Mold Making with Fiber-Reinforced Composites

Polyester Resin and Fiberglass Mat

With a little craftsmanship, making a mold isn't that difficult. A mold should be built under optimal conditions, meaning the material and room temperature should be around 20°C.
A dust-free environment and, if necessary, a dust extraction system should be available.
You'll also need the necessary materials. For a fiberglass-reinforced plastic (FRP) mold, you'll need the following:

Materials:

- Viapal Molding Coating UP 935 B
- DIEPAL 2140 or Alnex polyester resin
- 150/m² fiberglass mat
- 300/m² fiberglass mat
- Standard release wax
- PVA release coating
- Acetone

Tools and Resources:

- Modeling clay
- Digital scale
- Brushes and de-airing rollers
- Mixing cups and stirring sticks
- Cutter and scissors
- Dosing syringe
- Disposable gloves
- Respirator









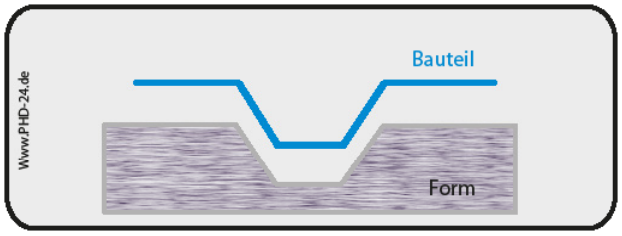
See also our list of materials with part numbers and a link on page 14.

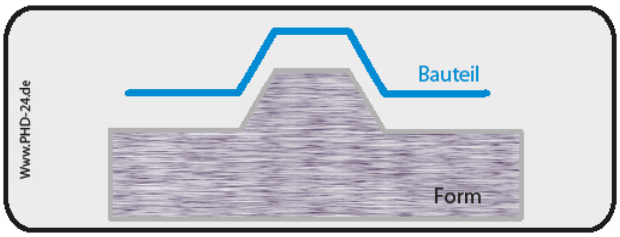
Form Types

There are essentially two types of forms:

The negative mold is used for smooth exterior surfaces, such as visible parts in model making or automotive bodywork (hoods).

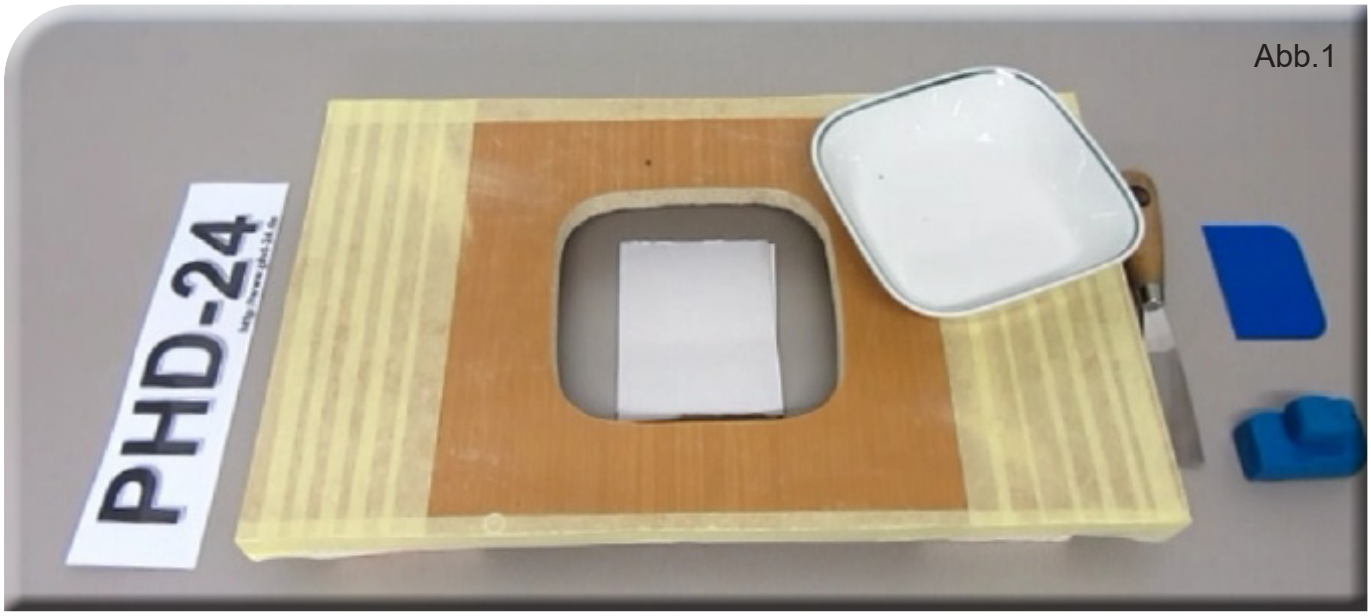
The positive mold is used for smooth inner surfaces, such as containers or pools.





