



Technical data

Laminating ceramic

R&G laminating ceramic is a refined, synthetic hard shell plaster exhibiting great hardness

Description

- **Absolutely non-toxic and environmentally acceptable material**
- **Very easy to use, fast curing**
- **Precise, distortion-free moulds with low expansion (moulding precision 0.2-0.3 mm per meter)**
- **Low-priced**
- **Suitable for normal pressure and vacuum**
- **Resistant up to 150 °C (without epoxy gealcoat)**

Processing

The **one-component powder** is mixed with water and cures completely, free of stress, and with very low expansion (approx. 0.2–0.3 mm per metre) in fifty minutes.

Laminating ceramic **can be combined with epoxy mould resin overlays**. This yields polishable, wear-resistant surfaces with a highly rigid and precise backup coat that is easy to apply. We recommend to use mould resin P + hardener EPH 573.

The advantages associated with this structure have been utilised in the construction of aircraft and automobiles for a number of years.

Moulds for 1:1 prototypes, engine cowlings, aircraft wings and fuselages as well as foaming and pressure moulds are made of this material.

Application limits

Although heat-resistant, moulds of **laminating ceramic with epoxy resin overlays** should not be exposed wherever possible to temperatures greater than approx. 50 °C.

At higher temperatures, the epoxy resin overlays undergo slight shrinkage when post-curing, whereas the laminating ceramic remains dimensionally stable. This can cause the mould to warp slightly, and plane surfaces may exhibit waviness.

Release agents

The overlay, like the customary GRP moulds, consists of **epoxy mould resin**, so the established R&G release agents can be used.



Laminierkeramik	Verarbeitung	Formenbau + Materialverbrauch
<p>White, low-viscosity compound for impregnating M1 glass fabric to make laminates with high tensile bending strength.</p> <ul style="list-style-type: none"> - For constructing moulds of all sizes - Each fabric layer yields a coat thickness of approx. 5 mm - One to two layers are sufficient, depending on the size of the mould 	<p>Scatter the powder in water, and mix vigorously (by hand or with a whisk)</p>	<p>In combination with epoxy mould resins as overlay. Recommended layout:</p> <ol style="list-style-type: none"> 1.) Mould resin P + Hardener EPH 573 (= 0,25 kg/m²) 2.) 2 layers 163 g/m² glass fabric + epoxy resin + Hardener L (= 0,58 kg/m²) 3.) 1 layer 280 g/m² glass fabric + epoxy resin + Hardener L (= 0,5 kg/m²) 4.) 1 layer M1 glass fabric + laminating ceramic + water = 11.5 kg <p>Total mould weight with 1 layer laminating ceramic approx. 12.8 kg/m² with 2 layers laminating ceramic approx. 24.3 kg/m²</p>

M 1 Glass fabric

Highly drapable, thick fabric mat complex

Specifically suitable for making lightweight, high-strength laminates in conjunction with R&G laminating ceramic. Each layer yields a coat thickness of approx. 5 mm in the laminate. Processing this fabric involves cutting it into manageable pieces, immersing the pieces into the low-viscosity ceramic compound to pre-impregnate them, and then laying them up.

Delivered width: 50 cm
Weight: 600 g/m² (± 15 %)

Packaged quantities: 1 m - 50 m, order no. 190 174-X



Making of a female mould for a receptacle



Structure of the M1 mat / fabric

All information, recommendations, and advice on the part of R&G Faserverbundwerkstoffe GmbH are published to the best of our knowledge and belief. They are noncommittal and contain neither explicit nor tacit assurance or warranty of particular properties. The values specified for properties are typical figures. Recommendations or advice serve to describe our products and possible applications in a general or exemplary, but not specifically individual manner. In the course of the constant technical advancement and improvement of our products there may be changes to the characteristic values, copy, and diagrams; no specific reference is made to any such change. Owing to our products' wide and highly diverse range of potential applications far beyond any of our attempts to analyse, the customer alone is responsible for examining our products' suitability for the respective processes and purposes and their respective processibility. All and any protective rights and the applicable laws, terms, and conditions must be observed by the buyer or user of our products at their own responsibility. Publication is not a licence and does not intend the violation of any patents.

