ASME B107.21-2005

(Revision of ASME B107.21-1998)

Wrench, Crowfoot

AN AMERICAN NATIONAL STANDARD

The American Society of Mechanical Engineers

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Three Park Avenue • New York, NY 10016

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

ASME issues written replies to inquiries concerning interpretations of technical aspects of this Standard. Interpretations are published on the ASME website under the Committee Pages at http://www.asme.org/codes/ as they are issued.

The American Society of Mechanical Engineers
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CONTENTS

FOREWORD

The American National Standards Committee B107, Socket Wrenches and Drives, under sponsorship of The American Society of Mechanical Engineers, was reorganized as an ASME Standards Committee and its title was changed to Hand Tools and Accessories. In 1996 its scope was expanded to address safety considerations.

The purposes of this Standard are to define performance and safety requirements specifically applicable to crowfoot wrenches and to specify test methods to evaluate performances relating to the defined requirements.

Members of the Hand Tools Institute Wrench Standards Committee have been major contributors to the development of this Standard in their committee work, their knowledge of the products, and their active efforts in the promotion of the adoption of the Standard.

This Standard is a revision of ASME B107.21-1998 Wrench, Crowfoot Attachments (Inch Series). Principal changes in this edition of the Standard are the addition of safety requirements, improved consistency of classification and dimensioning, and updating to conform to the structure and format of other B107 standards.

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

This revision was approved as an American National Standard on April 5, 2005.

ASME B107 STANDARDS COMMITTEE
Hand Tools and Accessories

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

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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
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New York, NY 10016-5990

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.

Interpretations. Upon request, the B107 Committee will render an interpretation of any requirement of the Standard. Interpretations can only be rendered in response to a written request sent to the Secretary of the B107 Standards Committee.

The request for interpretation should be clear and unambiguous. It is further recommended that the inquirer submit his/her request in the following format:

Subject:	Cite the applicable paragraph number(s) and the topic of the inquiry.
Edition:	Cite the applicable edition of the standard for which the interpretation is being requested.
Question:	Phrase the question as a request for an interpretation of a specific requirement suitable for general understanding and use, not as a request for an approval of a proprietary design or situation. The inquirer may also include any plans or drawings, which are necessary to explain the question; however, they should not contain proprietary names or information.

Requests that are not in this format may be rewritten in the appropriate format by the Committee prior to being answered, which may inadvertently change the intent of the original request.

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, which are open to the public. Persons wishing to attend any meeting should contact the Secretary of the B107 Standards Committee.

WRENCH, CROWFOOT

1 SCOPE

This Standard provides performance and safety requirements for crowfoot wrenches having a wrench component of the open end type or flare nut type. Each type is designed to receive the external drive end of a socket wrench handle.

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

2 CLASSIFICATION

Type I: Crowfoot wrench, flare nut
Class 1: Standard duty (see Fig. 1)
Class 2: Heavy duty (see Fig. 2)
Type II: Crowfoot wrench, open end
Class 1: Standard duty
Class 2: Heavy duty

3 NORMATIVE REFERENCES

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

ASME B107.4M-1995, Driving and Spindle Ends for Portable Hand, Impact, Air, and Electric Tools (Percussion Tools Excluded)
ASME B107.17M-1997, Gages, Wrench Openings, Reference
Publisher: The American Society of Mechancial Engineers (ASME), Three Park Avenue, New York, NY 10016-5990; Order Department: 22 Law Drive, Box 2300, Fairfield, NJ 07007-2300

ASTM B 117-97, Standard Practice for Operating Salt Spray (Fog) Apparatus
ASTM B 537-70 (1997), Standard Practice for Rating of Electroplated Panels Subjected to Atmospheric Exposure
ASTM B 571-97, Standard Test Methods for Adhesion of Metallic Materials
ASTM D 968-93, Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive
ASTM E 18-2000, Standard Test Methods for Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials
Publisher: American Society for Testing and Materials (ASTM), 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959

Guide to Hand Tools — Selection, Safety Tips, Proper Use and Care
Publisher: Hand Tools Institute (HTI), 25 North Broadway, Tarrytown, NY 10591

4 REQUIREMENTS

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

4.1 Marking

Each wrench shall be marked in a permanent manner with the nominal wrench opening size and the manufacturer's name or trademark of such known character that the manufacturer may be readily determined.

4.2 Materials

The materials used in the manufacture of the wrenches shall be such as to produce wrenches conforming to this standard.

4.3 Hardness

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

4.4 Proof Torque

When tested as specified, wrenches shall withstand the proof torque specified in the applicable tables without failure or permanent deformation (set), which might affect durability or serviceability of the wrenches.

4.5 Wrench Openings

4.5.1 Wrench openings shall be such as to ensure acceptance when gaged with gages conforming to ASME B107.17M.

4.5.2 Internal drive end dimensions shall conform to ASME B107.4M, except as noted in para. 4.7. Two sides of the internal drive square shall be parallel to the longitudinal axis of the socket wrench within ±3 deg.

4.5.3 The wrench opening 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 (6

point) hexagon or a double (12 point) hexagon configuration having an across-flats and an across-corner shape for fit up with hexagon fasteners.

