HUNTSMAN

Araldite® Trickle Impregnation System

Araldite®	**CY 236**	**100 pbw**
Aradur®	**XB 5979**	**30 pbw**

Liquid, 2-component trickle impregnation system, solventless and free of DDM.

Applications

Impregnation and mechanical reinforcement of highly stressed electric motor windings for ratings up to about 500 W.

Application method

Trickle process using any of the common impregnation equipment.

Features

Produces homogeneous winding impregnation with excellent mechanical and dielectrical properties.
Very good adhesion.

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Replaces Edition: May 2004

Araldite® CY 236 *Liquid, modified Epoxy Resin based on Bisphenol A.*

Viscosity	at 25°C	ISO 12058	mPa s	1200 – 1600*
Epoxy content		ISO 3001	Eq/kg	5.7 - 6.0*
Density	at 25°C	ISO 1675	g/cm³	1.15
Flash point		ISO 1523	°C	182
Vapour pressure	at 20°C	(Knudsen)	Pa	$< 10^{-2}$

Aradur® XB 5979 *Liquid, formulated Amine Hardener.*

Viscosity	at 25°C	ISO 2555	mPa s	120 – 200*
Density	at 25°C	ISO 1675	g/cm³	ca. 1.0
Flash point		ISO 1523	°C	> 112
Vapour pressure	at 20°C	(Knudsen)	Pa	$< 10^{-2}$

*Specified range

Storage

Store the components in a dry place according to the storage conditions stated on the label in tightly sealed original containers. Under these conditions, the shelf life will correspond to the expiry date stated on the label. After this date, the product may be processed only after reanalysis. Partly emptied containers should be tightly closed immediately after use.
For information on waste disposal and hazardous products of decomposition in the event of a fire, refer to the Material Safety Data Sheets (MSDS) for these particular products.
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Method / Processing

(guideline values)

The Trickle Method

The trickle method of applying solvent-free Araldite epoxy impregnating resin systems is suitable for insulating the round-wire windings of any axially symmetrical coil with windings parallel to the coil's axis.
This very economical impregnation method is mainly used for insulating and reinforcing the motor windings of smaller electrical power tools and household appliances. Besides facilitating simplified design, it is processed under favourable conditions and opens the way to efficient, automatic production.
The process guarantees homogeneous distribution of the impregnation mix, thus enhancing the balance of the component. The excellent mechanical and dielectric properties of the Araldite epoxy trickle resin systems - even at increased service temperatures and severe dynamic loads - contribute to a higher service life of the impregnated components.

Processing

Preheat the stator or rotor to 120-130 °C for the impregnation process.
Mount it in a fixture for rotation at 15-20 rpm. Incline the axis at 15-20° to the horizontal. Trickle carefully the prepared resin/hardener mix onto the upper end of the winding. When it strikes the hot winding, the mix will become very fluid and flow into the winding under the influence of gravity, capillary action and centrifugal force. All air will be expelled from the winding as the mix penetrates.
When the mix reaches the lower end of the winding, discontinue trickling and shift the unit's axis to the horizontal. Continue rotation in this position until the mix has gelled and solidified. This procedure keeps the mix from dripping off, thus minimising losses and cleaning work. A post-cure at an elevated temperature (≥ 30 min at 130 °C) is recommended.
The length of time required for impregnation up to gelling of the mix depends on the size of the winding, the diameter of the wire and the reactivity of the impregnation system as well as the preheating temperature of the windings. It is advisable to run preliminary tests to establish the exact cycle time and resin quantity required per winding. With ideal settings up to 600 units can be impregnated per hour, depending on the trickling equipment used and the size of the given winding.

Additional points

Compatibility between the wire enamel and the trickling resin system can vary among wires of different manufacturers even for enamels with the same chemical structure. Where doubt exists, always run a few practical tests before starting regular production.
To enhance heat dissipation in the winding - especially in the case of high power ratings and heavy wire diameters - fillers can be added to the trickle impregnation resin system. The amount added depends on the final properties required and on the processing capabilities of the trickle impregnation equipment used. For example, certain automatic trickle units are capable of processing only impregnation systems with viscosities lower than 2000 mPa·s. The viscosity can be adjusted by preheating the mix to about 40 °C in the storage tank.

