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Assembly tools for screws and nuts — Technical specifications —

Part 1: Hand-operated wrenches and sockets

Outils de manoeuvre pour vis et écrous — Spécifications techniques —

Partie 1: Clés de serrage et douilles à main

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

The committee responsible for this document is ISO/TC 29, *Small tools*, Subcommittee SC 10, *Assembly tools for screws and nuts, pliers and nippers*.

This fourth edition cancels and replaces the third edition (ISO 1711-1:2015), which has been technically revised with the following changes:

— in 6.2, the angle chamfer α of the test mandrel in Figure 1 has been changed from 30° max to $15° \leq \alpha \leq 30°$;

— revision of sizes for width across flats covered in Table 3; Sizes 3,5, 4,5, 26 and 28 have been deleted; Size 5,5 has been added.

A list of all parts in the ISO 1711 series can be found on the ISO website.

Assembly tools for screws and nuts — Technical specifications —

Part 1:
Hand-operated wrenches and sockets

1 Scope

This document specifies minimum values for Rockwell hardness and torsional strength for hand-operated wrenches and sockets.

It covers the following three series of torsion torques:

— Series A: usual box wrenches and socket wrenches;

EXAMPLE 1 Reference nos. 1 1 02 01 0; 1 1 02 02 0 and 1 1 02 02 1; 1 1 02 03 0; 1 1 02 04 0; 1 1 02 05 0; 1 1 02 06 0; 1 1 02 09 0; 1 1 02 10 0; 1 1 02 11 0; 1 1 02 12 0; 1 1 02 13 0 and 1 1 02 13 1; 1 1 02 14 0; 1 1 02 15 0; 1 1 08 01 0; 1 1 08 02 0.

— Series C: open end wrenches;

EXAMPLE 2 Reference nos. 1 1 01 01 0; 1 1 01 01 1; 1 1 01 02 0; 1 1 01 03 0; 1 1 01 04 0.

— Series E: hand-operated square drive sockets.

EXAMPLE 3 Reference nos. 2 1 02 01 0 and 2 1 02 01 1.

NOTE The wrenches and sockets mentioned above are listed under their respective reference numbers in ISO 1703.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 6508-1, *Metallic materials — Rockwell hardness test — Part 1: Test method*

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

4 Test torsion torques

The empiric formulae giving minimum test torsion torques, M, in newton metres, as a function of width across flats, s, in millimetres, are given for information in Table 1.

The minimum test torsion torques to be applied are given in Table 3.

Table 1 — Formulae giving minimum test torsion torques

Series			Minimum test torsion torque M N · m
A			$0{,}265\ 7 \cdot s^{2{,}34}$
C	Nominal width across flats, s	≤ 36	$0{,}039\ 2 \cdot s^{2{,}8}$
		> 36	$0{,}686\ 5 \cdot s^{2}$
E	Nominal dimension for driving square	6,3	$0{,}980\ 7 \cdot s^{1{,}7}$
		10	$0{,}350\ 7 \cdot s^{2{,}34}$ [a]
		12,5	$1{,}471 \cdot s^{2}$
		20	$2{,}451\ 7 \cdot s^{1{,}76}$
		25	$46{,}581\ 6 \cdot s$

[a] Test torque M applicable to Series A multiplied by the coefficient 1,32.

5 Hardness testing

The hardness test shall be carried out in accordance with ISO 6508-1.

Minimum Rockwell hardness values are given in Table 2.

Table 2 — Minimum Rockwell hardness values for wrenches and sockets

Nominal width across flats s mm	Minimum hardness	
	Alloy steel open end and double head wrenches [a] HRC	All other wrenches or sockets HRC
$s \leq 34$	42	39
$34 < s \leq 70$	39	35

[a] For carbon steel open end wrenches, the hardness value shall be 36 HRC.

