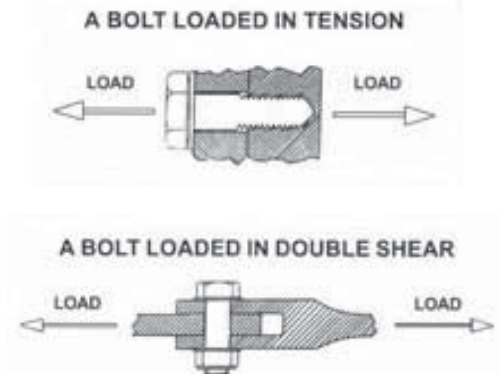
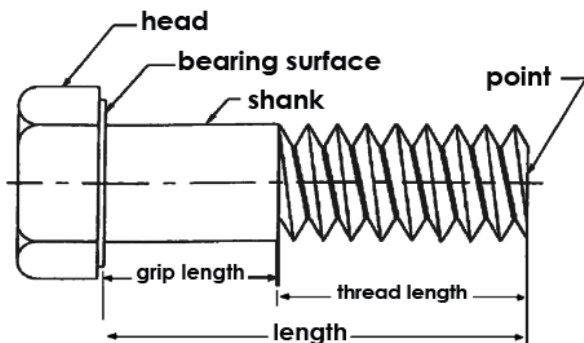

General Information & Formulas

- 1) Within a given diameter (i.e. 1/4, 3/8, 1/2, etc.) of any AN/MS/NAS series, all bolts will have the same thread length, no matter how long the bolt.
 - 2) The thread lengths for each series bolt are on the specification prints and in chart form on p. 29 for all sizes from #10–32 through 3/4–16.
 - 3) In all MS and NAS series bolts, the dash number is the grip in 1/16" (0.0625") increments, e.g. -18 = $18 \times 0.0625" = 1.125" = 18/16"$.
 - 4) Thus, to determine the overall length of a bolt, simply add the thread length for that series and diameter to the grip length you desire, e.g. NAS 1306–24: grip is 1.50" + threads: 0.578" = 2.078" overall length.
 - 5) In AN series bolts, you must have a chart or bolt gauge to determine lengths, grips or part numbers. THE DASH NUMBERS *DO NOT* INDICATE GRIPS NOR OVERALL LENGTHS
-

The Parts of a Bolt



Bolt Load Capacity Calculations

- Load calculations for bolts are always defined by the area of a circle (πr^2 ; $\pi = 3.1416$; $r =$ radius of circle or 1/2 the diameter)
- The minimum load capacity is calculated at the area it will bear upon times (x) minimum bolt strength rating.

Shear Loads:

Calculate at minimum dimension for full (grip) diameter.

Example NAS 1304: $r = .1243$; Area = $\pi r^2 = .049$ square inches.

.049 square inches x 95,000 psi (shear rating) = 4655 lb @ full diameter

Tensile Loads:

Calculate at maximum pitch diameter: see chart on page 72

Example NAS 1304: $r = .1134$; Area = $\pi r^2 = .0404$ square inches.

.0404 square inches x 160,000 psi (tensile rating) = 6464 lb

AN3 – AN20 AIRFRAME BOLTS

The most commonly available aircraft-spec bolts: these hex head, fine threaded fasteners have a minimum tensile strength of 125,000 psi and a minimum shear strength of 75,000 psi. Length of thread is consistent within each diameter, and grips (unthreaded shank) are available in 1/8" increments beginning at 1/16". Vastly superior to "Grade 8" tension bolts for almost all shear-type, race car applications.

NAS 1103/6203 AND NAS 1303/6603 SERIES CLOSE TOLERANCE BOLTS

These fine-threaded, dimpled-head hex bolts have a minimum tensile strength of 160,000 psi and a minimum shear strength of 95,000 psi. Thread length is consistent within each diameter (1103/6203 series have a shorter thread), and grips are available in 1/16" increments beginning at 1/16". Used in applications where a premium-quality, high strength bolt is necessary.

NAS 624/MS 21250 SERIES 12 POINT EXTERNAL WRENCHING BOLTS

These fine-threaded, twelve-point head bolts have a minimum tensile strength of 180,000 psi and a minimum shear strength of 108,000 psi. Thread length is consistent within each diameter and standard grips are in 1/8" increments beginning at 1/8". These bolts also have a large radius between the bolt head and shank for additional strength. This requires the use of the MS 20002C series beveled washer under the head. A "Superbolt" for the most demanding applications. Please note that "odd" grips, i.e. -15, -23, etc., are not standard and may not always be available. Please inquire for specifics.

MS 20004 SERIES INTERNAL WRENCHING BOLTS

Used where construction necessitates the use of an internal wrenching (Allen hex socket) bolt, they are fine-threaded with a minimum tensile strength of 160,000 psi and a minimum shear strength of 96,000 psi. Standard grips are in 1/8" increments beginning at 1/8". Like the NAS 624 series, they require the use of the MS 20002C beveled washer under the head. Another alternative for critical or limited access applications. PLEASE NOTE THAT HEAD BASE DIAMETERS AND HEAD HEIGHTS ON TWELVE-POINT HEAD AND INTERNAL WRENCHING BOLTS ARE IDENTICAL. Note also that like 12 point bolts, "odd" grips are not standard and may not always be available. Please inquire for specifics.

NAS 6303 HIGH TEMPERATURE ALLOY HEX BOLTS

Identical in external configuration to the NAS 6203 series bolts listed above. Made from A286 stainless steel alloy, rated for 1200°F operation. Minimum tensile strength is 160,000 psi; minimum shear strength is 95,000 psi. The brake hat bolt of choice for all serious race cars.

NAS 1102 TORQSETS

These are fully threaded (UNF) 100° flat head screws with a torq-set drive recess; 160,000 psi tensile strength. Used where high strength, a large head area and a positive drive are required (wings, undertrays, etc.). We also stock the drive tools and mating Tinnerman washers (p. 44).

OTHER MS AND NAS BOLTS

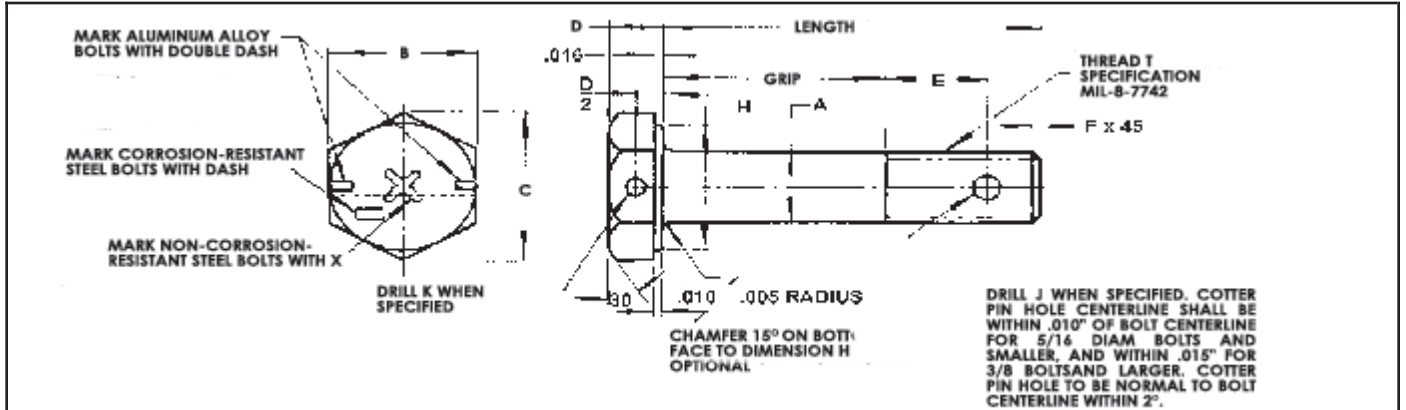
The bolts described above represent over 80% of current race car chassis usage. However, there are many other configurations and materials available under MS and NAS part numbers: contact us with your requirements and we can make a recommendation and provide technical details.

SEE PAGE 31 FOR INFORMATION ON CUSTOM CONFIGURATIONS.

*NOTE: Tensile strengths on AN3-AN20 bolts are equal to SAE grade 5.
Tensile strengths on all other series are at least equal to SAE grade*

AN3 - AN10 SERIES SPECIFICATIONS

Procurement Specification: MIL-B-6812



Dimensions are in INCHES. Unless otherwise specified, tolerances: decimals +/- .010, angles +/- 5°

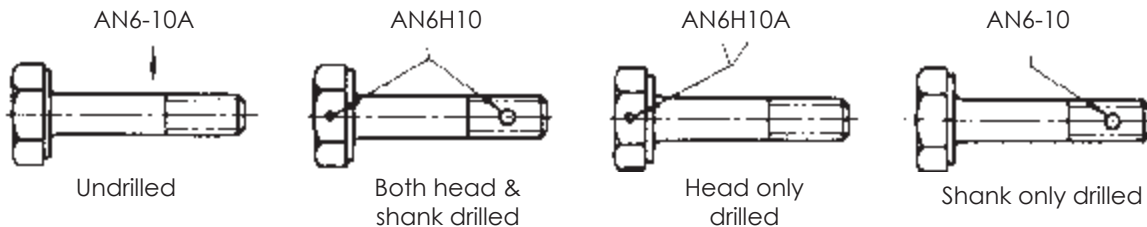
Basic AN Part #	Thread T	A Diameter		B		C	D		E	F		H Diam Min	J Drill Diam +.010 - .000	K Drill Diam +.010 - .000
		Max	Min	Max	Min		Max	Min		Max	Min			
AN3	#10-32 UNF-3A	.189	.186	.377	.365	.430	.141	.109	.266	.047	.015	.359	.070	.046
AN4	1/4-28 UNF-3A	.249	.246	.440	.428	.510	.172	.140	.313			.422	.076	
AN5	5/16-24 UNF-3A	.312	.309	.502	.490	.580	.204	.172	.359	.063	.031	.484	.076	.070
AN6	3/8-24 UNF-3A	.374	.371	.565	.553	.650	.235	.203	.438			.547		
AN7	7/16-20 UNF-3A	.437	.433	.627	.615	.720	.266	.234	.484			.609	.106	
AN8	1/2-20 UNF-3A	.499	.495	.752	.752	.870	.297	.265	.609	.734				
AN10	5/8-18 UNF-3A	.624	.620	.940	.940	1.090	.360	.328	.734	.078	.046	.922	.141	

MATERIAL: Non-corrosion-resistant steel, corrosion-resistant steel, or aluminum alloy.
See procurement spec.

FINISH: See procurement spec.

- Add "C" before dash number for corrosion-resistant steel bolt.
- Add "DD" before dash number for aluminum alloy bolt.
- Add "A" after dash number for undrilled bolt. See illustration below.
- Add "H" before dash number for bolt with drilled head and shank. See illustration below.
- Add "H" before dash number and "A" after dash number for bolt with drilled head only. See illustration below.

Illustration of Drilled & Undrilled Bolts & Part Numbers



Bolts shall be free from all hanging burrs and slivers which might become dislodged under usage. Countersinking of drilled holes in head is mandatory. Countersinking of drilled holes in shank is optional.

