

Brunel Hand Molding Hints

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Required Materials

Item	Notes
Brunel Hand parts – fingers, palm, etc	3D Printed
Brunel Hand mold parts	3D Printed
Urethane rubber	OpenBionics and the author used VytaFlex 30 .
Mold sealer	The author used SuperSeal .
Mold release	The author used Ease Release 205 , available in a spray bottle combo pack with SuperSeal.
Colorant	The author used SO-Strong Black .
Screws + inserts or other hardware to hold molds together	
Vinyl or other impermeable gloves	REQUIRED
Eye protection – goggles or suitable glasses	REQUIRED
Respirator or mask	Recommended
Plastic sheet	Like a painting drop cloth, you are guaranteed to make a mess and this will save you from cleaning up icky chemicals and tiny bits of rubber.
Mixing and measuring cups	The author used the Smooth On cups in 16oz and 32oz sizes.
Mixing device	Small paint mixing stick or other device, follow the manufacturer instructions.

Warning: These chemical products are not good for you.

Read and follow the MSDS and other documents provided by the manufacturer.

Anything I say is based on my experiences with using these molds and from reading the manufacturer provided documents and should not be considered as anything but hints or advice and you must read and follow those documents before using those products. I am not an expert and only you are responsible for your safety. I will mention safety precautions I have taken but I suggest doing more. In general you should avoid breathing vapors, skin contact, eye contact, getting it on your clothes, and ingesting any of these products.

Initial Setup

Prepare a suitable workspace in a well ventilated area and lay out your plastic sheet on a workbench, table, floor, or wherever you plan to use the urethane and other chemicals. Before opening or using any chemicals, read the manufacturer provided Safety Data Sheets and other literature and ensure that you are using proper safety equipment.

I would strongly recommend cleaning up all of your 3D printed parts: removing extraneous support structures, checking that all through-holes are clear of print debris, and so on. Test fit each Brunel Hand part in the molds.

With a quality print, the only modifications you might need to make on the molds are lightly sanding the plungers to fit tightly inside the cylinder while being removable. At this point, you should install the heat fit inserts in the mold parts that use them.

I suggest doing all work with the various chemicals over the plastic sheet. You will most likely spill some urethane and will definitely get overspray with the sealer and release agent.

Mold Preparation

The mold sealing agent recommended for your urethane should be applied to the mold components after cleaning up the prints and making sure the mold parts are dry and free of dust and dirt. Wear eye protection, skin protection, and whatever else the manufacturer recommends.

I suggest applying the sealing agent to every surface of every mold component following the manufacturer instructions. I achieved good results with the provided instructions for SuperSeal with two coats and drying for at least an hour after the final coat.

After the sealer dries, the recommended release agent should be applied to the areas of the mold that will come into contact with the urethane resin and the surrounding area. It will seep out of the gaps inside and outside of the mold so it is a good idea to apply almost everywhere. As before, read the datasheet and wear eye protection, gloves, and whatever else applies.

I used Ease Release 205 by spraying onto the mold, letting it sit for a few seconds, then lightly brushing it around. I did two coats roughly 10 minutes apart and let the final coat dry for at least 30 minutes.

Mold Assembly

At this point, assemble the molds and place the Brunel Hand parts in the cavities. Screw down the various top plate things and the thumb holder. Make sure you didn't put the plunger in yet. Double check that everything is secure and ready for the next step.

Mixing and Pouring Urethane

As always, follow the manufacturer provided instructions and datasheets. This step will likely require leaving the molds alone overnight so make sure that other people or animals will not be able to disturb them. I wore a respirator mask for this step and I strongly recommend you do. If you read the safety datasheets, you'll agree with me.

This is where you measure out the part A and part B of your urethane, add the colorant, and mix them together. Follow the instructions provided with your materials.

General suggestions:

- Mix up more urethane than you'll need and do the math to figure out how much you need.
- Stir thoroughly.
- Read the MSDS and instructions.
- If your resin is a 1:1 mixture by volume, you'll probably find that 2oz of part A and 2oz of part B results in 4oz of goo.
- Calculate how much colorant you will need before you open or pour anything.
- Seriously, do the math first. You will not have to worry about the pot life of the urethane or anything else like that if you already have everything set up and ready to pour.

For VytaFlex 30 specifically:

I used three 16oz cups and two separate mixing sticks. One stick was only used to stir the part B compound inside its container before pouring into the measuring cup while the other was used to mix in the colorant and the combination of part A and part B together. One cup was dedicated to measuring part A, the second cup held part B and those cups were poured into the third for mixing.

The first thing I did was open the container of part B and stir it as per instructions. Then I poured a measured amount into a cup and closed the bottle. Since I did math first, I added an appropriate number of drops of the color fluid to the cup of part B and mixed it in with the second mixing stick. Next, I opened the container of part A, measured the same amount into another cup, and closed the bottle. Finally, I poured the contents of both of those cups into an empty cup and mixed it thoroughly with the second mixing stick.

Pouring:

Although it seems wasteful, I suggest filling the cylinders (reservoirs/whatever you want to call them) almost completely with the urethane resin because I had some problems with the urethane failing to make it all the way up the sides of the hand parts, leaving small gaps as pictured below. This can happen with any part.

I also suggest slowly pressing the plunger all the way down. Don't stop when the urethane comes out of the cracks, it is trying to take the path of least resistance and hopefully you'll force enough into the mold cavity to achieve good results.



Demolding

Depending on the climate and where you leave the molds to sit, I suggest waiting a few hours longer than the manufacturer provided cure time. I wore gloves for this step and tried to keep the little rubber bits on the plastic sheet.

Unscrew the part holder plate things and try to gently pull the hand parts out of the cavity. The palms will not come out easily but try to use even and steady pressure once you get it started. There will be a stringer going to the injection hole but that will snap or it can be cut. I recommend at least disassembling the molds if not pulling off all of the excess urethane immediately after removing the hand parts because it does seem to get somewhat more difficult to do weeks later.

Now you can peel the excess urethane off the Brunel Hand parts and build the hand! There might be some urethane caught in the tendon channels which can be difficult to remove but an unfolded paperclip or other stiff wire and tweezers will help fix that.

The End

The molds are reusable, just reapply the release agent each time you use them.