ASME B107.4-2019

[Revision of ASME B107.4-2005 (R2011)]

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

AN AMERICAN NATIONAL STANDARD

The American Society of Mechanical Engineers

ASME B107.4-2019
[Revision of ASME B107.4-2005 (R2011)]

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

AN AMERICAN NATIONAL STANDARD

The American Society of Mechanical Engineers
Two Park Avenue • New York, NY • 10016 USA

Date of Issuance: May 10, 2019

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. Interpretations are published on the Committee web page and under http://go.asme.org/InterpsDatabase. Periodically certain actions of the ASME B107 Committee may be published as Cases. Cases are published on the ASME website under the B107 Committee Page at http://go.asme.org/B107committee as they are issued.

Errata to codes and standards may be posted on the ASME website 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.

The B107 Committee Page can be found at http://go.asme.org/B107committee. There is an option available to automatically receive an e-mail notification when errata are posted to a particular code or standard. This option can be found on the appropriate Committee Page after selecting "Errata" in the "Publication Information" section.

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

CONTENTS

FOREWORD

The American National Standards Committee B107, Socket Wrenches and Drives, under sponsorship of the American Society of Mechanical Engineers (ASME), held its organizational meeting on June 28, 1967. Subcommittee 1 on Driving Ends for Portable Hand, Air, and Electric Tools and Subcommittee 3 on Spindle Ends for Portable Air and Electric Tools were subsequently organized. These two subcommittees took over the work that was originally handled by Technical Committee 28 of Standards Committee B5. The Standard produced by the subcommittees was designated ASME B107.4-1982. This document was reaffirmed in 1988.

The Committee subsequently undertook a revision of the 1982 standard. The revised standard was approved as an American National Standard on October 16, 1995.

The ASME Standards Committee title was changed to Hand Tools and Accessories, and in 1996 its scope was expanded to include safety considerations. Following review by the Committee, a revision, ASME B107.4-2005, was approved as an American National Standard on March 14, 2005. It was reaffirmed in 2011.

Principal changes in this edition are changes to Tables 7, 7M, 9, 9M, 10, 13, and 13M, which were subsequently renumbered as described below. Tolerances and dimensions in some SI unit tables were adjusted to align significant digits properly. Tables and figures in the B107 series were renumbered in 2017 in a manner consistent with the numbering system used in other ASME standards. The former and current table and figure numbers for ASME B107.4 are listed below.

Before 2017	After 2017	Before 2017	After 2017
Tables		Tables (Cont'd)	
1, 1M	6-1	14, 14M	9-2
2, 2M	6-2	15, 15M	9-3
3, 3M	6-3	16, 16M	9-4
4, 4M	6-4	17	10-1
5, 5M	7-1	18	10-2
6, 6M	7-2	19, 20	10-3
7, 7M	8-1	21	10-4
8, 8M	8-2	22	11-1
9, 9M	8-3	Figures	
10, 10M	8-4	1	8-1
11A, 11AM	8-5	2	8-2
11B, 11BM	8-6	3	8-3
12, 12M	8-7		
13, 13M	9-1		

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 Foreword is not a part of ASME B107.4 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 is acknowledged and appreciated.

ASME B107.4-2019 was approved by the B107 Standards Committee on January 18, 2019 and by the Board on Standards and Testing on March 12, 2019. It was approved as an American National Standard on April 23, 2019. The requirements of the Standard take effect on the date of issue.

ASME B107 STANDARDS COMMITTEE
Hand Tools and Accessories

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

OFFICERS

J. S. Foote, *Chair*
B. Price, *Vice Chair*
E. Lawson, *Secretary*

COMMITTEE PERSONNEL

N. C. Cantlon, Jore Corp.
J. D. Davidson, IDEAL Industries, Inc.
D. M. Eggert, Snap-On Inc.
J. S. Foote, Trade Association Management, Inc.
D. R. Kritikos, Channellock, Inc.
C. Kuznia, General Services Administration
E. Lawson, The American Society of Mechanical Engineers
G. E. Olson, Gene Olson Engineering Consultant Ltd.
W. T. Pagac, Forever Associates, LLC
B. Price, Stanley Black & Decker
B. Rutledge, The Home Depot
W. C. Snyder, Wright Tool Co.
H. Yin, Microalloying International, Inc.
B. List, *Contributing Member*, Apex Tool Group, LLC

SUBCOMMITTEE 1 — WRENCHES

B. Price, *Chair,* Stanley Black & Decker
J. D. Davidson, IDEAL Industries, Inc.
C. Kuznia, General Services Administration
W. C. Snyder, Wright Tool Co.
H. Yin, Microalloying International, Inc.

CORRESPONDENCE WITH THE B107 COMMITTEE

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 or a case, 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 to provide 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 and 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 Standards 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.

Requests for interpretation should preferably be submitted through the online Interpretation Submittal Form. The form is accessible at http://go.asme.org/InterpretationRequest. Upon submittal of the form, the Inquirer will receive an automatic e-mail confirming receipt.

If the Inquirer is unable to use the online form, he/she may mail the request to the Secretary of the B107 Standards Committee at the above address. The request for an 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 in one or two words.
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. Please provide a condensed and precise question, composed in such a way that a "yes" or "no" reply is acceptable.
Proposed Reply(ies):	Provide a proposed reply(ies) in the form of "Yes" or "No," with explanation as needed. If entering replies to more than one question, please number the questions and replies.
Background Information:	Provide the Committee with any background information that will assist the Committee in understanding the inquiry. 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 the format described above may be rewritten in the appropriate format by the Committee prior to being answered, which may inadvertently change the intent of the original request.

Moreover, ASME does not act as a consultant for specific engineering problems or for the general application or understanding of the Standard requirements. If, based on the inquiry information submitted, it is the opinion of the Committee that the Inquirer should seek assistance, the inquiry will be returned with the recommendation that such assistance be obtained.

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 and/or telephone conferences that are open to the public. Persons wishing to attend any meeting and/or telephone conference should contact the Secretary of the B107 Standards Committee. Future Committee meeting dates and locations can be found on the Committee Page at http://go.asme.org/B107committee.

DRIVING AND SPINDLE ENDS FOR PORTABLE HAND, IMPACT, AIR, AND ELECTRIC TOOLS (PERCUSSION TOOLS EXCLUDED)

1 SCOPE

This Standard applies to portable power tools for drilling, grinding, polishing, sawing, and driving threaded fasteners, and hand tools for driving threaded fasteners. Other tools not classed as percussion tools belong in this category and may be added by revision or addition through the usual procedure.

This Standard includes dimensions and tolerances for both driving and driven elements where such coordination is important and not established by reference to the pertinent American National Standards. All dimensions are in inches and millimeters.

2 DEFINITIONS

percussion tools: hammers, chisels, scalers, tampers, clay diggers, and rock drills. Percussion tools are excluded from this Standard.

rounding: In this Standard, calculated values are rounded off as follows:

(a) if the next digit after the last digit to be retained is less than 5, the last digit to be retained is not changed

(b) if the next digit after the last digit to be retained is 5 or greater, the last digit to be retained is increased by one

tool: as used in this Standard, a portable device, either hand operated or powered by compressed air or electricity, for performing a mechanical operation.

3 REFERENCES

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

ANSI/ASME B1.1-1989 (R2001), Unified Inch Screw Threads (UN and UNR Thread Form)
ANSI B7.1-2000, Safety Requirements for the Use, Care and Protection of Abrasive Wheels
ANSI B92.1-1996, Involute Splines and Inspection, Inch Version
Publisher: American National Standards Institute (ANSI), 25 West 43rd Street, New York, NY 10036 (www.ansi.org)

ISO 1174-1:2011, Assembly tools for screws and nuts — Driving squares — Part 1: Driving squares for hand socket tools
ISO 1174-2:1996, Assembly tools for screws and nuts — Driving squares — Part 2: Driving squares for power socket tools
Publisher: International Organization for Standardization (ISO), Central Secretariat, Chemin de Blandonnet 8, Case Postale 401, 1214 Vernier, Geneva, Switzerland (www.iso.org)

4 ISO COMPATIBILITY

Italicization and bold type indicate ISO compatibility.
EXAMPLE: (***38.214***)

5 GAGE USE AND DESIGN

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

Manufacturers may use gages with tighter dimensions or tolerances than shown herein to ensure product acceptance.

