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

*Outils de manœuvre pour vis et écrous — Clés mâles coudées pour vis à
six plans 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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 2936 was prepared by Technical Committee ISO/TC 29, *Small tools*, Subcommittee SC 10, *Assembly tools for screws and nuts, pliers and nippers*.

This fifth edition cancels and replaces the fourth edition (ISO 2936:1995), which has been technically revised. In particular:

- Figure 1 has been technically modified;
- three lengths (standard, long and extra-long) for L_1 have been introduced as well as some new dimensions s ;
- the test method has been revised for which a new Figure 2 and a new Table 2 have been added;
- clause 5 "Designations" has been extended in accordance with the modifications.

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Assembly tools for screws and nuts — Hexagon socket screw keys

1 Scope

This International Standard specifies the dimensions, method of test, designation and marking of hexagon socket screw keys. It also specifies the minimum values of Rockwell hardness that shall 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 Hexagon socket screw keys are listed under number 112 in ISO 1703:1983, *Assembly tools for screws and nuts — Nomenclature*.

2 Normative references

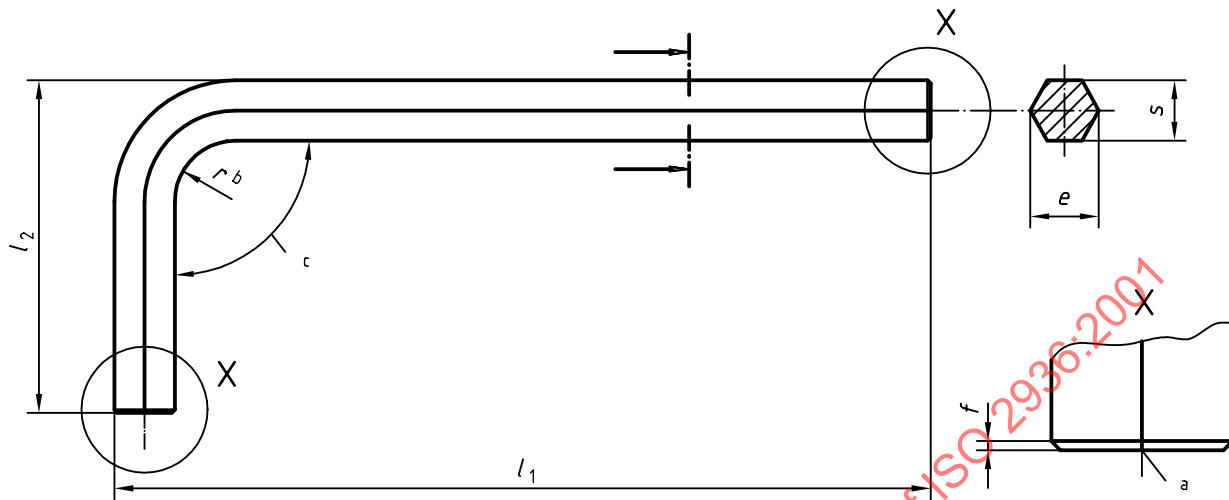
The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 898-1, *Mechanical properties of fasteners made of carbon steel and alloy steel — Part 1: Bolts, screws and studs*.

ISO 898-5, *Mechanical properties of fasteners made of carbon steel and alloy steel — Part 5: Set screws and similar threaded fasteners not under tensile stresses*.

