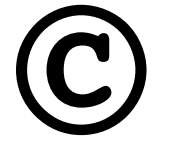
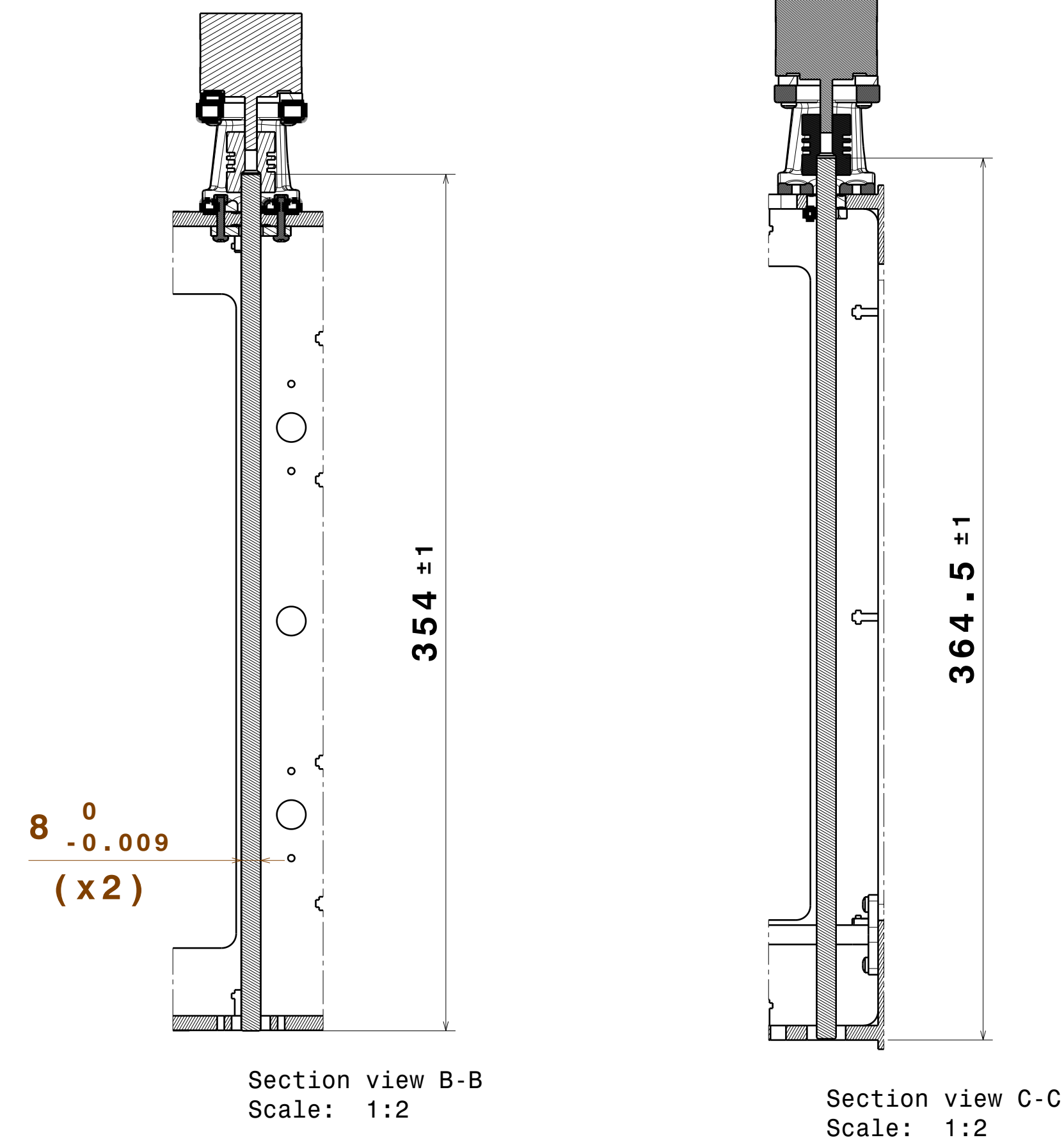


