Technical Datasheet

Hydrophobic Araldite® Casting Resin System

Araldite® CW 5957 CI	**Resin**	**100**	**pbw**
Aradur® HW 5958 CI	**Hardener**	**100**	**pbw**

Pre-filled, liquid, hot-curing, cycloaliphatic epoxy resin system with hydrophobic properties for outdoor applications in severe climatic conditions.

Application

Outdoor electrical insulation material for medium and high voltage applications in humid conditions: apparatus components, pin/post insulators, bushings, instrument transformers, sensors, etc.

Processing methods

Automatic pressure gelation process (APG)

Conventional gravity casting process under vacuum

Key Properties

Intrinsic Hydrophobicity
Hydrophobicity transfer and recovery
High mechanical properties
Excellent dielectric properties
Good thermal shock resistance
High resistance to erosion under UV-radiation
High tracking and arc resistance
Extended life-time of insulation

Product Data (Guideline Values)

Araldite® CW 5957 CI

Viscous, prefilled, hydrophobic, cycloaliphatic epoxy resin

Viscosity at 25°C	ISO 2555	Pa·s	60 -140
Epoxy content	ISO 3001	equiv/kg	1.9 – 2.0
Density at 25°C	ISO 2811	g/cm³	1.82 –1.90
Flash point	ISO 1523	°C	> 169
Vapour pressure at 20°C	Knudsen	Pa	< 0.01
Vapour pressure at 60°C	Knudsen	Pa	< 0.5
As supplied form	Liquid, grey paste		
Hazardous decomposition products	Carbon monoxide, carbon dioxide and other toxic gases and vapors if burned		
Disposal	Regular procedures approved by national and / or local authorities		

Aradur® HW 5958 CI

Viscous, prefilled, preaccelerated anhydride curing agent

Viscosity at 25°C	ISO 2555	Pa·s	60 - 100
Density at 25°C	ISO 2811	g/cm³	1.89 – 1.93
Flash point	ISO 1523	°C	> 165
Vapour pressure at 20°C	Knudsen	Pa	< 1
Vapour pressure at 60°C	Knudsen	Pa	< 10
As supplied form	Liquid, grey-brown paste		
Hazardous decomposition products	Carbon monoxide, carbon dioxide and other toxic gases and vapors if burned		
Disposal	Regular procedures approved by national and / or local authorities		

Remarks and Storage Conditions

Store the components dry at 18-25°C, in tightly sealed original containers. Under these conditions, the shelf life will correspond to the expiration date stated on the label. After this date, the product may be processed only following reanalysis. The hardener Aradur HW 5958 CI is sensitive to humidity. Partly emptied containers should be tightly closed immediately after use.

Prefilled, liquid components always show a small sedimentation. Before use, stir up carefully the components at about 40- 50°C.

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 prefilled resin systems:

Long pot life is desirable in the processing of any casting resin system. Prefilled components help to shorten the mixing time considerably. The two components will be mixed in the desired quantity under vacuum and at slight elevated temperature (up to 60°C). 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. Depending on quantity, mixer device, mixing temperature and application, the mixing time is, under a vacuum of 1 to 8 mbar, 0.25 to 1 h. The premixed components packed according their mixing ratio, could be used per container. In case of filler sedimentation, it's recommendable to empty the container completely. Before partial use, the content must be carefully homogenized at elevated temperature. We recommend also the same preheating temperature to prevent air enclosures for disloading the components. In automatic feeding and mixing installations, both components will be degassed and homogenized under a vacuum of about 2-5 mbar in their holding tanks again. From time to time the prefilled products are stirred up to avoid any sedimentation and irregular metering. After dosing and mixing with a static mixer, the system is fed directly to the vacuum casting chamber or, in case of automatic pressure gelation process, directly to the hot casting mould. Over feeding tubes one can serve several individual casting stations.

Specific Instructions

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 should be cooled and cleaned with the resin component to prevent sedimentation and/or undesired viscosity increase. Interruptions that extend over a weekend (approx. 48h) without cleaning are possible if the pipes are cooled at temperatures below 18°C.
Viscosity increase and gel time at various temperatures refer to Fig. 1 and 3.