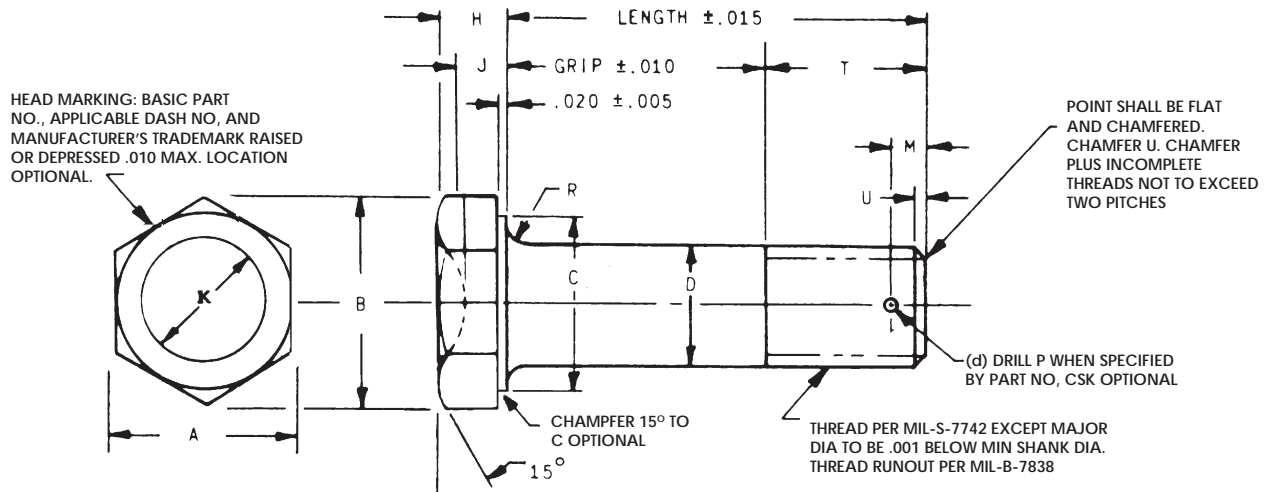
AN3 - AN10 Series Specifications

Dash No.	AN3		AN4		AN5		AN6		AN7		AN8		AN10	
	Grip	Length	Grip	Length	Grip	Length	Grip	Length	Grip	Length	Grip	Length	Grip	Length
3	.063	.469	.063	.469										
4	.125	.531	.063	.531	.063	.594								
5	.250	.656	.188	.656	.188	.719	.063	.703	.063	.719				
6	.375	.781	.313	.781	.313	.844	.188	.828	.188	.844	.063	.844		
7	.500	.906	.438	.906	.438	.969	.313	.953	.313	.969	.188	.969	.063	1.02
10	.625	1.03	.563	1.03	.563	1.09	.438	1.08	.438	1.09	.313	1.09	.188	1.14
11	.750	1.16	.688	1.16	.688	1.22	.563	1.20	.563	1.22	.438	1.22	.313	1.27
12	.875	1.28	.813	1.28	.813	1.34	.688	1.33	.688	1.34	.563	1.34	.438	1.39
13	1.00	1.41	.938	1.41	.938	1.47	.813	1.45	.813	1.47	.688	1.47	.563	1.52
14	1.13	1.53	1.06	1.53	1.06	1.59	.938	1.58	.938	1.59	.813	1.59	.688	1.64
15	1.25	1.66	1.19	1.66	1.19	1.72	1.06	1.70	1.06	1.72	.938	1.72	.813	1.77
16	1.38	1.78	1.31	1.78	1.31	1.84	1.19	1.83	1.19	1.84	1.06	1.84	.938	1.89
17	1.50	1.91	1.44	1.91	1.44	1.97	1.31	1.95	1.31	1.97	1.19	1.97	1.06	2.02
20	1.63	2.03	1.56	2.03	1.56	2.09	1.44	2.08	1.44	2.09	1.31	2.09	1.19	2.14
21	1.75	2.16	1.69	2.16	1.69	2.22	1.56	2.20	1.56	2.22	1.44	2.22	1.31	2.27
22	1.88	2.28	1.81	2.28	1.81	2.34	1.69	2.33	1.69	2.34	1.56	2.34	1.44	2.39
23	2.00	2.41	1.94	2.41	1.94	2.47	1.81	2.45	1.81	2.47	1.69	2.47	1.56	2.52
24	2.13	2.53	2.06	2.53	2.06	2.59	1.94	2.58	1.94	2.59	1.81	2.59	1.69	2.64
25	2.25	2.66	2.19	2.66	2.19	2.72	2.06	2.70	2.06	2.72	1.94	2.72	1.81	2.77
26	2.38	2.78	2.31	2.78	2.31	2.84	2.19	2.83	2.19	2.84	2.06	2.84	1.94	2.89
27	2.50	2.91	2.44	2.91	2.44	2.97	2.31	2.95	2.31	2.97	2.19	2.97	2.06	3.02
30	2.63	3.03	2.56	3.03	2.56	3.09	2.44	3.08	2.44	3.09	2.31	3.09	2.19	3.14
31	2.75	3.16	2.69	3.16	2.69	3.22	2.56	3.20	2.56	3.22	2.44	3.22	2.31	3.27
32	2.88	3.28	2.81	3.28	2.81	3.34	2.69	3.33	2.69	3.34	2.56	3.34	2.44	3.39
33	3.00	3.41	2.94	3.41	2.94	3.47	2.81	3.45	2.81	3.47	2.69	3.47	2.56	3.52
34	3.13	3.53	3.06	3.53	3.06	3.59	2.94	3.58	2.94	3.59	2.81	3.59	2.69	3.64
35	3.25	3.66	3.19	3.66	3.19	3.72	3.06	3.70	3.06	3.72	2.94	3.72	2.81	3.77
36	3.38	3.78	3.31	3.78	3.31	3.84	3.19	3.83	3.19	3.84	3.06	3.84	2.94	3.89
37	3.50	3.91	3.44	3.91	3.44	3.97	3.31	3.95	3.31	3.97	3.19	3.97	3.06	4.02
40	3.63	4.03	3.56	4.03	3.56	4.09	3.44	4.08	3.44	4.09	3.31	4.09	3.19	4.14
41	3.75	4.16	3.69	4.16	3.69	4.22	3.56	4.20	3.56	4.22	3.44	4.22	3.31	4.27
42	3.88	4.28	3.81	4.28	3.81	4.34	3.69	4.33	3.69	4.34	3.56	4.34	3.44	4.39
43	4.00	4.41	3.94	4.41	3.94	4.47	3.81	4.45	3.81	4.47	3.69	4.47	3.56	4.52
44	4.13	4.53	4.06	4.53	4.06	4.59	3.94	4.58	3.94	4.59	3.81	4.59	3.69	4.64
45	4.25	4.66	4.19	4.66	4.19	4.72	4.06	4.70	4.06	4.72	3.94	4.72	3.81	4.77
46	4.38	4.78	4.31	4.78	4.31	4.84	4.19	4.83	4.19	4.84	4.06	4.84	3.94	4.89
47	4.50	4.91	4.44	4.91	4.44	4.97	4.31	4.95	4.31	4.97	4.19	4.97	4.06	5.02
50	4.63	5.03	4.56	5.03	4.56	5.09	4.44	5.08	4.44	5.09	4.31	5.09	4.19	5.14
51	4.75	5.16	4.69	5.16	4.69	5.22	4.56	5.20	4.56	5.22	4.44	5.22	4.31	5.27
52	4.88	5.28	4.81	5.28	4.81	5.34	4.69	5.33	4.69	5.34	4.56	5.34	4.44	5.39
53	5.00	5.41	4.94	5.41	4.94	5.47	4.81	5.45	4.81	5.47	4.69	5.47	4.56	5.52
54	5.13	5.53	5.06	5.53	5.06	5.59	4.94	5.58	4.94	5.59	4.81	5.59	4.69	5.64
55	5.25	5.66	5.19	5.66	5.19	5.72	5.06	5.70	5.06	5.72	4.94	5.72	4.81	5.77
56	5.38	5.78	5.31	5.78	5.31	5.84	5.19	5.83	5.19	5.84	5.06	5.84	4.94	5.89
57	5.50	5.91	5.44	5.91	5.44	5.97	5.31	5.95	5.31	5.97	5.19	5.97	5.06	6.02
60	5.63	6.03	5.56	6.03	5.56	6.09	5.44	6.08	5.44	6.09	5.31	6.09	5.19	6.14
61	5.75	6.16	5.69	6.16	5.69	6.22	5.56	6.20	5.56	6.22	5.44	6.22	5.31	6.27
62	5.88	6.28	5.81	6.28	5.81	6.34	5.69	6.33	5.69	6.34	5.56	6.34	5.44	6.39
63	6.00	6.41	5.94	6.41	5.94	6.47	5.81	6.45	5.81	6.47	5.69	6.47	5.56	6.52
64	6.13	6.53	6.06	6.53	6.06	6.59	5.94	6.58	5.94	6.59	5.81	6.59	5.69	6.64
65	6.25	6.66	6.19	6.66	6.19	6.72	6.06	6.70	6.06	6.72	5.94	6.72	5.81	6.77
66	6.38	6.78	6.31	6.78	6.31	6.84	6.19	6.83	6.19	6.84	6.06	6.84	5.94	6.89

NAS 1103 - NAS 1116 Series Specifications

Procurement Specification: NAS 498

Bolt, Hex Head, Close Tolerance
160,000 PSI Short Thread



Basic Series	Thread	A	B REF	C MIN	D Dia		H +.015 -.000	J +.015 -.000	K DIA +/- .01	M +/- .010	P (d) DIA +.01 -.000	R RAD	T REF	U REF
					Before Plate	After Plate								
NAS1103	#10-32 UNF-3A	.376 .367	0.43	0.36	.1887 .1181	.1895 .1885	0.11	0.073	0.19	0.117	0.07	.020 .010	0.28	.016
NAS1104	1/4-28 UNF-3A	.439 .430	0.51	0.42	.2487 .2481	.2495 .2485	0.125	0.083	0.25	0.116	0.076	.020 .010	0.32	.018
NAS1105	5/16-24 UNF-3A	.502 .492	0.58	0.48	.3112 .3106	.3120 .3110	0.156	0.104	0.31	0.119	0.076	.020 .010	.038	.021
NAS1106	3/8-24 UNF-3A	.564 .553	0.65	0.55	.3745 .3735	.3745 .3735	0.188	0.125	0.38	0.12	0.106	.025 .015	0.39	.021
NAS1107	7/16-20 UNF-3A	.690 .679	0.79	0.67	.4362 .4356	.4370 .4360	0.219	0.146	0.44	0.124	0.106	.025 .015	0.45	.025
NAS1108	1/2-20 UNF-3A	.752 .741	0.87	0.73	.4987 .4981	.4995 .4985	0.25	0.167	0.50	0.123	0.106	.030 .020	0.45	.025
NAS1109	9/16-18 UNF-3A	.877 .865	1.01	0.86	.5607 .5601	.5616 .5605	0.281	0.188	0.56	0.124	0.106	.035 .020	0.51	.028
NAS1110	5/18-18 UNF-3A	.940 .928	1.09	0.92	.6232 .6226	.6240 .6230	0.312	0.208	0.62	0.124	0.141	.040 .025	0.54	.028
NAS1112	3/4-16 UNF-3A	1.064 1.052	1.23	1.05	.7482 .7476	.7490 .7480	0.375	0.250	0.75	0.128	0.141	.045 .030	0.57	.031
NAS1114	7/8-14 UNF-3A	1.252 1.239	1.44	1.23	.8732 .8726	.8740 .8730	0.438	0.292	0.88	0.134	0.141	.050 .035	0.65	.036
NAS1116	1-12 UNF-3A	1.440 1.427	1.66	1.42	.9982 .9976	.9990 .9980	0.50	0.333	1.00	0.139	0.141	.060 .045	0.77	.042

NAS 1103 - NAS 1116 Series Specifications (Length +/- .015)

Note: Use chart on page 27 for NAS 6203 - NAS 6216 length calculations.

