



COVID-19 Volunteers UK

Standard Operating Procedures

Welcome to the Covid-19 Volunteers UK group an effort to 'crowdcreate' 3D printed visors for NHS and frontline staff and help alleviate the strain on existing supplies.

Below you will find the group's Standard Operating Procedures (SOP) for FDM printing which must be followed in order to contribute to the Covid 19 Volunteers group in order to ensure that parts are printed as hygienically as possible and that shields manufactured and supplied are effective and contribute to the effort to fight the virus, rather than having a detrimental effect.

Please read the whole document (we know it's boring) and take care to follow all of the measures that are described in it - this ensures that both you and the recipients of your printed parts are as fully protected as far as possible and we can help to have a positive effect against this pandemic.

Thank you for your efforts.

Location of printing and precautions to take

The shields are being created for use in hospitals, so risk of infection must be kept to a minimum.

If you have the virus, or are showing symptoms, please do not print these shields until you and all of your household are given the all clear. This is 7 days for those with symptoms, and 14 days for others as per NHS guidelines. Review and ensure you follow the [gov.uk](https://www.gov.uk) advice.

Printing should be carried out in a well ventilated room, ideally separate from areas subject to high traffic or contamination.

Clean your workbench - if you have a workshop which doubles up as a garden shed, the NHS do not want sawdust from your latest carpentry project embedded in the shields.

Ensure children and pets are kept out of the printing environment - sticky fingerprint paintings by a toddler are not considered desirable or attractive on face shields. Similarly please keep food and drink away from the printer - we don't want an allergic reaction because you dropped a prawn sandwich, or soy from your latté on the headband whilst printing.



If you have an enclosure please use it. Use of one is not mandatory but it will help in protecting the print from contamination and help maintain a constant temperature which will be helpful for printing PETG.

Before Printing or touching printed parts

Wash your hands thoroughly - you should know how to do this by now 2 bars of Happy Birthday etc etc, back and front of hands and make sure your nails are clean.

Ideally use hand sanitizer before touching any parts that will form part of the finished shield and if you have protective gloves - nitrile or vinyl - wear them (**NOT** latex gloves as these can transfer latex to the print and cause an allergic reaction, please just use clean hands instead). If you have a face mask we **strongly** recommend that you wear this as well. Protective gloves means clean and sterile not your washing up gloves or those you use in the garden whilst you're pruning the roses.

Clean your printing bed with a suitable disinfectant. 70% Isopropyl alcohol is commonly used to clean printing beds anyway and is suitable for this purpose.

Make sure you have enough filament to complete each part. This will prevent either a half finished print or a cooling and reheating of the part allowing it to become contaminated. Each face shield part takes approximately 55g's of material. Please do not multi material print or use filament from different makes or types in a single print.

PETG is known to stick fast onto print beds so if you are using an intermediate layer to protect your printer (such as painters tape) please spray or wipe with disinfectant and allow to dry before printing.

Printing

We are printing the Prusa RC3 model. The download files can be found here:

<https://www.prusaprinters.org/prints/25857-protective-face-shield-rc1/comments>

The files are subject to update so please ensure you are working from the most up to date files.

There are two parts - a top and a bottom - please ensure you print both see below:



Covid19_headband_rc3



Bottom_reinforcement

Prusa are updating their disinfection and sterilization techniques constantly so please familiarise yourself with this link:

https://help.prusa3d.com/en/article/prusa-face-shield-disinfection_125457

The intention is that the shields will be printed and then sent to a central location where the clear plastic faceplate and elastic will be added and a packing list with instructions for the end user on how to assemble will be included with their package. If you are supplying these shields directly to anyone please ensure you supply the end user with this link to Prusa too, you can do this by printing the packing list which has this information included.

You can still send and supply the RC2 and RC1 models if you have previously downloaded and printed those but RC3 is the current version and if you are able to print it you should.

*NB: If you have the skillset it will be useful to model the following information (Date printed and Material) onto the print in relief ensuring you do not affect the structural integrity of the print - **this is not mandatory**. This is an advanced skill and we do not expect this on most units but now is a great time to learn how to model a little whilst we're all cooped up.*

1st print - the first print that you create will allow you to test your settings, it will also serve as a suitable shield for you to wear whilst creating further shields if you are sending masks to the central location this is the only shield that you will require the elastic and clear face plate for.



The clear face shield can be added using a sheet of PETG or items such as a clear laminator pouch or transparency, or even at a push a clear water or fizzy drinks bottle. It's purpose is to protect your further prints from infection by you. The strap can be added by a piece of approximately 35cm elastic or even an elastic band.

2nd print and onwards - put your shield on whilst working on subsequent prints.

Filaments

- PETG - This is the best filament to use because it is food safe and less likely to harbour the virus
- PLA - can also be used if there is no alternative, it is more prone to bacteria buildup so less ideal than PETG and it deforms at relatively low temperatures (60°C) i.e. hot water/dishwasher - even though these items are intended as single use.
- We are currently not accepting any other material types as we have received independent medical advice and it causes confusion in the supply chain and we need to keep things fast and simple. This includes ABS.
- Exotics - Please do not use PLA infused with wood, metal or other stuff such as glow in the dark or glitter - the NHS has a PPE shortage not a lack of fashion sense

Wash your hands before touching the filament - it will be heated to 200°C by the hotend but this is a new virus and information is limited on how long it survives in set environments.