Mould temperature

APG process	130 – 150 °C
Conventional vacuum casting	80 – 100 °C

Demoulding times (depending on mould temperature and casting volume)

APG process	10 – 30 min
Conventional vacuum casting	2 – 4 h

Cure conditions

APG process	10 h at 140°C
Conventional vacuum casting	16 h 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 Data (Guideline Values)

Viscosity

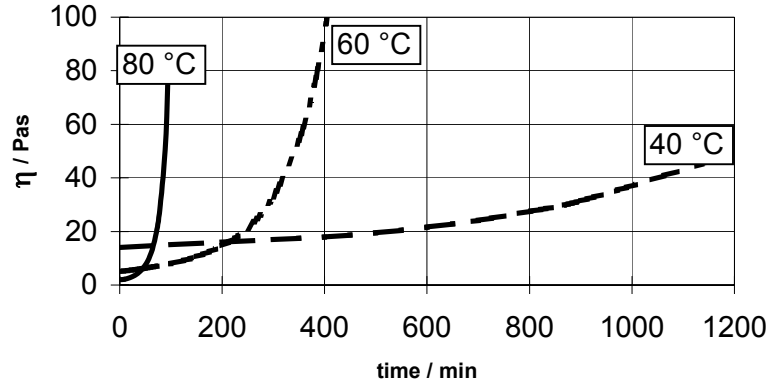

Figure 1: **Viscosity increase at 40, 60 and 80 °C**
(measurements with Rheomat 115, Shear rate D = 10 s^{-1})

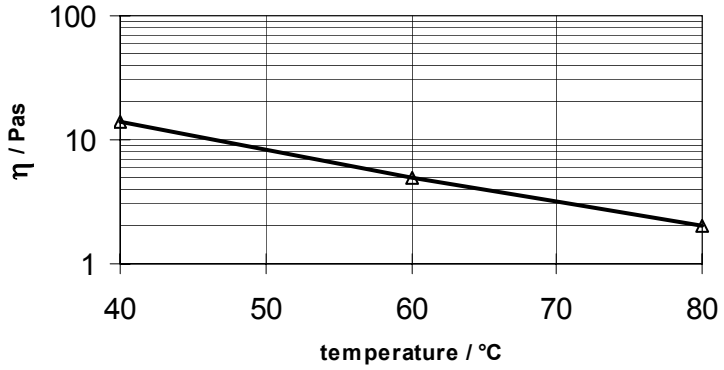

Figure 2: **Initial viscosity as a function of temperature**
(measurements with Rheomat 115, D = 10 s^{-1})

Gelation

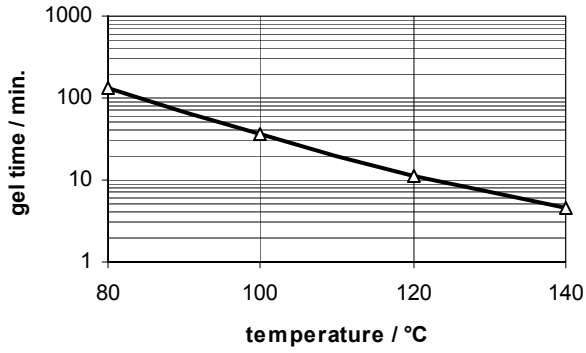

Figure 3**: Geltime as a function of temperature**
(measured with Gelnorm Instrument, ISO 9396)

Mechanical and Physical Properties (Guideline Values)

Determined on standard test specimen at 23°C. Cured for 6h/80°C+ 10h/140°C

Tensile strength	ISO 527	MPa	80 - 100
Elongation at break	ISO 527	%	1.0 – 1.4
E modulus from tensile test	ISO 527	MPa	11200 - 11800
Flexural strength at 23°C	ISO 178	MPa	130 – 150
Surface strain at 23°C	ISO 178	%	1.1 - 1.5
Double Torsion Test	CG 216-0/89		
Critical stress intensity factor (K_{IC})		$MPa \cdot m^{½}$	2.4 – 2.6
Specific energy at break (G_{IC})		J/m^2	420 - 470
Glass transition temperature (DSC)	ISO 11357-2	°C	105 – 120
Coefficient of linear thermal expansion	ISO 11359-2		
Mean value for temperature range: 20-60°C		10^{-6} / K	25 - 32
Thermal conductivity similar to	ISO 8894-1	W/(m·K)	0.95 - 1.05
Water absorption (specimen: 50x50x4 mm)	ISO 62		
10 days at 23°C		% by wt	0.05 - 0.15
60 min at 100°C		% by wt	0.05 - 0.15
Decomposition temperature (heating rate: 10K/min)	DTA	°C	350
Density (Filler load: 60% by wt.)	ISO 1183	g/cm^3	1.85 - 1.95

Electrical Properties (Guideline Values)

Determined on standard test specimen at 23°C. Cured for 6h/80°C+ 10h/140°C

Breakdown strength	IEC 60243-1	kV/mm	21 - 26
Diffusion breakdown strength	DIN VDE 0441-1	Class	HD 2
Temperature of specimen after test		°C	≤ 24
HV arc resistance	IEC 61621	s	182 - 186
HV Tracking and erosion resistance	IEC 60587	Class	1B3.5
Tracking resistance	IEC 60112		
with test solution A		CTI	> 600-0.0
with test solution B		CTI	> 600M-0.1

