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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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# Contents

	Page
Foreword .....	iv
<b>1 Scope</b> .....	<b>1</b>
<b>2 Normative references</b> .....	<b>1</b>
<b>3 Test torsion torques</b> .....	<b>1</b>
<b>4 Hardness testing</b> .....	<b>2</b>
<b>5 Torque testing</b> .....	<b>2</b>
5.1 General .....	2
5.2 Method .....	2
5.3 Test of box wrenches or open jaw wrenches .....	3
5.4 Test of socket wrenches .....	3
5.5 Test of hand-operated square drive sockets .....	3
<b>Bibliography</b> .....	<b>6</b>

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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](http://www.iso.org/directives)).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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 WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](#)

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 third edition cancels and replaces the second edition (ISO 1711-1:2007), which has been technically revised with the following changes:

- requirement for testing large wrenches in [5.3](#) slightly changed for safety reasons;
- additional widths across flat sizes not covered by ISO 272 included in [Table 3](#), in order to better reflect the current market situation.

ISO 1711 consists of the following parts, under the general title *Assembly tools for screws and nuts — Technical specifications*:

- *Part 1: Hand-operated wrenches and sockets*
- *Part 2: Machine-operated sockets ("impact")*

# Assembly tools for screws and nuts — Technical specifications —

## Part 1: Hand-operated wrenches and sockets

### 1 Scope

This part of ISO 1711 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 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 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 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, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 6508 (all parts), *Metallic materials — Rockwell hardness test*

### 3 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, $s$	$\leq 36$	$0,039\ 2 \cdot s^{2,8}$
		$> 36$	$0,686\ 5 \cdot s^2$
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.			

## 4 Hardness testing

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

Minimum Rockwell hardness values are given in [Table 2](#).

Table 2 — Minimum Rockwell hardness values for wrenches and sockets

Nominal width across flats $s$	Minimum hardness	
	Alloy steel open end and double head wrenches <sup>a</sup> 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.		

## 5 Torque testing

### 5.1 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.

### 5.2 Method

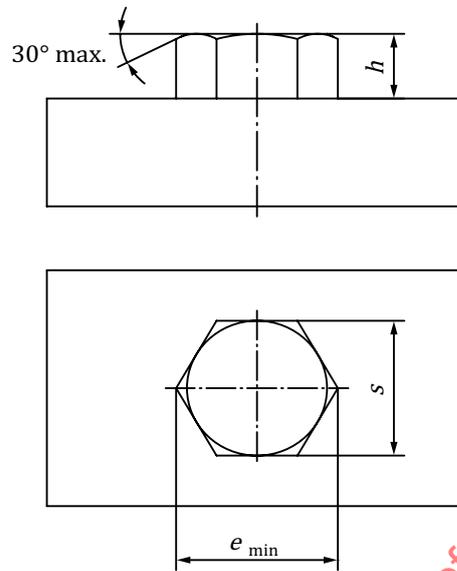
The wrench or the socket shall be fully engaged in a hexagon test mandrel as shown in [Figure 1](#). The height,  $h$ , and the width across corners,  $e_{\min}$ , of the mandrel are specified in [Table 3](#).

Smoothly apply the load until the minimum testing torque as given in [Table 3](#) is reached.

The nominal cross-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  $\pm 2,5\%$  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.



NOTE The use of the 30 degree 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**

### 5.3 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.

### 5.4 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.

### 5.5 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  $h/8$ , 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 torques and test mandrel height as function of width across flats