# DIRECT DRIVE ULTIMAKER MODIFICATION



CALUM E. DOUGLAS  
September 2012

### SHAFT LENGTHS



### Special Instructions:

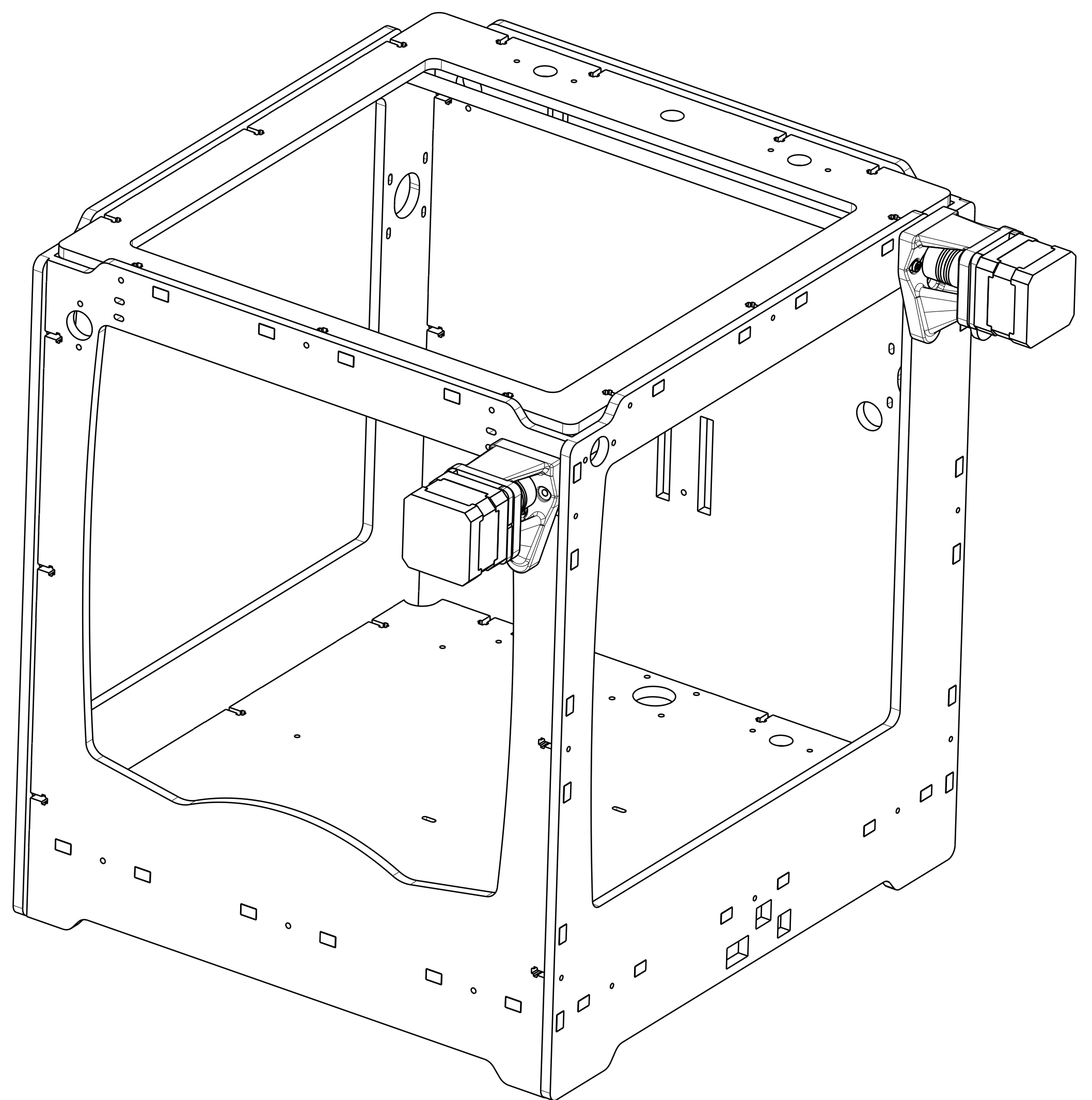
Change axis one at a time to completion. This keeps everything aligned with respect to pulleys.  
Remove any belt tensioners BEFORE attempting to remove old shafts.  
Lightly oil new shafts before insertion.  
Mount brackets to case BEFORE mounting stepper motor to brackets.  
Do not tighten up bolts in flexible couplings until final step.

Ensure couplings are spaced so that neither shaft intrudes into the middle flexible portion of coupler.

