# International Standard 7800

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# Metallic materials — Wire — Simple torsion test

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## Foreword

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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 7800 was developed by Technical Committee ISO/TC 164, *Mechanical testing of metals*, and was circulated to the member bodies in January 1983.



It has been approved by the member bodies of the following countries:



| | | |
|---|---|---|
| Australia | Germany, F.R. | Poland |
| Austria | Hungary | Romania |
| Bulgaria | Italy | South Africa, Rep. of |
| Canada | Japan | Spain |
| China | Korea, Dem. P. Rep. of | Switzerland |
| Czechoslovakia | Mexico | USA |
| Denmark | Netherlands | USSR |
| France | Norway | |

The member body of the following country expressed disapproval of the document on technical grounds:

United Kingdom

This International Standard cancels and replaces International Standards ISO 136-1972 and ISO 2627-1973, and ISO Recommendation R 957-1969, of which it constitutes a technical revision.



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# Metallic materials — Wire — Simple torsion test

## 1 Scope and field of application

This International Standard specifies the method for determining the ability of metallic wire of diameter or thickness 0,3 to 10 mm inclusive to undergo plastic deformation during simple torsion in one direction.

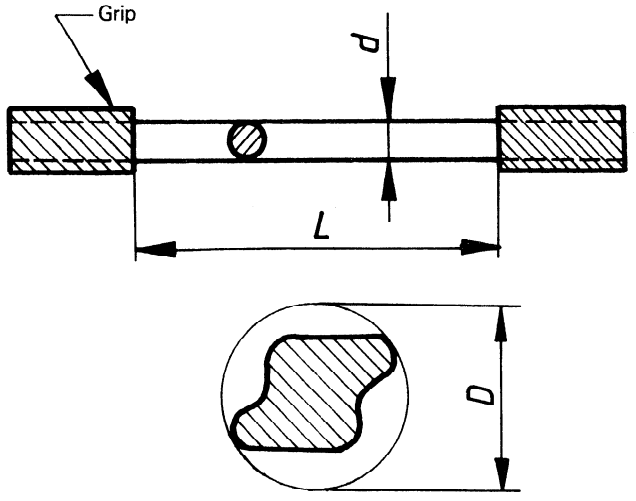


## 2 Principle

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

## 3 Symbols and designations

The symbols and designations used in the simple torsion test of wires are shown in the figure and specified in table 1.




**Figure**

**Table 1**

| Symbol | Designation | Unit |
|---|---|---|
| $d$ | Diameter of a round wire | mm |
| $D$ | Characteristic dimension for non-circular wires[1)] | mm |
| $L$ | Free length between grips | mm |
| $N_t$ | Number of turns | — |

1) 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** The grips shall be of sufficient hardness (to provide rigidity and/or resistance to abrasion). The grips shall be arranged 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.

**4.2** The machine shall be constructed so that a change of length between the grips, caused by the test piece during the test, is not prevented.

**4.3** 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.

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

**4.5** The machine shall be constructed so that an appropriate tensile stress (see 6.2) may be applied to the test piece.

## 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 hand or, if this is not possible, by hammering on a level surface of wood, plastic material or copper using a hammer of a similar material.

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

**5.4** Wire with a localized sharp curvature shall not be straightened.

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

**Table 2**

| Nominal diameter $d$[1) ] mm | Free length between grips (nominal) |
|---|---|
| $0{,}3 \leqslant d < 1$ | $200\ d$ |
| $1 \leqslant d < 5$ | $100\ d$[2)] |
| $5 \leqslant d$ | $50\ d$[3)] |

1) Or characteristic dimension $D$.

2) 50 $d$ may be used by special agreement when the machine will not permit the use of a length equal to 100 $d$.

3) 30 $d$ may be used by special agreement when the machine will not permit the use of a length equal to 50 $d$.

## 6 Procedure

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

**6.2** Place the test piece in the machine in such a way that its longitudinal axis coincides with the axis of the grips 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 just sufficient to straighten it, but not exceeding 2 % of the value of the nominal tensile strength of the wire.

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

**6.4** 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.

**6.5** If the number of turns meets the requirements of the relevant standard, the test piece is to be considered as having passed the test, irrespective of the position of failure. If the number of turns reached does not meet the requirements of the relevant standard and the failure is within 2 $d$ of the grips, the test is invalid and shall be repeated.



## 7 Test report

The test report shall include the following information:

a) reference to this International Standard;



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 (for example, free length between grips, application of tensile stress);

f) test result.

**Table 3**

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