(b) Modified Single or Double Hexagon Configuration. This design consists of a geomtric single (6 point) hexagon or a double (12 point) hexagon configuration having an across-flats and a modified or radial relieved across corner shape to ensure noncontact with the corners of hexagon and 12 point fasteners.

(c) Open End Configuration. This design consists of a simple geometric configuration having an across-flats shape for fit up with hexagon fasteners.

4.6 Finish

Wrenches shall be free from rust, burrs, pitts, nodules, blisters, cracks, or other conditions that may impair serviceability, safety, durability, or appearance.

4.6.1 Surface Finish. Forge flash shall be completely removed from the periphery of the drive end and the flare nut and open end portions of the wrench. Any remaining forge flash on any remaining surfaces between the heads shall blend smoothly with adjacent surfaces. External sharp edges shall be broken to 0.016 in. (0.41 mm) radius minimum, and shall not project more than 0.016 in. (0.41 mm) from adjacent surfaces.

4.6.2 Coatings. The wrench shall be coated with one of the coatings in accordance with para. 4.6.2(a), (b), or (c).

(a) Chrome Plate. The coatings shall be electrodeposited metals consisting of nickel followed by chromium. The minimum thickness shall be 0.00015 in. (0.0038 mm) for nickel or iron-nickel, and 0.000003 in. (0.000076 mm) for chromium, unless the wrench passes the test in para. 5.3.

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

(c) Alternate Coatings. Alternative coatings may be used in lieu of nickel-chromium and shall be subjected to the Alternative Coating Test as specified in para. 5.3.

4.7 Design

Wrenches shall be designed to allow accessibility to fasteners in confined and restricted areas. The internal drive surfaces, and the nut and bolt head engaging surfaces of the flare nut and open end openings, shall be finished in a smooth and well-defined manner. The corners and/or serrations in the openings shall be clearly defined (not smeared or torn). Type I wrenches shall be chamfered on both sides to provide a lead for the working surfaces. The slotted opening on Type I wrenches, and tips of all open ends on Type II wrenches, shall be chamfered or rounded to eliminate burrs.

When the internal drive end is furnished with a hole or recess for engagement of the ball/plunger on corresponding external drive end and the length of engagement of the external drive tang is less than twice the dimension of D_f in Table 7 of ASME B107.4M, the hole or recess shall be central in the corresponding internal drive.

4.7.1 Type I, Flare Nut. Type I wrenches shall have the flare nut design (see Figs. 1 and 2). The wrench shall have an internal drive opening at one end and a wrench opening to drive hexagonal fasteners. See Tables 1 through 4M.

The slotted opening may be rotated from the centerline of wrench.

4.7.2 Type II, Open End. Type II wrenches shall have the open end design (see Fig. 3). The wrench shall have an internal drive opening at one end and open wrench end at the other end. See Tables 5 through 7.

5 TEST PROCEDURES

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

5.1 Hardness

Hardness shall be tested in accordance with ASTM E 18. When surface preparation is necessary, the amount of material removed shall not exceed 0.007 in. (0.18 mm) in the area contaced by the indenter.

5.2 Proof Torque Test

Load tests shall be conducted on the sample wrenches to determine conformance with the applicable test load requirements specified in para. 4.5.

5.2.1 Mandrels for Wrench Openings. The wrenches shall be tested on mandrels conforming to Table 8 or 8M as applicable. Mandrels shall be hardened to a minimum of 55 HRC and smoothly finished on the wrench engaging surfaces.

5.2.2 Application of Proof Torque. Wrench openings shall be gaged prior to testing. The torque shall be applied with a suitable torque producing machine to mandrels that are fully seated and extend through the wrenching surfaces. Above 50% of peak value, torque shall be applied at a speed of 15 deg/min to 30 deg/min until peak value is verified, then torque shall be released. Following the removal of the proof torque, wrench openings will be regaged. Wrenches that do not sustain the proof torque or crack, fracture, or slip on the mandrel, have failed the test. The wrench shall also be considered to have failed the test if there is permanent spreading of the open end jaw in excess of the "NO-GO" gage sizes of ASME B107.17M by more than the following at the tips:

(a) 0.002 in. for nominal wrench openings $^3\!/_{16}$ in. to 1 in.

(b) 0.003 in. for nominal wrench openings $1^1\!/_{16}$ in. to $2^1\!/_4$ in.

(c) 0.004 in. for nominal wrench openings $2^5\!/_{16}$ in. to $3^1\!/_8$ in.

5.3 Alternative Coating Test

This test consists of an adhesion, abrasion, and corrosion test specified in paras. 5.3.2, 5.3.3, and 5.3.4.

5.3.1 Test Preparation. The quantity and condition of the wrenches 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 wrench does not have sufficient surface area to conduct the tests, a $^3\!/_4$ in. combination wrench, or a 4 in. x 6 in. panel(s) per ASTM B 537/ASTM D 968 Method A, shall be used.

5.3.2 Adhesion Test. Test specimens shall pass the file or grind-saw test of ASTM B 571.

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

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

6 DESIGNATIONS

Wrenches shall be designated by the following data in the sequence shown: Type, Class, Size of Drive, Size and Type of Openings (6 or 12 point), and Coating.

EXAMPLE: Wrench Type I crowfoot wrench, flare nut, Class 2, heavy duty, $^3\!/_8$ in. square drive, $^1\!/_2$ in. 12 point opening, black oxide.

