

Product Information

Electrical Insulation System

Impregnating varnish

Elmotherm[®] H 71

solvented, oven-drying, high bond strength, thermal class H, UL-recognized

Product description

Elmotherm[®] H 71 is a solvented impregnating varnish based on a modified polyester-imide.

The product consists of the polymeric binder, the so-called solid content, and a solvent mixture. The thinner 217 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 of both products 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 from 9th October 2008 (SVHC).

Areas of application

In electrical engineering, Elmotherm[®] H 71 can be used both for manufacturing and for repairing the following objects:

- centrifugal motors
- transformers
- generators
- drives in mining industry
- machines for ships

Properties of dried varnish

After drying the leathery material displays very good resistance to the effect of chemicals and their vapours and withstands high thermal stress.

Owing to the temperature index of 180 - 200 acc. UL (Underwriters Laboratories, USA) Elmotherm[®] H 71 can be used for machines in thermal class H (180 °C). UL have recognized this impregnating varnish under file no. E 73 288.

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[®] H 71 and thinner 217 can be stored in unopened containers for 12 months at 23 °C.

Flow time (Viscosity)

The flow time of Elmotherm[®] H 71 will be measured with the ISO-cup (6 mm), the product is ready for use when delivered.

The kind of processing, eg. 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 again by addition of thinner 217.

Processing methods

Elmotherm[®] H 71 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[®] H 71 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 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 the varnish and thinner.

Properties of varnish as supplied

Property	Value	Unit
Shelf life at 23 °C	12	Months
Appearance	brownish, transparent	-
Content of binder (1,5 g, 2h/135°C), Beck-test T 11 b following ISO 3251	46 ± 1	%
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	1,03 ± 0,03	g/cm ³

Drying conditions

Temperature	100	120	130	140	150	160	°C
Drying time		4 plus 4 plus			8	6	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	290	N
	155 °C	33	
	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
Proof voltage, Beck-test M 15 following IEC 60172 (Twisted Pair)	1000 V	197
Bond strength, Beck-test M 16 following IEC 60290 (Helical Coil)	22 N	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	$> 10^{12}$	$\Omega \cdot \text{cm}$
	180 °C	-	
Electrical strength after water immersion, Beck-test M 6b following IEC 60464 part 2	Initial value	158	kV/mm
	24 h storing	146	
Electrical strength at elevated temperatures, Beck-test M 6a following IEC 60464 part 2	155 °C	-	kV/mm
	180 °C	133	
Temperature at relative permittivity $\tan\delta=0,1$ Beck-test M 3b following IEC 60250	50 Hz, 1 V	176	°C
	1 kHz, 1 V	> 180	
	10 kHz, 1 V	> 180	

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	2,3	mg
	0,5 h at 100 °C	4,5	
Effect of liquids after 7 d storing, Beck-test M 10 following ISO 175	Ammonia solution 10 %	4,8	mg
	Acetic acid 5 %	3,3	
	Sodium hydroxide 1 %	3,4	
	Hydrochloric acid 10 %	2,2	
	Sulfuric acid 30 %	3	
	Iso-octane	0,6	
	Toluol	50	
	Transformer oil (mineral)	2	
	BecFluid® 9902	-	
	Solution of detergent	3,1	

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