ASME B107.110-2012

(Redesignation and Consolidation of ASME B107.1, B107.2, B107.5M, B107.10, B107.12, B107.33M, and B107.34)

Socket Wrenches, Handles, and Attachments

AN AMERICAN NATIONAL STANDARD

The American Society of Mechanical Engineers

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Two Park Avenue • New York, NY • 10016 USA

Date of Issuance: June 7, 2013

This Standard will be revised when the Society approves the issuance of a new edition.

ASME issues written replies to inquiries concerning interpretations of technical aspects of this Standard. Periodically certain actions of the ASME B107 Committee may be published as Cases. Cases and interpretations are published on the ASME Web site under the Committee Pages at http://cstools.asme.org/ as they are issued.

Errata to codes and standards may be posted on the ASME Web site under the Committee Pages to provide corrections to incorrectly published items, or to correct typographical or grammatical errors in codes and standards. Such errata shall be used on the date posted.

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The American Society of Mechanical Engineers
Two Park Avenue, New York, NY 10016-5990

CONTENTS

Tables

FOREWORD

The American National Standards Committee B107, Socket Wrenches and Drives, under sponsorship of The American Society of Mechanical Engineers (ASME), was reorganized on June 28, 1967 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.

In 1999, ASME initiated a project to consolidate hand tool standards by category of tool. The initial implementation included distinct standards within a single publication bearing a three-digit number corresponding to the responsible B107 subcommittee. Subsequent revisions are intended to integrate the component standards resulting in a more traditional document. In order to maintain continuity within the user community, the former component standard numbers are renamed as categories in the consolidated standard, and designations are provided in Nonmandatory Appendix A.

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

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.

This Standard supersedes, replaces, and renders obsolete the following standards:

ASME B107.1, Socket Wrenches, Hand (Inch Series)

ASME B107.2, Socket Wrenches, Extensions, Adaptors, and Universal Joints, Power Drive (Impact) (Inch Series)

ASME B107.5M, Socket Wrenches, Hand (Metric Series)

ASME B107.10, Handles and Attachments for Hand Socket Wrenches

ASME B107.12, Nutdrivers

ASME B107.33M, Socket Wrenches, Impact (Metric Series)

ASME B107.34, Socket Wrenches for Spark Plugs

Socket wrenches previously described in ASME B107.5M are included in Category 1. Socket wrenches and attachments previously described in ASME B107.33M are included in Category 2.

This Foreword is not a part of ASME B107.110, Socket Wrenches, Handles, and Attachments, and is included for information purposes only.

Members of the Hand Tools Institute, Wrench Standards Committee, through their knowledge and hard work, have been major contributors to the development of the B107 wrench standards. Their active efforts in the promotion of these standards are acknowledged and appreciated.

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 Standards Committee, at the address below.

Suggestions for the improvement of this Standard are welcome. They should be addressed to the Secretary, ASME B107 Standards Committee, Two Park Avenue, New York, NY 10016-5990.

ASME B107.110-2012 was approved by the B107 Standards Committee on April 11, 2012 and by the Board on Standards and Testing on August 17, 2012. It was approved as an American National Standard on November 27, 2012.

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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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
Two Park Avenue
New York, NY 10016-5990
http://go.asme.org/Inquiry

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.

Proposing a Case. Cases may be issued for the purpose of providing alternative rules when justified, to permit early implementation of an approved revision when the need is urgent, or to provide rules not covered by existing provisions. Cases are effective immediately upon ASME approval and shall be posted on the ASME Committee Web page.

Requests for Cases shall provide a Statement of Need and Background Information. The request should identify the Standard, the paragraph, figure or table number(s), and be written as a Question and Reply in the same format as existing Cases. Requests for Cases should also indicate the applicable edition(s) of the Standard to which the proposed Case applies.

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, that 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.

ASME procedures provide for reconsideration of any interpretation when or if additional information that might affect an interpretation is available. Further, persons aggrieved by an interpretation may appeal to the cognizant ASME Committee or Subcommittee. ASME does not "approve," "certify," "rate," or "endorse" any item, construction, proprietary device, or activity.

Attending Committee Meetings. The B107 Standards Committee regularly holds meetings that are open to the public. Persons wishing to attend any meeting should contact the Secretary of the B107 Standards Committee.

SOCKET WRENCHES, HANDLES, AND ATTACHMENTS

1 SCOPE

This Standard provides performance and safety requirements for socket wrenches (sockets), handles used with these wrenches, nutdrivers, and attachments used with socket wrenches, hereinafter collectively referred to as tools. 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 and lengths.

2 REFERENCES

The following is a list of publications referenced in this Standard. The latest edition shall be used.

ASME B46.1, Surface Texture, Surface Roughness Waviness and Lay

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

ASME B107.17, Gages and Mandrels for Wrench Openings

Publisher: The American Society of Mechanical Engineers (ASME), Two Park Avenue, New York, NY 10016-5990 (www.asme.org)

ASTM B117, Standard Practice for Operating Salt Spray (Fog) Apparatus

ASTM B537, Standard Practice for Rating of Electroplated Panels Subjected to Atmospheric Exposure

ASTM B571, Standard Practice for Qualitative Adhesion Testing of Metallic Coatings

ASTM D968, Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive

ASTM E18, Standard Test Methods for Rockwell Hardness of Metallic Materials

Publisher: The American Society for Testing and Materials (ASTM), 100 Barr Harbor Drive, P. O. Box C700, West Conshohocken, PA 19428-2959 (www.astm.org)

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

Publisher: Hand Tools Institute (HTI), 25 North Broadway, Tarrytown, NY 10591-3201 (www.hti.org)

SAE J1703, Motor Vehicle Brake Fluid

Publisher: Society of Automotive Engineers (SAE), 400 Commonwealth Drive, Warrendale, PA 15096 (www.sae.org)

3 CLASSIFICATION

(a) Category 1: Hand Driven Socket Wrenches. Detachable socket wrenches with square drive for hand use.

(b) Category 2: Socket Wrenches, Extensions, Adaptors, and Universal Joints, Power Drive (Impact). Detachable socket wrenches, extensions, adaptors, and universal joints for power drive impact use.

(c) Category 10: Handles and Attachments for Hand Socket Wrenches. The more generally used handles and attachments utilized by mechanics in repair and maintenance of vehicles, machinery, and other items.

(d) Category 12: Nutdrivers. With an integral socket and shaft that utilize a screwdriver-type handgrip.

(e) Category 34: Spark Plug Socket Wrenches. Detachable hand use socket wrenches with square drive for spark plugs.

Subclassifications are detailed in the classification section of each category.

4 PERFORMANCE REQUIREMENTS

The illustrations shown herein are descriptive and not restrictive, and are not intended to preclude the manufacture of tools that are otherwise in accordance with this Standard. Dimensions shall be in accordance with the applicable tables unless otherwise specified. Requirements unique to a category of tools are indicated in that section. Tools shall pass all of the applicable tests in section 5 and within category requirements as applicable.

4.1 Design

4.1.1 Nut-End Socket Opening. The internal wrench opening of a single hexagon (6-point) or a double hexagon (12-point) configuration, or a single square (4-point) or a double square (8-point) shall conform to one of the following wrenching opening designs.

(a) Standard Single or Double Hexagon Configuration. This design consists of a simple geometric single hexagon (6-point) or a double hexagon (12-point) configuration having an across-flats and an across-corner shape for fitting with commercial hexagon fasteners.

(b) Modified Single or Double Hexagon Configuration. This design consists of a geometric single hexagon (6-point) or a double hexagon (12-point) configuration that does not contact on the fastener's corners.

(c) Standard Single or Double Square Configuration. This design consists of a simple geometric single (4-point) square or a double (8-point) square configuration having an across-flats and an across-corner shape for fitting with commercial square fasteners.

The across-flats and across-corners tolerances of all the wrench opening designs shall be such as to ensure acceptance when gaged with gages conforming to ASME B107.17.

4.1.2 Bolt Clearance Hole for Category 1 and Category 2 Sockets. A space shall be provided for bolt clearance in all sockets except Category 1, Type III and Category 2, Type III universal joint sockets (Figs. 1-2 and 2-2). The diameter of the bolt clearance hole shall be in accordance with that of the applicable size socket as specified in the respective tables. The minimum depth for the bolt clearance hole, as measured from the nut end face, shall be 1.5 times the minimum Opening Depth, Nut End for sockets with overall length less than the following length values:

Drive Size, in. (mm)	Overall Length, in. (mm)
$\frac{1}{4}$ (6.3)	1.5 (38)
$\frac{3}{8}$, $\frac{1}{2}$ (10, 12.5)	2.0 (51)
$\frac{3}{4}$, 1 (20, 25)	3.0 (76)

or a minimum bolt clearance hole depth of 50% of the overall length for sockets with overall length equal to or greater than the length values listed above.

4.1.3 Drive Ends. Drive ends, when provided, shall conform to ASME B107.4.

4.1.4 Countersink of Nut-End Socket Opening. The nut end socket opening shall be countersunk with an included angle of 90 deg to 150 deg (for Category 34, the angle shall be 85 deg to 155 deg) and a minimum diameter equal to the across-corners dimension of the opening.

4.2 Materials

The materials used in the manufacture of the sockets shall be such as to produce tools conforming to requirements in this Standard.

4.3 Marking

Sockets 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 may be readily determined. Marking shall include the nominal socket opening size (distance across flats). Marking shall be as permanent as the normal life expectancy of the tool to which it is applied (providing the marked surface has not been subjected to an abrading action) and be capable of withstanding the cleaning procedures normally experienced during its intended use. The marked area of the tool may be exempt from the corrosion test in para. 5.3.4 when mutually agreed to by the manufacturer and the customer.

4.4 Hardness

Hardness requirements are shown within each category's requirements.

4.5 Finish

4.5.1 Surface Finish. All surfaces shall be free from pits, nodules, forge flash, burrs, cracks, and other conditions that would adversely affect the performance or safety of the tool. Metallic surfaces shall have a rust preventive treatment. When provided, coatings shall be adherent, smooth, continuous, and free from any conditions that may interfere with their protective value, safety, and function.

4.5.2 Coatings. Tools shall be coated with one or a combination of the following coatings. Category 2 tools shall be coated according to para. 4.5.2(b) only.

(a) Nickel-Chromium Coating. The coating shall be a protective, bright, decorative nickel-chromium plating, and shall pass the surface adhesion test as specified in the file, grind-saw, or heat-quench tests of ASTM B571. Sockets shall either pass the alternative coating test as specified in para. 5.3, or have a minimum coating thickness of 0.0002 in. (0.005 mm) for nickel or nickel-iron and 0.000005 in. (0.00013 mm) for chromium.

(b) Oxide or Phosphate Coating. The 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 plating and shall be subjected to the alternative coating tests as specified in para. 5.3.

4.6 Universal Joint Sockets (Categories 1, 2, and 34)

Universal joint sockets shall consist of a single (6-point) or double (12-point) hexagon socket and an internal drive end. Each member shall be permanently attached to each other or by means of an intermediate member to form a universal joint. The sockets shall be provided with a means to hold the drive-end and socket-end in any set position with a force adequate to hold the socket against gravity. For universal sockets with square block joints, angular deviation from centerline is 40 deg minimum. For universal sockets with ball swivel joints, angular deviation from the centerline is 20 deg minimum to 35 deg maximum. If hinge pins are used, they shall not extend beyond the periphery of the universal joint section for more than 0.031 in. (0.79 mm) and shall not interfere with the regular operation of the universal joint. The portion of the hinge pin that extends beyond the periphery shall not have sharp edges. Hinge

pins shall meet removal force requirements of Table 10-6 when tested per para. 10-3.9.

5 TESTS

Many of the tests herein are inherently hazardous. Adequate safeguards for personal and property shall be employed in conducting these tests. These tests are designed to evaluate the tools and materials and do not condone the use of the tools in an environment or manner inconsistent with safe use of the tools. Tests specific to a category of tool are described therein. Conformance with marking and other requirements not determined by test shall be verified by visual examination.

5.1 Hardness

The hardness range specified shall be tested in accordance with ASTM E18. Surface preparation may be necessary to ensure that the hardness of the substrate material is measured.

5.2 Proof Torque Test

Socket openings shall be gaged prior to testing and only sockets in accordance with the gage shall be tested. Sockets shall be loaded to the test load using mandrel depths specified in the applicable tables. Following the removal of the test load, the socket shall be regaged, and any tool that cracks, fractures, does not gage, or displays visible permanent deformation after loading shall have failed the test.

5.2.1 Mandrels for Nut End Socket Openings. Sockets shall be tested on mandrels as specified in ASME B107.17.

5.2.2 Application of Test Loads. The test loads shall be applied with a suitable torque-producing machine.

(a) Sockets. A drive end test mandrel of suitable strength and complying with the dimensional requirements of the drive tang specified in ASME B107.4 shall be employed. The test mandrel shall be driven by any suitable manual or mechanical means. The socket shall be engaged on the end of a mandrel to a depth in accordance with tables herein. Means shall be provided to maintain the mandrel insertion depth.

(b) Universal Joint Sockets. Tests shall be made in the same manner as specified in para. 5.2.2(a), except that means shall be provided to keep the parts of the universal joint socket assembly on a common axis about which the load is applied.

(c) Extensions, Adaptors. A test load shall be applied in the same manner as specified in para. 5.2.2(a), except that the external drive square shall be inserted in an internal square conforming to ASME B107.4 and secured in a mandrel.

5.3 Alternative Coating Tests

5.3.1 Samples. The quantity and condition of the sample tools 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 tool does not have sufficient surface area to conduct the tests, a 4 in. × 6 in. (101 mm × 152 mm) panel(s), per ASTM B537/ASTM D968 Method A, may be used if agreed to by the manufacturer and customer.

5.3.2 Adhesion Test. The coated surfaces shall pass the file or grind-saw test of ASTM B571.

5.3.3 Abrasion Test. The coated surfaces shall have no base material exposed when subjected to 100 L of falling sand test of ASTM D968 Method A.

5.3.4 Corrosion Test. The coated exterior surfaces shall be tested for corrosion resistance by exposure to a 48-hr salt spray test as specified in ASTM B117, without falling below the ASTM B537 rating of 6.

5.4 Pin Removal Test: Category 1, Type III and Category 34, Type II Universal Joint Sockets

Pin retention shall be tested in a device capable of applying force to the pin. The pin shall not move under load specified in Table 10-6.

6 SAFETY REQUIREMENTS AND LIMITATIONS OF USE

Instructors and employers shall stress proper use and safety in the use of the tools described in this Standard, information about which can be found in the Hand Tools Institute publication, Guide to Hand Tools — Selection, Safety Tips, Proper Use and Care.

Category 1
Hand Driven Socket Wrenches

1-1 CLASSIFICATION

NOTE: See Figs. 1-1 and 1-2.

Type I: sockets, single (6-point) and double (12-point) hexagon [see Tables 1-1 through 1-5 (Tables 1-1M through 1-5M)]

Type II: sockets, single (4-point) and double (8-point) square (see Tables 1-6 through 1-8)

Type III: universal joint sockets, single (6-point) and double (12-point) hexagon [see Tables 1-9 through 1-11 (Tables 1-9M through 1-11M)]

1-2 PERFORMANCE REQUIREMENTS

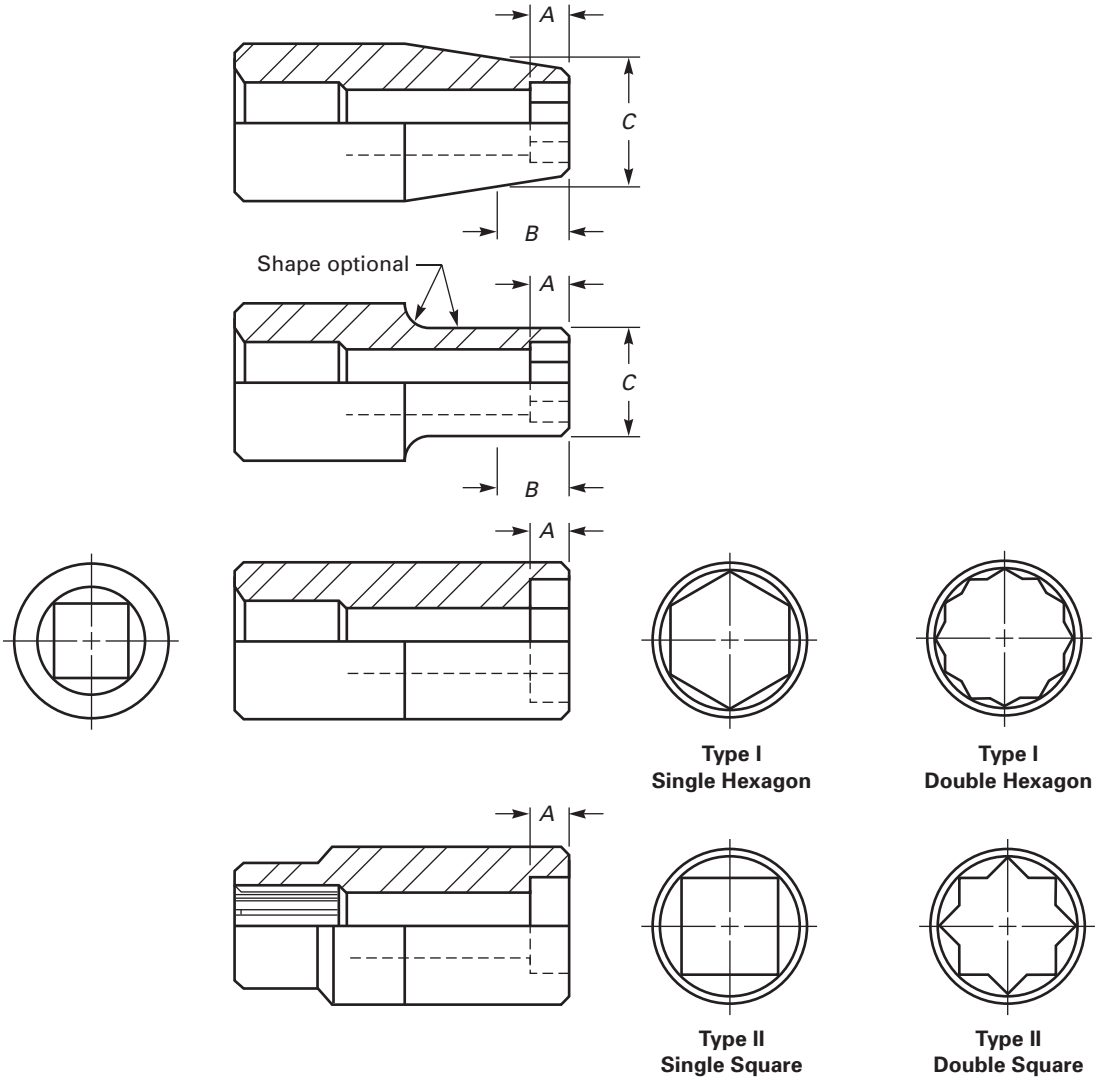
1-2.1 Design

Sockets shall comply with the applicable tables and figures herein.

1-2.2 Hardness

Sockets shall have a hardness of 38 HRC to 56 HRC.

