Poxy-Systems

Technical data

Epoxy Resin L

+ Hardener S, L, CL, EPH 500, W 300, GL 1, GL 2, EPH 573 and EPH 161

Description

- **Low viscosity, free of solvents and fillers**
- **Fast impregnation of glass, aramid, and carbon fibres**
- **High static and dynamic strength**

The R&G Epoxy Resin L is a bisphenol A/F resin. The bisphenol F component reduces the viscosity and prevents the resin from forming crystals at low storage temperatures (less than +5 °C).

The resin is diluted with a difunctional compound and is generally regarded as having a good physiological tolerance.
Owing to its low surface tension the system exhibits good filler absorption properties. And it has **excellent wetting properties with respect to reinforcing fibres** of glass, aramid, and carbon.

Application

Fibre composites (GFRP, SFRP, CFRP) in (**ultralight) aircraft construction, model construction, design of sports equipment, mould construction** and **motor sports.**

Processing

The resin is **suitable for all processing methods**, e.g. hand lay-up operations, winding, casting, and press moulding (also in vacuum). Metal, wood, plastics, ceramics, etc., can be joined with high-strength bonds without the application of contact pressure.
Curing takes place virtually free of shrinkage.

The **hardeners** S, L, CL, EPH 500, W 300, GL 1, GL 2, EPH 573 and EPH 161 are formulations of aliphatic and cycloaliphatic amines. They define the properties of the moulded materials.

Single component: 2,5 kg - 200 kg order no. 100 135-X, set of two components: (look at corresponding hardeners)

Epoxy Resin L	Unit	Value
Delivered state	-	liquid
Colour	-	yellowish
Density	g/cm³/23 °C	1.14 ± 0.01
Viscosity	mPa*s/25 °C	710 ± 70
Epoxy value	100/equivalent	0.56
Epoxy equivalent	g/equivalent	179
Chlorine content total	%	< 1
Chlorine content hydrolysable	ppm	< 500
Vapour pressure	mbar/ 25 °C	< 1
Refractive index	n_D 25	1.547
Flash point (ISO 3679)	°C	>150
Storage (sealed, at 15 °C)	months	36

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Hardeners

The hardeners exhibit different processing times so that you can select the one best suited to your needs:

Hardener S

Description

- **Hardener for Epoxy Resin L**
- **Processing time 15 minutes**
- **Free of nonylphenol, benzyl alcohol and DETA**
- **Curing temperatures from 5 °C**

Application

Modified cycloaliphatic polyamine hardener for small laminates, glued joints, and repairs.
Good static and dynamic strength. Fast curing in the thinnest layers as well.

Owing to the high reactivity and the resulting reaction heat, laminates may not be manufactured with a thickness exceeding 5 mm in one working cycle.

Single components: 1 kg - 25 kg order no. 100 140-X, sets of two components: 280 g package order no. 100 105-1, 1 kg package order no. 100 100-1

Hardener L

Description

- **Hardener for Epoxy Resin L**
- **Processing time 40 minutes**
- **Free of nonylphenol and DETA**
- **Curing temperatures from 8 °C**

Application

Modified cycloaliphatic polyamine hardener for larger laminates, glued joints, and mould construction.
Good static and dynamic strength, fast curing in the thinnest layers as well.

Hardener L is the most frequently used hardener for Epoxy Resin L.
Owing to the high reactivity and the resulting reaction heat, laminates may not be manufactured with a thickness exceeding 8 mm in one working cycle.

Single components: 1 kg - 10 kg order no. 100 145-X, sets of two components: 140 g package order no. 100 113-1, 280 g package order no. 100 115-1, 1 kg package order no. 100 110-1

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Hardener CL

Description

- **Hardener for Epoxy Resin L**
- **Processing time 60 minutes**
- **Free of nonylphenol and DETA**
- **Curing temperatures from 15 °C**
- **Tack-free curing even of thin layers**

Application

This resin system yields superior impregnating and wetting properties towards carbon, glass, aramid and natural fibres. It is especially suitable for carbon coating of automotive parts.

The resin system is ambient curing and develops no distinctive brittleness even at curing temperatures below 20 °C. We however recommend, to improve the mechanical and physical properties, to perform a post-curing at least at 40 °C over 15 h.

