
International Standard



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**Plastics — Plasticized compounds of homopolymers and copolymers of vinyl chloride —
Part 2 : Determination of properties**

*Plastiques — Compositions plastifiées d'homopolymères et copolymères de chlorure de vinyle —
Partie 2 : Détermination des propriétés*

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been set up 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.

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 2898/2 was developed by Technical Committee ISO/TC 61, *Plastics*, and was circulated to the member bodies in July 1978.

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

Australia	Greece	Poland
Austria	Hungary	Romania
Belgium	Iran	South Africa, Rep. of
Brazil	Ireland	Spain
Bulgaria	Israel	Sweden
Canada	Italy	Switzerland
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Egypt, Arab Rep. of	Korea, Rep. of	United Kingdom
Finland	Mexico	USA
France	Netherlands	USSR
Germany, F. R.	New Zealand	Yugoslavia

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

India

Plastics — Plasticized compounds of homopolymers and copolymers of vinyl chloride — Part 2 : Determination of properties

0 Introduction

The properties of a moulded article depend, amongst other things, on the composition of the moulding material, the shape and state of anisotropy of the moulding, and on the methods of test used. Anisotropy is a function of the moulding conditions, including the temperature, pressure, injection rate, etc. In addition, any post-treatment of the moulded article, such as a conditioning or annealing, will influence the values of the properties.

The values of the properties determined according to this International Standard are not applicable to specimens of other dimensions or to specimens prepared by a different procedure. Also, colorants and other additives may affect the property values.

In order to designate a material, it is only necessary to determine the properties described in Part 1 of this International Standard. Other test methods given in this International Standard shall be used to specify properties related to the intended application of the material.

1 Scope and field of application

This part of ISO 2898 specifies the equipment and general procedure for the preparation of standard test specimens from plasticized compounds of homopolymers and copolymers of vinyl chloride (VC), methods of testing the characteristic properties according to ISO 2898/1 and the test conditions for determining other relevant properties.

2 References

ISO 175, *Plastics — Determination of the effects of liquid chemicals including water.*¹⁾

ISO 176, *Plastics — Determination of loss of plasticizers — Activated carbon method.*

ISO 177, *Plastics — Determination of migration of plasticizers.*

ISO 291, *Plastics — Standard atmospheres for conditioning and testing.*

ISO 458, *Plastics — Determination of stiffness in torsion as a function of temperature.*²⁾

ISO 527, *Plastics — Determination of tensile properties.*³⁾

ISO 868, *Plastics — Determination of indentation hardness by means of a durometer (Shore hardness).*

ISO/R 1183, *Plastics — Methods for determining the density and relative density (specific gravity) of plastics, excluding cellular plastics.*

ISO 2898/1, *Plastics — Plasticized compounds of homopolymers and copolymers of vinyl chloride — Part 1 : Designation.*

IEC Publication 93, *Recommended methods of test for volume and surface resistivities of electrical insulating materials.*

3 Preparation of test specimens

3.1 Principle

Preparation of a rough sheet from the material to be tested, using a heated two-roll mill. Subsequent compression moulding of the preliminary sheet so produced into sheets of uniform thickness. Preparation of test specimens from these moulded sheets by machining or die-cutting.

3.2 Preparation of preliminary sheets

3.2.1 Apparatus

Two-roll mixing mill, capable of operating satisfactorily at temperatures up to and including 180 °C.

The rolls shall be cylindrical; the dimensions may be, for example : diameter of 150 mm; length of 300 mm.

1) At present at the stage of draft. (Revision of ISO/R 175 and ISO/R 462.)

2) At present at the stage of draft. (Revision of ISO/R 458.)

3) At present at the stage of draft. (Revision of ISO/R 527.)

3.2.2 Milling conditions

3.2.2.1 The surface temperature of the mill rolls and the moulding temperature used subsequently (see 3.3.3) shall be based on the Shore hardness value of the material in accordance with the following table :

Shore hardness (ISO 868)		Surface temperature, °C	
Scale	Value	Rolls	Moulds
A	up to 80	130 to 160	135 to 165
D	35 to 50	145 to 170	155 to 175
D	above 50	160 to 175	170 to 180

The temperature of the rolls shall be selected to permit the material to band on the surface of the roll between 1 and 2 min after the commencement of the milling.

3.2.2.2 Detailed schedules for the milling of individual compositions are not included in this International Standard, but the following remarks apply to mixes of all types.

The surface speed of the rolls shall be approximately 10 m/min.

It is customary for there to be a differential speed between the two mill rolls. The preferred ratio is 1 : 1,2, the front (working) roll being the slower.

Proper mill mixing of the material requires a rolling bank. The nip settings shall be determined by the desired thickness of the milled sheet. The sum of the thicknesses of all sheets used shall be slightly higher than the thickness of the moulded sheet or test specimen.