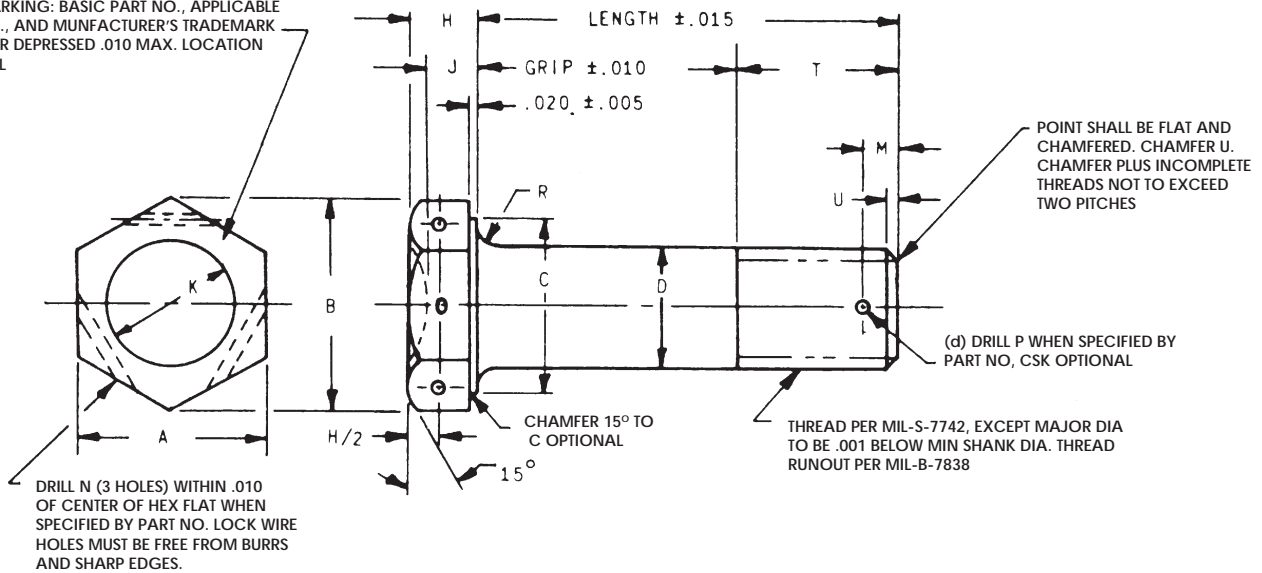
Dash No.	Grip +/- .010	NAS1103	NAS1104	NAS1105	NAS1106	NAS1107	NAS1108	NAS1109	NAS1110	NAS1112	NAS1114	NAS1116
1	.062	.338	.378	.437	.453	.515	.515	.573	.605	.634	.714	.832
2	.125	.401	.441	.500	.516	.578	.578	.636	.668	.697	.777	.895
3	.188	.464	.504	.563	.579	.641	.641	.699	.731	.760	.840	.958
4	.250	.526	.566	.625	.641	.703	.703	.761	.793	.822	.902	1.020
5	.312	.588	.628	.687	.703	.765	.765	.823	.855	.884	.964	1.082
6	.375	.651	.691	.750	.766	.828	.828	.886	.918	.947	1.027	1.145
7	.438	.714	.754	.813	.829	.891	.891	.949	.981	1.010	1.090	1.208
8	.500	.776	.816	.875	.891	.953	.953	1.011	1.043	1.072	1.152	1.270
9	.562	.838	.878	.937	.953	1.015	1.015	1.073	1.105	1.134	1.214	1.332
10	.625	.901	.941	1.000	1.016	1.078	1.078	1.136	1.168	1.197	1.277	1.395
11	.688	.964	1.004	1.063	1.079	1.141	1.141	1.199	1.231	1.260	1.340	1.458
12	.750	1.026	1.066	1.125	1.141	1.203	1.203	1.261	1.291	1.322	1.402	1.520
13	.812	1.088	1.128	1.187	1.203	1.265	1.265	1.323	1.355	1.384	1.464	1.582
14	.875	1.151	1.191	1.250	1.266	1.328	1.328	1.386	1.418	1.447	1.527	1.645
15	.938	1.214	1.254	1.313	1.329	1.391	1.391	1.449	1.481	1.510	1.590	1.708
16	1.000	1.276	1.316	1.375	1.391	1.453	1.453	1.511	1.543	1.572	1.652	1.770
17	1.062	1.338	1.378	1.437	1.453	1.515	1.515	1.573	1.605	1.634	1.714	1.832
18	1.125	1.401	1.441	1.500	1.516	1.578	1.578	1.636	1.668	1.697	1.777	1.895
19	1.188	1.464	1.504	1.563	1.579	1.641	1.641	1.699	1.731	1.760	1.840	1.958
20	1.250	1.526	1.566	1.625	1.641	1.703	1.703	1.761	1.793	1.822	1.902	2.020
21	1.312	1.588	1.628	1.687	1.703	1.765	1.765	1.823	1.855	1.884	1.964	2.082
22	1.375	1.651	1.691	1.750	1.766	1.828	1.828	1.886	1.918	1.947	2.027	2.145
23	1.438	1.714	1.754	1.813	1.829	1.891	1.891	1.949	1.981	2.010	2.090	2.208
24	1.500	1.776	1.816	1.875	1.891	1.953	1.953	2.011	2.043	2.072	2.152	2.270
25	1.562	1.838	1.878	1.937	1.953	2.015	2.015	2.073	2.105	2.134	2.214	2.332
26	1.625	1.901	1.941	2.000	2.016	2.078	2.078	2.136	2.168	2.197	2.277	2.395
27	1.688	1.964	2.004	2.063	2.079	2.141	2.141	2.199	2.231	2.260	2.340	2.458
28	1.750	2.026	2.066	2.125	2.141	2.203	2.203	2.261	2.291	2.322	2.402	2.520
29	1.812	2.088	2.128	2.187	2.203	2.265	2.265	2.323	2.355	2.384	2.464	2.582
30	1.875	2.151	2.191	2.250	2.266	2.328	2.328	2.386	2.418	2.447	2.527	2.645
31	1.938	2.214	2.254	2.313	2.329	2.391	2.391	2.449	2.481	2.510	2.590	2.708
32	2.000	2.276	2.316	2.375	2.391	2.453	2.453	2.511	2.543	2.572	2.652	2.770
34	2.125	2.401	2.441	2.500	2.516	2.578	2.578	2.636	2.668	2.697	2.777	2.895
36	2.250	2.526	2.566	2.625	2.641	2.703	2.703	2.761	2.793	2.822	2.902	3.020
38	2.375	2.651	2.691	2.750	2.766	2.828	2.828	2.886	2.918	2.947	3.027	3.145
40	2.500	2.776	2.816	2.875	2.891	2.953	2.953	3.011	3.043	3.072	3.152	3.270
42	2.625	2.901	2.941	3.000	3.016	3.078	3.078	3.136	3.168	3.197	3.277	3.395
44	2.750	3.026	3.066	3.125	3.141	3.203	3.203	3.261	3.291	3.322	3.402	3.520
46	2.875	3.151	3.191	3.250	3.266	3.328	3.328	3.386	3.418	3.447	3.527	3.645
48	3.000	3.276	3.316	3.375	3.391	3.453	3.453	3.511	3.543	3.572	3.652	3.770
50	3.125	3.401	3.441	3.500	3.516	3.578	3.578	3.636	3.668	3.697	3.777	3.895
52	3.250	3.526	3.566	3.625	3.641	3.703	3.703	3.761	3.793	3.822	3.902	4.020
54	3.375	3.651	3.691	3.750	3.766	3.828	3.828	3.886	3.918	3.947	4.027	4.145
56	3.500	3.776	3.816	3.875	3.891	3.953	3.953	4.011	4.043	4.072	4.152	4.270
58	3.625	3.901	3.941	4.000	4.016	4.078	4.078	4.136	4.168	4.197	4.277	4.395
60	3.750	4.026	4.066	4.125	4.141	4.203	4.203	4.261	4.291	4.322	4.402	4.520
62	3.875	4.151	4.191	4.250	4.266	4.328	4.328	4.386	4.418	4.447	4.527	4.645
64	4.000	4.276	4.316	4.375	4.391	4.453	4.453	4.511	4.543	4.572	4.652	4.770
66	4.125	4.401	4.441	4.500	4.516	4.578	4.578	4.636	4.668	4.697	4.777	4.895
68	4.250	4.526	4.566	4.625	4.641	4.703	4.703	4.761	4.793	4.822	4.902	5.020
70	4.375	4.651	4.691	4.750	4.766	4.828	4.828	4.886	4.918	4.947	5.027	5.145
72	4.500	4.776	4.816	4.875	4.891	4.953	4.953	5.011	5.043	5.072	5.152	5.270
74	4.625	4.901	4.941	5.000	5.016	5.078	5.078	5.136	5.168	5.197	5.277	5.395
76	4.750	5.026	5.066	5.125	5.141	5.203	5.203	5.261	5.291	5.322	5.402	5.520
78	4.875	5.151	5.191	5.250	5.266	5.328	5.328	5.386	5.418	5.447	5.527	5.645
80	5.000	5.276	5.316	5.375	5.391	5.453	5.453	5.511	5.543	5.572	5.652	5.770
82	5.125	5.401	5.441	5.500	5.516	5.578	5.578	5.636	5.668	5.697	5.777	5.895
84	5.250	5.526	5.566	5.625	5.641	5.703	5.703	5.761	5.793	5.822	5.902	6.020
86	5.375	5.651	5.691	5.750	5.766	5.828	5.828	5.886	5.918	5.947	6.027	6.145
88	5.500	5.776	5.816	5.875	5.891	5.953	5.953	6.011	6.043	6.072	6.152	6.270
90	5.625	5.901	5.941	6.000	6.016	6.078	6.078	6.136	6.168	6.197	6.277	6.395
92	5.750	6.026	6.066	6.125	6.141	6.203	6.203	6.261	6.291	6.322	6.402	6.520
94	5.875	6.151	6.191	6.250	6.266	6.328	6.328	6.386	6.418	6.447	6.527	6.645
96	6.000	6.276	6.316	6.375	6.391	6.453	6.453	6.511	6.543	6.572	6.652	6.770

NAS 1303 - NAS 1316 Series Specifications

Procurement Specification: MIL-B-7838

Bolt, Hex Head, Close Tolerance
160,000 PSI Tensile

HEAD MARKING: BASIC PART NO., APPLICABLE DASH NO., AND MANUFACTURER'S TRADEMARK RAISED OR DEPRESSED .010 MAX. LOCATION OPTIONAL



