



AEROSPACE STANDARD	AS954™	REV. H
	Issued 1967-06 Reaffirmed 2004-01 Revised 2023-03 Superseding AS954G and AS955	
(R) Wrenches, Hand, Twelve Point, High Strength, Thin Wall		

RATIONALE

The update of AS954 is to incorporate improvements and corrections compiled from committee findings and to incorporate AS955 into the AS954 standard. Bolt clearance requirements were reorganized to promote ease of use. Corrections were made to the qualification tests for wrench design and cycle torque. The 1/4 inch drive x 9/16 inch hand universal socket and 1-5/16 through 1-5/8 inch combination wrenches were added. Torque requirements for select box wrenches were increased to ensure a logical progression by nominal size. Wrench opening depth, bolt clearance diameter, bolt clearance length, and overall length dimensions for metric socket wrenches were updated to accommodate the bi-hexagonal (also known as double-hexagon or 12-point) fasteners common in the aerospace industry.

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1. SCOPE

This SAE Aerospace Standard (AS) covers high strength thin wall (commercial) sockets, universal sockets, box wrenches and torque adaptors which possess the strength, clearances, and internal wrenching design so configured that, when mated with bi-hexagonal fasteners conforming to the requirements of AS870 for inch sizes and ISO 4095 for metric sizes, they shall transmit torque to the fastener without bearing on the outer 5% of the fastener's wrenching points.

Inclusion of dimensional data in this document is not intended to imply that all the products described herein are stock production sizes. Consumers are requested to consult with manufacturers concerning lists of stock production sizes. The dimensional limits of box and combination wrench lengths have been established to provide configuration control for tool storage applications.

1.1 Classification

Wrenches, sockets, and adaptors covered by this AS shall be of the following types, classes, and styles, as specified:

1.1.1 Type I Sockets

Class 1 - Sockets

Style A - Regular length

Style B - Long length

Class 2 - Universal sockets (also known as flexible sockets)

1.1.2 Type II Wrenches, Box

Class 1 - Angled end, 15 degree

Style A - Regular length

Style B - Long length

Class 2 - Modified offset

Style A - Short length

Style B - Regular length

Class 3 - Deep offset

Style A - Short length

Style B - Regular length

Class 4 - Combination, box and open end wrench

Style A - Extra short length

Style B - Short length

Style C - Regular length

Style D - Long length

1.1.3 Type III Torque Adaptors

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2. APPLICABLE DOCUMENTS

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of the other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document; however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

AS478 Identification Marking Methods

AS870 Wrenching Configuration, Bi-Hexagonal (12 Point) Drive, Design Standard For

AS4984 Coating Requirements for Aerospace Hand Tools

2.2 ASME Publications

Available from ASME, P.O. Box 2900, 22 Law Drive, Fairfield, NJ 07007-2900, Tel: 800-843-2763 (U.S./Canada), 001-800-843-2763 (Mexico), 973-882-1170 (outside North America), www.asme.org.

ASME B46.1 Surface Texture

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

ASME B107.17 Gages and Mandrels for Wrench Openings

ASME B107.100 Flat Wrenches

2.3 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM E18 Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials, Standard Methods of Test For

2.4 ISO Publications

Available from International Organization for Standardization, ISO Central Secretariat, 1, ch. de la Voie-Creuse, CP 56, CH-1211 Geneva 20, Switzerland, Tel: +41 22 749 01 11, www.iso.org.

ISO 4095 Aerospace - Bihexagonal drives - Wrenching configuration - Metric series

3. REQUIREMENTS

3.1 Illustrations

The illustrations shown herein are descriptive, not restrictive, and are not intended to preclude sockets, universal sockets, box wrenches, and torque adaptors which are otherwise in accordance with this document.

3.2 Materials

Unless otherwise specified hereinafter, the materials used in the manufacture of the sockets, universal sockets, box wrenches, and torque adaptors shall be steel, the chemical composition and heat treatment of which shall be such as to produce tools conforming to the physical requirements specified herein. Powdered metal or cast steel shall not be used.

3.3 Marking

The sockets, universal sockets, box wrenches and torque adaptors shall be marked in a permanent manner with the nominal wrench opening size. In addition, the tools shall be marked with the country of origin and the manufacturer's name or with a trademark of known character that the source of manufacture may be determined. Marking requirement shall be in accordance with AS478.

3.4 Square Drive Ends

3.4.1 Drive End Dimensions

Internal drive end dimensions shall conform to ASME B107.4. External drive tangs in accordance with ASME B107.4 shall be used to judge the following requirements:

3.4.1.1 Internal Drive Opening

All internal drive openings shall be broached or formed in a smooth and well-defined manner. Tools having internal drive openings shall be firmly attachable to corresponding size external drive tangs by one of the following retention methods. For Type III torque adaptors, if the internal drive end thickness is less than twice the dimension D_f in Table 8-1 of ASME B107.4, the retention feature shall be centered in the internal drive opening within 0.010 inch (0.25 mm).

3.4.1.1.1 Detent Retention Feature

All four faces of the internal drive opening shall be recessed so that one of the recesses engages the spring-loaded steel ball on the corresponding external drive.

3.4.1.1.2 Cross-Hole Retention Feature

One or more of the faces of the internal drive opening shall be drilled with a cross-hole to engage the spring-loaded steel ball or plunger on the corresponding external drive.

3.4.2 Tang Engagement and Disengagement

The detachable sockets, universal sockets, and torque adaptors shall be so designed that external tangs can be inserted into the corresponding internal openings without undue force and shall be manually detachable without the use of any tools or keys and meet the minimum force requirements to remove the external tang as specified in applicable tables of ASME B107.4. Binding between surfaces and corners shall not be evident.

3.5 Hardness

Unless otherwise specified herein, sockets, universal sockets, box wrenches, and torque adaptors shall be hardened throughout to a Rockwell hardness of not less than 40 nor more than 54 on the "C" scale. Hardness definitions, nomenclature and procedures used herein can be found in ASTM E18. When grinding is necessary to prepare the test surface, the amount removed must not exceed 0.007 inch (0.18 mm) on the surface contacted by the indenter.

3.6 Finish

Wrenches shall be protected with one of the following three types as specified within AS4984.

Type I - Nickel chromium coating

Type II - Black oxide or black phosphate or other black finish coatings

Type III - Alternative coatings

3.6.1 Surface Finish Requirements for Nickel Chromium Coating or Alternative Coating

On all Type I sockets and universal sockets, the outer longitudinal surface or major diameter thereof shall have a surface roughness of 30 microinches maximum Ra, except where knurled or grooved. The remaining exterior longitudinal socket surface roughness shall be 150 microinches maximum Ra. On all Type II box Wrenches and Type III torque adaptors, a minimum of 180 degrees of the outer periphery of the box ends (90 degrees on each side of the longitudinal axis of the wrench) surface roughness shall be 30 microinches maximum Ra. Microinch measurements shall be made with a surface-measuring instrument using a 0.030 inch (0.76 mm) roughness width cutoff. Definitions and nomenclature used herein can be found in ASME B46.1.

3.6.2 Surface Finish Requirements for Black Oxide or Black Phosphate Treatment

The tools shall be coated with a chemically produced oxide or phosphate coating followed with a coating of rust preventive oil. All external surfaces shall have a maximum Ra roughness height value of 250 microinches. Microinch measurements shall be made with a surface-measuring instrument using a 0.030 inch (0.76 mm) roughness width cutoff. Definitions and nomenclature used herein can be found in ASME B46.1.

3.6.3 Surface Condition

All external surfaces shall be free from pits, nodules, forge flash, burrs, cracks, and other detrimental defects. The external forge flash shall blend smoothly with adjacent surfaces except that the forge flash shall be completely removed from the periphery of the heads of box wrenches and torque adaptors and from that portion of the handle which shall be essentially straight and uniform in section dimensions.

3.7 Performance Qualification Tests

Proof load testing, cycle load testing, and fragmentation testing shall be performed for all Type I sockets, Type II wrenches, and Type III torque adapters. Prior to performance testing, test sample wrench openings shall be gaged for conformance to ASME B107.17 and test sample drive openings shall be gaged for conformance to ASME B107.4.

As a design and process qualification test, the manufacturer shall maintain a record of compliance with the performance qualification test requirements with sample tools conforming to the applicable figures and tables. The tests shall be required whenever the design or method of manufacture is significantly changed.

3.7.1 Mandrels for Performance Tests

Wrench openings shall be tested on hexagonal mandrels. The size of all mandrels shall conform to the dimensions and tolerances specified in Table 1. The fifth and ninth columns of Table 1 does not apply when testing Type II box wrenches and Type III torque adaptors.

Mandrels shall be hardened to a Rockwell hardness of not less than 55 on the "C" scale and shall have smoothly finished wrench engagement surfaces.

3.7.2 Test Plugs for Performance Tests

3.7.2.1 Type I, Class 1 Sockets

A square test plug of suitable strength and complying with the minimum dimensional requirements of the external drive tang specified in ASME B107.4 shall be employed. The test plug may be driven by any suitable manual or mechanical means. The socket shall then be engaged on the end of the mandrel to a maximum depth in accordance with Table 1. A stop may be set at the outer end of the test plug to prevent slippage of the socket endwise from the mandrel.

Table 1 - Hexagon mandrel dimensions and engagement data for performance tests

Table 1A - Performance test mandrels - inch sizes, dimensions in inches

For Wrench Sizes	Hexagon Mandrel Across Flats Min (Inches)	Hexagon Mandrel Across Flats Max (Inches)	Mandrel Across Corners Min (Inches)	Mandrel Engagement Depth of Insertion Max (Inches)
3/16	0.1855	0.1880	0.2095	0.094
7/32	0.2168	0.2193	0.2440	0.109
1/4	0.2480	0.2505	0.2780	0.125
9/32	0.2793	0.2818	0.3133	0.141
5/16	0.3105	0.3130	0.3495	0.141
11/32	0.3418	0.3443	0.3860	0.156
3/8	0.3730	0.3760	0.4225	0.156
7/16	0.4355	0.4385	0.4935	0.218
1/2	0.4970	0.5010	0.5635	0.265
9/16	0.5595	0.5635	0.6339	0.328
5/8	0.6220	0.6260	0.7055	0.375
11/16	0.6845	0.6885	0.7769	0.375
3/4	0.7470	0.7510	0.8485	0.437
25/32	0.778	0.782	0.885	0.453
13/16	0.810	0.814	0.920	0.453
7/8	0.872	0.876	0.992	0.500
15/16	0.935	0.939	1.063	0.546
1	0.997	1.001	1.130	0.546
1-1/16	1.060	1.064	1.201	0.625
1-1/8	1.122	1.126	1.273	0.656
1-3/16	1.185	1.189	1.343	0.656
1-1/4	1.247	1.251	1.416	0.750
1-5/16	1.310	1.314	1.487	0.765
1-3/8	1.372	1.376	1.559	0.781
1-7/16	1.435	1.439	1.631	0.875
1-1/2	1.497	1.501	1.702	0.875
1-9/16	1.556	1.564	1.770	0.875
1-5/8	1.618	1.626	1.841	1.000
1-11/16	1.681	1.689	1.912	1.000
1-3/4	1.743	1.751	1.983	1.093

Table 1B - Performance test mandrels - metric sizes, dimensions in SI units

For Wrench Sizes	Hexagon Mandrel Across Flats Min (Millimeters)	Hexagon Mandrel Across Flats Max (Millimeters)	Mandrel Across Corners Min (Millimeters)	Mandrel Engagement Depth of Insertion Max (Millimeters)
5	4.950	5.015	5.58	2.00
5.5	5.450	5.515	6.13	2.40
6	5.950	6.025	6.68	2.60
7	6.950	7.025	7.79	3.20
8	7.950	8.025	8.95	4.00
9	8.950	9.025	10.11	4.40
10	9.950	10.025	11.27	4.80
11	10.950	11.025	12.40	5.60
12	11.924	12.025	13.53	6.00
13	12.924	13.025	14.67	6.40
14	13.924	14.025	15.80	7.00
15	14.924	15.025	16.92	7.40
16	15.924	16.025	18.06	8.00
17	16.924	17.025	19.20	8.80
18	17.924	18.025	20.35	9.60
19	18.924	19.025	21.49	10.20
20	19.924	20.025	22.64	10.60
21	20.924	21.025	23.78	11.20
22	21.924	22.025	24.93	11.80
23	22.924	23.025	26.07	12.20
24	23.924	24.025	27.20	12.80
25	24.924	25.025	28.27	13.40
26	25.924	26.025	29.38	13.80
27	26.924	27.025	30.53	14.40
28	27.924	28.025	31.67	15.00
29	28.924	29.025	32.81	15.40
30	29.924	30.025	33.96	16.00
32	31.924	32.025	36.25	16.80
34	33.924	34.025	38.52	17.60
36	35.924	36.025	40.83	19.20
41	40.823	41.025	46.45	21.60
46	45.823	46.025	52.12	24.00

3.7.2.2 Type I, Class 2 Universal Sockets

A test plug as in 3.7.2.1 shall be used except that a means shall be provided to keep universal socket parts in the axis about which the load is applied.

3.7.3 Proof Load Test

Torque shall be applied with a suitable torque producing machine. Torque shall be applied at a speed of 15 to 30 deg/min until proof load value is achieved; test load shall be held for 10 seconds, then torque shall be released. This proof load test shall be performed in the clockwise and counterclockwise direction. The items covered herein shall withstand the proof loads set forth in the applicable tables, without failure or permanent deformation (set) which might affect durability or serviceability of the tools. At the completion of the test, gaging shall be repeated to verify dimensional conformance after the proof load has been applied. Adequate safeguards for personnel and property shall be employed in conducting all tests. Approved eye protection shall be worn at all times and equipment safety shields in place when tests are in progress.

3.7.4 Cycle Load Test

The cycle load test shall consist of 2000 applications of the cyclic torque load in one direction at a rate between 15 to 120 cycles per minute, using the Table 1 mandrel dimensions and engagements. The tool being tested shall be indexed 30 degrees after 1000 load applications. Altogether 2000 cycles are required, reflecting 1000 applications of the cyclic load in one direction on each set of flats. Following the 2000-cycle load test, the tool shall withstand the torque proof load in the same direction as the cycle load test. The cyclic load values for all tools are located in the respective tables and are usually 70% of the proof load.

3.7.5 Fragmentation Test

One sample of each tool of Type I, II, and III shall be loaded to failure. Failure shall not result in fragmentation of the tool into two or more pieces. The tool shall be considered to have passed the fragmentation test if it:

- a. Fails without fragmentation at any torque above the proof load
- b. Reaches 120% of the proof torque without failure

Shearing of the wrenching surfaces (teeth) with evidence of plastic deformation prior to fracture shall not be considered failure of the test. Shearing of the wrenching surfaces in a brittle manner shall be considered failure of the test.

3.8 Wrench Opening

3.8.1 Wrench Design

The internal wrench design of all Type I sockets, Type II wrenches, and Type III torque adaptors shall be of a 12-point double-hexagon configuration that when mated with bi-hexagonal fasteners conforming to the requirements of AS870 or ISO 4095, will transmit torque to the fastener without bearing on the outer 5% of the fastener's wrenching points (see Figure 1).

