

ASME B107.10-2005
(Revision of ASME B107.10M-1996)

Handles and Attachments for Hand Socket Wrenches

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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CONTENTS

Foreword	iv
Committee Roster	v
Correspondence With the B107 Committee	vi
1 Scope	1
2 Classification	1
3 References	1
4 Requirements	1
5 Tests	3
6 Safety Requirements and Limitations of Use	9
Tables	
1 Type I, Class 1, Handles, Hinged	3
2 Type I, Class 2, Handles, Ratchet, Reversible	4
3 Type I, Class 3, Style A, Handles, Speeder, Brace Type, Single Revolving Handgrip	5
4 Type I, Class 3, Style B, Handles, Speeder, Spin Type, Screwdriver Grip	5
5 Type I, Class 4, Handles, T, Sliding	6
6 Type II, Class 1, Attachments, Universal Joint	6
7 Type II, Class 2, Style A, Attachments, Extension Bar, Solid	7
8 Type II, Class 2, Style B, Attachments, Extension Bar, Flexible	8
9 Type II, Class 3, Style A, Attachments, Adapter, Socket Wrench	8
10 Type II, Class 3, Style B, Attachments, Adapter, Ratchet	9

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 include safety considerations.

The purposes of this Standard are to define dimensional, performance, and safety requirements specifically applicable to handles and attachments for hand socket wrenches and to specify test methods to evaluate performance relating to the defined requirements.

This Standard is a revision of B107.10M-1996, Handles and Attachments for Hand Socket Wrenches – Inch and Metric Series. A principal change in this edition of the Standard is the elimination of metric information. Updated references, 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 of this Standard should be expressed in writing to the Secretary, B107 Committee at the address below.

Suggestions for the improvement of this Standard are welcomed. They 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.

This revision was approved as an American National Standard on October 19, 2005.

ASME B107 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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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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HANDLES AND ATTACHMENTS FOR HAND SOCKET WRENCHES

1 SCOPE

This Standard provides dimensional, performance, and safety requirements for the more generally used handles and attachments utilized by mechanics in repair and maintenance of vehicles, machinery, and other items.

Inclusion of dimensional data in this Standard is not intended to imply that all of the products described herein are stock production sizes. Consumers are requested to consult with manufacturers concerning lists of stock production sizes.

2 CLASSIFICATION

Type I: Handles

Class 1: Hinged

Class 2: Ratchet, reversible

Class 3: Speeder

Style A: Brace type, single, revolving handgrip

Style B: Spin type, screwdriver grip

Class 4: T, sliding

Type II: Attachments

Class 1: Universal joint

Class 2: Extension bar

Style A: Solid

Style B: Flexible

Class 3: Adapter

Style A: Socket wrench

Style B: Ratchet

3 REFERENCES

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

ASME B46.1-1995, Surface Texture (Surface Roughness, Waviness, and Lay)

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

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

ASTM B 117-97, Standard Practice for Operating Salt Spray (Fog) Apparatus

ASTM B 537-70 (1997), Standard Practice for Rating of Electroplated Panels Subjected to Atmospheric Exposure

ASTM B 571-97, Standard Test Methods for Adhesion of Metallic Materials

ASTM D 968-93, Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive

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

Publisher: ASTM International (ASTM), 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959

4 REQUIREMENTS

The illustrations herein are descriptive, not restrictive, and not intended to preclude the manufacture of handles and attachments that are otherwise in accordance with this Standard.

Handles and attachments shall pass the applicable tests in para. 5.

4.1 Marking

Handles and attachments shall be marked in a permanent manner with the manufacturer's name, or with a trademark of such known character that the manufacturer may be readily determined.

4.2 Drive End Dimensions

External and internal drive end dimensions shall conform to ASME B107.4M.

4.3 Hardness

Unless otherwise specified, drive tang and internal square of handles and attachments shall be hardened throughout from 38 HRC to 60 HRC.

4.4 Proof Torque

When tested as specified in para. 5.2, tools shall withstand the proof torque specified in the applicable tables without permanent deformation, cracks, failure of the ratcheting mechanisms, pins loosening, or other evidence of failure.