Nominal width across flats <sup>a</sup> <i>s</i>	Minimum test torsion torque <i>M</i> N · m							Test mandrel	
	Series							Height <i>h</i> <i>h</i> <sub>13</sub> mm	Width across corners <sup>d</sup> <i>e</i> <sub>min.</sub> mm
	A	C	E						
	Driving square nominal dimension <sup>b</sup>								
			6,3	10	12,5	20	25		
3,2	4,0	1,0	7,1	—	—	—	—	1,3	3,62
3,5 <sup>a</sup>	5,0	1,3	8,2	—	—	—	—	1,4	3,96
4	6,8	1,9	10,4	—	—	—	—	1,6	4,52
4,5 <sup>a</sup>	9,0	2,6	12,6	—	—	—	—	1,8	5,09
5	11,5	3,6	15,1	—	—	—	—	2	5,65
6 <sup>a</sup>	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 <sup>a</sup>	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	11,30
11	72,7	32,3	57,8	95,9	178	—	—	5,6	12,43
12 <sup>a</sup>	89,1	41,2	62 <sup>c</sup>	117,5	211,8	—	—	6	13,56
13	107,4	51,6	62 <sup>c</sup>	141,8	248,6	—	—	6,4	14,69
14 <sup>a</sup>	127,7	63,5	62 <sup>c</sup>	168,6	288,3	—	—	7	15,82
15	150,1	77,0	62 <sup>c</sup>	198,1	331	—	—	7,4	16,95
16	174,6	92,2	62 <sup>c</sup>	202 <sup>c</sup>	376,6	—	—	8	18,08
17 <sup>a</sup>	201,2	109,3	62 <sup>c</sup>	202 <sup>c</sup>	425,1	—	—	8,8	19,21
18	230,0	128,2	—	202 <sup>c</sup>	476,6	—	—	9,6	20,34
19 <sup>a</sup>	261,0	149,2	—	202 <sup>c</sup>	512 <sup>c</sup>	—	—	10,2	21,47
20 <sup>a</sup>	294,3	172,3	—	202 <sup>c</sup>	512 <sup>c</sup>	—	—	10,7	22,6
21	329,9	197,5	—	202 <sup>c</sup>	512 <sup>c</sup>	521	—	11,2	23,73
22 <sup>a</sup>	367,8	224,9	—	202 <sup>c</sup>	512 <sup>c</sup>	565	—	11,8	24,86
23 <sup>a</sup>	408,2	254,8	—	202 <sup>c</sup>	512 <sup>c</sup>	611	—	12,3	25,99
24	450,9	287,0	—	202 <sup>c</sup>	512 <sup>c</sup>	659	—	12,8	27,12
25 <sup>a</sup>	496,1	321,7	—	202 <sup>c</sup>	512 <sup>c</sup>	708	—	13,3	28,25
26 <sup>a</sup>	544	359	—	—	512 <sup>c</sup>	758	—	13,8	29,38
27	594	399	—	—	512 <sup>c</sup>	810	—	14,4	30,51
28 <sup>a</sup>	647	442	—	—	512 <sup>c</sup>	864	—	14,9	31,64
30	760	536	—	—	512 <sup>c</sup>	975	—	16	33,90
32 <sup>a</sup>	884	642	—	—	512 <sup>c</sup>	1 093	—	16,8	36,16

<sup>a</sup> Not according to ISO 272.  
<sup>b</sup> For dimensions of driving squares, see ISO 1174-1.  
<sup>c</sup> Value of test torque voluntarily limited. Driving squares have lower strengths than sockets of the same steel grade.  
<sup>d</sup>  $e_{min.} = s_{nom} \times 1,13$ .

Table 3 (continued)

Nominal width across flats <sup>a</sup> <i>s</i>	Minimum test torsion torque <i>M</i> N · m							Test mandrel	
	Series							Height <i>h</i> h13 mm	Width across corners <sup>d</sup> <i>e</i> <sub>min.</sub> mm
	A	C	E						
			Driving square nominal dimension <sup>b</sup>						
			6,3	10	12,5	20	25		
34	1 019	761	—	—	512 <sup>c</sup>	1 216	—	17,6	38,42
36	1 165	893	—	—	—	1 345	—	19,2	40,68
41	1 579	1 154	—	—	—	1 412 <sup>c</sup>	1 909,8	21,6	46,33
46	2 067	1 453	—	—	—	1 412 <sup>c</sup>	2 143	24	51,98
50	2 512	1 716	—	—	—	1 412 <sup>c</sup>	2 329,1	26,4	56,50
55	3 139	2 077	—	—	—	1 412 <sup>c</sup>	2 515	28,8	62,15
60	3 849	2 471	—	—	—	1 412 <sup>c</sup>	2 515 <sup>c</sup>	31,2	67,80
65	4 641	2 900	—	—	—	—	2 515 <sup>c</sup>	33,5	73,45
70	5 520	3 364	—	—	—	—	2 515 <sup>c</sup>	36	79,10
<sup>a</sup>	Not according to ISO 272.								
<sup>b</sup>	For dimensions of driving squares, see ISO 1174-1.								
<sup>c</sup>	Value of test torque voluntarily limited. Driving squares have lower strengths than sockets of the same steel grade.								
<sup>d</sup>	$e_{\text{min.}} = s_{\text{nom}} \times 1,13$ .								