NOTE: $H = 1/2 \text{ (NOMINAL HEX)} (1/\text{COS}(30^\circ) - 1/\text{COS}(15^\circ))$

$H = (.0597) \text{ (NOMINAL HEX)}$

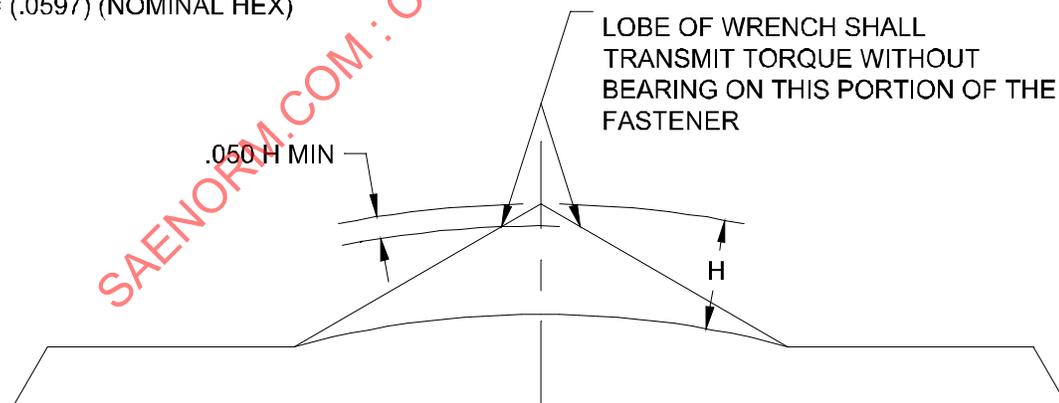
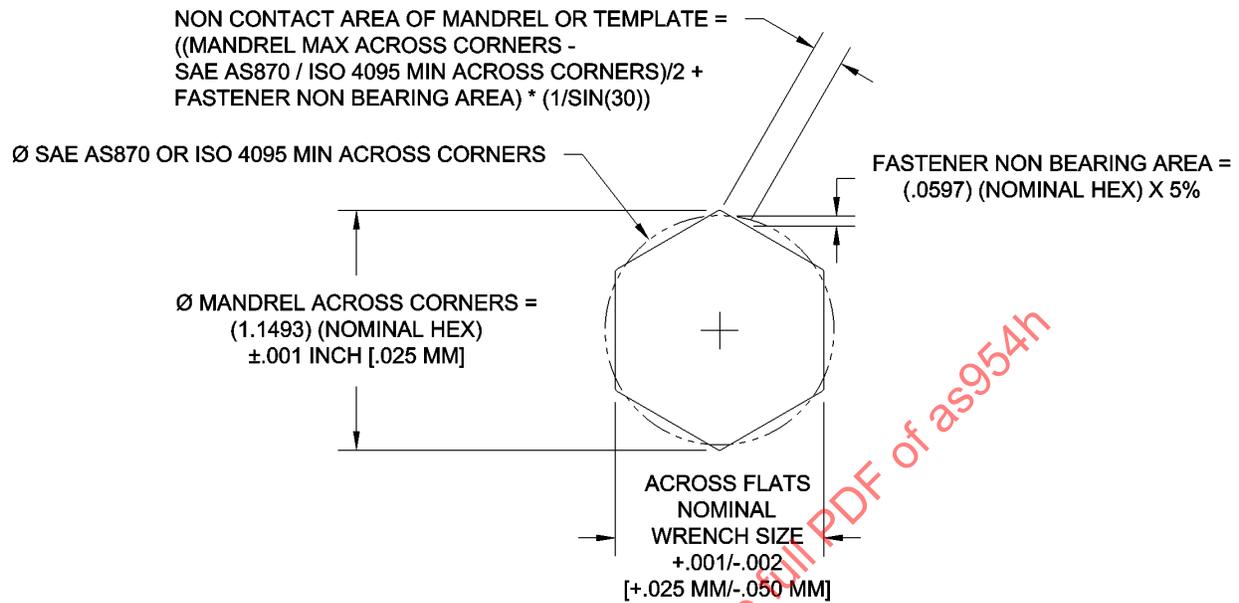


Figure 1 - Internal wrench engagement

3.8.2 Wrench Design Verification Test

Conformance of the wrench design to the requirements of 3.8.1 shall be demonstrated on a sample tool using a mandrel or a template. The mandrel or template shall conform to the requirements of Figure 2 and Table 2.



NOTE: DRAWING NOT TO SCALE FOR PURPOSE OF CLARITY

Figure 2 - Mandrel for wrench design verification test

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Table 2 - Hexagon mandrel or template dimensions for wrench design verification test**Table 2A - Wrench design verification test mandrel/template - inch sizes, primary dimensions in inches**

Nominal Wrench Size	Hexagon Across Flats Min (Inches)	Hexagon Across Flats Max (Inches)	Hexagon Across Corners Min (Inches)	Hexagon Across Corners Max (Inches)	AS870 Across Corners (A Min) Min (Inches)	Non-Bearing Area Min (Inches)	Non-Contact Area Min (Inches)	Non-Contact Area Min (Millimeters)
3/16	0.1855	0.1880	0.214	0.216	0.209	0.0006	0.008	0.20
7/32	0.2168	0.2193	0.250	0.252	0.244	0.0007	0.009	0.23
1/4	0.2480	0.2505	0.286	0.288	0.278	0.0007	0.011	0.28
9/32	0.2792	0.2818	0.322	0.324	0.313	0.0008	0.013	0.33
5/16	0.3105	0.3130	0.358	0.360	0.348	0.0009	0.014	0.36
11/32	0.3418	0.3443	0.394	0.396	0.385	0.0010	0.013	0.33
3/8	0.3730	0.3760	0.430	0.432	0.420	0.0011	0.014	0.36
7/16	0.4355	0.4385	0.502	0.504	0.490	0.0013	0.017	0.43
1/2	0.4980	0.5010	0.574	0.576	0.562	0.0015	0.017	0.43
9/16	0.5605	0.5635	0.645	0.647	0.632	0.0017	0.018	0.46
5/8	0.6230	0.6260	0.717	0.719	0.703	0.0019	0.020	0.51
11/16	0.6855	0.6885	0.789	0.791	0.775	0.0021	0.020	0.51
3/4	0.7480	0.7510	0.861	0.863	0.844	0.0022	0.023	0.58
25/32	0.7792	0.7822	0.897	0.899	0.879	0.0023	0.025	0.64
13/16	0.8105	0.8135	0.933	0.935	0.914	0.0024	0.026	0.66
7/8	0.8730	0.8760	1.005	1.007	0.986	0.0026	0.026	0.66
15/16	0.9355	0.9385	1.076	1.078	1.058	0.0028	0.026	0.66
1	0.9980	1.0010	1.148	1.150	1.129	0.0030	0.027	0.69
1-1/16	1.0605	1.0635	1.220	1.222	1.199	0.0032	0.029	0.74
1-1/8	1.1230	1.1260	1.292	1.294	1.271	0.0034	0.030	0.76
1-3/16	1.1855	1.1885	1.364	1.366	1.343	0.0035	0.030	0.76
1-1/4	1.2480	1.2510	1.436	1.438	1.409	0.0037	0.036	0.91
1-5/16	1.3105	1.3135	1.507	1.509	1.480	0.0039	0.037	0.94
1-3/8	1.3730	1.3760	1.579	1.581	1.552	0.0041	0.037	0.94
1-7/16	1.4355	1.4385	1.651	1.653	1.623	0.0043	0.039	0.99
1-1/2	1.4980	1.5010	1.723	1.725	1.694	0.0045	0.040	1.02
1-9/16	1.5605	1.5635	1.795	1.797	1.766	0.0047	0.040	1.02
1-5/8	1.6230	1.6260	1.867	1.869	1.837	0.0049	0.042	1.07
1-11/16	1.6855	1.6885	1.938	1.940	1.908	0.0050	0.042	1.07
1-3/4	1.7480	1.7510	2.010	2.012	1.979	0.0052	0.043	1.09

Table 2B - Wrench design verification test mandrel/template - metric sizes, primary dimensions in SI units

Nominal Wrench Size	Hexagon Across Flats Min (Millimeters)	Hexagon Across Flats Max (Millimeters)	Hexagon Across Corners Min (Millimeters)	Hexagon Across Corners Max (Millimeters)	ISO 4095 Across Corners (A Min) Min (Millimeters)	Non-Bearing Area Min (Millimeters)	Non-Contact Area Min (Millimeters)	Non-Contact Area Min (Inches)
5	4.950	5.015	5.720	5.770	5.54	0.015	0.24	0.010
5.5	5.450	5.515	6.295	6.345	6.11	0.016	0.24	0.010
6	5.950	6.025	6.875	6.925	6.67	0.018	0.27	0.011
7	6.950	7.025	8.025	8.075	7.77	0.021	0.32	0.013
8	7.950	8.025	9.165	9.215	8.91	0.024	0.33	0.013
9	8.950	9.025	10.315	10.365	10.04	0.027	0.35	0.014
10	9.950	10.025	11.465	11.515	11.18	0.030	0.37	0.015
11	10.950	11.025	12.615	12.665	12.28	0.033	0.43	0.017
12	11.950	12.025	13.765	13.815	13.42	0.036	0.44	0.017
13	12.950	13.025	14.915	14.965	14.51	0.039	0.51	0.020
14	13.950	14.025	16.065	16.115	15.65	0.042	0.52	0.021
15	14.950	15.025	17.215	17.265	16.79	0.045	0.54	0.021
16	15.950	16.025	18.365	18.415	17.93	0.048	0.56	0.022
17	16.950	17.025	19.515	19.565	19.07	0.051	0.57	0.023
18	17.950	18.025	20.665	20.715	20.21	0.054	0.59	0.023
19	18.950	19.025	21.815	21.865	21.28	0.057	0.67	0.026
20	19.950	20.025	22.965	23.015	22.42	0.060	0.69	0.027
21	20.950	21.025	24.115	24.165	23.56	0.063	0.71	0.028
22	21.950	22.025	25.255	25.305	24.70	0.066	0.71	0.028
23	22.950	23.025	26.405	26.455	25.84	0.069	0.73	0.029
24	23.950	24.025	27.555	27.605	26.98	0.072	0.74	0.029
25	24.950	25.025	28.705	28.755	28.12	0.075	0.76	0.030
26	25.950	26.025	29.855	29.905	29.26	0.078	0.78	0.031
27	26.950	27.025	31.005	31.055	30.40	0.081	0.79	0.031
28	27.950	28.025	32.155	32.205	31.54	0.084	0.81	0.032
29	28.950	29.025	33.305	33.355	32.68	0.087	0.82	0.032
30	29.950	30.025	34.455	34.505	33.82	0.090	0.84	0.033
32	31.950	32.025	36.755	36.805	36.04	0.096	0.93	0.037
34	33.950	34.025	39.055	39.105	38.32	0.101	0.96	0.038
36	35.950	36.025	41.345	41.395	40.60	0.107	0.98	0.039
41	40.950	41.025	47.095	47.145	46.30	0.122	1.06	0.042
46	45.950	46.025	52.845	52.895	52.00	0.137	1.14	0.045

- 3.8.2.1 The mandrel shall be of a nonferrous or ferrous material. When nonferrous material is used, torque shall be applied by the wrench to the mandrel to a level sufficient to cause an impression on the mandrel indicative of the loading pattern between the wrench and mandrel. When ferrous material is used, bluing shall be applied to the flats of the mandrel prior to the application of torque by the wrench to the mandrel to a level sufficient for the bluing to show the loading pattern. Care should be taken so that the true loading pattern can be discerned. The loading pattern shall not be on the corners of the mandrel.
- 3.8.2.2 The template shall be used in conjunction with an optical comparator. The centerline of the wrench configuration shall be placed on the centerline of the template and rotated until a point of contact between the wrench configuration and the template is established. The point of contact shall not be on the corners of the template.

3.8.3 Bolt and Nut End Opening Tolerance

Wrench opening tolerance shall be as specified in ASME B107.17. The bolt clearance hole shall not infringe on the internal wrench design or alter its shape for the minimum depth of the wrench opening "D" as depicted in Figures 3 through 8.

3.8.4 Clearance Holes

3.8.4.1 Through Hole Clearance

A through clearance hole with a minimum diameter of 1/2 the nominal square drive size, or equal to the bolt clearance diameter, shall extend completely through each socket.

3.8.4.2 Bolt Clearance Hole

The bolt clearance hole for all Type I sockets shall be in accordance with the diameter, length, and location defined in Figures 3 through 8 and Tables 3 through 8. The bolt clearance hole shall be measured using the gage defined in Appendix A. A "web" within the bolt clearance hole is acceptable provided all dimensional requirements are met. It is permissible for the wrench opening depth to be designed such that the minimum bolt clearance hole depth is completely contained within it.

3.9 Type I, Class 2, Universal Sockets

In addition to the requirements of 3.4, universal sockets shall be provided with a friction type device which will hold the drive end and the socket end in any set position with a force adequate to hold the universal joint against gravity. The hinge pin shall be solid and not extend beyond the periphery of the universal joint. The universal joint shall be capable of rotation in a complete arc when the angular deviation of either end member from the common centerline is 40 degrees.

3.10 Type II Box Wrenches and Type III Torque Adaptors

3.10.1 Type II, Class 1 Box Wrench, 15 Degree Angled End

The angled end box wrenches shall possess the wrenching design of 3.8.1 and shall conform to Figures 9 and 10 and Tables 9 and 10.

3.10.2 Type II, Class 2 Box Wrench, Modified Offset

The modified offset box wrenches shall possess the wrenching design of 3.8.1 and shall conform to Figures 9 and 11 and Tables 9 and 11.

3.10.3 Type II, Class 3 Box Wrench, Deep Offset

The deep offset box wrenches shall possess the wrenching design of 3.8.1 and shall conform to Figures 9 and 12 and Tables 9 and 12.

3.10.4 Type II, Class 4 Box Wrench, Combination

The combination box and open end wrenches shall have a box wrench head on one end and an open end wrench head on the other end. The box wrench head shall possess the wrenching design of 3.8.1 and shall conform to Figure 9 and Table 9. The open end wrench head shall conform to category 6 in ASME B107.100. The combination wrench shall conform to Figure 13 and Table 13.

3.10.5 Type III Torque Adaptor

Torque adaptors shall have a square drive at one end and a box wrench head with the wrenching design of 3.8.1 at the other end. One side of the square drive shall be within 3 degrees of parallel to a line drawn from the center of the drive through the center of the wrench opening. Torque adaptors shall conform to Figure 14 and Table 14.

3.11 Workmanship

All items covered herein shall be free from fins, burrs, external sharp or rough edges, corners, or surfaces and other defects which may impair their serviceability or durability. The inside edges of the sockets, box wrenches, and torque adaptors shall be chamfered.

3.11.1 Foreign Object Damage (FOD)

It is important to avoid damage to aircraft due to foreign objects. Rips, tears, broaching slugs, burrs, slivers, plating peel and/or any material which could be removed during gaging, load testing, or normal use and/or any indications of rust shall be unacceptable.

4. NOTES

4.1 Revision Indicator

A change bar (I) located in the left margin is for the convenience of the user in locating areas where technical revisions, not editorial changes, have been made to the previous issue of this document. An (R) symbol to the left of the document title indicates a complete revision of the document, including technical revisions. Change bars and (R) are not used in original publications nor in documents that contain editorial changes only.

4.2 Dimension Units

For tools with nominal sizes in inches, dimensions and properties in inches and pounds are primary; dimensions and properties in SI units are shown as the approximate equivalents of the primary units and are presented only for information.

For tools with nominal sizes in millimeters, dimensions and properties in SI units are primary; dimensions and properties in inches and pounds are shown as the approximate equivalents of the primary units and are presented only for information.

