

### GENERAL INSTRUCTIONS

**DESCRIPTION:** HELICAL COIL INSERTS ARE SCREW  
THREADED BUSHINGS COILED FROM DIAMOND-SHAPED  
CROSS-SECTION WIRE. THEY ARE SCREWED INTO  
TAPPED HOLES TO FORM NOMINAL SIZE INTERNAL  
THREADS. INSERTS ARE INSTALLED BY TORQUING  
THROUGH A DIAMETRAL TANG WHICH IS NOTCHED  
FOR TANG REMOVAL.

THREADS: ASSEMBLED INSERT, CLASSES 28 AND 30 ARE CONTROLLED BY TOLERANCE RANGE OF TAPPED HOLE INTO WHICH INSERT IS FITTED. THEREFORE, THE SAME INSERT IS USED FOR THREAD CLASSES 28 AND 30. THE GRIP COIL OR COILS OF THE SCREW LOCKING INSERT ARE SHAPED TO PROVIDE PREVAILING TORQUE.

**TAPPED HOLE: 60° AMERICAN NATIONAL OR UNIFORM FORM; TAPS AND GAGES STANDARD WITH MANUFACTURER.**

MINIMUM LENGTH OF INSERT: MINORAL INSERT  
LENGTHS ARE EQUAL TO 1, 1-1/2 AND 2 TIMES  
THE MINORAL MAJOR DIAMETER OF THE SCREW.  
FOR THREAD FOR FREE RUNNING INSERTS AND 1-1/2  
AND 2 TIMES THE MINORAL MAJOR DIAMETER OF  
THE SCREW, THREAD FOR SCREW LOCKING DEVICES.  
FOR AVAILABLE MINORAL LENGTHS OF SPECIFIC  
INSERTS, SEE STANDARD M2-2109 (INSERTS,  
SCREW THREAD, COARSE AND FINE, SCREW LOCK,  
HELICAL COIL) AND M2-2106 (INSERTS, SCREW  
THREAD, COARSE AND FINE, FREE RUNNING,  
HELICAL COIL).

LENGTH OF ASSEMBLED INSERT: THE MINIMUM LENGTH, L, OF ASSEMBLED INSERT IS EQUAL TO THE NOMINAL LENGTH MINUS 3/4 PITCH. MAXIMUM LENGTH OF ASSEMBLED INSERT IS EQUAL TO MINIMUM LENGTH, L, PLUS 1/4 PITCH.

DEPTH OF RECOMMENDED MINIMUM TAP DRILLED  
HOLE: FOR BLIND HOLES WITH A COUNTERSINK,  
AS SPECIFIED IN THE TABULATION, THE  
MINIMUM TAP DRILL DEPTH, F, SIGNALS THE  
MINIMUM LENGTH OF ASSEMBLED INSERT PLUS  
6 PITCHES WHEN STANDARD PICO TAPS ARE  
USED. FOR BLIND HOLES WITHOUT COUNTER-  
SINK THE MINIMUM TAP DRILL DEPTH FOR  
STANDARD PICO TAPS IS EQUAL TO MINIMUM  
LENGTH OF ASSEMBLED INSERT PLUS 5  
PITCHES. WHEN DESIGN WILL NOT PERMIT  
THE ABOVE TAP DRILL DEPTHS FOR STANDARD  
PICO TAPS, BOTTOMING TAPS MAY BE USED WHICH  
WILL ALLOW THE TAP DRILL DEPTH TO BE DE-  
CREASED UP TO 3 PITCHES. IF TAP DRILL DEPTH  
IS DECREASED BY THE MINIMUM OF 3 PITCHES,  
NO TAP END CLEARANCE IS PROVIDED.

