

AQma – Aquarium under control

# AQma v 1.3.1

AQma manual

Marcin Grunt  
magu@magu.pl

29/05/2016

## Table of Contents

1. Genesis .....	3
2. AQma, a description of the solution.....	3
3. What is needed? .....	4
4. Scheme .....	5
5. How to connect?.....	6
relay module .....	6
RTC module.....	6
Sensor automatic refills.....	7
Off circulation to feeding time .....	8
Keyboard.....	8
Buzzer and LED.....	8
6. first start .....	9
Application AQma Configurator .....	10
buttons .....	10
Configuration description circuit.....	11
7. The combination of AQma .....	11
Date and time .....	11
8. Feeding or delayed start .....	12
9. Automatic refill .....	12
10. timers.....	13
Switching manual .....	13
11. dosing pumps.....	13
Additional timers instead of peristaltic pumps.....	14
Mixed mode peristaltic pumps and timers .....	14
12. Control of filling signal (PWM) .....	15



## 1. Genesis

The device was created because I was strictly necessary :). At the beginning of the system it has been designed with a microcontroller and relays on the board. But it got a lot of the complications and somehow in the meantime, I came across Arduino Leonardo and started ... First, I bought the module with eight relays, so ready and watch RTC. Everything had to be quickly and simply, a pair of time trials set permanently and wsio ... Within half an hour I was able to program it quite tolerable, but then I thought, but it can dorobienie control, then refill, then a few ideas occurred to me. And finally ... I have plowed and all written from scratch, as it should be. It was to be quickly and descended so much time that zdążyłbym put Profiluxa :)

## 2. AQma, a description of the solution.

AQma device built on Arduino Leonardo, which is able to control a large part of electrical and electronic equipment used by aquarists. Due to the quite specific solutions AQma rather is designed for marine aquarium.

What can? Quite a lot :)

- It can work as an ordinary timer, on / off at a specific time.
- It can control three peristaltic pumps.
- It can work as an automatic refill.
- It can work as a time trial to set off the circulation to the time of feeding.
- It can work as a "retarder" power.
- It can work as a driver for the three LED lamps.

Configuration is done via USB applications AQma Configurator on Windows.

### 3. What is needed?

1. Arduino Leonardo or his clone.
2. Module eight SSRs 5V (recommended solution).

*Or for Pooh combiners DIY with triac optically isolated (there are reports that you can use ready module "AVT1679").*

*To control the metering pumps D1, D2, D3, DC  
 (If they are not converted to additional timers 230 - T4, T5, T6)  
 You can use a transistor for example. TIP120, resistor and diode 2,2kΩ:  
[http://maqu.pl/aqma\\_files/tip120-Arduino.png](http://maqu.pl/aqma_files/tip120-Arduino.png)*



**WARNING!!!**  
 In order to ensure the stable operation do not use magnetic relays! In addition, it is good to make two parallel capacitors and 10µF 100nF between the GND pin and 5V Arduino.

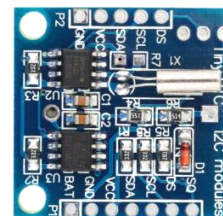
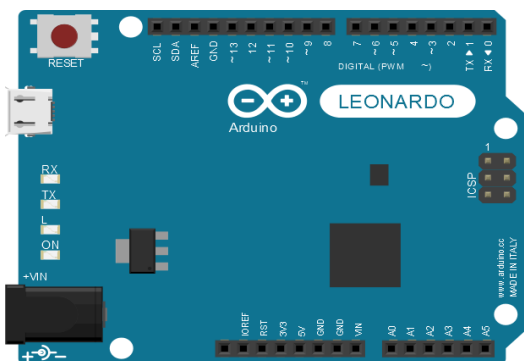
Module RTC - DS1307 or DS3231 (supposedly more accurate) the I2C, must necessarily be equipped with a battery (usually LIR2032), you need to beware of those with ordinary battery or even without any backup.

3. 9V power adapter (highly recommend transformer).
4. Libraries DS1307RTC.h, time.h, OneWire

