HUNTSMAN

®Araldite Casting Resin System

Araldite®	**CY 5995**	**100 pbw**
Aradur®	**HY 227**	**100 pbw**
Filler	**Silica flour**	**300 pbw**

Liquid, toughened, hot-curing casting resin system for producing castings with high mechanical end-properties and excellent thermal shock resistance.

Applications

Indoor electrical insulators for medium and high voltage, such as switch and apparatus components, bushings, instrument and dry type distribution transformers
Encapsulation of large metal parts

Processing methodes

Automatic pressure gelation process (APG)
(see our special brochure, Publ. No. 28160/e)
Conventional gravity casting process under vacuum

Properties

High mechanical and electrical properties
Excellent thermal shock resistance
Excellent toughness

Edition: **May 2004**
Replaces Edition: July 2003

Product data

(guideline values)

Araldite CY 5995

Liquid, toughened, solvent-free bisphenol A epoxy resin

Viscosity	at 25°C	ISO 12058	mPa s	45000 - 70000
Viscosity	at 40°C	ISO 12058	mPa s	6000 - 10000
Epoxy content		ISO 3001	equiv/kg	4.7 - 5.0
Density	at 25°C	ISO 1675	g/cm³	1.12 - 1.16
Flash point		ISO 1523	°C	> 200
Vapour pressure	at 25°C	(Knudsen)	Pa	c. 0.01

Casting resin CY 5995 contains an additif in suspension and is opac

Aradur HY 227

Liquid, modified and preaccelerated anhydride curing agent

Viscosity	at 25°C	ISO 12058	mPa s	1500 - 4000
Density	at 25°C	ISO 1675	g/cm³	1.15 - 1.19
	at 60°C	ISO 1675	g/cm³	1.13 - 1.17
Flash point		SO 1523	°C	145
Vapour pressure	at 25°C	(Knudsen)	Pa	c. 0.5
	at 60°C	(Knudsen)	Pa	c. 10

Storage

Store the components at 18-25°C, in tightly sealed and dry original containers. Under these conditions, the shelf life will correspond to the expiry date stated on the label. Product specific advise regarding storage can be found on product label. After this date, the product may be processed only following reanalysis. Partly emptied containers should be closed tightly immediately after use.
For information on waste disposal and hazardous products of decomposition in the event of fire, refer to the Material Safety Data Sheets (MSDS) for these particular products

Processing

(guideline values)

System Preparation

General instructions for preparing liquid resin systems

Long pot life is desirable in the processing of any casting resin system. Mix all of the components together very thoroughly at room temperature or slightly above and under vacuum. Intensive wetting of the filler is extremely important. Proper mixing will result in:

- better flow properties and reduced tendency to shrinkage
- lower internal stresses and therefore improved mechanical properties on object
- improved partial discharge behaviour in high voltage applications.

For the mixing of medium- to high viscous casting resin systems and for mixing at lower temperatures, we recommend special thin film degassing mixers that may produce additional self-heating of 10-15 °C as a result of friction. For low viscous casting resin systems, conventional anchor mixers are usually sufficient.

In larger plants, two premixers are used to mix the individual components (resin, hardener) with the respective quantities of fillers and additives under vacuum. Metering pumps then feed these premixes to the final mixer or a continuous mixer. The individual premixes can be stored at elevated temperature (about 60°C) for up to about 1 week, depending on formulation. Intermittent agitation during storage is advisable to prevent filler sedimentation.

Mixing time can vary from 0.5 to 3 hours, depending on mixing temperature, quantity, mixing equipment and the particular application. The required vacuum is 0.5 to 8 mbar. The vapour pressure of the individual components should be taken into account.

In the case of dielectrically highly stressed parts, we recommend checking the quality consistancy and predrying of the filler. Their moisture content should be $\leq$0.2%.