4.5 Finish

Tools shall be free from rust, burrs, pits, nodules, blisters, cracks, or other conditions that may impair serviceability, safety, durability, or appearance. All edges and

corners shall be rounded, chamfered, or have sharp edges removed.

4.5.1 Surface Finish. All surfaces shall have a maximum roughness of 200 $\mu\text{in.}$ when tested per para. 5.6. As a guideline, buffed or polished surfaces shall have a maximum roughness of 30 $\mu\text{in.}$ Handles and attachments with phosphate or oxide coating are excluded from the surface roughness requirements.

Forge flash shall blend smoothly with adjacent surfaces. External sharp edges shall be broken to 0.016 in. radius minimum, and shall not project more than 0.016 in. from adjacent surfaces.

4.5.2 Coatings. Handles and attachments shall be coated with one of the following:

(a) *Nickel-Chromium Plate.* The coatings shall be electrodeposited metals consisting of nickel followed by chromium. The minimum thickness shall be 0.00015 in. for nickel or iron-nickel, and 0.000003 in. for chromium, or the tool shall pass the alternative coating test as specified in para. 5.5.

(b) *Oxide Coating or Phosphate Coating.* Coating shall consist of a chemically produced oxide or phosphate, followed with a coating of rust preventative.

(c) *Alternative Coatings.* Alternative coatings may be used in lieu of nickel-chromium and shall be subjected to the alternative coating test as specified in para. 5.5.

4.6 Design, Type I, Handles

4.6.1 Class 1, Hinged (Illustration in Table 1). Handle shall include a steel hinged drive tang attached to a fork. The hinged drive tang shall be suitable for operation at an angle within a range of 90 deg in either direction from the longitudinal axis of the handle. The handle shall be provided with a tension device, which will hold the drive tang against gravity. The free end of the handle may have a transverse hole suitable for accommodating a slide rod. The hinge pin shall not extend beyond the periphery (or flat of the fork) by more than 0.031 in. Handle shall conform to Table 1 and pass the pin removal test in para. 5.9.

4.6.2 Class 2, Ratchet, Reversible (Illustration in Table 2). Handle shall be either gear head or clutch type and shall include a head for housing a ratchet mechanism, and a drive tang. The horizontal or side movement and vertical or up and down movement of the tang shall be held within the limits of Table 2. Ratcheting action shall be attained by means of a completely enclosed gear having hardened teeth engaging a hardened pawl or pawls, or by means of a completely enclosed clutch mechanism. Ratcheting action shall be reversible by manual movement of a shifting lever, button, or knob that permits ratcheting operation of the

drive tang in either direction of rotation. The ratcheting mechanism shall withstand the reverse torque of Table 2 when tested as specified in para. 5.3, and the drop test of para. 5.4. The ratchet handle shall withstand the proof torque specified, and shall show no indication of damage or adverse effects on the ratcheting mechanism and the handle after removal of the test torque. Handles shall conform to Table 2.

4.6.3 Class 3, Speeder. The requirements of para. 4.3 do not apply to these tools.

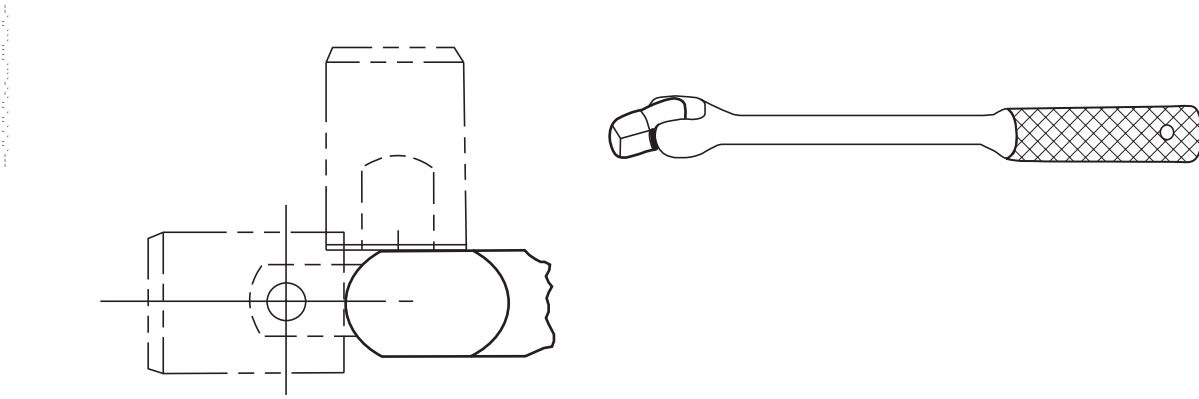
(a) *Style A, Brace Type, Single Revolving Handgrip (Illustration in Table 3).* Handles shall have a square external tang at one end, and an attached rotatable metal handgrip or knob at the other end. Grips or knobs shall be constructed so that they will rotate freely without binding after being subjected to the thrust load and pull loads specified in Table 3 and paras. 5.7 and 5.8. The shank shall not extend through the end of the handgrip or knob. Handles shall conform to Table 3.

