C-6 coatings

For highest surface resistivity

Features of C-6 coatings

C-6 coatings are one of the available insulation systems for electrical steel. They are typically used for applications requesting high surface resistivity like large diameter rotating machines. The coatings are temperature stabile and withstand burn-off treatments used to remove stator-winding insulation during rebuilding of motors. They are also suitable for Aluminium die casting, but they are not considered to withstand stress-relief annealing. Other properties include improved punchability when compared to uncoated electrical steel.

Characteristic properties

- Class C-6 (ASTM 976)
- Inorganic/organic coating system
- Thickness range between 3 and 8 µm
- Continuous temperature resistance 180 °C
- Free from chromate

Two class C-6 (ASTM 976) coatings are available at voestalpine: Remisol EB 500 FF and Dynophen gris sans BG, both produced by Rembrandtin. These coatings all meet the requirements of the respective insulation class:

Both are organic insulating varnishes with inorganic fillers and meet greatest demand for electrical insulation.
The coatings are free from chromate and the high content of functional fillers serves for outstanding pressure resistance and low creep. Thus both coatings suite perfectly for midsized and heavy machines, particularly for big generators. They withstand thermal strains like Aluminium die casting and the burn off process during a machine repair.

The special strengths of and the main differences between the two coatings can be described as:

Remisol EB 500 FF is free from both formaldehyde AND formaldehyde emissions.
It and can be applied in a thickness range between 3 and 6 µm per side.

Dynophen gris sans BG can be applied in a thickness range between 3 and 8 µm per side.

General description

The coatings differ generally in composition and are available in different thicknesses that are dependent on the respective varnish.

	Remisol EB 500 FF	Dynophen gris sans BG
Composition	Inorganic/organic	Inorganic/organic
Available layer thickness (µm)	3 – 6	3 – 8
Emission of formaldehyde at 100 °C	Not detectable*	yes

* taken from data sheet of varnish manufacturer

Coating assessment

The following tests are carried out to generally assess the coating layer in addition to a coating thickness measurement using magnetic method (DIN EN 2178) and an insulation resistance measurement by a subsequent Franklin test (DIN EN 60404-11).

	Remisol EB 500 FF	Dynophen gris sans BG
Cross-cut test DIN EN 2409	GtØB	GtØB
DIN EN13523-11 20 double strokes, methyl ethyl ketone test (rubbing test)	OK	OK

Insulation resistance

An essential requirement of electrical steel coatings is the electrical insulation of the strip surface in order to reduce interlaminar loss in the stack. Insulation resistance increases with increased layer thickness. Measurements are based on DIN EN 60404-11 (Franklin Test), and the values in the table below are typical for isovac 800-50A grade, coating thickness 5 µm.

Insulation resistance may differ from the typical values indicated below for other steel grades with the same layer thickness.

	Remisol EB 500 FF	Dynophen gris sans BG
Insulation resistance (Ohmcm²) DIN EN 60404-11	3000	3000

Thermal stability

C-6 coatings are marked by a high level of temperature resistance, but not stress relieve annealing. The qualitative assessments of resistance to thermal stress in the table correspond to the evaluations performed at voestalpine and refer to isovac 800-50A and a coating thickness of 5 µm:

	Remisol EB 500 FF	Dynophen gris sans BG
Short-term temperature resistance in air DIN IEC 60404-12	0.5 h /500 °C	0.5 h /500 °C
Continuous temperature resistance DIN IEC 60404-12	180 °C	180 °C
Resistance to burn off repair	Good	Good
Aluminium die casting	Good	Good

Processability

In addition to the measurable characteristics, important properties also include the processing properties such as abrasion behavior during stamping or improved punchability due to the lubricating effect of the coating. The characteristics indicated in the table below refer to isovac 800-50A and a coating thickness of 5 µm per side:

	Remisol EB 500 FF	Dynophen gris sans BG
Improvement in stamping and punching	Yes	Yes
Abrasion behavior	Good	Good

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