(guideline values)

Viscosity increase and Geltime

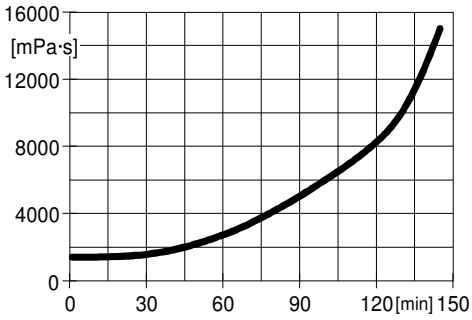

Fig.4.1: **Viscosity increase at 25°C**
(measurements with Hoeppler)

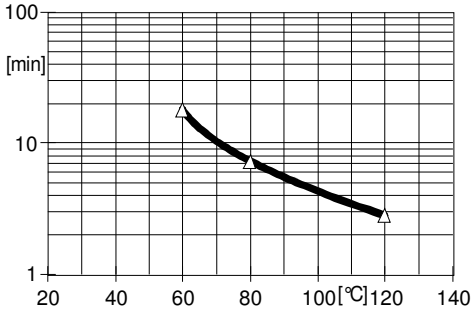

Fig.4.3: **Geltime measured with Gelnorm Instrument as a function of temperature**
(ISO 9396)

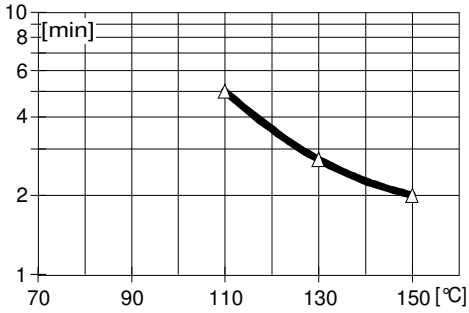

Fig.4.4: **Geltime at thin layer as a function of temperature**
(measurements on heating plate)

Dielectrical Properties

Determined on standard test specimen at 23°C
Cured for 3h at 80°C + 3h at 130°C

Breakdown strength (2 mm plate)	IEC 60243-1	kV/mm	18 - 20
Electrolytic corrosion	IEC 60426	grade	A-1

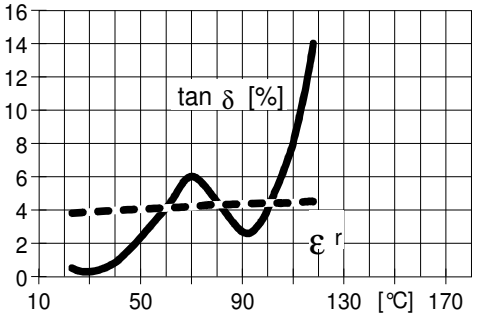

Fig.4.5: **Loss factor (tan δ) and dielectric constant (εr) as a function of temperature**
(measurement frequency: 50 Hz, IEC 60250)

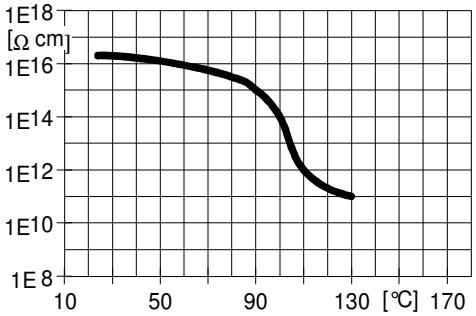

Fig.4.6: **Volume resistivity (ρ) as a function of temperature**
(measurement voltage: 1000 V, IEC 60093)

Mechanical and Physical Properties

(guideline values)

Determined on standard test specimen at 23°C
Cured for 3h at 80°C + 3h at 130°C

Tensile strength	ISO 527	MPa	65 - 75
Elongation at break	ISO 527	%	5 - 7
E modulus from tensile test	ISO 527	MPa	2300 - 2800
Flexural strength	ISO 178	MPa	105 - 115
Surface strain	ISO 178	%	8 - 9
E modulus from flexural test	ISO 178	MPa	2250 - 2650
Impact strength	ISO 179	kJ/m²	25 - 35
Glass transition temperature (DSC)	ISO 11357-2	°C	90 - 105
Water absorption (specimen: 50x50x4 mm)	ISO 62		
30 min at 100°C		% by wt.	0.40 - 0.50
Decomposition temperature (heating rate: 10K/min)			
	DTA	°C	≥ 350

Legal Note

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