INTERNATIONAL STANDARD 2112

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

Plastics — Aminoplastic moulding materials — Specification

Plastiques — Matières à mouler aminoplastes — Spécification

First edition — 1977-07-15

UDC 678.652.002.61

Ref. No. ISO 2112-1977 (E)

Descriptors : plastics, amino resins, moulding materials, specifications, tests, physical properties, classification.

Price based on 4 pages

FOREWORD

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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 2112 was developed by Technical Committee ISO/TC 61, *Plastics,* and was circulated to the member bodies in February 1975.

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

Austria	Israel	Spain
Belgium	Japan	Sweden
Canada	Netherlands	Switzerland
Czechoslovakia	New Zealand	Turkey
France	Poland	United Kingdom
Hungary	Romania	U.S.A.
India	South Africa, Rep. of	Yugoslavia

The member bodies of the following countries expressed disapproval of the document on technical grounds :

Germany
Italy

Printed in Switzerland

Plastics — Aminoplastic moulding materials — Specification

1 SCOPE AND FIELD OF APPLICATION

1.1 This International Standard establishes a specification applicable to four types of aminoplastic moulding materials classified according to use, as follows :

Type UF A — General purpose

Example : Urea-formaldehyde resin with cellulose filler.

Type MF B — Hot-water resistant

Example : Melamine-formaldehyde resin with cellulose filler.

Type MF C — Thermal resistant and electrical

Example : Melamine-formaldehyde resin with inorganic filler.

Type MF D — Impact resistant

Example : Melamine-formaldehyde resin with chopped cotton-cloth filler.

1.2 These types have been further subdivided into grades based on property levels and requirements, as follows :

Grade UF A10 **Grade UF A11**	— Substantially alpha-cellulose-filled materials
Grade UF A20	— Substantially woodflour-filled material
Grade MF B10	— Substantially alpha-cellulose-filled material
Grade MF B11	— Substantially alpha-cellulose-filled material for foodstuff contact applications
Grade MF B20	— Substantially woodflour-filled material

It should be noted that grade MF B11 is the only grade intended for foodstuff contact applications.

1.3 It must not be inferred from the above that materials of any particular type are necessarily unsuitable for applications other than those indicated, or that specific materials will be suitable for all applications within the wide descriptions given.

2 REFERENCES

ISO/R 62, *Plastics — Determination of water absorption.*[1]

ISO 75, *Plastics and ebonite — Determination of temperature of deflection under load.*

ISO/R 117, *Plastics — Determination of boiling water absorption.*[1]

ISO/R 171, *Plastics — Determination of bulk factor of moulding materials.*

ISO 178, *Plastics — Determination of flexural properties of rigid plastics.*

ISO/R 179, *Plastics — Determination of the Charpy impact resistance of rigid plastics (Charpy impact flexural test).*

ISO/R 180, *Plastics — Determination of the Izod impact resistance of rigid plastics (Izod impact flexural tests).*

ISO 181, *Plastics — Determination of the behaviour of rigid plastics in contact with an incandescent bar.*[2]

ISO 291, *Plastics — Standard atmospheres for conditioning and testing.*[3]

ISO 295, *Plastics — Compression moulding test specimens of thermosetting materials.*

ISO 2577, *Plastics — Thermosetting moulding materials — Determination of shrinkage of compression moulded test specimens in the form of bars.*

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

ISO 3671, *Plastics — Aminoplastic moulding materials — Determination of volatile matter.*

ISO 4614, *Plastics — Melamine-formaldehyde mouldings — Determination of extractable formaldehyde.*

1) These two documents are under revision and will be replaced by ISO 62, *Plastics — Determination of effects of immersion in water, including water absorption.*

2) At present at the stage of draft.

3) At present at the stage of draft. (Revision of ISO/R 291.)

IEC Publication 112, *Recommended method for determining the comparative tracking index of solid insulating materials under moist conditions.*

IEC Publication 167, *Recommended methods of test for determination of the insulation resistance of solid insulating materials.*

IEC Publication 243, *Recommended methods of test for electric strength of solid insulating materials at power frequencies.*

IEC Publication 250 and its Addendum, *Recommended method for testing the permittivity and dielectric dissipation factor of electrical insulating materials at power, audio and radio (including VHF) frequencies.*

IEC Publication 296, *Specification for new insulating oils for transformers and switchgear.*

3 DEFINITIONS

For the purpose of this International Standard, the following definitions apply :

3.1 aminoplastic moulding material : A thermosetting moulding compound consisting of an amino resin binder that has been intimately combined in the uncured or partially cured condition with fillers, pigments and other chemical agents.