Basic Series	Thread	A	B REF	C MIN	D Dia		H +.015 - .000	J +.015 - .000	K DIA +/- .01	M +/- .010	N DIA +.010 -.000	P (d) DIA +.01 -.000	R RAD	T REF	U REF
					Before Plate	After Plate									
NAS1303	#10-32 UNF-3A	.376 .367	0.43	0.359	.1887 .1181	.1895 .1885	0.11	0.073	0.19	0.163	0.046	0.07	.020 .010	0.338	0.016
NAS1304	1/4-28 UNF-3A	.439 .430	0.51	0.422	.2487 .2481	.2495 .2485	0.125	0.083	0.25	0.178	0.046	0.076	.020 .010	0.425	0.018
NAS1305	5/16-24 UNF-3A	.502 .492	0.58	0.484	.3112 .3106	.3120 .3110	0.156	0.104	0.31	0.181	0.07	0.76	.020 .010	0.469	0.021
NAS1306	3/8-24 UNF-3A	.564 .553	0.65	0.547	.3737 .3731	.3745 .3735	0.188	0.125	0.38	0.197	0.07	0.106	.025 .015	0.578	0.021
NAS1307	7/16-20 UNF-3A	.690 .679	0.79	0.672	.4362 .4356	.4370 .4360	0.219	0.146	0.44	0.201	0.07	0.106	.025 .015	0.594	0.025
NAS1308	1/2-20 UNF-3A	.752 .741	0.87	0.734	.4987 .4981	.4995 .4985	0.25	0.167	0.50	0.216	0.07	0.106	.030 .020	0.735	0.025
NAS1309	9/16-18 UNF-3A	.877 .865	1.01	0.859	.5607 .5601	.5616 .5605	0.281	0.188	0.56	0.218	0.07	0.141	.035 .020	0.84	0.028
NAS1310	5/18-18 UNF-3A	.940 .928	1.09	0.922	.6232 .6226	.6240 .6230	0.312	0.208	0.62	0.249	0.07	0.141	.040 .025	0.902	0.028
NAS1312	3/4-16 UNF-3A	1.064 1.052	1.23	1.047	.7482 .7476	.7490 .7480	0.375	0.250	0.75	0.252	0.07	0.141	.045 .030	1.041	0.031
NAS1314	7/8-14 UNF-3A	1.252 1.239	1.44	1.234	.8732 .8726	.8740 .8730	0.438	0.292	0.88	0.257	0.07	0.141	.050 .035	1.184	0.036
NAS1316	1-12 UNF-3A	1.440 1.427	1.66	1.422	.9982 .9976	.9990 .9980	0.50	0.333	1.00	0.264	0.07	0.141	.060 .045	1.309	0.042

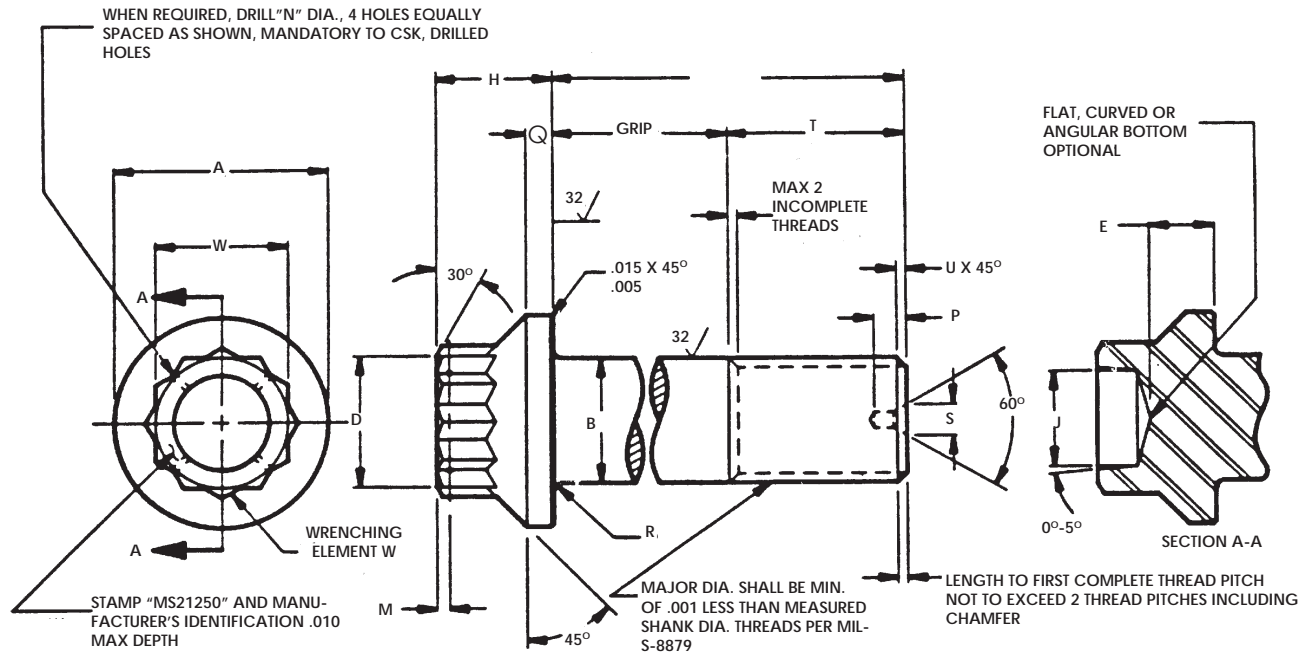
NAS 1303 - NAS 1316 Series Specifications (Length +/- .015)

Dash No.	Grip +/- .010	NAS 1303	NAS 1304	NAS 1305	NAS 1306	NAS 1307	NAS 1308	NAS 1309	NAS 1310	NAS 1312	NAS 1314	NAS 1316
1	.062	.400	.487	.531	.640	.656	.797	.902	.964	1.103	1.246	1.371
2	.125	.463	.550	.594	.703	.719	.860	.965	1.027	1.166	1.309	1.434
3	.188	.526	.613	.657	.766	.782	.923	1.028	1.090	1.229	1.372	1.497
4	.250	.588	.675	.719	.828	.844	.985	1.090	1.152	1.291	1.434	1.559
5	.312	.650	.737	.781	.890	.906	1.047	1.152	1.214	1.353	1.496	1.621
6	.375	.713	.800	.844	.953	.969	1.110	1.215	1.277	1.416	1.559	1.684
7	.438	.776	.863	.907	1.016	1.032	1.173	1.278	1.340	1.479	1.622	1.747
8	.500	.838	.925	.969	1.078	1.094	1.235	1.340	1.402	1.541	1.684	1.809
9	.562	.900	.987	1.031	1.140	1.156	1.297	1.402	1.464	1.603	1.746	1.871
10	.625	.963	1.050	1.094	1.203	1.219	1.360	1.465	1.527	1.666	1.809	1.934
11	.688	1.026	1.113	1.157	1.266	1.282	1.423	1.528	1.590	1.729	1.872	1.997
12	.750	1.088	1.175	1.219	1.328	1.344	1.485	1.590	1.652	1.791	1.934	2.059
13	.812	1.150	1.237	1.281	1.390	1.406	1.547	1.652	1.714	1.853	1.996	2.121
14	.875	1.213	1.300	1.344	1.453	1.469	1.610	1.715	1.777	1.916	2.059	2.184
15	.938	1.276	1.363	1.407	1.516	1.532	1.673	1.778	1.840	1.979	2.122	2.247
16	1.000	1.338	1.425	1.469	1.578	1.594	1.735	1.840	1.902	2.041	2.184	2.309
17	1.062	1.400	1.487	1.531	1.640	1.656	1.797	1.902	1.964	2.103	2.246	2.371
18	1.125	1.463	1.550	1.594	1.703	1.719	1.860	1.965	2.027	2.166	2.309	2.434
19	1.188	1.526	1.613	1.657	1.766	1.782	1.923	2.028	2.090	2.229	2.372	2.497
20	1.250	1.588	1.675	1.719	1.828	1.844	1.985	2.090	2.152	2.291	2.434	2.559
21	1.312	1.650	1.737	1.781	1.890	1.906	2.047	2.152	2.214	2.353	2.496	2.621
22	1.375	1.713	1.800	1.844	1.953	1.969	2.110	2.215	2.277	2.416	2.559	2.684
23	1.438	1.776	1.863	1.907	2.016	2.032	2.173	2.278	2.340	2.479	2.622	2.747
24	1.500	1.838	1.925	1.969	2.078	2.094	2.235	2.340	2.402	2.541	2.684	2.809
25	1.562	1.900	1.987	2.031	2.140	2.156	2.297	2.402	2.464	2.603	2.746	2.871
26	1.625	1.963	2.050	2.094	2.203	2.219	2.360	2.465	2.527	2.666	2.809	2.934
27	1.688	2.026	2.113	2.157	2.266	2.282	2.423	2.528	2.590	2.729	2.872	2.997
28	1.750	2.088	2.175	2.219	2.328	2.344	2.485	2.590	2.652	2.791	2.934	3.059
29	1.812	2.150	2.237	2.281	2.390	2.406	2.547	2.652	2.714	2.853	2.996	3.121
30	1.875	2.213	2.300	2.344	2.453	2.469	2.610	2.715	2.777	2.916	3.059	3.184
31	1.938	2.276	2.363	2.407	2.516	2.532	2.673	2.778	2.840	2.979	3.122	3.247
32	2.000	2.338	2.425	2.469	2.578	2.594	2.735	2.840	2.902	3.041	3.184	3.309
34	2.125	2.463	2.550	2.594	2.703	2.719	2.860	2.965	3.027	3.166	3.309	3.434
36	2.250	2.588	2.675	2.719	2.828	2.844	2.985	3.090	3.152	3.291	3.434	3.559
38	2.375	2.713	2.800	2.844	2.953	2.969	3.110	3.215	3.277	3.416	3.559	3.684
40	2.500	2.838	2.925	2.969	3.078	3.094	3.235	3.340	3.402	3.541	3.684	3.809
42	2.625	2.963	3.050	3.094	3.203	3.219	3.360	3.465	3.527	3.666	3.809	3.934
44	2.750	3.088	3.175	3.219	3.328	3.344	3.485	3.590	3.652	3.791	3.934	4.059
46	2.875	3.213	3.300	3.344	3.453	3.469	3.610	3.715	3.777	3.916	4.059	4.184
48	3.000	3.338	3.425	3.469	3.578	3.594	3.735	3.840	3.902	4.041	4.184	4.309
50	3.125	3.463	3.550	3.594	3.703	3.719	3.860	3.965	4.027	4.166	4.309	4.434
52	3.250	3.588	3.675	3.719	3.828	3.844	3.985	4.090	4.152	4.291	4.434	4.559
54	3.375	3.713	3.800	3.844	3.953	3.969	4.110	4.215	4.277	4.416	4.559	4.684
56	3.500	3.838	3.925	3.969	4.078	4.094	4.235	4.340	4.402	4.541	4.684	4.809
58	3.625	3.963	4.050	4.094	4.203	4.219	4.360	4.465	4.527	4.666	4.809	4.934
60	3.750	4.088	4.175	4.219	4.328	4.344	4.485	4.590	4.652	4.791	4.934	5.059
62	3.875	4.213	4.300	4.344	4.453	4.469	4.610	4.715	4.777	4.916	5.059	5.184
64	4.000	4.338	4.425	4.469	4.578	4.594	4.735	4.840	4.902	5.041	5.184	5.309
66	4.125	4.463	4.550	4.594	4.703	4.719	4.860	4.965	5.027	5.166	5.309	5.434
68	4.250	4.588	4.675	4.719	4.828	4.844	4.985	5.090	5.152	5.291	5.434	5.559
70	4.375	4.713	4.800	4.844	4.953	4.969	5.110	5.215	5.277	5.416	5.559	5.684
72	4.500	4.838	4.925	4.969	5.078	5.094	5.235	5.340	5.402	5.541	5.684	5.809
74	4.625	4.963	5.050	5.094	5.203	5.219	5.360	5.465	5.527	5.666	5.809	5.934
76	4.750	5.088	5.175	5.219	5.328	5.344	5.485	5.590	5.652	5.791	5.934	6.059
78	4.875	5.213	5.300	5.344	5.453	5.469	5.610	5.715	5.777	5.916	6.059	6.184
80	5.000	5.338	5.425	5.469	5.578	5.594	5.735	5.840	5.902	6.041	6.184	6.309
82	5.125	5.463	5.550	5.594	5.703	5.719	5.860	5.965	6.027	6.166	6.309	6.434
84	5.250	5.588	5.675	5.719	5.828	5.844	5.985	6.090	6.152	6.291	6.434	6.559
86	5.375	5.713	5.800	5.844	5.953	5.969	6.110	6.215	6.277	6.416	6.559	6.684
88	5.500	5.838	5.925	5.969	6.078	6.094	6.235	6.340	6.402	6.541	6.684	6.809
90	5.625	5.963	6.050	6.094	6.203	6.219	6.360	6.465	6.527	6.666	6.809	6.934
92	5.750	6.088	6.175	6.219	6.328	6.344	6.485	6.590	6.652	6.791	6.934	7.059
94	5.875	6.213	6.300	6.344	6.453	6.469	6.610	6.715	6.777	6.916	7.059	7.184
96	6.000	6.338	6.425	6.469	6.578	6.594	6.735	6.840	6.902	7.041	7.184	7.309

