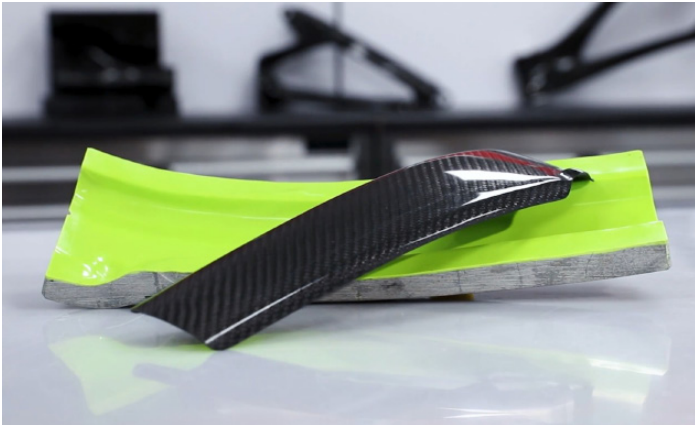


# Epoxy Mould Making Kit



## Kit Description

If you want to start making your own carbon fibre parts the first thing you'll need to do is make moulds for the parts you want to make. If you're new to composites this can be a daunting task and for this reason we have put together a comprehensive mould making kit which makes use of brand new materials and techniques to make the process of making high quality moulds as quick, easy and clean as possible.

Included in the kit is a quantity of special epoxy mould making 'putty', epoxy tooling gel coat, their appropriate hardeners, a tin of wax and the necessary incidentals (gloves, cups, mixing sticks).

A choice of epoxy mould making kit sizes is available. The regular sized kit contains materials to make a sufficiently strong mould of about 30cm x 30cm, (depending on the shape of the mould) whilst the large version of the kit contains materials to make a mould of around 60cm x 60cm.

## What is mould making putty?

The mould making putty in the kit replaces the need for chopped strand mat (unwoven fibre glass mat), polyester resin and catalyst normally used in fibreglass mould manufacture.

The reason for doing this is that polyester resin and its catalyst are both rather nasty to work with, difficult to ship and incompatible with the epoxy resin that will be used to create advanced composites parts themselves. For making smaller parts especially this new putty material is a fast, clean and highly effective way of making moulds requiring no prior fibreglass experience. Because of the way the putty is 'formed' into shape, it avoids the pitfalls of air-voids and blisters that can blight early mould making attempts with traditional fibreglass.

In the kit is a plastic container of slightly fibrous putty. With gloves on the putty can be handled, pulled apart and pushed back together with ease. Also in the kit is a small container of hardener for the putty which is darkly coloured. With the right amount of putty in your hand for the job you add the appropriate amount of hardener and mix the two materials together thoroughly. The putty is then shaped over and around the gel-coated pattern/part to form the body of the mould. A thickness of 1cm of putty for a small part or 2cm for a larger part would make for a strong durable mould. The process is clean and almost odourless.

## What Results Can I Expect?

Unlike working with the carbon fibre itself which requires some experience and dexterity with the material to get the best results, there is no part of the mould making process that should prevent even someone working with composites for the first time from producing a top quality mould.

Follow the instructions in this guide and you will certainly be able to produce a mould capable of yielding great looking products without difficulty.

## The Basics of Mould Making

A mould for composites (like carbon fibre) works in just the same way as a plastic mould does for jelly. You are creating a shape where the inside surface of your mould will become the outside surface of your part.

### The Pattern

#### Starting from Scratch

When all but the simplest moulds are required, the standard procedure for making a mould is to start with a 'pattern'. A pattern is basically a shape, often made out of MDF or (some other easily worked material) that is the same shape as the finished part you want to produce. You spend time shaping, sanding and polishing the pattern until it has the finish that you want on the final part. Special treatments are required to 'seal' an MDF pattern so that it can be used to take a mould from.

#### Starting from an Existing Part

In many cases, there is no need to produce a pattern (as described above) because you already have a finished part, made out of some other material (like plastic or metal) than you would like to copy in carbon fibre. In these circumstances you use the part itself as your pattern and take the mould directly off the original part. For the purposes of this guide, it is assumed that your mould will be based on an existing part in this way.

## Flanges and Barriers

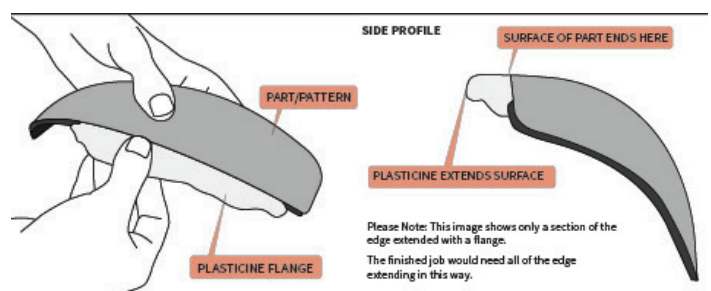
If your mould ends exactly where your finished part is to end (that is to say its sides are no longer than the intended sides on the finished part) then you will find that when you come to trim the finished part you will actually end up making the part slightly smaller than the original. For this reason, patterns are often produced with their outer edges extending beyond where the finished part will be trimmed to (known as flanging) or extending even more thoroughly onto another, often flat surface (known as barriering) in order to make the subsequent mould easier to handle and use and ensure that the finished part is slightly oversized ready to be trimmed back to the correct point.