3.2 amino resin : A synthetic resin derived from the reaction of urea, thiourea, melamine or allied compounds with aldehydes, usually formaldehyde.

4 GENERAL REQUIREMENTS

Aminoplastic moulding materials complying with this specification shall meet the appropriate property requirements shown in the table.

5 TEST SPECIMENS

Bulk factor, flow and volatile matter shall be determined on the moulding material. The other properties shall be determined on moulded test specimens prepared in accordance with annex B to ISO 295. It is permissible to machine[1] test specimens from sheet moulded according to the moulding conditions of ISO 295, annex B, as long as it can be shown that the specimens give results which do not differ significantly from those obtained using moulded specimens.

Test specimens to be used for determining the properties given in section B of the table shall be conditioned under prevailing atmospheric conditions as allowed in clause 3 of ISO 291, unless otherwise stated in the method of test or agreed between the interested parties.

Determination shall commence not less than 16 h and not more than 72 h after the test specimens have been moulded.

1) See ISO 2818.

TABLE — **Properties of aminoplastic moulding materials***

Property	Method of test	Units	Max. or Min.	TYPE UF A			TYPE MF B			TYPE MF C	TYPE MF D
				Grade UF A10	Grade UF A11	Grade UF A20	Grade MF B10	Grade MF B11	Grade MF B20	Grade MF C10	Grade MF D10
A Properties measured on moulding powder											
Bulk factor	ISO/R 171	–	Max.	X	X	X	X	X	X	X	X
Flow	**	–	–	X	X	X	X	X	X	X	X
Volatile matter	ISO 3671	%	Max.	X	–	–	–	–	–	–	–
B Properties measured on test specimens* **											
Flexural stress at rupture	ISO 178	MPa	Min.	80	70	70	80	80	70	50	60
Impact strength****											
– Charpy, notched	ISO/R 179	kJ/m^2	Min.	1,5	1,5	1,3	1,5	1,5	1,5	2,0	6,0
– Charpy, unnotched	ISO/R 179	kJ/m^2	Min.	6,5	6,0	5,5	7,0	7,0	6,0	3,5	6,0
– Izod	ISO/R 180 Method A	J/m of notch	Min.	15	15	11	15	15	14	20	60
Temperature of deflection under load	ISO 75 Method A	°C	Min.	110	110	95	150	150	130	140	120
Incandescence resistance	ISO 181	–	–	X	X	X	X	X	X	X	X
Insulation resistance after 24 h in water	IEC 167	Ω	Min.	10^{10}	10^{10}	10^{10}	10^{10}	–	10^{10}	10^8	10^8
Electric strength	IEC 243	MV/m	Min.	5,0	3,0	3,0	5,0	–	5,0	2,0	2,0
Tracking resistance	IEC 112 (proof test)	V	Min.	500	500	500	500	–	500	500	500
Dielectric dissipation factor (tan δ), 1 MHz	IEC 250	–	Max.	–	–	–	–	–	–	0,30	–
Water absorption — hot	ISO/R 117 Procedure B	mg	Max.	–	–	–	130	130	200	100	–
Water absorption — cold	ISO/R 62 Procedure A	mg	Max.	200	200	200	100	100	150	80	120
Mould shrinkage	ISO 2577	%	Max.	1,0	1,2	1,0	0,9	0,9	0,9	0,7	0,8
Post-shrinkage 48 h	ISO 2577	%	Max.	X	X	X	X	X	X	X	X
Extractable formaldehyde	ISO 4614										
– Water		$\mu g/cm^2$	Max.	–	–	–	–	*n*	–	–	–
– Acetic acid		$\mu g/cm^2$	Max.	–	–	–	–	*n*	–	–	–
– Alcohol		$\mu g/cm^2$	Max.	–	–	–	–	*n*	–	–	–

* The values specified in this table apply to the mean result for the property measured except for extractable formaldehyde; in this case, the individual results must comply with the limit.