Tolerances on gage dimensions within the Standard represent new manufactured or purchased gage sizes. The extreme size for all limit (GO and NO GO) gages shall not exceed the extreme limits of products specified within the Standard. All variations (manufacturing tolerance, calibration error, wear allowance, etc.) in the gages, whatever their cause or purpose, shall bring these gages within the extreme limits of the gage size specified within this Standard. Thus, a gage that represents a minimum limit may be larger, but never smaller, than the minimum specified for the product standard; likewise, the gage that represents a maximum limit may be smaller, but never larger, than the maximum size specified for the product standard.

6 SPINDLES FOR CHUCKS

See Tables 6-1 through 6-4.

7 HEXAGONAL DRIVES

See Tables 7-1 and 7-2.

8 SQUARE DRIVES

See Figures 8-1 through 8-3 and Tables 8-1 through 8-7.

9 SPLINE DRIVES

See Tables 9-1 through 9-4.

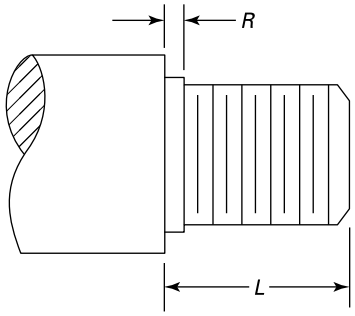
10 ABRASION TOOL SPINDLES

See Tables 10-1 through 10-4.

11 CIRCULAR SAW ARBORS

See Table 11-1.

Table 6-1 Threaded Spindles



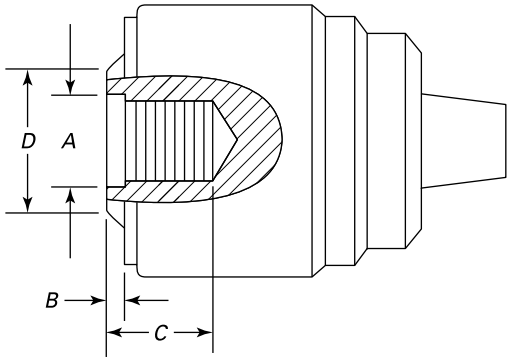
U.S. Customary Units, in.				
Nominal Dia. and Thread, UNF-2A	Pitch Dia.			
	Max.	Min.	*R*	*L*
3/8–24	0.3479	0.3455	1/16 ± 1/64	9/16 [Note (1)] +0.000, −0.030
1/2–20	0.4675	0.4649	1/16 ± 1/64	9/16 +0.000, −0.030
5/8–16 UN-2A	0.5844	0.5812	3/32 ± 1/64	11/16 +0.000, −0.030
3/4–16	0.7094	0.7062	3/32 ± 1/64	11/16 +0.000, −0.030

SI Units, mm				
Nominal Dia. and Thread, in., UNF-2A	Pitch Dia.			
	Max.	Min.	*R*	*L*
3/8–24	8.836	8.776	1.59 ± 0.39	14.29 [Note (1)] +0.00, −0.76
1/2–20	11.874	11.808	1.59 ± 0.39	14.29 +0.00, −0.76
5/8–16 UN-2A	14.843	14.762	2.38 ± 0.39	17.46 +0.00, −0.76
3/4–16	18.018	17.937	2.38 ± 0.39	17.46 +0.00, −0.76

GENERAL NOTE: Threads right hand.

NOTE: (1) Also 7/16 (11.11).

Table 6-2 Threaded Chucks

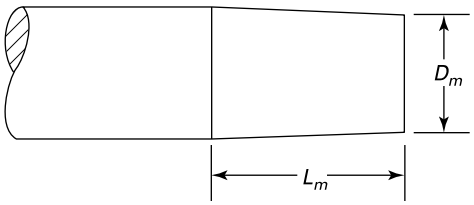


U.S. Customary Units, in.					
Nominal Dia. and Thread, UNF-2B	*A*		*B*,	*C*,	*D* [Note (1)], Nom.
	Max.	Min.	Min.	Min.	
3/8–24	0.385	0.380	0.115	19/32	5/8
1/2–20	0.510	0.503	0.115	19/32	7/8
5/8–16 UN-2B	0.635	0.629	0.146	25/32	1 1/8
3/4–16	0.760	0.754	0.146	13/16	1 1/4

SI Units, mm					
Nominal Dia. and Thread, in., UNF-2B	*A*		*B*,	*C*,	*D* [Note (1)], Nom.
	Max.	Min.	Min.	Min.	
3/8–24	9.77	9.65	2.92	15.09	15.88
1/2–20	12.95	12.78	2.92	15.09	22.23
5/8–16 UN-2B	16.12	15.98	3.71	19.84	28.58
3/4–16	19.30	19.15	3.71	20.64	31.75

NOTE: (1) Reference Manufacturer's Practice.

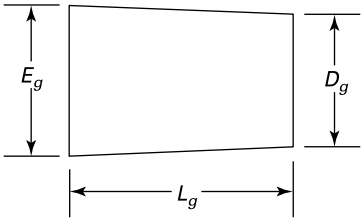
Table 6-3 Tapered Spindles



U.S. Customary Units, in.			
Number [Note (1)]	D_m	L_m	Taper, in./ft
1	0.335-0.333	0.656	0.92508
2 short	0.490-0.488	0.750	0.97861
2	0.490-0.488	0.875	0.97861
33	0.563-0.561	1.000	0.76194
6	0.626-0.624	1.000	0.62292
3	0.748-0.746	1.219	0.63898
SI Units, mm			
Number [Note (1)]	D_m	L_m	Taper, mm/m
1	8.50-8.46	16.66	77.0900
2 short	12.44-12.40	19.05	81.5508
2	12.44-12.40	22.23	81.5508
33	14.30-14.25	25.40	63.4950
6	15.90-15.85	25.40	51.9100
3	18.99-18.95	30.96	53.2483

NOTE: (1) Jacobs Taper Number.

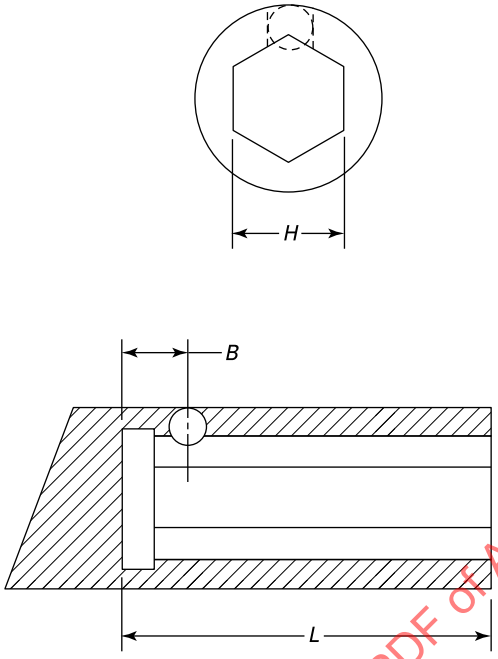
Table 6-4 Master Plug Gage Dimensions — Jacobs Taper



U.S. Customary Units, in.				
Number	E_g	D_g	L_g	Taper, in./ft [Note (1)]
1	0.38400	0.33341	0.65625	0.92508
2 short	0.54880	0.48764	0.75000	0.97861
2	0.55900	0.48764	0.87500	0.97861
33	0.62401	0.56051	1.00000	0.76194
6	0.67600	0.62409	1.00000	0.62292
3	0.81100	0.74610	1.21875	0.63898
SI Units, mm				
Number	E_g	D_g	L_g	Taper, mm/m [Note (1)]
1	9.7536	8.4686	16.6688	77.0900
2 short	13.9395	12.3861	19.0500	81.5508
2	14.1986	12.3861	22.2250	81.5508
33	15.8499	14.2370	25.4000	63.4950
6	17.1704	15.8519	25.4000	51.9100
3	20.5994	18.9509	30.9563	53.2483

NOTE: (1) Calculated from E_g, D_g, and L_g.

