

ASME B107.19-2004
[Revision of ASME B107.19-1993 (R1998)]

Pliers: Retaining Ring

AN AMERICAN NATIONAL STANDARD



**The American Society of
Mechanical Engineers**

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Three Park Avenue • New York, NY 10016

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FOREWORD

The American National Standards Committee B107, Socket Wrenches and Drives, under sponsorship of The American Society of Mechanical Engineers, was reorganized as an ASME Standards Committee and its title was changed to Hand Tools and Accessories. In 1996 its scope was expanded to address safety considerations.

The purposes of this Standard are to define performance and safety requirements specifically applicable to retaining ring pliers and to specify test methods to evaluate performance relating to the defined requirements.

Members of the Hand Tools Institute Pliers Standards Committee have been major contributors to the development of this Standard in their committee work, their knowledge of the products, and their active efforts in the promotion of the adoption of the Standard.

This Standard is a revision of ASME B107.19M-1993 (R1998) Pliers, Retaining Ring. Principal changes in this edition of the Standard are the inclusion of safety considerations and the use of references to ASME B107.25M-1996, Pliers—Performance Test Methods. Updated finish requirements and dimensional data are included.

The format of this Standard is in accordance with *The ASME Codes & Standards Writing Guide 2000*. Requests for interpretations of the technical requirements, and suggestions for the improvement of this Standard should be addressed to The American Society of Mechanical Engineers, Secretary, B107 Standards Committee, Three Park Avenue, New York, NY 10016-5990.

The requirements of this Standard become effective at the time of publication. ASME B107.19-2004 was approved as an American National Standard on May 25, 2004.

ASME B107 STANDARDS COMMITTEE

Hand Tools and Accessories

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

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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, B107 Standards Committee
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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 B107 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 B107 Standards 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 may be rewritten in the appropriate format by the Committee prior to being answered, which may inadvertently change the intent of the original request.

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Attending Committee Meetings. The B107 Standards Committee regularly holds meetings, which are open to the public. Persons wishing to attend any meeting should contact the Secretary of the B107 Standards Committee.

PLIERS: RETAINING RING

1 SCOPE

This Standard provides performance and safety requirements for pliers suitable for inserting and removing internal and external retaining rings including those covered by ASME B18.27. Inclusion of dimensional data in this Standard does not mean that all pliers described herein are stock production sizes. Consumers should consult with manufacturers concerning lists of stock production sizes.

This Standard may be used as a guide by state authorities or other regulatory bodies in the formulation of laws or regulations. It is also intended for voluntary use by establishments that use or manufacture the covered tools.

2 CLASSIFICATION

Type I: Retaining ring, internal

Class 1: With adjustable jaw stop and spring

Style A: Straight tip

Style B: 90 deg tip

Style C: 45 deg tip

Class 2: Without adjustable jaw stop and spring

Style A: Straight tip

Style B: 90 deg tip

Style C: 45 deg tip

Type II: Retaining ring, external

Class 1: With fixed jaw stop and spring

Style A: Straight tip

Style B: 90 deg tip

Style C: 45 deg tip

Class 2: With adjustable jaw stop and spring

Style A: Straight tip

Style B: 90 deg tip

Style C: 45 deg tip

Class 3: Without jaw stop and spring

Style A: Straight tip

Style B: 90 deg tip

Style C: 45 deg tip

Class 4: Grip ring pliers, with adjustable jaw stop and spring

Style B: 90 deg tip

Style C: 45 deg tip

Style E: 20 deg tip

Type III: Retaining ring, external (automotive)

Class 1: Straight jaw

Class 2: Knurled jaw

Type IV: Pliers with replaceable tips

Class 1: With spring

Class 2: With ratchet or with ratchet and spring

Class 3: With double ratchet

Type V: Retaining ring, internal and external (convertible)

Style A: Straight tip

Style B: 90 deg tip

Style C: 45 deg tip

Type VI: Retaining ring, replaceable tips, internal and external (universal)

Class 1: With spring

Style A: Straight tip

Style B: 90 deg tip

Class 2: With spring and adjustable jaw stop

Style A: Straight tip

Style B: 90 deg tip

3 REFERENCES

The following is a list of publications referenced in this Standard.

ASME B18.27-1998, Tapered and Reduced Cross Section Retaining Rings (Inch Series)

ASME B107.25-2002, Pliers: Performance Test Methods
Publisher: The American Society of Mechanical Engineers (ASME), Three Park Avenue, New York, NY 10016-5990; Order Department: 22 Law Drive, Box 2300, Fairfield, NJ 07007-2300

Guide to Hand Tools — Selection, Safety Tips, Proper Use and Care

Publisher: Hand Tools Institute (HTI), 25 North Broadway, Tarrytown, NY 10591

4 DEFINITIONS

convertible: changeable from internal to external setting by disassembly.

shroud: device used to limit tip travel on external ring pliers.

universal: changeable from internal to external setting without disassembly.

Definitions of other terms used within this Standard may be found in ASME B107.25.

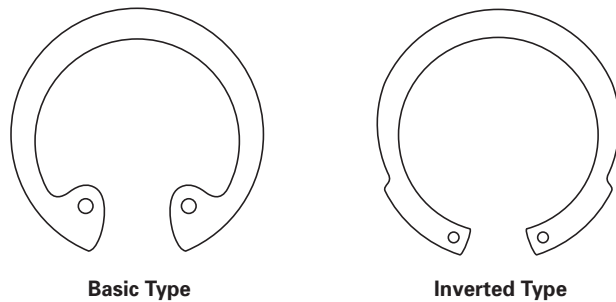


Fig. 1 Internal Retaining Rings

5 REQUIREMENTS

The illustrations shown herein are descriptive and not restrictive, and are not intended to preclude the manufacture of pliers that otherwise comply with this Standard. All figures are shown without comfort grips. Dimensions in tables are in inches unless otherwise indicated, and are for pliers without comfort grips.

5.1 Materials

The materials used in the manufacture of pliers shall be such as to produce pliers conforming to this Standard.

5.2 Design

Pliers shall be similar to the figure to which reference is made and shall be proportioned in all parts so as to be strong, durable, and easy to operate. Pliers shall be designed to install and remove the range of ring sizes specified in the applicable tables. Pliers shall withstand applicable test procedures without cracking or breaking.

5.2.1 Type I, Pliers, Retaining Ring, Internal. Pliers shall have integral tips for compressing internal retaining rings similar to those shown in Fig. 1. Pliers shall pass ring contraction test specified in para. 6.1 and the tip load test specified in para. 6.4.

5.2.1.1 Class 1, With Adjustable Jaw Stop and Spring. Pliers shall conform to the requirements of Table 1 and shall be similar to Fig. 2.

5.2.1.2 Class 2, Without Adjustable Jaw Stop and Spring. Pliers shall conform to the requirements of Table 1 and shall be similar to Fig. 3.

5.2.2 Type II, Pliers, Retaining Ring, External. Pliers shall have integral tips for expanding external retaining rings similar to those shown in Fig. 4. Pliers shall pass the ring expansion test specified in para. 6.2 and the tip load test specified in para. 6.4.

5.2.2.1 Class 1, With Fixed Jaw Stop and Spring. Pliers shall have a cover or stop to prevent over-expansion of rings. Pliers sizes shall conform to the requirements of Table 2 and be similar to Fig. 5.

5.2.2.2 Class 2, With Adjustable Jaw Stop and Spring. Pliers shall conform to the requirements of Table 3 and shall be similar to Fig. 6.

