

# Instructions for building DistoY (April 2025)

This document has been machine translated. In case of any ambiguities, please contact the author of the document to adjust/correct the text.



## Description

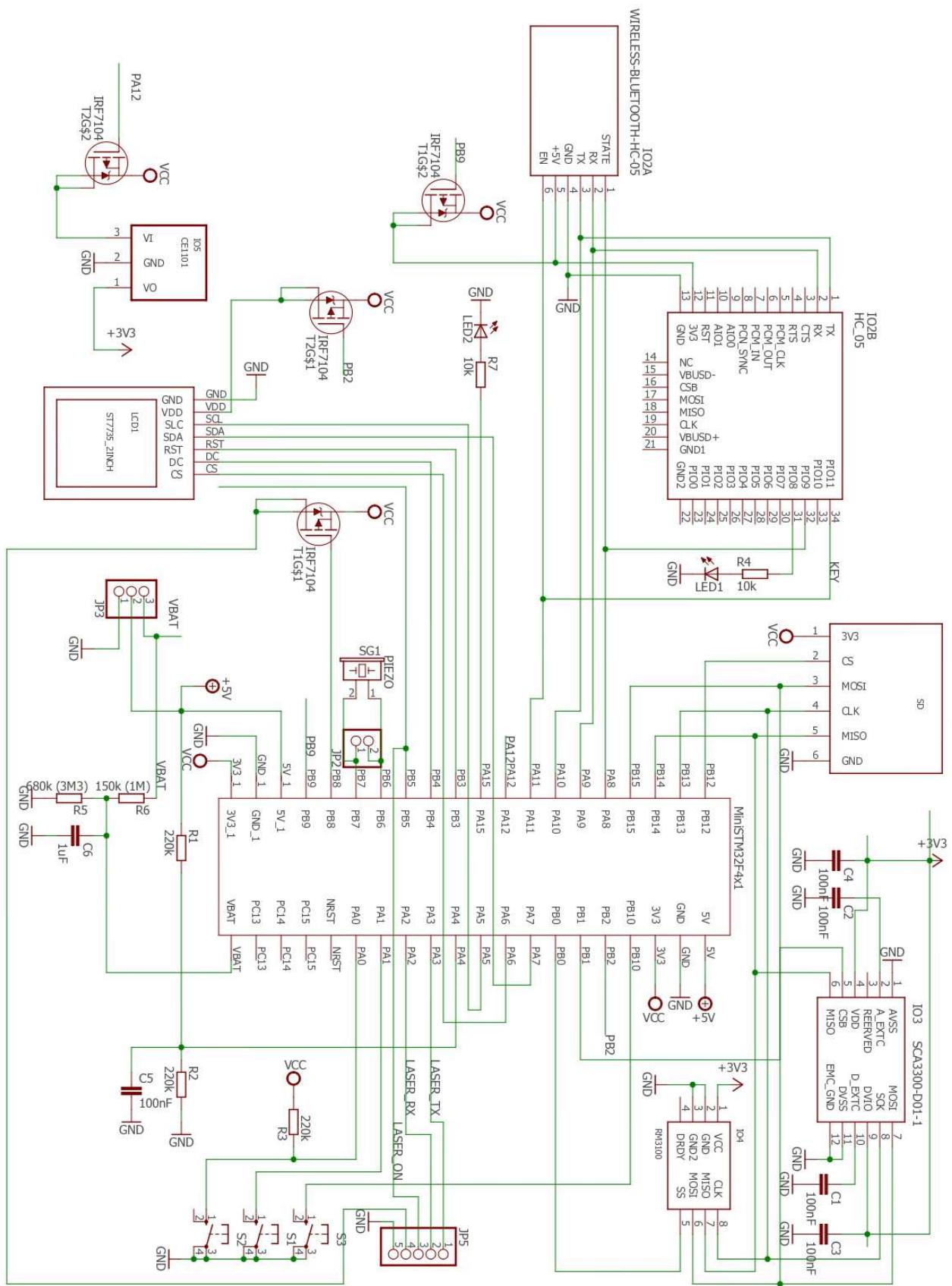
DistoY is still under development, so the following photographs may slightly differ from the current version. The following pages will describe how to construct a functional meter. The device consists of a printed circuit board that is largely populated with modules from China, which can be purchased on Aliexpress or Ebay. This concept was chosen for its simple and fast assembly and affordable price. Only a few components that could not be sourced as modules are soldered directly onto the printed circuit board. Furthermore, a disadvantage of the modules can be their modification (different pinout), therefore the PCB will have to be modified for a different module variant.

The printed circuit boards are designed in Eagle, and the software is programmed in CubeIDE for the STM32 MCU.

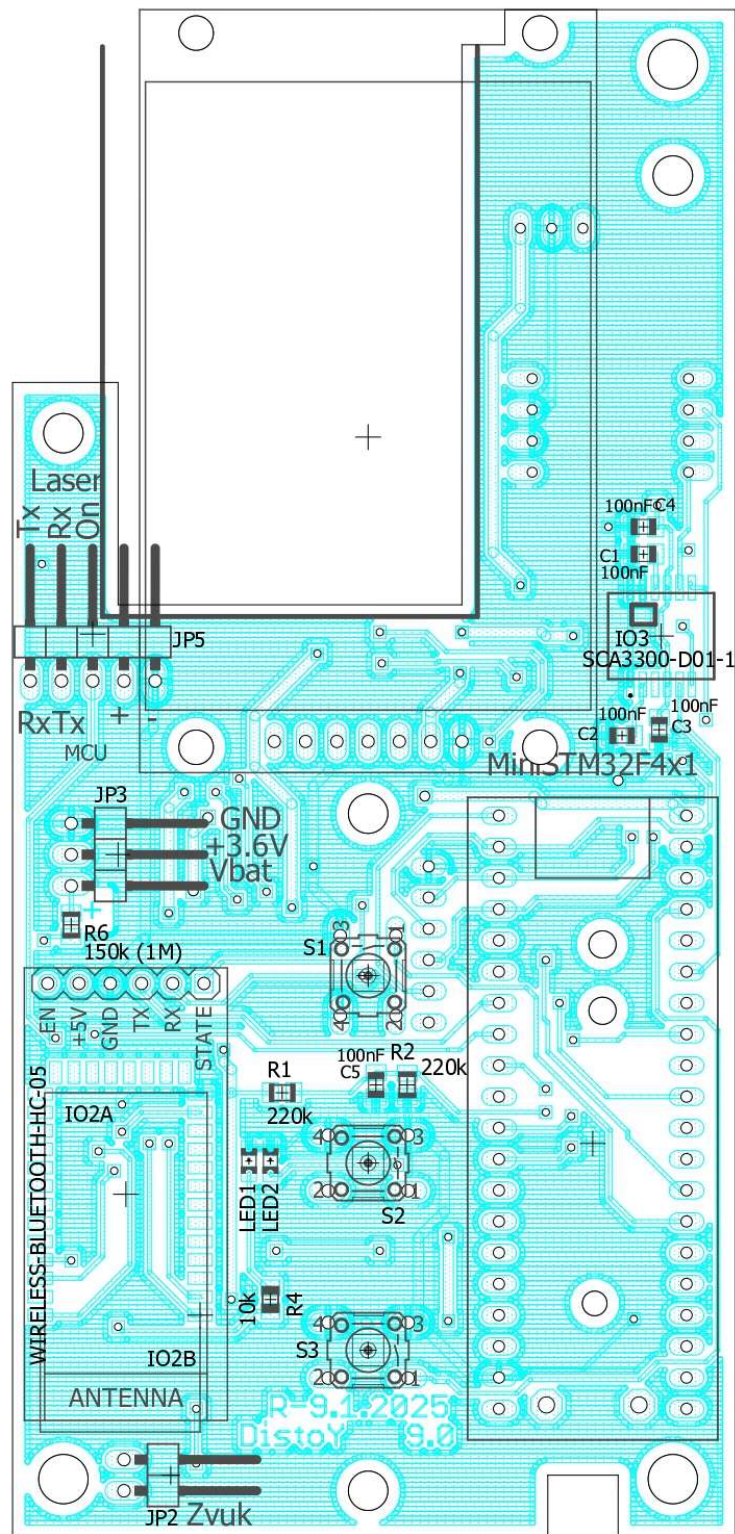
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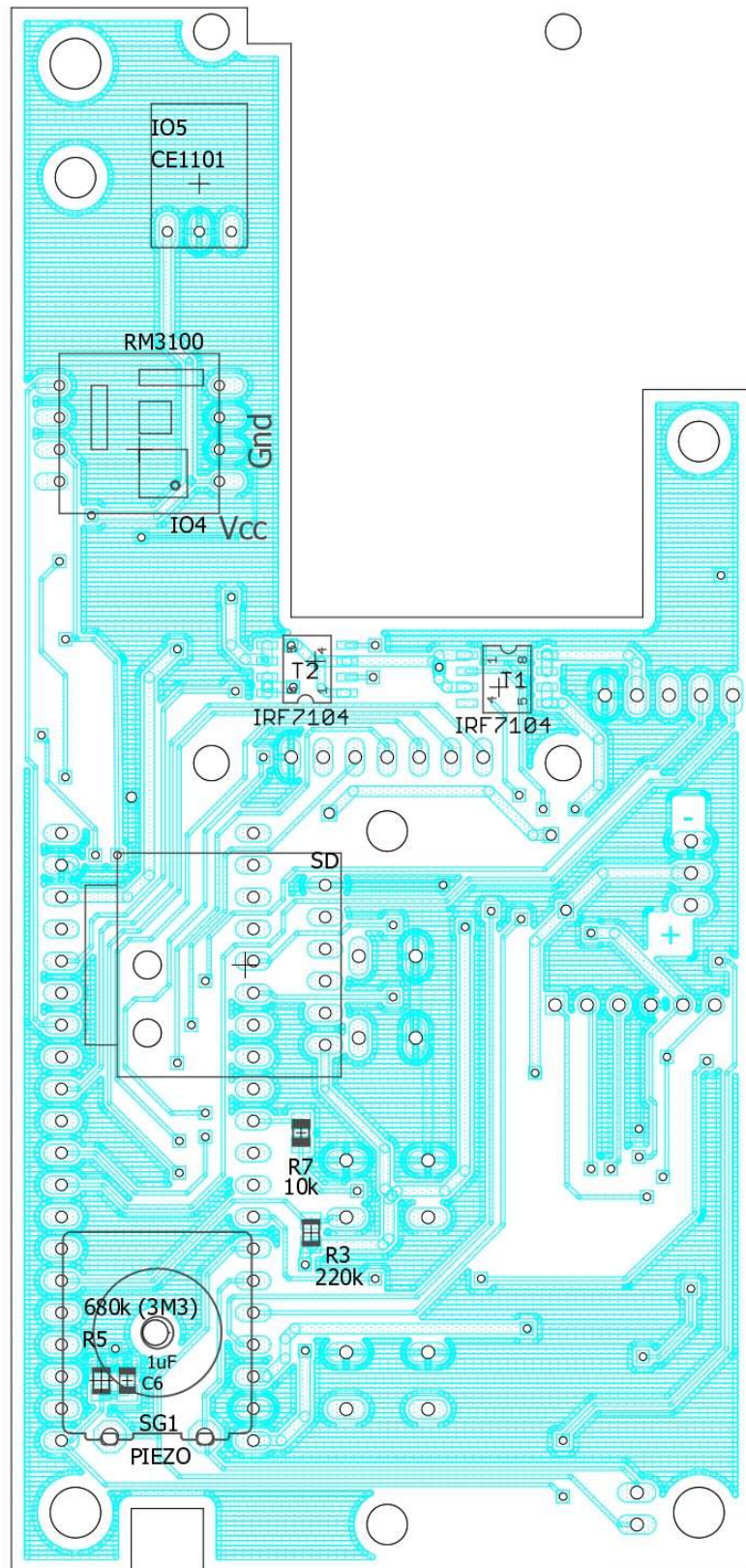
# Wiring diagram



# Component placement







# Parts list

| Designation | Value                         | Note                                           | Number    |
|-------------|-------------------------------|------------------------------------------------|-----------|
| C1–C5       | 100nF                         | C0805                                          | 5ks       |
| C6          | 1uF                           | C0805                                          | 1ks       |
| DIS1        | ST7789                        | display 2"                                     | 1ks       |
| IO1         | STM32F411CEU6                 | STM32 MCU module                               | 1ks       |
| IO2A / IO2B | HC-05                         | bluetooth modul                                | 1ks       |
| IO3         | SCA3300-D01                   | accelerometer                                  | 1ks       |
| IO4         | RM3100                        | magnetometer module                            | 1ks       |
| IO5         | CE1101                        | 3V3 stabilizer                                 | 1ks       |
| IO7         | 702A or 88B                   | laser module                                   | 1ks       |
| JP1         | PIN-1X5/90                    | angle pin + counterpiece                       | 1ch + 1ch |
| JP2         | PIN-1X2/90                    | angle pin + counterpiece                       | 1ch + 1ch |
| JP3         | PIN-1X3/90                    | angle pin + counterpiece                       | 1ch + 1ch |
| LED1        | red 0805                      | LED0805                                        | 1ks       |
| LED2        | blue 0805                     | LED0805                                        | 1ks       |
| R1 - R3     | 220k                          | R0805                                          | 3ks       |
| R4          | 10k                           | R0805                                          | 1ks       |
| R5          | 680k                          | R0805                                          | 1ks       |
| R6          | 150k                          | R0805                                          | 1ks       |
| R7          | 10k                           | R0805                                          | 1ks       |
| S1 - S3     | B3F-10XX, PHAP3301A, TS6601-5 | microswitch height 5mm                         | 3ks       |
| SD          | SD card                       | SD card module                                 | 1ks       |
| SG1         | piezo                         | 28mm                                           | 1ks       |
| T1, T2      | IRF7104 or AO4803A            | tranzistor 2x mosfet P                         | 2x        |
| further...  | straight pin strip (pins)     | Non-magnetic direct for MCU 1x20 pins          | 2x        |
| further...  | bent pin strip (pins)         | Non-magnetic bent for MCU programming 1x4 pins | 1ks       |
| further...  | screws - brass (both)         | 3x20 - 4ks, 3x12 - 8ks                         |           |
| further...  | plexiglass 2mm thick (both)   | 33x18mm-1ks, 40x50mm-1ks                       |           |

| Designation | Value                          | Note                                                             | Number            |
|-------------|--------------------------------|------------------------------------------------------------------|-------------------|
| further...  | battery accumulator            | 10x30x40mm                                                       | 1ks               |
| further...  | charging module                |                                                                  | 1ks               |
| further...  | switch                         | for example MFP 120-R,KLS7-SS02-12F20-EG4,<br>KLS7-SS-12F19B-G7, | 1ks               |
| further...  | SD card                        |                                                                  | 1ks               |
| further...  | flat cable wires               | for connectors                                                   |                   |
| further...  | bent pin strip (pins)          | (power and piezo connectors)                                     | 6, 4, 3 to 2 pins |
| further...  | female strip height 5.4mm      | (for SD card)                                                    | 6 pins            |
| further...  | socket strip height 8.5mm      | (power and piezo connectors)                                     | 5, 3 to 2 pins    |
| further...  | adhesive for gluing plexiglass | e.g.: B7000, T7000 or superglue                                  | 1ks               |

## What material to order



50m/164ft Laser Distance Measuring Sensor Range Finder Module Low cost Diastimeter Single & Continuous Measurement

★★★★★ 4.8 ~ 5 Reviews 34 orders

**CZK 1,028.77** ~~CZK 1,130.40~~ -9%

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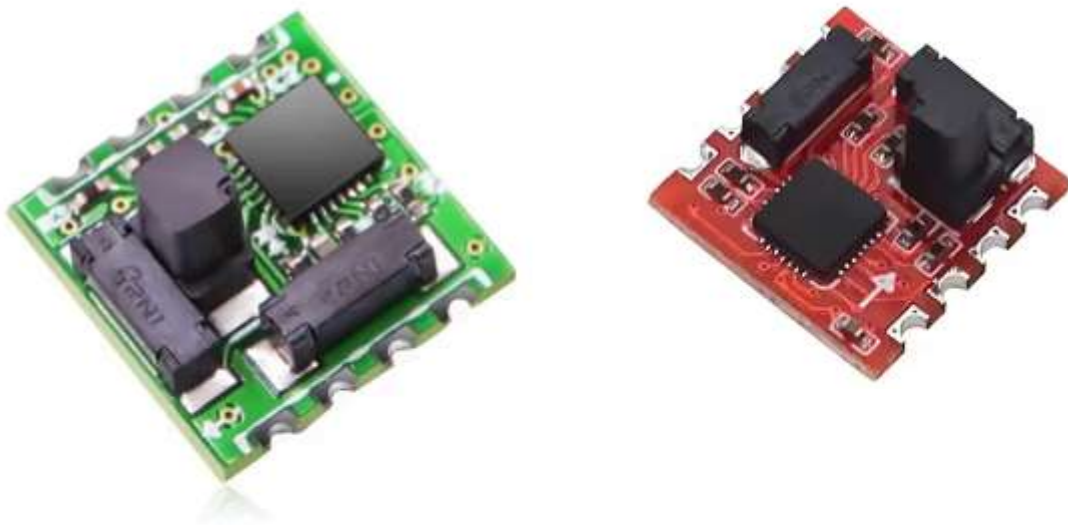
Price 45€

Laser distance meter

[https://www.aliexpress.com/item/32823813140.html?spm=a2g0o.productlist.0.0.520d28c9EVQ3FS&algo\\_pvid=e870d9cc-529b-4d5b-983a-86914f99914f&algo\\_exp\\_id=e870d9cc-529b-4d5b-983a-86914f99914f-0&pdp\\_ext\\_f=%7B%22sku\\_id%22%3A%2264998152327%22%7D&pdp\\_npi=2%40dis%21CZK%21%211028.77%21%21%21%21%21%402100bdd716533941843745110e399d%2164998152327%21sea](https://www.aliexpress.com/item/32823813140.html?spm=a2g0o.productlist.0.0.520d28c9EVQ3FS&algo_pvid=e870d9cc-529b-4d5b-983a-86914f99914f&algo_exp_id=e870d9cc-529b-4d5b-983a-86914f99914f-0&pdp_ext_f=%7B%22sku_id%22%3A%2264998152327%22%7D&pdp_npi=2%40dis%21CZK%21%211028.77%21%21%21%21%21%402100bdd716533941843745110e399d%2164998152327%21sea)

[https://www.aliexpress.com/item/32824312275.html?spm=a2g0o.order\\_list.order\\_list\\_main.151.242e1802hv7vAZ](https://www.aliexpress.com/item/32824312275.html?spm=a2g0o.order_list.order_list_main.151.242e1802hv7vAZ)

PNI RM3100  
Magnetic module  
13156 + 13104 + 13101



Magnetometer RM3100 SPI

Price 40€

[https://witmotion-sensor.com/products/military-grade-magnetometer-compensation-chip-pni-rm3100-high-accuracy-magnetometer-geomagnetism-magnet-field-sensor-spi-interface-high-revolution-electronic-compass-module-for-arduino?\\_pos=1&\\_sid=7c5dc2514&\\_ss=r](https://witmotion-sensor.com/products/military-grade-magnetometer-compensation-chip-pni-rm3100-high-accuracy-magnetometer-geomagnetism-magnet-field-sensor-spi-interface-high-revolution-electronic-compass-module-for-arduino?_pos=1&_sid=7c5dc2514&_ss=r)

[https://www.aliexpress.com/item/32996665855.html?spm=a2g0o.productlist.0.0.1e8115c9ajz4ds&algo\\_pvid=c6b97fee-7d93-49f7-8e8c-cffc2fa5f82e&algo\\_exp\\_id=c6b97fee-7d93-49f7-8e8c-cffc2fa5f82e-6&pdp\\_ext\\_f=%7B%22sku\\_id%22%3A%2212000022619310690%22%7D&pdp\\_npi=2%40dis%21CZK%21%21937.08%21%21%21%21%21%402100bb4c16533923265443823e88cc%2112000022619310690%21sea%21CZ%21183039565&curPageLogUid=vLazLqmftcKf](https://www.aliexpress.com/item/32996665855.html?spm=a2g0o.productlist.0.0.1e8115c9ajz4ds&algo_pvid=c6b97fee-7d93-49f7-8e8c-cffc2fa5f82e&algo_exp_id=c6b97fee-7d93-49f7-8e8c-cffc2fa5f82e-6&pdp_ext_f=%7B%22sku_id%22%3A%2212000022619310690%22%7D&pdp_npi=2%40dis%21CZK%21%21937.08%21%21%21%21%21%402100bb4c16533923265443823e88cc%2112000022619310690%21sea%21CZ%21183039565&curPageLogUid=vLazLqmftcKf)

[https://www.aliexpress.com/item/1005001596659242.html?spm=a2g0o.productlist.main.1.6a2875d0UhywUN&algo\\_pvid=46f3ee8a-a09b-4198-b11c-6b99b2278dcf&algo\\_exp\\_id=46f3ee8a-a09b-4198-b11c-6b99b2278dcf-0&pdp\\_npi=3%40dis%21CZK%21479.48%21455.6%21%21%21%21%21%40212249cb16814644091256402d0706%2112000030991079931%21sea%21CZ%21183039565&curPageLogUid=vLazLqmftcKf](https://www.aliexpress.com/item/1005001596659242.html?spm=a2g0o.productlist.main.1.6a2875d0UhywUN&algo_pvid=46f3ee8a-a09b-4198-b11c-6b99b2278dcf&algo_exp_id=46f3ee8a-a09b-4198-b11c-6b99b2278dcf-0&pdp_npi=3%40dis%21CZK%21479.48%21455.6%21%21%21%21%21%40212249cb16814644091256402d0706%2112000030991079931%21sea%21CZ%21183039565&curPageLogUid=vLazLqmftcKf)

