

## Fabrication and assembly of AST shear sensor

### Materials Required:

- 3D printed mould
- 3D printed spreader
- 3D printed adaptor x 3
- PlatSil Gel 10 parts A and B
- 1ml measuring equipment
- Silicone mixing cup/container of some sort
- Protective gloves
- Toothpick or something with a fine tip
- 2mm OD 1.5mm ID flexible tubing
- 6mm OD 4mm ID flexible tubing



Figure 1 – 3D printed tube adaptor

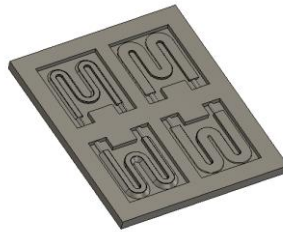


Figure 2 - 3D printed mould

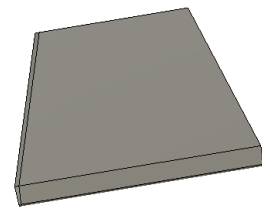


Figure 3 - 3D printed spreader

### Fabrication:

1. Use 1 ml measuring equipment to measure out and mix 3 ml of silicone gel part A with 3 ml of silicone gel part B in a disposable mixing cup. (Use protective gloves when handling PlatSil Gel)
2. Pour 1ml of the mixture into each sensor cavity in the 3D printed mould (use some tissues under the mould to keep the working surface clean).
3. Excess silicone mixture will be left over, this can be used to fill any remaining gaps in the sensor cavities.
4. Once all the sensor cavities are filled with silicone, use the 3D-printed spreader to spread the silicone evenly. The excess silicone that gets picked up by the spreader can be put back on top of the mould and the spreading motion can be repeated in the perpendicular direction.
5. Repeat the above step 3 times to ensure that silicone gets into all the gaps in the negatives of the acoustic channel.
6. Remove any excess silicone on the top of the mould using the spreader, this should leave a flat and even distribution of silicone in the sensor cavities.
7. Wait for 2 hours for the silicone to set.
8. Carefully remove the sensor slices.

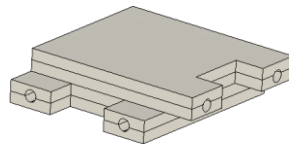
### Assembly:

1. Mix 1 ml of silicone gel part A with 1 ml of silicone gel part B and mix in a container like previously. This will be used as an adhesive to join the sensor slices.
2. Identify the correct pairs of slices that need to be joined together. When the sensor slices are laid out with the channel facing up. Each sensor slice that contains a wide channel (bottom half) must be paired with a sensor slice that contains a narrow channel (top half).



*Figure 4 - Wide channel (bottom side) on the left and narrow channel (right side) on the right.*

3. With the bottom half of the sensor slice laid flat, apply silicone mixture to the surface using a toothpick or something with a fine tip. Carefully remove any silicone that falls into the channel.
4. Place the top half of the sensor slice (channel side down) onto this, carefully ensuring that the top and bottom are aligned properly. Do not apply any force on the channels as there is a chance they could be glued shut.
5. Repeat steps 3 and 4 for the second half of the bi-layered sensor.
6. Wait 2 hours for this to set.
7. Repeat step 1 to get more silicone mixture.
8. Apply silicone mixture to the top side of one of the halves assembled using steps 3 and 4.
9. Place the other half from steps 3 and 4 on top of the first half but rotated by 90 degrees.



*Figure 5 - How the sensor should look after step 9.*

10. Wait 2 hours for this to set.
11. Now flexible tubing can be added to connect the sensor to the speaker/mic.
12. The 3D printer adaptor can be used to connect the 2mm OD tubing to the 6mm OD tubing. Silicone mixture can be used as an adhesive to securely connect the tubing to the sensor.