

STRESS GRADING VARNISHES

8001 + 8002

General

8001 : Modified phenolic resin with silicone carbide
8002 : Modified phenolic resin with silicone carbide

Corona protection varnish, air drying, grey pigmented, used in insulation systems of Class F high voltage rotating machines.

Application

All machines with an operating voltage of 6.3 kV and above should have a discharge protection coating.

During the design of high voltage machines thorough consideration has to be given to the problem of electrical discharges. These mostly local discharges cause the slow destruction of the insulation and therefore must be prevented. The discharges can occur inside and outside the slots.

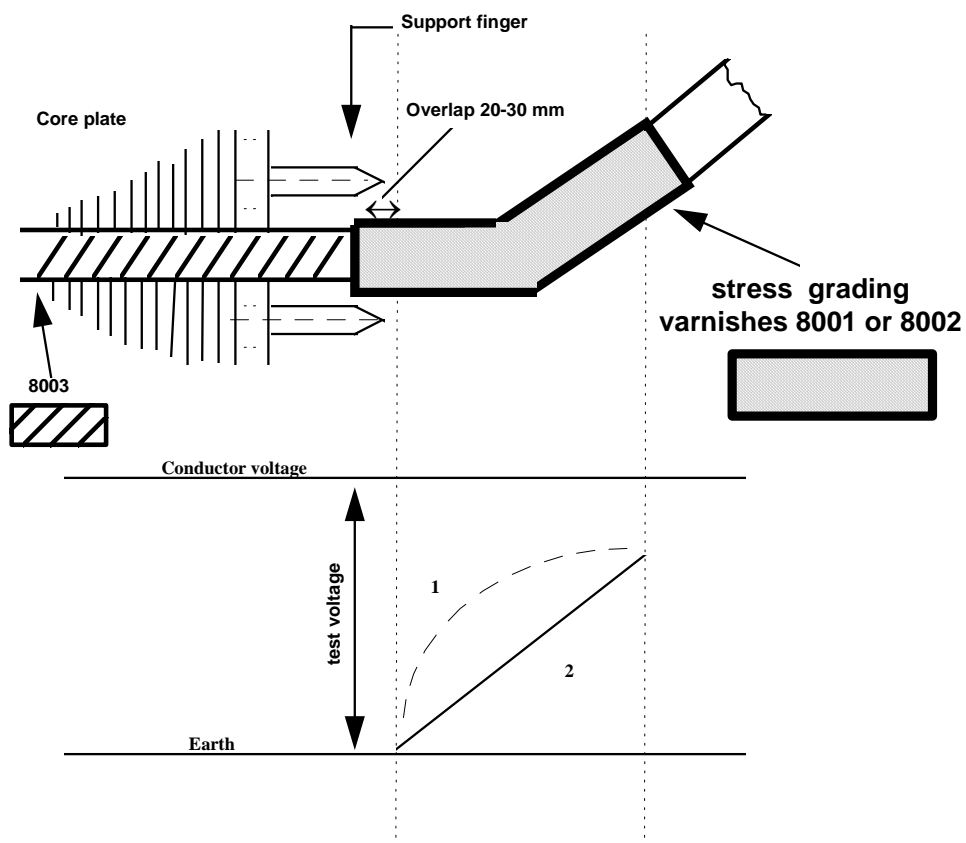
Outside the slot an almost linear voltage distribution along the end winding is desirable. This goal can be achieved using a semi-conductive layer with voltage dependent resistance. The stress grading varnishes 8001 and 8002 are especially suitable for this purpose.

Stress grading varnishes are used to prevent discharges on stator bars and coils in all kinds of high voltage machines. They can also be used to produce the necessary corona protection on test rods, bushings, lead through insulators, instrument transformers etc.

The varnishes are effective in two ways:

The highly heat resistant silicone carbides in the varnish withstand the effect of flashovers, protecting the insulation surface underneath from erosion caused by discharges. The current/voltage characteristic of the varnish layer, which is non-linear, ensures a favourable potential distribution on the surface of the insulation.

The following illustration shows schematically the layout of the corona protection layer on a generator bar or high voltage coil as well as the voltage curve of an applied test voltage on to such a bar with and without stress grading layer.



- Curve 1 : Voltage distribution along the coil at the end of the slot without a stress grading layer
- Curve 2 : Voltage potential distribution after applying with a stress grading layer

Processing

Because of the high density of the pigment it settles quickly at the bottom of the container; therefore the varnish has always to be stirred thoroughly before use.

The varnish can be applied with a brush to all surfaces. The viscosity can be adjusted using the appropriate thinner.

We recommend to apply the individual coats thinly, resulting in a final layer thickness of 0.2 - 0.5 mm. Before applying the next coat, at least 30 minutes must be allowed enabling the previous layer to dry.

