ASME-B107.14M

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ASME B107.14M-1994

(REVISION OF ANSI/ASME B107.14M–1985)

Hand Torque Tools

AN AMERICAN NATIONAL STANDARD

The American Society of Mechanical Engineers

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The American Society of Mechanical Engineers

345 East 47th Street, New York, N.Y. 10017

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This Standard will be revised when the Society approves the issuance of a new edition. There will be no addenda or written interpretations of the requirements of this Standard issued to this edition.

This code or standard was developed under procedures accredited as meeting the criteria for American National Standards. The Consensus 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 which provides an opportunity for additional public input from industry, academia, regulatory agencies, and the public-at-large.

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FOREWORD

(This Foreword is not part of ASME B107.14M-1994.)

The American National Standards Committee B107, Socket Wrenches and Drives, under sponsorship of the American Society of Mechanical Engineers, held its organizational meeting on June 28, 1967. Subsequently, the committee was reorganized as an ASME Standards Committee and its title was changed to Hand Tools and Accessories.

This Standard is a revision of ANSI/ASME B107.14M-1985 (Reaffirmed 1991). The following is a summary of the significant changes made to the 1985 edition of this Standard:

- Section 2 [Classification]; under Type 2, a further subdivision of Style into Designs A, B, and C; the classification level Form A, B, C, etc., redesignated Design A, B, C, etc.
- Section 3 [Applicable Standards], reference added to ASTM E18, Test Method of Rockwell Hardness.
- Para. 4.1 [Illustrations], editorially revised.
- Para. 4.3(a) [Operation], last sentence deleted.
- Para. 4.3(b) [Hand Position], last sentence revised.
- Para. 4.3 [Type 2 — Setting Torque Wrenches], reorganized and revised.
- Para. 4.4 [Type 3 — Limiting Torque Wrenches], reorganized and revised.
- Table 1 [Torque Wrench Capacity], entries for the 1½ in. drive size revised.
- Table 2 [Torque Wrench Increments], Maximum Increment for Type 3 wrench increased from 2 to 6% of Maximum Capacity.
- Para. 4.7 [Marking], revised.
- Para. 4.10 [Capacity], last sentence added.
- Para. 4.12 [Accuracy], revised.
- Para. 4.13 [Parallax and Gravity Errors], reorganized and revised.
- Para. 4.15 [Calibration and Cycle Life], revised.
- Section 5 [Conformance to This Standard], revised.
- New Table 3 [Accuracy] inserted. Old Table 3 renumbered Table 4.
- Fig. 9 [Type 3, Class A, Style 1, Design B — Female Hex Drive Graduated Screwdriver Grip Limiting Torque Wrench], redrawn.

Suggestions for improvement of this Standard will be welcome. They should be sent to The American Society of Mechanical Engineers, Att.: Secretary, ASME B107 Main Committee, 345 East 47th Street, New York, NY 10017.

This revision was approved as an American National Standard on February 16, 1994.

ASME STANDARDS COMMITTEE B107
Hand Tools and Accessories

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

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CONTENTS

HAND TORQUE TOOLS

1 SCOPE

This Standard covers common, manually operated torque wrenches and screwdrivers used for control of the tightness of threaded fasteners. It is not intended to describe products infrequently utilized or those designed for special purposes.

2 CLASSIFICATION

The following types and classes of hand torque tools are covered in this Standard.

Type 1 Indicating Torque Wrenches
- Class A — deflecting beam
  - Style 1 — plain scale
  - Style 2 — scale with feel impulse
  - Style 3 — scale with memory indicator
- Class B — rigid housing
  - Style 1 — plain dial
  - Style 2 — dial with signal
  - Style 3 — dial with memory indicator
- Class C — screwdriver grip
  - Style 1 — enclosed dial
  - Style 2 — exposed dial

Type 2 Setting Torque Wrenches
- Class A — graduated
  - Style 1 — nonratcheting
    - Design A — right- and left-hand torquing
    - Design B — right-hand torquing
    - Design C — left-hand torquing
  - Style 2 — ratcheting
    - Design A — right- and left-hand torquing
    - Design B — right-hand torquing
    - Design C — left-hand torquing
- Class B — nongraduated
  - Style 1 — nonratcheting
    - Design A — right- and left-hand torquing
    - Design B — right-hand torquing
    - Design C — left-hand torquing
  - Style 2 — ratcheting
    - Design A — right- and left-hand torquing
    - Design B — right-hand torquing
    - Design C — left-hand torquing

Type 3 Limiting Torque Wrenches
- Class A — screwdriver grip
  - Style 1 — graduated
    - Design A — male square drive
    - Design B — female hex drive
  - Style 2 — nongraduated
    - Design A — male square drive
    - Design B — female hex drive
- Class B — "T" handle grip
  - Style 1 — nonratcheting
  - Style 2 — ratcheting

3 APPLICABLE REFERENCES

The following standards form a part of this Standard to the extent specified herein. The latest issue in effect shall apply.

