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Mechanical Engineers

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PLIERS: WIRE CUTTERS/ STRIPPERS

ASME B107.37-2003

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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 general data, dimensional data, and safety considerations specifically applicable to wire cutters/strippers, and to specify test methods to evaluate performance relating to the defined requirements.

The format of this Standard is in accordance with *The ASME Codes & Standards Writing Guide*.

The requirements of this Standard become effective at the time of publication. ASME B107.37-2003 was approved as an American National Standard on May 1, 2003.

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Hand Tools and Accessories

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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
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 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 will be rewritten in this 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: WIRE CUTTERS/STRIPPERS

1 SCOPE

This Standard provides performance and safety requirements for wire strippers, and the cutting and stripping functions of multipurpose tools, for use on solid and stranded copper wire. 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 tools covered.

2 CLASSIFICATION

Type I: Wire strippers, pivoting handles

Class 1: for general-purpose insulation

Class 2: for polytetrafluoroethylene (Teflon®) insulation, MIL-W-16878 Types E and EE¹

Type II: Wire cutters/strippers, flat jaws and handles

Class 1: small frame, strippers forward of pivot, nonadjustable, with spring and lock optional

Class 2: large frame, strippers forward of pivot

Class 3: large frame, strippers rear of pivot

Class 4: small frame, strippers forward of pivot, adjustable size, with spring and lock optional

3 REFERENCES

The following documents form a part of this Standard to the extent specified herein. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this Standard are encouraged to investigate the possibility of applying the most recent editions of the documents indicated below.

ASME B46.1-2002, Surface Texture (Surface Roughness, Waviness, and Lay)²

ASME B107.25-2002, Pliers: Performance Test Methods²
 Publisher: The American Society of Mechanical Engineers (ASME International), Three Park Avenue, New

¹ Teflon is a registered trademark of E. I. du Pont de Nemours and Co.

² May also be obtained from American National Standards Institute, 25 West 43rd Street, New York, NY 10036.

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

MIL-W-16878, Wire, Electrical Insulated, High Temperature

Publisher: Department of Defense, Standardization Documents Order Desk, Building 4/D, 700 Robbins Avenue, Philadelphia, PA 19111-5094

4 DEFINITIONS

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

5 REQUIREMENTS

5.1 Illustrations

Illustrations shown herein are descriptive, not restrictive, and are not intended to preclude the manufacture of strippers otherwise in accordance with this Standard. Dimensions are without comfort grips.

5.2 Material

Material used in the manufacture of pliers shall be such as to produce pliers conforming to the requirements specified herein.

