

® Araldite Casting Resin System

NEW !

***Hydrophobicity transfer and recovery
in outdoor epoxy resin***

	System	A	B	
Araldite	CY 5622	100	100	pbw
Hardener	XW 1235	82	82	pbw
Accelerator	DY 062	0.45	0.45	pbw
Filler	Silica flour (Silanised)	325	355	pbw

Liquid, hot-curing, cycloaliphatic epoxy resin system for outdoor applications in severe climatic conditions.

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

Applications

Automatic pressure gelation process (APG)
Conventional gravity casting process under vacuum

Processing

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

Properties

The use of silanised silica flour ensures stable dielectric properties under outdoor humid conditions

Araldite CY 5622 + Hardener XW 1235 + Accelerator DY 062 + Silica flour silanised (mix ratio system B = 100 : 82 : 0.45 : 355 pbw) is equivalent to and available in pre-filled version as XB 5957 + XB 5958 (mix ratio = 100 : 100)

Additional Information

Edition: July 2003
Replaces Edition: March 2003

Product data

(guideline values)

Araldite CY 5622	Liquid, modified cycloaliphatic epoxy resin (Diglycidylester)			
Viscosity	at 25°C	MS DIN 125 Rheomat 115 A, Shear rate D = 6.65 s ⁻¹	mPa s	3000 - 5000
Epoxy content	at 60°C	ISO 3001	equiv/kg	5.30 - 5.60
Flash point		ISO 1675	g/cm ³	1.10 - 1.15
Vapor pressure	at 20°C	ISO 1523	°C	65
	at 60°C	(Knudsen)	Pa	4.5 · 10 ⁻⁴
		(Knudsen)	Pa	3 · 10 ⁻²

Aradr XW 1235	Liquid, modified cycloaliphatic anhydride hardener			
Viscosity	at 25°C	ISO 12058	mPa s	70 - 80
Density	at 25°C	ISO 1675	g/cm ³	1.18 - 1.20
Anhydride content			%	≥ 98
Flash point		ISO 1523	°C	165
Vapor pressure	at 20°C	(Knudsen)	Pa	< 1
	at 60°C	(Knudsen)	Pa	< 10

Accelerator DY 062	Liquid, tertiary amine			
Viscosity	at 25°C	ISO 12058	mPa s	approx. 10
Density	at 25°C	ISO 1675	g/cm ³	0.88 - 0.92
	at 60°C	ISO 1675	g/cm ³	0.84 - 0.89
Flash point		ISO 1523	°C	59
Vapor pressure	at 20°C	(Knudsen)	Pa	ca. 300
	at 60°C	(Knudsen)	Pa	ca. 1600

Remarks Araldite CY 5622 is an emulsion which is stabilized by a gelification agent. This gel can be liquefied by stirring or heating.
Hardener Hardener XW 1235 is sensitive to humidity. It is therefore necessary to store this product in sealed original containers.

Storage 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 November be processed only following 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 fire, refer to the Material Safety Data Sheets (MSDS) for these particular products.

Product data (for prefilled version)

(guideline values)

Araldite XB 5957 Viscous, prefilled, hydrophobic, cycloaliphatic epoxy resin

Aspect				Liquid, grey paste
Viscosity	at 25°C	Brookfield	Pa s	60 - 140
Epoxy content		ISO 3001	equiv/kg	1.90 – 2.00
Density	at 25°C	ISO 1675	g/cm ³	1.82 – 1.90
Flash point		ISO 1523	°C	> 169

Hardener XB 5958 Viscous, prefilled, preaccelerated anhydride curing agent

Aspect				Liquid, grey-brown paste
Viscosity	at 25°C	DIN 53015	Pa s	60 - 100
Density	at 25°C	ISO 1675	g/cm ³	1.89 – 1.93
Flash point		ISO 1523	°C	> 165

Mix ratio 100 : 100 pbw

Remarks Prefilled, liquid components may sometimes show a little sedimentation.
Before use, stir up carefully the components at about 50°C.
The hardener XB 5958 is sensitive to humidity.