MS21250 Series Specifications

Procurement Specification: MIL-B-8831

Bolt, Steel, External Wrenching
180,000 PSI FTU, 450°F, 12 Point



Dash No.	Thread MIL-S-8879	A Dia.	B Dia.	Nom Size W	D Dia	E Min	H	J + .010 - .030	M	N Dia +/- .005	P Max	Q	R	S Max	T Min	U +/- .016
02	.1640-32 UNJC-3A	.300 .290	.1635 .1625	0.2188	.219 .204	0.076	0.25	0.10	.062	.037	-	0.05	.041 .031	-	0.385	.031
03	.1900-32 UNJF-3A	.350 .340	.1895 .1885	0.25	.250 .235	0.092	0.265	0.125	.062	.037	-	0.055	.041 .031	-	0.42	.031
04	.2500-28 UNJF-3A	.438 .428	.2495 .2485	0.3125	.312 .297	0.135	0.30	0.18	.062	.037	-	0.069	.041 .031	-	0.492	.031
05	.3125-24 UNJF-3A	.531 .521	.3120 .3110	0.375	.375 .360	0.162	0.348	0.215	.070	.055	-	0.082	.041 .031	-	0.579	.047
06	.3750-24 UNJF-3A	.649 .639	.3745 .3735	0.4375	.437 .422	0.197	0.388	0.26	.070	.055	-	0.091	.057 .047	-	0.625	.047
07	.4375-20 UNJF-3A	.750 .740	.4370 .4360	0.50	.500 .485	0.228	0.435	0.32	.070	.055	-	0.099	.057 .047	-	0.721	.047
08	.5000-20 UNJF-3A	.828 .818	.4995 .4985	0.5625	.562 .547	0.254	0.504	0.38	.094	.055	-	0.123	.057 .047	-	0.768	.047
09	.5625-18 UNJF-3A	.938 .928	.5615 .5605	0.625	.625 .610	0.287	0.557	0.44	.094	.055	-	0.133	.057 .047	-	0.852	.062
10	.6250-18 UNJF-3A	1.050 1.040	.6240 .6230	0.6875	.687 .672	0.327	0.618	0.50	.094	.055	-	0.15	.073 .063	-	0.899	.062
12	.7500-16 UNJF-3A	1.230 1.220	.7490 .7480	0.8125	.812 .797	0.38	0.711	0.57	.094	.055	.200	0.178	.073 .063	.187	1.036	.062
14	.8750-14 UNJF-3A	1.438 1.428	.8740 .8730	0.9375	.937 .922	0.438	0.808	0.65	.125	.055	.260	0.198	.073 .063	.187	1.244	.078
16	1.000-12 UNJF-3A	1.625 1.615	.9990 .9980	1.0625	1.062 1.047	0.493	0.923	0.74	.125	.055	.260	0.222	.073 .063	.250	1.479	.078

MS21250 Series Specifications

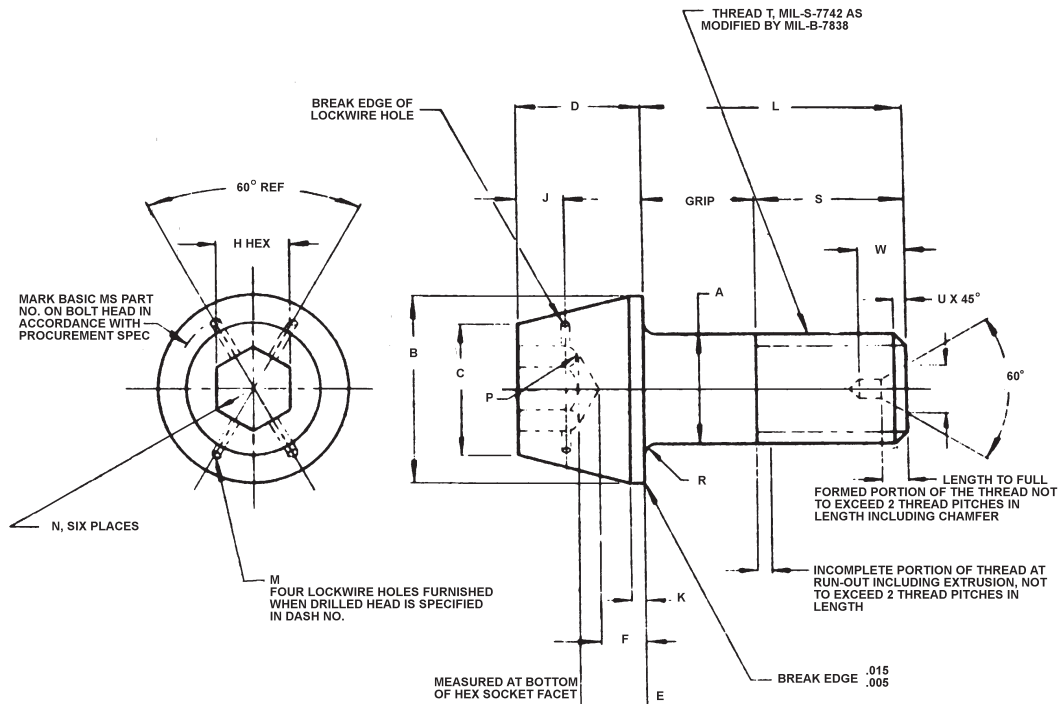
Length: +/- .015

Dash No.	Grip +/- .010	DIAMETER DASH NUMBERS											
		2	3	4	5	6	7	8	9	10	12	14	16
4	0.250	0.655	0.690	0.762	0.849	0.895	0.991	1.038	-	-	-	-	-
6	0.375	0.780	0.815	0.887	0.974	1.020	1.116	1.163	1.247	1.294	1.431	-	-
8	0.500	0.905	0.940	1.012	1.099	1.145	1.241	1.288	1.372	1.419	1.556	1.764	1.999
10	0.625	1.030	1.065	1.137	1.224	1.270	1.366	1.413	1.497	1.544	1.681	1.889	2.124
12	0.750	1.155	1.190	1.262	1.349	1.395	1.491	1.538	1.622	1.669	1.806	2.014	2.249
14	0.875	1.280	1.315	1.387	1.474	1.520	1.616	1.663	1.747	1.794	1.931	2.139	2.374
16	1.000	1.405	1.440	1.512	1.599	1.645	1.741	1.788	1.872	1.919	2.056	2.264	2.499
18	1.125	1.530	1.565	1.637	1.724	1.770	1.866	1.913	1.997	2.044	2.181	2.389	2.624
20	1.250	1.655	1.690	1.762	1.849	1.895	1.991	2.038	2.122	2.169	2.306	2.514	2.749
22	1.375	1.780	1.815	1.887	1.974	2.020	2.116	2.163	2.247	2.294	2.431	2.639	2.874
24	1.500	1.905	1.940	2.012	2.099	2.145	2.241	2.288	2.372	2.419	2.556	2.764	2.999
26	1.625	2.030	2.065	2.137	2.224	2.270	2.366	2.413	2.497	2.544	2.681	2.889	3.124
28	1.750	2.155	2.190	2.262	2.349	2.395	2.491	2.538	2.622	2.669	2.806	3.014	3.249
30	1.875	2.280	2.315	2.387	2.474	2.520	2.616	2.663	2.747	2.794	2.931	3.139	3.374
32	2.000	2.405	2.440	2.512	2.599	2.645	2.741	2.788	2.872	2.919	3.056	3.264	3.499
34	2.125	2.530	2.565	2.637	2.724	2.770	2.866	2.913	2.997	3.044	3.181	3.389	3.624
36	2.250	2.655	2.690	2.762	2.849	2.895	2.991	3.038	3.122	3.169	3.306	3.514	3.749
38	2.375	2.780	2.815	2.887	2.974	3.020	3.116	3.163	3.247	3.294	3.431	3.639	3.874
40	2.500	2.905	2.940	3.012	3.099	3.145	3.241	3.288	3.372	3.419	3.556	3.764	3.999
42	2.625	3.030	3.065	3.137	3.224	3.270	3.366	3.413	3.497	3.544	3.681	3.889	4.124
44	2.750	3.155	3.190	3.262	3.349	3.395	3.491	3.538	3.622	3.669	3.806	4.014	4.249
46	2.875	3.280	3.315	3.387	3.474	3.520	3.616	3.663	3.747	3.794	3.931	4.139	4.374
48	3.000	3.405	3.440	3.512	3.599	3.645	3.741	3.788	3.872	3.919	4.056	4.264	4.499
50	3.125	3.530	3.565	3.637	3.724	3.770	3.866	3.913	3.997	4.044	4.181	4.389	4.624
52	3.250	3.655	3.690	3.762	3.849	3.895	3.991	4.038	4.122	4.169	4.306	4.514	4.749
54	3.375	3.780	3.815	3.887	3.974	4.020	4.116	4.163	4.247	4.294	4.431	4.639	4.874
56	3.500	3.905	3.940	4.012	4.099	4.145	4.241	4.288	4.372	4.419	4.556	4.764	4.999
58	3.625	4.030	4.065	4.137	4.224	4.270	4.366	4.413	4.497	4.544	4.681	4.889	5.124
60	3.750	4.155	4.190	4.262	4.349	4.395	4.491	4.538	4.622	4.669	4.806	5.014	5.249
62	3.875	4.280	4.315	4.387	4.474	4.520	4.616	4.663	4.747	4.794	4.931	5.139	5.374
64	4.000	4.405	4.440	4.512	4.599	4.645	4.741	4.788	4.872	4.919	5.056	5.264	5.499
66	4.125	4.530	4.565	4.637	4.724	4.770	4.866	4.913	4.997	5.044	5.181	5.389	5.624
68	4.250	4.655	4.690	4.762	4.849	4.895	4.991	5.038	5.122	5.169	5.306	5.514	5.749
70	4.375	4.780	4.815	4.887	4.974	5.020	5.116	5.163	5.247	5.294	5.431	5.639	5.874
72	4.500	4.905	4.940	5.012	5.099	5.145	5.241	5.288	5.372	5.419	5.556	5.764	5.999
74	4.625	5.030	5.065	5.137	5.224	5.270	5.366	5.413	5.497	5.544	5.681	5.889	6.124
76	4.750	5.155	5.190	5.262	5.349	5.395	5.491	5.538	5.622	5.669	5.806	6.014	6.249
78	4.875	5.280	5.315	5.387	5.474	5.520	5.616	5.663	5.747	5.794	5.931	6.139	6.374
80	5.000	5.405	5.440	5.512	5.599	5.645	5.741	5.788	5.872	5.919	6.056	6.264	6.499
82	5.125	5.530	5.565	5.637	5.724	5.770	5.866	5.913	5.997	6.044	6.181	6.389	6.624
84	5.250	5.655	5.690	5.762	5.849	5.895	5.991	6.038	6.122	6.169	6.306	6.514	6.749
86	5.375	5.780	5.815	5.887	5.974	6.020	6.116	6.163	6.247	6.294	6.431	6.639	6.874
88	5.500	5.905	5.940	6.012	6.099	6.145	6.241	6.288	6.372	6.419	6.556	6.764	6.999
90	5.625	6.030	6.065	6.137	6.224	6.270	6.366	6.413	6.497	6.544	6.681	6.889	7.124
92	5.750	6.155	6.190	6.262	6.349	6.395	6.491	6.538	6.622	6.669	6.806	7.014	7.249
94	5.875	6.280	6.315	6.387	6.474	6.520	6.616	6.663	6.747	6.794	6.931	7.139	7.374
96	6.000	6.405	6.440	6.512	6.599	6.645	6.741	6.788	6.872	6.919	7.056	7.264	7.499

