
**Assembly tools for screws and nuts —
Hexagon socket screw keys**

*Outils de manoeuvre pour vis et écrous — Clés mâles coudées pour vis
à six pans creux*

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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 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 sixth edition cancels and replaces the fifth edition (ISO 2936:2001), of which it constitutes a minor revision, and [Clause 3](#) and [Table 1](#) of which have been revised. It also incorporates the Technical Corrigendum ISO 2936:2001/Cor 1:2007.

Assembly tools for screws and nuts — Hexagon socket screw keys

1 Scope

This International Standard specifies the dimensions, the method of test, the designation, and the marking of hexagon socket screw keys. It also specifies the minimum values of Rockwell hardness that are to be met.

The specifications of this International Standard apply for tightening of hexagon socket screws for property class less than or equal to 12,9 as defined in ISO 898-1 and for tightening of socket set screws as defined in ISO 898-5.

NOTE 1 Hexagon socket screw keys are listed under reference number 4 1 03 01 0 in ISO 1703.

2 Normative references

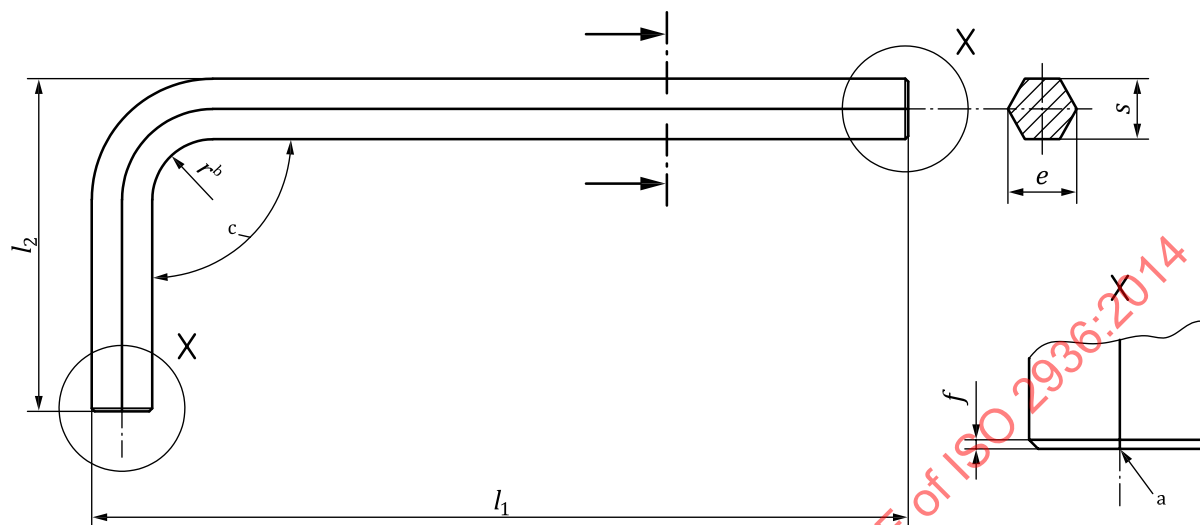
The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 898-1, *Mechanical properties of fasteners made of carbon steel and alloy steel — Part 1: Bolts, screws and studs with specified property classes — Coarse thread and fine pitch thread*

ISO 898-5, *Mechanical properties of fasteners made of carbon steel and alloy steel — Part 5: Set screws and similar threaded fasteners with specified hardness classes — Coarse thread and fine pitch thread*

3 Dimensions

See [Figure 1](#) and [Table 1](#).



Key

- a The corners can be sharp, rounded, or chamfered, and the radius of curvature or the chamfer, f , respectively, shall not be greater than half the difference between width across corners, e , and width across flats, s .

$$f_{\max} = \frac{e_{\max} - s_{\min}}{2}$$

Each end shall be square with the axis of each arm within $\pm 1^\circ$.

- b r shall not be smaller than 1,5 mm, $r \geq s$.

- c $90^\circ + 2^\circ$
 -1° for width across flats ≤ 17 mm;

$90^\circ + 3^\circ$
 -1° for width across flats > 17 mm.

Figure 1 — Hexagon socket screw key

Table 1 — Dimensions

Dimensions in millimetres

Width across flats s			Width across corners e^a		l_1			l_2	
nom.	max.	min.	max.	min.	Standard	Long	Extra-long	Limit deviations	Limit deviations
0,7	0,71	0,70	0,79	0,76	33	—	—	0 -2	7
0,9	0,89	0,88	0,99	0,96	33	—	—		11
1,3	1,27	1,24	1,42	1,37	41	63,5	81		13
1,5	1,50	1,48	1,68	1,63 ^b	46,5	63,5	91,5		15,5
2	2,00	1,96	2,25	2,18 ^c	52	77	102		18
2,5	2,50	2,46	2,82	2,75 ^c	58,5	87,5	114,5	0 -4	20,5
3	3,00	2,96	3,39	3,31 ^c	66	93	129		23
3,5	3,50	3,45	3,96	3,91	69,5	98,5	140		25,5
4	4,00	3,95	4,53	4,43 ^c	74	104	144		29
4,5	4,50	4,45	5,10	5,04	80	114,5	156		30,5
5	5,00	4,95	5,67	5,57 ^d	85	120	165		33
6	6,00	5,95	6,81	6,70 ^d	96	141	186		38
7	7,00	6,94	7,95	7,85	102	147	197	0 -6	41
8	8,00	7,94	9,09	8,97	108	158	208		44
9	9,00	8,94	10,23	10,10	114	169	219		47
10	10,00	9,94	11,37	11,23	122	180	234		50
11	11,00	10,89	12,51	12,31	129	191	247		53
12	12,00	11,89	13,65	13,44	137	202	262		57

