

JIS

JAPANESE INDUSTRIAL STANDARD

Liquid unsaturated
polyester resins for
fiber reinforced plastics

JIS K 6919—1992

Translated and Published

by

Japanese Standards Association

In the event of any doubt arising,
the original Standard in Japanese is to be final authority.

JAPANESE INDUSTRIAL STANDARD

J I S

Liquid unsaturated polyester resins for
fiber reinforced plastics

K 6919-1992

1. Scope

This Japanese Industrial standard specifies liquid unsaturated polyester resins (hereafter referred to as the "resin liquid") capable of manufacturing casting plate and laminated sheet for fiber reinforced plastics. However, except the resin liquids added with allyl series⁽¹⁾ or additives⁽²⁾.

Notes ⁽¹⁾ The allyl series mean the resin liquid made of allyl compounds as the monomer such as diallylphthalate, triallylcyanurate, etc.

⁽²⁾ Additives mean the fillers and extenders such as calcium carbonate, aluminium hydroxide, etc.

Remarks: Applicable standards to this Standard are shown in the following:

JIS K 6900	Glossary of Terms Used in Plastic Industry
JIS K 6901	Testing Methods for Liquid Unsaturated Polyester Resin
JIS K 6911	Testing Methods for Thermosetting Plastics
JIS K 7051	General Rules for Testing Methods of Glass Fiber Reinforced Plastics
JIS K 7052	Measuring Method for Fiber Content of Glass Fiber Reinforced Plastics
JIS K 7054	Testing Methods for Tensile Properties of Glass Fiber Reinforced Plastics
JIS K 7055	Testing Method for Flexural Properties of Glass Fiber Reinforced Plastics
JIS K 7056	Testing Method for Compressive Properties of Glass Fiber Reinforced Plastics
JIS K 7060	Testing Method for Barcol Hardness of Glass Fiber Reinforced Plastics
JIS K 7100	Standard Atmospheres for Conditioning and Testing of Plastics
JIS K 7113	Testing Method for Tensile Properties of Plastics
JIS K 7207	Testing Method for Deflection Temperature of Rigid Plastics Under Load
JIS K 7209	Testing Methods for Water and Boiling Water Absorption of Plastics
JIS R 3416	Finished Glass Fabrics
JIS R 6252	Abrasive Papers

2. Definitions

For the purposes of this Standard main definitions are in accordance with JIS K 6900 and JIS K 7051, and in addition the following definitions apply:

- (1) liquid unsaturated polyester resin The thermosetting resin of unsaturated polyester which is obtained by reaction of polybasic acid with polyhydric alcohol or of polybasic acid with alkylene oxide, dissolved in monomer to polymerize with it.
- (2) casting plate The compound of liquid unsaturated polyester resin with hardening agent or with hardening agent and accelerator, which is put into a mold and hardened.
- (3) laminated sheet The resin liquid compounded with hardening agent, impregnated with fiber reinforcing material, laminated and hardened.

3. Classification and symbols

The classification and symbols of resin liquids shall be as given in Table 1.

Table 1. Classification and symbols of resin liquids

Classification		Symbol	Summary
Standard type		UP-G	Having general performance
Special type	Heat resistance	UP-HM	Having medium heat resistance
		UP-HE	Having excellent heat resistance
	Chemical resistance ⁽³⁾	UP-CM	Having medium chemical resistance
		UP-CE	Having excellent chemical resistance
		UP-CEE	Having extremely excellent chemical resistance
	Self-extinguishing	UP-SM	Having medium self-extinguishing
		UP-SE	Having excellent self-extinguishing
	Flexible	UP-F	Having medium flexibility

Note ⁽³⁾ The chemical resistance performance is subjected to alkali resistance test according to 5.2.8.

Informative reference: The meanings of symbols in the table are as follows:

G : General

H : Heat Resistance

C : Chemical Resistance

S : Self-extinguishing

F : Flexibility

M : Superior in a certain performance (Medium)

E : Superior particularly in a certain performance (Excellent)

EE : Superior extremely in a certain performance (Extremely Excellent)

UP : Unsaturated Polyester Resin

4. Quality

The quality of liquid unsaturated polyester resin shall be subjected to tests of resin liquid, casting plate and laminated sheet according to 5. and comply with the specifications of Tables 2, 3 and 4.

Further, the quality of laminated sheet is specified relating to fiber reinforced plastics used generally.

Table 2. Quality of resin liquid

Test item	Quality reference	Applicable test clause
Appearance	To be free from foreign matter and separation of liquid	5.1.3
Specific gravity	Instructed value ± 0.02	5.1.4
Acid value	Instructed value ± 4	5.1.5
Viscosity	Instructed value $\pm 30 \%$	5.1.6
Gelation time	Instructed value $\pm 30 \%$	5.1.7

Remarks: The instructed values in the table shall be in accordance with agreement between the parties concerned with delivery.

Table 3. Quality of casting plate

Test item\symbol	UP-G	UP-HM	UP-HE	UP-CM	UP-CE	UP-CEE	UP-SM	UP-SE	UP-F	Applicable test clause
Barcol hardness	35 min.	40 min.	40 min.	35 min.	35 min.	35 min.	35 min.	35 min.	—	5.2.4
Water absorption (%)	0.3 max.	0.3 max.	0.3 max.	0.3 max.	0.3 max.	0.3 max.	0.5 max.	0.5 max.	2.0 max.	5.2.5
Boiling water absorption (%)	—	—	—	0.7 max.	0.5 max.	0.5 max.	—	—	—	5.2.6
Loading deflection temperature (°C)	60 min.	90 min.	110 min.	(80 min.)	(100 min.)	(100 min.)	—	—	—	5.2.7
Alkali resistance	—	—	—	To comply with it in 10 h	To comply with it in 50 h	To comply with it in 100 h	—	—	—	5.2.8
Self-extinguishing	—	—	—	—	—	—	Self-extinguishing	Non-inflammability	—	5.2.9
Tensile elongation percentage (%)	—	—	—	—	—	—	—	—	10 min.	5.2.10

Remarks: Numerical values shown in () in the table are the informative reference values.