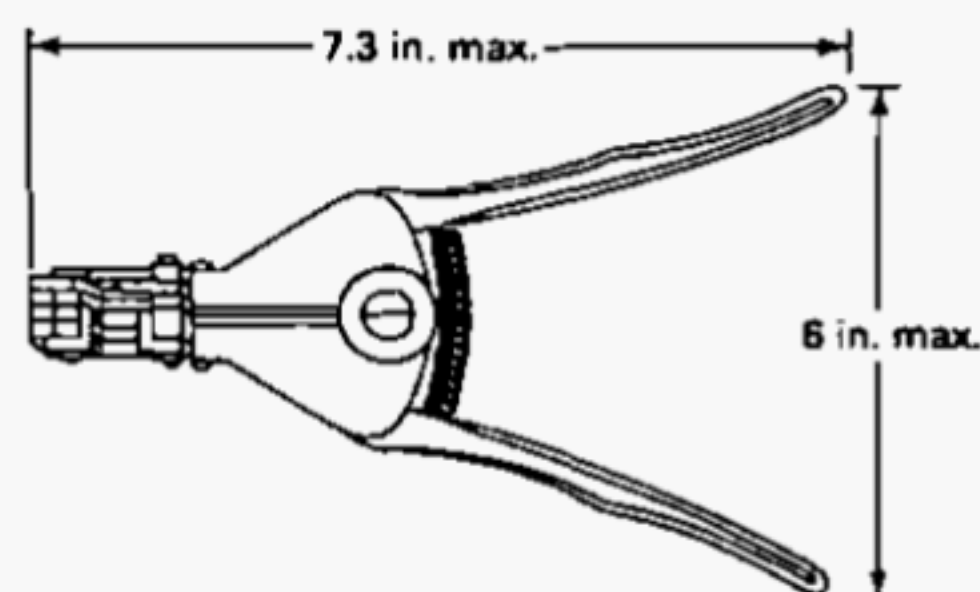
5.3 Design

Pliers shall be similar to the figure to which reference is made; shall be proportioned in all parts so as to be strong, durable, and easy to operate; and shall conform to the requirements specified herein. Strippers shall remove insulation in a neat and uniform manner without damaging the conductor, with a maximum of 35 lbf applied at the point of maximum handle curvature, or at the intended load point if there is no curvature. Pliers shall withstand applicable test procedures without cracking or breaking.

5.3.1 Type I, Wire Strippers, Pivoting Handles. Type I pliers shall strip the insulation from the wire on the compression stroke, leaving the wire either fully or partially stripped and free from damage of any sort.

Table 1 Type I, Class 1 Blade Sizes and Capacity

Blade Size	Wire Sizes (AWG)	Wire Type
1	8, 10	Solid and stranded
4	8	Solid
4	10, 12, 14, 16, 18, 20, 22	Solid and stranded
5	14, 16, 18, 20, 22, 24, 26, 28, 30	Solid and stranded

**Fig. 1 Type I, Class 1, Wire Cutter/Stripper, Pivoting Handle**

(a) Class 1, for general-purpose insulation, shall be capable of removing a minimum of 0.75 in. of insulation from general-purpose solid and stranded copper wire. Strippers shall consist essentially of a body, handles, stripping blades, serrated gripping jaws, and automatic stop return, and be similar to Fig. 1. Pliers shall be equipped with blades conforming to one of the sizes specified in Table 1.

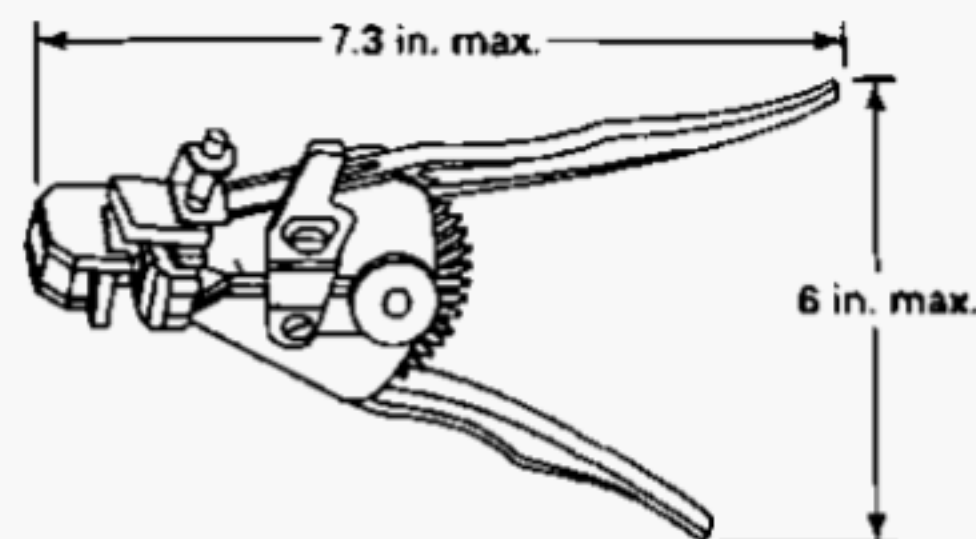
(1) The stripping blades shall have a sufficient number of adequately spaced grooves to accommodate the range of wire sizes specified in Table 1 without the necessity of making adjustments in any way.

(2) Pliers shall be provided with a device to stop return of the arms until after the stripped wire is removed. The stripper shall release the wire from the gripping jaws on partial release of compression and simultaneously hold the stripping jaws open to prevent crushing of the wire. Stripping and gripping jaws shall automatically return to the original stripping position as release of the compression is completed. Action shall be such that fine and stranded wires shall not be bent or mushroomed.

