
**Assembly tools for screws and nuts —
Ratcheting wrenches — Technical
requirements**

*Outils de manoeuvre pour vis et écrous — Clé à cliquet — Exigences
techniques*





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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).

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).

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For an explanation of the voluntary nature of standards, 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 www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 29, *Small tools*, Subcommittee SC 10, *Assembly tools for screws and nuts, pliers and nippers*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Assembly tools for screws and nuts — Ratcheting wrenches — Technical requirements

1 Scope

This document specifies the dimensions and technical requirements for ratcheting wrenches used in assembly or disassembly of hexagonal and double hexagonal fasteners.

NOTE The wrenches covered by this document are the ones identified in ISO 1703 under reference No.1 1 01 07 0, 1 1 01 08 0, 1 1 01 09 0 and 1 1 02 19 0, 1 1 02 20 0.

NOTE The wrenches according to this document are not intended for uses with impact stress of the wrench.

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 691, *Assembly tools for screws and nuts — Wrench and socket openings — Tolerances for general use*

ISO 1711-1:2019, *Assembly tools for screws and nuts — Technical specifications — Part 1: Hand-operated wrenches and sockets*

ISO 3318, *Assembly tools for screws and nuts — Open-ended wrenches, box wrenches and combination wrenches — Maximum widths of heads*

ISO 6507-1, *Metallic materials — Vickers hardness test — Part 1: Test method*

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

ISO 7738, *Assembly tools for screws and nuts — Combination wrenches — Lengths of wrenches and maximum thickness of heads*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

3.1

reversing torque

torque required to rotate the box-head ratchet of the wrench in the opposite direction to the direction of torque application

3.2

reversing device

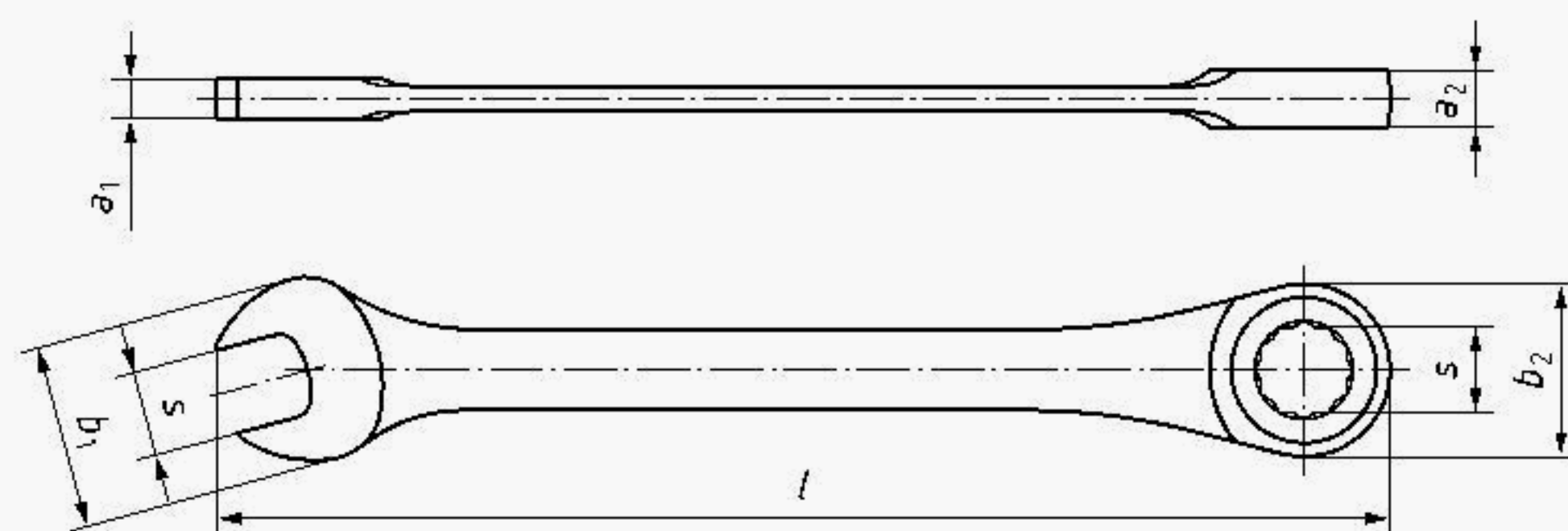
part of a reversible ratchet that allows the direction of torque application to be changed by the movement of a lever or similar