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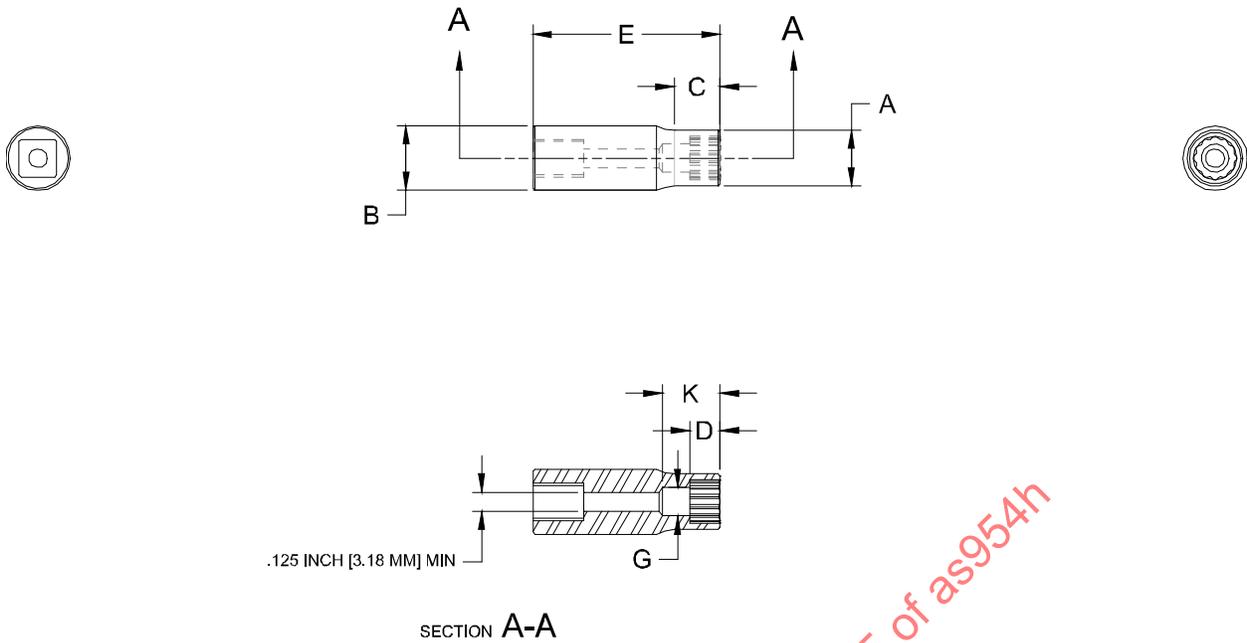


Figure 3 - Type I, Class 1 sockets - 1/4 inch square drive

Table 3 - Type I, Class 1 sockets - 1/4 inch square drive - inch and metric sizes

Table 3A - Type I, Class 1 sockets - 1/4 drive - inch sizes, primary dimensions in inches and pounds

Nominal Wrench Opening (Inches)	Nut End Diameter A Max (Inches)	Drive End Diameter B Max (Inches)	Wrench End Length C Min (Inches)	Wrench Opening Depth D Min (Inches)	Bolt Clearance Diameter G Min (Inches)	Style A Regular Length		Style B Long Length		Torque Requirements	
						Overall Length E Max (Inches)	Bolt Clearance Length K Min (Inches)	Overall Length E Min (Inches)	Bolt Clearance Length K Min (Inches)	Cyclic Load (lbf-in)	Proof Load (lbf-in)
3/16	0.315	0.440	0.175	0.175	0.157	1.270	0.342	1.930	1.158	140	200
7/32	0.343	0.440	0.190	0.190	0.190	1.270	0.357	1.930	1.158	150	225
1/4	0.380	0.440	0.205	0.205	0.190	1.270	0.393	1.930	1.158	210	300
9/32	0.430	0.440	0.215	0.215	0.250	1.270	0.429	1.930	1.158	260	375
5/16	0.470	0.470	-	0.250	0.250	1.270	0.464	1.930	1.158	310	450
11/32	0.500	0.500	-	0.265	0.313	1.270	0.515	1.930	1.158	360	525
3/8	0.550	0.550	-	0.265	0.313	1.270	0.515	1.930	1.158	420	600
7/16	0.635	0.635	-	0.345	0.375	1.270	0.595	1.930	1.158	420	600
1/2	0.687	0.687	-	0.350	0.438	1.270	0.650	1.930	1.158	420	600
9/16	0.750	0.750	-	0.355	0.500	1.270	0.655	1.930	1.158	420	600

Table 3B - Type I, Class 1 sockets - 1/4 drive - inch sizes, equivalent dimensions in SI units

Nominal Wrench Opening (Millimeters)	Nut End Diameter A Max (Millimeters)	Drive End Diameter B Max (Millimeters)	Wrench End Length C Min (Millimeters)	Wrench Opening Depth D Min (Millimeters)	Bolt Clearance Diameter G Min (Millimeters)	Style A Regular Length		Style B Long Length		Torque Requirements	
						Overall Length E Max (Millimeters)	Bolt Clearance Length K Min (Millimeters)	Overall Length E Min (Millimeters)	Bolt Clearance Length K Min (Millimeters)	Cyclic Load (N·m)	Proof Load (N·m)
3/16	8.00	11.18	4.45	4.45	3.99	32.26	8.69	49.02	29.41	16	23
7/32	8.71	11.18	4.83	4.83	4.83	32.26	9.07	49.02	29.41	17	25
1/4	9.65	11.18	5.21	5.21	4.83	32.26	9.98	49.02	29.41	24	34
9/32	10.92	11.18	5.46	5.46	6.35	32.26	10.90	49.02	29.41	29	42
5/16	11.94	11.94	-	6.35	6.35	32.26	11.79	49.02	29.41	35	51
11/32	12.70	12.70	-	6.73	7.95	32.26	13.08	49.02	29.41	41	59
3/8	13.97	13.97	-	6.73	7.95	32.26	13.08	49.02	29.41	47	68
7/16	16.13	16.13	-	8.76	9.53	32.26	15.11	49.02	29.41	47	68
1/2	17.45	17.45	-	8.89	11.13	32.26	16.51	49.02	29.41	47	68
9/16	19.05	19.05	-	9.02	12.70	32.26	16.64	49.02	29.41	47	68

Table 3C - Type I, Class 1 sockets - 1/4 drive - metric sizes, primary dimensions in SI units

Nominal Wrench Opening (Millimeters)	Nut End Diameter A Max (Millimeters)	Drive End Diameter B Max (Millimeters)	Wrench End Length C Min (Millimeters)	Wrench Opening Depth D Min (Millimeters)	Bolt Clearance Diameter G Min (Millimeters)	Style A Regular Length		Style B Long Length		Torque Requirements	
						Overall Length E Max (Millimeters)	Bolt Clearance Length K Min (Millimeters)	Overall Length E Min (Millimeters)	Bolt Clearance Length K Min (Millimeters)	Cyclic Load (N·m)	Proof Load (N·m)
5	8.15	12.95	4.00	4.00	3.50	32.25	8.00	49.00	29.40	12	17
5.5	8.90	12.95	4.50	4.50	4.00	32.25	9.00	49.00	29.40	15	22
6	9.90	12.95	5.00	5.00	4.50	32.25	10.00	49.00	29.40	20	28
7	10.90	12.95	5.50	5.50	5.50	32.25	11.00	49.00	29.40	29	42
8	12.20	12.95	6.40	6.40	6.50	32.25	12.00	49.00	29.40	41	58
9	13.45	13.45	-	6.70	7.50	32.25	13.00	49.00	29.40	49	70
10	14.75	14.75	-	6.70	8.50	32.25	14.00	49.00	29.40	49	70
11	16.00	16.00	-	8.30	9.50	32.25	15.00	49.00	29.40	49	70
12	17.30	17.30	-	8.90	10.50	32.25	16.00	49.00	29.40	49	70
13	18.55	18.55	-	8.90	11.50	32.25	17.00	49.00	29.40	49	70
14	19.80	19.80	-	9.00	12.50	32.25	18.00	49.00	29.40	49	70
15	21.50	21.50	-	10.00	13.50	32.25	19.00	49.00	29.40	49	70
16	22.00	22.00	-	11.20	14.50	32.25	20.00	49.00	29.40	49	70

Table 3D - Type I, Class 1 sockets - 1/4 drive - metric sizes, equivalent dimensions in inches and pounds

Nominal Wrench Opening (Millimeters)	Nut End Diameter A Max (Inches)	Drive End Diameter B Max (Inches)	Wrench End Length C Min (Inches)	Wrench Opening Depth D Min (Inches)	Bolt Clearance Diameter G Min (Inches)	Style A Regular Length		Style B Long Length		Torque Requirements	
						Overall Length E Max (Inches)	Bolt Clearance Length K Min (Inches)	Overall Length E Min (Inches)	Bolt Clearance Length K Min (Inches)	Cyclic Load (lbf·in)	Proof Load (lbf·in)
5	0.321	0.510	0.157	0.157	0.138	1.270	0.315	1.929	29.400	106	150
5.5	0.350	0.510	0.177	0.177	0.157	1.270	0.354	1.929	29.400	133	195
6	0.390	0.510	0.197	0.197	0.177	1.270	0.394	1.929	29.400	177	248
7	0.429	0.510	0.217	0.217	0.217	1.270	0.433	1.929	29.400	257	372
8	0.480	0.510	0.252	0.252	0.256	1.270	0.472	1.929	29.400	363	513
9	0.530	0.530	-	0.264	0.295	1.270	0.512	1.929	29.400	434	620
10	0.581	0.581	-	0.264	0.335	1.270	0.551	1.929	29.400	434	620
11	0.630	0.630	-	0.327	0.374	1.270	0.591	1.929	29.400	434	620
12	0.681	0.681	-	0.350	0.413	1.270	0.630	1.929	29.400	434	620
13	0.730	0.730	-	0.350	0.453	1.270	0.669	1.929	29.400	434	620
14	0.780	0.780	-	0.354	0.492	1.270	0.709	1.929	29.400	434	620
15	0.846	0.846	-	0.394	0.531	1.270	0.748	1.929	29.400	434	620
16	0.866	0.866	-	0.441	0.571	1.270	0.787	1.929	29.400	434	620

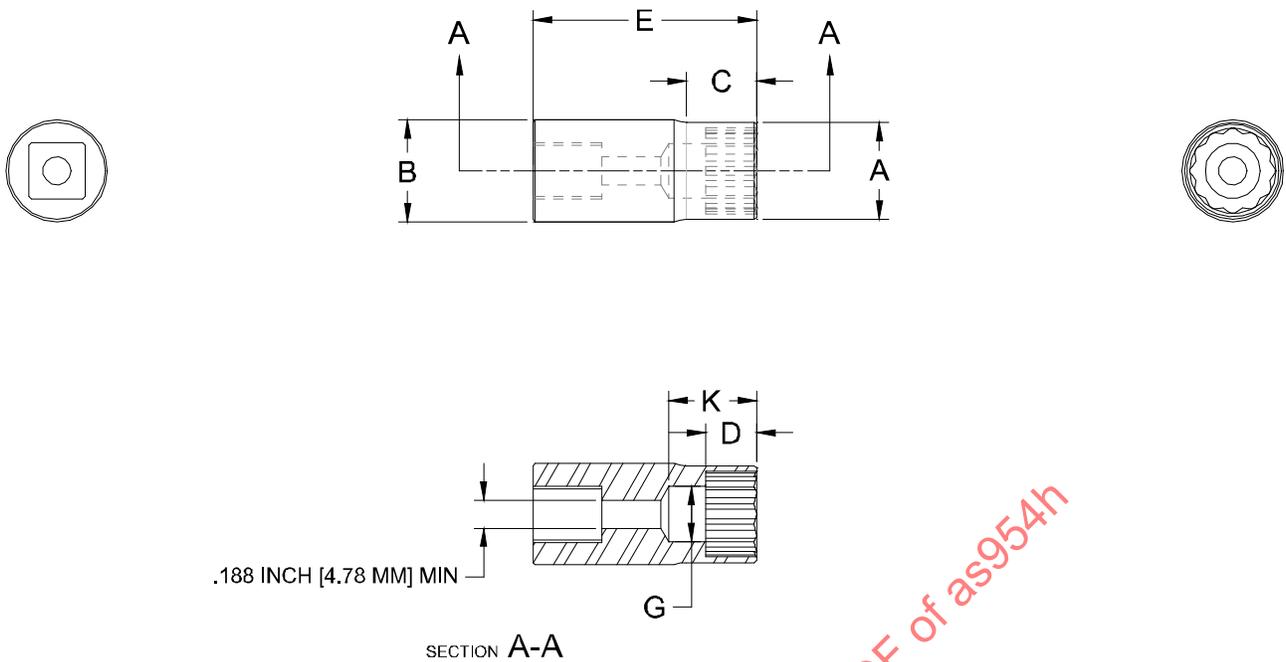


Figure 4 - Type I, Class 1 sockets - 3/8 inch square drive

Table 4 - Type I, Class 1 sockets - 3/8 inch square drive - inch and metric sizes

Table 4A - Type I, Class 1 sockets - 3/8 drive - inch sizes, primary dimensions in inches and pounds

Nominal Wrench Opening (Inches)	Nut End Diameter A Max (Inches)	Drive End Diameter B Max (Inches)	Wrench End Length C (Inches)	Wrench Opening Depth D Min (Inches)	Bolt Clearance Diameter G Min (Inches)	Style A Regular Length		Style B Long Length		Torque Requirements	
						Overall Length E Max (Inches)	Bolt Clearance Length K Min (Inches)	Overall Length E Min (Inches)	Bolt Clearance Length K Min (Inches)	Cyclic Load (lbf-in)	Proof Load (lbf-in)
1/4	0.400	0.690	0.205	0.205	0.190	1.270	0.393	1.930	1.158	210	300
9/32	0.435	0.690	0.215	0.215	0.250	1.270	0.429	1.930	1.158	260	375
5/16	0.470	0.690	0.265	0.250	0.250	1.270	0.464	1.930	1.158	310	450
11/32	0.499	0.690	0.265	0.265	0.313	1.270	0.515	1.930	1.158	470	675
3/8	0.550	0.690	0.265	0.265	0.313	1.520	0.515	1.930	1.158	630	900
7/16	0.660	0.690	0.345	0.345	0.375	1.520	0.595	1.930	1.158	870	1250
1/2	0.730	0.730	-	0.350	0.438	1.780	0.650	1.930	1.158	1680	2400
9/16	0.812	0.812	-	0.355	0.500	1.780	0.655	1.930	1.158	1750	2500
5/8	0.880	0.880	-	0.460	0.563	1.780	0.760	2.000	1.200	1750	2500
11/16	0.960	0.960	-	0.500	0.625	1.780	0.833	2.125	1.275	1750	2500
3/4	1.055	1.055	-	0.590	0.688	1.780	0.965	2.125	1.275	1750	2500
25/32	1.070	1.070	-	0.620	0.688	1.780	0.995	2.125	1.275	1750	2500
13/16	1.130	1.130	-	0.650	0.688	1.780	1.025	2.180	1.308	1750	2500
7/8	1.195	1.195	-	0.700	0.750	1.780	1.129	2.180	1.308	1750	2500
15/16	1.250	1.250	-	0.720	0.813	1.780	1.179	2.250	1.350	1750	2500
1	1.312	1.312	-	0.730	0.875	1.780	1.230	2.250	1.350	1750	2500

Table 4B - Type I, Class 1 sockets - 3/8 drive - inch sizes, equivalent dimensions in SI units

Nominal Wrench Opening (Inches)	Nut End Diameter A Max (Millimeters)	Drive End Diameter B Max (Millimeters)	Wrench End Length C Min (Millimeters)	Wrench Opening Depth D Min (Millimeters)	Bolt Clearance Diameter G Min (Millimeters)	Style A Regular Length		Style B Long Length		Torque Requirements	
						Overall Length E Max (Millimeters)	Bolt Clearance Length K Min (Millimeters)	Overall Length E Min (Millimeters)	Bolt Clearance Length K Min (Millimeters)	Cyclic Load (N·m)	Proof Load (N·m)
1/4	10.16	17.53	5.21	5.21	4.83	32.26	9.98	49.02	29.41	24	34
9/32	11.05	17.53	5.46	5.46	6.35	32.26	10.90	49.02	29.41	29	42
5/16	11.94	17.53	6.73	6.35	6.35	32.26	11.79	49.02	29.41	35	51
11/32	12.67	17.53	6.73	6.73	7.95	32.26	13.08	49.02	29.41	53	76
3/8	13.97	17.53	6.73	6.73	7.95	38.61	13.08	49.02	29.41	71	102
7/16	16.76	17.53	8.76	8.76	9.53	38.61	15.11	49.02	29.41	98	141
1/2	18.54	18.54	-	8.89	11.13	45.21	16.51	49.02	29.41	190	271
9/16	20.62	20.62	-	9.02	12.70	45.21	16.64	49.02	29.41	198	282
5/8	22.35	22.35	-	11.68	14.30	45.21	19.30	50.80	30.48	198	282
11/16	24.38	24.38	-	12.70	15.88	45.21	21.16	53.98	32.39	198	282
3/4	26.80	26.80	-	14.99	17.48	45.21	24.51	53.98	32.39	198	282
25/32	27.18	27.18	-	15.75	17.48	45.21	25.27	53.98	32.39	198	282
13/16	28.70	28.70	-	16.51	17.48	45.21	26.04	55.37	33.22	198	282
7/8	30.35	30.35	-	17.78	19.05	45.21	28.68	55.37	33.22	198	282
15/16	31.75	31.75	-	18.29	20.65	45.21	29.95	57.15	34.29	198	282
1	33.32	33.32	-	18.54	22.23	45.21	31.24	57.15	34.29	198	282

Table 4C - Type I, Class 1 sockets - 3/8 drive - metric sizes, primary dimensions in SI units

