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Metallic materials — Tube ring hydraulic pressure test

Matériaux métalliques — Essai d'expansion hydraulique sur anneau tubulaire

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Foreword

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This document 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 15363:2000), of which it constitutes a minor revision.

The main changes to the previous edition are:

— Addition of the comparison of symbols and designations used for steel tubes as Annex B for harmonizing EN 10275:1999.

Annex A and Annex B of this document are for information only.

Metallic materials — Tube ring hydraulic pressure test

1 Scope

This document specifies the ring hydraulic pressure test for metallic tubes. It is generally applied to tubes with an outside diameter greater than 120 mm and outside diameter to thickness ratio of not less than 20.

The objective of this test is to ascertain the value of the hoop stress required to produce a specified total circumferential (hoop) strain.

2 Symbols

Symbols and corresponding designations are given in Table 1.

Table 1 — Symbols and designations

Symbol	Designation	Unit
a	Measured tube test ring thickness	mm
A_t	Specified total circumferential strain	%
d	Measured outside diameter of the tube test ring	mm
l	Length of tube test ring	mm
p	Hydrostatic pressure to produce the specified total circumferential strain	MPa
R_{At}	Hoop strength at the specified total strain	MPa
NOTE For symbols used in standards for steel tubes, please see Annex B.		

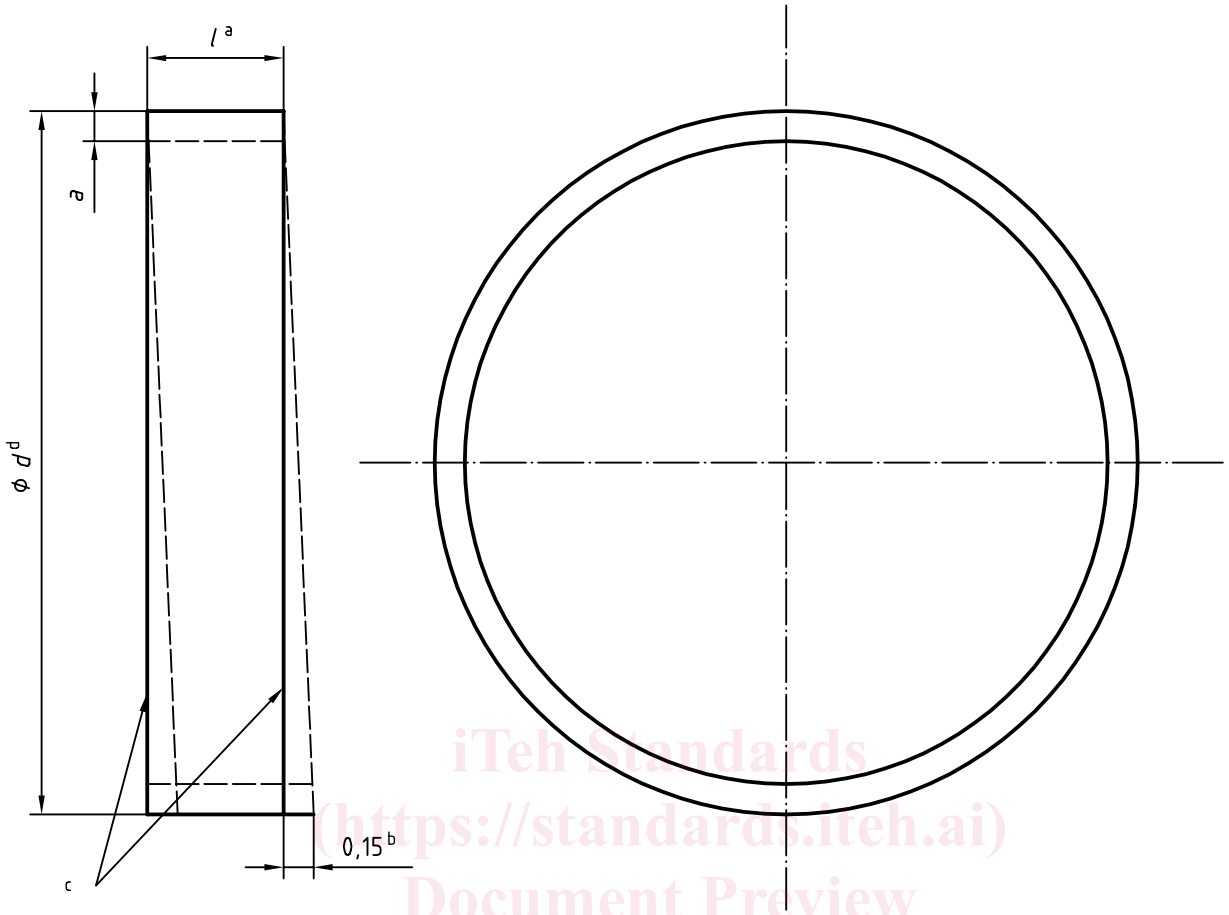
3 Principle

Unrestrained expansion of the test ring between two platens, under internal hydraulic pressure; the outer circumference of the tube is the effective test piece gauge length.

The test is carried out on a test piece taken from a welded or seamless tube of thickness up to a limit dependent upon the capacity of the machine and the strength of the tube (see Figure 1). All sharp edges are removed from product machined surfaces before testing. Where the hydraulic pressure required to produce the specified circumferential strain exceeds the capacity of the test machine, modified tests may be carried out as described in Annex A.

The test is specified when a measure of the hoop strength is required which is not influenced by cold forming and residual stress introduced when flattening a standard tensile test piece. The standard tensile test is necessary, however, when tensile strength and elongation measurements are required.

Dimensions in millimetres



Key

a Tolerance on *l*: ± 0,25 mm; *l* is commonly taken as 76 mm.

b Maximum deviation from normal.

c Both faces to be machined parallel with fine turned or ground finish.

d Measured outside diameter of the tube test ring.

Figure 1 — Test ring dimensions and tolerances

4 Apparatus

4.1 Testing machine, which shall be capable of allowing the test ring to expand freely without imposing any end restraint. This shall be achieved by leaving a small gap between the test piece and the top platen. Pressure loss during testing shall be prevented by the use of a flexible seal.

A typical testing machine is shown schematically in Figure 2.

4.2 Platens. To reduce to a minimum any friction between the test piece, platens and inner die, the platens shall be parallel and have a fine turned or ground finish. Prior to each test, friction at the contact surfaces shall be further minimized either by the use of a lubricant, such as graphited grease, or by the use of PTFE (polytetrafluorethylene) sheet. The platens shall be inspected regularly and any ridges that develop shall be removed.