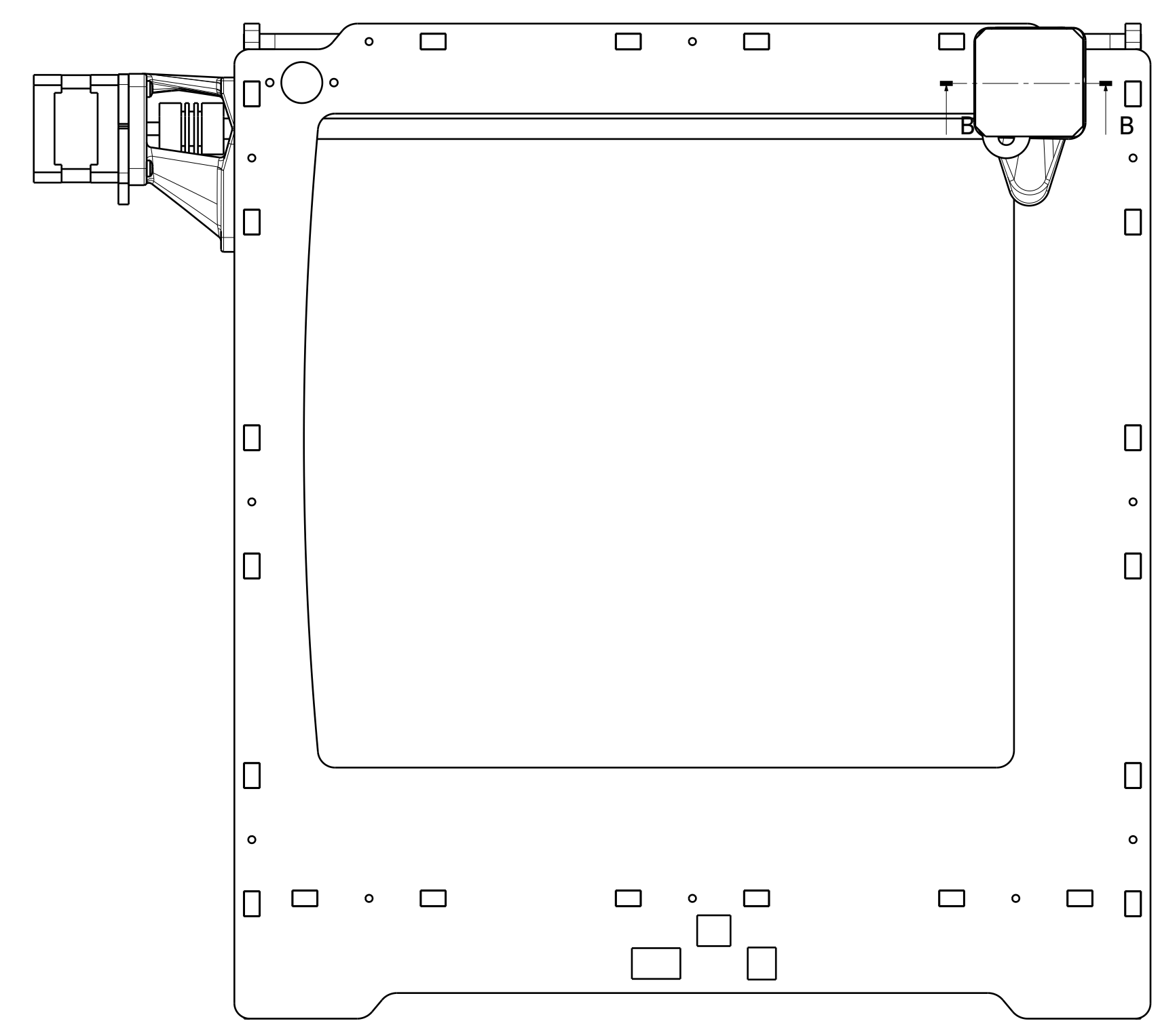
It is now possible to mount a heatsink and fan to both steppers (which was not possible before due to proximity of Z Stage. Recommended items are AKASA CHIPSET COOLERS, which come with heatsink, fan and thermally conductive adhesive pad. Part Number: AK210, price around 10 Euro.

When bought in h6 tolerance the diameter is guaranteed to 7.991 to 8.000mm.