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|                                                                                                                                                                                                                                                 |                                                                                     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|   <p>Obrázky jsou pouze pro referenční účely<br/>Viz specifikace produktu</p> | <b>Č. Mouser:</b> 81-SCA3300-D01-1                                                  |
|                                                                                                                                                                                                                                                 | <b>Výr. Č.:</b> SCA3300-D01-1                                                       |
|                                                                                                                                                                                                                                                 | <b>Výrobce:</b> Murata Electronics                                                  |
|                                                                                                                                                                                                                                                 | <b>číslo zákazníka:</b> <input type="text" value="číslo zákazníka"/>                |
|                                                                                                                                                                                                                                                 | <b>Popis:</b> Akcelerometry 3-AXIS +/-1.5G TO +/-6G                                 |
|                                                                                                                                                                                                                                                 | <b>Technické informace:</b> <a href="#">SCA3300-D01-1 Technické informace (PDF)</a> |
| <b>Model ECAD:</b>  Rozměry a symbol desky plošných spojů                                                                                                      |                                                                                     |
| Stáhněte si zdarma <a href="#">Library Loader</a> , kterým převedete tento soubor na formát požadovaný vaším nástrojem ECAD. <a href="#">Více informací o modelu ECAD.</a>                                                                      |                                                                                     |
| <b>Více informací</b> <a href="#">Další informace o Murata Electronics SCA3300-D01-1</a>                                                                                                                                                        |                                                                                     |

☐ Porovnat zboží

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Accelerometer SCA3300-D01-1

Price 40€

<https://cz.mouser.com/ProductDetail/Murata-Electronics/SCA3300-D01-1?qs=u4fy%2FsgLU9PJXg1inqbWiw%3D%3D>

Price 25€

[https://www.aliexpress.com/item/1005005053886020.html?spm=a2g0o.productlist.main.11.60c230acVK\\_EgzG&algo\\_pvid=22415751-b6e3-4f71-841d-3aa17e21a213&algo\\_exp\\_id=22415751-b6e3-4f71-841d-3aa17e21a213-5&pdp\\_npi=3%40dis%21CZK%21535.43%21535.43%21%21%21%21%40211bd93f16814642293687074d0778%2112000031467861345%21sea%21CZ%21183039565&curPageLogUid=BGHfVaDQ7J3v](https://www.aliexpress.com/item/1005005053886020.html?spm=a2g0o.productlist.main.11.60c230acVK_EgzG&algo_pvid=22415751-b6e3-4f71-841d-3aa17e21a213&algo_exp_id=22415751-b6e3-4f71-841d-3aa17e21a213-5&pdp_npi=3%40dis%21CZK%21535.43%21535.43%21%21%21%21%40211bd93f16814642293687074d0778%2112000031467861345%21sea%21CZ%21183039565&curPageLogUid=BGHfVaDQ7J3v)





AliExpress x9c103 module

Weight: 30.6g (with case)

**CZK92.48** ~~CZK108.68~~ 15% off  
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Buy 3 pieces get 5% off

TZT 1.44/1.77/2.0/2.4/2.8 Inch TFT Color Screen LCD Display Module Drive ST7735 ST7789 Interface SPI 128\*128 240\*320

★★★★★ 4.7 29 Reviews | 150 sold

Color: 2.0 TFT black board

2.0 Inch TFT Screen Module Black

37.0mm

62.0mm

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1PCS

103040 1200mah Polymer Li ion battery

Rechargeable 1200mAh Li-Po Battery 103040 Li-ion Lipo cells Lithium Li-Po Polymer Battery For MP3 MP4 DVD GPS Bluetooth Headset

★★★★★ 4.5 ~ 681 Reviews 1803 orders

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3.7V

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Type-C

Micro USB



5V 1A Type-C Micro USB 18650 TP4056 TC4056A Lithium Battery Charging Protection Board Charger Module + Dual Functions TP4056

★★★★☆ 2.5 2 Reviews 2 orders

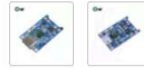
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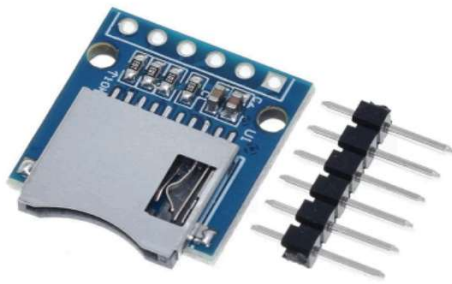


If the purchased battery already has built-in overcharge/short circuit protection, we can use both a longer and shorter version with and without a protective output.

USB C charging module LIPOL battery

Price 2€

[https://www.aliexpress.com/item/4001127288815.html?spm=a2g0o.order\\_list.0.0.278a1802sEld4M](https://www.aliexpress.com/item/4001127288815.html?spm=a2g0o.order_list.0.0.278a1802sEld4M)



★★★★★ 5.0 v 10 Reviews 41 orders

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130

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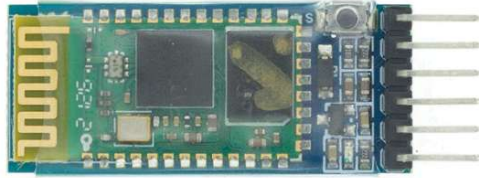


price 1€



## Bluetooth modul HC-05

Variant 1- module with blue base plate (will have to be modified)



HC-05 HC-06 RF Wireless Bluetooth Transceiver Slave Module HC05 / HC06 RS232 / TTL to UART Converter and Adapter For Arduino

★★★★★ 4.8 254 Reviews 588 orders

**CZK 63.57** ~~CZK 79.41~~ -20%

Price includes VAT

Color: HC-05



Quantity:

1 Additional 2% off (2 Pieces or more)  
9920 Pieces available

Ships to Czech Republic

Shipping: CZK 5.91

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More options

## HC-05 6PINS



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Variant 2- only module without board **RECOMMENDED** to purchase



## HC-05 No welding

BT module HC-05 price 3€

[https://www.aliexpress.com/item/1005001679091310.html?spm=a2g0o.productlist.main.7.781e49b3Bb049G&algo\\_pvid=5a78104d-d3fe-4336-b9af-05a45ba41df3&algo\\_exp\\_id=5a78104d-d3fe-4336-b9af-05a45ba41df3-3&pdp\\_npi=3%40dis%21CZK%2155.5%2147.11%21%21%21%21%21%21%402102176616814639151565041d0767%2112000020085108421%21sea%21CZ%21183039565&curPageLogUid=D1eUIUmNSKXT](https://www.aliexpress.com/item/1005001679091310.html?spm=a2g0o.productlist.main.7.781e49b3Bb049G&algo_pvid=5a78104d-d3fe-4336-b9af-05a45ba41df3&algo_exp_id=5a78104d-d3fe-4336-b9af-05a45ba41df3-3&pdp_npi=3%40dis%21CZK%2155.5%2147.11%21%21%21%21%21%21%402102176616814639151565041d0767%2112000020085108421%21sea%21CZ%21183039565&curPageLogUid=D1eUIUmNSKXT)



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Adjustable Mobile Phone Wrist Straps Hand Lanyard For iPhone XS 8 Samsung Xiaomi USB Gadget Key PSP Anti Lost Rope Cord Keycord

★★★★★ 4.8 ▾ 176 Reviews 600+ orders

**CZK 26.24** ~~€ZK43.88~~ .40% off

Price includes VAT

Color: green



Quantity: − 1 + Additional 5% off (2 Pieces or more)  
99983 Pieces available

Ships to 🇨🇪 Czech Republic

**Free Shipping**  
Estimated delivery on Jun 15  
🚚 **15-day delivery** on orders over CZK 215.11  
From China to Czech Republic via Cainiao Super Economy Global  
On-time guarantee

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**Buy Now** **Add to Cart** ♥ 1634

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Loop



<https://www.keny-shop.cz/tlumici-doraz-cocka-kulata-velka/>

Push-button keyboard **OK-** furniture lens stop (Jysk, OBI and similar)

Box

Price 4€ to 50€ depends on who we print for

DPS

Cena 4€

Other components

piezo, wires, switch, buttons, capacitors, resistors

2€

Brass screws (OBI - hobbymarket)

3x12mm

3x20mm

**Total price for  
materials without  
labor approx. 150€**

## Editing modules

First of all, it must be said that the Chinese save wherever they can, that's why some components are not copper, but iron! That's why it's necessary to check with a magnet everything that is magnetic before soldering any pins etc. Even if magnetic components are used, the influence will be suppressed during DISTAY calibration, but it still doesn't hurt to limit ferromagnetic components to a minimum.

### Laser module

- Need to remove/fly away Buzzer (**there is a magnet in it**)!
- Solder the wires with the connector to GND, Vcc (Vbat), Rx and Tx

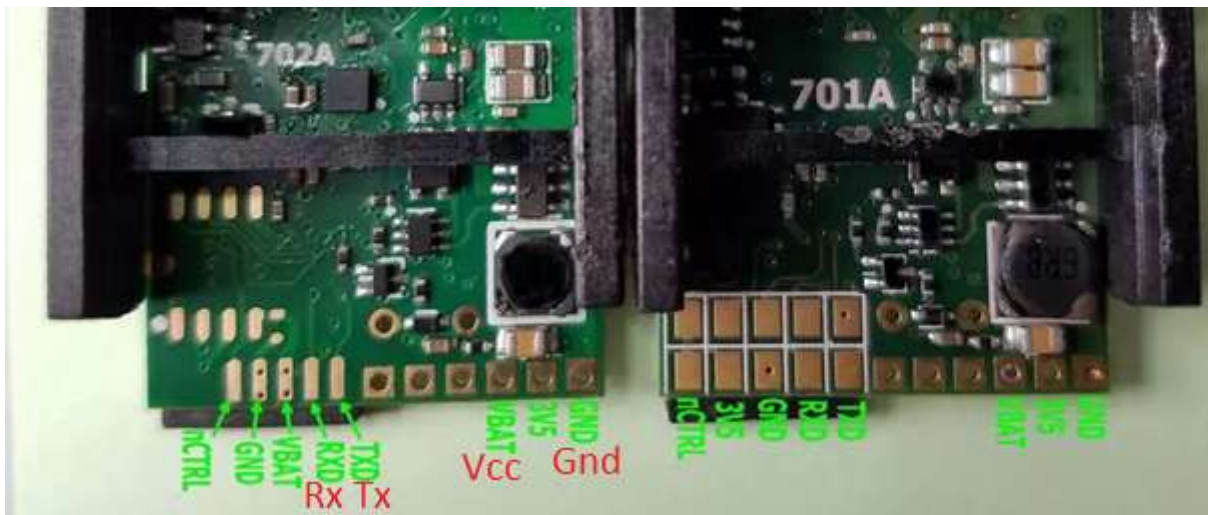
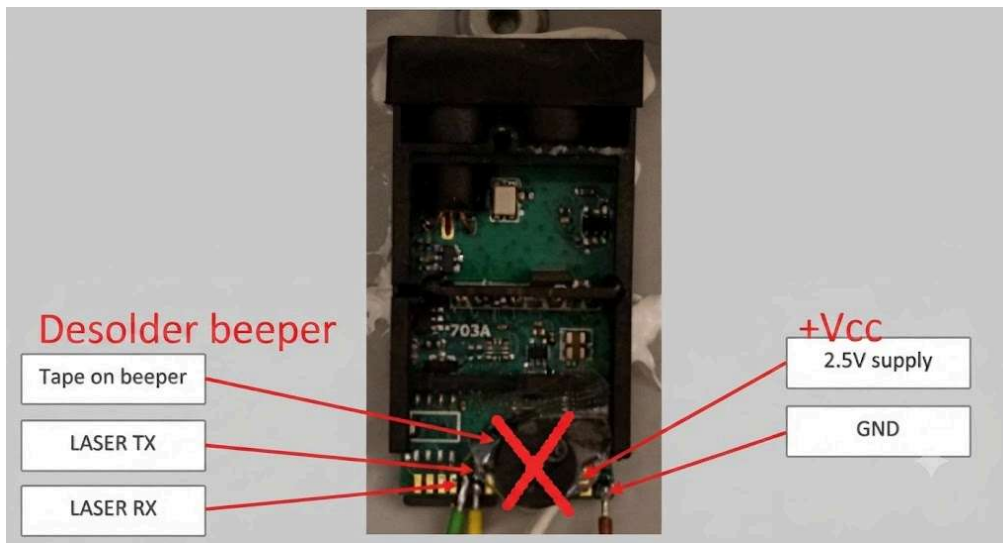
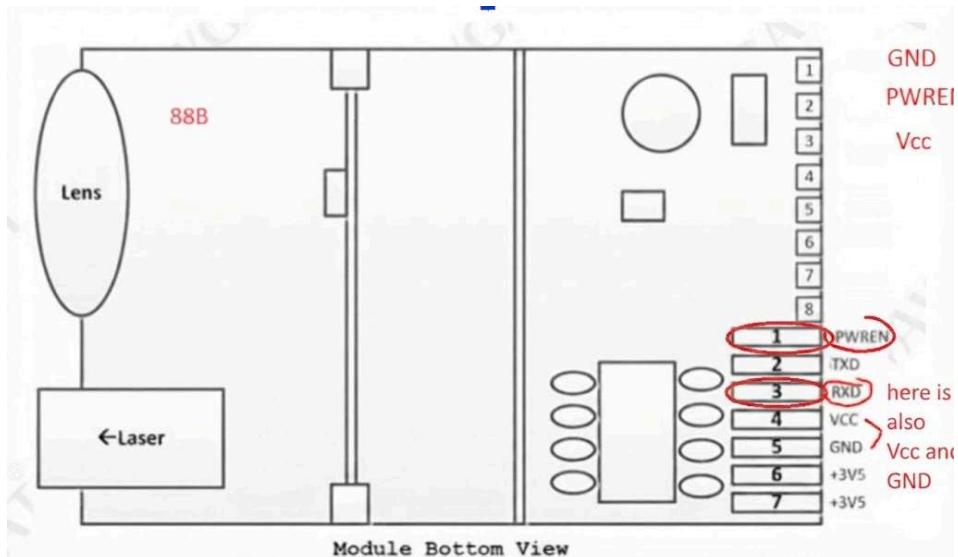


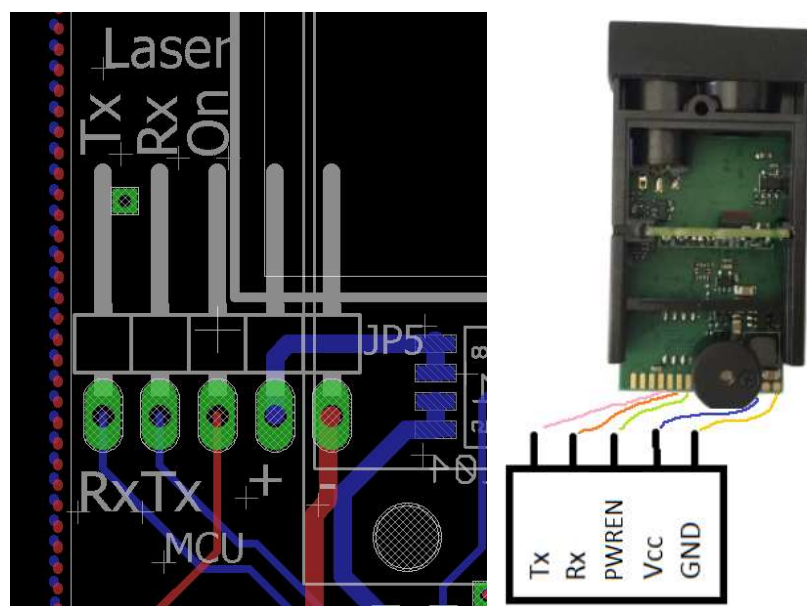
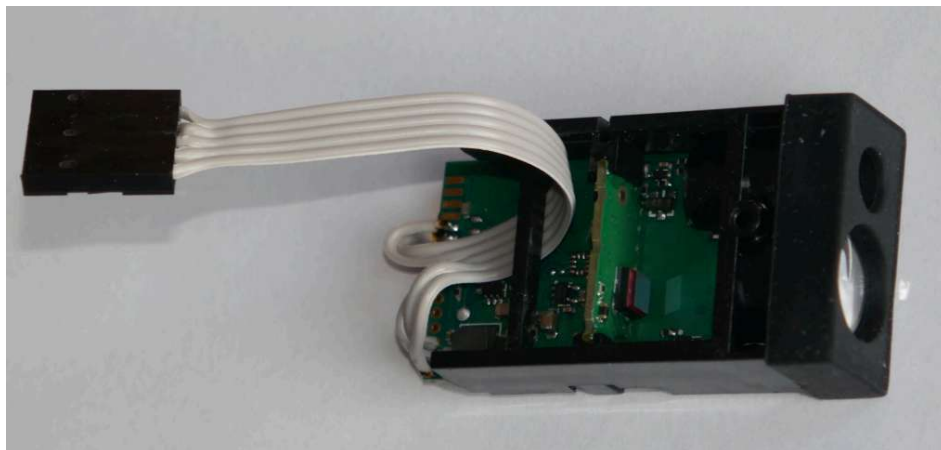
Image on the left: module 702A Image on the right: module 701A

If we have an 88B module, then the pins are connected according to the picture below:

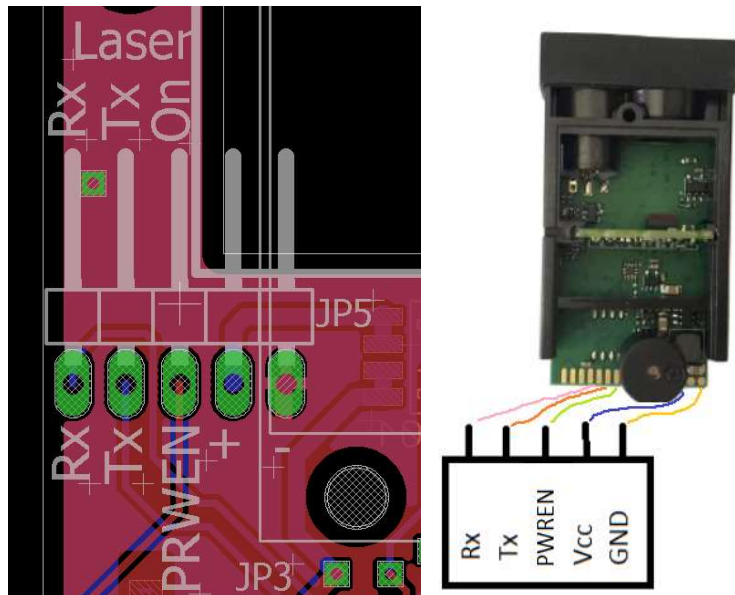


Note: nCTRL - low level activates continuous measurement (not connected), PWREN - low level turns off the rangefinder module (connected). Vcc, GND, RX, TX do not need to be explained.

We will create a five-core cable with a connector at the end, which we will connect according to the pictures. The cable will have Rx, Tx, PWREN, Vcc(3V6) and GND connected.



Old version 9.2<



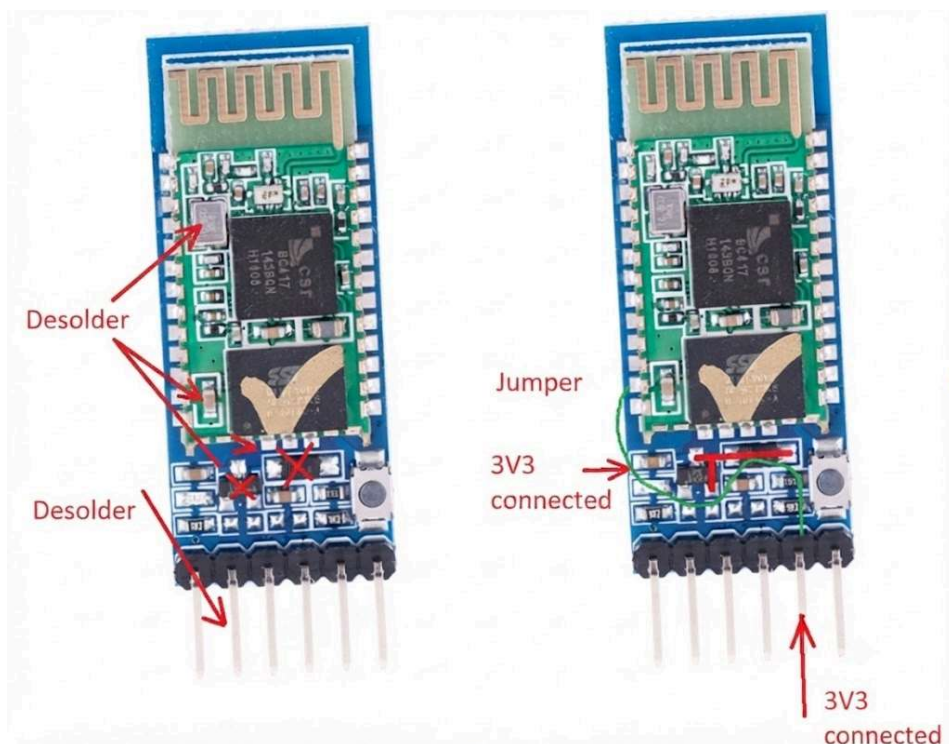
New Version 9.2 >

## **BT module HC-05 6pin**

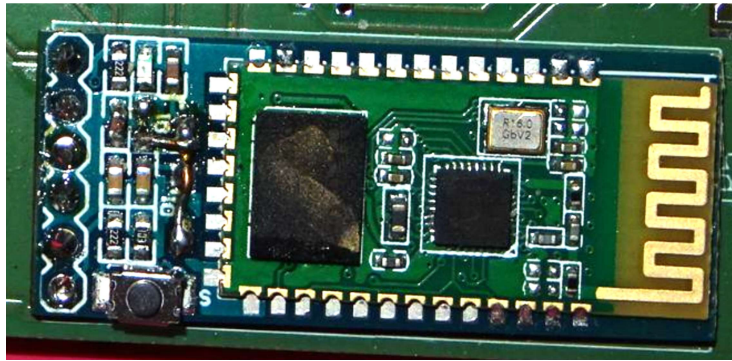
**Note:** If we use the (green) BT module without the (blue) base plate, there is no need to modify the module and we can solder the board directly to the PCB. This option is simpler, so I recommend **option 2**.