3.2.3 Procedure

Add the material to the mill rolls. Any material falling through the nip shall be carefully and quickly collected from the tray and returned to the moving mill rolls. After a sheet is formed, continue milling for approximately 5 min in such a way that optimum dispersion of all material components is obtained. This normally includes cutting the sheet, allowing it to form a roll, and re-feeding this roll into the nip. Remove the milled sheet from the rolls without stretching.

NOTE — Deviations from 3.2.2 and 3.2.3, if necessary, should be included in the test report.

3.3 Preparation of moulded sheet

3.3.1 Apparatus

3.3.1.1 **Hydraulic moulding press**, capable of developing a moulding pressure of at least 10 MPa*.

The press platens shall be equipped with means of heating and cooling such that the surface can be heated to a temperature of 180 °C and such that the maximum deviation at any point from the temperature at the centre of the platen does not exceed 3 °C within the moulding area.

3.3.1.2 Male/female mould, or window frame between two metal plates

Parting foils (for example : aluminium or photographic-type highly polished ferrotype plates) can be placed between the materials and the metal surfaces.

3.3.2 Moulding conditions

The necessary mass of material to fill a mould is predetermined, either by calculation from the known material density, or by making a trial moulding.

The moulding temperature shall be in accordance with the requirements given in the table (see 3.2.2.1).

3.3.3 Procedure

Place the required mass of pieces cut from the milled sheet in the preheated mould (3.3.1.2).

Close the preheated platens of the press (3.3.1.1) and maintain a pressure of approximately 0,3 MPa for 5 min to facilitate preheating the material. Then increase the mould pressure to between 2 and 10 MPa and maintain this pressure for 2 to 5 min. During this time, there shall be sufficient flow of the material between the mould and the metal surfaces to result in formation of a small amount of moulding flash. Cool the mould to approximately 40 °C or, in the case of very soft materials, to a lower temperature, while maintaining constant applied pressure. Open the mould and remove the sheet.

3.4 Preparation of test specimens

Prepare the required test specimens from the moulded sheet by machining or by stamping, using a sharp die of the required shape, the cutting edges of which are free from defects such as notches and burrs.

* 1 MPa = 1 MN/m²

4 Conditioning

The conditioning and all test determinations shall be made at 23 °C and 50 % relative humidity in accordance with the requirements of ISO 291, unless the relevant test method specifies otherwise.

The minimum time between the preparation of a test specimen

and the test determination shall be 16 h, except that for electrical properties it shall be 24 h. If Shore hardness values change significantly, a minimum time of 48 h is necessary.

5 Test methods

See the table.

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Property	Method	Test specimen ²⁾	Unit	Remarks
Density ¹⁾	ISO/R 1183, method A or B	Granules or fragments of moulded articles	g/cm ³	
Mechanical properties				
Shore hardness A or D ¹⁾	ISO 868	Disc of diameter 50 mm or square specimen 50 mm X 50 mm Thickness : 4 or 6 mm (Type A : 6 mm only)		Force applied to the specimen : 50 N
Tensile stress at break	ISO 527	Type 2 specimen 115 mm X 25/6 mm X 1 to 2 mm Distance between gauge marks : 25 mm	MPa	Speed D (100 mm/min), if Shore hardness D is applied for designation
Elongation at break			%	Speed E (500 mm/min), if Shore hardness A is applied for designation
Tensile stress at 100 % elongation ¹⁾	ISO 527	Type 2 specimen 115 mm X 25/6 mm X 1 to 2 mm Distance between gauge marks : 25 mm	MPa	Speed D (100 mm/min), if Shore hardness D is applied for designation Speed E (500 mm/min), if Shore hardness A is applied for designation
Thermal properties				
Torsional stiffness as a function of temperature ¹⁾	ISO 458	60 mm X 6 mm X 1 or 2 mm	°C	The values of the torsional stiffness are plotted as a function of temperature. The two temperatures at which the stiffness in torsion have values of 309 and 4,1 MPa are TST 309 and TST 4,1, respectively. For ISO 2898/1 : TST = 309
Fire behaviour : Methods under study by ISO/TC 92 and ISO/TC 61/SC 4				
Electrical properties³⁾				
Volume resistivity	IEC Publication 93	120 mm X 120 mm X 1 or 4 mm	Ω-cm	Test voltage : 500 V
Physico-chemical properties				
Loss of plasticizers	ISO 176, method B	Disc of diameter 50 mm and thickness 1 mm	% (m/m)	Revision recommended
Migration of plasticizers	ISO 177	Disc of diameter 50 mm and thickness 1 mm	mg	Revision in progress Absorbing sheets; unmodified, unfilled, unplasticized PVC Duration of test : 7 days
Resistance to chemical substances	ISO 175	For change in mass : disc φ 50 mm X 3 mm For change in mechanical properties : specimens as defined in the relevant International Standards	% (m/m) See the relevant International Standards	Immersion time : 7 days

1) Property used for designation (see ISO 2898/1).

2) For tolerances on test specimen dimensions, see the relevant ISO methods.

3) Other electrical properties may be determined in accordance with IEC standard methods.