** Test method to be determined.

*** Details of the methods, procedures and specimens to be used are given in clause 6.

**** Only one impact test (Charpy or Izod) to be used, as agreed between the interested parties.

X Limits to be agreed between the interested parties.

n Property to be measured. Limits will be inserted when these have been agreed.

6 METHODS OF TEST

For mechanical tests it is also permissible for the force to be applied in an alternative direction to that specified in the test methods, provided that the results do not differ significantly from those obtained when the force is applied in the specified direction.

6.1 Determination of flexural stress at rupture

See ISO 178. The specimen of length not less than 80 mm, of width 10 mm and thickness 4 mm shall be used for all grades. Five specimens shall be used for the determination.

For both moulded bars and specimens machined from sheet, the loads shall be applied parallel to the direction of moulding pressure. The testing speed shall be 2 ± 0,2 mm/min.

6.2 Determination of impact strength

6.2.1 *Charpy*

See ISO/R 179. The specimen 120 mm × 15 mm × 10 mm shall be used. Five specimens shall be used for the determination.

For both moulded bars and specimens machined from sheet, the loads shall be applied parallel to the direction of moulding pressure.

6.2.2 *Izod*

See ISO/R 180, Method A. The dimensions of the test specimen shall be 63,5 mm × 12,7 mm × 12,7 mm. Five specimens shall be used for the determination.

In the case of specimens machined from sheet, the loads shall be applied perpendicular to the direction of moulding pressure.

6.3 Determination of temperature of deflection under load

See ISO 75, Method A. Two specimens of length not less than 110 mm, of width 10 mm and thickness 4 mm shall be used for the determination.

6.4 Determination of incandescence resistance

See ISO 181.

6.5 Determination of insulation resistance

See IEC Publication 167. The specimen shall be in the form of a flat plate moulded to a thickness of 3,0 ± 0,25 mm. The dimensions shall be such that the axes of the drilled holes are at least 25 mm from the edge of the specimen. The taper pin electrodes shall be used. Before carrying out the test, the specimen shall be conditioned (without electrodes) in an oven at 50 ± 2 °C for 24 ± 1 h, and then cooled to room temperature in a desiccator. It shall then be immersed in distilled or deionized water at 23 ± 2 °C for 24 ± 1 h. Before testing, the surface water shall be removed with blotting or filter paper or with a clean absorbent cloth, and the electrodes fitted. The measurement of insulation resistance shall be made within 5 min after the end of the immersion. Three specimens shall be used for the determination.

6.6 Determination of electric strength at power frequencies

See IEC Publication 243. The step-by-step method shall be used with the test temperature 90 °C in oil. Preferably an oil complying with the requirements of Class II in IEC Publication 296 shall be used. The specimens shall be 3,0 ± 0,25 mm thick and not less than 100 mm in diameter. Two test specimens shall be used for the determination.

6.7 Determination of tracking resistance under moist conditions

See IEC Publication 112, Proof test. The applied voltage shall be the proof voltage given in the table of property requirements. The electrodes shall be as prescribed in IEC Publication 112 and the material shall not track before 51 drops of electrolyte have fallen. Two determinations shall be made.

6.8 Determination of dielectric dissipation factor

See IEC Publication 250. The conditions of test shall be : frequency 1 MHz, temperature 23 ± 2 °C, relative humidity 50 ± 5 %, electrodes metal foil or conductive paint. Two test pieces shall be used for the determination.

6.9 Determination of boiling water absorption

See ISO/R 117. Procedure B shall be used. Two test specimens shall be used for the determination.

6.10 Determination of water absorption

See ISO/R 62. Procedure A shall be used. Two test pieces shall be used for the determination.

6.11 Determination of mould shrinkage

See ISO 2577. Two specimens shall be used for the determination.

6.12 Determination of post-shrinkage

See ISO 2577. Two specimens shall be used for the determination.

Temperature of determination

Type UF A : 80 ± 2 °C
Types MF B, MF C, and MF D : 110 ± 3 °C

6.13 Determination of extractability of formaldehyde

See ISO 4614. Two test specimens shall be used for the determination.