DEPTH OF FULL THREADS OF TAPPED HOLE: FOR THRU OR BLIND TAPPED HOLES WITH A COUNTERSINK, AS SPECIFIED IN THE TABULATION, THE MINIMUM FULL THREAD  $L$  (ALSO MINIMUM FLANGE THICKNESS FOR THRU HOLES), EQUALS MINIMUM ASSEMBLED LENGTH OF INSERT,  $L$ , AS SPECIFIED IN THE TABULATION PLUS  $1/4$ - $1/8$  PITCH. FOR THRU OR BLIND TAPPED HOLES WITHOUT COUNTERSINK, THE MINIMUM FULL THREAD (ALSO MINIMUM FLANGE THICKNESS FOR THRU HOLES) SHALL NOT BE LESS THAN THE MINIMUM LENGTH OF INSERT,  $L$ , PLUS  $1/8$  PITCH.

**LAMINATE OF SOIL PROTECTION (WITH COUNTER-SINK HOLE):** THE MINIMUM LENGTH OF SOIL BREAK PROTECTION,  $P$ , AS SPECIFIED IN THE TABULATION, IS THE MINIMUM LENGTH OF PROTECTION, IS BASED ON THE MINIMUM LENGTH OF FIBER BUNDLING (CLASS 1) INSERT PLUS 1/4" FIBER. WHEN TAP IS REMOVED, THE SPECIFIED VALUES FOR  $P$  MAY BE INCREASED TO EQUAL THE MINIMUM DESIGN BORE OF THE TAP DRILL HOLE,  $P$ .  $I$  DIMENSIONS ARE NOT APPLICABLE TO SCREW-LOCK INSERTS FOR THE SIZES LISTED BELOW. FOR THESE SIZES, TAPD SHOULD BE REMOVED TO PREVENT ENGAGEMENT OF SCREW WITH GRAY COIL IN ACCORDANCE WITH REQUIREMENTS OF  $I$ .

1-1/2 DIAMETER LONG UNC 4-40 THRU 7/16-24  
2 DIAMETER LONG UNC 4-40 THRU 1/4-20  
1-1/2 DIAMETER LONG UNF 10-32 THRU 5/16-24  
2 DIAMETER LONG UNF 10-32 AND SMALLER.

**MINIMUM FULL THREAD PROJECTION: DIMENSION W IS MINIMUM DISTANCE THAT FIRST FULL THREAD OF BOLT MUST PROJECT BELOW WORK SURFACE TO INSURE A LOCKING EFFECT FOR SCREW-LOCKING INSERTS (LOCATED 1-1/2" P. MAX. BELOW SURFACE OF WORK).**

LENGTH OF BOLT PROJECTION (WITHOUT COUNTER-SUNK HOLES): FOR TAPPED HOLES, WITHOUT COUNTERSINK AND HAVING INSERTS INSTALLED AT A MINIMUM OF 1/4 PITCH BELOW THE BOSS SURFACE, THE SPECIFIED VALUES FOR K SHOULD BE DECREASED 1/4 PITCH WHEN TAP IS NOT PROVIDED.

COUNTERSINK AND COUNTERBORE: THE VALUES GIVEN IN THE TABULATION FOR DEPTH OF HOLE, P; NOMINAL FULL THREAD, N; AND LENGTH OF BOLT PROJECTION, E, ARE MEASURED FROM THE SURFACE OF THE BOSS OR FLANGE AND ARE BASED ON THE COUNTERSINK ANGLE TO N DIAMETER SHOWN. IF A COUNTERBORE OR COUNTERSINK OTHER THAN THAT SHOWN IS REQUIRED, THE VALUES FOR P, N AND E MUST BE MODIFIED.

**INSTALLATION OF DESERT (WITH COUNTERSUNK HOLE): THE TOP EDGE OF THE DESERT SHALL BE INSTALLED 3/4 PITCH TO 1-1/2 PITCHES BELOW TOP SURFACE OF TAPPED HOLE.**

**BLIND HOLE ASSEMBLY (WITHOUT REMOVAL OF TANG):** TO OBTAIN DESIGN BOLT-INSERT THREAD ENGAGEMENT EQUIVALENT TO A NOMINAL INSERT LENGTH WITHOUT REMOVING THE INSERT TANG, AN INSERT 1/2 DIAMETER GREATER IN NOMINAL LENGTH SHALL BE USED.

