

TABLE OF CONTENTS

FED. SUPPLY CLASS

5340

1.	DESCRIPTION	2
2.	MATERIAL	2
3.	THREADS.....	2
4.	TAPPED HOLE.....	2
5.	REDUCED FIRST COIL	3
6.	DIMENSIONAL DATA	3
7.	DEPTH OF RECOMMENDED MINIMUM TAP DRILL HOLE	3
8.	DEPTH OF FULL THREAD OF TAPPED HOLE.....	3
9.	LENGTH OF BOLT THREAD PROJECTION.....	4
10.	COUNTERSINK AND COUNTERBORE	4
11.	INSTALLATION OF INSERT	4
12.	BLIND HOLE ASSEMBLY (WITHOUT REMOVAL OF TANG).....	4
13.	GAGING PRACTICE.....	4
14.	PERMITTED MODIFICATIONS	5

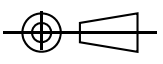
FIGURE

③	FIGURE 1 – INSERT INSTALLATION	6
---	--------------------------------------	---

TABLES

TABLE I – PART NUMBERS.....	5
TABLE II – LENGTHS OF THREAD ENGAGEMENT IN TERMS OF NOMINAL THREAD SIZE	7
TABLE III – FORMULAS FOR DIMENSIONS.....	7
TABLE IV – DIMENSIONS	8

THE INITIAL RELEASE OF THIS DOCUMENT SUPERSEDES MS33537, REVISION E, AMENDMENT 1. ③

THIRD ANGLE PROJECTION		CUSTODIAN NATIONAL AEROSPACE STANDARDS COMMITTEE	REVISION 3
PROCUREMENT SPECIFICATION NONE		TITLE INSERT, SCREW THREAD, HELICAL COIL, INCH SERIES, COARSE AND FINE THREAD, STANDARD ASSEMBLY DIMENSIONS FOR	CLASSIFICATION DESIGN STANDARD
			MS33537 SHEET 1 OF 14

GENERAL INSTRUCTIONS

1. DESCRIPTION

Helical coil inserts are screw thread 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.

2. MATERIAL

As specified on the drawing.

3. THREADS

Assembled inserts, Classes 2B and 3B, are controlled by the tolerance range of the tapped hole into which insert is fitted. Due to the radius on the crest of the insert at the minor diameter, the assembled insert will accept external threaded parts which are threaded to AS8879. The grip coil or coils of the screw locking insert are shaped to provide a prevailing torque when the screw is installed in the assembled insert.

4. TAPPED HOLE

60° Unified Internal thread form with the minimum major diameter based on a truncation to 0.125p.

4.1 Designation for tapped hole

The drawing note for the tapped hole, per table IV, that will accept the helical coil insert shall be in accordance with the following examples:

EXAMPLE 1

.3125-24 UNF-3B HELICAL COIL
INSERT THD PER NASM33537
.67 MIN FULL THD DEPTH

For Blind Hole (Based on 2 Diameter
Engagement) (Minor Diameter Drill Depth
Tolerance approx. .060 or as otherwise
appropriate)

.3125-24 UNF-3B HELICAL COIL
INSERT THD THRU PER NASM33537 INSTALL
INSERT .75-1.5 TURNS BELOW SURFACE
REMOVE TANG – (NOT REQUIRED WITH
TANGLESS INSERTS)

For thru hole with Insert being Assembled
(Based on 2 Diameter Engagement)

EXAMPLE 2

MINOR DIA .3215-.3288 x .791-.851 DEEP
.36-.39 DIA x 115°-125° CSK
THD PER NASM33537 FOR
.3125-24 UNF-3B HELICAL COIL INSERT
.67 MIN FULL THD DEPTH
PITCH DIA .3395-.3421
MAJOR DIA .3666 MIN

MINOR DIA .3215-.3288 THRU
.36-.39 DIA x 115°-125° CSK
THD THRU PER NASM33537 FOR
.3125-24 UNF-3B HELICAL COIL INSERT
PITCH DIA .3395-.3421
MAJOR DIA .3666 MIN
INSTALL INSERT .75-1.5 TURNS
BELOW SURFACE
REMOVE TANG - (NOT REQUIRED WITH
TANGLESS INSERTS)

REVISION

3

NASM33537

SHEET 2



Document Sharing Hub

5. REDUCED FIRST COIL

The first coil of the free insert adjacent to the tang has been reduced in diameter on the larger inserts to facilitate starting the insert into the tapped hole.