4 Classification

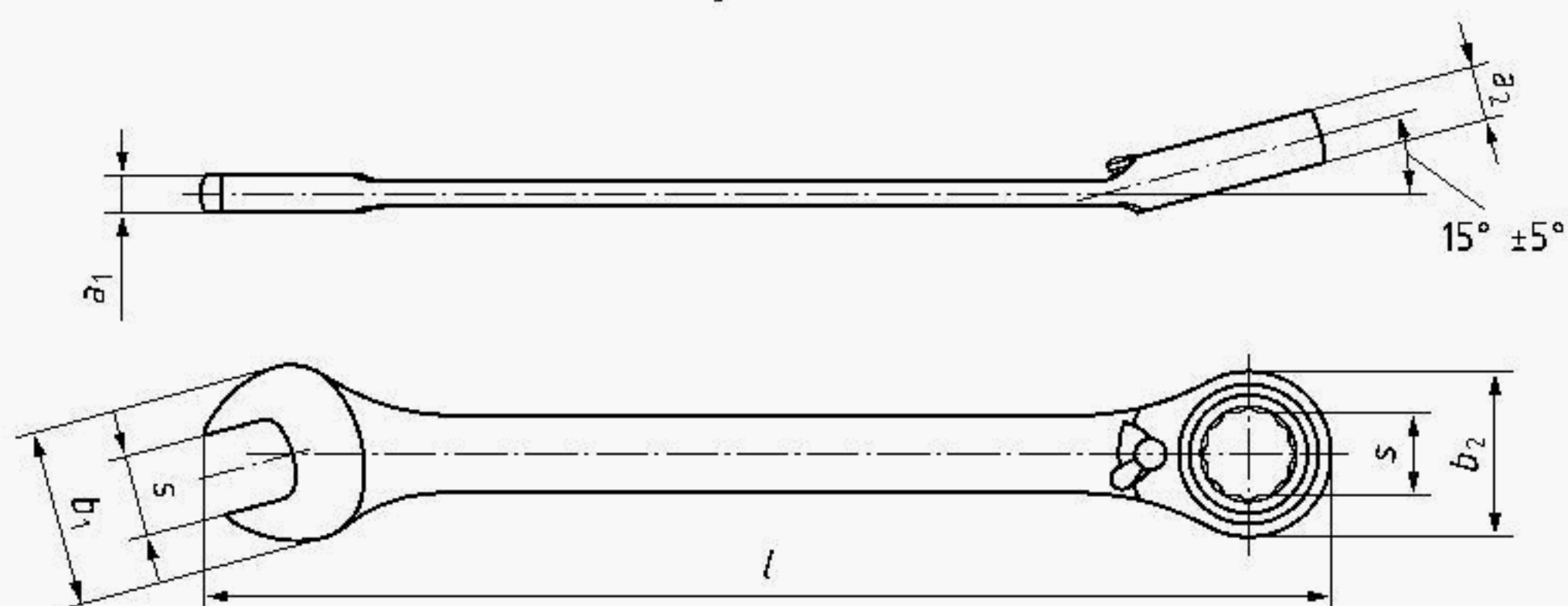
Ratcheting wrenches to which this document applies are classified as combination wrenches, ratcheting and double-headed box wrenches, ratcheting (for recommended combinations of the wrench structures, see [Annex A](#)).