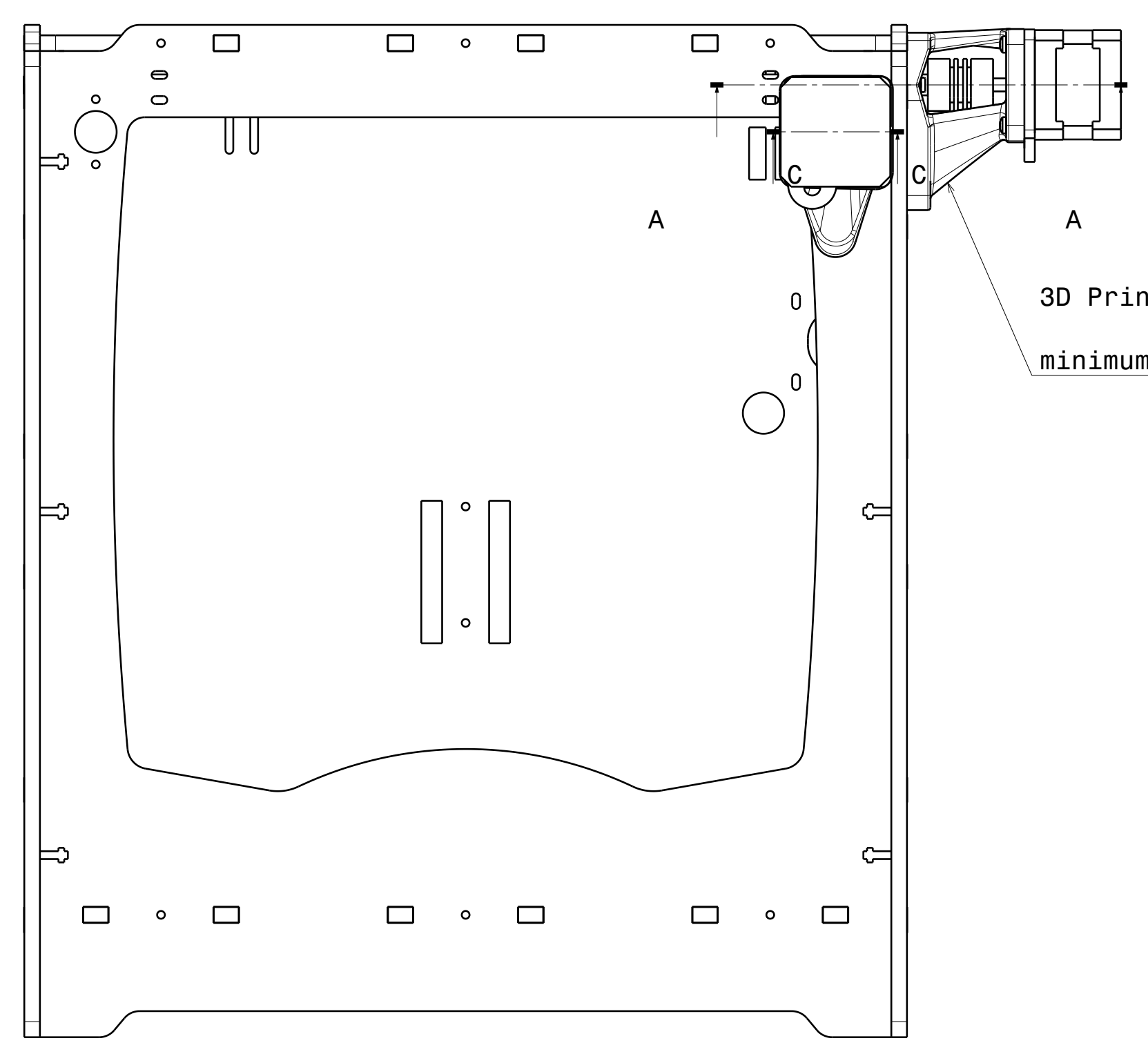
(For interest, excellent help for reference with hole and shaft tolerances to be found here: [http://www.misumiusa.com/CategoryImages/Metric\\_2006\\_pdf/METRIC1835-1836.pdf](http://www.misumiusa.com/CategoryImages/Metric_2006_pdf/METRIC1835-1836.pdf) )