Nominal Wrench Opening (Millimeters)	Nut End Diameter A Max (Millimeters)	Drive End Diameter B Max (Millimeters)	Wrench End Length C Min (Millimeters)	Wrench Opening Depth D Min (Millimeters)	Bolt Clearance Diameter G Min (Millimeters)	Style A Regular Length		Style B Long Length		Torque Requirements	
						Overall Length E Max (Millimeters)	Bolt Clearance Length K Min (Millimeters)	Overall Length E Min (Millimeters)	Bolt Clearance Length K Min (Millimeters)	Cyclic Load (N·m)	Proof Load (N·m)
5.5	10.10	17.60	4.50	4.50	4.00	32.25	9.00	49.00	29.40	15	21
6	10.10	17.60	5.00	5.00	4.50	32.25	10.00	49.00	29.40	20	28
7	11.05	17.60	5.50	5.50	5.50	32.25	11.00	49.00	29.40	29	42
8	12.20	17.60	6.40	6.40	6.50	32.25	12.00	49.00	29.40	43	62
9	13.60	17.60	6.70	6.70	7.50	32.25	13.00	49.00	29.40	62	89
10	15.00	17.60	6.70	6.70	8.50	38.50	14.00	49.00	29.40	84	120
11	16.75	17.60	8.30	8.30	9.50	38.50	15.00	49.00	29.40	108	155
12	17.80	22.40	8.90	8.90	10.50	38.50	16.00	49.00	29.40	144	205
13	18.80	22.40	8.90	8.90	11.50	45.25	17.00	49.00	29.40	182	260
14	20.00	22.40	9.00	9.00	12.50	45.25	18.00	49.00	29.40	196	280
15	22.40	22.40	-	10.00	13.50	45.25	19.00	49.00	29.40	196	280
16	22.50	22.50	-	11.20	14.50	45.25	20.00	50.00	30.00	196	280
17	23.80	23.80	-	12.70	15.00	45.25	21.00	50.00	30.00	196	280
18	24.60	24.60	-	13.50	16.00	45.25	22.00	54.00	32.40	196	280
19	25.70	25.70	-	15.00	17.00	45.25	24.50	54.00	32.40	196	280
20	27.76	27.76	-	15.20	18.00	45.25	25.50	54.00	32.40	196	280
21	28.80	28.80	-	16.00	19.00	45.25	26.00	63.00	37.80	196	280
22	30.00	30.00	-	17.80	19.00	45.25	28.50	63.00	37.80	196	280
23	31.30	31.30	-	17.80	20.00	45.25	29.00	64.00	38.40	196	280
24	32.50	32.50	-	18.30	21.00	45.25	30.00	65.00	39.00	196	280
25	33.00	33.00	-	18.30	22.00	45.25	31.00	67.00	40.20	196	280
26	35.00	35.00	-	18.30	22.50	45.25	31.25	67.00	40.20	196	280

Table 4D - Type I, Class 1 sockets - 3/8 drive - metric sizes, equivalent dimensions in inches and pounds

Nominal Wrench Opening (Millimeters)	Nut End Diameter A Max (Inches)	Drive End Diameter B Max (Inches)	Wrench End Length C Min (Inches)	Wrench Opening Depth D Min (Inches)	Bolt Clearance Diameter G Min (Inches)	Style A Regular Length		Style B Long Length		Torque Requirements	
						Overall Length E Max (Inches)	Bolt Clearance Length K Min (Inches)	Overall Length E Min (Inches)	Bolt Clearance Length K Min (Inches)	Cyclic Load (lbf-in)	Proof Load (lbf-in)
5.5	0.398	0.693	0.177	0.177	0.157	1.270	0.354	1.929	1.157	133	186
6	0.398	0.693	0.197	0.197	0.177	1.270	0.394	1.929	1.157	177	248
7	0.435	0.693	0.217	0.217	0.217	1.270	0.433	1.929	1.157	257	372
8	0.480	0.693	0.252	0.252	0.256	1.270	0.472	1.929	1.157	381	549
9	0.535	0.693	0.264	0.264	0.295	1.270	0.512	1.929	1.157	549	788
10	0.591	0.693	0.264	0.264	0.335	1.516	0.551	1.929	1.157	743	1062
11	0.659	0.693	0.327	0.327	0.374	1.516	0.591	1.929	1.157	956	1372
12	0.701	0.882	0.350	0.350	0.413	1.516	0.630	1.929	1.157	1275	1814
13	0.740	0.882	0.350	0.350	0.453	1.781	0.669	1.929	1.157	1611	2301
14	0.787	0.882	0.354	0.354	0.492	1.781	0.709	1.929	1.157	1735	2478
15	0.882	0.882	-	0.394	0.531	1.781	0.748	1.929	1.157	1735	2478
16	0.886	0.886	-	0.441	0.571	1.781	0.787	1.969	1.181	1735	2478
17	0.937	0.937	-	0.500	0.591	1.781	0.827	1.969	1.181	1735	2478
18	0.969	0.969	-	0.531	0.630	1.781	0.866	2.126	1.276	1735	2478
19	1.012	1.012	-	0.591	0.669	1.781	0.965	2.126	1.276	1735	2478
20	1.093	1.093	-	0.598	0.709	1.781	1.004	2.126	1.276	1735	2478
21	1.134	1.134	-	0.630	0.748	1.781	1.024	2.480	1.488	1735	2478
22	1.181	1.181	-	0.701	0.748	1.781	1.122	2.480	1.488	1735	2478
23	1.232	1.232	-	0.701	0.787	1.781	1.142	2.520	1.512	1735	2478
24	1.280	1.280	-	0.720	0.827	1.781	1.181	2.559	1.535	1735	2478
25	1.299	1.299	-	0.720	0.866	1.781	1.220	2.638	1.583	1735	2478
26	1.378	1.378	-	0.720	0.886	1.781	1.230	2.638	1.583	1735	2478

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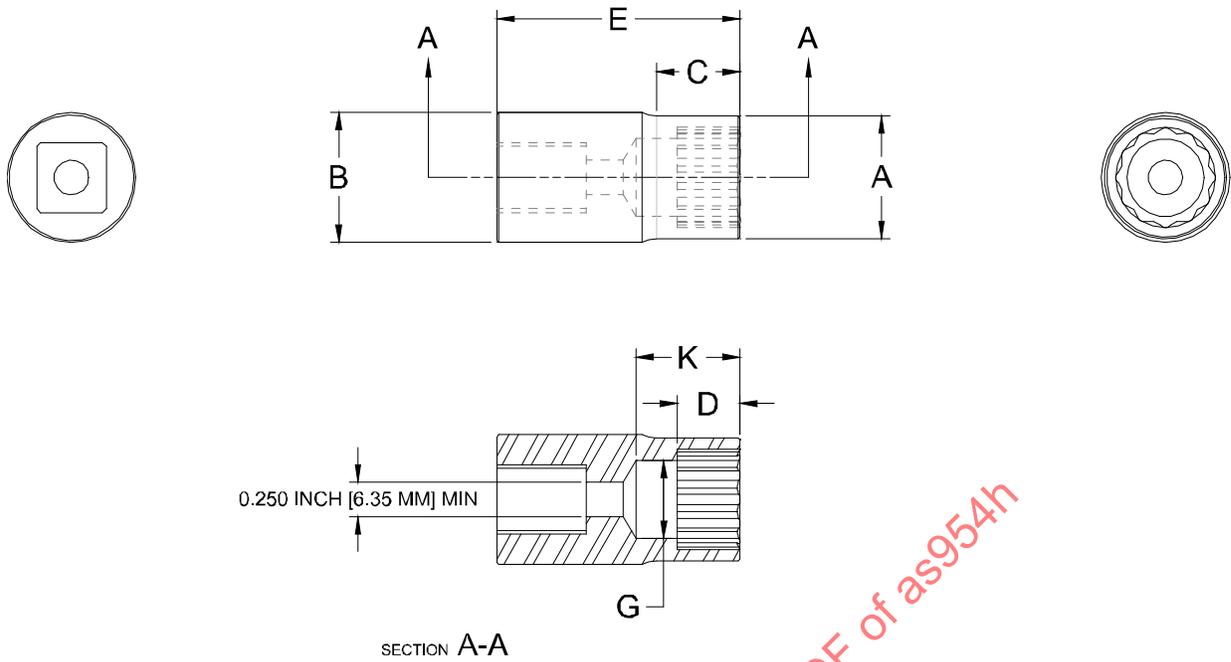


Figure 5 - Type I, Class 1 sockets - 1/2 inch square drive

Table 5 - Type I, Class 1 sockets - 1/2 inch square drive - inch and metric sizes

Table 5A - Type I, Class 1 sockets - 1/2 drive - inch sizes, primary dimensions in inches and pounds

Nominal Wrench Opening (Inches)	Nut End Diameter A Max (Inches)	Drive End Diameter B Max (Inches)	Wrench End Length C (Inches)	Wrench Opening Depth D (Inches)	Bolt Clearance Diameter G (Inches)	Style A Regular Length		Style B Long Length		Torque Requirements	
						Overall Length E (Inches)	Bolt Clearance Length K (Inches)	Overall Length E (Inches)	Bolt Clearance Length K (Inches)	Cyclic Load (lbf-in)	Proof Load (lbf-in)
3/8	0.580	0.880	0.265	0.265	0.313	1.780	0.515	2.930	1.758	840	1200
7/16	0.680	0.940	0.345	0.345	0.375	1.780	0.595	2.930	1.758	1190	1700
1/2	0.740	0.940	0.350	0.350	0.438	1.780	0.650	2.930	1.758	1680	2400
9/16	0.818	0.940	0.355	0.355	0.500	1.780	0.655	2.930	1.758	2520	3600
5/8	0.892	0.940	0.460	0.460	0.563	1.780	0.760	2.930	1.758	2800	4000
11/16	0.960	0.960	-	0.500	0.625	1.780	0.833	2.930	1.758	3850	5500
3/4	1.055	1.055	-	0.590	0.688	1.780	0.965	2.930	1.758	4200	6000
25/32	1.070	1.070	-	0.620	0.688	1.780	0.995	2.930	1.758	4200	6000
13/16	1.130	1.130	-	0.650	0.688	1.780	1.025	2.930	1.758	4200	6000
7/8	1.200	1.200	-	0.700	0.750	1.850	1.129	2.930	1.758	4200	6000
15/16	1.300	1.300	-	0.720	0.813	1.900	1.179	2.930	1.758	4200	6000
1	1.370	1.370	-	0.730	0.875	1.950	1.230	2.930	1.758	4200	6000
1-1/16	1.440	1.440	-	0.750	0.938	1.970	1.250	2.930	1.758	4200	6000
1-1/8	1.510	1.510	-	0.780	1.000	2.000	1.280	2.930	1.758	4200	6000
1-3/16	1.550	1.550	-	0.790	1.063	2.030	1.290	2.930	1.758	4200	6000
1-1/4	1.580	1.580	-	0.810	1.063	2.050	1.310	2.930	1.758	4200	6000
1-5/16	1.650	1.650	-	0.840	1.125	2.070	1.340	2.930	1.758	4200	6000

Table 5B - Type I, Class 1 sockets - 1/2 drive - inch sizes, equivalent dimensions in SI units

Nominal Wrench Opening (Inches)	Nut End Diameter A Max (Millimeters)	Drive End Diameter B Max (Millimeters)	Wrench End Length C Min (Millimeters)	Wrench Opening Depth D Min (Millimeters)	Bolt Clearance Diameter G Min (Millimeters)	Style A Regular Length		Style B Long Length		Torque Requirements	
						Overall Length E Max (Millimeters)	Bolt Clearance Length K Min (Millimeters)	Overall Length E Min (Millimeters)	Bolt Clearance Length K Min (Millimeters)	Cyclic Load (N·m)	Proof Load (N·m)
3/8	14.73	22.35	6.73	6.73	7.95	45.21	13.08	74.42	44.65	95	136
7/16	17.27	23.88	8.76	8.76	9.53	45.21	15.11	74.42	44.65	134	192
1/2	18.80	23.88	8.89	8.89	11.13	45.21	16.51	74.42	44.65	190	271
9/16	20.78	23.88	9.02	9.02	12.70	45.21	16.64	74.42	44.65	285	407
5/8	22.66	23.88	11.68	11.68	14.30	45.21	19.30	74.42	44.65	316	452
11/16	24.38	24.38	-	12.70	15.88	45.21	21.16	74.42	44.65	435	621
3/4	26.80	26.80	-	14.99	17.48	45.21	24.51	74.42	44.65	475	678
25/32	27.18	27.18	-	15.75	17.48	45.21	25.27	74.42	44.65	475	678
13/16	28.70	28.70	-	16.51	17.48	45.21	26.04	74.42	44.65	475	678
7/8	30.48	30.48	-	17.78	19.05	46.99	28.68	74.42	44.65	475	678
15/16	33.02	33.02	-	18.29	20.65	48.26	29.95	74.42	44.65	475	678
1	34.80	34.80	-	18.54	22.23	49.53	31.24	74.42	44.65	475	678
1-1/16	36.58	36.58	-	19.05	23.83	50.04	31.75	74.42	44.65	475	678
1-1/8	38.35	38.35	-	19.81	25.40	50.80	32.51	74.42	44.65	475	678
1-3/16	39.37	39.37	-	20.07	27.00	51.56	32.77	74.42	44.65	475	678
1-1/4	40.13	40.13	-	20.57	27.00	52.07	33.27	74.42	44.65	475	678
1-5/16	41.91	41.91	-	21.34	28.58	52.58	34.04	74.42	44.65	475	678

Table 5C - Type I, Class 1 sockets - 1/2 drive - metric sizes, primary dimensions in SI units

Nominal Wrench Opening (Millimeters)	Nut End Diameter A Max (Millimeters)	Drive End Diameter B Max (Millimeters)	Wrench End Length C Min (Millimeters)	Wrench Opening Depth D Min (Millimeters)	Bolt Clearance Diameter G Min (Millimeters)	Style A Regular Length		Style B Long Length		Torque Requirements	
						Overall Length E Max (Millimeters)	Bolt Clearance Length K Min (Millimeters)	Overall Length E Min (Millimeters)	Bolt Clearance Length K Min (Millimeters)	Cyclic Load (N·m)	Proof Load (N·m)
8	14.00	23.87	6.40	6.40	6.50	45.25	12.00	76.00	45.60	56	80
9	15.10	23.87	6.70	6.70	7.50	45.25	13.00	76.00	45.60	77	110
10	16.80	23.87	6.70	6.70	8.50	45.25	14.00	76.00	45.60	108	155
11	18.20	23.87	8.30	8.30	9.50	45.25	15.00	76.00	45.60	136	195
12	18.70	23.87	8.90	8.90	10.50	45.25	16.00	76.00	45.60	168	240
13	20.25	23.87	8.90	8.90	11.50	45.25	17.00	76.00	45.60	206	295
14	21.80	23.87	9.00	9.00	12.50	45.25	18.00	76.00	45.60	245	350
15	22.40	23.87	10.00	10.00	13.50	45.25	19.00	76.00	45.60	294	420
16	23.87	23.87	-	11.20	14.50	45.25	20.00	76.00	45.60	340	485
17	24.75	24.75	-	12.70	15.00	45.25	21.00	76.00	45.60	392	560
18	26.14	26.14	-	13.50	16.00	45.25	22.00	76.00	45.60	476	680
19	27.20	27.20	-	15.00	17.00	45.25	24.50	76.00	45.60	476	680
20	27.95	27.95	-	15.20	18.00	45.25	25.50	76.00	45.60	476	680
21	28.95	28.95	-	16.00	19.00	45.25	26.00	76.00	45.60	476	680
22	30.20	30.20	-	17.80	19.00	47.00	28.50	76.00	45.60	476	680
23	31.25	31.25	-	17.80	20.00	48.50	29.00	76.00	45.60	476	680
24	32.15	32.15	-	18.30	21.00	48.50	30.00	76.00	45.60	476	680
25	33.40	33.40	-	18.30	22.00	49.50	31.00	76.00	45.60	476	680
26	35.05	35.05	-	18.30	22.50	50.00	31.25	76.00	45.60	476	680
27	36.75	36.75	-	19.10	23.00	50.00	31.50	76.00	45.60	476	680
28	37.80	37.80	-	19.10	23.50	50.50	31.75	76.00	45.60	476	680
29	39.50	39.50	-	19.30	24.00	51.00	32.00	76.00	45.60	476	680
30	42.40	42.40	-	20.30	25.00	51.50	32.50	76.00	45.60	476	680
32	44.05	44.05	-	20.60	27.00	52.00	33.00	76.00	45.60	476	680

Table 5D - Type I, Class 1 sockets - 1/2 drive - metric sizes, equivalent dimensions in inches and pounds

