

Heavy Electrical

® Araldite Casting Resin System

Araldite®	CY 184	100 pbw
Hardener	HT 907	90 pbw
Accelerator	DY 071	3 pbw
Silica Flour (Silanized)		300 pbw

**Hot curing, cycloaliphatic epoxy resin casting system
for outdoor applications in difficult climatic conditions.
Insulation of big metal parts.**

Outdoor electrical insulators for applications in medium and high voltage:
apparatus and switchgear parts, insulators and bushings, instrument
transformers.

Applications

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

Processing

Very good mechanical and electrical properties
Good thermal shock and crack resistance
Good toughness combined with dimensional stability
Very good resistance to erosion by UV radiation
High tracking and arc resistance

Properties

The use of silanised silica flour insures stable dielectrical properties
under outdoor humid conditions

Product data

(guideline values)

Araldite CY 184	Liquid, formulated, cycloaliphatic epoxy resin (Diglycidylester)				
Viscosity	at 25°C	DIN 53019	mPa s	700 - 1000	
Epoxy content		ISO 3001	Eq/kg	5.8 - 6.10	
Density	at 25°C	ISO 1675	g/cm ³	1.20 - 1.25	
Flash point		DIN 51758	°C	169	
Vapour pressure	at 20°C	(Knudsen)	Pa	< 0.01	

Hardener HT 907	Room-temperature solid anhydride hardener				
Viscosity	at 40°C	DIN 53015	mPa s	40 - 50	
Density	at 25°C	ISO 1675	g/cm ³	1.36 - 1.40	
	at 60°C	ISO 1675	g/cm ³	1.15 - 1.20	
Fusion point			°C	34 - 38	
Anhydride content			%	≤ 1	
Flash point		DIN 51758	°C	140	
Vapour pressure	at 100°C	(Knudsen)	Pa	ca. 390	

Accelerator DY 071	Liquid accelerator, tertiary amine				
Viscosity	at 25°C	DIN 53015	mPa s	250 - 500	
Density	at 25°C	ISO 1675	g/cm ³	1.0 - 1.1	
Flash point		DIN 51758	°C	135	
Vapour tension	at 20°C	(Knudsen)	Pa	ca. 0.05	
	at 60°C	(Knudsen)	Pa	ca. 0.5	

Remarks The Hardener HT 907 is sensible to humidity.

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 behavior 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. In case of outdoor application particularly thorough wetting is essential. The required vacuum is 0.5 to 8 mbar. The vapor pressure of the individual components should be taken into account.

In the case of dielectrically highly stressed parts, we recommend checking the quality consistency 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 40°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.

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

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 - 40 min
Conventional vacuum casting	3 - 8 h

Cure conditions (minimum post curing)

APG process	6-12h at 130°C or 140°C
Conventional vacuum casting	10h-20h at 130°C or 140°C

For any outdoor application, we recommend the use of silanised silica flour; for example Silbond W12-EST (Quarzwerke GmbH, Frechen, D). Again it is essential to achieve a thorough crosslinking. 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.

System tested: CY 184 / HT 907 / DY 071 / Silica flour
Mix ratio: 100 / 90 / 3 / 300

Process Viscosities

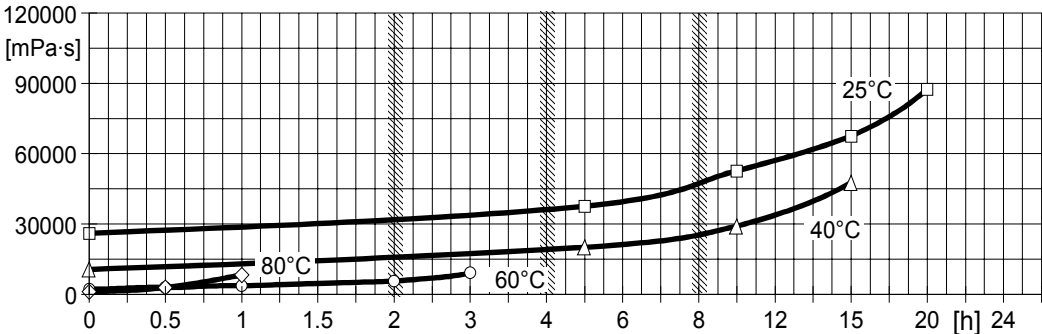


Fig.4.1: Viscosity increase at 25, 40, 60 and 80°C
(measurements with Rheomat 115)
(Shear rate $D = 10 \text{ s}^{-1}$)

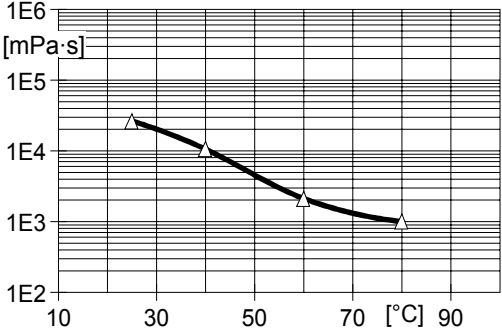


Fig.4.2: Initial viscosity as a function of temperature
(measurements with Rheomat 115, $D = 10 \text{ s}^{-1}$)