For the BT module with a base plate, it is necessary to remove the angled pins and convert the power supply to 3.3V, therefore it is necessary to solder the original stabilizer from the module and solder it so that the 3V3 pin is connected to Vcc.

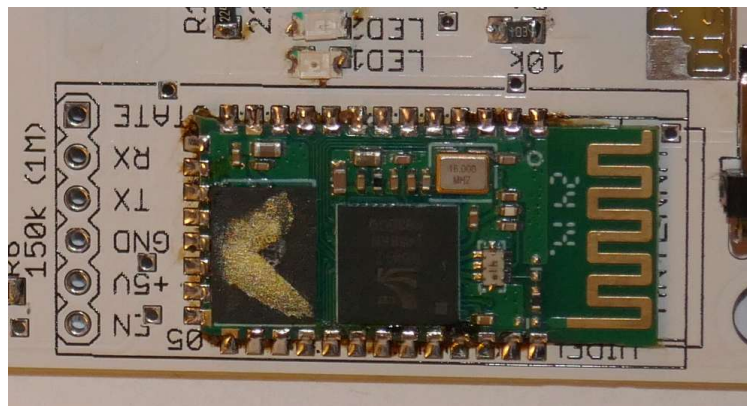
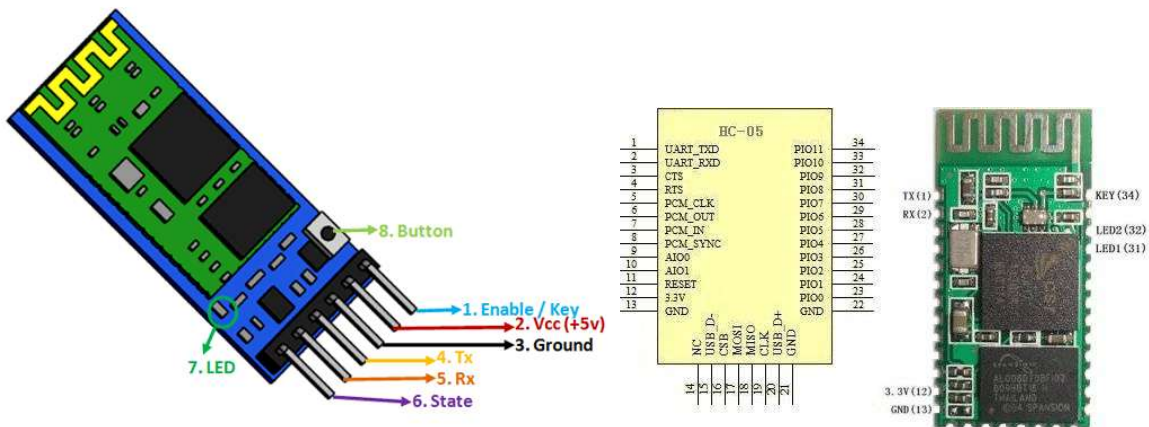
- We solder the diode, stabilizer and pins (magnetic, angular)
- connect as shown in the picture so that pin 3V3 is connected to pin Vcc 3.6-6V (green path must beep on multimeter)







**option 1-** when the board has a green mod mounted on a blue baseboard

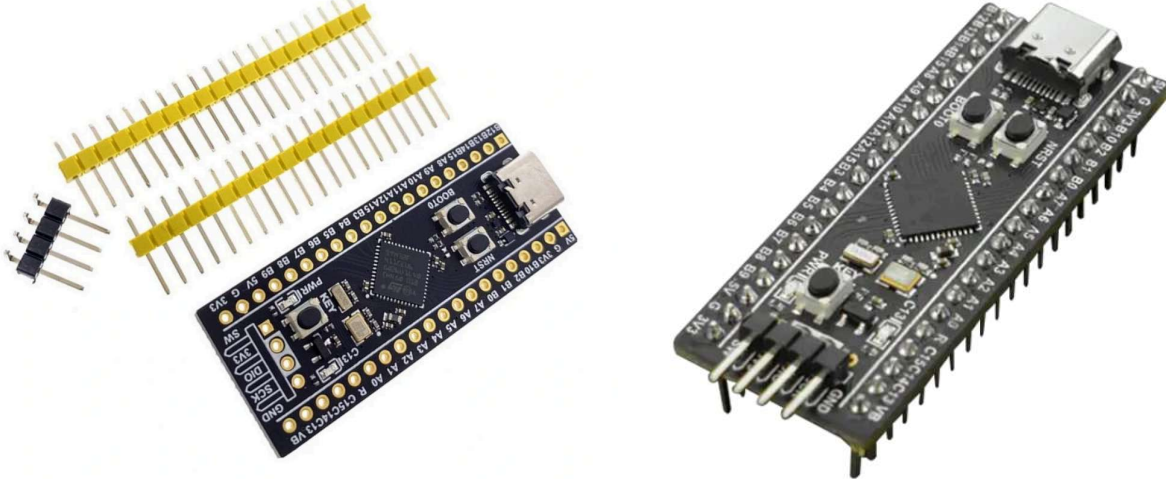


**option 2-** when only the green module is mounted on the board without the blue base plate

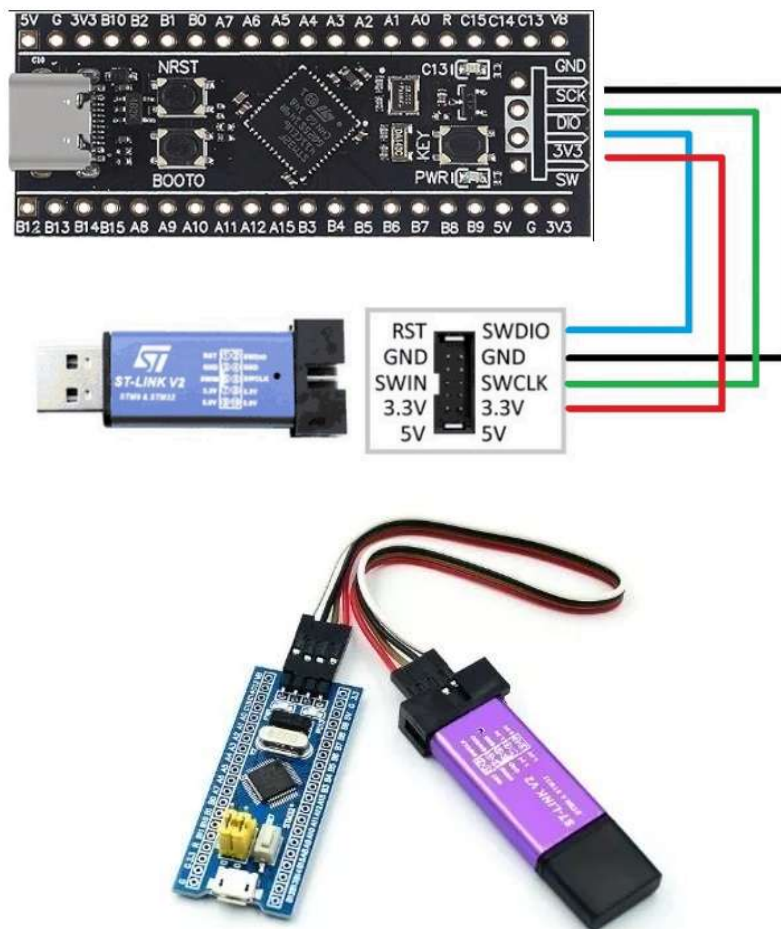
## MCU STM32F411CEU6

For STM32, we check whether the pins are non-magnetic, otherwise we use purchased pins that are non-magnetic!

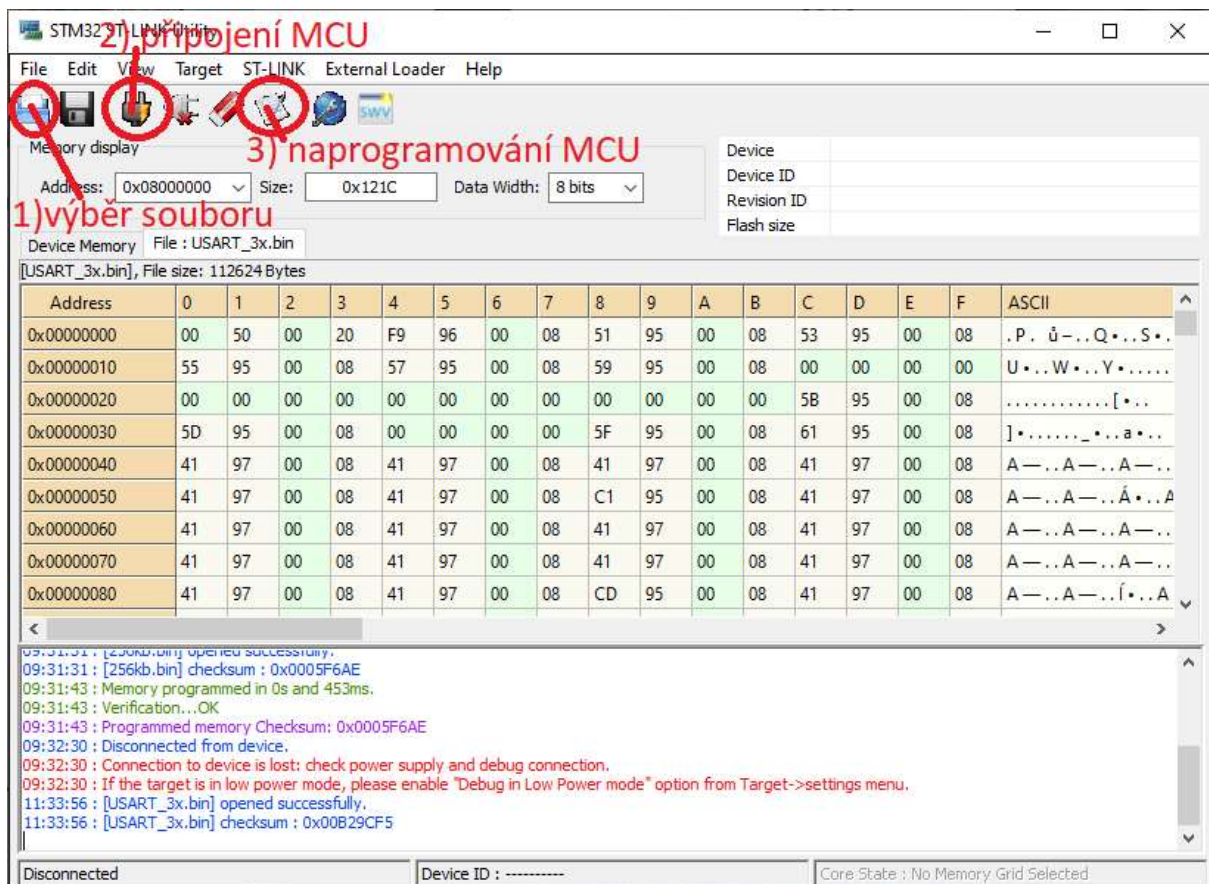
- We are running into **non-magnetic** pins for ports 1x20(1,2) and angled PIN 1x4 (3)
- Solder the angled Pin 1x4 (3) as shown in the picture, so that it does not stick out too high, you must use a suitable type of angled pins



We connect the programmer to the MCU in the following way



We use software for programming **STM32 ST-LINK Utility** (or more advanced users can program directly in CUBEIDE).



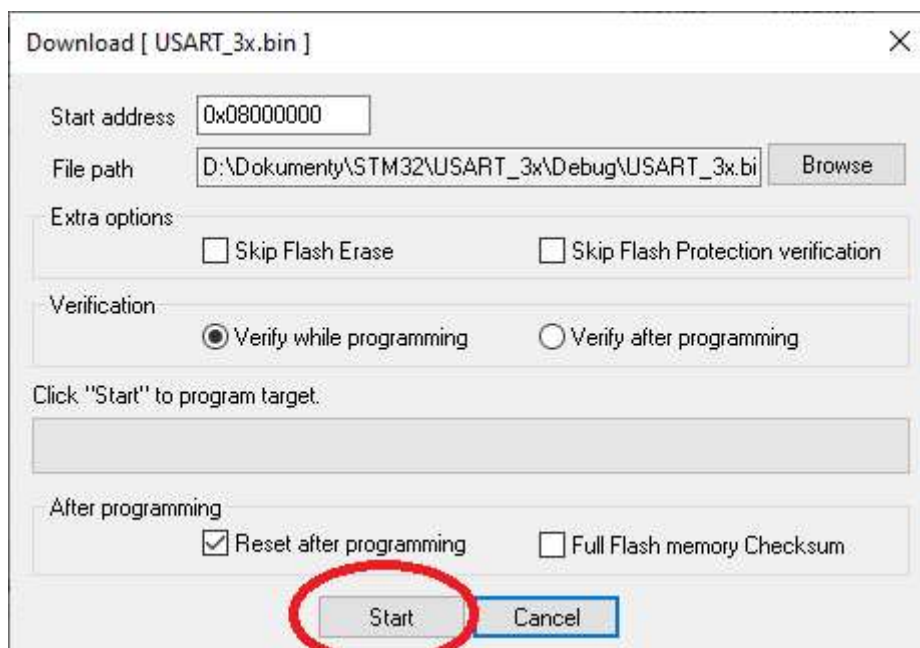
**Programming procedure:** 1) turn on the STM32 ST-LINK Utility and connect the programmer to the MCU

2) use button [1] to open the program file\*.bin

3) use button [2] to connect the programmer to the MCU

4) press the [3] button to turn on programming - a window will open in which we press the Start button and begin programming

5) Done - programmed



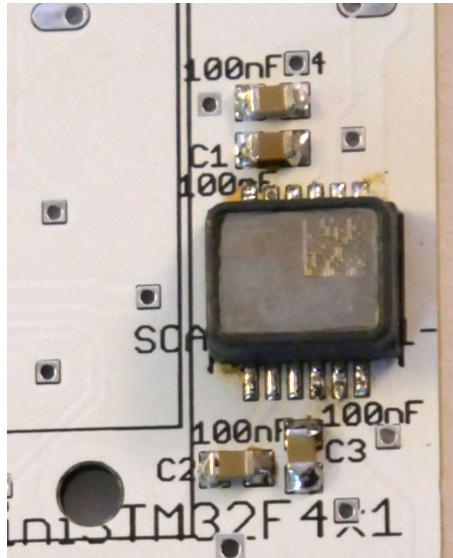




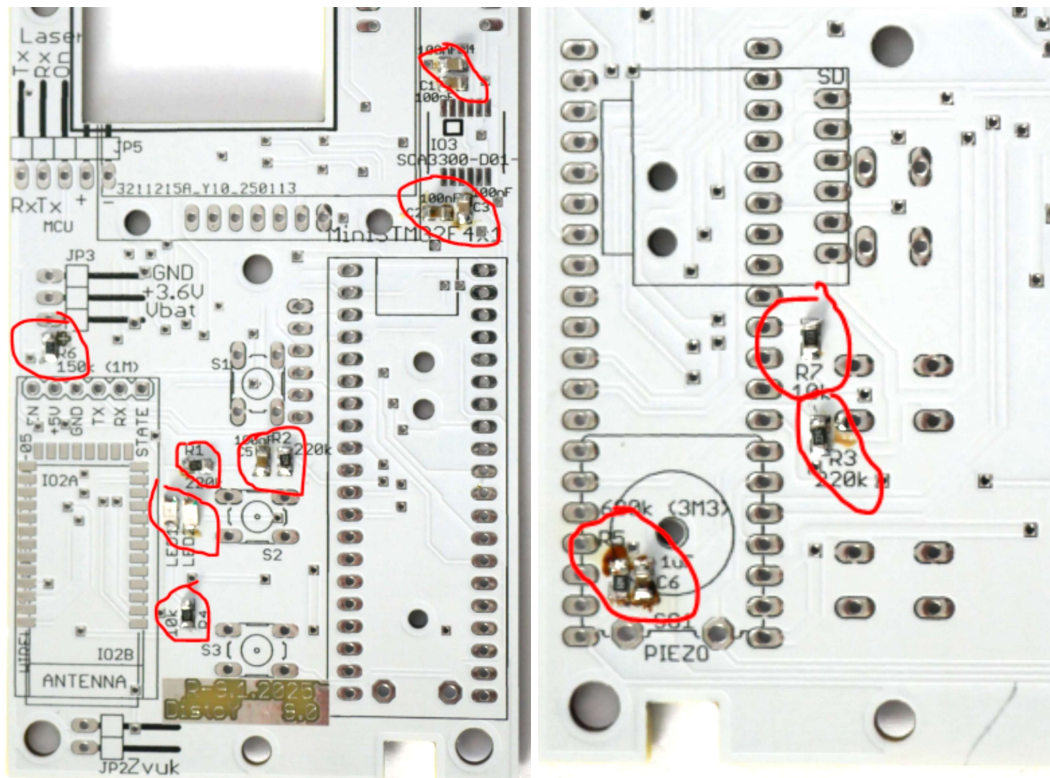
# THEPCB assembly

When we have pre-prepared components. We can solder the components onto the PCB. Some components are not mounted on the board, the board is also created for other components than those that were finally used.

- 1) We are flying the SCA3300 accelerometer



- 2) Solder the resistors and capacitors according to the wiring diagram

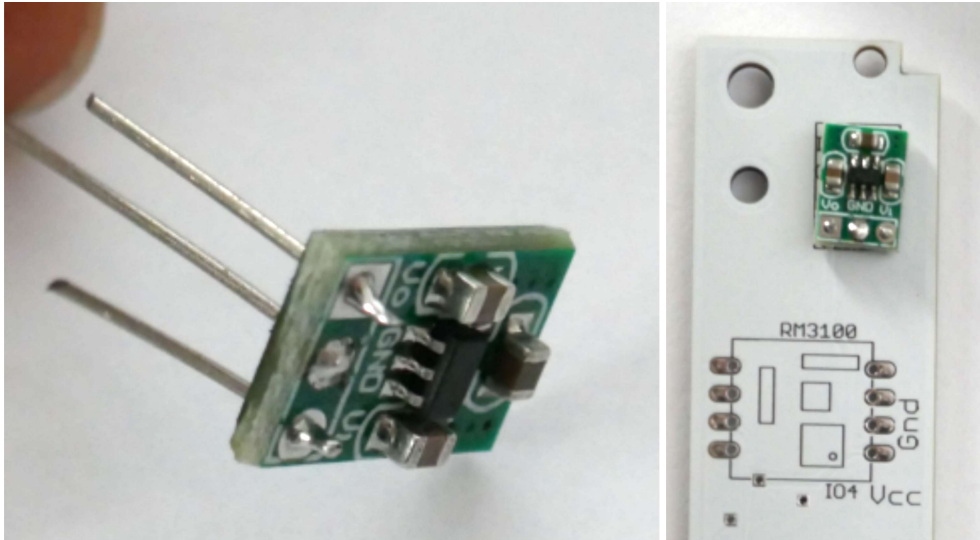


- 3) We solder the buttons

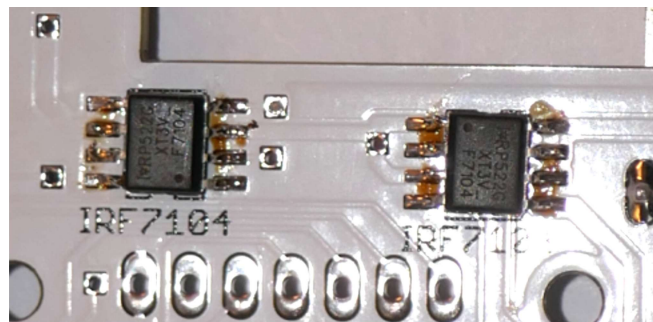




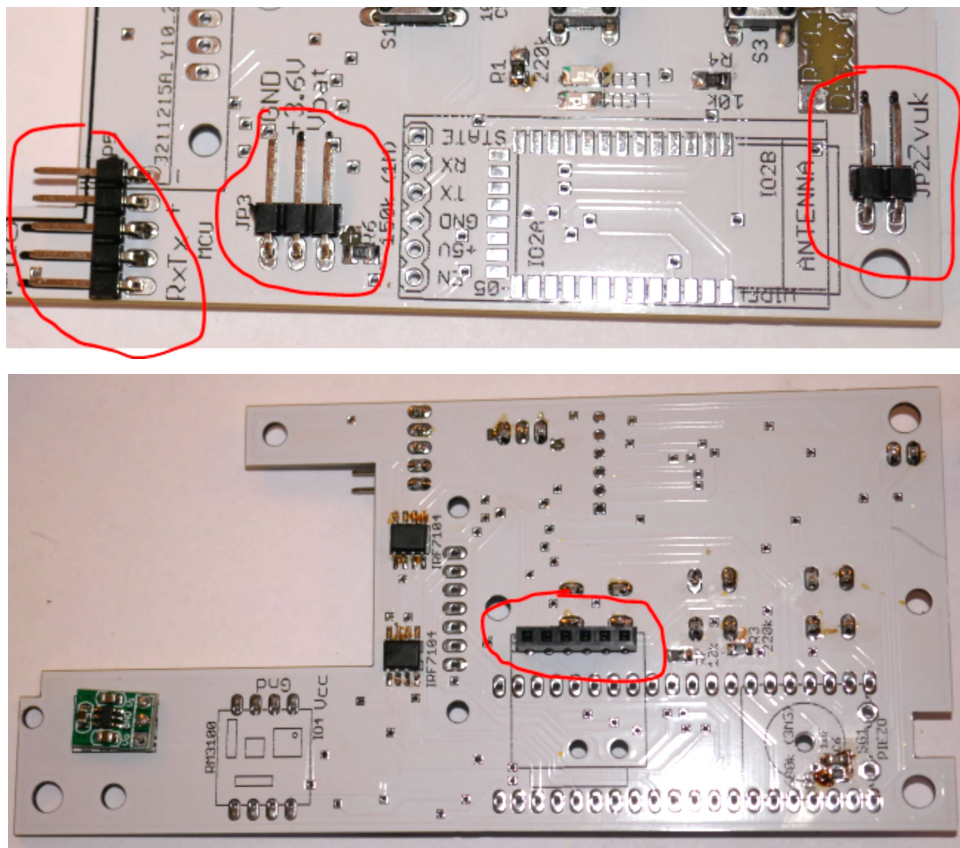
- 4) We replace the legs of the stabilizer and can install the stabilizer into the board.



