AXALTA COATING SYSTEMS
Energy Solutions

Voltatex® 4100 Impregnating Resin

Technical Data Sheet

Chemical Base

Unsaturated polyester imide resin, vinyl-toluene based.

Product Description

Clear, yellow-brown glazing, styrene free, one pack ready to use impregnating resin, thermosetting.

Voltatex® 4100 is compliant with:

- Regulation (EC) No 1907/2006 (REACH)
  - including Annex XIV (SVHC's, PBT/vPvB)
  - including Annex XVII and Regulation (EU) No 2017/1000 (PFOA)
- Directive 2011/65/EU (RoHS)
- Regulation (EU) 2019/1021 (persistent organic pollutants)

Characteristics

- single component
- very high capillary activity
- low evaporation losses while processing
- high resin retention in the object
- low draining losses in the oven
- high efficiency due to favourable curing conditions and excellent impregnating results

The cured resin compound is characterized by:

- good resistance against solvent gases and against long term thermal stress
- high bond strength
- low tendency to crack
- tough-elastic compound

UL (Underwrites Laboratories)

UL-File-Nr.: E 101752 (M) Underwriters Laboratories Inc., USA

Typical Applications

- electric motors
- transformers
- suitable for: Insulation systems of **thermal class 180 (H)** acc. to IEC 60085:2007

Ready to use; no mixing required

Voltatex® 4100 is supplied ready to use and does not require the addition of hardener, accelerator or thinner.

Optionally the viscosity can be adjusted using the **thinner Voltatex® T032** upon customer needs and wishes.

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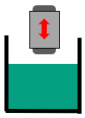

Processing

The resin can be applied by using

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

Stability

A virtually unlimited tank stability can be achieved provided Voltatex® 4100 is kept below 25 °C and at least 30 % of the tank contents are consumed monthly and replaced by fresh resin.

Example:

Tank contents:	1,000 kg
Resin refreshment:	300 kg per month

Voltatex® 4100 is **sensitive to light** and therefore must be protected accordingly. This is valid for the material inside the delivered items as well as for the material inside the impregnating equipment.

Curing

In order to minimise evaporation of reactive components while curing, the impregnated objects should be heated up to the curing temperature in the shortest possible time. The air exchange in the curing zone should be kept to the minimum permitted by safety considerations.

If **active cooling** after the curing process is included in the process, please ensure to not exceed a temperature reduction on the part of maximal 5 °C (5 K) per minute to minimise cracking.

Cleaning

Once cured Voltatex® 4100 is almost insoluble. Therefore, all application equipment should be cleaned in time with cleaner **Voltatex® T050 or Voltatex® T060** (data sheets available on request).

All cleaning and maintenance of the impregnating equipment should follow operational needs and must be carried out in accordance with the equipment manufacturer's instructions.

Packaging / Stock Items

Voltatex® 4100 is available in:

- 25 kg cans (non-returnable)

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Storage

A temperature range of above -20 °C and below 25 °C is recommended as storage temperature, at lower temperatures please consult us. In originally closed delivery items, the product has a **shelf life of 6 months** if the storage temperature doesn't exceed 25 °C. We recommend storing the product between 20 - 25 °C.

If not consumed completely, opened containers have to be closed immediately again after taking out the required amount of resin.

Health & Safety

Completely cured Voltatex® 4100 is biologically inactive and not dangerous to health.
When processing the liquid resin, please consult the Material Safety Data Sheet (MSDS) of Voltatex® 4100 and follow the regulations of your local authorities.

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Product Specifications

Table 1: Specifications of the Liquid Product

Viscosity at 25 °C in acc. with DIN 53019 [1)]	220 - 280 mPas
Storage Stability / Shelf Life at 25 °C [2)]	6 months
Reactivity at 100 °C in acc. with Company Standard Energy Solutions 014 [1), 3)]	
Gel Time	6.0 - 12.0 min
Reaction Time	14.0 - 24.0 min
Flow Time at 23 °C acc. to Company Standard Energy Solutions – 018 [4)]	57 - 73 s