5.2.2.3 Class 3, Without Jaw Stop and Spring. Pliers shall conform to the requirements of Table 3 and be similar to Fig. 7.

5.2.2.4 Class 4, Grip Ring Pliers, With Adjustable Jaw Stop and Spring. Pliers shall be suitable for expanding external grip rings and external heavy-duty-type rings similar to those shown in Fig. 4. Pliers shall conform to the requirements of Table 4 and be similar to Fig. 8.

5.2.3 Type III, Pliers, Retaining Ring, External (Automatic). Pliers shall be provided with a spring for holding the jaws in a closed position. Pliers shall pass the test in para. 6.5.

5.2.3.1 Class 1, Straight Jaw. Pliers shall have tapered jaws. The outside of the jaws at the tip end shall be serrated or knurled. Pliers shall conform to the dimensions shown in Fig. 9.

5.2.3.2 Class 2, Knurled Jaw. Pliers shall be capable of expanding (horseshoe) "C" washers and lock rings, similar to those shown in Fig. 10). The tip end of the jaws shall be at right angles to the longitudinal axis of the jaws, and the outside serrated or knurled. Pliers

Table 1 Type I

Tip Diameter, T +0.002, -0.005	Overall Length, K ± 0.5	Jaw Length, P ± 0.25	Joint Width, S ± 0.188	Handle Span, W ± 0.5	Tip Offset Length, Styles B and C, L	Rings	
						Basic, Bowed, or Beveled Type	Inverted Type
0.025	5.5	1.88	0.75	1.8	0.31 ± 0.06	0.250*-0.312*	N/A
0.038	5.5	1.88	0.75	1.8	0.31 ± 0.06	0.375*-0.562	0.750-1.000*
0.047	5.5	1.88	0.75	1.8	0.31 ± 0.06	0.625*-1.023	1.062-1.375*
0.070	6.4	2.13	0.875	2.0	0.38 ± 0.06	1.062*-1.750	1.438-2.000*
0.090	8.8	2.50	1.125	2.6	0.50 ± 0.13	1.812*-3.000	2.062-3.000*

GENERAL NOTES:

- The K and P dimensions shown are for Style A (straight tip) configuration.
- The asterisk (*) indicates test ring sizes.

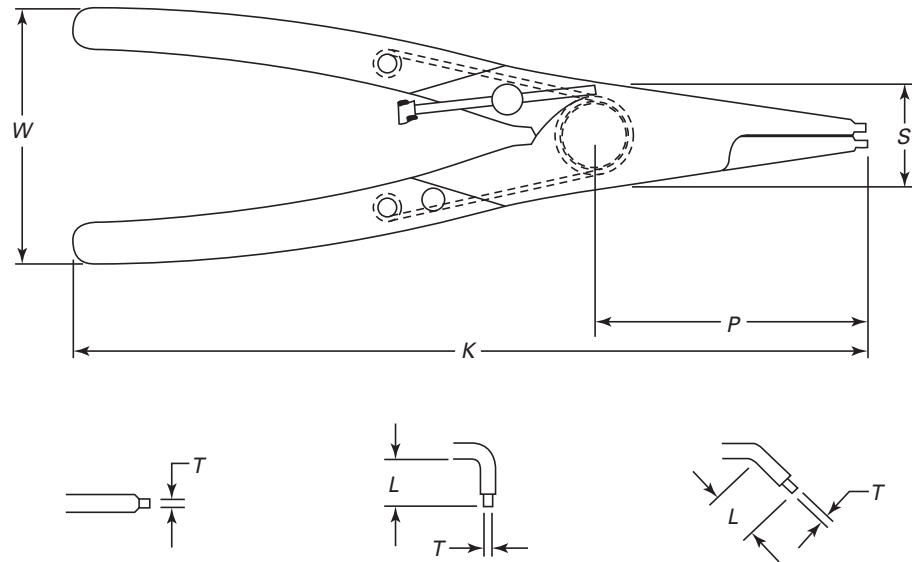
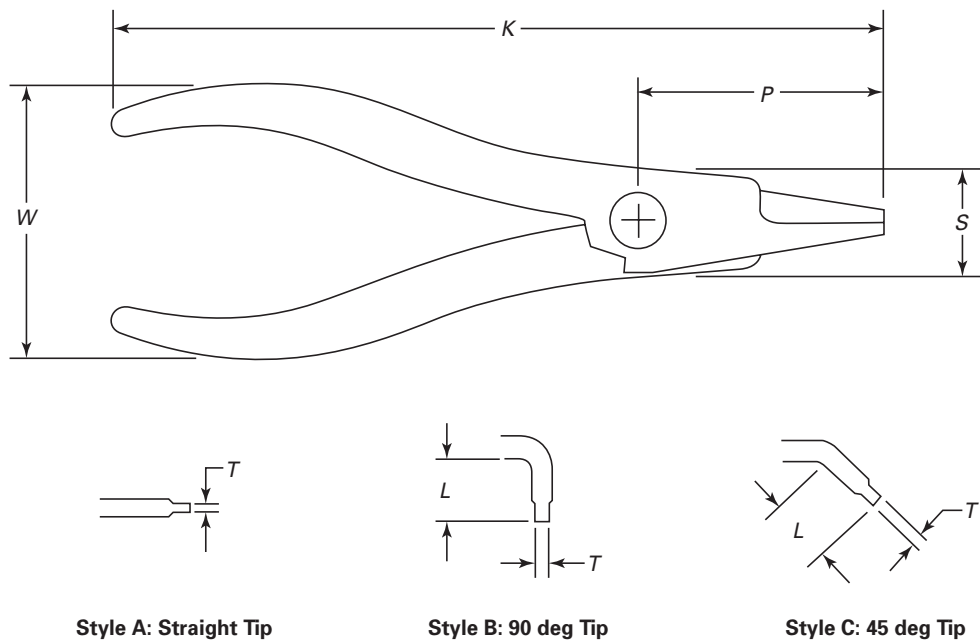
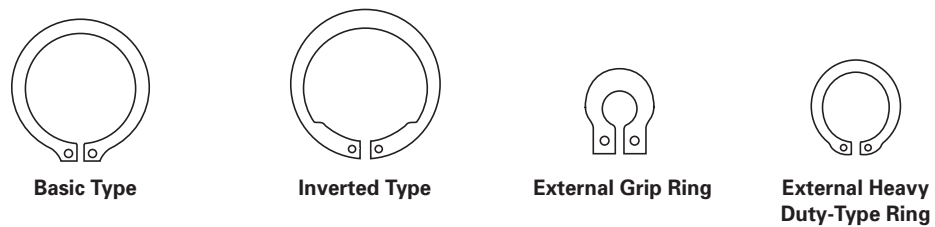
**Fig. 2 Type I, Class 1****Fig. 3 Type I, Class 2****Fig. 4 External Retaining Rings**

Table 2 Type II, Class 1

Tip Dia., <i>T</i> ±0.003	Overall Length, <i>K</i> ±0.13	Shroud Width, <i>S</i> ±0.06	Handle Span, <i>W</i> ±0.13	Shroud Stop Opening, <i>J</i>	Bend Length, Styles B and C, <i>L</i> ±0.06	Nominal Shaft Dia. for External Rings, Basic Type or Bowed Type	Test Ring Size [Note (1)]
0.023	5.31	0.5	1.63	0.115 ± 0.005	0.22	0.125	0.125
0.023	5.31	0.5	1.63	0.143 ± 0.003	0.22	0.156	0.156
0.023	5.31	0.5	1.63	0.184 ± 0.004	0.22	0.188–0.236	0.188, 0.236

GENERAL NOTE: The *J* dimension applies to Style A only.