Table 7-1 Hexagonal Chucks



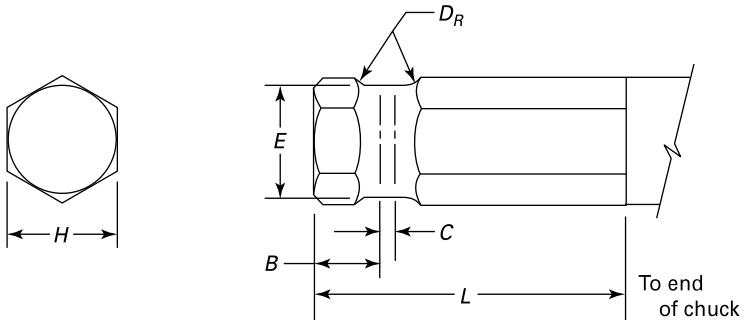
U.S. Customary Units, in.

Nominal Hexagon		*H*		*B*,	*L*,
in.	mm	Max.	Min.	±0.005	Max.
1/4	6.35	0.255	0.253	3/8	15/16
5/16	7.94	0.316	0.314	13/64	1
7/16	11.11	0.444	0.442	17/64	1 1/8
5/8	15.88	0.632	0.630	11/32	1 5/8
3/4	19.05	0.758	0.755	11/32	1 7/8

SI Units, mm

Nominal Hexagon		*H*		*B*,	*L*,
mm	in.	Max.	Min.	±0.13	Max.
6.35	1/4	6.47	6.43	9.53	23.81
7.94	5/16	8.02	7.98	5.16	25.40
11.11	7/16	11.27	11.23	6.75	28.57
15.88	5/8	16.05	16.00	8.73	41.27
19.05	3/4	19.25	19.18	8.73	47.62

Table 7-2 Hexagonal Shanks



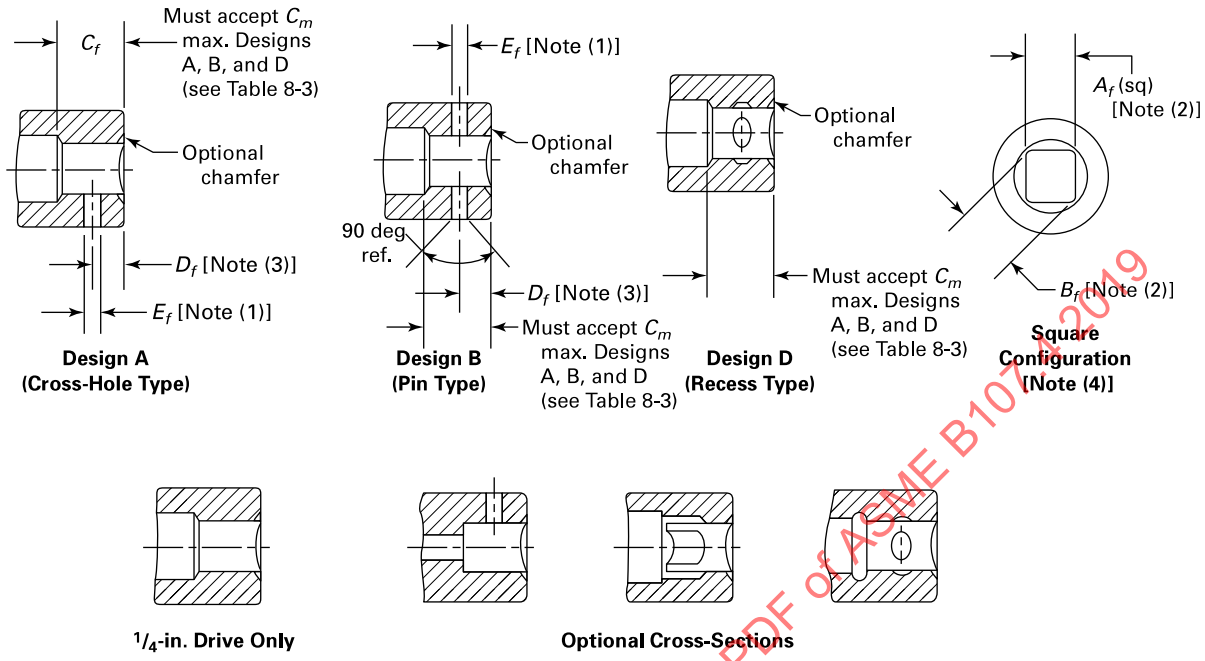
U.S. Customary Units, in.

Nominal Hexagon		*H*						
in.	mm	Max.	Min.	*B*	*C*	D_R	*E*, Dia.	*L*
1/4	6.35	0.250	0.248	11/32	1/16	3/32	3/16	1
5/16	7.94	0.312	0.310	3/16	3/64	3/32	1/4	1 1/16
7/16	11.11	0.4375	0.435	1/4	1/32	7/64	11/32	1 1/4
5/8	15.88	0.625	0.622	5/16	1/16	5/32	17/32	1 3/4
3/4	19.05	0.750	0.747	5/16	1/16	5/32	21/32	2

SI Units, mm

Nominal Hexagon		*H*						
mm	in.	Max.	Min.	*B*	*C*	D_R	*E*, Dia.	*L*
6.35	1/4	6.35	6.30	8.73	1.59	2.38	4.76	25.40
7.94	5/16	7.92	7.87	4.76	1.19	2.38	6.35	26.99
11.11	7/16	11.11	11.05	6.35	0.79	2.78	8.73	31.75
15.88	5/8	15.87	15.80	7.94	1.59	3.97	13.49	44.45
19.05	3/4	19.05	18.97	7.94	1.59	3.97	16.67	50.80

Figure 8-1 Square Drive Specifications for Hand, Power, and Impact Wrenches — Internal End



GENERAL NOTE: Design C is not included in Table 8-1 since it only refers to external squares, ring type.

NOTES:

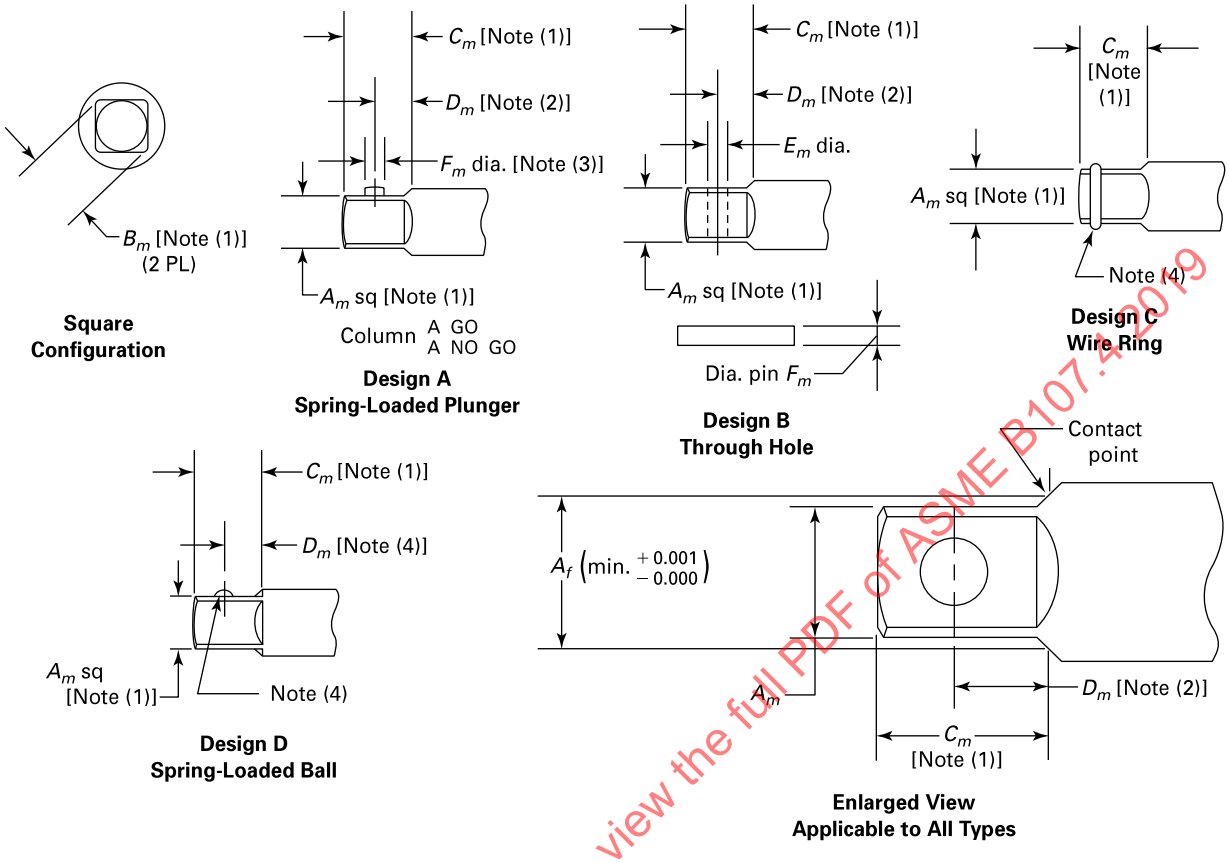
(1) Neither cross-hole Design A nor Design B nor recess Design D is required for $^1/_4$-in. drive internal openings; however, if recessed, Design D must be recessed on four sides.
   (a) Either recess Design D on four sides or cross-hole Design A on one, two, or four sides is required on $^3/_8$-in., $^1/_2$-in., $^3/_4$-in., and 1-in. sizes.
   (b) Cross-hole Design B shall be through two opposite sides.

