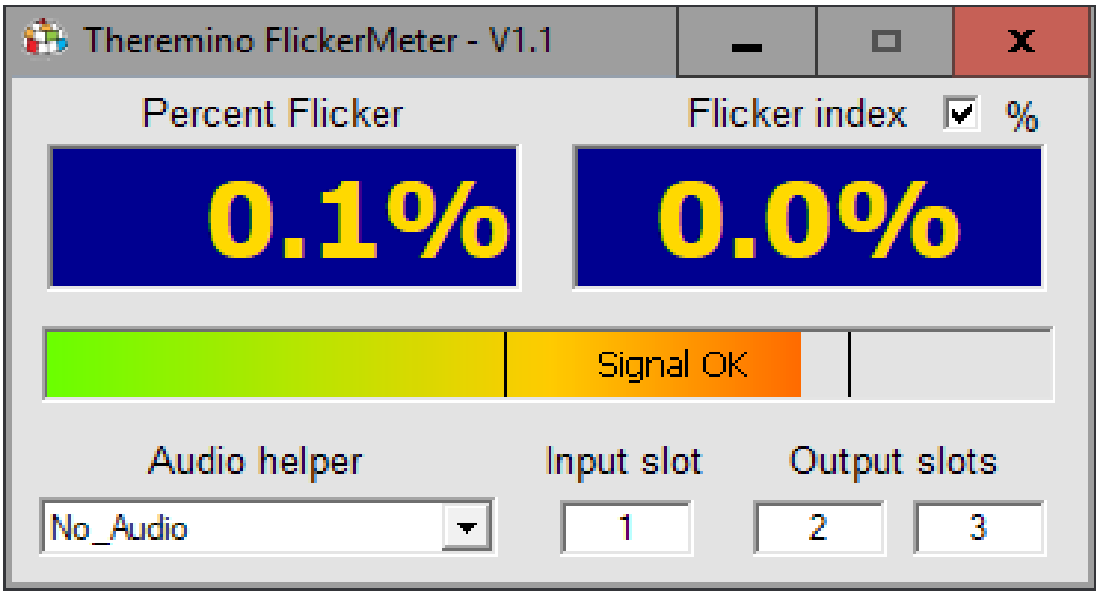
Theremino **System**



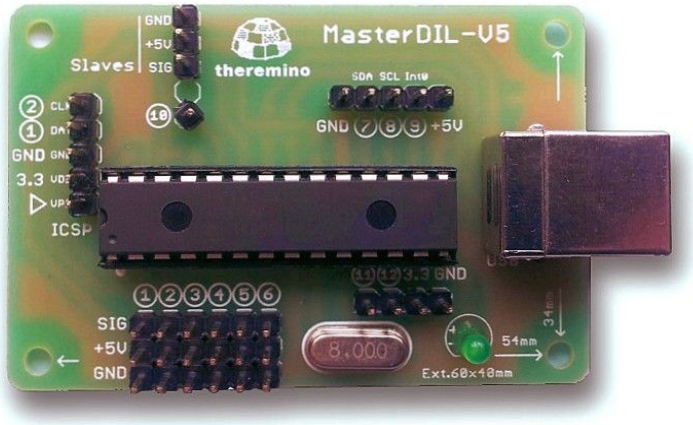
Theremino FlickerMeter

Building the hardware

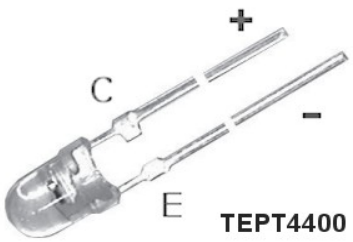
Components

For this project we need only three components:

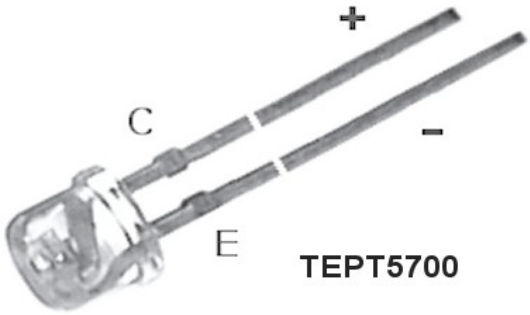
1) The Master module, that we use in almost all the projects.



