

Product Information

Electrical Insulation System
Impregnating Varnish

Elmotherm[®] VF970

Single component, epoxy-phenolic system. High mechanical and chemical resistance.

Product description

Elmotherm® VF 970 is a single component, impregnating varnish based on epoxy-phenolic system. The product consists of a polymeric binder, the so-called solid content and a solvent mixture.

Thinner® D133 will be available for the dilution of the varnish.

It is designed for use in applications where high bond strength and/or good moisture and chemical resistance are required.

Polymerization is initiated by the effect of heat and proceeds as a rapid chain-reaction until a three-dimensionally cross linked, duroplastic cured material is produced.

The product fulfils the directive 2011/65/UE and 2002/95/CE (RoHS).

The raw materials of the product are pre-registered according to directive to CE 1907/2006 and s.m.i. (REACH).

The product does not contain polycyclic aromatic hydrocarbons and substances listed in the SVHC Candidate List.

Areas of application

Preferred applications for Elmotherm® VF 970 are:

- hermetic motors
- generators
- transformers
- machines for ships

Properties of cured resin

The tough-hard material displays very good mechanical and dielectric properties even under high temperatures. Windings impregnated with Elmotherm® VF 970 show exceptional bond strength. In addition, the cured material displays good resistance to the effects of liquid chemicals and their vapours.

Owing to the high temperature index of 180-200 (acc. UL = Underwriters Laboratories USA), Elmotherm® VF 970 can be used for machines in thermal class H (180°C).

UL have registered the product under file E 171184 (component) and file E 171185 (systems).

Flow time

Elmotherm® VF 970 is produced with a relative low viscosity: 60-80 sec measured with FORD 4 cup (in acc. ASTM D1200) at 25°C.

The kind of processing, e.g. with higher ambient temperatures, leads to rising losses of solvent and increased flow time.

In this case it will be necessary to adjust the flow time by addition of Thinner® D 133.

Processing methods

Elmotherm® VF 970 can be processed by all conventional impregnating methods, such as dipping dip-rolling or flooding.

Processing under vacuum is basically possible, in this case the pressure should not drop under 25-30 mbar to avoid excessive evaporation of solvent and the ensuing negative effect on the penetration.

Elmotherm® VF 970 shows slow susceptibility to influence of foreign substance, such a punching grease oil or primers.

However, pollution of the varnish should be avoided as much as possible to guarantee impeccable flow time and reliable drying.

After impregnation the drainage follows and it lasts from 15 to 45 minutes, then, starting from room temperature, the drying process begins in an oven with circulating air.

First step will be operation with supply of fresh air in order to let the solvents evaporate. This process leads (with preference) into an after-burning system. Later, with switching over to circulating air the real drying temperature and the indicated drying times will be effective. In order to calculate time and energy consumption it will be advantageous to have available in advance the heating curves for the objects that have to be impregnated.

Generally the drying in two steps to remove better solvents is recommended in particular when big objects or similar with complex winding construction have to be impregnated. As guide value the first step will be 2-4 hours at 130-150°C. If a second impregnation is carried out, this first step will be dispensable.

It is absolutely essential to stir up the varnish in the containers carefully every time before using.

It will be necessary to follow the instructions of the Material Safety Data Sheet (MSDS) of this product and thinner.

Storage and stability

Under appropriate storage conditions, protected from humidity and solar radiations, Elmotherm® VF 970 can be stored in unopened containers at 23°C for 12 months.

Properties of varnish as supplied

Property	Value	Unit
Shelf life at 23°C	12	months
Appearance/color	Liquid/amber	
Density at 23°C, DIN 51757	955-975	g/l
Content of binder (1g/1h/150°C), ISO 3251	39-41	%
Flow time at 25°C ASTM D1200, 4 mm (Ford cup)	60-80	sec

Curing condition

Temperature	100	110	120	130	140	150	°C
Curing Time			7-8	3-4	2-3	1-2	h

Mechanical properties in dried condition

Test criterion	Condition	Value	Unit
Condition in thick layer, following IEC 60464 part2	Upper side Under side interior	S1 U1 I 3,3	
Bond strength, Elantas test following 61083 method (helical coil)	23°C 155°C 180°C	>290 >50 >45	N
Mandrel test (3 mm) Elantas test following 60464-3	23°C	180	°

Temperature Index

Test criterion	Value	Unit
Proof voltage Elantas test following IEC 60172 (twisted pair)	1000 V	-
Bond strength, Elantas test Following IEC 60290 (helical coil)	20 N	-

Dielectric properties in dried condition

Test criterion	Condition	Value	Unit
Volume resistivity after water immersion Elantas test following IEC 60464 part 2	Initial value 7 d storing	>10 ¹⁸ >10 ¹⁵	Ω × cm
Volume resistivity at elevated temperature Elantas test following IEC 60464 part 2	155 °C 180 °C	>10 ¹¹ -	Ω × cm
Electrical strength, after water immersion Elantas test following IEC 60464 part 2	Initial value 24 h storing	>140 -	KV/mm
Electrical strength, at elevated temperature Elantas test following IEC 60464 part 2	155 °C 180 °C	> 125 > 120	KV/mm
Temperature at relative permittivity tang °= 0,1 Elantas test following IEC 60250	50 Hz 1 KHz 10 KHz	> 165 > 190 > 190	°C

Resistance to chemicals

Test criterion	Condition	Value	Unit
Resistance to vapour of solvents Elantas test following IEC 60464 part 2	Acetone Xylene Methanol Hexane	resistant resistant resistant resistant	- - - -
Water absorption Elantas test following IEC 62	at 23 °C 0,5 h at 100 °C	< 10 < 10	mg mg
Resistance to liquids after storing Elantas test following IEC 175	Ammonia solution 10% Acetic acid 5% Sodium hydroxide 1% Hydrochloric acid 10% Sulfuric acid 30% Iso-octane Toluol Transformer oil Solution of detergent	< 15 < 10 < 10 < 5 < 5 < 1 < 1 < 5 < 10	mg

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