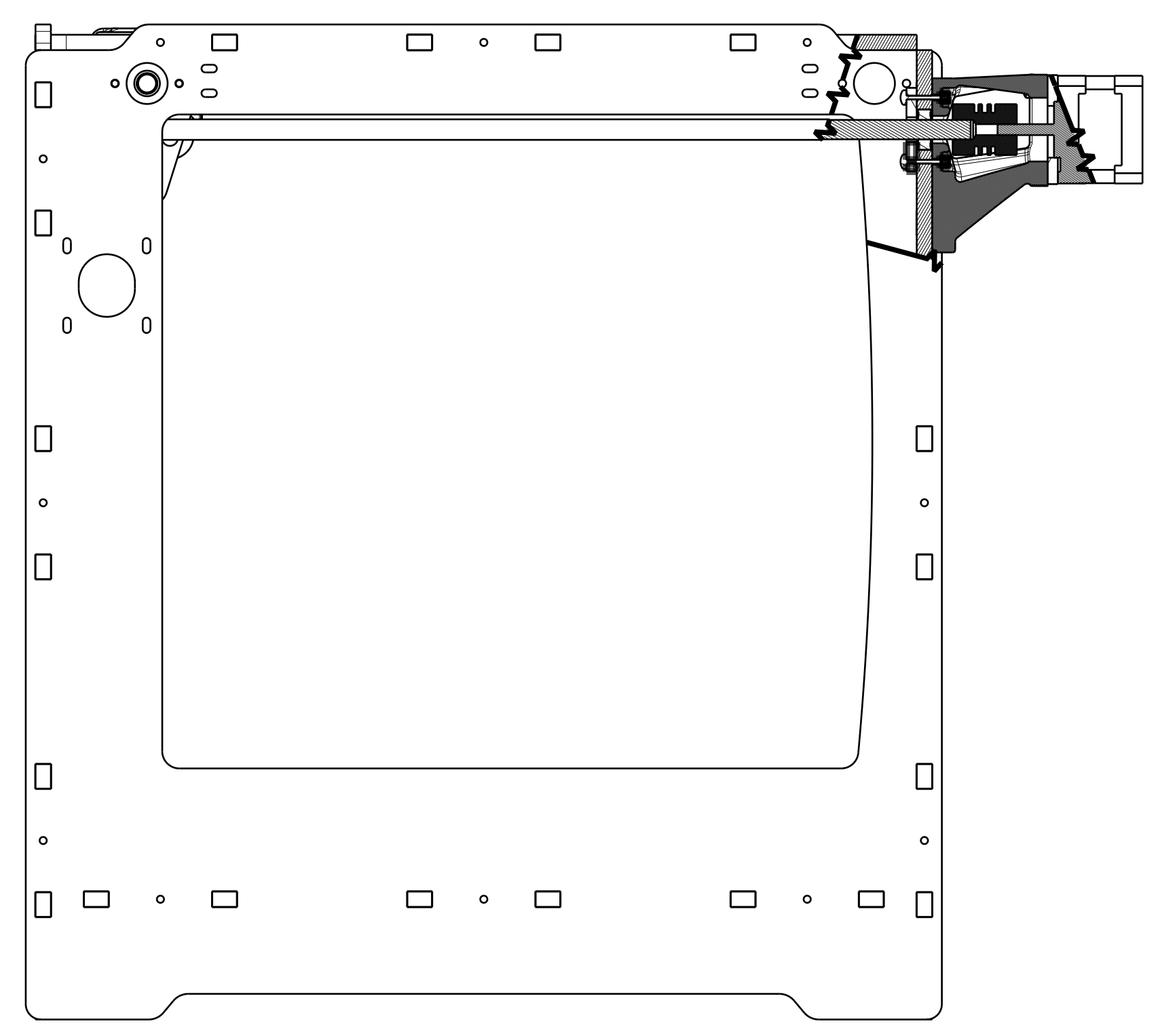
Isometric view  
Scale: 1:2



Right view  
Scale: 1:2



Front view  
Scale: 1:2



Left view  
Scale: 1:2

### SUGGESTED SOURCES FOR COMPONENTS

M3 Bolts and nuts can be bought almost at any good industrial outlet. Normal nuts can be used instead of self locking "nylocks". But are prone to self loosen under vibration.

