INTERNATIONAL STANDARD

ISO 7800

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Metallic materials — Wire — Simple torsion test

Matériaux métalliques — Fils — Essai de torsion simple

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. 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.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 7800 was prepared by Technical Committee ISO/TC 164, *Mechanical testing of metals*, Subcommittee SC 2, *Ductility testing*.

This second edition cancels and replaces the first edition (ISO 7800:1984), which has been technically revised.

Metallic materials — Wire — Simple torsion test

1 Scope

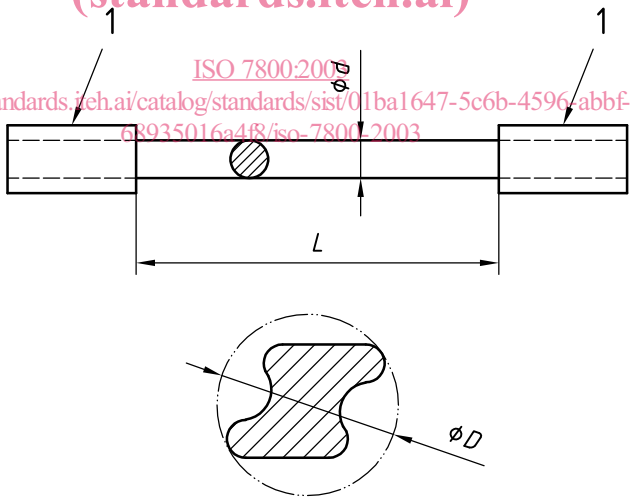
This International Standard specifies a method for determining the ability of metallic wire of diameter or characteristic dimension 0,1 mm to 10 mm inclusive to undergo plastic deformation during simple torsion in one direction.

2 Symbols and designations

The symbols and designations used in the simple torsion test of wires are shown in Figure 1 and listed in Table 1.

3 Principle

The test consists of twisting a test piece of wire around its own axis in one direction.



Key

1 grip

Figure 1

Table 1 — Symbols and designations

Symbol	Designation	Unit
d	Diameter of a round wire	mm
D	Characteristic dimension for non-circular wires [a]	mm
L	Free length between grips	mm
N_t	Number of turns	–

[a] The characteristic dimension for non-circular wires is the maximum dimension of the cross section and is usually specified in the relevant standard.

4 Testing equipment

4.1 Grips, having a minimum hardness of 55 HRC, and parallel faces.

The recommended types of grips are given in Annex A.

4.2 Testing machine, constructed so that a change of length between the grips, caused by contraction of the test piece during testing, is not prevented and that an appropriate tensile stress (see 7.1) may be applied to the test piece.

The grips shall be placed in the testing machine in such a way that during testing they remain on the same axis and do not apply any bending force to the test piece.

One of the grips shall be capable of being rotated around the axis of the test piece while the other shall not be subject to any angular deflection, except for such deflection as may be necessary to measure the torque.

The distance between the grips shall be capable of adjustment for different test piece lengths.

5 Test piece

5.1 The length of wire to be used as the test piece shall be as straight as possible.

5.2 If straightening is necessary, it shall be done by a suitable method. A recommended method is given in Annex B.

During straightening, the surface of the wire shall not be damaged and the test piece shall not be subjected to any twisting.

Wire with localized sharp curvature shall not be tested.

Unless otherwise specified, the nominal free length between the grips shall be as given in Table 2.

Table 2 — Dependence of free length between the grips on nominal diameter or characteristic dimension of the wire

Nominal diameter, d, or characteristic dimension, D mm	**Free length between grips** (nominal) [a]
$0{,}3 \leqslant d\,(D) < 1$	$200\ d\,(D)$
$1 \leqslant d\,(D) < 5$	$100\ d\,(D)$
$5 \leqslant d\,(D)$	$50\ d\,(D)$
[a] Free length between the grips shall be maximum of 300 mm.	

6 Testing conditions

In general, the test is carried out at a temperature between 10 °C and 35 °C. Tests carried out under controlled conditions, where required, shall be made at a temperature of (23 ± 5) °C.

7 Procedure

7.1 Place the test piece in the testing machine (4.2) in such a way that its longitudinal axis coincides with the axis of the grips (4.1) and so that it remains straight during the test. Unless otherwise specified this may be ensured by applying to the test piece a constant tensile stress not exceeding 2 % of the nominal tensile strength of the wire.

7.2 After placing the test piece in the testing machine, rotate one grip at a reasonable constant speed until the test piece breaks or until a specified number of turns, N_t, is reached. Count the number of complete turns imparted to the wire by the rotating grip.

NOTE For verification of number of turns, a coloured surface line should be drawn.

7.3 Unless otherwise specified in the relevant standard, the speed of testing shall not exceed the values given in Table 3, in the case of steel, copper and copper alloys, aluminium and aluminium alloys of the diameters given.

NOTE Because the simple torsion test is an isothermal test, an essential increasing of temperature of the test piece should be avoided. The temperature increase should not be higher than 60 °C.

7.4 If the number of turns, N_t, meets the requirements of the relevant standard, the test piece shall be considered as having passed the test, irrespective of the position of failure. If the number of turns, N_t, reached does not meet the requirements of the relevant standard and the failure is within 2 d or 2 D distance from the grips, the test shall be considered invalid and shall be repeated.

7.5 Where the fracture in the torsion test is required to be characterized, it should be done on the basis of Annex C.

NOTE For wires of smaller diameter or characteristic dimension it may not be possible to make a distinction between some of the classes in Annex C (e.g. 2b versus 3b)

Table 3 — Rate of testing

Diameter, d, or characteristic dimension, D mm	**Maximum number of turns per second**		
	Steel	Copper and copper alloys	Aluminium and aluminium alloys
$d\,(D) < 1$	1	5	1
$1 \leqslant d\,(D) < 1{,}5$	0,5	2	
$1{,}5 \leqslant d\,(D) < 3$		1,5	
$3 \leqslant d\,(D) < 3{,}6$		1	
$3{,}6 \leqslant d\,(D) < 5$			
$5 \leqslant d\,(D) \leqslant 10$	0,25	0,5	

8 Test report

The test report shall include at least the following information:

a) reference to this International Standard, i.e., ISO 7800;

b) identification of the test piece (type of the material, cast number, etc.);

c) diameter, d , or characteristic dimension, D, of the test piece;

d) details regarding the test piece preparation (method of straightening, etc.);

e) test conditions (e.g., free length between the grips, application of tensile stress);

f) number of turns.

NOTE The test report may include an evaluation of the fracture.

Annex A
(informative)

Recommended types of grip depending on the diameter, d, or characteristic dimension, D, of the wire

Table A.1 — Recommended types of grip

d (D) mm	Type of grip
$0{,}1 \leqslant d\ (D) < 0{,}3$	Smooth
$0{,}3 \leqslant d\ (D) \leqslant 3$	Lightly serrated
$d\ (D) > 3$	V-grooved