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ISO 10606

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Steel for the reinforcement of concrete — Determination of percentage total elongation at maximum force

Acier à béton pour armatures passives — Détermination de l'allongement total pour cent sous charge maximale

Reference number
ISO 10606:1995(E)

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.

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.

International Standard ISO 10606 was prepared by Technical Committee ISO/TC 17, *Steel*, Subcommittee SC 16, *Steels for the reinforcement and prestressing of concrete*.

Annex A of this International Standard is for information only.

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Steel for the reinforcement of concrete — Determination of percentage total elongation at maximum force

1 Scope

This International Standard specifies two methods for determining the percentage total elongation at maximum force, A_{gt}, by tensile testing of ordinary reinforcing steel. One method is based on measurement with an extensometer during the tensile test. The other method is based on measurement after fracture.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 7500-1:1986, *Metallic materials — Verification of static uniaxial testing machines — Part 1: Tensile testing machines.*

ISO 9513:1989, *Metallic materials — Verification of extensometers used in uniaxial testing.*

3 Definition

For the purposes of this International Standard, the following definition applies.

3.1 percentage total elongation at maximum force: Increase in the gauge length of the test piece at maximum force, expressed as a percentage of the original gauge length (L_0). [ISO 6892]

See figure 1.

4 Apparatus

4.1 Tensile testing machine, class 1, verified according to ISO 7500-1.

4.2 Marking equipment, for marking the test pieces according to clause 5 (for measurement after fracture).

4.3 Measuring device, for measuring the distances between the marks before and after fracture.

4.4 Extensometer, class 2, verified according to ISO 9513 (for measurement during the tensile test).

5 Test piece

5.1 Test piece to be measured after fracture

The test piece shall be sufficiently long to allow for the free length between the grips to be at least

— 350 mm if $d \leqslant 25$ mm;

— 400 mm if 25 mm $< d \leqslant$ 32 mm;

— 500 mm if 32 mm $< d \leqslant$ 40 mm;

where d is the nominal diameter of the test piece.

The free length shall be subdivided into equal parts of 10 mm or 5 mm by means of fine marks or scribed lines, but not by notches which could result in premature fracture. The width of the marks shall not exceed 0,2 mm. The tolerance on the distance between the marks shall allow the distance between any two marks to be measured with a deviation below ± 0,2 mm.

5.2 Test piece to be measured by an extensometer

The test piece shall be sufficiently long to allow for a minimum extensometer gauge length of 100 mm.

6 Tensile test procedure

The test is carried out at ambient temperature between 10 °C and 35 °C.

The test piece shall be held in the tensile testing machine by means of grips.

Every endeavour shall be made to ensure that the test piece is held in such a way that the force is applied as axially as possible.

The straining rate, defined by the speed of separation of the crossheads of the machine divided by the original free length between the grips, shall never exceed 0,008 s^{-1}. During yield, the straining rate shall be between 0,000 25 s^{-1} and 0,002 5 s^{-1}.

The test piece shall be strained to fracture.

7 Measurement with an extensometer

The total percentage elongation at maximum force is determined by recording the elongation as shown in figure 1 during the tensile test, by means of an extensometer with a minimum gauge length of 100 mm.

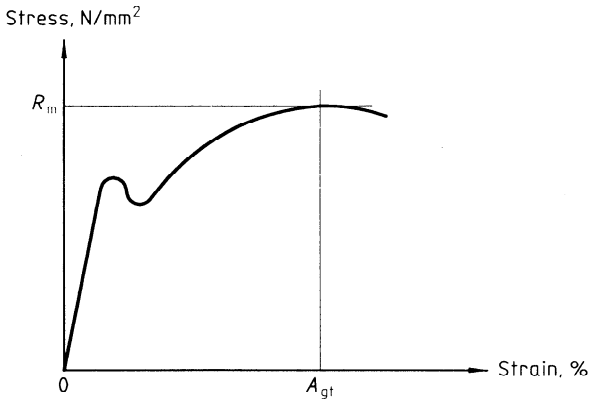

Figure 1 — Example of a stress/strain curve

The elongation shall be recorded before the force has dropped more than 0,1 % from its maximum value.

8 Measurement after fracture

Select two marks, y and v, between which the distance before the tensile test was at least 100 mm. Both marks shall be on that side of the necking zone where the grips are farthest from the point of rupture. Neither of them shall be nearer to the grips than 20 mm or the nominal diameter d, whichever is greater. In addition, they shall not be nearer to the point of rupture or centre of the necking than 50 mm or $2d$, whichever is greater. See figure 2.

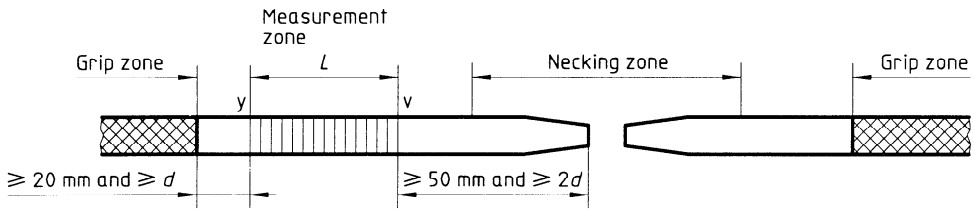

Figure 2 — Measurement after fracture

The percentage total elongation at maximum force, A_{gt}, is calculated using the formula

$$A_{gt} = \left[\frac{L - L_0}{L_0} + \frac{R_m}{E} \right] \times 100$$

where

L is the length, in millimetres, after fracture shown in figure 2;

L_0 is the distance, in millimetres, between the same marks before the test;

R_m is the tensile strength, in newtons per square millimetre;

E is the modulus of elasticity, which is taken to be 200×10^3 N/mm^2.

9 Test report

The test report shall include the following information:

a) reference to this International Standard;

b) method of determination (extensometer or measurement after fracture);

c) identification of the test piece;

d) the calculated value of A_{gt}.

Annex A
(informative)

Bibliography

[1] ISO 6892:1984, *Metallic materials — Tensile testing.*

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ICS 77.140.60; 91.080.40

Descriptors: steels, reinforced concrete, reinforcing steels, tests, mechanical tests, tension tests, determination, elongation.

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