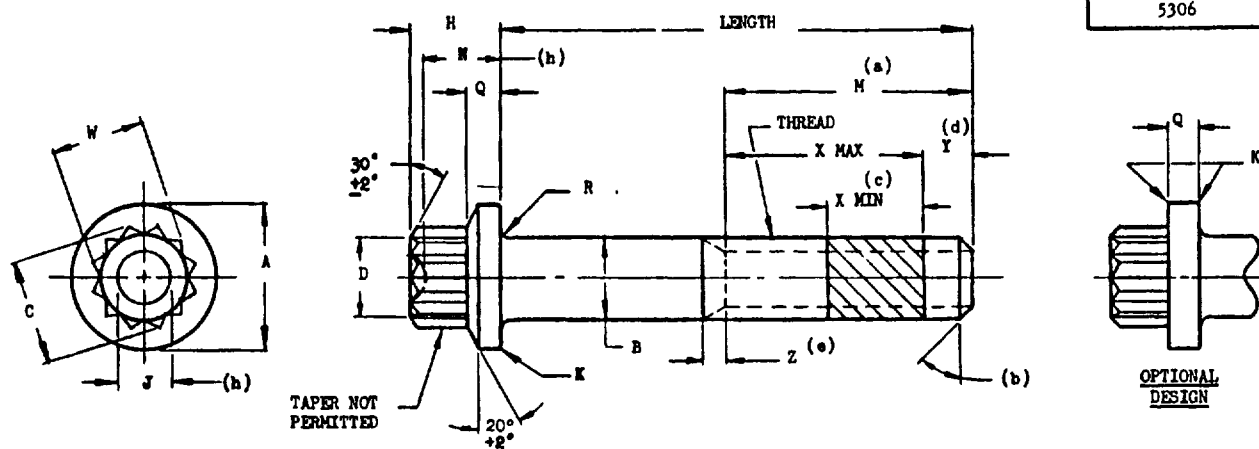


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(f)	THREAD	A DIA	B DIA	C MIN	D	H	J	K CHAMFER OR RAD MAX	M MIN	N	Q	R	W	X MIN	ULTIMATE TENSILE STRENGTH POUNDS (FTU) MIN
	1/4 - 28 UNF - 3A	.375 .365	.2500 .2435	.277	.250 .235	.250 .244	.155 .115		1.000	.229	.072 .052	.011 .009	.251 .243	.178	2,950
	5/16 - 24 UNF - 3A	.468 .457	.3125 .3053	.347	.312 .297	.312 .306	.190 .150	.008	1.125	.291	.103 .083	.017 .012	.313 .304	.208	4,650
	3/8 - 24 UNF - 3A	.562 .550	.3750 .3678	.419	.375 .360	.375 .368	.225 .185		1.250	.353	.135 .115	.020 .015	.376 .367		7,050
	7/16 - 20 UNF - 3A	.656 .642	.4375 .4294	.491	.437 .422	.437 .430	.270 .230	.010	1.375	.415	.166 .146	.023 .018	.439 .430	.250	9,490
	1/2 - 20 UNF - 3A	.750 .735	.5000 .4919	.561	.500 .485	.500 .492	.307 .267		1.500	.477	.197 .177	.026 .020	.502 .492		12,790
	5/8 - 18 UNF - 3A	.937 .921	.6250 .6163	.703	.625 .610	.625 .616	.390 .350		1.750	.601	.228 .208	.032 .024	.627 .616	.278	19,200

- (a) THREAD LENGTH. THE LENGTH OF THE BOLT THREAD IS MEASURED FROM THE EXTREME POINT TO THE LAST PITCH OF COMPLETE THREAD. ON SHORT BOLTS THE COMPLETE (FULL FORMED) THREADS SHALL EXTEND TO WITHIN TWO THREAD PITCH LENGTHS OF THE HEAD.
- (b) THE POINT SHALL BE FLAT AND CHAMFERED. THE FLAT SHALL BE NORMAL TO THE AXIS OF THE BOLT AND THE CHAMFER SHALL BE AT AN ANGLE OF 35° TO 45° WITH THE PLANE OF THE FLAT. THE CHAMFER SHALL EXTEND SLIGHTLY BELOW THE ROOT OF THE THREAD, AND THE EDGE BETWEEN FLAT AND CHAMFER SHALL BE SLIGHTLY ROUNDED.
- (c) X MIN REPRESENTS THE MINIMUM LENGTH OF EXTERNAL THREAD REQUIRED FOR ENGAGEMENT WITH COMPLETE INTERNAL THREAD PITCHES. THE ELEMENT SHALL ENGAGE WITHIN THIS MINIMUM LENGTH AND MEET REQUIREMENTS OF MIL-F-18240. X MIN IS EQUAL TO 5 THREAD PITCHES. X MAXIMUM EQUALS THE LENGTH OF COMPLETE THREAD BETWEEN Y AND Z.
- (d) Y MIN SHALL HAVE AT LEAST ONE PITCH OF COMPLETE THREAD. Y MAXIMUM EQUALS 2 PITCHES OF COMPLETE THREAD PLUS 2 PITCHES WHICH INCLUDES THE INCOMPLETE THREAD AND CHAMFER. THE LOCKING ELEMENT SHALL NOT BE EFFECTIVE WITHIN THE AREA OF Y MINIMUM.
- (e) Z EQUALS INCOMPLETE THREAD AND/OR EXTRUSION ANGLE PERMISSIBLE UP TO 2 THREAD PITCHES LENGTH MAXIMUM. THE ELEMENT OR ANY MACHINE HOLES OR GROOVES FOR THE ELEMENT SHALL NOT PENETRATE THIS AREA.
- (f) THREADS SHALL BE FULLY FORMED BY ANY SINGLE ROLLING PROCESS, AND IN ACCORDANCE WITH SPECIFICATION MIL-S-7742.
- (g) BASED ON 80,000 PSI ULTIMATE STRENGTH, AND STRESS AREA = $3.1416 \left(\frac{H}{2} - \frac{3H}{16} \right)^2$ (SEE HANDBOOK H28 1957) PART I.
- (h) INDENTATION IN HEAD MAY BE OMITTED AT MANUFACTURER'S OPTION.