- a) Combination wrenches, ratcheting (Type I, see [Figure 1](#)):
 - 1) Class A: flat shape;
 - 2) Class B: offset shape with reversing device;
 - 3) Class C: flat shape with flexible head;
- b) Double-headed box wrenches, ratcheting (Type II, see [Figure 2](#)):
 - 1) Class A: flat shape;
 - 2) Class B: offset shape with reversing device;
 - 3) Class C: flat shape with flexible head.

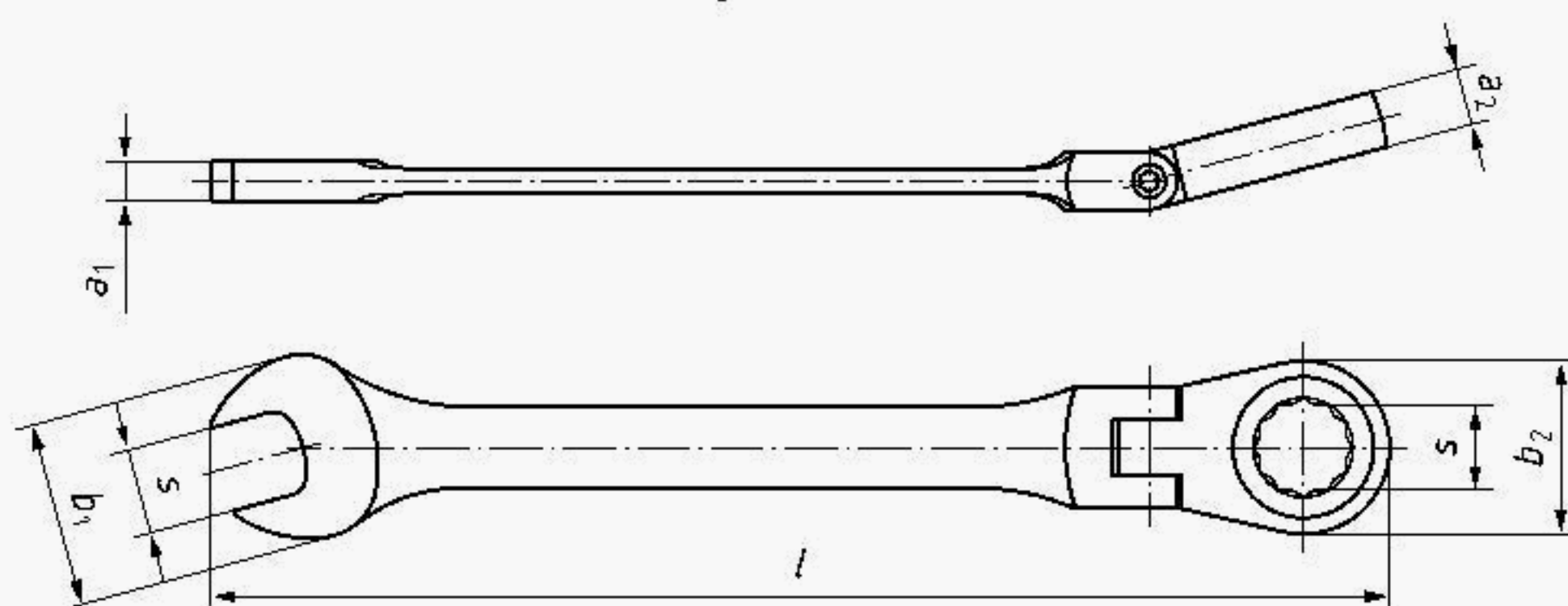
NOTE [Figures 1](#) and [2](#) show only examples and do not influence the design of the wrench.



