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## **Voltatex® 4200 1-component-resin**

Voltatex® 4200 is a low emission, ready-to-use impregnating 1K dip resin, based on unsaturated polyesterimide resins.

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### **Attributes**

- single component
- free of styrene and vinyltoluene
- low emission, VOC-free
- resistant to refrigerants
- not classified as dangerous in the meaning of transport regulations

The cured resin compound is characterized by:

- high thermal and mechanical strength, especially under long-term stress
- good resistance against solvent gases
- good adhesion

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### **Application**

- hermetic motors
- transformers, especially with thick wires and shaped conductors
- suitable for: Insulation systems up to thermal class 200 (N)

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### **Standards**

- UL-File-Nr.: E 101752 (M) Underwriters Laboratories Inc., USA
- Isolation-system temperature of thermal class 200 (N) acc. to IEC 60085:2007
- Temperature Index in acc. with IEC 60455-3-5, Type 220, Testing Method in acc. with IEC 60216
- Temperature class acc. to UL 1446:

Twisted Pair ASTM D2307 MW 30:200  
MW 35:220

Helical Coil ASTM D2519 MW 30:240  
MW 35:220

Insulation-system acc. to UL 1446 (IEC 61858):

Class 130 C190HE  
R150HE  
Z130HE  
Z150HE  
Class 155 C290HE

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CZ255HE  
R201HE  
R203HE  
Z200HE  
Class 180 R342HE  
R342HE2

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### **Delivery forms**

The dip resin is delivered in 25 kg and 200 kg one-way-cans. Additionally 1000 kg containers (returnable) are available (not for oversea export).

### **Storage**

The resin can be stored for up to 6 months at max. 25 °C if sealed correctly in original containers. We recommend a storage at 20-25 °C. Opened containers have to be resealed and protected against direct daylight!

### **Hardening**

Voltatex® 4200 is a low emission product; nevertheless to minimize evaporation of reactive components while curing the impregnated objects should be heated up to the curing temperature in the shortest possible time. The air flow in the curing zone should be kept to the minimum permitted by safety considerations.

Curing times (Dip & Bake process):

at 130 °C: 2h

at 150 °C: 1 h

Curing times (trickle process):

at 130 °C: 15-30 min.

at 150 °C: 10-15 min.

In the cooling pool, the temperature change should be limited to max. 5 °C.

### **Protection**

Voltatex® 4200 is biologically inactive and safe to health. Implement normal protective measures when processing the liquid dip resin: See the Material safety data sheet (MSDS).

### **Processing**

The impregnating resin can be applied by using

- all kind of conventional dip & bake equipment
- continuous and vacuum dip processes

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- VPI process
  - Trickling machines
  - Hot dipping process
  - Electric heating process with "Heat in resin"

Unlimited tank stability with resin Voltatex® 4200 can be achieved as long as the material is kept below 25 °C and at least 20 % of the tank content is used and replaced with fresh resin per month.

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### Cleaning

Once cured Voltatex® 4200 is almost insoluble. Therefore, application equipment should be cleaned regularly with cleaner Voltatex® T050 or T060.

All equipment cleaning and maintenance should be carried out in accordance with the equipment manufacturer's instructions.

| Mechanical                                      | Unit of measure | Values   | Test method                              |
|-------------------------------------------------|-----------------|----------|------------------------------------------|
| Bond strength of twisted coils room temperature | N               | 325 ± 40 | IEC 60455-2 test method A acc. IEC 61033 |
| Bond strength of twisted coils 130 °C           | N               | 90 ± 20  | IEC 60455-2 test method A acc. IEC 61033 |
| Bond strength of twisted coils 155 °C           | N               | 80 ± 10  | IEC 60455-2 test method A acc. IEC 61033 |
| Bond strength of twisted coils 180 °C           | N               | 52 ± 12  | IEC 60455-2 test method A acc. IEC 61033 |
| Shore D hardness room temperature               |                 | 77 ± 5   | IEC 60455-2 test method acc. ISO 868     |