(b) Class 2 shall be designed for removal of polytetrafluoroethylene (Teflon®) insulation, MIL-W-16878 Types E (200°C, 600 V) and EE (200°C, 1,000 V), which requires an unusual amount of precision and rigidity in the stripping operation. Pliers shall consist essentially of a body, handles, stripping blades, gripping jaws, an automatic stop return, an optional short latch, and a stripping

Table 2 Type I, Class 2 Blade Sizes and Capacity

Blade Size, 600 V Insulation	Blade Size, 1,000 V Insulation	Wire Sizes (AWG)	Wire Type
1E	1EE	10, 12, 14	Stranded
2E	2EE	16, 18, 20, 22, 24, 26	Stranded
3E	3EE	26, 28, 30	Stranded

**Fig. 2 Type I, Class 2, Wire Stripper for Teflon® Insulation, MIL-W-16878 Types E and EE**

length stop, and be similar to Fig. 2. Pliers shall be equipped with blades conforming to one of the sizes specified in Table 2.

(1) Stripping blades shall be in accordance with subparagraph (a)(1) above and have a sufficient number of adequately spaced grooves to accommodate the range of wire sizes specified in Table 2 without the necessity of making adjustments in any way. The blades shall be installed in matched pairs (upper and lower). Support and guidance shall be provided to ensure proper blade alignment when the upper and lower blades are closed on the wire. The stripping blades shall be designed to both cut and accurately position the insulation immediately surrounding the particular place on the wire that is being stripped. The applicable size of blades shown in Table 2 shall also be permanently and legibly marked in a plainly visible place on the blades for each stripper.

(2) The stationary gripping jaw shall lie in a plane approximately parallel to the centers of the stripping holes so that the wire to be stripped will be properly aligned with the applicable groove.

(3) The automatic stop return shall be in accordance with subparagraph (a)(2) above.

(4) Strippers may be provided with a short stop latch that shall be easily engaged or disengaged, at the option of the user. When engaged, this short stop latch shall limit the strippers' length of stroke to approximately 0.25 in., so that the portion of the insulation on a wire usually stripped off may be severed but only partially removed. This separated piece of insulation may be left to temporarily protect the stripped end of the wire from damage, and may be removed by the

