



# The Extrubox

## **Summary:**

The Extrubox, a non-permanent enclosure, adaptable to any printer size and removable from your printer in seconds!

## **Introduction:**

The Extrubox, a printer enclosure customizable in size and removable within seconds from your printer when not needed!

This article is a little longer, please read it carefully, I've made every effort to leave no questions unanswered, but if there are any I am of course available in the comments section!

## **Why the Extrubox?**

I wanted to have an enclosure but didn't want to lock my printer permanently in a tight box so that I could work on the printer without having to lift it out. I have several printers with different features that I use to print different things. Sometimes I need an enclosure on one printer, sometimes on another. Therefore, I don't need multiple enclosures.

This is how the idea of the Extrubox came about, which I can simply place over the printer where I need it at the moment, for maintenance work, etc. the printer can remain in place. The rear panel, which is attached with magnets, is simply removed and the housing is taken away from the printer.

The goal was to create an enclosure that each of you who can also operate a printer can easily build yourself at home and is scalable to your desired size.

For me, this includes a simple, functional and chic design.

You can order the 3030 aluminum extrusions and panels (I recommend polycarbonate instead of acrylic, as it's much easier and safer to work with) custom online, more on that further down in the article.

I chose 3030 extrusions because they are also used for many printers (e.g. Prusa) and therefore there are already some accessories and attachments available.

I wish you a lot of fun with the Extrubox, if you like it I would be very happy about a Like and a Follow. Feel free to check out my other designs!

**(Description also available as .pdf in english and german!)**

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### **What to expect when building the Extrubox:**

- Since some magnets will be inserted into printed parts, you will need to place print pauses at the appropriate locations and use a small drip of super glue to insert the magnets. Do some test prints to make sure your filament is set correctly and the magnets fit into the holes. A properly adjusted filament is also necessary for the screws.
- You will need to drill and countersink the polycarbonate panels precisely (*you can replace the countersunk screws with button head screws*). Before drilling, check again if everything is drawn correctly. Dimensioned sketches as .f3d files and .dxf files of the panels are available (unfortunately it is not possible to export the dimensions as .dxf files in Fusion360). You can open the .f3d file and view the dimensions there, adjust them and export them as .dxf if necessary).
- For the power supply of the printer and possibly for a filament guide as I have realized you have to saw and file/grind cutouts (*for an extra charge you can have the panels not only cut, but also milled and drilled. You can use the .dxf files for this purpose*).
- When mounting the Extrubox, it is important to make sure that all aluminum extrusions are precisely aligned with each other, so that nothing tilts later and everything is angled properly.

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### **Dimension of the Extrubox:**

The dimensions of the 3030 extrusions and the panels refer to the size of the box which you can see in the photos. Compatible with Prusa i3 MK2/MK2.5/MK3/MK4 and many other printers in this size range.

**How to adjust the enclosure to your desired size you will find out in a section below.**

#### **Outer dimensions:**

Height: 540mm (*without handles 492mm*)

Width: 533mm (*without hinge 520mm*)

Depth: 645mm (*without door handles 630mm*)

Inner dimensions:

Height (*from bottom to panel*): 487mm

Width (*between inner sides of 3030 extrusions*): 460mm

Depth (*between inner side of 3030 extrusion to rear panel*): 581mm

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**What you need** (*Detailed list of all materials available as pdf!*):

(*basic configuration without PTFE coupler and spool holder*)

Fastening material (*M3 countersunk screws can also be replaced by button head screws (+2mm)*):

- 8x M3 nyloc nut
- 8x M3 square nut
- 68x M5 T-nut for 3030 Extrusion (+16 pcs. for optional stiffening)
- 68x M5x12 button head (+16 pcs. for optional stiffening)
- 28x M3x8 button head
- 26x M3x6 countersunk head (*if button head: +2mm*)
- 11x M3x5 cylinder head (*if PETG foot +4 screws*)
- 8x M3x10 cylinder head
- 4x M3x40 cylinder head

Magnets:

- 28x 5x5mm cylinder magnets (+6/+12 pcs. for PTFE coupling)

Foam rubber tape:

- 6mm wide, 2mm thick, 4,7m length

Tools:

- 3,5mm drill bit
- Countersink (*Countersunk screws can also be replaced by button head screws (2mm head height), screw length +2mm! In addition, the foam rubber tape at the magnetic closers has to be cut out*).
- Allen wrench
- Saw and file

- superglue

#### 3030 Aluminum extrusions:

30x30mm, 8mm slot

- 5x 460mm (rear R+L and traverses between the sides)
- 2x 481mm (front R+L)
- 2x 550mm (sides bottom)
- 2x 580mm (sides top)

#### Polycarbonate panels:

*(The dimensions of the 3 panels on the sides and top are specified 1 mm smaller to compensate for possible intolerances. If you trust your cutting service or cut them yourself you can make them 1mm bigger, this will bring a little extra stability.).*

In the files, in addition to the .dxf files, you will find an .f3d file in which all panes are fully dimensioned.

length x width; thickness 3mm

- 2x 452 x 253 (doors)
- 2x 549 x 429 (sides)
- 1x 549 x 459 (top)
- 1x 482 x 473 (back)

#### Filament:

I recommend PETG, as the enclosure can reach critical temperatures for PLA. A 500g spool is sufficient.