ANSI B107.4, Driving and Spindle Ends for Portable Hand, Air, and Electric Tools

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

ASTM E18,[1] Test Method for Rockwell Hardness

4 REQUIREMENTS

4.1 Illustrations

Figures 1 through 14 are descriptive and not restrictive. They are not intended to preclude the manufacture or purchase of other forms of torque wrenches conforming to this Standard.

[1]ASTM Specifications are available from the ASTM, 1916 Race Street, Philadelphia, PA 19103.

4.2 Type 1 — Indicating Torque Wrenches

(a) Operation. Indicating torque wrenches shall measure changes in torque applied through a deflecting member. They shall operate in both clockwise and counterclockwise directions.

(b) Drive tang. The drive tang shall comply with para. 4.9.1.

(c) Indicator. A dial, scale, or a digital readout shall be located so as to permit convenient and accurate reading. The graduation marks shall be colored and shaped so as to be distinct and easily read. The width of the mark shall not be greater than one-half the adjacent space width. The width of the pointer tip or indicator line shall not be greater than the widest graduation mark, nor shall the pointer completely cover any graduation mark on the outer scale. The pointer shall be located close to the scale face so as to minimize parallax error. If a digital readout is used, the numbers should be at least ⅛ in. (3.2 mm) high, and they shall be visible at viewing angles of up to 45 deg. from normal.

(d) Hand Position. If, in order to achieve the required accuracy, it is necessary to apply the load at a specific point on the handgrip, the handgrip shall be pivoted at that point.

(e) Auxiliary Functions. Additional features may be incorporated at the torque wrench to improve accuracy or usefulness. The inclusion of such features shall not be cause for rejection of the torque wrench providing it conforms with the performance requirements of this Standard.

4.2.1 Type 1, Class A, Deflecting Beam. Flexing of a cantilever beam connecting the square drive and the handgrip shall provide the basis of operation. Class A deflecting beam torque wrenches may be similar to that shown in Fig. 2.

(a) Type 1, Class A, Style 1, Plain Scale. No auxiliary operational features are required.

(b) Type 1, Class A, Style 2, Scale with Feel Impulse. A mechanism with physical impulse signal capable of being adjusted without the use of tools to any graduated value of the wrench shall be provided. The transmission of the preselected value shall be indicated by a physical impulse which shall cause a temporary reduction in the load applied.

(c) Type 1, Class A, Style 3, Scale with Memory Indicator. An auxiliary pointer or other device capable of retaining an indication of the maximum torque transmitted through the wrench shall be provided. The pointer shall function at any graduated torque value within the accuracy requirements of this Standard. Means shall be provided for resetting the pointer. Normal handling of the wrench shall not cause the pointer to be displaced.

4.2.2 Type 1, Class B, Rigid Housing. The deflecting member and dial mechanism shall be enclosed within the rigid housing. The pointer and dial face shall be protected by a transparent cover which shall be so located and constructed as to be reasonably free from accidental damage resulting from being struck or abraded. Class B rigid housing torque wrenches may be similar to that shown in Fig. 3.

(a) Type 1, Class B, Style 1, Plain Dial. No auxiliary operational features are required.

(b) Type 1, Class B, Style 2, Dial with Signal. A signal mechanism capable of being adjusted without the use of tools to any graduated value of the wrench shall be provided. The signal shall operate automatically within the accuracy requirements of this Standard.

(c) Type 1, Class B, Style 3, Dial with Memory Indicator. An auxiliary pointer or other device capable of retaining an indication of the maximum torque transmitted through the wrench shall be provided. The pointer shall function at any graduated torque value within the accuracy requirements of this Standard. Means shall be provided for resetting the pointer. Normal handling of the wrench shall not cause the pointer to be displaced.

4.2.3 Type 1, Class C, Screwdriver Grip. The grip and the drive shall lie on the same axis rotation to allow the wrench to be used like a screwdriver. All Type 1, Class C wrenches shall be limited to a capacity of 100 in.-lb (11.3 N•m) and those with capacities over 400 in.-lb (4.5 N•m) shall be equipped with a ¼ in. (6.3 mm) female square drive on the top of the handle, or with other auxiliary driving means.

(a) Type 1, Class C, Style 1, Enclosed Dial. The pointer and face shall be protected by a suitable transparent cover. The wrench may be similar to that shown in Fig. 4.

(b) Type 1, Class C, Style 2, Exposed Dial. The pointer and face shall be left unprotected. The wrench may be similar to that shown in Fig. 5.

4.3 Type 2 — Setting Torque Wrenches

(a) Operation. Setting type wrenches shall sense torque transmitted by comparing the load applied with a self-contained standard. The transmission of the preselected value shall be indicated by a physical impulse which shall cause a temporary reduction in the load applied. Operation shall be such as to minimize abrupt overtravel. Reset shall be automatic upon release of load application. The drive shall be located at one end of the wrench and the handgrip at the other.

(b) Hand Position. If, in order to achieve the required accuracy, it is necessary to apply the load at a specific location on the handgrip, the handgrip shall be so designed or marked.