Single components: 3,5 kg - 20 kg order no. 109 285-H-X, set of two components: 260 g package order no. 109 285-AP-0, 930 g package order no. 109285-AP-2, 3,25 kg package order no. 109 285-AP-3

Hardener EPH 500

Description

- **Hardener for Epoxy Resin L**
- **Processing time 60 minutes**
- **Free of nonylphenol and DETA**
- **Curing temperatures from 10 °C**
- **Absolute tack-free surfaces**

Application

Hardener with medium pot life for many applications in model- and sports equipment construction. Absolute tack-free surfaces, extensively light resistant and color fast.

Single components: 1,58 kg - 25,2 kg order no. 100 147-X, set of two components: 1,165 kg package order no. 100 106-2

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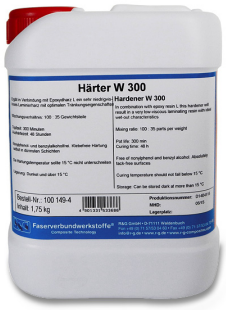
Hardener W 300



Description

- **Hardener for Epoxy Resin L**
- **Processing time 300 minutes**
- **Free of nonylphenol, benzyl alcohol and DETA**
- **Curing temperatures from 15 °C**
- **Tack-free curing even of thin layers**

Application

Highly transparent hardener with extended pot life. For coatings and thick laminates. Also for casting.

Single components: 1,75 kg - 26,25 kg order no.. 100 149-X, sets of two components: 965 g package order no. 100 108-3, 3,375 kg package order no. 100 108-4

Hardener GL 1

Description

- **Hardener for Epoxy Resin L**
- **Processing time 30 minutes**
- **Free of nonylphenol, benzyl alcohol and DETA**
- **Curing temperatures from 10 °C**

Application

The well-proven R&G Epoxy Resin L in combination with Hardener GL 1 offers an **approval by the Germanische Lloyd** for the construction of boats and rotor blades for wind turbines.

Fast hardener for small components and repairs. Also for accelerating hardener GL. 2

The resin component itself is absolutely free of crystallization due to its Bisphenol A/F base! The resin system is ambient curing and develops no distinctive brittleness even at curing temperatures below 20 °C. We however recommend, to improve the mechanical and physical properties, to perform a post-curing at least at 40 °C over 15 h.

Single components: 0,75 kg - 20 kg order no. 104 095-X, sets of two components: 360 g package order no. 1040950-AP, 930 g package order no. 1040951-AP, 3,25 kg Gebinde Bestell-Nr. 1040952-AP

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Hardener GL 2

Description

- **Hardener for Epoxy Resin L**
- **Processing time 210 minutes**
- **Free of nonylphenol, benzyl alcohol and DETA**
- **Curing temperatures from 15 °C**

Application

The well-proven R&G Epoxy Resin L in combination with Hardener GL 1 offers an **approval by the Germanische Lloyd** for the construction of boats and rotor blades for wind turbines.

Slow hardener for large components, especially in the vacuum infusion process.

The resin component itself is absolutely free of crystallization due to its Bisphenol A/F base! The resin system is ambient curing and develops no distinctive brittleness even at curing temperatures below 20 °C. We however recommend, to improve the mechanical and physical properties, to perform a post-curing at least at 40 °C over 15 h.

Single components: 0,75 kg - 20 kg order no. 104 100-X, sets of two components: 360 g package order no. 1041000-AP, 930 g package order no. 1041001-AP, 3,25 kg package order no. 1041002-AP

Hardener EPH 573

Description

- **Hardener for Epoxy Resin L**
- **Processing time 15 minutes**
- **Curing temperatures from 5 °C**
- **High chemical resistance**

Application

Fast hardener for small components and repairs.