a) Class A



b) Class B

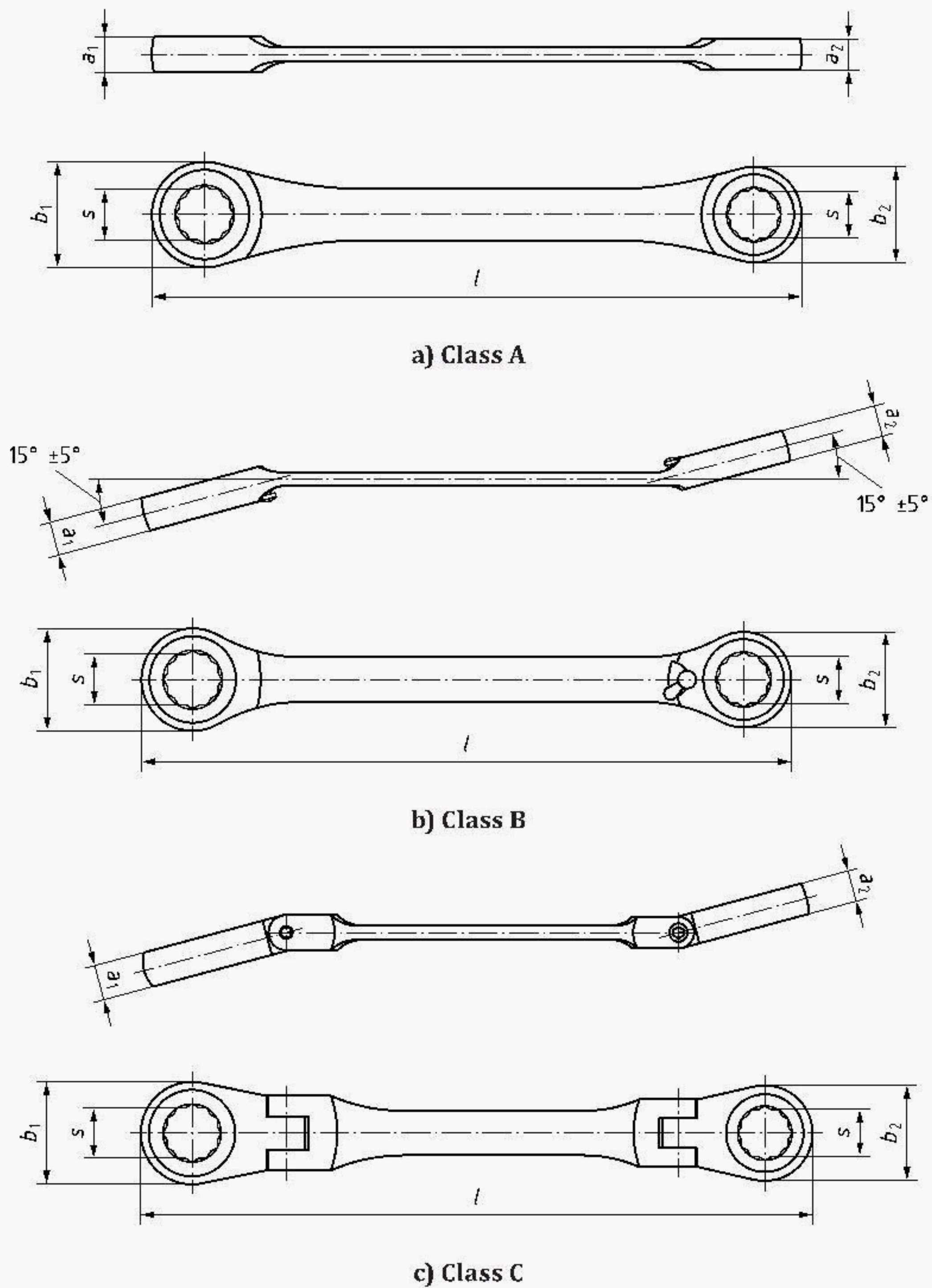


c) Class C

Key

s	nominal width across flats
a_1, a_2	thickness of head
b_1, b_2	outside widths of head
l	overall length

Figure 1 — Combination wrenches, ratcheting, Type I



Key

- s nominal width across flats
- a_1, a_2 thickness of head
- b_1, b_2 outside widths of head
- l overall length

Figure 2 — Double-headed box wrenches, ratcheting, Type II

5 Dimension

5.1 Dimensions of combination wrenches, ratcheting

The dimensions of combination wrenches, ratcheting are given in [Table 1](#), see [Figure 1](#).

