

## Setting up the scanning system

### Threaded rods for fixing horizontal absorbers:

- 9 st - M4 (4 mm diameter) - length = 10 mm (Al base) + 70 mm (tungsten pieces =  $2 \times 19 + 2 \times 13 + 3 \times 2 = 70$ ) ~ 80 mm
- <https://tools.se/produkterSe/fastteknik/industriinfastning/helgangad-stang/Gangstang-HGS-4.8-ANS-FZB-1411093-sv-se#v=SE-2605977>
- Malmö!

These have been processed and tested.

### Screws for setting up LYCCA ring:

#### 12 cylindrical distance pins for LYCCA ring top <-> bottom - 2x12 M6 screws:

- From top:  $l = 10 + 10 = 20$  mm, no protruding head
- <https://tools.se/produkterSe/fastteknik/industriinfastning/maskingangad-insexskruf/-SchaferPeters-A2-1411468-sv-se?categoryId=1073748027#v=SE-2027270>
- Here we chose M6x25mm with no head!
- 
- From bottom: Drill small larger “holes” for head?  $-> l = 10$  (Al base) + 10 (Plexi bottom) + 10 (in distance pin) = 30 mm
- <https://tools.se/produkterSe/fastteknik/industriinfastning/maskingangad-insexskruf/Insexskruf-MF6S-10.9-Forsankt-cyl.-huvud-ANS-FZB-1411311-sv-se>
- Here we chose M6x35 or M6x30mm (if former does not work) with försänkt head!

#### 2 screws for correct positioning of the LYCCA base on the table

- $l = 10 + 10 + 15 + (\text{depth in table}) = 15 = 50$  (max), this is M6!
- They cannot have head or something like that. See storage in lab.

#### 12 M3 screws for fixing each LYCCA module in the bottom plate

- Or is it possible with the final module configuration?
- $l = 5$  mm, head not very important!?
- This length does not exist!!
- WE HAVE IT IN\_HOUSE!! This is true!

Dubbelhäftande tape to fix the 4 plastic boxes on the preamplifiers and the preamps to the bottom plate.

- <https://tools.se/produkterSe/fastighet/tejp-och-tatningslist/ovrigt-tejp-och-hallare/Mattejp-Universal-561705617156172-TESA-1405469-sv-se>

### Screws positioning system

- KK50-bottom <-> top plate: 6 st; HEAD=8x4, THRU=4.5 (no thread), thickness top plate = 10 mm
  - Final: 6 st, M4x25mm with M4 nut + M4 plate
- KK50-wagon <-> KK60-base:
  - Wagon: 4 st; M4x0.7
  - KK60-base; 4?=2; HEAD 9.5x4.7, THRU=5.5
    - \* Final: 2 st M4x10mm. These have been optimised for the usage of the most threads in the KK50 wagon. M4x12mm was protruding! Fix these really tight as they need to sustain a large load.
- Linear guide base <-> top-plate: 4 st; 7.5(measured~8)x5.3, THRU=4.5x(15-5.3=9.7), thickness top plate = 10 mm
  - Final: 4 st M4x25mm + M4 nut + M4 plate
- Linear guide wagon <-> KK60-base:
  - Wagon: M4 THRU
  - KK60-base; 4?=2; HEAD 9.5x4.7, THRU=5.5
    - Final: M5x25mm. Nuts and plates were too tedious to install.
- Collimator arm <-> KK60-wagon:
  - Wagon: 4 st; M5x0.8
  - Thickness collimator arm = 10 mm
    - \* Final: M5x18 + plate M5.

Remarks: Sadly no plates matches the space for the screw heads on the base of the linear units, unclear why this construction.

### Mounting the wagon onto the linear guide

1. First a plastic temporary filler was removed from underneath the oiled up wagon.
2. The wagon needs to be slowly and carefully slid onto the guide.
  - At first try 2 of the bearing balls were pushed out of their course.

- With a forceps (pincett) the cleaned balls were moved back.
  - At second try it was successful.
3. It is important that the guide is not fixed when run, as it needs to adapt its path to horizontal with the linear unit.

### **Mounting the collimator arm on the KK60 and placing the collimator**

1. Make sure that you mount it in such a way that the arm extends on that side of the KK60 where there is no “frame” sticking out.
2. Fix the two screws (see above for which screws to use) with the longest distance from the arm first. Fix as much as possible and verify that they are positioned correctly by observing horizontal arm (both on wagon and w.r.t. table).
3. Fix the other screws as good as possible.
4. Place the collimator and observe no change in the set-up.

### **Setting up the Raspberry Pi - Gertbot - stepper motors**

1. Before booting the *Lundiumberry* (Raspberry Pi 3, Model B installed with Raspbian): The Gertbot goes on top of the pins on the raspberry pi (only one way, otherwise it will hit ethernet connector)
2. The 2 phase stepper motors *17H261-02S/D* are run with 1.2 A per phase. On the specification sheet it is stated that each phase has a resistance of 4 Ohm. According to <http://compotech.se/blogg/2014/06/sa-valjer-du-ratt-spanning-din-stegmotordrift/> at least 4.8 V should be enough. 6 V was chosen as an objective.
3. The Gertbot controller requires at least 8 V (8-18 V is recommended, see [gertbot.com](http://www.gertbot.com)) to function. This has the consequence that it is necessary to connect a resistor in series with the phase of the stepper motors. A 15 V nominal input voltage was chosen which implies 6 Ohms resistors.
4. 6.7 Ohms, 5.5 W resistors were connected via a connection board. Assuming a motor current of 1.2 A we need ~ 10 W resistors and these are getting somewhat too hot.
5. The stepper motors were connected to the Gertbot as illustrated in the figures below!
6. Important convention: Red wire connected to A1 and striped red wire to A2, red wire connected to B1 and striped green wire to B2. Correspondingly for 2nd connected stepper motor. Important since this determines the polarity of rotation.