(2) Square tolerances shall be such as to ensure acceptance when gaged with gages conforming to Table 8-2 and the figure above it.

(3) D_f max. does not equal D_m min. (see Figure 8-2); however, due to edge radius, plunger diameter, and square dimension interactions, no interference or interchangeability problem exists.

(4) The minimum retention force of recess-type Design D shall be such as to ensure the holding force specified in Table 8-1 when tested with weights conforming to Table 8-6 and this figure.

Figure 8-2 Square Drive Specifications for Hand, Power, and Impact Wrenches — External End



GENERAL NOTES:

(a) D_m min. does not equal D_f max. (see Figure 8-1); however, due to edge radius, plunger diameter, and square dimension interactions, no interference or interchangeability problem exists.

(b) For impact wrenches, A_m should be held as close to maximum as practical.

NOTES:

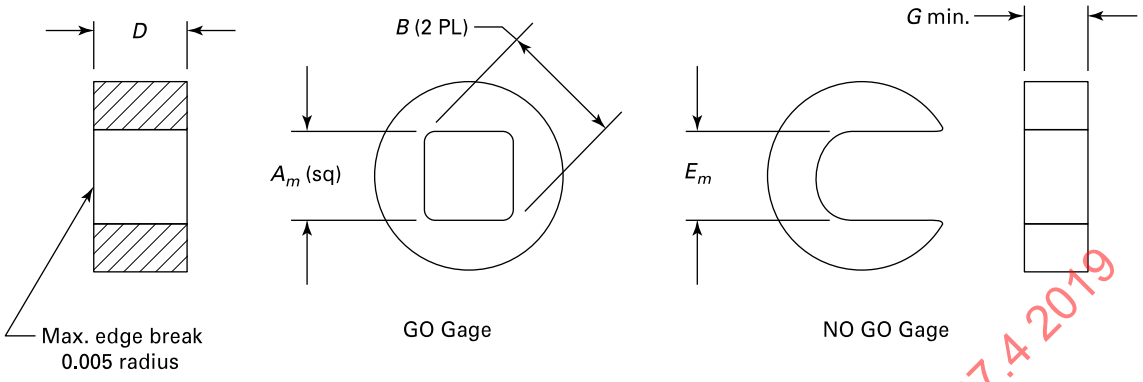
(1) Square tolerances shall be such as to ensure acceptance when gaged with gages conforming to Table 8-4.

(2) Dimension D_m tolerance shall be such as to ensure acceptance when gaged with gages conforming to Table 8-7.

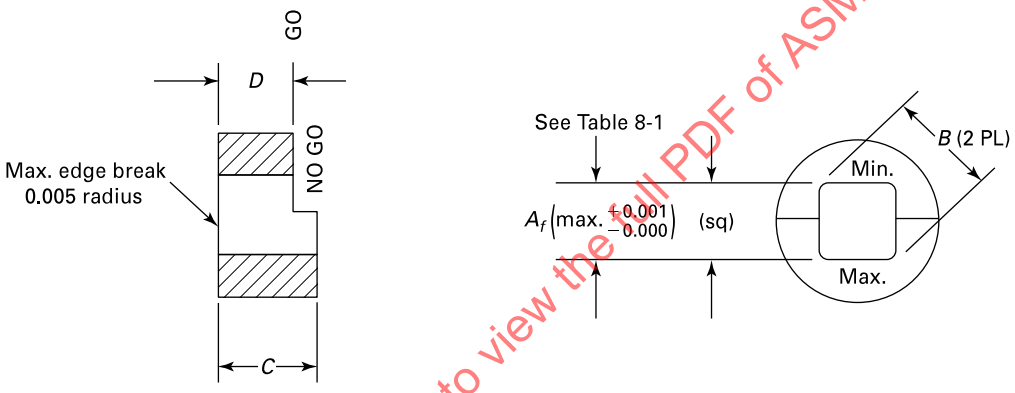
(3) F_m is the diameter of a plunger or pin and does not apply to a spring-loaded ball or ball-shaped plunger or wire ring.

(4) The minimum retention force of the ball or wire ring shall be such as to ensure the holding force of weights conforming to Table 8-5 .

Figure 8-3 Square Drive Gage Specifications for Hand, Power, and Impact Wrenches — External End



Square Gage



Length Gage

Table 8-1 Square Drive Specifications for Hand, Power, and Impact Wrenches — Internal End

U.S. Customary Units, in.

Drive Size		A_f		B_f,	D_f		E_f		Minimum Force to Retain Square,
in.	mm	Max.	Min.	Min.	Max.	Min.	Design A, Min.	Design B, Min.	Design D, lbf
1/4	6.3	***0.2603***	***0.2527***	***0.3352***	***0.161***	0.136	0.090	0.118	***1.5***
3/8	10.0	***0.3853***	***0.3777***	0.5052	***0.224***	0.199	0.170	0.204	***4.0***
1/2	12.5	***0.5113***	***0.5027***	0.6702	***0.318***	0.293	0.201	0.220	***6.0***
5/8 [Note (1)]	16.0	0.6333	0.6277	0.8432	0.318	0.290	...	0.250	...
3/4	20.0	***0.7613***	***0.7527***	1.0052	0.415	***0.390***	0.216	0.250	...
1	25.0	***1.0125***	***1.0035***	1.3502	***0.602***	0.577	0.234	0.280	...
1 1/2	40.0	1.5155	***1.5045***	***1.9842***	***0.645***	***0.620***	...	***0.377***	...
2 1/2	63.0	2.5205	***2.5045***	***3.3592***	***1.505***	***1.480***	...	***0.500***	...
3 1/2	...	3.5205	3.5045	4.7022	2.370	2.345	...	0.700	...

SI Units, mm

Drive Size		A_f		B_f,	D_f		E_f		Minimum Force to Retain Square,
mm	in.	Max.	Min.	Min.	Max.	Min.	Design A, Min.	Design B, Min.	Design D, N
6.3	1/4	***6.612***	***6.419***	***8.514***	***4.09***	3.45	2.29	3.00	***6.67***
10.0	3/8	***9.787***	***9.594***	12.832	***5.69***	5.05	4.32	5.18	***17.79***
12.5	1/2	12.987	12.769	17.023	***8.08***	7.44	5.11	5.59	***26.69***
16.0 [Note (1)]	5/8	16.086	15.944	21.417	8.08	7.37	...	6.35	...
20.0	3/4	***19.337***	***19.119***	25.532	10.54	***9.91***	5.49	6.35	...
25.0	1	***25.718***	***25.489***	34.295	***15.29***	14.66	5.94	7.11	...
40.0	1 1/2	38.494	***38.214***	50.399	***16.38***	15.75	...	***9.58***	...
63.0	2 1/2	64.021	***63.614***	***85.324***	***38.23***	37.59	...	***12.70***	...
...	3 1/2	89.421	89.014	119.436	60.20	59.56	...	17.78	...

