inconel	Titanium	Inconel
9	14,29	.5625-18	11,81	.3125-SP	9,65	9,40	0,991	17,81	42,55	68,19	1,12	2,09
10	15,88	.6250-18	13,21	.3750-SP	9,91	9,65	1,041	18,63	55,17	87,45	1,39	2,58
12	19,05	.7500-16	15,88	.4375-SP	10,16		1,12	23,54	91,04	148,36	2,00	3,71
14	22,23	.8750-14	18,42	.5000-SP	10,29	9,78	1,14	25,92	148,95	237,90	2,73	5,06
16	25,40	1.0000-12	21,08	.5625-SP	11,05	10,54		29,22	210,78	338,44	3,56	6,61

[c] Code A only

Table 2 : Grip Length

Dimensions in millimeters.

Grip dash No.	Permissible grip overlap		G ± 0,127	Length below head (G max. + B) ± 0,254				
	Min.	Max.		9	10	12	14	16
5	6,35	7,94	7,94	29,40	31,69	36,52	41,34	46,04
6	7,94	9,53	9,53	30,99	33,28	38,11	42,93	47,63
7	9,53	11,11	11,11	32,57	34,86	39,69	44,51	49,21
8	11,11	12,70	12,70	34,16	36,45	41,28	46,10	50,80
9	12,70	14,29	14,29	35,75	38,04	42,87	47,69	52,39
10	14,29	15,88	15,88	37,34	39,63	44,46	49,28	53,98
11	15,88	17,46	17,46	38,92	41,21	46,04	50,86	55,56
12	17,46	19,05	19,05	40,51	42,80	47,63	52,45	57,15
13	19,05	20,64	20,64	42,10	44,39	49,22	54,04	58,74
14	20,64	22,23	22,23	43,69	45,98	50,81	55,63	60,33
15	22,23	23,81	23,81	45,27	47,56	52,39	57,21	61,91
16	23,81	25,40	25,40	46,86	49,15	53,98	58,80	63,50
17	25,40	26,99	26,99	48,45	50,74	55,57	60,39	65,09
18	26,99	28,58	28,58	50,04	52,33	57,16	61,98	66,68
19	28,58	30,16	30,16	51,62	53,91	58,74	63,56	68,26
20	30,16	31,75	31,75	53,21	55,50	60,33	65,15	69,85
21	31,75	33,34	33,34	54,80	57,09	61,92	66,74	71,44
22	33,34	34,93	34,93	56,39	58,68	63,51	68,33	73,03
23	34,93	36,51	36,51	57,97	60,26	65,09	69,91	74,61
24	36,51	38,10	38,10	59,56	61,85	66,68	71,50	76,20
25	38,10	39,69	39,69	61,15	63,44	68,27	73,09	77,79
26	39,69	41,28	41,28	62,74	65,03	69,86	74,68	79,38
27	41,28	42,86	42,86	64,32	66,61	71,44	76,26	80,96
28	42,86	44,45	44,45	65,91	68,20	73,03	77,85	82,55
29	44,45	46,04	46,04	67,50	69,79	74,62	79,44	84,14
30	46,04	47,63	47,63	69,09	71,38	76,21	81,03	85,73
31	47,63	49,21	49,21	70,67	72,96	77,79	82,61	87,31
32	49,21	50,80	50,80	72,26	74,55	79,38	84,20	88,90
33	50,80	52,39	52,39	73,85	76,14	80,97	85,79	90,49
34	52,39	53,98	53,98	75,44	77,73	82,56	87,38	92,08
35	53,98	55,56	55,56	77,02	79,31	84,14	88,96	93,66
36	55,56	57,15	57,15	78,61	80,90	85,73	90,55	95,25
37	57,15	58,74	58,74	80,20	82,49	87,32	92,14	96,84
38	58,74	60,33	60,33	81,79	84,08	88,91	93,73	98,43
39	60,33	61,91	61,91	83,37	85,66	90,49	95,31	100,01
40	61,91	63,50	63,50	84,96	87,25	92,08	96,90	101,60
41	63,50	65,09	65,09	86,55	88,84	93,67	98,49	103,19
42	65,09	66,68	66,68	88,14	90,43	95,26	100,08	104,78

(continued)

Table 2 : Grip Length

Dimensions in millimeters.