(b) *Style B, Spin Type, Screwdriver Grip (Illustration in Table 4).* Handles shall consist of a steel shank having a square drive tang at one end and a handgrip at the other end. The handle grip shall be shaped so as to afford a comfortable grip and shall be secured to the shank in such a manner that separation will not occur under the pulling load specified in Table 4. The handle grip shall be made of a durable and comfortable material. The handle shall be free from rough edges, sharp corners, or tool marks. Handles shall conform to Table 4.

4.6.4 Class 4, T, Sliding (Illustration in Table 5). Handle shall consist of a socket holder and a steel rod. The socket holder shall have a transverse tool to accommodate the rod and form a "T" or "L" handle tool. The socket holder shall have means to be secured at any desired point on the rod. Each end of the rod shall have a steel ball staked in place, or other means of preventing the socket holder from sliding off, except that this shall not be accomplished by flattening or crimping the ends of the bar. Sliding rod on $\frac{3}{4}$ in. drive and 1 in. drive may have the retaining feature on one end only. Handle shall conform to Table 5.

4.7 Design, Type II, Attachments

4.7.1 Class 1, Universal Joint (Illustration in Table 6). Attachment shall consist of a square external tang and a square internal socket, permanently attached to each other or to an intermediate member in a manner so as to form a universal type of joint. The universal joint shall be provided with a tension device which shall hold the socket end relative to the drive end in any set position against gravity. It shall be capable of rotation in a complete circle when the angular deviation of either end member from the common centerline is 30 deg minimum. Hinge pins shall not extend beyond the periphery of the universal joint for more than 0.031 in. Attachment

**Table 1 Type I, Class 1, Handles, Hinged**

Drive Size, in.	Overall Length, in. [Note (1)]		Maximum Dimension Across Hinge (Fork Width), in.	Handgrip		Minimum Proof Torque, lbf-in.	Maximum Shank Handle [Note (2)] (Cross-section or Diameter), in.	Minimum Force Required for Removal of Hinge Pins, lb
	Min.	Max.		Minimum Length, in.	Minimum Diameter or Width, in.			
1/4	4.875	6	0.625	1.5	0.375	400	0.562	80
3/8	7	10	0.875	2.25	0.5	1,200	0.781	250
1/2	9	24	1.187	3	0.687	4,000	0.906	400
3/4	17.75	---	1.781	3.5	0.75	9,000	1.25	1,000
1	22	---	2.25	3.5	0.812	15,000	1.25	1,500

NOTES:

- (1) This measurement shall be taken with tang perpendicular to the handle (see illustration).
 (2) This measurement shall be taken at the midpoint of the handle's overall length.

shall conform to Table 6 and pass the pin removal test in para. 5.9.

4.7.2 Class 2, Extension Bar. Attachment shall have a square internal socket at one end and an external drive tang at the opposite end.

(a) *Style A, Solid* (Illustration in Table 7). Attachment shall conform to Table 7.

(b) *Style B, Flexible* (Illustration in Table 8). Attachment shall be capable of bending 90 deg and returning to within 5 deg of original alignment when released. Attachment shall be capable of sustaining the proof torque (without permanent deformation) in both clockwise and counterclockwise directions, and shall conform to Table 8. The requirements of para. 4.3 do not apply to these tools.