Specific Instructions

The effective pot-life of the mix is about 2 days at temperatures below 25°C. Conventional batch mixers should be cleaned once a week or at the end of work. For longer interruptions of work, the pipes of the mixing and metering installations have to be cooled and cleaned with the resin component to prevent sedimentation and/or undesired viscosity increase. Interruptions over a week-end (approx. 48h) without cleaning are possible if the pipes are cooled at temperatures below 18°C.For the APG process, an increase of the filler content, e.g. 300 pbw. is recommendable. Exothermic temperature, shrinkage and other properties could be positively influenced.

Viscosity increase and gel time at various temperatures, refer to Figs: 4.1 and 4.4.

Mould temperature

APG process	130 - 160°C
Conventional vacuum casting	70 - 100°C

Demoulding times (depending on mould temperature and casting volume)

APG process	12 - 40 min
Conventional vacuum casting	5 - 8h

Cure conditions (minimal postcure)

APG process	4h at 130°C or 3h at 140°C
Conventional vacuum casting	12h at 130°C or 8h at 140°C

To determine whether crosslinking has been carried to completion and the final properties are optimal, it is necessary to carry out relevant measurements on the actual object or to measure the glass transition temperature. Different gelling and cure cycles in the manufacturing process could lead to a different crosslinking and glass transition temperature respectively.

Processing Viscosities

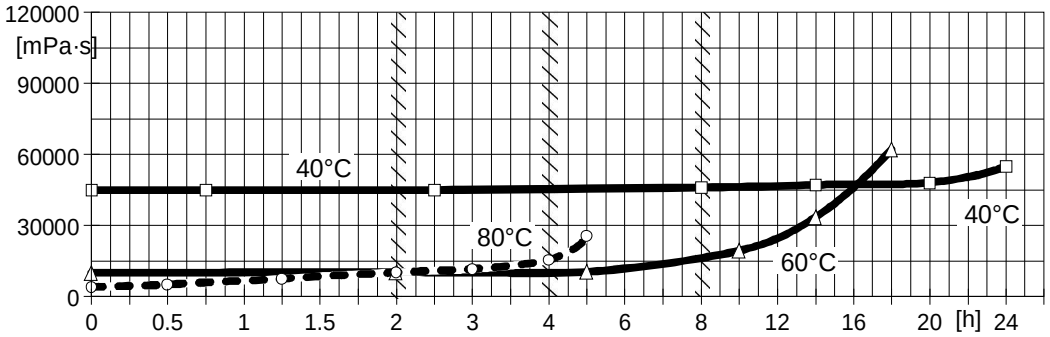

Fig.4.1: **Viscosity increase at 40, 60 and 80°C** (measurements with Rheomat 115)
(Shear rate D = 10 s^{-1})

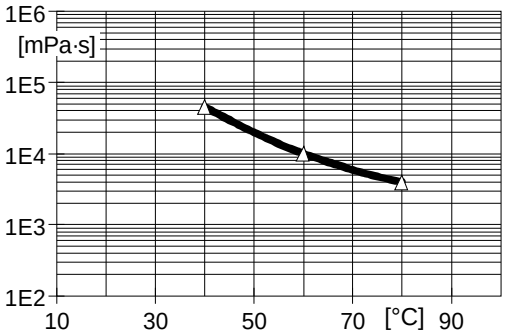

Fig.4.2: **Initial viscosity as a function of temperature**
(measurements with Rheomat 115, D = 10 s^{-1})

Gelation- and Cure Times

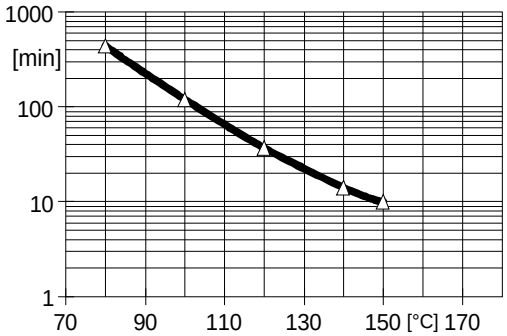

Fig.4.4: **Geltime as a function of temperature**
(**measured with Gelnorm Instrument,**
DIN 16945/6.3.1)