6. DIMENSIONAL DATA

- 6.1 For free running and screw locking inserts having a nominal length of 1, 1.5, 2, 2.5, and 3 times the nominal major diameter of the screw thread, dimensional data for the following features have been calculated and are listed in Table IV:

Nominal length (L_n)
Length of assembled insert (L)
Tapped hole diameters (V , V_1 , V_2)
Depth of drilling and tapping (FP , FB , and H)
Countersink diameters (M)
Required bolt thread projection (J and K)

For all other nonstandard variations in nominal length, the above dimensions shall be calculated from the formulas given in Table III, using rounding procedures contained in ASTM SI 10.

- 6.2 See Table I for MS part numbers and nominal lengths of available inserts.

6.3 INSERT LENGTH SELECTION:

For applications where the tensile strength of the installed insert is a consideration, Table II will aid in applying the standard design practice of relating the tensile strength of the bolt material against the shear strength of the parent or boss material to develop the full load value of the bolt rather than stripping the parent or tapped material. In using this table, the following factors must be considered.

- 6.3.1 Actual bolt tensile strength, particularly in the lower bolt tensile ranges, may be significantly higher than the nominal values. This should be considered in insert length selection.
- 6.3.2 The parent material shear strengths are for room temperature. Elevated temperatures significantly reduce shear strength values; compensation should be made when required.
- 6.3.3 When parent material shear strength falls between two tabulated values, use the lower of the two.

7. DEPTH OF RECOMMENDED MINIMUM TAP DRILL HOLE

The tabulated depth of blind hole for thread tapping allows sufficient depth for assembled insert top coil to be 1.5 pitches below boss surface. For insert sizes .3125 and smaller, drill depth FP provides for minimum full thread depth H , using a plug tap having 4 pitches tap chamfer, plus a length equal to $0.5 \times$ nominal insert size to clear the tap external center (conical end), plus 1 pitch tap end clearance. For insert sizes larger than .3125, drill depth FP is for plug tap having 4 pitches tap chamfer, plus 1 pitch tap end clearance. Drill depth FB is for bottoming taps having 2 pitches tap chamfer, plus 1 pitch tap end clearance. If tap drill holes are not countersunk, the assembled insert top coil may be 0.5 pitch max below boss surface which allows for a 1 pitch reduction in tabulated depth of blind drilled hole dimensions.

8. DEPTH OF FULL THREAD OF TAPPED HOLE

For thru or blind tapped holes with a countersink as specified in Table IV, the Minimum Full Thread, H (also minimum flange thickness for thru hole), equals nominal length of insert, L_n , as specified in the tabulation, plus 1 pitch. For thru or blind tapped holes without countersink, the minimum full thread (also minimum flange thickness for thru hole) shall not be less than the nominal length of insert, L_n .

REVISION

3

NAS 33537

SHEET 3



Document Sharing Hub

9. LENGTH OF BOLT THREAD PROJECTION

9.1 INSERT WITH TANG REMOVED

The maximum length of bolt thread projection, J , into the assembled insert in a blind hole is equal to the minimum design depth of the tap drill hole, FP or FB . The minimum length of bolt thread projection to provide full thread engagement and thus to ensure full development of potential joint tensile strength is J_{min} . It is equal to the maximum length, L , of the insert, plus 3 pitch (the maximum depth of the assembled insert top coil from boss surface, 1.5 pitch, plus bolt chamfer 1.5 pitch). Bolt projection, J_{min} , will also ensure full engagement with the grip coil or coils of a screw locking insert.

9.2 INSERT WITHOUT TANG REMOVED

The maximum length of bolt thread projection, K , into the assembled insert when tang is not removed is the minimum length of insert plus 0.25 pitch.