NOTE:

(1) Test ring shall be of beryllium copper.

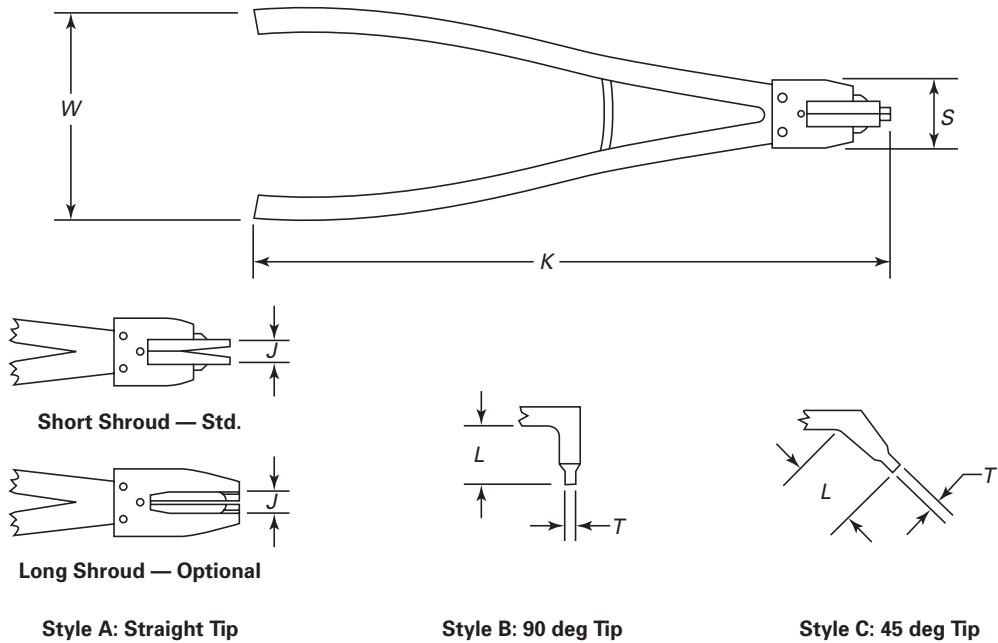


Fig. 5 Type II, Class 1

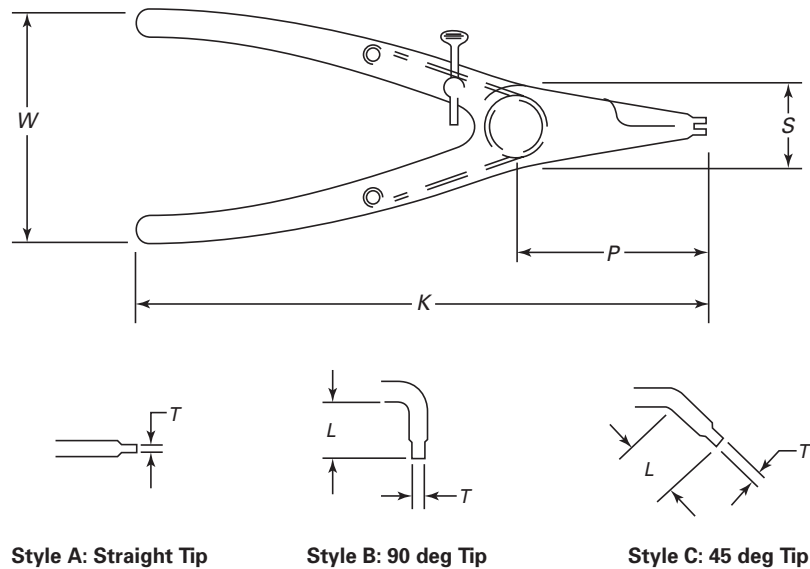


Fig. 6 Type II, Class 2

Table 3 Type II, Classes 2 and 3

Tip Dia., T $+0.002, -0.005$	Overall Length, K ± 0.5	Jaw Length, P ± 0.38	Jaw Width, S ± 0.31	Handle Span, W ± 0.5	Bend Length, Styles B and C, L	Nominal Shaft Dia. for External Rings		Test Ring Sizes	
						Basic, Bowed, or Beveled Type	Inverted Type	Basic, Bowed, or Beveled Type	Inverted Type
0.038	6.0	2.00	0.88	2.5	0.31 ± 0.06	0.250–0.672	0.500–0.781	0.250	0.781
0.047	6.0	2.00	0.88	2.5	0.31 ± 0.06	0.688–0.875	0.812–1.000	0.688	1.000
0.070	6.6	2.38	1.00	2.8	0.41 ± 0.06	0.938–1.438	1.062–2.000	0.938	2.000
0.115	9.0	3.06	1.13	4	0.56 ± 0.13	1.500–3.500	2.125–3.156	1.500	3.156

GENERAL NOTE: The K and P dimensions shown are for Style A (straight tip) configuration.

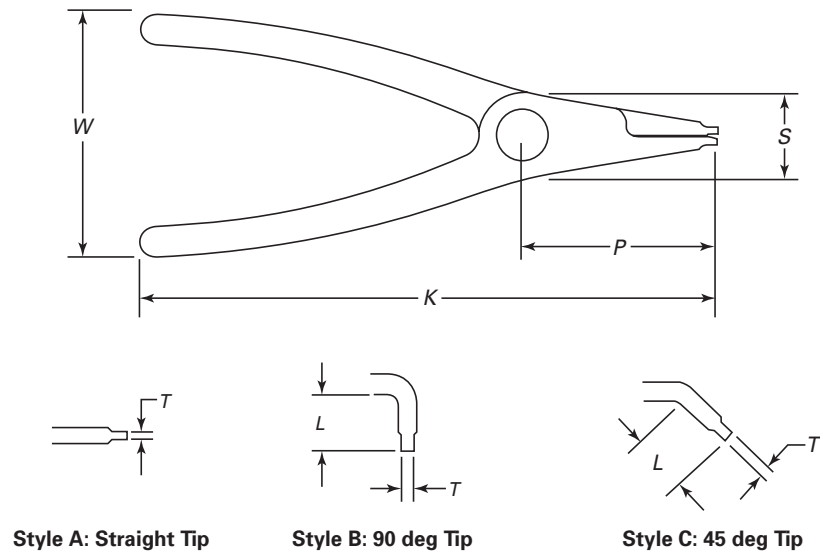


Fig. 7 Type II, Class 3

Table 4 Type II, Class 4

Tip Diameter, <i>T</i> +0.002, −0.005	Overall Length, <i>K</i> ±0.5	Jaw Length, <i>P</i> ±0.25	Jaw Width, <i>S</i> ±0.19	Handle Span, <i>W</i> ±0.5	Bend Length, Styles B and C, <i>L</i>	Nominal Shaft Dia. for External Rings		Test Ring Size	
						Grip Type	Heavy Type	Grip Type	Heavy Type
0.034	5.0	1.06	0.88	2.88	0.31 ± 0.06	0.094	N/A	0.094	N/A
0.040	5.0	1.06	0.88	2.88	0.31 ± 0.06	0.125–0.156	0.394–0.473	0.125	0.473
0.047	5.0	1.06	0.88	2.88	0.31 ± 0.06	0.187–0.250	0.500–0.669	0.187	0.669
0.070	8.8	1.63	0.88	3.88	0.38 ± 0.13	0.313–0.750	0.750–0.984	0.313	0.984

GENERAL NOTE: The *K* and *P* dimensions shown are for Style E (20 deg tip) configuration.