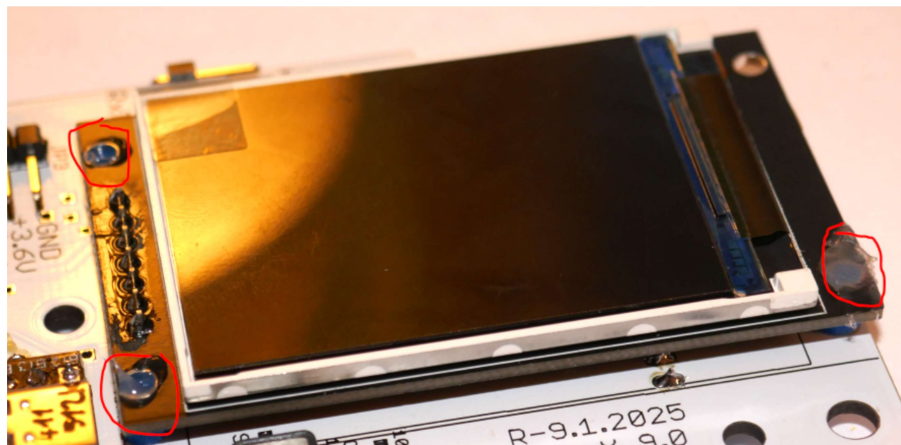
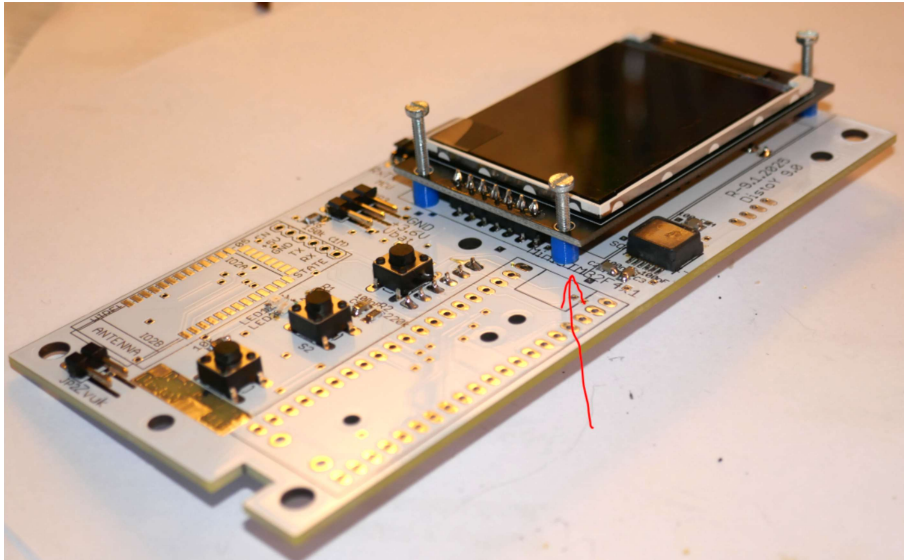
- 5) We will install transistors



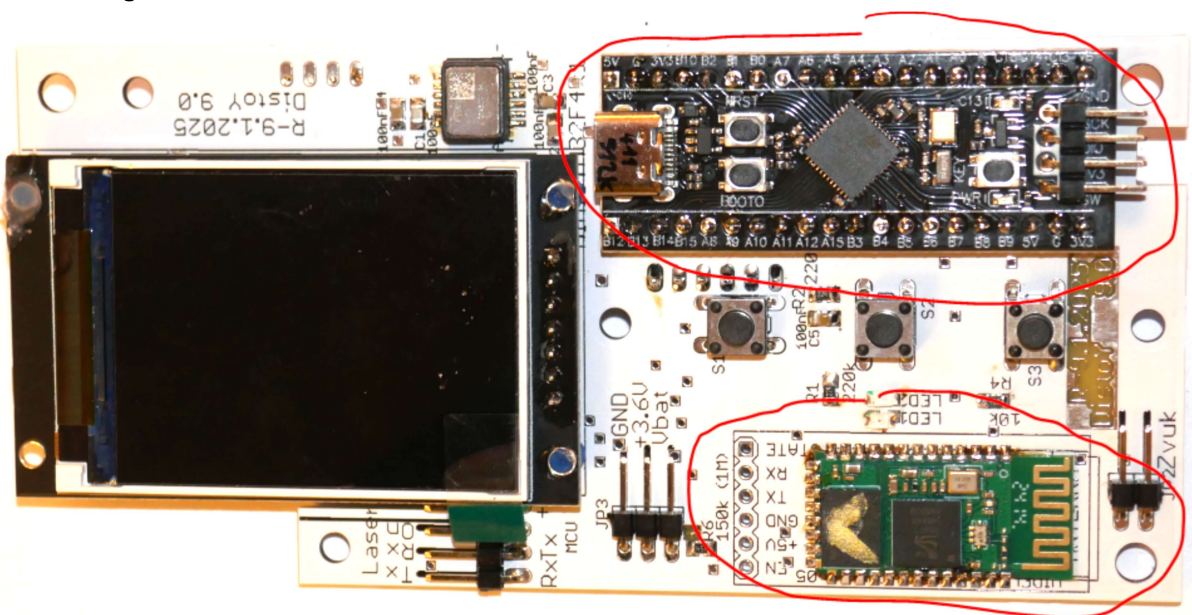
- 6) Solder the angle pins and the female connector according to the wiring diagram.



- 7) We support the display with printed spacers and secure it against displacement with a 2mm screw. We solder the display. Finally, using hot melt adhesive injected into the hole between the PCB display and the spacer, we glue the display to the PCB.

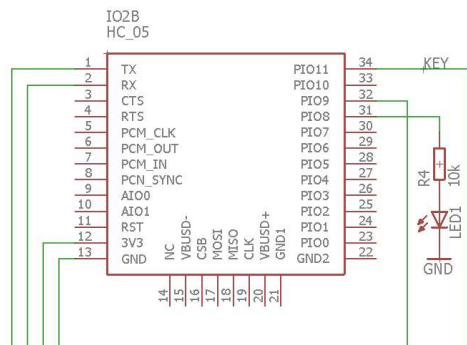


- 8) Soldering the MCU, bluetooth

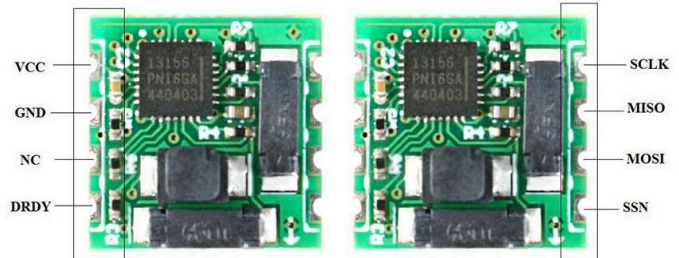
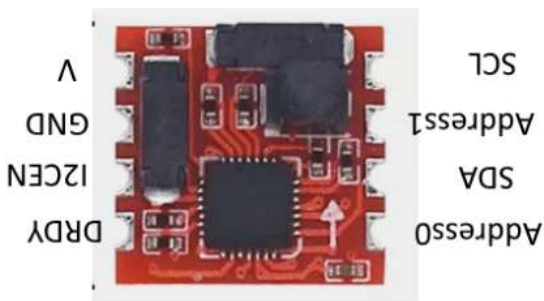
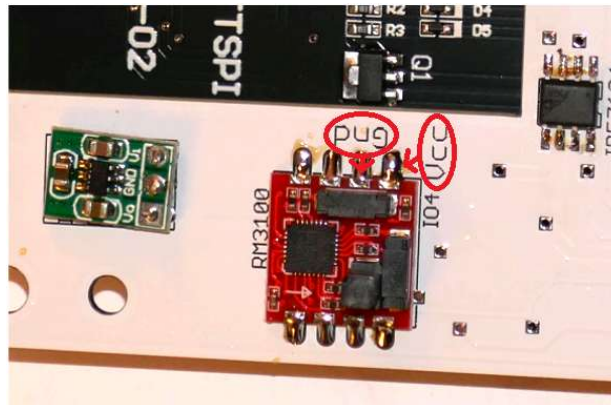




*Note: For Bluetooth, we don't have to solder all the pins. Just solder only the ones that are used, see the picture. This means that you only need to solder pins number 1, 2, 12, 13, 31, 32 and 34.*

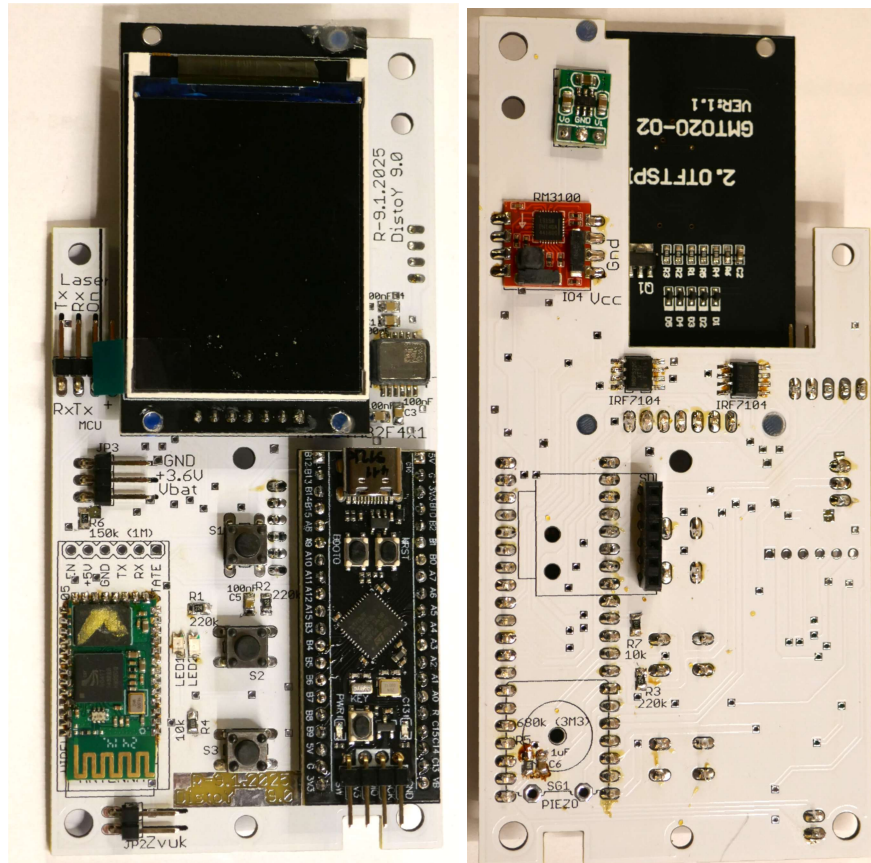


## 9) Soldering the RM3100 magnetometer

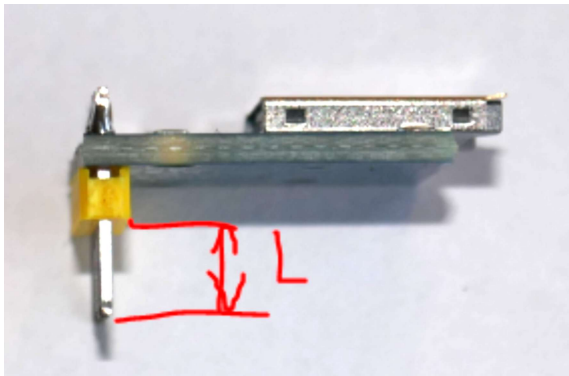
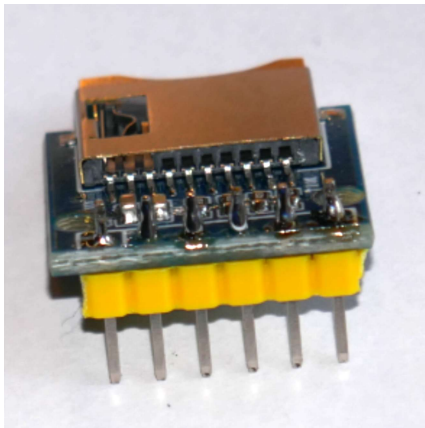
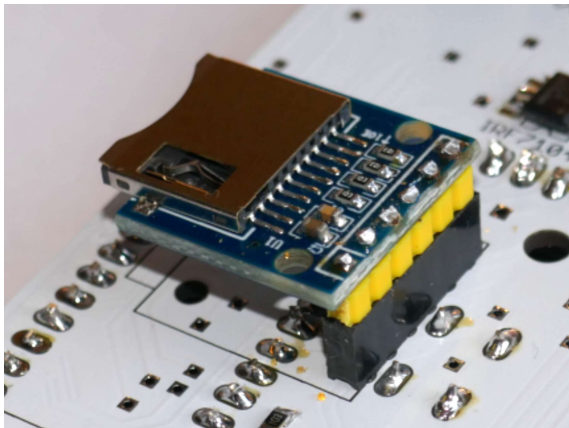


**!SHAME on the RM3100 module!** -The red version has a reversed pinout (rotated 180°) compared to the green version. Check with the seller which version you have. The PCB is designed for the green version. To prevent the red version from showing the cardinal points in reverse, it is necessary **select option 2 in the configuration menu**(Menu -> Settings -> Config.) (1 - default, 2 - swapped X and Y axes for magnetometer (red variant))

10) Done - the assembled board should look something like this



11) Finally, before installation, we insert the SD card slot into the plastic box. The pins on the slot may be too long, so I recommend tearing the pins out of the plastic. Insert the SD card PCB into the female connector strip and solder it, and trim the excess ends. See pictures.

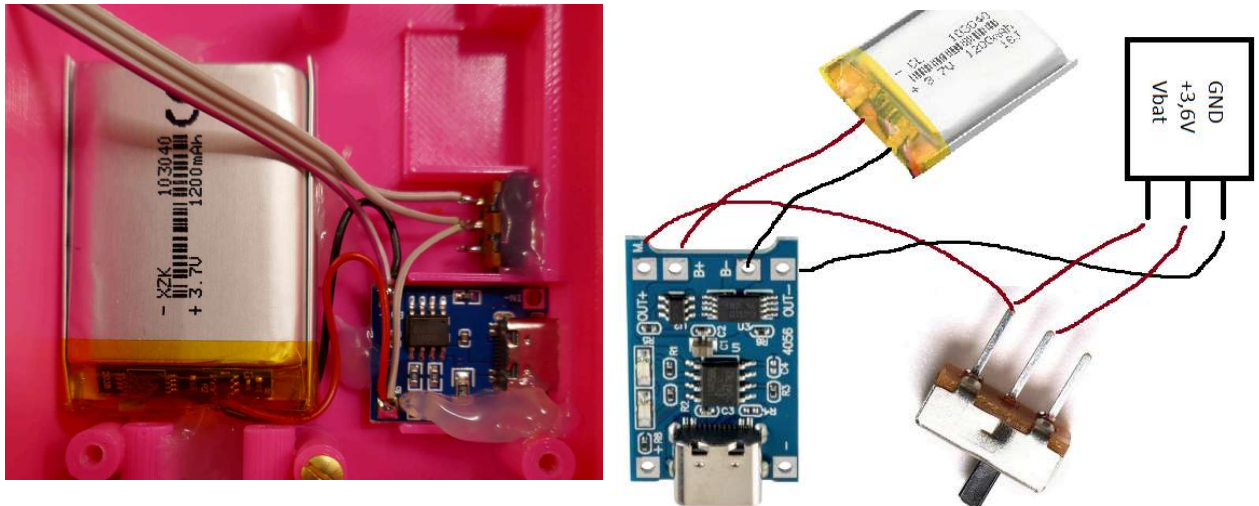




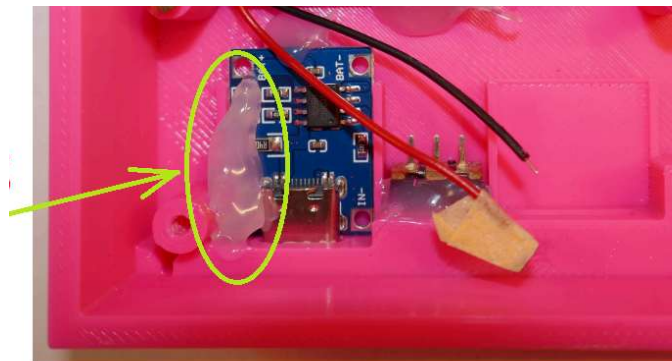
## Fitting a plastic box

Before actually assembling the box, it is necessary to pre-screw all the screws into their places so that the threads are cut. This means that we always screw the screw in one turn and then loosen it again and continue until the thread is cut. We tighten the screws carefully so that the roller into which the screw is screwed does not break and we have trouble disassembling the box. It may also be necessary to run a file through the printed box so that the individual parts fit together.

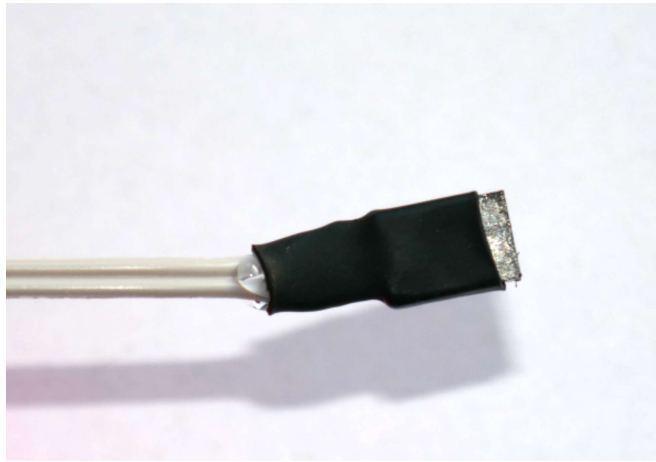
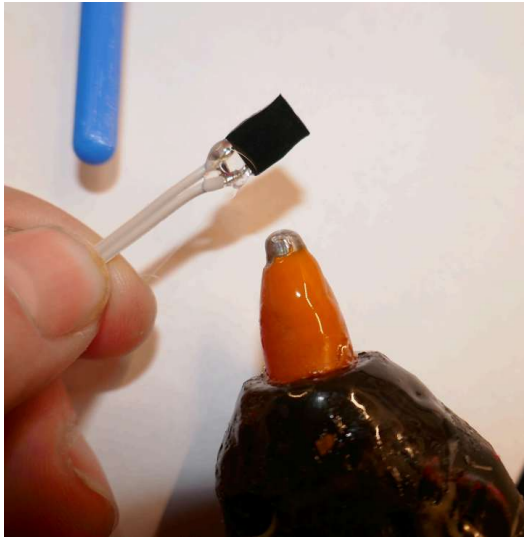
- 1) We insert the charging module, switch and battery into the box, solder the wires and secure everything with hot melt glue. **When working with the battery, be careful of short circuits!**



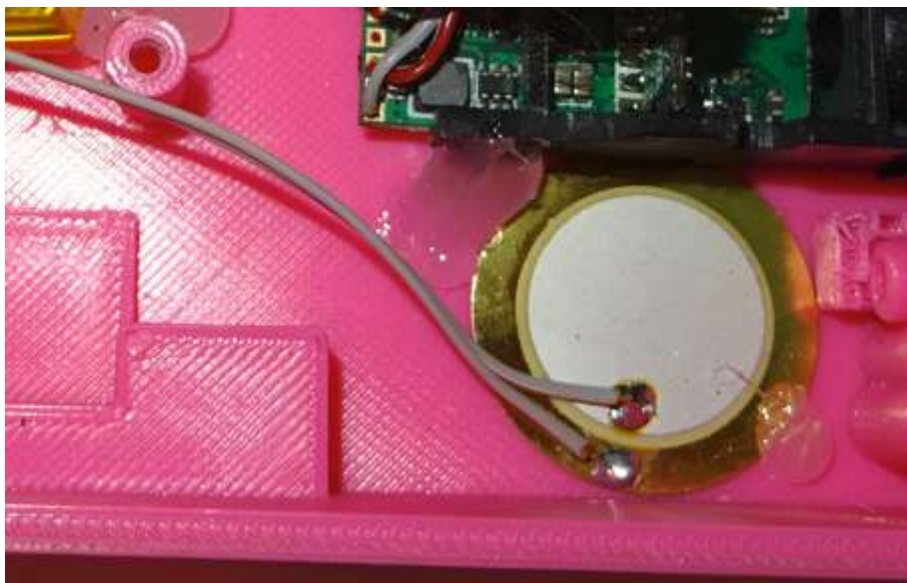
We will use glue to create a “light guide” from the LEDs to the hole in the box.