Nominal Wrench Opening (Millimeters)	Nut End Diameter A Max (Inches)	Drive End Diameter B Max (Inches)	Wrench End Length C Min (Inches)	Wrench Opening Depth D Min (Inches)	Bolt Clearance Diameter G Min (Inches)	Style A Regular Length		Style B Long Length		Torque Requirements	
						Overall Length E Max (Inches)	Bolt Clearance Length K Min (Inches)	Overall Length E Min (Inches)	Bolt Clearance Length K Min (Inches)	Cyclic Load (lbf-in)	Proof Load (lbf-in)
8	0.551	0.940	0.252	0.252	0.256	1.781	0.472	2.992	1.795	496	708
9	0.594	0.940	0.264	0.264	0.295	1.781	0.512	2.992	1.795	682	974
10	0.661	0.940	0.264	0.264	0.335	1.781	0.551	2.992	1.795	956	1372
11	0.717	0.940	0.327	0.327	0.374	1.781	0.591	2.992	1.795	1204	1726
12	0.736	0.940	0.350	0.350	0.413	1.781	0.630	2.992	1.795	1487	2124
13	0.797	0.940	0.350	0.350	0.453	1.781	0.669	2.992	1.795	1823	2611
14	0.858	0.940	0.354	0.354	0.492	1.781	0.709	2.992	1.795	2168	3098
15	0.882	0.940	0.394	0.394	0.531	1.781	0.748	2.992	1.795	2602	3717
16	0.940	0.940	-	0.441	0.571	1.781	0.787	2.992	1.795	3009	4293
17	0.974	0.974	-	0.500	0.591	1.781	0.827	2.992	1.795	3469	4956
18	1.029	1.029	-	0.531	0.630	1.781	0.866	2.992	1.795	4213	6019
19	1.071	1.071	-	0.591	0.669	1.781	0.965	2.992	1.795	4213	6019
20	1.100	1.100	-	0.598	0.709	1.781	1.004	2.992	1.795	4213	6019
21	1.140	1.140	-	0.630	0.748	1.781	1.024	2.992	1.795	4213	6019
22	1.189	1.189	-	0.701	0.748	1.850	1.122	2.992	1.795	4213	6019
23	1.230	1.230	-	0.701	0.787	1.909	1.142	2.992	1.795	4213	6019
24	1.266	1.266	-	0.720	0.827	1.909	1.181	2.992	1.795	4213	6019
25	1.315	1.315	-	0.720	0.866	1.949	1.220	2.992	1.795	4213	6019
26	1.380	1.380	-	0.720	0.886	1.969	1.230	2.992	1.795	4213	6019
27	1.447	1.447	-	0.752	0.906	1.969	1.240	2.992	1.795	4213	6019
28	1.488	1.488	-	0.752	0.925	1.988	1.250	2.992	1.795	4213	6019
29	1.555	1.555	-	0.760	0.945	2.008	1.260	2.992	1.795	4213	6019
30	1.669	1.669	-	0.799	0.984	2.028	1.280	2.992	1.795	4213	6019
32	1.734	1.734	-	0.811	1.063	2.047	1.299	2.992	1.795	4213	6019

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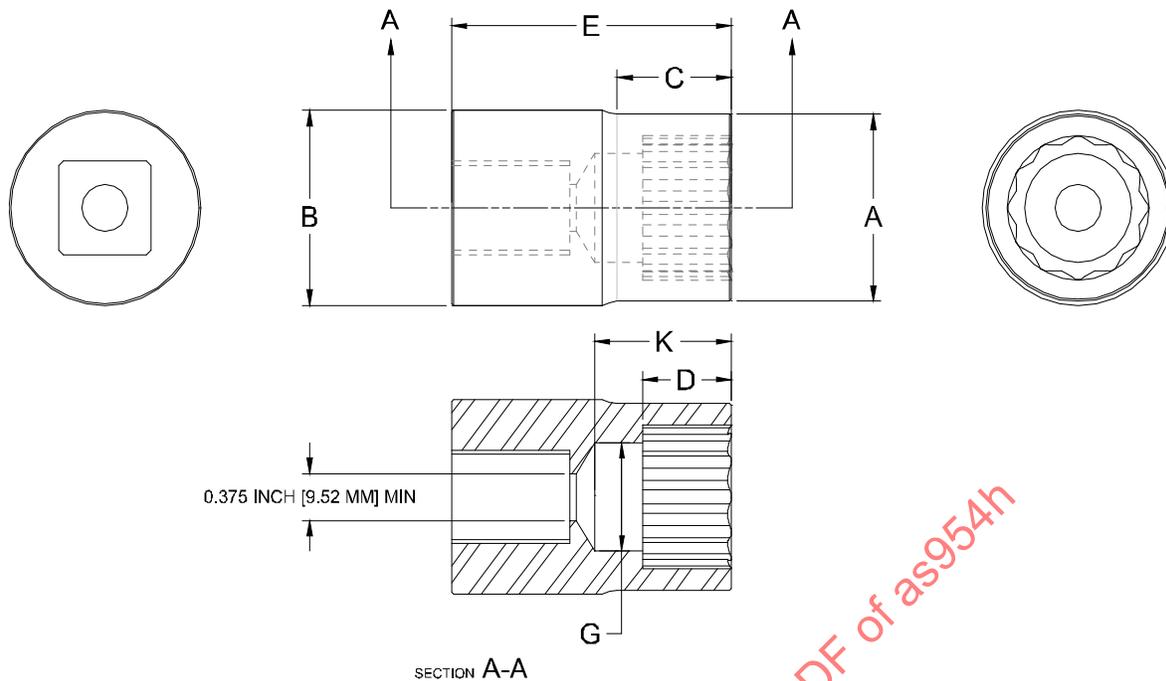


Figure 6 - Type I, Class 1 sockets - 3/4 inch square drive

Table 6 - Type I, Class 1 sockets - 3/4 inch square drive - inch and metric sizes

Table 6A - Type I, Class 1 sockets - 3/4 drive - inch sizes, primary dimensions in inches and pounds

Nominal Wrench Opening (Inches)	Nut End Diameter A Max (Inches)	Drive End Diameter B Max (Inches)	Wrench End Length C Min (Inches)	Wrench Opening Depth D Min (Inches)	Bolt Clearance Diameter G Min (Inches)	Style A Regular Length		Torque Requirements	
						Overall Length E Max (Inches)	Bolt Clearance Length K Min (Inches)	Cyclic Load (lbf-in)	Proof Load (lbf-in)
3/4	1.200	1.500	0.737	0.590	0.688	2.300	0.965	7350	10500
13/16	1.295	1.500	0.813	0.650	0.688	2.300	1.025	7700	11000
7/8	1.340	1.500	0.875	0.700	0.750	2.300	1.129	10500	15000
15/16	1.420	1.500	0.900	0.720	0.813	2.300	1.179	11900	17000
1	1.510	1.575	0.938	0.730	0.875	2.300	1.230	12600	18000
1-1/16	1.575	1.575	-	0.750	0.938	2.300	1.250	12600	18000
1-1/8	1.635	1.635	-	0.780	1.000	2.350	1.280	12600	18000
1-3/16	1.700	1.700	-	0.790	1.063	2.350	1.290	12600	18000
1-1/4	1.825	1.825	-	0.810	1.063	2.400	1.310	12600	18000
1-5/16	1.920	1.920	-	0.840	1.125	2.700	1.340	12600	18000
1-3/8	1.980	1.980	-	0.900	1.188	2.700	1.400	12600	18000
1-7/16	2.075	2.075	-	0.950	1.250	2.700	1.450	12600	18000
1-1/2	2.135	2.135	-	1.000	1.313	2.700	1.500	12600	18000
1-9/16	2.200	2.200	-	1.050	1.375	2.700	1.550	12600	18000
1-5/8	2.270	2.270	-	1.100	1.438	2.700	1.600	12600	18000
1-11/16	2.400	2.400	-	1.150	1.500	3.200	1.650	12600	18000
1-3/4	2.510	2.510	-	1.200	1.563	3.200	1.700	12600	18000

Table 6B - Type I, Class 1 sockets - 3/4 drive - inch sizes, equivalent dimensions in SI units

Nominal Wrench Opening (Inches)	Nut End Diameter A Max (Millimeters)	Drive End Diameter B Max (Millimeters)	Wrench End Length C Min (Millimeters)	Wrench Opening Depth D Min (Millimeters)	Bolt Clearance Diameter G Min (Millimeters)	Style A Regular Length		Torque Requirements	
						Overall Length E Max (Millimeters)	Bolt Clearance Length K Min (Millimeters)	Cyclic Load (N·m)	Proof Load (N·m)
3/4	30.48	38.10	18.72	14.99	17.48	58.42	24.51	830	1186
13/16	32.89	38.10	20.65	16.51	17.48	58.42	26.04	870	1243
7/8	34.04	38.10	22.23	17.78	19.05	58.42	28.68	1186	1695
15/16	36.07	38.10	22.86	18.29	20.65	58.42	29.95	1345	1921
1	38.35	40.01	23.83	18.54	22.23	58.42	31.24	1424	2034
1-1/16	40.01	40.01	-	19.05	23.83	58.42	31.75	1424	2034
1-1/8	41.53	41.53	-	19.81	25.40	59.69	32.51	1424	2034
1-3/16	43.18	43.18	-	20.07	27.00	59.69	32.77	1424	2034
1-1/4	46.36	46.36	-	20.57	27.00	60.96	33.27	1424	2034
1-5/16	48.77	48.77	-	21.34	28.58	68.58	34.04	1424	2034
1-3/8	50.29	50.29	-	22.86	30.18	68.58	35.56	1424	2034
1-7/16	52.71	52.71	-	24.13	31.75	68.58	36.83	1424	2034
1-1/2	54.23	54.23	-	25.40	33.35	68.58	38.10	1424	2034
1-9/16	55.88	55.88	-	26.67	34.93	68.58	39.37	1424	2034
1-5/8	57.66	57.66	-	27.94	36.53	68.58	40.64	1424	2034
1-11/16	60.96	60.96	-	29.21	38.10	81.28	41.91	1424	2034
1-3/4	63.75	63.75	-	30.48	39.70	81.28	43.18	1424	2034

Table 6C - Type I, Class 1 sockets - 3/4 drive - metric sizes, primary dimensions in SI units

Nominal Wrench Opening (Millimeters)	Nut End Diameter A Max (Millimeters)	Drive End Diameter B Max (Millimeters)	Wrench End Length C Min (Millimeters)	Wrench Opening Depth D Min (Millimeters)	Bolt Clearance Diameter G Min (Millimeters)	Style A Regular Length		Style B Long Length		Torque Requirements	
						Overall Length E Max (Millimeters)	Bolt Clearance Length K Min (Millimeters)	Overall Length E Min (Millimeters)	Bolt Clearance Length K Min (Millimeters)	Cyclic Load (N·m)	Proof Load (N·m)
19	30.50	33.00	15.00	15.00	17.00	59.00	24.50	85.00	51.00	598	854
21	33.00	33.00	-	16.00	19.00	59.00	26.00	85.00	51.00	678	968
22	35.05	38.10	17.80	17.80	19.00	59.00	28.50	85.00	51.00	767	1096
23	36.10	39.10	17.80	17.80	20.00	59.00	29.00	85.00	51.00	867	1239
24	37.00	40.00	18.30	18.30	21.00	59.00	30.00	85.00	51.00	902	1288
25	37.85	40.00	18.30	18.30	22.00	59.00	31.00	85.00	51.00	967	1381
26	38.85	40.00	18.30	18.30	22.50	59.00	31.25	85.00	51.00	1016	1452
27	41.00	41.00	-	19.10	23.00	59.00	31.50	85.00	51.00	1076	1537
28	41.00	41.00	-	19.10	23.50	60.00	31.75	85.00	51.00	1186	1694
29	42.10	42.10	-	19.30	24.00	60.00	32.00	85.00	51.00	1305	1864
30	43.00	43.00	-	20.30	25.00	60.00	32.50	85.00	51.00	1415	2022
32	47.05	47.05	-	20.60	27.00	61.00	33.00	85.00	51.00	1420	2030
34	49.00	49.00	-	22.00	29.00	64.00	34.00	85.00	51.00	1420	2030
36	51.80	51.80	-	23.90	30.00	67.00	37.00	85.00	51.00	1420	2030
41	58.80	58.80	-	27.90	34.00	70.00	41.00	85.00	51.00	1420	2030
46	65.40	65.40	-	31.50	38.00	83.00	45.00	85.00	51.00	1420	2030

Table 6D - Type I, Class 1 sockets - 3/4 drive - metric sizes, equivalent dimensions in inches and pounds

Nominal Wrench Opening (Millimeters)	Nut End Diameter A Max (Inches)	Drive End Diameter B Max (Inches)	Wrench End Length C Min (Inches)	Wrench Opening Depth D Min (Inches)	Bolt Clearance Diameter G Min (Inches)	Style A Regular Length		Style B Long Length		Torque Requirements	
						Overall Length E Max (Inches)	Bolt Clearance Length K Min (Inches)	Overall Length E Min (Inches)	Bolt Clearance Length K Min (Inches)	Cyclic Load (lbf-in)	Proof Load (lbf-in)
19	1.201	1.299	0.591	0.591	0.669	2.323	0.965	3.346	2.008	5293	7559
21	1.299	1.299	-	0.630	0.748	2.323	1.024	3.346	2.008	6001	8568
22	1.380	1.500	0.701	0.701	0.748	2.323	1.122	3.346	2.008	6789	9700
23	1.421	1.539	0.701	0.701	0.787	2.323	1.142	3.346	2.008	7674	10966
24	1.457	1.575	0.720	0.720	0.827	2.323	1.181	3.346	2.008	7983	11400
25	1.490	1.575	0.720	0.720	0.866	2.323	1.220	3.346	2.008	8559	12223
26	1.530	1.575	0.720	0.720	0.886	2.323	1.230	3.346	2.008	8992	12851
27	1.614	1.614	-	0.752	0.906	2.323	1.240	3.346	2.008	9523	13604
28	1.614	1.614	-	0.752	0.925	2.362	1.250	3.346	2.008	10497	14993
29	1.657	1.657	-	0.760	0.945	2.362	1.260	3.346	2.008	11550	16498
30	1.693	1.693	-	0.799	0.984	2.362	1.280	3.346	2.008	12524	17896
32	1.852	1.852	-	0.811	1.063	2.402	1.299	3.346	2.008	12568	17967
34	1.929	1.929	-	0.866	1.142	2.520	1.339	3.346	2.008	12568	17967
36	2.039	2.039	-	0.941	1.181	2.638	1.457	3.346	2.008	12568	17967
41	2.315	2.315	-	1.098	1.339	2.756	1.614	3.346	2.008	12568	17967
46	2.575	2.575	-	1.240	1.496	3.268	1.772	3.346	2.008	12568	17967

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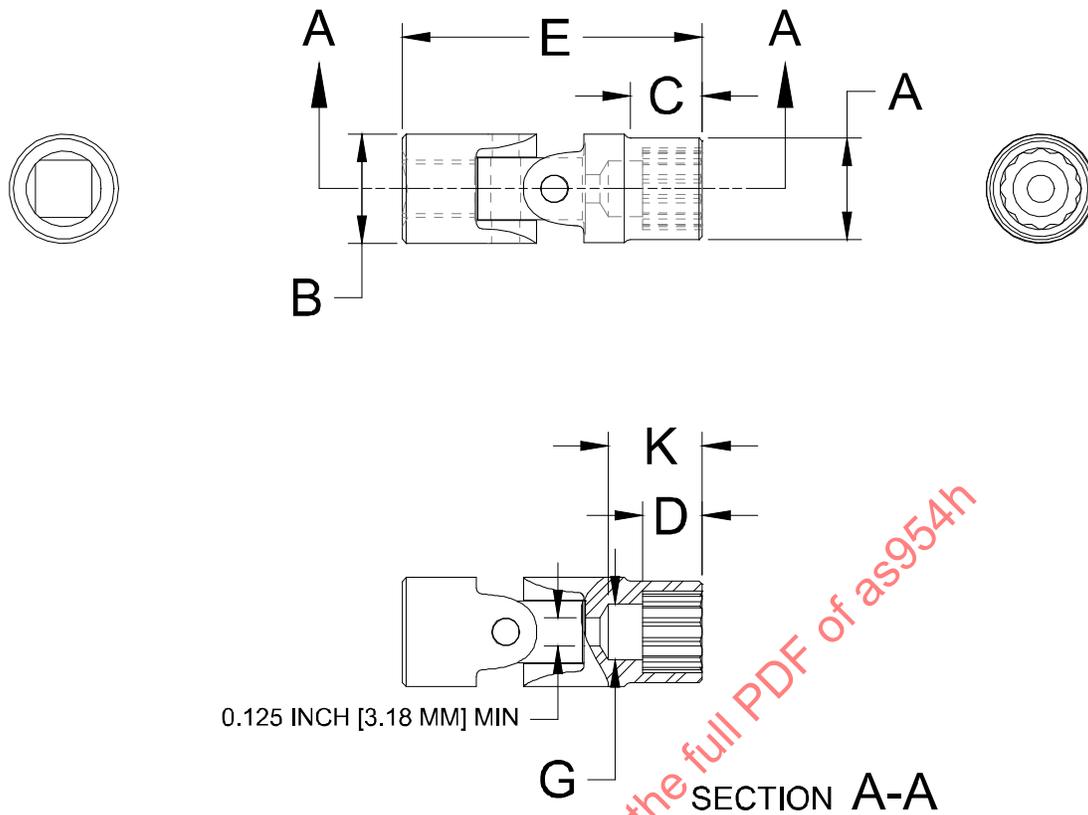