4.7.3 Class 3, Adapter

(a) *Style A, Socket Wrench* (Illustration in Table 9). Attachment shall have an external square drive tang at one end and an internal square socket at the other end. Attachment shall conform to Table 9.

(b) *Style B, Ratchet* (Illustration in Table 10). Attachment shall have a square external drive tang at one end and a square internal socket on the other end. The ratchet mechanism shall be the reversible type permitting ratcheting operation of the drive tang in either direction and shall be completely enclosed. Attachment shall conform to Table 10.

5 TESTS

The tests specified herein are inherently hazardous and adequate safeguards for personnel and property shall be employed in conducting these tests.

5.1 Hardness

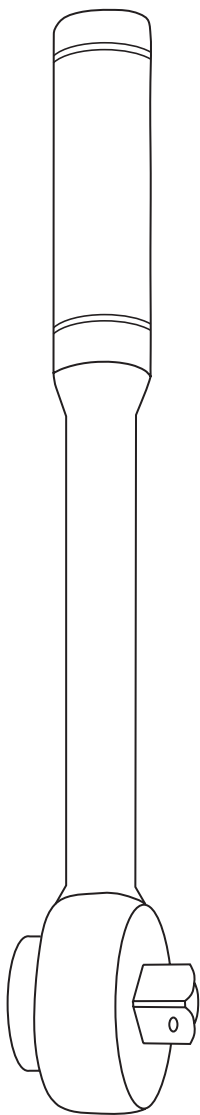
Handles and attachments for which hardness requirements are specified shall be tested in accordance with ASTM E 18.

5.2 Proof Torque Test

Torque shall be applied with a suitable torque-producing machine. Above 50% of peak value, torque shall be applied at a speed of 15 deg/min to 30 deg/min until peak value is verified, then torque shall be released. Direct bending and shear loading shall be avoided in all torque tests. Drive squares of test equipment shall conform to ASME B107.4M.

5.2.1 Adapter Attachments. Adapter tests shall be made in the manner specified in para. 5.2, except that the external drive tang shall be inserted in an internal socket and secured in a mandrel.

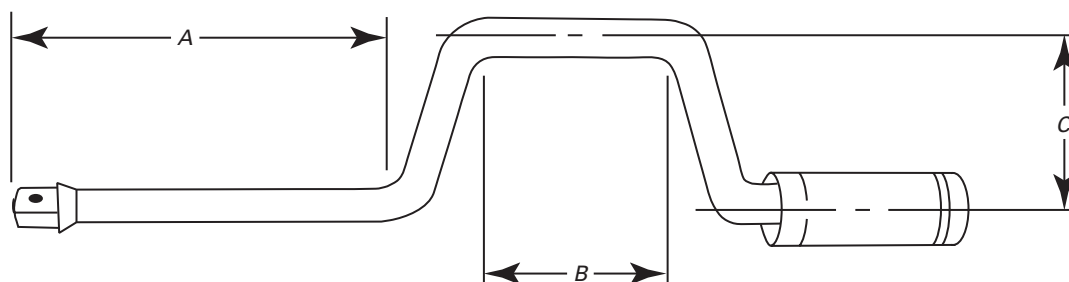
5.2.2 T, Sliding, and Ratchet Handles. The external drive tang shall be inserted into an internal mandrel. The pawl of the ratchet shall be engaged with the teeth of the gear by a normal rotation of the handle without