Fig. 1-1 Type I Sockets and Type II Sockets



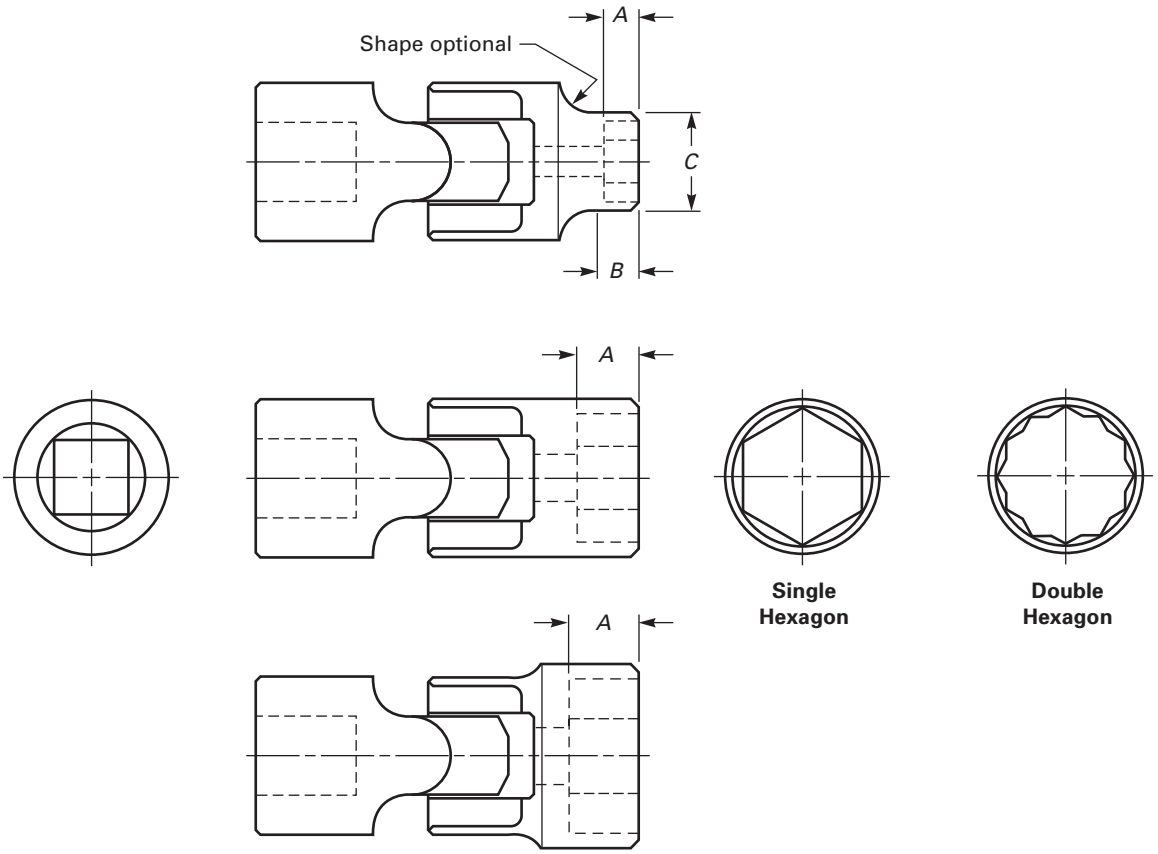
GENERAL NOTES:

(a) *A* shall be equal to or greater than nut opening depth in applicable tables.

(b) Maximum nut end diameter of socket *C* shall not be exceeded for length *B* and shall conform to applicable tables.

(c) *B* length shall be greater than or equal to the minimum nut opening depth in applicable tables.

Fig. 1-2 Type III Universal Joint Sockets



GENERAL NOTES:

(a) *A* shall be greater than or equal to nut opening depth in applicable tables.

(b) Maximum nut end diameter of socket *C* shall not be exceeded for length *B* and shall conform to applicable tables.

(c) *B* length shall be greater than or equal to the minimum nut opening depth in applicable tables.

Table 1-1 Type I Sockets, Single and Double Hexagon, 1/4 in. Drive

Nominal Socket Opening, in.	Maximum Outside Diameter, mm		Minimum Opening Depth, Nut End, in.	Minimum Bolt Clearance Hole Diameter, in.	Minimum Proof Torque, lbf-in.
	Nut End	Drive End			
1/8	0.250	0.510	0.094	0.078	35
5/32	0.281	0.510	0.094	0.093	60
3/16	0.338	0.510	0.094	0.125	95
7/32	0.382	0.510	0.109	0.125	135
1/4	0.425	0.510	0.125	0.141	190
9/32	0.457	0.510	0.141	0.156	250
5/16	0.510	0.510	0.141	0.172	320
11/32	0.547	0.547	0.156	0.203	400
3/8	0.597	0.597	0.156	0.281	500
7/16	0.683	0.683	0.219	0.281	500
1/2	0.697	0.697	0.266	0.344	500
9/16	0.778	0.778	0.328	0.406	500

Table 1-1M Type I Sockets, Single and Double Hexagon, 1/4 in. Drive

Nominal Socket Opening, mm	Maximum Outside Diameter, mm		Minimum Opening Depth, Nut End, mm	Minimum Bolt Clearance Hole Diameter, mm	Minimum Proof Torque, N·m
	Nut End	Drive End			
3.2	6.10	12.95	1.60	1.98	7
4	7.10	12.95	2.40	2.35	8
4.5	7.60	12.95	2.60	2.97	9
5	8.15	12.95	2.80	3.18	10
5.5	8.90	12.95	2.80	3.56	14
6	9.90	12.95	3.05	3.56	16
6.3	9.90	12.95	3.15	3.95	21
7	10.90	12.95	3.55	4.32	27
8	12.20	12.95	3.55	5.33	38
9	13.45	13.45	4.05	5.33	49
10	14.75	14.75	4.60	6.60	63
11	16.00	16.00	5.45	7.62	68
12	17.30	17.30	6.10	8.33	68
13	18.55	18.55	6.75	8.33	68
14	19.80	19.80	8.35	10.35	68
15	21.50	21.50	8.35	11.35	68
16	22.00	22.00	8.75	11.68	68

Table 1-2 Type I Sockets, Single and Double Hexagon, 3/8 in. Drive

Nominal Socket Opening, in.	Maximum Outside Diameter, in.		Minimum Opening Depth, Nut End, in.	Minimum Bolt Clearance Hole Diameter, in.	Minimum Proof Torque, lbf-in.
	Nut End	Drive End			
1/4	0.472	0.690	0.125	0.141	270
9/32	0.496	0.690	0.141	0.156	350
5/16	0.521	0.690	0.141	0.172	440
11/32	0.567	0.690	0.156	0.203	550
3/8	0.613	0.690	0.156	0.281	660
7/16	0.683	0.690	0.219	0.281	930
1/2	0.751	0.880	0.266	0.344	1,240
9/16	0.814	0.880	0.328	0.406	1,610
19/32	0.852	0.885	0.352	0.428	1,800
5/8	0.890	0.890	0.375	0.450	2,000
11/16	0.968	0.968	0.375	0.469	2,200
3/4	1.110	1.110	0.437	0.531	2,200
13/16	1.141	1.141	0.453	0.594	2,200
7/8	1.250	1.250	0.500	0.656	2,200
15/16	1.310	1.310	0.500	0.656	2,200
1	1.380	1.380	0.547	0.656	2,200

Table 1-2M Type I Sockets, Single and Double Hexagon, 3/8 in. Drive

Nominal Socket Opening, mm	Maximum Outside Diameter, mm		Minimum Opening Depth, Nut End, mm	Minimum Bolt Clearance Hole Diameter, mm	Minimum Proof Torque, N·m
	Nut End	Drive End			
5.5	10.10	17.60	2.80	3.56	14
6	10.10	17.60	3.05	3.56	25
6.3	10.10	17.60	3.15	3.95	29
7	11.05	17.60	3.56	4.32	37
8	12.20	17.60	3.56	4.75	52
9	13.60	17.60	4.05	5.33	66
10	15.00	17.60	4.60	6.60	82
11	16.75	17.60	5.45	7.62	112
12	17.80	22.40	6.10	8.33	124
13	18.80	22.40	6.75	8.33	147
14	20.00	22.40	8.35	10.35	175
15	22.40	22.40	8.35	10.35	203
16	22.50	22.50	9.50	11.68	237
17	23.80	23.80	9.50	12.35	249
18	24.60	24.60	10.15	12.35	249
19	25.70	25.70	11.10	14.30	249
20	27.76	27.76	11.10	14.30	249
21	28.80	28.80	11.60	15.10	249
22	30.00	30.00	12.35	16.66	249
23	31.30	31.30	12.35	16.66	249
24	32.50	32.50	12.75	18.35	249
25	33.00	33.00	13.25	18.35	249
26	35.00	35.00	13.75	18.35	249

Table 1-3 Type I Sockets, Single and Double Hexagon, ½ in. Drive

Nominal Socket Opening, in.	Maximum Outside Diameter, in.		Minimum Opening Depth, Nut End, in.	Minimum Bolt Clearance Hole Diameter, in.	Minimum Proof Torque, lbf-in.
	Nut End	Drive End			
3/8	0.655	0.940	0.156	0.281	1,100
7/16	0.730	0.940	0.219	0.281	1,500
1/2	0.775	0.940	0.266	0.344	2,000
9/16	0.845	0.940	0.328	0.406	2,600
19/32	0.920	0.940	0.352	0.428	3,000
5/8	0.942	0.970	0.375	0.450	3,300
11/16	1.010	1.020	0.375	0.469	4,100
3/4	1.110	1.110	0.437	0.531	5,000
13/16	1.145	1.145	0.453	0.594	5,000
7/8	1.250	1.250	0.500	0.656	5,000
15/16	1.310	1.310	0.500	0.656	5,000
1	1.380	1.380	0.547	0.656	5,000
1 1/16	1.480	1.480	0.625	0.656	5,000
1 1/8	1.540	1.540	0.656	0.781	5,000
1 3/16	1.675	1.675	0.656	0.781	5,000
1 1/4	1.750	1.750	0.750	0.781	5,000
1 5/16	1.820	1.820	0.750	0.906	5,000
1 3/8	1.885	1.885	0.781	0.906	5,000
1 7/16	1.955	1.955	0.845	0.906	5,000
1 1/2	2.025	2.025	0.850	0.906	5,000

Table 1-3M Type I Sockets, Single and Double Hexagon, ½ in. Drive

Nominal Socket Opening, mm	Maximum Outside Diameter, mm		Minimum Opening Depth, Nut End, mm	Minimum Bolt Clearance Hole Diameter, mm	Minimum Proof Torque, N·m
	Nut End	Drive End			
8	14.00	23.87	3.75	4.75	80
9	15.10	23.87	4.05	5.33	110
10	16.80	23.87	4.60	6.60	153
11	18.20	23.87	5.45	7.62	170
12	18.70	23.87	6.10	8.33	203
13	20.25	23.87	6.75	8.33	249
14	21.80	23.87	8.35	10.35	282
15	22.40	23.87	8.35	10.35	339
16	23.87	23.87	9.50	11.68	407
17	24.75	24.75	9.50	12.35	475
18	26.14	26.14	10.15	12.35	542
19	27.20	27.20	11.10	14.30	565
20	27.95	27.95	11.50	14.30	570
21	28.95	28.95	11.70	15.10	570
22	30.20	30.20	12.45	16.66	570
23	31.30	31.30	12.70	16.66	570
24	32.50	32.50	13.85	18.35	570
25	33.40	33.40	14.00	18.35	570
26	35.95	35.95	14.60	18.35	570
27	36.75	36.75	15.80	20.35	570
28	37.80	37.80	16.25	20.35	570
29	39.50	39.50	16.65	20.35	570
30	42.40	42.40	16.65	22.35	570
31	43.20	43.20	17.80	22.35	570
32	44.05	44.05	19.00	22.35	570

Table 1-4 Type I Sockets, Single and Double Hexagon, 3/4 in. Drive

Nominal Socket Opening, in.	Maximum Outside Diameter, in.		Minimum Opening Depth, Nut End, in.	Minimum Bolt Clearance Hole Diameter, in.	Minimum Proof Torque, lbf-in.
	Nut End	Drive End			
3/4	1.290	1.450	0.437	0.531	6,000
13/16	1.300	1.450	0.453	0.594	6,800
7/8	1.385	1.575	0.500	0.656	7,700
15/16	1.450	1.575	0.546	0.656	8,700
1	1.535	1.575	0.546	0.656	9,700
1 1/16	1.610	1.610	0.625	0.656	10,800
1 1/8	1.690	1.690	0.656	0.781	11,900
1 3/16	1.750	1.750	0.656	0.781	13,000
1 1/4	1.870	1.870	0.750	0.781	14,200
1 5/16	1.920	1.920	0.765	0.906	15,400
1 3/8	1.980	1.980	0.781	0.906	16,700
1 7/16	2.075	2.075	0.850	0.906	18,000
1 1/2	2.145	2.145	0.850	1.031	18,000
1 9/16	2.260	2.260	0.850	1.031	18,000
1 5/8	2.325	2.325	1.000	1.031	18,000
1 11/16	2.400	2.400	1.000	1.156	18,000
1 3/4	2.510	2.510	1.093	1.156	18,000
1 13/16	2.575	2.575	1.125	1.156	18,000
1 7/8	2.695	2.695	1.125	1.281	18,000
2	2.885	2.885	1.218	1.281	18,000
2 1/16	3.025	3.025	1.218	1.406	18,000
2 1/8	3.075	3.075	1.218	1.406	18,000
2 3/16	3.150	3.150	1.375	1.515	18,000
2 1/4	3.260	3.260	1.375	1.515	18,000
2 5/16	3.300	3.300	1.375	1.531	18,000
2 3/8	3.333	3.333	1.375	1.531	18,000

Table 1-4M Type I Sockets, Single and Double Hexagon, 3/4 in. Drive

Nominal Socket Opening, mm	Maximum Outside Diameter, mm		Minimum Opening Depth, Nut End, mm	Minimum Bolt Clearance Hole Diameter, mm	Minimum Proof Torque, N·m
	Nut End	Drive End			
19	30.50	33.00	12.45	14.30	780
21	33.00	33.00	12.45	15.10	930
22	35.05	38.10	12.45	16.66	972
23	36.10	39.10	12.70	16.66	1 015
24	37.00	40.00	13.85	18.35	1 085
25	37.85	40.00	14.00	18.35	1 160
26	38.85	40.00	14.60	18.35	1 240
27	41.00	41.00	15.90	20.35	1 330
28	41.00	41.00	16.25	20.35	1 420
29	42.10	42.10	16.65	20.35	1 520
30	43.00	43.00	16.65	22.35	1 640
31	45.10	45.10	17.80	22.35	1 730
32	47.05	47.05	19.05	24.35	1 820
34	49.00	49.00	20.00	24.45	2 000
35	50.40	50.40	20.10	24.45	2 030
36	51.80	51.80	21.45	27.50	2 030
38	54.10	54.10	22.25	27.50	2 030
40	57.65	57.65	22.75	30.50	2 030
41	58.80	58.80	24.90	30.50	2 030
42	58.80	58.80	25.40	31.00	2 030
46	65.40	65.40	28.60	33.50	2 030
50	72.15	72.15	29.75	36.50	2 030
54	78.10	78.10	30.95	39.50	2 030
55	79.10	79.10	33.55	39.50	2 030
58	80.00	80.00	35.00	39.50	2 030
60	84.45	84.45	35.00	39.50	2 030

Table 1-5 Type I Sockets, Single and Double Hexagon, 1 in. Drive

Nominal Opening, in.	Maximum Outside Diameter, in.		Minimum Opening Depth, Nut End, in.	Minimum Bolt Clearance Hole Diameter, in.	Minimum Proof Torque, lbf-in.
	Nut End	Drive End			
1 1/16	1.812	2.188	0.625	0.781	11,700
1 1/8	2.000	2.188	0.656	0.906	12,800
1 3/16	2.000	2.188	0.656	0.906	14,100
1 1/4	2.125	2.188	0.750	0.906	15,400
1 5/16	2.125	2.250	0.765	0.906	16,700
1 3/8	2.250	2.250	0.781	0.906	18,000
1 7/16	2.280	2.250	0.859	0.906	19,500
1 1/2	2.320	2.250	0.859	1.031	21,000
1 9/16	2.390	2.250	0.859	1.031	22,000
1 5/8	2.480	2.375	1.000	1.031	24,000
1 11/16	2.572	2.500	1.000	1.156	26,000
1 3/4	2.635	2.625	1.093	1.156	27,000
1 13/16	2.780	2.750	1.125	1.156	28,000
1 7/8	2.780	2.875	1.125	1.281	28,000
1 15/16	2.885	2.875	1.125	1.281	28,000
2	2.947	2.947	1.218	1.281	28,000
2 1/16	3.050	3.050	1.218	1.406	28,000
2 1/8	3.150	3.150	1.218	1.406	28,000
2 3/16	3.210	3.210	1.375	1.531	28,000
2 1/4	3.300	3.300	1.375	1.531	28,000
2 5/16	3.360	3.360	1.375	1.531	28,000
2 3/8	3.430	3.430	1.375	1.531	28,000
2 7/16	3.500	3.500	1.375	1.656	28,000
2 1/2	3.572	3.572	1.375	1.656	28,000
2 9/16	3.572	3.572	1.375	1.656	28,000
2 5/8	3.760	3.760	1.500	1.781	28,000
2 3/4	3.885	3.885	1.750	1.781	28,000
2 13/16	4.010	4.010	1.750	1.906	28,000
2 15/16	4.135	4.135	1.750	1.906	28,000
3	4.135	4.135	2.000	2.031	28,000
3 1/8	4.385	4.385	2.000	2.031	28,000
3 1/4	4.510	4.510	2.000	2.281	28,000
3 3/8	4.635	4.635	2.200	2.281	28,000
3 1/2	4.760	4.760	2.200	2.281	28,000
3 3/4	5.135	5.135	2.200	2.531	28,000
3 7/8	5.260	5.260	2.500	2.531	28,000
4	5.437	5.437	2.500	2.781	28,000
4 1/8	5.640	5.640	2.500	2.781	28,000
4 1/4	5.828	5.828	2.500	3.031	28,000
4 1/2	6.010	6.010	2.500	3.031	28,000

Table 1-5M Type I Sockets, Single and Double Hexagon, 1 in. Drive

Nominal Opening, mm	Maximum Outside Diameter, mm		Minimum Opening Depth, Nut End, mm	Minimum Bolt Clearance Hole Diameter, mm	Minimum Proof Torque, N·m
	Nut End	Drive End			
34	57.15	57.15	20.00	26.00	2 400
36	57.15	57.15	21.45	27.50	2 530
38	57.40	57.40	22.25	27.50	2 640
40	59.20	59.20	22.75	30.50	2 760
41	60.95	60.95	24.90	30.50	2 820
46	69.85	69.85	28.60	33.50	3 160
50	74.05	74.05	29.75	36.50	3 160
54	79.65	79.65	30.95	39.50	3 160
55	79.65	79.65	33.55	39.50	3 160
60	85.50	85.50	35.00	39.50	3 160
70	96.50	96.50	38.00	46.00	3 160
74	103.00	103.00	40.50	46.00	3 160

Table 1-6 Type II Sockets, Square, 4-Point and 8-Point, $\frac{1}{4}$ in. Drive

Nominal Opening, in.	Maximum Outside Diameter, in.		Minimum Opening Depth, Nut End, in.	Minimum Bolt Clearance Hole Diameter, in.	Minimum Proof Torque, lbf-in.
	Nut End	Drive End			
$\frac{3}{16}$	0.433	0.510	0.093	0.125	125
$\frac{1}{4}$	0.510	0.510	0.125	0.141	200
$\frac{5}{16}$	0.572	0.572	0.140	0.172	300
$\frac{3}{8}$	0.696	0.696	0.156	0.281	550

Table 1-7 Type II Sockets, Square, 4-Point and 8-Point, 3/8 in. Drive

Nominal Opening, in.	Maximum Outside Diameter, in.		Minimum Opening Depth, Nut End, in.	Minimum Bolt Clearance Hole Diameter, in.	Minimum Proof Torque, lbf-in.
	Nut End	Drive End			
1/4	0.572	0.690	0.125	0.141	250
5/16	0.625	0.690	0.140	0.172	400
3/8	0.739	0.937	0.156	0.281	900
7/16	0.833	1.000	0.218	0.281	1,250
1/2	0.942	1.135	0.265	0.344	1,450
9/16	1.051	1.135	0.328	0.406	1,600
5/8	1.130	1.250	0.375	0.469	2,000
11/16	1.190	1.310	0.375	0.469	2,000

Table 1-8 Type II Sockets, Square, 4-Point and 8-Point, 1/2 in. Drive

Nominal Opening, in.	Maximum Outside Diameter, in.		Minimum Opening Depth, Nut End, in.	Minimum Bolt Clearance Hole Diameter, in.	Minimum Proof Torque, lbf-in.
	Nut End	Drive End			
3/8	0.739	0.947	0.156	0.281	1,600
7/16	0.833	1.010	0.218	0.281	1,700
1/2	0.942	1.135	0.265	0.344	2,000
9/16	1.051	1.135	0.328	0.406	2,700
5/8	1.130	1.260	0.375	0.469	3,600
11/16	1.225	1.322	0.375	0.469	4,300
3/4	1.317	1.385	0.437	0.531	5,000
13/16	1.440	1.447	0.453	0.594	5,000
7/8	1.523	1.572	0.500	0.656	5,000
15/16	1.650	1.650	0.546	0.656	5,000
1	1.760	1.760	0.546	0.656	5,000