1) The values refer to the time of manufacturing. As the product is chemically reactive, both reactivity and viscosity can change during storage depending on the local storage conditions. Especially inside impregnating machines the product can take on individual values in dependence of material consumption / turnover and processing parameters.
2) As the product is chemically reactive, the shelf life is considered from the date of manufacturing, not from the delivery date. The shelf life of the delivered product batch is printed on the label of the delivery item or can be taken from the delivery papers.
3) Company Standard Energy Solutions 014 „Reactivity Determination“ in acc. with DIN 46448
4) Company standard Energy Solutions – 018 „Flow Time Measurement of structural-viscous Impregnating Resins

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Product Specifications

Table 2: Specifications of the Cured Product

Curing Condition: 2 h at 130 °C [5)]

Dielectric Strength in acc. with IEC 60455-2, Test Method in acc. with IEC 60243-1	
at room temperature and 50 % rel. humidity	≥ 53 kV/mm
at 155 °C	≥ 60 kV/mm
at room temperature, after 96 h storage at 92 % rel. humidity	≥ 36 kV/mm
at room temperature, after 168 h storage in oil at 105 °C	≥ 76 kV/mm
Volume Resistivity in acc. with IEC 60455-2 Test Method in acc. with IEC 60093	
at 155 °C	≥ 10^{09} Ω cm

5) The curing condition of 2h at 130 °C refers to all measurements of the cured product and is to be understood as temperature and time on the test specimen. Other curing conditions can lead to different values than given in this data sheet.

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Typical Characteristics

Table 3: Typical Characteristics of the Liquid Product

Appearance	clear, yellow-brown
Emissions while Curing in acc. with IEC 60455-3-5: 2006 *) The country-specific VOC-value is available on request	approx. 5.7 % (weight)
Curing Time	
at 130 °C	≥ 2 h

The curing conditions stated here are to be understood as examples and recommendations based on best practice. They are considered from the time when the part reaches the indicated temperature. The required time to heat up the part to the curing temperature is not included. It is recommended to adapt the curing conditions to the requirements of the end product.

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Typical Characteristics

Table 4: Typical Characteristics of the Cured Product

Curing Condition: 2 h at 130 °C [5)]

Shore-D-Hardness in acc. with IEC 60455-2, Test Method acc. to ISO 868	
at room temperature	55 - 65
Water Absorption in acc. with Company Standard Energy Solutions – 015	
after 96 hours at 23°C	0.6 - 0.8 %
Bond Strength on Twisted Coils in acc. with IEC 60455-2, Test Procedure in acc. with IEC 61033, Method A [6)]	
at room temperature	110 - 1300 N
at 130 °C	23 - 33 N
at 155 °C	20 - 28 N
at 180 °C	22 - 30 N
Glass Transition Temperature	approx. 10 - 60 °C
Thermal Conductivity in acc. with DIN 51046	approx. 0.17 W/mK
Tracking Resistance in acc. with IEC 60455-2, Test Method acc. to IEC 60112	CTI 600
Dielectric Dissipation Factor tan δ in acc. with IEC 60455-2, Test Method in acc. with IEC 60250	
intersection point 0.2 = $200 \cdot 10^{-3}$	110 - 150°C

6) Magnet wire quality used for the preparation of the test specimen: MW 35 C, diameter 0,315 mm, grade 2, no lubricant

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Table 5: Chemical Resistance

Liquid Chemicals in acc. with Company Standard Energy Solutions 017	resistant to: • transformer oil

Table 6: Temperature Index, Thermal Class

Temperature Index in acc. with IEC 60455-3-5, Test Method in acc. with IEC 60216	Type 180	
Bond Strength in acc. with IEC 61033, method B, (“Helical Coil Method”), endpoint criterion 22 N	MW 35	209 °C
Proof Voltage in acc. with IEC 60172 (“Twisted Pair Method”)	MW 30 MW 35	207 °C 196 °C

Table 7: UL-Approval

Temperature Class in acc. with UL 1446			
	Twisted Pair	ASTM D2307	MW 30 200 MW 35 180
	Helical Coil	ASTM D2519	MW 30 200
Insulation Systems in acc. with UL 1446 (IEC 61858)			
	Class 130		C190HE R150HE Z130HE Z150HE
	Class 155		C290HE CZ255HE R201HE R203HE Z200HE

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