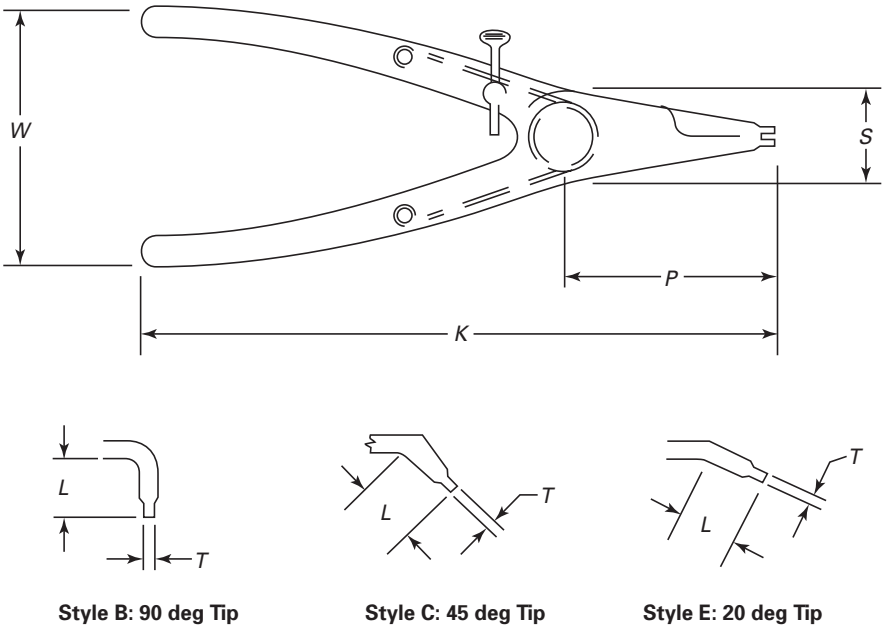


Fig. 8 Type II, Class 4

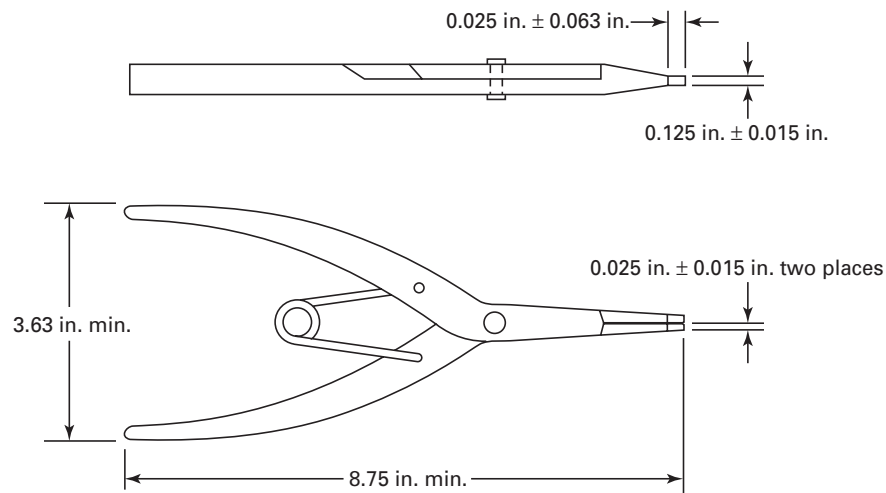


Fig. 9 Type III, Class 1

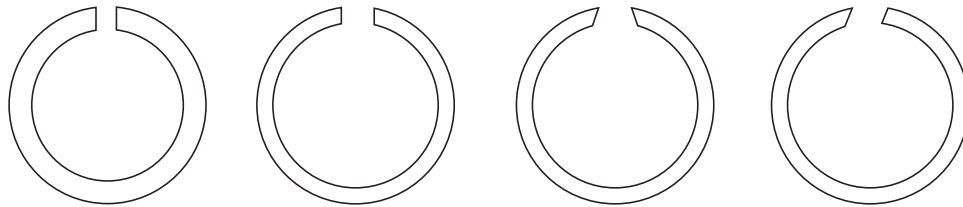


Fig. 10 External Retaining Rings (Lock Ring)

shall conform to the requirements of Table 5 and be similar to Fig. 11.

5.2.4 Type IV, Pliers With Replaceable Tips, Retaining Ring, Internal and External. Pliers shall be of either internal design for compressing rings similar to Fig. 1 or external design for expanding rings similar to Fig. 4. Pliers shall pass the applicable ring contraction test specified in para. 6.1 or the ring expansion test specified in para. 6.2. Pliers shall also pass the tip load test specified in para. 6.4 and the replaceable tip pull-off test specified in para. 6.6.

5.2.4.1 Class 1, With Spring. Pliers shall conform to the dimensions shown in Fig. 12. Replaceable tips shall conform to the requirements of Table 6 and be similar to Fig. 13.

5.2.4.2 Class 2, With Ratchet or With Ratchet and Spring. The ratchet shall be designed in such a manner that the jaw may be locked and released in any position within the capacity of the pliers. The locking arrangement of the ratchet shall be capable of being released with the hand maintaining a grip on the handle. The pliers shall conform to the dimensions in Fig. 14. Replaceable tips shall conform to the dimensions in Table 7 and be similar to Fig. 13.

5.2.4.3 Class 3, With Double Ratchet. The ratchet shall be designed in such a manner that the jaw may be locked and released in any position within the collapsing or expanding capacity of the pliers. The locking arrangement of the ratchet shall be spring-loaded and capable of being released with the hand maintaining a grip on the handle. The pliers shall conform to the re-

Table 5 Type III, Class 2

Tip Width, <i>H</i> ±0.05	Overall Length, <i>K</i> ±1	Jaw Length, <i>P</i> ±0.750	Jaw Opening, <i>C</i>		Max. Tip Notch Depth, <i>Q</i>	Max. Jaw Height, <i>F</i>	Min. Knurl Length, <i>G</i>	Max. Pivot Height, <i>J</i>
			Min.	Max.				
0.055	8	2.5	0.7812	1.75	0.125	0.375	0.375	0.375

GENERAL NOTE: The *C* dimension shall be measured when the handles of the assembled tool are in a fully closed position.

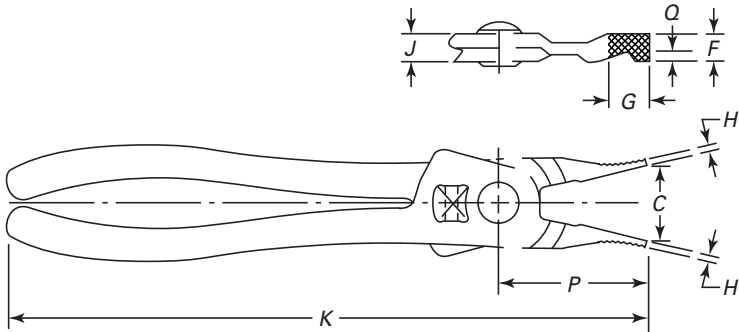
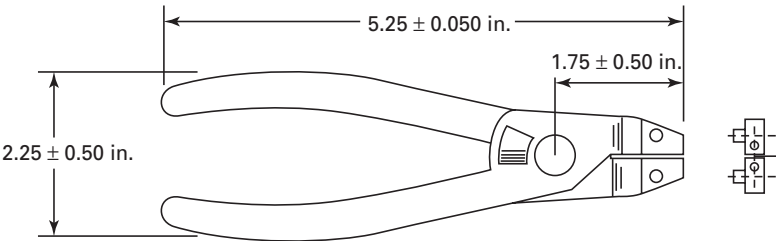
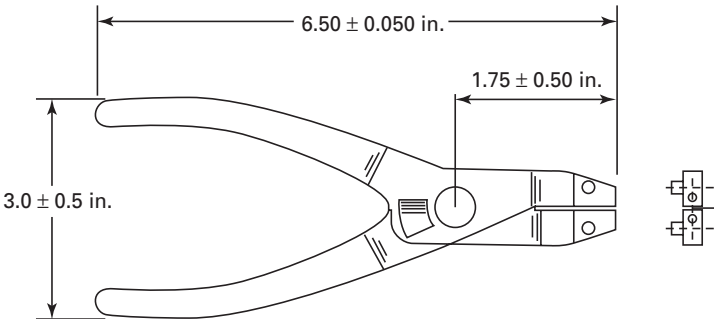