Table 1 — Dimensions of combination wrenches, ratcheting

Dimensions in millimetres

Nominal width across flat s^a	a_1 maximum	a_2 maximum	b_1 maximum	b_2 maximum	l minimum
6	4,5 ^b	7,5	20 ^c	18,5	80
7	5 ^b	8	22 ^c	19	80
8	5 ^b	8 ^b	24 ^c	19,5	85
9	5,5 ^b	8,5 ^b	25 ^c	21,5	90
10	6 ^b	9 ^b	28 ^c	23	90
11	6,5 ^b	9,5 ^b	30 ^c	24 ^d	100
12	7 ^b	10 ^b	32	26 ^d	100
13	7 ^b	11 ^b	34 ^c	28 ^d	100
14	7,5 ^b	11,5 ^b	36 ^c	30 ^d	110
15	8 ^b	12 ^b	39 ^c	32 ^d	115
16	8 ^b	12,5 ^b	41 ^c	34 ^d	120
17	8,5 ^b	13 ^b	42 ^c	35 ^d	120
18	9 ^b	14 ^b	45 ^c	38 ^d	125
19	9 ^b	14,5 ^b	47 ^c	40,5 ^d	130
20	10 ^b	15 ^b	49 ^c	42,5	130
21	10 ^b	15,5 ^b	51 ^c	43,5 ^d	150
22	10,5 ^b	16 ^b	53 ^c	45,5 ^d	150
23	11 ^b	17 ^b	55 ^c	50	150
24	12	17,5 ^b	57 ^c	51	230
25	12 ^b	18 ^b	59 ^c	51,5 ^d	235
26	12	18	59	54	245
27	13	19 ^b	64 ^c	55,5 ^d	255
28	13,5	19,5	65	59	265
29	13,5	19,5	67	60	275
30	13,5 ^b	20 ^b	70 ^c	61 ^d	285
31	13,5	20	72	65	290
32	14,5 ^b	21 ^b	74 ^c	65 ^d	300
34	15 ^b	22,5 ^b	78 ^c	66	320
36	15,5 ^b	23,5 ^b	83 ^c	70	335
38	16,5	24	88	71	350
41	17,5 ^b	26,5 ^b	93 ^c	74	380

^a The tolerances shall be in accordance with ISO 691.

^b The value shall be according to ISO 7738.

^c The value shall be according to ISO 3318.

^d The value is approximately equal to the value in ISO 3318, multiplied by factor 1,3.

5.2 Dimensions of double-headed box wrenches, ratcheting

The dimensions of double-headed box wrenches, ratcheting are given in Table 2, see Figure 2.