Configuring *Lundiumberry* with Gertbot: 1. From <https://www.gertbot.com/download.html> download:

\* Gertbot debug GUI, executable for Rasbian

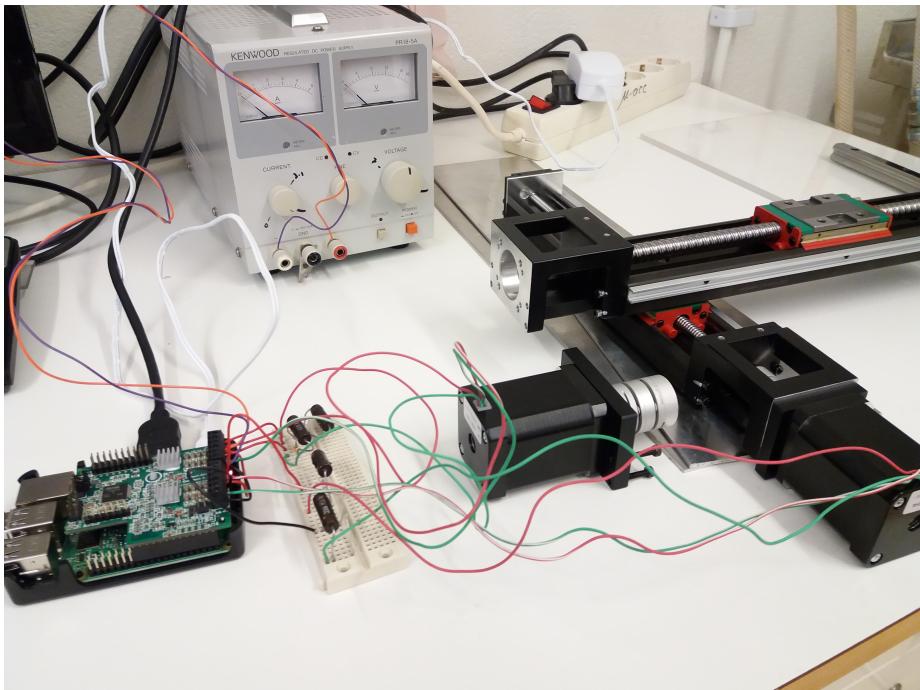


Figure 1: Stepper motor connection

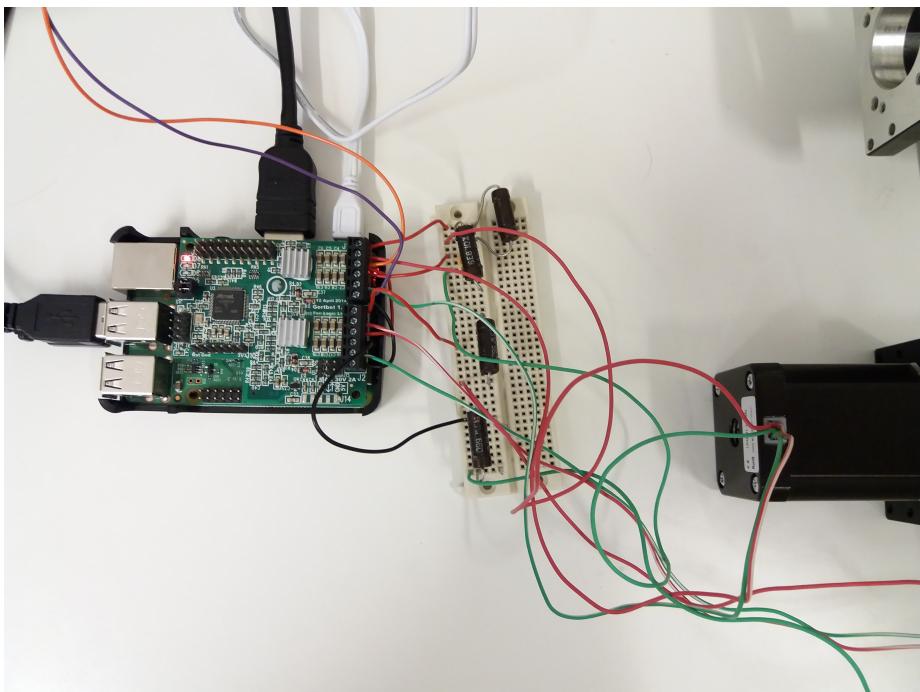


Figure 2: Stepper motor connection (close up)

- \* Drivers for Python 3 (.py)
  - \* Executable to enable the uart
2. Follow: <[https://www.isnr.de/images/Tools/low\\_cost\\_CT/How-to-set-up-the-Raspberry-Pi-and-](https://www.isnr.de/images/Tools/low_cost_CT/How-to-set-up-the-Raspberry-Pi-and-)>
  3. Execute GUI for debug with: `sudo ./gertbot`
    - \* Click connect and one board (#3) should be found
    - \* For channels 1 and 3 choose `Step gray off` and try it out.
    - \* For details of the GUI: <[https://www.gertbot.com/gbdownload/man/Gertbot\\_GUI.pdf](https://www.gertbot.com/gbdownload/man/Gertbot_GUI.pdf)>

### Activating end-stops