6 Torque testing

6.1 General

For combined wrenches (for example, reference nos. 1 1 01 05 0 and 1 1 01 06 0), the box wrench side shall be tested in accordance with Table 3, Series A, and the open end wrench side shall to be tested in accordance with Table 3, Series C.

6.2 Method

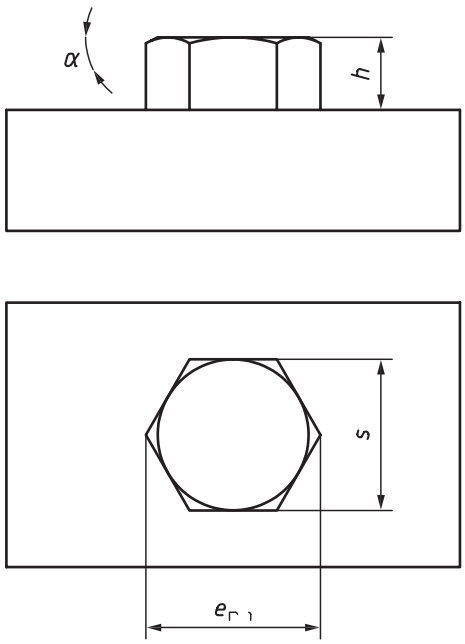
The wrench or the socket shall be fully engaged in a hexagon test mandrel as shown in Figure 1. The height, h, and the width across corners, e_{min}, of the mandrel are specified in Table 3. The angle of the chamfer α shall be between 15° and 30°.

Smoothly apply the load until the minimum testing torque as given in Table 3 is reached.

The nominal across-flats dimension of the test mandrel shall be equal to the nominal dimension, s, with a tolerance of h8. The mandrel shall be hardened to not less than hardness 55 HRC.

A device in which the mandrel can be rotated at a certain torque determined with an accuracy of ±2,5 % may also be used for this test.

Following the application of the minimum test torsion torque, any possible damage or deformation shall not affect usability of tool.



Key

α angle of the chamfer, $15° \leq \alpha \leq 30°$

e_{min} width across corners

h test mandrel height

s width across flats

NOTE The use of the 30° chamfer will reduce the effective engagement which might affect the ultimate test torque.

Figure 1 — Test mandrel height, width across flats, and width across corners

6.3 Test of box wrenches or open jaw wrenches

Apply the load as far along the shaft of the wrench as possible, perpendicular to its longitudinal axis. Use an appropriate test device that will safely test large wrenches.

Load the wrench once in each direction during the test.

For open jaw wrenches, the head shall remain perpendicular to the mandrel axis during the test. For box wrenches, the axis of the head shall remain perpendicular to the mandrel axis during the test.

6.4 Test of socket wrenches

Apply the load as far along the shaft of the wrench as possible, perpendicular to its longitudinal axis. Use an appropriate test device that will safely test large wrenches.

The axis of the socket wrenches and the axis of the mandrel shall remain coaxial during the test.

6.5 Test of hand-operated square drive sockets

A square mandrel of hardness not less than 55 HRC shall be used for driving the socket. The nominal across-flats dimension of this mandrel shall be equal to the maximum dimension, with a tolerance of h8, of the corresponding driving square.

The axes of the two mandrels and the axis of the socket shall remain coaxial during the test.

Table 3 — Minimum test torsion torque and test mandrel height as function of width across flats