GRIP LENGTH OF BOLTS SHALL BE MEASURED FROM UNDERSIDE OF HEAD TO THE END OF FULL CYLINDRICAL PORTION OF THE SHANK. DASH NO. INDICATES PREFERRED LENGTHS IN 0.125" INCREMENTS. INTERMEDIATE OR LONGER LENGTHS IN 0.062" INCREMENTS MAY BE OBTAINED BY SPECIFYING SIGNIFICANT DASH NUMBERS. LENGTH AND GRIP OF A BOLT WITH AN ODD DASH NUMBER WILL BE 0.062" GREATER THAN SHOWN FOR THE BOLT WITH THE PRECEDING EVEN SECOND DASH NUMBER.

MS20004 - MS20014 Series Specifications Procurement Specification: MIL-B-7838

Bolts, Internal Wrenching
160,000 PSI FTU & 96,000 PSI FTU



Basic MS Part No.	Thread T	A Diameter		B Diameter		C Diameter	D	E	F Min	H Hex		J	K	M Diameter +.005 - .000	N Max Rad
		Max	Min	Max	Min					Max	Min				
20004	1/4-28 UNF-3A	.2492	.2477	.438	.428	.342	.250	.112	.068	.190	.188	.078	.063	.037	.010
20005	5-16-24 UNF-3A	.3117	.3102	.531	.521	.394	.312	.144	.094	.221	.219	.094	.063	.055	.010
20006	3/8-24 UNF-3A	.3742	.3727	.649	.639	.520	.375	.183	.116	.315	.313	.125	.063	.055	.011
20007	7/16-20 UNF-3A	.4367	.4347	.750	.740	.534	.438	.208	.141	.315	.313	.156	.063	.055	.011
20008	1/2-20 UNF-3A	.4991	.4971	.828	.818	.625	.500	.247	.169	.3785	.3755	.172	.063	.055	.011
20009	9/16-18 UNF-3A	.5616	.5596	.938	.928	.723	.562	.279	.190	.441	.438	.203	.094	.055	.011
20010	5/8-18 UNF-3A	.624	.622	1.05	1.04	.826	.625	.317	.216	.5035	.5005	.234	.094	.055	.019
20012	3/4-16 UNF-3A	.7488	.7468	1.23	1.22	.921	.750	3.85	.273	.566	.563	.281	.094	.055	.022
20014	7/8-14 UNF-3A	.8737	.8707	1.438	1.438	1.083	.875	.450	.327	.6295	.6257	.344	.094	.055	.022

Basic MS Part No.	P Rad		R Rad		S Min Ref.	U +/- .016	V Max	W Max	Tensile Strength lb Min	Concentricity		
	Max	Min	Max	Min						X	Y	Z
20004	.020	.010	.041	.031	.475	.031	.187	.250	6,190	.005	.007	.0045
20005	.020	.010	.041	.031	.537	.047	.187	.250	9,820	.006	.008	.0045
20006	.020	.010	.057	.047	.662	.047	.187	.250	15,200	.008	.010	.0045
20007	.020	.010	.057	.047	.767	.047	.187	.250	20,600	.009	.011	.006
20008	.020	.010	.057	.047	.767	.047	.187	.250	27,400	.010	.012	.006
20009	.020	.010	.057	.047	.850	.062	.187	.250	34,800	.011	.014	.006
20010	.020	.010	.073	.063	.912	.062	.187	.250	43,600	.012	.016	.006
20012	.030	.015	.073	.063	1.037	.062	.187	.250	63,200	.015	.018	.006
20014	.030	.015	.073	.063	1.162	.078	.187	.250	86,100	.018	.022	.009

MATERIAL: Alloy steel; see procurement spec. **FINISH:** Cadmium plate, QQ-P-416, Type II, Class 3 **HARDNESS:** Rockwell C34 to C40

DIMENSIONS ARE AFTER PLATING AND IN INCHES. UNLESS OTHERWISE SPECIFIED, TOLERANCES: DECIMALS +/- .010, ANGLES +/- 1°

MS20004 - MS20014 Series Specifications

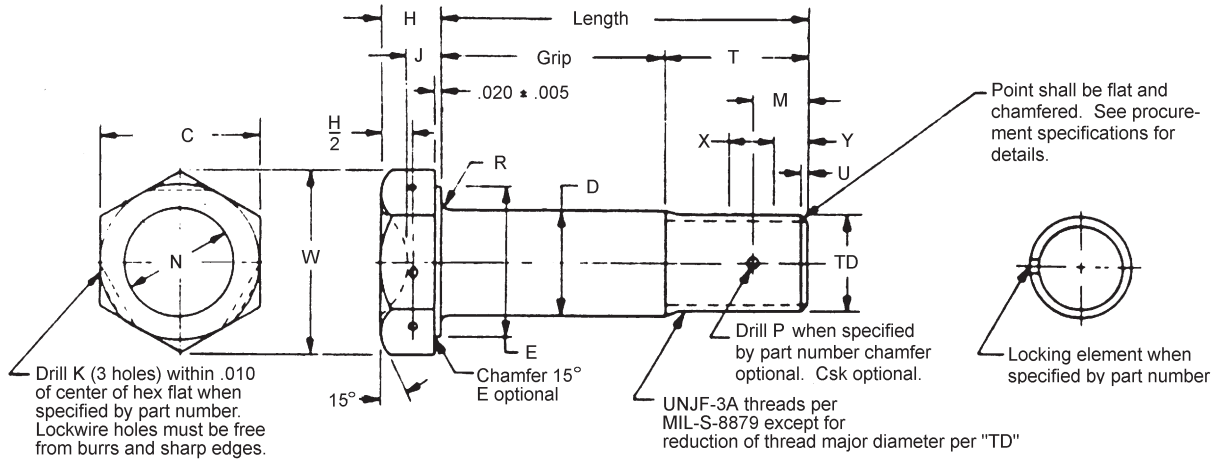
Length: +/- .015

Dash No.	Grip +/- .010	MS2004 1/4	MS2005 5/16	MS2006 3/8	MS2007 7/16	MS2008 1/2	MS2009 9/16	MS20010 5/8	MS20012 3/4	MS20014 7/8
4 6	.250 .375	.750 .875	.938	1.062	-	-	-	-	-	-
8 10	.500 .625	1.000 1.125	1.062 1.188	1.888 1.312	1.312 1.438	1.312 1.438	1.500	1.562	-	-
12 14	.750 .875	1.250 1.375	1.312 1.438	1.438 1.562	1.562 1.688	1.562 1.688	1.625 1.750	1.688 1.812	1.812 1.938	2.062
16 18	1.000 1.125	1.500 1.625	1.562 1.688	1.688 1.812	1.812 1.938	1.812 1.938	1.875 2.000	1.938 2.062	2.062 2.188	2.188 2.312
20 22	1.250 1.375	1.750 1.875	1.812 1.938	1.938 2.062	2.062 2.188	2.062 2.188	2.125 2.250	2.188 2.312	2.312 2.438	2.438 2.562
24 26	1.500 1.625	2.000 2.125	2.062 2.188	2.188 2.312	2.312 2.438	2.312 2.438	2.375 2.500	2.438 2.562	2.562 2.688	2.688 2.812
28 30	1.750 1.875	2.250 2.375	2.312 2.438	2.438 2.562	2.562 2.688	2.562 2.688	2.625 2.750	2.688 2.812	2.812 2.938	2.938 3.062
32 34	2.000 2.125	2.500 2.625	2.562 2.688	2.688 2.812	2.812 2.938	2.812 2.938	2.875 3.000	2.938 3.062	3.062 3.188	3.188 3.312
36 38	2.250 2.375	2.750 2.875	2.812 2.938	2.938 3.062	3.062 3.188	3.062 3.188	3.125 3.250	3.188 3.312	3.312 3.438	3.438 3.562
40 42	2.500 2.625	3.000 3.125	3.062 3.188	3.188 3.312	3.312 3.438	3.312 3.438	3.375 3.500	3.438 3.562	3.562 3.688	3.688 3.812
44 46	2.750 2.875	3.250 3.375	3.312 3.438	3.438 3.562	3.562 3.688	3.562 3.688	3.625 3.750	3.688 3.812	3.812 3.938	3.938 4.062
48 50	3.000 3.125	3.500 3.625	3.562 3.688	3.688 3.812	3.812 3.938	3.812 3.938	3.875 4.000	3.938 4.062	4.062 4.188	4.188 4.312
52 54	3.250 3.375	3.750 3.875	3.812 3.938	3.938 4.062	4.062 4.188	4.062 4.188	4.125 4.250	4.188 4.312	4.312 4.438	4.438 4.562
56 58	3.500 3.625	4.000 4.125	4.062 4.188	4.188 4.312	4.312 4.438	4.312 4.438	4.375 4.500	4.438 4.562	4.562 4.688	4.688 4.812
60 62	3.750 3.875	4.250 4.375	4.312 4.438	4.438 4.562	4.562 4.688	4.562 4.688	4.625 4.750	4.688 4.812	4.812 4.938	4.938 5.062
64 66	4.000 4.125	4.500 4.625	4.562 4.688	4.688 4.812	4.812 4.938	4.812 4.938	4.875 5.000	4.938 5.062	5.062 5.188	5.188 5.312
68 70	4.250 4.375	4.750 4.875	4.812 4.938	4.938 5.062	5.062 5.188	5.062 5.188	5.125 5.250	5.188 5.312	5.312 5.438	5.438 5.562
72 74	4.500 4.625	5.000 5.125	5.062 5.188	5.188 5.312	5.312 5.438	5.312 5.438	5.375 5.500	5.438 5.562	5.562 5.688	5.688 5.812
76 78	4.750 4.875	5.250 5.375	5.312 5.438	5.438 5.562	5.562 5.688	5.562 5.688	5.625 5.750	5.688 5.812	5.812 5.938	5.938 6.062
80 82	5.000 5.125	5.500 5.625	5.562 5.688	5.688 5.812	5.812 5.938	5.812 5.938	5.875 6.000	5.938 6.062	6.062 6.188	6.188 6.312
84 86	5.250 5.375	5.750 5.875	5.812 5.938	5.938 6.062	6.062 6.188	6.062 6.188	6.125 6.250	6.188 6.312	6.312 6.438	6.438 6.562
88 90	5.500 5.625	6.000 6.125	6.062 6.188	6.188 6.312	6.312 6.438	6.312 6.438	6.375 6.500	6.438 6.562	6.562 6.688	6.688 6.812

