

ISO

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ISO RECOMMENDATION

R 400

TENSILE TESTING OF COPPER AND COPPER ALLOYS

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To become
ISO 6892-1984

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BRIEF HISTORY

The ISO Recommendation R 400, *Tensile Testing of Copper and Copper Alloys*, was drawn up by Technical Committee ISO/TC 26, *Copper and Copper Alloys*, the Secretariat of which is held by the Deutscher Normenausschuss (DNA).

Work on this question by the Technical Committee began in 1958 and led, in 1961, to the adoption of a Draft ISO Recommendation.

In February 1962, this Draft ISO Recommendation (No. 498) was circulated to all the ISO Member Bodies for enquiry. It was approved by the following Member Bodies:

Australia	India	Spain
Bulgaria	Italy	Sweden
Burma	Japan	Switzerland
Canada	Netherlands	Turkey
Denmark	Poland	United Kingdom
Finland	Portugal	U.S.S.R.
Germany	Republic of South Africa	Yugoslavia

Three Member Bodies opposed the approval of the Draft:

Belgium
France
U.S.A.

The Draft ISO Recommendation was then submitted by correspondence to the ISO Council, which decided, in November 1964, to accept it as an ISO RECOMMENDATION.

TENSILE TESTING OF COPPER AND COPPER ALLOYS

1. SCOPE

This ISO Recommendation applies to the tensile testing of wrought and cast products of copper and copper alloys of diameter not less than 5 mm (0.2 in) or thicknesses not less than 2.5 mm (0.1 in). For the tensile testing of certain products of smaller dimensions and for tubes, other ISO Recommendations are applicable.

2. PRINCIPLE OF TEST

The test consists in subjecting a test piece to increasing tensile stress, generally to fracture, with a view to determining one or more of the mechanical properties enumerated hereafter. The test is carried out at ambient temperature, unless otherwise specified.

3. DEFINITIONS

3.1 Gauge length. At any moment during the test, the length of the cylindrical or prismatic portion of the test piece on which an increase in length is measured. In particular, a distinction should be made between the following:

- (a) *the original gauge length (L_0)*. Gauge length before the test piece is strained, and
- (b) *the gauge length after fracture (L_u)*. Gauge length after the test piece has been fractured and the fractured parts have been carefully fitted together so that they lie in a straight line.

- 3.2 *Stress (actually “nominal stress”)*. At any moment during the test, load divided by the original cross-sectional area of the test piece.
- 3.3 *Percentage permanent elongation*. Increase in the gauge length of a test piece subjected to a stress after removal of that stress, expressed as a percentage of the original gauge length.
- 3.4 *Stress at specified permanent set (R_r)*. Stress at which, after removal of load, the specified percentage permanent elongation occurs. (See Fig. 4(a)).
- 3.4.1 The symbol used for this stress is supplemented by an index giving the specified percentage elongation.
- 3.5 *Proof stress (R_p)**. Stress at which the specified percentage non-proportional elongation occurs. (See Fig. 4(b)).
- 3.5.1 The symbol used for this stress is supplemented by an index giving the specified percentage elongation.
- 3.6 *Maximum load (F_m)*. The highest load which the test piece withstands during the test.
- 3.7 *Final load (F_u)*. Load imposed on the test piece at the moment of fracture.
- 3.8 *Tensile strength (R_m)*. Maximum load divided by the original cross-sectional area of the test piece, i.e. stress corresponding to the maximum load.
- 3.9 *Percentage elongation after fracture (A)*. Permanent elongation of the gauge length after fracture $L_u - L_0$, expressed as a percentage of the original gauge length L_0 .
- 3.10 *Percentage reduction of area after fracture (Z)*. Maximum change in cross-sectional area after fracture, $S_0 - S_u$, expressed as a percentage of the original cross-sectional area S_0 .
- 3.11 *Percentage elongation factor at point of constriction (Z_u)*. Maximum change in cross-sectional area after fracture, $S_0 - S_u$, expressed as a percentage of the minimum cross-sectional area after fracture S_u .

* In the United States of America and Canada this stress is called “yield strength (offset)” in contrast to the stress called “yield strength” which corresponds to a specified total elongation (usually 0.5 per cent) with the test piece under tension.