BRITISH STANDARD

BS EN ISO 4613-2:1995
Incorporating Amendment No. 1

Plastics — Ethylene/vinyl acetate (E/VAC) moulding and extrusion materials —

Part 2: Preparation of test specimens and determination of properties

The European Standard EN ISO 4613-2:1995, with the incorporation of amendment A1:2004, has the status of a British Standard

ICS 83.080.20

BSI British Standards

National foreword

This British Standard has been prepared by Technical Committee PRI/32, and is the official English language version of EN 4613-2:1995, *Plastics — Ethylene/vinyl acetate (E/VAC) moulding and extrusion materials — Part 2: Preparation of test specimens and determination of properties*, including amendment A1:2004, published by the European Committee for Standardization (CEN). EN 4613-2:1995 was produced as a result of international discussions in which the United Kingdom took an active part.

EN 4613-2:1995 has been approved by CEN member bodies under the weighted voting procedures introduced in 1988 to coincide with the introduction of "New Approach" Directives from the Commission of the European Community.

Cross-references

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Summary of pages

This document comprises a front cover, an inside front cover, the EN ISO title page, pages 2 to 7 and a back cover.

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English version

Plastics — Ethylene/vinyl acetate (E/VAC) moulding and extrusion materials — Part 2: Preparation of test specimens and determination of properties

(includes amendment A1:2004)

Plastiques — Ethylène/acétate de vinyle (E/VAC) pour moulage et extrusion — Partie 2: Préparation des éprouvettes et détermination des propriétés (inclut l'amendement A1:2004)

Kunststoffe — Ethylen-Vinylacetat (E/VAC) Formmassen — Teil 2: Herstellung von Probekörpern und Bestimmung von Eigenschaften (enthält Änderung A1:2004)

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CEN

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Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart 36, B-1050 Brussels

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Foreword

The text of the International Standard ISO 4613-2:1995 has been prepared by Technical Committee ISO/TC 61, Plastics, in collaboration with CEN/TC 249, Plastics.

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Foreword to amendment A1

This document (EN ISO 4613-2:1995/A1:2004) has been prepared by Technical Committee ISO/TC 61, Plastics, in collaboration with Technical Committee CEN/TC 249, Plastics, the Secretariat of which is held by IBN.

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Plastics — Ethylene/vinyl acetate (E/VAC) moulding and extrusion materials —

Part 2:
Preparation of test specimens and determination of properties

1 Scope

This part of ISO 4613 specifies the methods of preparation of test specimens and the test methods to be used in determining the properties of E/VAC moulding and extrusion materials. Requirements for handling test material and for conditioning both the test material before moulding and the specimens before testing are given here.

Procedures and conditions for the preparation of test specimens and procedures for measuring properties of the materials from which these specimens are made are given. Properties and test methods which are suitable and necessary to characterize E/VAC moulding and extrusion materials are listed.

The properties have been selected from the general test methods in ISO 10350. Other test methods in wide use for or of particular significance to these moulding and extrusion materials are also included in this part of ISO 4613, as are the designatory properties specified in part 1.

In order to obtain reproducible and comparable test results, it is necessary to use the methods of preparation and conditioning, the specimen dimensions and the test procedures specified herein. Values determined will not necessarily be identical to those obtained using specimens of different dimensions or prepared using different procedures.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 4613. 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 4613 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 62:1980, *Plastics — Determination of water absorption.*

ISO 75-1:1993, *Plastics — Determination of temperature of deflection under load — Part 1: General test method.*

ISO 75-2:1993, *Plastics — Determination of temperature of deflection under load — Part 2: Plastics and ebonite.*

ISO 178:1993, *Plastics — Determination of flexural properties.*

ISO 179:1993, *Plastics — Determination of Charpy impact strength.*

ISO 293:1986, *Plastics — Compression moulding test specimens of thermoplastic materials.*

ISO 527-1:1993, *Plastics — Determination of tensile properties — Part 1: General principles.*

ISO 527-2:1993, *Plastics — Determination of tensile properties — Part 2: Test conditions for moulding and extrusion plastics.*

ISO 527-4:—[1], *Plastics — Determination of tensile properties — Part 4: Test conditions for isotropic and orthotropic fibre-reinforced plastic composites.*

ISO 899-1:1993, *Plastics — Determination of creep behaviour — Part 1: Tensile creep.*