3 Dimensions

See Figure 1 and Table 1.



a The corners may 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 $90^\circ \begin{smallmatrix} +2^\circ \\ -1^\circ \end{smallmatrix}$ for width across flats ≤ 17 mm

$90^\circ \begin{smallmatrix} +3^\circ \\ -1^\circ \end{smallmatrix}$ 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			Limit deviations	l_2	
nom.	max.	min.	max.	min.	Standard	Long	Extra-long			Limit deviations
0,7	0,71	0,70	0,79	0,76	33	—	—	$\begin{smallmatrix} 0 \\ -2 \end{smallmatrix}$	7	$\begin{smallmatrix} 0 \\ -2 \end{smallmatrix}$
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	$\begin{smallmatrix} 0 \\ -4 \end{smallmatrix}$	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	4,44 ^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	5,58 ^d	85	120	165		33	
6	6,00	5,95	6,81	6,71 ^d	96	141	186		38	
7	7,00	6,94	7,94	7,85	102	147	197	$\begin{smallmatrix} 0 \\ -6 \end{smallmatrix}$	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	$\begin{smallmatrix} 0 \\ -7 \end{smallmatrix}$	57	
13	13,00	12,89	14,79	14,56	145	213	277		63	$\begin{smallmatrix} 0 \\ -3 \end{smallmatrix}$
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	17,97	168	240	307		76	
17	17,00	16,89	19,35	19,09	177	262	337		80	
18	18,00	17,89	20,49	20,21	188	262	358		84	
19	19,00	18,87	21,63	21,32	199	—	—	$\begin{smallmatrix} 0 \\ -12 \end{smallmatrix}$	89	$\begin{smallmatrix} 0 \\ -5 \end{smallmatrix}$
21	21,00	20,87	23,91	23,58	211	—	—		96	
22	22,00	21,87	25,05	24,71	222	—	—		102	
23	23,00	22,87	26,16	25,86	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	32,59	311	—	—		141	

Table 1 (continued)

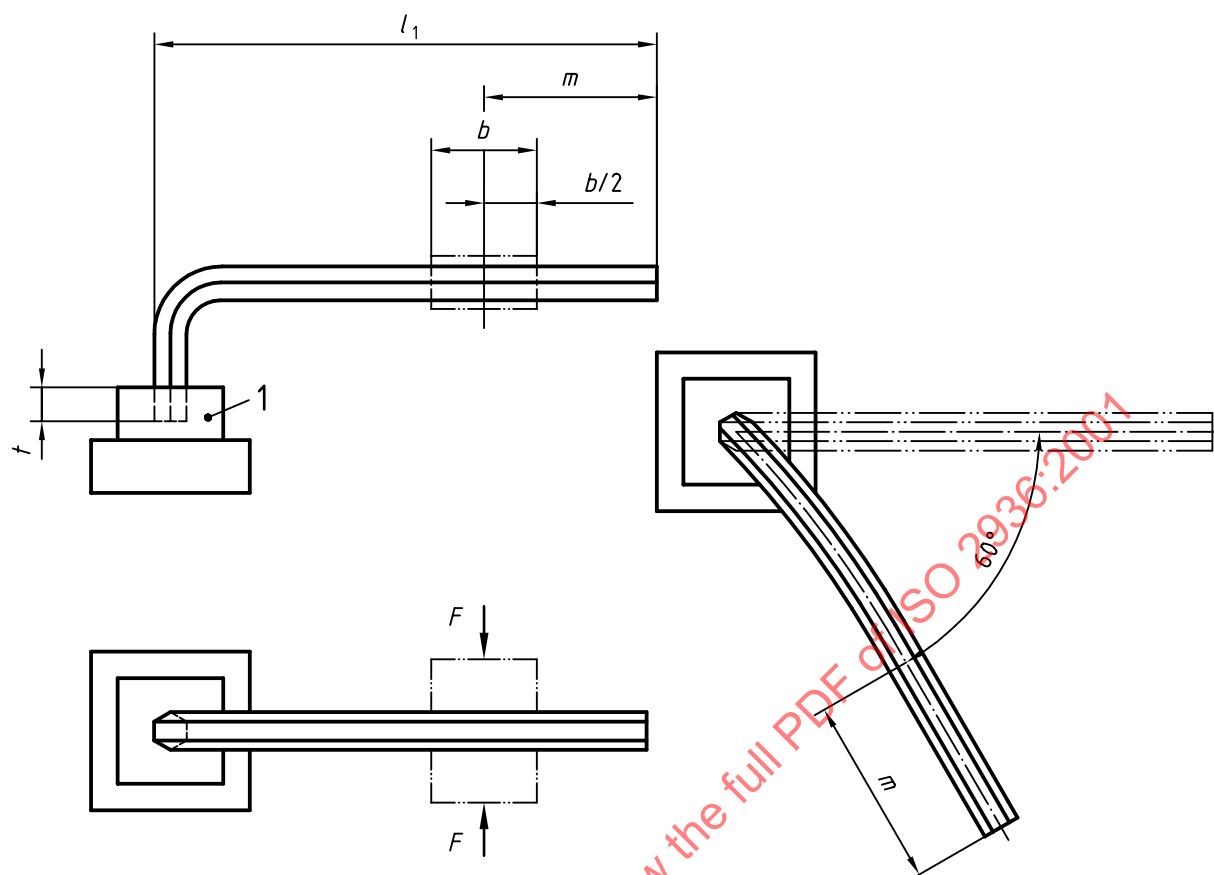
Width across flats			Width across corners							
s			e^a		l_1				l_2	
nom.	max.	min.	max.	min.	Standard	Long	Extra-long	Limit deviations		Limit deviations
30	30,00	29,87	34,17	33,75	315	—	—	$\begin{smallmatrix} 0 \\ -12 \end{smallmatrix}$	142	$\begin{smallmatrix} 0 \\ -5 \end{smallmatrix}$
32	32,00	31,84	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 $1,5 \leq s \leq 36$) $e_{\max} = 1,13 s_{\max}$ (from $8 \leq s \leq 36$) b $e_{\max} = 1,13 s_{\min} - 0,04$ 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 and including 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 s nom.	Force-initiating contact area b ± 1
$0,7 \leq s \leq 5$	10
$5 < s \leq 17$	20
$s > 17$	50

