

# APPLICATION MANUAL

## Composite Mold Making System with SikaBiresin® GC155

17.12.2024 / VERSION 01 / SIKA SERVICES AG

## HEALTH AND SAFETY EQUIPMENT

Use protection gear according to the Safety Data Sheet as described below.

## REQUIREMENTS (PRECONDITIONS AND ACTIONS)

Brief description of the content of the following list

- All SikaBiresin® products mentioned in this document are suitable for experienced professional users only. Tests under actual processing conditions and with additional materials such as fibers and release agents must be performed to proof material compatibility
- Use this application manual in conjunction with the current Product Data Sheets
- The material temperature and the ambient temperature of the workshop shall be between 18-25 °C. Materials need approx. 48 h to climatize. If stored in colder conditions make sure it is not crystallized. In case the material is crystallized, proceed according to the instructions provided in the Product Data Sheet, to remove the crystallization.
- The workshop and tools must be free of contaminants (e.g. dust, soil, release agents or solvents)
- Use a plug or model, that can withstand a temperature of 60 °C for several hours without deformation
- Use wax-based release agent in combination with the gelcoat system (no semi-permanent release agent). Please make sure that your preferred release agent works well with the gelcoat system. Small scale trials are recommended.

## INTRODUCTION

The new SikaBiresin® mold making system consists of four different epoxy resin systems:

- SikaBiresin® GC155 (Gelcoat)
- SikaBiresin® CR169thix (Coupling layer)
- SikaBiresin® CR168 (Wet Lay-up laminating resin)
- SikaBiresin® CR131 (Infusion resin)

The system is developed and optimized to produce large-scale fibre-reinforced Composite molds with high thermal stability up to 140°C.

Due to the long potlife and processing window of the epoxy resin systems, it offers a high degree of flexibility and processing safety, to support the production of high-quality molds.

This application manual focuses on the production of the so-called “skin coat”, consisting of gelcoat, coupling layer and laminating resin. The subsequent infusion processing with the SikaBiresin® CR131 system is not part of this manual.

## ADDITIONAL INFORMATION

The individual Product Data Sheet shall prevail over this “Application Manual”. All conditions stated in the individual Product Data Sheet regarding application, storage, etc. shall continue to apply.

APPLICATION MANUAL

Composite Mold Making System

with SikaBiresin® GC155

17.12.2024, VERSION 01

APPLICATION MANUAL Composite Molds.docx

Corporate / English

## APPLICATION GUIDELINE

### Gelcoat SikaBiresin® GC155

Mix SikaBiresin® GC155 (A) with SikaBiresin® GC155 (B) following the mixing ratio indicated in the latest Product Data Sheet. Small amounts can be mixed by hand with a wooden spatula. Bigger amounts must be mixed by machine to ensure sufficient homogenization within a certain time frame. Machine mixing process is approved with a star-shaped stirrer at rotation speed < 300 rpm, to minimize air entrapment in the material. Mix at least three minutes for full homogenization and apply the mixture within 1 hour after mixing. The gelcoat system SikaBiresin® GC155 can be applied to the plug surface by using a roller or a brush.

#### Roller Application:

The application of the gelcoat by roller is tested and approved with a short pile laminating roller (also known as sheepskin/lambskin roller).

Distribute the gelcoat evenly on the model with sufficient pressure to ensure the recommended layer thickness of 300-400 µm. Always make sure to move the roller with plenty of material on the mold surface to avoid running dry. Regularly check the thickness of the wet gelcoat film, using a wet film comb. While classical gelcoats may only be applied in one direction by brush, SikaBiresin® GC155 can be applied in various directions by roller (criss-cross). Keeping the recommended layer thickness mentioned above is crucial. Lower film thickness may result in blank spots, whereas higher film thickness may promote sagging on vertical surfaces.

#### Brush Application:

For brush application the bristles must have a length of 2-3 cm. Longer brushes can be carefully cut to the required length using a pair of scissors. Apply the material in long, parallel strokes, working in one direction only. Always make sure to move the brush with plenty of material on the mold surface to avoid running dry. Regularly check the thickness of the wet gelcoat film, using a wet film comb. Keeping the recommended layer thickness mentioned above is crucial. Lower film thickness may result in blank spots, whereas higher film thickness may promote sagging on vertical surfaces.