Grip dash No.	Permissible grip overlap		G ± 0,127	Length below head (G max. + B) ± 0,254				
	Min.	Max.		9	10	12	14	16
43	66,68	68,26	68,26	89,72	92,01	96,84	101,66	106,36
44	68,26	69,85	69,85	91,31	93,60	98,43	103,25	107,95
45	69,85	71,44	71,44	92,90	95,19	100,02	104,84	109,54
46	71,44	73,03	73,03	94,49	96,78	101,61	106,43	111,13
47	73,03	74,61	74,61	96,07	98,36	103,19	108,01	112,71
48	74,61	76,20	76,20	97,66	99,95	104,78	109,60	114,30
49	76,20	77,79	77,79	99,25	101,54	106,37	111,19	115,89
50	77,79	79,38	79,38	100,84	103,13	107,96	112,78	117,48
51	79,38	80,96	80,96	102,42	104,71	109,54	114,36	119,06
52	80,96	82,55	82,55	104,01	106,30	111,13	115,95	120,65
53	82,55	84,14	84,14	105,60	107,89	112,72	117,54	122,24
54	84,14	85,73	85,73	107,19	109,48	114,31	119,13	123,83
55	85,73	87,31	87,31	108,77	111,06	115,89	120,71	125,41
56	87,31	88,90	88,90	110,36	112,65	117,48	122,30	127,00
57	88,90	90,49	90,49	111,95	114,24	119,07	123,89	128,59
58	90,49	92,08	92,08	113,54	115,83	120,66	125,48	130,18
59	92,08	93,66	93,66	115,12	117,41	122,24	127,06	131,76
60	93,66	95,25	95,25	116,71	119,00	123,83	128,65	133,35
61	95,25	96,84	96,84	118,30	120,59	125,42	130,24	134,94
62	96,84	98,43	98,43	119,89	122,18	127,01	131,83	136,53
63	98,43	100,01	100,01	121,47	123,76	128,59	133,41	138,11
64	100,01	101,60	101,60	123,06	125,35	130,18	135,00	139,70
65	101,60	103,19	103,19	124,65	126,94	131,77	136,59	141,29
66	103,19	104,78	104,78	126,24	128,53	133,36	138,18	142,88
67	104,78	106,36	106,36	127,82	130,11	134,94	139,76	144,46
68	106,36	107,95	107,95	129,41	131,70	136,53	141,35	146,05
69	107,95	109,54	109,54	131,00	133,29	138,12	142,94	147,64
70	109,54	111,13	111,13	132,59	134,88	139,71	144,53	149,23
71	111,13	112,71	112,71	134,17	136,46	141,29	146,11	150,81
72	112,71	114,30	114,30	135,76	138,05	142,88	147,70	152,40
73	114,30	115,89	115,89	137,35	139,64	144,47	149,29	153,99
74	115,89	117,48	117,48	138,94	141,23	146,06	150,88	155,58
75	117,48	119,06	119,06	140,52	142,81	147,64	152,46	157,16
76	119,06	120,65	120,65	142,11	144,40	149,23	154,05	158,75
77	120,65	122,24	122,24	143,70	145,99	150,82	155,64	160,34
78	122,24	123,83	123,83	145,29	147,58	152,41	157,23	161,93
79	123,83	125,41	125,41	146,87	149,16	153,99	158,81	163,51
80	125,41	127,00	127,00	148,46	150,75	155,58	160,40	165,10
81	127,00	128,59	128,59	150,05	152,34	157,17	161,99	166,69

(continued)

Table 2 : Grip Length (concluded)

Dimensions in millimeters.

Grip dash No.	Permissible grip overlap		G ± 0,127	Length below head (G max. + B) ± 0,254				
	Min.	Max.		9	10	12	14	16
82	128,59	130,18	130,18	151,64	153,93	158,76	163,58	168,28
83	130,18	131,76	131,76	153,22	155,51	160,34	165,16	169,86
84	131,76	133,35	133,35	154,81	157,10	161,93	166,75	171,45
85	133,35	134,94	134,94	156,40	158,69	163,52	168,34	173,04
86	134,94	136,53	136,53	157,99	160,28	165,11	169,93	174,63
87	136,53	138,11	138,11	159,57	161,86	166,69	171,51	176,21
88	138,11	139,70	139,70	161,16	163,45	168,28	173,10	177,80
89	139,70	141,29	141,29	162,75	165,04	169,87	174,69	179,39
90	141,29	142,88	142,88	164,34	166,63	171,46	176,28	180,98
91	142,88	144,46	144,46	165,92	168,21	173,04	177,86	182,56
92	144,46	146,05	146,05	167,51	169,80	174,63	179,45	184,15
93	146,05	147,64	147,64	169,10	171,39	176,22	181,04	185,74
94	147,64	149,23	149,23	170,69	172,98	177,81	182,63	187,33
95	149,23	150,81	150,81	172,27	174,56	179,39	184,21	188,91
96	150,81	152,40	152,40	173,86	176,15	180,98	185,80	190,50
97	152,40	153,99	153,99	175,45	177,74	182,57	187,39	192,09
98	153,99	155,58	155,58	177,04	179,33	184,16	188,98	193,68
99	155,58	157,16	157,16	178,62	180,91	185,74	190,56	195,26
100	157,16	158,75	158,75	180,21	182,50	187,33	192,15	196,85
101	158,75	160,34	160,34	181,80	184,09	188,92	193,74	198,44
102	160,34	161,93	161,93	183,39	185,68	190,51	195,33	200,03
103	161,93	163,51	163,51	184,97	187,26	192,09	196,91	201,61
104	163,51	165,10	165,10	186,56	188,85	193,68	198,50	203,20
105	165,10	166,69	166,69	188,15	190,44	195,27	200,09	204,79
106	166,69	168,28	168,28	189,74	192,03	196,86	201,68	206,38
107	168,28	169,86	169,86	191,32	193,61	198,44	203,26	207,96
108	169,86	171,45	171,45	192,91	195,20	200,03	204,85	209,55
109	171,45	173,04	173,04	194,50	196,79	201,62	206,44	211,14
110	173,04	174,63	174,63	196,09	198,38	203,21	208,03	212,73
111	174,63	176,21	176,21	197,67	199,96	204,79	209,61	214,31
112	176,21	177,80	177,80	199,26	201,55	206,38	211,20	215,90