Storage 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 November be processed only following 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 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 for shrinkage
- lower internal stresses and therefore improved mechanical properties of cast components
- improved partial discharge behavior in high voltage applications.

For the mixing of medium- to high viscosity casting resin systems and for mixing at lower temperatures, we recommend special thin film degassing mixers that November produce additional self-heating of 10-15 °C as a result of friction. For low viscosity 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 pbw, we recommend checking the quality consistency and predrying of the filler. Their moisture content should be $\leq 0.2\%$.

Specific Instructions

CY 5622 is supplied with a gel-like consistency. It is readily liquefied by stirring or heating. For an optimized processing we recommend to prepare first individual premixtures of resin and hardener with the filler. It is recommend to apply a temperature of 50-60°C for the preparation of the mixtures. As CY 5622 contains rheological additives, in most of the cases there is no need to add additional anti-settling additives (for the resin part).

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 week-end (approx. 48h) without cleaning are possible if the pipes are cooled at temperatures below 18°C.

Mold temperature

Accelerator content

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

Demolding times (depending on mold temperature and casting volume)

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

Cure conditions (minimum post curing)

APG process	10h at 140°C
Conventional vacuum casting	16h at 140°C

For any outdoor application, we recommend the use of silanised silica flour. 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 recommended to carry out relevant measurements on the actual object or to measure the glass transition temperature.

System :

Araldite CY 5622 / Hardener XW 1235 / Acc. DY 062 / Filler W12 EST; 100/ 82/ 0.45/ 325 (A) or 355 (B)

Process Viscosity

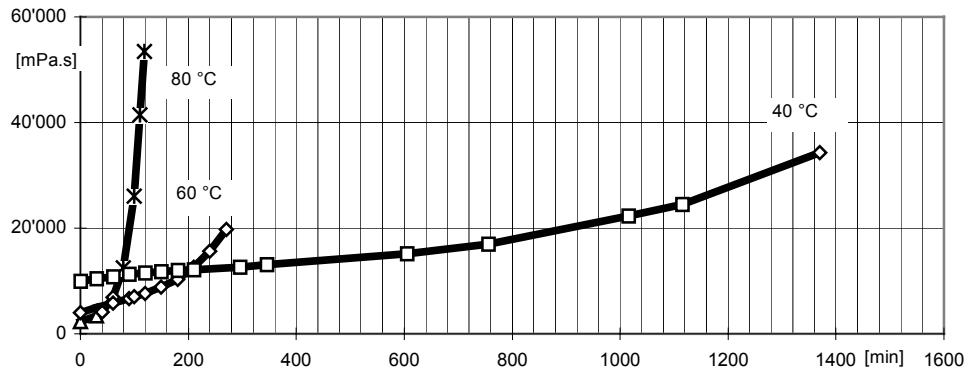


Fig. 5.1: Viscosity increase at 40, 60 and 80°C ; System A : 64 % filler content
(measurements with Rheomat 115 A, ; MS DIN 125, Shear rate $D = 6.65 \text{ s}^{-1}$)