Master Model

In these instructions, we assume that a master model is available. (See Fig. 1)



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You can also make a master model out of wood, plaster, modeling clay, aluminum, or fiberglass-reinforced plastic (FRP). For a master model made of an absorbent material, such as plaster, a smooth surface is achieved by coating or sealing the mold with a topcoat resin or varnish. It is important that the master model be made very cleanly and precisely, as this will ultimately save a lot of time and rework on the finished parts.

Partition Board Joints / Gap Covers

You can use putty or modeling clay.
Roll the modeling clay into small worms, press them into the gap, and then carefully trim off the excess with a blade or putty knife.
Mix the body filler with a small amount of hardener and apply it to the gap.
Using less hardener gives you time to trim the body filler with a blade or putty knife before it hardens. (See Figs. 2 and 3)

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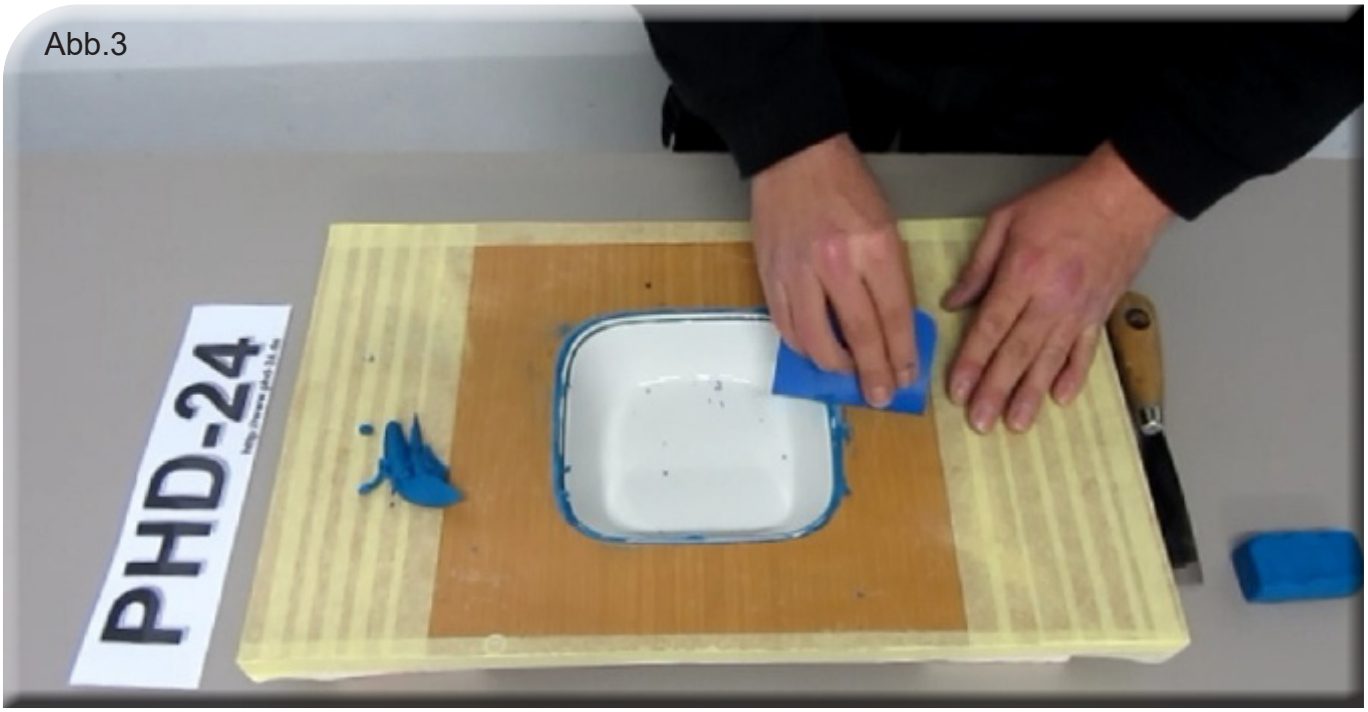