Single components: 460 g - 23 kg order no. 112120-X

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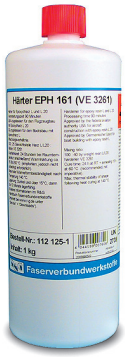
Hardener EPH 161



Description

- **Hardener for Epoxy Resin L and L 20**
- **Processing time 90 minutes**
- **Free of DETA**
- **Curing temperatures from 18 °C**

Application

The well-proven R&G Epoxy Resin L in combination with Hardener EPH 161 **is approved for the costruction of vehicle components.**

For heat-resisting laminates up to max. 120 °C in conjunction with Epoxy Resin L and L 20.
Components of this system are curing very good at room temperature and can be demoulded and processed without difficulty. The system yields a low-viscosity laminating resin that exhibits superior impregnating and wetting properties to glass, aramid, and carbon fibres.The static and dynamic stability is very good..

To increase the heat resistance and get ideal mechanical strength properties, the components must be post cured at elevated temperatures. As standard value a post-curing about 15 hours at approx. 60 °C is recommended. The Tg-forerun averages approx. 20 °C. That means:

Curing temperature (15 h)	Glasstransition temperature (TG) (approx.)
60 °C	80 °C
70 °C	90 °C
80 °C	100 °C
90 °C	110 °C
100 °C	120 °C

Single component: 1 kg - 25 kg order no.. 112 125-X, set of two components: 250 g package order no. 100 130-0, 895 g package order no. 100 130-1

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Overwiev about the technical data of all epoxy resin systems with Epoxy Resin L

	Resin L + Hardener S	Resin L + Hardener L	Resin L + Hardener CL	Resin L + Hardener EPH 500	Resin L + Hardener W 300
Processing time 100 g-Ansatz at 20 °C	15 Min	40 min	60 min	60 min	300 min
Mixing ratio in parts by weight	**100 : 40**	**100 : 40**	**100 : 30**	**100 : 63**	**100 : 35**
Mixing ratio in parts by volume	100 : 45	100 : 45	100 : 36	100 : 71	100 : 42
Mixed viscosity in mPa.s	887 ± 100	580 ± 100	500 ± 100	620 ± 100	300 ± 100
Colour	light yellow	light yellow	highly transparent	light yellow	highly transparent
Areas of application	Fast hardener for small components and repairs. Also suitable for bonding.	Hardener with medium pot life for many applications in model and sports equipment. Also suitable for bonding.	Highly transparent hardener with medium pot life for many applications in model and sports equipment. Excellent mechanical properties. Specially developed for CFRP coatings.	Hardener for many applications in model and sports equipment. Also suitable for bonding	Highly transparent hardener with extended pot life. For coatings and thick laminates. Also suitable for potting.
Characteristics	Medium viscosity	Low viscosity	Low viscosity	Medium viscosity	Very low viscosity
	Solvent-free and filler-free	Solvent-free and filler-free	Solvent-free and filler-free	Solvent-free and filler-free	Solvent-free and filler-free
	Free of nonylphenol, benzyl alcohol and DETA	Free of nonylphenol and DETA	Free of nonylphenol and DETA	Free of nonylphenol and DETA	Free of nonylphenol, benzyl alcohol and DETA
	High static and dynamic strength	High static and dynamic strength	High static and dynamic strength		
	Non-cytotoxic (cell damaging)	Non-cytotoxic (cell damaging)	Non-cytotoxic (cell damaging)	Non-cytotoxic (cell damaging)	
			Largely UV stable		Very good UV resistance
		Tack free curing even in very thin layers	Tack free curing even in very thin layers	Tack free curing even in very thin layers	Tack free curing even in very thin layers
			Excellent fibre wetting		Very good impact strenght
			Increased heat resistance after heat curing		
	Curing temperatures from 5 °C	Curing temperatures from 8 °C	Curing temperatures from 15 °C	Curing temperatures from 10 °C	Curing temperatures from 15 °C
Admission	Cytox	Cytox		Cytox	
Curing	Curing at RT (23° C) for 16-24 h	Curing at RT (23 °C) above 24 h	24 h at RT (23 °C) above 24 h annealing optional	Curing at RT (23 °C) for 24-36 h	Curing at RT (23 °C) 48 -72 h
Heat resistance	≈ 60 °C	≈ 60 °C	Max. 85 °C at add. annealing 15 h / 70 °C	≈ 60 °C	≈ 60 °C

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Overwiev about the technical data of all epoxy resin systems with Epoxy Resin L

