INTERNATIONAL STANDARD

**ISO 2936**

Sixth edition
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# 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*

Reference number
ISO 2936:2014(E)

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# Foreword

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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

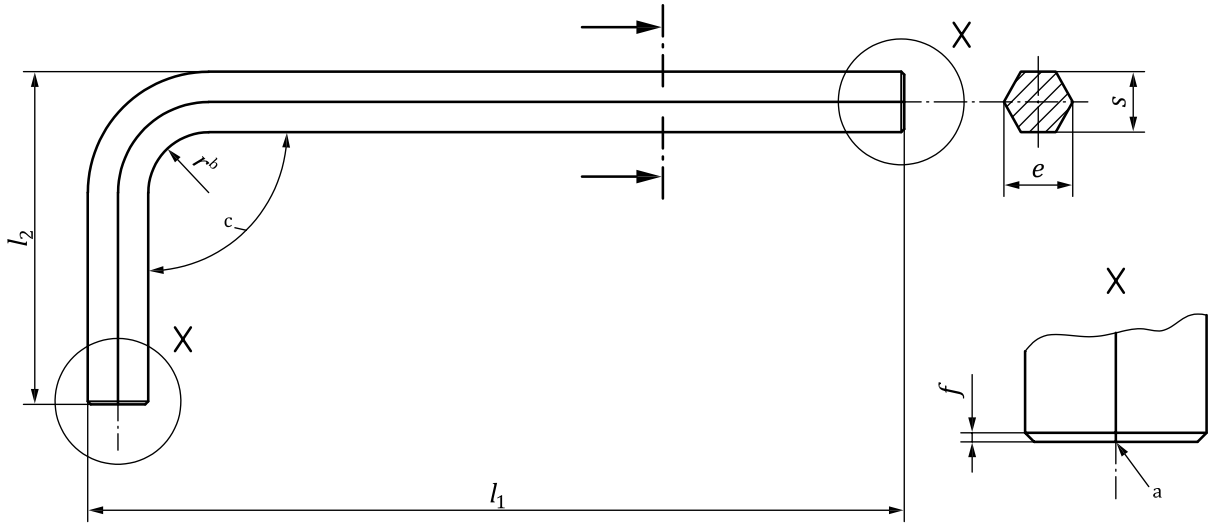
The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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 ±1°.

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

c $90°^{+2°}_{-1°}$ for width across flats ≤ 17 mm;

$90°^{+3°}_{-1°}$ 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 | — | — | | 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 | $^{0}_{-2}$ | 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 | | 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 | $^{0}_{-4}$ | 29 | $^{0}_{-2}$ |
| 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 | | 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 | $^{0}_{-6}$ | 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 $1{,}5 \le s \le 36$);
$e_{min} = 1{,}13\ s_{min}$ (from $8 \le s \le 36$).

b $e_{min} = 1{,}13\ s_{min} - 0{,}04$.

c $e_{min} = 1{,}13\ s_{min} - 0{,}03$.

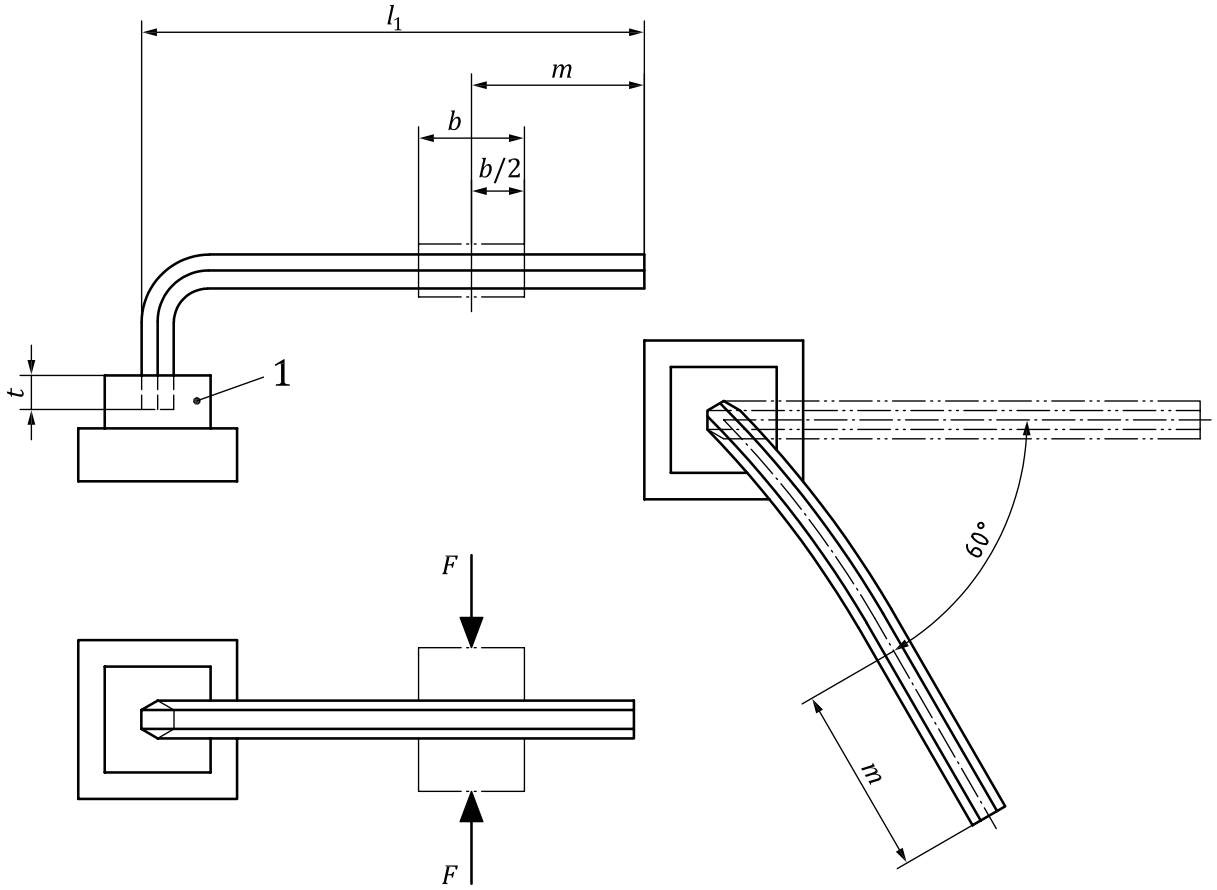
d $e_{min} = 1{,}13\ s_{min} - 0{,}02$.

## 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<br>$s$ | Minimum Rockwell hardness of key[a] | Minimum proof torque[b]<br>$M_d$ | Width across flats of hexagon socket adapter[c] | | Key engagement[d]<br>$t$ | |
|---|---|---|---|---|---|---|
| | | | 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 $s$ | 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 |
| 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 $t \approx 1{,}2\ s$ ($t \approx 1{,}5\ s$ 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:

a) "Socket screw key";

b) a reference to this International Standard, i.e. ISO 2936;

c) its width across the flats, $s$, in millimetres;

d) capital letter M, in the case of the design with a long length;

e) 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 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 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 mm and extra-long length (L) is designated as follows:

**Socket screw key ISO 2936-10 L**

## 6 Marking

Hexagon socket screw keys of 3 mm in size and above shall be marked legibly and permanently with at least:

a) the name or trademark of the manufacturer (or supplier);

b) the width across flats.

If not worked on the tool itself, this information shall be given at least on the smallest commonly used packaging unit.

# Bibliography

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

**ICS 25.140.30**

Price based on 9 pages