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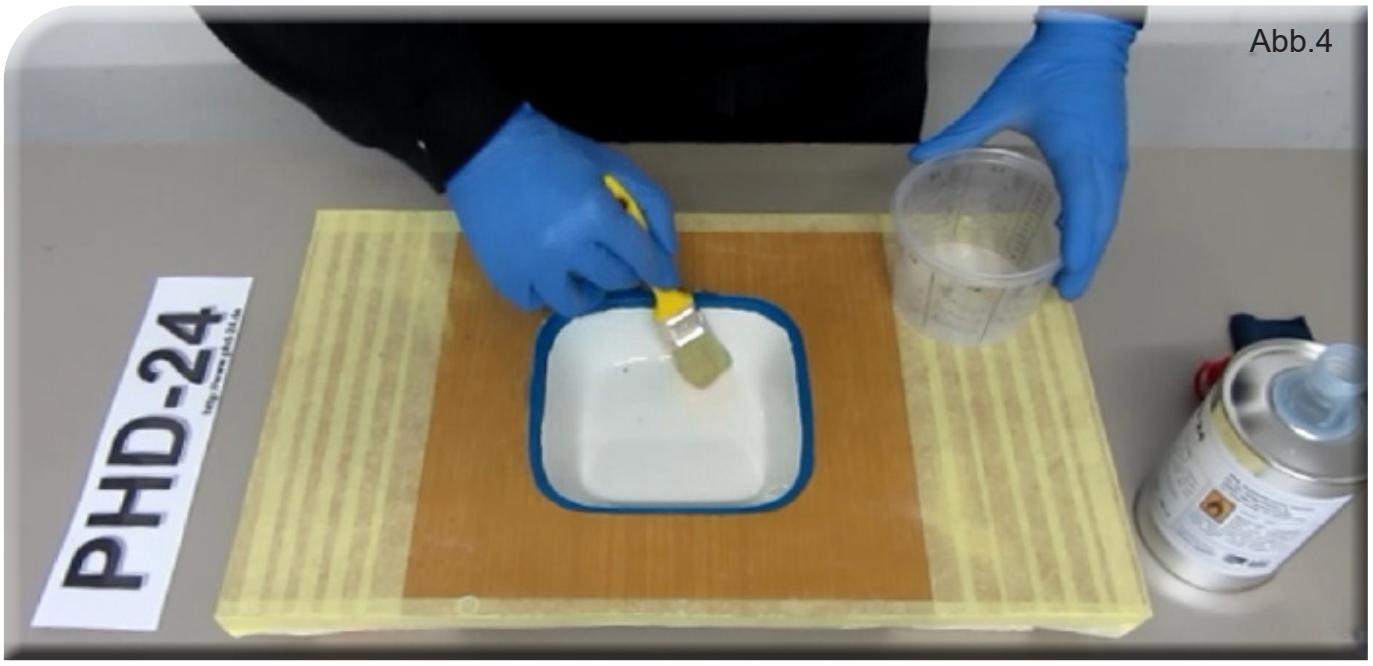
Separating layer(s)

For an optimal release layer, we recommend the following application process:

Layer 1:
Apply standard release wax using a brush, cotton cloth, or spray gun (spray pressure of 2.5–3.5 bar and a nozzle size of 1.2–1.5 mm), let it sit for 2 minutes, and polish. (See Fig. 4) For hard-to-reach areas, we recommend release spray wax.