7 SAFETY REQUIREMENTS AND LIMITATIONS OF USE

Instructors and employers shall stress safety and proper use of crowfoot wrenches. Information can be found in the HTI publication, Guide to Hand Tools — Selection, Safety Tips, Proper Use and Care.

If using a crowfoot wrench for torque measuring applications, consult the torque instrument manufacturer's literature for a correction formula for accessories.

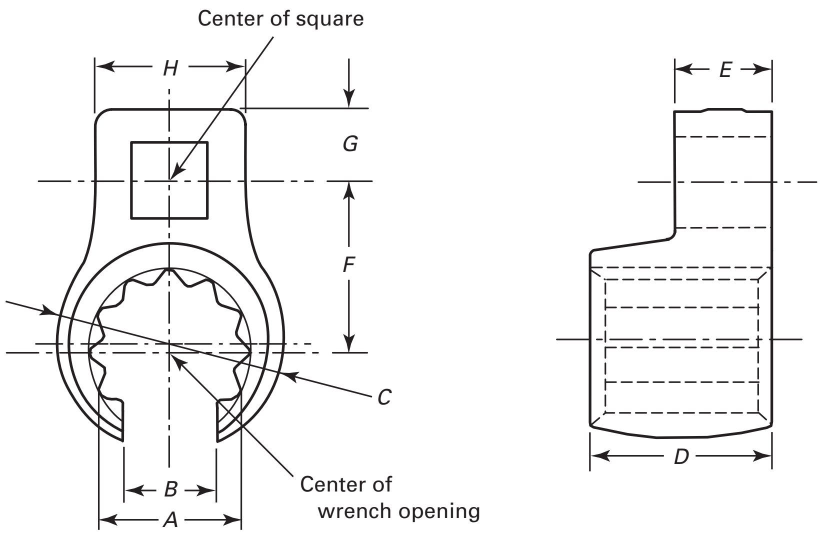

Fig. 1 Type I, Class 1 Crowfoot Wrench, Flare Nut, Standard Duty

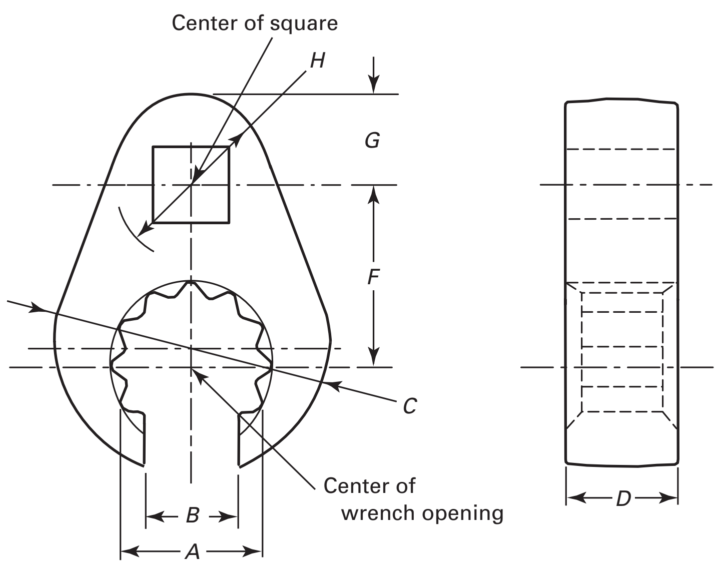

Fig. 2 Type I, Class 2 Crowfoot Wrench, Flare Nut, Heavy Duty

Table 1 Type I, Class 1, Flare Nut 1/4 in. Square Drive Standard Duty

Nominal Wrench Opening, *A*	Min. Slot Opening, *B*	Max. Head Width, *C*	Max. Head Thickness, *D*	Max. Drive End Thickness, *E*	Max. Center Distance, *F*	Max. Drive Square Location, *G*	Max. Drive End Width, *H*	Min. Proof Torque, lbf-in.
	Dimensions, in.							
3/16	0.105	0.437	0.312	0.250	0.484	0.265	0.515	50
7/32	0.105	0.437	0.312	0.250	0.484	0.265	0.515	50
1/4	0.117	0.500	0.312	0.250	0.484	0.265	0.515	60
9/32	0.117	0.500	0.312	0.250	0.484	0.265	0.515	60
5/16	0.142	0.535	0.344	0.282	0.484	0.265	0.515	75
11/32	0.142	0.562	0.344	0.282	0.484	0.265	0.515	75
3/8	0.193	0.625	0.531	0.312	0.531	0.265	0.515	75
7/16	0.255	0.719	0.593	0.312	0.578	0.265	0.515	200
1/2	0.317	0.812	0.593	0.312	0.625	0.265	0.515	200
9/16	0.343	0.875	0.593	0.312	0.656	0.265	0.515	225