(c) Auxiliary Functions. Additional features may be incorporated in the torque wrench to improve accuracy or usefulness. The inclusion of such features shall not be cause for rejection of the torque wrench providing it otherwise conforms with the performance requirements of this Standard.

4.3.1 Type 2, Class A, Graduated. A graduated scale with increments appropriately numbered shall be located on the wrench and positioned as to permit convenient reading. Selection of the desired torque value shall be made by manual means not requiring a separate tool or implement. Provision shall be made to indicate precisely the selected torque value on the graduated scale. The adjustment means shall be adequately protected against accidental change by an appropriate device or lock. Graduated setting type torque wrenches may be similar to that shown in Fig. 6.

4.3.2 Type 2, Class B, Nongraduated. The torque wrench shall not be graduated or equipped with a means for graduated adjustment. A separate tool or implement shall be required to engage the adjustment provision of the wrench in order to select the controlling torque value. Means shall be provided to protect the torque setting from accidental changes. Nongraduated setting type torque wrenches may be similar to that shown in Fig. 7.

4.3.3 Type 2, Classes A and B, Style 1, Nonratcheting. A square drive tang without auxiliary operational features shall be provided. The drive shall comply with the requirements of para. 4.9.1.

4.3.4 Type 2, Classes A and B, Style 2, Ratcheting. The square drive tang provided shall be equipped with a ratcheting mechanism. The ratchet shall comply with the requirements of para. 4.9.2.

4.3.5 Type 2, Classes A and B, Styles 1 and 2, Design A, Right- and Left-Hand Torquing. They shall be calibrated in a clockwise and counterclockwise direction.

4.3.6 Type 2, Classes A and B, Styles 1 and 2, Design B, Right-Hand Torquing. They shall be calibrated in a clockwise direction.

4.3.7 Type 2, Classes A and B, Styles 1 and 2, Design C, Left-Hand Torquing. They shall be calibrated in the counterclockwise direction.

4.4 Type 3 — Limiting Torque Wrenches

Limiting torque wrenches shall operate by releasing the drive tang at the preselected torque value followed by automatic reset. The release and reset sequence shall occur a minimum of two times in one full revolution of the drive. The reset action should not cause a reverse torque (backlash) which might tend to loosen the fastener being tightened. They shall be calibrated in a clockwise direction.

4.4.1 Type 3, Class A, Screwdriver Grip. The wrench shall be in a screwdriver configuration. The grip shall be round and knurled or fluted or lobular shaped. The maximum capacity of Type 3, Class A wrenches shall be 40 in.-lb (4.5 N•m).

4.4.1.1 Type 3, Class A, Style 1, Graduated. A graduated scale with increments appropriately numbered shall be located on the wrench and positioned so as to permit convenient reading. Selection of the desired torque value shall be made by manual means not requiring a separate tool or implement. Provision shall be made to indicate precisely the selected torque value on the graduated scale. The adjustment means shall be adequately protected against accidental change by an appropriate device or lock. The wrench may be similar to that shown in Figs. 8 or 9.

4.4.1.2 Type 3, Class A, Style 2, Nongraduated. The torque wrench shall not be graduated or equipped with a means for graduated adjustment. A separate tool or implement shall be required to engage the adjustment provision of the wrench in order to select the controlling torque value. Means shall be provided to protect the torque setting from accidental changes. The wrench may be similar to that shown in Figs. 10 or 11.

4.4.1.3 Type 3, Class A, Styles 1 and 2, Design A, Male Square Drive. A ¼ in. (6.3 mm) square drive tang without auxiliary operational features shall be provided. The drive shall comply with the requirements of para. 4.9.1.

4.4.1.4 Type 3, Class A, Styles 1 and 2, Design B, Female Hex Drive. A ¼ in. (6.3 mm) hexagon socket drive integral with the wrench shall be provided. The drive shall comply with the requirements of para. 4.9.3.

4.4.2 Type 3, Class B, "T" Handle Grip. The wrench shall be in a "T" handle configuration and may be similar to that shown in Fig. 12. The wrench shall not be graduated or equipped with a means for graduated adjustment. A separate tool or implement shall be required to engage the adjustment provision of the wrench in order to select the controlling torque value. Means shall be provided to protect the torque setting from accidental changes. The maximum capacity of Type 3, Class B wrenches shall be 150 in.-lb. (16.9 N•m). The drive shall comply with the requirements of para. 4.9.1.

(a) Type 3, Class B, Style 1, Nonratcheting. A square drive tang without auxiliary operational features shall be provided.

(b) Type 3, Class B, Style 2, Ratcheting. A square drive tang with an integral ratcheting mechanism shall be provided. The ratchet shall be nonreversible and provide driving engagement in the right-hand (clockwise) direction. The ratchet shall index a minimum of eight times in one full revolution of the drive.

4.5 Materials

The materials used in the manufacture of torque wrenches shall be such as to assure compliance with the requirements of this Standard.

4.6 Instructions

Torque wrenches shall be supplied with instructions covering their accuracy, application, use, care, and guidance on the proper use of adapters and extensions.