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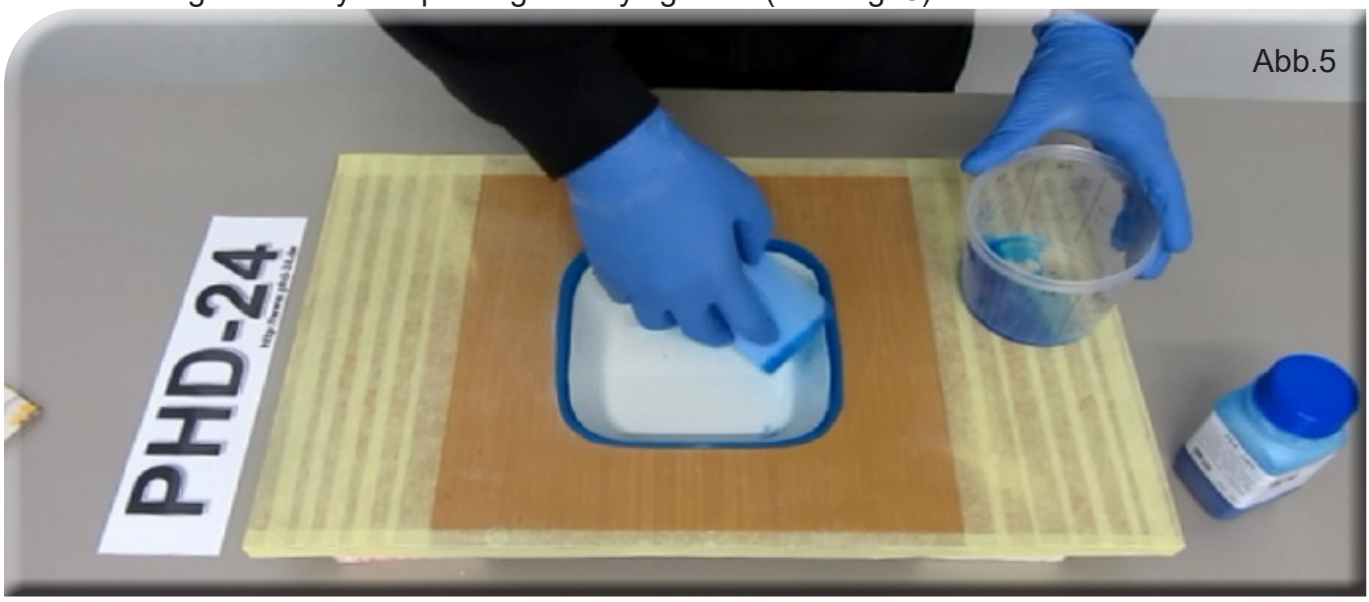
Layer 2:
The PVA varnish can be applied with a fine-pored sponge, a brush, or a spray gun (spray pressure of approx. 3–3.5 bar and a 1–1.5 mm nozzle). The drying time is approximately 20 minutes (at 20°C); when using a spray gun, it is approximately 10 minutes. High humidity can prolong the drying time. (See Fig. 5)



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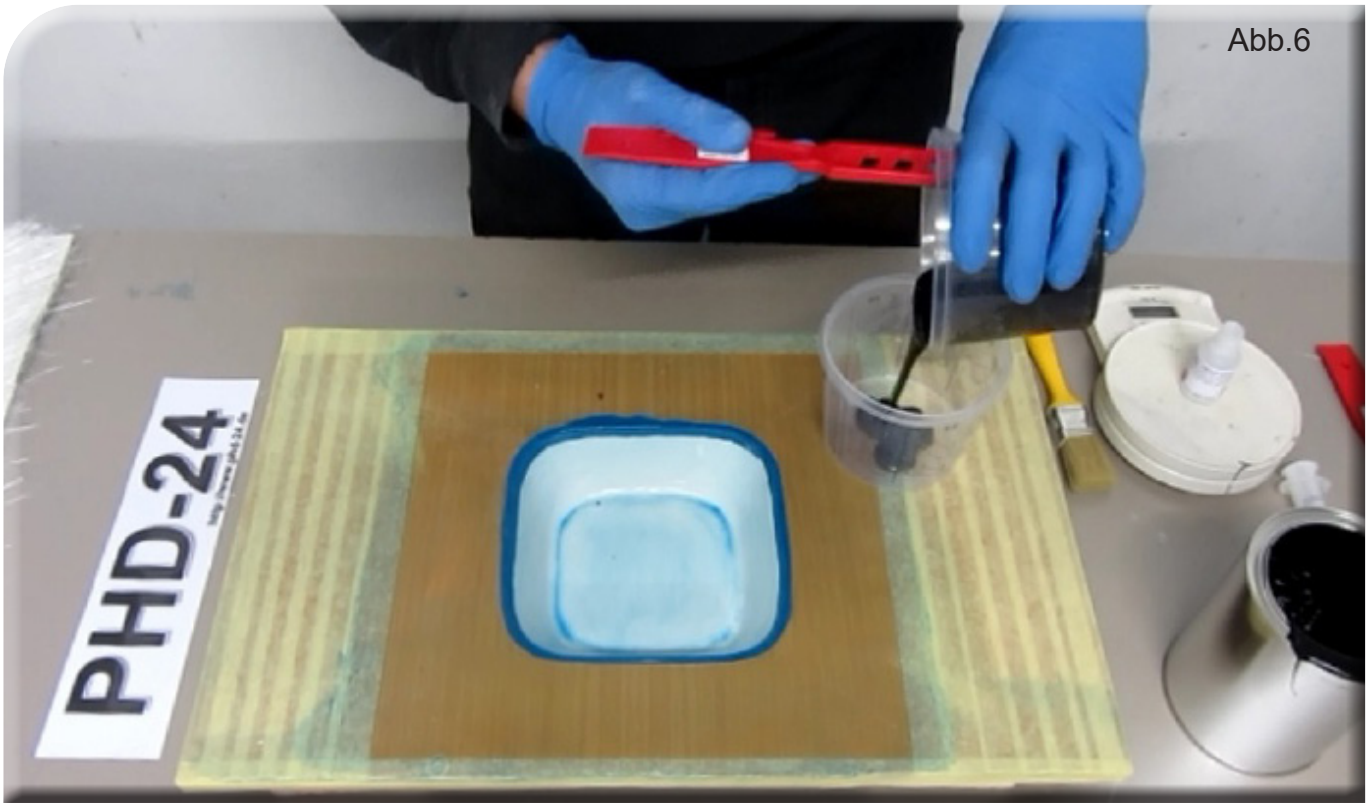
Laminating