Table 1-9 Type III Sockets, Universal Joint, Single and Double Hexagon, 1/4 in. Drive

Nominal Opening, in.	Maximum Outside Diameter, in.		Minimum Opening Depth, Nut End, in.	Minimum Proof Torque, lbf-in.
	Nut End	Drive End		
3/16	0.315	0.540	0.094	95
7/32	0.356	0.540	0.109	135
1/4	0.397	0.540	0.125	190
9/32	0.438	0.540	0.141	250
5/16	0.510	0.540	0.141	300
11/32	0.519	0.540	0.156	300
3/8	0.580	0.580	0.158	300
7/16	0.683	0.683	0.219	300
1/2	0.697	0.697	0.266	300
9/16	0.812	0.812	0.312	300

Table 1-9M Type III Sockets, Universal Joint, Single and Double Hexagon, 1/4 in. Drive

Nominal Opening, mm	Maximum Outside Diameter, mm		Minimum Opening Depth, Nut End, mm	Minimum Proof Torque, N·m
	Nut End	Drive End		
3.2	6.00	14.30	1.60	7
4	7.00	14.30	2.40	8
5	8.30	14.30	2.70	10
5.5	9.00	14.30	2.80	14
6	9.80	14.30	3.05	16
6.3	10.00	14.30	3.20	21
7	10.95	14.30	3.55	27
8	12.25	14.30	3.55	34
9	13.45	14.30	4.05	34
10	15.25	15.60	4.60	34
11	17.20	17.20	5.45	34
12	17.60	17.60	6.10	34
13	18.00	18.00	6.75	34
14	18.90	19.00	8.05	34

Table 1-10 Type III Sockets, Universal Joint, Single and Double Hexagon, 3/8 in. Drive

Nominal Opening, in.	Maximum Outside Diameter, in.		Minimum Opening Depth, Nut End, in.	Minimum Proof Torque, lbf-in.
	Nut End	Drive End		
5/16	0.510	0.790	0.141	440
3/8	0.690	0.790	0.158	450
7/16	0.791	0.790	0.219	625
1/2	0.791	0.820	0.266	725
9/16	0.820	0.820	0.312	750
5/8	0.885	0.885	0.343	750
11/16	1.070	0.885	0.375	750
3/4	1.070	0.885	0.406	750
7/8	1.220	0.937	0.500	750

Table 1-10M Type III Sockets, Universal Joint, Single and Double Hexagon, 3/8 in. Drive

Nominal Opening, mm	Maximum Outside Diameter, mm		Minimum Opening Depth, Nut End, mm	Minimum Proof Torque, N·m
	Nut End	Drive End		
7	11.00	20.00	3.55	29
8	12.30	20.00	3.55	37
9	14.00	20.00	4.05	52
10	18.05	20.05	4.60	57
11	19.00	20.05	5.45	69
12	19.05	20.05	6.10	77
13	19.25	20.80	6.75	82
14	19.95	20.80	8.35	84
15	22.40	21.56	8.35	85
16	23.87	22.50	9.55	85
17	24.40	22.50	9.55	85
18	26.14	22.50	10.15	85
19	27.00	22.50	11.10	85
20	28.20	22.85	11.50	85
21	29.45	23.25	11.70	85
22	30.70	23.70	12.40	85
24	33.10	25.00	13.50	85

Table 1-11 Type III Sockets, Universal Joint, Single and Double Hexagon, ½ in. Drive

Nominal Opening, in.	Maximum Outside Diameter, in.		Minimum Opening Depth, Nut End, in.	Minimum Proof Torque, lbf-in.
	Nut End	Drive End		
1/2	0.773	1.010	0.266	1,000
9/16	0.854	1.010	0.312	1,350
5/8	0.947	1.010	0.345	1,500
11/16	1.046	1.060	0.375	1,750
3/4	1.105	1.150	0.437	1,750
13/16	1.197	1.150	0.453	1,750
7/8	1.273	1.150	0.500	1,750
15/16	1.400	1.150	0.500	1,750

Table 1-11M Type III Sockets, Universal Joint, Single and Double Hexagon, ½ in. Drive

Nominal Opening, mm	Maximum Outside Diameter, mm		Minimum Opening Depth, Nut End, mm	Minimum Proof Torque, N·m
	Nut End	Drive End		
12	18.70	25.65	6.10	96
13	20.00	25.65	6.75	120
14	21.35	25.65	8.35	145
15	22.70	25.65	8.35	160
16	24.20	25.70	9.55	170
17	25.60	26.25	9.55	190
18	27.00	27.20	10.15	200
19	27.95	28.45	11.10	200
20	29.30	28.60	11.50	200
21	30.80	28.60	11.70	200
22	32.05	28.60	12.45	200

Category 2
Socket Wrenches, Extensions, Adaptors, and Universal Joints, Power Drive (Impact)

2-1 CLASSIFICATION

NOTE: See Figs. 2-1 through 2-5.

Type I: sockets, single hexagon (6-point) and double hexagon (12-point)

Type II: sockets, single square (4-point) and double square (8-point)

Type III: universal sockets, single hexagon (6-point) and double hexagon (12-point)

Type IV: bars, extension

Type V: adaptors

Type VI: universal joint

Type VII: sockets, #5 spline drive, single hexagon (6-point) and double hexagon (12-point)

2-2 PERFORMANCE REQUIREMENTS

2-2.1 Design

2-2.1.1 Type I and Type VII Sockets, Single Hexagon (6-point) and Double Hexagon (12-Point) and Type II Sockets, Single Square (4-Point) and Double Square (8-Point). Sockets shall be similar to Fig. 2-1 and shall conform to Tables 2-1 through 2-13.

2-2.1.2 Type III, Universal Sockets, Single (6-Point) and Double (12-Point) Hexagon. Type III universal sockets shall be similar to Fig. 2-2 and comply with Tables 2-14 and 2-15 (Tables 2-14M and 2-15M).

2-2.1.3 Type IV, Extension Bars. Extension bars shall have an external square drive at one end and an internal square drive of the same size at the other end. The extension bar shall be similar to Fig. 2-3 and shall comply with Table 2-16.

2-2.1.4 Type V, Adaptors. Adaptors shall have an external square drive at one end with a different size and an internal square drive at the other end. Adaptors shall be similar to Fig. 2-4 and shall comply with Table 2-17.

2-2.1.5 Type VI, Universal Joints. Universal joints shall have an external square at one end and internal drive square of the same size at the other end. Each member shall be permanently attached to each other. Universal joints with $\frac{1}{4}$ in., $\frac{3}{8}$ in., and $\frac{1}{2}$ in. drives shall be provided with a means to hold the drive end and external square end in any set position with a force adequate to hold the external square end against gravity. Type VI universal joints shall be similar to Fig. 2-5 and comply with Table 2-18.

2-2.2 Hardness

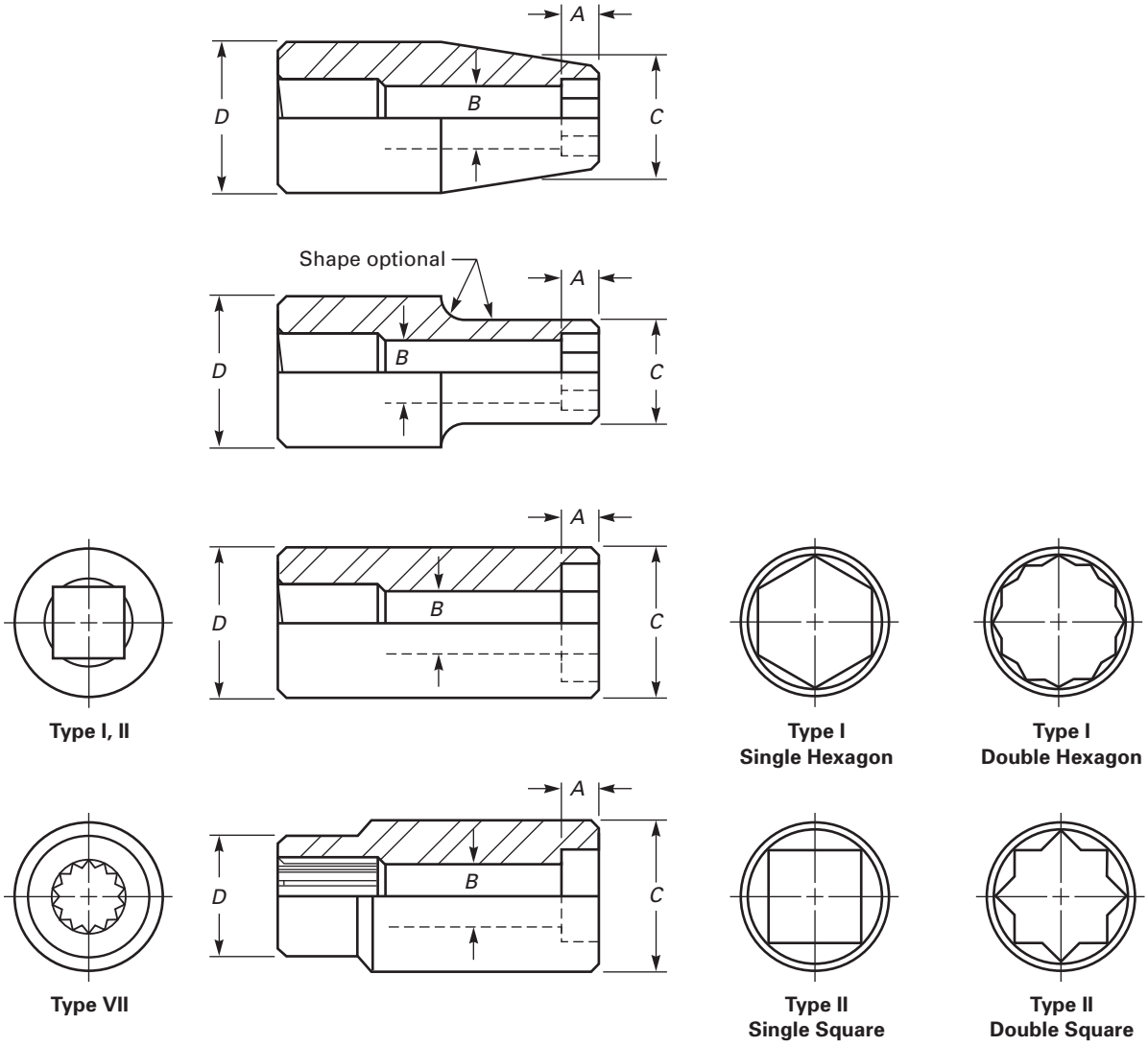
Sockets and attachments shall have a hardness value for the sizes within the range shown in the table below except that the maximum hardness for Type I, $\frac{1}{2}$ in. drive thin wall sockets shall be 52 HRC.

	HRC	
Drive Size, in. (mm)	Min.	Max.
$\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$ (6.3, 10, 12.5)	38	55
$\frac{3}{4}$ (20)	38	52
1 (25), $1\frac{1}{2}$, #5 Spline	35	50
$2\frac{1}{2}$, $3\frac{1}{2}$	28	42

2-2.3 Bolt Clearance Hole

A bolt clearance hole may be provided in Type III universal sockets. The diameter of the hole if provided shall be in accordance with the applicable size socket as specified in Tables 2-14 and 2-15 (Tables 2-14M and 2-15M).

Fig. 2-1 Type I, II, and VII Sockets



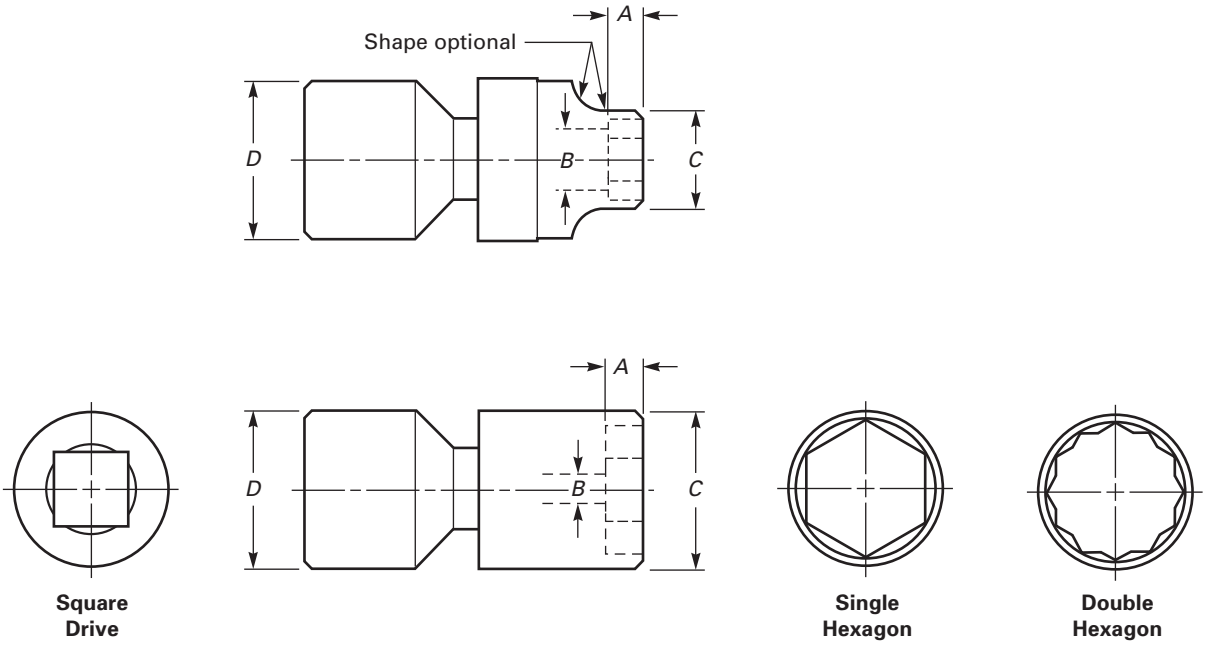
GENERAL NOTES:

(a) *A* shall be equal to or greater than nut opening depth in applicable tables.

(b) Maximum nut end diameter of socket *C* shall not be exceeded for length *B* and shall conform to applicable tables.

(c) *B* length shall be greater than or equal to the minimum nut opening depth *A* in applicable tables.

Fig. 2-2 Type III, Universal Sockets, Single Hexagon (6-Point) and Double Hexagon (12-Point)



GENERAL NOTES:
(a) *A* shall be equal to or greater than nut opening depth in applicable tables.
(b) Maximum nut end diameter of socket *C* shall not be exceeded for length *B* and shall conform to applicable tables.
(c) *B* length shall be greater than or equal to the minimum nut opening depth *A* in applicable tables.
(d) *D* is the outside diameter, drive end and shall conform to applicable tables.

Fig. 2-3 Type IV, Bar Extension

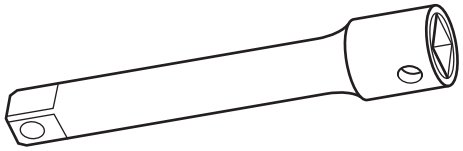


Fig. 2-4 Type V, Adaptor

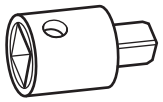


Fig. 2-5 Type VI, Universal Joint

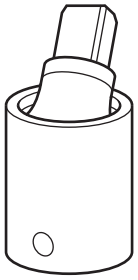


Table 2-1 Type I Sockets, Single Hexagon (6-Point) and Double Hexagon (12-Point), ¼ in. Drive

Nominal Opening, in.	Outside Diameter, in.				Minimum Nut Opening Depth, *A*, in.	Minimum Bolt Clearance Hole Diameter, *B*, in.	Minimum Proof Torque, lbf-in.
	Nut End, *C*		Drive End, *D*				
	Min.	Max.	Min.	Max.			
3/16	0.285	0.350	0.435	0.510	0.110	0.130	95
7/32	0.325	0.385	0.435	0.510	0.125	0.130	135
1/4	0.360	0.424	0.440	0.510	0.125	0.150	190
9/32	0.400	0.490	0.450	0.510	0.125	0.171	250
5/16	0.440	0.502	0.470	0.510	0.141	0.171	320
11/32	0.475	0.535	0.490	0.535	0.156	0.203	400
3/8	0.510	0.580	0.515	0.580	0.156	0.281	500
7/16	0.590	0.660	0.550	0.660	0.203	0.203	600
1/2	0.665	0.737	0.550	0.730	0.209	0.344	600
9/16	0.740	0.815	0.550	0.780	0.281	0.406	600

Table 2-1M Type I Sockets, Single Hexagon (6-Point) and Double Hexagon (12-Point), ¼ in. Drive

Nominal Opening, mm	Outside Diameter, mm				Minimum Nut Opening Depth, *A*, mm	Minimum Bolt Clearance Hole Diameter, *B*, mm	Minimum Proof Torque, N·m
	Nut End, *C*		Drive End, *D*				
	Min.	Max.	Min.	Max.			
5	8.0	9.1	11.7	14.0	2.8	3.2	10
5.5	8.7	9.7	11.7	14.0	2.8	3.6	14
6	9.3	10.6	11.7	14.0	3.1	3.6	16
7	10.6	11.6	11.9	14.0	3.6	4.3	27
8	11.7	12.8	12.4	14.0	3.6	5.3	38
9	12.8	14.1	13.0	16.0	4.1	5.3	49
10	13.9	15.6	14.0	16.0	4.6	6.6	63
11	15.1	16.6	14.4	16.7	5.5	7.6	68
12	16.4	17.8	14.4	17.7	6.1	8.3	68
13	17.8	19.1	15.0	19.1	6.8	8.3	68
14	19.1	20.7	19.1	21.0	7.5	10.4	68
15	20.3	21.6	20.3	22.0	7.5	10.4	68

Table 2-2 Type I Sockets, Single Hexagon (6-Point) and Double Hexagon (12-Point), 3/8 in. Drive

Nominal Opening, in.	Outside Diameter, in.				Minimum Nut Opening Depth, *A*, in.	Minimum Bolt Clearance Hole Diameter, *B*, in.	Minimum Proof Torque, lbf-in.
	Nut End, *C*		Drive End, *D*				
	Min.	Max.	Min.	Max.			
5/16	0.471	0.515	0.677	0.760	0.141	0.171	440
11/32	0.490	0.552	0.677	0.760	0.156	0.203	550
3/8	0.527	0.605	0.677	0.760	0.156	0.281	660
7/16	0.613	0.697	0.677	0.760	0.203	0.281	930
1/2	0.693	0.823	0.700	0.823	0.209	0.344	1,240
9/16	0.771	0.885	0.771	0.885	0.249	0.406	1,600
5/8	0.860	0.948	0.860	0.948	0.281	0.469	2,000
11/16	0.860	1.031	0.865	1.031	0.318	0.469	2,200
3/4	1.021	1.073	0.865	1.073	0.356	0.531	2,200

Table 2-2M Type I Sockets, Single Hexagon (6-Point) and Double Hexagon (12-Point), 3/8 in. Drive

Nominal Opening, mm	Outside Diameter, mm				Minimum Nut Opening Depth, *A*, mm	Minimum Bolt Clearance Hole Diameter, *B*, mm	Minimum Proof Torque, N·m
	Nut End, *C*		Drive End, *D*				
	Min.	Max.	Min.	Max.			
8	11.7	14.5	16.3	20.0	3.6	5.3	52
9	13.1	15.7	16.3	20.0	4.1	5.3	66
10	13.9	17.0	16.3	20.0	4.6	6.6	82
11	15.1	18.2	17.1	20.0	5.5	7.6	112
12	16.4	19.4	17.1	20.0	6.1	8.3	124
13	17.8	20.7	17.9	28.0	6.8	8.3	147
14	19.1	21.9	19.1	28.0	8.4	10.4	175
15	20.3	23.1	20.3	28.0	8.4	10.4	203
16	21.5	24.4	20.3	28.0	9.6	11.7	237
17	23.3	25.6	20.3	28.0	9.6	12.4	249
18	23.8	26.9	20.3	28.0	10.2	12.4	249
19	25.1	28.1	20.3	28.0	11.0	13.5	249
20	27.2	29.3	20.3	34.0	11.0	14.0	249
21	28.5	30.6	20.3	34.0	11.7	15.0	249
22	29.5	31.8	20.3	34.0	12.5	15.0	249
23	30.8	33.0	20.3	34.0	12.7	16.0	249
24	31.8	34.3	20.3	34.0	13.9	17.5	249