#### Simple Flanges

One of the easiest ways to create some simple flanges on your pattern is to use Plasticine (a type of modelling clay never intended to cure or dry) to simply extend the edges of your pattern (your original part) all the way around its edge. Plasticine is cheap, easy to work with and resin will not bond to it, making it an ideal choice.

One disadvantage of this method is that the finish on the flanges will be quite rough and will certainly all need to be trimmed off the finished part, back to the point where the flange starts. This is often all that is required though so the flange still serves its purpose.

#### Other Methods of Flanges and Barriers



For larger parts it is sometimes easier to use strips of plastic affixed to the edge of the part, secured from the inside, to extend the edges rather than Plasticine.

Finally it may be more practical to fix the original part (or pattern) down onto a flat surface, such as a small sheet of plastic, and run the flanges down from the edges of the part until they meet the surface. Depending on the complexity of the part, any combination of strips of plastic, Plasticine or other materials can be used to achieve this.

## Step By Step Practical Guide

Before starting to make your first part we suggest you:

- Clear a work area that gives you plenty of space and protect with newspaper if appropriate.
- Clean the original part you want to take a mould from thoroughly to ensure there is no dirt or grease on the part.

### Prepare the part

**TIP: Make sure you've read and understood the information about flanges and barriers in the previous section. Decide whether the part you want to make a mould from requires the addition of flanges or barriers and if so make them up on the part before proceeding.**

#### Wax the part

Start by applying coats of mould release wax to the part. The wax will ensure that no matter what the part is made from (within reason) the mould will not stick to it.

Apply the wax using a clean lint-free cloth sparingly but thoroughly over the surface of the part. After applying the wax wait several minutes for it to dry (it will get a 'cloudy' appearance once dry) and then polish off using a separate clean lint-free cloth.

Add 5 more layers of wax by repeating these steps until you have built up 6 layers of wax in total. Doing this will ensure that no areas of the mould could have been missed and that the layer of wax will be impermeable to the resin.

#### Apply PVA Mould Release Agent to part

As a double safety measure we suggest that once you have waxed your part you then apply a single coat of PVA Mould Release Agent to the part. The PVA Mould Release Agent serves the same purpose as the wax applied in the previous section but by using both techniques together, the risk of a 'sticker' are reduced even further. If you have applied barriers to your part ensure you cover these with the Mould Release Agent whilst you coat the rest of the part.

Start by pouring about a capful of the release agent onto a lint-free cloth. By using a lint-free cloth (available from most supermarkets, hardware stores etc.) you will avoid any small flecks of the cloth from contaminating the coating of release agent.

Start wiping the release agent over the surface of your part gently using the cloth. The blue colouring in the release agent is there to help you see where you've been and how thick the coat of release agent is. Ideally, you're looking to have a thin but consistent cover of the release agent all over the surface of the part. You may need to top-up the release agent on your cloth as you go.

Once you have coated the part thoroughly (ensuring you have worked the agent into any awkward corners) set it to one side and leave it for about 20 minutes until dry to the touch.

**TIP: Apply a small amount of release agent to a part of the mould that will not be used in the finished part. That way you can do your touch-test for dryness without risking marking the PVA on the part's working surface.**

### Mix Epoxy Tooling Gel Coat with its hardener

Once the PVA has dried properly you're ready to apply the Epoxy Tooling Gel coat. This is the bright green Epoxy Tooling Gel mixed with its hardener.

Put on a pair of the Nitrile gloves. Put the mixing pot on your scales and measure 10 parts of the Epoxy Tooling Resin with 1 part of the Epoxy Tooling Resin Hardener into the same pot. For example 200g of resin should be mixed with 20g of hardener. Try to gauge enough total resin to give your part one thick coat.

Using one of the mixing sticks, stir the resin and hardener together thoroughly. In the video this process has been shortened but in reality you should spend a good few minutes mixing the two parts, particularly as at colder room temperatures they may be quite thick.

Once you have finished mixing in one container, it is good practice to transfer the mixed resin into a second container and undertake further mixing of the resin using a new mixing stick. Doing so will eliminate the risk of accidentally using unmixed resin from the bottom or sides of the container.

### Apply Epoxy Tooling Gel Coat

Next, still wearing the Nitrile gloves and using the 1" laminating brush, apply a tick and even coat of the mixed resin to the surface of the part. Ensure that you get the resin into any awkward corners of the part but be careful that you don't end up with thick pools of resin in these areas. You want the resin to be as thick as possible without falling or running off the part, this will give you a good thickness of tooling resin to flat and polish in subsequent stages.