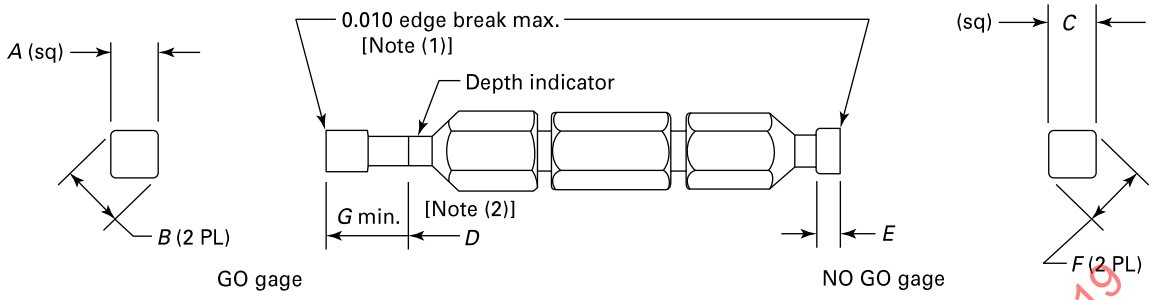
GENERAL NOTES:

(a) Dimensions set in **boldface** *italic* type, sizes 1/4 in. (6.3 mm) through 1 in. (25 mm), are compatible (will fit) with ISO 1174-1:2011 for hand socket tools.

(b) Dimensions set in **boldface** *italic* type, sizes 1 1/2 in. (40 mm) through 2 1/2 in. (60 mm), are compatible (will fit) with ISO 1174-2:1996 for power socket tools.

NOTE: (1) Not recommended for new products.

Table 8-2 Square Drive Gage Specifications for Hand, Power, and Impact Wrenches — Internal End



U.S. Customary Units, in.

Drive Size		*A* (GO), +0.0002 −0.0000	*B* (GO), +0.0002 −0.0002	*C* (NO GO), +0.0000 −0.0002	*D*, +0.003 −0.000 [Notes (1) and (3)]	*E*, Min.	*F* (NO GO)	
in.	mm						Max.	Min.
1/4	6.3	0.2527	0.3350	0.2603	0.312	0.250	0.3334	0.3301
3/8	10.0	0.3777	0.5050	0.3853	0.438	0.250	0.5039	0.4989
1/2	12.5	0.5027	0.6700	0.5113	0.625	0.250	0.6684	0.6617
5/8	16.0	0.6277	0.8430	0.6333	0.656	0.250	0.8414	0.8330
3/4	20.0	0.7527	1.0050	0.7613	0.938	0.250	1.0034	0.9934
1	25.0	1.0035	1.3500	1.0125	1.125	0.250	1.3484	1.3349
1 1/2	40.0	1.5045	1.9840	1.5155	1.625	0.250	1.9824	1.9626
2 1/2	63.0	2.5045	3.3590	2.5205	2.265	0.250	3.3574	3.3238
3 1/2	...	3.5045	4.7020	3.5205	3.265	0.250	4.7004	4.6534

SI Units, mm

Drive Size		*A* (GO), +0.005 −0.000	*B* (GO), +0.005 −0.005	*C* (NO GO), +0.000 −0.005	*D*, +0.08 −0.00 [Notes (1) and (3)]	*E*, Min.	*F* (NO GO)	
mm	in.						Max.	Min.
6.3	1/4	6.419	8.509	6.612	7.92	6.35	8.468	8.385
10.0	3/8	9.594	12.827	9.787	11.13	6.35	12.799	12.672
12.5	1/2	12.769	17.018	12.987	15.88	6.35	16.977	16.807
16.0	5/8	15.944	21.412	16.086	16.66	6.35	21.372	21.158
20.0	3/4	19.119	25.527	19.337	23.83	6.35	25.486	25.232
25.0	1	25.489	34.290	25.718	28.58	6.35	34.249	33.906
40.0	1 1/2	38.214	50.394	38.494	41.28	6.35	50.353	49.850
63.0	2 1/2	63.614	85.319	64.021	57.53	6.35	85.278	84.425
...	3 1/2	89.014	119.431	89.421	82.93	6.35	119.390	118.196

GENERAL NOTE: Gage tolerances are gage manufacturing tolerances.

NOTES:

(1) Do not include the length of the chamfer as part of the NO GO gaging procedure. If edge break is more than 0.010 in. (0.254 mm), the difference must be added to *D*.

(2) *G* min. = a minimum dimension
= *A* min. for up to 1 in. or 25 mm.
= 1 in. min. or 25 mm min., for *A* greater than 1 in. or 25 mm

If *G* min. is made equal to *D*, then G min. can be used as the depth indicator.

(3) Square drive opening shall accept min. of length *D*.

Table 8-3 Square Drive Specifications for Hand, Power, and Impact Wrenches — External End

U.S. Customary Units, in.

Drive Size		A_m, All Designs		Maximum B_m, All Designs	C_m Designs A, B, and D		C_m Design C		Minimum D_m, Designs A, B, and D	Minimum E_m, Design B	Maximum F_m, Designs A and B	Minimum Force to Remove Square, lbf
in.	mm	Max.	Min.		Max.	Min.	Max.	Min.				
1/4	6.3	0.2518	***0.2467***	***0.3298***	0.312	0.265	...	...	***0.156***	...	***0.078***	***1.5***
3/8	10.0	0.3768	***0.3717***	***0.4998***	0.438	0.406	0.516	0.482	***0.218***	...	0.140	***4.0***
1/2	12.5	0.5018	***0.4967***	***0.6648***	0.625	0.531	0.665	0.619	***0.312***	...	0.156	***6.0***
5/8 [Note (1)]	16.0	0.6268	0.6217	0.8338	0.656	0.594	0.794	0.760	0.322	...	0.156	...
3/4	20.0	0.7518	***0.7467***	***0.9998***	0.938	0.750	0.938	0.875	***0.409***	0.250	0.188	10.0
1	25.0	1.0018	***0.9965***	1.3398	1.125	1.000	1.170	1.130	***0.596***	0.250	***0.188***	12.0
1 1/2	40.0	1.5028	***1.4975***	***1.9678***	1.625	1.562	...	...	0.641	***0.345***	0.250	...
2 1/2	63.0	***2.4998***	2.4845	3.3438	2.265	2.234	...	...	***1.515***	***0.430***	0.312	...
3 1/2	...	3.4998	3.4845	4.6868	3.265	3.234	...	...	2.380	0.578	0.500	...

SI Units, mm

Drive Size		A_m, All Designs		Maximum B_m, All Designs	C_m Designs A, B, and D		C_m Design C		Minimum D_m, Designs A, B, and D	Minimum E_m, Design B	Maximum F_m, Designs A and B	Minimum Force to Remove Square, N
mm	in.	Max.	Min.		Max.	Min.	Max.	Min.				
6.3	1/4	6.396	***6.266***	***8.377***	7.92	6.73	...	...	***3.96***	...	***1.98***	***6.67***
10.0	3/8	9.571	***9.441***	***12.695***	11.13	10.31	13.11	12.24	***5.54***	...	3.56	***17.79***
12.5	1/2	12.746	***12.616***	***16.886***	15.88	13.49	16.89	15.72	***7.92***	...	3.96	***26.69***
16.0 [Note (1)]	5/8	15.921	15.791	21.179	16.66	15.09	20.17	19.30	8.18	...	3.96	...
20.0	3/4	19.096	***18.966***	***25.395***	23.83	19.05	23.83	22.23	***10.39***	6.35	4.78	44.48
25.0	1	25.446	***25.311***	34.031	28.58	25.40	29.72	28.70	***15.14***	6.35	***4.78***	53.38
40.0	1 1/2	38.171	***38.037***	49.982	41.28	39.67	...	...	***16.28***	***8.76***	6.35	...
63.0	2 1/2	***63.495***	63.106	84.933	57.53	56.74	...	...	***38.48***	***10.92***	7.92	...
...	3 1/2	88.895	88.506	119.045	82.93	82.14	...	...	60.45	14.68	12.70	...