Table 2-3 Type I Sockets, Single Hexagon (6-Point) and Double Hexagon (12-Point), ½ in. Drive

Nominal Opening, in.	Outside Diameter, in.				Minimum Nut Opening Depth, *A*, in.	Minimum Bolt Clearance Hole Diameter, *B*, in.	Minimum Proof Torque, lbf-in.
	Nut End, *C*		Drive End, *D*				
	Min.	Max.	Min.	Max.			
3/8	0.550	0.715	0.850	1.135	0.156	0.281	1,100
7/16	0.638	0.806	0.850	1.135	0.203	0.281	1,500
1/2	0.726	0.897	0.850	1.135	0.209	0.344	2,000
9/16	0.814	0.987	0.850	1.135	0.249	0.406	2,600
5/8	0.902	1.070	0.850	1.135	0.281	0.469	3,300
11/16	0.990	1.169	0.990	1.197	0.318	0.469	4,100
3/4	1.062	1.260	1.004	1.260	0.356	0.531	5,000
13/16	1.135	1.325	1.019	1.335	0.418	0.594	5,000
7/8	1.207	1.390	1.033	1.410	0.479	0.594	5,000
15/16	1.280	1.455	1.048	1.485	0.490	0.656	5,000
1	1.352	1.521	1.062	1.560	0.490	0.656	5,000
1 1/16	1.425	1.586	1.077	1.635	0.490	0.687	5,000
1 1/8	1.497	1.651	1.091	1.710	0.632	0.781	5,000
1 3/16	1.570	1.716	1.105	1.785	0.632	0.796	5,000
1 1/4	1.642	1.781	1.120	1.860	0.632	0.812	5,000
1 5/16	1.789	2.197	1.120	1.906	0.748	0.906	5,000
1 3/8	1.861	2.197	1.120	1.906	0.748	0.937	5,000
1 7/16	1.933	2.322	1.120	2.031	0.748	1.000	5,000
1 1/2	2.005	2.387	1.120	2.156	0.847	1.062	5,000
1 9/16	2.075	2.445	1.120	2.250	0.847	1.062	5,000

Table 2-3M Type I Sockets, Single Hexagon (6-Point) and Double Hexagon (12-Point), ½ in. Drive

Nominal Opening, mm	Outside Diameter, mm				Minimum Nut Opening Depth, *A*, mm	Minimum Bolt Clearance Hole Diameter, *B*, mm	Minimum Proof Torque, N·m
	Nut End, *C*		Drive End, *D*				
	Min.	Max.	Min.	Max.			
9	15.0	16.5	21.0	28.0	4.1	5.3	110
10	15.1	17.8	21.0	28.0	4.6	6.6	153
11	16.4	19.0	21.0	28.0	5.5	7.6	170
12	17.7	20.8	21.0	28.0	6.1	8.3	203
13	19.2	21.5	21.0	28.0	6.8	8.3	249
14	20.6	22.8	23.0	37.0	8.4	10.4	282
15	22.0	26.0	23.0	37.0	8.4	10.4	339
16	23.5	28.8	23.0	37.0	9.6	11.7	407
17	24.9	28.8	24.0	37.0	9.6	12.4	475
18	26.4	28.8	24.3	37.0	10.2	12.4	542
19	27.8	32.0	25.0	37.0	11.1	13.5	565
20	29.1	32.0	25.0	37.0	11.5	14.0	570
21	29.8	32.0	25.0	37.0	11.7	15.0	570
22	30.5	33.6	25.0	37.0	12.5	15.0	570
23	32.6	35.1	26.0	37.0	12.7	16.0	570
24	34.0	36.3	26.0	37.0	13.9	17.5	570
25	34.8	38.1	26.0	40.0	14.0	18.3	570
26	36.7	38.3	26.0	40.0	14.6	18.3	570
27	37.9	40.2	27.7	44.5	15.8	18.3	570
29	40.4	44.5	27.7	44.5	16.7	20.0	570
30	40.4	44.6	27.7	44.6	16.7	20.0	570
32	42.7	47.2	27.7	48.0	18.3	23.0	570
34	42.7	49.5	27.7	49.5	20.0	23.0	570
35	49.3	52.7	27.7	53.0	20.0	23.0	570
36	49.6	54.0	28.0	54.5	20.0	26.0	570

Table 2-4 Type I Sockets, Single Hexagon (6-Point) and Double Hexagon (12-Point), 3/4 in. Drive

Nominal Opening, in.	Outside Diameter, in.				Minimum Nut Opening Depth, *A*, in.	Minimum Bolt Clearance Hole Diameter, *B*, in.	Minimum Proof Torque, lbf-in.
	Nut End, *C*		Drive End, *D*				
	Min.	Max.	Min.	Max.			
9/16	0.990	1.100	1.490	1.640	0.249	0.406	3,700
5/8	1.083	1.187	1.490	1.640	0.281	0.469	4,400
11/16	1.146	1.217	1.490	1.640	0.318	0.469	5,100
3/4	1.141	1.268	1.490	1.640	0.356	0.531	6,900
13/16	1.213	1.385	1.490	1.640	0.418	0.594	8,200
7/8	1.285	1.635	1.490	1.640	0.479	0.594	8,600
15/16	1.357	1.635	1.490	1.640	0.490	0.656	9,600
1	1.429	1.635	1.490	1.715	0.490	0.656	11,000
1 1/16	1.501	1.701	1.520	1.790	0.490	0.687	14,000
1 1/8	1.552	1.760	1.550	1.865	0.632	0.781	16,000
1 3/16	1.680	1.980	1.580	1.940	0.632	0.796	17,000
1 1/4	1.736	2.197	1.610	2.015	0.632	0.812	18,000
1 5/16	1.796	2.197	1.640	2.090	0.740	0.937	18,000
1 3/8	1.920	2.197	1.670	2.165	0.740	0.937	18,000
1 7/16	1.934	2.322	1.700	2.165	0.740	1.000	18,000
1 1/2	2.052	2.387	1.730	2.165	0.847	1.062	18,000
1 9/16	2.075	2.445	1.730	2.165	0.847	1.062	18,000
1 5/8	2.240	2.510	1.730	2.165	0.847	1.125	18,000
1 11/16	2.490	2.570	1.730	2.165	0.970	1.187	18,000
1 3/4	2.490	2.650	1.730	2.165	0.980	1.187	18,000
1 13/16	2.563	2.730	1.730	2.165	0.990	1.250	18,000
1 7/8	2.600	2.815	1.730	2.165	1.062	1.312	18,000
2	2.720	2.980	1.730	2.165	1.062	1.375	18,000
2 1/16	2.800	3.060	1.730	2.165	1.150	1.437	18,000
2 3/16	2.920	3.230	1.730	2.165	1.193	1.500	18,000
2 1/4	3.000	3.310	1.730	2.165	1.276	1.562	18,000
2 3/8	3.120	3.460	1.730	2.165	1.303	1.562	18,000

Table 2-4M Type I Sockets, Single Hexagon (6-Point) and Double Hexagon (12-Point), ¾ in. Drive

Nominal Opening, mm	Outside Diameter, mm				Minimum Nut Opening Depth, *A*, mm	Minimum Bolt Clearance Hole Diameter, *B*, mm	Minimum Proof Torque, N·m
	Nut End, *C*		Drive End, *D*				
	Min.	Max.	Min.	Max.			
17	27.5	31.9	37.9	48.0	9.6	12.4	554
18	28.0	32.2	37.9	48.0	10.2	12.4	610
19	30.1	33.6	37.9	48.0	11.1	13.5	780
20	31.9	34.9	38.4	48.0	11.5	14.0	780
21	33.8	37.4	38.9	48.0	11.7	15.0	930
22	33.8	40.7	38.9	48.0	12.5	15.0	972
23	37.4	41.3	38.9	48.0	12.7	16.0	1 015
24	37.4	42.0	39.0	48.0	13.9	17.5	1 085
25	40.2	43.0	39.0	48.0	14.0	18.3	1 160
26	40.2	43.5	39.0	48.0	14.6	18.3	1 240
27	40.2	45.0	39.0	49.5	15.8	18.3	1 580
28	43.5	45.5	40.4	49.5	16.3	19.0	1 695
29	45.4	47.3	40.4	49.5	16.7	20.0	1 810
30	45.4	51.0	40.4	49.8	16.7	20.0	1 885
31	46.7	51.5	41.1	49.8	17.8	22.0	1 955
32	47.7	51.7	41.7	58.0	18.3	23.0	2 030
33	49.8	51.7	42.5	58.0	19.1	24.0	2 030
34	49.8	55.8	42.5	58.0	20.0	24.0	2 030
35	51.3	57.2	43.0	58.0	20.1	24.0	2 030
36	52.9	58.0	43.6	58.0	21.5	26.0	2 030
38	55.1	60.6	43.6	58.0	22.3	27.0	2 030
40	59.1	63.5	43.6	58.0	22.8	29.0	2 030
41	59.1	65.2	44.2	58.0	24.9	30.5	2 030
42	61.7	65.2	44.2	58.0	25.4	31.0	2 030
43	62.5	65.3	44.2	58.0	25.4	31.0	2 030
46	66.0	71.3	44.2	68.0	28.6	32.5	2 030
50	69.3	74.8	44.2	68.0	29.8	36.5	2 030

Table 2-5 Type I Sockets, Single Hexagon (6-Point) and Double Hexagon (12-Point), 1 in. Drive

Nominal Opening, in.	Outside Diameter, in.				Minimum Nut Opening Depth, *A*, in.	Minimum Bolt Clearance Hole Diameter, *B*, in.	Minimum Proof Torque, lbf-in.
	Nut End, *C*		Drive End, *D*				
	Min.	Max.	Min.	Max.			
3/4	1.281	1.448	1.990	2.135	0.356	0.531	8,000
13/16	1.365	1.510	1.990	2.135	0.418	0.594	10,000
7/8	1.417	1.544	1.990	2.135	0.479	0.594	11,000
15/16	1.480	1.607	1.990	2.135	0.490	0.656	13,000
1	1.490	1.763	1.990	2.135	0.490	0.656	14,000
1 1/16	1.521	1.763	1.990	2.197	0.490	0.687	15,000
1 1/8	1.552	1.823	1.990	2.197	0.632	0.781	17,300
1 3/16	1.680	1.980	1.990	2.197	0.632	0.796	19,700
1 1/4	1.736	2.197	1.990	2.197	0.632	0.812	22,000
1 5/16	1.828	2.260	1.990	2.197	0.740	0.937	22,000
1 3/8	1.920	2.322	1.990	2.322	0.740	0.937	22,000
1 7/16	2.012	2.397	1.990	2.397	0.740	1.000	24,000
1 1/2	2.104	2.473	1.990	2.473	0.847	1.062	24,000
1 9/16	2.196	2.548	1.990	2.548	0.847	1.062	26,000
1 5/8	2.288	2.623	1.990	2.623	0.847	1.125	26,000
1 11/16	2.379	2.699	1.990	2.699	0.970	1.187	28,000
1 3/4	2.471	2.774	1.990	2.774	0.980	1.187	28,000
1 13/16	2.563	2.849	2.240	2.849	0.990	1.250	30,000
1 7/8	2.655	2.925	2.240	2.925	1.062	1.312	30,000
1 15/16	2.747	3.000	2.240	3.000	1.062	1.312	30,000
2	2.839	3.073	2.240	3.073	1.062	1.375	32,000
2 1/16	2.931	3.073	2.240	3.073	1.169	1.437	32,000
2 1/8	3.023	3.166	2.240	3.166	1.169	1.500	32,000
2 3/16	3.115	3.260	2.365	3.260	1.193	1.500	32,000
2 1/4	3.240	3.385	2.365	3.385	1.276	1.562	32,000
2 5/16	3.302	3.447	2.365	3.447	1.276	1.562	32,000
2 3/8	3.365	3.510	2.365	3.510	1.303	1.562	32,000
2 7/16	3.490	3.640	2.365	3.640	1.353	1.687	32,000
2 1/2	3.490	3.640	2.365	3.640	1.353	1.750	32,000
2 9/16	3.615	3.760	2.365	3.760	1.380	1.750	32,000
2 5/8	3.615	3.760	2.365	3.760	1.460	1.812	32,000
2 11/16	3.677	3.885	2.365	3.885	1.460	1.875	32,000
2 3/4	3.740	4.010	2.365	4.010	1.490	1.875	32,000
2 13/16	3.990	4.100	2.365	4.100	1.567	1.937	32,000
2 7/8	3.990	4.100	2.365	4.100	1.567	1.937	32,000
2 15/16	3.990	4.135	2.365	4.135	1.600	1.937	32,000
3	4.115	4.260	2.365	4.260	1.675	2.125	32,000
3 1/8	4.115	4.385	2.365	4.385	1.708	2.125	32,000
3 1/4	4.180	4.572	2.365	4.572	1.708	2.312	32,000
3 3/8	4.240	4.760	2.365	4.760	1.870	2.375	32,000
3 1/2	4.740	5.040	2.365	5.040	1.911	2.375	32,000
3 5/8	4.750	5.050	2.365	5.050	2.000	2.560	32,000
3 7/8	4.900	5.365	2.365	5.365	2.150	2.625	32,000
4	5.120	5.520	2.365	5.520	2.200	2.850	32,000
4 1/8	5.300	5.680	2.365	5.680	2.250	2.850	32,000
4 1/4	5.400	5.835	2.365	5.835	2.300	2.850	32,000
4 1/2	5.600	6.150	2.365	6.150	2.400	3.090	32,000

Table 2-5M Type I Sockets, Single Hexagon (6-Point) and Double Hexagon (12-Point), 1 in. Drive

Nominal Opening, mm	Outside Diameter, mm				Minimum Nut Opening Depth, *A*, mm	Minimum Bolt Clearance Hole Diameter, *B*, mm	Minimum Proof Torque, N·m
	Nut End, *C*		Drive End, *D*				
	Min.	Max.	Min.	Max.			
19	33.4	38.0	48.6	58.0	11.1	13.5	900
22	37.9	41.6	48.6	58.0	12.5	15.0	1 240
24	38.7	44.0	48.6	58.0	13.9	17.5	1 470
27	42.3	46.7	48.6	58.0	15.8	18.3	1 695
28	44.8	46.7	48.6	58.0	16.3	19.0	1 955
30	45.5	54.2	51.4	58.0	16.7	20.0	2 225
32	47.7	54.2	51.4	58.0	18.3	23.0	2 490
33	51.3	54.2	51.4	58.0	19.1	24.0	2 490
35	51.3	58.0	51.4	58.0	20.1	24.0	2 490
36	55.1	58.0	51.4	58.0	21.5	26.0	2 712
38	55.1	61.0	51.4	58.0	22.3	27.0	2 712
41	59.1	65.2	51.4	58.0	24.9	30.5	2 940
46	66.0	71.3	57.7	68.0	28.6	32.5	3 390
50	69.3	76.9	58.4	68.0	29.8	36.5	3 615
52	74.3	77.9	58.4	68.0	29.8	37.0	3 615
54	76.9	83.4	58.4	68.0	31.0	39.5	3 615
55	81.7	83.4	58.4	68.0	33.6	39.5	3 615
60	84.1	89.8	58.4	68.0	35.0	39.5	3 615
65	89.4	95.9	58.4	70.6	35.0	39.5	3 615
70	94.8	101.0	58.4	70.6	35.0	39.5	3 615

Table 2-6 Type I Sockets, Single Hexagon (6-Point) and Double Hexagon (12-Point), 1½ in. Drive

Nominal Opening, in.	Outside Diameter, in.				Minimum Nut Opening Depth, *A*, in.	Minimum Bolt Clearance Hole Diameter, *B*, in.
	Nut End, *C*		Drive End, *D*			
	Min.	Max.	Min.	Max.		
1 3/8	2.490	2.885	2.990	3.260	0.740	0.937
1 7/16	2.490	2.885	2.990	3.260	0.740	1.000
1 1/2	2.553	2.915	2.990	3.260	0.847	1.062
1 9/16	2.553	2.915	2.990	3.260	0.847	1.093
1 5/8	2.615	3.041	2.990	3.260	0.847	1.125
1 11/16	2.740	3.041	2.990	3.260	0.970	1.187
1 3/4	2.740	3.135	2.990	3.260	0.980	1.187
1 13/16	2.865	3.135	2.990	3.260	0.990	1.250
1 7/8	2.921	3.198	2.990	3.260	1.062	1.312
1 15/16	2.990	3.260	2.990	3.260	1.062	1.312
2	3.178	3.573	3.240	3.573	1.062	1.375
2 1/16	3.183	3.635	3.240	3.635	1.169	1.437
2 1/8	3.183	3.635	3.240	3.635	1.169	1.500
2 3/16	3.240	3.698	3.240	3.698	1.193	1.500
2 1/4	3.365	3.822	3.240	3.822	1.276	1.562
2 5/16	3.365	3.822	3.240	3.822	1.276	1.562
2 3/8	3.490	3.885	3.240	3.885	1.303	1.562
2 7/16	3.615	3.941	3.240	3.941	1.353	1.687
2 1/2	3.678	4.073	3.240	4.073	1.353	1.750
2 9/16	3.740	4.103	3.240	4.103	1.380	1.750
2 5/8	3.865	4.198	3.240	4.198	1.460	1.812
2 11/16	3.925	4.260	3.240	4.260	1.460	1.875
2 3/4	4.053	4.385	3.240	4.385	1.490	1.875
2 13/16	4.115	4.573	3.240	4.573	1.567	1.937
2 7/8	4.178	4.635	3.240	4.635	1.567	1.937
2 15/16	4.178	4.698	3.240	4.698	1.600	1.937
3	4.365	4.835	3.240	4.835	1.675	2.125
3 1/16	4.490	4.885	3.240	4.885	1.695	2.125
3 1/8	4.553	4.941	3.240	4.941	1.708	2.125
3 3/16	4.615	5.010	3.240	5.010	1.708	2.187
3 1/4	4.678	5.073	3.240	5.073	1.708	2.312
3 5/16	4.740	5.135	3.240	5.135	1.790	2.312
3 3/8	4.865	5.135	3.240	5.135	1.870	2.375
3 7/16	4.865	5.198	3.240	5.198	1.890	2.375
3 1/2	4.865	5.260	3.240	5.260	1.911	2.375
3 9/16	4.920	5.322	3.240	5.322	1.955	2.387
3 5/8	4.990	5.385	3.240	5.385	2.000	2.560
3 11/16	4.990	5.448	3.240	5.448	2.040	2.560
3 3/4	5.115	5.573	3.240	5.573	2.080	2.600
3 13/16	5.240	5.635	3.240	5.635	2.120	2.600

Table 2-6 Type I Sockets, Single Hexagon (6-Point) and Double Hexagon (12-Point), 1½ in. Drive (Cont'd)

Nominal Opening, in.	Outside Diameter, in.				Minimum Nut Opening Depth, *A*, in.	Minimum Bolt Clearance Hole Diameter, *B*, in.
	Nut End, *C*		Drive End, *D*			
	Min.	Max.	Min.	Max.		
3 7/8	5.302	5.698	3.240	5.698	2.150	2.625
3 15/16	5.490	5.822	3.240	5.822	2.175	2.700
4	5.490	5.885	3.240	5.885	2.200	2.850
4 1/16	5.553	5.941	3.240	5.941	2.225	2.850
4 1/8	5.740	6.073	3.240	6.073	2.250	2.850
4 3/16	5.740	6.103	3.240	6.103	2.275	2.875
4 1/4	5.802	6.135	3.240	6.135	2.300	2.875
4 5/16	5.865	6.322	3.240	6.322	2.325	3.000
4 3/8	5.921	6.322	3.240	6.322	2.350	3.000
4 7/16	5.990	6.395	3.240	6.395	2.375	3.000
4 1/2	6.115	6.573	3.240	6.573	2.400	3.090
4 5/8	6.302	6.573	3.240	6.573	2.425	3.125
4 3/4	6.365	6.635	3.240	6.635	2.450	3.290