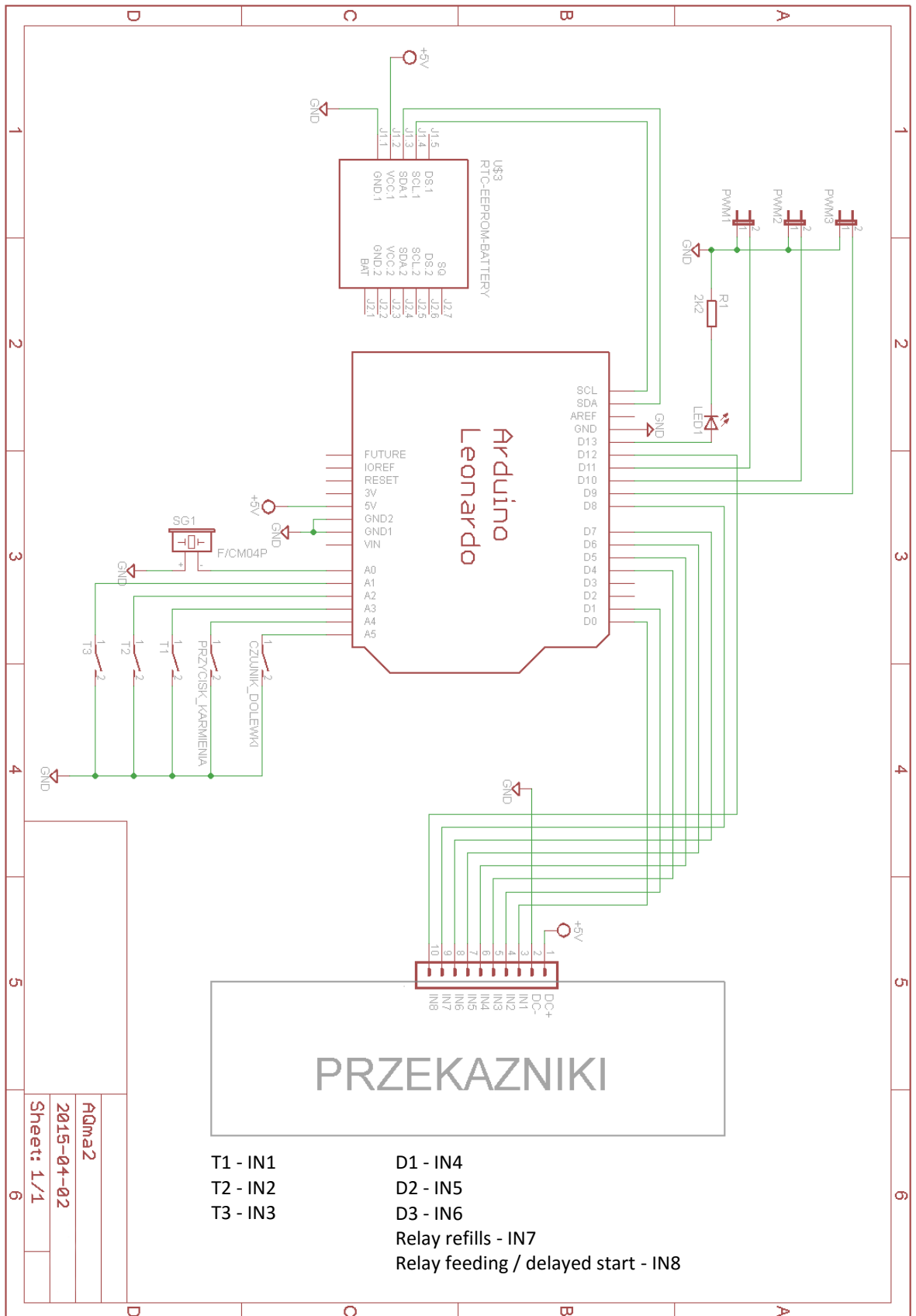
*On grazing you need to throw circle 8z!:*

5. five microswitchy
6. LED with resistor
7. Buzzer 5V generator

If the main elements will look like this, it should not need any combination of code, or a combination.