**PERMITTED MODIFICATIONS:** VALUES FOR F, N, K, R, AND INSTALLATION DEPTH OF INSERT MAY BE MODIFIED TO SUIT REQUIREMENTS FOR PRODUCTION TOOLING, DESIGN, ETC.

**INSTALLATION OF INSERT (WITHOUT COUNTER-SUNK HOLES):** FOR ALUMINUM FLANGE THICKNESS (EQUAL TO NOMINAL INSERT LENGTH), THE TOP EDGE OF THE INSERT SHALL BE INSTALLED 1/4 PITCH TO 1/2 PITCH BELOW TOP SURFACE OF TAPPED HOLE.

This military standard is approved by the Department of Defense and is mandatory on all activities. Selection for all new engineering and design specifications and for repetitive use shall be made from this document.

[illegible]

Ⓐ CANCELED AFTER 11 JANUARY 1971. USE MS33537.

THIS IS A DESIGN STANDARD. NOT TO BE USED AS A PART NUMBER. (A) FOR CHANGES SEE SHEET 1.

P.A. USAF - AFSC Other Cost Army - CR Navy - Wap	TITLE DESERT, SCREW THREADS, HELICAL COIL, ASSEMBLY AND HOLE, DIMENSIONS FOR	MILITARY STANDARD MS33646
PROCUREMENT SPECIFICATION	SUPERSEDES:	SHEET 1 OF 5

DD FORM 672-1 (Coordinated)

**FORWARD ORDERING OF THIS JOURNAL ARE ENCOURAGED**

APPROVED 17 JUL 61 REVISED (A) 11 JAN 71

NOTE:—When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government hereby assumes no responsibility, and the fact that the Government may have furnished, furnished, or is in any way supplying the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any way endorsing the product or any other product in connection, or conveying any right or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

