SAE Aerospace
An SAE International Group

AEROSPACE STANDARD

SAE MA1565

REV. A

Issued 1981-08
Revised 1996-03
Reaffirmed 2006-05

Inserts, Screw Thread, Helical Coil Metric Series Procurement Specification For FSC5340

RATIONALE

This document has been reaffirmed to comply with the SAE 5-year Review policy.

1. SCOPE:

1.1 Scope:

This SAE Metric Aerospace Standard defines the requirements for corrosion resistant steel helical coil metric series screw thread inserts made from formed wire, the inner surfaces of which, after assembly, provide internal threads of the diameter and pitch specified on the drawing.

1.2 Classification:

Inserts shall be of the following types:

a. MA1565-1: Free Running
b. MA1565-2: Screw Locking (Self-Locking)

2. APPLICABLE DOCUMENTS:

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

AS1310	Fastener Torque for Threaded Applications, Definitions of
MA1370	Screw Threads, MJ Profile, Metric Series
MA1567	Insert, Screw Thread, Helical Coil Metric Series, Standard Assembly Dimensions for
AMS 2400	Plating, Cadmium
AS7245	Inserts, Screw Thread, Helical Coil 19Cr-9.2Ni, Corrosion Resistant Steel

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
SAE WEB ADDRESS: **http://www.sae.org**

2.2 ANSI Publications:

Available from ANSI, 11 West 42nd Street, New York, NY 10036-8002.

ANSI B1.13M Metric Screw Threads - M Profile
ANSI B1.21M Metric Screw Threads - MJ Profile

3. REQUIREMENTS:

3.1 Material:

3.1.1 Composition: The chemical composition of the wire shall conform to material composition requirements of AS7245.

3.1.2 Properties:

3.1.2.1 Tensile Strength: Wire tensile strength shall be in accordance with AS7245.

3.1.2.2 Bending: Wire shall withstand, without cracking, bending when tested in accordance with AS7245.

3.2 Design:

The insert shall conform to the requirements of the applicable drawing and of this document.

3.2.1 Removal Notch: The tang removal notch shall be located as shown on the drawing and shall be of such depth that the insert may be installed without failure of the tang and that the tang may be removed, after assembly, without affecting the function of the installed insert.

3.2.2 Threads: The inserts, when assembled in threaded holes conforming to MA1567, shall form threads conforming to ANSI B1.13M, except for the locking feature of MA1565-2 inserts which shall conform to the applicable insert drawing. The assembled insert (both types) shall accept and function with parts externally threaded to MA1370, ANSI B1.13M, and ANSI B1.21M.

3.3 Self-Locking Torque:

MA1565-2 insert, when assembled in threaded holes conforming to MA1567 and tested in accordance with 4.4.4, shall provide a frictional lock to retain the bolt within the torque limits specified in Table 1. For definitions of torque terms, see AS1310.

TABLE 1 - Self-Locking Torque at Room Temperature

Nominal Insert Size	Maximum Locking Torque Installation or Removal N.m	Minimum Breakaway Torque N.m	Nominal Insert Size	Maximum Locking Torque Installation or Removal N.m	Minimum Breakaway Torque N.m
M2X0.4	0.12	0.003			
M2.2X0.45	0.14	0.02	M18X1.5	42	5.5
M2.5X0.45	0.22	0.06	M18X2	42	5.5
			M18X2.5	42	5.5
M3X0.5	0.44	0.1			
M3.5X0.6	0.68	0.12	M20X1.5	54	7
M4X0.7	0.9	0.16	M20X2	54	7
			M20X2.5	54	7
M5X0.8	1.6	0.3			
M6X1	3	0.4	M22X1.5	70	9
M7X1	4.4	0.6	M22X2	70	9
			M22X2.5	70	9
M8X1	6	0.8			
M8X1.25	6	0.8	M24X2	80	11
M10X1	10	1.4	M24X3	80	11
M10X1.25	10	1.4			
M10X1.5	10	1.4	M27X2	95	12
			M27X3	95	12
M12X1.25	15	2.2			
M12X1.5	15	2.2	M30X2	110	14
M12X1.75	15	2.2	M30X3	110	14
M14X1.5	23	3	M33X2	125	16
M14X2	23	3	M33X3	125	16
M16X1.5	32	4.2	M36X2	140	18
M16X2	32	4.2	M36X3	140	18
			M39X2	150	20
			M39X3	150	20