Edition 01/2010, subject to change





Laminating and cast resin

Low-viscosity compound for laminating with M 1 glass fabric

Description

Particular advantages: high dimensional accuracy, reinforced with M1 special fabric for particularly high tensile bending strength.

Application

Laminating ceramic is ideal for making moulds of any size. Moulds are also possible for longer components (fuselages, large surfaces, boat hulls).



Processing

Scatter the powder in water, and mix vigorously until all lumps have disappeared. A drilling machine with a cage-type paddle can be used to mix larger quantities. Smaller quantities can be mixed with a hand whisk.

Mould layout

First an overlay of mould resin is applied to the master pattern. After initial gelling, small radii and edges are filled with inspissated epoxy laminating resin (e.g. epoxy resin L + hardener L and cotton flock or chopped glass fibres), and two to three layers of glass fabric applied to the mould surface. One possible layout consists of two layers of 163 g/m² and one layer of 280 or 390 g/m² glass filament fabric, each impregnated with epoxy laminating resin.

M1 glass fabric pre-impregnated with laminating ceramic is applied directly to the wet laminate. M1 is a fabric / mat complex manufactured specifically for the laminating ceramic.

Processing the M1 fabric involves cutting it into manageable pieces of approx. 30 x 30 cm. These pieces are impregnated in a pail containing laminating ceramic and then laid up. Each layer yields a coat thickness of approx. 5 mm. Stiffening ribs can be integrated when the pre-impregnated mat pieces are rolled up, applied, and pressed into place.

Laminating ceramic is a physiologically safe material. Special industrial safety precautions are not necessary.

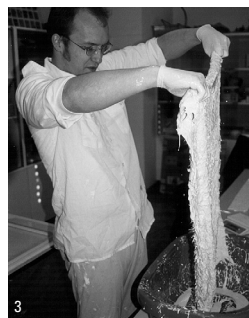
Packaged quantities 1 kg to 25 kg, order no. 115 315-X



The laminating ceramic is mixed (0.28 l water to 1 kg powder)



The M1 fabric is immersed



After pre-impregnation...



... the M1 fabric is laid on the "wet" epoxy resin laminate ...



... and carefully pressed on by hand

Edition 01/2010, subject to change

All information, recommendations, and advice on the part of R&G Faserverbundwerkstoffe GmbH are published to the best of our knowledge and belief. They are noncommittal and contain neither explicit nor tacit assurance or warranty of particular properties. The values specified for properties are typical figures. Recommendations or advice serve to describe our products and possible applications in a general or exemplary, but not specifically individual manner. In the course of the constant technical advancement and improvement of our products there may be changes to the characteristic values, copy, and diagrams; no specific reference is made to any such change. Owing to our products' wide and highly diverse range of potential applications far beyond any of our attempts to analyse, the customer alone is responsible for examining our products' suitability for the respective processes and purposes and their respective processibility. All and any protective rights and the applicable laws, terms, and conditions must be observed by the buyer or user of our products at their own responsibility. Publication is not a licence and does not intend the violation of any patents.





Laminating ceramic	Data
Delivered state	powdery
Colour	ivory
Mixing ratio	1 kg powder to 0,28 l water = 0,6 l moulding compound
Consumption 1 layer M 1 fabric (= 5 mm)	8,5 kg powder per m ² laminate + 2,38 l water
Consumption 2 layers M 1 fabric (= 10 mm)	17 kg powder per m ² laminate + 4,76 l water
Processing time	35 min
Final solidification	50 min
Tensile bending strength	38 MPa
Heat resistance	approx. 150 °C (without epoxy overlay!)
Storage (well sealed)	practically unlimited

All information, recommendations, and advice on the part of R&G Faserverbundwerkstoffe GmbH are published to the best of our knowledge and belief. They are noncommittal and contain neither explicit nor tacit assurance or warranty of particular properties. The values specified for properties are typical figures. Recommendations or advice serve to describe our products and possible applications in a general or exemplary, but not specifically individual manner. In the course of the constant technical advancement and improvement of our products there may be changes to the characteristic values, copy, and diagrams; no specific reference is made to any such change. Owing to our products' wide and highly diverse range of potential applications far beyond any of our attempts to analyse, the customer alone is responsible for examining our products' suitability for the respective processes and purposes and their respective processibility. All and any protective rights and the applicable laws, terms, and conditions must be observed by the buyer or user of our products at their own responsibility. Publication is not a licence and does not intend the violation of any patents.