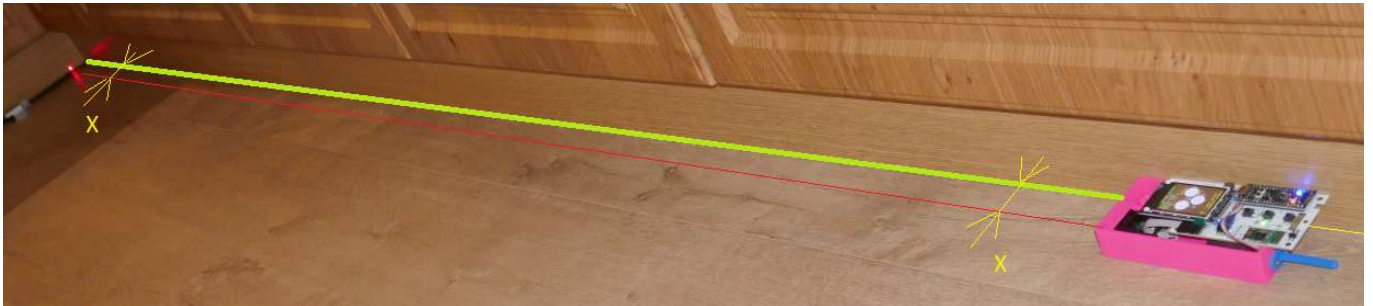
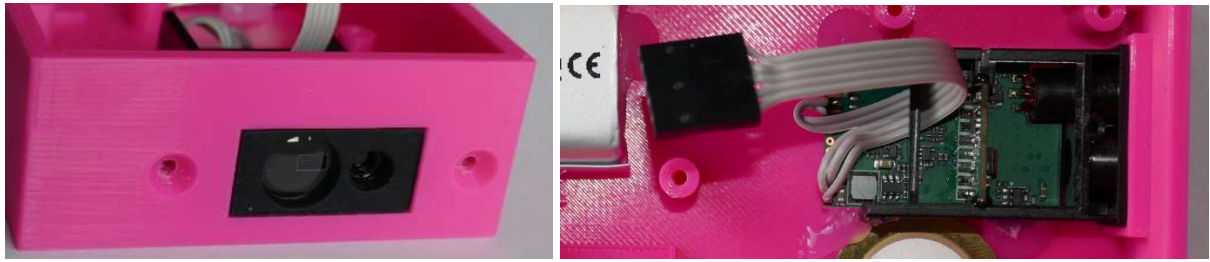
- 2) We make the connectors by purchasing the appropriate connector, or soldering the ferrule onto the wires. We apply glue from a hot melt gun. We put the shrink tubing over the connector and shrink it. Finally, we can write the wire labels on the connector.



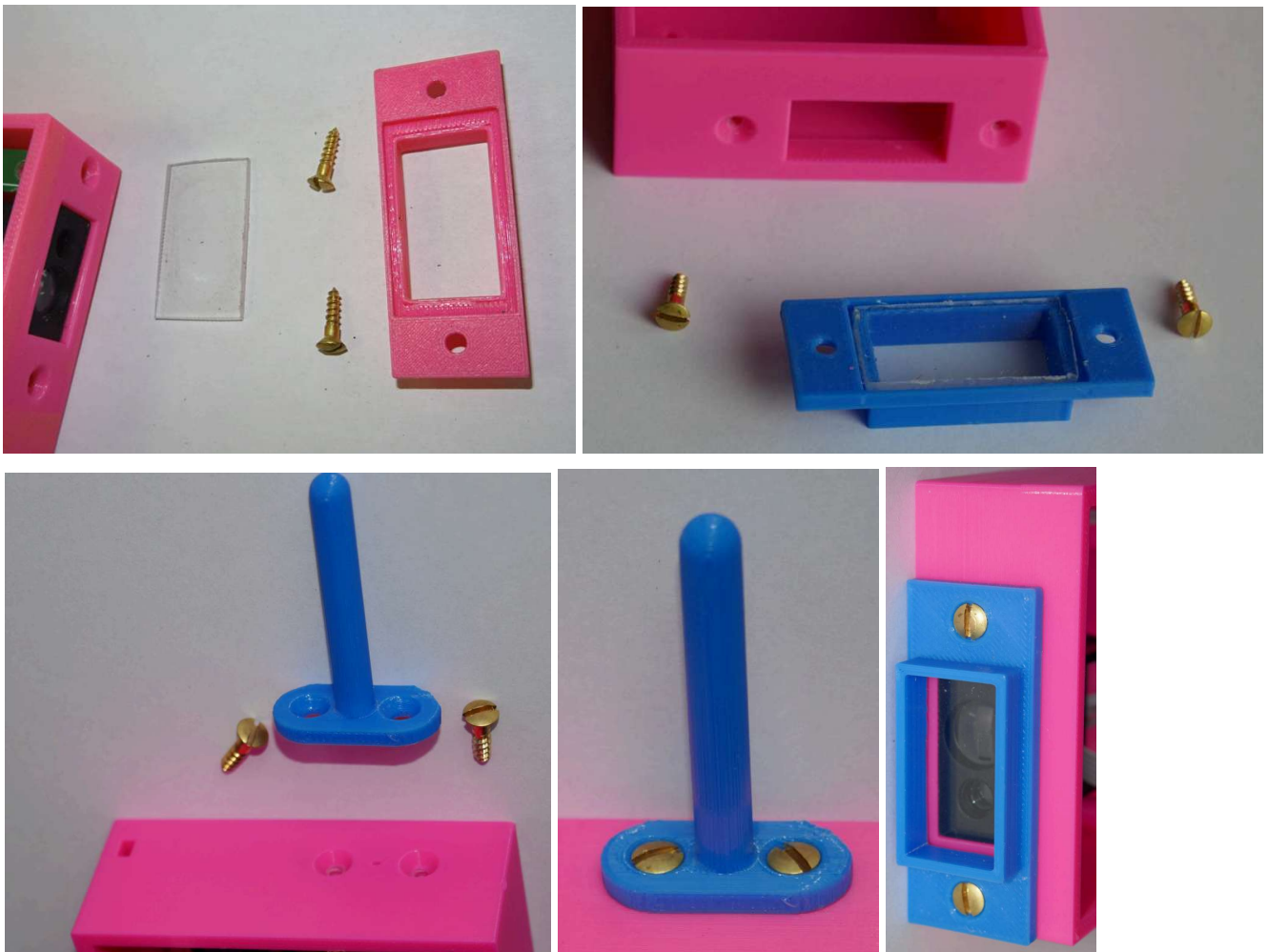
- 3) We solder a two-core cable to the piezo, with a connector at the end. We attach the piezo element with the soldered cable using hot melt adhesive.



- 4) We insert the laser module into the window. It is advisable to connect the module to the board, turn on the laser and try to make the laser shine as horizontally as possible with the base on which the box is placed. Or best of all, put the box on the floor, lean it against the wall and aim at the opposite wall. Before using the glue, correct the laser beam so that it is horizontal with both the floor and the wall. Then secure the laser with hot melt glue against movement.



- 5) We screw the measuring rod and the protective cover onto the laser using 3x12mm brass screws. The protective cover consists of 2mm plexiglass and a cap.

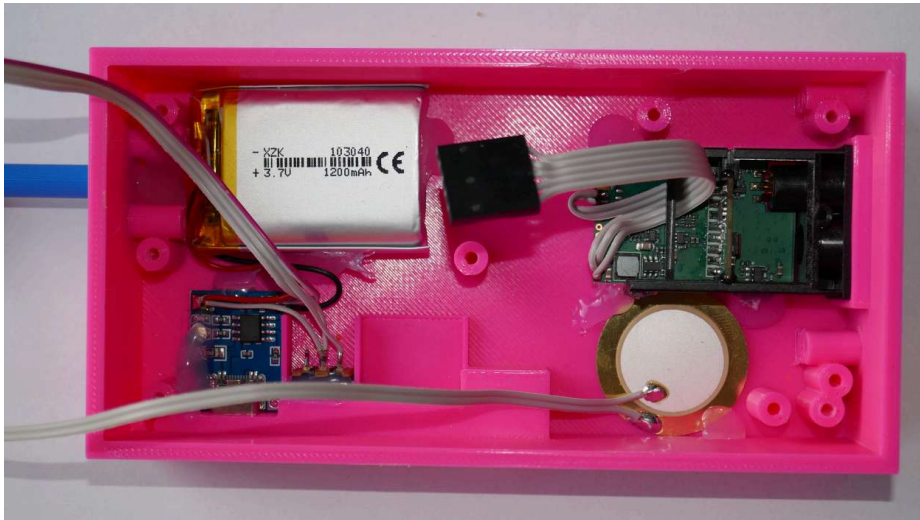




6) We glue a 2mm plexiglass slide into the top cover using glue.



7) We have the box ready.



8) We insert the printed circuit board into the box and secure it with 4 brass screws 3x12. Next, we connect the power, laser and piezo connectors.





9) Insert the buttons into the top cover



10) We stick laminated button labels and we can stick a keypad on the OK button on cabinets from Jysk OBI and the like



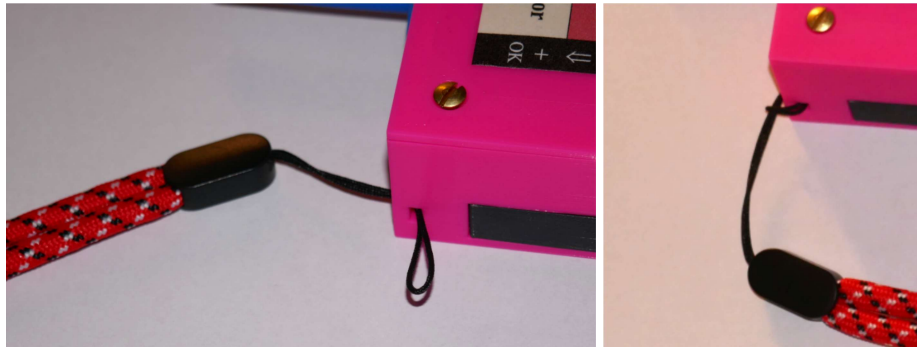
11) Place the cover on the box and screw it in with 3x20 brass screws.



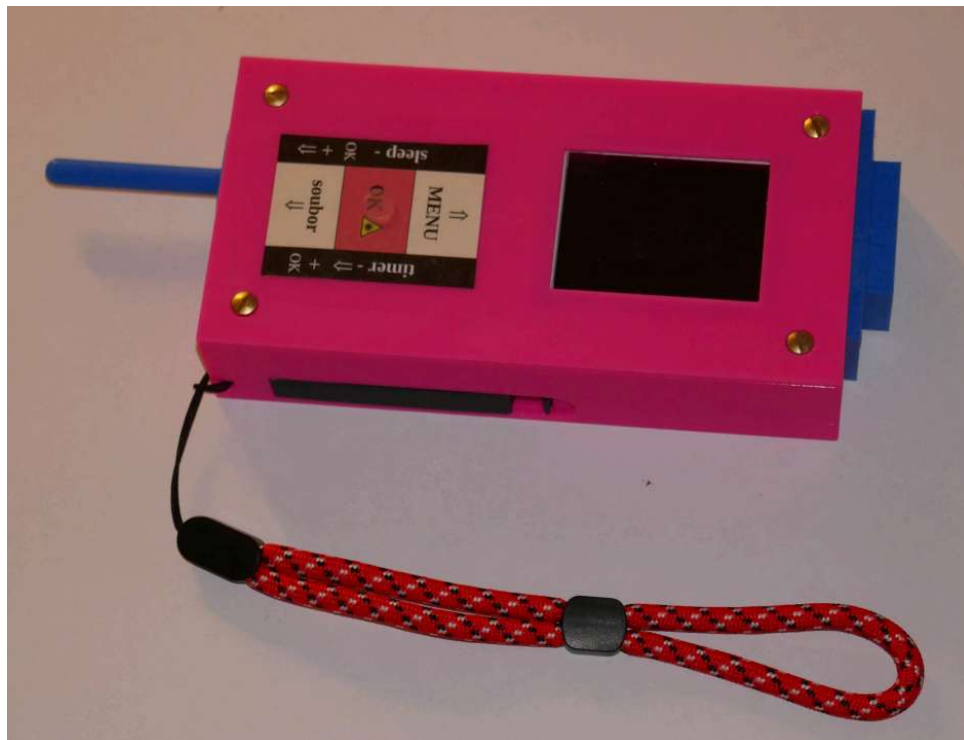
12) We put on the plastic cover of the switch and connectors



13) Insert the loop into the hole.



14) Now we can turn it on, set it up, calibrate it and measure it :-)



## Boot menu

```
ACC MAG 64 100%
Date: 05.08.2026
Time: 04:54:49

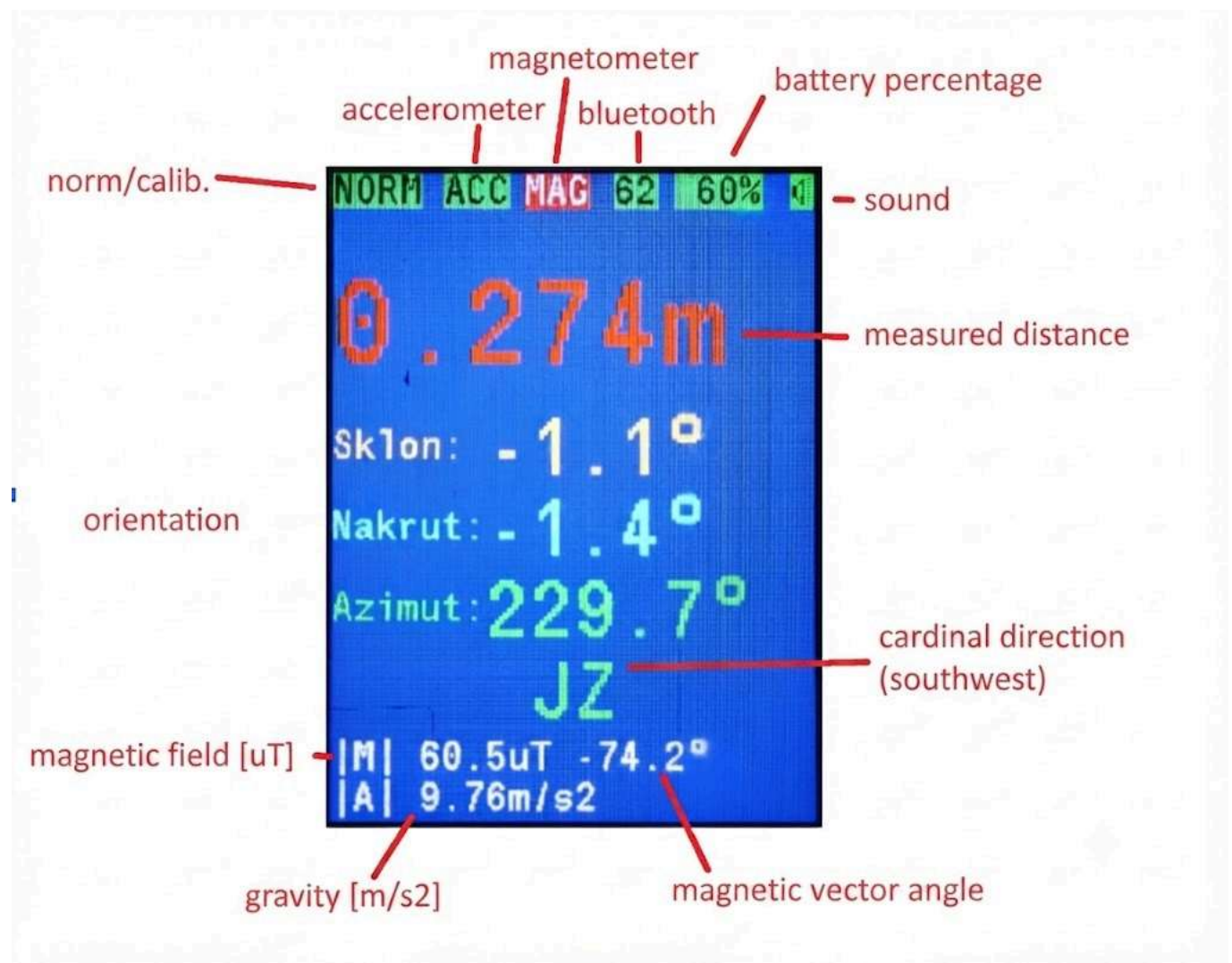
SD card      OK
Free:3774/3776MB

Reading calibrat. OK
Test RM3100  OK
RM3100 cycles 0060
SCA3300 Init  OK
Laser 703A   OK
BT 00:00:13:01:33:56
DisY
^ - Coef. not load
v - pause
```

Displays time, reads SD card, reads whether communication with sensors is OK. Can be paused by holding down the down arrow after turning on the device.



## Main screen(menu->measure)



**standard/gauge.** -If I use calibration in the Topodroid program, it switches to calibration. Otherwise it is normal.

**accelerometer** -red (hand is knocking), green is shaking OK

**magnetometr** -red (iron somewhere nearby), green mag interference OK

**bluetooth** -shows the buffer size and in addition green (not connected bluetooth), yellow (connected bluetooth)

**battery percentage** -displays battery status, additionally changes colors green/yellow/red

**sound** -red (off) / green (on)

**measured distance** -length in meters

**world orientation**- NW, W, SW, S, SE, E, NE, S

**magnetic vector angle** -angle in degrees at which the magnetic field enters the earth

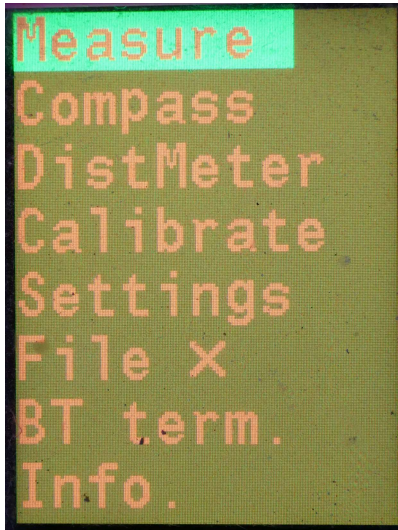
**magnetic field [uT]** -magnetic field level in uT

**gravity [m/s2]** -gravitational acceleration measured by a meter in m/s2

**orientation** -inclination, roll and azimuth



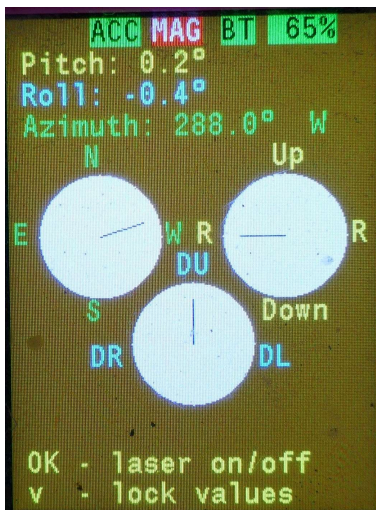
## Menu



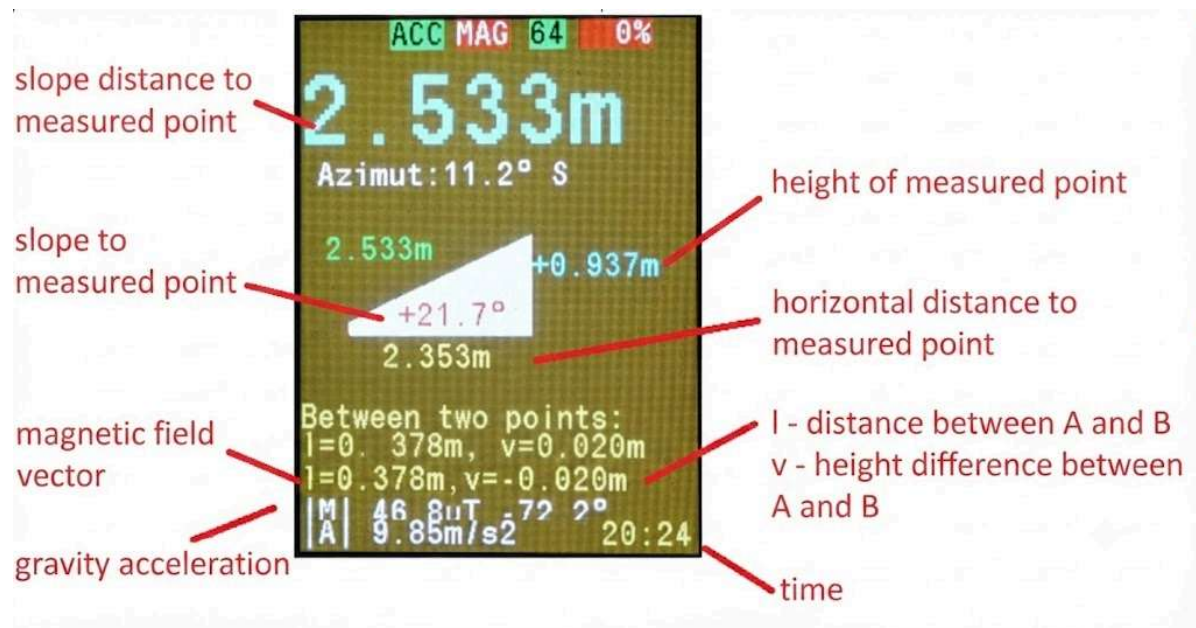
After pressing the up/menu button, we can scroll through the menu. Confirmation is made by pressing the OK button.

