# INTERNATIONAL STANDARD

# ISO 9853

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## Injection-moulded unplasticized poly(vinyl chloride) (PVC-U) fittings for pressure pipe systems — Crushing test

*Raccords moulés en poly(chlorure de vinyle) non plastifié (PVC-U) pour canalisations avec pression — Essai à l'écrasement*

Reference number
ISO 9853:1991(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 9853 was prepared by Technical Committee ISO/TC 138, *Plastics pipes, fittings and valves for the transport of fluids.*

Annexes A and B of this International Standard are for information only.



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## Introduction

Injection-moulded unplasticized poly(vinyl chloride) fittings can be crushed without their failing if they contain no residual stresses as a result of the moulding process. However, if these residual stresses are too great, the fitting will fail when a crushing force is applied.

The percentage deformation of a fitting, in relation to its initial diameter, constitutes a simple criterion for the selection of fittings having an acceptable level of internal stresses.

# Injection-moulded unplasticized poly(vinyl chloride) (PVC-U) fittings for pressure pipe systems — Crushing test

## 1 Scope

This International Standard specifies a crushing test to determine the percentage deformation of injection-moulded unplasticized poly(vinyl chloride) (PVC-U) fittings and recommends a basic specification (see annex A).

It applies to injection-moulded PVC-U fittings

— for pressure pipelines, in accordance with ISO 264;

— with solvent sockets, in accordance with ISO 727;

— with sockets with elastomeric sealing rings, in accordance with ISO 2048.

## 2 Definition

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

**percentage deformation** $X$: The change in diameter of a fitting, in relation to its initial diameter, determined by using the crushing test specified in this International Standard and given by the following formula:

$$X = \frac{h_0 - h_1}{h_0} \times 100 \qquad \ldots (1)$$

where

$h_0$ is the distance, in millimetres, between the plates of the press when they are in contact, without the application of a force, with the test piece;

$h_1$ is the distance, in millimetres, between the plates of the press when the percentage deformation $X$ is attained.

NOTE 1 For a given percentage deformation $X$, the distance $h_1$ is calculated as follows:

$$h_1 = \frac{h_0(1 - X)}{100} \qquad \ldots (2)$$

## 3 Principle

The fitting to be tested is inserted between the two plates of an appropriate press. The force necessary to give a percentage deformation $X$ is applied at a constant speed of 50 mm/min. The fitting is examined to determine whether it has fractured and, if so, the type of fracture.

## 4 Apparatus

The apparatus consists essentially of the following elements.

**4.1 Press**, operated mechanically or hydraulically, capable of applying a sufficient force to carry out the test, with a closing speed of the plates that can be controlled to 50 mm/min $\pm$ 5 mm/min. See figure 1 for an example.

**4.2 Appropriate supports**, to permit the application of the force between the grooves of fittings containing rubber joints.

NOTE 2 Special apparatus may be required for particular components such as reducing tees.

## 5 Test pieces

The test pieces shall be as-manufactured fittings, i.e. fittings which have not been subjected to any transformation or solvent jointing.

In the case of fittings containing rubber sealing rings, the rings shall be removed before testing.

Take at least three test pieces.

NOTE 3 For fittings which have components such as sockets, caps and reducers, a larger number of test pieces may be required (see 7.2).

The fittings shall not be tested until a period of at least 24 h has elapsed after their manufacture.

## 6 Conditioning of the test pieces

Before testing the test pieces, condition them at 23 °C ± 2 °C for at least 2 h.

## 7 Procedure

**7.1** Carry out the test at 23 °C ± 2 °C.

**7.2** Place the fitting flat on the centre of the mobile plate of the press, in such a way that the axis or axes of the socket(s) is (are) parallel to the plane of the plate.

If required, place the supports (4.2) in position.

In the case of fittings which have components such as sockets, caps and reducers, place the weld line, if there is one, in the following positions:

a) position 1: at 90° to the planes of contact between the fitting and the plates of the press;

b) position 2: in contact with the plates.

Test half of each batch in position 1 and the other half in position 2.

**7.3** Move the mobile plate so that the crown of the fitting contacts the fixed plate, without the application of force, and measure the distance $h_0$, in millimetres, between the plates.

**7.4** Set the closing speed of the plates at 50 mm/min ± 5 mm/min and start the test.

**7.5** Stop the test either when the fitting fails or when the distance between the plates reaches the value of $h_1$, calculated using equation (2), corresponding to the recommended percentage deformation $X$ (see annex A). Record the force applied.