Table 2-7 Type I Sockets, Single Hexagon (6-Point), 2½ in. Drive

Nominal Opening, in.	Maximum Outside Diameter, in.		Minimum Nut Opening Depth, *A*, in.	Minimum Bolt Clearance Hole Diameter, *B*, in.
	Nut End, *C*	Drive End, *D*		
2¼	4.600	5.500	1.276	1.562
2⅜	4.700	5.500	1.303	1.562
2⁷⁄₁₆	4.750	5.500	1.353	1.687
2⁹⁄₁₆	4.800	5.500	1.380	1.750
2⅝	4.850	5.500	1.460	1.812
2¾	5.000	5.500	1.490	1.875
2¹³⁄₁₆	5.050	5.750	1.567	1.937
2¹⁵⁄₁₆	5.100	5.750	1.600	1.937
3	5.200	5.750	1.675	2.125
3⅛	5.250	5.750	1.708	2.125
3⅜	5.500	5.750	1.870	2.375
3½	5.600	5.750	1.911	2.375
3¾	6.250	6.000	1.913	2.600
3⅞	6.250	6.000	2.150	2.625
4⅛	6.250	6.000	2.250	2.850
4¼	7.000	6.000	2.300	2.875
4½	7.000	6.000	2.400	3.090
4⅝	7.000	6.000	2.550	3.125
5	7.500	6.000	2.763	3.375
5¾	8.625	6.000	3.188	3.875
6⅛	9.000	6.000	3.400	4.125

Table 2-8 Type I Sockets, Single Hexagon (6-Point) and Double Hexagon (12-Point), Thin Wall, 1/2 in. Drive

Nominal Opening, in.	Outside Diameter, in.				Minimum Nut Opening Depth, *A*, in.	Minimum Bolt Clearance Hole Diameter, *B*, in.	Minimum Proof Torque, lbf-in.
	Nut End, *C*		Drive End, *D*				
	Min.	Max.	Min.	Max.			
3/8	0.556	0.636	0.850	1.135	0.156	0.281	1,100
7/16	0.633	0.713	0.850	1.135	0.203	0.281	1,500
1/2	0.711	0.791	0.850	1.135	0.209	0.344	2,000
9/16	0.788	0.868	0.850	1.135	0.249	0.406	2,600
5/8	0.866	0.946	0.850	1.135	0.281	0.469	3,300
11/16	0.944	1.024	0.964	1.197	0.318	0.469	4,100
3/4	1.020	1.100	1.004	1.260	0.356	0.531	5,000
13/16	1.098	1.158	1.019	1.335	0.418	0.594	5,000
7/8	1.175	1.255	1.033	1.410	0.479	0.594	5,000
15/16	1.253	1.333	1.048	1.485	0.490	0.656	5,000
1	1.330	1.410	1.062	1.560	0.490	0.656	5,000
1 1/16	1.408	1.488	1.077	1.635	0.490	0.687	5,000
1 1/8	1.485	1.565	1.091	1.710	0.632	0.781	5,000
1 3/16	1.563	1.643	1.105	1.785	0.632	0.796	5,000
1 1/4	1.640	1.720	1.120	1.860	0.632	0.812	5,000
1 5/16	1.718	1.798	1.120	1.860	0.748	0.906	5,000
1 3/8	1.795	1.875	1.120	1.860	0.748	0.937	5,000
1 7/16	1.872	1.952	1.120	2.000	0.748	1.000	5,000
1 1/2	1.950	2.030	1.120	2.000	0.847	1.062	5,000
1 9/16	2.028	2.108	1.120	2.000	0.847	1.062	5,000

Table 2-9 Type I Sockets, Single Hexagon (6-Point) and Double Hexagon (12-Point), Thin Wall, 3/4 in. Drive

Nominal Opening, in.	Outside Diameter, in.				Minimum Nut Opening Depth, *A*, in.	Minimum Bolt Clearance Hole Diameter, *B*, in.	Minimum Proof Torque, lbf-in.
	Nut End, *C*		Drive End, *D*				
	Min.	Max.	Min.	Max.			
1/2	0.801	0.940	1.490	1.635	0.209	0.344	3,000
9/16	0.990	1.010	1.490	1.635	0.249	0.406	3,700
5/8	1.003	1.187	1.490	1.635	0.281	0.469	4,400
11/16	1.141	1.187	1.490	1.635	0.318	0.469	5,100
3/4	1.141	1.260	1.490	1.640	0.356	0.531	6,000
13/16	1.213	1.385	1.490	1.640	0.418	0.594	6,800
7/8	1.285	1.635	1.490	1.640	0.479	0.594	7,700
15/16	1.357	1.635	1.490	1.640	0.490	0.656	8,700
1	1.429	1.635	1.490	1.715	0.490	0.656	9,700
1 1/16	1.501	1.701	1.520	1.790	0.490	0.687	10,800
1 1/8	1.573	1.760	1.520	1.865	0.632	0.781	11,900
1 3/16	1.645	1.980	1.520	1.940	0.632	0.796	13,000
1 1/4	1.717	2.197	1.520	2.015	0.632	0.812	14,200
1 5/16	1.789	2.197	1.520	2.090	0.740	0.937	15,400
1 3/8	1.861	2.197	1.520	2.165	0.740	0.937	16,700
1 7/16	1.933	2.322	1.520	2.165	0.740	1.000	18,000
1 1/2	2.005	2.387	1.520	2.165	0.847	1.062	18,000
1 9/16	2.028	2.445	1.545	2.165	0.847	1.062	18,000
1 5/8	2.145	2.510	1.578	2.165	0.847	1.125	18,000
1 11/16	2.245	2.510	1.578	2.165	0.970	1.187	18,000
1 3/4	2.325	2.510	1.578	2.165	0.980	1.187	18,000
1 13/16	2.400	2.560	1.578	2.165	0.990	1.250	18,000
1 7/8	2.490	2.640	1.578	2.165	1.062	1.312	18,000
2	2.650	2.800	1.578	2.165	1.062	1.375	18,000
2 1/16	2.730	2.880	1.578	2.165	1.150	1.437	18,000
2 3/16	2.895	3.050	1.578	2.165	1.193	1.500	18,000
2 1/4	3.000	3.125	1.578	2.165	1.276	1.562	18,000
2 3/8	3.140	3.290	1.578	2.165	1.303	1.562	18,000

Table 2-10 Type II Sockets, Single Square (4-Point) and Double Square (8-Point), 3/8 in. Drive

Nominal Opening, in.	Outside Diameter, in.				Minimum Nut Opening Depth, *A*, in.	Minimum Bolt Clearance Hole Diameter, *B*, in.	Minimum Proof Torque, lbf-in.
	Nut End, *C*		Drive End, *D*				
	Min.	Max.	Min.	Max.			
1/4	0.466	0.491	0.677	0.697	0.125	0.156	270
5/16	0.559	0.666	0.677	0.760	0.141	0.171	440
3/8	0.637	0.760	0.677	0.760	0.156	0.281	660
7/16	0.740	0.854	0.740	0.854	0.203	0.281	930
1/2	0.865	0.948	0.865	0.948	0.209	0.343	1,240
9/16	0.950	1.041	0.950	1.041	0.249	0.406	1,600
5/8	1.052	1.138	1.052	1.138	0.281	0.469	2,000
11/16	1.115	1.198	1.115	1.198	0.318	0.469	2,200

Table 2-11 Type II Sockets, Single Square (4-Point) and Double Square (8-Point), 1/2 in. Drive

Nominal Opening, in.	Outside Diameter, in.				Minimum Nut Opening Depth, *A*, in.	Minimum Bolt Clearance Hole Diameter, *B*, in.	Minimum Proof Torque, lbf-in.
	Nut End, *C*		Drive End, *D*				
	Min.	Max.	Min.	Max.			
3/8	0.697	0.760	0.865	1.010	0.156	0.281	1,100
7/16	0.802	0.860	0.927	1.010	0.203	0.281	1,500
1/2	0.898	0.978	0.927	1.041	0.209	0.344	2,000
9/16	0.990	1.041	0.990	1.138	0.249	0.406	2,600
5/8	1.099	1.166	1.104	1.197	0.281	0.469	3,300
11/16	1.178	1.260	1.178	1.260	0.318	0.469	4,100
3/4	1.302	1.343	1.115	1.385	0.356	0.531	5,000
13/16	1.365	1.447	1.115	1.447	0.418	0.594	5,000
7/8	1.490	1.573	1.245	1.572	0.479	0.594	5,000
15/16	1.601	1.666	1.302	1.697	0.490	0.656	5,000
1	1.678	1.760	1.302	1.760	0.490	0.656	5,000
1 1/16	1.823	1.843	1.302	1.843	0.490	0.687	5,000

Table 2-12 Type II Sockets, Single Square (4-Point) and Double Square (8-Point), 3/4 in. Drive

Nominal Opening, in.	Outside Diameter, in.				Minimum Nut Opening Depth, *A*, in.	Minimum Bolt Clearance Hole Diameter, *B*, in.	Minimum Proof Torque, lbf-in.
	Nut End, *C*		Drive End, *D*				
	Min.	Max.	Min.	Max.			
1/2	0.990	1.073	1.490	1.635	0.209	0.344	3,000
9/16	1.146	1.166	1.490	1.635	0.249	0.406	3,700
5/8	1.235	1.260	1.490	1.635	0.281	0.469	4,400
11/16	1.330	1.355	1.490	1.635	0.318	0.469	5,100
3/4	1.490	1.635	1.490	1.635	0.356	0.531	6,900
13/16	1.615	1.698	1.600	1.760	0.418	0.594	8,200
7/8	1.740	1.760	1.615	1.826	0.479	0.594	8,600
15/16	1.802	1.826	1.615	1.826	0.490	0.656	9,600
1	1.927	2.135	1.615	2.135	0.490	0.656	11,000
1 1/16	1.990	2.135	1.740	2.135	0.490	0.687	14,000
1 1/8	2.115	2.322	1.740	2.322	0.632	0.781	16,000
1 1/4	2.365	2.447	1.740	2.447	0.632	0.812	18,000
1 5/16	2.490	2.697	1.740	2.697	0.740	0.937	18,000
1 7/16	2.615	2.697	1.740	2.697	0.740	1.000	18,000
1 1/2	2.740	2.823	1.740	2.823	0.847	1.062	18,000

Table 2-13 Type VII Sockets, Single Hexagon (6-Point) and Double Hexagon (12-Point), #5 Spline Drive

Nominal Opening, in.	Outside Diameter, in.				Minimum Nut Opening Depth, *A*, in.	Minimum Bolt Clearance Hole Diameter, *B*, in.	Minimum Proof Torque, lbf-in.
	Nut End, *C*		Drive End, *D*				
	Min.	Max.	Min.	Max.			
3/4	1.281	1.448	2.365	2.406	0.356	0.531	6,400
13/16	1.365	1.510	2.365	2.406	0.418	0.594	7,400
7/8	1.417	1.544	2.365	2.406	0.479	0.594	8,400
15/16	1.480	1.607	2.365	2.406	0.490	0.656	9,400
1	1.490	1.763	2.365	2.406	0.490	0.656	10,500
1 1/16	1.521	1.763	2.365	2.406	0.490	0.687	11,700
1 1/8	1.552	1.823	2.365	2.406	0.632	0.781	12,800
1 1/4	1.736	2.197	2.365	2.406	0.632	0.812	15,400
1 5/16	1.828	2.380	2.365	2.406	0.740	0.937	16,700
1 3/8	1.920	2.450	2.365	2.406	0.740	0.937	18,000
1 7/16	2.012	2.600	2.365	2.406	0.740	1.000	19,500
1 1/2	2.104	2.645	2.365	2.473	0.847	1.062	21,000
1 5/8	2.288	2.800	2.365	2.510	0.847	1.125	24,000
1 11/16	2.379	2.900	2.365	2.635	0.970	1.187	26,000
1 13/16	2.563	3.020	2.365	2.822	0.990	1.250	29,000
1 7/8	2.655	3.020	2.365	2.822	1.062	1.312	31,000
2	2.839	3.150	2.365	3.073	1.062	1.375	34,000
2 1/16	2.931	3.220	2.365	3.073	1.169	1.437	36,000
2 3/16	3.115	3.365	2.365	3.260	1.193	1.500	40,000
2 1/4	3.240	3.440	2.365	3.260	1.276	1.562	42,000
2 3/8	3.365	3.585	2.365	3.385	1.303	1.562	46,000
2 7/16	3.490	3.655	2.365	3.510	1.353	1.687	48,000
2 1/2	3.490	3.730	2.365	3.510	1.353	1.750	48,000
2 9/16	3.615	3.800	2.365	3.635	1.380	1.750	48,000
2 5/8	3.615	3.875	2.365	3.760	1.460	1.812	48,000
2 3/4	3.740	4.050	2.365	4.010	1.490	1.875	48,000
2 13/16	3.990	4.100	2.365	4.135	1.567	1.937	48,000
2 15/16	3.990	4.240	2.365	4.135	1.600	1.937	48,000
3	4.115	4.310	2.365	4.260	1.675	2.125	48,000
3 1/8	4.115	4.455	2.365	4.260	1.708	2.125	48,000
3 3/8	4.240	4.760	2.365	4.635	1.870	2.375	48,000
3 1/2	4.740	4.760	2.365	4.760	1.911	2.375	48,000

Table 2-14 Type III Universal Sockets, Single Hexagon (6-Point) and Double Hexagon (12-Point), 3/8 in. Drive

Nominal Opening, in.	Outside Diameter, in.				Minimum Nut Opening Depth, *A*, in.	Minimum Bolt Clearance Hole Diameter, *B*, in.	Minimum Depth of Bolt Clearance Hole, in.	Minimum Proof Torque, lbf-in.
	Nut End, *C*		Drive End, *D*					
	Min.	Max.	Min.	Max.				
3/8	0.520	0.760	0.677	0.910	0.156	0.281	0.234	450
7/16	0.607	0.760	0.677	0.910	0.203	0.281	0.305	625
1/2	0.677	0.823	0.677	0.910	0.209	0.344	0.314	725
9/16	0.740	0.850	0.677	0.910	0.249	0.406	0.374	750
5/8	0.855	0.948	0.730	0.910	0.281	0.469	0.422	750
11/16	0.970	1.010	0.730	0.910	0.318	0.469	0.477	750
3/4	1.030	1.135	0.730	0.910	0.356	0.531	0.534	750

Table 2-14M Type III Universal Sockets, Single Hexagon (6-Point) and Double Hexagon (12-Point), 3/8 in. Drive

Nominal Opening, mm	Outside Diameter, mm				Minimum Nut Opening Depth, *A*, mm	Minimum Bolt Clearance Hole Diameter, *B*, mm	Minimum Depth of Bolt Clearance Hole, mm	Minimum Proof Torque, N·m
	Nut End, *C*		Drive End, *D*					
	Min.	Max.	Min.	Max.				
8	12.6	14.1	20.0	24.4	3.55	7.0	5.3	37
9	13.8	15.3	20.0	24.4	4.05	7.0	6.1	52
10	15.0	19.3	20.0	24.4	4.60	8.0	6.9	57
11	16.2	19.3	20.0	24.4	5.45	8.5	8.2	69
12	17.4	19.3	20.0	24.4	6.10	8.5	9.2	77
13	18.6	20.9	20.0	28.0	6.75	9.0	10.1	82
14	19.8	22.5	20.0	28.0	7.00	10.0	10.5	84
15	20.7	22.9	20.0	28.0	7.00	10.5	10.5	85
16	22.2	24.1	20.0	28.0	8.00	11.5	12.0	85
17	23.1	25.7	20.0	28.0	8.00	11.5	12.0	85
18	24.6	26.7	20.0	28.0	9.00	12.0	13.5	85
19	25.8	28.8	20.0	28.0	9.00	13.0	13.5	85
20	26.5	29.4	22.7	28.0	11.50	13.0	17.3	85
21	27.5	30.2	22.7	28.0	11.70	13.0	17.6	85
22	29.0	31.8	22.7	28.0	12.00	13.0	18.0	85
23	30.0	33.3	22.7	28.0	12.70	13.0	19.1	85
24	31.0	34.9	22.7	28.0	13.85	13.0	20.8	85

Table 2-15 Type III Universal Sockets, Single Hexagon (6-Point) and Double Hexagon (12-Point), 1/2 in. Drive

Nominal Opening, in.	Outside Diameter, in.				Minimum Nut Opening Depth, *A*, in.	Minimum Bolt Clearance Hole Diameter, *B*, in.	Minimum Depth of Bolt Clearance Hole, in.	Minimum Proof Torque, lbf-in.
	Nut End, *C*		Drive End, *D*					
	Min.	Max.	Min.	Max.				
7/16	0.600	0.814	0.865	1.063	0.203	0.281	0.305	850
1/2	0.681	0.891	0.865	1.063	0.209	0.344	0.314	1,000
9/16	0.763	0.968	0.865	1.063	0.249	0.406	0.374	1,350
5/8	0.844	1.046	0.865	1.063	0.281	0.469	0.422	1,500
11/16	0.926	1.123	0.927	1.250	0.318	0.469	0.477	1,750
3/4	1.001	1.260	0.927	1.250	0.356	0.531	0.534	1,750
13/16	1.009	1.278	0.927	1.250	0.418	0.594	0.627	1,750
7/8	1.178	1.355	0.927	1.250	0.479	0.594	0.719	1,750
15/16	1.252	1.433	0.927	1.250	0.490	0.656	0.735	1,750
1	1.333	1.510	0.927	1.250	0.490	0.656	0.735	1,750
1 1/16	1.364	1.515	0.927	1.250	0.490	0.687	0.735	1,750
1 1/8	1.439	1.590	0.927	1.250	0.632	0.781	0.948	1,750
1 3/16	1.514	1.665	0.927	1.250	0.632	0.796	0.948	1,750
1 1/4	1.588	1.740	0.927	1.250	0.632	0.812	0.948	1,750
1 5/16	1.663	1.815	0.927	1.250	0.748	0.906	1.122	1,750

Table 2-15M Type III Universal Sockets, Single Hexagon (6-Point) and Double Hexagon (12-Point), 1/2 in. Drive

Nominal Opening, mm	Outside Diameter, mm				Minimum Nut Opening Depth, *A*, mm	Minimum Bolt Clearance Hole Diameter, *B*, mm	Minimum Depth of Bolt Clearance Hole, mm	Minimum Proof Torque, N·m
	Nut End, *C*		Drive End, *D*					
	Min.	Max.	Min.	Max.				
10	15.0	20.7	22.5	28.0	4.60	8.0	6.9	57
11	16.5	20.7	22.5	28.0	5.45	8.5	8.2	69
12	18.0	21.7	22.5	28.0	6.10	8.5	9.2	96
13	19.5	22.6	22.5	28.0	6.75	9.0	10.1	120
14	21.1	24.6	22.5	37.0	8.00	10.0	12.0	145
15	22.5	25.4	23.7	37.0	8.00	10.5	12.0	160
16	23.8	26.6	25.6	37.0	8.50	11.5	12.8	170
17	25.5	27.9	27.5	37.0	9.00	11.5	13.5	190
18	26.6	30.1	28.5	37.0	9.50	12.0	14.3	200
19	28.0	32.0	28.5	37.0	10.50	13.0	15.8	200
21	30.4	32.9	28.5	37.0	11.70	13.0	17.6	200
22	31.6	34.4	28.5	37.0	12.45	13.0	18.7	200
24	34.3	36.4	28.7	37.0	13.85	13.0	20.8	200

Table 2-16 Type IV, Bar Extension

Drive Size, in.	Nominal Length, in.	Maximum Shank Diameter, in.	Overall Length, in.		Minimum Proof Torque, lbf-in.
			Min.	Max.	
1/4	2	0.380	1.750	2.500	500
	4	0.380	3.750	4.500	500
	6	0.380	5.750	6.500	500
3/8	3	0.510	2.500	3.500	1,200
	6	0.510	5.500	6.500	1,200
	12	0.510	11.500	12.500	1,200
1/2	3	0.700	2.500	3.500	3,500
	5	0.700	4.500	6.000	3,500
	6	0.700	5.500	6.500	3,500
	10	0.700	9.500	10.500	3,500
3/4	3	1.313	2.500	3.500	9,000
	7	1.313	6.500	7.500	9,000
	10	1.313	9.500	10.500	9,000
	13	1.313	12.500	13.500	9,000
1	3	1.563	2.500	3.500	15,000
	7	1.563	5.500	7.500	15,000
	13	1.563	11.500	13.500	15,000

Table 2-17 Type V, Adaptors

External Drive Size, in., Nominal	Internal Drive Size, in., Nominal	Maximum Overall Length, in.	Maximum Outside Diameter, in.	Proof Torque, lbf-in.
3/8	1/4	1.000	0.625	450
1/4	3/8	1.125	0.687	450
3/8	1/2	1.625	1.188	2,000
1/2	3/8	1.563	1.063	2,000
1/2	5/8	1.906	1.375	3,500
1/2	3/4	2.270	1.688	4,500
5/8	1/2	1.813	1.375	4,500
5/8	3/4	2.270	1.688	4,500
3/4	1/2	2.031	1.375	4,500
3/4	5/8	2.031	1.563	9,000
3/4	1	3.060	2.250	14,000
1	3/4	2.688	2.063	14,000

Table 2-18 Type VI, Universal Joint

External and Internal Drive End Size, in., Nominal	Maximum Overall Length, in.	Maximum Diameter, in.	Minimum Proof Torque lbf-in.
1/4	1.688	0.625	250
3/8	2.500	1.000	1,000
1/2	3.063	1.500	2,800
5/8	3.500	1.500	5,000
3/4	4.250	2.000	7,000
1	6.100	2.750	10,000

Category 10
Handles and Attachments for Hand Socket Wrenches

10-1 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: adaptor
Style A: socket wrench
Style B: ratchet

10-2 PERFORMANCE REQUIREMENTS

10-2.1 Design, Type I, Handles

10-2.1.1 Class 1, Hinged (Illustration in Table 10-1). 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 10-1 and pass the pin removal test in para. 10-3.9.