**Table 2 Type I, Class 2, Handles, Ratchet, Reversible**

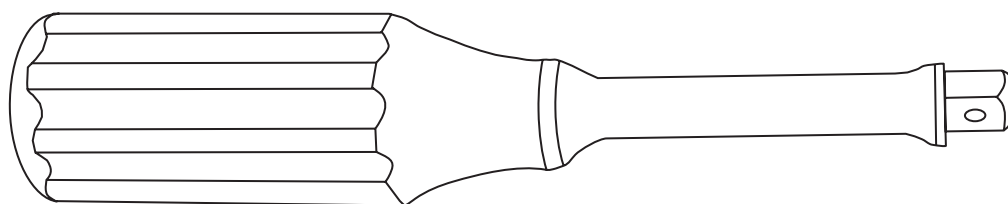
Drive Size, in.	Head Dimensions				Minimum Handgrip Thickness or Diameter, in.	Minimum Gearhead Number of Teeth in Gear	Maximum Horizontal or Side Movement of Tang in Handle, in.	Maximum Vertical or Up and Down Movement of Tang in Handle, in.	Maximum Reverse Torque Ratcheting Starting (Torsional Moment for Each Tooth of Gear), ozf-in.	Minimum Proof Torque, lbf-in.	Maximum Shank Handle (Diameter or Cross-section) [Note (1)]	Minimum Cycle Test Torque, lbf-in. [Note (2)]
	Minimum Overall Length, in.	Maximum Width, in.	Less Tang and Reverse Lever, in.	Maximum Head Thickness								
1/4	4.375	1.125	0.593	0.875	0.281	18	0.012	0.02	10	450	0.562	90
3/8	5.75	1.875	0.875	1.000	0.500	18	0.014	0.02	25	1,800	0.781	360
1/2	9.500	1.937	1.000	1.375	0.500	24	0.014	0.028	50	4,500	0.906	900
3/4	17.000	2.875	1.375	1.750	0.750	24	0.014	0.034	200	12,000	1.562	2,400
1	20.000	3.875	1.750		0.750	24	0.014	0.034	300	22,000	1.687	4,400

NOTES:

- (1) This measurement shall be taken at the midpoint of the handle's overall length.
 (2) Cycle test torque is 20% of proof torque.

**Table 3 Type I, Class 3, Style A, Handles, Speeder, Brace Type, Single Revolving Handgrip**

Drive Size, in.	Maximum Diameter of Rod, in.	Overall Length, in.		Minimum Radius of Crank Sweep, C, in.	Minimum Length Extension, A, in.	Minimum Thrust Load End Grip, lb	Minimum Proof Torque Offset Handle Rotating Direction, lbf-in.	Minimum End Grip Removal Pull Test, lb	Minimum Grip Length, B, in.
		Min.	Max.						
1/4	0.437	12	16.5	2.500	5.0	50	140	50	2.50
3/8	0.500	14	18.0	2.875	5.0	100	475	50	2.50
1/2	0.562	16	20.0	3.375	5.5	125	700	50	3.25

**Table 4 Type I, Class 3, Style B, Handles, Speeder, Spin Type, Screwdriver Grip**

Drive Size, in.	Minimum Length of Shank Beyond Handle, in.	Handle Length, in.		Handle Diameter, in.		Minimum Pull Load on Shank, lb	Minimum Torque, lbf-in.
		Min.	Max.	Min.	Max.		
1/4	1.87	2.63	4	0.88	1.27	50	90

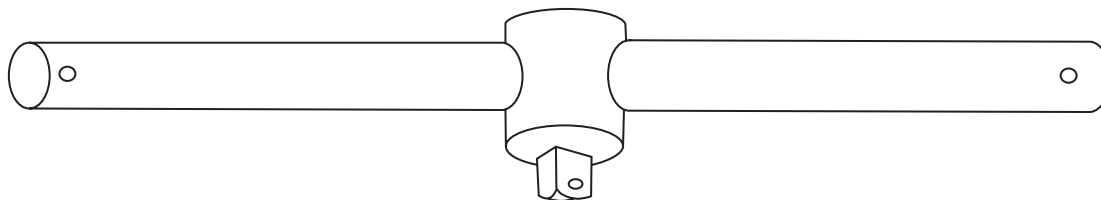
the need of manual adjustment of the ratcheting mechanism for seating. The load shall be applied near the free end of the handle after a stop has been set at the outer end of the driving head to prevent slippage of the drive tang endwise from the socket. The T-handle shall be tested with the external drive tang at one end of the bar.

