

Product Information

Electrical Insulation System

Impregnating varnish

Elmotherm[®] UF 92 (N)

solvented, oven-drying, elastic material, UL-recognized, thermal class 200

Product description

Elmotherm® UF 92 (N) is a solvented impregnating varnish based on an modified polyester-imide. The product consists of the polymeric binder, the so-called solid content, and a solvent mixture. This solvent mixture is free of halogen and aromatic substances. The thinner 241 will be available for the dilution of the varnish.

Varnish and thinner fulfil the directives 2011/65/EU, 2003/11/EC and 2006/121/EC, the raw materials are pre-registered acc. to the directive No. 1907/2006/EC (REACH). The products do not contain by recipe substances listed in Art. 57/Anex XIV 1907/2006/EC (SVHC).

Areas of application

In electrical engineering, Elmotherm® UF 92 (N) is used both for manufacturing and for repairing the following objects:

- centrifugal motors
- transformers
- generators
- drives in mining industry
- drives on ships

Properties of dried varnish

After drying the elastic material displays high resistance to the effect of chemicals and their vapours and withstands high thermal stress. In addition, this varnish shows excellent behaviour at low temperatures (77 K).

Owing to the thermal properties Elmotherm® UF 92 (N) can be used for thermal class 200 acc. DIN EN 60085. UL (Underwriters Laboratories, USA) have recognized the product under file no. E 171184.

A reduction in the degree of hardness of normally used enamelled wires does not occur if the components are properly impregnated.

Storage stability

Under appropriate storage conditions, protected from humidity and solar radiation, Elmotherm UF 92 (N) and thinner 241 can be stored in unopened containers at 23 °C for 12 months.

Flow time (Viscosity)

The flow time of Elmotherm® UF 92 (N) will be measured with the ISO-cup (6 mm), the product is ready to use when delivered.

The kind of processing, e.g. with higher ambient temperatures, leads possibly to rising losses of solvents and increased flow time. In this case it will be necessary to adjust the flow time by addition of thinner 241.

Processing methods

Elmotherm® UF 92 (N) 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 below 25-30 mbar to avoid excessive evaporation of solvents and the ensuing negative effect on the penetration.

Elmotherm® UF 92 (N) displays low susceptibility to the influence of foreign substances, such as punching grease, oils or primers. However, pollution of the varnish should be avoided as much as possible to guarantee impeccable flow and reliable drying.

After impregnation follows the drainage during 15 to 45 minutes, then, starting from room temperature, the drying process in an oven with circulating air. First step will be operation with supply of fresh air to evaporate the solvents, leading (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.

To calculate time and energy consumption it will be advantageous to have the heating curves for the objects to be impregnated available in advance.

Generally the drying in two steps to remove the solvents best is recommended, in particular when big objects or such with complex winding construction have to be impregnated. As a guide value the first step will be 2- 4 hours at 100-120 °C. If a second impregnation will be carried out, this first step will be dispensable..

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

Properties of varnish as supplied

Property	Value	Unit
Shelf life at 23 °C	12	Months
Appearance	yellowish, clear	-
Content of binder (1,5 g, 2h/135°C), Beck-test T 11 b following ISO 3251	48,5 ± 1,5	%
Flow time at 23°C, Beck-test V22 following ISO 2431	47 ± 5	s
Viscosity at 23 °C, Beck-test V 18 following DIN 53019	-	mPa.s
Density at 23 °C; following ISO 2811-2	1,02 ± 0,03	g/l

Drying conditions

Temperature	23	80	130	140	150	160	°C
Drying time			6		4	2	h

Mechanical properties in dried condition

Test criterion	Condition	Value	Unit
Condition in thick layer, Beck-test M 1 following IEC 60464 part 2	Upper side	S 1	-
	Under side	U 1	
	Interior	I 3.1	
Bond strength, Beck-test M 2 following IEC 61083, method A (Twisted Coil)	23 °C	> 180	N
	155 °C	> 30	
	180 °C	> 25	
Mandrel test (3 mm), Beck-test M 4 following IEC 60464-3	23 °C	180	Degree

Temperature index

Test criterion	Limiting value	TI
Bond strength, Beck-test M 16 following IEC 60290 (Helical Coil)	22 N	212
		203

Dielectrical properties in dried condition

Test criterion	Condition	Value	Unit
Volume resistivity after water immersion, Beck-test M 5 following IEC 60464 part 2	Initial value	$> 10^{16}$	$\Omega \cdot \text{cm}$
	7 d storing	$> 10^{15}$	
Volume resistivity at elevated temperatures, Beck-test M 13 following IEC 60464 part 2	155 °C	$> 10^{11}$	$\Omega \cdot \text{cm}$
	180 °C	-	
Electrical strength after water immersion, Beck-test M 6b following IEC 60464 part 2	Initial value	> 100	kV/mm
	24 h storing	> 80	
Electrical strength at elevated temperatures, Beck-test M 6a following IEC 60464 part 2	155 °C	> 100	kV/mm
	180 °C	> 80	
Temperature at relative permittivity $\tan\delta=0,1$ Beck-test M 3b following IEC 60250	50 Hz, 1 V	> 100	°C
	1 kHz, 1 V	> 155	
	10 kHz, 1 V	> 100	

Effect of liquid chemicals, including water

Test criterion	Condition	Result, Value	Unit
Resistance to vapour of solvents, Beck-test M 7 following ISO 60464 part 2	Acetone	resistant	-
	Xylene	resistant	
	Methanol	resistant	
	Hexane	resistant	
	Carbone disulphide	resistant	
Water absorption, Beck-test M 9 following ISO 62	24 h at 23 °C	< 5	mg
	0,5 h at 100 °C	< 10	
Effect of liquids after 7 d storing, Beck-test M 10 following ISO 175	Ammonia solution 10 %	< 10	mg
	Acetic acid 5 %	< 5	
	Sodium hydroxide 1 %	< 5	
	Hydrochloric acid 10 %	< 5	
	Sulfuric acid 30 %	< 5	
	Iso-octane	< 50	
	Toluol	< 5	
	Transformer oil (mineral)	< 5	
	BecFluid® 9902	-	
	Solution of detergent	< 5	

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Manufacturing site: ELANTAS Italia S.r.l., Via San Martino 6, 15028 Quattordio (AL), Italy
www.elantas.com