10-2.1.2 Class 2, Ratchet, Reversible (Illustration in Table 10-2). 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 10-2. 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 10-2 when tested as specified in para. 5.3 and the drop test of para. 10-3.6. 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 10-2.

10-2.1.3 Class 3, Speeder. The requirements of para. 10-2.3 do not apply to these tools.

(a) Style A, Brace Type, Single Revolving Handgrip (Illustration in Table 10-3). 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 10-3 and paras. 10-3.7 and 10-3.8. The shank shall not extend through the end of the handgrip or knob. Handles shall conform to Table 10-3.

(b) Style B, Spin Type, Screwdriver Grip (Illustration in Table 10-4). 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 10-4. 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 10-4.

10-2.1.4 Class 4, T-Handle, Sliding (Illustration in Table 10-5). 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 10-5.

10-2.2 Design, Type II, Attachments

10-2.2.1 Class 1, Universal Joint (Illustration in Table 10-6). 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 that 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 shall conform to Table 10-6 and pass the pin removal test in para. 10-3.9.

10-2.2.2 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 10-7). Attachment shall conform to Table 10-7.

(b) Style B, Flexible (Illustration in Table 10-8). 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 10-8. The requirements of para. 10-2.3 do not apply to these tools.

10-2.2.3 Class 3, Adaptor

(a) Style A, Socket Wrench (Illustration in Table 10-9). 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 10-9.

(b) Style B, Ratchet (Illustration in Table 10-10). 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 10-10.

10-2.3 Hardness

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

10-3 TESTS

10-3.1 Adaptor Attachments

Adaptor 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.

10-3.2 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 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.

10-3.3 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.

10-3.4 Hinged Handles

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

10-3.5 Reverse Torque, Ratcheting, Type I, Class 2 Handle, Ratchet, Reversible; and Type II, Class 3, Style B, Attachment, Adaptor, Ratchet, Socket Wrench

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

10-3.6 Drop Test, Type I, Class 2, Ratchet, Reversible

The ratchet handle shall be dropped on concrete twelve times from a height of 6 ft, 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.

10-3.7 Thrust Load Test

A load, as specified in Table 10-3, 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.

10-3.8 Pull Test

A load, as specified in Table 10-3, shall be applied to the knob away from the drive square. Load shall be applied for a minimum of 10 sec. After removal of load, the knob shall operate freely without binding.

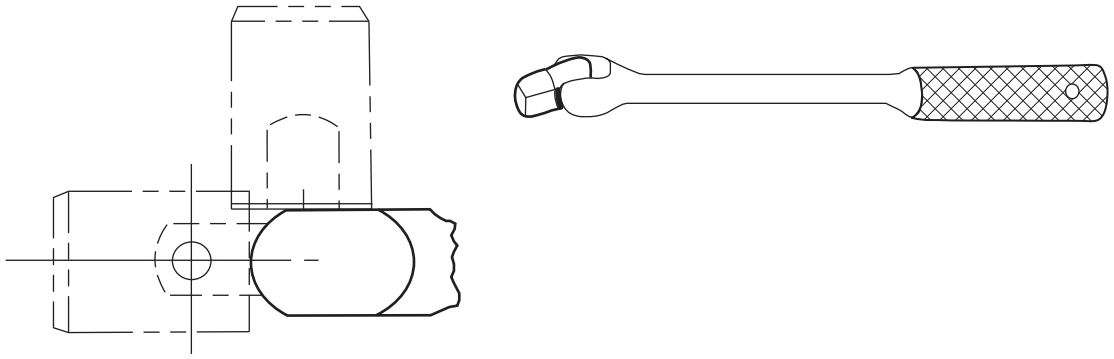
10-3.9 Pin Removal Test

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

10-3.10 Cycle Test

The applied torque for cycle testing shall be as specified in Table 10-2, i.e., 20% of the proof torque specified in this table. Ratchet mechanism shall withstand minimum of 50,000 cycles using the cycle test torque as specified in Table 10-2. Cycle test shall be carried out in one direction and shall be run at a frequency not exceeding 60 load cycles per minute (i.e., 1.0 Hz maximum). The ratchet shall advance by minimum one tooth on each cycle. Care must be taken during the cycle test to ensure the square drive is loaded to the specified cycle test load, but does not impose shock load on the any portion of the ratchet. Following the cycle test, the ratchet handle shall carry the proof load specified in Table 10-2 without jamming or other evidence of malfunction.

Table 10-1 Type I, Class 1, Handles, Hinged



Drive Size, in.	Overall Length, in. [Note (1)] Min.	Overall Length, in. [Note (1)] Max.	Maximum Dimension Across Hinge (Fork Width), in.	Handgrip Minimum Length, in.	Handgrip Minimum Diameter or Width, in.	Minimum Proof Torque, lbf-in.	Maximum Shank Handle [Note (2)] (Cross-Section or Diameter), in.	Minimum Force Required for Removal of Hinge Pins, lb
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).

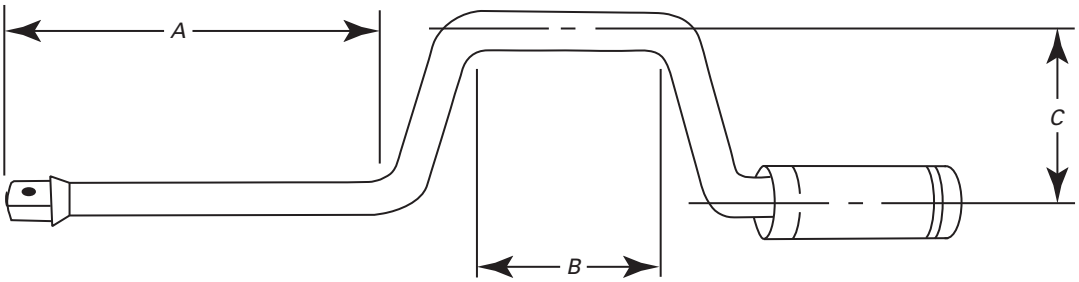
(2) This measurement shall be taken at the midpoint of the handle's overall length.

Table 10-2 Type I, Class 2, Handles, Ratchet, Reversible

Drive Size, in.	Minimum Overall Length, 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)]
		Maximum Width, in.	Maximum Head Thickness Less Tang and Reverse Lever, in.								
1/4	4.375	1.125	0.593	0.281	18	0.012	0.02	10	450	0.562	90
3/8	5.750	1.875	0.875	0.500	18	0.014	0.02	25	1,800	0.781	360
1/2	9.500	1.937	1.000	0.500	24	0.014	0.028	50	4,500	0.906	900
3/4	17.000	2.875	1.375	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

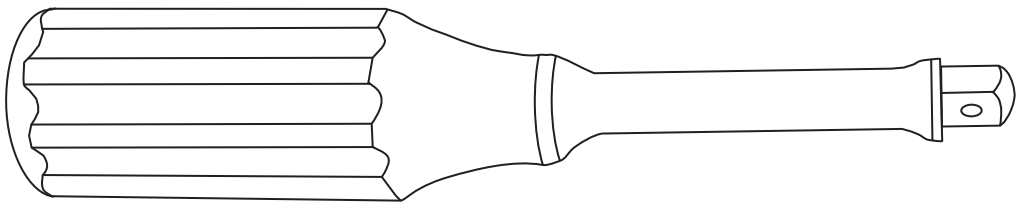
NOTES:
(1) This measurement shall be taken at the midpoint of the handle's overall length.
(2) Cycle test torque is 20% of proof torque.

Table 10-3 Type I, Class 3, Style A, Handles, Speeder, Brace Type, Single Revolving Handgrip



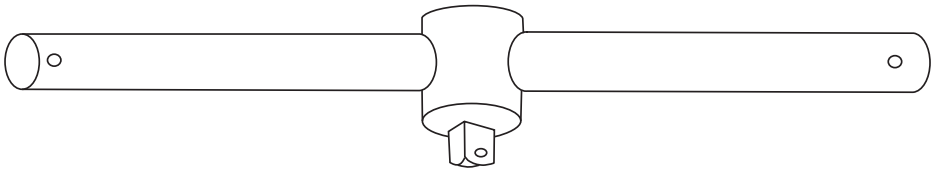
Drive Size, in.	Maximum Diameter of Rod, in.	Overall Length, in.		Minimum Radius of Crank Sweep, *C*, in.	Minimum Length Extension, *A*, in.	Minimum Thrust Load End Grip, lb	Minimum Proof Torque Offset Handle Rotating Direction, lbf-in.	Minimum End Grip Removal Pull Test, lb	Minimum Grip Length, *B*, 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 10-4 Type I, Class 3, Style B, Handles, Speeder, Spin Type, Screwdriver Grip



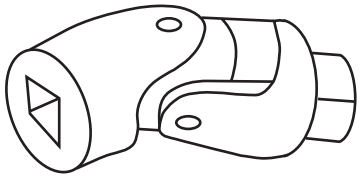
Drive Size, in.	Minimum Length of Shank Beyond Handle, in.	Handle Length, in.		Handle Diameter, in.		Minimum Pull Load on Shank, lb	Minimum Torque, lbf-in.
		Min.	Max.	Min.	Max.		
1/4	1.87	2.63	4	0.88	1.27	50	90

Table 10-5 Type I, Class 4, Handles, T, Sliding



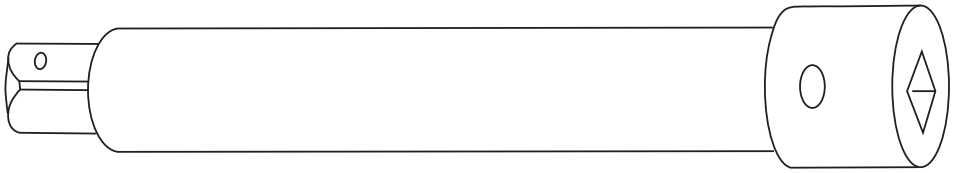
Drive Size, in.	Sliding Rod				Maximum Socket Holder Overall Length, in.	Minimum Proof Torque, lbf-in.
	Diameter, in.		Length, in.			
	Min.	Max.	Min.	Max.		
1/4	0.230	0.313	4	5	1.093	400
3/8	0.355	0.438	6	8	1.375	1,000
1/2	0.480	0.625	9	13	1.750	2,500
3/4	0.730	0.875	17	20	2.500	9,000
1	0.855	1.125	20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

Table 10-6 Type II, Class 1, Attachments, Universal Joint



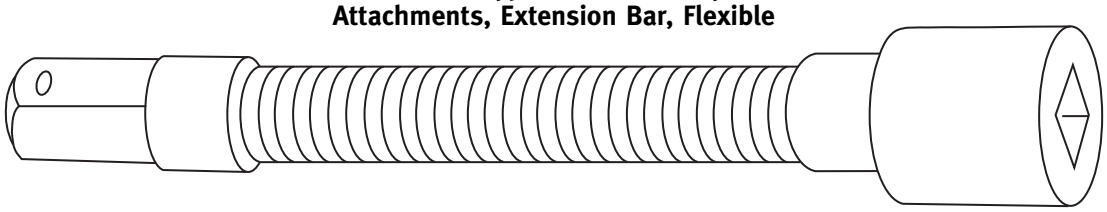
Drive Size, in.	Maximum Overall Length, in.	Maximum Diameter, in.	Minimum Proof Torque, lbf-in.	Minimum Force Required for Removal of Hinge Pins, lb
1/4	1.50	0.59	250	80
3/8	2.25	0.79	750	250
1/2	2.88	1.01	1,750	400
3/4	4.25	1.63	4,000	1,000

Table 10-7 Type II, Class 2, Style A, Attachments, Extension Bar, Solid



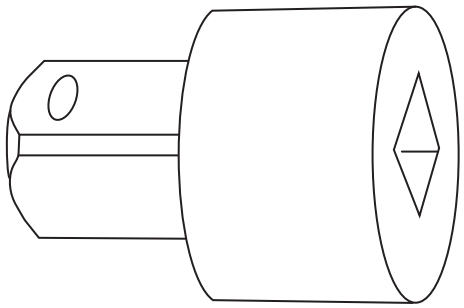
Drive Size, in.	Nominal Length, in.	Maximum Shank Diameter, in.	Overall Length, in.		Minimum Proof Torque, lbf-in.
			Min.	Max.	
1/4	1	0.343	1.0	1.5	500
1/4	2	0.343	1.5	2.5	500
1/4	3	0.343	2.5	3.5	500
1/4	4	0.343	3.5	4.5	500
1/4	6	0.343	5.5	6.5	500
1/4	10	0.343	9.5	10.5	500
1/4	14	0.343	13.5	14.5	500
1/4	17	0.343	16.5	17.5	500
3/8	1	0.500	1.0	1.5	1,200
3/8	2	0.500	1.5	2.5	1,200
3/8	3	0.500	2.5	3.5	1,200
3/8	5	0.500	4.5	5.5	1,200
3/8	6	0.500	5.5	6.5	1,200
3/8	8	0.500	7.5	8.5	1,200
3/8	9	0.500	8.5	9.5	1,200
3/8	10	0.500	9.5	10.5	1,200
3/8	11	0.500	10.5	11.5	1,200
3/8	12	0.500	11.5	12.5	1,200
3/8	18	0.500	17.0	19.0	1,200
3/8	20	0.500	19.0	21.0	1,200
3/8	24	0.500	23.0	25.0	1,200
3/8	34	0.500	33.0	35.0	1,200
1/2	2	0.656	1.5	3.0	3,500
1/2	3	0.656	2.5	3.5	3,500
1/2	5	0.656	4.5	6.0	3,500
1/2	6	0.656	5.5	6.5	3,500
1/2	10	0.656	9.5	10.5	3,500
1/2	15	0.656	14.5	15.5	3,500
1/2	20	0.656	19.0	21.0	3,500
1/2	24	0.656	23.0	25.0	3,500
1/2	30	0.656	29.0	31.0	3,500
1/2	34	0.656	33.0	35.0	3,500
1/2	36	0.656	35.0	37.0	3,500
1/2	48	0.656	46.0	50.0	3,500
3/4	3	1.000	2.5	3.5	9,000
3/4	5	1.000	4.5	5.5	9,000
3/4	8	1.000	7.5	8.5	9,000
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 10-8 Type II, Class 2, Style B, Attachments, Extension Bar, Flexible



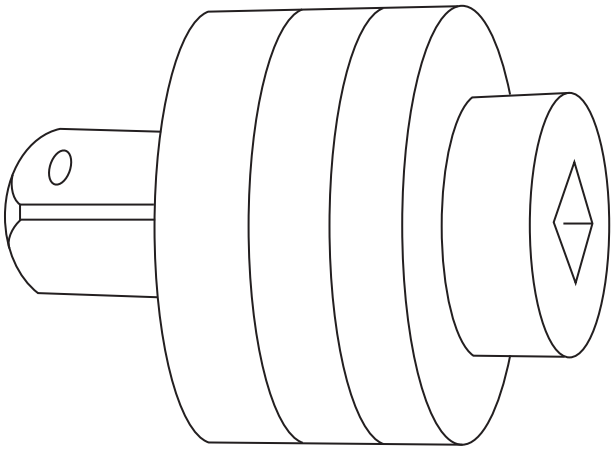
Drive Size, in.	Overall Length, in.		Minimum Proof Torque, lbf-in.
	Min.	Max.	
1/4	3.5	4.5	25
1/4	5.5	6.5	25
1/4	7.5	8.5	35

Table 10-9 Type II, Class 3, Style A, Attachments, Adaptor, 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.		
3/8	1/4	0.625	1.000	0.625	450
1/4	3/8	0.625	1.125	0.687	450
1/2	3/8	1.093	1.500	0.875	2,000
3/8	1/2	1.250	1.500	1.000	2,000
3/4	1/2	1.500	1.937	1.125	4,500
1/2	3/4	1.687	2.125	1.500	4,500
3/4	1	2.250	2.875	2.000	14,000
1	3/4	2.000	2.625	1.500	14,000

Table 10-10 Type II, Class 3, Style B, Attachments, Adaptor, 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.
1/4	1.125	2.000	18	10	450
3/8	1.437	2.125	18	25	1,500
1/2	1.750	3.000	18	60	4,000
3/4	2.625	4.000	18	120	7,500
1	3.500	5.125	18	300	15,000

Category 12
Nutdrivers

12-1 CLASSIFICATION

Type I: conventional length
Class 1: solid shaft
Style A: conventional handle
Style B: cushion grip handle
Class 2: hollow shaft
Style A: conventional handle
Style B: cushion grip handle
Type II: stubby length
Style A: conventional handle
Style B: cushion grip handle
Type III: miniature handle

12-2 PERFORMANCE REQUIREMENTS

12-2.1 Design

12-2.1.1 Type I, Class 1: Conventional Length — Solid Shaft. Type I, Class 1 nutdrivers shall consist of a round steel solid shaft with a socket at one end and a handle at the other end. The nutdrivers shall be similar to Fig. 12-1 and conform to Table 12-1 or 12-1M for the size specified. Style A nutdrivers shall be provided with a conventional color-coded handle and/or shaft. Style B nutdrivers shall be provided with a cushion grip handle and need not be color-coded.

12-2.1.2 Type I, Class 2: Conventional Length — Hollow Shaft. Type I, Class 2 nutdrivers shall consist of a round steel hollow shaft with a socket at one end and a handle at the other end. The nutdrivers shall be similar to Fig. 12-2 and conform to Table 12-2 or 12-2M for the size specified. The minimum hole depth for hollow shaft nutdrivers shall be dimension *F* in Fig. 12-2. Style A nutdrivers shall be provided with a conventional color-coded handle and/or shaft. Style B nutdrivers shall be provided with a cushion grip handle and need not be color-coded.

12-2.1.3 Type II: Stubby Length. Type II nutdrivers shall consist of round steel shaft with socket at one end and a handle at the other end. A bolt clearance hole shall be provided in the shaft of the socket end. The nutdriver shall be similar to Fig. 12-3 and conform to Table 12-3 or 12-3M for the size specified. Style A nutdrivers shall be provided with a conventional color-coded handle and/or shaft. Style B nutdrivers shall be provided with a cushion grip handle and need not be color-coded.

12-2.1.4 Type III: Miniature Handle. Type III nutdrivers shall consist of a round steel shaft with a socket at one end and a handle at the other end. A bolt clearance hole shall be provided in the shaft socket end. The nutdriver shall be similar to Fig. 12-4 and conform to Table 12-4 or 12-4M for the size specified. Handle and/or shaft shall be color-coded.