Wear protective gloves if you have them Nitrile or Vinyl - these aren't essential but are heavily advised and are a good extra layer of protection, the same goes for a face mask if you have one. **Do not** use latex gloves; these can cause the end user an allergic reaction.

Keep contaminants away from the printer whilst printing - that includes those pets and children

On a clear **airtight** plastic bag (eg Freezer bag) please write the following with a permanent marker or similar pen that will not damage the integrity of the bag.

- The material that the shield has been made from
- The date of printing and sealing the last unit that will be included in the bag
- If you are assigned to print for a particular order or hospital the name of the order/hospital
- An email address that we can contact you with should we need to

If you can print sticky labels with this information to go on the bag then this is perfectly acceptable as well.



Print all parts of the shield there are two parts please ensure to print both.

Once the print has completed remove it from the print bed with the minimum of handling and seal in the prepared plastic bag (sealable freezer bag or ziplock).

Ideally, there would be one bag per print but we realise that this may not be practical so please try to keep to either 1, 2, 5 or maximum 10 in any bag.

If you are printing both PLA and PETG please separate the headbands into different bags for each material.

If you are supplying a complete kit having obtained visors and elastic from the central depot you can package the printed parts, the visor, and the elastic in one bag to form a shield kit. Do **NOT** remove the protective film from the visor. Allow the user to do this when they are ready to use it.

After printing

Current information is that the virus can last for up to 3 days on plastic therefore it is recommended that finished units remain sealed for that period prior to use. If you are sending to the central depot you can send them on the day you seal the bag. If you are delivering direct to the end user please advise the user not to open the bag until the three days after the date on the bag.



So you've got some headbands printed... you legend! Now what?

There are two options:

1) **Send to our central location via DPD.** If you are sending your parts to the central address please fill out the google form below, this will also track how many shields you have delivered:

<https://forms.gle/WA1duXTVyBWRnLzu6>

Once this form is filled out and you have selected "Pimoroni - Sheffield" in the "Where are you Shipping to?" section of the form DPD will get in touch with you about collecting your Parcel and delivering to the central location.

2) **Supply locally yourself with your regional coordinators.** When supplying direct to health workers please fill out this google form that will allow us to track your shields. You will need to select "Other" at the "Where are you shipping them to?" input box and type in the name of the order you have been given:

<https://forms.gle/WA1duXTVyBWRnLzu6>

Then please print off this Packing Doc (fill in the top section):

<https://docs.google.com/document/d/1ipGBP1CCZsUscppO69OJKRDLRTV-3Uv eHzpW1vbnM-l/edit?usp=sharing>

and include it with the order and send to the address you've been given.

You followed all the above instructions, right? You've packaged and labelled everything correctly? Ok NEXT PAGE



If you are posting to the central location please label your box or package for the following address for DPD collection

Do not deliver in person to this location. We must keep staff at these locations safe.

Pimoroni

FAO: 3dcrowd
Pimoroni Ltd.
2 Manton St
Sheffield S2 4BA

This is a volume game do not send **until you have 20 or more units (ideally multiples of 20)**.
For packaging recommendations see the FAQs below.



Dropoff in person

These locations will not accept in-person deliveries of less than 50 units.

If you have more than 50 units, you can hand deliver by fulfilling the following criteria:

You must get permission ahead of time - and that means whilst you are at home not after a two hour drive when you are five minutes from the depot

You should fill out the attached booking form:

Pimoroni in Sheffield- Booking form:

<https://forms.gle/akf2Yb6JYhUu6ifN6>

Your printed units should be packaged in two levels of packaging. One must be easily removed and disposed of. The inner packaging must only have been handled with clean hands or gloves. See FAQs below. Once you have approval you can deliver to:

Pimoroni

FAO: 3dcrowd
Pimoroni Ltd.
2 Manton St
Sheffield S2 4BA



mini-FAQ

Will you cover postage?

Yes. DPD will cover our shipments to Sheffield (within reason!)

How should I package it?

Padded envelope or carefully boxed is the ideal. Multiple small clean bagged items inside a large box is another. We want to reduce the possibility of Covid-19 transmission via post. Please ensure all open edges are sealed with packing tape. If you are having the package picked up please ensure it can be retrieved from a clean and dry location.

The best advice for packaging is here.

https://www.dpd.co.uk/content/products_services/shipping_advice.jsp

Can I organise a group pickup to make enough for a dropoff?

Yes, this is what's been happening. Please self-organise around it, if you can hit 50, do it - Slack can help but maintain distance guidelines when handing them over (no self congratulatory bear hugs at having achieved 50 units) and keep trip distances to a minimum.

How often should I send?

Whenever you have enough to complete an order you've been supplied by your regional coordinator or have enough pieces to make 20 visors for the central depot.

What's next?

It's likely that we will have more locations for delivery soon; London, Manchester, Kent, and more are all being discussed. We are also looking into ways to make the drops safe, so that smaller producers can hand deliver safely.

If you become symptomatic

Please, if you come down with symptoms and suspect you have COVID-19 - please ensure that you inform the admin team and regional coordinator ASAP, so that appropriate precautions can be made to destroy or quarantine the stock that you have already created.

Review and ensure you follow the [gov.uk](https://www.gov.uk) advice on self-isolation.



Checklist

- Find suitable print location
- Clean your workbench
- Wash your hands, don protective gloves and mask if available and shield if this is not your first print
- Clean the print bed with disinfectant (isopropyl alcohol)
- Check filament supply
- Print shield
- Complete information on plastic bag
- Seal shield pieces in bag
- Package and send