



Steel — Tensile testing of sheet and strip less than 3 mm and not less than 0,5 mm thick

Acier — Essai de traction des tôles et feuillards d'épaisseur inférieure à 3 mm et au moins égale à 0,5 mm

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FOREWORD

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO Member Bodies). The work of developing International Standards is carried out through ISO Technical Committees. Every Member Body interested in a subject for which a Technical Committee has been set up 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.

Draft International Standards adopted by the Technical Committees are circulated to the Member Bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 86 was drawn up by Technical Committee ISO/TC 17, *Steel*, and circulated to the Member Bodies in March 1972.

It has been approved by the Member Bodies of the following countries :

Australia	Germany	Spain
Austria	Hungary	Sweden
Belgium	India	Switzerland
Canada	Ireland	Thailand
Chile	Italy	Turkey
Czechoslovakia	Netherlands	United Kingdom
Denmark	New Zealand	U.S.A.
Egypt, Arab Rep. of	Poland	U.S.S.R.
Finland	Romania	
France	South Africa, Rep. of	

The Member Bodies of the following countries expressed disapproval of the document on technical grounds :

Japan
Norway

This International Standard cancels and replaces ISO Recommendation R 86-1959.

Steel — Tensile testing of sheet and strip less than 3 mm and not less than 0,5 mm thick

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies requirements for the tensile testing of flat rolled steel products less than 3 mm and not less than 0,5 mm thick.

For the tensile testing of other steel products, ISO 82, ISO 89 and ISO 375 are applicable.

2 REFERENCES

ISO 82, *Steel — Tensile testing*.

ISO 89, *Steel — Tensile testing of wire*.

ISO 375, *Steel — Tensile testing of tubes*.

ISO/R 147, *Load calibration of testing machines for tensile testing of steel*.

ISO/R 205, *Determination of proof stress and proving test for steel at elevated temperatures*.

ISO/R 377, *Selection and preparation of samples and test pieces for wrought steel*.

ISO/R 783, *Mechanical testing of steel at elevated temperatures — Determination of lower yield stress and proof stress and proving test*.

ISO 2573, *Determination of K-values of a tensile testing system*.¹⁾

3 PRINCIPLE

The test consists in straining a test piece by 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. For tests at elevated temperatures, ISO/R 205 and ISO/R 783 are applicable.

1) At present at the stage of draft.

4 DEFINITIONS

4.1 gauge length : The prescribed part of the prismatic portion of the test piece on which elongation is measured at any moment during the test. In particular, a distinction is to be made between the following :

4.1.1 original gauge length (L_o) : Gauge length before the test piece is strained;

4.1.2 final gauge length (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.

4.2 extensometer gauge length (L_e) : The length of the parallel portion of the test piece used for the measurement of extension by means of an extensometer. (The length may differ from L_o and may be any value greater than b (see clause 5) but less than the parallel length L_c .)

4.3 percentage permanent elongation : Increase in the gauge length of a test piece subjected to a prescribed stress and after removal of the stress, expressed as a percentage of the original gauge length. If a symbol for this elongation is used it is to be supplemented by an index indicating the prescribed stress.

4.4 percentage elongation after fracture (A) : Permanent elongation of the gauge length after fracture, $L_u - L_o$, expressed as a percentage of the original gauge length, L_o .

NOTE — The original gauge length (in millimetres) on which the elongation after fracture is calculated is to be recorded as a suffix to the symbol, for example A_{50} .

4.5 maximum load (F_m) : The highest load which the test piece withstands during the test.

4.6 stress (actually "nominal stress") : At any moment during the test, load divided by the original cross-sectional area of the test piece.

4.7 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.

4.8 yield stresses : In a steel which exhibits a yield phenomenon, a point is reached during the test at which plastic deformation, soon after it has been initiated, continues to occur at nearly constant stress.

4.8.1 upper yield stress (R_{eH}) : The value of stress measured at the commencement of plastic deformation at yield (see figure 3);

or

the value of stress measured at the first peak obtained during yielding even when that peak is equal to or less than any subsequent peaks observed during plastic deformation at yield (see figure 4).

4.8.2 lower yield stress (R_{eL}) : The lowest value of stress measured during plastic deformation at yield, ignoring any initial transient effects which might occur. (See figures 3 and 4.)

NOTE — If a steel which usually exhibits a yield phenomenon is in a cold-worked or heat-treated condition, the yield phenomenon may not exist. In such cases a proof stress must be specified. (See 4.9 and 4.10.)

4.9 proof stress (non-proportional elongation) (R_p) : The stress at which a non-proportional elongation, equal to a specified percentage of the original gauge length, occurs. (See figure 7).

When a proof stress (R_p) is specified, the non-proportional elongation is to be stated (for example 0,2 %) and the symbol used for the stress is to be supplemented by an index giving this prescribed percentage of the original gauge length, for example $R_{p0,2}$.

4.10 proof stress (total elongation) or proof stress under load (R_t) : The stress at which a non-proportional elongation plus elastic elongation, equal to a specified percentage of the original gauge length, occurs. (See figure 8.)

When a proof stress (R_t) is specified, or agreed between the interested parties, the total elongation is to be stated and the symbol used for the stress is to be supplemented by an appropriate index, for example $R_{t0,5}$.

NOTE — The value obtained by the total elongation method will only be equivalent to R_p if suitable allowance is made for the measurement of elastic extension.

4.11 permanent set stress (R_r) ; (stress at permanent set limit) : The stress at which, after removal of load, a prescribed permanent elongation, expressed as a percentage of the original gauge length, occurs. The symbol used for this stress is to be supplemented by an index giving the prescribed percentage of the original gauge length, for example $R_{r0,2}$. (See figure 9.)