	Resin L + Hardener GL 1	Resin L + Hardener GL 2	Resin L + Hardener EPH 573	Resin L + Hardener EPH 161
Processing time 100 g-Ansatz at 20 °C	30 min	210 min	15 min	90 min
Mixing ratio in parts by weight	**100 : 30**	**100 : 30**	**100 : 23**	**100 : 25**
Mixing ratio in parts by volume	100 : 35	100 : 35	100 : 25	100 : 29
Mixed viscosity in mPa.s	820	248	750 ± 100	560 ± 100
Colour	light yellow	transparent	light yellow	light yellow
Areas of application	Fast hardener for small components and repairs. Also for accelerating hardener GL. 2	Slow hardener for large components, especially in the vacuum infusion process	Fast hardener for small components and repairs.	Slow hardener for large components and thick laminates. With resin L approved for the construction of vehicle components.
Characteristics	Medium viscosity	very low viscosity	Medium viscosity	low viscosity
	Solvent-free and filler-free	Solvent-free and filler-free	Solvent-free and filler-free	Solvent-free and filler-free
	Free of nonylphenol, benzyl alcohol and DETA	Free of nonylphenol, benzyl alcohol and DETA		Free of DETA
	High static and dynamic strength	High static and dynamic strength	High static and dynamic strength	High static and dynamic strength
			High chemical resistance	Excellent fibre wetting
				Increased heat resistance after heat curing
	Curing temperatures from 10 °C	Curing temperatures from 15 °C	Curing temperatures from 5 °C	Curing temperatures from 18 °C
Admission	GL	GL		TÜV
Curing	24 h at RT(23 °C) + Annealing 15h at min. 40 °C	24 h at RT (23 °C) + Annealing 15h at min. 40 °C	24 h at RT (23 °C)	24 h at RT (23 °C) + Tempering 15 h at min. 60 °C
Heat resistance	Max. 80 °C at add. annealing 15 h / 70 °C	Max. 85 °C at add. annealing 15 h / 70 °C	Max. 70 °C (at add. annealing 15 h/60 °C)	Max. 120 °C (at add. annealing 15 h/100 °C)

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Mechanical characteristics pure resin samples	Resin L + Hardener S	Resin L + Hardener L	Resin L + Hardener CL	Resin L + Hardener EPH 500	Resin L + Hardener W 300
Tensile strength in MPa max. to	68	69	83	-	-
Compressive strength in MPa max.to	116	91	111	-	-
Flexural strength in MPa max.to	110	111	137	-	-
Elongation at break in % max. to	-	4.7	5.5	-	-
Impact strength in kJ/m² max.to	-	-	-	-	-
Modulus of elasticity in bending test in Mpa max. to	-	2950	3220	-	-

Mechanical characteristics of GRP	Resin L + Hardener S	Resin L + Hardener L	Resin L + Hardener CL	Resin L + Hardener EPH 500	Resin L + Hardener W 300
Tensile strength in MPa max. to	238	302		204	
Compressive strength in MPa max. to	390	253		203	
Flexural strength in MPa max. to	310	431		240	
Elongation at break in % max. to	376	91		375	
Impact strength in kJ/m² max. to	14725	15900		12263	
MPa max. to					

Mechanical characteristics of CFRP	Resin L + Hardener S	Resin L + Hardener L	Resin L + Hardener CL	Resin L + Hardener EPH 500	Resin L + Hardener W 300
Tensile strength in MPa max. to	384	698		343	
Compressive strength in MPa max. to		384			
Flexural strength in MPa max. to	607	720		471	
Elongation at break in % max. to		49			
Impact strength in kJ/m² max. to	35413	50400		32400	
Modulus of elasticity in bending test in Mpa max. to					

Tensile strength according to DIN EN ISO 527-4
Compressive strength according to DIN EN ISO 1426
Flexural strength according to DIN EN ISO 14125/ Verfahren A
Impact strength according to DIN EN ISO 179-1
Modulus of elasticity in bending test according to DIN EN ISO 14125 / Verfahren A

Structure sample twill GRP (3 mm thickness): 12 layers of glass fabric 296 g / m² Atlas, ITG92626 Quasi-isotropic laminate structure / Laminated by hand Cured at room temperature + 15 hours at 60 ° C for 24 h