Table 1 (continued)

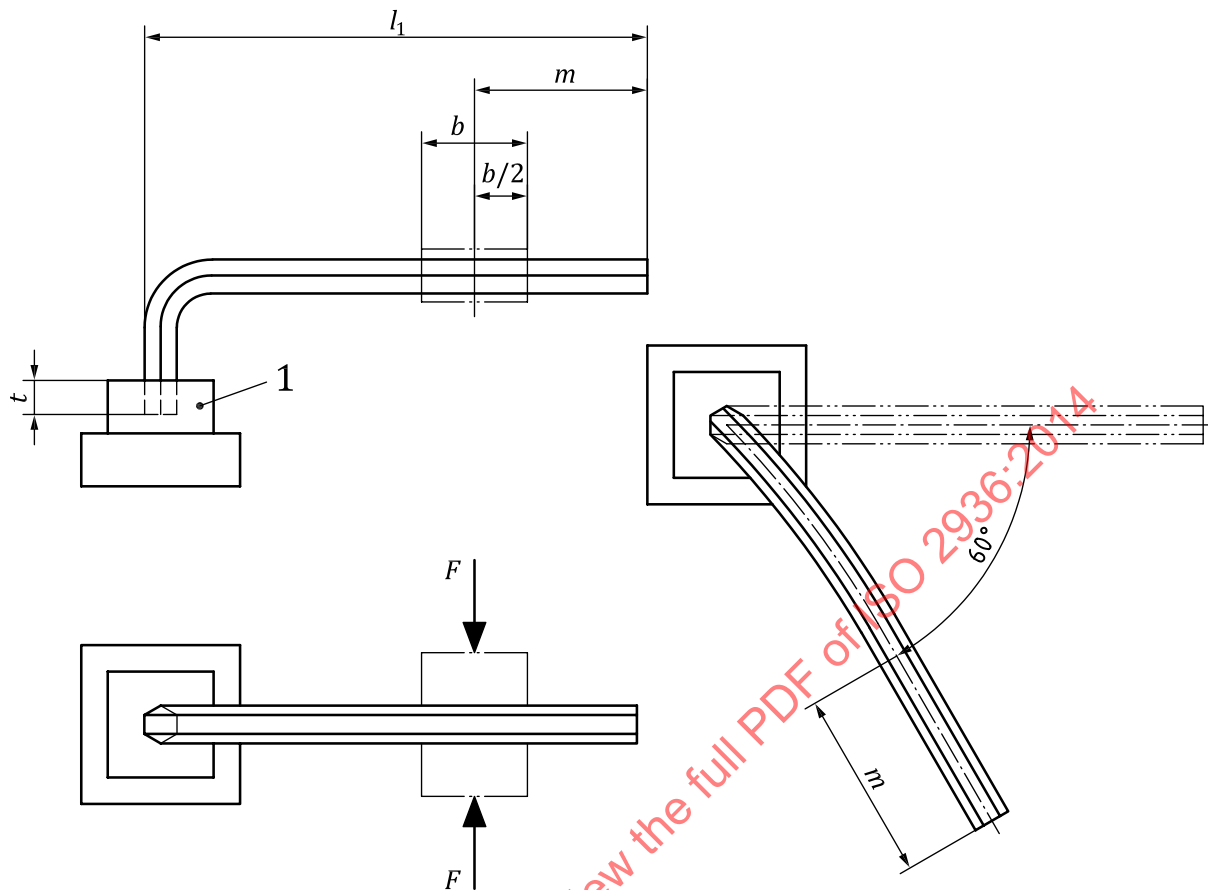
Width across flats s			Width across corners e^a		l_1				l_2	
nom.	max.	min.	max.	min.	Standard	Long	Extra-long	Limit deviations		Limit deviations
13	13,00	12,89	14,79	14,57	145	213	277	0 -7	63	0 -3
14	14,00	13,89	15,93	15,70	154	229	294		70	
15	15,00	14,89	17,07	16,83	161	240	307		73	
16	16,00	15,89	18,21	17,96	168	240	307		76	
17	17,00	16,89	19,35	19,09	177	262	337		80	
18	18,00	17,89	20,49	20,22	188	262	358		84	
19	19,00	18,87	21,63	21,32	199	—	—		89	
21	21,00	20,87	23,91	23,58	211	—	—	0 -12	96	0 -5
22	22,00	21,87	25,05	24,71	222	—	—		102	
23	23,00	22,87	26,19	25,84	233	—	—		108	
24	24,00	23,87	27,33	26,97	248	—	—		114	
27	27,00	26,87	30,75	30,36	277	—	—		127	
29	29,00	28,87	33,03	32,62	311	—	—		141	
30	30,00	29,87	34,17	33,75	315	—	—		142	
32	32,00	31,84	36,45	35,98	347	—	—		157	
36	36,00	35,84	41,01	40,50	391	—	—		176	
^a $e_{\max} = 1,14 s_{\max} - 0,03$ (from $1,5 \leq s \leq 36$); $e_{\min} = 1,13 s_{\min}$ (from $8 \leq s \leq 36$). ^b $e_{\min} = 1,13 s_{\min} - 0,04$. ^c $e_{\min} = 1,13 s_{\min} - 0,03$. ^d $e_{\min} = 1,13 s_{\min} - 0,02$.										