Figure 7 - Type I, Class 2 universal sockets - 1/4 inch square drive

Table 7 - Type I, Class 2 universal sockets - 1/4 inch square drive - inch and metric sizes

Table 7A - Type I, Class 2 universal sockets - 1/4 drive - inch sizes, primary dimensions in inches and pounds

Nominal Wrench Opening (Inches)	Wrench End Diameter A Max (Inches)	Drive End Diameter B Max (Inches)	Wrench End Length C Min (Inches)	Wrench Opening Depth D Min (Inches)	Overall Length E Max (Inches)	Bolt Clearance Diameter G Min (Inches)	Bolt Clearance Length K Min (Inches)	Cyclic Torque Load (lbf-in)	Proof Torque Load (lbf-in)
1/4	0.385	0.515	0.205	0.205	1.359	0.190	0.330	210	300
5/16	0.470	0.515	0.250	0.250	1.437	0.250	0.408	310	450
3/8	0.540	0.540	-	0.265	1.500	0.313	0.437	350	500
7/16	0.625	0.540	-	0.345	1.625	0.375	0.545	350	500
1/2	0.687	0.540	-	0.350	1.688	0.438	0.550	350	500
9/16	0.750	0.540	-	0.355	1.750	0.500	0.555	350	500

Table 7B - Type I, Class 2 universal sockets - 1/4 drive - inch sizes, equivalent dimensions in SI units

Nominal Wrench Opening (Inches)	Wrench End Diameter A Max (Millimeters)	Drive End Diameter B Max (Millimeters)	Wrench End Length C Min (Millimeters)	Wrench Opening Depth D Min (Millimeters)	Overall Length E Max (Millimeters)	Bolt Clearance Diameter G Min (Millimeters)	Bolt Clearance Length K Min (Millimeters)	Cyclic Load (N-m)	Proof Load (N-m)
1/4	9.78	13.08	5.21	5.21	34.52	4.83	8.38	24	34
5/16	11.94	13.08	6.35	6.35	36.50	6.35	10.36	35	51
3/8	13.72	13.72	-	6.73	38.10	7.95	11.10	40	56
7/16	15.88	13.72	-	8.76	41.28	9.53	13.84	40	56
1/2	17.45	13.72	-	8.89	42.88	11.13	13.97	40	56
9/16	19.05	13.72	-	9.02	44.45	12.70	14.10	40	56

Table 7C - Type I, Class 2 universal sockets - 1/4 drive - metric sizes, primary dimensions in SI units

Nominal Wrench Opening (Millimeters)	Wrench End Diameter A Max (Millimeters)	Drive End Diameter B Max (Millimeters)	Wrench End Length C Min (Millimeters)	Wrench Opening Depth D Min (Millimeters)	Overall Length E Max (Millimeters)	Bolt Clearance Diameter G Min (Millimeters)	Bolt Clearance Length K Min (Millimeters)	Cyclic Load (N·m)	Proof Load (N·m)
5	8.30	14.30	4.00	4.00	36.10	3.50	7.50	12	17
5.5	9.00	14.30	4.50	4.50	36.50	4.00	8.00	16	23
6	9.80	14.30	5.00	5.00	37.00	4.50	8.25	20	28
7	10.95	14.30	5.50	5.50	38.25	5.50	9.50	29	42
8	12.25	14.30	6.40	6.40	39.25	6.50	10.25	39	56
9	13.45	14.30	6.70	6.70	39.50	7.50	10.50	39	56
10	15.25	15.60	6.70	6.70	40.00	8.50	11.00	39	56
11	17.20	17.20	-	8.30	43.00	9.50	13.75	39	56
12	17.60	17.60	-	8.90	43.00	10.50	13.75	39	56
13	18.00	18.00	-	8.90	43.00	11.50	13.75	39	56
14	18.90	19.00	9.00	9.00	44.50	12.50	14.00	39	56

Table 7D - Type I, Class 2 universal sockets - 1/4 drive - metric sizes, equivalent dimensions in inches and pounds

Nominal Wrench Opening (Millimeters)	Wrench End Diameter A Max (Inches)	Drive End Diameter B Max (Inches)	Wrench End Length C Min (Inches)	Wrench Opening Depth D Min (Inches)	Overall Length E Max (Inches)	Bolt Clearance Diameter G Min (Inches)	Bolt Clearance Length K Min (Inches)	Cyclic Torque Load (lbf·in)	Proof Torque Load (lbf·in)
5	0.327	0.563	0.157	0.157	1.421	0.138	0.295	106	150
5.5	0.354	0.563	0.177	0.177	1.437	0.157	0.315	142	204
6	0.386	0.563	0.197	0.197	1.457	0.177	0.325	177	248
7	0.431	0.563	0.217	0.217	1.506	0.217	0.374	257	372
8	0.482	0.563	0.252	0.252	1.545	0.256	0.404	345	496
9	0.530	0.563	0.264	0.264	1.555	0.295	0.413	345	496
10	0.600	0.614	0.264	0.264	1.575	0.335	0.433	345	496
11	0.677	0.677	-	0.327	1.693	0.374	0.541	345	496
12	0.693	0.693	-	0.350	1.693	0.413	0.541	345	496
13	0.709	0.709	-	0.350	1.693	0.453	0.541	345	496
14	0.744	0.748	0.354	0.354	1.752	0.492	0.551	345	496

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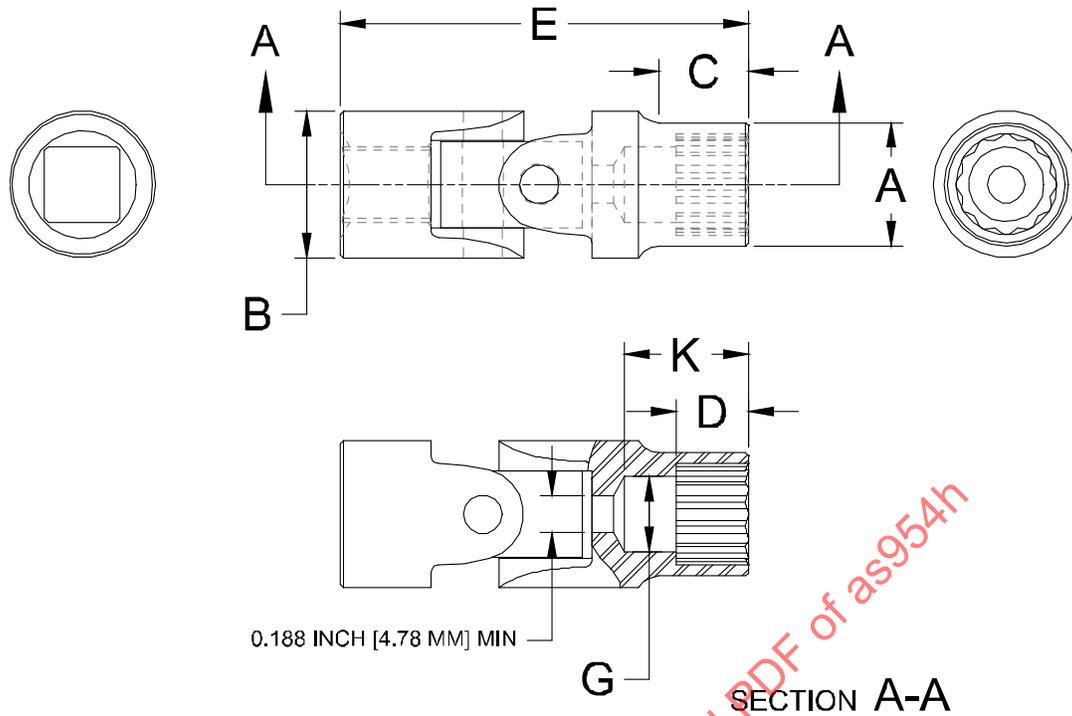


Figure 8 - Type I, Class 2 universal sockets - 3/8 inch square drive

Table 8 - Type I, Class 2 universal sockets - 3/8 inch square drive - inch and metric sizes

Table 8A - Type I, Class 2 universal sockets - 3/8 drive - inch sizes, primary dimensions in inches and pounds

Nominal Wrench Opening (Inches)	Wrench End Diameter A Max (Inches)	Drive End Diameter B Max (Inches)	Wrench End Length C Min (Inches)	Wrench Opening Depth D Min (Inches)	Overall Length E Max (Inches)	Bolt Clearance Diameter G Min (Inches)	Bolt Clearance Length K Min (Inches)	Cyclic Torque Load (lb·in)	Proof Torque Load (lb·in)
3/8	0.550	0.750	0.265	0.265	2.000	0.313	0.437	630	900
7/16	0.660	0.750	0.345	0.345	2.125	0.375	0.545	700	1000
1/2	0.730	0.750	0.350	0.350	2.187	0.438	0.550	700	1000
9/16	0.812	0.785	-	0.355	2.250	0.500	0.555	700	1000
5/8	0.880	0.785	-	0.460	2.250	0.563	0.660	700	1000
11/16	0.960	0.785	-	0.500	2.250	0.625	0.720	700	1000
3/4	1.055	0.785	-	0.590	2.312	0.688	0.810	700	1000

Table 8B - Type I, Class 2 universal sockets - 3/8 drive - inch sizes, equivalent dimensions in SI units

Nominal Wrench Opening (Inches)	Wrench End Diameter A Max (Millimeters)	Drive End Diameter B Max (Millimeters)	Wrench End Length C Min (Millimeters)	Wrench Opening Depth D Min (Millimeters)	Overall Length E Max (Millimeters)	Bolt Clearance Diameter G Min (Millimeters)	Bolt Clearance Length K Min (Millimeters)	Cyclic Load (N·m)	Proof Load (N·m)
3/8	13.97	19.05	6.73	6.73	50.80	7.95	11.10	71	102
7/16	16.76	19.05	8.76	8.76	53.98	9.53	13.84	79	113
1/2	18.54	19.05	8.89	8.89	55.55	11.13	13.97	79	113
9/16	20.62	19.94	-	9.02	57.15	12.70	14.10	79	113
5/8	22.35	19.94	-	11.68	57.15	14.30	16.76	79	113
11/16	24.38	19.94	-	12.70	57.15	15.88	18.29	79	113
3/4	26.80	19.94	-	14.99	58.72	17.48	20.57	79	113

Table 8C - Type I, Class 2 universal sockets - 3/8 drive - metric sizes, primary dimensions in SI units

Nominal Wrench Opening (Millimeters)	Wrench End Diameter A Max (Millimeters)	Drive End Diameter B Max (Millimeters)	Wrench End Length C Min (Millimeters)	Wrench Opening Depth D Min (Millimeters)	Overall Length E Max (Millimeters)	Bolt Clearance Diameter G Min (Millimeters)	Bolt Clearance Length K Min (Millimeters)	Cyclic Load (N-m)	Proof Load (N-m)
7	11.00	20.00	5.50	5.50	50.00	5.50	9.50	29	42
8	12.30	20.00	6.40	6.40	50.25	6.50	10.25	43	62
9	14.00	20.00	6.70	6.70	50.50	7.50	10.50	62	89
10	18.05	20.05	6.70	6.70	51.00	8.50	11.00	70	105
11	19.00	20.05	8.30	8.30	54.25	9.50	13.75	77	110
12	19.05	20.05	8.90	8.90	54.25	10.50	13.75	77	110
13	19.25	20.80	8.90	8.90	54.25	11.50	13.75	77	110
14	19.95	20.80	9.00	9.00	55.00	12.50	14.00	77	110
15	22.40	21.56	-	10.00	56.25	13.50	15.25	77	110
16	23.87	22.50	-	11.20	57.75	14.50	16.75	77	110
17	24.40	22.50	-	12.70	59.75	15.00	18.25	77	110
18	26.14	22.50	-	13.50	60.75	16.00	19.25	77	110
19	27.00	22.50	-	15.00	62.00	17.00	20.50	77	110

Table 8D - Type I, Class 2 universal sockets - 3/8 drive - metric sizes, equivalent dimensions in inches and pounds

Nominal Wrench Opening (Millimeters)	Wrench End Diameter A Max (Inches)	Drive End Diameter B Max (Inches)	Wrench End Length C Min (Inches)	Wrench Opening Depth D Min (Inches)	Overall Length E Max (Inches)	Bolt Clearance Diameter G Min (Inches)	Bolt Clearance Length K Min (Inches)	Cyclic Torque Load (lbf-in)	Proof Torque Load (lbf-in)
7	0.433	0.787	0.217	0.217	1.969	0.217	0.374	257	372
8	0.484	0.787	0.252	0.252	1.978	0.256	0.404	381	549
9	0.551	0.787	0.264	0.264	1.988	0.295	0.413	549	788
10	0.711	0.789	0.264	0.264	2.008	0.335	0.433	620	929
11	0.748	0.789	0.327	0.327	2.136	0.374	0.541	682	974
12	0.750	0.789	0.350	0.350	2.136	0.413	0.541	682	974
13	0.758	0.819	0.350	0.350	2.136	0.453	0.541	682	974
14	0.785	0.819	0.354	0.354	2.165	0.492	0.551	682	974
15	0.882	0.849	-	0.394	2.215	0.531	0.600	682	974
16	0.940	0.886	-	0.441	2.274	0.571	0.659	682	974
17	0.961	0.886	-	0.500	2.352	0.591	0.719	682	974
18	1.029	0.886	-	0.531	2.392	0.630	0.758	682	974
19	1.063	0.886	-	0.591	2.441	0.669	0.807	682	974

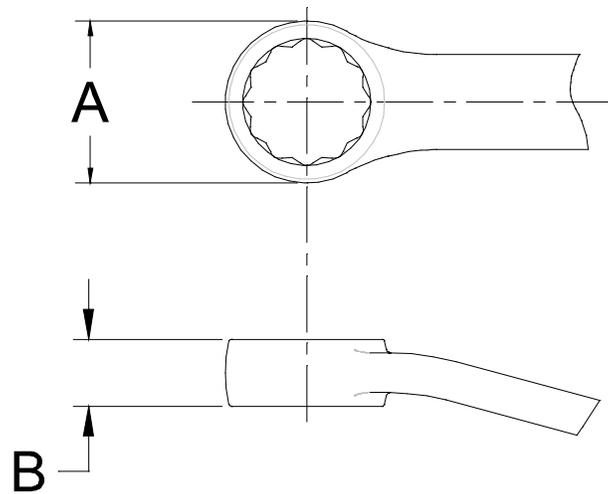


Figure 9 - Type II box wrenches

Table 9 - Type II box wrenches - inch and metric sizes

Table 9A - Type II box wrenches - inch sizes, primary dimensions in inches and pounds

