

AMERICAN NATIONAL STANDARD

# General Purpose Uniform Cross Section Spiral Retaining Rings

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ANSI B27.6-1972

**REAFFIRMED 1999**

FOR CURRENT COMMITTEE PERSONNEL  
PLEASE SEE ASME MANUAL AS-11

***SECRETARIAT***

SOCIETY OF AUTOMOTIVE ENGINEERS  
THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

***PUBLISHED BY***

**THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS**

United Engineering Center

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## FOREWORD

Formation of Subcommittee 3 was authorized by Standards Committee B27 at its meeting on November 30, 1950. Organization meeting of the Subcommittee was held on October 24, 1951 at which time it was agreed that bearing retainer rings, if included in the standard, would conform with practice of Anti-Friction Bearing Manufacturers Association and that technical development within the Subcommittee would be limited to general purpose retainer rings. Subgroups were appointed to investigate materials, adequacy of the AFBMA bearing retainer ring standard, general purpose and aeronautical ring usage.

One of the subgroups prepared a draft proposal, General Purpose Uniform Section Spiral Retaining Ring, which was circulated to members of Subcommittee 3 on May 8, 1970. The next meeting of the Subcommittee was held on February 4, 1971 at which time changes were made to satisfy comments received as a result of this ballot. It was then agreed to circulate the revised draft proposal to the ANSI B27 Standards Committee. The letter ballot was circulated on August 17, 1971. All who responded balloted affirmative. Several of the affirmative ballots offered editorial type comments. Each comment was carefully reviewed by a subgroup and minor nontechnical changes were made to the document. The Standard was duly approved by sponsors and was submitted to the American National Standards Institute for designation, as an American Standard. This was granted on July 11, 1972.

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AMERICAN NATIONAL STANDARD

**GENERAL PURPOSE UNIFORM CROSS SECTION  
SPIRAL RETAINING RINGS**  
External Types – 2A01, 2A02  
Internal Types – 2B01, 2B02

**1.0 INTRODUCTORY NOTES**

**1.1 Scope**

This standard is intended to cover complete general and dimensional data for two series of general purpose uniform cross section spiral retaining rings which may be used with the nominal size shafts and housings listed and in grooves of the recommended dimensions listed.

**1.2 Ring Types**

**1.2.1 External Rings.** The external retaining rings covered by this standard are designated Type 2A01 Light Duty and Type 2A02 Heavy Duty. Dimensions of rings, grooves and gages applicable to the various shaft sizes are given in Tables 1 and 2, respectively.

**1.2.2 Internal Rings.** The internal retaining rings covered by this standard are designated Type 2B01 Light Duty and Type 2B02 Heavy Duty. Dimensions of rings, grooves and gages applicable to the various housing bores are given in Tables 3 and 4, respectively.

**1.3 Applicability**

The rings denoted in this standard are intended primarily for use with the shaft, housing, and groove sizes recommended; however, in certain cases these diameters may be altered somewhat to suit the requirements of a particular design. When such changes are made, care should be taken to not alter the shaft or housing size to such an extent that the ring will take enough permanent set to allow a loose fit after the ring has been assembled into the groove. Neither should the groove diameter be altered to the extent to permit the ring to fit loosely.

**1.4 Dimensions**

All dimensions in this standard are in inches unless otherwise stated.

**2.0 GENERAL DATA**

**2.1 Material**

**2.1.1 Carbon Spring Steel.** Retaining rings made from carbon spring steel shall conform to the chemical composition of SAE 1070 to 1090 or AISI 1070 to 1090 or equivalent and have the following physical properties:

Material Thickness (minimum)	Rockwell Scale	Hardness	Tensile Strength (psi)
0.0067	15N	85-90	269,000-299,000
0.0142	30N	68-73	255,000-285,000
0.0213	A	72-78	221,000-251,000
0.0433	C	43-49	211,000-236,000

**2.1.2 Corrosion Resistant Steel.** Retaining rings made from corrosion resistant steel shall conform to the chemical composition of SAE 30302 or equivalent and have the following physical properties:

Material Thickness (minimum)	Rockwell Scale	Hardness	Tensile Strength (psi)
0.008	15N	83.0-86.0	210,000-250,000
0.016	30N	64.0-69.5	210,000-250,000
0.023	A	72.0-74.9	200,000-230,000
0.048	C	39.8-48.5	185,000-235,000
0.062	C	38.0-47.0	175,000-225,000

**2.2 Finish**

Unless otherwise specified, rings shall be furnished with a natural (as processed) finish, unplated or uncoated. Where corrosion preventative treatment is required, rings shall be plated or coated as agreed upon between the manufacturer and the purchaser. However, where plated or coated rings are subject to hydrogen embrittlement they shall be baked for three hours at 375°F, or other suitable times and temperatures,

as soon as possible after the plating or coating operation to obviate such embrittlement.

### 2.3 Crimp

Unless otherwise specified by the purchaser, the following types of rings and sizes shall be uncrimped:

Ring Type	Nominal Ring Size
2A01 Light Duty External	0.500-1.500
2A02 Heavy Duty External	0.469-0.688
2B01 Light Duty Internal	0.500-1.500
2B02 Heavy Duty Internal	0.469-0.750

All other rings shall be crimped. See Fig. 2 for crimp illustration.

### 2.4 Removal Notches or Slots

Unless otherwise specified in the contract or order, the rings shall have removal notches or slots as follows:

Ring Type	Nominal Ring Size	Removal Provision
2A01 Light Duty External	0.500- 2.750	Notch
	2.813-11.000	Slot
2A02 Heavy Duty External	All	Notch
2B01 Light Duty Internal	0.500- 2.750	Notch
	2.813-11.000	Slot
2B02 Heavy Duty Internal	All	Notch

### 2.5 Dish

The dish shall be considered the height difference indicated in Figure 1 and shall not exceed the values shown in the following table:

Radial Wall	Maximum Allowable Dish
0-0.039	0.001
0.040-0.069	0.002
0.070-0.099	0.003
0.100-0.129	0.004
0.130-0.159	0.005
0.160-0.194	0.006
0.195-0.224	0.007
0.225-0.259	0.008
0.260-0.294	0.009
0.295-0.339	0.010
0.340-0.394	0.011
0.395-0.474	0.012
0.475-0.649	0.013
0.650-1.000	0.014

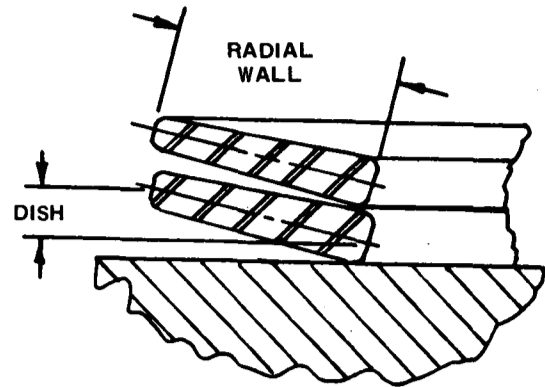


FIGURE 1

### 2.6 Misalignment

The leaves of the ring shall lie above each other as specified below and illustrated in Figure 2:

Nominal Ring Size	Maximum Misalignment
0.375-0.984	0.010
1.000-1.969	0.020
2.000-5.905	0.045
6.000 and above	0.070

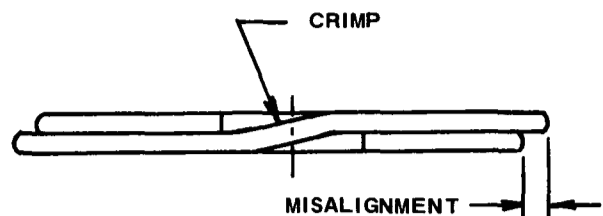


FIGURE 2

### 2.7 Lateral Deformation

Lateral deformation may be cutoff deformation or lateral kink as illustrated. Lateral kink usually exists over a short section of the ring circumference and is not the same as helix which is a uniform slope along the entire 360 degrees. Lateral deformation shall be inspected by placing the ring between parallel hardened and ground steel platens equipped with a deflection gage graduated in thousandths so located that readings are obtained at approximately the center of

