ASME B18.27-1998

REAFFIRMED 2005

REAFFIRMED 2017

REAFFIRMED 2010

FOR CURRENT COMMITTEE PERSONNEL

TAPERED AND REDUCED CROSS SECTION RETAINING RINGS (INCH SERIES)

Incorporating ASME B18.27.1, B18.27.2, B18.27.3, B18.27.4, and B18.27.5

AN AMERICAN NATIONAL STANDARD

The American Society of Mechanical Engineers

AN AMERICAN NATIONAL STANDARD

ASME B18.27a-1999

ADDENDA

to

ASME B18.27-1998
TAPERED AND REDUCED
CROSS SECTION
RETAINING RINGS
(INCH SERIES)

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS
Three Park Avenue • New York, NY 10016

Date of Issuance: May 10, 2000

This code or standard was developed under procedures accredited as meeting the criteria for American National Standards. The Standards Committee that approved the code or standard was balanced to assure that individuals from competent and concerned interests have had an opportunity to participate. The proposed code or standard was made available for public review and comment that provides an opportunity for additional public input from industry, academia, regulatory agencies, and the public-at-large.

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AN AMERICAN NATIONAL STANDARD

ASME B18.27b-2000

ADDENDA

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CROSS SECTION
RETAINING RINGS
(INCH SERIES)

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AN AMERICAN NATIONAL STANDARD

TAPERED AND REDUCED CROSS SECTION RETAINING RINGS (INCH SERIES)

Incorporating ASME B18.27.1, B18.27.2, B18.27.3, B18.27.4, and B18.27.5

ASME B18.27-1998

Date of Issuance: July 30, 1999

The 1998 edition of this Standard is being issued with an automatic addenda subscription service. The use of an addenda allows revisions made in response to public review comments or committee actions to be published as necessary. The next edition of this Standard is scheduled for publication in 2001.

This code or standard was developed under procedures accredited as meeting the criteria for American National Standards. The Standards Committee that approved the code or standard was balanced to assure that individuals from competent and concerned interests have had an opportunity to participate. The proposed code or standard was made available for public review and comment that provides an opportunity for additional public input from industry, academia, regulatory agencies, and the public-at-large.

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The American Society of Mechanical Engineers
Three Park Avenue, New York, NY 10016-5990

ASME B18.27a-1999

Following approval by the ASME B18 Committee and ASME, and after public review, ASME B18.27a-1999 was approved by the American National Standards Institute on May 10, 1999.

Addenda to the 1998 edition of ASME B18.27 are issued in the form of replacement pages. Revisions, additions, and deletions are incorporated directly into the affected pages. It is advisable, however, that this page, the Addenda title and copyright pages, and all replaced pages be retained for reference.

SUMMARY OF CHANGES

This is the first Addenda to be published to ASME B18.27-1998.

Replace or insert the pages listed. Changes given below are identified on the pages by a margin note, **(a)**, placed next to the affected area. The pages not listed are the reverse sides of the listed pages and contain no changes.

Page	*Location*	*Change*
iii	Foreword	Updated to reflect Addenda
ix	Preface	Updated to reflect Addenda
xi	Contents	Updated to reflect Addenda
135–189	ASME B18.27.4	Added

FOREWORD

(a)
(b)

American National Standards Committee B27 for the standardization of plain and lock washers was organized in March 1926 as Sectional Committee B27, under the aegis of the American Standards Association (later the United States of America Standards Institute and, as of October 6, 1969, the American National Standards Institute, Inc.), with the Society of Automotive Engineers and The American Society of Mechanical Engineers as joint secretariats. In 1950, this Committee was designated as responsible for the standardization of washers and machine rings.

At a meeting of ANSI B27 Standards Committee held on February 4, 1971, it was recommended to the secretariats (ASME and SAE) that Subcommittees 1, 2, and 4 on Washers be merged into ANSI B18 Standards Committee and that Subcommittee 3 on Retaining Rings become a separate Standards Committee retaining the B27 designation. This change was subsequently approved by ANSI.

Formation of Subcommittee 1 on Tapered and Reduced Section Retaining Rings was authorized by Standards Committee B27 at its meeting on October 15, 1974. At this meeting, it was decided that no further effort should be expended on inch dimensional products and Subcommittee 1 was assigned the responsibility of preparing American metric standards for tapered and reduced section retaining rings.