There are two variants of the feet. If you decide for the variant for printing from flexible material you also need a small amount of TPU or similar.

#### Printed parts:

- 12x 3030Angle (+4 pcs. for optional stiffening)
- 2x 3030Angle small
- 12x panel support
- 2x corner bracket
- 7x T-slot block
- 4x door closer

- 5x rear closer
- 4x door hinge (HingeA recommended)
- 2x door handle
- 4x foot (flex or PETG)
- 2x handle

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**General assembly procedure** *(I will go into the individual components in more detail below):*

It is recommended to assemble the left and right frames first, once the extrusions are joined, check that all joints are flush and angled.

If you want to use the hard plastic version of the feet, you must insert them into the slots before assembling the extrusions.

Next, join the two sides with the extrusions at the top front, bottom front and top back. In these three extrusions you must first insert a magnetic T-slot block into the outer groove, do not tighten the screws yet, they will be precisely aligned later. Check again if the extrusions of the whole frame are flush and angular to each other. Also measure the distance between the side parts at the back bottom, this must have the same distance as given by the profile at the back top.

Optional reinforcement: My long-term test has shown that it can be useful, but is not absolutely necessary, to attach additional 3030 angles colored red in the picture (see section "Optional reinforcement" below). These help to maintain the angularity of the enclosure when it gets moved a lot.

In the next step you insert the prepared panels on the right, left and top. Now is a good time to also insert the feet into the extrusions at the bottom, if you printed them from flexible filament.

Then you can insert the door hinges into the slots and roughly slide them into place. Do not tighten the screws yet. Now attach the counterparts of the hinges, the handles and the magnetic closers to the doors.

Now prepare the rear panel, remembering to make a suitable cutout for the power cable of your printer. Next you can insert the last four magnetic T-slot blocks into the extrusions at the back and align them correctly with the help of the rear panel.

Next you can glue the 2mm foam rubber tape. It is intended to close the two millimeter gaps between the feet, at the back, front and bottom.

Now you only have to attach the handles and, if desired, the spool holder, as well as hang in the doors, and you're done!

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## **The individual components in detail (printing instructions below):**

### **Holes and cutouts:**

In the files you will find drawings as a .pdf, a .f3d-file with the dimensioned sketches and .dxf files of the panes and their holes/cutouts. You can use the .dxf files to order ready drilled and milled panels.

I recommend to buy polycarbonate panes instead of acrylic, as this material is much easier to work with and does not tend to crack. If you order already drilled/milled panes you can also use acrylic, this is a bit more scratch resistant.

For drilling you need a 3.5mm drill bit. For the countersunk screws you need at least a 7mm countersink. Make sure to countersink straight and not too deep. As mentioned before, you can also replace all countersunk screws with button head screws (2mm head height). Keep in mind that the screw length for countersunk screws is the total length and for button head screws it is measured from the bottom of the head. So order these screws 2mm longer and cut out the foam rubber tape at the screw head locations.

The cutouts for power cables and possibly a filament feedthrough can be drilled, sawed and filed, or sanded.

### **3030 Angle connector (standard and small):**

Standard: You can put two more angles at the top front and two more at the top back to ensure better angularity when the case is moved frequently. Per bracket you need 4 M5x12 button head screws, as well as 4 M5 T-nuts. The panels are then screwed on with one M3x8 button head screw each.

Small: Will be attached to the front on the inside. If you need this space for your printer you can also attach them to the upper side of the extrusion. Of course you can also use the large standard brackets instead of the small ones. Each bracket requires 2 M5x12 button head screws and 2 M5 T-nuts.

### **Optional reinforcement:**

My long-term test has shown that it can be useful, but is not absolutely necessary, to attach the additional 3030 brackets colored red. These help to maintain the angularity of the enclosure when it is moved a lot. You can decide whether you only attach them at the back or also at the top front. You will need 4 additional M5x12 pan-head screws and 4 M5 T-nuts for each bracket.

### **Panel supports:**

Since polycarbonate is slightly more elastic than acrylic, it is recommended to attach the additional fasteners of the panels when the panel size exceeds 40cm. These are fastened with one M5x12mm screw and one M5 T-nut each. The panel is then screwed on with an M3x8mm button head screw.

