

# INTERNATIONAL STANDARD

# ISO 8491

Second edition  
1998-11-01

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## **Metallic materials — Tube (in full section) — Bend test**

*Matériaux métalliques — Tubes — Essai de cintrage sur tronçon*



Reference number  
ISO 8491:1998(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 8491 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 8491:1986), of which it constitutes a technical revision.

Annex A of this International Standard is for information only.

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# Metallic materials — Tube (in full section) — Bend test

## 1 Scope

This International Standard specifies a method for determining the ability of full-section metallic tubes of circular cross-section to undergo plastic deformation in bending. It is intended for tubes with an outside diameter no greater than 65 mm, although the range of the outside diameter for which this International Standard is applicable may be more exactly specified in the relevant product standard.

NOTE — Bend tests of the test pieces taken from tubes in the form of transverse strips should be made in accordance with ISO 7438 so as to increase the original curvature of the test piece.

## 2 Symbols, designations and units

Symbols, designations and units for the bend test of tubes in full section are given in table 1 and are shown in figure 1.

Table 1

Symbol	Designation	Unit
$a^a$	Wall thickness of the tube	mm
$D$	Outside diameter of the tube	mm
$L$	Length of the test piece before the test	mm
$r$	Inside radius at the bottom of the groove	mm
$\alpha$	Angle of the bend	degree

<sup>a</sup> The symbol  $T$  is also used in steel tube standards.

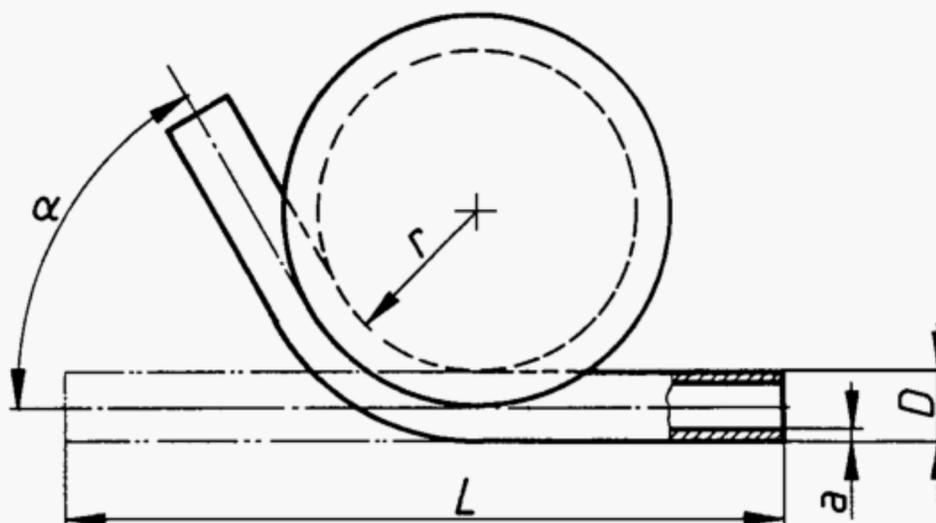


Figure 1

### 3 Principle

Bending a straight tube in full section around a grooved former of a specified radius  $r$  until the angle of bend  $\alpha$  (see figure 1) reaches the value specified in the relevant product standard.

### 4 Testing equipment

**4.1 Tube-bending machines**, designed to prevent the section of the tube from becoming oval.

The tube bend former of the machine shall have a groove corresponding in profile to the outside diameter of the tube. The radius at the bottom of the groove shall be specified in the relevant product standard.

NOTE — The tolerance of radius  $r$ , the depth and ovality of the groove, all have an effect on the test result.

### 5 Test piece

The test piece shall be a portion of a straight tube of any length which will allow the test to be carried out on the tube-bending machine.

### 6 Procedure

**6.1** In general, the test shall be carried out at ambient temperature within the limits of 10 °C to 35 °C. The test carried out under controlled conditions shall be made at a temperature of  $(23 \pm 5)$  °C.

**6.2** Bend the unfilled test piece of the tube by means of a tube-bending machine, ensuring contact between the test piece and the tube bend former over the length of bend, until the specified angle of bend is reached.

**6.3** If welded tubes are subjected to the test, the position of the weld shall be at 90° to the plane of bending i.e. the neutral axis, unless otherwise indicated in the relevant product standard.

**6.4** Interpretation of the bend test of tubes shall be carried out in accordance with the requirements of the relevant product standard. When these requirements are not specified, the test piece shall be considered to have passed the test if no cracks are visible without the use of magnifying aids.

### 7 Test report

A test report shall be provided when so specified in the relevant product standard. In this case, the test report shall include at least the following information:

- a) reference to this International Standard, i.e. ISO 8491;
- b) identification of the test piece;
- c) dimensions of the test piece;
- d) angle of bend  $\alpha$  and radius  $r$ ;
- e) position of the weld in relation to the plane of bending, if relevant;
- f) result of the test.

**Annex A**  
(informative)

**Bibliography**

- [1] ISO 7438:1985, *Metallic materials — Bend test.*

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**ICS 77.040**

**Descriptors:** metal products, metal tubes, tests, bend tests.

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