International Standard 3672/1

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Plastics — Unsaturated polyester resins — Part 1 : Designation

Plastiques — Résines de polyesters non saturés — Partie 1 : Désignation

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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 3672/1 was developed by Technical Committee ISO/TC 61, *Plastics,* and was circulated to the member bodies in October 1978.

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

Australia	Greece	Romania
Austria	Hungary	Spain
Belgium	Iran	Switzerland
Canada	Italy	Turkey
Czechoslovakia	Japan	USA
Egypt, Arab Rep. of	Korea, Rep. of	USSR
Finland	Mexico	Yugoslavia
France	Poland	

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

Germany, F.R.
United Kingdom

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Plastics — Unsaturated polyester resins — Part 1 : Designation

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies a method of designation for unsaturated polyester resins, based on properties both before and after polymerization.

The object of this designation method is to allocate to each commercial product a group of letters and digits, called the "designation", giving in a coded form certain information on the product : commercial type, approximate values of principal properties and preferred processing methods.

Thus, all products having similar properties and therefore likely to have the same uses will have the same designation, so aiding the users in their choice, as long as manufacturers quote the "designation" in their data sheets.

2 REFERENCES

ISO 62, *Plastics — Determination of water absorption.*

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

ISO 175, *Plastics — Determination of the effects of liquid chemicals including water.*

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

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

ISO 527, *Plastics — Determination of tensile properties.*

ISO/R 584, *Plastics — Determination of the maximum temperature and the rate of increase of temperature during the setting of unsaturated polyester resins.*

ISO 1675, *Plastics — Liquid resins — Determination of density by the pyknometer method.*

ISO 2114, *Plastics — Unsaturated polyester resins — Determination of acid value.*

ISO 2211, *Liquid chemical products — Measurement of colour in Hazen units (platinum-cobalt scale).*

ISO 2535, *Plastics — Unsaturated polyester resins — Measurement of gel time at 25 °C.*

ISO 2554, *Plastics — Unsaturated polyester resins — Determination of hydroxyl value.*

ISO 3219, *Plastics — Polymers in the liquid, emulsified or dispersed state — Determination of viscosity with a rotational viscometer working at defined shear rate.*

3 TYPES

Eight types are defined and designated by a letter, as follows :

– Rigid and semi-rigid resins	R
– Flexible resins	S
– Resins of specified burning characteristics[1)]	F
– Heat-resistant resins	T
– Chemical-resistant resins	C
– Weather-resistant resins	W
– Resins with special optical properties	L
– Special or particular resins (see note)	P

NOTE – In the case of special or particular resins, it would be possible to classify resins as water-emulsifiable resins, water-tolerant resins, etc.

Some resins could be considered as belonging to various types and their type designation may include two or, at a maximum, three letters.

The choice of one or more letters and of their order in classification will be defined by the resin manufacturer who will indicate in the first position the property to which he would like to attract the users' attention.

4 PRODUCTS AND TEST SPECIMENS USED FOR THE DETERMINATIONS

For group 1 the determinations shall be carried out on the unpolymerized resin (see table 1) and for group 2 on the polymerized resin (see table 2).

This polymerized resin shall be prepared as specified in 8.1.

5 DESIGNATION SYSTEM

5.1 Indication of type

The first part of the designation shall consist of one, two or, at most, three letters corresponding to the types defined in clause 3, preceded by symbol "UP" for unsaturated polyester.

5.2 Indication of the properties used for designation and the classes of values

The second part of the designation shall consist of a group of six digits and a group of two digits, with a space between the groups, as follows :

– each digit shall correspond to one of the properties given in tables 1 and 2;

– the position (I, II, III, etc.) of each digit in groups 1 and 2, shall indicate the property to which it refers;

– the value of each digit shall indicate the class (1, 2, 3, etc.), corresponding to a certain range of values of the property, as given in tables 1 and 2.

1) For a complete assessment of the fire performance of a material, information is required on, at least, the following properties :

- ignitability;
- combustibility;
- flammability;
- heat release;
- smoke release;
- noxious gas release.

Appropriate methods of test are under study and will, as appropriate, be included in International Standard ISO 3672/2.