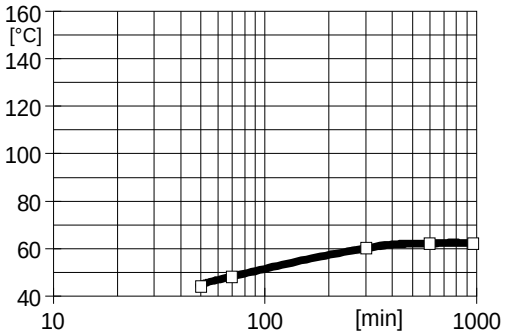

Fig.4.5: **Glass transition temperature as a function of the cure time**
(at **isothermic crosslinking,**
IEC 61006)

Mechanical and Physical Properties

(guideline values)

Determined on standard test specimen at 23°C
Cured for: 2h at 100°C + 10h at 140°C

Tensile strength	ISO 527	MPa	65 - 75
Elongation at break	ISO 527	%	1.7 - 2.1
E modulus from tensile test	ISO 527	MPa	8500 - 9500
Flexural strength	ISO 178	MPa	130 - 140
Surface strain	ISO 178	%	2.2 - 2.4
E modulus from flexural test	ISO 178	MPa	9400 - 9700
Impact strength	ISO 179	kJ/m²	14 - 16
Double Torsion Test	CG 216-0/89		
Critical stress intensity factor (K_{IC})		$MPa \cdot m^{½}$	3.4 - 3.6
Specific energy at break (G_{IC})		J/m²	1100 - 1200
Glass transition temperature (DSC)	IEC 61006	°C	55 - 65
Coefficient of linear thermal expansion	DIN 53752		Fig.5.2
Mean value for temperature range: 20-40°C		K^{-1}	$41 - 45 \cdot 10^{-6}$
Thermal conductivity similar to	ISO 8894-1	W/mK	0.75 - 0.8
Flammability	UL 94		
Thickness of specimen: 4 mm		class	HB
Thickness of specimen: 12 mm		class	HB
Water absorbtion (specimen: 50x50x4 mm)	ISO 62		
10 days at 23°C		% by wt.	c. 0.25
100h at 100°C (specimen: 6×10×15 mm)		% by wt.	1.10 - 1.25
Decomposition themperature (heating rate: 10K/min)			
	DTA	°C	c. 350
Density (**Filler load: 60% by wt.**)	DIN 55990	g/cm³	1.70 - 1.80

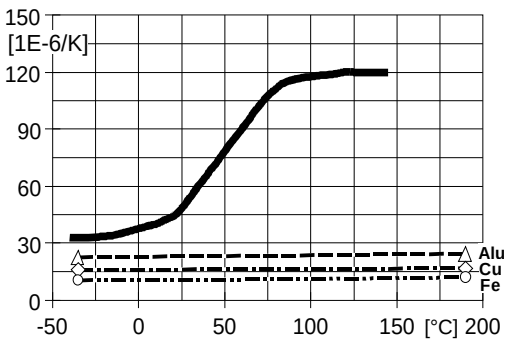

Fig.5.2: **Coefficient of linear thermal expansion (α) as a function of temperature**
(reference temperature: 23°C, DIN 53752)

Electrical Properties

(guideline values)

Determined on standard test specimen at 23°C
Cured for: 2h at 100°C + 10h at 140°C

Breakdown strength	IEC 60243-1	kV/mm	19 - 24
Diffusion breakdown strength	DIN/ VDE 0441/1	class	HD 1
Temperature of specimen after test		°C	$\leq$ 23
HV arc resistance	ASTM D 495	s	182 - 185
Tracking resistance	IEC 60112		
with test solution A		CTI	>600-0.1
with test solution B		CTI	>600M-0.2
Electrolytic corrosion	DIN 53489	grade	A-1

