



METRIC AEROSPACE STANDARD

MA4035™**REV. A**

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Superseding MA4035

(R) Rings, Retaining - Spiral Wound, Uniform Section
Corrosion Resistant, Procurement Specification for, Metric

RATIONALE

Delete MIL-STD-105, revise sampling requirements and acceptance testing based on zero defectives, add formula for calculating minimum interference fit, update references, extensive editorial updates.

1. SCOPE

1.1 Scope

This specification covers the procurement requirements for corrosion resistant steel retaining rings of the spiral wound type with uniform rectangular cross-sections.

1.2 Classification

Retaining rings shall be of the types and classes shown in Table 1.

Table 1 - Classification

Type	Class	Description
I – External Ring	1	Medium Duty
	2	Heavy Duty
II – Internal Ring	1	Medium Duty
	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 200 °C.

1.4 Dimensions and Tolerances

Dimensions and tolerances in this specification are in millimeters unless otherwise specified.

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2. REFERENCES

2.1 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.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

AMS2248 Chemical Check Analysis Limits, Corrosion and Heat-Resistant Steels and Alloys, Maraging and Other Highly-Alloyed Steels, and Iron Alloys

MA4016 Ring, Retaining - External, Spiral Wound, Heavy & Medium Duty Cres, Metric

MA4017 Ring, Retaining - Internal, Spiral Wound, Heavy & Medium Duty Cres, Metric

2.1.2 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM E8/E8M Tension Testing of Metallic Materials

ASTM E18 Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials

ASTM E353 Chemical Analysis of Stainless, Heat-Resisting, Maraging, and Other Similar Chromium-Nickel-Iron Alloys

ASTM E1417/E1417M Standard Practice for Liquid Penetrant Testing

2.1.3 ASME Publications

Available from ASME, P.O. Box 2900, 22 Law Drive, Fairfield, NJ 07007-2900, Tel: 800-843-2763 (U.S./Canada), 001-800-843-2763 (Mexico), 973-882-1170 (outside North America), www.asme.org.

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

2.1.4 U.S. Government Publications

Copies of these documents are available online at <http://quicksearch.dla.mil>.

Military Standard:

MIL-STD-2073-1 Standard Practice for Military Packaging

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)
°C	degree Celsius
mm	millimeter
MPa	megapascals
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 Composition

Shall conform to the percentages by weight shown in Table 2, determined by wet chemical methods in accordance with ASTM E353, by spectrographic methods, or by other analytical methods

Table 2 - Material composition

Element	Min	Max
Carbon	---	0.15
Manganese	---	2.00
Silicon	---	1.00
Phosphorus	---	0.040
Sulfur	---	0.030
Chromium	17.00	19.00
Nickel	7.00	10.00
Molybdenum	---	0.75
Copper	---	0.75

3.1.1 Check Analysis

Material composition variations shall meet the requirements of AMS2248.

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 MA part standard as in 2.1.1. Dimensions shall conform after all processing.

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 ASME B46.1.

3.2.3 Crimp

Retaining rings requiring crimping (see Figure 1) shall meet the following requirements:

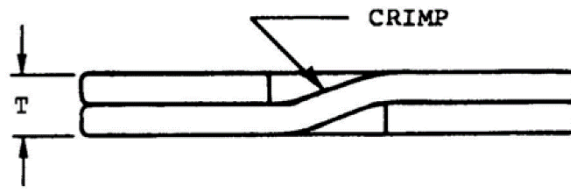


Figure 1 - Crimped retaining ring

3.2.3.1 Crimp Height

The height of the crimp (see Figure 2) shall be equal to the actual thickness of the ring within the tolerances specified in Table 3.

Table 3 - Crimp height tolerance

Ring Thickness T, mm	Crimp Height Tol, mm
up thru 1.12	+0.05, -0.10
1.13 thru 1.69	+0.08, -0.13
1.70 and up	+0.13, -0.18

3.2.3.2 Crimp Length, Angle, and Radius

The crimp length, angle, and radius (see Figure 2) shall conform to the dimensions and tolerances specified in Table 4.