Edition 01/2010, subject to change





Example applications

Aircraft construction — a flying wing



An M1 fabric layer pre-impregnated with laminating ceramic is laid on the "wet" epoxy resin laminate



Stiffening ribs of M1 fabric/laminating ceramic reinforce the rear side of the mould



The female mould's inner side shows the smooth, glossy surface of R&G mould resin P

Aircraft construction — a single-seater sports plane



M1 glass fabric is measured and cut to size



The edge reinforcements are laminated



The finished edge reinforcements. A honeycomb sandwich construction was adopted for the large surfaces to reduce weight.

Aircraft construction — cowlings



Engine cowlings for a General Electric CF 6/50 (Boeing 747, DC 10, Airbus A 300). The master pattern is lifted with a crane



Side view of the finished mould



Radome of ceramic moulding compound

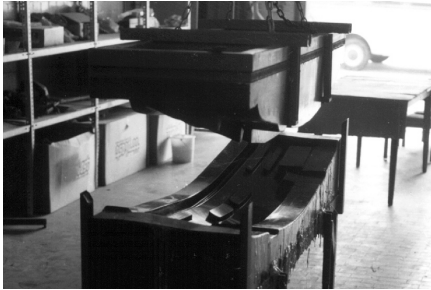
Edition 01/2010, subject to change

All information, recommendations, and advice on the part of R&G Faserverbundwerkstoffe GmbH are published to the best of our knowledge and belief. They are noncommittal and contain neither explicit nor tacit assurance or warranty of particular properties. The values specified for properties are typical figures. Recommendations or advice serve to describe our products and possible applications in a general or exemplary, but not specifically individual manner. In the course of the constant technical advancement and improvement of our products there may be changes to the characteristic values, copy, and diagrams; no specific reference is made to any such change. Owing to our products' wide and highly diverse range of potential applications far beyond any of our attempts to analyse, the customer alone is responsible for examining our products' suitability for the respective processes and purposes and their respective processibility. All and any protective rights and the applicable laws, terms, and conditions must be observed by the buyer or user of our products at their own responsibility. Publication is not a licence and does not intend the violation of any patents.





Automobile construction — a cold-pressing mould for BMW front spoilers



Upper and lower mould halves



Closed pressure mould



Painted spoiler on the BMW 3 Series AWD model

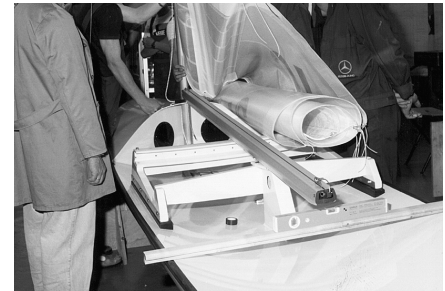
Boot building — a sailing canoe



Female mould of epoxy resin / laminating ceramic



The finished hull is glued to the top panel



The superstructure is assembled

Boot building — a mould for a glider's wing



M1 glass fabric pre-impregnated with laminating ceramic is laid on the wet epoxy resin / glass fabric laminate



Each mould half is stiffened with two 50 mm aluminium tubes



Male and female

All information, recommendations, and advice on the part of R&G Faserverbundwerkstoffe GmbH are published to the best of our knowledge and belief. They are noncommittal and contain neither explicit nor tacit assurance or warranty of particular properties. The values specified for properties are typical figures. Recommendations or advice serve to describe our products and possible applications in a general or exemplary, but not specifically individual manner. In the course of the constant technical advancement and improvement of our products there may be changes to the characteristic values, copy, and diagrams; no specific reference is made to any such change. Owing to our products' wide and highly diverse range of potential applications far beyond any of our attempts to analyse, the customer alone is responsible for examining our products' suitability for the respective processes and purposes and their respective processibility. All and any protective rights and the applicable laws, terms, and conditions must be observed by the buyer or user of our products at their own responsibility. Publication is not a licence and does not intend the violation of any patents.

Edition 01/2010, subject to change

