

## Laminating resin MGS® L 326

Hardeners MGS® 265, 260 S

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<b>Approval</b>	-
<b>Application</b>	applications requiring high heat resistance, boat and shipbuilding, sports equipment, automobile parts, moulds and tools
<b>Operational temperature</b>	-60 °C up to +150 °C (-76°F up to 302 °F) after heat treatment
<b>Processing</b>	at temperatures between 20 °C and 50 °C ( 68 - 122 °F) recommended 25 - 35 °C (77 - 95 °F)
<b>Features</b>	high heat resistance, yet initial cure of room temperature good mechanic properties, pot life from approx. 1,5 hour to approx. 5 h short curing time at high temperatures
<b>Special modifications</b>	on request
<b>Storage</b>	shelf life of 24 months in originally sealed containers

### Characteristics

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**Laminating resin MGS® L 326**

Medium-viscous laminating resin systems with different pot lives for processing of glass, carbon and aramide fibers. Due to their very good mechanical properties, these systems are suitable for the production of components featuring high static and dynamic loadability and high heat resistance.

Laminating resin L 326 is a modified resin based on bisphenol A/F. It is crystallization-resistant down to -20 °C. The hardeners are modifications of cycloaliphatic amines. Due to their chemical structure, the hardeners may crystallize at temperatures below +15 °C, which is visible as a clouding or solidification of the contents of the container. Before processing, the crystallization must be removed by slow warming up to approx. 50 °C-60°C (122 °F-140 °F) in a water bath or oven and stirring or shaking will clarify the contents of the container without any loss of quality. Use only completely transparent products. Before warming up, open containers slightly to permit equalization of pressure. Caution during warm-up! Do not warm up over an open flame! While stirring up use safety equipment (gloves, eyeglasses, respirator).

The range of pot lives is between approx. 2 and 4 hours at 20 °C (68 °F). The mixed viscosity at this temperature is somewhat too high for some applications. Optimal viscosities for hand lamination are obtained at temperatures in the range of 25-35 °C (77 °F-95 °F). Pot life is then between approx. 1 h to 3 h. Following initial curing at room temperature, the parts are still brittle and require heat treatment at a min. temperature of 50 °C (122 °F) before processing or demolding. Direct curing at more elevated temperatures (60-100 °C/140-212 °F) is possible in the case of thin-walled parts (laminar thicknesses of up to approx. 10 - 20 mm depending on the hardener used). The curing times can be reduced to a few minutes by this.

Non-tacky, high-gloss surfaces are obtained even with unfavorable curing conditions, such as low temperatures or high relative humidity.

The laminating resin systems do not contain any unreactive components. All raw materials and additives feature a very low vapor pressure, therefore permitting processing of the material under vacuum even at elevated temperatures (VARIM process). Compatibility problems are not to be expected in combination with UP gelcoats, various paints (e.g. PUR-based), etc. However, comprehensive tests are indispensable.

The relevant industrial safety regulations for the handling of epoxy resins and hardeners and our instructions for safe processing are to be observed.

Although our resin systems are very unlikely to crystallize at low temperatures, storage conditions of 15-30 °C (59-86 °F) and low humidity are recommended. After dispensing material, the containers must again be closed carefully, to avoid contamination or absorption of water. All amine hardeners show a chemical reaction when exposed to air, known as „blushing“. This reaction is visible as white carbamide crystals, which could make the materials unusable.

**Application**

**Laminating resin MGS® L 326**
**Specifications**

		Laminating resin L 326
<b>Density</b>	[g/cm <sup>3</sup> ]	1,14 - 1,19
<b>Viscosity</b>	[mPas]	5.000 - 7.000
<b>Epoxy-equivalent</b>	[g/equivalent]	170 - 190
<b>Epoxy-value</b>	[equivalent /100g]	0,52 - 0,59
<b>Refractory index</b>		1,5720 - 1,5740

**Measuring conditions:**

measured at 25 °C / 77 °F

		Hardener 265	Hardener 260 S
<b>Density</b>	[g/cm <sup>3</sup> ]	0,91 - 0,93	0,93 - 0,97
<b>Viscosity</b>	[mPas]	10 - 20	80 - 100
<b>Amine value</b>	[mg KOH/g]	650 - 700	450 - 500
<b>Refractory index</b>		1,4864 - 1,4885	1,4980 - 1,4985

**Measuring conditions:**

measured at 25 °C / 77 °F

	Laminating resin L 326	Hardener 265	Hardener 260 S
<b>Average EP - Value</b>	0,55	-	
<b>Average amine equivalent</b>	-	46	62