Table 2 — Dimensions of double-headed box wrenches, ratcheting

Dimensions in millimetres

Nominal width across flat $s_1^a \times s_2^a$	a_1 maximum	a_2 maximum	b_1 maximum	b_2 maximum	l minimum
6 × 7	7,5	8	18,5	19	80
7 × 8	8	8 ^b	19	19,5	85
8 × 9	8 ^b	8,5 ^b	19,5	21,5	95
8 × 10	8 ^b	9 ^b	19,5	23	105
10 × 11	9 ^b	9,5 ^b	23	24 ^c	115
10 × 12	9 ^b	10 ^b	23	26 ^c	115
10 × 13	9 ^b	11 ^b	23	28 ^c	130
11 × 13	9,5 ^b	11 ^b	24 ^c	28 ^c	130
12 × 13	10 ^b	11 ^b	26 ^c	28 ^c	130
12 × 14	10 ^b	11,5 ^b	26 ^c	30 ^c	130
13 × 14	11 ^b	11,5 ^b	28 ^c	30 ^c	130
13 × 15	11 ^b	12 ^b	28 ^c	30 ^c	130
13 × 16	11 ^b	12,5 ^b	28 ^c	34 ^c	130
13 × 17	11 ^b	13 ^b	28 ^c	35 ^c	140
14 × 15	11,5 ^b	12 ^b	30 ^c	32 ^c	140
14 × 16	11,5 ^b	12,5 ^b	30 ^c	34 ^c	140
14 × 17	11,5 ^b	13 ^b	30 ^c	35 ^c	140
15 × 16	12 ^b	12,5 ^b	32 ^c	34 ^c	140
15 × 18	12 ^b	14 ^b	32 ^c	38 ^c	140
16 × 17	12,5 ^b	13 ^b	34 ^c	35 ^c	140
16 × 18	12,5 ^b	14 ^b	34 ^c	38 ^c	145
17 × 19	13 ^b	14,5 ^b	35 ^c	40,3 ^c	150
18 × 19	14 ^b	14,5 ^b	38 ^c	40,5 ^c	150
18 × 21	14 ^b	15,5 ^b	38 ^c	43,5 ^c	160
19 × 22	14,5 ^b	16 ^b	40,5 ^c	45,5 ^c	175
19 × 24	14,5 ^b	17,5 ^b	40,5 ^c	51	175
20 × 22	15 ^b	16 ^b	42,5	45,5 ^c	180
21 × 22	15,5 ^b	16 ^b	43,5 ^c	45,5 ^c	180
21 × 23	15,5 ^b	17 ^b	43,5 ^c	50	190
21 × 24	15,5 ^b	17,5 ^b	43,5 ^c	51	190
22 × 24	16 ^b	17,5 ^b	45,5 ^c	51	200
24 × 27	17,5 ^b	19 ^b	51	55,5 ^c	220
24 × 30	17,5 ^b	20 ^b	51	61 ^c	220
25 × 28	18 ^b	19,5	51,5 ^c	59	250
27 × 30	19 ^b	20 ^b	55,5 ^c	61 ^c	250

^a The tolerances shall be in accordance with ISO 691.

^b The value shall be according to ISO 7738.

^c The value is approximately equal to the value in ISO 3318, multiplied by factor 1,3.

Table 2 (continued)

Nominal width across flat $s_1^a \times s_2^a$	a_1 maximum	a_2 maximum	b_1 maximum	b_2 maximum	l minimum
27 × 32	19 ^b	21 ^b	55,5 ^c	65	270
30 × 32	20 ^b	21 ^b	61 ^c	65	270
^a The tolerances shall be in accordance with ISO 691.					
^b The value shall be according to ISO 7738.					
^c The value is approximately equal to the value in ISO 3318, multiplied by factor 1,3.					