2) A photo-transistor. All the models are OK, but if you have to buy it, is advisable to choose a TEPT4400 or a TEPT5700, that have a high sensitivity and cylinders such as LEDs, that are simple to fix. Just make a hole of 3 mm or 5 mm in the plastic and insert them under pressure.



TEPT4400

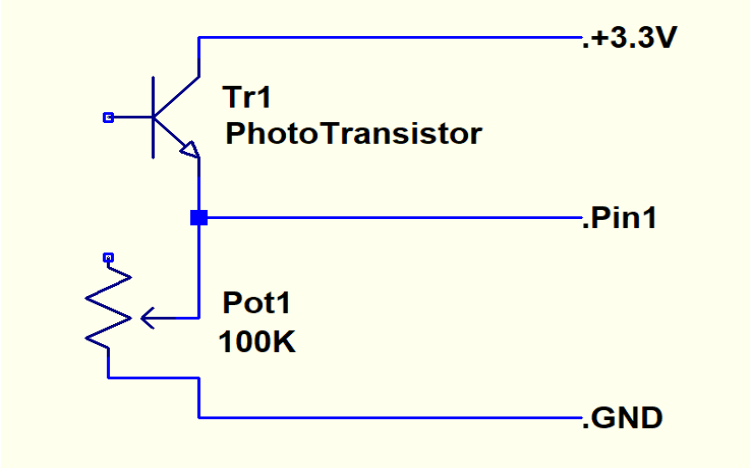


TEPT5700

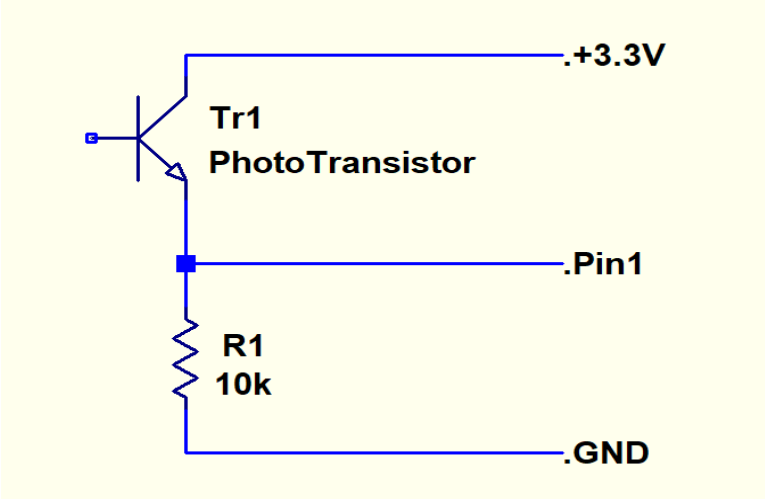
3) A 100 k ohm linear potentiometer

Wiring diagram

With a 100 k linear potentiometer, the sensitivity is adapted to the brightness to be measured.



Or you could use a single 10 k resistor.