12-2.2 Handles

12-2.2.1 Color Coding. Color coding is optional. When color coding is used, Style A nutdrivers shall have handles and/or shafts color-coded in accordance with the following:

Socket Opening Nominal Size, in.	Color
5/64	Amber or yellow
3/32	Blue
7/64	Brown
1/8	Red
5/32	Amber or yellow
3/16	Black
7/32	Brown
1/4	Red
9/32	Orange
5/16	Amber or yellow
11/32	Green
3/8	Blue
7/16	Brown
1/2	Red
9/16 and larger	Optional

Socket Opening Nominal Size, mm	Color
2	Amber or yellow
3	Blue
3.2	Brown
4	Red
4.5	Amber or yellow
5	Black
5.5	Brown
6	Red
7	Orange
8	Amber or yellow
9	Green
10	Blue
11	Brown
12	Red
13 and larger	Optional

12-2.2.2 Handle Shape and Finish. Handles shall be suitably shaped and finished to provide a comfortable grip. They shall be free from rough edges, sharp corners, or tool marks that affect the appearance and comfort of the tool. They shall meet the dimensional requirements specified in the applicable tables.

12-2.2.3 Handle With Internal Drive. When specified, handles shall be provided with a $\frac{1}{4}$ in. (6.3 mm) or $\frac{3}{8}$ in. (10 mm) square internal drive opening. Square drive dimensions and tolerances shall be in accordance with ASME B107.4. The drive shall be flush with the butt end of the handle. The drive shall be capable of meeting the same torsional load requirements as set forth for the socket end contained herein. A square external drive tang in accordance with ASME B107.4 shall be used for the test mandrel.

12-2.2.4 Cushion Grip. Style B nutdriver handles shall be furnished with cushion grips. The grip material shall be capable of meeting the handle solvent test as specified in para. 12-3.3. The length of the cushion grip shall be at least 60% of the handle length, and there shall be no detectable slippage between the handle and the cushion grip under normal usage. The original hardness shall be Shore A50 to A75 when tested in accordance with ASTM D2240, and the hardness after the solvent test shall not be greater than Shore A80.

WARNING: Cushion grips are not intended to give any degree of protection against electric shock and shall not be used on or near live electrical circuits.

12-3 TESTS

12-3.1 Torsional Moment Test

Test shall be conducted in a manner similar to that shown in Fig. 12-5. Test mandrels shall conform to ASME B107.17. The socket openings shall be gaged prior to testing. The tests shall be conducted after preheating the entire tool to a uniform temperature of 125°F (57.7°C), and the torque specified in the applicable table shall be applied within 1 min after removing the tool from the heating medium. The socket of the tool shall be inserted over the mandrel to the depth specified in Table 12-5 or 12-5M. Proof load test speed shall not be less than 15 deg per minute or faster than 30 deg per minute after the loading has reached more than 50% of the tested load. The handle may be gripped in the area beyond the insertion distance of the socket shaft by suitable means. It shall be permissible to support the handle in order to maintain the tool in a suitable position for testing, provided the supporting means does not exert pressure end-wise during testing. Any cracking, failure of the socket opening to conform to the gaging requirement, or failure to sustain the proof torque for the prescribed time shall constitute failure. When tested to the minimum assembly torque value specified, the assembly shall not show a permanent slippage between the shaft and handle.

12-3.2 Bending Moment Test

Test shall be conducted in a manner similar to that shown in Fig. 12-6. Test mandrels shall conform to ASME B107.17. The socket of the tool shall be inserted over the mandrel to the depth specified in Table 12-5 or 12-5M. A force of such magnitude to create the bending moment specified in the applicable table shall be applied at or near the middle of the natural grip of the handle for a minimum of 10 sec. The force is to act perpendicular to the axis of the tool. The tool shall not crack, break, or show any signs of visible permanent set or looseness in the handle. The test shall be conducted at room temperature.

12-3.3 Solvent Tests

Nutdrivers shall be capable of meeting the following test requirements. Handles are to be fully immersed in motor vehicle brake fluid (SAE J1703), gasoline, ethylene glycol, and ethyl alcohol for 15 min at room temperature, removed, wiped off, and allowed to stand for 24 hr. A new assembly shall be used for each of the test liquids. There shall be no permanent swelling, surface attack (except for manufacturer's identification or paint removal), or degradation of the ability to meet applicable performance requirements contained herein. The handle hardness after testing shall not be greater than Shore A80 when tested in accordance with ASTM D2240.

Fig. 12-1 Type I, Class 1, Styles A and B: Conventional Length Nutdriver With Solid Shaft

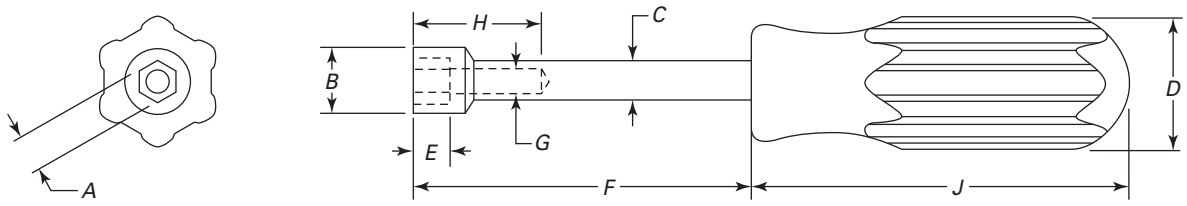


Table 12-1 Type I, Class 1, Styles A and B: Conventional Length Nutdriver With Solid Shaft

Nominal Socket Opening, *A*, in.	Maximum Socket Outside Diameter, *B*, in.	Maximum Shaft Diameter, *C*, in.	Minimum Handle Outside Diameter, *D*, in.	Minimum Hex Depth, *E*, in.	Minimum Shaft Length, *F*, in.	Minimum Hole Diameter, *G*, in.	Minimum Depth of Hole, *H*, in.	Minimum Handle Length, *J*, in.	Minimum Proof Torque, lbf-in.	Minimum Bending Moment Test Load, lbf-in.
5/32	0.335	0.32	0.87	0.18	2.81	0.100	1.00	3.12	50	45
3/16	0.385	0.32	0.87	0.18	2.81	0.105	1.00	3.12	75	60
7/32	0.400	0.32	0.87	0.18	2.81	0.115	1.00	3.12	75	60
1/4	0.450	0.38	0.87	0.18	2.81	0.118	1.00	3.12	100	90
9/32	0.475	0.38	0.87	0.18	2.81	0.129	1.00	3.12	100	90
5/16	0.510	0.38	0.87	0.21	2.81	0.141	1.00	3.12	125	105
11/32	0.545	0.38	0.87	0.25	2.81	0.170	1.00	3.12	125	105
3/8	0.585	0.45	0.87	0.25	2.81	0.196	1.00	3.12	150	120
7/16	0.660	0.45	1.00	0.28	2.81	0.265	1.00	3.50	150	145
1/2	0.720	0.51	1.00	0.31	2.81	0.321	1.00	3.50	175	175
9/16	0.814	0.57	1.06	0.43	2.87	0.386	1.00	3.62	175	260
5/8	0.892	0.63	1.06	0.43	2.87	0.445	1.00	3.62	200	300
11/16	0.952	0.70	1.12	0.43	3.87	0.445	1.00	3.62	250	375
3/4	1.054	0.70	1.12	0.43	3.87	0.505	1.00	4.00	250	375
13/16	1.108	0.70	1.12	0.43	3.87	0.567	1.00	4.00	250	375
7/8	1.201	0.70	1.12	0.43	3.87	0.567	1.00	4.00	250	375

Table 12-1M Type I, Class 1, Styles A and B: Conventional Length Nutdriver With Solid Shaft

Nominal Socket Opening, *A*, mm	Maximum Socket Outside Diameter, *B*, mm	Maximum Shaft Diameter, *C*, mm	Minimum Handle Outside Diameter, *D*, mm	Minimum Hex Depth, *E*, mm	Minimum Shaft Length, *F*, mm	Minimum Hole Diameter, *G*, mm	Minimum Depth of Hole, *H*, mm	Minimum Handle Length, *J*, mm	Minimum Proof Torque, N·m	Minimum Bending Moment Test Load, N·m
4	8.5	8.1	22	2.4	70	2.2	25	79	8	7
4.5	9.7	8.1	22	2.6	70	2.5	25	79	8	8
5	9.7	9.5	22	2.8	70	2.9	25	79	9	8
5.5	10.2	9.5	22	2.8	70	3.3	25	79	11	9
6	10.8	9.5	22	3.1	70	3.6	25	79	11	11
7	12.1	9.5	22	3.6	70	4.2	25	79	11	12
8	13.0	10.2	22	3.6	70	5.2	25	79	11	14
9	13.8	11.8	22	4.1	70	5.3	25	79	13	15
10	15.6	11.8	25	4.6	70	6.3	25	88	16	18
11	16.8	13.4	25	5.5	70	7.3	25	88	20	22
12	17.5	15	25	6.1	70	8.3	25	88	23	26
13	18.5	15	25	6.1	70	8.3	25	88	24	32
14	20.6	16.8	27	6.1	70	10.1	25	92	25	39
16	22.7	16.8	27	7.0	70	11.1	25	92	26	45
17	23.6	16.8	27	8.0	70	11.7	25	92	31	49
18	24.5	16.8	27	9.0	70	12.2	25	92	34	56

Fig. 12-2 Type I, Class 2: Styles A and B: Conventional Length Nutdriver With Hollow Shaft

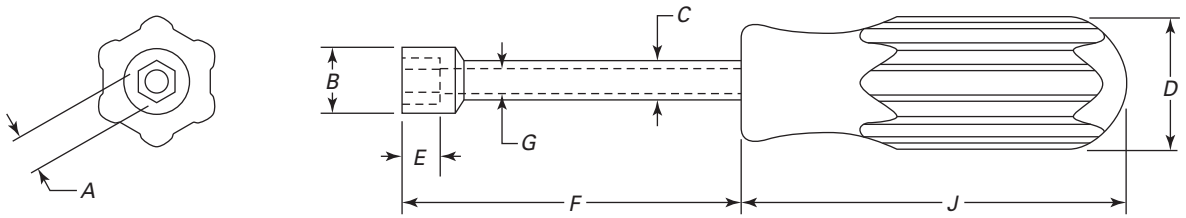


Table 12-2 Type I, Class 2, Styles A and B: Conventional Length Nutdriver With Hollow Shaft

Nominal Socket Opening, *A*, in.	Maximum Socket Diameter Outside, *B*, in.	Maximum Shaft Diameter, *C*, in.	Minimum Handle Outside Diameter, *D*, in.	Minimum Hex Depth, *E*, in.	Minimum Shaft Length, *F*, in.	Minimum Hole Diameter, *G*, in.	Minimum Handle Length, *J*, in.	Minimum Proof Torque, lbf-in.	Minimum Bending Moment Test Load, lbf-in.
5/32	0.335	0.32	0.87	0.18	2.81	0.100	3.12	50	45
3/16	0.385	0.32	0.87	0.18	2.81	0.105	3.12	55	50
7/32	0.400	0.32	0.87	0.18	2.81	0.115	3.12	75	60
1/4	0.450	0.38	0.87	0.18	2.81	0.118	3.12	75	75
9/32	0.475	0.38	0.87	0.18	2.81	0.129	3.12	75	80
5/16	0.510	0.38	0.87	0.21	2.81	0.141	3.12	75	90
11/32	0.545	0.38	0.87	0.25	2.81	0.170	3.12	85	95
3/8	0.585	0.45	0.87	0.25	2.81	0.196	3.12	95	110
7/16	0.660	0.45	1.00	0.28	2.81	0.265	3.50	135	145
1/2	0.720	0.51	1.00	0.31	2.81	0.321	3.50	150	200
9/16	0.814	0.57	1.06	0.43	2.87	0.386	3.62	160	260
5/8	0.892	0.63	1.06	0.43	2.87	0.445	3.62	175	300
11/16	0.952	0.70	1.12	0.43	3.87	0.445	3.62	225	375
3/4	1.054	0.70	1.12	0.43	3.87	0.505	4.00	225	375
13/16	1.108	0.70	1.12	0.43	3.87	0.567	4.00	225	375
7/8	1.201	0.70	1.12	0.43	3.87	0.567	4.00	225	375

Table 12-2M Type I, Class 2, Styles A and B: Conventional Length Nutdriver With Hollow Shaft

Nominal Socket Opening, *A*, mm	Maximum Socket Outside Diameter, *B*, mm	Maximum Shaft Diameter, *C*, mm	Minimum Handle Outside Diameter, *D*, mm	Minimum Hex Depth, *E*, mm	Minimum Shaft Length, *F*, mm	Minimum Hole Diameter, *G*, mm	Minimum Handle Length, *J*, mm	Minimum Proof Torque, N·m	Minimum Bending Moment Test Load, N·m
4	8.5	8.1	22	2.4	70	2.2	79	8	7
4.5	9.7	8.1	22	2.6	70	2.5	79	8	8
5	9.7	9.5	22	2.8	70	2.9	79	9	8
5.5	10.2	9.5	22	2.8	70	3.3	79	11	9
6	10.8	9.5	22	3.1	70	3.6	79	11	11
7	12.1	9.5	22	3.6	70	4.2	79	11	12
8	13.0	10.2	22	3.6	70	5.2	79	11	14
9	13.8	11.8	22	4.1	70	5.3	79	13	15
10	15.6	11.8	25	4.6	70	6.3	88	16	18
11	16.8	13.4	25	5.5	70	7.3	88	20	22
12	17.5	15.0	25	6.1	70	8.3	88	23	26
13	18.5	15.0	25	6.1	70	8.3	88	24	32
14	20.6	16.8	27	6.1	70	10.1	92	25	39
16	22.7	16.8	27	7.0	70	11.1	92	26	45
17	23.6	16.8	27	8.0	70	11.7	92	31	49
18	24.5	16.8	27	9.0	70	12.2	92	34	56

Fig. 12-3 Type II, Styles A and B: Stubby Length Nutdriver

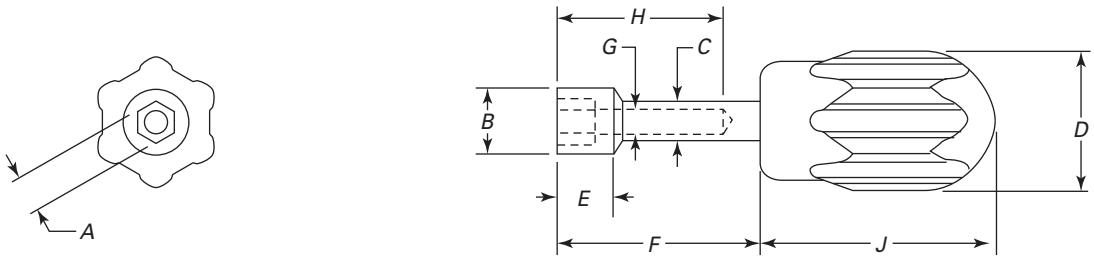


Table 12-3 Type II, Styles A and B: Stubby Length Nutdriver

Nominal Socket Opening, *A*, in.	Maximum Socket Outside Diameter, *B*, in.	Maximum Shaft Diameter, *C*, in.	Minimum Handle Outside Diameter, *D*, in.	Minimum Hex Depth, *E*, in.	Minimum Shaft Length, *F*, in.	Minimum Hole Diameter, *G*, in.	Minimum Depth of Hole, *H*, in.	Minimum Handle Length, *J*, in.	Minimum Proof Torque, lbf-in.	Minimum Bending Moment Test Load, lbf-in.
5/32	0.335	0.32	1.06	0.18	1.12	0.100	0.87	1.62	50	45
3/16	0.385	0.32	1.06	0.18	1.12	0.105	0.87	1.62	75	60
7/32	0.400	0.32	1.06	0.18	1.12	0.115	0.87	1.62	75	60
1/4	0.450	0.38	1.06	0.18	1.12	0.118	0.87	1.62	100	90
9/32	0.475	0.38	1.06	0.18	1.12	0.129	0.87	1.62	100	90
5/16	0.510	0.38	1.06	0.21	1.12	0.141	0.87	1.62	125	105
11/32	0.545	0.38	1.06	0.25	1.12	0.170	0.87	1.62	125	105
3/8	0.585	0.45	1.06	0.25	1.12	0.196	0.87	1.62	150	120
7/16	0.660	0.45	1.06	0.28	1.12	0.265	0.87	1.62	150	145
1/2	0.720	0.51	1.06	0.31	1.12	0.321	0.87	1.62	175	175
9/16	0.814	0.57	1.06	0.43	1.12	0.386	0.87	1.62	175	260
5/8	0.892	0.63	1.06	0.43	1.12	0.445	0.87	1.62	200	300

Table 12-3M Type II, Styles A and B: Stubby Length Nutdriver

Nominal Socket Opening, *A*, mm	Maximum Socket Outside Diameter, *B*, mm	Maximum Shaft Diameter, *C*, mm	Minimum Handle Outside Diameter, *D*, mm	Minimum Hex Depth, *E*, mm	Minimum Shaft Length, *F*, mm	Minimum Hole Diameter, *G*, mm	Minimum Depth of Hole, *H*, mm	Minimum Handle Length, *J*, mm	Minimum Proof Torque, N·m	Minimum Bending Moment Test Load, N·m
4	8.5	8.1	27	2.4	28	2.2	22	41	8	7
4.5	9.7	8.1	27	2.6	28	2.5	22	41	8	8
5	9.7	9.5	27	2.8	28	2.9	22	41	9	8
5.5	10.2	9.5	27	2.8	28	3.3	22	41	11	9
6	10.8	9.5	27	3.1	28	3.6	22	41	11	11
7	12.1	9.5	27	3.6	28	4.2	22	41	11	12
8	13.0	10.2	27	3.6	28	5.2	22	41	11	14
9	13.8	11.8	27	4.1	28	5.3	22	41	13	15
10	15.6	11.8	27	4.6	28	6.3	22	41	16	18

Fig. 12-4 Type III: Miniature Handle Nutdriver

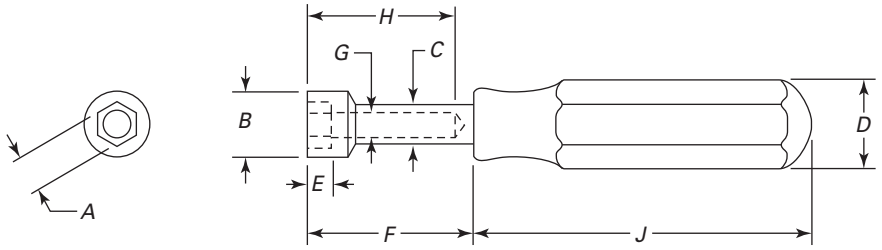


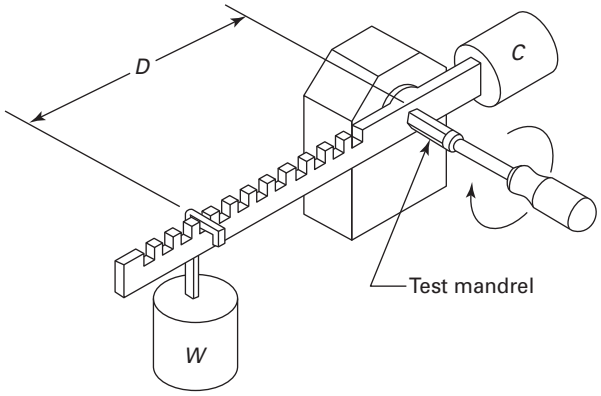
Table 12-4 Type III: Miniature Handle Nutdriver