Nominal width across flats [a] s	Minimum test torsion torque M N · m							Test mandrel mm	
	Series							Height h h13	Width across corners [d] e_{min}
	A	C	E Driving square nominal dimension [b]						
			6,3	10	12,5	20	25		
3,2	4	1	7,1	—	—	—	—	1,3	3,62
4	6,8	1,9	10,4	—	—	—	—	1,6	4,52
5	11,5	3,6	15,1	—	—	—	—	2	5,65
5,5	14,3	4,6	17,8	—	—	—	—	2,4	6,22
6 [a]	17,6	5,9	20,6	23,2	—	—	—	2,8	6,78
7	25,2	9,1	26,8	33,3	—	—	—	3,2	7,91
8	34,5	13,2	33,6	45,5	94,1	—	—	4	9,04
9 [a]	45,4	18,4	41,1	60	119,2	—	—	4,4	10,17
10	58,1	24,7	49,2	76,7	147,1	—	—	4,8	11,3
11	72,7	32,3	57,8	95,9	178	—	—	5,6	12,43
12 [a]	89,1	41,2	62 [c]	117,5	211,8	—	—	6	13,56
13	107,4	51,6	62 [c]	141,8	248,6	—	—	6,4	14,69
14 [a]	127,7	63,5	62 [c]	168,6	288,3	—	—	7	15,82
15	150,1	77	62 [c]	198,1	331	—	—	7,4	16,95
16	174,6	92,2	62 [c]	202 [c]	376,6	—	—	8	18,08
17 [a]	201,2	109,3	62 [c]	202 [c]	425,1	—	—	8,8	19,21
18	230	128,2	—	202 [c]	476,6	—	—	9,6	20,34
19 [a]	261	149,2	—	202 [c]	512 [c]	—	—	10,2	21,47
20 [a]	294,3	172,3	—	202 [c]	512 [c]	—	—	10,7	22,6
21	329,9	197,5	—	202 [c]	512 [c]	521	—	11,2	23,73
22 [a]	367,8	224,9	—	202 [c]	512 [c]	565	—	11,8	24,86
23 [a]	408,2	254,8	—	202 [c]	512 [c]	611	—	12,3	25,99
24	450,9	287	—	202 [c]	512 [c]	659	—	12,8	27,12
25 [a]	496,1	321,7	—	202 [c]	512 [c]	708	—	13,3	28,25
27	594	399	—	—	512 [c]	810	—	14,4	30,51
30	760	536	—	—	512 [c]	975	—	16	33,9
32 [a]	884	642	—	—	512 [c]	1 093	—	16,8	36,16
34	1 019	761	—	—	512 [c]	1 216	—	17,6	38,42
36	1 165	893	—	—	—	1 345	—	19,2	40,68
41	1 579	1 154	—	—	—	1 412 [c]	1 909,8	21,6	46,33
46	2 067	1 453	—	—	—	1 412 [c]	2 143	24	51,98
50	2 512	1 716	—	—	—	1 412 [c]	2 329,1	26,4	56,5

[a] Not according to ISO 272.

[b] For dimensions of driving squares, see ISO 1174-1.

[c] Value of test torque voluntarily limited. Driving squares have lower strengths than sockets of the same steel grade.

[d] $e_{min} = s_{nom} \times 1{,}13$.

Table 3 *(continued)*

Nominal width across flats [a] *s*	**Minimum test torsion torque** *M* N · m							**Test mandrel mm**	
	Series							**Height** *h* h13	**Width across corners** [d] e_{min}
	A	**C**	**E** Driving square nominal dimension [b]						
			6,3	10	12,5	20	25		
55	3 139	2 077	—	—	—	1 412 [c]	2 515	28,8	62,15
60	3 849	2 471	—	—	—	1 412 [c]	2 515 [c]	31,2	67,8
65	4 641	2 900	—	—	—	—	2 515 [c]	33,5	73,45
70	5 520	3 364	—	—	—	—	2 515 [c]	36	79,1

[a] Not according to ISO 272.

[b] For dimensions of driving squares, see ISO 1174-1.

[c] Value of test torque voluntarily limited. Driving squares have lower strengths than sockets of the same steel grade.

[d] $e_{min} = s_{nom} \times 1{,}13$.

Bibliography

[1] ISO 272, *Fasteners — Hexagon products — Widths across flats*

[2] ISO 1174-1, *Assembly tools for screws and nuts — Driving squares — Part 1: Driving squares for hand socket tools*

[3] ISO 1703, *Assembly tools for screws and nuts — Designation and nomenclature*

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