Fig. 11 Type III, Class 2



Internal Retaining Ring Pliers
(Handles Are in Fully Closed Position)



External Retaining Ring Pliers

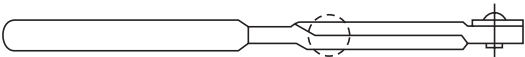


Fig. 12 Type IV, Class 1

Table 6 Replaceable Tips for Type IV, Class 1, and Type VI

Tip Diameter, A	Tip Angle, B deg ± 5	Tip Length, C	Min. Length Bent Portion, D	Min. Length Straight Portion, E	Nominal Housing Diameter for Internal Rings		Nominal Shaft Diameter for External Rings	
					Basic Type	Inverted Type	Basic Type	Inverted Type
0.039 +0/-0.007	0 15 45 90	0.059 +0.01/-0.01	... 0.25 0.25 0.25	1 0.5 0.5 0.5	0.375*-0.438	0.75-1.000*	0.250*-0.469	0.5-0.781*
0.047 +0/-0.007	0 15 45 90	0.074 +0.01/-0.014	... 0.25 0.25 0.25	1 0.5 0.5 0.5	0.453*-0.562	1.062-1.375*	0.500*-0.875	0.812-1.000*
0.074 +0/-0.017	0 15 45 [Note (1)] 90 [Note (1)]	0.086 +0.022/-0.01	... 0.25 0.25 0.25	0.875 0.5 0.5 0.5	1.062*-1.75	1.438-2.000*	0.938*-1.438	1.062-2.000*

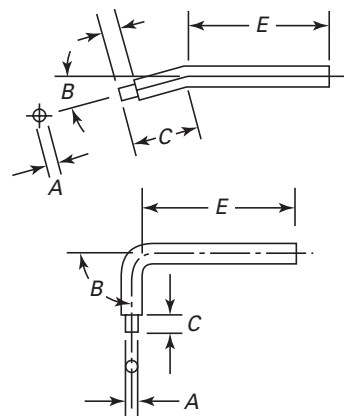
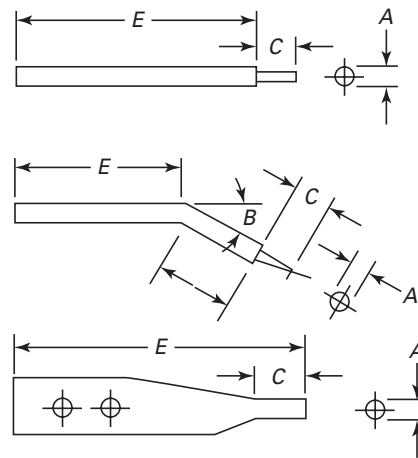
GENERAL NOTES:

(a) The asterisk (*) indicates test ring sizes.

(b) Tips with 15 deg and 45 deg angle exclude radius dimension. Tips with 90 deg angle include radius dimension.

NOTE:

(1) External only.

**Hex Stock for Type IV Class 2 and Type VI****Plate Stock for Type IV, Classes 2 and 3****Fig. 13 Replaceable Tips**

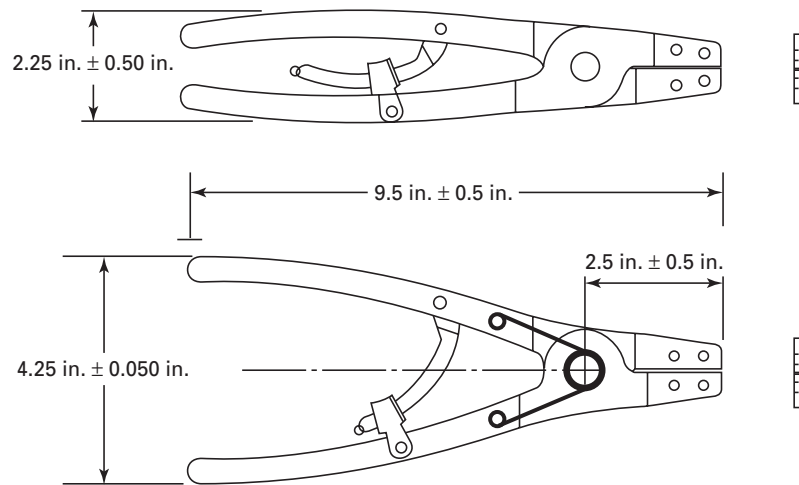


Fig. 14 Type IV, Class 2

Table 7 Replaceable Tips for Type IV, Classes 2 and 3, and Type VI

Tip Dia., <i>A</i> +0.002, −0.005	Tip Angle, <i>B</i> deg ± 5	Tip Length, <i>C</i> +0.024, −0.010	Min. Length Bent Portion, <i>D</i>	Min. Length Straight Portion, <i>E</i>	Nominal Housing Dia. for Internal Rings, in.		Nominal Shaft Dia. for External Rings, in.	
					Basic Type	Inverted Type	Basic Type	Inverted Type
Tips for Type IV, Class 2 and Type VI: Hex Stock								
0.108	15	0.129	0.32	0.950	2.440*–3.125	2.625–3.000*	1.500*–3.500	2.125–3.346*
0.108	45	0.129	0.44	0.920				
0.123	45	0.129	0.44	0.920	3.156*–4.000	3.156–4.000*	1.562*–3.750	3.500–3.750*
Tips for Type IV, Class 2: Plate Stock								
0.108	0	0.147	N/A	2.000	2.440*–3.125	2.625–3.000*	1.500*–3.500	2.125–3.346*
0.108	15	0.147	0.44	1.375				
0.108	45	0.147	0.44	1.375				
0.108	90	0.147	0.44	1.375				
0.120	0	0.160	N/A	2.000	3.156*–4.000	3.156–4.000*	1.562*–3.750	3.500–3.750*
0.120	15	0.160	0.44	1.375				
0.120	45	0.160	0.44	1.375				
0.120	90	0.160	0.44	1.375				
Tips for Type IV, Class 3: Plate Stock								
0.120	0	0.230	N/A	2.225	3.062–6.000*	3.156*–4.000*	3.543*–6.500*	3.500*–3.938*
0.120	45	0.230	0.61	1.500				
0.120	90	0.230	0.61	1.500				
0.150	0	0.230	N/A	2.875	6.250*–10.000*	N/A	N/A	N/A
0.150	45	0.230	1.14	3.000				
0.150	90	0.230	1.14	3.000				
0.170	0	0.230	N/A	3.375	N/A	N/A	6.750*–10.000*	N/A
0.170	45	0.230	1.14	3.625				
0.170	90	0.230	1.14	3.625				

GENERAL NOTE: The asterisk (*) indicates test ring sizes.

quirements of Table 8 and be similar to Fig. 15. Replaceable tips shall conform to the requirements of Table 7 and be similar to Fig. 13.