GENERAL NOTES:

(a) Dimensions set in **boldface** *italic* type, sizes 1/4 in. (6.3 mm) through 1 in. (25 mm), are compatible (will fit) with ISO 1174-1:2011 for hand socket tools.

(b) Dimensions set in **boldface** *italic* type, sizes 1 1/2 in. (40 mm) through 2 1/2 in. (60 mm), are compatible (will fit) with ISO 1174-2:1996 for power socket tools.

NOTE: (1) Not recommended for new products.

Table 8-4 Square Drive Gage Specifications for Hand, Power, and Impact Wrenches — External End

U.S. Customary Units, in.

Drive Size		A_m, +0.0002 −0.0002,	B, +0.0002 −0.0002,	C, +0.000 −0.001		D, +0.001 −0.000		G Min.,	E_m, +0.0002 −0.0000,
mm	in.	All Designs	All Designs	Designs A, B, and D	Design C	Designs A, B, and D	Design C	Designs A, B, and D	All Designs
1/4	6.3	0.2520	0.3300	0.312	...	0.265	...	0.312	0.2467
3/8	10.0	0.3770	0.5000	0.438	0.516	0.406	0.482	0.438	0.3717
1/2	12.5	0.5020	0.6650	0.625	0.653	0.531	0.619	0.625	0.4967
5/8	16.0	0.6270	0.8340	0.656	0.794	0.594	0.760	0.656	0.6217
3/4	20.0	0.7520	1.0000	0.938	0.915	0.750	0.875	0.938	0.7467
1	25.0	1.0020	1.3400	1.125	1.170	1.000	1.130	1.125	0.9965
1 1/2	40.0	1.5030	1.9680	1.625	...	1.562	...	1.625	1.4975
2 1/2	63.0	2.5000	3.3440	2.265	...	2.234	...	2.265	2.4845
3 1/2	...	3.5000	4.6870	3.265	...	3.234	...	3.265	3.4845

SI Units, mm

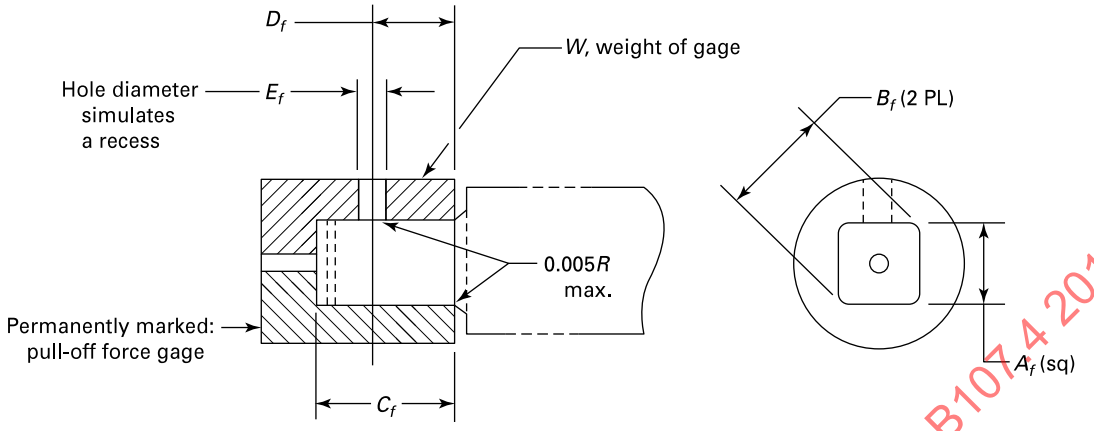
Drive Size		A_m, +0.000 −0.005,	B, +0.005 −0.005,	C, +0.00 −0.03		D, +0.03 −0.00		G Min.,	E_m, +0.005 −0.000,
mm	in.	All Designs	All Designs	Designs A, B, and D	Design C	Designs A, B, and D	Design C	Designs A, B, and D	All Designs
6.3	1/4	6.401	8.382	7.92	...	6.73	...	7.92	6.266
10.0	3/8	9.576	12.700	11.13	13.11	10.31	12.24	11.13	9.441
12.5	1/2	12.751	16.891	15.88	16.59	13.49	15.72	15.88	12.616
16.0	5/8	15.926	21.184	16.66	20.17	15.09	19.30	16.66	15.791
20.0	3/4	19.101	25.400	23.83	23.24	19.05	22.23	23.83	18.966
25.0	1	25.451	34.036	28.58	29.72	25.40	28.70	28.58	25.311
40.0	1 1/2	38.176	49.987	41.28	...	39.67	...	41.28	38.037
63.0	2 1/2	63.500	84.938	57.53	...	56.74	...	57.53	63.106
...	3 1/2	88.900	119.050	82.93	...	82.14	...	82.93	88.506

GENERAL NOTES:

(a) NO GO gage must be used by rotating gage 90 deg to check both sets of across-flat dimensions.

(b) Gage tolerances are tool makers' gage manufacturing tolerances.

Table 8-5 Square Drive Pull-Off Force Gage Specifications for Designs C and D Hand, Power, and Impact Wrenches — External End



U.S. Customary Units, in.

Drive Size		A_f, +0.0010 −0.0000	B_f, +0.005 −0.000	C_f, +0.025 −0.000	D_f, +0.000 −0.002	E_f, +0.000 −0.002	Total Weight of Gage, W, lb	
in.	mm						Max.	Min.
1/4	6.3	0.2603	0.335	0.312	...	...	1.58	1.5
3/8	10.0	0.3853	0.505	0.438	0.224	0.076	4.20	4.0
1/2	12.5	0.5113	0.670	0.625	0.318	0.110	6.30	6.0
3/4	20.0	0.7613	1.005	0.938	0.415	0.216	10.50	10.0
1	25.0	1.0125	1.350	1.125	0.602	0.234	12.60	12.0

SI Units, mm

Drive Size		A_f, +0.020 −0.000	B_f, +0.13 −0.00	C_f, +0.64 −0.00	D_f, +0.00 −0.05	E_f, +0.00 −0.05	Total Weight of Gage, W, kg	
mm	in.						Max.	Min.
6.3	1/4	6.612	8.51	7.92	...	...	0.71	0.68
10.0	3/8	9.787	12.83	11.13	5.68	1.93	1.90	1.81
12.5	1/2	12.987	17.02	15.88	8.07	2.78	2.86	2.72
20.0	3/4	19.337	25.53	23.83	10.54	5.49	4.77	4.54
25.0	1	25.718	34.29	28.58	15.29	5.94	5.71	5.44

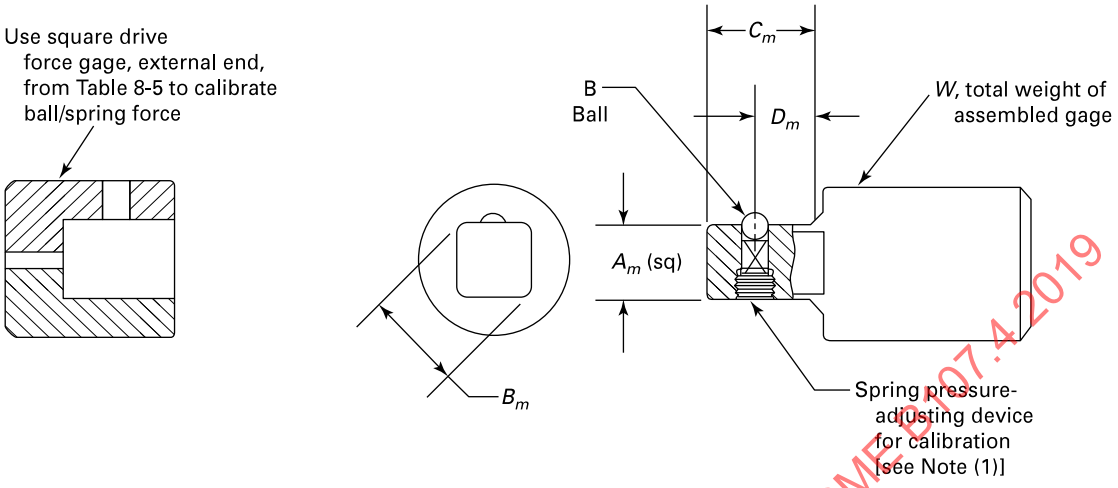
GENERAL NOTES:

(a) The C_m of the product being gaged must pass the Figure 8-3 length gage prior to pull-off force gaging.