Subcommittee 1 prepared a draft proposal, General Purpose Tapered and Reduced Cross Section Retaining Rings, which was balloted on June 16, 1975. At a subcommittee meeting held on February 17, 1976, results from the letter ballot were reviewed. The proposal was accepted by the Subcommittee and presented to the B27 Standards Committee at its May 7, 1976, meeting. At that meeting, a letter ballot of the entire committee was authorized. The Standard was duly approved by the Committee and its sponsors and submitted to the American National Standards Institute for designation as an American Standard. This designation was granted on October 20, 1977.

It was recommended that American National Standards Committee B27 be made part of ASME B18 Main Committee. As a result, Subcommittee 27 of ASME B18 has the responsibility of developing and maintaining standards for retaining rings.

A need evolved for commercial and military requirements to develop inch series standards for General Purpose Tapered and Reduced Cross Section Type Retaining Rings. It was agreed by the ASME B18 Main Committee to have Subcommittee 27 develop these required inch series standards. The first of the inch standards, B18.27.1, covering External Type NA1, Internal Type NA2, and E-Ring Type NA3 rings, was approved by ANSI on July 16, 1998.

The second of the inch standards, B18.27.2, covering Heavy Duty External Type NA4, Reinforced E-Rings NA5, and C-Rings Type NA6, was approved by ANSI on July 16, 1998.

The third of the inch standards, B18.27.3, covering Bowed External Rings NA7, Bowed Internal Rings NA8, and Bowed External E-Rings NA9, was approved by ANSI on July 16, 1998.

The fourth of the inch standards, B18.27.4, covering Inverted External Rings NA10, Inverted Internal Rings NA11, Beveled External Rings NA12, and Beveled Internal Rings NA13, was approved by ANSI on May 10, 1999.

The fifth and final of the inch standards, B18.27.5, covering External Self-Locking Rings Type NA14, External Interlocking Rings Type NA15, and External Bowed Locking Prongs Rings NA16, was approved by ANSI on February 11, 2000.

ASME B18 STANDARDS COMMITTEE
Standardization of Bolts, Nuts, Rivets, Screws, Washers, and Similar Fasteners

(The following is the roster of the Committee at the time of approval of this Standard.)

OFFICERS

D. A. Clever, *Chair*
R. D. Strong, *Vice Chair*
S. W. Vass, *Vice Chair*
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J. G. Zeratsky, National Rivet & Manufacturing Co.

SUBCOMMITTEE 27 — RETAINING RINGS AND RETAINING CLIPS

J. Altman, *Chair,* Rotor Clip Co.
D. A. Clever, Deere & Co.
A. P. Cockman, Ford Motor Co.
A. Herskovitz, U.S. Army
W. H. Kopke, ITW Shakeproof Industrial Products
J. G. Langenstein, Consultant
L. L. Lord, Caterpillar, Inc.
S. Mallo, Meyer Retaining Ring Co.
W. McClelland, Smalley Stell Ring Co.
H. McCormick, C-K Engineering, Inc.
R. Meyer, Meyer Retaining Ring Co.
J. Slass, Rotor Clip Co.
R. Slass, Rotor Clip Co.
R. Swajer, Industrial Retaining Ring Co.

CORRESPONDENCE WITH B18 COMMITTEE

General. ASME Standards are developed and maintained with the intent to represent the consensus of concerned interests. As such, users of this Standard may interact with the Committee by requesting interpretations, proposing revisions, and attending Committee meetings. Correspondence should be addressed to:

Secretary, B18 Main Committee
The American Society of Mechanical Engineers
Three Park Avenue
New York, NY 10016-5990

Proposing Revisions. Revisions are made periodically to the Standard to incorporate changes that appear necessary or desirable, as demonstrated by the experience gained from the application of the Standard. Approved revisions will be published periodically.

The Committee welcomes proposals for revisions to this Standard. Such proposals should be as specific as possible, citing the paragraph number(s), the proposed wording, and a detailed description of the reasons for the proposal, including any pertinent documentation.

Interpretations. Upon request, the B18 Committee will render an interpretation of any requirement of the Standard. Interpretations can only be rendered in response to a written request sent to the Secretary of the B18 Main Committee.

The request for interpretation should be clear and unambiguous. It is further recommended that the inquirer submit his/her request in the following format:

Subject: Cite the applicable paragraph number(s) and the topic of the inquiry.