5.2.5 Type V, Pliers, Retaining Ring, Internal and External (Convertible). Pliers shall have integral tips for compressing internal retaining rings similar to those shown in Fig. 1, and expanding external rings similar to those shown in Fig. 4, except for grip style and heavy-duty rings. Pliers shall pass tests specified in paras. 6.1, 6.2, and 6.4. Pliers shall conform to the requirements of Table 9 and be similar to Fig. 16. Pliers shall have all parts captive with either of the two jaw-handle sections so that it is not necessary to detach any parts from either of the jaw-handle sections to change the pliers setting.

5.2.6 Type VI, Pliers, Retaining Ring, Replaceable Tips, Internal and External (Universal). Pliers shall be suitable for compressing internal retaining rings similar to Fig. 1, and for expanding basic-type and inverted-type rings similar to Fig. 4. The pliers shall pass tests in paras. 6.1 and 6.2. Replaceable tips shall conform to the dimensions in Tables 6 and 7 and Fig. 13. Pliers shall conform to the requirements of Table 10 and be similar to Fig. 17.

5.3 Handles

5.3.1 Characteristics. Handles shall be shaped to provide a comfortable grip and shall be free from rough edges and sharp corners. Outer hand gripping surfaces shall be smooth, knurled, impressed, or furnished with comfort grips.

5.3.2 Comfort Grips. When comfort grips are furnished on handles, they shall be made of rubber, plastic, or other suitable material capable of withstanding normal use without deteriorating or rubbing off and shall pass the solvent resistance test specified in para. 6.7. Comfort grips shall remain permanently attached under normal use.

WARNING: Comfort grips on handles are not intended to give any degree of protection against electric shock and shall not be used on or near live electric circuits.

5.4 Joint

5.4.1 Construction. There shall be no excessive sideways movement, play, or other indication of looseness when pliers are opened or closed that will affect their function.

5.4.2 Fastener Hardness. The fastener hardness shall be from 25 HRC to 50 HRC except that when the fastener receives a case-hardening treatment, a maximum hardness equivalent to 60 HRC shall be permitted.

5.5 Jaws

Jaws shall operate through the required pliers movement without binding and shall be either integral with, or securely affixed to, the handles. Depending on the type and style, the tips of the jaws shall be either integral with, or securely joined to, the jaws.

5.6 Tips

Tips shall have a hardness of 45 HRC to 55 HRC. The tips shall be properly formed to provide for gripping and securely holding the retaining rings. Replaceable tips shall be interchangeable for use with both internal and external pliers, and shall be held by a screw or similar means to ensure retention. Tips shall be within 5 deg of style description.

5.7 Spring

The spring, when supplied, shall be captive, durable, and capable of returning the handles to an open position.

5.8 Jaw Stops

5.8.1 The adjustable jaw stop, when supplied, shall limit jaw travel such that the tip-to-tip distance may be set and changed by the user.

5.8.2 The fixed jaw stop (also referred to as a shroud), when supplied, shall limit the jaw travel to a specific tip-to-tip distance.

5.9 Finish

Surfaces shall have a rust preventive treatment and be essentially free from pits, nodules, burrs, cracks, and other conditions that would adversely affect the performance or safety of the tool. When provided, coatings shall be adherent, smooth, continuous, and free from any conditions that would interfere with their protective value, safety, and function.

Table 8 Type IV, Class 3

Design Type	Dimensions (Less Tips)			To Be Used With Repl. Tip Dia. (See Table 6)	Nominal Housing or Shaft Dia. for Internal or External Rings	
	Overall Length, <i>K</i> ±0.5	Jaw Length, <i>P</i> ±0.5	Handle Span, <i>W</i> ±0.5		Basic	Inverted
Internal	15	3	3.9	0.12	3.062*–6.000*	3.156*–4.000*
External	15	2.8	4.8	0.12	3.543*–6.500*	3.500*–4.000*
Internal	27	3	6.8	0.15	6.250*–10.000*	N/A
External	17.5	2.8	5	0.17	6.750*–10.000*	N/A

- GENERAL NOTES:
- (a) The asterisk (*) indicates test ring sizes.
 - (b) Internal design type dimensions are with pawl in second ratchet notch as shown in Fig. 15.
 - (c) External design type dimensions in fully closed position.

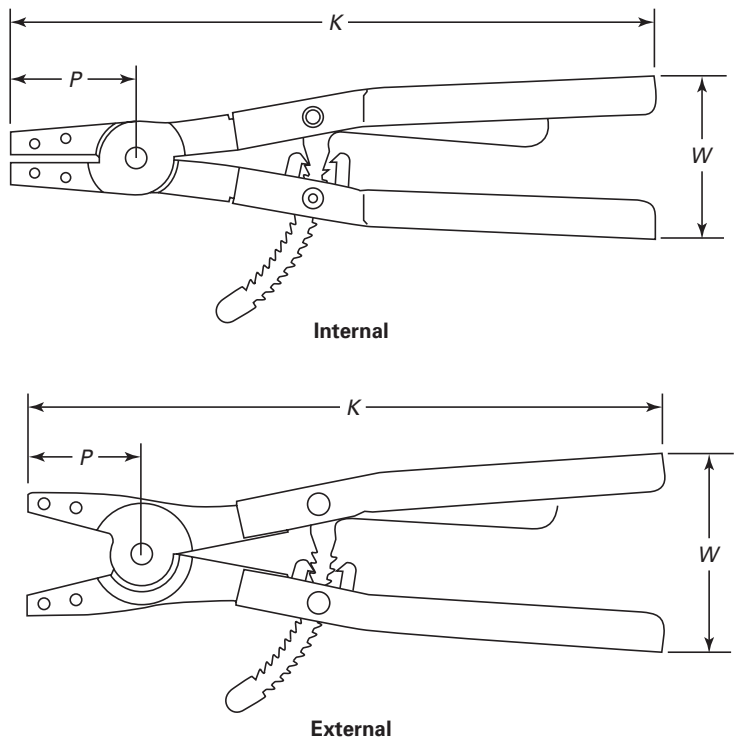


Fig. 15 Type IV, Class 3

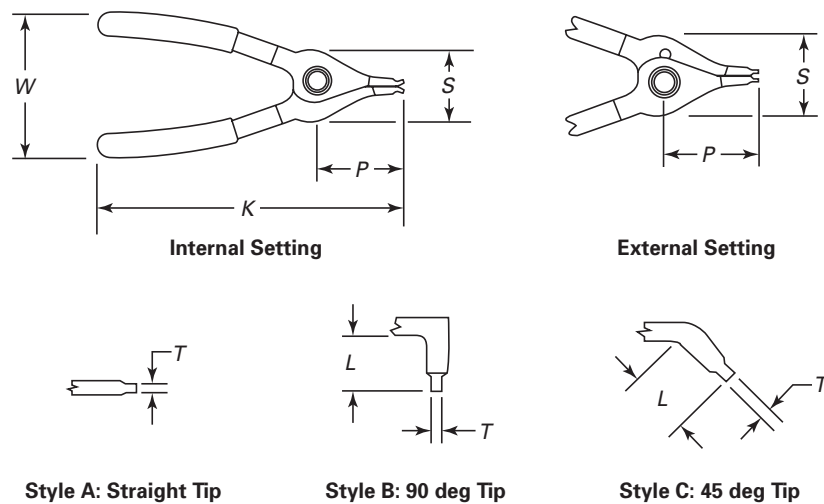
Table 9 Type V

Internal Position Tip Dia., T $+0.002, -0.005$	Overall Length, K ± 0.50	Jaw Length, P ± 0.25	Jaw Width, S ± 0.25	Handle Span, W ± 0.50	Bend Length, L ± 0.06	Housing Diameter for Internal Rings	
						Basic, Bowed, or Beveled Type	Inverted Type
0.038	5.75	1.63	1.19	1.50	0.31	0.375*-0.562	0.750-1.000*
0.047	5.75	1.63	1.19	1.50	0.31	0.626*-1.023	1.062-1.375*
0.070	7.75	1.88	1.44	2.75	0.34	1.062*-1.750	1.438-2.000*
0.090	9.13	2.88	1.75	2.75	0.56	1.812*-3.000	2.062-3.000*

