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Plastics — Melamine/phenolic moulding materials — Specification

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Foreword

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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 4896 was prepared by Technical Committee ISO/TC 61, *Plastics*.

This second edition cancels and replaces the first edition (ISO 4896:1979) of which it constitutes a technical revision.

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Plastics — Melamine/phenolic moulding materials — Specification

1 Scope

1.1 This International Standard specifies requirements for three types of melamine/phenolic material, classified according to use as follows:

- type MPF A: general-purpose;
- type MPF C: heat-resistant¹⁾;
- type MPF E: electrical.

1.1.1 Type MPF A is sub-divided into three grades based on resistance to tracking (see table 1):

- MPF A10: substantially alpha-cellulose-filled material;
- MPF A11: substantially alpha-cellulose-filled material;
- MPF A20: substantially woodflour-filled material.

1.1.2 Type MPF is sub-divided into two grades:

- MPF C10: alpha-cellulose and mineral-filled material;
- MPF C20: woodflour- and mineral-filled material.

1.2 It is not to 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 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publi-

cation, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard 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 175:1987, *Plastics and ebonite — Determination of temperature of deflection under load*.

ISO 171:1980, *Plastics — Determination of bulk factor of moulding materials*.

ISO 178:1975, *Plastics — Determination of flexural properties of rigid plastics*.

ISO 179:1982, *Plastics — Determination of Charpy impact strength of rigid materials*.

ISO 180:1982, *Plastics — Determination of Izod impact strength of rigid materials*.

ISO 181:1981, *Plastics — Determination of flammability characteristics of rigid plastics in the form of small specimens in contact with an incandescent rod*.

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

ISO 295:1974, *Plastics — Compression moulding test specimens of thermosetting materials*.

ISO 2577:1984, *Plastics — Thermosetting moulding materials — Determination of shrinkage*.

ISO 2818:1980, *Plastics — Preparation of test specimens by machining*.

1) Type MPF C has heat resistance superior to that of type MPF A.

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

IEC 167:1964, *Methods of test for the determination of the insulation resistance of solid insulating materials.*

IEC 243:1967, *Recommended methods of test for electric strength of solid insulating materials at power frequencies.*

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

3 Definitions

For the purposes of this International Standard, the following definitions apply.

3.1 melamine/phenolic moulding material: Thermosetting moulding compound consisting of a melamine/phenolic-resin binder that has been intimately combined in the uncured or partially cured condition with fillers, pigments and other chemical agents.

3.2 melamine/phenolic resin: Synthetic resin derived from the reaction of melamine and phenol with aldehydes, usually formaldehyde, either co-condensed or physical mixtures.

4 General requirements

Melamine/phenolic moulding materials shall comply with the appropriate property requirements given in table 1.

5 Test specimens

Bulk factor and flow shall be measured on the moulding material. The other properties shall be determined on moulded specimens prepared in accordance with ISO 295. It is permissible to machine specimens (see ISO 2818) from sheet moulded under the moulding conditions of ISO 295, as long as it can be shown that the specimens give results which do not differ significantly from those obtained using moulded specimens.

Specimens used for determining the properties given in section B of table 1 shall be conditioned under prevailing atmospheric conditions as allowed in ISO 291, unless otherwise stated in the method of test or agreed between the interested parties.

Tests shall commence not less than 16 h and not more than 72 h after the test specimens have been moulded, unless otherwise specified in the test methods.

When the test specimens are moulded from powder that has been preheated or dried, this fact shall be stated in the test report. The conditions of preheating or drying shall also be given.

6 Methods of test

For mechanical tests, it is 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. When the force has been applied in an alternative direction to that specified, then this fact shall be stated in the test report.

6.1 Determination of flexural stress at rupture

See ISO 178. Five test specimens of length not less than 80 mm, of width 10 mm and of thickness 4 mm shall be used.

For both moulded bars and test specimens machined from material moulded in the form of a plate, the loads shall be applied parallel to the direction of application of the moulding pressure. The test speed shall be 2 mm/min \pm 0,2 mm/min.

6.2 Determination of Charpy impact strength

See ISO 179. For both moulded bars and test specimens machined from material moulded in the form of a plate, the loads shall be applied parallel to the direction of application of the moulding pressure.

6.2.1 Charpy notched impact strength

See ISO 179/3C. Five test specimens shall be used.

6.2.2 Charpy unnotched impact strength

See ISO 179/3D. Five test specimens shall be used.

6.3 Determination of Izod impact strength

See ISO 180/2A. Five test specimens shall be used.

In the case of specimens machined from material moulded in the form of a plate, the loads shall be applied perpendicular to the direction of application of the moulding pressure.

6.4 Determination of temperature of deflection under load

See ISO 75, method A. Two test specimens of length not less than 110 mm, of width 10 mm and of thickness 4 mm shall be used.

6.5 Determination of incandescence resistance

See ISO 181.

6.6 Determination of insulation resistance

See IEC 167. The test specimen shall be in the form of a flat plate moulded to a thickness of $3,0 \text{ mm} \pm 0,25 \text{ mm}$. Taper pin electrodes shall be used. Before carrying out the test, the specimen shall be conditioned (without electrodes) in an oven at $50 \text{ °C} \pm 2 \text{ °C}$ for $24 \text{ h} \pm 1 \text{ h}$, and then cooled to room temperature in a desiccator. It shall then be immersed in distilled or deionized water at $23 \text{ °C} \pm 2 \text{ °C}$ for $24 \text{ h} \pm 1 \text{ h}$. 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 period. At least two specimens shall be tested.