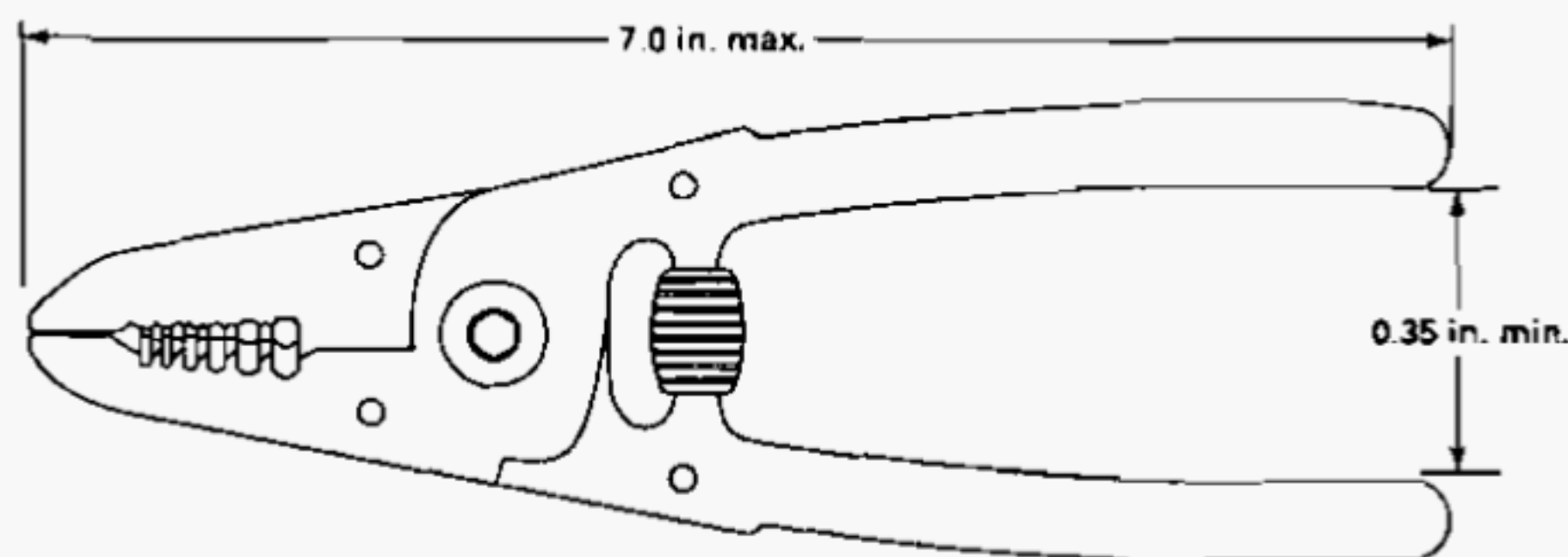


Fig. 3 Type II, Class 1, Wire Cutter/Stripper, Small Frame, Strippers Forward of Pivot, Nonadjustable, With Spring and Lock Optional

operator's fingers when it is no longer needed. This short stop latch shall also incorporate a device that shall function within the limited stroke imposed by the short stop latch and shall be similar to, but independent of, the automatic stop return described in subparagraph (a)(2) above. When the short stop latch is disengaged, it shall in no way interfere with the operation of the wire stripper.

(5) A stripping length stop may be provided so that the ends of the wires may be repeatedly stripped to a predetermined length. This stop shall be adjustable so that any desired stripping length from 0.25 in. through 1.0 in. may be selected and easily set. This stop shall be constructed or designed so that no position in its range will obstruct the operator's view of the grooves and markings on the stripping blades as they close on the wire.

5.3.2 Type II, Wire Cutters/Strippers, Flat Jaws and Handles. Type II pliers shall be fabricated by joining two halves using flat, one-piece, jaw/handle construction. The joint shall serve as a pivot point, holding both halves of the strippers together. These strippers shall strip general-purpose solid and/or stranded copper wire. The wire to be stripped shall be placed in the applicable groove size, the pliers closed against a positive stop (Class 4 excluded), and the insulation slug pulled off the conductor. Type II strippers shall consist essentially of jaws and handles with comfort grips and be similar to Figs. 3 through 6.

Class 1, 2, and 3 stripping edges shall provide various sizes of grooves suitable for stripping the type and range of wire sizes specified in Table 3. A groove size shall be provided for applicable wire gage sizes. Each groove shall be accurate for the size marked. Pliers shall also provide a straight, smooth cutting or shearing surface that shall be at least 0.30 in. long. A hole approximately 0.13 in. in diameter and suitably located for loop bending of stripped conductors may be provided.

Class 4 stripping edges are forward of the pivot and shall have an adjustable groove suitable for stripping

the type and range of wire sizes specified in Table 3. Pliers shall also provide a straight, smooth cutting or shearing surface that shall be at least 0.30 in. long. A hole approximately 0.13 in. in diameter and suitably located for loop bending of stripped conductors may be provided.

5.4 Handles

5.4.1 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.

5.4.2 Strength. There shall be no evidence of cracks or breakage during the load test specified in para. 6.3.

5.4.3 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. 6.4. 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.

5.5 Joint

5.5.1 Construction. There shall be no excessive sideways movement, play, or other indication of looseness that will affect pliers' function when they are opened or closed. Pliers shall pass the joint integrity test specified in para. 6.5.

5.5.2 Fastener Hardness. The fastener hardness shall be from 25 to 55 HRC, except that when the fastener receives a case-hardening treatment, a maximum hardness equivalent to 60 HRC shall be permitted.