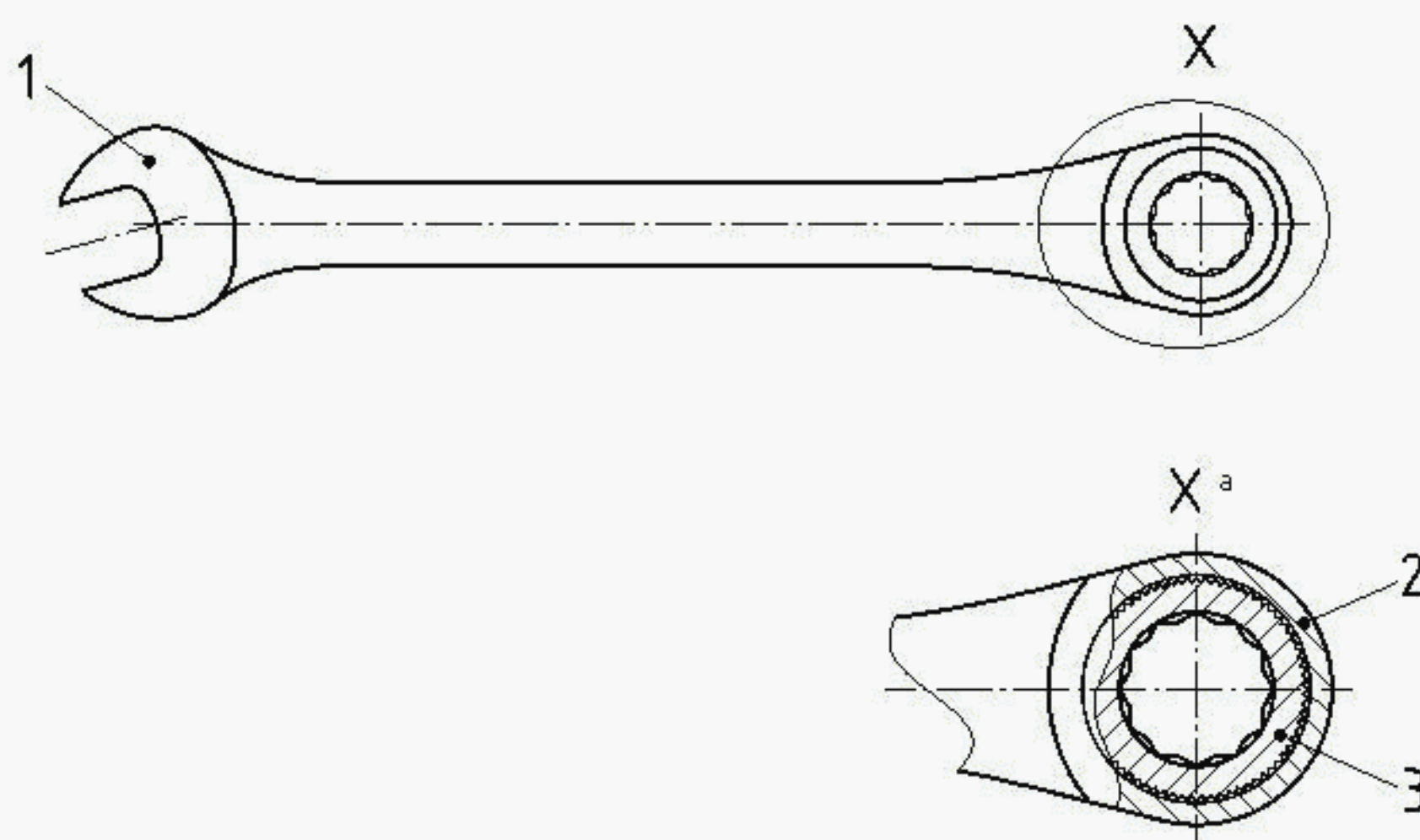
6 Hardness

The hardness of ratcheting wrenches shall be as given in Table 3, see Figure 3.

Hardness shall be tested in accordance with ISO 6508-1 or ISO 6507-1. Microhardness is acceptable when tested in accordance with ISO 6507-1.

Table 3 — Hardness

Position	Hardness	
	s ≤ 34 mm	s > 34 mm
open-end	≥42 HRC	≥39 HRC
ratchet housing		
ratchet rotating gear	≥45HRC	



Key

- 1 open-end
- 2 ratchet housing
- 3 ratchet rotating gear
- ^a Box-end.

Figure 3 — Hardness position

7 Reversing torque testing

The reversing torque for the box-end of ratcheting wrenches shall not exceed the value in [Table 4](#). Each ratchet shall be rotated 360° after the torque test and before measuring the reversing torque.

Table 4 — Reversing torque

Nominal width across flats <i>s</i> mm	Maximum reversing torque <i>M</i> N·m
$6 \leq s \leq 11$	0,07
$12 \leq s \leq 15$	0,18
$16 \leq s \leq 19$	0,28
$20 \leq s \leq 41$	0,35

8 Torque testing

The minimum test torque values for the box-end of ratcheting wrenches shall be in accordance with the minimum test torque values of ISO 1711-1, series A.