| Thermal                      | Unit of measure | Conditions | Value    | Test method                           |
|------------------------------|-----------------|------------|----------|---------------------------------------|
| Temperature index            | °C              |            | type 220 | IEC 60455 test method acc. IEC 60216  |
| Bond strength IEC 60317-8    | °C              | MW 30      | 238      | IEC 61033, method B, final point 22 N |
| Bond strength IEC 60317-13   | °C              | MW 35      | 229      | IEC 61033, method B, final point 22 N |
| Testing voltage IEC 60317-8  | °C              | MW 30      | 212      | IEC 60172                             |
| Testing voltage IEC 60317-13 | °C              | MW 35      | 222      | IEC 60172                             |

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| Thermal              | Unit of measure     | Conditions                       | Value | Test method |
|----------------------|---------------------|----------------------------------|-------|-------------|
| Thermal conductivity | $W(m \cdot K)^{-1}$ | at 23 °C, 130 °C, 155 °C, 180 °C | 0.22  | ASTM E1530  |

| Chemical             | Unit of measure | Conditions                       | Values    | Test method                           |
|----------------------|-----------------|----------------------------------|-----------|---------------------------------------|
| Resistance           |                 | distilled water, transformer oil | resistant | Factory standard Energy Solutions 017 |
| Resistance           |                 | Hexane, methanol, acetone, xylol | resistant | Factory Standard Energy Solutions 019 |
| VOC acc. 31. BlmSchV | %               |                                  | 1.1       | 2010/75/EU                            |

| Electrical                                                   | Unit of measure | Values | Test method                              |
|--------------------------------------------------------------|-----------------|--------|------------------------------------------|
| Dielectric strength at 23 °C after 96 h storage at 90 % r.h. | kV/mm           | 40-90  | IEC 60455-2 test method acc. IEC 60243-1 |
| Dielectric strength at 23 °C and 50 % r.h.                   | kV/mm           | 70-90  | IEC 60455-2 test method acc. IEC 60243-1 |
| Dielectric strength at 155 °C                                | kV/mm           | 65-105 | IEC 60455-2 test method acc. IEC 60243-1 |
| Dielectric strength at 105 °C after 168 h oil immersion      | kV/mm           | 85-130 | IEC 60455-2 test method acc. IEC 60243-1 |

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| Electrical                                           | Unit of measure | Values                             | Test method                                 |
|------------------------------------------------------|-----------------|------------------------------------|---------------------------------------------|
| Specific volume resistance at 155 °C                 | Ω*cm            | 10 <sup>10</sup> -10 <sup>12</sup> | acc. IEC 60455-2 test method acc. IEC 60093 |
| Specific volume resistance at 180 °C                 | Ω*cm            | 10 <sup>9</sup> -10 <sup>11</sup>  | acc. IEC 60455-2 test method acc. IEC 60093 |
| Specific volume resistance at 200 °C                 | Ω*cm            | 10 <sup>9</sup> -10 <sup>11</sup>  | acc. IEC 60455-2 test method acc. IEC 60093 |
| Specific volume resistance after 7 d water immersion | Ω*cm            | 10 <sup>14</sup> -10 <sup>16</sup> | acc. IEC 60455-2 test method acc. IEC 60093 |

| Liquid phase              | Unit of measure | Conditions | Values                                     | Test method                                |
|---------------------------|-----------------|------------|--------------------------------------------|--------------------------------------------|
| Viscosity                 | mPas            | 25 °C      | 1800-2700                                  | acc. DIN 53019                             |
| Gel time                  | min             | 100 °C     | 7-13                                       | acc. company standard Energy Solutions-001 |
| Reaction time             | min             | 100 °C     | 8-16                                       | acc. company standard Energy Solutions-001 |
| Curing time               | min             | at 150 °C  | 120                                        | dipping method                             |
| Curing time               | min             | at 130 °C  | 60                                         | dipping method                             |
| Impact on enamelled wires |                 |            | compatible with all common enamelled wires |                                            |

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