



AEROSPACE STANDARD	AS7330™	REV. A
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Rings, Retaining - Spiral Wound, Uniform Section Corrosion Resistant Steel Procurement Specification For		
FSC 5365		

RATIONALE

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1. SCOPE:

1.1 Type:

This procurement specification covers aircraft quality retaining rings of the spiral wound type with uniform rectangular cross-sections and made from a corrosion resistant austenitic iron base alloy of the type identified under the Unified Numbering System as UNS S30200, and of spring temper condition.

1.2 Classification:

Retaining rings shall conform to one of the following types and classes:

- a. Type I - External Ring, Class 1, Medium Duty
- b. Type I - External Ring, Class 2, Heavy Duty
- c. Type II - Internal Ring, Class 1, Medium Duty
- d. Type II - Internal Ring, Class 2, Heavy Duty

1.3 Application:

Intended for use on aerospace propulsion systems for retaining parts on shafts and in housing bores where extended temperature use is not greater than 400 °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 2645 Fluorescent Penetrant Inspection
AMS 5866 Steel Wire, Flat, Corrosion Resistant, 18Cr-9.0Ni (SAE 30302) Spring Temper

2.1.1.2 Aerospace Standards:

AS3215 Ring, Retaining - Spiral, Internal, Heavy Duty, Cres
AS3216 Ring, Retaining - Spiral, External, Heavy Duty, Cres
AS3217 Ring, Retaining - Spiral, Internal, Light Duty, Cres
AS3218 Ring, Retaining - Spiral, External, Light Duty, Cres
AS3219 Ring, Retaining, Spiral, Minimum Distortion, Dimensional and Acceptance Standard For

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 Standard:

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 18 Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials

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

ANSI/ASME B46.1 Surface Texture (Surface Roughness, Waviness, and Lay)

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
in ²	- square inch
lbf	- pounds force
ks	- kips (1000 pounds) per square inch
sp gr	- specific gravity
HR15N	- hardness, Rockwell, 15N scale
HR30N	- hardness, Rockwell, 30N scale
HRA	- hardness, Rockwell, A scale
HRC	- hardness, Rockwell, C scale

3. TECHNICAL REQUIREMENTS:

3.1 Material:

Shall be AMS 5866 spring temper steel, corrosion resistant, flat wire, unless otherwise specified on the part drawing.

3.2 Design:

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

- 3.2.1 Design and Dimensions: Unless otherwise specified on the part drawing, retaining rings furnished under this specification shall conform to the design, shape, dimensions, and other requirements specified on the applicable AS standard drawing as in 2.1.1.2. Dimensions shall conform after all processing.

NOTE: Class 1, Medium Duty, is assigned to the AS Light Duty rings as in 2.1.1.2.

- 3.2.2 Surface Texture: Surface texture of finished parts shall conform to the requirements as specified on the part drawing, determined in accordance with ANSI/ASME B46.1.
- 3.2.3 Crimp: Retaining rings that are required to be crimped (offset at ring ends) shall meet the requirements in AS3219.
- 3.2.4 Irregularity of Form: The following ring form irregularities shall be not greater than that specified in AS3219:
- Dish and parallelism
 - Misalignment
 - Radial deformation
 - Distortion and kink

- 3.2.5 Removal Provision: All rings shall be notched to facilitate their removal from the groove. Notch dimensions shall be as specified on the part drawing.
- 3.2.6 Edges: The edges of the ring material shall be rounded except at the ends and at the removal notches. The edge radius shall be as specified on the part drawing. All edges, including those at the retaining ring ends and at the removal notches, shall be free from burrs, slivers, dents, nicks, cracks, and other irregularities.
- 3.3 Fabrication:
- 3.3.1 Rings shall be wound as a spiral of two or more turns from strip of uniform cross section and rounded edges, cold worked sufficiently to meet the requirements of 3.4 on the finished rings.
- 3.3.2 Passivation: Unless otherwise specified on the part drawing, finished rings shall be passivated by immersion in one of the following solutions at the temperature and for the time shown, and then rinsing and drying:
- 20 to 50% by volume of nitric acid at 70 to 90 °F for 30 to 40 minutes.
 - 20 to 50% by volume of nitric acid plus 2 to 3% by weight of sodium dichromate operated at 70 to 90 °F for 30 to 40 minutes, at 120 to 130 °F for 20 to 30 minutes, or at 145 to 155 °F for 10 to 15 minutes.
- 3.4 Properties:
- 3.4.1 Hardness: Shall be used as a reference to approximate tensile strength, and shall be as specified in Table 1, determined in accordance with ASTM E 18.

TABLE 1 - Hardness, Reference

Ring Wire, Cross Section Thickness minimum, inch	Hardness
0.008 to 0.015, inclusive	83.0 to 86.0 HR15N
over 0.015 to 0.022, inclusive	64.0 to 69.5 HR40N
over 0.022 to 0.047, inclusive	72.0 to 74.9 HRA
over 0.047 to 0.062, inclusive	39.8 to 48.5 HRC
over 0.062 to 0.074, inclusive	38.0 to 47.0 HRC

- 3.4.2 Tensile Strength: Rings rectangular section wire shall have tensile strength specified in Table 2, determined in accordance with ASTM E 8.

TABLE 2 - Tensile Strength

Ring Wire, Cross Section Thickness minimum, inch	Tensile Strength ksi
0.008 to 0.022, inclusive	210 to 250
over 0.022 to 0.047, inclusive	200 to 235
over 0.047 to 0.062, inclusive	185 to 235
over 0.062 to 0.074, inclusive	175 to 225

- 3.4.3 Rings shall not be rejected on the basis of hardness if the tensile strength properties specified in 3.4.2 are met.
- 3.4.4 Performance: Retaining rings shall be capable of undergoing the test of 4.5.2.1 without showing indications of cracks, excessive permanent set or distortion or other conditions detrimental to use of the rings. Distortion or permanent set shall not be to the extent where the minimum diametral interference fit between the ring diameter and the groove diameter, under the stack-up of tolerances is less than 0.003 times the groove diameter as specified in Tables 5 and 6, calculated as follows:

$$F = \phi A - \phi C \geq 0.003 \phi C \quad (\text{Eq. 1})$$

where:

F = minimum interference fit between ring and groove after performance test

ϕA = maximum ID, external ring as measured after performance test

ϕA = minimum OD, internal ring as measured after performance test

ϕC = minimum groove diameter, external ring

ϕC = maximum groove diameter, internal ring

3.5 Quality:

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

- 3.5.1 Fluorescent Penetrant Inspection: Parts shall be fluorescent penetrant inspected in accordance with AMS 2645. There shall be no evidence of cracks, seams, laminations, blanking tears, or laps.

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 the 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.