You should have all the materials ready and cut or tear the fiberglass mats to size.
To calculate how much gelcoat is needed, you can weigh a piece of fiberglass mat cut to fit the mold.

Example: The cut piece of 300 g/m² fiberglass mat weighs 200 grams.
Calculate the surface area: 200g ÷ 300g/m² = 0.67m²
Recommended application rate for mold-building gelcoat: 500–850g/m².
Calculate the amount of resin: 850 g/m² × 0.67 m² = 569.5 g
With a hardener addition of 2%, this would be (rounded):
550 g of Mold-Building Gelcoat and 11 g of hardener

Mix the Mold-Building Gelcoat UP 935 B with the hardener and transfer it to another container. This prevents resin that has not been thoroughly mixed from remaining at the edges and bottom of the original container. (See Fig. 6)



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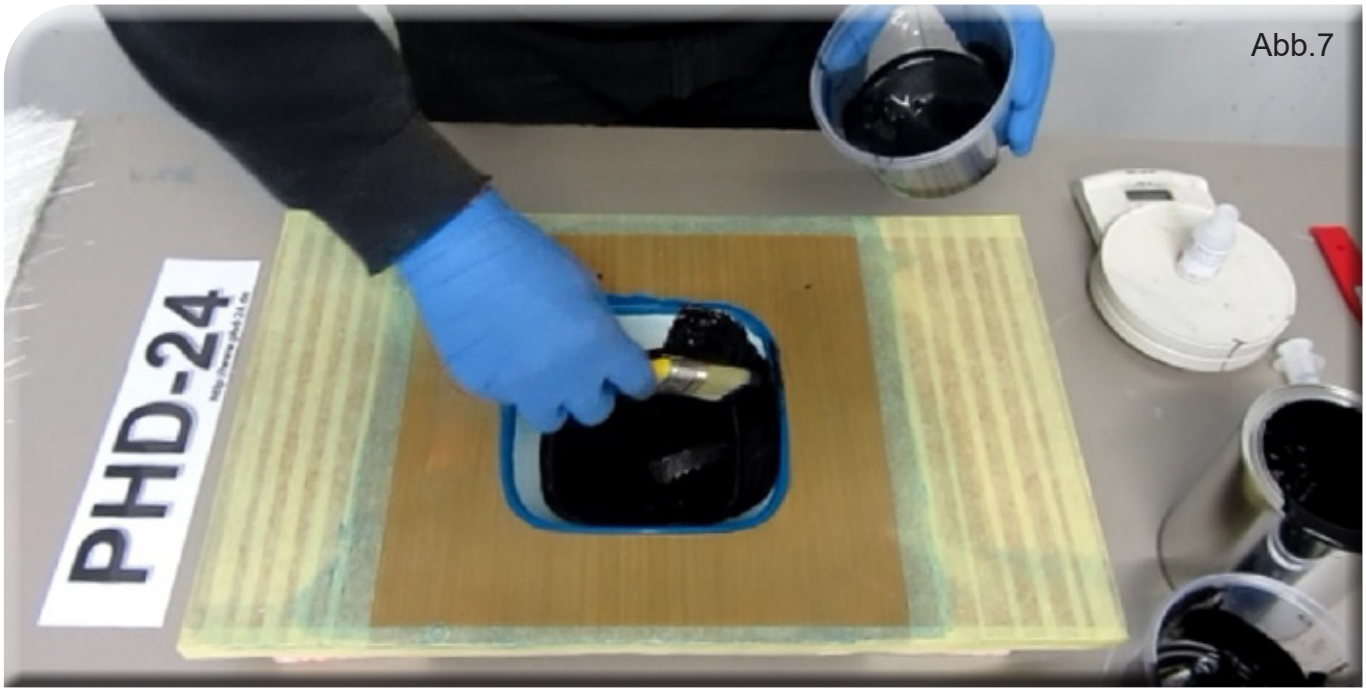
Apply the mixture to the mold, spreading it in one direction whenever possible to avoid air pockets. Allow the resin to set until the surface is still slightly tacky but no longer stringy. The best way to check this is with the finger test (wear gloves!). To achieve an even surface, it is advisable to apply two coats, allowing the first coat to set until it passes the finger test. (See Fig. 7)