Table 3 — Test values

Width across flats of key <i>s</i> mm	Minimum Rockwell hardness of key ^a HRC	Minimum proof torque ^b <i>M</i> _d N·m	Width across flats of hexagon socket adapter ^c max. mm min. mm		Key engagement ^d <i>t</i> Limit deviations 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	
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	

Table 3 (continued)

Width across flats of key s mm	Minimum Rockwell hardness of key ^a HRC	Minimum proof torque ^b M_d N·m	Width across flats of hexagon socket adapter ^c		Key engagement ^d	
			max. mm	min. mm	t mm	Limit deviations mm
30	45	4 000	30,330	30,080	36	$\begin{smallmatrix} +2 \\ 0 \end{smallmatrix}$
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 $M_d = 0,85 (0,7 R_m) (0,224 5s^3)$ where R_m is the tensile strength. This formula does not apply to keys of widths across flats s from $29 \text{ mm} \leq s \leq 36 \text{ mm}$.

^c Hardness of the test hexagon socket adapter:

$s \leq 17$: 60 HRC min.

$s > 17$: 55 HRC min.

Width across corners of hexagon socket adapter: $e_{\min.} = e_{\max.} (\text{Table 1}) + 0,05$

^d $t \approx 1,2 s$ ($t \approx 1,5 s$ 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";
- 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.
- capital letter L in the case of the design with an extra-long length.

EXAMPLE 1 A hexagon socket screw key with a width across flats $s = 10 \text{ mm}$ is designated as follows:

Socket screw key ISO 2936 - 10

EXAMPLE 2 A hexagon socket screw key, with a width across flats $s = 10 \text{ mm}$ and long length (M) is designated as follows:

Socket screw key ISO 2936 - 10 M

EXAMPLE 3 A hexagon socket screw key, with a width across flats $s = 10 \text{ mm}$ and extra-long length (L) is designated as follows:

Socket screw key ISO 2936 - 10 L