

Inserts, Screw Threads, Helical Coil
72Ni-15.5Cr-0.95(Cb+Ta)-2.5Ti-0.70Al-7.0Fe
Corrosion and Heat Resistant Alloy
Procurement Specification For

FSC 5340

RATIONALE

AS7246 has been reaffirmed to comply with the SAE five-year review policy.

1. SCOPE:

1.1 Type:

This specification covers closely-wound helical coil, screw thread inserts made from an age hardenable nickel base alloy formed wire of the type identified under the Unified Numbering System as UNS N07750. The inner surface of the insert coil, after assembly into a screw thread tapped hole, provides internal threads of standard 60° Unified Form.

1.2 Application:

Primarily to provide hard, smooth internal screw threads in heat resistant alloys for use at temperatures up to approximately 1000 °F or where low permeability is desired, and for salvaging worn or damaged internal threads.

2. REFERENCES:

2.1 Applicable Documents:

The following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other documents shall be the issue in effect on the date of the purchase order.

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

AMS 2269 Chemical Check Analysis Limits, Wrought Nickel and Nickel Base Alloys
AMS 2371 Quality Assurance Sampling of Corrosion and Heat Resistant Steels and Alloys,
Wrought Products and Forging Stock

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2.1.2 U.S. Government Publication: Available from Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

MIL-STD-2073-1 DoD Materiel, Procedures for Development and Application of Packaging Requirements

2.1.3 ASTM Publications: Available from ASTM, 1916 Race Street, Philadelphia, PA 19103-1187.

ASTM E 8 Tension Testing of Metallic Materials

ASTM E 290 Semi-Guided Bend Test for Ductility of Metallic Materials

ASTM E 354 Chemical Analysis of High-Temperature, Electrical, Magnetic, and Other Similar Iron, Nickel, and Cobalt-Base Alloys

2.1.4 ANSI Publication: Available from American National Standards Institute, 11 West 42nd Street, 13th Floor, New York, NY 10036.

ANSI Y14.5M Dimensioning and Tolerancing

2.2 Definitions:

DEFECTIVE: Is a unit of product that has one or more defects.

PRODUCTION INSPECTION LOT: Shall be all finished inserts of the same part number, made from a single heat of alloy, heat treated at the same time to the same specified condition, produced as one continuous run, and submitted for vendor's inspection at the same time.

2.3 Unit Symbols:

% - percent (1% = 1/100)

ksi - kips (1000 pounds) per square inch

° - degree, angular

°F - degree, Fahrenheit

3. TECHNICAL REQUIREMENTS:

3.1 Material:

3.1.1 Chemical Composition: Shall conform to the percentages by weight specified in Table 1, determined by wet chemical methods in accordance with ASTM E 354, by spectrochemical methods, or by other analytical methods acceptable to purchaser.

3.1.1.1 Check Analysis: Composition variation shall meet the requirements of AMS 2269.

3.1.2 Condition: Wire cold drawn and formed by rolling to achieve the properties as in 3.1.3, and to conform to the cross-section as specified on the insert drawing.

TABLE 1 - Material Composition

Element	% By Weight	
	min	max
Carbon	---	0.08
Manganese	---	1.00
Silicon	---	0.50
Phosphorus /1/	---	0.015
Sulfur	---	0.010
Chromium	14.00	17.00
Nickel + Cobalt	70.00	---
Columbium + Tantalum	0.70	1.20
Titanium	2.25	2.75
Aluminum	0.40	1.00
Iron	5.00	9.00
Cobalt /1/	---	1.00
Copper	---	0.50
/1/ Determination not required for routine acceptance		

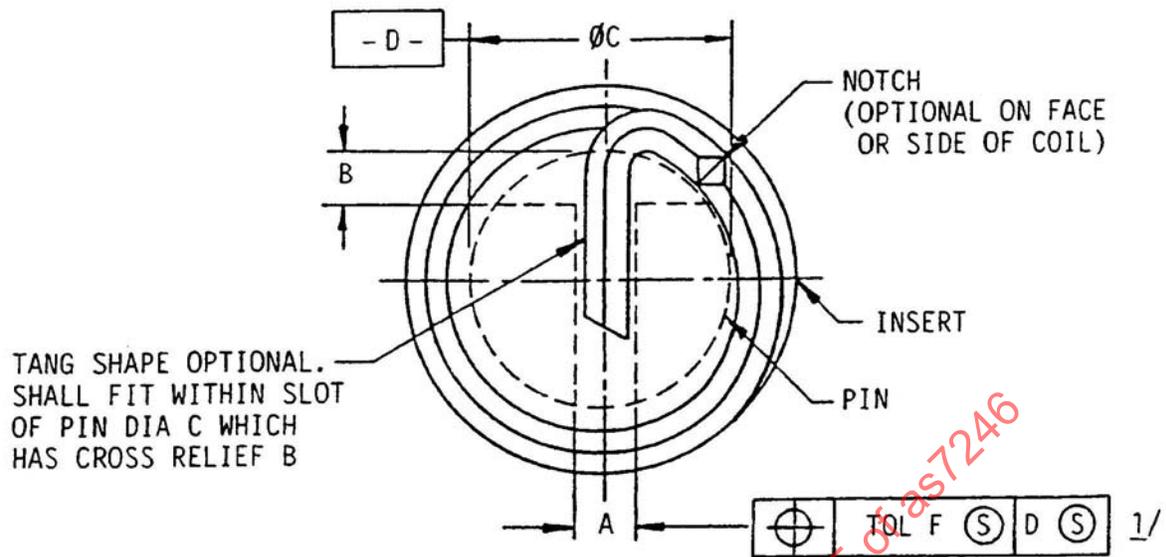
3.1.3 Properties (Before Coiling and Heat Treatment):