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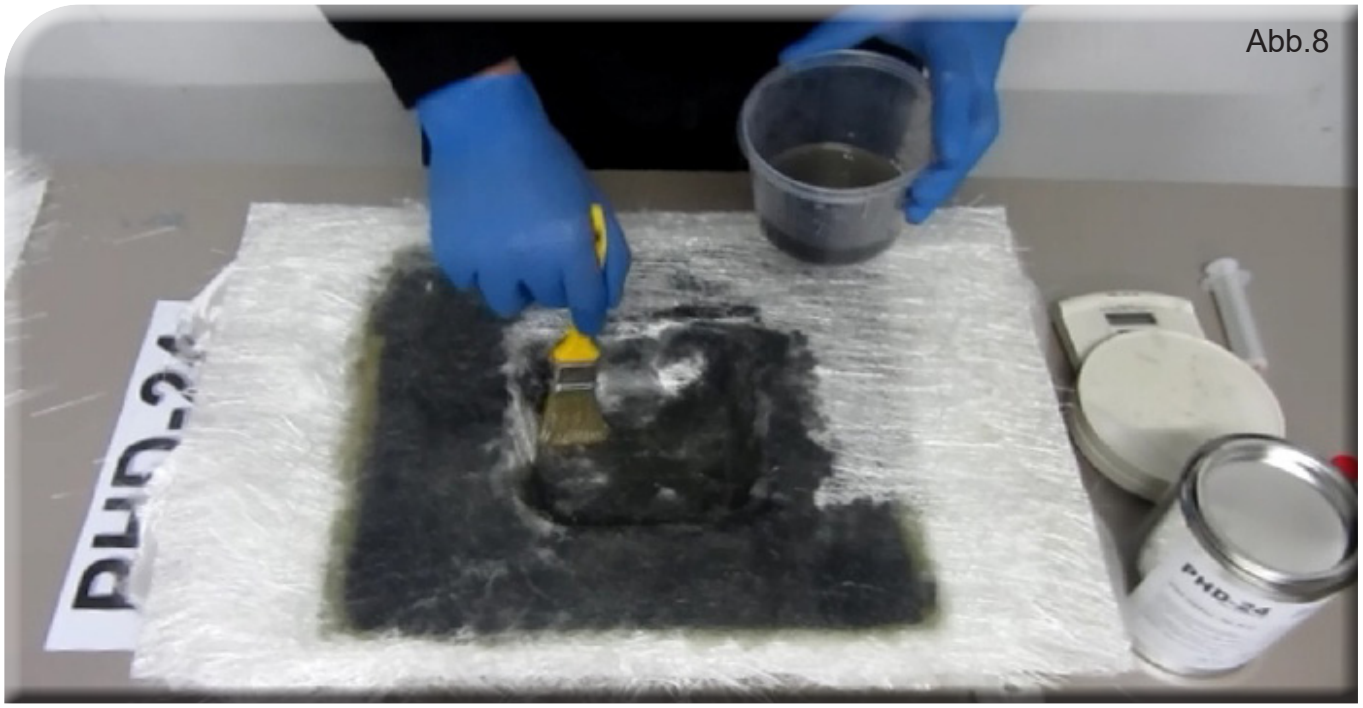
After applying the second layer, continue laminating wet-on-wet! Mix DIEPAL polyester resin with 1.5% hardener.

To determine the amount of resin, you can use the following rule of thumb:
Total glass weight × 2.5 = amount of resin.

Apply a coat of resin to the mold, lay down the first layer of 150 g/m² fiberglass mat, and saturate the fabric. Use a brush to smooth and dab from the center toward the edges to remove any air still trapped in the laminate. (See Fig. 8)