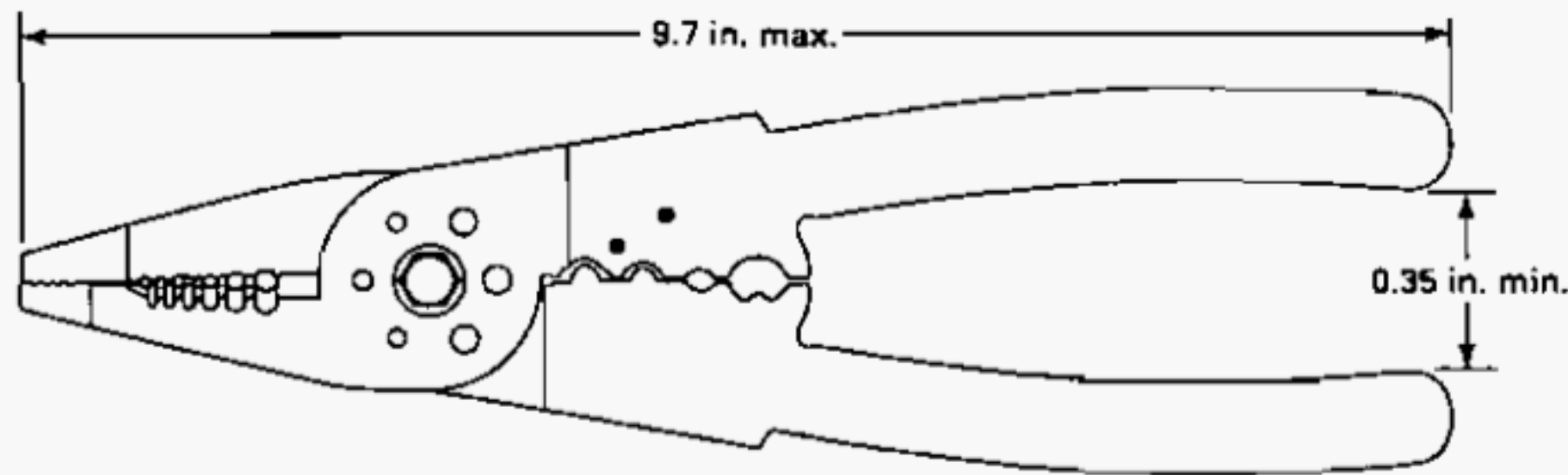


Fig. 4 Type II, Class 2, Wire Cutter/Stripper, Large Frame, Strippers Forward of Pivot

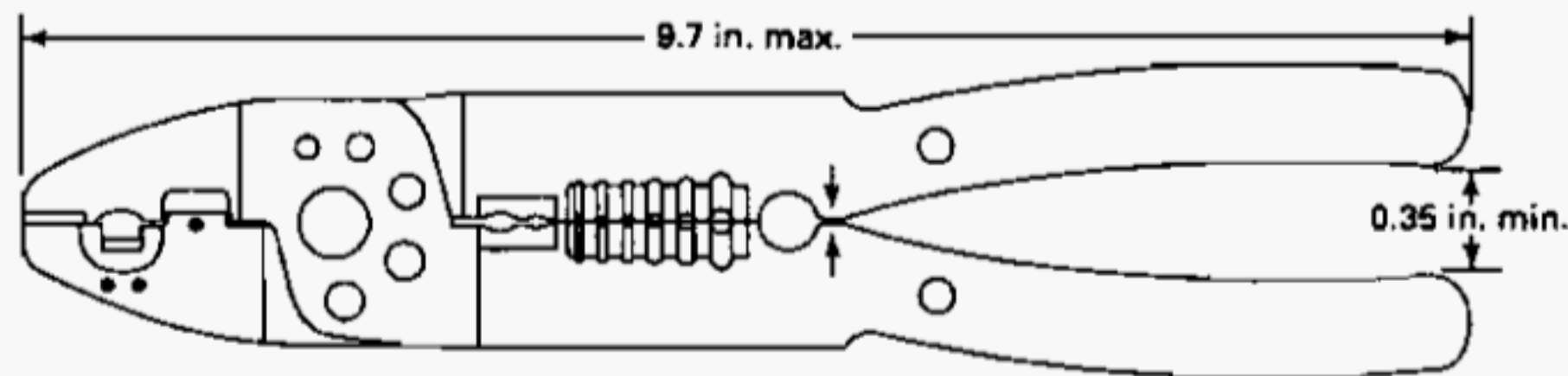


Fig. 5 Type II, Class 3, Wire Cutter/Stripper, Large Frame, Strippers Rear of Pivot

