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# ISO

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

## ISO RECOMMENDATION R 1711

HAND OPERATED WRENCHES AND SOCKETS  
TECHNICAL SPECIFICATIONS

1st EDITION

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## BRIEF HISTORY

The ISO Recommendation R 1711, *Hand operated wrenches and sockets – Technical specifications*, was drawn up by Technical Committee ISO/TC 29, *Small tools*, the Secretariat of which is held by the Association Française de Normalisation (AFNOR).

Work on this question led to the adoption of Draft ISO Recommendation No. 1711, which was circulated to all the ISO Member Bodies for enquiry in October 1968. It was approved, subject to a few modifications of an editorial nature, by the following Member Bodies :

|                |                       |                |
|----------------|-----------------------|----------------|
| Australia      | Ireland               | Switzerland    |
| Austria        | Israel                | Thailand       |
| Belgium        | Italy                 | Turkey         |
| Brazil         | Japan                 | U.A.R.         |
| Czechoslovakia | Korea, Rep. of        | United Kingdom |
| France         | New Zealand           | U.S.A.         |
| Germany        | Poland                | U.S.S.R.       |
| Greece         | Portugal              | Yugoslavia     |
| Hungary        | South Africa, Rep. of |                |
| India          | Spain                 |                |

The following Member Body opposed the approval of the Draft :

Sweden

This Draft ISO Recommendation was then submitted by correspondence to the ISO Council, which decided to accept it as an ISO RECOMMENDATION.

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## HAND OPERATED WRENCHES AND SOCKETS

### TECHNICAL SPECIFICATIONS

#### 1. SCOPE

This ISO Recommendation, relating to assembly tools for bolts and screws, deals with hand operated wrenches and sockets.

It specifies minimum values for hardness and torsional strength which should be satisfied by these tools. It provides for three series of torsion torques, i.e. :

- **series A** : Usual ring wrenches and socket wrenches (Examples\* : Wrenches Nos. 5 – 6 – 8 – 9 – 10 – 11 – 15 – 16 – 17 – 18 – 19 – 20 – 21 – 26 – 27);
- **series C** : Alloy steel open jaw wrenches (Examples\* : Wrenches Nos. 1 – 4);
- **series E** : Hand operated square drive sockets (Example\* : Socket No. 24).

Torques to be applied during tests have been determined by empirical formulae given in Table 1 for guidance.

TABLE 1 – Formulae giving test torques  $M$  as a function of width across flats  $s$

| Series   |                                 |                                                      | $s^{**}$ in millimetres | $s^{**}$ in inches                |
|----------|---------------------------------|------------------------------------------------------|-------------------------|-----------------------------------|
|          |                                 |                                                      | Test torque $M$         |                                   |
|          |                                 |                                                      | in newton metres N.m    | in pound-force feet lbf.ft        |
| <b>A</b> |                                 |                                                      | $0.2657 s^{2.34}$       | $1429 \times 0.2657 s^{2.34}$     |
| <b>C</b> | Widths across flats $s$         | $s \leq 36 \text{ mm } (1 \frac{13}{32} \text{ in})$ | $0.0392 s^{2.8}$        | $6329 \times 0.0392 s^{2.8}$      |
|          |                                 | $s > 36 \text{ mm } (1 \frac{13}{32} \text{ in})$    | $0.6865 s^2$            | $475.8 \times 0.6865 s^2$         |
| <b>E</b> | Dimension for driving square mm | 6.3                                                  | $0.9807 s^{1.7}$        | $180.5 \times 0.9807 s^{1.7}$     |
|          |                                 | 10                                                   | $0.3507 s^{2.34 ***}$   | $1429 \times 0.3507 s^{2.34 ***}$ |
|          |                                 | 12.5                                                 | $1.4710 s^2$            | $475.8 \times 1.4710 s^2$         |
|          |                                 | 20                                                   | $2.4517 s^{1.7}$        | $180.5 \times 2.4517 s^{1.7}$     |
|          |                                 | 25                                                   | $46.5816 s$             | $18.73 \times 46.5816 s$          |

\* The wrenches and socket listed are taken from ISO Recommendation R 1703, *Nomenclature of the assembly tools for bolts and screws*. (At present Draft ISO Recommendation).

\*\*  $s$  : width across flats.

\*\*\* Torque  $M$  applicable to series A multiplied by the coefficient 1.32.

## 2. HARDNESS TESTING

The hardness test should be carried out according to the conditions specified in ISO Recommendation R 80, *Rockwell hardness test (B and C scales) for steel*.

The values given in Table 2 are minimum values.

TABLE 2 Hardness HRC for wrenches and sockets

| Width across flats <i>s</i> |                                  | Hardness HRC                               |                                           |
|-----------------------------|----------------------------------|--------------------------------------------|-------------------------------------------|
|                             |                                  | for alloy steel open jaw wrenches*<br>min. | for all other wrenches or sockets<br>min. |
| over —                      | up to 32 mm (1 $\frac{1}{4}$ in) | 39                                         | 39                                        |
| 32 mm (1 $\frac{1}{4}$ in)  | 60 mm (2 $\frac{3}{8}$ in)       | 39                                         | 35                                        |

\* For carbon steel open jaw wrenches : 36 HRC.

## 3. TORQUE TESTING

### 3.1 Procedure

Place the wrench or socket over a hexagonal test mandrel and apply the corresponding torque.

Do not jerk or strike the wrench or socket when testing and apply the load gradually until the minimum testing torque is reached. The torque is calculated as the product of the magnitude of the load by the distance measured between the point of application of the load and the centre of the test mandrel.

The nominal across flats dimension of the test mandrel should be equal to the nominal dimension *s* with a tolerance of h8. The mandrel should be hardened to not less than 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 torque, the wrench or socket should not show permanent deformation or other damage which could influence usability.

### 3.2 Test of hexagonal wrenches or open jaw wrenches

The test mandrel should touch the bottom of the jaw opening.

Apply the load as far along the shaft of the wrench as possible, perpendicular to its longitudinal axis. Use an extension tube when testing large wrenches.

Load the wrench once in each direction during the test.

### 3.3 Test of socket wrenches

The hexagonal test mandrel should be inserted in the socket up to a depth of  $0.8d$  with a tolerance of h13 (*d* being the diameter of the bolt according to ISO Recommendation R 272, *Hexagon bolts and nuts — Widths across flats, heights of heads, thicknesses of nuts — Metric series*).

Apply the load as far along the shaft of the wrench as possible, perpendicular to its longitudinal axis. Use an extension tube when testing large wrenches.

### 3.4 Test of hand operated square drive sockets

The hexagonal test mandrel should be inserted in the socket up to a depth of  $0.8d$  (*d* being the nominal diameter of the bolt according to ISO Recommendation R 272).

A square mandrel of hardness not less than 55 HRC should be used for driving the socket. The nominal across flats dimension of this mandrel should be equal to the maximum dimension, with a tolerance of h8, of the corresponding driving square.