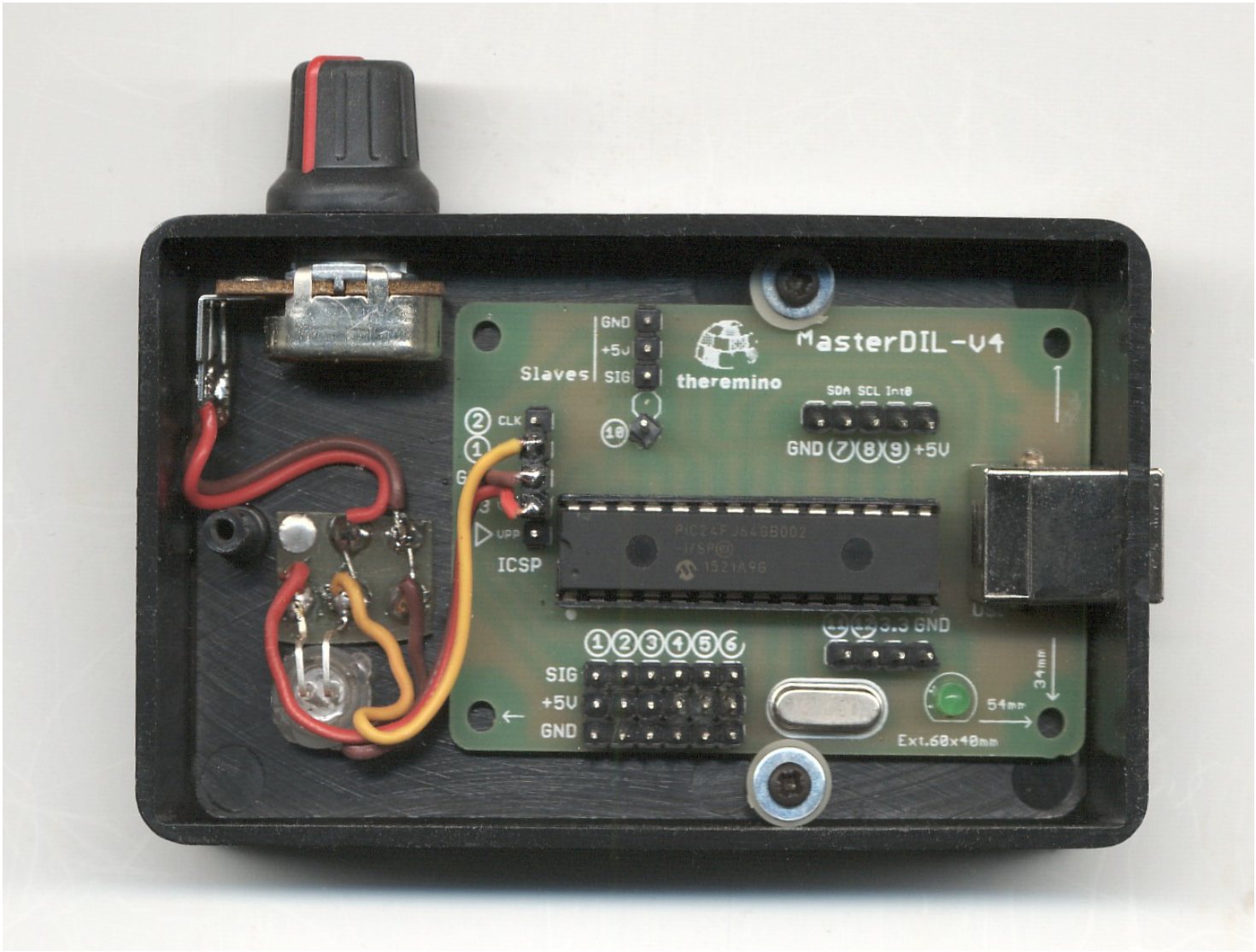


In this case, to adjust the signal you move away or approaches the meter to the lamp, until the application indicates that the signal is adequate.

Container

This device could also be left bare with flying leads. But every time you use the wires would bow and end up breaking. So it's good to find him a little box to use as container.

You do not need to use a metal container. It could be plastic or wood, or only a lath open, on which fix the master module and other components, so that they can not move relative to one another.