4.7 Marking

The wrenches shall be marked in a legible and permanent manner with the following information:

(a) a name or known trademark which enables positive identification of the manufacturer

(b) model number

(c) country of origin

(d) units of torque such as ft-lb, Kgf•m, N•m, etc.

(e) arrow or arrows with the word "TORQUES" or "TORQUE" indicating the direction of torque for wrenches that are calibrated in one direction.

Optional markings such as serial number, conversion tables, secondary torque scales, Date Code or Month and Year of Manufacture (e.g., 12/88 for December 1988), etc., may also be included.

4.8 Finish

4.8.1 Surfaces. The exterior of torque wrenches 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 wrench.

Scales or dial faces shall be appropriately finished in contrasting colors applied by a method normally associated with hand tools. Protection from environmental damage shall be provided by suitable coatings or transparent cover.

4.8.2 Coatings. The coatings shall be tightly adherent, uniform in appearance and free from defects that would prevent full compliance with the requirements of this Standard. They should 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 wrench. Cadmium plating shall not be used as a coating.

4.9 Drives

4.9.1 Plain Square Drives. Drive tangs shall conform with the requirements of ANSI B107.4, and those on wrenches with capacity of over 100 oz-in. (0.71 N•m) shall have a hardness of not less than Rockwell C34.

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 wrench. The drive ball shall be located as shown in Fig. 1.

4.9.2 Ratchet Drives. The operational characteristics of ratchet drives incorporated in all ratchet drive torque wrenches shall conform with the requirements of ANSI B107.10M.

4.9.3 Female Hex Drives. Female hex drives used in Type 3, Class A, Styles 1 and 2, Design B wrenches shall accommodate screwdriver bits meeting the requirements of ANSI B107.4. Insertion and removal of bits should be accomplished without the use of tools, and means should be provided to hold the bits securely in place.

4.10 Capacity

The highest graduated value of the torque wrench shall not exceed the limit specified in Table 1. The lowest graduated value shall be no greater than 20% of the highest graduated value.

4.11 Increments

The range between the lowest and highest graduated values shall be divided into equal graduations. The size of each increment shall be equal to or less than that specified by Table 2. Increments shall be identified by appropriate numbers at intervals not greater than each tenth line. This requirement shall not apply to nongraduated wrenches.

TABLE 1 TORQUE WRENCH CAPACITY

Drive Size		Maximum Load		
in.	mm	in.-lb	ft-lb	N·m
1/4	6.3	250	–	30
3/8	10	1200	100	135
1/2	12.5	3000	250	340
3/4	20	8400	700	1000
1	25	–	2000	2700
1 1/2	40	–	6000	9000

TABLE 2 TORQUE WRENCH INCREMENTS

Wrench Type	Maximum Increment (% of Maximum Capacity)
1	5
2	1
3	6

4.12 Accuracy

The deviation of torque applied from the torque set or indicated by the wrench shall not exceed values shown in Table 3. Accuracy limits shall be prominently and clearly stated in the instructions.

4.13 Parallax and Gravity Errors

4.13.1 Parallax Error. The parallax error for Type 1 wrenches at 45 deg. viewing angle shall not exceed 4% of the maximum graduated value.

4.13.2 Gravity Error, Type 1 Wrenches. The pointer on Type 1 wrenches shall not change its indication by more than 2% of the maximum graduated value when the wrench position in relation to gravity is changed.

4.13.3 Gravity Error, Type 2 Wrenches. Type 2 wrenches shall operate within the accuracy limits specified in para. 4.12 in any orientation of the handle in respect to gravity.

4.14 Operating Load

Loads applied to the center of the designated hand position shall not exceed those shown in Table 4 when an amount of torque equal to the maximum capacity has been transmitted through it. Appropriate extension handles shall be used as provided by the manufacturer. This requirement shall not apply to Type 1, Class C wrenches, or to Type 3 wrenches.

4.15 Calibration and Cycle Life

The torque wrench shall perform satisfactorily for 5,000 cycles in each direction of operation at maximum capacity without physical failure while maintaining the required level of accuracy. Subsequently, the torque wrench shall perform for 20,000 cycles in each direction of operation at 50% of capacity without physical failure.

4.16 Overload

Type 1 and Type 2 torque wrenches shall be capable of transmitting an amount of torque equal to 125% of maximum capacity in appropriate directions of operation without physical failure.

5 CONFORMANCE TO THIS STANDARD

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

Product Design Tests are to be used to establish the suitability of the product design described herein and to perform the functions required within the scope of this Standard. These tests are performed initially on all product designs and thereafter when the design is revised. They shall consist of examinations and tests covered in paras. 5.1 and 5.2.

Quality Conformance Tests shall consist of examinations and tests specified in paras. 5.1.1 and 5.2.4.

5.1 Examination

5.1.1 Visual Examination. Conformance with requirements not verified by test shall be established by visual examination. Coating composition and characteristics shall be determined either by appropriate tests or reference to manufacturer's specifications, drawings, or procurement documents.