**Processing details**

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## Laminating resin MGS® L 326

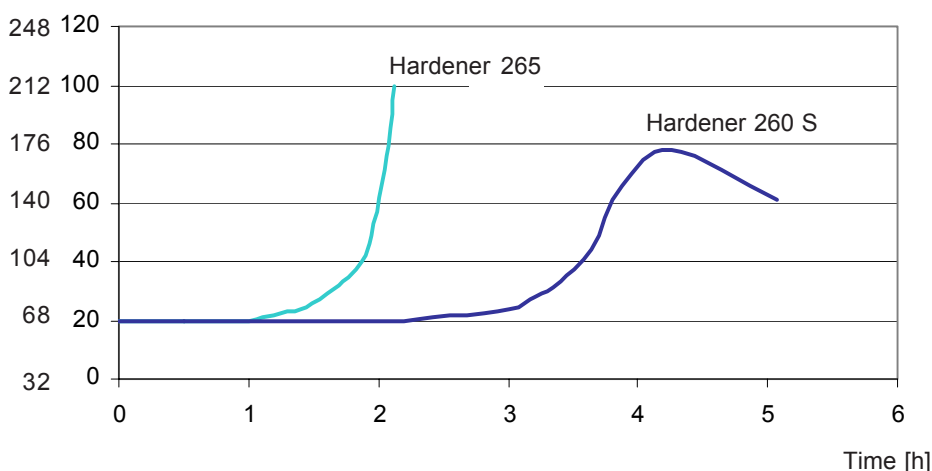
### Mixing ratios

	L 326: Hardener 265	L 326: Hardener 260 S
<b>Parts by weight</b>	100 : 25 ± 2	100 : 35 ± 2
<b>Parts by volume</b>	100 : 30 ± 2	100 : 42 ± 2

The mixing ratio stated must be observed carefully. Adding more or less hardener will not result in a faster or slower cure, but in incomplete curing with limited performance, that can not be corrected in any way.

Resin and hardener must be mixed carefully. Mix until no clouding is visible in the mixing container. Special attention must be paid to the walls and bottom of the mixing container.

[°F] [°C] Temperature



### Temperature development

#### Sample preparation

100 g / initial curing at 30 °C (86 °F)

The optimum processing temperature is in the range between 20 and 40°C. Higher processing temperatures are possible, but will shorten pot life. An increase in temperature of 10°C will halve the pot life. Water (for example very high humidity or contained in fabrics or fillers) causes an acceleration of the resin / hardener reaction. Different temperatures and humidities during processing have no significant effect on the mechanical properties of the cured product.

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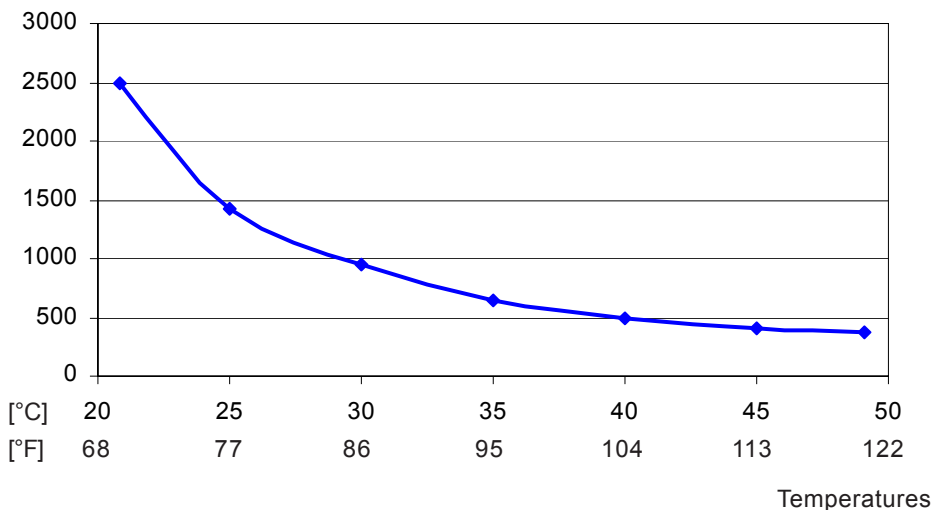
May, 2006

