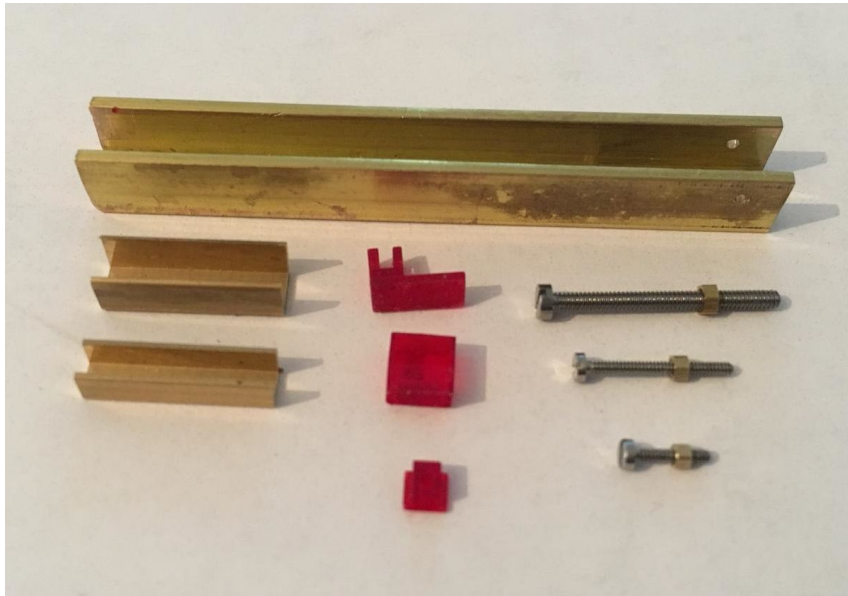


Manual to assemble *the drive*



1. Template rail
2. 12.5mm Sleeve
3. 12.5mm Inner-rail
4. Shuttle
5. Drive-base (?)
6. Screw-base
7. M 1,4 x 16 screw
8. M 1,4 SW 2 H 1 nut
9. M 1 x 10 screw
10. M 1 SW 1,5 H 1 nut
11. M 1 x 5 screw
12. M 1 SW 1,5 H 1 nut

Assembling the shuttle

The first step is to assemble the shuttle, on which the probe will get attached.

1. Insert a M1 nut (Figure 1) into the gap of the 3D-printed shuttle (Figure 2).
2. Screw a M1x10 screw (Figure 3) inside the top hole of the shuttle, so that it penetrates through both holes and the nut (Figure 4).
3. Glue the nut and the shuttle together, but pay attention to not accidentally get some glue the screw.



Figure 1: M1 SW 1,5 H 1 nut

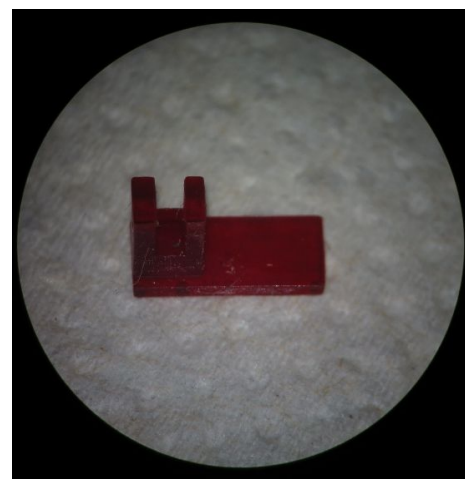


Figure 2: Shuttle



Figure 3: M 1 x 10 screw

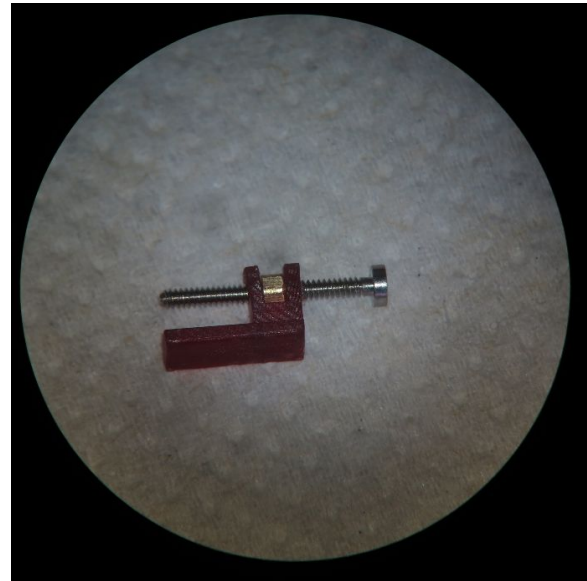


Figure 4: Shuttle with screw and nut

Drilling the joint hole

The next step is to drill a hole through the drive, which will be used to connect both rails to each other.