For all Type 2 and Type 3 graduated torque wrenches, if the graduated scale is such that major graduations are on the barrel and minor graduations are on the sleeve and one full rotation of the sleeve advances one graduation on the barrel, then the zero graduation on the sleeve must align with the corresponding graduation on the barrel within ±1 minor graduation on the sleeve throughout its entire range.

5.1.2 Operating Load. The operating load for Type 1, Classes A and B, and Type 2 wrenches shall be calculated by dividing the maximum scale reading by the distance between the center of the drive tang and the center of the grip.

TABLE 3 ACCURACY

Type	Class/Style Design	Accuracy 20% to 100% of Capacity (% of Reading)	Accuracy Below 20% of Capacity (% of Full Capacity)
1	All	4%	0.8%
2	All Except Design A	4%	0.8%
2	Design A	4% Clockwise 6% Counterclockwise	0.8% Clockwise 1.2% Counterclockwise
3	All	6%	1.2%

TABLE 4 TORQUE WRENCH OPERATING LOAD

Drive Size		Maximum Load	
in.	mm	lb	N
1/4	6.3	50	230
3/8	10	125	550
1/2	12.5	175	780
3/4	20	250	1110
1 & larger	25 & larger	300	1340

5.2 Tests

5.2.1 Parallax Error, Type 1 Wrenches. The torque wrench scale shall be located so that it is in a horizontal plane. The pointer shall be adjusted to indicate zero when viewed from directly above the scale. The viewing plane shall be rotated 45 deg. clockwise about an axis through the pointer and the apparent change in the relationship between the pointer and scale observed. The change shall be equal to, or less than that specified in para. 4.13.1.

5.2.2 Gravity Error.

5.2.2.1 Gravity Error, Type 1 Wrenches. The torque wrench shall be located so it is in a horizontal plane. The pointer shall be adjusted to indicate zero when viewed from directly above the scale. The wrench shall then be rotated and supported at each end so the scale is in a vertical plane and the pointer axis is horizontal. In this position, and when viewed at 90 deg. to the scale the pointer should not be off the zero position more than ±2% of the maximum graduated value.

5.2.2.2 Gravity Error, Type 2 Wrenches. The gravity error test for Type 2 wrenches shall be conducted immediately after the accuracy test at the lowest test point specified in para. 5.2.4. If the wrench was tested in one of the gravity dependent positions (Fig. 14), then it should be tested again at the lowest test point in the other gravity dependent position. If the wrench was tested in a gravity independent position (Fig. 13), then it should be tested again at the lowest test point in both of the gravity dependent positions (Fig. 14).

5.2.3 Drives. Drive tangs and ratchets shall be measured and tested independently from the torque wrench to establish conformance with the requirements referenced in para. 4.9. The rejection criteria shown in the reference shall apply as appropriate.

5.2.4 Accuracy

(a) Measuring Equipment. Accuracy testing shall be performed on equipment capable of indicating torque applied within an accuracy of ±1% or better at any point within the calibrated range of the wrench. Interpolated readings of measuring equipment shall be made no more precisely than one-half of the smallest increment. Accuracy shall be independently verified by a route traceable to NIST. Force transmitted through the wrench to the tester shall be applied at the hand position in a plane perpendicular to the axis of the wrench drive tang.

(b) Test Points. All torque wrenches except for nongraduated types shall be subjected to an accuracy test at, or nearest to the lowest graduated value 20%, 60%, and 100% of maximum capacity. Nongraduated wrenches shall be tested at a value at which they are set, or if supplied not set, at the maximum rated torque value and at a value equal to 20% of the maximum capacity.

(c) Load Position. All accuracy test loads shall be applied at the midpoint of the handgrip.

(d) Test Sequence. Accuracy test readings shall be taken in progression from lower torque values to higher. If, during a torque adjustment operation with a Type 2 or Type 3 graduated wrench, the target test value is exceeded on the scale, the wrench shall be first adjusted back to its lowest calibrated value, and then back to the target test value. All torque wrenches shall be operated

three times at 50% of maximum capacity before any test sequence is begun. All Type 1 wrenches shall be appropriately adjusted to indicate zero torque applied after the unrecorded operations and before any test sequence is begun.

The test sequence shall begin when the torque wrench is mounted in the tester. Load shall be applied at the appropriate place within the designated hand position until the wrench indicates and/or signals the target torque value. The amount shown by the tester shall be read and recorded. Immediately following the taking of the tester reading, load shall be removed from the wrench. On Type 1 and Type 2 wrenches, three readings shall be taken at each of the three target torque values beginning with the lowest. On Type 3 wrenches, a number of readings equal to three times the number of releases in one revolution of the handle shall be taken at each of the three target values beginning with the lowest.

When the sequence has been completed with the readings at the highest target value, the test load shall be relieved and the torque wrench removed from the tester. Each reading taken at each test point shall be within the sum of the allowed tolerance and accuracy of the test equipment.

(1) Type 1. The pointer or needle of the wrench shall be adjusted to indicate zero torque applied in the plane of operation before being mounted in the tester for any test sequence. Classes A and B, Style 2 wrenches shall have the signal device appropriately adjusted between each test operation. The indicated value of the memory device of Classes A and B, Style 3 wrenches shall be read and recorded following the application of each test load.