External Position Tip Dia., T $+0.002, -0.005$	Overall Length, K ± 0.50	Jaw Length, P ± 0.25	Jaw Width, S ± 0.25	Handle Span, W ± 0.50	Bend Length, L ± 0.06	Shaft Diameter for External Rings	
						Basic, Bowed, or Beveled Type	Inverted Type
0.038	5.75	1.63	1.25	2.75	0.31	0.250*-0.672	0.500-0.781*
0.047	5.75	1.63	1.25	2.75	0.31	0.688*-0.875	0.812-1.000*
0.070	7.75	1.88	1.63	3.75	0.34	0.938*-1.438	1.062-2.000*
0.090	9.13	2.88	1.88	4	0.56	1.500*-3.500	2.125-3.250*

GENERAL NOTES:

- (a) The K and P dimensions shown are for Style A (straight tip) configuration.
(b) The asterisk (*) indicates test ring sizes.

**Fig. 16 Type V****Table 10 Type VI**

Class	Overall Length, K ± 0.5	Jaw Length, P ± 0.38	Jaw Width, S ± 0.25	Handle Span, W ± 0.5	Features
1	6	1.50	1.0	3	With spring
2	7	1.75	1.3	5	With spring and adjustable jaw stop

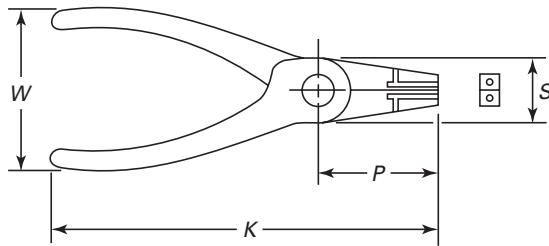


Fig. 17 Type VI

5.10 Marking

Pliers shall be marked in a plain and permanent manner with the manufacturer's name or with a trademark of such known character that the source of manufacture shall be readily determined. Types I, II, and V pliers shall also be marked with the pliers' tip size. Marking shall be as permanent as the normal life expectancy of the pliers to which it is applied (providing the marked surface has not been subjected to a fretting or abrading action) and be capable of withstanding the cleaning procedures normally experienced during its intended use.

6 TEST PROCEDURES

SAFETY WARNING: Many tests required herein are inherently hazardous and adequate safeguards for personnel and property shall be employed in conducting such tests.

6.1 Ring Contraction Test

The test rings used for contraction tests shall comply with ASME B18.27.1 external type NA1, internal type NA2. One contraction of three test rings, of each test ring size specified in the applicable table (1, 6, 7, or 8) for the pliers, shall be performed. The pliers tips shall be fully inserted in the test ring. The ring shall then be contracted by pressure on the pliers handles until the ring lugs contact each other. With the ring lugs contacting each other, the ring shall not become dislodged from the pliers tips when the pliers operator removes his hand from the ring. After completion of the above tests, one new ring of the smallest size, and one new ring of the largest size in the range of the specified pliers, shall be held loosely between the thumb and the forefinger, while the pliers tips are inserted in the ring holes to ensure that there was no pliers tip deformation due to the ring contraction test. Pliers shall exhibit no evidence of cracks or breakage. Types V and VI pliers shall be assembled in the internal position, and there shall be no deformation during this test that would prevent assembly or disassembly.

6.2 Ring Expansion Test

One expansion of three test rings of each test ring size shall be performed. The pliers tips shall be inserted fully in the test ring. The ring shall then be expanded by pressure on the pliers handles until the internal diameter of the ring is at least 1% greater than the diameter of the shaft over which the ring is designed to pass during installation. After completion of the above tests, one new ring of the smallest and one new ring of the largest size, in the applicable size range of the pliers, shall be held loosely between the thumb and forefinger, while the pliers tips are inserted in the ring holes to ensure that there was no pliers tip deformation during the ring expansion test. Pliers shall exhibit no evidence of cracks or breakage.

6.2.1 Types II and IV Pliers. Test rings shall comply with ASME B18.27.1 type NA1 and ASME B18.27.3 type NA7 [see Note (1) of Table 2].

6.2.2 Types V and VI Pliers. Test rings shall comply with ASME B18.27.1 type NA1 and ASME B18.27.3 type NA7. Pliers shall be assembled in the external position, and there shall be no deformation during this test that would prevent assembly or disassembly.

6.3 Hardness Test

The hardness requirements specified in this Standard shall be tested in accordance with ASME B107.25, para. 5.3.

6.4 Tip Load Test, Types I, II, IV, V, and VI

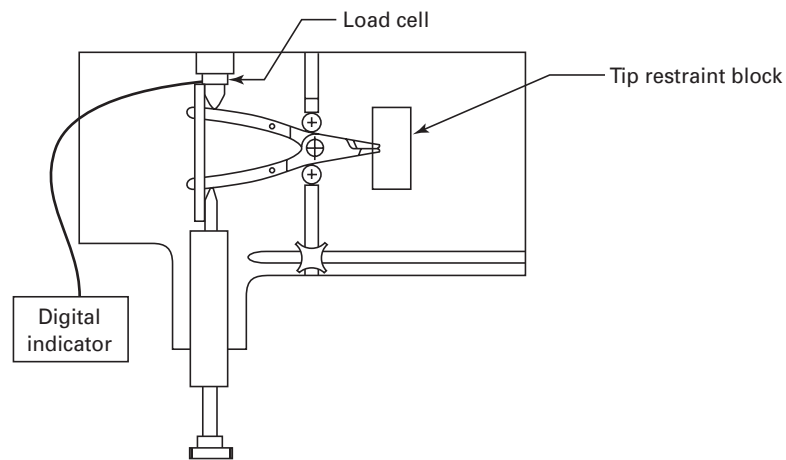
Pliers shall meet the requirements of Table 11. The pliers under test shall be supported in a manner suitable for applying the load properly and determining the tip load (see Figs. 18 and 19). The pliers tips shall be fully inserted in the tip restraint block. Loads shall be applied at the point of maximum-handle curvature. Handle load values shall be determined in accordance with formula $F = (\text{Tip Load} \times N) / H$ (see Fig. 19). If any part of the pliers breaks, cracks, or chips; if the handles contact each other during the test; or if there is permanent tip-to-tip deformation exceeding 0.002 in.; the pliers have failed the test.