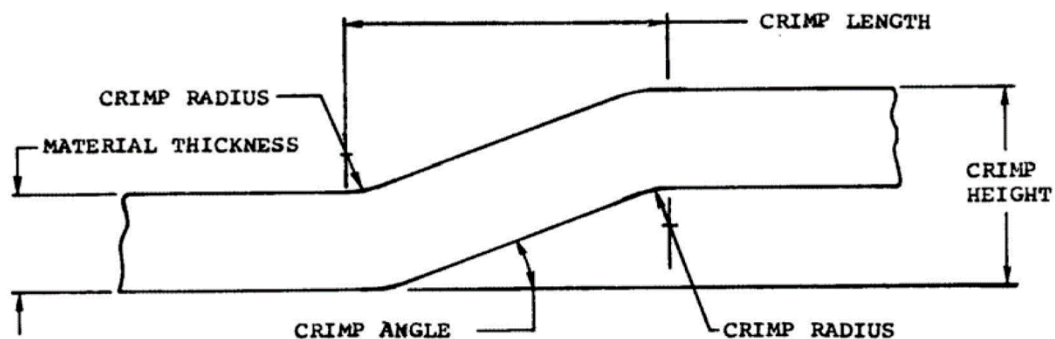


Figure 2 - Crimp

Table 4 - Crimp dimensions

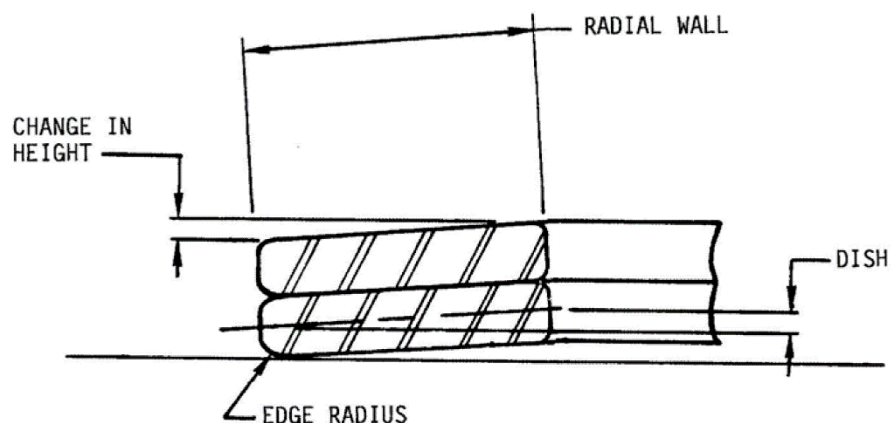
Material Thickness mm	Material Width, mm /Figure 6/	Crimp Angle Max	Crimp Length Max, mm	Crimp Radius Min, mm
up thru 0.53	up thru 6.35	20 degrees	2.5	0.4
0.54 thru 0.79	up thru 6.35	20 degrees	3.5	0.4
0.80 and over	up thru 6.35	20 degrees	5.0	0.4
All Thicknesses	greater than 6.35	20 degrees	6.5	0.8

3.2.4 Dish and Parallelism

The dish shall be considered the height difference in the ring cross section axis of symmetry between the outside diameter (OD) and the inside diameter (ID) as shown in Figure 3. Retaining ring manufacture shall be such as to minimize the amount of the dish. In addition, the radial walls of the retaining rings shall be parallel to each other such that the retaining ring thickness at all locations is within the thickness tolerances specified on the part drawing (see Figure 4). The combined effect of dish and parallelism variation shall be such that the change in retaining ring height in the free state, as shown in Figure 3, shall not exceed the values specified in Table 5.

Table 5 - Allowable change in height

Radial Wall mm	Max Allowable Change in Height
Up thru 1.11	0.025
1.12 thru 1.77	0.050
1.78 thru 2.53	0.075
2.54 thru 3.29	0.10
3.30 thru 4.05	0.13
4.06 thru 4.94	0.15
4.95 thru 5.71	0.18
5.72 thru 6.59	0.20
6.60 thru 7.48	0.23
7.49 thru 8.63	0.25
8.64 thru 10.02	0.28
10.03 thru 12.05	0.30
12.06 thru 16.49	0.33
16.50 thru 25.40	0.36

**Figure 3 - Dish and parallelism**