## Compass(Menu -> Compass)

Displays a simple compass with a spirit level.



## Distancemeter (Menu -> DistMeter)



DistoY works here as a distancemeter.

Above is information about magnetic interference and knocking. The blue text indicates the measured distance. The white text below indicates the azimuth - the direction in which the measurement was made.

The triangle in the middle reads:

red value - slope to the measured point

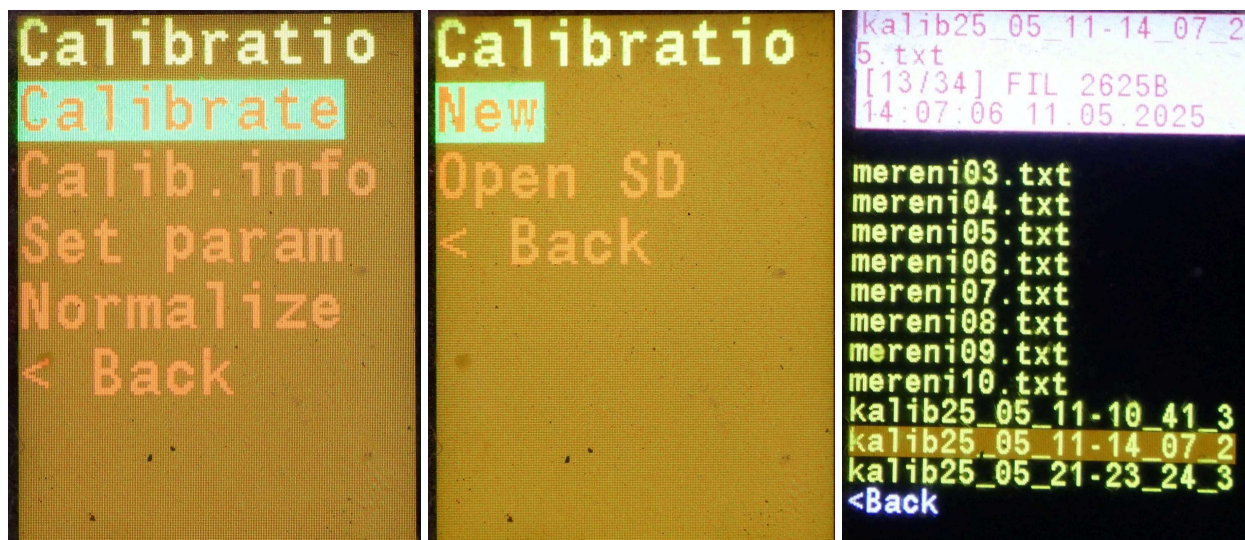
green value - measured oblique distance

blue value - calculated depth to the measured point

yellow value - calculated horizontal distance to the measured point

The white value at the bottom is the accelerometer's gravitational acceleration in  $\text{m/s}^2$  ( $9.85\text{m/s}^2$ ), magnetic field intensity in  $\mu\text{T}$  ( $46.8\mu\text{T}$ ) and magnetic field vector ( $-72.2^\circ$ )

## Calibration(Menu -> Calibration)



**Calibrate-** performs calibration, either new or you can open a saved one from SD cards. How to calibrate is explained in the chapter DistaY calibration (Menu -> Calibration -> Calibrate -> Nova)

**See also: koef.-** displays accelerometer and magnetometer calibration coefficients

**Next Delku-** Sets the correct display of the distance between two points. (Sets the length between the laser and the measuring stick)

**Nast. Acc -**Setting of gravitational acceleration at the measurement location. (For example, for the Czech Republic  $9.81\text{m/s}^2$ )

**Nast. Mag -**Setting the magnetic field intensity in  $\mu\text{T}$  (For the Czech Republic 2025 -  $69\mu\text{T}$ ) We will find out the exact value <https://www.ngdc.noaa.gov/geomag/calculators/magcalc.shtml#igrfwmm> or <https://www.magnetic-declination.com/>

**Normalize -**The device must be at rest and free from magnetic interference (on the ground in nature). The correct gravitational acceleration and magnetic field intensity must be set at the measurement location. The calibration coefficients are recalculated so that the device correctly displays the units of magnetic field and gravitational acceleration. If the device has been calibrated correctly and the correct acceleration and intensity values have been set before calibration, then there is no need to turn on NORMALIZATION.

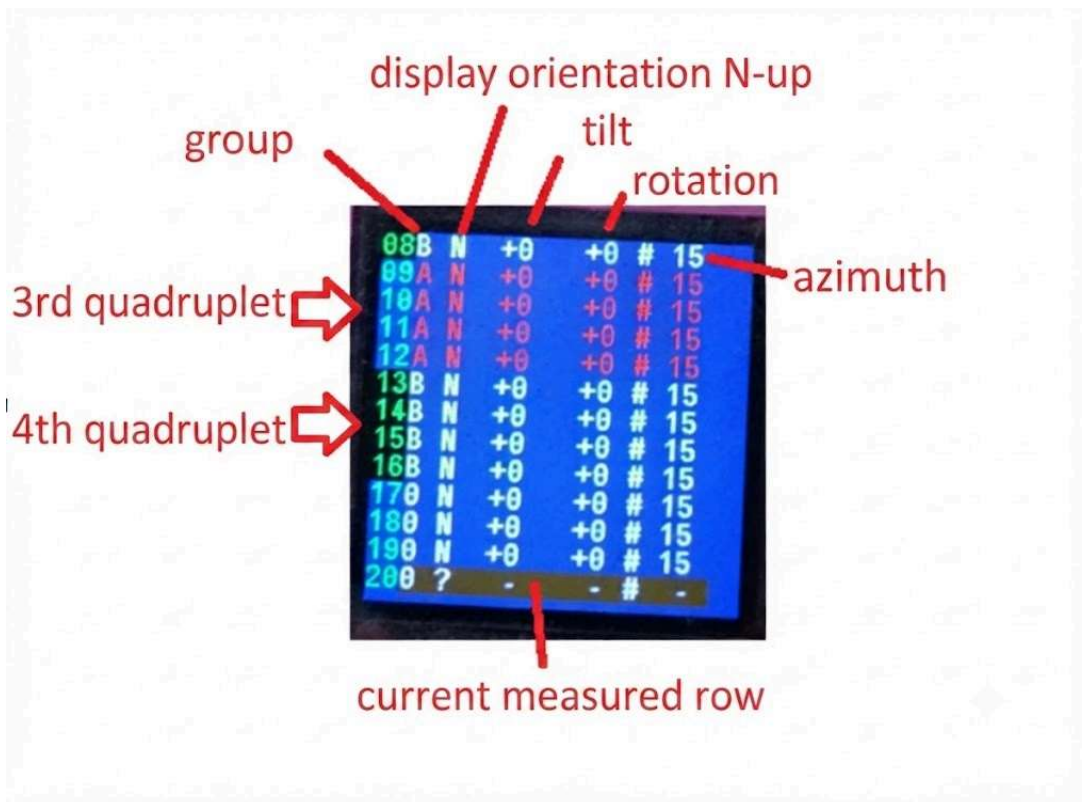
## DistaY calibration (Menu -> Calibration->Calibrate->New)





|                     |                     |                     |                     |
|---------------------|---------------------|---------------------|---------------------|
| 01A N -2 -5 #282    | 170 L +88 +132 # 64 | 330 N +48 +2 #276   | 410 N +50 -2 #310   |
| 02A P -2 -87 #284   | 180 N +88 +12 # 87  | 340 P +47 -91 #274  | 420 P +46 -92 #314  |
| 03A D -2 +162 #284  | 190 P +86 -93 #105  | 350 D +50 -177 #275 | 430 D +54 +178 #311 |
| 04A L -2 +94 #284   | 200 D +84 +165 #106 | 360 L +51 +94 #266  | 440 L +49 +91 #316  |
| 05B N +0 -11 #101   | 210 N -86 -42 #239  | 370 N +43 -2 # 36   | 450 L -52 +87 #320  |
| 06B P +0 -87 #102   | 220 P -86 -65 #313  | 380 P +47 -88 # 30  | 460 N -45 -2 #321   |
| 07B D +0 -178 #100  | 230 D -85 -169 #289 | 390 D +41 +177 # 32 | 470 P -45 -92 #313  |
| 08B L +0 +88 #100   | 240 L -83 +51 #247  | 400 L +33 +90 # 25  | 480 D -47 +179 #317 |
| 09A N +0 -2 #198    | 250 N +48 +9 #196   | 410 N -52 -1 # 31   | 490 N +45 -3 #224   |
| 10A L +0 +88 #200   | 260 P +48 -80 #189  | 420 P -48 -92 # 31  | 500 P +47 -90 #220  |
| 11A D +0 -169 #201  | 270 D +52 -175 #190 | 430 D -58 +177 # 31 | 510 D +48 -177 #218 |
| 12A P +0 -97 #196   | 280 L +49 +100 #185 | 440 L -57 +86 # 30  | 520 L +45 +95 #217  |
| 13B N -6 -1 # 17    | 290 N +44 +3 #115   | 450 N -47 -3 #116   | 530 N -42 -8 #224   |
| 14B P -6 -81 # 15   | 300 P +46 -89 #115  | 460 P -50 -89 #113  | 540 P -42 -88 #218  |
| 15B D -6 +169 # 12  | 310 D +43 -177 #115 | 470 D -49 -179 #111 | 550 D -41 +177 #219 |
| 16B L -6 +101 # 13  | 320 L +33 +96 #102  | 480 L -49 +91 #107  | 560 L -45 +89 #212  |
| 170 L +88 +132 # 64 | 330 N +48 +2 #276   | 490 N -43 +0 #199   | Done - calculate    |

In calibration, we use the OK button to perform the operations as we are used to in measurement. If we press the up arrow while pressing the OK button, we jump to MENU. Or after pressing OK + down, the calibration will be calculated. If we press only one of the arrows separately, we will move in the table and we can measure the already measured values again.



The first 16 values are displayed graphically in quads either in a group **A** or **B**. From the 17th value to 56, all measurements are displayed in white in the group **0**. First 4 x 4 measurements (groups **A** and **B**) must always be measured with a precisely focused laser, always to one point (see calibration description).

The display orientation takes on the following values: **N**- display up, **D**- display down, **L**- display to the left, **P**- display to the right.

The next value displayed is the tilt of the device in degrees. If the device is pointing the laser downwards, the angle is -90°. If it is pointing upwards, the angle is +90° and if the device is exactly horizontal, then 0° is displayed. Rotation is how the display is turned in degrees. The last value is the azimuth in degrees where the laser is pointing. From the measured values, we can find out where we were aiming during calibration. For example, if we measure **03A D -2 +162 #284** so this is the third measurement group **A** the display was pointing down. The pitch was -2° which is a nearly horizontal measurement. The roll was +162° (which is the display down, but not quite - 180° is completely down). And the azimuth 284 was approximately due west (**0** - sever, **90** - EXIT, **180**- them, **270**- west).



```

01A N -2 -5 #282
02A P -2 -87 #284
03A D -2 +162 #284
04A L -2 +94 #284
05B N +0 -11 #101
06B P +0 -87 #102
07B D +0 -178 #100
08B L +0 +88 #100
09A N +0 +2 #198
10A L +0 +88 #200
11A D +0 -169 #201
12A P +0 -97 #196
13B N -6 -1 # 17
14B P -6 -81 # 15
15B D -6 +169 # 12
16B L -6 +101 # 13
170 L +88 +132 # 64

```

error value (here.  
error in X axis is -0.7 degrees)

green checkmark - error in this axis OK  
red cross - error in this axis.  
bad measurements in this direction.

indicates error to  
the precise point  
in individual axes  
X,Y,Z.  
first numerically,  
then with a  
checkmark/symbol

rot 4 - means 4th  
quadruplet

```

Kalib ACC .. OK
Kalib MAG .. OK
rot1 -1.2 0.0 -0.2 ✓
rot2 9.8 0.0 10.0 ✓
rot3 -9.8 0.0 -10.0 ✓
rot4 -10.0 0.0 -10.0 ✓
rotACC -2.8 0.0 -2.3
Zkontr. zameru bodu!
rotMAG 8.7 5.0 5.0
^ - zpet
OK- info+poslat data
v - ulozit

```

redo

magnetometer error  
in individual axes in  
order X,Y,Z

menu what happens after  
pressing which button

```

Kalib ACC .. OK
Kalib MAG .. OK
rot1 1.4 0.0 -0.1 ✗
rot2 -0.0 0.0 -0.0 ✗
rot3 -0.0 0.0 0.0 ✗
rot4 -0.1 0.0 -0.0 ✗
rotACC 0.3 0.0 -0.0
Zkontr. zameru bodu!
rotMAG 10.0 1.9 -4.8
^ - zpet
OK- info+poslat data
v - ulozit kalibraci

```

X-axis calibration error

```

Kalib ACC .. OK
Kalib MAG .. OK
rot1 -0.1 0.0 -0.0 ✓
rot2 -0.0 0.0 -0.0 ✓
rot3 -0.0 0.0 0.0 ✓
rot4 -0.1 0.0 -0.0 ✓
rotACC -0.1 0.0 -0.0
Zamera na bod OK.
rotMAG 0.0 -0.0 0.1
^ - zpet
OK- info+poslat data
v - ulozit kalibraci

```

Calibration OK

```

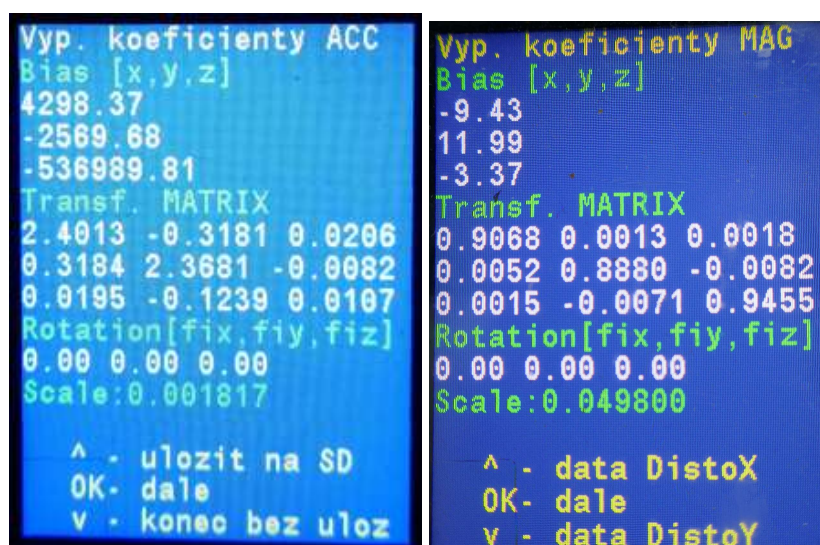
Kalib ACC .. OK
Kalib MAG .. OK
rot1 -0.1 0.0 -0.0 ✓
rot2 -0.0 0.0 -0.0 ✓
rot3 -0.0 0.0 0.0 ✓
rot4 -0.1 0.0 -0.0 ✓
rotACC -0.1 0.0 -0.0
Zamera na bod OK.
^ - zpet
OK- info+poslat data
v - ulozit kalibraci

```

Calibration calculation in progress

After pressing the Calibrate button, the coefficients and calibration errors are calculated. The lines rot1-4 indicate the tilt and rotation error of the meter. This means how much our hand shook when we aimed at

exactly one point in four different display orientations. If all three errors in all three axes X, Y, Z were zero, it means that the laser always aimed at exactly the same point during each measurement. If there is a red cross in the yellow field after this line, it means that the measurement error for this specific direction was outside the limit and it is appropriate to perform the measurement in this direction again. For example, if the error was at rot3, then we will remeasure the third quadrant when we measured exactly at the point. (Press the Back button (Up) and in the table we will move to the relevant measurements and overwrite them with new values). If we are satisfied with the calibration, we will press the Save button (Down) and the calculated coefficients will be written to the device's memory. If we are not sure, we will press the OK button and continue...

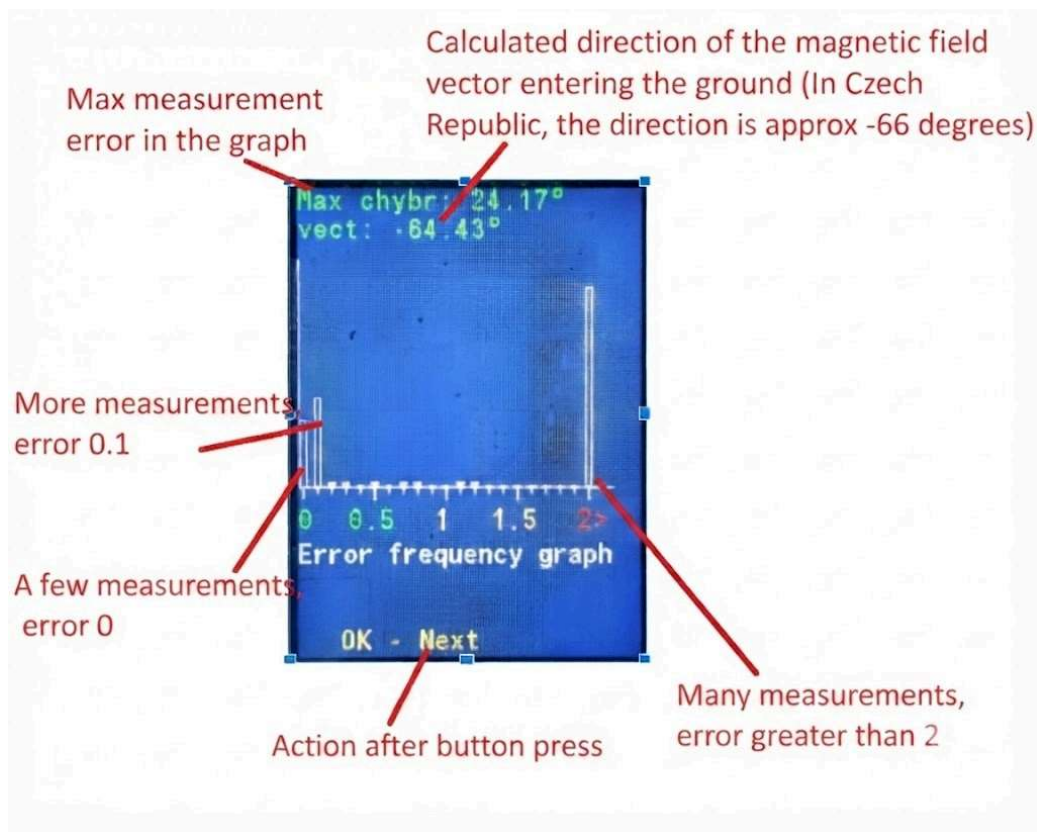


If we press OK, a table with the calculated accelerometer calibration coefficients will be displayed, we can choose whether to save the measured calibration data in DistaY format to the SD card (up arrow), or we can press the down arrow to end the calibration without saving.

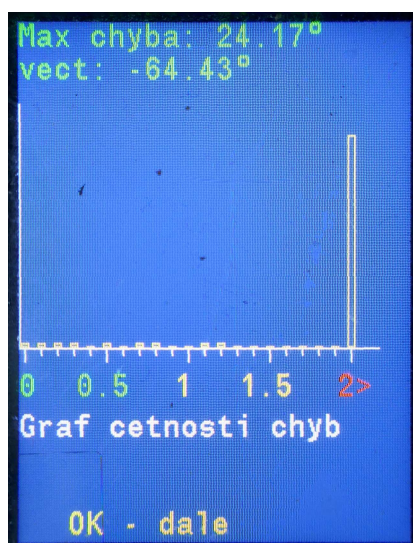
After pressing OK again, a table with the magnetometer calibration coefficients will be displayed. We can choose whether to send the measured values to the device via BT in either DistaX or DistaY format.

After pressing OK again, a graph with errors and the measured magnetic field vector appears.

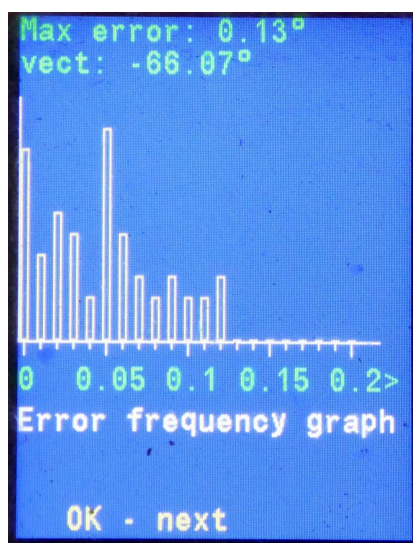




We can verify the measured magnetic field vector by <https://www.ngdc.noaa.gov/geomag/calculators/magcalc.shtml#igrfwmm> or <https://www.magnetic-declination.com/> (inclination item). If the measured value is too different from what we found on the pages [noaa](https://www.noaa.gov/) then the calibration is probably incorrect.