The minimum test torque values for the open-end of ratcheting wrenches shall be in accordance with the minimum test torque values of ISO 1711-1, series C.

The torque testing procedure shall be performed in accordance with ISO 1711-1:2019, 5.2 and 5.3. After the torque testing, any possible damage or deformation shall not affect the usability of the tool.

9 Drop testing

The ratcheting wrenches shall be dropped from a height of 1,8 m onto a concrete surface 12 times, six times in a vertical orientation with the box-end of the wrench downwards and six times with the wrench placed in a horizontal position.

After the drop testing, any possible damage or deformation shall not affect the usability of the tool.

10 Function

Where the ratchet head is flexible, the head shall be capable of being set into position without excessive force. It shall hold the set position when the wrench body is held in the horizontal position.

Where the ratchet head is reversible, the reversing lever shall be capable of being set into position without excessive force. It shall remain in the desired position when the ratcheting feature is activated.

11 Cycle testing

For the box-end of ratcheting wrenches, the cycle test method shall be carried out in accordance with the torque test method with an applied torque values that is 35 % of the minimum test torque of ISO 1711-1, series A, at a rate not to exceed 60 cycles per minute. Non-reversible ratcheting wrenches shall withstand a cycle test of 5 000 cycles in one direction only. Wrenches with a reversing device shall be tested for minimum 2 500 cycles in both clockwise and counter-clockwise directions separately. After the cycle testing, any possible damage or deformation shall not affect usability of tool.

Following the application of the cycle testing, the wrench shall be subjected to reversing torque testing in accordance with [Clause 7](#) and torque testing in accordance with [Clause 8](#).

12 Test sequence

The tests ([Clauses 7 to 11](#)) shall be performed in the sequence shown in [Table 5](#) on the same sample.

Table 5 — Test sequence

Wrenches	Wrenches
Type I, Class A	Type I, Class B and Class C
Type II, Class A	Type II, Class B and Class C
1. Reversing torque testing (Clause 7) 2. Torque testing (Clause 8) 3. Drop testing (Clause 9) 4. Cycle testing (Clause 11) 5. Reversing torque testing (Clause 7) 6. Torque testing (Clause 8)	1. Reversing torque testing (Clause 7) 2. Torque testing (Clause 8) 3. Drop testing (Clause 9) 4. Function (Clause 10) 5. Cycle testing (Clause 11) 6. Reversing torque testing (Clause 7) 7. Torque testing (Clause 8)

13 Designation

A ratcheting wrench in accordance with this document shall be designated by:

- “Ratcheting wrench”;
- a reference to this document, i.e. ISO 21982;
- the type;
- the nominal width across flats of open-end and box-end, s , in millimetres;
- the overall length, l , in millimetres.

EXAMPLE 1 A ratcheting wrench of type I, class A with $s = 17$ mm and $l = 230$ mm is designated as follow:

Ratcheting wrench ISO 21982 I A17 – 230

EXAMPLE 2 A ratcheting wrench of type II, class B with $s_1 = 17$ mm, $s_2 = 19$ mm and $l = 250$ mm is designated as follow:

Ratcheting wrench ISO 21982 II B17 × 19 – 250

14 Marking

Ratcheting wrenches shall be marked, permanently and legibly, with at least the following:

- the nominal width across flat, s , in millimetres;
- the name or trademark of the manufacturer (or the responsible supplier).

Annex A (informative)

Recommended combinations

The recommended combinations for the wrench structures are shown in [Table A.1](#).

Table A.1 — Recommended combinations for the wrench structures

Type	Non-reversible		Reversible	
	Flat	Flexible	Offset	Flexible
Combination wrenches, ratcheting	×			
		×		
			×	
				×
Double-headed box wrenches, ratcheting	×			
		×		
			×	
				×

Bibliography

- [1] ISO 1703, *Assembly tools for screws and nuts — Nomenclature*