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If the fiberglass layer appears transparent, it is ideal; if white spots are visible, apply a small amount of resin with a brush. Alternatively, you can use a de-airing roller. Continue working with a 300 g/m² fiberglass mat and repeat the steps until the second-to-last layer. Approximately 4–6 layers of 300 g/m² fiberglass mat should be sufficient for a smaller mold. The number of layers depends on the future requirements for the mold. A mold should always be laminated thicker than the final part it will produce, so that a drying part does not warp a mold that is too thin due to shrinkage.
Alternatively, you can replace 300 g/m² fiberglass mats with 450 g/m² or 600 g/m² mats to achieve a certain material thickness more quickly.
To quickly produce thick laminates with high mechanical properties, you can also work with composite fabrics, biaxial fabrics, roving fabrics, etc.
Always alternate between roving fabrics and fiberglass mats to avoid glass pockets.
Fiberglass mats should always be impregnated from the bottom up.
Make sure there is always enough resin on the surface and that the mat is impregnated from the bottom layer after it is laid in place.
The final layer should be impregnated with a minimal amount of resin and have a matte sheen after drying.
If the surface is shiny, too much resin has been applied; you can counteract this by using a release fabric. After removing the release fabric, the component is completely dust-free and clean, leaving a uniform, rough surface texture—thus providing an optimal substrate for further lamination, sealing, or bonding. (See Fig. 9)
You save yourself the hassle of sanding, and there's no need to clean up sanding dust. This part was produced without using a sanding mesh.

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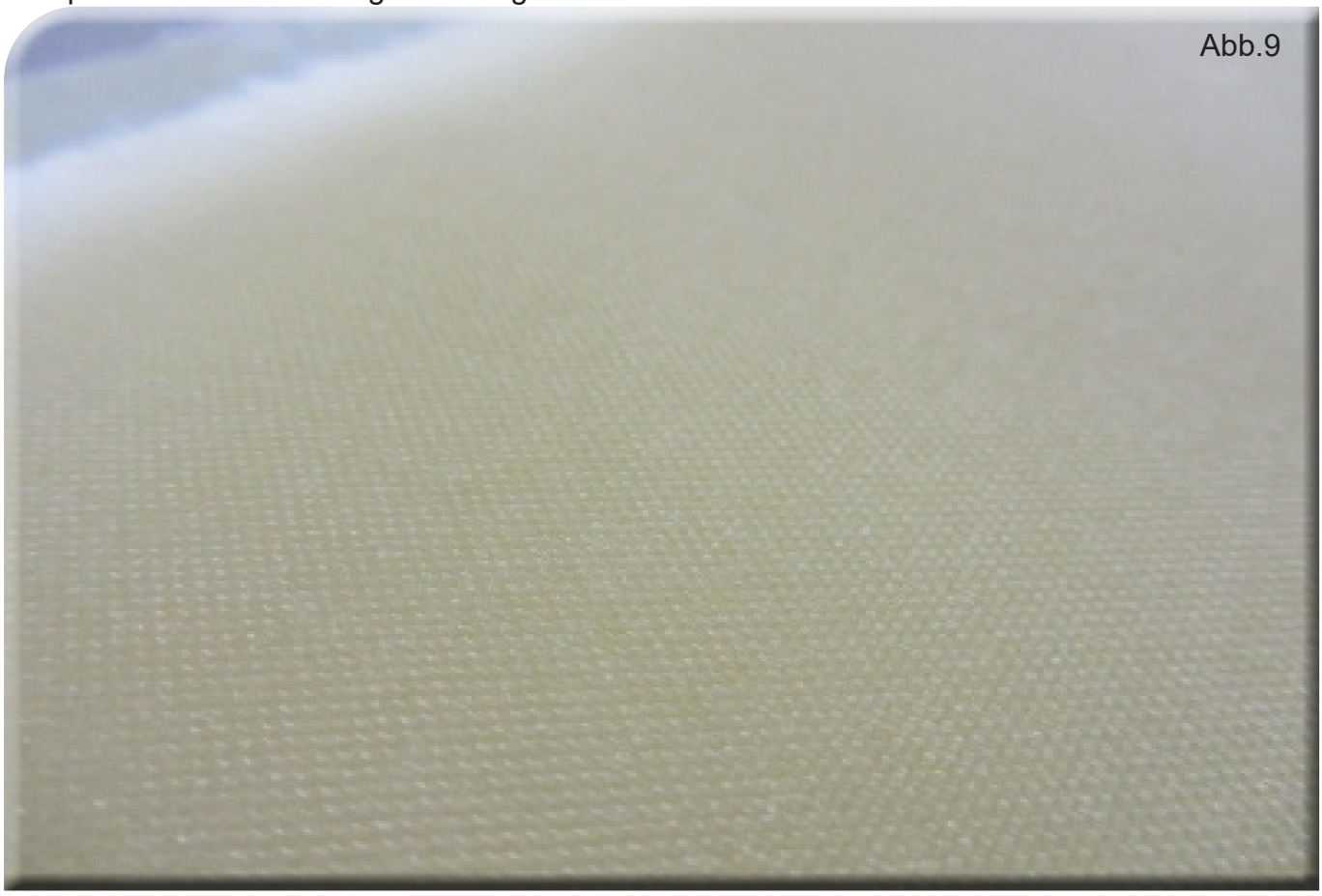
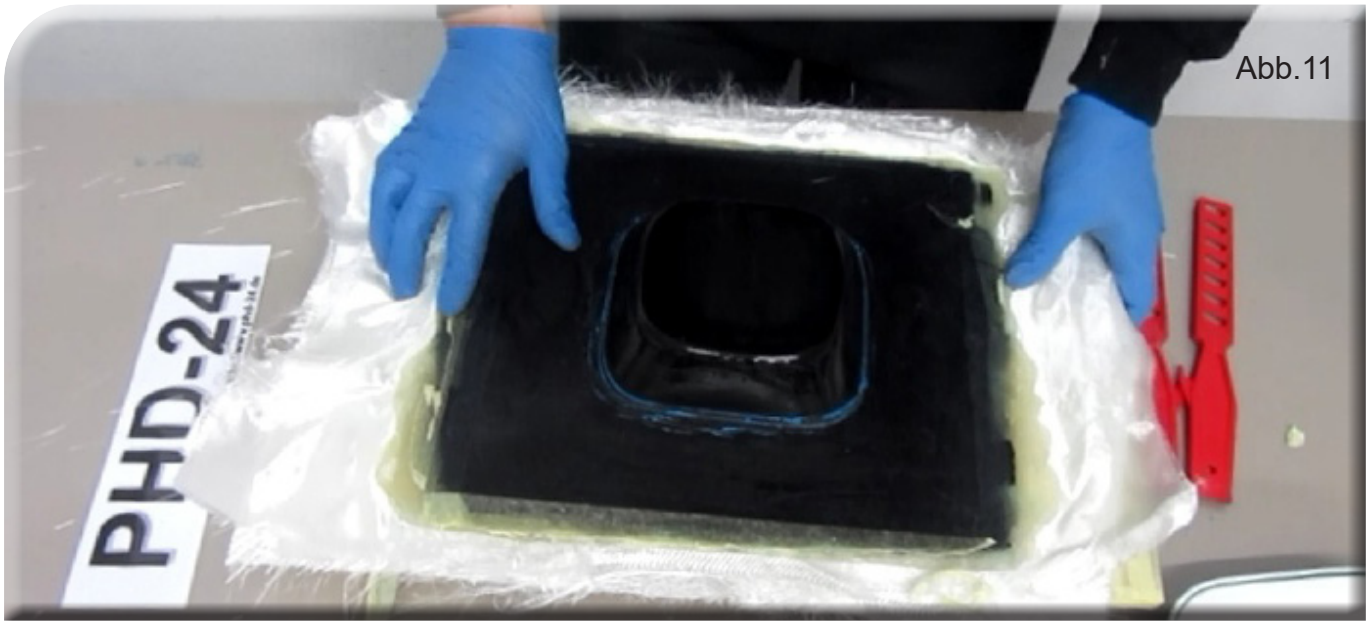


