

# MEMS building protocol

## Part 1- MEMS wire cable Assembly

### Reagents:

- Super glue (Loctite, 415)
- Soldering tip thinner & cleaner

### Equipment:

- 1 scissor
- Medical tape
- Double-side tape
- Clamp holder
- Stripping tool
- Soldering iron
- Components of the controlling module (Table below taken from Protocol P2)

**Table: Components of the controlling module (short-listed)**

Component Name	Amount	Item Number (see S1, shopping list)
6-pin connector for MEMS	1	49
Single wire cables	6	50

### Preparing the 6-wire MEMS cable.

**Step1.** Cut 6 single wire cables (item 50) of different colors (recommended length: 2.3-2.5m)

**Step2.** Prepare a flat and clean surface to put together the 6-wires.

**Step3.** Place the 6-wires as close as possible to each other, and on top of a double-side tape, leaving 1cm from one end (see Fig.1)

**Step4.** Then hold the cables together by placing a thin layer of medical tape underneath and do at least a loop around the six cables.

**Step5.** Repeat Step4 every 20-30cm of wires length.

**Step6.** Cut the end of the 6-wires to the same length.

**Step7.** Remove 1mm coating from the end by holding a single wire with a Clamp and pushing outwards the colorful plastic with a stripping tool.

**Step8.** Hold this wire in a sturdy position as shown and isolate by soldering it (see Fig.3)

**Step9.** Repeat Steps 7-8 for all the 6 wires, but one wire at a time. This prevents damaging or twisting them.

### **Prepare the 6-pin connector for MEMS**

**Step10.** Hold the connector (item 50) in a fixed position. It helps to connect it to a MEMS PCB, but avoid repeating this procedure more than once

**Note!** The connector has a limited number of times it can open-close, so ideally only do Step6 once.

**Step11.** Carefully solder each pin of the connector, but just adding a small drop of solder otherwise the six contacts may touch each other to make short-circuit (see Fig.2)

**Caution!** It is very important to make sure each of the contacts do not touch each other.

### **Assembly of the MEMS-cable (wires+connector)**

**Step12.** Hold the connector in a fixed position

**Step13.** Solder one of the prepared six wires (Steps 8-9) to one of the connector's six pins (step 11). Make sure to have stable hands to guarantee each wire-pin soldered does not touch any of the other connections.

**Caution!** This is one of the most delicate steps of this assembly, as it is difficult to hold the wire while soldering it to one of the pin's connectors. One can easily make a short-circuit.,

**Step14.** Repeat Step 12, one at a time, soldering each of the other 5 wires-to-pin.

**Step15.** Finally, glue the wires after soldering with super glue (fresh glue, taken right from the package). Start by adding a layer on the front side, from the top white part of the connector which overlaps the wires, to the base in a taper-like-structure as shown in Fig. 4.

**Step16.** Repeat Step 14 for the back side.

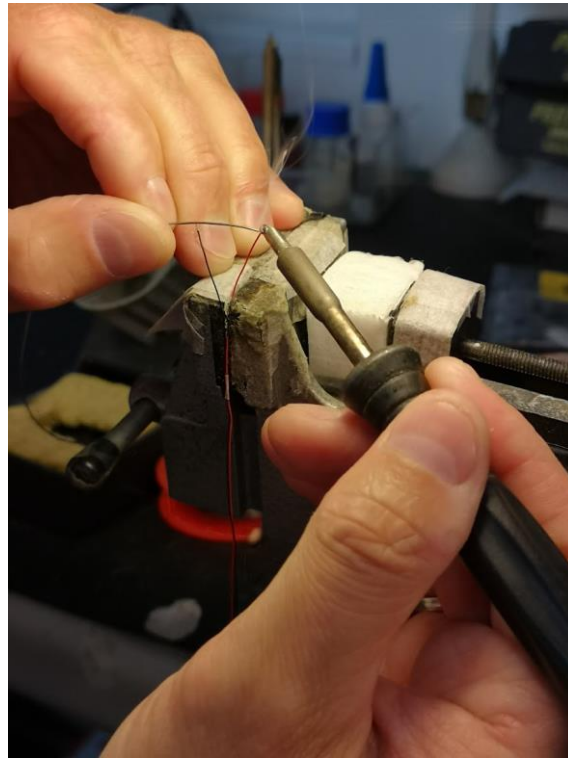
**Step17.** Add 2 more layers of super glue on the front and back side but wait around 3h for the glue to dry before adding another layer.

**Step18.** On a second phase, use the same super glue but first let it dry for around 1h before using it. Then add a layer of this glue on the front and back side. Wait for it to try for 3-4h.