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		FED. SUP CLASS 5340									
NOMINAL SIZE		.112	.138	.164	.190	.250	.3125				
THREADS PER INCH		60	32	32	24 (a)	32	20 (a)	28	18 (a)	24	
ASSEMBLED INSERT	PD, MAX, CLASS 2B	.0991	.1214	.1475	.1672	.1736	.2223	.2311	.2817	.2902	
	PD, MAX, CLASS 3B	.0982	.1204	.1465	.1661	.1726	.2211	.2300	.2803	.2890	
	PD, MIN, ALL CLASSES	.0958	.1177	.1437	.1629	.1697	.2175	.2266	.2764	.2854	
	MINOR DIA, MAX, CLASS 2B	.0939	.1160	.139	.156	.164	.207	.220	.265	.277	
	MINOR DIA, MAX, CLASS 3B	.0939	.1160	.1389	.1555	.1641	.2067	.2190	.2630	.2754	
	MINOR DIA, MIN, ALL CLASSES	.0849	.1060	.1300	.1450	.1560	.1960	.2110	.2520	.2670	
	L MIN LENGTH OF INSERT WHEN NOMINAL LENGTH = 1 DIA	.093	.115	.141	.159	.167	.212	.223	.271	.281	
	NOMINAL LENGTH = 1-1/2 DIA	.149	.184	.223	.254	.262	.336	.348	.427	.438	
	NOMINAL LENGTH = 2 DIA	.205	.253	.305	.349	.357	.462	.473	.583	.594	
	F DEPTH OF BLIND HOLE, MIN WHEN NOMINAL LENGTH = 1 DIA	.250	.310	.336	.419	.362	.525	.446	.617	.541	
TAPPED HOLE	NOMINAL LENGTH = 1-1/2 DIA	.306	.379	.418	.514	.457	.650	.571	.773	.697	
	NOMINAL LENGTH = 2 DIA	.362	.448	.500	.609	.552	.775	.696	.930	.854	
	H MIN FULL THREAD WHEN NOMINAL LENGTH = 1 DIA	.110	.170	.200	.230	.230	.300	.290	.370	.380	
	NOMINAL LENGTH = 1-1/2 DIA	.190	.260	.280	.330	.330	.430	.410	.530	.510	
	NOMINAL LENGTH = 2 DIA	.250	.310	.360	.420	.410	.550	.540	.680	.670	
	PD, MAX FOR CLASS 2B INSERTS	.1306	.1611	.1872	.2203	.2133	.2863	.2765	.3529	.3433	
	CLASS 3B INSERTS	.1299	.1601	.1862	.2192	.2123	.2851	.2754	.3515	.3421	
	PD, MIN, ALL CLASSES	.1283	.1583	.1843	.2170	.2103	.2825	.2732	.3484	.3395	
	MINOR DIA, MAX, ALL CLASSES	.121	.150	.176	.205	.202	.267	.264	.334	.330	
	MINOR DIA, MIN, ALL CLASSES	.116	.144	.170	.199	.196	.261	.257	.328	.323	
	MINOR DIA, MIN, ALL CLASSES	.1404	.1733	.1993	.2370	.2253	.3062	.2904	.3751	.3595	
	K MAX LENGTH OF BOLT PROJECTION IF TANG IS NOT REMOVED, WHEN INSERT NOMINAL LENGTH = 1 DIA	.100	.122	.149	.169	.175	.225	.232	.285	.291	
	NOMINAL LENGTH = 1-1/2 DIA	.156	.191	.231	.264	.270	.351	.357	.441	.448	
	NOMINAL LENGTH = 2 DIA	.212	.260	.313	.359	.365	.475	.482	.597	.604	
	H COUNTERBORE DIAMETER MAXIMUM	.180	.210	.240	.280	.260	.340	.330	.410	.400	
	MINIMUM	.140	.170	.200	.240	.220	.300	.290	.370	.360	
	H MIN LENGTH OF BOLT FIRST FULL THREAD PROJECTION FOR THE SCREW LOCKING INSERT ASSEMBLY, WHEN INSERT NOMINAL LENGTH = 1-1/2 DIA	.16	.19	.21	.26	.23	.33	.29	.40	.38	
	NOMINAL LENGTH = 2 DIA	.19	.23	.26	.31	.28	.40	.36	.48	.46	
(a) NOT RECOMMENDED FOR NEW DESIGN. SEE MIL-S-7742 FOR RECOMMENDED SERIES.											
THIS IS A DESIGN STANDARD. NOT TO BE USED AS A PART NUMBER.											
P.A. USAF - AFSC		TITLE					MILITARY STANDARD				
Other Code		INSERT, SCREW THREADS, HELICAL COIL, ASSEMBLY AND HOLE, DIMENSIONS FOR					MS33646				
Army - CS Navy - Nop											
PROCUREMENT SPECIFICATION		SUPERSEDES					SHEET 2				

DD FORM 672-1 (Coordinated)

PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE.

APPROVED 17 JUL 61 REVISED A FOR CHANGES SEE SHEET 1.