### End Caps:

The end caps are more of a visual detail, they are attached with two M3x5mm button head screws each.

### Magnetic door lock and rear magnetic closer:

The magnetic T-slot blocks must be inserted into the grooves before assembling the extrusions. The counterparts are fastened to the panels with 2 M3x6 countersunk screws each. Then you can align the T-slot blocks exactly and secure them with a M3x5 cylinder head screw. Make sure that the polarization of the magnets is correct.

### Feet:

There are two variants. For printing with a flexible material, these can be pressed into the profile afterwards and for printing from PETG. These must be slid into the groove before mounting the profile and fastened with an M3x5 cylinder screw.

### Hinges:

Here, too, there are two variants. I made the non-hinged version first (a nice print-in-place model), but afterwards I realized that it is much more practical to be able to unhinge the doors, e.g. for printing PLA.

Both hinge variants need one M3x40 screw each, make sure to tighten them only slightly. In the part which is at the door two square nuts are inserted. In the part which is fixed to the extrusion, a M3 stop nut is fixed with a M3x10 cylinder screw before mounting. Turn the screw only slightly into the nut, when the part is in the right position in the groove you can tighten the screw.

### Door handles:

The door handles are of course not a must, as the doors can be easily opened without handles. They are attached with two M3x8 button head screws each.

### Foam rubber tape:

6mm wide, 2mm thick; you'll need about 4.7m. The foam rubber is attached to the back side, bottom side between the feet and to the front side. Remember, if you have replaced the countersunk screws with button head screws, cut out the foam rubber at the magnetic closers. Thoroughly degrease the surfaces before sticking it on.

### Handles:

Print the handles in a sufficient stability. I recommend at least 4 perimeters and 20% infill. Attach the handles so that the Extrubox remains balanced when lifted.

There are three versions of the handle: Extrutim logo, Extrubox logo and without logo.

Each handle is attached with 2 M5x12 bolts and 2 M5 T-nuts.

### PTFE coupler:

The PTFE adapter has a magnetic coupling to easily separate the enclosure from it. You can attach it from the inside, from the outside or from both sides. For the latter, there is a version with through holes to connect and fix the two bases with 3 M3x10 cylinder screws.

If you want to mount the coupling on one side only, it will be fixed with 3 M3x8 button head screws. Per clutch you need 6 5x5mm cylinder magnets. Pay attention to the correct polarization. Each coupling also requires a standard PTFE adapter (3/8" thread (9.53mm)).

### Internal spool holder and filament guide:

Keep in mind that the spool holder may not always be compatible depending on the enclosure size and printer model. However, since some would like to have the spool inside the enclosure I wanted to give you that option with the spool holder and associated filament guide. Whether the spool holder is compatible with your chosen setup, however, you have to weigh for yourself.

Keep in mind that there are different spool sizes. This spool holder is designed for a spool width of up to 100mm.

To mount the spool holder and the filament guide you need 2 additional M5x12 screws, 2 T-Nuts and 2 M3x8 button head screws.

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### **Adapt the Extrubox to your desired size:**

In principle, this works quite easy. We take the dimensions between the inner sides of the 3030 extrusions which are variable and add the fixed dimensions of the overlapping panels or extrusions.

The side panels, as well as the panel at the top and the extrusions at the bottom R+L and traverses between the sides do not overlap and can be varied freely.

- Rear panel:  
Width=  $X+22\text{mm}$   
Height=  $X+13\text{mm}$
- Door panel (x2):  
Width=  $X/2+23\text{mm}$   
Height=  $X+22\text{mm}$
- Extrusion rear R+L=  $X+30\text{mm}$
- Extrusion front R+L=  $X+51\text{mm}$
- Extrusion top R+L=  $X+30\text{mm}$



**Keep in mind that if you have very large windows, you may need to install additional panel supports and hinges.**

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### **Print instructions:**

Filament: PETG

Layer height: 0,2mm

Infill: 20%

For parts like the 3030Angles or handles, I recommend at least 4 perimeters and increasing the infill slightly. The rest of the parts can be printed with 3 perimeters. Print all parts as they are aligned, supports are not necessary.

To insert the magnets, simply add a print pause in the slicer.

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### **Changelog:**

#### **Possible future features and accessories:**

- Hygrometer attachment
- Air filter system
- Illumination system
- Internal heater
- Various other spool holders

None of the accessories listed are currently available specially for the Extrubox. But that can change!

Of course, not every accessory has to be made especially for the Extrubox, so a simple cut-out in one of the panels is all you need to attach a hygrometer, there is also a wide range of accessories already available for the 3030 extrusions.

The license of the model prohibits to edit and distribute model files, but I invite you to create accessories for the Extrubox independently from my created files. Let me know if you have created something for it so that I can link it directly here!