3.3 Material, finish and lubricant

The material, surface treatment and lubrication shall be in accordance with table 3.

Table 3 : Material, surface treatment and lubricant

Element	Material code	Material	Surface treatment	Lubricant	Bolt identification
Bolt	K	Titanium alloy TA6V as per AMS4967 or AMS4928 Rc min. = 650 MPa	Aluminium coating as per EN4473	Cetyl alcohol as per EN6117	A white paint identification at thread end
	L	Inconel 718 as per AMS5962 or AMS5662 + cold working. R = 1 510 MPa			A blue paint identification at thread end
Washer	None	Titanium alloy TA6V as per AMS4967 or AMS4928 Rc min. = 650 MPa			A white paint spot on outer diameter

3.4 Mechanical characteristics

Mechanical characteristics shall be in accordance with table 4.

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	209 955	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	170 000

* To be confirmed.

3.5 Oversizes

3.5.1 First oversize

First oversize shall be in accordance with table 5.

Table 5 : First oversize

Dimensions in millimeters.

Dia. code No.	D diameter .0156 inch oversize shank	
	max.	min.
9X	14,658	14,633
10X	16,246	16,220
12X	19,421	19,395
14X	22,596	22,570
16X	25,771	25,745
[a)] Code A only		

3.5.2 Second oversize

Second oversize shall be in accordance with table 6.

Table 6 : Second oversize

Dimensions in millimeters.

Dia. code No.	D diameter .0312 inch oversize shank	
	max.	min.
9Y	15,055	15,029
10Y	16,642	16,617
12Y	19,817	19,791
14Y	22,992	22,967
16Y	26,167	26,142
[a)] Code A only		

3.5.3 Third oversize

Third oversize shall be in accordance with table 7.

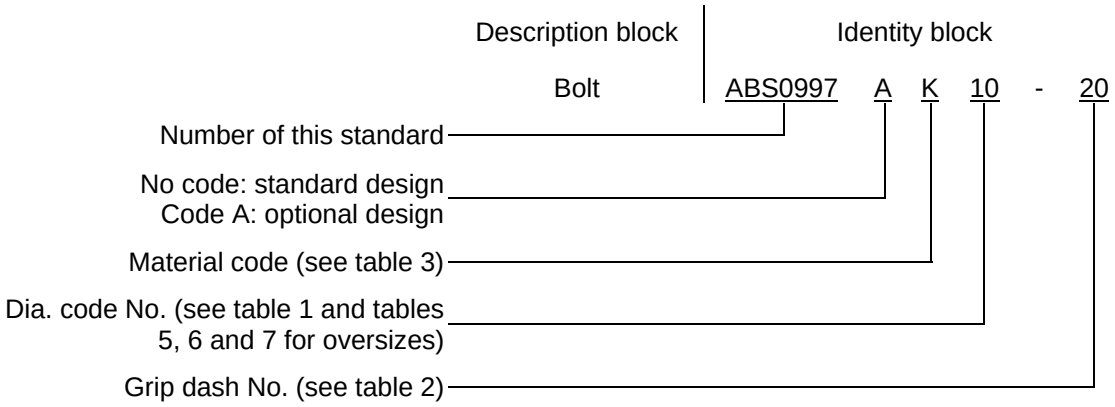
Table 7 : Third oversize

Dimensions in millimeters.

Dia. code No.	D diameter .0625 inch oversize shank	
	max.	min.
10Z	17,437	17,412
12Z	20,612	20,587
14Z	23,787	23,762
16Z	26,962	26,937
[a)] Code A only		

4 Designation

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



When calling up oversize fasteners there is no requirement for a '-' between the diameter code and the Grip length, see example below.

ABS0997AK10X20.

Note: Washers shall be delivered in a plastic bag together with bolts.

5 Marking

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

6 Technical specification

EN6116.

RECORD OF REVISIONS

Issue	Clause modified	Description of modification
1 11/02		New Standard.
2 07/04		Drill center dimple added and detail A modified in figure 1. Table 2 modified. Grip dash No's 90 to 112 added in table 3. Table 7 added. AMS5962 added. Finish and lubricant added for washer in table 1. 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		Optional design added. Ø D1 and V dimensions created in table 1.
4 02/12		Figure 1 modified. Ø D1 and V dimensions modified in table 1.