ISO 1133:1991, *Plastics — Determination of the melt mass-flow rate (MFR) and the melt volume-flow rate (MVR) of thermoplastics.*

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

ISO 1210:1992, *Plastics — Determination of the burning behaviour of horizontal and vertical specimens in contact with a small-flame ignition source.*

ISO 1628-3:1991, *Plastics — Determination of viscosity number and limiting viscosity number — Part 3: Polyethylenes and polypropylenes.*

ISO 2818:1994, *Plastics — Preparation of test specimens by machining.*

ISO 3146:1985, *Plastics — Determination of melting behaviour (melting temperature or melting range) of semi-crystalline polymers.*

ISO 3167:1993, *Plastics — Multipurpose test specimens.*

ISO 4589-2:—[1], *Plastics — Determination of burning behaviour by oxygen index — Part 2: Ambient-temperature test.*

ISO 4613-1:1993, *Plastics — Ethylene/vinyl acetate (E/VAC) moulding and extrusion materials — Part 1: Designation and specification.*

ISO 8256:1990, *Plastics — Determination of tensile-impact strength.*

ISO 8985:1989, *Plastics — Ethylene/vinyl acetate copolymer (E/VAC) thermoplastics — Determination of vinyl acetate content.*

ISO 10350:1993, *Plastics — Acquisition and presentation of comparable single-point data.*

IEC 93:1980, *Methods of test for volume resistivity and surface resistivity of solid electrical insulating materials.*

IEC 112:1979, *Method for determining the comparative and the proof tracking indices of solid insulating materials under moist conditions.*

IEC 243-1:1988, *Methods of test for electric strength of solid insulating materials — Part 1: Tests at power frequencies.*

IEC 250:1969, *Recommended methods for the determination of the permittivity and dielectric dissipation factor of electrical insulating materials at power, audio and radio frequencies including metre wavelengths.*

IEC 296:1982, *Specification for unused mineral insulating oils for transformers and switchgear.*

3 Preparation of test specimens

Test specimens shall be prepared by compression moulding.

It is essential that the specimens are always prepared by the same procedure using the same processing conditions.

The material shall be kept in moisture-proof containers until it is required for use.

Moisture content of filled or reinforced materials shall be expressed as a percentage of the total mass of the compound.

3.1 Treatment of the material before moulding

Before processing, no pretreatment of the material sample is normally necessary.

3.2 Compression moulding

Compression-moulded sheets shall be prepared in accordance with ISO 293, using the conditions specified in table 1.

The test specimens required for the determination of the properties shall be machined from the compression-moulded sheets in accordance with ISO 2818 or stamped.

1) To be published.

A type 1 (frame) mould may be used, but it is necessary to start cooling whilst simultaneously applying the full pressure. This avoids the melt being pressed out of the frame and avoids sink marks. For thicker sheet (~ 4 mm), a type 2 (positive) mould has been found to work satisfactorily. The preheating time depends on the type of mould and the energy input (steam, electricity). For frame moulds, 5 min is usually sufficient, but for positive moulds, due to the bigger mass, a preheating time of 5 min to 15 min can be necessary, especially if electric heating is used.

When using a positive (type 2) mould, a pressure of about 5 MPa to 10 MPa shall be applied to the material.

4 Conditioning of test specimens

Test specimens shall be conditioned for at least 16 h at 23 °C ± 2 °C.There is no requirement for this to be done at a particular relative humidity.

5 Determination of properties

In the determination of properties and the presentation of data, the standards, supplementary instructions and notes given in ISO 10350 shall be applied. All tests shall be carried out in the standard atmosphere of 23 °C ± 2 °C and (50 ± 5) % relative humidity unless specifically stated otherwise in tables 2 and 3.

Table 2 is compiled from ISO 10350, and the properties listed are those which are appropriate to E/VAC moulding and extrusion materials. These properties are those considered useful for comparisons of data generated for different thermoplastics.

Table 3 contains those properties, not found specifically in table 2, which are in wide use or of particular significance in the practical characterization of E/VAC moulding and extrusion materials.