4 Method of test

Insert the short arm of the key into a female hexagon socket adapter having a Rockwell hardness as given in Table 3. Smoothly apply an increasing load at a distance m from the end of the long arm of the key (where $m = l_1/3$, with a tolerance of ± 2 mm) until the proof torque is reached. It shall be ensured throughout the whole test procedure that the friction lock contact with the tool surface is maintained over the total area of the force-initiating contact area b as given in Table 2. The load shall be applied perpendicular to the axis of the key, and the torque is calculated as the product of the applied load and the distance between the point of application of the load and the axis of the adapter. Test values are given in Table 3.

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

For a key with a width across the flats of up to 14 mm, the hexagon socket screw key shall show a total deformation, to torsion fracture, of at least 60° under load and a permanent deformation before failure.



Key

1 female hexagon socket adapter

Figure 2 — Test configuration

Table 2 — Test dimensions for force-initiating contact area

Dimensions in millimetres

Width across flats nom.	b
0,7 to 5	10 ± 1
> 5 to 17	20 ± 1
> 17	50 ± 1

Table 3 — Test values

Width across flats of key s	Minimum Rockwell hardness of key ^a	Minimum proof torque ^b M_d	Width across flats of hexagon socket adapter ^c		Key engagement ^d t	
			max.	min.		Limit deviations
mm	HRC	N · m	mm	mm	mm	mm
0,7	52	0,08	0,724	0,711	1,5	+1 0
0,9		0,18	0,902	0,889	1,7	
1,3		0,53	1,295	1,270	2	
1,5		0,82	1,545	1,520	2	
2		1,9	2,045	2,020	2,5	
2,5		3,8	2,560	2,520	3	
3		6,6	3,080	3,020	3,5	
3,5		10,3	3,595	3,520	4,5	
4		16	4,095	4,020	5	
4,5		22	4,595	4,520	5,5	
5		30	5,095	5,020	6	
6		52	6,095	6,020	8	
7		80	7,115	7,025	9	
8		120	8,115	8,025	10	

Table 3 (continued)

Width across flats of key <i>s</i>	Minimum Rockwell hardness of key ^a	Minimum proof torque ^b <i>M</i> _d	Width across flats of hexagon socket adapter ^c		Key engagement ^d <i>t</i>	
			max.	min.		Limit deviations
mm	HRC	N · m	mm	mm	mm	mm
9	48	165	9,115	9,025	11	+2 0
10		220	10,115	10,025	12	
11		282	11,142	11,032	13	
12		370	12,142	12,032	15	
13		470	13,142	13,032	16	
14		590	14,142	14,032	17	
15	45	725	15,230	15,050	18	
16		880	16,230	16,050	19	
17		980	17,230	17,050	20	
18		1 158	18,230	18,050	21,5	
19		1 360	19,275	19,065	23	
21		1 840	21,275	21,065	25	
22		2 110	22,275	22,065	26	
23		2 414	23,275	23,065	27,5	
24		2 750	24,275	24,065	29	
27		3 910	27,275	27,065	32	
29		4 000	29,275	29,065	35	
30		4 000	30,330	30,080	36	
32		4 000	32,330	32,080	38	
36		4 000	36,330	36,080	43	

^a The hexagon socket screw keys shall be hardened to a through hardness over their whole length.

^b *M*_d = 0,85 (0,7 *R*_m) (0,224 5 *s*³), where *R*_m is the tensile strength. This formula does not apply to keys of widths across flats *s* from 29 mm ≤ *s* ≤ 36 mm.

^c Hardness of the test hexagon socket adapter:
s ≤ 17 mm: 60 HRC min.
s > 17 mm: 55 HRC min.
Width across corners of hexagon socket adapter: *e*_{min.} = *e*_{max.} (Table 1) + 0,05.

^d *t* ≈ 1,2 *s* (*t* ≈ 1,5 *s* for sizes smaller than 1,5 mm). These values apply to the test only. In practice, key engagement is less.

5 Designation

A socket screw key conforming to this International Standard shall be designated by:

- "Socket screw key";
- a reference to this International Standard, i.e. ISO 2936;
- its width across the flats, s , in millimetres;
- capital letter M, in the case of the design with a long length;