- 3.1.3.1 Ultimate Tensile Strength: Formed wire, before coiling into parts and heat treatment, shall have an ultimate tensile strength not lower than 130 ksi, determined in accordance with ASTM E 8.
- 3.1.3.2 Bending: Formed wire from which inserts are coiled shall withstand, without cracking, bending at room temperature through an angle of 180E around a diameter equal to twice the cross-sectional dimension of the formed wire in the plane of the bend, determined in accordance with ASTM E 290.

3.2 Design:

Finished (completely manufactured) parts shall conform to the following requirements:

- 3.2.1 Dimensions: The dimensions of finished parts, after all processing, shall conform to the part drawing.
- 3.2.2 Tang location and approximate shape shall be as shown in Figure 1 and Table 2. The tang removal notch shall be located as shown on the part drawing and shall be of such depth that the part 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.



NOTE 1/: TOL F = 0.004 FOR INSERT SIZES 0.086 TO 0.4375, INCL
 = 0.010 FOR INSERT SIZES 0.500 TO 1.000, INCL
 = 0.020 FOR INSERT SIZES 1.125 TO 1.500, INCL

NOTE 2: DIMENSIONS IN INCHES. SEE TABLE 2 FOR DIMENSIONS A, B, AND C.

NOTE 3: DIMENSIONING AND TOLERANCING: ANSI Y14.5M

FIGURE 1 - Tang Locating Dimensions

TABLE 2 - Tang Locating Dimensions

Thread Size	Dimensions, inch A	Dimensions, inch B	Dimensions, inch ϕ C
0.086 -56	0.024 - 0.026	0.007 - 0.009	0.053 - 0.055
0.099 -48	0.032 - 0.034	0.009 - 0.011	0.064 - 0.066
0.099 -56	0.028 - 0.030	0.008 - 0.010	0.081 - 0.083
0.112 -40	0.034 - 0.036	0.009 - 0.011	0.074 - 0.076
0.112 -48	0.032 - 0.034	0.009 - 0.011	0.073 - 0.075
0.125 -40	0.034 - 0.036	0.014 - 0.016	0.089 - 0.091
0.138 -32	0.044 - 0.046	0.019 - 0.021	0.100 - 0.102
0.138 -40	0.037 - 0.039	0.019 - 0.021	0.103 - 0.105
0.164 -32	0.044 - 0.046	0.019 - 0.021	0.126 - 0.128
0.164 -36	0.040 - 0.042	0.019 - 0.021	0.127 - 0.129
0.190 -24	0.060 - 0.062	0.019 - 0.021	0.141 - 0.143
0.190 -32	0.051 - 0.053	0.019 - 0.021	0.152 - 0.154
0.250 -20	0.072 - 0.074	0.027 - 0.029	0.192 - 0.194
0.250 -28	0.059 - 0.061	0.019 - 0.021	0.207 - 0.209
0.3125-18	0.081 - 0.083	0.033 - 0.035	0.249 - 0.251
0.3125-24	0.069 - 0.071	0.021 - 0.025	0.264 - 0.266
0.375 -16	0.092 - 0.094	0.038 - 0.040	0.301 - 0.303
0.375 -24	0.069 - 0.071	0.023 - 0.025	0.327 - 0.329
0.4375-14	0.111 - 0.113	0.055 - 0.057	0.354 - 0.356
0.4375-20	0.087 - 0.089	0.045 - 0.047	0.379 - 0.381
0.500 -13	0.124 - 0.126	0.075 - 0.077	0.410 - 0.412
0.500 -20	0.089 - 0.091	0.045 - 0.047	0.421 - 0.423
0.5625-12	0.141 - 0.143	0.085 - 0.087	0.467 - 0.469
0.5625-18	0.099 - 0.101	0.065 - 0.067	0.499 - 0.501
0.625 -11	0.155 - 0.157	0.113 - 0.115	0.520 - 0.522
0.625 -18	0.099 - 0.101	0.088 - 0.090	0.562 - 0.564
0.750 -10	0.185 - 0.187	0.116 - 0.118	0.624 - 0.626
0.750 -16	0.108 - 0.110	0.086 - 0.088	0.678 - 0.680
0.875 -9	0.185 - 0.187	0.155 - 0.157	0.749 - 0.751
0.875 -14	0.124 - 0.126	0.134 - 0.136	0.793 - 0.795
1.000 -8	0.249 - 0.251	0.155 - 0.157	0.843 - 0.845
1.000 -12	0.129 - 0.131	0.134 - 0.136	0.909 - 0.911
1.000 -14	0.124 - 0.126	0.124 - 0.126	0.918 - 0.920
1.125 -7	0.247 - 0.249	0.155 - 0.157	0.934 - 0.936
1.125 -12	0.149 - 0.151	0.134 - 0.136	1.034 - 1.036
1.250 -7	0.252 - 0.254	0.155 - 0.157	1.059 - 1.061
1.250 -12	0.149 - 0.151	0.134 - 0.136	1.159 - 1.161
1.375 -6	0.249 - 0.251	0.155 - 0.157	1.185 - 1.187
1.375 -12	0.149 - 0.151	0.134 - 0.136	1.284 - 1.286
1.500 -6	0.249 - 0.251	0.155 - 0.157	1.309 - 1.311
1.500 -12	0.149 - 0.151	0.134 - 0.136	1.409 - 1.411