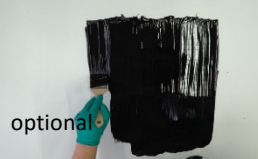
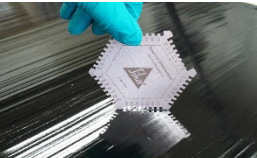
#### General advice for gelcoat application:

Before proceeding with the coupling layer, the gelcoat film must reach the tack stage. At an ambient temperature of 23 °C the tack stage is reached after approx. 5-6 hours. Higher or lower ambient temperatures will influence the timing. The tack stage can be verified by slightly streaking a glove-protected finger over the gelcoat. The tack stage is reached when an indentation is visible on the gelcoat, but no material remains on the glove. If material is visible on the glove as well, the tack stage has not yet been reached. For classical gelcoats it is important to apply the coupling layer before the gelcoat is completely dry. One of the big advantages for SikaBiresin® GC155 is the fact that the gelcoat can be left to dry/cure at room temperature (23 °C) before starting with the coupling layer.

The tack stage has successfully been tested to be persistent for an interval up to 24 hours after application of the gelcoat at 23 °C and humidity <70 % RH. Longer open times need to be verified with Sika's Technical Service.

If the open time of the gelcoat has passed, the adhesion to the subsequent layers can be lower or might fail completely. The advantage of leaving the gelcoat to dry (up to 24 h) before applying the coupling layer is the decreased risk of damaging the wet gelcoat layer. Furthermore, it gives more flexibility in



production. After application of the gelcoat, there is a window of 6-24 hours to apply the coupling system. However, it is crucial to ensure a clean and dust-free environment and/or protect the open gelcoat.

<p><b>1</b></p>	<p>Prepare tools for mixing and application of the gelcoat. Machine mixing with a star-shaped stirrer at up to 300 rpm for at least 3 minutes. Application by with a short pile laminating roller. Optionally a brush with short bristles (2-3 cm) can be used.</p>		<p>optional</p> 
<p><b>2</b></p>	<p>Apply the gelcoat preferably by laminating roller. Optionally a brush can be used. In this case it is important to apply in one direction only. Independently of the application method, a layer thickness of 300-400 µm is recommended.</p>		<p>optional</p> 
<p><b>3</b></p>	<p>During application regularly check the layer thickness by using a wet film comb. Correct the layer thickness when out of specification.</p>		

**Coupling layer SikaBiresin® CR169 thix**

Apply coupling layer only when the gelcoat is sufficiently dry (see description of tack stage above). Mix SikaBiresin® CR169thix (A) with hardener SikaBiresin® CH132-5, following the mixing ratio indicated in the latest Product Data Sheet. Small amounts can be mixed by hand with a wooden spatula. Bigger amounts must be mixed by machine to ensure sufficient homogenization within a certain time frame. Machine mixing process is approved with a star-shaped stirrer at rotation speed < 300 rpm, to minimize air entrapment in the material. Due to the high difference in viscosity/thixotropy between component A and B for this resin system, proceed especially careful at the beginning of the mixing process to avoid splattering of the hardener. Mix at least three minutes for full homogenization and apply within 45 minutes after mixing.

The coupling layer is best applied by roller (e.g. sheepskin roller) to receive a thin film. The layer thickness is not defined for the coupling layer but should be as low as possible. Its purpose is to ensure the chemical bonding between gelcoat and FRP laminate. Thick layers of coupling resin bear the risk of sagging.



<p><b>4</b></p>	<p>Prepare tools for mixing and application of the coupling layer SikaBiresin® CR169thix. Machine mixing with a star-shaped stirrer at up to 300 rpm for at least 3 minutes. Due to a large viscosity gap between A- and B-component, there is an increased risk of splattering at the beginning of the mixing process. Make sure to start with low mixing speed.</p>	
<p><b>5</b></p>	<p>Apply the coupling resin by laminating roller. The product shall be applied in thin layers, covering the whole gelcoat surface.</p>	

### **Laminating resin SikaBiresin® CR168**

The reinforcement layers of the skin coat can be applied directly after finishing the coupling layer. However, they need to be in place before the coupling layer is dry, to ensure a sufficient bonding. Mix SikaBiresin® CR168 (A) with SikaBiresin® CH132-5, following the mixing ratio indicated in the latest Product Data Sheet. Small amounts can be mixed by hand with a wooden spatula. Bigger amounts must be mixed by machine to ensure sufficient homogenization within a certain time frame. Machine mixing process is approved with a star-shaped stirrer at rotation speed < 300 rpm, to minimize air entrapment in the material. Mix at least three minutes for full homogenization and apply within 45 minutes after mixing.