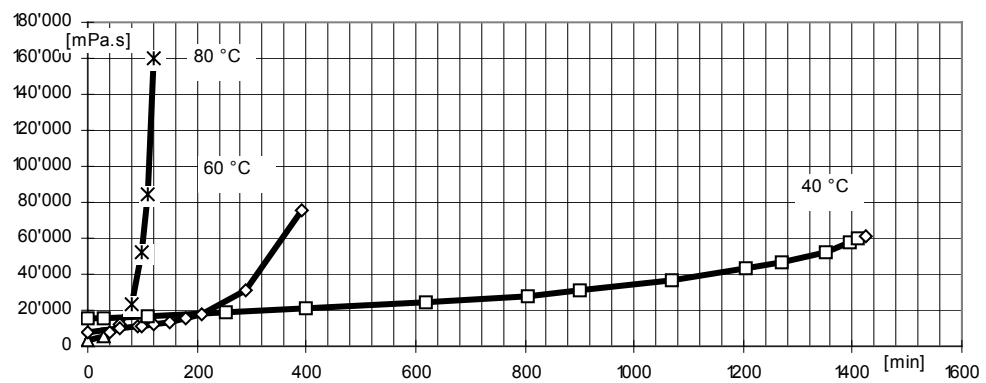


Fig. 5.2: Viscosity increase at 40, 60 and 80°C ; System B : 66 % filler content
(measurements with Rheomat 115 A, ; MS DIN 125, Shear rate $D = 6.65 \text{ s}^{-1}$)

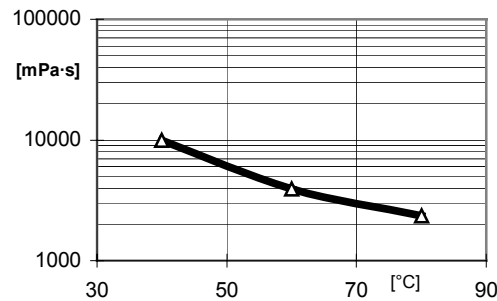


Fig. 5.3: Initial viscosity as a function of temperature, System A: 64 % filler content
(measurements with Rheomat 115 A, MS DIN 125, Shear rate $D = 6.65 \text{ s}^{-1}$)

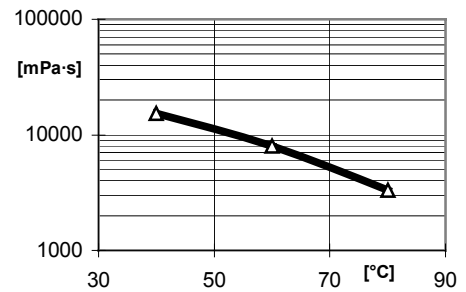


Fig. 5.4: Initial viscosity as a function of temperature, System B: 66 % filler content
(measurements with Rheomat 115 A, MS DIN 125, Shear rate $D = 6.65 \text{ s}^{-1}$)

Gelation and Cure Times

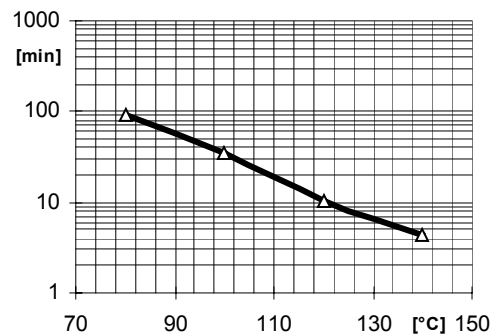


Fig. 5.5: Geltime measured as a function of temperature, System A: 64 % filler content
(measurements with Gelnorm Instrument / DIN 16945)

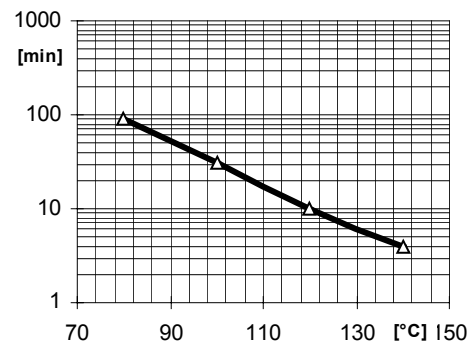


Fig. 5.6: Geltime measured as a function of temperature, System B: 66 % filler content
(measurements with Gelnorm Instrument / DIN 16945)

Mechanical and Physical Properties

(guideline values)

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

System :

Araldite CY 5622 / Hardener XW 1235 / Acc. DY 062 / Filler W12 EST
100/ 82/ 0.45/ 325 (A) or 355 (B)