Unmolding

The mold should cure for at least 24 hours at 25°C.
Using plastic or wooden wedges, the mold should come away from the master mold.
(See Fig. 10)



After demolding (see Fig. 11), you can trim the mold and, if necessary,
polish it to a high gloss. You should use silicone-free polishing compounds for this.
Small imperfections in the surface can be filled with a small amount of mold-building gel coat and smoothed out using a
strip of Scotch tape.
Other imperfections can also be corrected with sandpaper (grit 600 to 2000).
When sanding and polishing, be careful not to generate localized heat.

Good luck!

List of Materials

Article	Item number with link
Viapal Mold-Building Coating UP 935 B	16010-V
Polyester Resin DIEPAL 2140 or Allnex 4627 BEMT/56	D-17010-V A-10010-V
Fiberglass Mat 150/m²	20150-P
Fiberglass Mat 300/m²	20300-P
Fiberglass Filament Fabric Finish 163 g/m²	23160-G-V
Release Wax Standard 2	34025-V
PVA Release Coating 2	33025-2
Modeling Wax	50903325
Acetone	35120-V
Digital Scale	76083
Laminating Brush	70030-V
De-airing Roller	84050-V
Mixing Cup	71001
Dosing Syringe	71903
Mixing Sticks	71010
Knife (Cutter)	85001
Scissors	85010
Disposable Gloves (M)	74010
Respirator FFA1P2 R D	39102

If you have any questions, please don‘t hesitate to contact us.

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Stand 06/2026