3.4 Workmanship:

The formed wire shall be of uniform quality and temper; smooth, clean, free from kinks, waviness, splits, cracks, laps, seams, scale, segregation, and other defects which may impair the serviceability of the insert.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

The vendor of inserts shall supply all samples and shall be responsible for performing all required tests. Results of such tests shall be reported to the purchaser as required by 4.6. Purchaser reserves the right to perform such confirmatory testing as he/she deems necessary to ensure that the inserts conform to the requirements of this document.

4.2 Responsibility for Compliance:

The manufacturer's system for parts production shall be based on preventing product defects, rather than detecting the defects at final inspection and then requiring corrective action to be invoked. An effective manufacturing in-process control system shall be established, subject to the approval of the purchaser, and used during production of parts.

4.3 Classification of Tests:

The inspection and testing of inserts shall be classified as either qualification tests or acceptance tests.

4.3.1 Qualification Tests: Qualification tests shall be performed on inserts selected from the first lot of inserts of each size produced by a supplier and shall be repeated whenever a significant change is made in the manufacturing process. The qualification test shall consist of the tests and inspections defined in Table 2. The removal notch tests shall be performed on five samples each. All other qualification tests shall be conducted in accordance with acceptance test requirements. The acceptance number in all cases is ZERO.

4.3.2 Acceptance Tests: Acceptance tests shall consist of the tests and inspection defined in Table 2. Acceptance tests shall be performed on a sampling basis. Sampling shall be in accordance with 4.3.2.1 and 4.3.2.2. The acceptance number in all cases is ZERO.

4.3.2.1 Nondestructive Tests - Visual and Dimensional: A random sample shall be selected from each production inspection lot; the size for the sample to be as specified in Table 3. All dimensional characteristics are considered imperfect when out of tolerance.

4.3.2.2 Destructive Tests - Screw Locking Torque: A random sample shall be selected from each production sample lot per Table 3. Normal sample size inspection shall be in effect until conditions for adjusting from normal to reduced sampling size are satisfied. Normal sampling size inspection shall resume when the conditions for switching from reduced to normal sample size occur.

TABLE 2 - Qualification and Acceptance Test Requirements

Characteristics	Required Paragraph	Test Method Per Paragraph Qualification	Test Method Per Paragraph Acceptance
Material Composition	3.1.1	4.4.2	4.4.2
Material Tensile Strength	3.1.2.1	4.4.2	4.4.2
Material Bending	3.1.2.2	4.4.2	4.4.2
Design	3.2	4.4.1	4.4.1
Removal Notch	3.2.1	4.4.3	4.4.3
Threads	3.2.2	4.4.1	4.4.1
Self-Locking Torque[1]	3.3	4.4.4	4.4.4
Workmanship	3.5	4.4.1	4.4.1

[1] Self-locking torque is applicable to MA1565-2 inserts only.

TABLE 3 - Sampling Plan for Acceptance Tests

Nondestructive Tests Visual and Dimensional Characteristics Production Inspection Lot Size	Nondestructive Tests Visual and Dimensional Characteristics Sample Size	Destructive Tests Removal Notch & Self-Locking Torque Production Inspection Lot Size	Destructive Tests Removal Notch & Self-Locking Torque Normal Sample Size	Destructive Tests Removal Notch & Self-Locking Torque Reduced Sample Size
90 & under	8	50 & under	2	2
91 to 150	12	51 to 500	3	2
151 to 280	19	501 to 35 000	5	2
281 to 500	21	35 001 & over	8	5
501 to 1200	27			
1201 to 3200	35			
3201 to 10 000	38			
10 001 to 35 000	46			
35 001 to 150 000	56			
150 001 & over	64			

4.3.2.2.1 Normal to Reduced Sample Size Switching: Switching from normal to reduced sample shall be instituted providing the following conditions are satisfied:

a. The preceding 10 lots have been on normal inspection and all have been accepted.
b. Production of a sample item or items using similar processes has been continuous under normal size sampling without a break longer than 90 days.
c. Reduced inspection is considered desirable.