(2) Type 2. The load shall be applied at a rate sufficiently slow and steady so that after the release, the wrench will not overtravel causing the test equipment to indicate torque in excess of the release torque.

(3) Type 3. The load shall be applied at a rate sufficiently slow and steady so that at each release the maximum torque applied can be accurately read.

5.2.5 Calibration Life and Overload. The calibration life tests shall be performed after the accuracy test has been satisfactorily completed.

The torque tool shall be loaded to full capacity and completely relieved 5,000 times in each calibrated direction of operation at the rate of 60 cycles per minute or less. Type 1 and 2 wrenches shall then be loaded once to 125% of full capacity in each calibrated direction of operation.

The wrench shall be examined for physical failure and shall be rejected if evidence of physical failure is found. The tool shall then be subjected again to the requirements of para. 4.12 and the test procedure of para. 5.2.4 and shall be rejected if the tests are not satisfactorily completed.

If the tool passes the above test, it shall then be loaded to 50% of full capacity and completely relieved 20,000 times in each calibrated direction of operation. Accurate performance shall not be required at the conclusion of this test, but deformation or physical failure shall be cause for rejection.

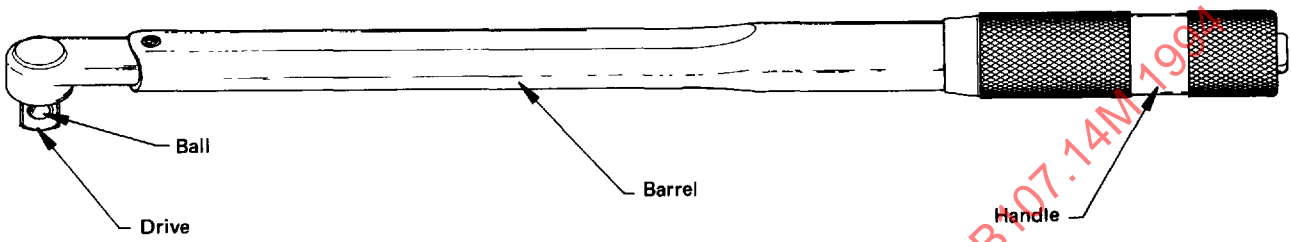

FIG. 1 LOCATION OF DRIVE BALL ON PLAIN DRIVE WRENCHES

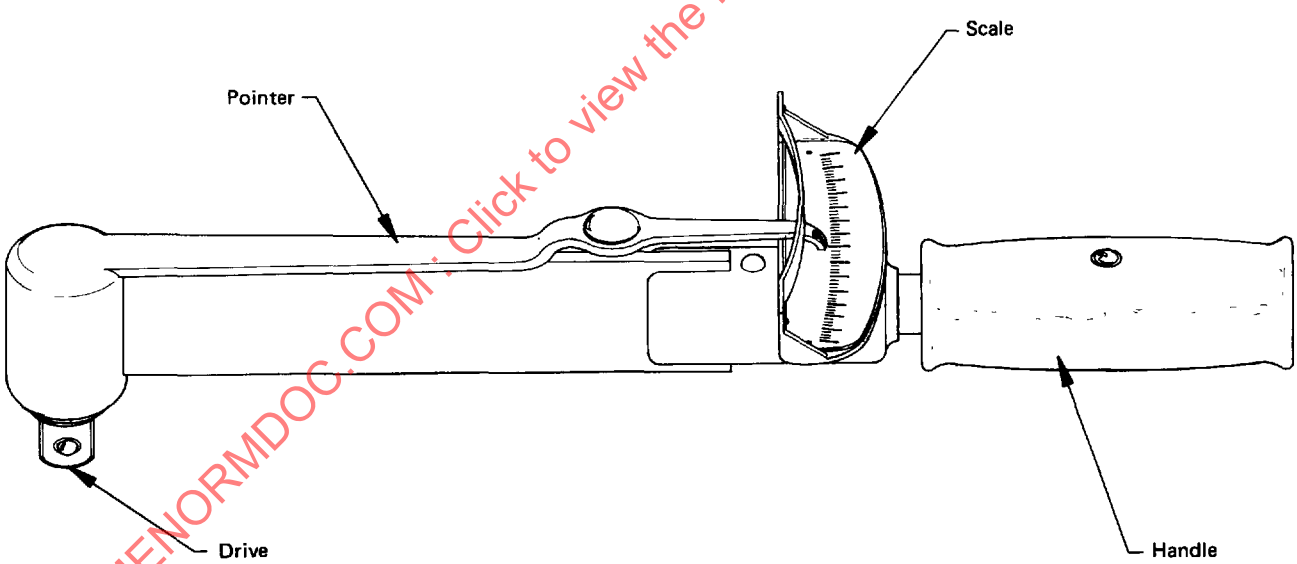