Bad calibration graph (probably 24°)  
(angle of magnetic field vector is -64°)



Good calibration graph (errors up to 0.13°)  
(angle of magnetic field vector is -66°)

The error graph shows which error occurs most often in the measurement. If the errors are too large, it means that we performed the calibration near magnetic interference (in my case, for example, once near the tire - steel wires in the tire). The calibration needs to be performed again and better. After pressing

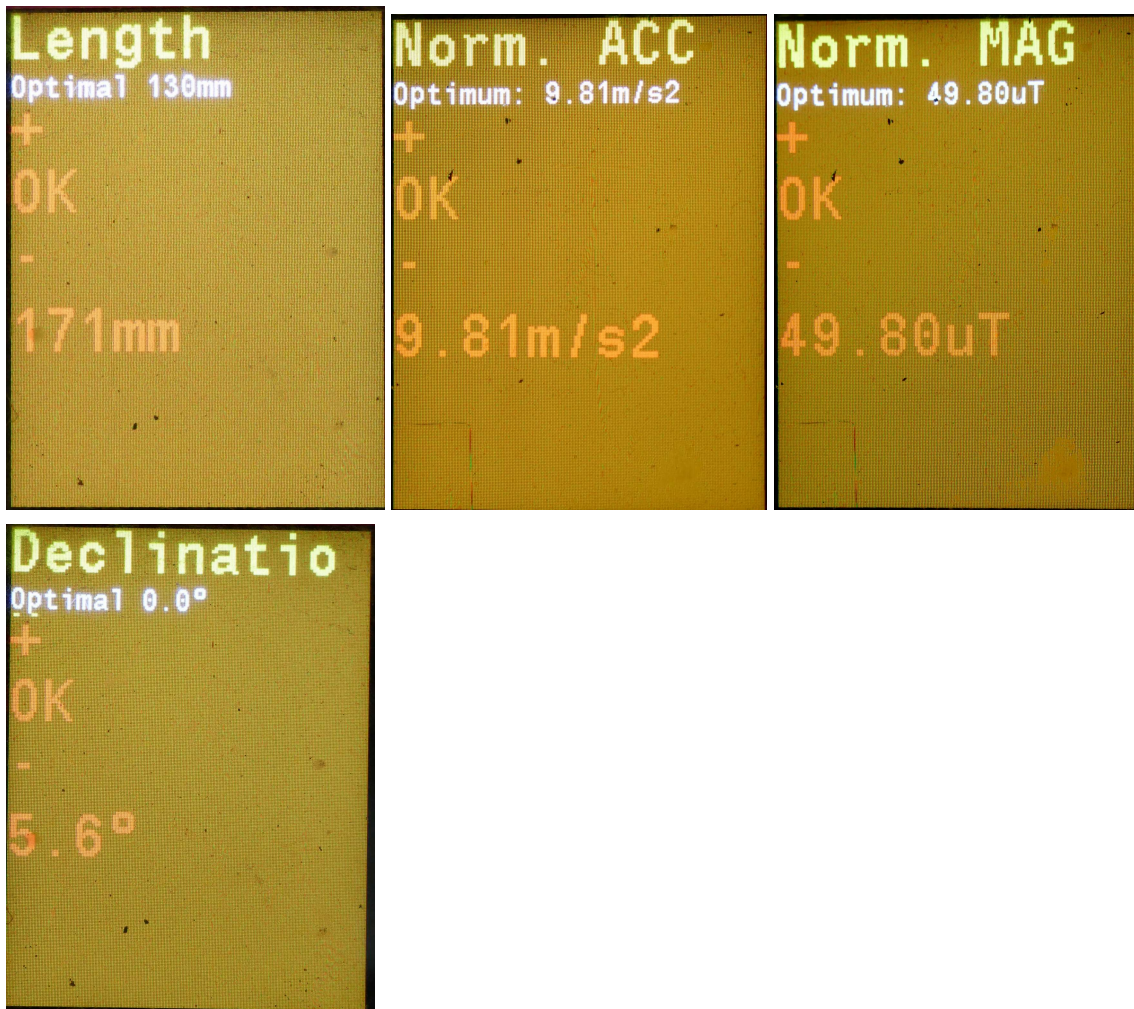
the OK button, we will again get to the calibration calculation window and so on until we finish the calibration by pressing the back button in the calibration calculation window and then in the table of measured values, using the OK+(up arrow) shortcut, we will get to the menu.

### Display of calibration coefficients(Menu -> Calibration->Acc coef./Mag coef.)

|                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                             |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Mag Coefficients</b><br><b>Bias [x,y,z]</b><br>8.064<br>-20.82<br>20.100<br><b>Transf. MATRIX</b><br>0.9017 0.0008 0.00073<br>0.0234 0.9081 -0.0033<br>0.0028 -0.0269 0.9043<br><b>Rotation [fix,fiy,fiz]</b><br>0.00 0.00 0.00<br><b>Scale:0.049600</b><br><br>OK - next | <b>ACC Coefficients</b><br><b>Bias [x,y,z]</b><br>-4.94<br>-33.63<br>-40.10<br><b>Transf. MATRIX</b><br>0.9991 -0.0059 0.0023<br>0.0054 0.9988 -0.0015<br>0.0023 0.0003 0.9976<br><b>Rotation [fix,fiy,fiz]</b><br>0.00 0.00 0.00<br><b>Scale:0.001817</b><br><br>OK - next |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|



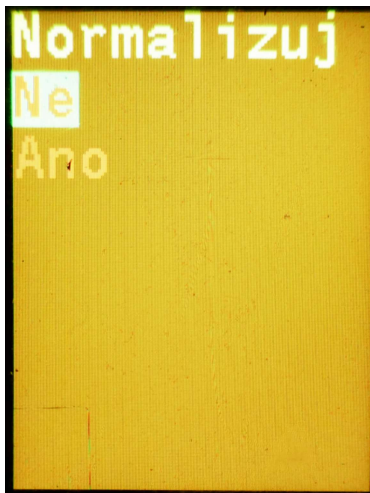
Length / Gravitational acceleration / Magnetic field intensity settings(Menu -> Calibration->Length/Norm. Acc/Norm. Mag)



Laser length adjustment      Gravitational acceleration at a location Mag. field in place. for the Czech Republic 49.8uT

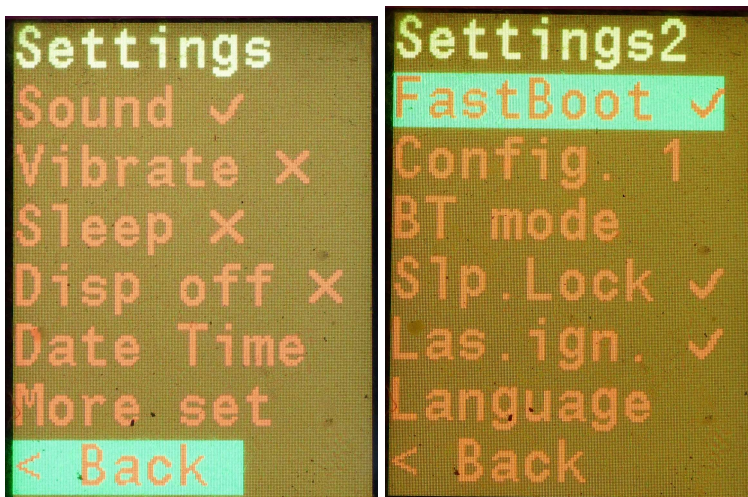
We can find out at: <https://www.ngdc.noaa.gov/geomag/calculators/magcalc.shtml#igrfwmm>

## Standardization (Menu -> Calibration->Normalize)



It calculates the scale so that the accelerometer and magnetometer units agree. It must be done in a forest, without interference from metals and without shaking the device.

## Settings(Menu -> Settings)



**Sound**(Menu -> Settings -> Sound) - Turns sound on/off

**Vibration**- If enabled, even if ACC and MAG values are out of range, the measurement is ignored

**Sleep**- Automatic DistaY sleep - sleep consumption only 3.5mA (time can be selected)

**Disp off**- Automatic display shutdown - saves 50mA (time can be selected)

**Date of birth**- Setting the date and time

**Next step**- Settings menu2

**FastBoot**(Menu -> Settings -> FastBoot) - Turns on fast boot / messages are displayed slowly during startup

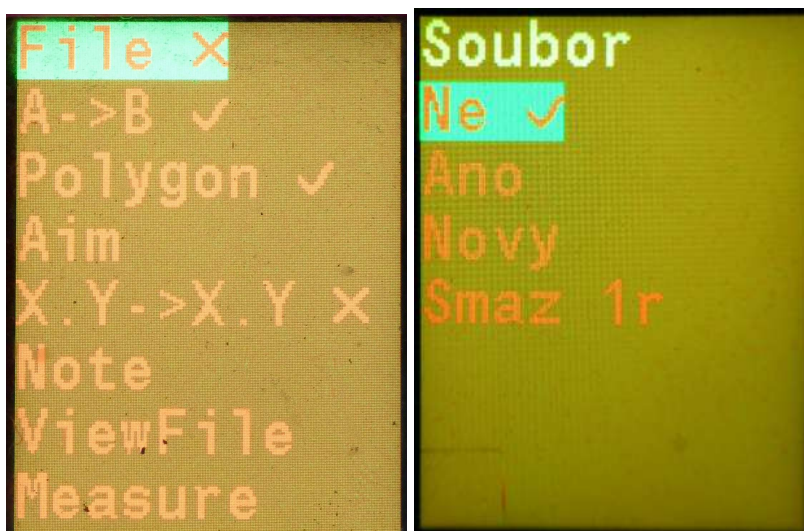
**Configuration**(Menu -> Settings -> Config.) - Selects the hardware configuration (1 - default, 2 - swapped X and Y axes for magnetometer (red variant), *additional features will be delivered based on added hardware*)

**Nast.BT**(Menu -> Settings -> BT Settings) - Selects the protocol by which DistoY should communicate





### Saving to a file(Menu -> File)



**File**(Menu -> File -> File) - Turns on/off saving to a file or creates a new file (it is recommended to create new files for each measurement).

**It is** -It is not saved to a file.

**Again**- Continues the open file

**New**- Creates a new file

**About 1 year**- Deletes the last point in the polygon with its targets

**A->B/B->A**(Menu -> File -> A->B/B->A) - Direction - toggle between forward and backward polygon points.



**Polygon**(Menu -> File -> Polygon) - selects that the polygon should be measured and the intention is canceled

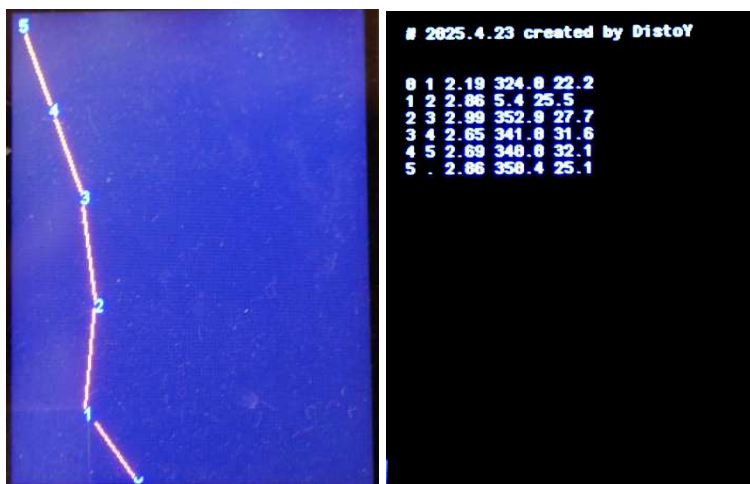
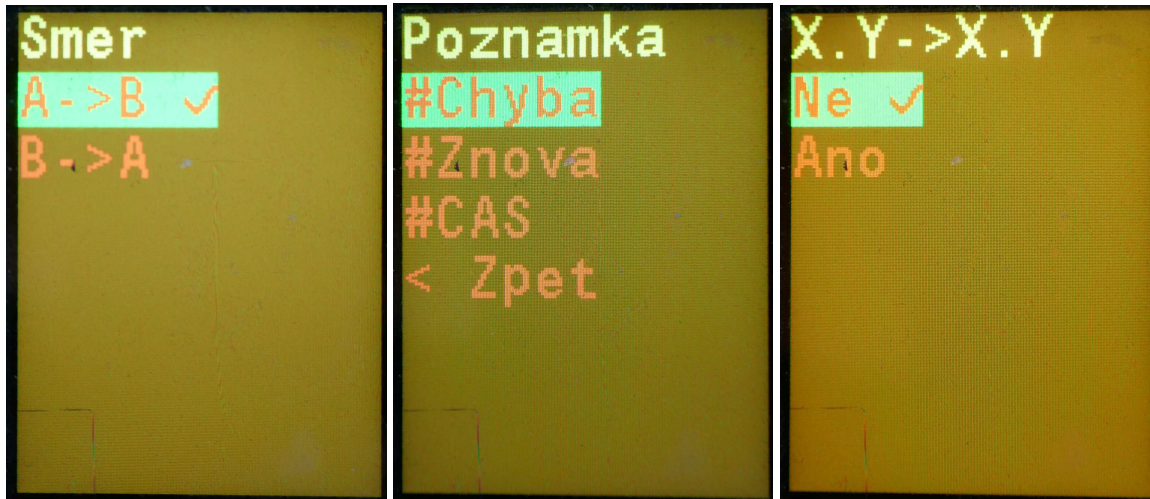
**Resentment**(Menu -> File -> Scope) - selects that the target should be measured and the polygon will be deleted

**X.Y->X.Y**(Menu -> File -> X.Y->X.Y) - the auxiliary polygon (turn) will be measured (and numbered). Until now, the points were e.g. 45, 46, 47 and from now on the points will be 47.0, 47.1, 47.2. When the auxiliary polygon is deleted, the numbering will continue 48, 49, ... etc ...

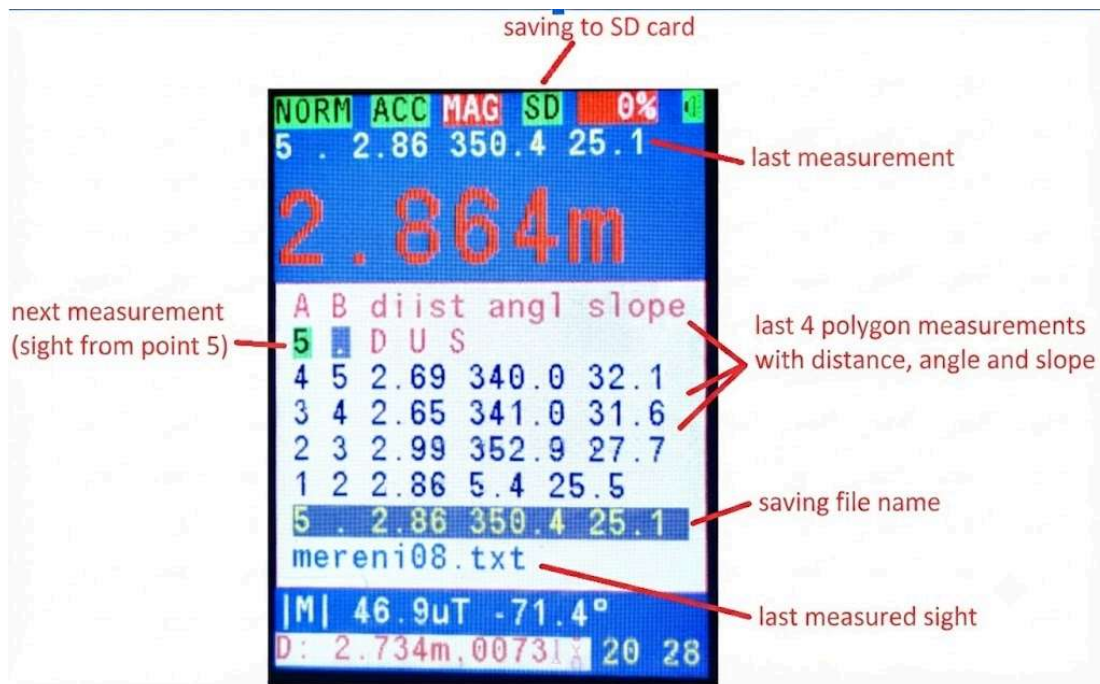
**Note**(Menu -> File -> Note) - Inserts a line into the file with the text: #Error, #Retry, time for example: #12.7.2022 12:45:14

**Dental.soub**- Displays the current floor plan, side view and contents of the saved file

**Measurement**(Menu -> File -> Measurement) - Jumps to measurement



**Note:** If saving to file is selected, you can access menu->file from menu->measurement by pressing the shortcut key ↵ (down arrow)



In SD card saving mode, the SD symbol appears in the measurement and after each measurement, the top line is drawn with the data saved to the SD card. The display also shows a table with the next measurement and the last measured points.

## **Bluetooth terminal (Menu -> BT term.)**

In this menu DistoY can communicate using text protocol via BT. Individual commands can be displayed with the command **help[enter]** / **help<LF>**.

It is advisable to use a program for connection, for example **Hyperterminal** for PC, or **Serial Bluetooth Terminal** pro Android.

### **List of commands:**

**time [h.m.s][enter]**- sets the time (separated by dots) (e.g.: time 5.5[enter] - sets 5h 5min )

**date [d.m.r][enter]** - sets the date (separated by dots) (e.g.: date 5.5.25[enter] - sets May 5, 2025)

**a[enter]** - prints raw data (12 5 32) - separated by a space

**b[enter]** - prints uT data uncalibrated (12.4 5.1 32.78)

**k[enter]** - prints calibrated uT data (12.9 5.8 31.3)

**cyk [n] [enter]**- set cycles [n]

**m[enter]** - raw data + button increment

**c[enter]** - prints raw data (12,5,32) - separated by comma

**save[enter]**- saves configuration to eeprom

**cat [file] [enter]**- lists the contents of the file (e.g.: cat jesk.txt [enter], cat /slax/jesk01.txt[enter], etc...)

**dir [adr] [enter]**- lists the contents of a directory (e.g.: dir[enter] root directory, dir /slax[enter] - lists the slax directory, dir / - lists the root directory, etc....)

**rm [file/directory][enter]**- deletes file/**empty**directory (rm mereni05.txt)

**file [name] [enter]**- file name for saving measurements without extension (name[n].txt) (e.g.: file amateur[enter], file jesk[enter], file mereni[enter])

**default [enter]**- factory settings

**norm acc/mag/delka [enter]** - reads the standard value

**norm2 acc/mag/delka [x] [enter]** - writes the standard value x, serves to define the current value for calibrating the scale (so that the units agree correctly)

we can find out at: <https://www.ngdc.noaa.gov/geomag/calculators/magcalc.shtml#igrfwmm>

**echo 0/1[enter]**- Turns echo on/off

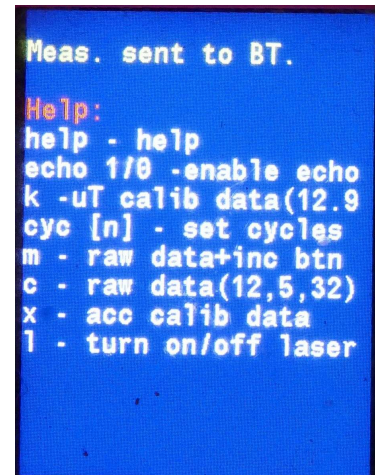
**name [x]** - set device name

**scale acc/mag[enter]**- prints the scale x (used to convert raw value to a value with a unit, for example to uT, m/s<sup>2</sup>, etc.. calculated during calibration from a standardized value - norm command)

**scale2 acc/mag [x][enter]** - records measurement x

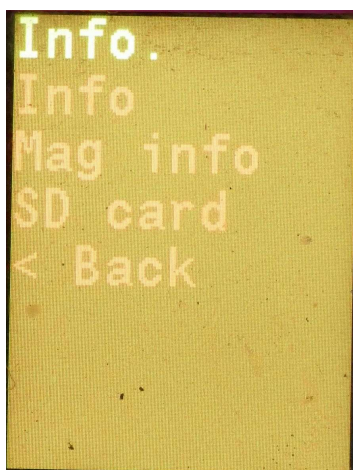
**kal [acc/mag][enter]**- lists calibration coefficients

**cal2 [acc/mag] [b/m0/m1/m2/r] x y z [enter]** - write calibration coefficients

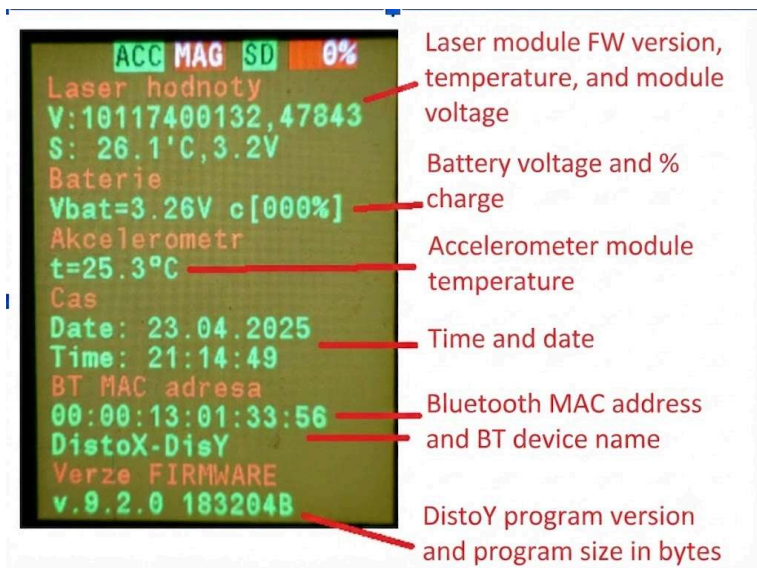




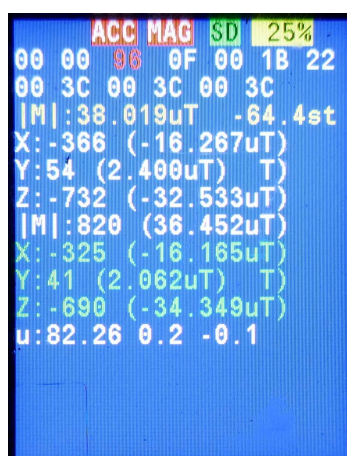
## Information menu(Menu -> Info)



## Information(Menu -> Info -> Information)



## Magnetometer information(Menu -> Info -> Mag.info)



**Hexadecimal characters** The memory from the accelerometer is read out on the mountain

**White |M|** above followed by the number st is the calibrated magnetic field intensity + magnetic field vector in degrees