6.5 Tip Load Test, Type III

Suitable test equipment shall be used for load testing. The tips shall be fully inserted in the tip restraint block (see Figs. 18 and 19). Handle load of $F \text{ lbf} = 300 \text{ lbf-in.} / H \text{ in.}$ shall be applied at the point of maximum

Table 11 Tip Test Specifications

Nominal Tip Diameter	Tip Restraint Block Hole Size, +0.010, -0.000	Min. Tip Load, <i>L</i> lbf
0.023	0.031	20
0.025	0.031	28
0.034	0.052	60
0.038	0.052	69
0.039	0.052	71
0.040	0.052	73
0.047	0.052	83
0.070	0.098	124
0.074	0.098	130
0.087	0.098	154
0.090	0.098	159
0.108	0.166	174
0.115	0.166	204
0.116	0.166	204
0.120	0.166	212
0.123	0.166	220
0.150	0.166	265

**Fig. 18 Typical Apparatus for Applying Test Loads to Pliers**

handle curvature. Permanent set, as defined in ASME B107.25, shall not exceed 0.060 in. If any part of the pliers breaks, cracks, or chips; if the handles contact each other during the test; the pliers have failed the test.

6.6 Replaceable Tip Pull-Off Test

A 60 lbf load shall be applied to the tips for 5 sec, creating a straight pull-out force. There shall be no tip slippage.

6.7 Solvent Resistance Test

Pliers with comfort grips shall be tested in accordance with ASME B107.25, para. 5.5.1.

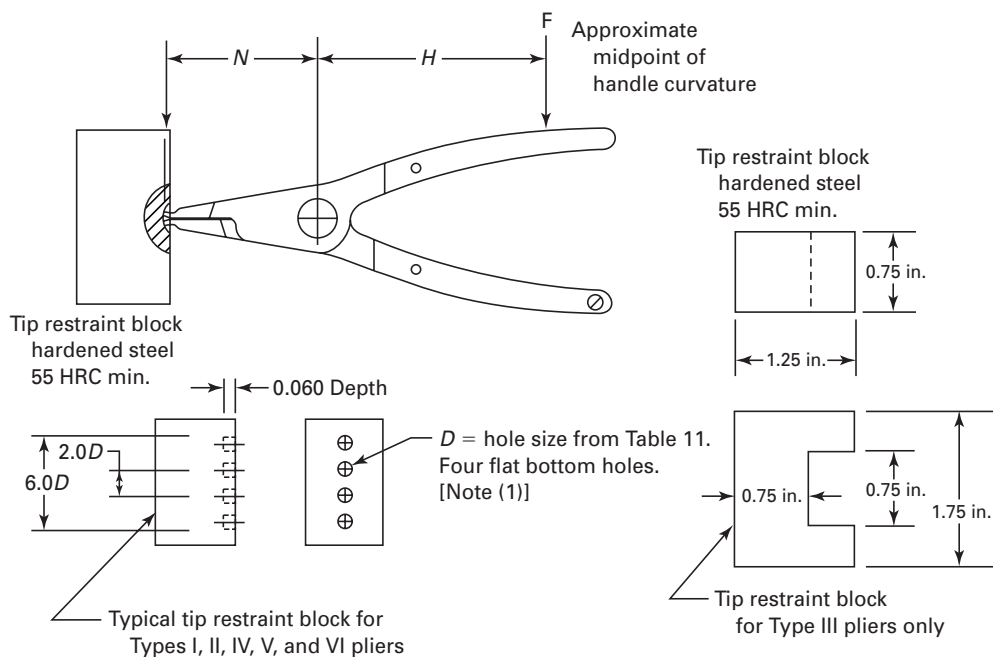
7 SAFETY REQUIREMENTS AND LIMITATIONS OF USE

Instructors and employers shall stress proper use and safety in the use of pliers, information about which can be found in the HTI publication, *Guide to Hand Tools — Selection, Safety Tips, Proper Use and Care*.

8 DESIGNATIONS

Pliers shall be designated by the following data in the sequence shown:

- (a) Type
- (b) Class
- (c) Style
- (d) Nominal tip diameter



GENERAL NOTE: Always test with full tip insertion.

NOTE:

(1) Inner holes for external pliers; gutter holes for internal pliers.

Fig. 19 Tip Load Test Parameters

AMERICAN NATIONAL STANDARDS FOR HAND TOOLS

Socket Wrenches, Hand (Inch Series)	B107.1-2002
Socket Wrenches, Extensions, Adaptors, and Universal Joints, Power Drive (Impact) (Inch Series)	B107.2-2002
Driving and Spindle Ends for Portable Hand, Impact, Air, and Electric Tools (Percussion Tools Excluded)	B107.4M-1995
Socket Wrenches, Hand (Metric Series)	B107.5M-2002
Adjustable Wrenches	B107.8-2003
Handles and Attachments for Hand Socket Wrenches—Inch and Metric Series	B107.10M-1996
Pliers: Diagonal Cutting and End Cutting	B107.11-2002
Nutdrivers (Spin Type, Screwdriver Grip) (Inch Series)	B107.12-2004
Pliers: Long Nose, Long Reach	B107.13-2003
Hand Torque Tools	B107.14M-1994
Flat Tip Screwdrivers	B107.15-2002
Shears (Metal Cutting, Hand)	B107.16M-1998 (R2004)
Gages, Wrench Openings, Reference	B107.17M-1997
Pliers: Wire Twister	B107.18-2003
Pliers: Retaining Ring	B107.19-2004
Pliers: Lineman's, Iron Worker's, Gas, Glass, Fence, and Battery	B107.20-2004
Wrench, Crowfoot Attachments	B107.21-1998
Electronic Cutters	B107.22M-1998
Pliers: Multiple Position, Adjustable	B107.23-2004
Locking Pliers	B107.24-2002
Pliers: Performance Test Methods	B107.25-2002
Pliers: Multiple Position, Electrical Connector	B107.27-2003
Electronic Torque Instruments	B107.28M-1997
Electronic Tester, Hand Torque Tools	B107.29M-1998
Cross Tip Screwdrivers	B107.30-2002
Screwdrivers, Cross Tip Gaging	B107.31M-1997
Socket Wrenches, Impact (Metric Series)	B107.33M-2002
Socket Wrenches for Spark Plugs	B107.34-2003
Nut Drivers (Spin Type, Screwdriver Grip) (Metric Series)	B107.35M-1997
Pliers: Locking, Clamp, and Tubing Pinch-Off	B107.36-2002
Pliers: Wire Cutters/Strippers	B107.37-2003
Electronic Pliers	B107.38M-1998
Nail Hammers: Safety Requirements	B107.41-2004
Hatchets: Safety Requirements	B107.42M-1997 (R2004)
Wood-Splitting Wedges	B107.43-2002
Glaziers' Chisels and Wood Chisels	B107.44-2002
Ripping Chisels and Flooring/Electricians' Chisels	B107.45-2002
Stud, Screw, and Pipe Extractors: Safety Requirements	B107.46-2004
Metal Chisels: Safety Requirements	B107.47M-1998
Metal Punches and Drift Pins: Safety Requirements	B107.48M-1998
Nail Sets: Safety Requirements	B107.49M-1998
Brick Chisels and Brick Sets: Safety Requirements	B107.50M-1998
Star Drills: Safety Requirements	B107.51-2001
Nail-Puller Bars: Safety Requirements	B107.52M-1998
Ball Peen Hammers: Safety Requirements	B107.53-2004
Heavy Striking Tools: Safety Requirements	B107.54-2001
Axes: Safety Requirements	B107.55M-2002
Body Repair Hammers and Dolly Blocks: Safety Requirements	B107.56-1999
Bricklayers' Hammers and Prospecting Picks: Safety Requirements	B107.57-2001
Riveting, Scaling, and Tinner's Setting Hammers: Safety Requirements	B107.58M-1998
Slugging and Striking Wrenches	B107.59-2002
Pry Bars	B107.60-2004
Wrenches	B107.100-2002

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