NAS6303 - NAS6316 Series Specifications

Procurement Specification: NAS4003

A 286 Stainless Steel
Bolt, Hex Head, Close Tolerance
160,000 PSI Short Thread



Basic No.	Nominal Thread Size	C	D Diameter				E Dia Min	H	J	K Dia	M	N	P	R Rad	T	TD Dia	U Max	W Min	X	Y
			Un-plated	Before Chrome Plating	Before Cad Plate or Al Coating	After Plating or Coating														
NAS 6303	.1900-32	.376 .367	.1895 .1890	.1850 .1845	.1187 .1181	.1895 .1885	.335	.125 .073	.088 .073	.056 .046	.174 .154	.18 .20	.080 .070	.020 .010	.323	.184 .181	.039	.410	.156	.094
NAS 6304	.2500-28	.439 .429	.2450 .2445	.2450 .2445	.2487 .2481	.2495 .2485	.398	.098 .083	.098 .083	.056 .046	.180 .160	.24 .26	.086 .076	.020 .010	.370	.244 .241	.045	.480	.179	.107
NAS 6305	.3125-24	.502 .492	.3075 .3070	.3075 .3070	.3112 .3106	.3120 .3110	.460	.119 .104	.119 .104	.080 .070	.192 .172	.30 .32	.086 .076	.020 .010	.438	.306 .302	.052	.552	.208	.125
NAS 6306	.3750-24	.564 .554	.3700 .3695	.3700 .3695	.3737 .3731	.3745 .3735	.523	.140 .125	.140 .125	.080 .070	.193 .173	.37 .39	.116 .106	.025 .015	.454	.368 .364	.052	.623	.208	.125
NAS 6307	.4375-20	.690 .678	.4325 .4320	.4325 .4320	.4362 .4356	.4370 .4360	.648	.161 .146	.161 .146	.080 .070	.209 .189	.43 .45	.116 .106	.025 .015	.528	.431 .426	.062	.764	.250	.150
NAS 6308	.5000-20	.752 .741	.4950 .4945	.4950 .4945	.4987 .4981	.4995 .4985	.710	.182 .167	.182 .167	.080 .070	.208 .188	.49 .51	.116 .106	.030 .020	.528	.493 .488	.062	.836	.250	.150
NAS 6309	.5625-18	.877 .865	.5570 .5565	.5570 .5565	.5607 .5601	.5615 .5605	.835	.203 .188	.203 .188	.080 .070	.217 .197	.55 .57	.151 .141	.035 .020	.594	.555 .550	.068	.978	.278	.167
NAS 6310	.6250-18	.940 .928	.6195 .6190	.6195 .6190	.6232 .6226	.6240 .6230	.898	.223 .208	.223 .208	.080 .070	.217 .197	.61 .63	.151 .141	.040 .025	.626	.618 .612	.068	1.05	.278	.167
NAS 6312	.7500-16	1.065 1.052	.7445 .7440	.7445 .7440	.7482 .7476	.7490 .7480	1.023	.265 .250	.265 .250	.080 .070	.232 .212	.74 .76	.151 .141	.045 .030	.666	.743 .737	.078	1.191	.312	.188
NAS 6314	.8750-14	1.252 1.239	.8695 .8690	.8695 .8690	.8732 .8726	.8740 .8730	1.210	.307 .292	.307 .292	.080 .070	.251 .231	.87 .89	.151 .141	.050 .035	.759	.868 .861	.089	1.405	.357	.214
NAS 6316	1.000-12	1.440 1.427	.9945 .9940	.9945 .9940	.9982 .9976	.9990 .9980	1.398	.348 .333	.348 .333	.080 .070	.274 .254	.99 1.01	.151 .141	.060 .045	.895	.993 .986	.104	1.619	.417	.250

Material: A-286 per AMS 5731 or AMS 5737. Locking element - plastic per MIL-F-18240 and QPL 18240

Heat Treat: 160 ksi minimum ultimate tensile, 95 ksi minimum ultimate shear.

Finish: Unplated - Passivated to meet requirements of NAS4003
 Cadmium plated - Cadmium plate per QQ-P-416, Type II, Class 2. Parts plated to Class 3 may be used until stock depleted. Embrittlement test per QQ-P-416 does not apply.
 Chromium plated - Chromium plated per QQ-C-320. Class 2 on shank only. All other surfaces cadmium plated.
 No chromium within .020 of line of tangency of head-to-shank fillet. Chromium in thread runout permitted.
 Chromium plated bolts not available with grip dash number 1 or 2.

NAS6303 - NAS6316 Series Specifications

Length: +/- .015

Dash No.	Grip +/- .010	6303 .1900-32	6304 .2500-28	6305 .3125-24	6306 .3750-24	6307 .4375-20	6308 .5000-20	6309 .5625-18	6310 .6250-18	6312 .7500-16	6314 .8750-14	6316 1.000-12
1	.062	.385	.432	.500	.516	.590	.590	.656	.688	.728	.821	.957
2	.125	.448	.495	.563	.579	.653	.653	.719	.751	.791	.884	1.020
3	.188	.511	.558	.626	.642	.716	.716	.782	.814	.854	.947	1.083
4	.250	.573	.620	.688	.704	.778	.778	.844	.876	.916	1.009	1.145
5	.312	.635	.682	.750	.766	.840	.840	.906	.938	.978	1.071	1.207
6	.375	.698	.745	.813	.829	.903	.903	.969	1.001	1.041	1.134	1.270
7	.438	.761	.808	.876	.892	.966	.966	1.032	1.064	1.104	1.197	1.333
8	.500	.823	.870	.938	.954	1.028	1.028	1.094	1.126	1.166	1.259	1.395
9	.562	.885	.932	1.000	1.016	1.090	1.090	1.156	1.188	1.228	1.321	1.457
10	.625	.948	.995	1.063	1.079	1.153	1.153	1.219	1.251	1.291	1.384	1.520
11	.688	1.011	1.058	1.126	1.142	1.216	1.216	1.282	1.314	1.354	1.447	1.583
12	.750	1.073	1.120	1.188	1.204	1.278	1.278	1.344	1.376	1.416	1.509	1.645
13	.812	1.135	1.182	1.250	1.266	1.340	1.340	1.406	1.438	1.478	1.571	1.707
14	.875	1.198	1.245	1.313	1.329	1.403	1.403	1.469	1.501	1.541	1.634	1.770
15	.938	1.261	1.308	1.376	1.392	1.466	1.466	1.532	1.564	1.604	1.697	1.833
16	1.000	1.323	1.370	1.438	1.454	1.528	1.528	1.594	1.626	1.666	1.759	1.895
17	1.062	1.385	1.432	1.500	1.516	1.590	1.590	1.656	1.688	1.728	1.821	1.957
18	1.125	1.448	1.495	1.563	1.579	1.653	1.653	1.719	1.751	1.791	1.884	2.020
19	1.188	1.511	1.558	1.626	1.642	1.716	1.716	1.782	1.814	1.854	1.947	2.083
20	1.250	1.573	1.620	1.688	1.704	1.778	1.778	1.844	1.876	1.916	2.009	2.145
21	1.312	1.635	1.682	1.750	1.766	1.840	1.840	1.906	1.938	1.978	2.071	2.207
22	1.375	1.698	1.745	1.813	1.829	1.903	1.903	1.969	2.001	2.041	2.134	2.270
23	1.438	1.761	1.808	1.876	1.892	1.966	1.966	2.032	2.064	2.104	2.197	2.333
24	1.500	1.823	1.870	1.938	1.954	2.028	2.028	2.094	2.126	2.166	2.259	2.395
25	1.562	1.885	1.932	2.000	2.016	2.090	2.090	2.156	2.188	2.228	2.321	2.457
26	1.625	1.948	1.995	2.063	2.079	2.153	2.153	2.219	2.251	2.291	2.384	2.520
27	1.688	2.011	2.058	2.126	2.142	2.216	2.216	2.282	2.314	2.354	2.447	2.583
28	1.750	2.073	2.120	2.188	2.204	2.278	2.278	2.344	2.376	2.416	2.509	2.645
29	1.812	2.135	2.182	2.250	2.266	2.340	2.340	2.406	2.438	2.478	2.571	2.707
30	1.875	2.198	2.245	2.313	2.329	2.403	2.403	2.469	2.501	2.541	2.634	2.770
31	1.938	2.261	2.308	2.376	2.392	2.466	2.466	2.532	2.564	2.604	2.697	2.833
32	2.000	2.323	2.370	2.438	2.454	2.528	2.528	2.594	2.626	2.666	2.759	2.895
34	2.125	2.448	2.495	2.563	2.579	2.653	2.653	2.719	2.751	2.791	2.884	3.020
36	2.250	2.573	2.620	2.688	2.704	2.778	2.778	2.844	2.876	2.916	3.009	3.145
38	2.375	2.698	2.745	2.813	2.829	2.903	2.903	2.969	3.001	3.041	3.134	3.270
40	2.500	2.823	2.870	2.938	2.954	3.028	3.028	3.094	3.126	3.166	3.259	3.395
42	2.625	2.948	2.995	3.063	3.079	3.153	3.153	3.219	3.251	3.291	3.384	3.520
44	2.750	3.073	3.120	3.188	3.204	3.278	3.278	3.344	3.376	3.416	3.509	3.645
46	2.875	3.198	3.245	3.313	3.329	3.403	3.403	3.469	3.501	3.541	3.634	3.770
48	3.000	3.323	3.370	3.438	3.454	3.528	3.528	3.594	3.626	3.666	3.759	3.895
50	3.125	3.448	3.495	3.563	3.579	3.653	3.653	3.719	3.751	3.791	3.884	4.020
52	3.250	3.573	3.620	3.688	3.704	3.778	3.778	3.844	3.876	3.916	4.009	4.145
54	3.375	3.698	3.745	3.813	3.829	3.903	3.903	3.969	4.001	4.041	4.134	4.270
56	3.500	3.823	3.870	3.938	3.954	4.028	4.028	4.094	4.126	4.166	4.259	4.395
58	3.625	3.948	3.995	4.063	4.079	4.153	4.153	4.219	4.251	4.291	4.384	4.520
60	3.750	4.073	4.120	4.188	4.204	4.278	4.278	4.344	4.376	4.416	4.509	4.645
62	3.875	4.198	4.245	4.313	4.329	4.403	4.403	4.469	4.501	4.541	4.634	4.770
64	4.000	4.323	4.370	4.438	4.454	4.528	4.528	4.594	4.626	4.666	4.759	4.895
66	4.125	4.448	4.495	4.563	4.579	4.653	4.653	4.719	4.751	4.791	4.884	5.020
68	4.250	4.573	4.620	4.688	4.704	4.778	4.778	4.844	4.876	4.916	5.009	5.145
70	4.375	4.698	4.745	4.813	4.829	4.903	4.903	4.969	5.001	5.041	5.134	5.270
72	4.500	4.823	4.870	4.938	4.954	5.028	5.028	5.094	5.126	5.166	5.259	5.395
74	4.625	4.948	4.995	5.063	5.079	5.153	5.153	5.219	5.251	5.291	5.384	5.520
76	4.750	5.073	5.120	5.188	5.204	5.278	5.278	5.344	5.376	5.416	5.509	5.645
78	4.875	5.198	5.245	5.313	5.329	5.403	5.403	5.469	5.501	5.541	5.634	5.770
80	5.000	5.323	5.370	5.438	5.454	5.528	5.528	5.594	5.626	5.666	5.759	5.895
82	5.125	5.448	5.495	5.563	5.579	5.653	5.653	5.719	5.751	5.791	5.884	6.020
84	5.250	5.573	5.620	5.688	5.704	5.778	5.778	5.844	5.876	5.916	6.009	6.145
86	5.375	5.698	5.745	5.813	5.829	5.903	5.903	5.969	6.001	6.041	6.134	6.270
88	5.500	5.823	5.870	5.938	5.954	6.028	6.028	6.094	6.126	6.166	6.259	6.395
90	5.625	5.948	5.995	6.063	6.079	6.153	6.153	6.219	6.251	6.291	6.384	6.520
92	5.750	6.073	6.120	6.188	6.204	6.278	6.278	6.344	6.376	6.416	6.509	6.645
94	5.875	6.198	6.245	6.313	6.329	6.403	6.403	6.469	6.501	6.541	6.634	6.770
96	6.000	6.323	6.370	6.438	6.454	6.528	6.528	6.594	6.626	6.666	6.759	6.895