- Contact must be made between the conductive and the stress grading layer, such that the stress grading layer must overlap the conductive layer by at least 20 - 30 mm.
- The conductive varnish layer has to extend slightly beyond the metal parts which are at earth potential. This determines the position of the overlap of both layers.
- To determine the minimum length of the stress grading layer, an average of 2 kV/cm can be assumed, whereby the highest machine test voltage is the reference.

Example : Operating voltage: 15 kV
 Test voltage: 33 kV
 Length of layer $\frac{33}{2}$ = 16.5 cm

Properties of the varnishes at the time of delivery :

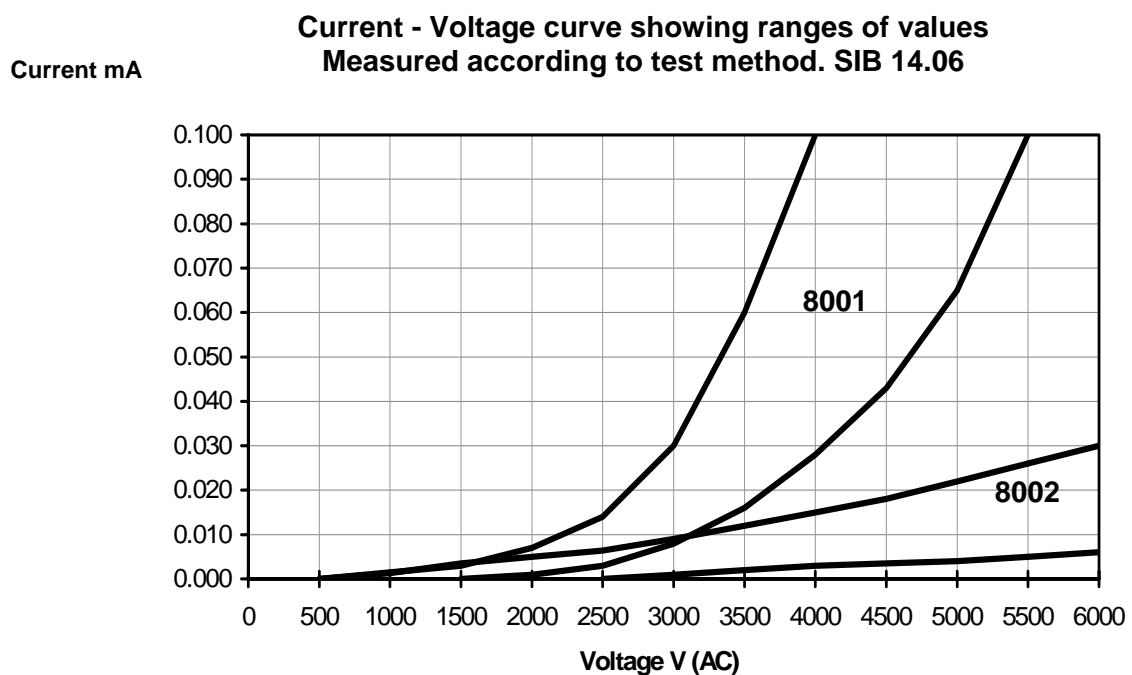
			8001	8002	
Viscosity	at 20 °C	mPa·s	1000 ± 100	1100 ± 100	DIN 53019
Density		g/m ³	ca. 1.28	ca. 1.28	ISO 2811-2
Solids content		%	52 ± 3	52 ± 3	IEC 60464-1/-2
Flash point		°C	≥ 14	≥ 14	ISO 1523
Drying - surface drying - complete drying	at 23 °C	minutes hours	30 10	30 10	DIN 46449
Thermal class			F	F	IEC 60085
Thinner			9139	9139	

Characteristics

The difference between 8001 and 8002 is the flexibility. Varnish 8001 is a hard varnish, which after a short time in operation loses its initial thermoplasticity. Varnish 8002 is a very flexible varnish which remains thermoplastic even after a long time at elevated temperature. The varnishes differ also in their current/voltage characteristics (see graph below) and in their properties according to the table below.

	8001	8002
Protection against corona	good	good
Adhesion on rigid insulation - e.g. Samicatherm	good	good
Adhesion on flexible insulation - e.g. Samicaflex	medium	medium
Resistance to : - Moisture, oil, solvents	very good	very good
Thermal ageing : - in thermal class B machines - in thermal class F machines	good becomes hard	good becomes hard

Stress grading varnishes 8001 and 8002



Storage Varnishes 8001 and 8002 stored in a sealed container 20 - 25°C have a shelf life of at least 1 year.
Pigmented varnishes tend to settle and must be stirred before use.

Supply The varnishes are supplied ready for use in cans of 1,2,5,10,20 or 25 kg..

Hygiene When processing the varnish the usual precautions have to be taken :

- General cleanliness in the work place
- Eye and skin contact with the varnish to be avoided
- No eating or drinking while working
- Good room ventilation as well as extraction of the solvent vapours required.
- In case of eye contact, rinse thoroughly with water until the irritation ceases
- Protect skin