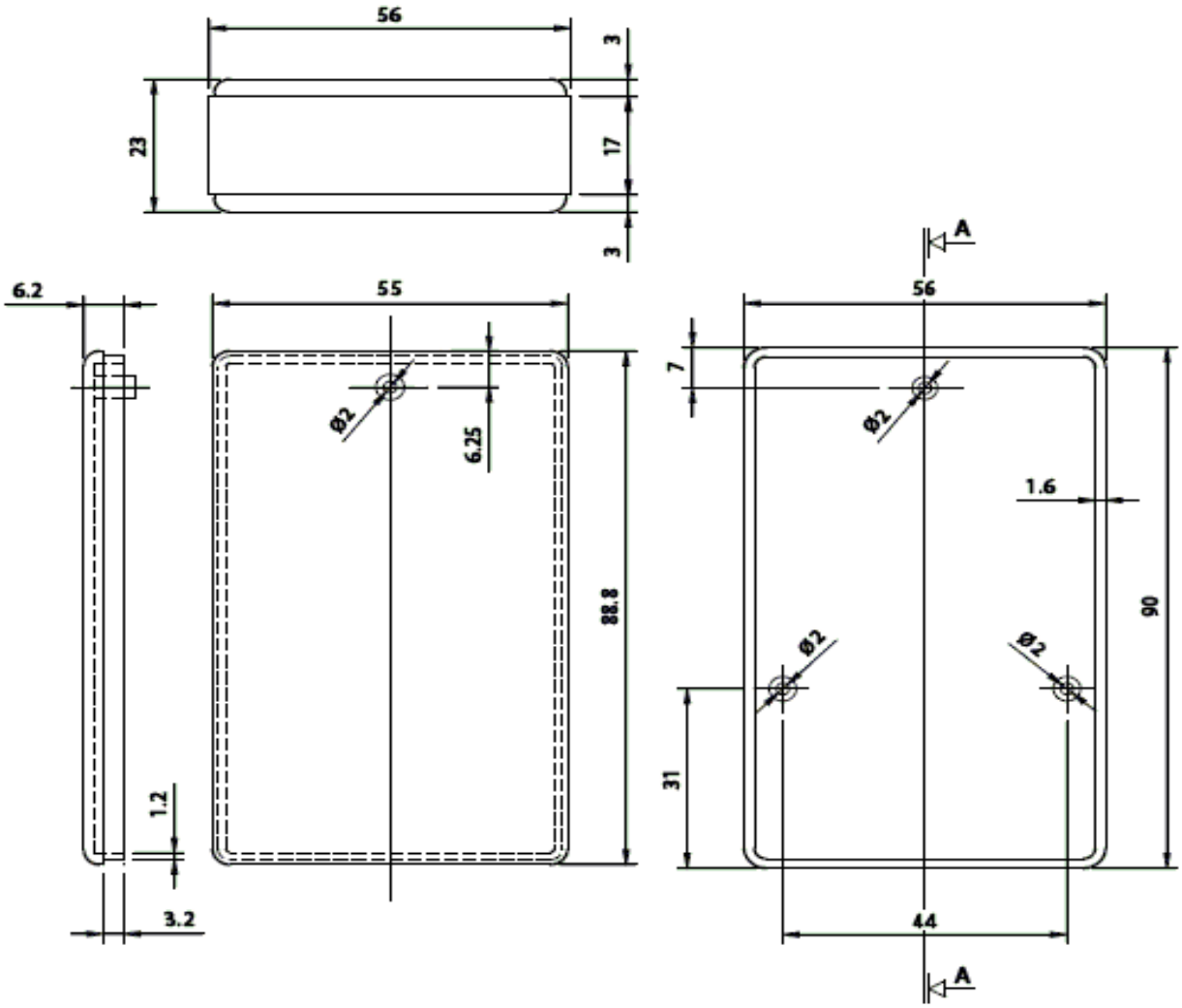


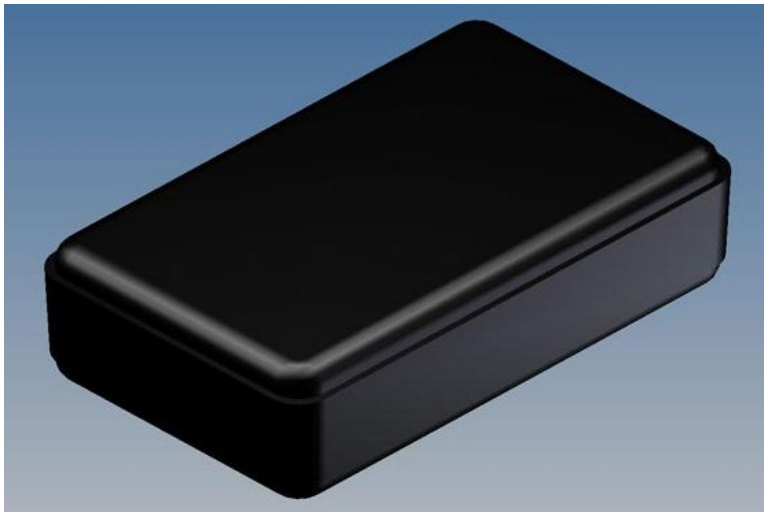
The brown and red wires are connected to potentiometer side and central. If you connect the wrong side the potentiometer will work inverted (decrease the signal by turning it clockwise) if so, just weld the wire on the opposite side.

To secure the wires a bit of epoxy glass with six copper pads was used, glued to the box with a drop of super glue (Attack). In place of this plate you could use a piece of breadboard or even solder the wires one to another, and then glue them to the plastic bottom.

