

### **Electronics (openPBR)**

The openPBR is controlled by an Arduino AT Mega 2560. The whole system is powered by a 12V network adapter. The gas supply system and LED panel run on 12V. A voltage regulator (LM317) is providing the sensors and pumps with 5V. In this first iteration the whole wiring is placed on one standard breadboard so it is possible to rebuild this setup with a simple Arduino starter kit and some additional parts like MOSFETs and the LM317. In future we will produce a shield which will make the workflow with this setup even simpler.

#### **Parts list:**

ELEGOO UNO R3 Ultimate Starter Kit, 46,99 Euro

[https://www.amazon.de/Elegoo-Vollst%C3%A4ndige-Ultimate-Tutorial-Mikrocontroller/dp/B01IHCKKKK?ref\\_ast\\_sto\\_dp](https://www.amazon.de/Elegoo-Vollst%C3%A4ndige-Ultimate-Tutorial-Mikrocontroller/dp/B01IHCKKKK?ref_ast_sto_dp)

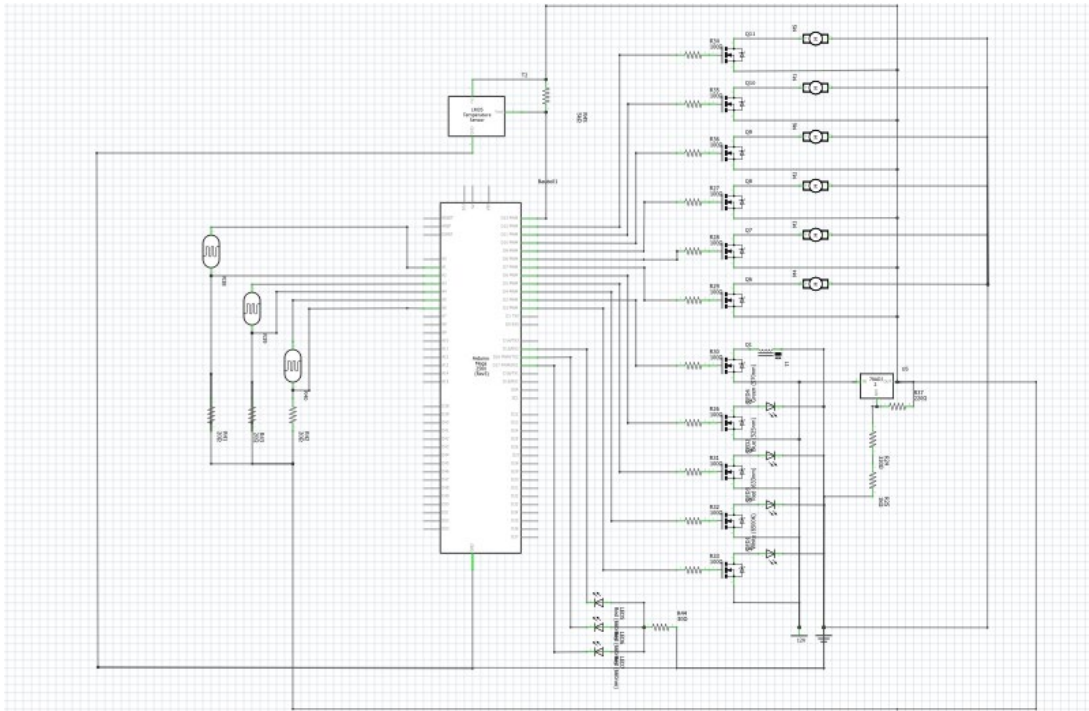
Arduino Mega 2560, ATmega 2560 34,40 Euro

[https://www.reichelt.de/arduino-mega-2560-atmega-2560-usb-arduino-mega-p119696.html?&trstct=pos\\_0](https://www.reichelt.de/arduino-mega-2560-atmega-2560-usb-arduino-mega-p119696.html?&trstct=pos_0)