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		FED. SUP CLASS 5360							
NOMINAL SIZE		.375		.4375		.500		.5625	
THREAD PER INCH		16 (a)	24	18 (a)	20	13 (a)	20	12 (a)	18
ASSUMED INSERT	PD, MAX, CLASS 2B	.3401	.3528	.3972	.4104	.4565	.4731	.5152	.5323
	PD, MAX, CLASS 3B	.3387	.3514	.3957	.4091	.4548	.4717	.5135	.5308
	PD, MIN, ALL CLASSES	.3344	.3479	.3911	.4050	.4500	.4675	.5084	.5264
	MINOR DIA, MAX, CLASS 2B	.321	.340	.376	.395	.434	.457	.490	.515
	MINOR DIA, MAX, CLASS 3B	.3182	.3372	.3717	.3916	.4294	.4537	.4843	.5106
	MINOR DIA, MIN, ALL CLASSES	.3070	.3300	.3600	.3830	.4170	.4460	.4720	.5020
	L MIN LENGTH OF INSERT WHEN NOMINAL LENGTH = 1 DIA	.328	.344	.384	.400	.442	.462	.500	.521
	NOMINAL LENGTH = 1-1/2 DIA	.516	.531	.603	.619	.692	.712	.781	.808
	NOMINAL LENGTH = 2 DIA	.753	.779	.821	.838	.942	.962	1.062	1.083
	TAPPED HOLE	F DEPTH OF BLIND HOLE, MIN WHEN NOMINAL LENGTH = 1 DIA	.719	.604	.830	.712	.924	.775	1.021
NOMINAL LENGTH = 1-1/2 DIA		.906	.791	1.049	.931	1.174	1.025	1.302	1.148
NOMINAL LENGTH = 2 DIA		1.093	.979	1.267	1.150	1.424	1.275	1.583	1.430
H MIN FULL THREAD WHEN NOMINAL LENGTH = 1 DIA		.640	.420	.510	.490	.580	.550	.650	.680
NOMINAL LENGTH = 1-1/2 DIA		.630	.600	.730	.710	.830	.800	.930	.900
NOMINAL LENGTH = 2 DIA		.810	.790	.950	.930	1.080	1.050	1.210	1.180
PD, MAX, FOR CLASS 2B INSERTS		.4203	.4059	.4890	.4744	.5554	.5371	.6225	.6035
CLASS 3B INSERTS		.4189	.4047	.4875	.4731	.5537	.5357	.6208	.6020
PD, MIN, ALL CLASSES		.4156	.4020	.4839	.4700	.5499	.5325	.6167	.5986
MINOR DIA, MAX, ALL CLASSES		.398	.392	.463	.458	.525	.522	.588	.586
MINOR DIA, MIN, ALL CLASSES	.390	.385	.453	.450	.515	.513	.578	.577	
MAJOR DIA, MIN, ALL CLASSES	.4454	.4220	.5179	.4937	.5865	.5562	.6562	.6251	
K MAX LENGTH OF BOLT PROJECTION IF TAP IS NOT REMOVED, WHEN INSERT	NOMINAL LENGTH = 1 DIA	.344	.354	.402	.413	.461	.475	.521	.535
	NOMINAL LENGTH = 1-1/2 DIA	.532	.543	.621	.632	.711	.725	.802	.816
	NOMINAL LENGTH = 2 DIA	.719	.729	.840	.851	.942	.975	1.083	1.097
	N	COUNTERSINK DIAMETER MAXIMUM MINIMUM	.680 .640	.660 .620	.560 .520	.530 .490	.620 .580	.590 .550	.690 .650
H MIN LENGTH OF BOLT FIRST FULL THREAD PROJECTION FOR THE SCREW LOCKING INSERT ASSEMBLY, WHEN	NOMINAL LENGTH = 1-1/2 DIA	.66	.62	.54	.50	.60	.55	.67	.61
	NOMINAL LENGTH = 2 DIA	.56	.52	.45	.41	.53	.47	.58	.51
(a) NOT RECOMMENDED FOR NEW DESIGN, SEE MIL-8-7742 FOR RECOMMENDED SERIES.									
THIS IS A DESIGN STANDARD. NOT TO BE USED AS A PART NUMBER.									
P.A. USAF - AFSC Other Code Army - CE Navy - aop		TITLE INSERT, SCREW THREADS, HELICAL COIL, ASSEMBLY AND HOLE, DIMENSIONS FOR				MILITARY STANDARD MS33646			
PROCUREMENT SPECIFICATION		SUPERSEDES				SHEET 3			

DD FORM 672-1 (Continued)

PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE.