Structure sample twill carbon fiber (3.5 mm thickness): 12 layers carbon fabric 200 g / m² canvas Style 450
Quasi-isotropic laminate structure / Laminated by hand
Cured at room temperature + 15 hours at 60 ° C for 24 h

Tensile strength according to DIN EN ISO 527-4 compressive strength according to DIN EN ISO 1426 flexural strength according to DIN EN ISO 14125 / Method A impact strength according to DIN EN ISO 179-1 modulus bending test according to DIN EN ISO 14125 / Method A Interlaminar shear strength according to DIN EN ISO 2563

Structure sample twill GRP (4 mm thickness): 16 layers of glass fabric 296g / m2 Atlas, ITG91745
Laminate construction 0 ° / 90 ° / manufactured in RTM
Curing for 24 h at RT + 15h at 60 ° C

Structure sample twill carbon fiber (2 mm thickness): 8 layers of 200 g / m2 Canvas, Style 450
Laminate construction 0 ° / 90 ° / manufactured in RTM
Curing for 24 h at RT + 15h at 60 ° C

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Mechanical characteristics pure resin samples	Resin L + Hardener GL 1	Resin L + Hardener GL 2	Resin L + Hardener EPH 573	Resin L + Hardener EPH 161
Tensile strength in MPa max. to	74	74.8	-	70
Compressive strength in MPa max.to	-	-	125	125
Flexural strength in MPa max.to	165	119	140	130
Elongation at break in % max. to	-	-	-	9.5
Impact strength in kJ/m² max.to	-	-	40	40
Modulus of elasticity in bending test in Mpa max. to	-	-	3500	3600

Mechanical characteristics of GRP	Resin L + Hardener GL 1	Resin L + Hardener GL 2	Resin L + Hardener EPH 573	Resin L + Hardener EPH 161
Tensile strength in MPa max. to		316	-	-
Compressive strength in MPa max. to		282	360	360
Flexural strength in MPa max. to		431	488	488
Elongation at break in % max. to		97	225	205
Impact strength in kJ/m² max. to		15500	25000	23500
MPa max. to			38	36

Mechanical characteristics of CFRP	Resin L + Hardener GL 1	Resin L + Hardener GL 2	Resin L + Hardener EPH 573	Resin L + Hardener EPH 161
Tensile strength in MPa max. to		752		
Compressive strength in MPa max. to		421	395	444
Flexural strength in MPa max. to		723	520	730
Elongation at break in % max. to		87		
Impact strength in kJ/m² max. to		51200	41000	46000
Modulus of elasticity in bending test in Mpa max. to			45	54

Tensile strength according to DIN EN ISO 527-4
Compressive strength according to DIN EN ISO 1426
Flexural strength according to DIN EN ISO 14125/ Verfahren A
Impact strength according to DIN EN ISO 179-1
Modulus of elasticity in bending test according to DIN EN ISO 14125 / Verfahren A

Structure sample twill GRP (3 mm thickness): 12 layers of glass fabric 296 g / m² Atlas, ITG92626 Quasi-isotropic laminate structure / Laminated by hand Cured at room temperature + 15 hours at 60 ° C for 24 h

Structure sample twill carbon fiber (3.5 mm thickness): 12 layers carbon fabric 200 g / m² canvas Style 450
Quasi-isotropic laminate structure / Laminated by hand
Cured at room temperature + 15 hours at 60 ° C for 24 h

Tensile strength according to DIN EN ISO 527-4 compressive strength according to DIN EN ISO 1426 flexural strength according to DIN EN ISO 14125 / Method A impact strength according to DIN EN ISO 179-1 modulus bending test according to DIN EN ISO 14125 / Method A Interlaminar shear strength according to DIN EN ISO 2563

Structure sample twill GRP (4 mm thickness): 16 layers of glass fabric 296g / m2 Atlas, ITG91745
Laminate construction 0 ° / 90 ° / manufactured in RTM
Curing for 24 h at RT + 15h at 60 ° C

Structure sample twill carbon fiber (2 mm thickness): 8 layers of 200 g / m2 Canvas, Style 450
Laminate construction 0 ° / 90 ° / manufactured in RTM
Curing for 24 h at RT + 15h at 60 ° C

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