SLOVENSKI STANDARD
SIST ISO 2898-2:1996

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Polimerni materiali - Mehčane zmesi homo- in kopolimerov vinilklorida (PVC-P) - 2. del: Priprava preskušancev in ugotavljanje lastnosti

Plastics -- Plasticized compounds of homopolymers and copolymers of vinyl chloride (PVC-P) -- Part 2: Preparation of test specimens and determination of properties

Plastiques -- Compositions plastifiées d'homopolymères et de copolymères de chlorure de vinyle (PVC-P) -- Partie 2: Préparation des éprouvettes et détermination des caractéristiques

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INTERNATIONAL STANDARD

ISO 2898-2

Second edition
1989-11-01

Plastics — Plasticized compounds of homopolymers and copolymers of vinyl chloride (PVC-P) —

Part 2:

Preparation of test specimens and determination of properties

Plastiques — Compositions plastifiées d'homopolymères et de copolymères de chlorure de vinyle (PVC-P) —

Partie 2: Préparation des éprouvettes et détermination des caractéristiques

Reference number
ISO 2898-2 : 1989 (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 approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 2898-2 was prepared by Technical Committee ISO/TC 61, *Plastics.*

This second edition cancels and replaces the first edition (ISO 2898-2 : 1980), of which it constitutes a technical and editorial revision. The main technical change concerns the choice of properties, and therefore test methods, for characterizing a plasticized PVC compound. In addition, more recent test methods and sizes of test specimen have been used.

ISO 2898 consists of the following parts, under the general title *Plastics — Plasticized compounds of homopolymers and copolymers of vinyl chloride (PVC-P)*:

— *Part 1: Designation*

— *Part 2: Preparation of test specimens and determination of properties*

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Plastics — Plasticized compounds of homopolymers and copolymers of vinyl chloride (PVC-P) —

Part 2: Preparation of test specimens and determination of properties

1 Scope

This part of ISO 2898-2 specifies the equipment and method to be used to prepare standard test specimens from plasticized compounds of homopolymers and copolymers of vinyl chloride (VC). It also gives detailed instructions on the standard test methods and conditions to be used for determining the properties indicated in ISO 2898-1 for the purposes of designation, and other relevant properties. The properties and test conditions may be used in addition to identify a material and to control its quality in a reproducible manner.

The properties of a moulded article depend, among other things, on the composition of the moulding material, on 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 in accordance with this part of ISO 2898 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.

The use of this part of ISO 2898 may involve hazardous materials, operations and equipment. This part of ISO 2898 does not purport to address all of the safety problems associated with its use. It is the responsibility of the user to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 2898. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 2898 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 176 : 1976, *Plastics — Determination of loss of plasticizers — Activated carbon method.*

ISO 291 : 1977, *Plastics — Standard atmospheres for conditioning and testing.*

ISO 458-2 : 1985, *Plastics — Determination of stiffness in torsion of flexible materials — Part 2: Application to plasticized compounds of homopolymers and copolymers of vinyl chloride.*

ISO/R 527 : 1966, *Plastics — Determination of tensile properties.*

ISO 868 : 1985, *Plastics and ebonite — Determination of indentation hardness by means of a durometer (Shore hardness).*

ISO 1183 : 1987, *Plastics — Methods for determining the density and relative density of non-cellular plastics.*

ISO 2898-1 : 1986, *Plastics — Plasticized compounds of homopolymers and copolymers of vinyl chloride (PVC-P) — Part 1: Designation.*

ISO 3451-5 : 1989, *Plastics — Determination of ash — Part 5: Poly(vinyl chloride).*

IEC 93 : 1980, *Methods of test for volume resistivity and surface resistivity of solid 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 150 mm; length 300 mm.

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 table 1.

Table 1

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	145 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 min and 2 min after the commencement of the milling. There shall be a maximum difference of 4 °C between the rolls and ± 2 °C along the length of each roll.

3.2.2.2 Detailed schedules for the milling of individual compositions are not included in this part of ISO 2898, 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 amount of material should preferably be such that the ratio of the diameter of the rolling bank to the nip width is 10:1. The nip settings shall be determined by the desired thickness of the milled sheet. During mill mixing, the nip width shall be about 1 mm.

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.

Deviations from 3.2.2 and 3.2.3, if necessary, shall 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 from the temperature at the centre of the platen does not exceed 3 K at any point 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 mass of material necessary to fill the mould is determined in advance, either by calculation from the known material density, or by making a trial moulding. The sum of the thicknesses of all the milled sheets used shall be slightly greater than the thickness of the moulded sheet or test specimen.

The moulding temperature shall be in accordance with the requirements given in table 1.

3.3.3 Procedure

Place the required number of milled sheets, preferably cross-layered, 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 a maximum of 5 min to facilitate preheating of the material. Then increase the mould pressure to between 2 MPa and 10 MPa and maintain this pressure for 2 min 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 from the moulded sheet

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

*) 1 MPa = 1 MN/m²

4 Conditioning

The conditioning and all tests shall be carried out 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 determination of Shore hardness A or D shall be 4 days. For all other tests, the minimum time between preparation of a test specimen and the test shall be 48 h unless it is shown that a shorter conditioning time does not change the result.

5 Test methods

See table 2.

Table 2

Property	Units	Method	Test specimen[2]	Remarks
Density[1]	g/cm³	ISO 1183, method A or B	Piece of a moulded sheet (see 3.3)	Report the results to two decimal places
Sulfated ash	% (*m*/*m*)	ISO 3451-5, method A or B	Pellets	
Mechanical properties				
Shore hardness A or D[1]		ISO 868	Disc of diameter 50 mm or square specimen 50 mm × 50 mm Thickness: 4 mm or 6 mm (Type A: 6 mm only)	Force applied to specimen: 50 N Use D if Shore hardness A > 85
Tensile stress at 100 % elongation	MPa	ISO/R 527	Type 2 specimen Thickness: 1 mm to 2 mm Distance between gauge marks: 25 mm	Speed E (500 mm/min)
Thermal properties				
Torsional stiffness as a function of temperature[1]	°C	ISO 458-2	60 mm × 6 mm × 2 mm NOTE — For very flexible compounds, use a 60 mm × 6 mm × 4 mm specimen at high temperatures of test	The values of the torsional stiffness are plotted as a function of temperature. The two temperatures at which the stiffness in torsion has values of 300 MPa and 4,1 MPa are TST 300 and TST 4,1, respectively. For ISO 2898-1, TST = 300.
Electrical properties[3]				
Volume resistivity	Ω·cm	IEC 93	120 mm × 120 mm × (1 or 4) mm	Test voltage: 500 V
Physico-chemical properties				
Loss of plasticizers	% (*m*/*m*)	ISO 176, method B	Disc of diameter 50 mm and thickness 1 mm	

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.