

ASME B107.28-2005
(Revision of ASME B107.28M-1997)

Electronic Torque Instruments

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 Standard 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 provide performance and safety considerations specifically applicable to electronic torque instruments and to specify test methods to evaluate performance relating to the defined requirements.

Members of the Hand Tools Institute Torque Instruments 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 Standard.

This Standard is a revision of ASME B107.28M-1997 Electronic Torque Instruments. Type designators for different accuracy ratings have been added.

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

The requirements of this Standard become effective at the time of publication. This revision was approved as an American National Standard on March 14, 2005.

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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ELECTRONIC TORQUE INSTRUMENTS

1 SCOPE

This Standard provides performance and safety requirements for manually operated electronic torque instruments with integral or interchangeable heads. It includes requirements for endurance, torque value ranges, and accuracy for these torque instruments. It is not intended to describe products infrequently utilized or those designed for special purposes.

2 CLASSIFICATION

Type I: Electronic torque instruments, 1% accuracy

Type II: Electronic torque instruments, 4% accuracy

3 REFERENCES

The following is a list of publications referenced in this Standard

ASME B107.4M-1995, Driving and Spindle Ends for Portable Hand, Impact, Air, and Electric Tools (Percussion Tools Excluded)

ASME B107.10M-1996, Handles and Attachments for Hand Socket Wrenches — Inch and Metric Series

Publisher: American Society of Mechanical Engineers (ASME), Three Park Avenue, New York, NY 10016-5990; Order Department: 22 Law Drive, Box 2300 or Box 2900 Fairfield, NJ 07007-2300 or -2900

ASTM E 18-00, Standard Test Methods for Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials

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

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

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

4 DEFINITIONS

accuracy: the allowable inaccuracy, also known as permissible deviation, tolerance, or error band. A higher value means a lower certainty of correctness.

rated capacity: the maximum intended torque the user shall measure or apply.

5 REQUIREMENTS

The illustration shown herein is descriptive and not restrictive, and is not intended to preclude the manufacture of an electronic torque instrument that is otherwise in accordance with this Standard. Conformance with requirements not verified by test shall be established by visual examination. Coatings composition and characteristics shall be determined either by appropriate tests or reference to manufacturer's specifications, drawings, or procurement documents.

5.1 Design

The torque instrument shall be capable of electronically indicating the torque applied through the use of a transducer and digital display. The torque value readout shall be visible at a viewing angle up to 45 deg from normal. It shall have an integral power supply capable of meeting the requirements specified in para. 5.11. When tested in accordance with para. 6.2, the maximum allowable digital conversion time shall not exceed 100 msec (minimum of 10 times per second).

5.2 Finish

Exterior surfaces of the torque instrument shall be smoothly finished. Sharp edges and corners capable of causing injury shall be removed, and parts subject to corrosion shall be appropriately protected. Minor blemishes shall be permitted, provided they do not detract substantially from the appearance or operation of the torque instrument. Protection from environmental damage shall be provided by suitable coating or transparent cover.

5.3 Coatings

Coatings shall be tightly adherent, uniform in appearance, and free from conditions that would prevent full compliance with the requirements of this Standard. They shall protect the base metal from corrosion under use and storage conditions normally associated with hand tools, and they shall not peel, crack, or blister in such use or storage. Minor blemishes shall be permitted, provided they do not detract substantially from the appearance or operation of the torque instrument. Cadmium plating shall not be used as a coating.

5.4 Drives

Drives shall conform to the requirements of ASME B107.4M.

Table 1 Torque Instrument Capacity

Drive Sizes		Maximum Load		
in.	mm	lbf-in.	lbf-ft	N-m
1/4	6.3	250	N/A	30
3/8	10.0	1200	100	135
1/2	12.5	3000	250	340
3/4	20.0	N/A	700	1000

Table 2 Torque Instrument Operation Load

Drive Sizes		Maximum Load	
in.	mm	lb	N
1/4	6.3	50	225
3/8	10.0	125	560
1/2	12.5	150	670
3/4	20.0	200	900

**Fig. 1 Drive Ball Location**

5.4.1 Plain Square Drive. The square drive shall be oriented so that any two of the opposite flats shall be parallel within 5 deg of the longitudinal axis of the instrument. The drive ball shall be located as shown in Fig. 1.

5.4.2 Ratchet Drive. The operational characteristics of the ratchet, when incorporated, shall conform to the requirements of ASME B107.10M.

5.5 Operating Range

The rated capacity of the torque instrument shall not exceed the limit specified in Table 1. The lowest indicated value shall be no greater than 20% of the rated capacity.

5.6 Resolution

The range between the lowest and highest values shall be divided into equal increments. The size of each increment shall be equal to or less than 0.1% of the rated capacity value for Type I and 0.4% for Type II.

5.7 Operating Loads

The load required to achieve the rated capacity of the instrument shall not exceed those shown in Table 2. The load must be applied to the center of the designated handgrip or marked load position and perpendicular to the instrument axis (centerline). Extension handles shall be used when provided by the manufacturer.