4. While the glue is drying you can drill a hole into the two rails with the help of the bigger template rail (Figure 5).

5. Make sure, that there is no gap between the three rails, and that they are at the very corner of the biggest rail. After the rails are aligned, fix the setup in the drill (Figure 6).

6. Use a 0.9mm drill-head to drill a hole in both sides of the rails (Figure 7). Be as accurate as possible in order to not damage the template rail and to get the holes on the intended place.

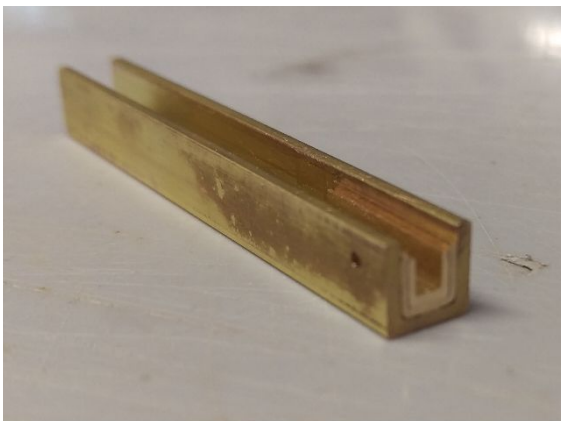


Figure 5: Both rails inside the template rail



Figure 6: Drilling a hole through the rails

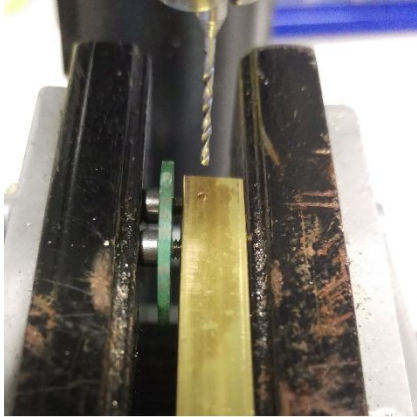


Figure 7: Drilling a hole from the other side as well

Fixing the screw-base and inserting the shuttle

The shuttle will now get inserted and fixed to the drive.

7. After you drilled a hole in both rails, remove the template rail. Now you can glue the small 3D-printed screw-base (Figure 8) to the inner rail and let it dry (Figure 9). Make sure to use the right side of the screw-base, so that it fits into the rail.

8. Insert the shuttle with the screw (Figure 4) into the inner rail. Usually you have to rasp the 3D-printed shuttle a bit so it fits tightly into the rail. Beware to not rasp away too much, since if the shuttle sits too loose the probe could get shaky.

9. Once the two parts are connected, use a 20G needle or similar, to hold the 2 parts together (Figure 10). Now you can carefully insert the screw into the hole of the screw-base, but beware to not press too hard, else the glued on cover-piece will come off.

