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INTERNATIONAL
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AEROSPACE STANDARD

SAE AS7211

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Submitted for recognition as an American National Standard

Superseding AMS 7211E

PIN, COTTER, STEEL, CORROSION AND HEAT RESISTANT 18Cr-10.5Ni-0.40Ti PROCUREMENT SPECIFICATION FOR

FSC 5315

1. SCOPE:

1.1 Type:

This procurement specification covers split cotter pins made from a corrosion and heat resistant steel of the type identified under the Unified Numbering System as UNS S32100.

1.2 Application:

Primarily for use where a corrosion and heat resistant cotter pin is required for locking parts in applications up to 1500 °F.

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.

2.1.1.1 Aerospace Material Specifications:

AMS 2248 Chemical Check Analysis Limits, Wrought Corrosion and Heat Resistant Steels and Alloys, Maraging and Other Highly Alloyed Steels, and Iron Alloys

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

2.1.2.1 Military Standards:

MIL-STD-1312 Fasteners, Test Methods
MIL-STD-2073-1 DoD Materiel, Procedures for Development and Application of Packaging Requirements
MS9245 Pin, Cotter - CRES, AMS 7211

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

ASTM A 262 Standard Practices for Detecting Susceptibility to Intergranular Attack in Austenitic Stainless Steels
ASTM E 353 Chemical Analysis of Stainless, Heat-Resisting, Maraging, and Other Similar Chromium-Nickel-Iron Alloys

2.2 Definitions:

DEFECTIVE: A unit of product which contains one or more defects.

PRODUCTION INSPECTION LOT: Shall be all finished parts 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)
°F - degree Fahrenheit
HV10 - hardness, Vickers, measured under a 10 kg load
HR15N - hardness, Rockwell, 15N scale
kg - kilogram
sp gr - specific gravity

3. TECHNICAL REQUIREMENTS:

3.1 Material:

The cotter pins shall be made from half-round wire conforming to the following requirements:

3.1.1 Composition: Shall conform to the percentages by weight specified in Table 1, determined by wet chemical methods in accordance with ASTM E 353, by spectrochemical methods, or by other analytical methods acceptable to purchaser.

TABLE 1 - Material Composition

Element	% by Weight Min	% by Weight Max
Carbon	--	0.08
Manganese	--	2.00
Silicon	0.40	1.00
Phosphorus	--	0.040
Sulfur	--	0.030
Chromium	17.00	19.00
Nickel	8.00	12.00
Titanium	5x(C+N)	0.70
Molybdenum	--	0.75
Copper	--	0.75
Nitrogen	--	0.75
Iron	remainder	

3.1.2 Check Analysis: Composition variations shall meet the applicable requirements of AMS 2248.

3.1.3 Condition: Wire shall be solution heat treated free from continuous carbide network (determined in accordance with ASTM A 262, Practice E) and cold finished.

3.1.4 Tolerances: Permissible variations in cross-sectional dimensions of the half-round wire for manufacture of cotter pins shall be ±0.002 inch for major axis and ±0.001 inch for the minor axis.

3.2 Design:

Unless otherwise specified on the part drawing, cotter pins furnished to this specification shall conform to the design, dimensions, and other requirements specified on the MS9245 standard part drawing, having ends slightly rounded, beveled, or pointed with one end slightly extended beyond the other to permit easy assembly (see Figure 1).

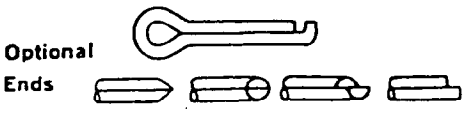

FIGURE 1 - Optional Cotter Pin Ends

3.3 Cleaning:

Parts, after finishing, shall be degreased and immersed in one of the following solutions for the time and temperature shown:

a. One volume of nitric acid (sp gr 1.42) and 9 volumes of water for not less than 20 minutes at room temperature.

b. One volume of nitric acid (sp gr 1.42) and 4 volumes of water for 30 to 40 minutes at room temperature.

c. One volume of nitric acid (sp gr 1.42) and 4 volumes of water for 10 to 15 minutes at 140 to 160 °F.

3.4 Properties:

Cotter pins shall conform to the following requirements:

3.4.1 Hardness: Shall have hardness in conformance with Table 2, unless otherwise specified on the part drawing and determined in accordance with MIL-STD-1312-6.

TABLE 2 - Hardness of Cotter Pins

Nominal Pin Diameter inch	Vickers Hardness HV10	Rockwell Hardness HR15N
0.062 and less	200 to 350	65 to 78
0.078 and 0.094	170 to 350	60 to 78
0.109 and larger	140 to 220	55 to 67

3.4.2 Bending: Either prong of any cotter pin shall withstand bending flat on itself, without cracking; the flat of the prong shall form the outside of the bend.

3.5 Quality:

Cotter pins, as received by purchaser, shall be uniform in quality and condition, sound, and free from foreign materials and from imperfections detrimental to usage of the parts. The ends of the prongs shall not be spread open.

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 that the parts conform to the requirements of this specification.

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 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 inherent in random sampling, that the parts comprising a production inspection lot satisfy the requirements of this specification.

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

TABLE 3 - Summary of Acceptance Tests

TABLE 3A - Nondestructive Tests

Characteristic	Req. Para.	Sample Size	Test Method
Design & dimensions	3.2	4.4.2	Conventional measuring methods
Quality	3.5	4.4.2	Visual

TABLE 3B - Destructive Tests

Characteristic	Req. Para.	Sample Size	Test Method
Material composition	3.1	4.4.1	ASTM E 353
Hardness	3.4.1	4.4.3	MIL-STD-1312-6
Bending	3.4.2	4.4.4	Per 3.4.2

4.4 Acceptance Tests Sampling:

4.4.1 Material: One sample of wire, from which cotter pins were made, from each heat of alloy.