
INTERNATIONAL STANDARD



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**Plastics — Polystyrene moulding and extrusion materials —
Designation**

Matières plastiques — Polystyrènes pour moulage et extrusion — Désignation

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Descriptors : plastics, thermoplastic resins, polystyrene, moulding materials, casting, extrusions, designation.

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.

Prior to 1972, the results of the work of the Technical Committees were published as ISO Recommendations; these documents are now in the process of being transformed into International Standards. As part of this process, Technical Committee ISO/TC 61 has reviewed ISO Recommendation R 1622 and found it technically suitable for transformation. International Standard ISO 1622 therefore replaces ISO Recommendation R 1622-1970 to which it is technically identical.

ISO Recommendation R 1622 was approved by the Member Bodies of the following countries :

Austria	Iran	South Africa, Rep. of
Belgium	Israel	Spain
Brazil	Italy	Sweden
Czechoslovakia	Japan	Switzerland
Egypt, Arab Rep. of	Korea, Rep. of	Turkey
France	Netherlands	United Kingdom
Germany	Poland	U.S.A.
Hungary	Portugal	U.S.S.R.
India	Romania	

No Member Body expressed disapproval of the Recommendation.

The Member Body of the following country disapproved the transformation of ISO/R 1622 into an International Standard :

Canada

Plastics – Polystyrene moulding and extrusion materials – Designation

1 SCOPE AND FIELD OF APPLICATION

This International Standard provides a method of designation and the general requirements for polystyrene moulding and extrusion materials.

Major types of polystyrene moulding and extrusion materials are differentiated from one another by appropriate levels of selected specific properties. Polystyrene itself is described by selected general characteristics for reference purposes.

These types are amorphous homopolymers of styrene, coloured or uncoloured. Excluded are styrene copolymers, homopolymers of substituted styrenes, and those modified with other polymers, such as elastomers. Specific tests for special purpose materials, such as light-stabilized or anti-static grades, are not included. High pigment contents may affect properties.

Other properties may be necessary to specify materials for particular purposes.

2 REFERENCES

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/R 291, *Plastics – Standard atmospheres for conditioning and testing*.

ISO/R 292, *Plastics – Determination of the melt flow index of polyethylene and polyethylene compounds*.

ISO 293, *Plastics – Compression moulding test specimens of thermoplastic materials*.

ISO/R 294, *Plastics – Injection moulding test specimens of thermoplastic materials*.

ISO 306, *Plastics – Determination of the Vicat softening temperature of thermoplastics*.

ISO/R 489, *Plastics – Determination of the refractive index of transparent plastics*.

ISO/R 527, *Plastics – Determination of tensile properties*.

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

ISO 2557, *Plastics – Amorphous thermoplastic moulding materials – Preparation of test specimens with a defined level of shrinkage*.¹⁾

IEC Publication 250, *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*.

3 DESIGNATION

Types of polystyrene materials are identified by two-digit numerical designations. The first digit refers to Vicat softening temperature, specifically to whichever one of the four ranges in table 2 includes the average value for the pertinent polystyrene. The second digit similarly refers to melt flow index. The mechanical properties such as impact strength and flexural modulus, which are necessary to designate other styrene-containing plastics, need not be considered here.

Thus, for example, type "14" describes polystyrene within the lowest Vicat softening temperature range and the greatest melt flow index range. Type "41" describes polystyrene within the highest softening temperature range and the lowest melt flow index range. Tensile strength increases directly with softening temperature.

Not all possible combinations of softening temperature and melt flow index are provided by available polystyrenes. The designated types given in table 1 are presently available.

TABLE 1 – Available types

Vicat softening temperature	Melt flow index	Polystyrene type
1	2, 3, 4	12, 13, 14
2	2, 3	22, 23
3	1, 2	31, 32
4	1, 2	41, 42

1) At present at the stage of draft.

4 GENERAL REQUIREMENTS

4.1 Table 2 lists the physical properties and methods for determining them to differentiate the designated types of polystyrene. Finer differentiation of any property may be agreed upon by the parties concerned.

4.2 Characteristic properties of polystyrene moulding and extrusion materials, and methods for their determination, are listed in table 3.

4.3 Average results of tests shall conform to the tabulated requirements. Only those tests characteristic of type shall be used to establish conformity of a material to type. Other properties needed for a particular purpose may be identified, with method for determination, and specified between manufacturer and purchaser. Routine inspection shall be limited to those properties required to identify the material to the satisfaction of the purchaser.

5 TEST SPECIMENS

5.1 Preparation

Test specimens shall be moulded by a compression or

injection process, conforming to ISO 293 and ISO/R 294 respectively, and under conditions recommended by the manufacturer.

Since most mechanical properties of injection moulded specimens are affected by excessive residual stresses, it is important that these stresses be controlled. (In compression moulded specimens, such residual stresses are usually minimal, but they should be controlled.) For test purposes, this control shall be accomplished by adjusting moulding conditions so that maximum shrinkage is within the range of 65 to 70 %, which is a normal range of orientation.

Shrinkage shall be evaluated according to ISO 2557.

5.2 Conditioning

Moulded test specimens shall be allowed to cool, after moulding or annealing, under standard atmospheric condition (2) ($23 \pm 2^\circ\text{C}$ and 50 % relative humidity) specified in 3.1 of ISO/R 291, for at least 16 h before testing.

TABLE 2 – Characteristics of type

Property		Method of test	Unit	Tentative limiting values for each property				
				Limit	Type			
					1	2	3	4
Thermal	Vicat softening temperature	ISO 306 ¹⁾ Method B (50 N load, ethylene glycol)	°C	min.	—	80,0	90,0	100,0
				max.	79,9	89,9	99,9	—
Rheological	Melt flow index	ISO/R 292 Method C (200 °C, 50 N, pellets)	g/10 min	min.	—	4,0	8,0	16,0
				max.	3,9	7,9	15,9	—

1) VST values are 5,0 °C higher when determined by 10 N load; differences due to heating rates of 50 °C and 120 °C per hour are less than 1 °C.

TABLE 3 – Characteristics of polystyrene

Property		Method of test	Unit	Limit	Tentative limiting values
Physical	Relative density	ISO/R 1183		min. max.	1,045 1,07
	Refractive index	ISO/R 489		min. max.	1,585 1,600
Electrical	Dielectric dissipation factor	IEC 250			0,000 5
	Relative permittivity	(60 Hz to 1 MHz)			2,60
Mechanical ¹⁾	Impact strength – Charpy	ISO/R 179 unnotched specimens (50 mm × 6 mm × 4 mm)	kJ/m ²		<i>Normal ranges</i> injection 10 to 20 compression 4 to 6
	– Izod	ISO/R 180 (63,5 mm × 12,7 mm × 3,2 mm)	J/mm		injection 0,01 to 0,025 compression 0,005 to 0,015
	Tensile strength (to fail)	ISO/R 527 Type 1 specimen Test speed B	N/mm ²		injection 35 to 60 compression 25 to 50
Chemical	Residual monomer (other volatiles may be present)	2)			to be determined by purchaser and supplier

1) Values of mechanical properties are those determined at 65 to 70 % maximum shrinkage; each supplier or user should develop his own correlation between shrinkage and such values to normalize them to this shrinkage level.

2) At present under consideration (method by gas chromatography).

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