Gelation and Cure Times

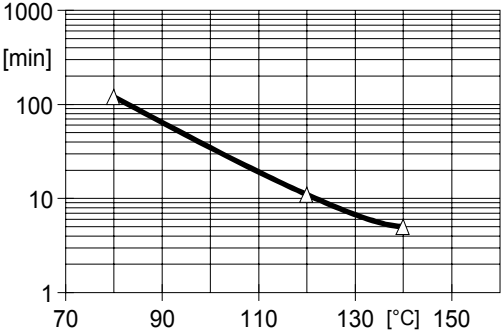


Fig.4.3: Gelttime measured as a function of temperature
(measurements with Gelnorm Instrument /
DIN 16945/ 6.3.1)

Mechanical and Physical Properties

(guideline values)

System tested: CY 184 / HT 907 / DY 071 / Silica flour
Mix ratio: 100 / 90 / 3 / 300

Determined on standard specimen at 23°C
Cured for: 6h at 80°C + 10h at 130°C

Tensile strength	ISO 527	N/mm ²	90 - 100
Elongation at break	ISO 527	%	1.7 - 1.9
E modulus from tensile test	ISO 527	N/mm ²	10000-11000
Flexural strength	ISO 178	N/mm ²	150 - 165
Surface strain	ISO 178	%	1.9 - 2.2
Compressive strength	ISO 604	N/mm ²	160 - 170
Impact strength	ISO 179	kJ/m ²	8 - 9
Double Torsion Test	CG 216-0/ 89		
Critical stress intensity factor (K _{IC})		MPa·m ^{1/2}	2.2 - 2.5
Specific energy at break (G _{IC})		J/m ²	510 - 540
Martens temperature	DIN 53458	°C	95 -
Glass transition temperature (DSC)	CEI 1006	°C	100 - 110
Coefficient of linear thermal expansion	DIN 53752		
Mean value for temperature range: 20 - 60°C		K ⁻¹	39 - 41·10 ⁻⁶
Thermal conductivity similar to	ISO 8894-1	W/mK	0.8 - 0.9
Glow resistance	DIN 53459	grade	2b
Water absorption(specimen: 50×50×4 mm)	ISO 62		
10 days at 23°C		% by wt.	0.10 - 0.20
60 min at 100°C		% by wt.	0.15 - 0.20
Decomposition temperature (heating rate: 10K/min.)	DTA	°C	375
Density	DIN 55990	g/cm ³	1.6 - 1.7
Filler load		%	60

Electrical Properties

(guideline values)

System tested: CY 184 / HT 907 / DY 071 / Silica flour
 Mix ratio: 100 / 90 / 3 / 300

Determined on standard specimen at 23°C
 Cured for: 6h at 80°C + 10h at 130°C

Breakdown strength	CEI 243-1	kV/mm	19 - 21
Diffusion breakdown strength	DIN/ VDE 0441/ 1	grade	HD2
HV arc resistance	ASTM D 495	s	185 - 190
Tracking resistance	CEI 112		
with test solution A		CTI	> 600-0.0
with test solution B		CTI	> 600M-0.0
Electrolytic corrosion	DIN 53489	grade	A-1
Incline Plane Tracking and Erosion Test	ASTM D 2303		
Initial Tracking Voltage (i.t.v.)		kV/min	3.5 / 50
Time to track (t.t.t.)		h	30 - 40
Dissipation factor tan δ	DIN 53483		
at 23°C		%	1.5 - 2
at 50°C		%	2.5 - 3
at 80°C		%	3 - 4
at 100°C		%	4 - 5
Dielectric constant ϵ_r	DIN 53483		
at 23°C			3.8 - 4.2
at 50°C			3.9 - 4.3
at 80°C			4.2 - 4.6
at 100°C			4.3 - 4.7
Volume resistivity	DIN 53482		
at 23°C		$\Omega \cdot \text{cm}$	10^{15}
at 50°C		$\Omega \cdot \text{cm}$	10^{15}
at 80°C		$\Omega \cdot \text{cm}$	10^{14}
at 100°C		$\Omega \cdot \text{cm}$	10^{14}

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 "Hygienic precautions for handling plastics products".

Handling precautions	Safety precautions at workplace: protective clothing gloves arm protectors goggles/safety glasses respirator/dust mask Skin protection before starting work after washing Treatment of contaminated skin Clean shop requirements Disposal of spillage Ventilation: of workshop of workplace	yes essential recommended when skin contact likely yes recommended Apply barrier cream to exposed skin Apply barrier or nourishing cream Dab off with absorbent paper, wash with warm water and alkali-free soap, then dry with disposable towels. Do not use solvents Cover workbenches, etc. with light colored paper Use disposable breakers, etc. Soak up with sawdust or cotton waste and deposit in plastic-lined bin Renew air 3 to 5 times an hour Exhaust fans. Operatives should avoid inhaling vapors.
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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 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 vapors should be moved outdoors immediately. In any case of doubt call for medical assistance.
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Note	Araldite® is a registered trademark of Huntsman LLC or an affiliate thereof in one or more countries, but not all countries.
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