## Laminating resin MGS® L 326

### Laminating resin L 326 - Hardeners 265/260 S

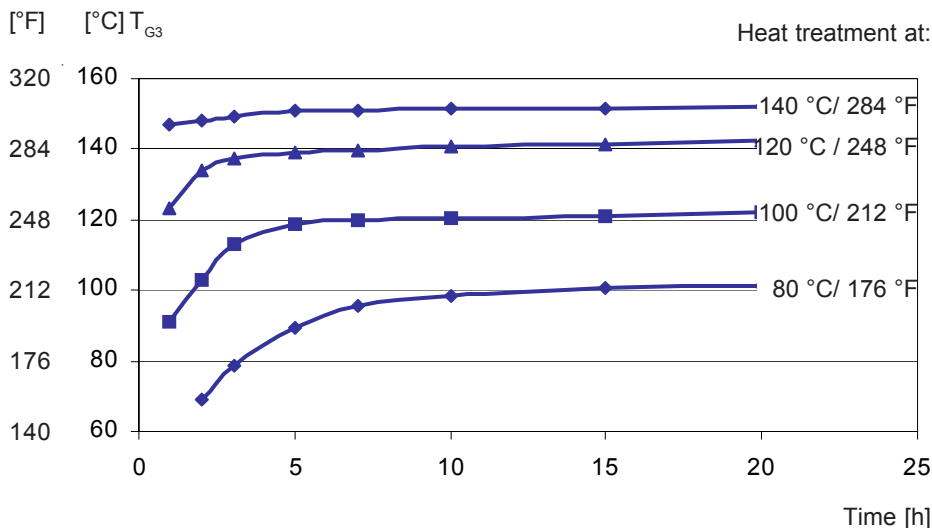
### Viscosity of mixture

[mPas] Viscosity



### Laminating resin L 326, Hardener 260 S

### Development of T<sub>G</sub>



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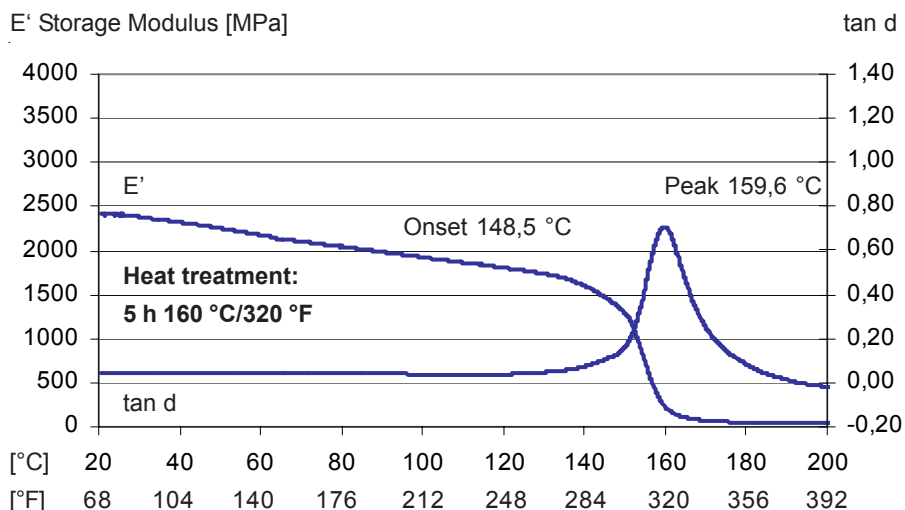
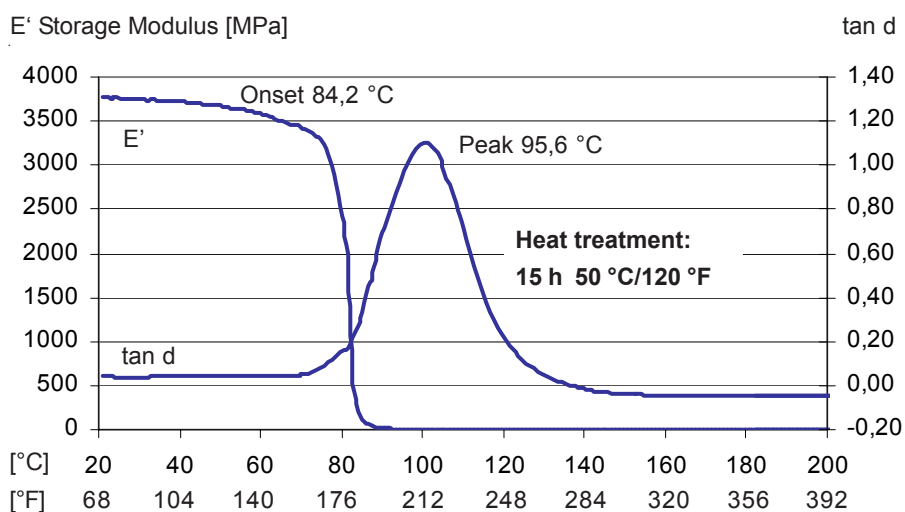
## Laminating resin MGS® L 326