Table 2 Type I, Class 1, Flare Nut 3/8 in. Square Drive Standard Duty

Nominal Wrench Opening, *A*	Min. Slot Opening, *B*	Max. Head Width, *C*	Max. Head Thickness, *D*	Max. Drive End Thickness, *E*	Max. Center Distance, *F*	Max. Drive Square Location, *G*	Max. Drive End Width *H*	Min. Proof Torque, lbf-in.
	Dimensions, in.							
3/8	0.193	0.625	0.624	0.406	0.531	0.328	0.656	150
7/16	0.255	0.719	0.624	0.406	0.578	0.328	0.656	175
1/2	0.317	0.812	0.624	0.406	0.625	0.328	0.656	200
9/16	0.343	0.875	0.624	0.406	0.656	0.328	0.656	225
5/8	0.406	0.998	0.750	0.406	0.765	0.328	0.656	250
11/16	0.442	1.091	0.750	0.406	0.812	0.328	0.656	310
3/4	0.443	1.185	0.781	0.406	0.859	0.328	0.656	450
13/16	0.531	1.263	0.781	0.406	0.906	0.328	0.656	450
7/8	0.531	1.357	0.812	0.406	1.000	0.328	0.656	625
15/16	0.578	1.435	0.812	0.406	1.000	0.328	0.656	625
1	0.656	1.513	0.843	0.406	1.047	0.328	0.656	625
1 1/16	0.656	1.590	0.843	0.406	1.078	0.328	0.656	625

Table 3 Type I, Class 1, Flare Nut 1/2 in. Square Drive Standard Duty

Nominal Wrench Opening, *A*	Dimensions, in. Min. Slot Opening, *B*	Max. Head Width, *C*	Max. Head Thickness, *D*	Max. Drive End Thickness, *E*	Max. Center Distance, *F*	Max. Drive Square Location, *G*	Max. Drive End Width, *H*	Min. Proof Torque, lbf-in.
1 1/8	0.755	1.688	0.937	0.531	1.172	0.438	0.875	825
1 3/16	0.812	1.750	0.937	0.531	1.203	0.438	0.875	825
1 1/4	0.890	1.844	0.937	0.531	1.250	0.438	0.875	825
1 5/16	0.916	1.906	0.937	0.531	1.281	0.438	0.875	900
1 3/8	1.015	2.000	1.000	0.531	1.328	0.438	0.875	900
1 7/16	1.015	2.062	1.000	0.531	1.359	0.438	0.875	900
1 1/2	1.015	2.125	1.000	0.531	1.391	0.438	0.875	900
1 9/16	1.063	2.188	1.000	0.531	1.438	0.438	0.875	1100
1 5/8	1.130	2.281	1.000	0.531	1.469	0.438	0.875	1100
1 11/16	1.265	2.375	1.062	0.531	1.531	0.438	0.875	1100
1 3/4	1.265	2.438	1.062	0.531	1.562	0.438	0.875	1150
1 13/16	1.265	2.531	1.062	0.531	1.609	0.438	0.875	1200
1 7/8	1.265	2.625	1.124	0.531	1.656	0.438	0.875	1200
1 15/16	1.265	2.688	1.124	0.531	1.688	0.438	0.875	1200
2	1.515	2.781	1.124	0.531	1.734	0.453	0.906	1400
2 1/16	1.515	2.844	1.187	0.531	1.766	0.453	0.906	1450
2 1/8	1.515	2.904	1.187	0.531	1,812	0.453	0.906	1450
2 3/16	1.515	3.000	1.187	0.531	1,844	0.453	0.906	1500
2 1/4	1.515	3.094	1.187	0.531	1.891	0.453	0.906	1500
2 5/16	1.515	3.156	1.250	0.531	1.922	0.453	0.906	1500
2 3/8	1.630	3.250	1.250	0.531	1.969	0.469	0.938	1600
2 7/16	1.630	3.312	1.250	0.531	2.000	0.469	0.938	1650
2 1/2	1.630	3.609	1.250	0.531	2.047	0.469	0.938	1700
2 9/16	1.755	3.500	1.312	0.531	2.109	0.469	0.938	1750
2 5/8	2.015	3.562	1.312	0.531	2.141	0.469	0.938	1800
2 11/16	2.015	3.625	1.312	0.531	2.172	0.469	0.938	1800
2 3/4	2.015	3.719	1.312	0.531	2.219	0.484	0.969	1850
2 13/16	2.015	3.781	1.374	0.531	2.250	0.484	0.969	1900
2 15/16	2.015	3.938	1.374	0.531	2.328	0.484	0.969	1950
3 1/8	2.015	4.188	1.374	0.531	2.453	0.484	0.969	2000

Table 4 Type I, Class 2, Flare Nut 3/8 in. Square Drive Heavy Duty

Nominal Wrench Opening, *A*	Dimensions, in. Min. Slot Opening, *B*	Max. Head Width, *C*	Max. Head Thickness, *D*	Max. Center Distance, *F*	Max. Drive Square Location, *G*	Max. Drive End Diameter, *H*	Min. Proof Torque, lbf-in.
3/8	0.193	0.891	0.406	0.656	0.470	0.938	240
7/16	0.255	1.000	0.406	0.656	0.470	0.938	320
1/2	0.317	1.094	0.468	0.719	0.470	0.938	400
9/16	0.343	1.219	0.468	0.828	0.470	0.938	510
5/8	0.406	1.296	0.468	0.828	0.470	0.938	625
11/16	0.442	1.406	0.562	0.859	0.470	1.060	750
3/4	0.442	1.515	0.562	0.859	0.470	1.060	880
13/16	0.531	1.719	0.593	0.922	0.470	1.190	1025
7/8	0.531	1.719	0.593	0.922	0.470	1.190	1180
15/16	0.578	1.984	0.641	1.000	0.470	1.190	1280
1	0.656	1.984	0.641	1.000	0.470	1.190	1480