Edition: Cite the applicable edition of the Standard for which the interpretation is being requested.

Question: Phrase the question as a request for an interpretation of a specific requirement suitable for general understanding and use, not as a request for an approval of a proprietary design or situation. The inquirer may also include any plans or drawings, which are necessary to explain the question; however, they should not contain proprietary names or information.

Requests that are not in this format will be rewritten in this format by the Committee prior to being answered, which may inadvertently change the intent of the original request.

ASME procedures provide for reconsideration of any interpretation when or if additional information that might affect an interpretation is available. Further, persons aggrieved by an interpretation may appeal to the cognizant ASME Committee or Subcommittee. ASME does not "approve," "certify," "rate," or "endorse" any item, construction, proprietary device, or activity.

Attending Committee Meetings. The B18 Main Committee regularly holds meetings, which are open to the public. Persons wishing to attend any meeting should contact the Secretary of the B18 Main Committee.

PREFACE

(a)
(b)

ORGANIZATION OF THIS DOCUMENT

This Standard compiles the following standards:

Standard	*Title*
ASME B18.27.1	External Type NA1, Internal Type NA2, E-Ring Type NA3
ASME B18.27.2	Heavy Duty External Type NA4, Reinforced E-Rings NA5, C-Rings Type NA6
ASME B18.27.3	Bowed External Rings NA7, Bowed Internal Rings NA8, Bowed External E-Rings NA9
ASME B18.27.4	Inverted External NA10, Inverted Internal NA11, Beveled External NA12, Beveled Internal NA13
ASME B18.27.5	External Self-Locking Rings NA14, External Interlocking Rings NA15, External Bowed Locking Prongs Rings NA16

ADDENDA SERVICE

This edition of ASME B18.27-1998 includes an automatic addenda subscription service up to the publication of the next edition. The addenda subscription service will include the additional B18.27 documents not already included in the initial publication and approved revisions to the existing parts.

ASME B18.27b-2000

Following approval by the ASME B18 Committee and ASME, and after public review, ASME B18.27b-2000 was approved by the American National Standards Institute on February 11, 2000.

Addenda to the 1998 edition of ASME B18.27 are issued in the form of replacement pages. Revisions, additions, and deletions are incorporated directly into the affected pages. It is advisable, however, that this page, the Addenda title and copyright pages, and all replaced pages be retained for reference.

SUMMARY OF CHANGES

This is the second Addenda to be published to ASME B18.27-1998. A previous Addenda was published in May 2000.

Replace or insert the pages listed. Changes given below are identified on the pages by a margin note, **(b)**, placed next to the affected area. Previous Addenda changes are indicated by **(a)**. The pages not listed are the reverse sides of the listed pages and contain no changes.

Page	*Location*	*Change*
iii	Foreword	Updated to reflect Addenda
ix	Preface	Updated to reflect Addenda
xi	Contents	Updated to reflect Addenda
4	3.2.1	Revised
5	Table 1	Revised in its entirety
	3.3.1	Revised
191–224	ASME B18.27.5	Added

CONTENTS

(a)
(b)

ASME B18.27.1

EXTERNAL TYPE NA1, INTERNAL TYPE NA2, E-RING TYPE NA3

1 INTRODUCTORY NOTES

1.1 Scope

This Standard covers complete general and dimensional data for three series of general purpose tapered and reduced cross section retaining rings, which may be used with the nominal size shafts and housings listed and in grooves of the recommended dimensions listed. Also included are formulas and tolerances on which dimensional data are based. Three appendices include guidance for assembly and recommended standard drawing formats.

The inclusion of dimensional data in this Standard is not intended to imply that all of the products described are stock production sizes. Consumers should consult with suppliers concerning lists of stock production sizes.

1.2 ISO Standard

There are no existing ISO Standards for these products.

1.3 Ring Types

1.3.1 External Rings. Dimensions of basic external retaining rings and grooves for various shaft sizes are given in Table 6. See Nonmandatory Appendix A for equivalent metric data.

1.3.2 Internal Rings. Dimensions for basic internal retaining rings and grooves for various housing sizes are given in Table 7. See Nonmandatory Appendix C for equivalent metric data.

1.3.3 External E-Rings. Dimensions of E-Type external retaining rings and grooves for various shaft sizes are given in Table 8. See Nonmandatory Appendix E for equivalent metric data.