10. COUNTERSINK AND COUNTERBORE

The values given in Table IV for Depth of Hole, FP , FB , Minimum Full Thread H , and Length of Bolt Projection, J and K , are measured from the top surface of the boss or piece and are based on installing the insert below the countersink as in 11.1. If a counterbore or countersink other than that shown is required or no countersink is used, the values for FP , FB , H , J , and K must be modified to compensate.

11. INSTALLATION OF INSERT

11.1 WITH COUNTERSUNK HOLE

The top edge of the insert shall be installed 0.75p to 1.5p below top surface of the tapped hole.

11.2 WITHOUT COUNTERSUNK HOLE

The top edge of the insert shall be installed 0.25p to 0.5p below top surface of tapped hole.

11.3 TANG REMOVAL

The tang should be removed from the insert after installation.

12. BLIND HOLE ASSEMBLY (WITHOUT REMOVAL OF TANG)

When the insert tang is not removed, as may be the case with blind hole applications, an insert 0.5 diameter longer than the required nominal length will fulfill the necessary bolt-insert full thread engagement, provided that the bolt projection satisfies the original J_{min} and the longer insert K_{max} tabulated values.

13. GAGING PRACTICE

Accuracy of the finished thread, when the insert is installed, is dependent upon the accuracy of the tapped hole. If the finished tapped hole gages satisfactorily, the installed insert will be within the thread tolerance when the insert meets the drawing requirements. It is, therefore, not necessary to gage the installed insert. After the insert is installed, the GO thread plug gage may not enter freely because the insert may not have been fully seated in the tapped hole; however, the insert should become seated after a bolt or screw is installed and tightened.

REVISION

3

NAS 33537

SHEET 4



Document Sharing Hub

14. PERMITTED MODIFICATIONS

Values for FP, FB, H, J, K, M, and installation depth of insert may be modified to suit requirements for production tooling, design, assembly, etc. See Table III for formulas. Countersink included angle may be modified from $120^\circ \pm 5^\circ$ to 90° provided that for UNC sizes .190-24 and smaller and UNF sizes .4375-20 and smaller, the top edge of the insert shall be installed 1.0 to 1.5p below top surface of the tapped hole.

TABLE I – PART NUMBERS

INSERT NOMINAL LENGTH	FREE RUNNING INSERTS		SCREW LOCKING INSERTS	
	CRES AS7245		CRES NASM8846	
	COARSE	FINE	COARSE	FINE
1 DIA	MS122076 thru MS122115 per NASM122076 thru NASM122115	MS124651 thru MS124690 per NASM124651 thru NASM124690	MS21209C0210 thru MS21209C2410 per NASM21209 /1/	MS21209F0310 thru MS21209F2410 per NASM21209 /1/
1.5 DIA	MS122116 thru MS122155 per NASM122116 thru NASM122155	MS124691 thru MS124730 per NASM124691 thru NASM124730	MS21209C0215 thru MS21209C2415 per NASM21209 /1/	MS21209F0315 thru MS21209F2415 per NASM21209 /1/
2 DIA	MS122156 thru MS122195 per NASM122156 thru NASM122195	MS124731 thru MS124770 per NASM124731 thru NASM124770	MS21209C0220 thru MS21209C2420 per NASM21209 /1/	MS21209F0320 thru MS21209F2420 per NASM21209 /1/
2.5 DIA	MS122196 thru MS122235 per NASM122196 thru NASM122235	MS124771 thru MS124810 per NASM124771 thru NASM124810	MS21209C0225 thru MS21209C2425 per NASM21209 /1/	MS21209F0325 thru MS21209F2425 per NASM21209 /1/
3 DIA	MS122236 thru MS122275 per NASM122236 thru NASM122275	MS124811 thru MS124850 per NASM124811 thru NASM124850	MS21209C0230 thru MS21209C2430 per NASM21209 /1/	MS21209F0330 thru MS21209F2430 per NASM21209 /1/

/1/ NASM21209 offers Cadmium Plating and Dry Film Lubricant Coating options.

③ COMPLETELY REVISED

REVISION

3

NASM33537

SHEET 5



Document Sharing Hub