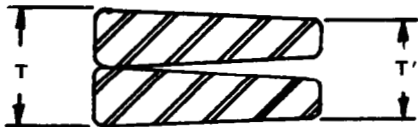
the platens. The specimen shall then be compressed under a ten (10) pound load and the distance between the platens determined. The ring shall be acceptable if this distance does not exceed the minimum recommended groove width "F". A comparatively simple inspection fixture is depicted in Figure 4.

### 2.8 Ring Section Edge Radius (R)

The edges of the ring material shall be rounded and the radius shall not be less than  $T/8$  nor more than  $T/4$  where  $T$  equals the ring thickness. Ring thickness shall be measured under 10 pounds load as illustrated in Figure 4 and described in Paragraph 2.7 but shall be measured in a location other than at the ring ends or gap.

### 2.9 Parallelism (P)

The side outer surfaces of the rings in the free state shall be parallel to each other within one half the total tolerance of the ring section thickness as illustrated in Figure 3.



$$P_{\max} = T - T' = \frac{T \text{ total tolerance}}{2}$$

FIGURE 3

### 2.10 Total Free Height (S)

The maximum total free height,  $S_{\max}$ , (reference Column S and illustrations in Tables 1 through 4) shall not exceed the sum of the maximum section thickness  $T_{\max}$  plus  $0.375 \times$  nominal section thickness  $T_{\text{nom}}$ :

$$S_{\max} = T_{\max} + 0.375 T_{\text{nom}}$$

### 2.11 Workmanship

Retaining rings shall be free from burrs, rust, pit marks, cracks and all other defects that might affect their serviceability.

### 2.12 Performance Test

The suitability of the retaining rings with regard to uniformity of temper and section shall be determined by the rings being capable of successfully passing the following described tests.

External rings after having been expanded to pass over external gage diameter "E" shall not in the free state be entered by external gage diameter "D" when the axes of the ring and gage are parallel. Internal rings after having been compressed to fit into internal gage diameter "E" shall not in the free state enter internal gage diameter "D" when the axes of the ring and gage are parallel.

### 2.13 Ring Gages

#### 2.13.1 External Ring Gage Diameter E.

The external ring gage diameter  $E$  is equal to the nominal shaft size,  $B_{\text{nom}}$ :

$$E = B_{\text{nom}}$$

#### 2.13.2 External Ring Gage Diameter D.

The external ring gage diameter  $D$  is equal to the minimum recommended groove diameter,  $C_{\text{min}}$ , minus 0.005 times the nominal shaft diameter,  $B_{\text{nom}}$ :

$$D = C_{\text{min}} - 0.005 B_{\text{nom}}$$

#### 2.13.3 Internal Ring Gage Diameter E.

The internal ring gage diameter  $E$  is equal to the nominal housing size,  $B_{\text{nom}}$ :

$$E = B_{\text{nom}}$$

#### 2.13.4 Internal Ring Gage Diameter D.

The internal ring gage diameter  $D$  is equal to the maximum recommended groove diameter,  $C_{\text{max}}$ , plus 0.005 times the nominal housing diameter,  $B_{\text{nom}}$ :

$$D = C_{\text{max}} + 0.005 B_{\text{nom}}$$

### 2.14 Designation

Nominal ring sizes are intended for use on corresponding nominal shaft sizes and housing bores. Where specifying these retaining rings on drawings, parts lists, purchase orders, etc., it is recommended the following data be included in the designation and appear in the sequence shown: Product name (noun first), including the ANSI type designation and series; nominal ring size; material; and protective finish, if required. See examples below:

Ring Type 2A01 Light Duty External Retaining, 1.250, Steel, Cadmium Plated.

Ring Type 2B02 Heavy Duty Internal Retaining, 2.750, Corrosion Resistant Steel