6.7 Determination of electric strength at power frequencies

See IEC 243. At least two²⁾ specimens shall be used for the determination. Each shall be $3,0 \text{ mm} \pm 0,25 \text{ mm}$ thick and not less than 100 mm in diameter. Each test specimen shall be immersed in oil at a temperature of $90 \text{ °C} \pm 2 \text{ °C}$ for 15 min to 20 min, before the test, and during the test. The oil should, preferably, be one complying with the requirements of IEC 296. The 20 s step-by-step method shall be used.

6.8 Determination of tracking resistance under moist conditions

See IEC 112. Test solution A shall be used. For quality-control purposes, the proof test may be used; the numerical value of the applied voltage shall be that of the comparative tracking index (CTI) given in

the table of property requirements. Two determinations shall be made.

6.9 Determination of water absorption

See ISO 62. Two test specimens $50 \text{ mm} \pm 1 \text{ mm}$ in diameter and $3 \text{ mm} \pm 0,2 \text{ mm}$ thick shall be used or, when agreed between the purchaser and supplier, square specimens of side $50 \text{ mm} \pm 0,2 \text{ mm}$ cut from $4 \text{ mm} \pm 0,2 \text{ mm}$ thick moulded plates. When the second type of test specimen is used, the requirements shall also be the subject of agreement between purchaser and supplier.

6.9.1 Hot-water absorption

See ISO 62, method 4.

6.9.2 Cold-water absorption

See ISO 62, method 1.

6.10 Determination of mould shrinkage

See ISO 2577. Two test specimens shall be used. For materials intended for injection or transfer moulding, the method of preparation of the test specimens shall be agreed between purchaser and supplier.

6.11 Determination of post-moulding shrinkage

See ISO 2577. Two test specimens shall be used. For materials intended for injection or transfer moulding, the method of preparation of the test specimens shall be agreed between purchaser and supplier.

7 Marking

Moulding materials purporting to comply with the requirements of this International Standard shall be supplied in containers marked with the identity of the supplier, the material type and grade, the batch reference number and the number of this standard.

2) It may be necessary to measure the short-time value on an additional test specimen in order to determine the initial voltage to be applied.

Table 1 — Properties of melamine/phenolic moulding materials

The values specified in this table are the mean result for the property measured.

Property	Unit	max. or min.	Type MPF A			Type MPF C		Type MPF E	Method of test
			Grade			Grade		Grade	
			MPF A10	MPF A11	MPF A20	MPF C10	MPF C20	MPF E10	
A) Properties measured on moulding powder									
Bulk factor	—	max.	×	×	×	×	×	×	ISO 171
Flow	—	—	×	×	×	×	×	×	1)
B) Properties measured on test specimens 2)									
Flexural stress at rupture	MPa	min.	80	80	80	70	70	60	ISO 178
Impact strength 3)									
— Charpy, notched	kJ/m ²	min.	1,5	1,5	1,5	1,5	1,2	1,5	ISO 179/3C
— Charpy, unnotched	kJ/m ²	min.	7,0	7,0	6,0	5,0	4,0	4,0	ISO 179/3D
— Izod	kJ/m ²	min.	1,5	1,5	1,5	1,5	1,4	1,5	ISO 180/2A
Temperature of deflection under load	°C	min.	135	135	135	160	160	160	ISO 75, method A
Incandescence resistance									
— average burning time, <i>t</i>	s	max.	*)	*)	*)	*)	*)	*)	ISO 181
— average destroyed length, <i>L</i>	mm	max.	*)	*)	*)	*)	*)	*)	ISO 181
Insulation resistance after 24 h in water	Ω	min.	10 ¹⁰	10 ¹⁰	10 ¹⁰	10 ¹⁰	10 ¹⁰	10 ¹²	IEC 167
Electric strength	MV/m	min.	3	3	3	3	3	6	IEC 243
Tracking resistance	V	min.	CTI 500	CTI 300	CTI 175	CTI 500	CTI 500	CTI 500	IEC 112

Property	Unit	max. or min.	Type MPF A			Type MPF C		Type MPF E	Method of test
			Grade			Grade		Grade	
			MPF A10	MPF A11	MPF A20	MPF C10	MPF C20	MPF E10	
Water absorption									
— hot	mg	max.	250	250	250	150	150	150	ISO 62, method 4 ⁴⁾
— cold	mg	max	150	150	150	120	120	120	ISO 62, method 1 ⁴⁾
Mould shrinkage	%	max.	x	x	x	x	x	x	ISO 2577 ⁵⁾
Post-moulding shrinkage	%	max.	x	x	x	x	x	x	ISO 2577 ⁵⁾ (ex- posure time 48 h ± 1 h)

x Indicates that the limits are to be agreed between the interested parties.

^{*)} Indicates that limits will be added later.

- 1) Test method in preparation.
- 2) Details of the methods, procedures and specimens to be used are given in clause 6.
- 3) The Charpy and Izod methods are alternatives, to be used as agreed between the interested parties.
- 4) See 6.9 regarding the use of an alternative type of test specimen.
- 5) See 6.10 and 6.11 regarding preparation of test specimens.

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