FIG. 2 TYPE 1, CLASS A — DEFLECTING BEAM INDICATING TORQUE WRENCH

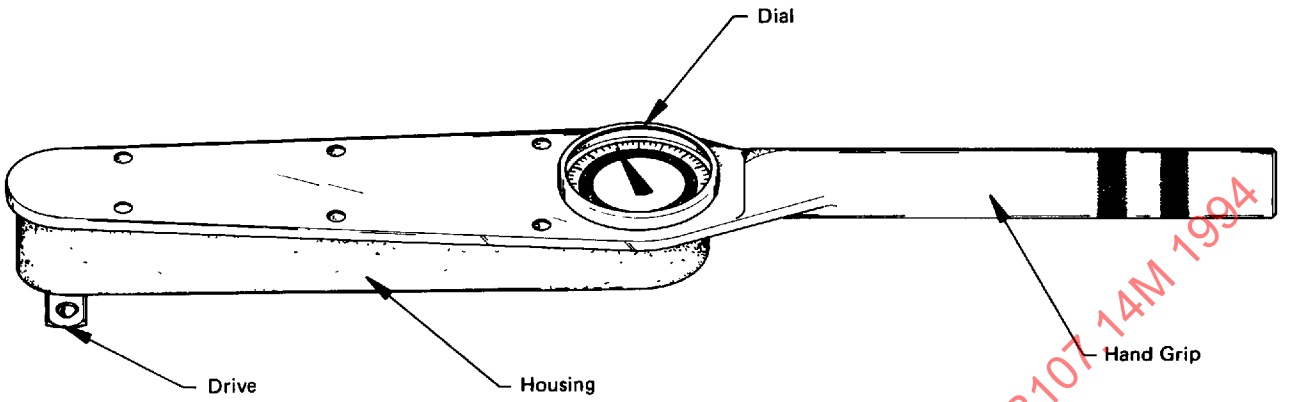

FIG. 3 TYPE 1, CLASS B — RIGID HOUSING DIAL INDICATING TORQUE WRENCH

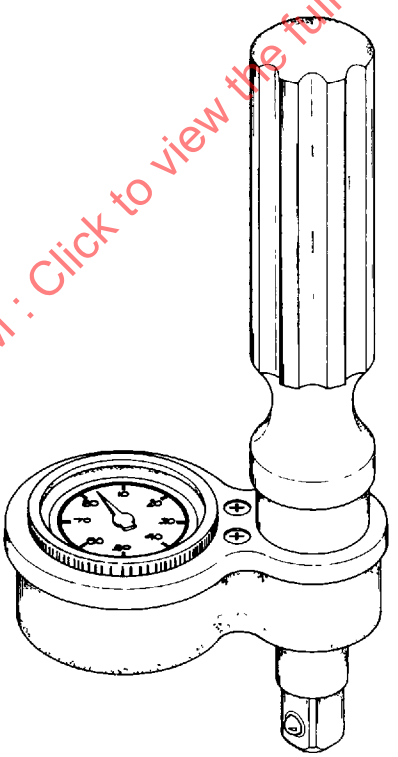

FIG. 4 TYPE 1, CLASS C, STYLE 1 — SCREWDRIVER GRIP ENCLOSED DIAL INDICATING TORQUE WRENCH

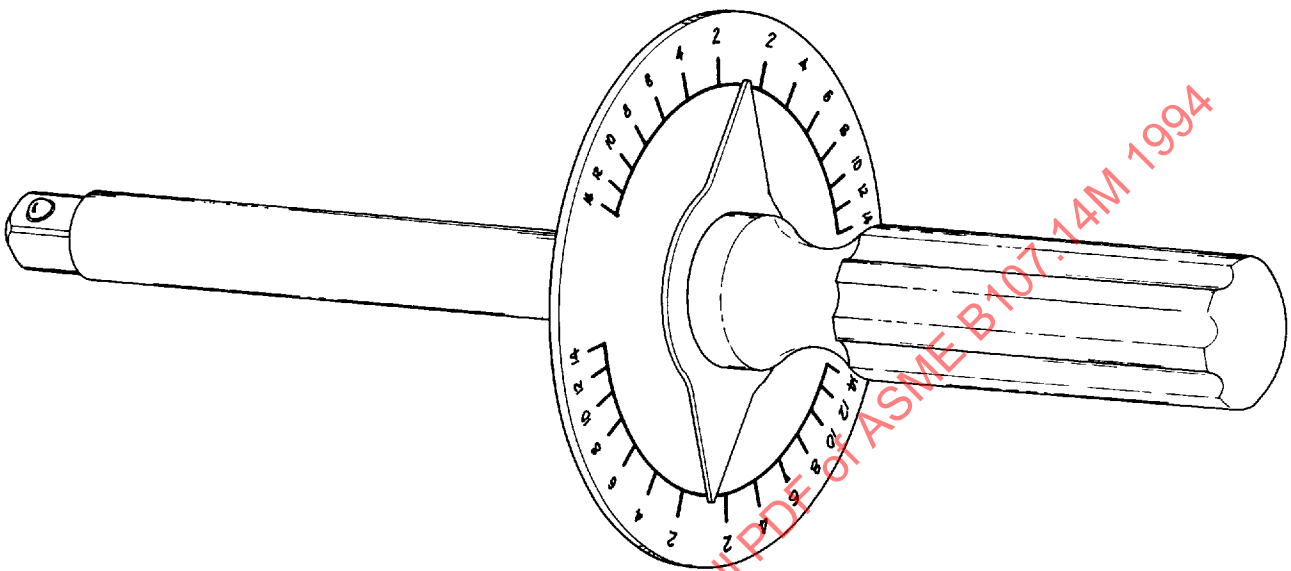

FIG. 5 TYPE 1, CLASS C, STYLE 2 — SCREWDRIVER GRIP EXPOSED DIAL INDICATING TORQUE WRENCH

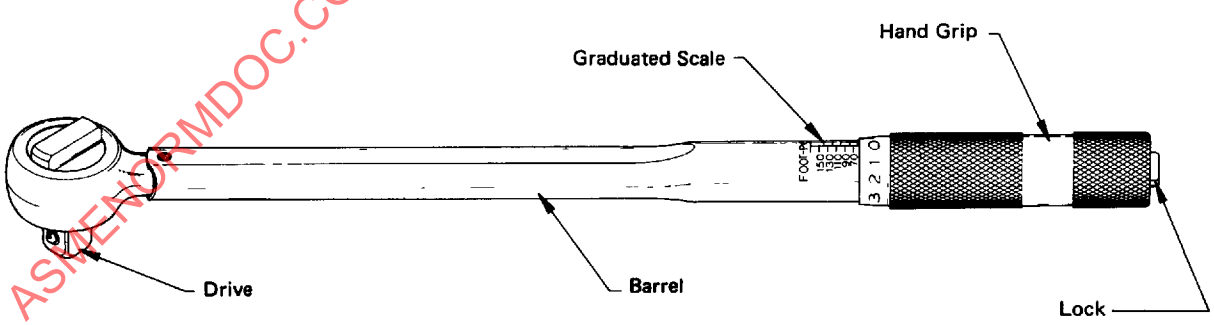

FIG. 6 TYPE 2, CLASS A — SETTING TORQUE WRENCH (GRADUATED)

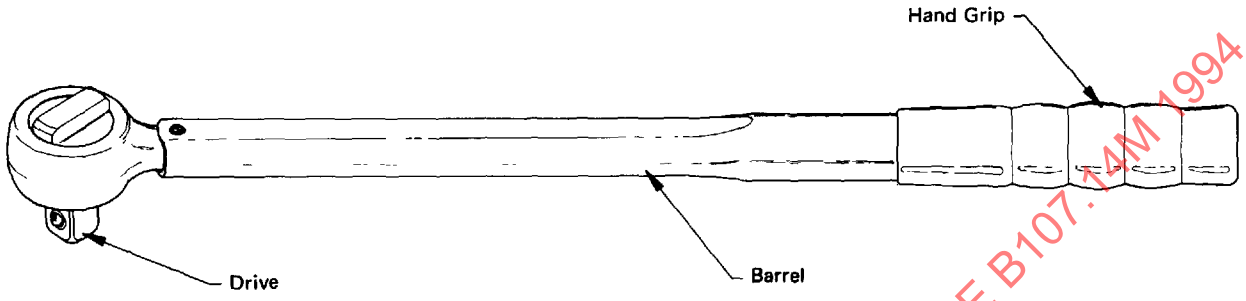

FIG. 7 TYPE 2, CLASS B — SETTING TORQUE WRENCH (NONGRADUATED)

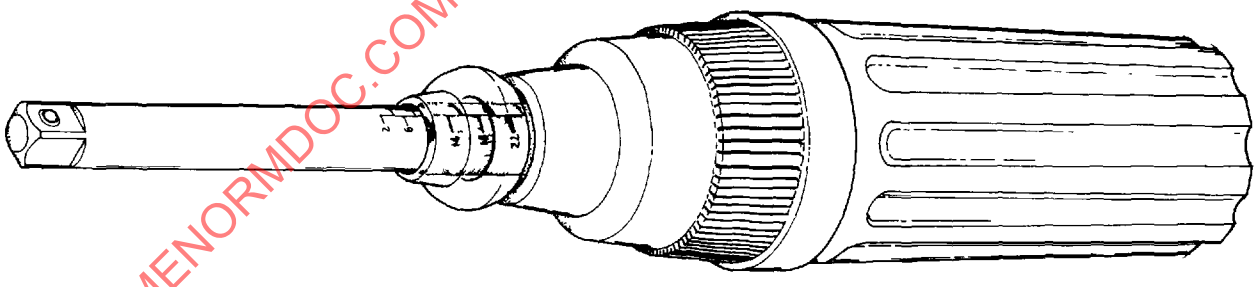

FIG. 8 TYPE 3, CLASS A, STYLE 1, DESIGN A — MALE SQUARE DRIVE GRADUATED SCREWDRIVER GRIP LIMITING TORQUE WRENCH