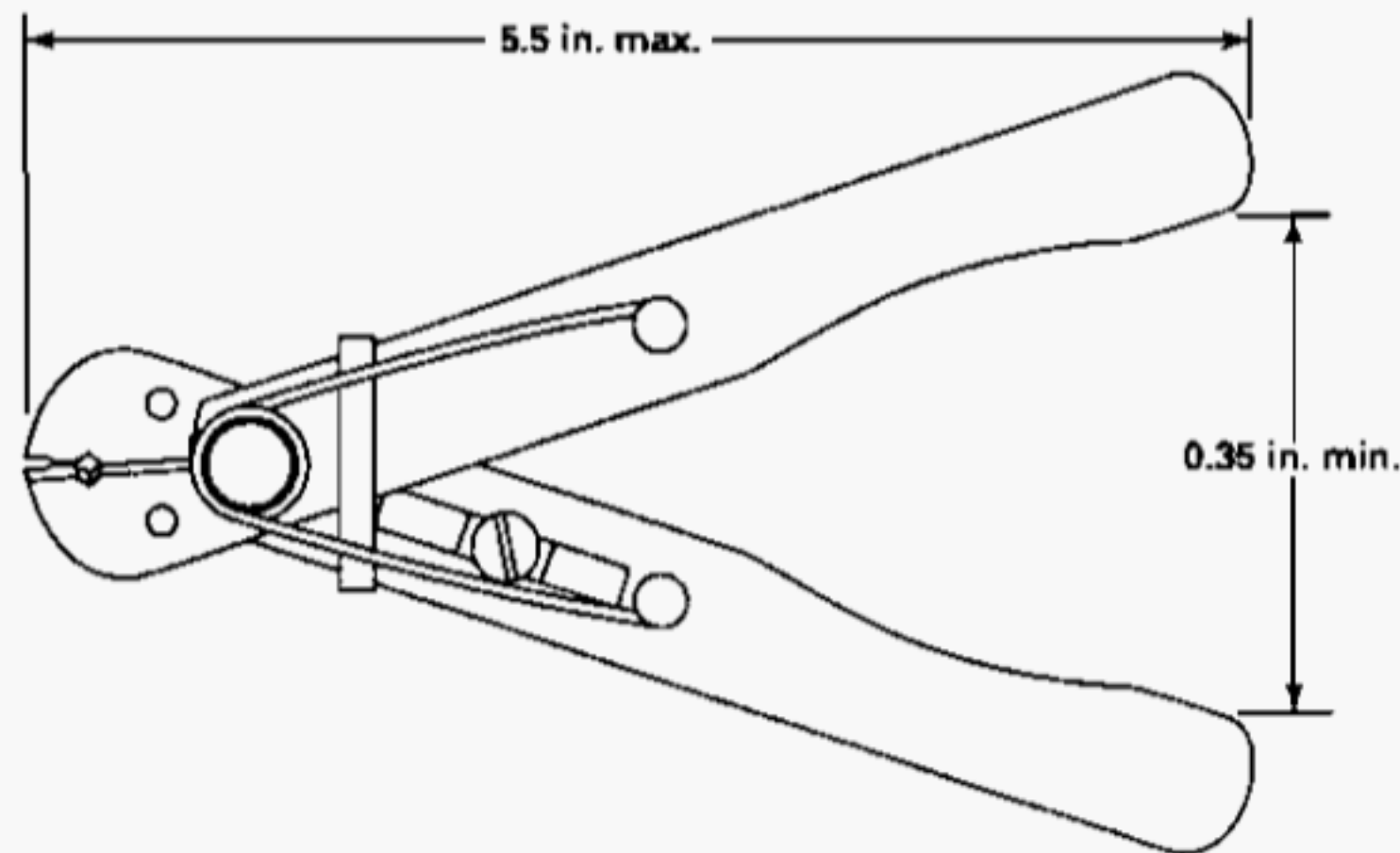


Fig. 6 Type II, Class 4, Wire Cutter/Stripper, Small Frame, Strippers Forward of Pivot, Adjustable Size, With Spring and Lock Optional

Table 3 Type II Blade Sizes and Capacity

Class	Wire Sizes (AWG)	Wire Type
1	8, 10, 12, 14, 16	Solid and stranded
1	16, 18, 20, 22, 24, 26	Solid and stranded
1	22, 24, 26, 28, 30	Solid and stranded
1, 2	10, 12, 14, 16, 18, 20	Solid and stranded
2, 3	10, 12, 14, 16, 18, 20/22	Solid and stranded
3	10, 12, 14, 16, 18	Solid and stranded
3	12, 14, 16	Solid and stranded
4	12 through 26 (adjustable)	Solid

5.6 Jaws/Blades

5.6.1 Jaw Opening. Jaws shall open in a smooth and uniform manner to allow insertion of maximum rated unstripped wire size.