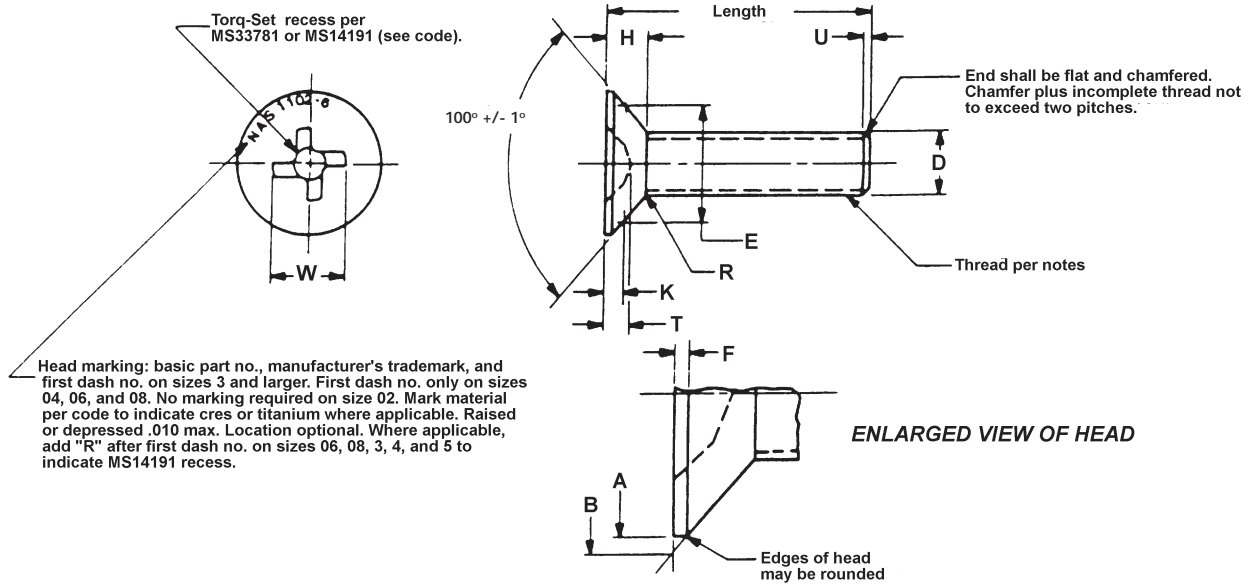
NOTE: THE ABOVE CHART MAY ALSO BE USED FOR NAS6203 THROUGH NAS6216 LENGTH CALCULATIONS

Intermediate and longer lengths may be specified by use of whole grip dash numbers only. Nominal grip dimension equals grips grip dash number times 0.0625 (rounded to three decimal places). Nominal length equals nominal grip plus "T".

NAS1102 Series Specifications

Procurement Specification: MIL-B-87114

Screw, Machine Flat 100 DEG Head Full Thread, Torq-Set



Part No.	Thread	A Dia.	B Absolute Min Dia.	F	H Ref.	R	U Ref.	D Dia. Max	T Max	W Max	Recess Gage Penetration		K	E Dia.
											Max	Min		
NAS1102-02	.0860-56 UNJC 3A	.172 .162	.126	.015 .005	.036	.015 .005	.010	.086	.043	.115	.0315	.0225	-	-
NAS1102-04	.1120-40 UNJC 3A	.225 .213	.177	.015 .005	.045	.015 .005	.013	.112	.055	.0148	.0405	.0305	-	-
NAS1102-06	.1380-32 UNJC 3A	.279 .267	.231	.015 .005	.057	.020 .010	.016	.138	.066	.182	.0500	.0395	-	-
NAS1102-08	.1640-32 UNJC 3A	.332 .319	.270	.020 .010	.068	.020 .010	.016	.164	.078	.215	.0595	.0480	.0268 .0240	.2671 .2667
NAS1102-3	.1900-32 UNJF 3A	.385 .371	.322	.020 .010	.080	.020 .010	.016	.190	.090	.248	.0685	.0560	.0290 .0263	.3147 .3143
NAS1102-4	.2500-28 UNJF 3A	.507 .491	.442	.020 .010	.106	.020 .010	.018	.250	.118	.325	.0890	.0750	.0342 .0316	.4245 .4241
NAS1102-5	.3125-24 UNJF 3A	.635 .617	.568	.020 .010	.133	.020 .010	.021	.312	.122	.357	.0860	.0700	.0395 .0370	.5389 .5385
NAS1102-6	.3750-24 UNJF 3A	.762 .742	.694	.020 .010	.160	.020 .010	.021	.375	.145	.427	.0103	.0850	.0450 .0426	.6532 .6528

LENGTH CHART						MIN TENSILE STRENGTH, LBS		MATERIAL:
DASH NO.	LENGTH	DASH NO.	LENGTH	DASH NO.	LENGTH	PART NO.	ALLOY STEEL CRES (160 KSI) Ti (6AL-4V)	
TOLERANCE +.000, -.031		12	.750	26	1.625	NAS1102-02	591	Alloy steel, 4140 per MIL-S-5626, 4340 per MIL-S-5000, or 8740 per MIL-S-6049
3	.188	14	.875	28	1.750	NAS1102-04	966	Cres per AMS5737 (A286), except for heat treatment, designated by "E" code
4	.250	16	1.00	30	1.875	NAS1102-06	1450	Titanium alloy (6AL-4V) per AMS4967, designated by "V" code
5	.312	TOLERANCE +.000, -.062		32	2.000	NAS1102-08	2240	HEAT TREAT:
6	.375	18	1.125	TOLERANCE +.000, -.094		NAS1102-3	3180	Alloy steel - 160,000 - 180,000 psi UTS per MIL-H-6875
7	.438	20	1.250	34 TO 96	2.125 TO 6.000	NAS1102-4	5820	Cres- 160,000 psi UTS min. at room temp.
8	.500	22	1.375			NAS1102-5	9200	Titanium alloy- 160,000 psi UTS min.
10	.625	24	1.500			NAS1102-6	14,000	

Rockwell Hardness (Tensile Strength)

C	A	Tensile PSI (000)	C	A	B	Tensile PSI (000)
60	81	311	30	65.5	-	136
55	78.5	287	28	64.5	-	129
50	76	256	26	63.5	-	123
48	74.5	237	24	62.5	-	118
46	73.5	221	22	61.5	99	112
44	72.5	208	20	60.5	97	107
42	71.5	194	18	59.5	96	103
40	70.5	181	16	58.0	95	100
38	69.5	170	12	56.5	92	93
36	68.5	160	8	55.0	89	88
34	67.5	150	4	53.0	86	83
32	66.5	142	1	51.0	83	80

External Threads "J" Type (Controlled Radius Root) Class 3A Per MIL-S-8879C

Dimensions are in inches

Size Threads per Inch	Major Diameter		Pitch Diameter		Minor Diameter	
	Min	Max	Min	Max	Min	Max
.1120-40 (#4-40)	.1069	.1120	.0939	.0958	.0798	.0832
.1380-32 (#6-32)	.1320	.1380	.1156	.1177	.0979	.1019
.1640-32 (#8-32)	.1580	.1640	.1415	.1437	.1238	.1279
.1900-32 (#10-32)	.1840	.1900	.1674	.1697	.1497	.1539
.2500-24 (1/4-28)	.2435	.2500	.2243	.2268	.2041	.2088
.3125-24 (5/16-24)	.3053	.3125	.2827	.2854	.2591	.2644
.3750-24 (3/8-24)	.3678	.3750	.3450	.3479	.3214	.3268
.4375-20 (7/16-20)	.4294	.4375	.4019	.4050	.3736	.3797
.5000-20 (1/2-20)	.4919	.5000	.4643	.4675	.4360	.4422
.5625-18 (9/16-18)	.5538	.5625	.5230	.5264	.4916	.4983
.6250-18 (5/8-18)	.6163	.6250	.5854	.5889	.5540	.5608
.7500-16 (7/8-14)	.7406	.7500	.7056	.7094	.6702	.6778
.8750-14 (7/8-14)	.8647	.8750	.8245	.8286	.7841	.7925
1.000-12 (1-12)	.9886	1.000	.9415	.9459	.8944	.9038