INTERCHANGEABILITY RELATIONSHIP MS21099 SELF LOCKING EXTERNAL DRIVE BOLTS CAN UNIVERSALLY REPLACE MS21295 SELF LOCKING INTERNAL DRIVE BOLTS OF LIKE DASH NUMBERS, AND MS24673 NON SELF LOCKING INTERNAL DRIVE BOLTS OF LIKE THREAD SIZE AND LENGTH, IN APPLICATIONS NOT TO EXCEED 250°F THESE MS21295 INTERNAL DRIVE SELF LOCKING BOLTS ARE UNIVERSALLY INTERCHANGEABLE WITH MS21099 EXCEPT FOR TYPE OF DRIVE. BUT MS24673 INTERNAL DRIVE NON SELF LOCKING BOLTS CANNOT UNIVERSALLY REPLACE MS21099 EXTERNAL DRIVE SELF LOCKING BOLTS.

DIMENSIONS IN INCHES.
THIS STANDARD TAKES PRECEDENCE OVER DOCUMENTS REFERENCED HEREIN.
REFERENCED DOCUMENTS SHALL BE OF THE ISSUE IN EFFECT ON DATE OF INVITATION FOR BID

P.A. Navy - WP Other Cost USAF - 11	TITLE BOLT, SELF LOCKING, CORROSION RESISTING STEEL, 80 KSI FtU, 250° F, 12-POINT, EXTERNAL WRENCHING (EXTERNALLY WRENCHING CAP SCREWS)	MILITARY STANDARD MS21099(ASG)
PROCUREMENT SPECIFICATION PP-8-86 & MIL-P-18240	SUPERSEDES	SHEET 1 OF 2

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MATERIAL: STEEL, CORROSION-RESISTING, FEDERAL STANDARD NO. 66, STEEL NUMBERS 302, 303, 304, 305 AND 316, OR EQUAL TO OR INTERCHANGEABLE WITH THE 16:18 CHROMIUM NICKEL ALLOY STEEL DEVELOPED FOR COLD HEADING.

HARDNESS: RB80 MIN

TREATMENT: PASSIVATED (SEE PROCUREMENT SPECIFICATION).

SURFACE ROUGHNESS: THE SURFACE OF THE SHANK, FILLET AND BEARING AREA SHALL NOT EXCEED 125 IN ACCORDANCE WITH MIL-STD-10.

LOCKING ELEMENT: IN ACCORDANCE WITH SPECIFICATION MIL-F-18240, LOCKING ELEMENT AREA MUST PASS THRU A PLAIN RING GAGE, EQUAL TO THE MAXIMUM MAJOR THREAD DIAMETER + .010 INCH, FREELY OR WITH FINGER PRESSURE.

MAGNETIC PERMEABILITY: THESE SCREWS SHALL HAVE A MAGNETIC PERMEABILITY OF 2.0 MAX (AIR = 1.0) FOR A FIELD OF H=200 ORSTEDS USING A MAGNETIC INDICATOR PER MIL-I-17214.

DESIGN AND USAGE LIMITATIONS: SEE MS15981.

EXAMPLE OF PART NUMBER: MS21099 - 56 - 1/4-28 BOLT, SELF LOCKING, CORROSION RESISTING STEEL, 1 INCH LONG.

NOMINAL SIZE		1/4 - 28 UNF - 3A	5/16 - 24 UNF - 3A	3/8 - 24 UNF - 3A	7/16 - 20 UNF - 3A	1/2 - 20 UNF - 3A	5/8 - 18 UNF - 3A
L: LENGTH TOLERANCE		DASH NO	DASH NO	DASH NO	DASH NO	DASH NO	DASH NO
.375	±.016	17	18				
.437		23	24	25			
.500		30	31	32			
.625		37	38	39			
.750		44	45	46			
.875		50	51	52			
1.000	(a)	56	57	58	59	60	61
1.250		64	65	66	67	68	69
1.500		72	73	74	75	76	77
1.750		79	80	81	82	83	84
2.000		86	87	88	89	90	91
2.250		92	93	94		95	102
2.500	±.031		96	97		98	99
3.000				100		101	103

(a) MINIMUM THREAD LENGTH: BOLTS ABOVE HEAVY LINE SHALL HAVE COMPLETE (FULL FORM) THREADS EXTENDING TO WITHIN TWO THREADS OF THE HEAD.

APPROVED 24 Mar 65 REVISED

This standard has been approved by the Bureau (Department of the Navy) and the Department of the USAF and is mandatory for use by that activity. All other military activities are required to employ this standard where suitable.

P.A. Navy - Wepe Other Cust USAF - 11	TITLE BOLT, SELF LOCKING, CORROSION RESISTING STEEL, 80 KSI Ftu, 250° F, 12-POINT, EXTERNAL WRENCHING	MILITARY STANDARD MS21099(ASG)
PROCUREMENT SPECIFICATION FF-S-86 AND MIL-F-18240	SUPERSEDES	SHEET 2 OF