Once you have applied this coat, set the mould on one side and leave for between 2 and 3 hours depending on the temperature of the room you're working in. The resin will cure quicker in a warmer room and slower in a colder room. Keep checking until the resin on the part is firm and but still tacky. If your glove sticks slightly to the resin without any of it coming off on the glove then the level of tack is about right. Don't allow the tooling resin to cure beyond this point otherwise the putty will not bond to it correctly when applied.

**TIP: In a composites workshop, resin is cleaned from brushes and other laminating equipment before it cures using acetone. As a hobby laminator, your best access to something similar would be a large container of nail polish remover which is essentially the same thing. Use liberal quantities of the nail polish remover in a pot to rinse the brush and any other equipment clean so it can be used again. Alternatively, wrap your brush in some plastic film and keep it in the freezer. The low temperature will prevent the resin from curing so that you can simply defrost it and use it next time you're laminating!**

### Mix Mould Making Putty with its hardener

Once the resin has cured (but is still tacky) you're ready to mix the Mould Making Putty with its hardener. The putty is the grey fibrous material in the large bag, its hardener is a dark blue liquid in a tall bottle.

Wearing a pair of nitrile gloves (very important because the hardener will stain your skin) remove the amount of putty you will need from the bag. Try to gauge enough putty to cover the surface of the part with 10-15mm of putty (around 1/2 inch). Weigh the putty and calculate the amount of hardener you will need for that much putty.

The hardener should be mixed with the putty at a ratio of 8%. For example 60g of hardener is correct for 750g of putty.

Mix the putty and hardener by holding the putty in one hand and shaping a well in it. Add the hardener to the well and close the putty in around it. Use both hands to mix the hardener thoroughly into the putty. The blue colour of the hardener will show you when the two materials are thoroughly mixed as it will be the same shade of blue all the way through.

## Apply Mould Making Putty

With the bulk of the putty sat to one side, start taking small amounts and applying them to all areas of the part where you applied the tooling resin. Be sure to consolidate the fibres of the putty (press it down) as you go.

Work your way across the whole surface of the part, applying the putty about 10-15mm thick (1/2 inch). It doesn't matter too much if some areas are too thick but areas that are too thin will result in a weak mould that is easy to break. If you need more putty mix some more up. Don't be tempted to 'thin out' other areas.

Be very careful to ensure that you press the putty well into any tight corners. If you don't you will have 'air voids' between the tooling resin and the reinforcement (the putty) which will be vulnerable and soon break causing a blister on the inside of the mould.

Finally, inspect the part to ensure that all areas where you put tooling resin are now backed up with putty.

Put the mould to one side and leave it to cure for at least 24hrs before attempting to release it.

## Release the Mould

Once the putty has fully cured (the tooling resin will have fully cured too by now) it's time to separate the mould from the part.

If you attached the part to a board before you started (like in the video) then the first place to start is often to release the mould/part from the board. If the board is flexible, try flexing it. If not, use something sharp like a knife blade to get under the edge of the mould and separate it from the board.

Once the board has been released it should be straightforward to remove the part from the inside of the mould. The finished mould material is very strong but nonetheless be careful not to break the mould by applying too much force when releasing the part from the inside.

## Prepare and Polish Mould

With the part now removed from inside of the mould we can go about cleaning and preparing the mould ready to make its first part. First, use soap and water to clean the inside of the mould which will remove any PVA residue.

Sometimes there will be a small amount of 'fettling' to do to the inside of the mould to remove any light areas of roughness (particularly around any barriers or flanges you added) that you may want to rub smooth using a range of wet-and-dry abrasive papers. If you do this work up through the grits, use water, change it often, until you're happy.

Whatever the finish of the inside of the mould, that is the finish we can expect on the parts made using the mould. Because we normally want out carbon fibre parts to have a high gloss surface finish, it's important that we give the inside surface of our mould a high gloss surface finish.

Using the polishing compound included in the kit and a clean cloth polish the inside of the mould until it has a consistent glossy finish.

Wash the mould to remove any trace of the polishing compound (this may attack wax or PVA that you apply to the mould when you make your first part).

**IMPORTANT: You have now made your mould however the inside surface of the mould will stick completely to any resin that you use to make your parts unless it is treated thoroughly with mould release wax or PVA mould release agent. In our guides about making parts we cover the process of waxing or sealing your mould. You must follow these steps or your first part will stick and destroy you mould!**

## Repair and Care

**Don't drop or stand on your mould, otherwise it might break.**

If you use the mould to make lots of parts, over time it will become slightly scratched. You can return the mould to a high level of gloss by re-polishing the inside surface at any time.

Deeper scratches (so long as they have not gone through the tooling gel coat) can be rubbed out using a series of wet-and-dry abrasive papers and brought back up to gloss using polishing compound.

## Disclaimer

This data is not to be used for specifications. Values listed are for typical properties and should not be considered minimum or maximum.

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