Table 4M Type I, Class 2, Flare Nut ³⁄₈ in. Square Drive Heavy Duty (Metric)

Nominal Wrench Opening, *A*	Min. Slot Opening, *B* (mm)	Max. Head Width, *C* (mm)	Max. Head Thickness, *D* (mm)	Max. Center Distance, *F* (mm)	Max. Drive Square Location, *G* (mm)	Max. Drive End Diameter, *H* (mm)	Min. Proof Torque, N·m
9	4.5	22.9	10.3	16.7	11.9	23.8	25
10	4.8	24.0	10.3	16.7	11.9	23.8	30
11	6.4	25.4	10.3	16.7	11.9	23.8	35
12	7.0	27.0	10.3	18.3	11.9	23.8	40
13	8.0	27,8	11.9	18.3	11.9	23.8	45
14	8.7	31.0	11.9	21.0	11.9	23.8	55
15	10.3	32.1	11.9	21.0	11.9	23.8	65
16	10.3	32.9	11.9	21.0	11.9	23.8	75
17	11.1	35.7	14.3	21.8	11.9	26.9	85
18	11.1	36.1	14.3	21.8	11.9	26.9	95
19	11.1	36.1	14.3	21.8	11.9	26.9	105
20	12.0	43.7	16.3	23.4	11.9	30.2	120
21	13.5	43.7	16.3	23.4	11.9	30.2	130
22	13.5	43.7	16.3	23.4	11.9	30.2	145