			System A	System B
			Filler load : 64%	Filler load : 66%
Tensile strength	ISO 527	MPa	65 - 90	80 - 105
Elongation at break	ISO 527	%	0.80 - 1.20	1.20 - 1.60
E modulus from tensile test	ISO 527	MPa	10600 - 11000	11300 - 11700
Flexural strength	ISO 178	MPa	125 - 145	130 - 150
Surface strain	ISO 178	%	1.30 - 1.60	1.35 - 1.65
E modulus from flexural test	ISO 178	MPa	11000 - 11500	11300 - 11800
Double Torsion Test	CG 216			
Critical stress intensity factor (K_{IC})		MPa·m ^{1/2}	2.30 - 2.50	2.40 - 2.60
Specific energy at break (G_{IC})		J/m ²	460 - 500	490 - 530
Glass transition temperature (DSC)	IEC 61006	°C	100 - 115	100 - 115
Coefficient of linear thermal expansion	ISO 11359-2			
Mean value for temperature range: 20 - 80°C		K ⁻¹	34 - 37.10 ⁻⁶	32 - 35.10 ⁻⁶
Thermal conductivity similar to	ISO 8894	W/m.K	0.90 - 1.00	0.95 - 1.05
Water absorption (specimen: 50x50x4 mm)	ISO 62			
10 days at 23°C		% by wt.	0.10 - 0.15	0.10 - 0.15
60 min. at 100°C		% by wt.	0.07 - 0.12	0.07 - 0.12
Decomposition temperature (heating rate: 10 K/min.)				
DTA		°C	350	350
Density	ISO 1183	g/cm ³	1.83 - 1.92	1.85 - 1.95
Filler content		%	64	66

Electrical Properties

(guideline values)

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

System :

Araldite CY 5622 / Hardener XW 1235 / Acc. DY 062 / Filler W12 EST
100/ 82/ 0.45/ 325 (A) or 355 (B)

			System A	System B
			Filler load : 64%	Filler load : 66%
Breakdown strength	IEC 60243-1	kV/mm	21 - 26	21 - 26
HV diffusion breakdown strength	DIN 57 441	Class	HD - Class 2	HD - Class 2
Temperature of specimen after test		°C	< 24	< 24
HV arc resistance	IEC 61621	s	183 - 186	184 - 186
Tracking resistance with test solution A	IEC 60112	CTI	> 600 0.0	> 600 0.0
with test solution B			> 600 M 0.1	> 600 M 0.1
HV tracking resistance	IEC 60587	class	1B3.5	1B3.5
Electrolytic corrosion	IEC 60426	grade	A-1	A-1

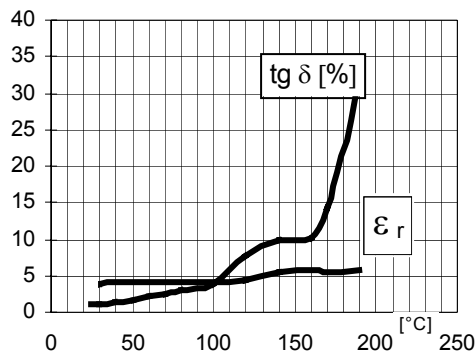


Fig.7.1: Loss factor (tan δ) and dielectric constant (ε_r) as a function of temperature,
System A : 64 % filler content
(measurement frequency: 50 Hz / IEC 60250)

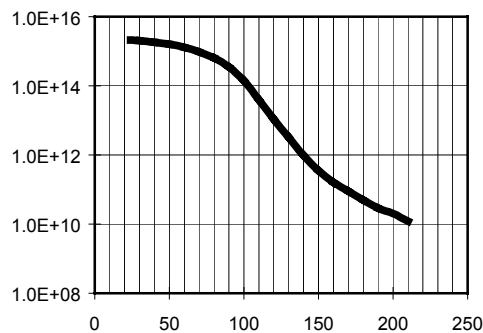


Fig.7.3: Volume resistivity (ρ) as a function of temperature
System A : 64 % filler content
(measurement voltage: 1000 V / IEC 60093)