3.3 Fabrication:

3.3.1 Inserts shall be coiled from cold drawn and shaped wire as in 3.1 and shall be precipitation heat treated by heating to $1300\text{ }^{\circ}\text{F} \pm 25\text{ }^{\circ}\text{F}$, holding at heat for not less than 4 hours, and cooling in air.

3.3.2 Spacing: Inserts shall stretch with approximately equal spacing between turns when extended axially beyond their elastic limit.

3.4 Ultimate Tensile Strength (Wire and Inserts After Heat Treatment):

Formed wire, after being precipitation heat treated as in 3.3.1, shall have ultimate tensile strength not lower than 180 ksi, determined in accordance with ASTM E 8.

3.5 Workmanship:

Inserts shall be uniform in quality and condition, clean, sound, smooth, and free from foreign materials and imperfections detrimental to the usage of the insert.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

The vendor of parts shall supply all samples for vendor's test and shall be responsible for performing all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure the parts conform to the requirements of this specification.

4.2 Responsibility for Compliance:

The manufacturer's system for parts production should 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 Production Acceptance Tests:

The purpose of production acceptance tests is to check, as simply as possible, using a method which is inexpensive and representative of the part usage, with the uncertainty in random sampling, that the parts comprising a production inspection lot conform to the requirements of this specification.

4.4 Classification of Tests:

Tests to determine conformance to all technical requirements of this specification are classified as acceptance tests and are to be performed on each production inspection lot. A summary of acceptance tests is specified in Table 3.

TABLE 3 - Summary of Acceptance Tests

Characteristic	Req. Para.	Sample Size	Test Method
Nondestructive Tests			
Packaging & Identification	5.1	None	Visual
Dimensions	3.2.1	Table 4	Conventional measuring methods
Tang Location	3.2.2	Table 4	Figure 1 slotted pin
Tang Removal Notch	3.2.2	Table 4	Visual
Workmanship	3.5	Table 4	Visual
Destructive Tests			
Material Composition	3.1.1	4.5.1	ASTM E 354
Ultimate Tensile Strength (Before Coiling & H.T.)	3.1.3.1	Table 5	ASTM E 8
Bending (Before Coiling & H.T.)	3.1.3.2	Table 5	ASTM E 290
Tang Removal	3.2.2	Table 5	Installed insert and assembled bolt or screw
Spacing	3.3.2	Table 5	Per 3.3.2
Ultimate Tensile Strength (After H.T.)	3.4	Table 5	ASTM E 8

4.5 Acceptance Test Sampling:

4.5.1 Material: Sample shall be in accordance with AMS 2371.

4.5.2 Nondestructive Tests - Visual and Dimensional: A random sample shall be selected from each production inspection lot; the size of the sample to be as specified in Table 4. All dimensional characteristics are considered defective when out of tolerance.

4.5.3 Destructive Tests: A random sample shall be selected from each production lot; the size of the sample shall be as specified in Table 5.

4.5.4 Acceptance Quality: Of random samples tested, acceptance quality shall be zero defectives.

TABLE 4 - Sampling Data

Nondestructive Tests
Visual and Dimensional Characteristics

Production Inspection Lot	Sample Size
90 & under	8
91 to 150	12
151 to 280	19
281 to 500	21
501 to 1200	27
1201 to 3200	35
3201 to 10000	38
10001 to 35000	46
35001 to 150000	56
150001 & over	64

TABLE 5 - Sampling Data

Destructive Tests

Production Inspection Lot Size	Sample Size
50 & under	2
51 to 500	3
501 to 35000	5
35001 & over	8