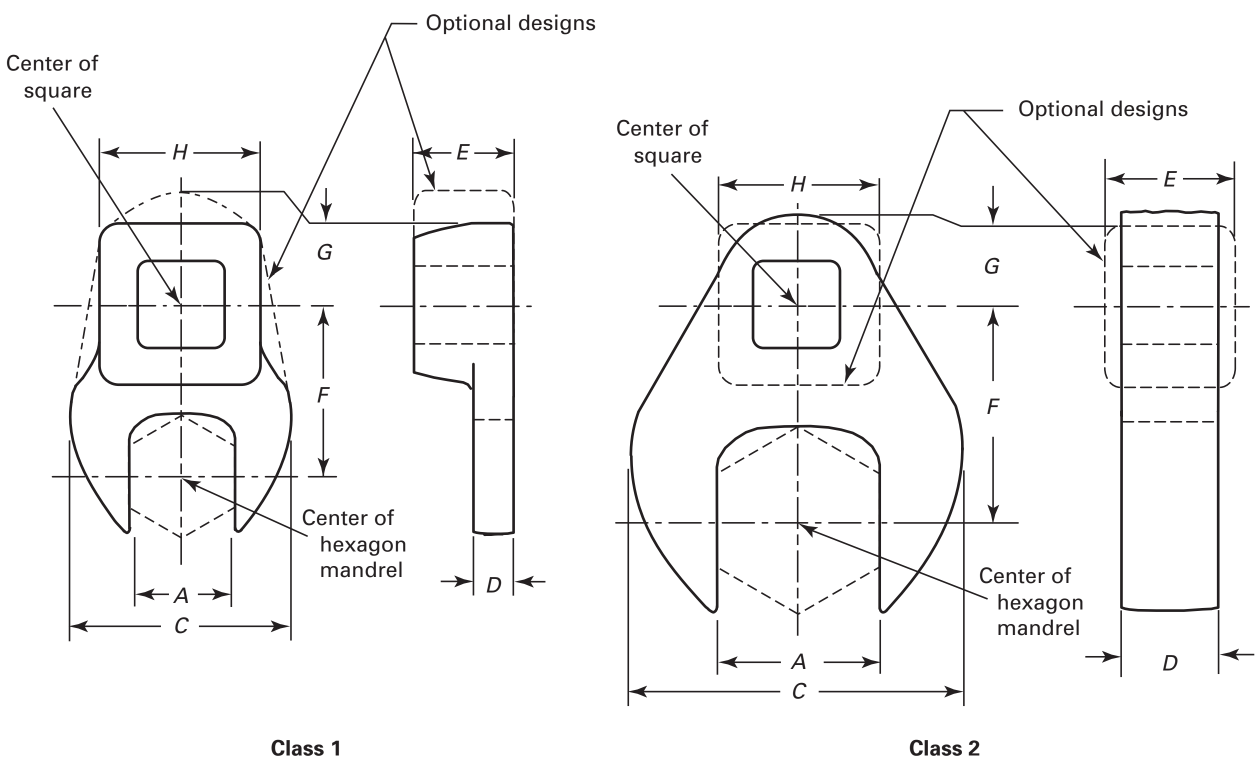

Fig. 3 Type II Crowfoot Wrench, Open End

Table 5 Type II, Class 1, Open End 3⁄8 in. Square Drive Standard Duty

Nominal Wrench Opening, *A*	Dimensions, in. Max. Head Width, *C*	Max. Head Thickness, *D*	Max. Drive End Thickness, *E*	Max. Center Distance, *F*	Max. Drive Square Location, *G*	Max. Drive End Width, *H*	Min. Proof Torque, lbf-in.
3⁄8	0.951	0.250	0.656	0.750	0.375	0.750	105
7⁄16	0.951	0.250	0.656	0.750	0.375	0.750	140
1⁄2	1.137	0.270	0.656	0.820	0.375	0.750	175
9⁄16	1.270	0.270	0.656	0.955	0.375	0.750	210
5⁄8	1.387	0.350	0.656	1.000	0.375	0.750	263
11⁄16	1.570	0.350	0.656	1.117	0.438	1.000	315
3⁄4	1.625	0.350	0.719	1.125	0.438	1.000	368
13⁄16	1.750	0.350	0.719	1.141	0.438	1.000	420
7⁄8	1.812	0.370	0.719	1.156	0.438	1.000	473
15⁄16	2.010	0.370	0.719	1.188	0.438	1.000	525
1	2.078	0.375	0.719	1.188	0.438	1.000	578
1 1⁄16	2.215	0.375	0.719	1.219	0.438	1.000	630
1 1⁄8	2.125	0.375	0.719	1.219	0.438	1.000	700
1 3⁄16	2.156	0.375	0.719	1.250	0.438	1.000	770
1 1⁄4	2.188	0.375	0.719	1.281	0.438	1.000	840
1 5⁄16	2.188	0.375	0.719	1.344	0.438	1.000	910
1 3⁄8	2.438	0.375	0.719	1.344	0.438	1.000	980
1 7⁄16	2.438	0.375	0.719	1.406	0.438	1.000	1050
1 1⁄2	2.625	0.375	0.719	1.469	0.438	1.125	1120
1 9⁄16	2.625	0.375	0.719	1.500	0.438	1.125	1190
1 5⁄8	2.750	0.375	0.719	1.531	0.438	1.125	1260
1 11⁄16	2.750	0.375	0.719	1.594	0.438	1.125	1330
1 3⁄4	2.938	0.375	0.719	1.594	0.438	1.125	1400
1 13⁄16	2.938	0.375	0.719	1.656	0.438	1.125	1470
1 7⁄8	3.250	0.375	0.719	1.656	0.438	1.125	1540
1 15⁄16	3.375	0.375	0.719	1.750	0.438	1.125	1540
2	3.500	0.500	0.812	1.781	0.520	1.125	1540
2 1⁄16	3.500	0.500	0.812	1.812	0.520	1.125	1540
2 1⁄8	3.625	0.500	0.812	1.830	0.520	1.125	1540
2 3⁄16	3.688	0.500	0.812	1.906	0.520	1.125	1540
2 1⁄4	3.938	0.500	0.812	1.969	0.520	1.125	1540
2 5⁄16	4.000	0.500	0.812	2.000	0.520	1.125	1540
2 3⁄8	4.188	0.500	0.812	2.156	0.520	1.125	1540
2 7⁄16	4.188	0.500	0.812	2.281	0.520	1.125	1555
2 1⁄2	4.312	0.500	0.812	2.312	0.580	1.125	1600
2 9⁄16	4.375	0.500	0.812	2.344	0.580	1.125	1660
2 5⁄8	4.625	0.500	0.812	2.469	0.580	1.125	1760
2 11⁄16	4.750	0.500	0.812	2.500	0.580	1.125	1830
2 3⁄4	4.812	0.500	0.812	2.531	0.640	1.285	1900
2 13⁄16	4.812	0.500	0.812	2.656	0.640	1.285	2075
2 7⁄8	5.125	0.500	0.812	2.688	0.640	1.285	2135
2 15⁄16	5.188	0.500	0.812	2.719	0.640	1.285	2200
3	5.188	0.500	0.812	2.719	0.640	1.285	2200

Table 5M Type II, Class 1, Open End 3⁄8 in. Square Drive Standard Duty (Metric)

Nominal Wrench Opening, *A*	Dimensions, mm						Min. Proof Test Torque, N·m
	Max. Head Width, *C*	Max. Head Thickness, *D*	Max. Drive End Thickness, *E*	Max. Center Distance, *F*	Max. Drive Square Location, *G*	Max. Drive End Width, *H*	
9	23.7	6.5	16.7	20.0	9.5	19.5	12
10	24.2	6.5	16.7	20.0	9.5	19.5	16
11	24.2	6.5	16.7	20.0	9.5	19.5	18
12	28.5	7.0	16.7	22.0	9.5	19.5	20
13	28.5	7.0	16.7	22.0	9.5	19.5	24
14	30.5	7.0	16.7	22.0	9.5	19.5	30
15	35.0	9.0	16.7	24.0	9.5	19.5	33
16	35.0	9.0	16.7	24.5	9.5	19.5	36
17	36.5	9.0	16.7	25.5	9.5	19.5	39
18	41.6	9.0	16.7	28.5	11.0	25.5	41
19	41.6	9.0	18.3	28.5	11.0	25.5	45
20	41.6	9.0	18.3	31.0	11.0	25.5	48
21	44.5	9.5	18.3	31.5	11.0	25.5	53
22	44.5	9.5	18.3	33.5	11.0	25.5	57
23	52.0	10.0	18.3	36.0	11.0	25.5	60
24	52.0	10.0	18.3	37.0	11.0	25.5	65