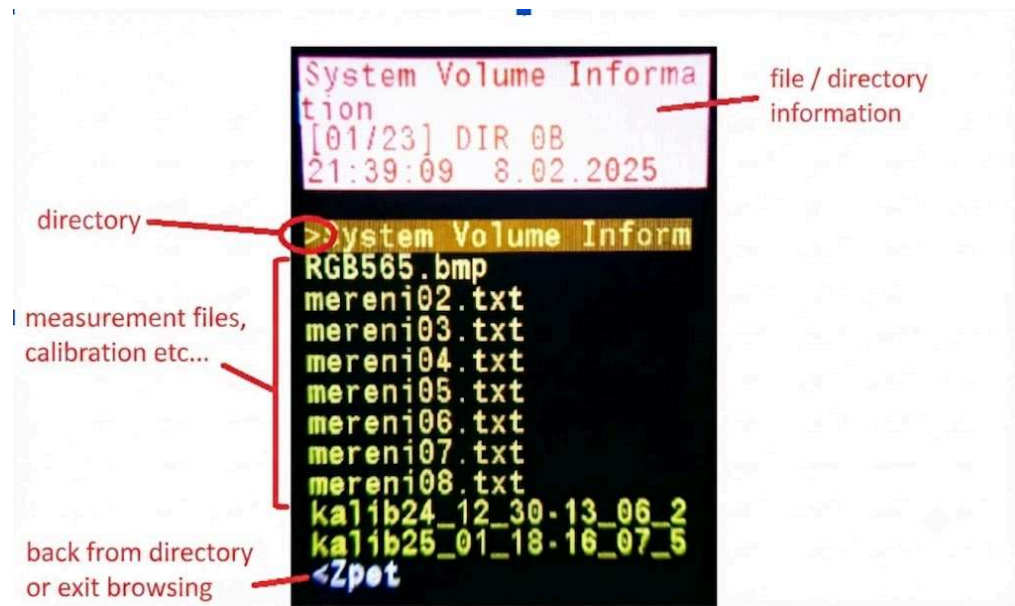
**White X, Y, Z-** are uncalibrated values read from the magnetometer

**Below them is |M|**, which indicates the uncalibrated absolute value of the magnetic field intensity.

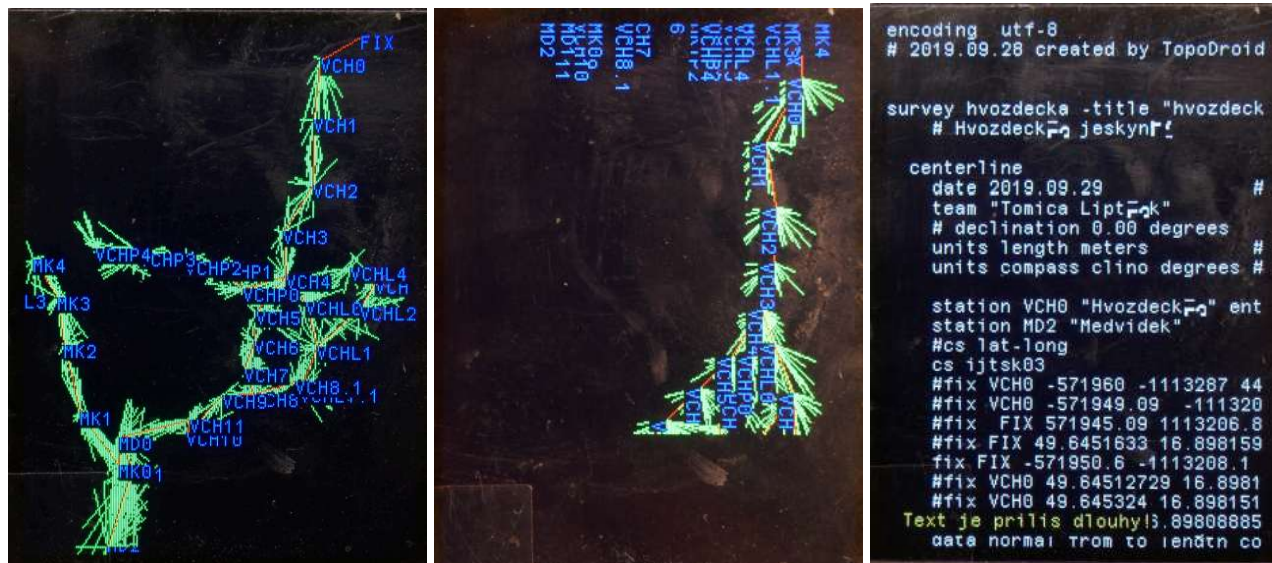
**Green X, Y, Z-** calibrated values read from the magnetometer are recalculated

**in:-** is the azimuth

### Browsing the SD card(Menu -> Info -> SD card)



It is used to view the content on the inserted SD card. Use the up and down arrows to move, OK to confirm. It is possible to open and plot map files \*.TXT, \*.TH. Images \*.BIN 320x240 pixels and any text files.



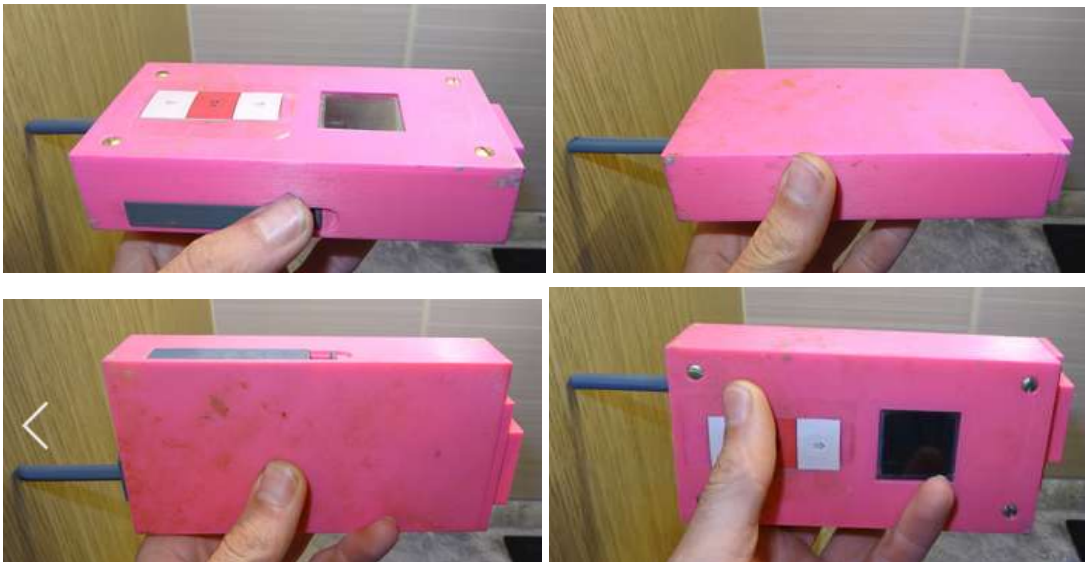
DistoY can draw a floor plan. An expanded side view. And display the contents of text files. When displaying text files, use the up and down arrows to move 10 lines. Use the arrows + OK to move left and right. Use the OK button to end viewing.

## Calibration

Calibration can be performed using external software (e.g. Topodroid, etc.), or using **manual calibration** in the device.

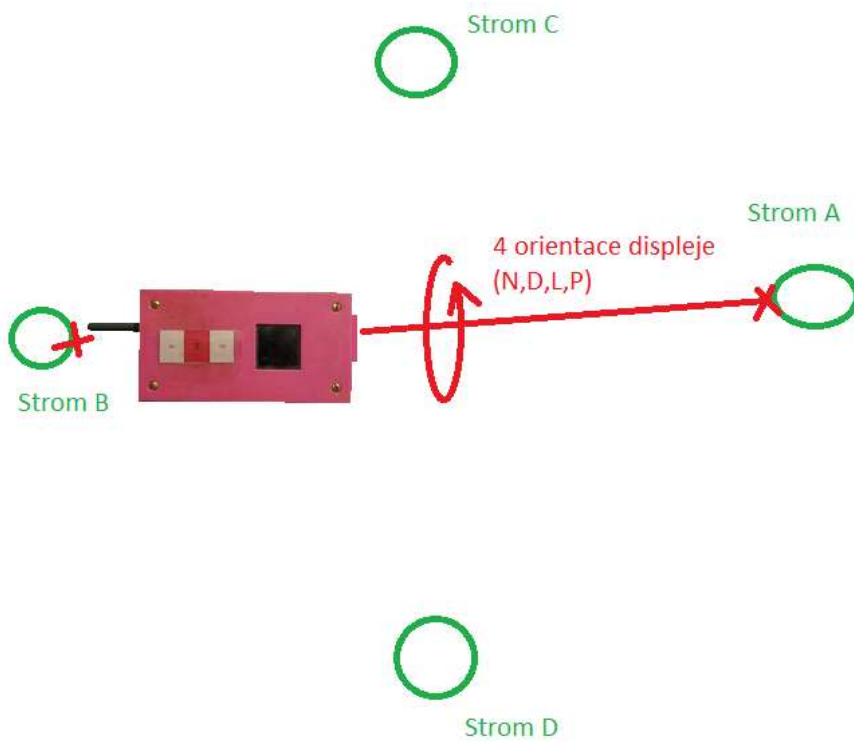
For calibration, 56 measurements need to be taken (less is possible, but not recommended). The first 16 measurements must be precisely aimed at the laser point. Further measurements should be directed approximately. Of the first 16 measurements, 4 measurements are always to the same point, only the orientation of the display changes (4 measurements x 4 orientations = 16 measurements). Next, 4 measurements (orientations) are taken up and 4 measurements down. That's  $16 + 8 = 24$  measurements. This is followed by measurements in an oblique direction at an angle of approximately 45 degrees up in four cardinal directions and four orientations of the display. That's another 16 measurements and then finally measurements obliquely at an angle of approximately -45 degrees down again in four arbitrary cardinal directions and four orientations of the display. Another 16 values, so a total of  $16 + 16 + 24 = 56$  measurements.

So, graphically again:

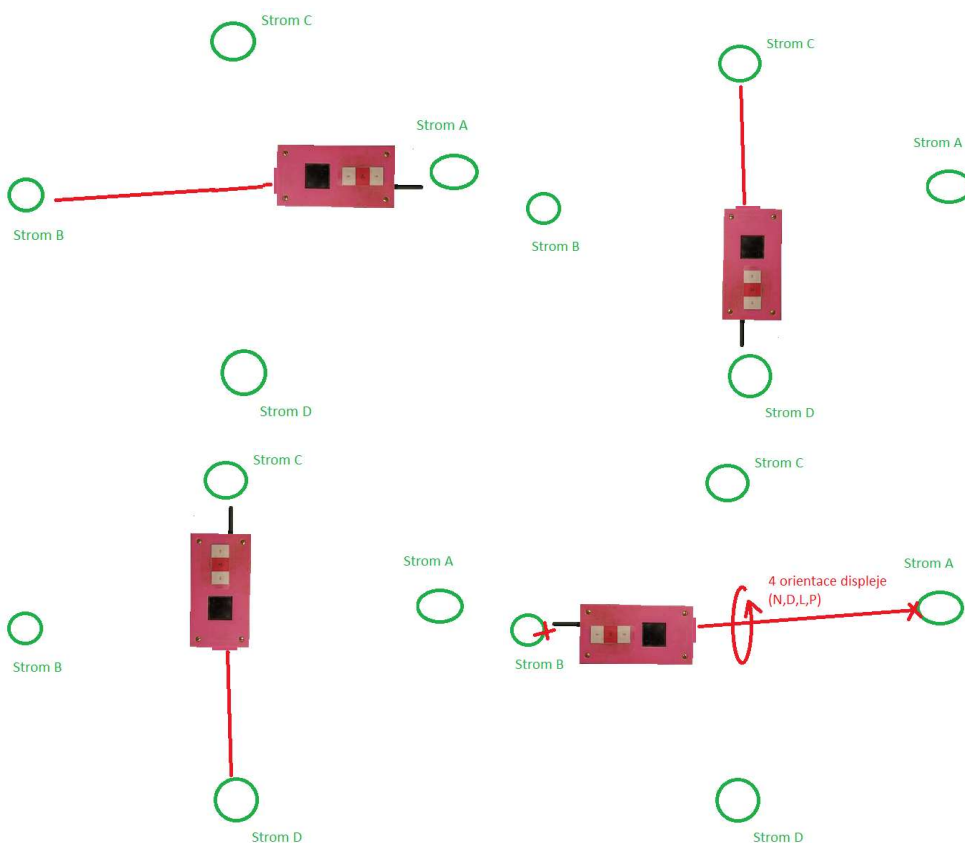


We aim the laser at a precise horizontal point for four display orientations (Up, Down, Left, Right). As we have aimed, we aim at another horizontal point for four display orientations, but a different cardinal point. The display rotation angles do not need to be chosen precisely, it is enough to choose an angle of about 90 degrees between the sides.





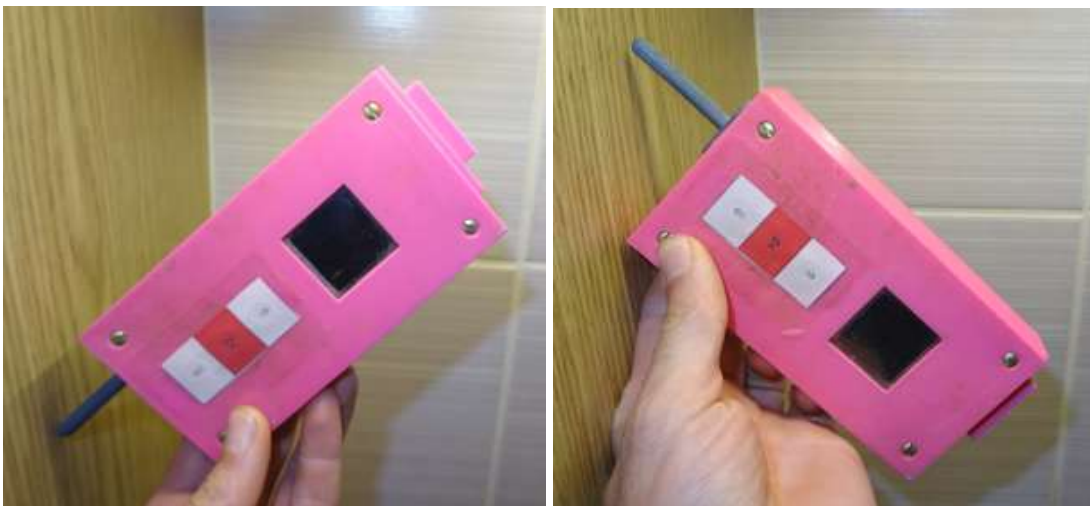
We will perform measurements in four directions (we have a total of 4 orientations x 4 directions = 16 measurements)



Next, we will perform four display orientations for the laser pointing up and four display orientations for the laser pointing down. (4 + 4 = 8 measurements)



Then 4 orientations for the laser pointing diagonally upwards and 4 orientations for the laser pointing diagonally downwards. All this for the 4 cardinal points. That is 4 orientations x 4 cardinal points x 2 (up/down) = 32 measurements



A total of 56 measurements.

It is not important to follow the exact cardinal directions when measuring, it is only necessary that the angle between individual measurements is approximately 90 degrees. It is best to perform calibration somewhere in the forest, among trees, and if possible, lean the device against each measurement so that it does not knock (for example, against a tree). It is also important to be careful of magnetic interference, so do not perform calibration at home in the garden next to a fence or the like.

## DistoY recovery procedure

1. We will install the printed circuit board with components. See chapter [PCB assembly](#)
2. We prepare a plastic box to which we add the battery and charging module + cabling. See chapter [Fitting a plastic box](#)
3. We program the MCU. See chapter [MCU STM32F411CEU6](#)
4. We set in the param menu according to the BT module used. See chapter [Settings](#)
5. We set the BT communication version. See chapter [Settings](#)
6. We set the correct length of the laser. See chapter [Length Settings](#)
7. We set the gravitational acceleration. <http://checkweighers.eu/gravity-calculator/>
8. We set the intensity of the magnetic field. <https://www.magnetic-declination.com/>
9. We will perform calibration. See chapter [Calibration](#) a [DistaY calibration](#)
10. We can perform the test on a closed polygon.

## Parametry DistoY

**Battery:**Li-Po 1200mAh, charging via USB-C

**Consumption:**laser aiming 103 mA, actual measurement 146 mA (1-2 seconds), idle 67 mA, sleep mode 4.7 mA

**Estimated endurance:**measurement approx. 10h, idle approx. 18h, sleep mode approx. 10 days

**Distance meter:**Laser 50m (can be replaced with a larger one with a longer range - I saw extreme modules of about 6000m on Aliexpress, but then it would be necessary to modify the box, etc.)

**Communication protocol:**same as DistoX (connects with TopoDroid and others via Bluetooth)

**Accelerometer type:** SCA3300

**Magnetometr typ:** RM3100

**MCU:** STM32F411CEU6 (128kB RAM, 512kB flash)

**Display:**240H x 320V dots color 2"

**Memory:**64 measurements buffer for download via Bluetooth (Topodroid), or SD/SDHC memory card option (storing to \*.th file - Therion) - limited by the size of the inserted card

**Calibration:**It can be done using Topodroid, but it is more appropriate to use "manual calibration", where the device calculates the calibration coefficients itself by aiming at 16 precise values at 4 points in the horizontal direction and then aiming inaccurately at 40 directions on an imaginary sphere.

**Box:**plastic 3D printing - space for creating different resistant variants

**Sleep mode:**Again

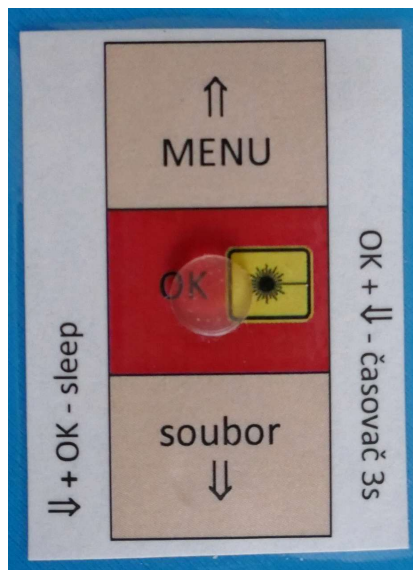
**Delayed start of measurement:**Year - 3s

**Measurement speed:**1 measurement / approx. 2s

**Function:**DistoX type meter / rangefinder / digital compass / spirit level / magnetic field intensity and vector meter / connection mode with PC/terminal - remote device settings



## DistoY keys



### Key names

- ↑ - up arrow
- OK - print OK
- ↓ - down arrow

### Meaning of the MEASUREMENT keys

- ↑ - menu
- OK - laser measurement
- ↓ - menu file
- OK + ↓ - delayed measurement 3s
- ↓ + OK - Sleep mode (low power consumption)

### Meaning of the START keys (if held at startup)

- ↑ - When starting, holding the up button does not load the calibration coefficients
- ↓ - the initialization menu is paused

### Meaning of the MENU keys

- ↑ - arrow move up
- OK - confirmation of selection
- ↓ - down arrow

### Meaning of CALIBRATION keys

- ↑ - arrow move up
- OK - laser measurement
- ↓ - down arrow
- OK + ↑ - menu - jumps to MENU
- OK + ↓ - calibration - the calibration is calculated from the measured values in the table

### Meaning of the next menu keys (rangefinder, info, etc.)

- ↑ - MENU
- OK - laser measurement, possibly turns on/off

## DistoY consumption and battery life

The recommended DistoY design uses a 1200mA battery. The battery capacity decreases over time, or a different type of battery with a different capacity and dimensions can be used in the design of the device if it fits into the meter box. Therefore, the stated battery life may vary. If we want to completely minimize consumption, it is advisable to put the device to sleep as much as possible (keyboard shortcut: **down arrow+OK** or automatic powerdown mode). You can also select the automatic switching off of the LCD display in the settings (reducing consumption by **-50mA**). If bluetooth is connected it has a **-20mA** lower consumption than when waiting for a connection (connected BT consumption 20mA / waiting for a connection BT consumption 40mA). If we want to minimize consumption, it is advisable to set the BT connection without disconnection in Topodroid (can be found in the Topodroid settings). The lowest consumption is in Sleep mode of about 3.4mA, so if the measurement is not taking place constantly, the longest battery life (up to days) can be achieved by automatically putting the meter to sleep. If we were to measure constantly - the laser rangefinder would still be measuring, then the consumption would be around 200mA and the battery life would be around 5h during this continuous measurement. In practice, it is rather possible to estimate an average between 5h and 18h if, for example, the meter is at rest, the display is off, BT is not connected. Then you can expect a life of around 11h.

It would probably be best to find out the exact battery life from user experience.

*Table of approximate battery life 1000mAh (1200mAh used in DistoY)*

|   | <b>Regime</b>                             | <b>consumption</b> | <b>battery life 1000mAh</b> |
|---|-------------------------------------------|--------------------|-----------------------------|
| 1 | Sleep mode                                | 3.4mA              | approx. 300h (12 days)      |
| 2 | Meter idle, display on, BT not connected  | 103mA              | 9h 30min                    |
| 3 | Meter idle, display on, BT connected      | 83mA               | 12h                         |
| 4 | Laser measures (1 second)                 | 200mA              | 5h                          |
| 5 | Meter idle, display off, BT not connected | 53mA               | 18h 45min                   |
| 6 | Meter idle, display off, BT connected     | 33mA               | 30h                         |
| 7 | Aiming (laser beam on)                    | 183mA              | 5h 30min                    |