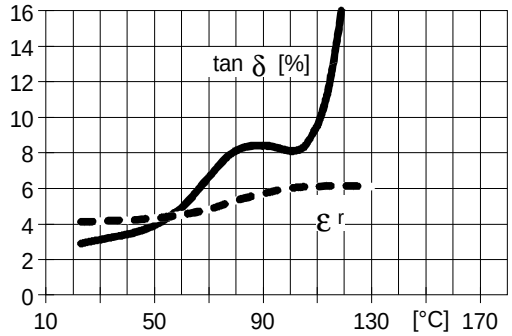

Fig.6.1: **Loss factor (tan d) and dielectric constant (er) as a function of temperature** (measurement frequency: 50 Hz, IEC 60250/ DIN 53483)

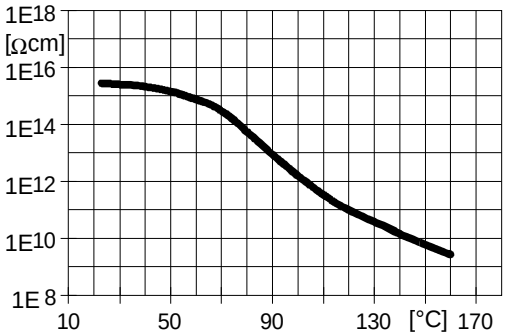

Fig.6.2: **Volume resistivity (r) as a function of temperature**
(measurement voltage: 1000 V, IEC 60093/ DIN 53482)

Special Properties and Values

(guideline values)

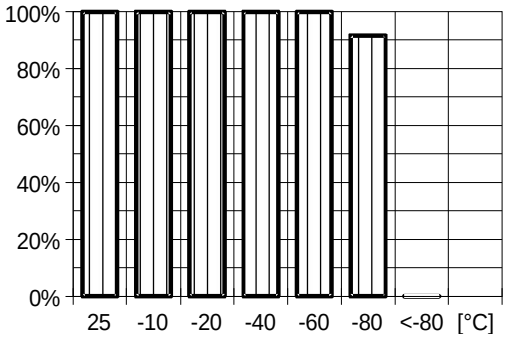

Fig.7.1: **Crackresistance / Temperature shock test**
Passed specimen (%) as a function of the temperature steps
Mean failure temperature: - 98°C
Embedded metal parts with 2 mm radius

Industrial hygiene

Mandatory and recommended industrial hygiene procedures should be followed whenever our products are being handled and processed. For additional information please consult the corresponding Safety Data Sheets and the brochure "Hygenic precautions for handling plastics products".

Handling precautions

Safety precautions at workplace:	
protective clothing	yes
gloves	essential
arm protectors	recommended when skin contact likely
goggels/safety glasses	yes
respirator/dust mask	recommended
Skin protection	
before starting work	Apply barrier cream to exposed skin
after washing	Apply barrier or nourishing cream
Cleansing of contaminated skin	Dab off with absorbent paper, wash with warm water and alkali-free soap, then dry with disposable towels. Do not use solvents
Clean shop requirements	Cover workbenches, etc. with light coloured paper Use disposable breakers, etc.
Disposal of spillage	Soak up with sawdust or cotton waste and deposit in plastic-lined bin
Ventilation:	
of workshop	Renew air 3 to 5 times an hour
of workplace	Exhaust fans. Operatives should avoid inhaling vapours.

First Aid

Contamination of the **eyes** by resin, hardener or casting mix should be treated immediately by flushing with clean, running water for 10 to 15 minutes. A doctor should then be consulted.
Material smeared or splashed on the **skin** should be dabbed off, and the contaminated area then washed and treated with a cleansing cream (see above). A doctor should be consulted in the event of severe irritation or burns. Contaminated clothing should be changed immediately.
Anyone taken ill after **inhaling** vapours should be moved out of doors immediately. In all cases of doubt call for medical assistance.

Note

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APPROVED TO ISO 9000 ff