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Standard Specification for Insulated and Insulating Hand Tools¹

This standard is issued under the fixed designation F1505; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification covers the testing of insulated and insulating hand tools used for working on, or in close proximity to, energized electrical apparatus or conductors operating at maximum voltage of 1000 V ac or 1500 V dc.

1.2 The specific use of these tools is beyond the scope of this specification.

1.3 The values stated in SI units are to be regarded as standard. The values given in parentheses after SI units are provided for information only and are not considered standard.

1.4 The following precautionary caveat pertains to the test method portion only, Section 7, of this specification: *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.5 This specification does not purport to address all of the safety problems associated with the use of tools on, or in close proximity to, energized electrical apparatus.

1.6 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:²

D149 Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies

D618 Practice for Conditioning Plastics for Testing

D5025 Specification for Laboratory Burner Used for Small-Scale Burning Tests on Plastic Materials

D5207 Practice for Confirmation of 20-mm (50-W) and 125-mm (500-W) Test Flames for Small-Scale Burning Tests on Plastic Materials

2.2 ASME/ANSI Standards:³

ASME B18.3-2002 Socket Cap, Shoulder, Set Screws, Hex and Spline Keys

ASME B107 Series of Standards for Hand Tools and Accessories

2.3 IEC Standard:⁴

IEC 60900:2012 (Ed. 3) Live Working – Hand tools for use up to 1000 V ac and 1500 V dc

IEC 61318:2007 (Ed. 3) Live Working – Conformity assessment applicable to tools, devices and equipment

2.4 ISO Standards:⁵

ISO 1174-1:1996 Assembly tools for screws and nuts—Driving Squares—Part 1: Driving squares for hand socket tools

ISO 5744:2004 Pliers and nippers—Methods of test

2.5 Federal Specification:⁶

GGG-R-791H (19 July 1994) Rules, Measuring

3. Terminology

3.1 Definitions:

3.1.1 *insulated hand tools, n*—those covered with insulating material in order to protect the user from electric shock and to minimize the risk of short circuits between parts at different potentials.

3.1.2 *insulating hand tools, n*—those made predominantly of insulating material, except for metal inserts at the working head or active part or used for reinforcement but with no exposed metal parts. In either case, to protect the user from electric shocks, as well as, to prevent short-circuits between exposed parts at different potentials.

¹ This specification is under the jurisdiction of ASTM Committee F18 on Electrical Protective Equipment for Workers and is the direct responsibility of Subcommittee F18.35 on Tools & Equipment.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at www.astm.org/contact. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ Available from American Society of Mechanical Engineers (ASME), ASME International Headquarters, Three Park Ave., New York, NY 10016-5990, <http://www.asme.org>.

⁴ Available from Institute of Electrical and Electronics Engineers, Inc. (IEEE), 445 Hoes Ln., P.O. Box 1331, Piscataway, NJ 08854-1331, <http://www.ieee.org>.

⁵ Available from International Organization for Standardization (ISO), 1 rue de Varembe, Case postale 56, CH-1211, Geneva 20, Switzerland, <http://www.iso.ch>.

⁶ Available from DoD ASSIST-Quick Search, DLA Document Services, Building 4/D, 700 Robbins Ave., Philadelphia, PA 19111-5094, <http://quicksearch.dla.mil>.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *acceptance test, n*—a contractual test to prove to the customer that the device meets certain conditions of its specification.

3.2.2 *formation of lots or batches, n*—the product is assembled into identifiable lots, sub-lots, batches, or in such other manner as may be prescribed. Each lot or batch, as far as practicable, consists of units of product of a single type, grade, class, size, and composition, manufactured under essentially the same conditions and essentially the same time.

3.2.3 *major defect, n*—defect on product that is likely to result in failure, or to reduce significantly the functionality of the product.

3.2.4 *minor defect, n*—defect on product, other than major, that is not likely to reduce significantly the functionality of the product.

3.2.5 *routine test, n*—a test to which each individual device is subjected during or after manufacture to ascertain whether it complies with certain criteria.