(b) While retaining the gage, the square drive shall be lifted gradually in a vertical manner, avoiding any side loads.

(c) The above gage simulates the worst-case condition of an internal square to test the pull-off force retention of an external square of Design C (wire) and Design D (ball).

Table 8-6 Square Drive Retention Force Gage Specifications for Design D (Recess-Type) Hand, Power, and Impact Wrenches — Internal End



U.S. Customary Units, in.

Drive Size		A_m			c_m			Ball Size, B	Total Weight of Gage, *W*, lb	
in.	mm	Max.	Min.	B_m, Max.	Max.	Min.	D_m, Min.	±0.005	Max.	Min.
1/4	6.3	0.252	0.2467	0.330	0.312	0.265	0.156	0.125	1.58	1.5
3/8	10.0	0.377	0.3717	0.500	0.438	0.406	0.218	0.187	4.20	4.0
1/2	12.5	0.502	0.4967	0.663	0.625	0.531	0.312	0.250	6.30	6.0

SI Units, mm

Drive Size		A_m			c_m			Ball Size, B	Total Weight of Gage, *W*, kg	
mm	in.	Max.	Min.	B_m, Max.	Max.	Min.	D_m, Min.	±1.27	Max.	Min.
6.3	1/4	6.401	6.266	8.38	7.92	6.73	3.96	3.17	0.71	0.68
10.0	3/8	9.576	9.441	12.70	11.13	10.31	5.54	4.75	1.90	1.81
12.5	1/2	12.751	12.616	16.89	15.88	13.49	7.92	6.35	2.86	2.72

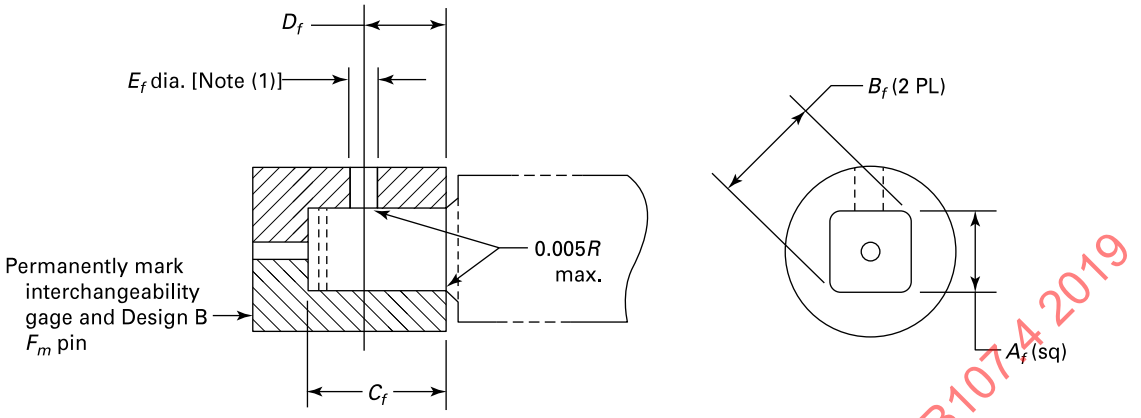
GENERAL NOTES:

(a) Square drive shall be lifted gradually in a vertical manner, avoiding any side loads, while retaining the gage.

(b) Design D (internal-type recess) is generally not used on drive sizes larger than 1/2 in. (12.5 mm).

NOTE: (1) Use the corresponding drive size force gage from Table 8-5 to calibrate the retention force of the ball and spring.

Table 8-7 Square Drive Interchangeability Gage Specifications for Designs A and B Hand, Power, and Impact Wrenches — External End



U.S. Customary Units, in.

Drive Size		A_f, +0.0010 −0.0000	B_f, +0.005 −0.000	C_f, +0.025 −0.000	D_f, +0.000 −0.002	E_f, +0.000 −0.002		Maximum F_m Pin, +0.0005 −0.0000, Design B
in.	mm					Design A, Min.	Design B, Min.	
1/4	6.3	0.2527	0.335	0.312	0.161	0.090	0.118	0.0780
3/8	10.0	0.3777	0.505	0.438	0.224	0.170	0.204	0.1400
1/2	12.5	0.5027	0.670	0.625	0.318	0.201	0.220	0.1560
5/8	16.0	0.6277	0.843	0.656	0.318	...	0.250	0.1560
3/4	20.0	0.7527	1.005	0.938	0.415	0.216	0.250	0.1880
1	25.0	1.0035	1.350	1.125	0.602	0.234	0.280	0.1880
1 1/2	40.0	1.5045	1.984	1.625	0.645	...	0.337	0.2500
2 1/2	63.0	2.5045	3.359	2.265	1.505	...	0.500	0.3120
3 1/2	89.0	3.5045	4.702	3.265	2.370	...	0.700	0.5000

SI Units, mm

Drive Size		A_f, +0.020 −0.000	B_f, +0.13 −0.00	C_f, +0.64 −0.00	D_f, +0.00 −0.05	E_f, +0.00 −0.05		Maximum F_m Pin, +0.013 −0.000, Design B
mm	in.					Design A, Min.	Design B, Min.	
6.3	1/4	6.419	8.51	7.92	4.09	2.29	3.00	1.980
10.0	3/8	9.594	12.83	11.12	5.69	4.32	5.18	3.550
12.5	1/2	12.769	17.02	15.87	8.08	5.11	5.59	3.960
16.0	5/8	15.944	21.41	16.66	8.08	...	6.35	3.960
20.0	3/4	19.119	25.53	23.82	10.54	5.49	6.35	4.770
25.0	1	25.489	34.29	28.57	15.29	5.94	7.11	4.770
40.0	1 1/2	38.214	50.39	41.27	16.38	...	8.56	6.350
63.0	2 1/2	63.614	85.32	57.53	38.23	...	12.70	7.920
89.0	3 1/2	89.014	119.43	82.93	60.20	...	17.78	12.700

GENERAL NOTES:

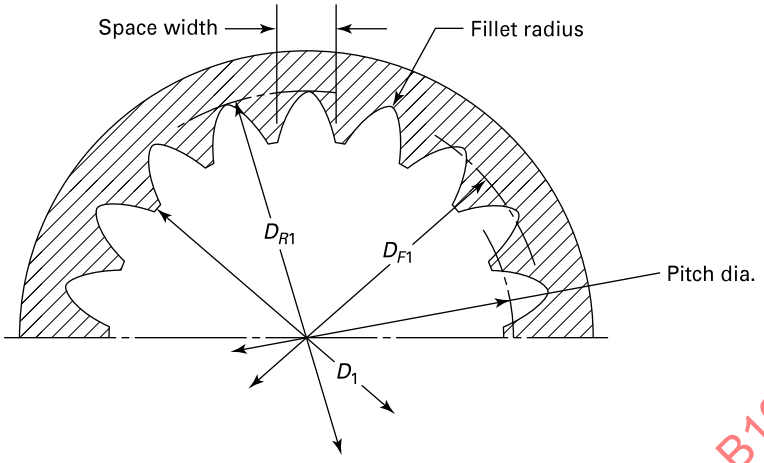
(a) The C_m of the product being gaged must pass the Figure 8-3 length gage prior to pull-off force gaging.

(b) The above gage simulates the worst-case condition of an internal square to test the interchangeability of an external square of Design A (plunger) and Design B (pin).

(c) Product to be oriented to engage plunger or pin into E_f diameter of gage.