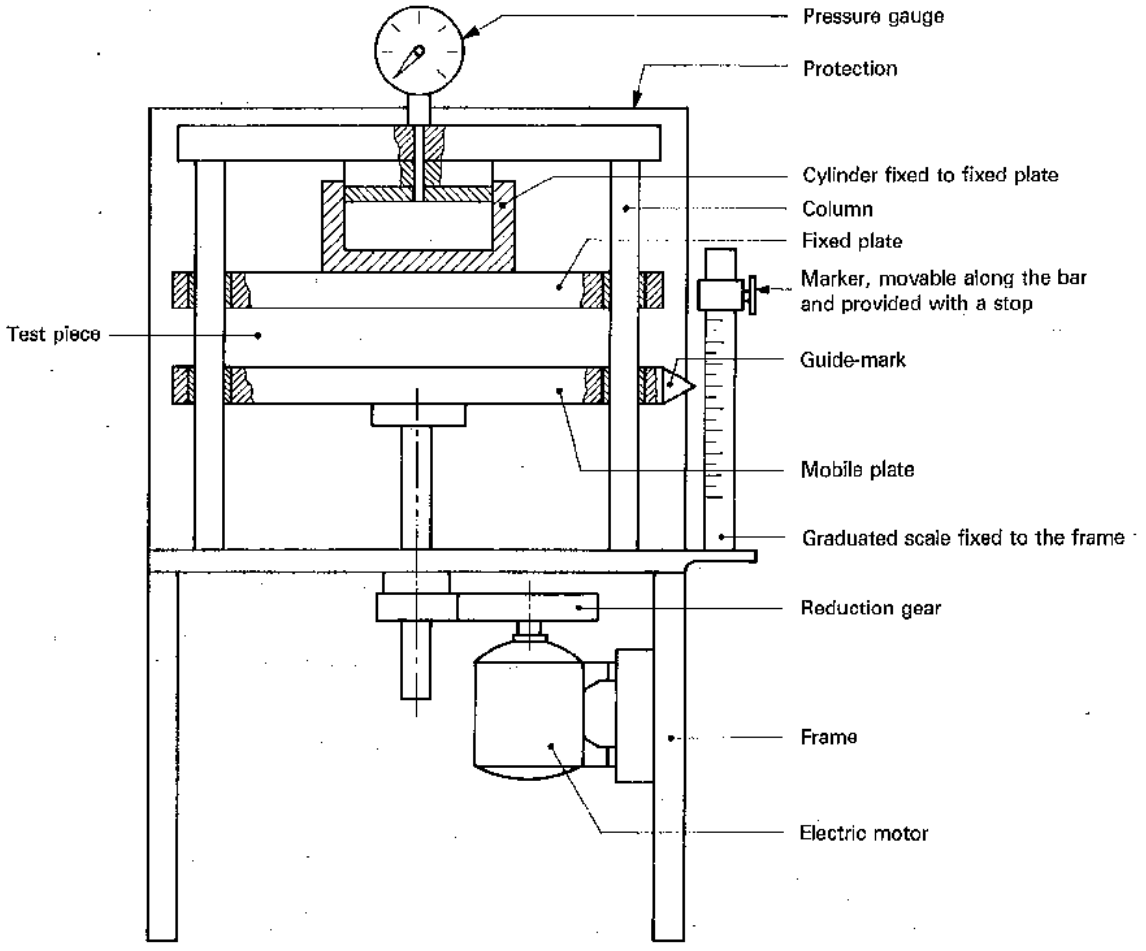


**Figure 1 — Example of a press**

**7.6** If required, examine the fitting to determine the type and position of failure.

## 8 Test report

The test report shall include the following information:

a) a reference to this International Standard;

b) the type of fitting;

c) the nominal diameter of the fitting;

d) the type of socket(s) of the fitting;

e) the number of test pieces tested;

f) the conditioning period;

g) whether supports were used or not;

h) the position of the weld line in relation to the plates (if appropriate);

i) the force applied (in newtons);

j) the values of $h_0$ (in millimetres), $h_f$ (in millimetres) and $X$ (as a percentage) for each test piece;

k) the result of the test, i.e. whether the fitting failed or not, and, if required, the type and place of fracture;

l) details of any incidents which may have influenced the results.

In addition, particular product standards may require that the following extra information be provided:

— whether cracking was superficial or whether it extended throughout the whole thickness of the fitting wall;

— whether the fitting delaminated;

— whether the fracture occurred along the weld line;

— whether the fracture was general.

## Annex A
(informative)

## Basic specification

The batch of fittings under test is deemed to have met the test requirements if, for a percentage deformation $X$, no fitting has failed catastrophically.

The basic specification is

$X = 20\%$

However, for special applications which require more stringent specifications, a higher value may be defined and specified in the product standards.

## Annex B
(informative)

## Bibliography

[1] ISO 264:1976, *Unplasticized polyvinyl chloride (PVC) fittings with plain sockets for pipes under pressure — Laying lengths — Metric series.*

[2] ISO 727:1985, *Fittings of unplasticized polyvinyl chloride (PVC-U), chlorinated polyvinyl chloride (PVC-C) or acrylonitrile/butadiene/styrene (ABS) with plain sockets for pipes under pressure — Dimensions of sockets — Metric series.*

[3] ISO 2048:1990, *Double-socket fittings for unplasticized poly(vinyl chloride) (PVC-U) pressure pipes with elastic sealing ring type joints — Minimum depths of engegement.*

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**Descriptors:** polyvinyl chloride, injection moulding, pressure equipment, plastics products, pipe fittings, specifications, tests, crushing tests.

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