Max. T <sub>g</sub> for heat treatment at 80 °C/176 °F	90 - 100 °C/194 - 212 °F
Max. T <sub>g</sub> for heat treatment at 100 °C/212 °F	110 - 120 °C/230 - 248 °F
Max. T <sub>g</sub> for heat treatment at 120 °C/248 °F	130 - 140 °C/266 - 284 °F
Max. T <sub>g</sub> for heat treatment at 140 °C/284 °F	140 - 150 °C/284 - 302 °F

**T<sub>g</sub> unconditioned**

### DMA - T<sub>g</sub> (peak) tan delta laminating resin L 326 with hardener 260 S measuring after heat treatment

**DMA**



#### Measurement conditions

Coupon thickness: 2 mm  
Heating rate: 2 K/min  
Frequency: 1 Hz

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**Laminating resin MGS® L 326**
**Mechanical data**

Mechanical data of neat resin		
<b>Density</b>	[g/cm <sup>3</sup> ]	1,18 - 1,20
<b>Flexural strength</b>	[N/mm <sup>2</sup> ]	100 - 120
<b>Modulus of elasticity</b>	[kN/mm <sup>2</sup> ]	3,2 - 3,5
<b>Tensile strength</b>	[N/mm <sup>2</sup> ]	70 - 80
<b>Compressive strength</b>	[N/mm <sup>2</sup> ]	90 - 110
<b>Elongation at break</b>	[%]	5,0 - 6,5
<b>Impact strength</b>	[KJ/m <sup>2</sup> ]	40 - 50
<b>Water absorption at 23°C</b>	24 h [%]	0,10 - 0,20
	7 d [%]	0,20 - 0,50
<b>Fatigue strength under reversed bending stresses</b> acc. to DLR Brunsw.	10 %	exp. > 2 x 10 <sup>6</sup>
	90 %	exp. > 2 x 10 <sup>6</sup>
<b>Curing:</b> 24 h at 23 °C (74°F) + 15 h at 60 °C (140 °F)		
<b>Typical data</b> according to <b>WL 5.3203 Parts 1 and 2</b> of the German Aviation Materials Manual.		

**Advice:**

Mechanical data are typical for the combination of laminating resin L 326 with hardener 265, 260 S. Data can differ in other applications.

## Laminating resin MGS® L 326

### Data of reinforced resin Static tests in standard climate

### Mechanical data

Reinforced with		GRC Glass fibre	CRC Carbon fibre	SRC Aramide fibre
<b>Flexural strength</b>	[N/mm <sup>2</sup> ]	500 - 550	700 - 730	340 - 360
<b>Tensile strength</b>	[N/mm <sup>2</sup> ]	410 - 440	480 - 540	310 - 340
<b>Compressive strength</b>	[N/mm <sup>2</sup> ]	400 - 430	450 - 500	140 - 160
<b>Interlaminar shear strength</b>	[N/mm <sup>2</sup> ]	40 - 45	45 - 50	28 - 32
<b>Modulus of elasticity</b>	[kN/mm <sup>2</sup> ]	18 - 21	34 - 36	15 - 17
<p><b>GRC samples:</b> 16 layers of glass fabric, 8H satin, 296 g/m<sup>2</sup> (8.7/sq.yd.), 4 mm (0.16 in) thick</p> <p><b>CRC samples:</b> 8 layers of carbon fabric, plain, 200 g/m<sup>2</sup> (5.9 oz/sq.yd.) 2 mm (0.08 in) thick</p> <p><b>SRC samples:</b> 15 layers of aramide fabric, 4H satin, 170 g/m<sup>2</sup> (5.0 oz/sq.yd.), 4 mm (0.16 in) thick</p> <p>Fibre content of samples during processing/testing: 40 - 45 vol% Data calculated for fibre content of 43 vol%</p> <p>Typical data according to WL 5.3203 Parts 1 and 2 of the GERMAN AVIATION MATERIALS MANUAL</p>				

### Measuring conditions:

Curing: 24 h at 23 °C (74 °F)  
+ 15 h at 80 °C (176 °F)