NOTE: (1) E_f will be through both sides for Design B.

Table 9-1 Spline Drives — Internal Spline Proportions



U.S. Customary Units, in.

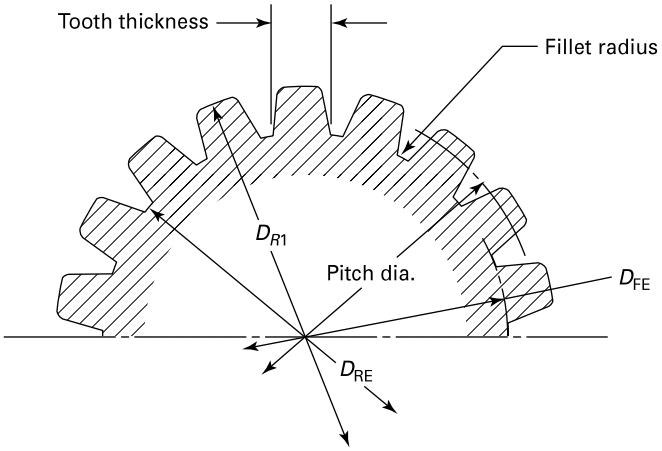
Drive Size Number	Nominal Size	Number of Teeth	Pitch	Press Angle, deg	Pitch Dia.	Major Dia., D_{R1} Max.	Major Dia., D_{R1} Min.	Form Dia., D_{F1}	Minor Dia., D_1 Max.	Minor Dia., D_1 Min.	Fillet Radius	Space Width Max. Act	Space Width Min. Eff
1	0.5420	12	$^{24}/_{48}$	30	0.5000	0.5840	0.5750	0.5457	0.4633	0.4583	0.009	0.0678	0.0654
2	0.6500	12	$^{20}/_{40}$	30	0.6000	0.7000	0.6900	0.6540	0.5550	0.5500	0.012	0.0811	0.0785
2A	0.7500	14	$^{20}/_{40}$	30	0.7000	0.8000	0.7900	0.7540	0.6550	0.6500	0.013	0.0812	0.0785
3	0.9380	14	$^{16}/_{32}$	30	0.8750	0.9985	0.9875	0.9415	0.8185	0.8125	0.017	0.1009	0.0982
4	1.2500	14	$^{12}/_{24}$	30	1.1667	1.3297	1.3167	1.2540	1.0903	1.0833	0.025	0.1338	0.1309
5 [Note (1)]	1.6250	14	$^{10}/_{12}$	20	1.4000	1.6850	1.6700	1.6358	1.3620	1.3520	0.055	0.2015	0.1980
5A	1.9000	18	$^{10}/_{20}$	30	1.8000	1.9950	1.9800	1.9040	1.7100	1.7000	0.033	0.1601	0.1571
6	2.3750	18	$^{8}/_{16}$	30	2.2500	2.4930	2.4750	2.3795	2.1370	2.1250	0.041	0.1995	0.1963

SI Units, mm

Drive Size Number	Nominal Size	Number of Teeth	Module	Press Angle, deg	Pitch Dia.	Major Dia., D_{R1} Max.	Major Dia., D_{R1} Min.	Form Dia., D_{F1}	Minor Dia., D_1 Max.	Minor Dia., D_1 Min.	Fillet Radius	Space Width Max. Act	Space Width Min. Eff
1	13.77	12	1.0583/0.5292	30	12.700	14.833	14.605	13.861	11.767	11.641	0.23	1.722	1.661
2	16.51	12	1.2700/0.6350	30	15.240	17.780	17.526	16.612	14.097	13.970	0.30	2.059	1.994
2A	19.05	14	1.2700/0.6350	30	17.780	20.320	20.066	19.152	16.637	16.510	0.33	2.062	1.994
3	23.83	14	1.5875/0.7938	30	22.225	25.361	25.083	23.914	20.789	20.638	0.43	2.562	2.494
4	31.75	14	2.1167/1.0583	30	29.634	33.774	33.444	31.852	27.693	27.516	0.64	3.398	3.325
5 [Note (1)]	41.28	14	2.5400/2.1167	20	35.560	42.799	42.418	41.549	34.594	34.341	1.40	5.118	5.030
5A	48.26	18	2.5400/1.2700	30	45.720	50.673	50.292	48.362	43.434	43.180	0.84	4.066	3.990
6	60.33	18	3.1750/1.5875	30	57.150	63.322	62.865	60.439	54.279	53.975	1.04	5.067	4.986

NOTE: (1) Size 5 prescribes proportions in common use for splined socket drives. Other splines conform to ANSI B92.1-1996 for fillet root, side fit, Class 1 (except the minor diameter maximum dimension, D_1 max., for sizes 3, 4, 5A, and 6).

Table 9-2 Spline Drives — External Spline Proportions



U.S. Customary Units, in.

Drive Size Number	Nominal Size	Number of Teeth	Pitch	Press Angle, deg	Pitch Dia.	Major Dia., D_{R1}		Form Dia., D_{FE}	Minor Dia., D_{RE}		Fillet Radius	Tooth Thickness	
						Max.	Min.		Max.	Min.		Max. Eff	Min. Act
1	0.542	12	$^{24}/_{48}$	30	0.5000	0.5417	0.5367	0.4543	0.4167	0.4077	0.018	0.0639	0.0615
2	0.650	12	$^{20}/_{40}$	30	0.6000	0.6500	0.6450	0.5460	0.5000	0.4900	0.021	0.0770	0.0744
2A	0.750	14	$^{20}/_{40}$	30	0.7000	0.7500	0.7450	0.6460	0.6000	0.5900	0.020	0.0770	0.0743
3	0.938	14	$^{16}/_{32}$	30	0.8750	0.9375	0.9325	0.8085	0.7500	0.7390	0.025	0.0967	0.0940
4	1.250	14	$^{12}/_{24}$	30	1.1667	1.2500	1.2450	1.0793	1.0167	1.0037	0.038	0.1294	0.1265
5 [Note (1)]	1.625	14	$^{10}/_{12}$	20	1.4000	1.6150	1.6110	1.3156	1.2500	1.2350	0.050	0.1950	0.1900
5A	1.900	18	$^{10}/_{20}$	30	1.8000	1.9000	1.8950	1.6950	1.6200	1.6150	0.044	0.1556	0.1526
6	2.375	18	$^{8}/_{16}$	30	2.2500	2.3750	2.3700	2.1205	2.0250	2.0070	0.055	0.1948	0.1915

SI Units, mm

Drive Size Number	Nominal Size	Number of Teeth	Module	Press Angle, deg	Pitch Dia.	Major Dia., D_{R1}		Form Dia., D_{FE}	Minor Dia., D_{RE}		Fillet Radius	Tooth Thickness	
						Max.	Min.		Max.	Min.		Max. Eff	Min. Act
1	13.77	12	1.0583/0.5292	30	12.700	13.759	13.632	11.539	10.584	10.356	0.46	1.623	1.562
2	16.51	12	1.2700/0.6350	30	15.240	16.510	16.383	13.868	12.700	12.446	0.53	1.955	1.890
2A	19.05	14	1.2700/0.6350	30	17.780	19.050	18.923	16.408	15.240	14.986	0.51	1.955	1.887
3	23.83	14	1.5875/0.7938	30	22.225	23.812	23.686	20.536	19.050	18.771	0.64	2.456	2.388
4	31.75	14	2.1167/1.0583	30	29.634	31.750	31.623	27.414	25.824	25.494	0.97	3.286	3.213
5 [Note (1)]	41.28	14	2.5400/2.1167	20	35.560	41.021	40.919	33.416	31.750	31.369	1.27	4.953	4.826
5A	48.26	18	2.5400/1.2700	30	45.720	48.260	48.133	43.078	41.148	41.020	1.12	3.952	3.876
6	60.33	18	3.1750/1.5875	30	57.150	60.325	60.198	53.861	51.435	50.978	1.40	4.947	4.864

NOTE: (1) Size 5 prescribes proportions in common use for splined socket drives. Other splines conform to ANSI B92.1-1996 for fillet root, side fit, Class 1.