

# Technical Information

## VETRESIT<sup>â</sup> 14

**MATERIAL** Laminate consisting of heat-resisting epoxy resin reinforced with glass fabric.

**GENERAL PROPERTIES** High mechanical strength, good resistance to heat and moisture, low dielectric losses and high electric strength. Resists chemicals. Low density. Temperature class F (155°C).

- APPLICATION**
- For mechanical, electrical and electronic applications, even at high temperatures and humidity.
  - Bed plates, cover plates, wedges, pacers, structural components etc. For electrical machines and equipment operating in the highest voltage and output ranges. For supraconductor applications (cryogenic temperatures).
  - For equipment components in the chemical industry
  - For thin insulation up to 10 m length as for slot inserts, partial conductor insulation, interstice layers for large machines.

For thickness 0.2 to 2 mm, please ask for VETRESIT 17.

SUPPLY	Sheets	Standard Size Width x Length (mm)	Thickness h (mm)	Other sizes supplied on request
		1200 x 3000	0,5 - 15	
		1040 x 2140	1 - 60	
		1040 x 1040	1 - 100	

**MACHINABILITY** VETRESIT 14 can be sawn, milled, turned, drilled or ground. Since glass fibre materials subject machining tools to considerable wear, very sharp hard metal tools or preferably diamond tools should be used. The material can be machined dry using a dust and chip vacuum extractor, or wet with a suitable cooling liquid. For varnishing and for a durable adhesion the raw surfaces have to be ground.

Expert joining of VETRESIT-parts and of VETRESIT to other materials will be professionally done on request, as it is a speciality of MICAFIL AG. Do not hesitate to contact us for this kind of services.



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**MACHINED PARTS** Finished ready for use in accordance with customer's drawings. Varnishing on request (standard: clear varnish).

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**FINISH** VETRESIT 14 sheets and strips are usually supplied „as pressed“, with a smooth surface. VETRESIT 14 can be ground on one or both sides for closer thickness tolerances or other special requirements (e.g. varnishing). Grinding does not affect the water absorption properties of the material.

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**STANDARDS** VETRESIT® 14 meets the following standard specifications:

ISO 1642	:	EP GC3
NEMA LI 1	:	Grade G 11
DIN/EN 60893	:	EP GC 203

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	Properties		Standards	Units	Values
	Support: Glass fabric (GC)		ISO 1172	mass %	≥ 60 <sup>1)</sup>
	Density		ISO 1183	g/cm <sup>3</sup>	1,6 - 2,0
<b>Electrical properties</b>	Electric strength, ⊥ 50 Hz, 1 min., h = 3 mm	23 °C	IEC 243	kV/mm	13,5 - 20
		90 °C			13,5 - 20
	Electric strength,    50 Hz, 1 min., h = 25 mm	23 °C	IEC 243	kV/mm	1,6 - 2,2
		90 °C			1,6 - 2,2
	Volume resistivity		IEC 93	MΩ · cm	10 <sup>6</sup> - 10 <sup>10</sup>
	Surface resistivity		IEC 93	MΩ	10 <sup>5</sup> - 10 <sup>9</sup>
	Insulation resistance, wet		IEC 167	MΩ	≥ 5 · 10 <sup>4</sup>
	Dissipation factor tan δ 50 Hz	23 °C	IEC 250		0,02 - 0,04
90 °C		0,03 - 0,10			
Relative permittivity ε <sub>r</sub> 50 Hz	23 °C	IEC 250		4,0 - 5,5	
	90 °C			4,5 - 6,0	
Comparative tracking index (Solution A)		IEC 112	CTI	250	
<b>Mechanical properties</b>	Tensile strength	MR	ISO 527	N/mm <sup>2</sup>	220 - 350
		QR			220 - 300
	Flexural strength	MR	ISO 178	N/mm <sup>2</sup>	350 - 450 <sup>2)</sup>
		QR			350 - 450 <sup>2)</sup>
	Compressive strength	⊥	ISO 604	N/mm <sup>2</sup>	350 - 500
					250 - 350
	Impact strength	⊥	ISO 179	kJ/m <sup>2</sup>	100 - 180
		100 - 180			
Notched specimen impact (Charpy)	⊥	ISO 179	kJ/m <sup>2</sup>	50 - 130	
				50 - 80	
Flexural modulus of elasticity	MR	ISO 178	N/mm <sup>2</sup>	18 - 23 · 10 <sup>3</sup>	
	QR			18 - 23 · 10 <sup>3</sup>	
Splitting load			DIN 53463	N	3000 - 4000
<b>Thermal properties</b>	Temperature class		IEC 85	-	F (155 °C)
	Linear thermal expansion (20 - 100°C)	⊥	DIN 52328	°K <sup>-1</sup>	13 - 20 · 10 <sup>-6</sup>
					40 - 60 · 10 <sup>-6</sup>
	Thermal conductivity (20 - 100°C)		⊥	VDE 0304 T1	W/m K
Flammability h = 1 mm			ASTM D - 635		self-extinguishing

<sup>1)</sup> For thickness < 2mm: 50%.

<sup>2)</sup> After heating for 1h at 150°C the flexural strength of the material should be at least 50% of the ambient temperature value.

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	Properties	Standards	Units	Values
<b>Physical and chemical properties</b>	Water absorption h = 4 mm, Test A	ISO 62	mg mass %	≤ 23 ≤ 0,10
	Oil absorption (24h/55°C + h = 4 mm 4h in Oil 90°C)		mass %	≤ 0,01
	Resistance against: – solvents (except phenols and ketones) – mineral oils – Acids (diluted), bases	ASTM D-543		good very good good
	⊥	perpendicular to layers		
	∥	parallel to layers		
	MR	machine direction along support		
	QR	cross direction to support		

*The properties values have been determined by standard test specimens- shown above. The data cannot be used directly for structural components.*

*Unless otherwise specified, all data were measured at ambient temperature. The contents of this publication are based on our present experience. They are an indication for application of our products without any liability for us. Notice of legal requirements and existing patent rights has to be taken.*

*Due to the many application and manufacturing process possibilities, we cannot give any warranty for the technical results in individual cases.*



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