Housing dimensions

This is the container TEKO 10011, with external dimensions of 90 x 56 x 23 mm, which we used in the prototype of the previous page.





www.teko.it/it/prodotti/famiglia/PO/serie/soap-2

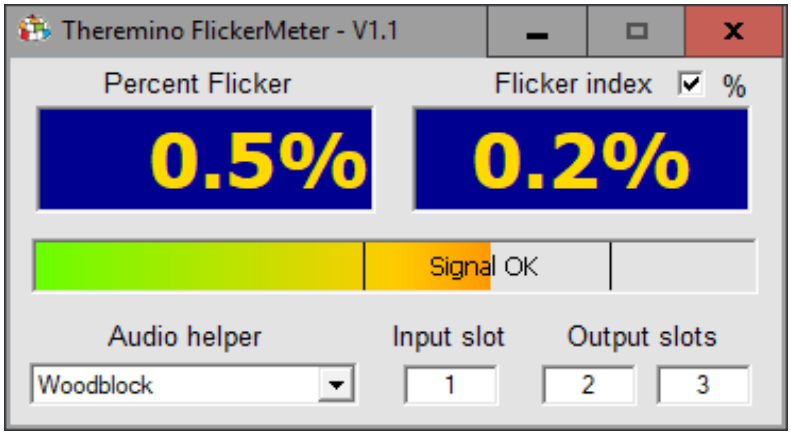
The finished device

On the left you see the USB plug, at the top the knob adjustment potentiometer and at the bottom right the sensor (a TEPT5700 photo-transistor which has an almost flat top).

In this image the photo-transistor is inserted into a LED holder, but the device will work equally well if you do a rough hole in the plastic and fix the photo-transistor with a drop of glue.

The measurement software

To calculate the flicker values we use the "Flicker Meter" application



- Download the application from ***this page***
- Unzip the file in any folder on your computer.
- Connect the USB cable and launch the application.

In order to easily launch the application it is good to link to "Theremino_FlickerMeter.exe" file on your desktop or in your system tray or in the Windows 10 application bar.

During startup of the "Flicker_Meter" also the application "Theremino_HAL" is started. The HAL takes care of the USB communication with the measuring device. Normally Theremino_HAL should launch minimized, and close by itself at the end. You need not change its parameters except in special cases.

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The instructions for use and other documentation files are in the same ***page*** from which you download the application "Flicker Meter".

Automatic adjustment attempts

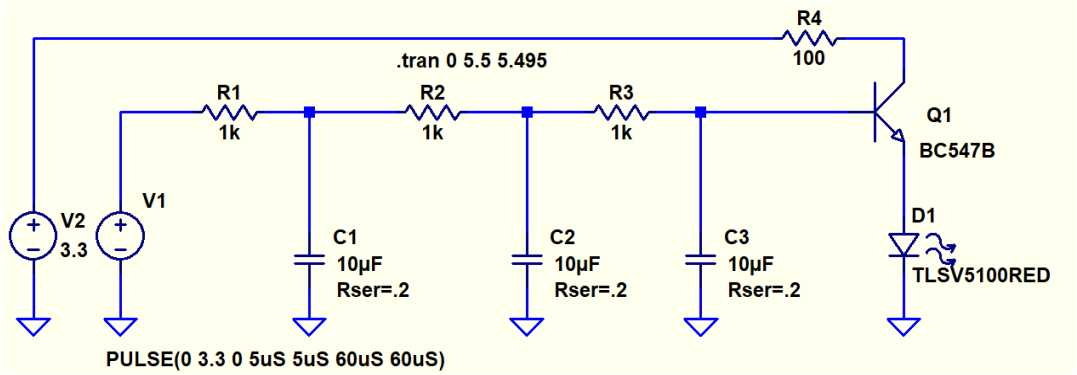
In the first versions a sensitivity regulation circuit was foreseen. But we could not find a simple solution, so the potentiometer remains the only valid solution.

Integrated circuits that simulate a variable resistor have only 32 or 64 positions, while a thousand would be necessary.

The best solution found using a FastPwm to adjust the brightness of a LED coupled with a photo-resistor. But PWM filtering requires a complex circuit, whose delays make regulation difficult and slow. You could use integrated to filter the Pwm, but the circuit would be too complicated.

In conclusion we get this:

- Inaccurate measurements.
- Inability to measure below 0.5% because of the noise introduced by the photo-resistor and by residues of PWM.
- Need to use components difficult to find. For example, if the photo-resistor is changed with another model, or filter capacitors are not accurate, then you must change the PID parameters in the software, in order to avoid that goes into self-oscillation or to become slow in response.
- Circuit complex and difficult to build.
- Control software complex and difficult to regulate.



This scheme is the LED driver. The input signal is coming from a FastPwm Pin set to 20 KHz. After the LED there is a photo-resistor (less than 1 k at 100 lux) that replaces the potentiometer.

Do not build this circuit.
It only serves to explain what we have experienced.