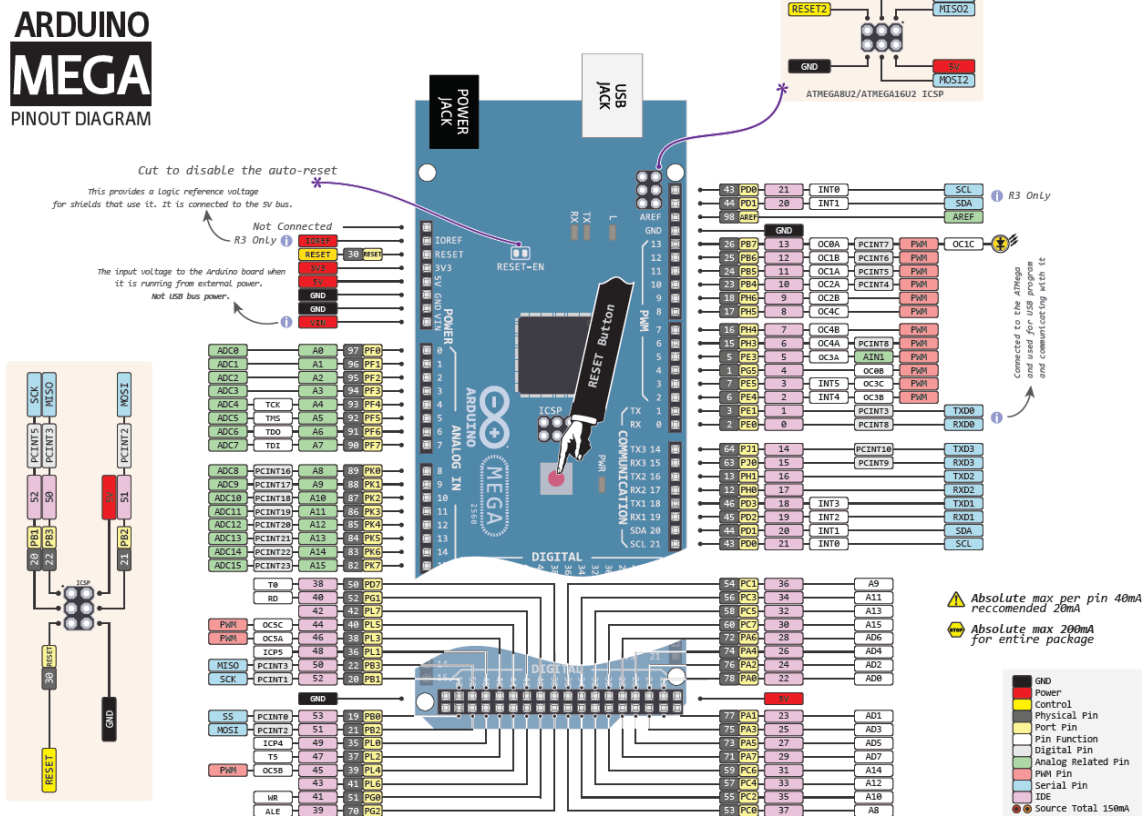
Prices for MOSFET and LM317 are in the Pumps DIY step by step PDF and LED

Total: 81,39

The circuit diagram of the openPBR, three sensors edition (a fritzing file is in the GitHub repository).



Arduino AT Mega 2560 pin diagram:



## Software

The Open PBR is controlled by one single Arduino script, which enables by varying 9 variables full control of all parameters.

These variables are for light, pumping time (one for each pump), interval of measurement and wished OD of dilution.

To get the output of the openPBR the free serial log program PuTTY:

<https://www.chiark.greenend.org.uk/~sgtatham/putty/latest.html>

User manual:

1. Start the Arduino IDE open the openPBR\_control
2. Select the COM of the Arduino
3. Choose your settings:
  - For the light color and intensity set the value between 0 and 255 in line 91,92,93,94 for the according color.
  - To adjust the interval of measurement, type a value between 30000 and 1000000 in line 99. This value is given in milliseconds so one minute is 60000 milliseconds.
  - To adjust the time for the pumps to run also in milliseconds, line 100.
  - The value for the OD that starts the pumping can be set for every chamber starting at line 383.
4. Upload the code to the Arduino
5. Start PuTTY and Select the COM of the Arduino
6. Choose the output file folder and and give your .csv a name.
7. Start PuTTY
8. Close PuTTY and the values are stored in the .csv file

To convert the values into OD see: Sensors openPBR DIY step by step on GitHub

For help contact: [igemberl@hu-berlin.de](mailto:igemberl@hu-berlin.de)