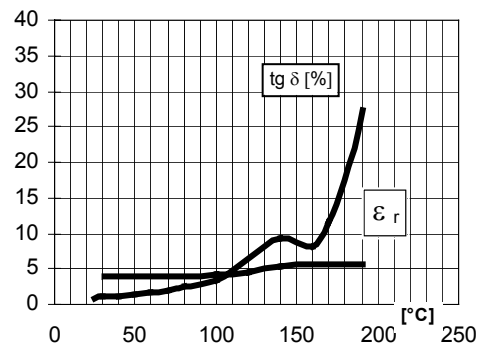


Fig.7.2: Loss factor (tan δ) and dielectric constant (ε_r) as a function of temperature,
System B : 66 % filler content
(measurement frequency: 50 Hz / IEC 60250)

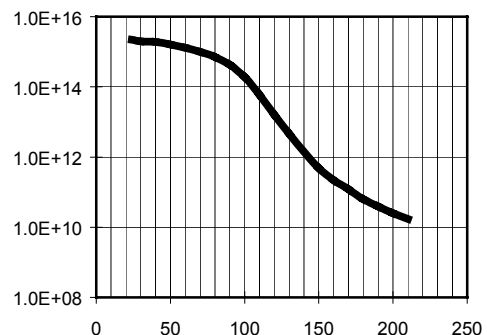


Fig.7.4: Volume resistivity (ρ) as a function of temperature
System B : 66 % filler content
(measurement voltage: 1000 V / IEC 60093)

General information about hydrophobicity

Hydrophobicity

For any detailed information about Hydrophobicity, please ask for the following publications:

- /1/ Cycloaliphatic Epoxy Insulators - Experiences over 30 Years
Ulrich Massen and Christian Beisele, Vantico Ltd., Basel, CH
ETG Fachtagung, Bad Nauheim (D) – September 1999
- /2/ New Outdoor Epoxy Systems with Hydrophobic Properties
Christian Beisele, Vantico Ltd., Basel, CH
Insulator 2000, Barcelona (E) – November 1999
- /3/ From Cycloaliphatic to New Hydrophobic Epoxy Resin
C. Beisele, F. Bidamant, U. Massen
INSULEC 2000, Hyderabad - India - 23-24 November 2000
- /4/ Hydrophobes Cycloaliphatisches Epoxyharzsystem für Freiluftanwendungen
C. Beisele
Presentation given at course „Epoxidharze in der Elektrotechnik“ (26688/71.512)
Technische Akademie Esslingen, Germany, May 16-18, 2001
- /5/ Experiences with new Hydrophobic Cycloaliphatic Epoxy Outdoor Insulation Systems
C. Beisele, R. Kultzow
IEEE Electrical Insulation Magazine, July / August 2001 – Vol. 17, N°4
- /6/ Hydrophobic Cycloaliphatic Epoxy – Latest Findings and Future Developments
C. Beisele
2001 World Insulator Congress, Shanghai, November 2001

The following brochure is also available :
“Top-class hydrophobicity with new Araldite® epoxy systems”

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" (Publ. No. 24264/e).

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
Treatment 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 colored 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 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 physician should be consulted.

Material *smeard or* (omit smeard) splashed on the **skin** should be dabbed off, and the contaminated area then washed and treated with a cleansing cream (see above). A physician 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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All recommendations for use of our products, whether given by us in writing, verbally, or to be implied from results of tests carried out by us are based on the current status of our knowledge. Notwithstanding any such recommendations the Buyer shall remain responsible for assuring himself that the products as supplied by us are suitable for his intended process or purpose. Since we cannot control the application, use or processing of the products, we cannot accept responsibility therefore. The Buyer shall ensure that the intended use of the products will not infringe any third party's intellectual property rights. We warrant that our products are free from defects in accordance with and subject to our general conditions of supply.