TABLE 1 – **Group 1 – Properties of unpolymerized resins**

Designation order number	Classes							
	1	2	3	4	5	6	7	8
I	**Viscosity at 23 °C and shear rate = 1 s^{-1} : Pa·s* (ISO 3219)**							
	< 0,3	0,3 to < 0,5	0,5 to < 0,85	0,85 to < 1,5	1,5 to < 2,5	2,5 to < 5	⩾ 5	Thixotropic
II	**Gel time at 25 °C : minutes (ISO 2535)**							
	< 20	20 to < 60	⩾ 60	–	–	–	–	–
III	**Reactivity at 80 °C – Time from 65 to 90 °C : minutes (ISO/R 584)**							
	< 2	2 to < 4	4 to < 6	6 to < 12	⩾ 12	–	–	–
IV	**Reactivity at 80 °C – Time from 65 °C to maximum temperature : minutes (ISO/R 584)**							
	< 3	3 to < 6	6 to < 9	9 to < 15	⩾ 15	–	–	–
V	**Reactivity at 80 °C – Maximum temperature : °C (ISO/R 584)**							
	< 120	120 to < 150	150 to < 180	180 to < 210	210 to < 250	⩾ 250	–	–
VI	**Hazen coloration : Hazen units (ISO 2211)**							
	< 40	40 to < 100	100 to < 200	200 to < 500	⩾ 500	–	–	–

* 1 Pa·s = 10 P (poise)

TABLE 2 – **Group 2 – Properties of polymerized resins**

Designation order number	Classes						
	1	2	3	4	5	6	7
VII	**Tensile stress at break at 23 °C : MPa* (ISO/R 527**)**						
	< 40	40 to < 70	⩾ 70				
VIII	**Temperature of deflection under load : °C (ISO 75)**						
	< 40	40 to 55	56 to 65	66 to 75	76 to 90	91 to 150	> 150

* 1 MPa = 1 N/mm^2

** Test specimen : Type 1 – Testing speed : 1 mm/min

NOTES

1 Not every combination of property classes will be achievable in practice.

Note also that the designation of a material will not correspond, except by chance, with a vertical column.

2 The value of each property to be taken into consideration in defining in which class a product belongs is the mean value found in manufacture and normally given in data sheets.

Because of inevitable variations in manufacturing conditions, the product classified as belonging to a given class for one property may incidentally fall :

– in the adjacent lower class if the mean value of this property is near the lower limit of the designation class;

– in the adjacent upper class if the mean value is near the upper limit.

This applies to the properties of both group 1 and group 2.

3 The second paragraph of clause 6 describes how to omit an indication of the class of one or more properties.

5.3 Indication of one or more preferred processing methods

The following processing methods may be indicated in the designation, by small letters, as follows :

— resin adapted to various methods (general)	g
— resin for casting	r
— resin for moulding by compression	p
— resin for hand-lay-up moulding	h
— resin for filament winding	e
— resin for centrifugal moulding	c
— resin for another moulding method (see note)	a

NOTE — In this case, the method shall be clearly indicated.

These seven letters may be used separately or in combination.

6 DESIGNATION OF A POLYESTER RESIN

In accordance with the designation system specified in clause 5, a polyester resin shall be designated by : one letter or a group of two or three letters; an interval; six digits; an interval; two digits; an interval; one or more letters.

If one of the properties, usually designated by a digit indicating the class, is not specified, an "x" shall be inserted at the appropriate place in the designation.

Example : An unsaturated polyester resin with specified burning characteristics (consequently of type F) preferably processed by compression moulding (letter p) and having the values given in table 3 for its properties will be designated by UP F 22235x 34 p.

7 SPECIAL PROPERTIES

These properties shall not be included in the designation; if necessary, they shall be given in actual values only.

Examples of such properties are the following :

a) for the unpolymerized resin :

- indication of type of monomer;
- acid value, determined by the method specified in ISO 2114;
- hydroxyl value, determined by the method specified in ISO 2554;
- density, determined by the method specified in ISO 1675;
- volatile matter (the method of test will be the subject of a future International Standard).

b) for the polymerized resin

- flexural properties, determined by the method specified in ISO 178;
- water absorption, determined by the method specified in ISO 62;
- resistance to chemicals, determined by the method specified in ISO 175;
- incandescence resistance, determined by the method specified in ISO 181.

TABLE 3 — **Example for designation of a polyester resin**

Group	Designation order number	Property	Value	Class
1	I	Viscosity at 23 °C, 1 s^{-1}	0,38 Pa·s	2
	II	Gel time at 25 °C	26 min	2
		Reactivity at 80 °C :		
	III	— Time from 65 to 90 °C	3 min 45 s	2
	IV	— Time from 65 °C to maximum temperature	7 min 15 s	3
	V	— Maximum temperature	220 °C	5
	VI	Hazen coloration	Not specified	x
2	VII	Tensile stress at break	75 MPa	3
	VIII	Temperature of deflection under load	70 °C	4

NOTE — The designation does not exempt the manufacturer from giving in his literature the actual values of the designated properties, together with tolerances of manufacture and measurement.