3.2.6 *sampling test, n*—a test on a number of devices taken at random from a batch.

3.2.7 *type test, n*—a test of one or more devices made to a certain design to show that the design meets certain specifications.

4. Performance Requirements

4.1 Insulated and insulating tools shall be designed and manufactured in such a way that they do not constitute a danger for the user or the installation if they are used properly.

4.2 The mechanical specifications for insulated and insulating hand tools having the same function shall comply with the corresponding ANSI or ISO standards. The mechanical performance of the working parts shall be maintained even after the application of any insulating layer(s). The insulation material shall be such that it will adequately withstand the electrical, mechanical, and thermal stresses to which it may be exposed during normal use. Insulating hand tools specially designed for live working in an environment of live parts at different potentials (boxes with electrical equipment, live working on underground cables, etc.), that generally are used to hold or move live conductors or to cut wires of small section, must have adequate mechanical properties to avoid the risk of breaking and the possible corresponding electrical consequences. These tools shall be checked for compliance with 7.8.

4.3 All insulating material shall be flame resistant in accordance with 7.7.

4.4 The insulating coating may consist of one or more layers. If two or more layers are utilized, contrasting colors shall be employed.

4.5 The design and construction of the handles shall provide a secure handhold and prevent unintentional slipping.

4.6 The tool shall have an operating temperature range from -20°C to $+70^{\circ}\text{C}$.

4.7 The insulating material shall adhere securely to the conductive parts of the tool and any outer layer of the material over the temperature range from -20°C to $+70^{\circ}\text{C}$.

4.8 Tools intended for use at extremely low temperatures (-40°C) shall be designated “Category C” and shall be designed for this purpose.

4.9 Double-ended tools such as box wrenches, keys for hexagonal socket screws, double ended socket wrenches, double-head open-end wrenches, etc., are not allowed for insulated tools but are allowed for insulating tools.

4.10 Tools Capable of Being Assembled:

4.10.1 *Retaining Devices for Tools Capable of Being Assembled*—Tools capable of being assembled shall have suitable retaining devices to prevent unintentional separation of the assembly. The retaining forces shall be tested in accordance with 7.9.

4.10.2 *Insulation Design for Tools Capable of Being Assembled*—In the case of connecting parts of tools capable of being assembled, the insulation shall be applied in such a manner that if any part becomes detached during use, no conductive part, which may still be live, can be inadvertently touched or cause a disruptive charge.

4.10.3 *Tools Capable of Being Assembled with Square Drives*—Tools capable of being assembled with square drives shall have square drives and square sockets in accordance with ISO 1174-1 (for separating forces, see 7.9.1). To ensure compatibility of insulation between different manufacturers, these tools shall be designated with overlapping elements described in Fig. 1. Their dimensions and tolerances shall be in accordance with Table 1.

4.10.4 *Interchangeability of Components Made by Different Manufacturers*—Tools capable of being assembled and designed to be interchangeable between different manufacturers shall be specifically marked in accordance with 5.6.5. There are considerable difficulties in developing a unified standard for the mechanical joining systems for components and tools for different manufacturers. For safety reasons, only mechanically locked retaining systems shall be used for these kind of tools. Manufacturers shall include the following information in the instructions for use: To ensure that the complete assembly of insulated tool components from different manufacturers will withstand separating forces that are expected during the intended use, prior to the use of any assembly the use shall ensure, by pulling by hand in a separating direction, that the retaining devices of all used elements are working efficiently and no component gets separated.

5. Additional Requirements

5.1 *Screwdrivers and Wrenches*—The following uninsulated areas on the working head are permissible (see Fig. 2):

5.1.1 *Screwdrivers* for slotted head screws, cross tip and other types, an 18 mm (0.709 in.) maximum length, is permissible for the exposed tip.

5.1.2 The blade insulation of screwdrivers shall be bonded to the handle. The outer diameter of the insulation, over a length of 30 mm (1.181 in.), in Area C of Fig. 2, shall not