Nominal Socket Opening, *A*, in.	Maximum Socket Outside Diameter, *B*, in.	Maximum Shaft Diameter, *C*, in.	Minimum Handle Outside Diameter, *D*, in.	Minimum Hex Depth, *E*, in.	Minimum Shaft Length, *F*, in.	Minimum Hole Diameter, *G*, in.	Minimum Depth of Hole, *H*, in.	Minimum Handle Length, *J*, in.	Minimum Proof Torque, lbf-in.
5/64	0.193	0.20	0.50	0.07	1.18	0.050	0.25	2.18	6
3/32	0.193	0.20	0.50	0.09	1.18	0.063	0.28	2.18	8
7/64	0.255	0.26	0.50	0.10	1.18	0.075	0.31	2.18	10
1/8	0.255	0.26	0.50	0.12	1.18	0.097	0.34	2.18	20
5/32	0.335	0.32	0.50	0.15	1.18	0.100	0.78	2.18	30
3/16	0.385	0.32	0.50	0.18	1.18	0.100	0.78	2.18	40
7/32	0.400	0.32	0.50	0.18	1.18	0.115	0.78	2.18	40
1/4	0.450	0.38	0.50	0.18	1.18	0.118	0.78	2.18	40
9/32	0.475	0.38	0.50	0.18	1.18	0.129	0.78	2.18	40
5/16	0.510	0.38	0.50	0.21	1.18	0.141	0.78	2.18	40
11/32	0.545	0.38	0.50	0.25	1.18	0.170	0.78	2.18	40
3/8	0.585	0.45	0.50	0.25	1.18	0.196	0.78	2.18	40
7/16	0.660	0.45	0.50	0.28	1.18	0.265	0.78	2.18	40
1/2	0.720	0.51	0.50	0.31	1.18	0.321	0.78	2.18	40
9/16	0.814	0.57	0.50	0.43	1.18	0.386	0.78	2.18	40
5/8	0.892	0.63	0.50	0.43	1.18	0.445	0.78	2.18	40

Table 12-4M Type III: Miniature Handle Nutdriver

Nominal Socket Opening, *A*, mm	Maximum Socket Outside Diameter, *B*, mm	Maximum Shaft Diameter, *C*, mm	Minimum Handle Outside Diameter, *D*, mm	Minimum Hex Depth, *E*, mm	Minimum Shaft Length, *F*, mm	Minimum Hole Diameter, *G*, mm	Minimum Depth of Hole, *H*, mm	Minimum Handle Length, *J*, mm	Minimum Proof Torque, N·m
2	5.0	5.0	12	1.6	30	1.5	6	55	1
3	5.0	5.0	12	1.8	30	2.0	8	55	2
3.2	7.5	7.5	12	2.0	30	2.2	9	55	3
4	8.5	8.1	12	2.4	30	2.2	20	55	5
4.5	9.7	8.1	12	2.6	30	2.5	20	55	5
5	9.7	9.5	12	2.8	30	2.9	20	55	6
5.5	10.2	9.5	12	2.8	30	3.3	20	55	6
6	10.8	9.5	12	3.1	30	3.6	20	55	6
7	12.1	9.5	12	3.6	30	4.2	20	55	6
8	13.0	10.2	12	3.6	30	5.2	20	55	6
9	13.8	11.8	12	4.1	30	5.3	20	55	6
10	15.6	11.8	12	4.6	30	6.3	20	55	6

Fig. 12-5 Torsional Moment Test



D = distance, in. (mm)
W = weight, lb (N)
C = a counterweight used to balance beam
$D \times W$ = in.-lb (N·m)

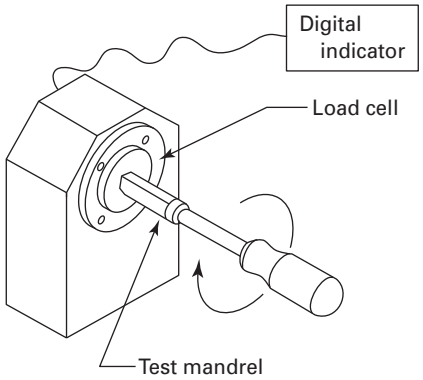


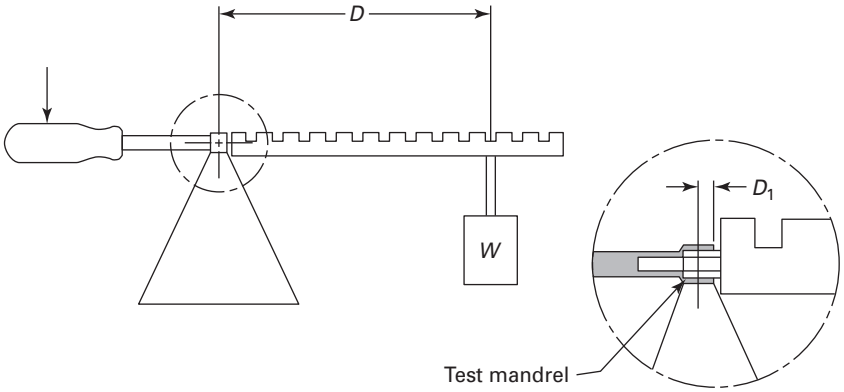
Table 12-5 Torsional Moment Test: Hexagonal Mandrel Dimensions and Maximum Depth of Mandrel Insertion

Nominal Size of Wrench Opening, in.	Across Flats Dimension	Across Flats Tolerance		Minimum Across Corners, in.	Maximum Depth of Mandrel Insertion, in.
		Plus (+)	Minus (–)		
5/64	0.078	0.001	0.002	0.0889	0.078
3/32	0.094	0.001	0.002	0.1061	0.094
7/64	0.109	0.001	0.002	0.1233	0.094
1/8	0.125	0.001	0.002	0.1405	0.094
5/32	0.156	0.001	0.002	0.1745	0.094
3/16	0.188	0.001	0.002	0.2095	0.094
7/32	0.219	0.001	0.002	0.2440	0.109
1/4	0.250	0.001	0.002	0.2780	0.125
9/32	0.281	0.001	0.002	0.3133	0.141
5/16	0.313	0.001	0.002	0.3495	0.141
11/32	0.344	0.001	0.002	0.3860	0.156
3/8	0.375	0.001	0.002	0.4225	0.156
7/16	0.438	0.001	0.002	0.4935	0.218
1/2	0.500	0.001	0.003	0.5635	0.265
9/16	0.563	0.001	0.003	0.6339	0.328
5/8	0.625	0.001	0.003	0.7055	0.375
11/16	0.688	0.001	0.003	0.7769	0.375
3/4	0.750	0.001	0.003	0.8485	0.437
13/16	0.813	0.001	0.003	0.9201	0.453
7/8	0.875	0.001	0.003	0.9917	0.500

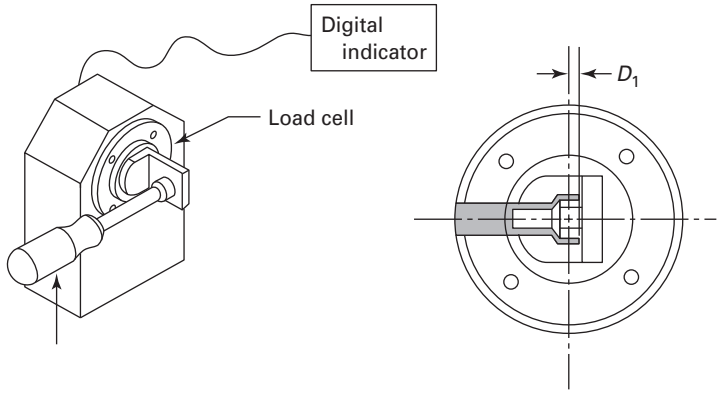
Table 12-5M Torsional Moment Test: Hexagonal Mandrel Dimensions and Maximum Depth of Mandrel Insertion

Nominal Size of Wrench Opening, mm	Across Flats Dimension	Across Flats Tolerance		Minimum Across Corners, mm	Maximum Depth of Mandrel Insertion, mm
		Plus (+)	Minus (–)		
2	2.00	0.025	0.050	2.22	2.4
3	3.00	0.025	0.050	3.34	2.4
3.2	3.20	0.025	0.050	3.57	2.4
4	4.00	0.025	0.050	4.46	2.4
4.5	4.50	0.025	0.050	5.10	2.4
5	5.00	0.025	0.050	5.58	2.6
5.5	5.50	0.025	0.050	6.13	2.8
6	6.00	0.025	0.050	6.68	3.0
7	7.00	0.025	0.050	7.79	3.6
8	8.00	0.025	0.050	8.95	3.8
9	9.00	0.025	0.050	10.11	4.0
10	10.00	0.025	0.050	11.27	5.0
11	11.00	0.025	0.050	12.40	5.7
12	12.00	0.025	0.050	13.53	6.4
13	13.00	0.025	0.076	14.67	7.1
14	14.00	0.025	0.076	15.80	9.5
16	16.00	0.025	0.076	18.06	9.6
17	17.00	0.025	0.076	19.20	9.6
18	18.00	0.025	0.076	20.35	10.5

Fig. 12-6 Bending Moment Test



D = distance, in. (mm)
W = weight, lb (N)
D_1 = a stop point for the socket face equal to $^1/_2$ the mandrel insertion depth
$D \times W$ = in.-lb (N·m)



Category 34
Spark Plug Socket Wrenches

34-1 CLASSIFICATION

NOTE: See Fig. 34-1.

Type I: socket, single hexagon (6-point)
Class 1: regular length
Class 2: long length
Type II: universal socket, single hexagon (6-point)
Class 1: square block
Class 2: ball swivel

34-2 PERFORMANCE REQUIREMENTS

34-2.1 Design

Sockets shall meet the requirements in Tables 34-1 through 34-5 and shall provide the following features.

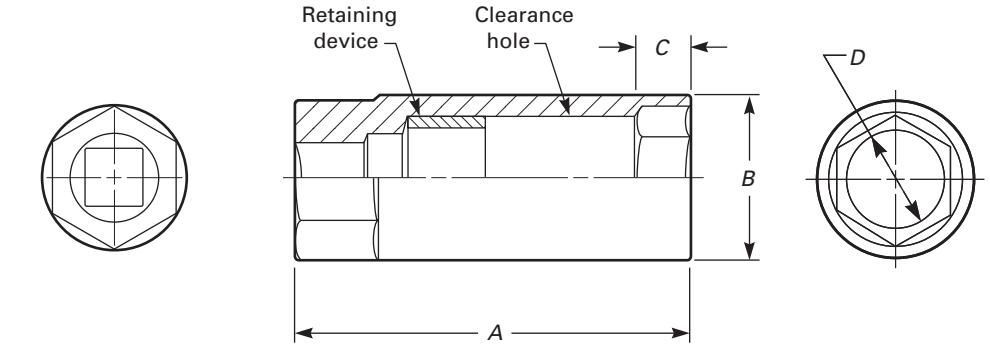
34-2.1.1 Clearance Hole. An area shall be provided for clearance of the insulator section of the spark plug. The diameter of the clearance hole shall be in accordance with that of the applicable size socket, as specified in the respective tables. The minimum depth of the clearance hole shall be of sufficient depth as to clear the insulator section of the spark plug size for which it is intended. The diameter and depth of the clearance hole may be included in the wrench opening area, if size and depth of the wrench opening are adequate to provide the clearance. A through hole between the drive square and the clearance hole may be provided.

34-2.1.2 Retaining Device. A replaceable, oil-resistant, and heat-resistant retaining bushing, or other equally suitable device shall be installed inside the socket to avoid damaging the spark plug insulator and for aligning the spark plug for easy installation and removal. This bushing should be pliable and compressible to reduce side loading to the spark plug insulator.

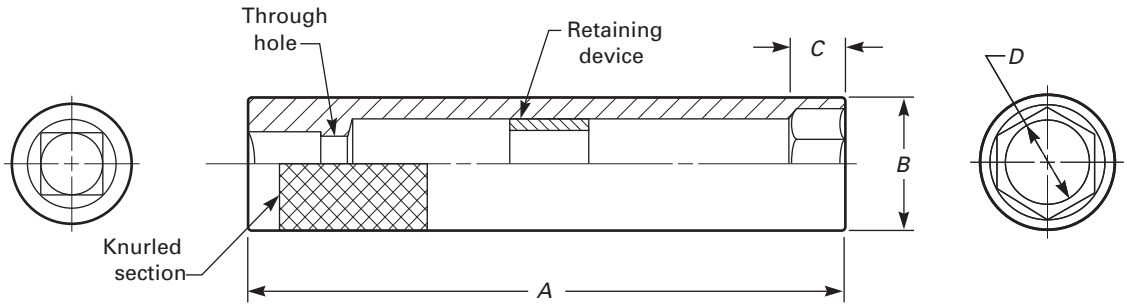
34-2.2 Hardness

Sockets shall be heat treated to a hardness of 38 HRC to 54 HRC.

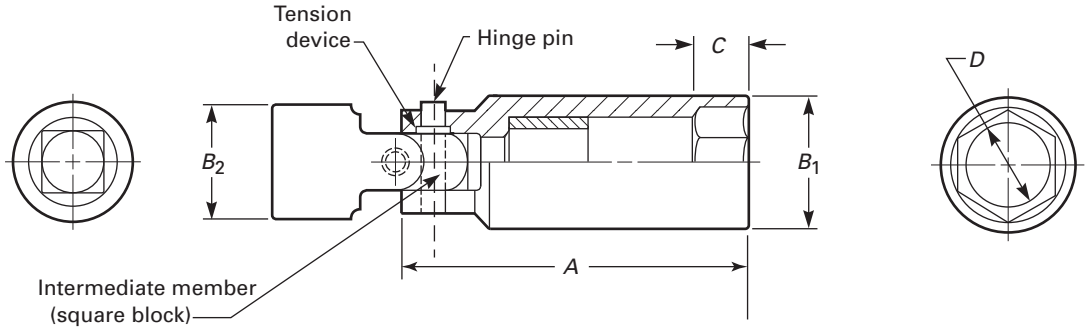
Fig. 34-1 Socket Wrenches for Spark Plugs



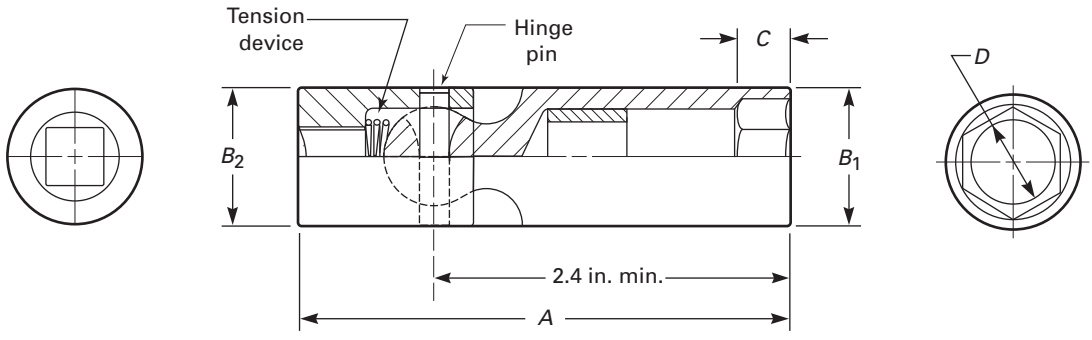
(a) Type I, Class 1



(b) Type I, Class 2



(c) Type II, Class 1



(d) Type II, Class 2

Table 34-1 Type I, Class 1, Spark Plug Socket, Regular Length, Single Hexagon

Nominal Opening, in.	Internal Drive Square, in.	Maximum Overall Length, *A*, in.	Maximum Outside Diameter, *B*, in.	Minimum Depth of Opening Nut End, *C*, in.	Minimum Diameter of Spark Plug Clearance Hole, *D*, in.	Minimum Proof Torque, lbf-in.
5/8	3/8	3.000	0.890	0.188	0.469	1,500
5/8	1/2	3.000	0.890	0.188	0.469	1,500
3/4	3/8	3.000	1.067	0.218	0.525	1,700
13/16	3/8	3.000	1.080	0.218	0.680	1,800
13/16	1/2	3.000	1.080	0.218	0.735	1,800
7/8	1/2	3.650	1.218	0.250	0.813	1,900

Table 34-1M Type I, Class 1, Spark Plug Socket, Regular Length, Single Hexagon

Nominal Opening, mm	Internal Drive Square, mm	Maximum Overall Length, *A*, mm	Maximum Outside Diameter, *B*, mm	Minimum Depth of Opening Nut End, *C*, mm	Minimum Diameter of Spark Plug Clearance Hole, *D*, mm	Minimum Proof Torque, N·m
18.0	10.0	76.0	25.8	5.1	13.0	192
20.8	10.0	76.0	27.5	5.5	19.0	203

Table 34-2 Type I, Class 2, Spark Plug Socket, Long Length, Single Hexagon

Nominal Opening, in.	Internal Drive Square, in.	Minimum Overall Length, *A*, in.	Maximum Outside Diameter, *B*, in.	Minimum Depth of Opening Nut End, *C*, in.	Minimum Diameter of Spark Plug Clearance Hole, *D*, in.	Minimum Proof Torque, lbf-in.
5/8	3/8	3.800	0.890	0.188	0.469	1,500
13/16	3/8	5.750	1.080	0.218	0.680	1,800

Table 34-3 Type II, Class 1, Universal Spark Plug Socket, Square Block, Single Hexagon, 3/8 in. Drive

Nominal Opening, in.	Minimum Socket Length, *A*, in.	Maximum Outside Diameter of Nut End, B_1, in.	Maximum Outside Diameter of Drive End, B_2, in.	Minimum Depth of Opening Nut End, *C*, in.	Minimum Diameter of Spark Plug Clearance Hole, *D*, in.	Minimum Proof Torque, lbf-in.
5/8	2.400	0.890	0.885	0.188	0.469	1,000
13/16	2.400	1.080	0.885	0.218	0.735	1,000

Table 34-4 Type II, Class 2, Universal Spark Plug Socket, Ball Swivel, Single Hexagon, 3/8 in. Drive

Nominal Opening, in.	Minimum Overall Length, *A*, in.	Maximum Outside Diameter of Nut End, B_1, in.	Maximum Outside Diameter of Drive End, B_2, in.	Minimum Depth of Opening Nut End, *C*, in.	Minimum Diameter of Spark Plug Clearance Hole, *D*, in.	Minimum Proof Torque, lbf-in.
5/8	3.400	0.890	1.000	0.188	0.469	1,500
13/16	3.400	1.080	1.000	0.218	0.735	1,800

Table 34-5 Depth of Mandrel Insertion

Nominal Size of Wrench Opening	Maximum Depth of Mandrel Insertion
U.S. Customary Units (in.)	
5/8	0.188
3/4	0.218
13/16	0.218
7/8	0.250
SI Units (mm)	
18.0	5.50
20.8	5.50

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NONMANDATORY APPENDIX A
DESIGNATIONS

This Nonmandatory Appendix is provided to assist with specifying details needed to order the tools described in this Standard. Tools should be designated by the following data in the sequence shown.

(a) Category 1, Hand Driven Socket Wrenches

(1) Description, e.g., ASME B107.110, Category 1 Hand Driven Socket Wrench

(2) Type

(3) Drive size

(4) Wrench nominal opening size and configuration

(5) Finish

EXAMPLE: ASME B107.110, Category 1 Hand Driven Socket Wrench, Type I, $\frac{1}{4}$ in. drive size, $\frac{5}{16}$ in. opening, single hexagon.

(b) Category 2, Power Driven Socket Wrenches and Attachments

(1) Description, e.g., ASME B107.110, Category 2 Power Driven Socket

(2) Type

(3) Drive size

(4) Wrench opening size and configuration (when applicable)

(5) Finish

(c) Category 10, Handles and Attachments for Hand Socket Wrenches

(1) Description, e.g., ASME B107.110, Category 10 Flexible Extension Bar

(2) Type

(3) Class

(4) Style

(5) Drive size(s)

(6) Finish

(d) Category 12, Nutdrivers

(1) Description, e.g., ASME B107.110, Category 12 Nutdriver

(2) Type

(3) Class

(4) Style

(5) Socket-opening size

(6) Color-coding

(7) Options

EXAMPLE: ASME B107.110, Category 12 Nutdriver Type I, Class 2, Style B, $\frac{1}{4}$ in. opening, color-coded shaft, handle with internal drive.

(e) Category 34, Spark Plug Socket Wrenches

(1) Description, e.g., ASME B107.110, Category 34 Spark Plug Socket Wrench

(2) Type

(c) Class

(4) Drive size

(e) Wrench opening size and configuration

(6) Finish

EXAMPLE: ASME B107.110, Category 34 Spark Plug Socket Wrench, Type I, Class 1, $\frac{3}{8}$ in. drive, $\frac{5}{8}$ in. opening, single hexagon, black oxide.

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