Table 6 Type II, Class 1, Open End 1⁄2 in. Square Drive Standard Duty

Nominal Wrench Opening, *A*	Dimensions, in.						Min. Proof Torque, lbf-in.
	Max. Head Width, *C*	Max. Head Thickness, *D*	Max. Drive End Thickness, *E*	Max. Center Distance, *F*	Max. Drive Square Location, *G*	Max. Drive End Width, *H*	
15⁄16	1.968	0.656	0.656	1.795	0.531	1.031	2800
1	1.968	0.656	0.656	1.795	0.531	1.031	2900
1 1⁄16	2.156	0.656	0.656	1.795	0.562	1.031	3000
1 1⁄8	2.250	0.656	0.656	1.812	0.594	1.031	3100
1 3⁄16	2.380	0.656	0.656	1.812	0.594	1.031	3200
1 1⁄4	2.500	0.656	0.656	2.045	0.594	1.031	3300
1 5⁄16	2.620	0.656	0.656	2.045	0.594	1.031	3400
1 3⁄8	2.750	0.656	0.656	2.045	0.594	1.031	3500
1 7⁄16	2.880	0.656	0.656	2.045	0.594	1.031	3600
1 1⁄2	3.000	0.656	0.656	2.045	0.594	1.031	3700
1 9⁄16	3.130	0.656	0.656	2.045	0.594	1.031	3800
1 5⁄8	3.250	0.656	0.656	2.045	0.594	1.031	4000
1 11⁄16	3.380	0.656	0.656	2.295	0.594	1.031	4200
1 3⁄4	3.500	0.656	0.656	2.295	0.594	1.031	4400
1 13⁄16	3.620	0.656	0.656	2.295	0.594	1.031	4600
1 7⁄8	3.750	0.656	0.656	2.295	0.594	1.031	4800
2	4.000	0.656	0.656	2.295	0.594	1.031	5000
2 1⁄4	4.250	0.656	0.656	2.545	0.594	1.031	5000
2 3⁄8	4.406	0.656	0.656	2.545	0.594	1.031	5000
2 7⁄16	4.406	0.656	0.656	2.545	0.594	1.031	5000
2 1⁄2	4.406	0.656	0.656	2.545	0.594	1.031	5000

Table 7 Type II, Class 2, Open End $\frac{3}{8}$ in. Square Drive Heavy Duty

	Dimensions, in.						
Nominal Wrench Opening, *A*	Max. Head Width, *C*	Max. Head Thickness, *D*	Max. Drive End Thickness, *E*	Max. Center Distance, *F*	Max. Drive Square Location, *G*	Max. Drive End Width, *H*	Min. Proof Torque, lbf-in.
$\frac{3}{8}$	0.937	0.390	0.440	0.688	0.656	0.750	150
$\frac{7}{16}$	1.015	0.405	0.440	0.750	0.656	0.750	200
$\frac{1}{2}$	1.187	0.405	0.440	0.797	0.656	0.750	250
$\frac{9}{16}$	1.265	0.405	0.440	0.844	0.656	0.750	300
$\frac{5}{8}$	1.375	0.405	0.440	0.891	0.656	0.750	375
$\frac{11}{16}$	1.500	0.405	0.440	0.969	0.656	1.000	450
$\frac{3}{4}$	1.625	0.405	0.440	1.108	0.719	1.000	525
$\frac{13}{16}$	1.828	0.425	0.440	1.176	0.719	1.000	600
$\frac{7}{8}$	1.890	0.425	0.440	1.274	0.719	1.000	675
$\frac{15}{16}$	2.015	0.425	0.440	1.156	0.719	1.000	750
1	2.110	0.425	0.440	1.409	0.719	1.000	825
$1\frac{1}{16}$	2.125	0.425	0.440	1.219	0.719	1.000	900
$1\frac{1}{8}$	2.125	0.425	0.440	1.219	0.719	1.000	1000
$1\frac{3}{16}$	2.188	0.425	0.440	1.281	0.719	1.000	1100
$1\frac{1}{4}$	2.203	0.425	0.440	1.281	0.719	1.000	1200
$1\frac{5}{16}$	2.203	0.425	0.440	1.344	0.719	1.000	1300
$1\frac{3}{8}$	2.422	0.425	0.440	1.344	0.719	1.000	1400
$1\frac{7}{16}$	2.442	0.425	0.440	1.406	0.719	1.000	1500
$1\frac{1}{2}$	2.594	0.425	0.440	1.469	0.719	1.125	1600
$1\frac{9}{16}$	2.594	0.425	0.440	1.469	0.719	1.125	1700
$1\frac{5}{8}$	2.734	0.425	0.440	1.531	0.719	1.125	1800
$1\frac{11}{16}$	2.734	0.425	0.440	1.594	0.719	1.125	1900
$1\frac{3}{4}$	2.922	0.425	0.440	1.594	0.719	1.125	2000
$1\frac{13}{16}$	2.922	0.425	0.440	1.656	0.719	1.125	2100
$1\frac{7}{8}$	3.234	0.425	0.440	1.656	0.719	1.125	2200
$1\frac{15}{16}$	3.234	0.425	0.440	1.719	0.719	1.125	2200
2	3.469	0.500	0.562	1.719	0.812	1.125	2200
$2\frac{1}{16}$	3.469	0.500	0.562	1.781	0.812	1.125	2200
$2\frac{1}{8}$	3.656	0.500	0.562	1.906	0.812	1.125	2200
$2\frac{3}{16}$	3.656	0.500	0.562	1.906	0.812	1.125	2200
$2\frac{1}{4}$	3.906	0.500	0.562	1.969	0.812	1.125	2200
$2\frac{5}{16}$	3.906	0.500	0.562	2.031	0.812	1.125	2200
$2\frac{3}{8}$	4.156	0.500	0.562	2.156	0.812	1.125	2200
$2\frac{7}{16}$	4.156	0.500	0.562	2.281	0.812	1.125	2200
$2\frac{1}{2}$	4.344	0.500	0.625	2.344	0.812	1.125	2200
$2\frac{9}{16}$	4.344	0.500	0.625	2.344	0.812	1.125	2200
$2\frac{5}{8}$	4.594	0.500	0.625	2.469	0.812	1.125	2200
$2\frac{11}{16}$	4.594	0.500	0.625	2.469	0.812	1.125	2200
$2\frac{3}{4}$	4.781	0.500	0.656	2.531	0.812	1.250	2200
$2\frac{13}{16}$	4.781	0.500	0.656	2.531	0.812	1.250	2200
$2\frac{7}{8}$	5.141	0.500	0.656	2.594	0.812	1.250	2200
$2\frac{15}{16}$	5.141	0.500	0.656	2.719	0.812	1.250	2200
3	5.141	0.500	0.656	2.719	0.812	1.250	2200