Shafts were bought from [www.conrad.de](http://www.conrad.de)

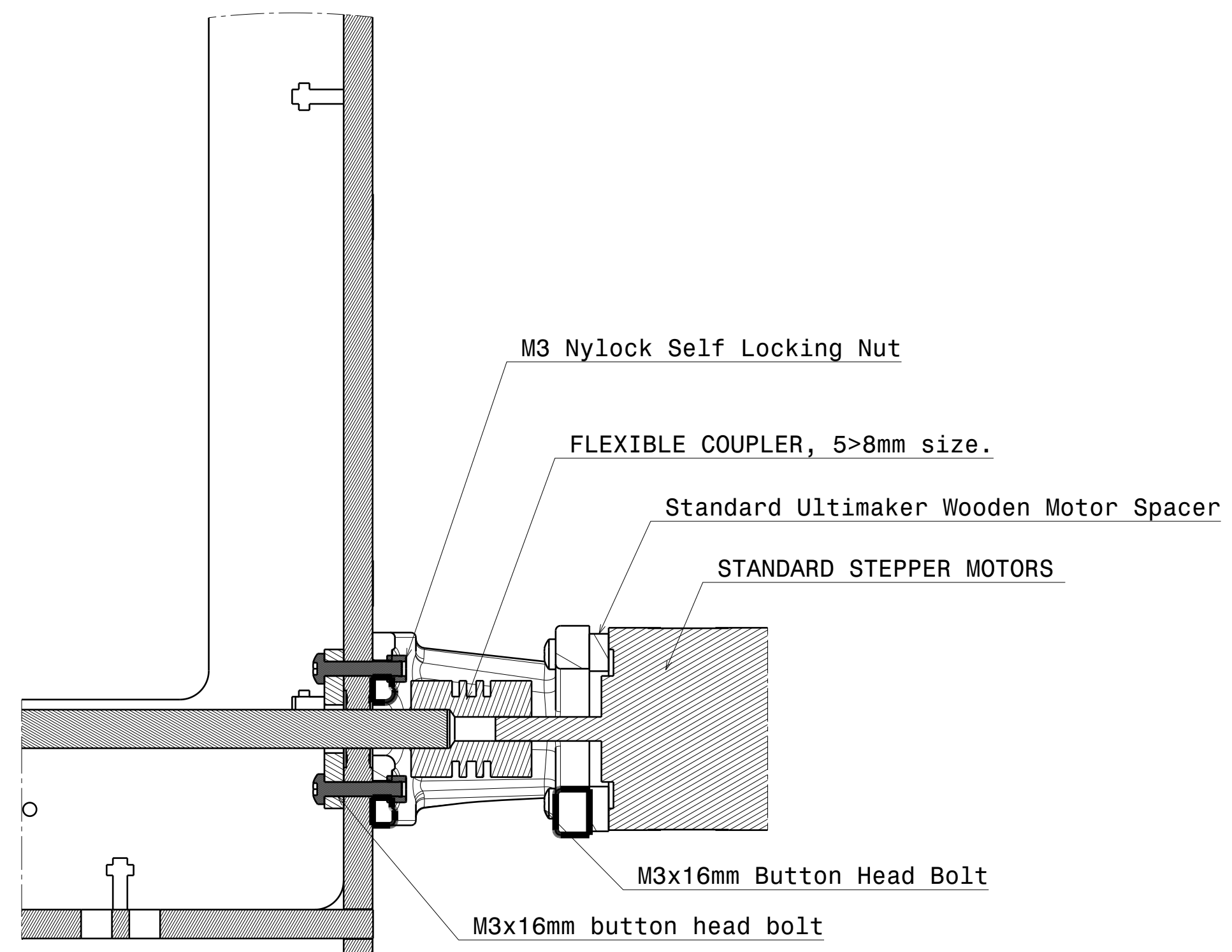
5>8mm Flexible Couplers were bought from ebay and shipped from China. Do not purchase couplers that use grub screws to lock the shaft to the coupler. These damage the shafts and do not provide reliable indexing.

Better couplers use 2x M4 bolts to tighten the end of the coupler in a pincer movement.

Typical cost for a coupler is 5 Euros  
Typical cost for a silver steel 500mm 8mm h6 shaft is 6 Euros

### PARTS LIST

- M3x16mm Button Head Bolts x12
- M3 Nylocks x4
- 8mm "silver steel" shafts in "h6" diameter tolerance x2
- Motor Bracket, PLA 25% infill x2
- Ultimaker Standard Motor Wooden Spacers x2
- Ultimaker Standard Steppers x2
- 5 to 8mm Flexible Shaft Couplers x2



Section view A-A  
Scale: 1:1