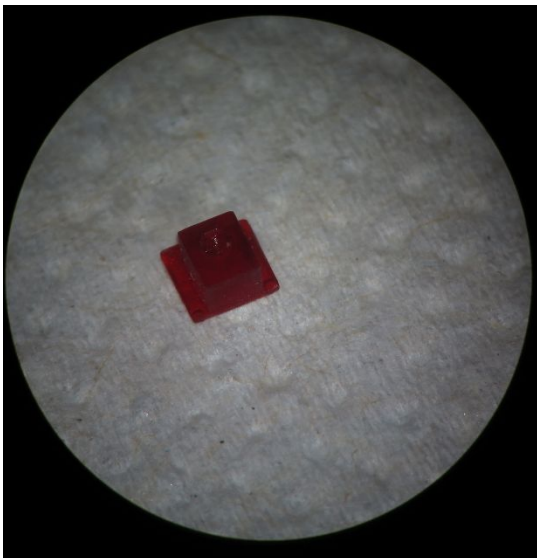


Figure 8: Screw-base

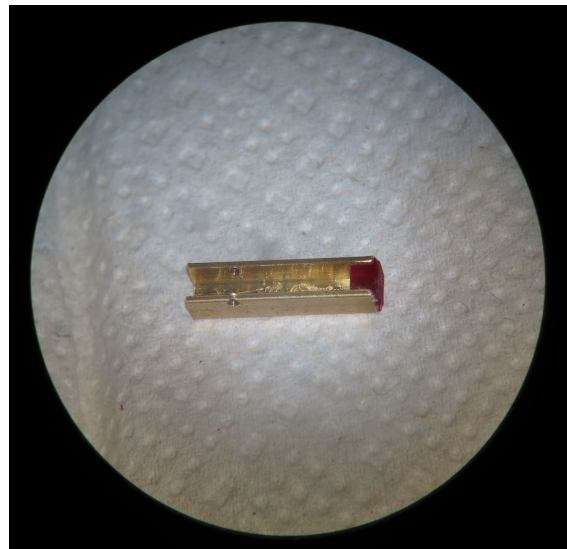


Figure 9: Screw-base glued to the rail



Figure 10: Both parts combined

Soldering the carriage nut

The carriage nut will get soldered to the top of the drive, to fix the screw that moves the shuttle.

10. For the next step we need to fix the drive, since we have to solder the top part of the drive. Take a M1,4x16 screw (Figure 11), put a *protection tube* over it and screw a M1,4 nut (Figure 12) onto it. Then place it on the top of the drive (Figure 13).

11. Solder only the nut to the rail (Figure 14) and pay attention, that there is **no gap between the nut and the screw** under it. Afterwards unscrew the screw and, if possible remove the protection tube as well. If the tube got soldered to the drive as well you have to cut it off close to the base and leave the remaining tube part on the drive.

12. Rasp the overlapping solder on the rail away, so that it fits again into the bigger rail, without any resistance (Figure 15).