Table 1 — Conditions for compression moulding of test specimens

Material	Moulding temperature °C	Average cooling rate °C/min	Demoulding temperature °C	Full pressure MPa	Full-pressure time min	Preheating pressure MPa	Preheating time min
⩽ 10 % vinyl acetate	155	15	⩽ 40	20	5 ± 1	Contact	5 to 15
> 10 % vinyl acetate	125	15	⩽ 40	10	5 ± 1	Contact	5 to 15

Table 2 — General properties and test conditions (selected from ISO 10350)

Property	Unit	Standard	Specimen type (dimensions in mm)	Specimen preparation[1)]	Test conditions and supplementary instructions
Rheological properties					
Melt mass-flow rate	g/10 min	ISO 1133	Moulding compound	—	See conditions given in part 1 of this International Standard
Melt volume-flow rate	cm^3/10 min				
Mechanical properties					
Tensile modulus	MPa	ISO 527-1, ISO 527-2, ISO 527-4	See ISO 3167	Q	Test speed 1 mm/min
Yield stress	MPa				Test speed 50 mm/min
Yield strain	%				Test speed 50 mm/min
Nominal strain at break	%				Test speed 50 mm/min
Stress at break	MPa				Test speed 5 mm/min. Only to be quoted if strain at break is less than 10 %
Strain at break	%				
Tensile creep modulus	MPa	ISO 899-1	See ISO 3167	Q	At 1 h / At 1 000 h: Strain $\leqslant$ 0,5 %
Flexural modulus	MPa	ISO 178	80 × 10 × 4	Q	Test speed 2 mm/min
Charpy notched impact strength	kJ/m^2	ISO 179	80 × 10 × 4 V-notch, $r = 0{,}25$	Q	Method 1e (edgewise impact)
Tensile notched impact strength	kJ/m^2	ISO 8256	80 × 10 × 4 double V-notch, $r = 1$	Q	Only to be quoted if fracture cannot be obtained with notched Charpy test
Thermal properties					
Melting temperature	°C	ISO 3146	Moulding compound	—	Method C (DSC or DTA). Use 10 °C/min
Temperature of deflection under load	°C	ISO 75-1, ISO 75-2	110 × 10 × 4 edgewise or 80 × 10 × 4 flatwise	Q	0,45 MPa and 1,8 MPa
Coefficient of linear thermal expansion	$°C^{-1}$	TMA (see ISO 10350)	Prepared from ISO 3167	Q	Parallel / Normal: Record the secant value over the temperature range 23 °C to 55 °C
Flammability	mm/min	ISO 1210	125 × 13 × 3	Q	Method A — linear burning rate of horizontal specimens
Ignitability	%	ISO 4589-2	80 × 10 × 4	Q	Procedure A — top surface ignition
Electrical properties					
Relative permittivity	—	IEC 250	$\geqslant 80 \times \geqslant 80 \times 1$	Q	Frequency 100 Hz and 1 MHz (compensate for electrode edge effect)
Dissipation factor	—				
Volume resistivity	Ω·m	IEC 93	$\geqslant 80 \times \geqslant 80 \times 1$	Q	Voltage 100 V
Surface resistivity	Ω				
Electric strength	kV/mm	IEC 243-1	$\geqslant 80 \times \geqslant 80 \times 1$ / $\geqslant 80 \times \geqslant 80 \times 3$	Q	Use 25 mm/75 mm coaxial-cylinder electrode configuration. Immerse in IEC 296 transformer oil. Use short time (rapid rise) test
Comparative tracking index	—	IEC 112	$\geqslant 15 \times \geqslant 15 \times 4$	Q	Use solution A

1) See next page.

Property	Unit	Standard	Specimen type (dimensions in mm)	Specimen prep-aration[1)]	Test conditions and supplementary instructions
Other properties					
Water absorption	%	ISO 62	50 × 50 × 3 or ϕ 50 × 3 disc	Q	24 h immersion in water at 23 °C
Density	kg/m^3	ISO 1183	—	Q	Test specimen to be taken from compression-moulded sheet prepared as in 3.2
1) Q = Compression moulding					

Table 3 — Additional properties and test conditions of particular utility to E/VAC moulding and extrusion materials

Property	Unit	Standard	Specimen type (dimensions in mm)	Specimen prep-aration	Test conditions and supplementary instructions
Viscosity number	ml/g	ISO 1628-3	Moulding compound	—	—
Vinyl acetate content	%	ISO 8985	Moulding compound	—	—

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