Table 8 Hexagon Mandrel Dimensions

Nominal Wrench Opening	Hexagon Mandrel Dimensions, in.		
	Across Flats Tolerances		Across Corners, Min. [Note (1)]
3/16	+0.001	−0.002	0.2095
7/32	+0.001	−0.002	0.2440
1/4	+0.001	−0.002	0.2780
9/32	+0.001	−0.002	0.3133
5/16	+0.001	−0.002	0.3495
11/32	+0.001	−0.002	0.3860
3/8	+0.001	−0.002	0.4225
7/16	+0.001	−0.002	0.4935
1/2	+0.001	−0.003	0.5635
9/16	+0.001	−0.003	0.6339
5/8	+0.001	−0.003	0.7055
11/16	+0.001	−0.003	0.7769
3/4	+0.001	−0.003	0.8485
13/16	+0.001	−0.003	0.9201
7/8	+0.001	−0.003	0.9917
15/16	+0.001	−0.003	1.0631
1	+0.001	−0.003	1.1297
1 1/16	+0.001	−0.003	1.2013
1 1/8	+0.001	−0.003	1.2728
1 3/16	+0.001	−0.003	1.3443
1 1/4	+0.001	−0.003	1.4160
1 5/16	+0.001	−0.003	1.4870
1 3/8	+0.001	−0.003	1.5590
1 7/16	+0.001	−0.003	1.6310
1 1/2	+0.001	−0.003	1.7020
1 9/16	+0.001	−0.007	1.7700
1 5/8	+0.001	−0.007	1.8410
1 11/16	+0.001	−0.007	1.9120
1 3/4	+0.001	−0.007	1.9830
1 13/16	+0.001	−0.007	2.0540
1 7/8	+0.001	−0.007	2.1240
1 15/16	+0.001	−0.007	2.1950
2	+0.001	−0.007	2.2660
2 1/16	+0.001	−0.007	2.3370
2 1/8	+0.001	−0.007	2.4080
2 3/16	+0.001	−0.007	2.4790
2 1/4	+0.001	−0.007	2.5490
2 5/16	+0.001	−0.007	2.6210
2 3/8	+0.001	−0.007	2.6910
2 7/16	+0.001	−0.007	2.7620
2 1/2	+0.001	−0.007	2.8330
2 9/16	+0.001	−0.008	2.9030
2 5/8	+0.001	−0.008	2.9740
2 11/16	+0.001	−0.008	3.0450
2 3/4	+0.001	−0.008	3.1160
2 13/16	+0.001	−0.008	3.1870
2 15/16	+0.001	−0.008	3.3280
3	+0.001	−0.008	3.3990
3 1/8	+0.001	−0.008	3.5410

NOTE:

(1) For sizes not listed, multiply nominal size by 1.133055 for mandrel dimension across corners. Applicable to mandrels over 1 1/2 in. nominal size.

Table 8M Hexagon Mandrel Dimensions (Metric)

Nominal Wrench Opening	Hexagon Mandrel Dimensions, mm		
	Across Flats Tolerances		Min. Across Corners
9	+ 0.025	− 0.050	10.11
10	+ 0.025	− 0.050	11.27
11	+ 0.025	− 0.050	12.40
12	+ 0.025	− 0.076	13.53
13	+ 0.025	− 0.076	14.67
14	+ 0.025	− 0.076	15.80
15	+ 0.025	− 0.076	16.92
16	+ 0.025	− 0.076	18.06
17	+ 0.025	− 0.076	19.20
18	+ 0.025	− 0.076	20.35
19	+ 0.025	− 0.076	21.49
20	+ 0.025	− 0.076	22.64
21	+ 0.025	− 0.076	23.78
22	+ 0.025	− 0.076	24.93
23	+ 0.025	− 0.076	26.07
24	+ 0.025	− 0.076	27.20

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