Figure 11: M 1,4 x 16 screw



Figure 12: M 1,4 H 1 nut

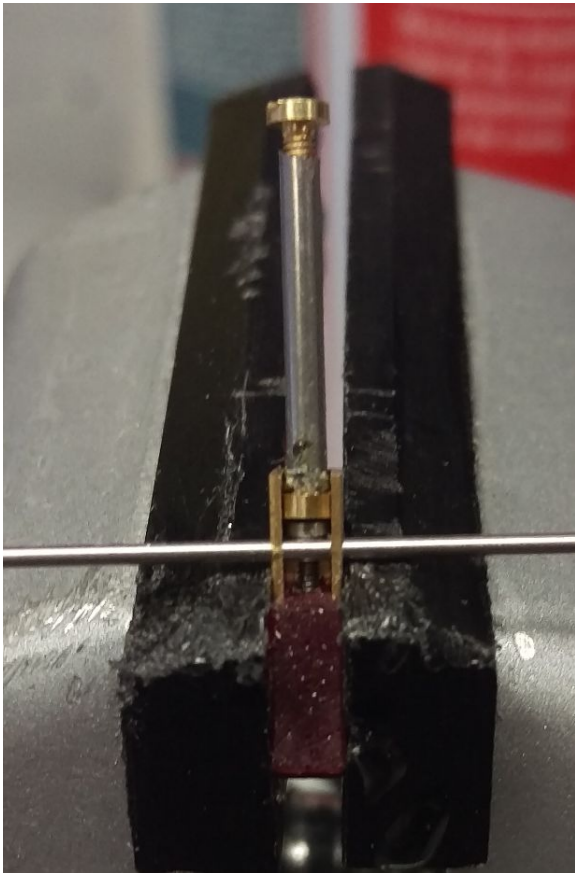


Figure 13: Drive ready to get soldered

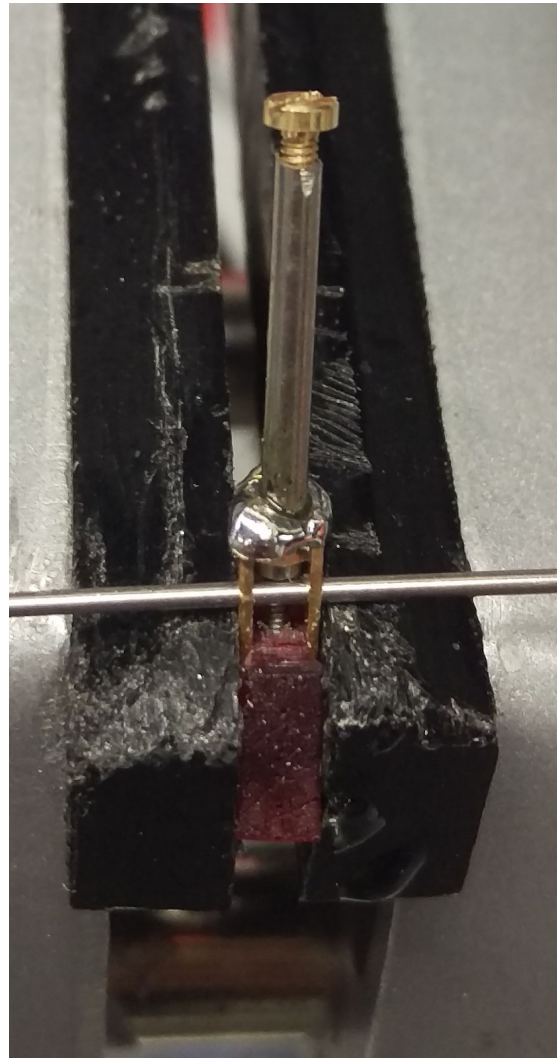


Figure 14: After applying the solder to the rail and nut

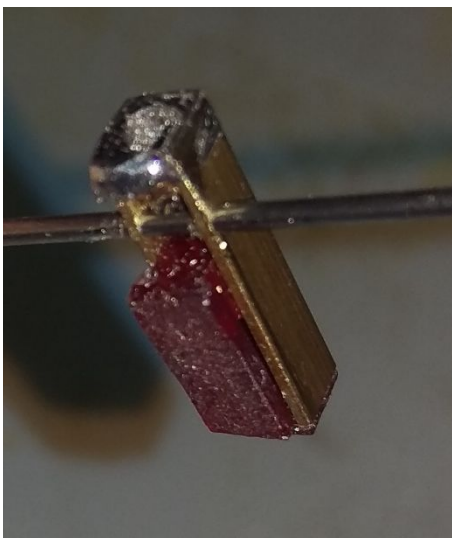


Figure 15: After soldering and rasping the drive

Connecting the drive and the sleeve

The final step is to connect the drive to the sleeve and make sure that the drive is working as intended.

13. Afterwards, remove the needle and place the drive inside the sleeve - the outer rail. Take a M1x5-screw (Figure 16) and a M1-nut (Figure 1) and screw the screw through the hole, that you drilled through the both rails before. Then fix the screw with the nut (Figure 17).

14. Glue the bigger 3D-printed drive-base onto the bottom of the drive (Figure 18).

15. In the end one should check under the microscope, if the movement of the shuttle is not biased while moving in both vertical and horizontal planes. In order to not damage the carriage nut you should use maximal a 1mm screwdriver. Sometimes a bit lubricating oil can help to make the movement of the shuttle smoother.