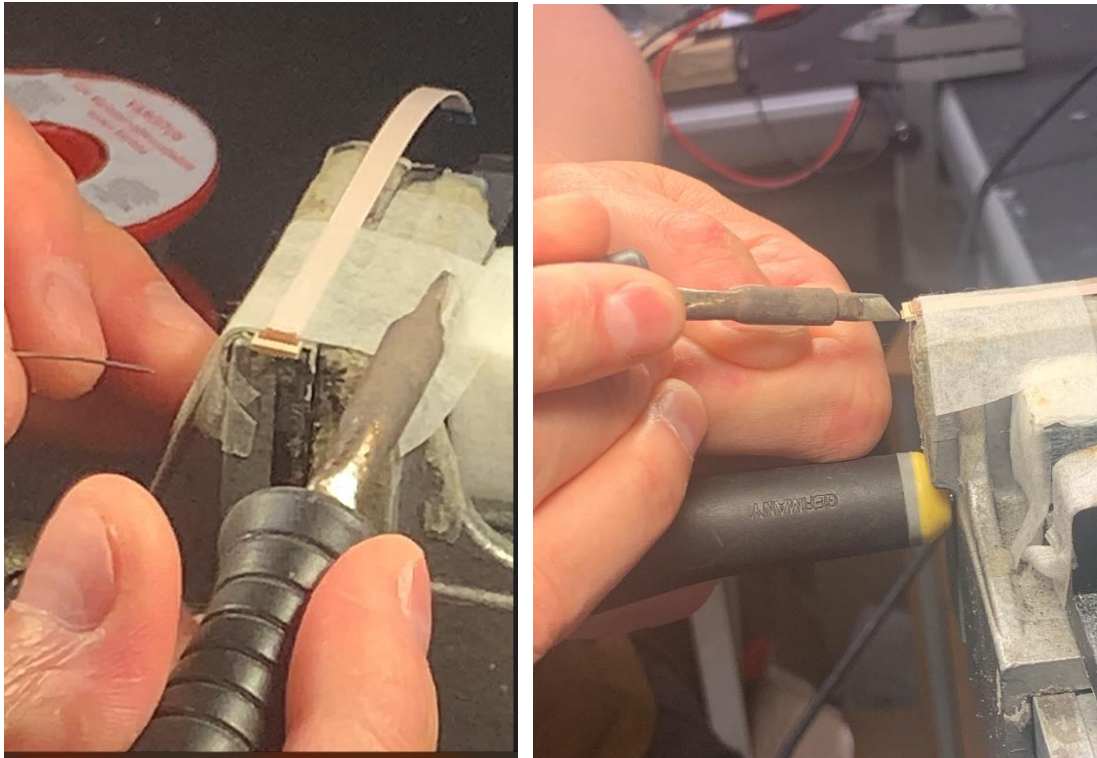
**Step19.** Repeat Step 17 for 3-4 more times.



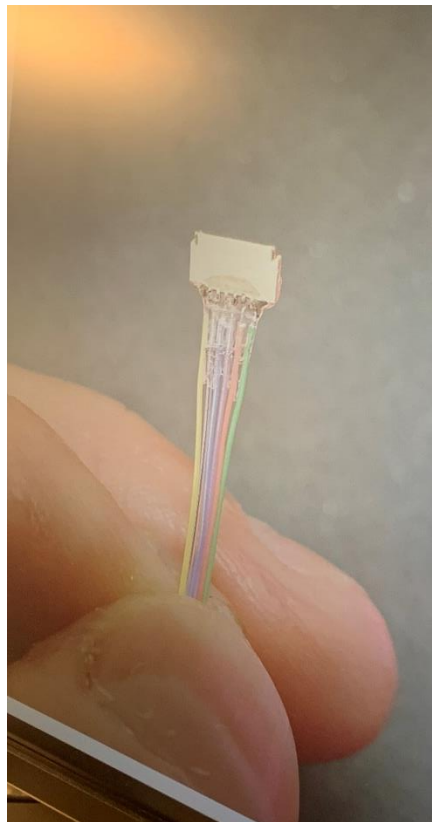
*Fig. 1: 6-wires of different colors (left) and placement of wires together (right).*



*Fig. 2: Soldering of a single wire after removing protection (step 8).*



*Fig. 3: Illustration of the 6-pin connector soldering, one at a time while connector is hold in a stable position (step 11).*



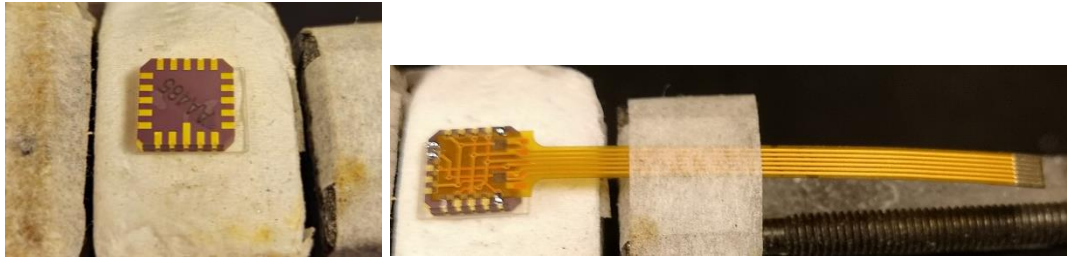
*Fig.4: Illustration of MEMS wires with connector after multiple layers of super glue..*

## Part 2- MEMS mirror assembly

**Step20.** Place the MEMS mirror on a surface with the MEMS circuitry facing up, i.e., protective glass facing down.

**Step21.** Align the MEMS PCB to the MEMS circuitry such that it overlaps the marker at the bottom left corner, as shown in Fig. 5. Hold it in place with medical tape.