4.3.2.2.2 Reduced to Normal Sample Size Switching: When reduced sample size inspection is in effect, normal sample size inspection shall be instituted if any of the following conditions occur on original inspection:

a. A lot is rejected.
b. Production of a sample item or items using similar processes ceases or is delayed for a period greater than 90 days.
c. Other conditions warrant that normal sample size inspection be resumed.

4.4 Test Methods:

4.4.1 Examination of the Product: Inserts shall be visually examined for conformance with drawing and workmanship requirements using conventional inspection methods and instruments.

4.4.2 Material: The supplier shall certify that material complies with the composition, tensile strength, and bending requirements of AS7245.

4.4.3 Installed Inserts: Inserts shall be installed in a threaded hole conforming to MA1567 and the tang removed. Insert a test bolt conforming to 4.4.4.1 so that one full thread extends beyond the end of the insert to determine if the tang has broken off at the notch cleanly enough so that the tang end of the installed insert does not interfere with the installation of a test bolt.

4.4.4 Self-Locking Torque:

4.4.4.1 Torque Test Bolts: Assembled screw locking inserts shall be torque tested with bolts having metric threads in accordance with ANSI B1.13M, ANSI B1.21M, or MA1370, cadmium plated per AMS 2400, and a hardness of 36-44 HRC. The bolts selected for this test shall be of sufficient length so the thread runout does not enter the insert and that a minimum of one full thread extends past the end of the insert when the bolt is fully seated.

4.4.4.2 Torque Test Block and Spacer: The insert to be tested shall be installed in a threaded hole conforming to MA1567 in a test block meeting the requirements of Figure 1 and made from 2024-T4 aluminum alloy. After installation the tang shall be removed. The surface of the test block from which the insert is assembled shall be marked “TOP” and shall be marked to indicate the radial location where the assembled insert begins. A steel spacer meeting the requirements of Figure 2 shall be used for developing the bolt load.

4.4.4.3 Torque Test Method: The torque test shall consist of a 15-cycle, room temperature test. A new bolt or screw and a new tapped hole shall be used for each complete 15-cycle test. For each of the 15 cycles, bolts shall be assembled and seated to the assembly torque specified in Table 4. Bolts shall be completely disengaged from the insert at the end of each cycle. The self-locking and breakaway torques shall be observed while the bolt is being assembled and disassembled to determine compliance with requirements of 3.3. The test shall be run at a rate slow enough to yield a dependable measure of torque and avoid heating of the bolt.

4.5 Quality:

The inserts shall be considered to have failed if, at the conclusion of any of the tests and inspections, any of the following conditions exist:

4.5.1 Any break or crack in the insert.

4.5.2 Installation or removal torque exceeds the maximum locking torque value in Table 1.

4.5.3 Breakaway torque less than the values in Table 1.

4.5.4 Movement of the insert beyond ±90° relative to the TOP surface when installing or removing the test bolt.

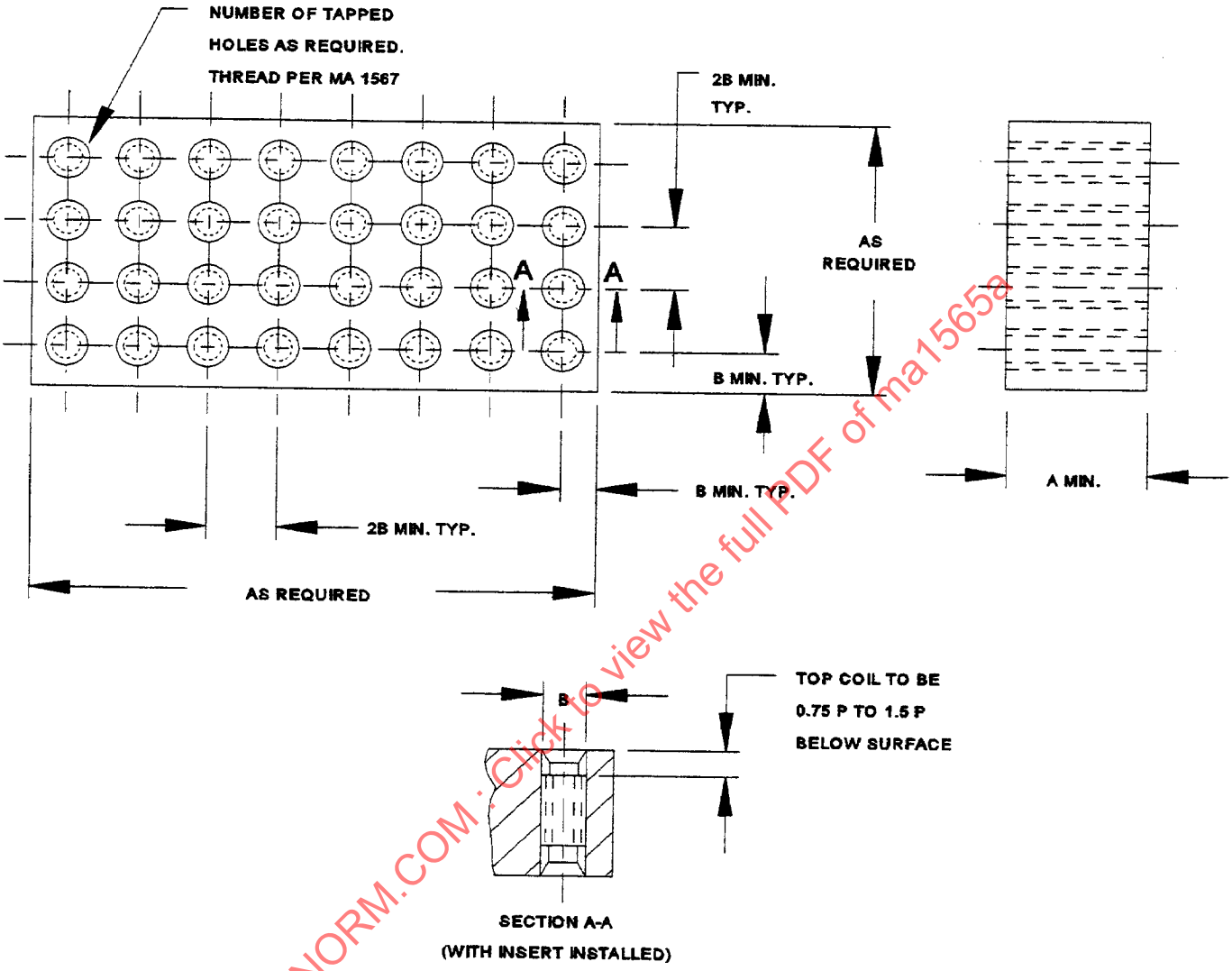
4.5.5 Seizure or galling of the insert or test bolt.

4.5.6 Tang not broken off cleanly leaving a fin or burr which interferes with the test bolt at installation.

4.5.7 Tang breaks off during insert installation.

4.6 Reports:

On request, the vendor of inserts shall furnish with each shipment two copies of a report stating that the wire conforms to the chemical composition and tensile strength requirements of this document and has been tested for conformance with all the other requirements of this document. This report shall include the purchase order, this document number and its revision letter, control number, part number, and quantity. The control number shall be a designation indicating round wire acceptance testing and batch processing of inserts.



A = NOMINAL LENGTH OF INSERT AS LISTED ON THE APPLICABLE INSERT DRAWING PLUS ONE PITCH.

B = MAJOR DIAMETER OF THE TAPPED HOLE PER MA 1567

P = THREAD PITCH

FIGURE 1