Nominal Wrench Opening (Inches)	Type II Class 1, 2, & 3 Double Box Wrenches		Type II Class 4 Combination Wrench		Type II Torque Requirements			
	Box End Diameter A Max (Inches)	Box End Thickness B Max (Inches)	Box End Diameter A Max (Inches)	Box End Thickness B Max (Inches)	Type II Class 1 & 4 15 Degree Angled Box & Combination Wrenches		Type II Class 2 & 3 Modified Offset & Deep Offset Box Wrenches	
					Cyclic Load (lbf-in)	Proof Load (lbf-in)	Cyclic Load (lbf-in)	Proof Load (lbf-in)
3/16	0.345	0.230	0.345	0.230	110	165	110	165
7/32	0.375	0.250	0.375	0.250	120	180	110	165
1/4	0.425	0.250	0.435	0.250	150	220	150	220
9/32	0.445	0.250	0.460	0.250	170	250	170	248
5/16	0.495	0.287	0.560	0.287	248	355	210	300
11/32	0.535	0.300	0.590	0.300	332	475	259	370
3/8	0.578	0.327	0.615	0.327	420	605	420	605
7/16	0.660	0.349	0.710	0.349	520	750	500	715
1/2	0.750	0.386	0.802	0.386	840	1200	710	1020
9/16	0.830	0.428	0.895	0.406	1150	1650	1050	1500
5/8	0.920	0.478	0.986	0.478	1540	2200	1540	2200
11/16	1.010	0.498	1.060	0.498	1840	2640	1840	2640
3/4	1.090	0.538	1.130	0.538	2100	3000	2000	2860
25/32	1.135	0.550	1.180	0.550	2200	3150	2160	3080
13/16	1.180	0.562	1.230	0.562	2310	3300	2310	3300
7/8	1.270	0.594	1.340	0.594	2590	3700	2540	3630
15/16	1.360	0.615	1.420	0.615	3220	4600	3160	4510
1	1.450	0.630	1.530	0.640	3850	5500	3770	5390
1-1/16	1.530	0.660	1.640	0.720	4200	6000	4160	5940
1-1/8	1.610	0.690	1.720	0.780	4620	6600	4540	6490
1-3/16	1.690	0.720	1.790	0.800	5110	7300	4770	6815
1-1/4	1.780	0.750	1.900	0.840	5600	8000	-	-
1-5/16	1.860	0.780	2.000	0.840	6300	9000	-	-
1-3/8	1.940	0.810	2.080	0.870	7070	10100	-	-
1-7/16	2.020	0.840	2.160	0.910	7840	11200	-	-
1-1/2	2.110	0.870	2.250	0.940	8400	12000	-	-
1-9/16	-	-	2.340	0.940	9520	13600	-	-
1-5/8	-	-	2.480	0.970	10500	15000	-	-
1-11/16	-	-	2.531	1.000	11200	16000	-	-
1-3/4	-	-	2.688	1.062	11900	17000	-	-

Table 9B - Type II box wrenches - inch sizes, equivalent dimensions in SI units

Nominal Wrench Opening (Inches)	Type II Class 1, 2, & 3 Double Box Wrenches		Type II Class 4 Combination Wrench		Type II Torque Requirements			
	Box End Diameter A Max (Millimeters)	Box End Thickness B Max (Millimeters)	Box End Diameter A max (Millimeters)	Box End Thickness B Max (Millimeters)	Type II Class 1 & 4 15 Degree Angled Box & Combination Wrenches		Type II Class 2 & 3 Modified Offset & Deep Offset Box Wrenches	
					Cyclic Load (N·m)	Proof Load (N·m)	Cyclic Load (N·m)	Proof Load (N·m)
3/16	8.76	5.84	8.76	5.84	12	19	12	19
7/32	9.53	6.35	9.53	6.35	14	20	12	19
1/4	10.80	6.35	11.05	6.35	17	25	17	25
9/32	11.30	6.35	11.68	6.35	19	28	19	28
5/16	12.57	7.29	14.22	7.29	28	40	24	34
11/32	13.59	7.62	14.99	7.62	38	54	29	42
3/8	14.68	8.31	15.62	8.31	47	68	47	68
7/16	16.76	8.86	18.03	8.86	59	85	56	81
1/2	19.05	9.80	20.37	9.80	95	136	80	115
9/16	21.08	10.87	22.73	10.31	130	186	119	169
5/8	23.37	12.14	25.04	12.14	174	249	174	249
11/16	25.65	12.65	26.92	12.65	208	298	208	298
3/4	27.69	13.67	28.70	13.67	237	339	226	323
25/32	28.83	13.97	29.97	13.97	249	356	244	348
13/16	29.97	14.27	31.24	14.27	261	373	261	373
7/8	32.26	15.09	34.04	15.09	293	418	287	410
15/16	34.54	15.62	36.07	15.62	364	520	357	510
1	36.83	16.00	38.86	16.26	435	621	426	609
1-1/16	38.86	16.76	41.66	18.29	475	678	470	671
1-1/8	40.89	17.53	43.69	19.81	522	746	513	733
1-3/16	42.93	18.29	45.47	20.32	577	825	539	770
1-1/4	45.21	19.05	48.26	21.34	633	904	-	-
1-5/16	47.24	19.81	50.80	21.34	712	1017	-	-
1-3/8	49.28	20.57	52.83	22.10	799	1141	-	-
1-7/16	51.31	21.34	54.86	23.11	886	1265	-	-
1-1/2	53.59	22.10	57.15	23.88	949	1356	-	-
1-9/16	-	-	59.44	23.88	1076	1537	-	-
1-5/8	-	-	62.99	24.64	1186	1695	-	-
1-11/16	-	-	64.29	25.40	1265	1808	-	-
1-3/4	-	-	68.28	26.97	1345	1921	-	-

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Table 9C - Type II box wrenches - metric sizes, primary dimensions in SI units

Nominal Wrench Opening (Millimeters)	Type II Class 1, 2, & 3 Double Box Wrenches		Type II Class 4 Combination Wrench		Type II Torque Requirements			
	Box End Diameter A Max (Millimeters)	Box End Thickness B Max (Millimeters)	Box End Diameter A Max (Millimeters)	Box End Thickness B Max (Millimeters)	Type II Class 1 & 4 15 Degree Angled Box & Combination Wrenches		Type II Class 2 & 3 Modified Offset & Deep Offset Box Wrenches	
					Cyclic Load (N·m)	Proof Load (N·m)	Cyclic Load (N·m)	Proof Load (N·m)
6	10.5	6.6	11.0	6.4	17	24	14	20
7	11.8	6.8	12.5	6.5	23	33	19	27
8	13.5	7.3	14.0	7.2	32	45	24	34
9	14.0	8.1	15.5	7.8	42	60	32	45
10	15.7	8.9	16.5	8.3	52	75	50	71
11	17.9	9.3	18.3	8.8	66	95	57	80
12	18.3	9.8	19.8	9.0	84	120	64	91
13	19.5	10.0	20.7	9.2	102	145	80	115
14	23.0	10.8	23.0	9.6	126	180	110	158
15	24.4	11.3	24.5	10.1	150	215	140	200
16	25.4	12.0	25.4	10.9	175	250	174	248
17	27.0	12.7	27.2	11.5	196	280	187	267
18	27.7	13.0	28.2	11.8	217	310	213	304
19	28.5	13.7	29.1	12.4	238	340	226	323
20	31.0	14.1	31.5	13.0	252	360	243	347
21	32.3	14.3	32.7	13.5	273	390	260	372
22	33.4	14.5	34.0	14.3	305	435	285	408
23	34.1	14.7	35.3	14.7	336	480	318	455
24	34.9	15.0	36.6	15.2	371	530	356	509
25	37.0	16.0	38.9	16.1	410	585	391	559
26	38.0	16.0	40.7	16.4	448	640	425	608
27	40.4	16.5	42.0	17.0	490	700	470	671
28	43.0	17.0	43.4	17.5	532	760	497	710
29	43.5	17.5	44.7	18.2	560	800	525	750
30	44.0	17.7	46.0	18.8	623	890	556	795
32	47.8	19.0	48.3	19.2	728	1040	633	905
34	-	-	50.8	19.9	749	1070	-	-
36	-	-	54.8	23.1	858	1225	-	-
41	-	-	62.9	24.5	1162	1660	-	-

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Table 9D - Type II box wrenches - metric sizes, equivalent dimensions in inches and pounds

Nominal Wrench Opening (Millimeters)	Type II Class 1, 2, & 3 Double Box Wrenches		Type II Class 4 Combination Wrench		Type II Torque Requirements			
					Type II Class 1 & 4 15 Degree Angled Box & Combination Wrenches		Type II Class 2 & 3 Modified Offset & Deep Offset Box Wrenches	
	Box End Diameter A Max (Inches)	Box End Thickness B Max (Inches)	Box End Diameter A Max (Inches)	Box End Thickness B Max (Inches)	Cyclic Load (lbf-in)	Proof Load (lbf-in)	Cyclic Load (lbf-in)	Proof Load (lbf-in)
6	0.413	0.260	0.433	0.252	150	212	124	177
7	0.465	0.268	0.492	0.256	204	292	168	239
8	0.531	0.287	0.551	0.283	283	398	212	301
9	0.551	0.319	0.610	0.307	372	531	283	398
10	0.618	0.350	0.650	0.327	460	664	443	628
11	0.705	0.366	0.720	0.346	584	841	504	708
12	0.720	0.386	0.780	0.354	743	1062	566	805
13	0.768	0.394	0.815	0.362	903	1283	708	1018
14	0.906	0.425	0.906	0.378	1115	1593	974	1398
15	0.961	0.445	0.965	0.398	1328	1903	1239	1770
16	1.000	0.472	1.000	0.429	1549	2213	1540	2195
17	1.063	0.500	1.071	0.453	1735	2478	1655	2363
18	1.091	0.512	1.110	0.465	1921	2744	1885	2691
19	1.122	0.539	1.146	0.488	2106	3009	2000	2859
20	1.220	0.555	1.240	0.512	2230	3186	2151	3071
21	1.272	0.563	1.287	0.531	2416	3452	2301	3292
22	1.315	0.571	1.339	0.563	2699	3850	2522	3611
23	1.343	0.579	1.390	0.579	2974	4248	2815	4027
24	1.374	0.591	1.441	0.598	3284	4691	3151	4505
25	1.457	0.630	1.531	0.634	3629	5178	3461	4948
26	1.496	0.630	1.602	0.646	3965	5664	3762	5381
27	1.591	0.650	1.654	0.669	4337	6196	4160	5939
28	1.693	0.669	1.709	0.689	4709	6727	4399	6284
29	1.713	0.689	1.760	0.717	4956	7081	4647	6638
30	1.732	0.697	1.811	0.740	5514	7877	4921	7036
32	1.882	0.748	1.902	0.756	6443	9205	5603	8010
34	-	-	2.000	0.783	6629	9470	-	-
36	-	-	2.157	0.909	7594	10842	-	-
41	-	-	2.476	0.965	10285	14692	-	-

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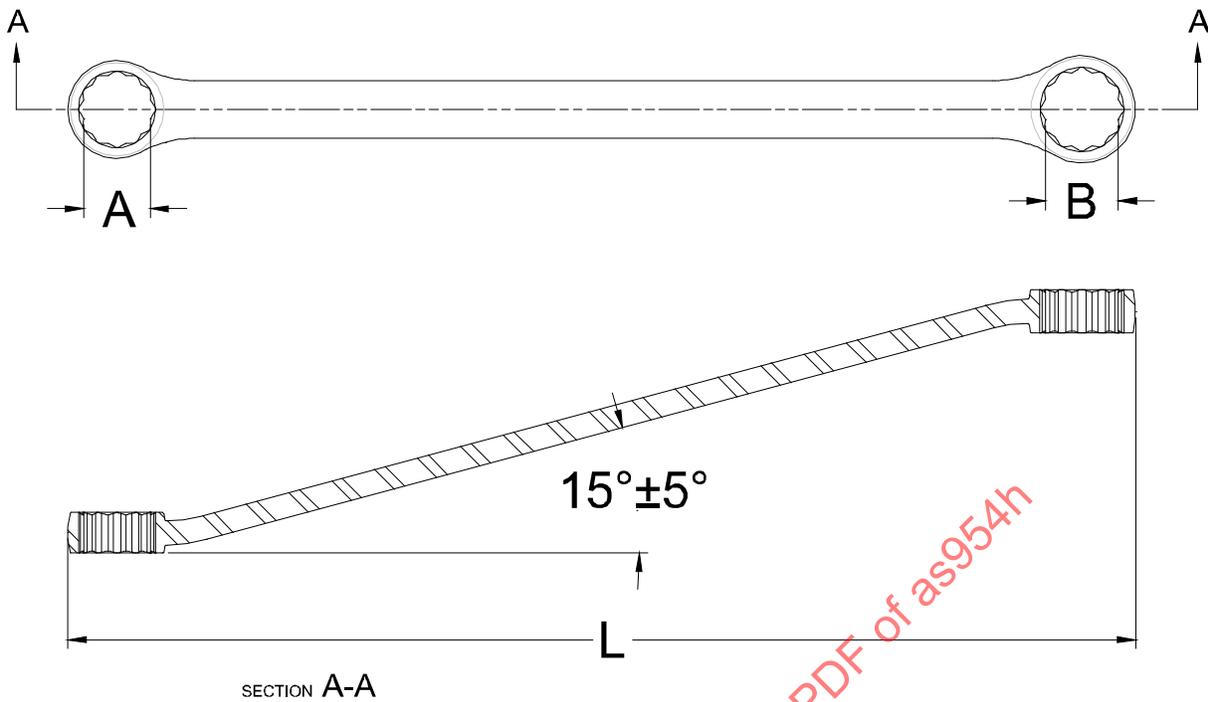


Figure 10 - Type II, Class 1, 15 degree angled ends box wrench

Table 10 - Type II, Class 1, 15 degree angled ends box wrenches - inch and metric sizes

Table 10A - Type II, Class 1, 15 degree angled box wrenches - inch sizes, primary dimensions in inches

Nominal Wrench Opening (Inches)		Style A Regular Length L (Inches)		Style B Long Length L (Inches)	
Small End A	Large End B	Min	Max	Min	Max
7/32	1/4	-	-	7.00	8.10
1/4	5/16	6.30	7.25	7.48	8.25
5/16	3/8	6.81	8.05	8.46	9.06
3/8	7/16	7.44	8.46	9.45	10.04
7/16	1/2	7.80	8.78	10.25	11.22
1/2	9/16	8.10	10.04	11.22	11.81
9/16	5/8	8.30	10.04	12.01	12.75
5/8	11/16	10.04	10.75	12.50	13.58
11/16	3/4	10.83	11.50	13.78	14.50
11/16	13/16	11.75	12.25	15.00	15.50
3/4	7/8	11.78	13.50	15.50	16.00
25/32	7/8	11.81	13.75	15.75	16.25
13/16	7/8	12.60	14.09	-	-
7/8	15/16	12.99	15.00	-	-
15/16	1	15.20	15.75	-	-
1-1/16	1-1/4	18.00	18.50	-	-
1-1/4	1-5/16	19.00	19.50	-	-
1-1/4	1-3/8	20.00	20.50	-	-
1-1/4	1-7/16	20.75	21.25	-	-
1-7/16	1-1/2	21.75	22.25	-	-

Table 10B - Type II, Class 1, 15 degree angled box wrenches - inch sizes, equivalent dimensions in SI units

Nominal Wrench Opening (Inches)		Style A Regular Length L (Millimeters)		Style B Long Length L (Millimeters)	
Small End A	Large End B	Min	Max	Min	Max
7/32	1/4	-	-	178	206
1/4	5/16	160	184	190	210
5/16	3/8	173	204	215	230
3/8	7/16	189	215	240	255
7/16	1/2	198	223	260	285
1/2	9/16	206	255	285	300
9/16	5/8	211	255	305	324
5/8	11/16	255	273	318	345
11/16	3/4	275	292	350	368
11/16	13/16	298	311	381	394
3/4	7/8	299	343	394	406
25/32	7/8	300	349	400	413
13/16	7/8	320	358	-	-
7/8	15/16	330	381	-	-
15/16	1	386	400	-	-
1-1/16	1-1/4	457	470	-	-
1-1/4	1-5/16	483	495	-	-
1-1/4	1-3/8	508	521	-	-
1-1/4	1-7/16	527	540	-	-
1-7/16	1-1/2	552	565	-	-

Table 10C - Type II, Class 1, 15 degree angled box wrenches - metric sizes, primary dimensions in SI units

Nominal Wrench Opening (Millimeters)		Style A Regular Length L (Millimeters)		Style B Long Length L (Millimeters)	
Small End A	Large End B	Min	Max	Min	Max
6	7	160	184	190	210
8	9	173	204	215	230
10	11	189	215	240	255
12	13	198	223	260	285
13	14	-	-	285	300
13	15	206	255	-	-
14	15	211	255	305	324
15	16	-	-	318	345
16	18	255	273	-	-
17	19	275	292	350	368
20	22	300	349	-	-
21	23	320	358	-	-
22	24	330	381	-	-
27	30	390	405	-	-
30	32	425	440	-	-