5.2.3 Speeder Handles. Brace type speeders shall be tested by inserting the external drive tang into the internal mandrel, and supporting the end handle in line with the drive end. The load shall be applied to the crank centrally between the throws. The lever arm shall be the throw of the crank as measured by the distance between the center of the offset and the center of the body of the tool. The load in pounds that is applied

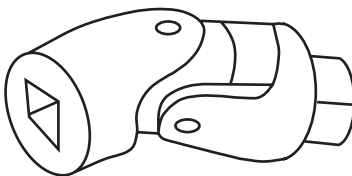
shall be calculated from the throw so as to produce the required torque. Spin type speeders shall be tested by inserting the external drive tang into the internal mandrel, with the handle gripped in the jaws of a chuck to which the proof torque is applied.

5.2.4 Hinged Handles. Torque tests shall be made with the tang perpendicular to the axis of the handle.

5.2.5 Universal Joint Attachments. Tests shall be made in the same manner as specified in para. 5.3, except that the external drive tang shall be inserted into an internal mandrel. In addition, means shall be provided to keep the parts of the universal joint assembly in the axis about which the load is applied.

**Table 5 Type I, Class 4, Handles, T, Sliding**

Drive Size, in.	Sliding Rod				Maximum Socket Holder Overall Length, in.	Minimum Proof Torque, lbf-in.
	Diameter, in.		Length, in.			
	Min.	Max.	Min.	Max.		
1/4	0.230	0.313	4	5	1.093	400
3/8	0.355	0.438	6	8	1.375	1,000
1/2	0.480	0.625	9	13	1.750	2,500
3/4	0.730	0.875	17	20	2.500	9,000
1	0.855	1.125	20	32	3.500	15,000

**Table 6 Type II, Class 1, Attachments, Universal Joint**

Drive Size, in.	Maximum Overall Length, in.	Maximum Diameter, in.	Minimum Proof Torque, lbf-in.	Minimum Force Required for Removal of Hinge Pins, lb
1/4	1.50	0.59	250	80
3/8	2.25	0.79	750	250
1/2	2.88	1.01	1,750	400
3/4	4.25	1.63	4,000	1,000

5.3 Reverse Torque, Ratcheting, Type I, Class 2 Handle, Ratchet, Reversible, and Type II, Class 3, Style B, Attachment, Adapter, Ratchet, Socket Wrench

A torque shall be applied to ratchets and ratcheting adapters to determine conformance with the reverse torque ratcheting torsional moment requirement of Tables 2 and 10, respectively. Before applying the torque, the ratchet mechanism should be revolved several times by hand.

5.4 Drop Test, Type I, Class 2, Ratchet, Reversible

The ratchet handle shall be dropped on concrete from a height of 6 ft 12 times, of which the shifter shall strike first on concrete at least twice. After this test, all component parts shall remain properly assembled and the ratchet mechanism shall work satisfactorily.

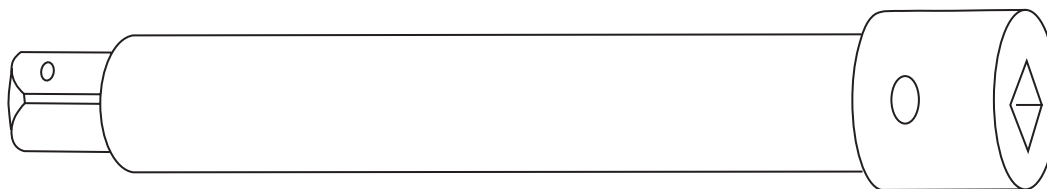
5.5 Alternative Coating Test

This test consists of an adhesion, abrasion, and corrosion test specified in paras. 5.5.2 through 5.5.4.

5.5.1 Test Preparation. The quantity and condition of the handles and attachments used for the following testing shall be per the manufacturer's standard practice or as mutually agreed to by the manufacturer and the customer. If the handle/attachment does not have sufficient surface area to conduct the tests, a 3/4 in. combination wrench, or a 4 in. × 6 in. panel(s) per ASTM B 537/ASTM D 968 Method A, shall be used.

5.5.2 Adhesion Test. Handles and attachments shall pass the file or grind-saw test of ASTM B 571.

5.5.3 Abrasion Test. Test specimens shall have no base material exposed after being subjected to 100 L of falling sand per ASTM D 968 Method A.