1.4 Designations

Retaining rings in this Standard shall be designated by the following data in the sequence shown: ring series type number; size; material; protective finish, if required or by, optionally, ASME B18.24.3 PIN Code. See examples below:

NA1-37, Carbon spring steel, phosphate
R271NAA0037NN056NNAA1

NA2-75, Corrosion resistant steel
R271NAB0075NN519NNAB1

NA3-S118, Beryllium copper
R271NACS118NN643NNAA1

1.5 Applicability

The rings covered by 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.

1.6 Dimensions

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

1.7 Supplementary Information

Allowable loads, maximum radii and chamfers, clearance dimensions, and gaging diameters for all three ring series are included in Mandatory Appendices I, II, and III. RPM limits for external basic and external E-rings are included in Mandatory Appendices I and III.

1.8 Reference Standards

Unless otherwise specified, the referenced standard shall be the most recent issue at the time of order placement.

ASTM E 18, Standard Test Method for Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials

ASTM B 117, Standard Practice for Operating Salt Spray (Fog) Testing Apparatus

ASTM A 380, Standard Practice for Cleaning and Descaling Stainless Steel Parts, Equipment, and Systems

ASTM B 695, Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel

ASTM DS-56F/SAE HS-1086, Unified Numbering System (UNS) for Metal and Alloys

Publisher: The American Society for Testing and Materials (ASTM), 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959

2 GENERAL DATA

2.1 Basic Retaining Rings

Type NA1 retaining rings covered by this Standard are spread over a shaft by means of a pliers or special tool and allowed to relax and seat in a circumferential groove, thereby providing an external protruding shoulder that can be used for locating and retaining a part on the shaft.

Type NA2 retaining rings covered by this Standard are compressed into a housing by means of a pliers or special tool and allowed to relax and seat in a circumferential groove, thereby providing an internal protruding shoulder that can be used for locating and retaining a part contained inside of the housing.

In both cases, the rings have a tapered section to provide a more uniform distribution of stresses during expansion or compression.

2.2 E-Type Retaining Rings

Type NA3 retaining rings covered by this Standard contain three prongs connected by a reduced section bridge to provide greater resilience during installation. The rings are installed radially, usually by means of an applicator, and provide a high shoulder for abutment by a retained part.

3 MATERIAL

Standard materials used in the manufacture of the retaining rings shall be carbon spring steel, corrosion-resistant steel, or beryllium copper.

3.1 Carbon Spring Steel

Retaining rings made from carbon spring steel shall conform to the chemical composition of UNS G10600 to UNS G10900 or equivalent and have the following physical properties.

3.1.1 Heat Treatment. The retaining rings shall be heat treated by austempering up to Size 345. For sizes from 350 to 1000, the rings shall be heat treated by either austempering or by quench and temper. All sizes are to be heat treated to the hardness shown in Table 1.

3.1.2 Surface Treatment

3.1.2.1 Phosphate Coating. Finish shall consist of basic zinc phosphate treatment and subsequent supplementary treatment to enhance Shelf Life (example of supplementary treatment: *wax, light drying oil).*

3.1.2.2 Zinc Plating. Finish shall consist of mechanically applied zinc with a dichromate conversion treatment similar to ASTM B 695 Type II, Class 8. The resulting treatment shall be capable of withstanding 72 hours to white corrosion or red rust. Salt spray corrosion resistance test method shall be similar to ASTM B 117.

NOTE: Electroplating has the potential of introducing Hydrogen Embrittlement. Therefore, its application for retaining rings is not allowed.

3.1.2.3 Oil Finish. To extend Shelf Life, rings shall be coated with a thin film of non-tacky water displacing rust preventative oil.

3.2 Corrosion-Resistant Steel

Retaining rings made from corrosion-resistant steel shall conform to the chemical composition of UNS S15700 or equivalent (AISI 632, AMS 5520).

Optional Material: For rings with thickness of 0.062 or greater, retaining rings may be made from UNS S17700.

3.2.1 Heat Treatment. The retaining rings shall be heat treated to the hardness values as specified in Table 2. (b)

3.2.2 Surface Treatment. Retaining rings shall be cleaned free of scale, grease, oil, and other foreign material in conformance to ASTM A 380.

3.3 Beryllium Copper

Retaining rings made from beryllium copper shall conform to the chemical composition of Alloy 25, CDA 172 or equivalent (UNS C17200) and have the following physical properties.