SikaBiresin® CR168 is a viscosity optimized resin for Wet Lay-up, best applied by roller (e.g. sheepskin roller) on the fabrics. It is successfully tested with 2 layers of glass fabric twill weave 200 g/m<sup>2</sup>. Make sure to laminate the fabrics without wrinkles and air entrapments. The slight thixotropic modification of SikaBiresin® CR168 prevents sagging on vertical areas but requires a little more effort to wet out the fibers properly, compared to conventional wet lay-up systems. If necessary, use a grooved roller to compress the layers and air entrapments.

After finishing the last reinforcement layer of the skin coat, add one layer of peel-ply, using the same laminating technique. Do not use coated or PTFE based peel ply, as this could weaken the adhesion to the following main laminate.

<p><b>6</b></p>	<p>Prepare tools for mixing and application of the laminating resin SikaBiresin® CR168. Machine mixing with a star-shaped stirrer at up to 300 rpm for at least 3 minutes.</p>	
<p><b>7</b></p>	<p>Apply the laminating resin on the reinforcement layers by laminating roller. Make sure to wet out all areas of the fiber material to avoid dry spots. It is recommended to use a grooved compression roller to remove potential air entrancements from the laminate.</p>	

**Pre-cure and further processing**

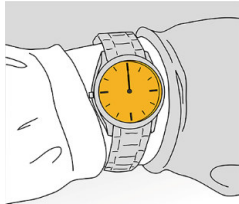

A pre-cure is highly recommended to avoid micro-cracking and delamination of the laminate due to further processing or demolding. The pre-cure should be at least 4 hours at 60°C with a heat-up rate of approx. 10 °C/h. Cool-down to ambient temperature before removing the peel-ply.

The peel-ply shall not be removed from the skin coat until subsequent processing (e.g. proceeding with the main/infusion laminate). This is necessary to ensure a clean and freshly activated surface to obtain optimal bonding between the layers.

Remove the peel-ply in a flat angle to the mold surface to avoid damage inside the laminate. No vertical pulling.

The resulting surface must be dry and roughly structured by the peel-ply. Otherwise, the adhesion to the following layers can be negatively affected.

Subsequently, the installation of the main laminate by infusion or wet lay-up may follow.

<p><b>8</b></p>	<p>After finishing the skin coating process curing over night at ambient temperature (approx. 23 °C) followed by a pre-cure is highly recommended. Suitable pre-cure process is 4 hours at 60 °C with a heating rate of 10 °C/h. Make sure to have a homogeneous heat distribution over the whole mold surface.</p>	
<p><b>9</b></p>	<p>Pull off the peel ply in a flat angle to avoid damage inside the laminate. No vertical pulling! The peel ply protects the laminate surface from pollution. Therefore, it should be removed shortly before the next processing step (dry fiber lay up for infusion laminate).</p>	

Version given by



## LEGAL NOTE

The information and, in particular, the recommendations relating to the application and end-use of Sika products, are given in good faith based on Sika's current knowledge and experience of the products when properly stored, handled and applied under normal conditions in accordance with Sika's recommendations. In practice, the differences in materials, substrates and actual site conditions are such that no warranty in respect of merchantability or of fitness for a particular purpose, nor any liability arising out of any legal relationship whatsoever, can be inferred either from this information, or from any written recommendations, or from any other advice offered. The user of the product must test the products suitability for the intended application and purpose. Sika reserves the right to change the properties of its products. The proprietary rights of third parties must be observed. All orders are accepted subject to our current terms of sale and delivery. Users must always refer to the most recent issue of the local Product Data Sheet for the product concerned, copies of which will be supplied on request.