5.8 Accuracy

The torque instrument shall operate within the accuracy limits specified herein throughout its calibrated range. The calibrated range shall be from 20% or less to 100% of the rated capacity value. Within the calibrated range for Type I, the value indicated by the torque instrument shall not deviate more than 1% of the applied torque in a clockwise hand direction and not more than 1.5% in a counterclockwise hand direction. For Type II, it shall not deviate more than 4% in a clockwise hand direction and not more than 6% in a counterclockwise hand direction.

5.9 Calibration and Cycle Life

The torque instrument shall pass the test in para. 6.3.

5.10 Overload

The instrument shall have a warning device to indicate when the applied torque has exceeded its rated capacity and shall pass the test in para. 6.4.

5.11 Battery Life

The torque instrument shall pass the test specified in para. 6.5 and shall have an indicator to warn of a low battery condition. On a torque instrument having the capability of storing torque readings, the indicator shall store values internally or give sufficient notice to allow for downloading of the stored values to a data logger or similar device.

5.12 Marking

The torque instrument shall be marked in a legible manner with the following information:

- (a) the manufacturer's name or a trademark of such known character that enables positive identification of the manufacturer
- (b) model number and serial number
- (c) rated capacity with units of measure
- (d) load position (on instruments for which accuracy is dependent upon load position)

5.13 Operating Modes

At least one of the following modes shall be provided.

5.13.1 Track Mode. The torque instrument shall allow direct measurement of the torque applied and shall display the value.

5.13.2 Peak Mode. The torque instrument shall allow direct measurement of the torque applied and shall display the highest value since last reset for a minimum of 5 sec.

6 TEST PROCEDURES

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

6.1 Hardness Test

The hardness of the drive square, as specified in para. 5.4, shall be tested in accordance with ASTM E 18. When grinding is necessary to prepare the test surface, the amount removed must not exceed 0.007 in. (0.18 mm) on the surface contacted by the indenter.

6.2 Accuracy Tests

The instrument shall be loaded 3 times to maximum capacity and the instrument reset to zero before accuracy tests are conducted. Accuracy tests on the torque instrument shall be conducted at the lowest point in the calibrated range and at 20%, 60%, and 100% of rated capacity. Three readings shall be taken at each test point, starting with the lowest value and progressing to the rated capacity. Each reading taken at each test point shall be within the allowed tolerance of the instrument being measured. When the sequence has been completed with the readings at the highest target value, the test load shall be relieved and the torque instrument removed from the tester. All test loads shall be applied at the midpoint of the handgrip or at the marked load position. The torque instrument shall meet the accuracy requirements of para. 5.8 when tested in a temperature range of $70^{\circ}\text{F} \pm 20^{\circ}\text{F}$ ($21^{\circ}\text{C} \pm 11^{\circ}\text{C}$).

The test shall be performed on equipment capable of indicating torque applied within an accuracy of $\pm 0.25\%$ for Type I and $\pm 1\%$ for Type II at any point within the calibrated range of the torque instrument. Interpolated readings of the measuring equipment shall be made no more precisely than one-half of the smallest increment. Accuracy of test equipment shall be independently verified by a route traceable to the National Institute of Standards and Technology (NIST).

6.3 Calibration and Cycle Life Test

The torque instrument shall meet, without recalibration (adjustment of electronic circuitry) or adjustments to the instrument, the accuracy requirements after being stressed from no load to rated capacity, 5,000 times in a clockwise direction and then in a counterclockwise direction at a rate not to exceed 20 operations per

minute. Subsequently, the instrument shall be stressed from no load to 50% of rated capacity, 20,000 times in a clockwise direction and then 20,000 times in a counterclockwise direction at a rate not to exceed 20 times per minute. The instrument, after recalibration and minor adjustment if necessary, shall meet the accuracy requirements. Instrument display shall be active. Batteries may be replaced as required.

6.4 Overload Test

The torque instrument shall be loaded once to 125% of its rated capacity in each a clockwise and a counterclockwise direction using a known torque reference. The torque instrument shall show no signs of permanent deformation or physical failure. Accurate performance shall not be required at the conclusion of this test.

6.5 Battery Life Test

When the torque instrument is continually cycled at its maximum power consumption, battery life shall be 10 hr. minimum. The instrument shall not be cycled in excess of 4 cycles per minute.

7 DESIGNATIONS

Instruments shall be designated in the following sequence:

- (a) type (accuracy)
- (b) rated capacity
- (c) drive size
- (d) drive configuration
- (e) operating modes required

8 SAFETY REQUIREMENTS AND LIMITATION OF USE

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

B107 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-2005
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.	B107.12-2004
Pliers: Long Nose, Long Reach	B107.13-2003
Hand Torque Tools (Mechanical).	B107.14-2004
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	B107.21-2005
Electronic Cutters.	B107.22M-1998 (R2004)
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	B107.28-2005
Electronic Tester, Hand Torque Tools	B107.29-2005
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
Pliers: Locking, Clamp, and Tubing Pinch-Off	B107.36-2002
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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	B107.55-2002
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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