5.6.2 Characteristics. There shall be no excessive movement, play, or other indication of looseness of jaws that will affect pliers' function when they are in use.

5.6.3 Gripping jaws. Type I, Class 1 and 2 jaws shall have continuous and uniform projections and shall be designed to firmly grip but not damage the wire insulation.

5.6.4 Hardness. Stripping and cutting surface hardness shall be 50–59 HRC. Hardness determination shall be taken within 0.125 in. of stripping/cutting edges.

5.6.5 Cut Test. Cutting blades shall pass the cut test in para. 6.1.

5.7 Spring

When a spring is furnished, it shall be captive, durable, and capable of opening the jaws under normal use. The spring shall open the jaws to allow insertion of maximum rated stripped wire size.

5.8 Finish

5.8.1 Appearance. All surfaces shall be free from pits, burrs, cracks, and other conditions that may adversely affect appearance or performance. Ground surfaces shall have a maximum surface roughness of 150 μ in. R_a (arithmetic average), with a cutoff length of 0.03 in. Surfaces shall be tested in accordance with ASME B46.1.

5.8.2 Coating. All steel surfaces shall be coated to prevent rust. Coating shall be adherent, smooth, continuous, and free from pits, blisters, nodules, and any other conditions that would interfere with their protective value and serviceability.

5.9 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 manufacturer and country of origin shall be readily determined. Gage size of the applicable wires shall be permanently and legibly marked, and plainly visible on the face of the blade or jaw, just above or adjacent to the applicable stripping area (except for Type II, Class 4 strippers).

6 TEST PROCEDURES

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

6.1 Cut Test

6.1.1 Wire Cut Test. All pliers with cutters shall cut cleanly through both the insulation and wire of all sizes specified in the applicable tables. The cut test shall be performed three times without damage to the cutting edge.

6.1.2 Stripping Test. All pliers shall be tested by stripping wire sizes specified in the applicable tables. After stripping, the copper wire shall not be nicked, cut, bent, or mushroomed. Upon completion of the test, there shall be no evidence of nicking, chipping, or dulling of the blade; loosening of handles; failure of rollers to rotate freely; scoring or loosening of pins and rivets; or any permanent deformation resulting from test.

Table 4 Handle Load Test

Type	Class	Load, lbf	Max. Permanent Set, in.
I	1, 2	50	0.06
II	1	91	0.06
II	2	63	0.06
II	3	48	0.06
II	4	45	0.06

(a) Type I pliers shall be tested by stripping appropriate wire according to blade size, as specified in Table 1 or Table 2. This stripping test shall be conducted by stripping a minimum of 0.75 in. of insulation from three ends of wires for each size groove within the capacity of the stripper being tested. If a short stop latch is supplied, this test shall be conducted with the short stop latch disengaged and then repeated with the short stop latch engaged.

(b) Type II pliers shall be tested by stripping wire specified in Table 3. This stripping test shall be conducted by stripping a minimum of 0.75 in. of insulation from three ends of wires for each size groove within the capacity of the stripper being tested. The insulation shall be removed with a maximum pull-off force of 20 lb while the handles are clamped, without rotary motion of the tool or wire.

6.2 Hardness Test

Hardness shall be tested in accordance with ASME B107.25, para. 5.3.

6.3 Handle Load Test

Pliers shall be tested, using Table 4, in accordance with ASME B107.25, para. 5.1. If the permanent set exceeds the amount specified, the pliers shall be considered to have failed the test.

6.4 Solvent Resistance Test for Comfort Grips

Comfort grips shall be tested in accordance with ASME B107.25, para. 5.5.

6.5 Joint Integrity Test

Pliers shall be tested in accordance with ASME B107.25, para. 5.4.1, using a minimum of 1.50 lbf. Maximum allowable play shall be 0.01 in./in. of handle length measured from the pivot to the end of the handle.

7 SAFETY REQUIREMENTS AND LIMITATIONS OF USE

Instructors and employers shall stress proper and safe 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) wire sizes
- (d) optional features
 - (1) handles. If comfort grip handles are required, it should be noted on the procurement document.
 - (2) springs. If springs are required, it should be noted on the procurement document.