

## **Product Information**

Electrical Insulation System

Coating varnish

# **Elmotherm<sup>®</sup> FS 190**

solvented, colourless, air-drying, resistant to tracking, thermal class 155 (F)

## Product description

Elmotherm® FS 190 is a solvented, air-drying coating varnish based on a modified Alkyd resin, cross-linking with the influence of atmospheric oxygen. For thinning of this varnish the thinner 225 should be used.

This product is available as a red-pigmented version, too (see Elmotherm® FS 190 oxidrot).

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 from 9<sup>th</sup> of October 2008 (SVHC).

## Areas of application

Elmotherm® FS 190 is used for protecting windings and components against humidity and the effect of liquid chemicals in the production of

- Motors and generators
- Transformers
- Drives in chemical industry

## Properties of dried material

The dried varnish film is distinguished by good elasticity, which is advantageous for processing of tubes and flexes and when temperature cycling is in question.

In particular significant is the very good resistance of this varnish against humidity and the effect of liquid chemicals and their vapours.

Owing to the thermal properties Elmotherm® FS 190 can be used for thermal class 155 acc. DIN EN 60085 (former: F).

## Flow time (Viscosity)

The flow time of Elmotherm® FS 190 will be measured with the ISO-cup (6 mm) acc. ISO 2431 the product is ready to use when delivered.

## Processing methods

Elmotherm® FS 190 is used as a coating varnish only, not as an impregnating agent. An impregnating process has to be carried out with a corresponding impregnating material.

The flow time of air-drying varnishes in opened containers will increase permanently due to the evaporation of solvents, film forming can occur additionally. Therefore the containers should be closed clean and carefully after application. The flow time should be checked frequently and adapted with thinner 225 if required.

Elmotherm® FS 190 can be applied by dipping or brushing with the flow time when delivered.

Spraying will also be possible, then it is recommended to add 10-20 % of thinner 225. In this case it will be advantageous to preheat the objects up to 50-60 °C for faster drying of the varnish, a second layer can be applied after 10-20 minutes already. The protective action can be incomplete due to the so-called spray shadows, then some parts of the object will not be coated.

During storage and processing the temperature of the varnish should not exceed 25 °C, in addition it has to be protected from humidity and solar radiation. The content of started containers has to be processed quickly.

Drying of the varnish will be normally at ambient temperature, time can be shortened with support of heat, e.g. with hot air at 90-100 °C.

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

### Properties of component as supplied

| Property                                                                     | Value           | Unit   |
|------------------------------------------------------------------------------|-----------------|--------|
| Shelf life at 23 °C                                                          | 6               | Months |
| Appearance                                                                   | brownish, clear | -      |
| Content of binder (1,5 g, 2 h / 130 °C), Beck-test T 11 b following ISO 3251 | 45 ± 1          | %      |
| Flow time at 23 °C, Beck-test V 22 following ISO 2431                        | 40 ± 3          | s      |
| Viscosity at 23 °C, Beck-test V 18 following DIN 53019                       | -               | mPa·s  |
| Density at 23 °C, Beck-test S 11 following ISO 2811-2                        | 0,89 ± 0,03     | g/cm³  |

### Drying conditions

| Surface     | 23 °C        | 90 °C    |
|-------------|--------------|----------|
| dust-dry    | 20 - 30 min. | 3-5 min. |
| touch-dry   | 2-3 h        | 1 h      |
| fully dried | 24 h         | 2 h      |

### Mechanical properties in dried condition

| Test criterion                                         | Condition | Value | Unit   |
|--------------------------------------------------------|-----------|-------|--------|
| Mandrel test, Beck-test M 4 following IEC 60464 part 3 | 23°C      | 180   | Degree |
| Porosity, Beck-test M 18                               | 5000 V    | 0     | Pores  |

### Temperature index

| Test criterion                                                             | Limiting value | TI |
|----------------------------------------------------------------------------|----------------|----|
| Proof voltage, Beck-test M 15 following IEC 60172 (Twisted Pair)           | 1000 V         | -  |
| Bond strength, Beck-test M 16 following IEC 61033, method B (Helical Coil) | 22 N           | -  |

## 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          | -                 | $\Omega \cdot \text{cm}$ |
| Electrical strength after water immersion, Beck-test M 6b following IEC 60464 part 2       | Initial value   | 114               | kV/mm                    |
|                                                                                            | 24 h storing    | 108               |                          |
| Electrical strength at elevated temperatures, Beck-test M 6a following IEC 60464 part 2    | 155 °C          | -                 | kV/mm                    |
| Temperature at Relative permittivity $\tan\delta=0,1$ , Beck-test M 3b following IEC 60250 | 50 Hz, 1V       | -                 | °C                       |
|                                                                                            | 1 kHz, 1 V      | -                 |                          |
|                                                                                            | 10 kHz, 1V      | 207               |                          |
| Comparative Tracking Index, Beck-test M 26 following IEC 60112                             | test solution B | $> 600 \text{ M}$ | CTI                      |

## Effect of liquid chemicals, including water

| Test criterion                                                                 | Condition                | Result, Value | Unit |
|--------------------------------------------------------------------------------|--------------------------|---------------|------|
| Resistance to vapour of solvents, Beck-test M 7 following IEC 60464 part 2     | Acetone                  | resistant     | -    |
|                                                                                | Xylene                   | resistant     |      |
|                                                                                | Methanol                 | resistant     |      |
|                                                                                | Hexane                   | resistant     |      |
|                                                                                | Carbon disulphide        | -             |      |
| Water absorption, Beck-test M 9 following ISO 62                               | 24 h at 23 °C            | $< 5$         | mg   |
|                                                                                | 0,5 h at 100 °C          | $< 7$         |      |
| Effect of liquid chemicals after 7 d storing, Beck-test M 10 following ISO 175 | Ammonia solution 10 %    | -             | mg   |
|                                                                                | Acetic acid 5 %          | 8             |      |
|                                                                                | Sodium hydroxide 1 %     | 14            |      |
|                                                                                | Hydrochloric acid 10 %   | 4             |      |
|                                                                                | Sulforic acid 30 %       | 4             |      |
|                                                                                | Iso-octane               | 1,2           |      |
|                                                                                | Toluol                   | 62            |      |
|                                                                                | Transformer oil, mineral | 3             |      |
|                                                                                | BecFluid® 9902           | -             |      |
|                                                                                | Solution of detergent    | 6             |      |

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