**Table 7 Type II, Class 2, Style A, Attachments, Extension Bar, Solid**

Drive Size, in.	Nominal Length, in.	Maximum Shank Diameter, in.	Overall Length, in.		Minimum Proof Torque, lbf-in.
			Min.	Max.	
$\frac{1}{4}$	1	0.343	1.0	1.5	500
$\frac{1}{4}$	2	0.343	1.5	2.5	500
$\frac{1}{4}$	3	0.343	2.5	3.5	500
$\frac{1}{4}$	4	0.343	3.5	4.5	500
$\frac{1}{4}$	6	0.343	5.5	6.5	500
$\frac{1}{4}$	10	0.343	9.5	10.5	500
$\frac{1}{4}$	14	0.343	13.5	14.5	500
$\frac{1}{4}$	17	0.343	16.5	17.5	500
$\frac{3}{8}$	1	0.500	1.0	1.5	1,200
$\frac{3}{8}$	2	0.500	1.5	2.5	1,200
$\frac{3}{8}$	3	0.500	2.5	3.5	1,200
$\frac{3}{8}$	5	0.500	4.5	5.5	1,200
$\frac{3}{8}$	6	0.500	5.5	6.5	1,200
$\frac{3}{8}$	8	0.500	7.5	8.5	1,200
$\frac{3}{8}$	9	0.500	8.5	9.5	1,200
$\frac{3}{8}$	10	0.500	9.5	10.5	1,200
$\frac{3}{8}$	11	0.500	10.5	11.5	1,200
$\frac{3}{8}$	12	0.500	11.5	12.5	1,200
$\frac{3}{8}$	18	0.500	17.0	19.0	1,200
$\frac{3}{8}$	20	0.500	19.0	21.0	1,200
$\frac{3}{8}$	24	0.500	23.0	25.0	1,200
$\frac{3}{8}$	34	0.500	33.0	35.0	1,200
$\frac{1}{2}$	2	0.656	1.5	3.0	3,500
$\frac{1}{2}$	3	0.656	2.5	3.5	3,500
$\frac{1}{2}$	5	0.656	4.5	6.0	3,500
$\frac{1}{2}$	6	0.656	5.5	6.5	3,500
$\frac{1}{2}$	10	0.656	9.5	10.5	3,500
$\frac{1}{2}$	15	0.656	14.5	15.5	3,500
$\frac{1}{2}$	20	0.656	19.0	21.0	3,500
$\frac{1}{2}$	24	0.656	23.0	25.0	3,500
$\frac{1}{2}$	30	0.656	29.0	31.0	3,500
$\frac{1}{2}$	34	0.656	33.0	35.0	3,500
$\frac{1}{2}$	36	0.656	35.0	37.0	3,500
$\frac{1}{2}$	48	0.656	46.0	50.0	3,500
$\frac{3}{4}$	3	1.000	2.5	3.5	9,000
$\frac{3}{4}$	5	1.000	4.5	5.5	9,000
$\frac{3}{4}$	8	1.000	7.5	8.5	9,000
$\frac{3}{4}$	16	1.000	15.0	17.0	9,000
1	8	1.375	7.5	8.5	15,000
1	17	1.375	16.0	18.0	15,000

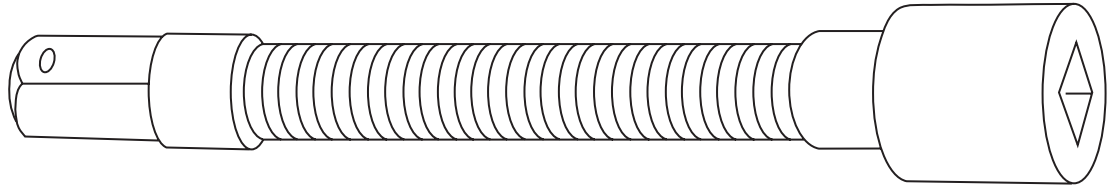


Table 8 Type II, Class 2, Style B, Attachments, Extension Bar, Flexible

Drive Size, in.	Overall Length, in.		Minimum Proof Torque, lbf-in.
	Min.	Max.	
$\frac{1}{4}$	3.5	4.5	25
$\frac{1}{4}$	5.5	6.5	25
$\frac{1}{4}$	7.5	8.5	35