Figure 16: M 1x5 screw

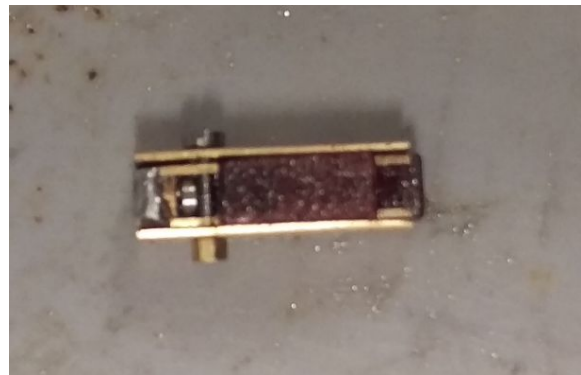


Figure 17: Drive fixed with screw and nut

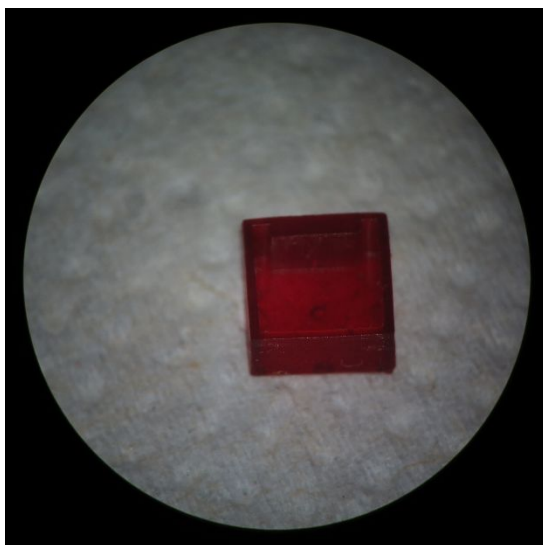
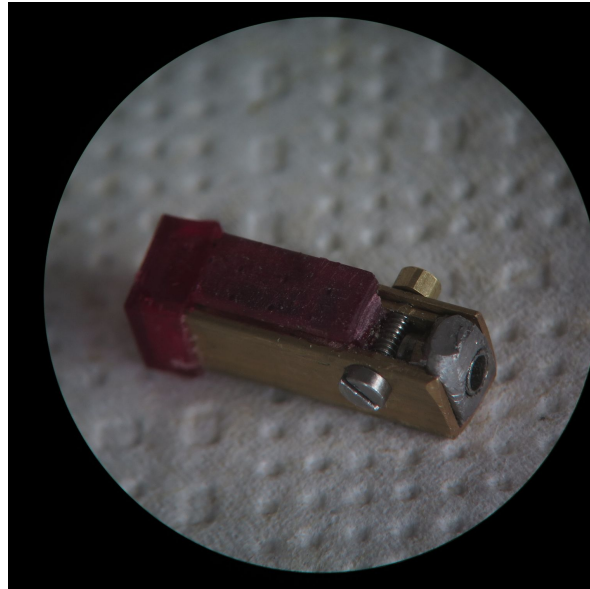
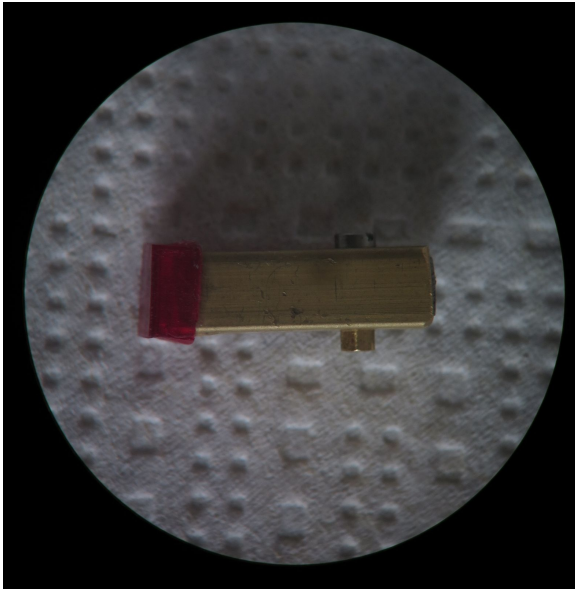
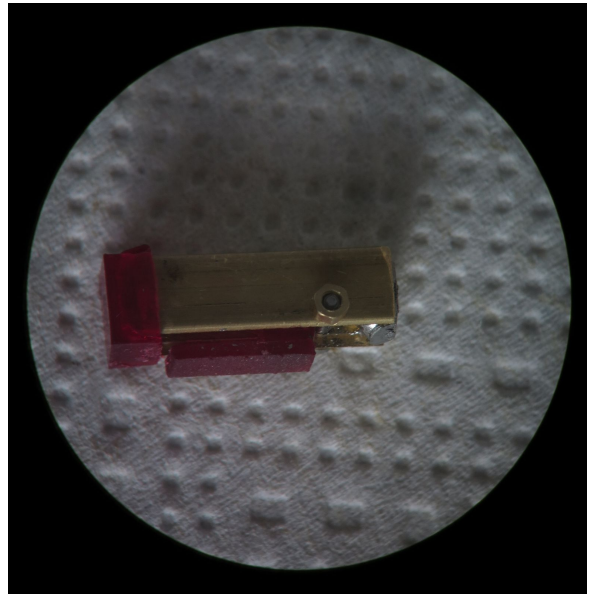
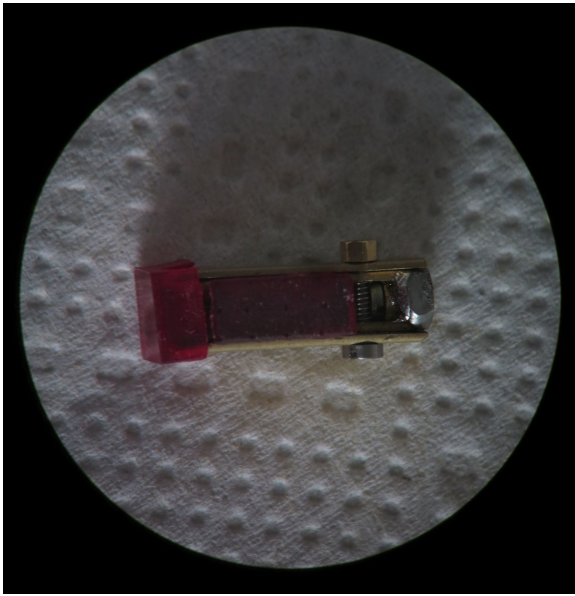


Figure 18: Drive-base



Figures 19-22: The finished drive from all sides