APPROVED 17 JUL 61 REVISED 1 FOR CHANGES SEE SHEET 1



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FED. SUP CLASS 5140									
NOMINAL SIZE		1.125		1.250		1.375		1.500	
THREADS PER INCH		7 (a)	12	7 (a)	12	6 (a)	12	6 (a)	12
ASSEMBLED INSERT	FD, MAX, CLASS 2B	1.0616	1.0787	1.1668	1.2039	1.2771	1.3291	1.4022	1.4542
	FD, MAX, CLASS 3B	1.0393	1.0768	1.1644	1.2019	1.2745	1.3270	1.3996	1.4522
	FD, MIN, ALL CLASSES	1.0322	1.0709	1.1572	1.1959	1.2667	1.3209	1.3917	1.4459
	MINOR DIA, MAX, CLASS 2B	.998	1.053	1.123	1.172	1.225	1.303	1.350	1.428
	MINOR DIA, MAX, CLASS 3B	.9875	1.0443	1.1125	1.1696	1.2146	1.2948	1.3396	1.4198
	MINOR DIA, MIN, ALL CLASSES	.9703	1.0350	1.0950	1.1600	1.1950	1.2850	1.3200	1.4100
	MIN LENGTH OF INSERT WHEN								
	NOMINAL LENGTH = 1 DIA	1.018	1.062	1.143	1.188	1.250	1.312	1.375	1.438
	NOMINAL LENGTH = 1-1/2 DIA	1.580	1.625	1.768	1.812	1.938	2.000	2.125	2.188
	NOMINAL LENGTH = 2 DIA	2.143	2.188	2.393	2.438	2.625	2.688	2.875	2.938
TAPPED HOLE	DEPTH OF BLIND HOLE, MIN WHEN								
	NOMINAL LENGTH = 1 DIA	1.911	1.583	2.036	1.708	2.292	1.833	2.417	1.958
	NOMINAL LENGTH = 1-1/2 DIA	2.473	2.146	2.661	2.333	2.979	2.521	3.167	2.708
	NOMINAL LENGTH = 2 DIA	3.036	2.708	3.286	2.958	3.667	3.208	3.917	3.458
	MIN FULL THREAD WHEN								
	NOMINAL LENGTH = 1 DIA	1.270	1.210	1.390	1.330	1.540	1.460	1.670	1.580
	NOMINAL LENGTH = 1-1/2 DIA	1.830	1.770	2.020	1.960	2.230	2.150	2.420	2.330
	NOMINAL LENGTH = 2 DIA	2.390	2.330	2.640	2.580	2.920	2.830	3.170	3.080
	FD, MAX FOR CLASS 2B INSERTS	1.2262	1.1860	1.3524	1.3112	1.4926	1.4364	1.6177	1.5615
	CLASS 3B INSERTS	1.2239	1.1841	1.3490	1.3092	1.4900	1.4343	1.6151	1.5595
FD, MIN, ALL CLASSES	1.2178	1.1792	1.3428	1.3042	1.4832	1.4292	1.6082	1.5542	
MINOR DIA, MAX, ALL CLASSES	1.186	1.159	1.311	1.284	1.436	1.409	1.571	1.534	
MINOR DIA, MIN, ALL CLASSES	1.171	1.140	1.296	1.265	1.421	1.390	1.546	1.515	
MAJOR DIA, MIN, ALL CLASSES	1.2850	1.2187	1.4100	1.3437	1.5620	1.4687	1.6870	1.5937	
K	MAX LENGTH OF BOLT PROJECTION IF TANG IS NOT REMOVED, WHEN INSERT								
	NOMINAL LENGTH = 1 DIA	1.054	1.083	1.179	1.208	1.292	1.333	1.417	1.458
	NOMINAL LENGTH = 1-1/2 DIA	1.616	1.646	1.804	1.833	1.979	2.021	2.167	2.208
	NOMINAL LENGTH = 2 DIA	2.179	2.208	2.429	2.458	2.667	2.708	2.917	2.958
R	COUNTERSINK DIAMETER								
	MAXIMUM	1.320	1.260	1.450	1.380	1.600	1.510	1.730	1.630
	MINIMUM	1.280	1.220	1.410	1.340	1.540	1.470	1.690	1.590
N	MIN LENGTH OF BOLT FIRST FULL THREAD PROJECTION FOR THE SCREW LOCKING INSERT ASSEMBLY, WHEN INSERT								
	NOMINAL LENGTH = 1-1/2 DIA								
	NOMINAL LENGTH = 2 DIA								
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P.A. USAF - AFSC		TITLE				MILITARY STANDARD			
Other Cost		INSERTS, SCREW THREADS, HELICAL COIL, ASSEMBLY AND HOLES, DIMENSIONS FOR				MS33646			
Army - CE									
Navy - 60									
PROCUREMENT SPECIFICATION		SUPERSEDES				SHEET 5			

APPROVED 17 JUL 61 REVISED (A) FOR CHARGES SEE SHEET 1.