**Note!** The smooth black square at the end of the PCB should be facing down, i.e., it has the same direction as the MEMS protective glass.

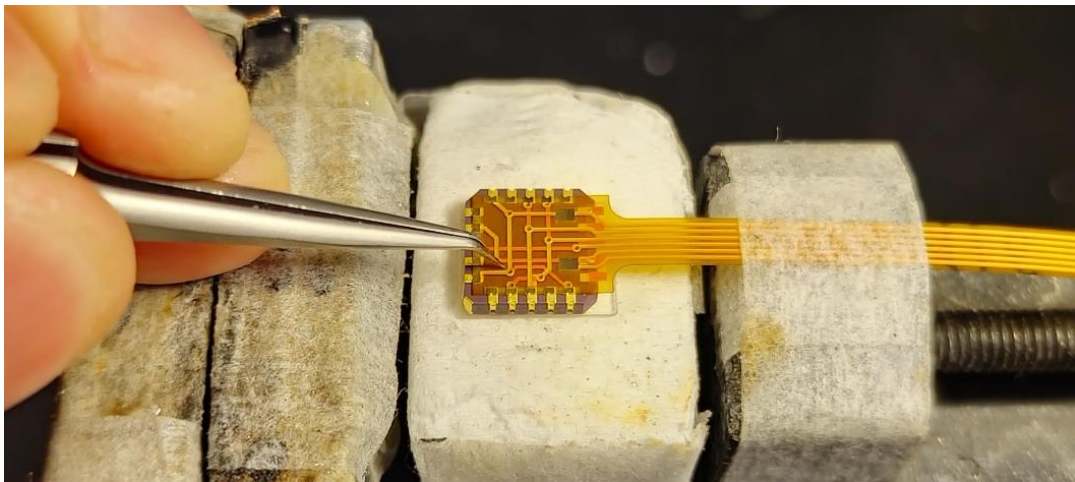


**Step22.** Start by soldering a few of the outermost points of the MEMS circuit of each line/column (see Fig. 6-left)

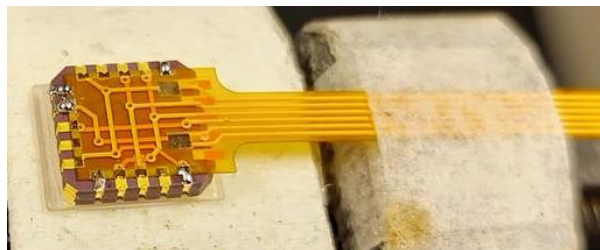
**Step23.** Then continue Step 22, now soldering the remaining points, still on the back side.

**Step24.** Turn the MEMS up and solder the final part, as shown in Fig. 7.

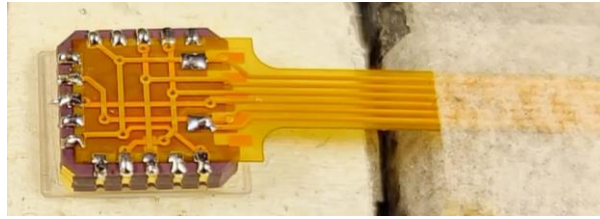
**Step25.** Attach the connector for the uTLens on the circuitry side (see Figs. 8)



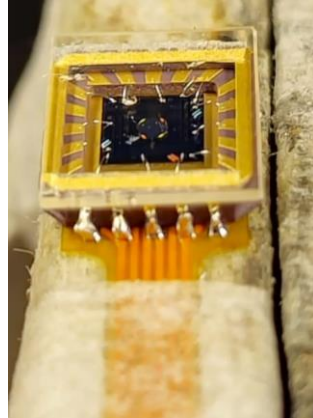
*Fig. 5: overlap of MEMS PCB into the MEMS circuitry.*



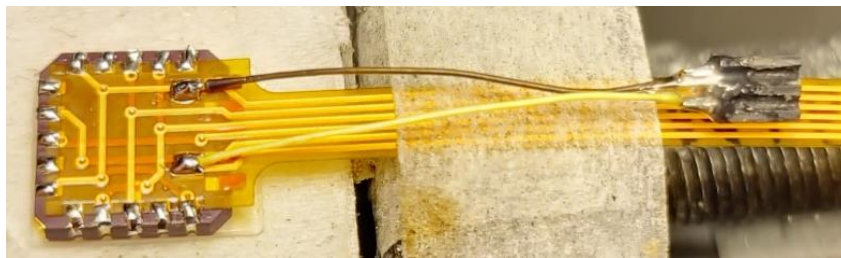




*Fig. 6: top) Soldering of outermost points; right) second phase, soldering the remaining points.*



*Fig. 7: top) Illustration of soldering on the MEMS front side.*



*Fig. 8: top) Attachment of the connector to the uTLens.*