Table 10D - Type II, Class 1, 15 degree angled box wrenches - metric sizes, equivalent dimensions in inches

Nominal Wrench Opening (Millimeters)		Style A Regular Length L (Inches)		Style B Long Length L (Inches)	
Small End A	Large End B	Min	Max	Min	Max
6	7	6.30	7.24	7.48	8.27
8	9	6.81	8.03	8.46	9.06
10	11	7.44	8.46	9.45	10.04
12	13	7.80	8.78	10.24	11.22
13	14	-	-	11.22	11.81
13	15	8.11	10.04	-	-
14	15	8.31	10.04	12.01	12.76
15	16	-	-	12.52	13.58
16	18	10.04	10.75	-	-
17	19	10.83	11.50	13.78	14.49
20	22	11.81	13.74	-	-
21	23	12.60	14.09	-	-
22	24	12.99	15.00	-	-
27	30	15.35	15.94	-	-
30	32	16.73	17.32	-	-

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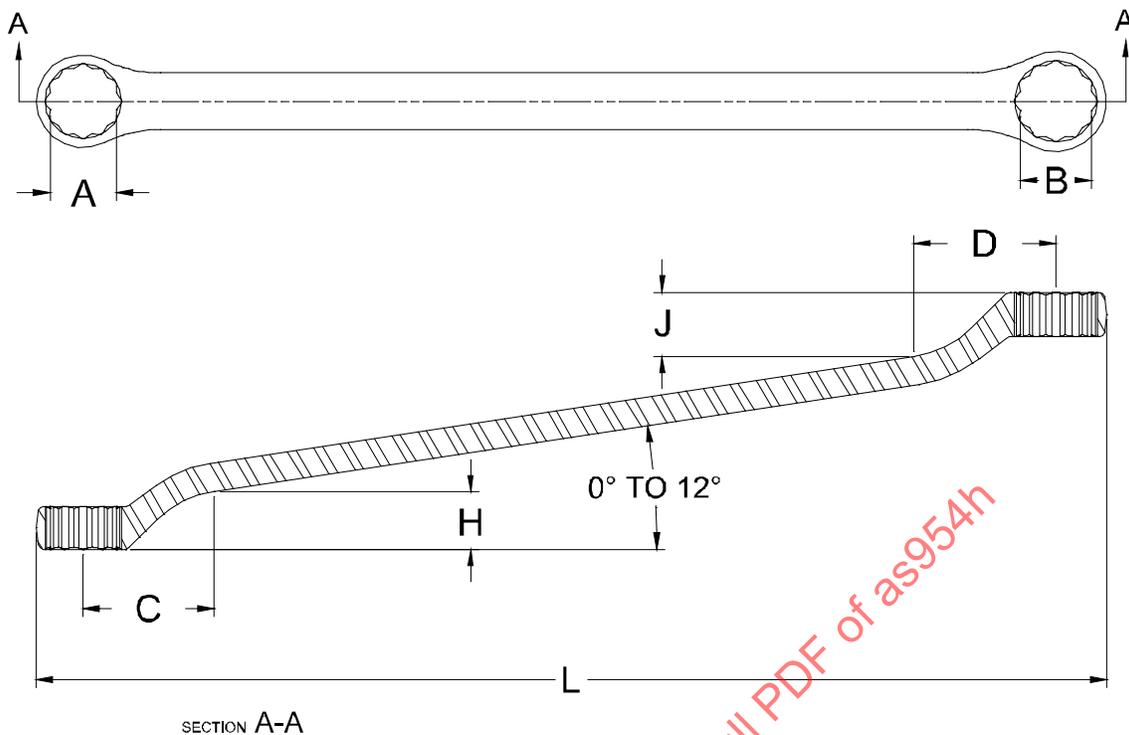


Figure 11 - Type II, Class 2, modified offset box wrenches

Table 11 - Type II, Class 2, modified offset box wrenches - inch and metric sizes

Table 11A - Type II, Class 2, modified offset box wrenches - inch sizes, primary dimensions in inches

Nominal Wrench Opening (Inches)		Small End Target Blend Location C (Inches)	Small End Offset H Min (Inches)	Large End Target Blend Location D (Inches)	Large End Offset J Min (Inches)	Style A Short Length L (Inches)		Style B Regular Length L (Inches)	
Small End A	Large End B					Min	Max	Min	Max
1/4	5/16	0.500	0.22	0.625	0.28	3.15	4.50	-	-
5/16	3/8	0.625	0.28	0.750	0.31	3.94	4.75	-	-
3/8	7/16	0.750	0.31	0.875	0.33	4.50	5.00	7.09	8.07
7/16	1/2	0.875	0.33	1.000	0.39	5.00	5.71	7.80	8.86
1/2	9/16	1.000	0.39	1.125	0.45	5.25	5.91	8.50	9.65
9/16	5/8	1.125	0.45	1.250	0.50	5.50	6.30	9.00	9.84
5/8	11/16	1.250	0.50	1.375	0.56	-	-	9.60	10.82
5/8	3/4	1.250	0.50	1.500	0.62	6.00	6.50	10.00	11.02
11/16	3/4	1.375	0.56	1.500	0.62	-	-	10.30	11.42
11/16	13/16	1.375	0.56	1.625	0.68	6.25	8.07	10.50	11.42
3/4	13/16	1.500	0.62	1.625	0.68	-	-	11.05	12.50
13/16	7/8	1.625	0.68	1.750	0.72	-	-	11.75	12.87
7/8	15/16	1.750	0.72	1.875	0.76	-	-	12.75	13.75
15/16	1	1.875	0.76	2.000	0.82	-	-	13.25	15.75

Table 11B - Type II, Class 2, modified offset box wrenches - inch sizes, equivalent dimensions in SI units

Nominal Wrench Opening (Inches)		Small End Target Blend Location C (Millimeters)	Small End Offset H Min (Millimeters)	Large End Target Blend Location D (Millimeters)	Large End Offset J Min (Millimeters)	Style A Short Length L (Millimeters)		Style B Regular Length L (Millimeters)	
Small End A	Large End B					Min	Max	Min	Max
1/4	5/16	12.70	5.6	15.88	7.1	80	114	-	-
5/16	3/8	15.88	7.1	19.05	7.9	100	121	-	-
3/8	7/16	19.05	7.9	22.23	8.4	114	127	180	205
7/16	1/2	22.23	8.4	25.40	9.9	127	145	198	225
1/2	9/16	25.40	9.9	28.58	11.4	133	150	216	245
9/16	5/8	28.58	11.4	31.75	12.7	140	160	229	250
5/8	11/16	31.75	12.7	34.93	14.2	-	-	244	275
5/8	3/4	31.75	12.7	38.10	15.7	152	165	254	280
11/16	3/4	34.93	14.2	38.10	15.7	-	-	262	290
11/16	13/16	34.93	14.2	41.28	17.3	159	205	267	290
3/4	13/16	38.10	15.7	41.28	17.3	-	-	281	318
13/16	7/8	41.28	17.3	44.45	18.3	-	-	298	327
7/8	15/16	44.45	18.3	47.63	19.3	-	-	324	349
15/16	1	47.63	19.3	50.80	20.8	-	-	337	400

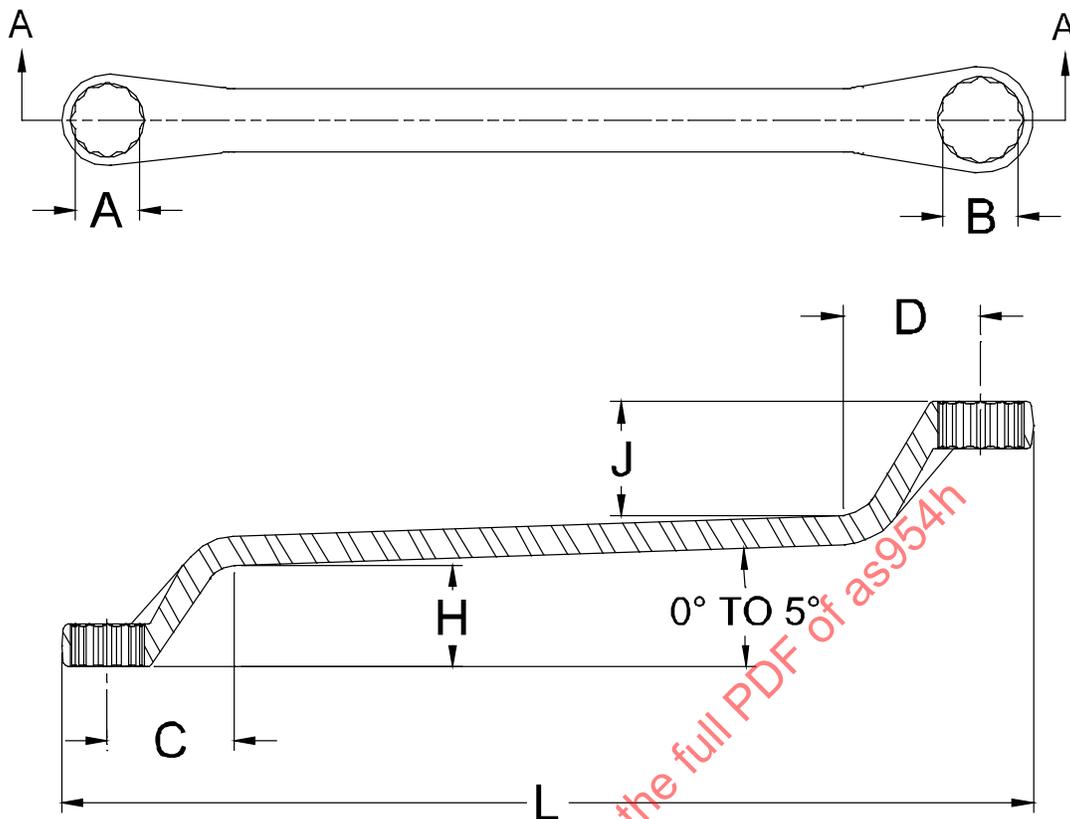
Table 11C - Type II, Class 2, modified offset box wrenches - metric sizes, primary dimensions in SI units

Nominal Wrench Opening (Millimeters)		Small End Target Blend Location C (Millimeters)	Small End Offset H Min (Millimeters)	Large End Target Blend Location D (Millimeters)	Large End Offset J Min (Millimeters)	Style A Short Length L (Millimeters)		Style B Regular Length L (Millimeters)	
Small End A	Large End B					Min	Max	Min	Max
6	7	12	5.0	14	5.8	80	114	110	151
7	8	14	5.8	16	6.5	-	-	150	165
8	9	16	6.5	18	7.3	100	121	160	175
8	10	16	6.5	20	8.1	-	-	175	190
10	11	20	8.1	22	8.8	114	127	180	205
10	13	20	8.1	26	10.4	-	-	195	220
11	13	22	8.8	26	10.4	-	-	198	225
12	13	24	9.6	26	10.4	127	145	208	230
13	14	26	10.4	28	11.2	133	150	-	-
13	15	26	10.4	30	11.9	-	-	216	245
14	15	28	11.2	30	11.9	140	160	229	250
15	16	30	11.9	32	12.7	158	170	-	-
15	18	30	11.9	36	14.2	-	-	244	270
16	17	32	12.7	34	13.5	-	-	244	275
16	18	32	12.7	36	14.2	-	-	254	280
17	19	34	13.5	38	15.0	159	205	262	290
18	19	36	14.2	38	15.0	-	-	267	290
18	21	36	14.2	42	16.5	-	-	281	318
19	22	38	15.0	44	17.3	-	-	291	320
20	22	40	15.8	44	17.3	-	-	296	325
21	22	42	16.5	44	17.3	-	-	298	327
21	23	42	16.5	46	18.1	-	-	315	341
21	24	42	16.5	48	18.8	-	-	324	349
24	27	48	18.8	54	21.2	-	-	337	400
27	30	54	21.2	60	23.5	-	-	390	410
27	32	54	21.2	64	25.0	-	-	420	445
30	32	60	23.5	64	25.0	-	-	430	485

Table 11D - Type II, Class 2, mod. offset box wrenches - metric sizes, equivalent dimensions in inches

Nominal Wrench Opening (Millimeters)		Small End Target Blend Location C (Inches)	Small End Offset H Min (Inches)	Large End Target Blend Location D (Inches)	Large End Offset J Min (Inches)	Style A Short Length L (Inches)		Style B Regular Length L (Inches)	
Small End A	Large End B					Min	Max	Min	Max
6	7	0.472	0.20	0.551	0.23	3.15	4.49	4.33	5.94
7	8	0.551	0.23	0.630	0.26	-	-	5.91	6.50
8	9	0.630	0.26	0.709	0.29	3.94	4.76	6.30	6.89
8	10	0.630	0.26	0.787	0.32	-	-	6.89	7.48
10	11	0.787	0.32	0.866	0.35	4.49	5.00	7.09	8.07
10	13	0.787	0.32	1.024	0.41	-	-	7.68	8.66
11	13	0.866	0.35	1.024	0.41	-	-	7.80	8.86
12	13	0.945	0.38	1.024	0.41	5.00	5.71	8.19	9.06
13	14	1.024	0.41	1.102	0.44	5.24	5.91	-	-
13	15	1.024	0.41	1.181	0.47	-	-	8.50	9.65
14	15	1.102	0.44	1.181	0.47	5.51	6.30	9.02	9.84
15	16	1.181	0.47	1.260	0.50	6.22	6.69	-	-
15	18	1.181	0.47	1.417	0.56	-	-	9.61	10.63
16	17	1.260	0.50	1.339	0.53	-	-	9.61	10.83
16	18	1.260	0.50	1.417	0.56	-	-	10.00	11.02
17	19	1.339	0.53	1.496	0.59	6.26	8.07	10.31	11.42
18	19	1.417	0.56	1.496	0.59	-	-	10.51	11.42
18	21	1.417	0.56	1.654	0.65	-	-	11.06	12.52
19	22	1.496	0.59	1.732	0.68	-	-	11.46	12.60
20	22	1.575	0.62	1.732	0.68	-	-	11.65	12.80
21	22	1.654	0.65	1.732	0.68	-	-	11.73	12.87
21	23	1.654	0.65	1.811	0.71	-	-	12.40	13.43
21	24	1.654	0.65	1.890	0.74	-	-	12.76	13.74
24	27	1.890	0.74	2.126	0.84	-	-	13.27	15.75
27	30	2.126	0.84	2.362	0.93	-	-	15.35	16.14
27	32	2.126	0.84	2.520	0.98	-	-	16.54	17.52
30	32	2.362	0.93	2.520	0.98	-	-	16.93	19.09

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SECTION A-A

Figure 12 - Type II, Class 3, deep offset box wrenches

Table 12 - Type II, Class 3, deep offset box wrenches - inch and metric sizes

Table 12A - Type II, Class 3, deep offset box wrenches - inch sizes, primary dimensions in inches

Nominal Wrench Opening (Inches)		Small End Target Blend Location C (Inches)	Small End Offset H Min (Inches)	Large End Target Blend Location D (Inches)	Large End Offset J Min (Inches)	Style A Short Length L (Inches)		Style B Regular Length L (Inches)	
Small End A	Large End B					Min	Max	Min	Max
1/4	9/32	0.500	0.36	0.562	0.42	3.50	4.00	-	-
1/4	5/16	0.500	0.36	0.625	0.44	3.90	4.40	5.50	6.75
5/16	3/8	0.625	0.44	0.750	0.51	4.25	4.75	5.71	7.25
3/8	7/16	0.750	0.51	0.875	0.61	4.65	5.20	6.89	7.68
7/16	1/2	0.875	0.61	1.000	0.70	5.10	5.60	7.68	8.27
1/2	9/16	1.000	0.70	1.125	0.80	5.45	6.00	8.35	9.06
9/16	5/8	1.125	0.80	1.250	0.90	5.75	6.50	8.66	9.50
5/8	11/16	1.250	0.90	1.375	1.00	6.25	6.75	9.45	10.24
5/8	3/4	1.250	0.90	1.500	1.10	6.40	6.90	9.65	10.50
11/16	13/16	1.375	1.00	1.625	1.18	6.75	7.25	10.04	11.00
3/4	7/8	1.500	1.10	1.625	1.18	-	-	10.70	12.40