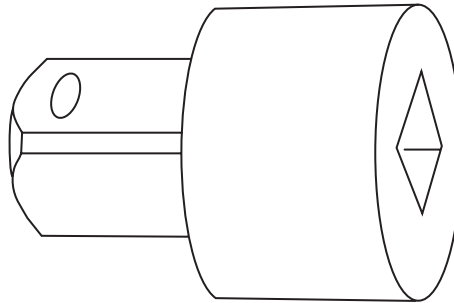


Table 9 Type II, Class 3, Style A, Attachments, Adapter, Socket Wrench

Drive Size, in.		Overall Length, in.		Maximum Outside Diameter, in.	Minimum Proof Torque, lbf-in.
External Drive Tang	Internal Drive Tang	Min.	Max.		
$\frac{3}{8}$	$\frac{1}{4}$	0.625	1.000	0.625	450
$\frac{1}{4}$	$\frac{3}{8}$	0.625	1.125	0.687	450
$\frac{1}{2}$	$\frac{3}{8}$	1.093	1.500	0.875	2,000
$\frac{3}{4}$	$\frac{1}{2}$	1.250	1.500	1.000	2,000
$\frac{3}{4}$	$\frac{1}{2}$	1.500	1.937	1.125	4,500
$\frac{1}{2}$	$\frac{3}{4}$	1.687	2.125	1.500	4,500
$\frac{3}{4}$	1	2.250	2.875	2.000	14,000
1	$\frac{3}{4}$	2.000	2.625	1.500	14,000

5.5.4 Corrosion Test. Test specimens shall be tested for corrosion resistance by exposure to a 48 hr salt spray test, as specified in ASTM B 117, without falling below the ASTM B 537 rating of 6.

5.6 Surface Roughness Test

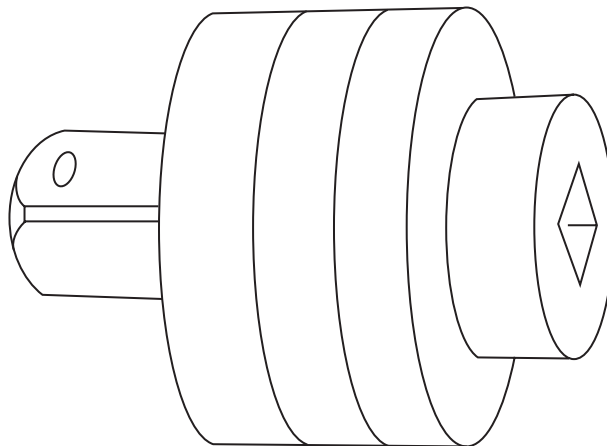
Measurement shall be made with a surface measuring instrument using a 0.03 in. cutoff. Surface roughness values shall be rated as the arithmetical average. Definitions and nomenclature used herein can be found in ASME B46.1.

5.7 Thrust Load Test

A load, as specified in Table 3, shall be applied to the knob toward the drive square. During application of load, the speeder shall be rotated two full revolutions. After removal of the load, the knob shall operate freely without binding.

5.8 Pull Test

A load, as specified in Table 3, shall be applied to the knob away from the drive square. Load shall be applied

**Table 10 Type II, Class 3, Style B, Attachments, Adapter, Ratchet**

Drive Size, in.	Maximum Outside Diameter Socket End, in.	Maximum Overall Length, in.	Minimum Number of Teeth in Gear	Maximum Reverse Torque Ratcheting Starting (Torsional Moment for Each Tooth of Gear), in.-oz	Minimum Proof Torque, lbf-in.
$\frac{1}{4}$	1.125	2.000	18	10	450
$\frac{3}{4}$	1.437	2.125	18	25	1,500
$\frac{1}{2}$	1.750	3.000	18	60	4,000
$\frac{3}{4}$	2.625	4.000	18	120	7,500
1	3.500	5.125	18	300	15,000

for a minimum of 10 sec. After removal of load, the knob shall operate freely without binding.

5.9 Pin Removal Test

Pin retention shall be tested in a device capable of applying force to the pins. The pin shall not move under load.

6 SAFETY REQUIREMENTS AND LIMITATIONS OF USE

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

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