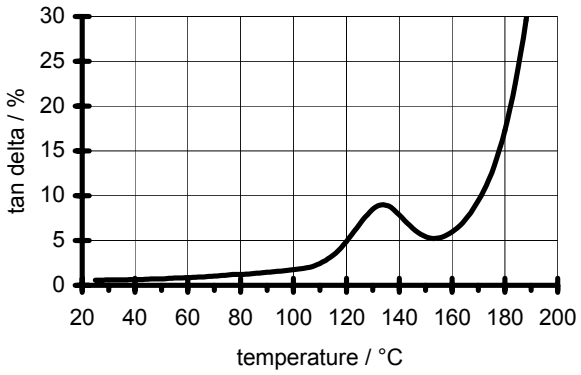

Figure 4: **Loss factor (tan δ) at 50 Hz (IEC 60250)**

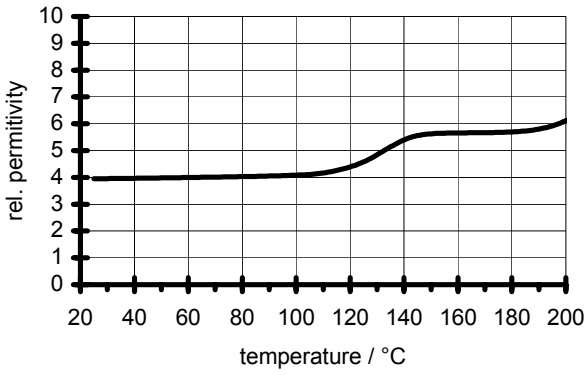

Figure 5: **Rel. permitivity (ε_r) at 50 Hz (IEC 60250)**

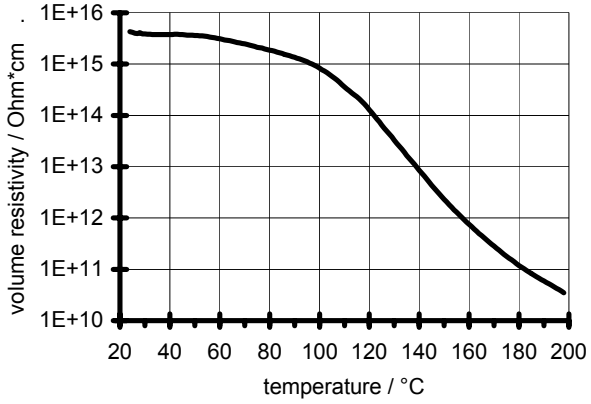

Figure 6: **Volume resistivity at 50 Hz (IEC 60093)**

Special Properties (Guideline Values)

Thermal Shock Resistance

Temperature shock test conditions:

- Test specimen with embedded sharp edged metal parts (edge radius: 2 mm)
- Molding time: 15 min
- Mold temperature: 145 °C
- Post curing: 10 h / 140 °C

Test result:
Average crack temperature: -23 °C
(For comparison: CY 184 / XW 1235 / DY 062 / 66 % W12EST: -12 °C)

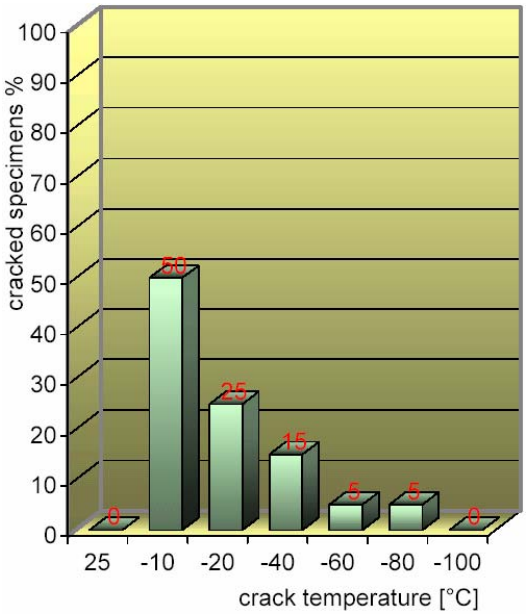

Fig. 6 Temperature shock test

Industrial hygiene

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

Handling Precautions

Safety precautions at workplace:	
protective clothing	yes
gloves	essential
arm protectors	recommended when skin contact likely
goggles/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
Cleaning 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 beakers, 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 vapors.

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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