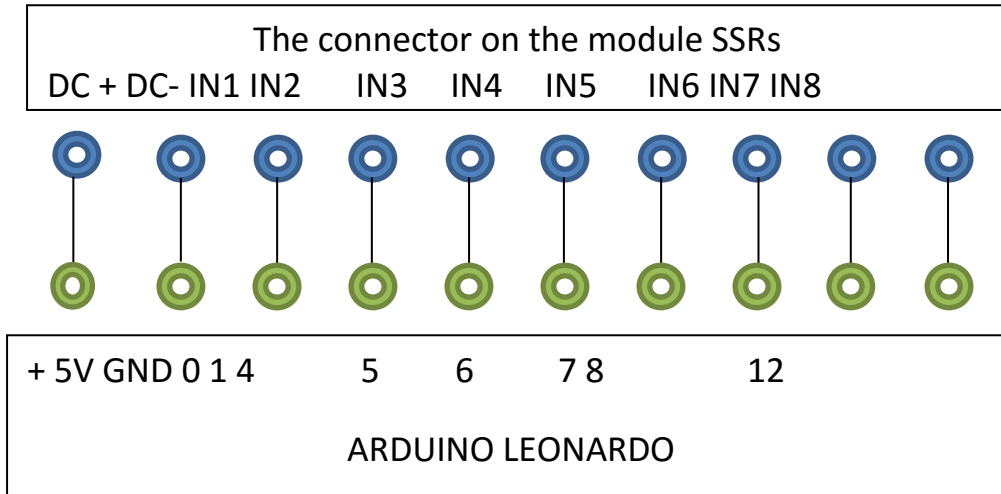


## 4. Scheme



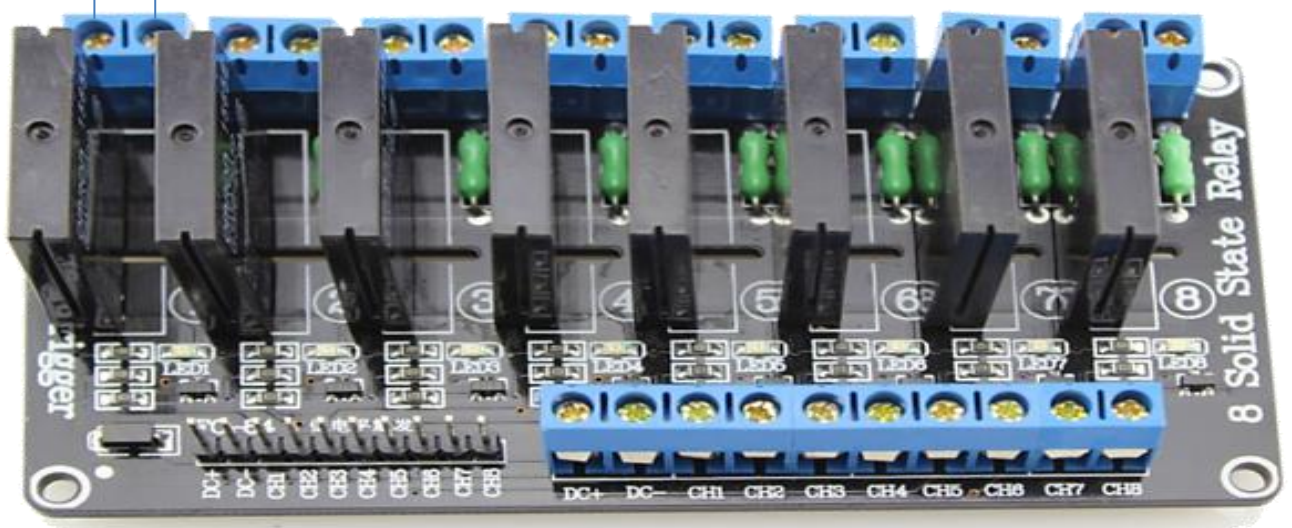
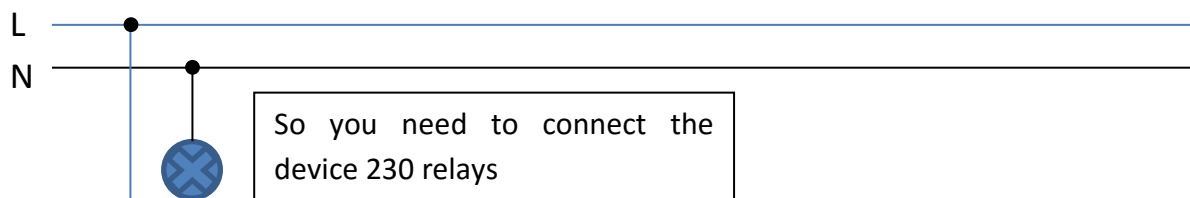
## 5. How to connect?

### relay module

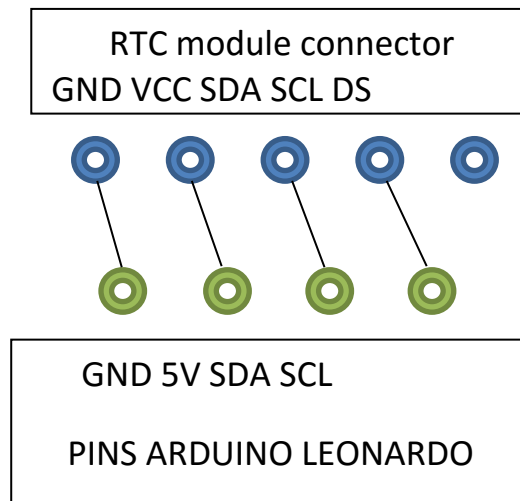


If the relays operate "vice versa" (when they should be included remain off, and while should be excluded are included) in the code for the Arduino interchange true from false variables ON, OFF. As below:

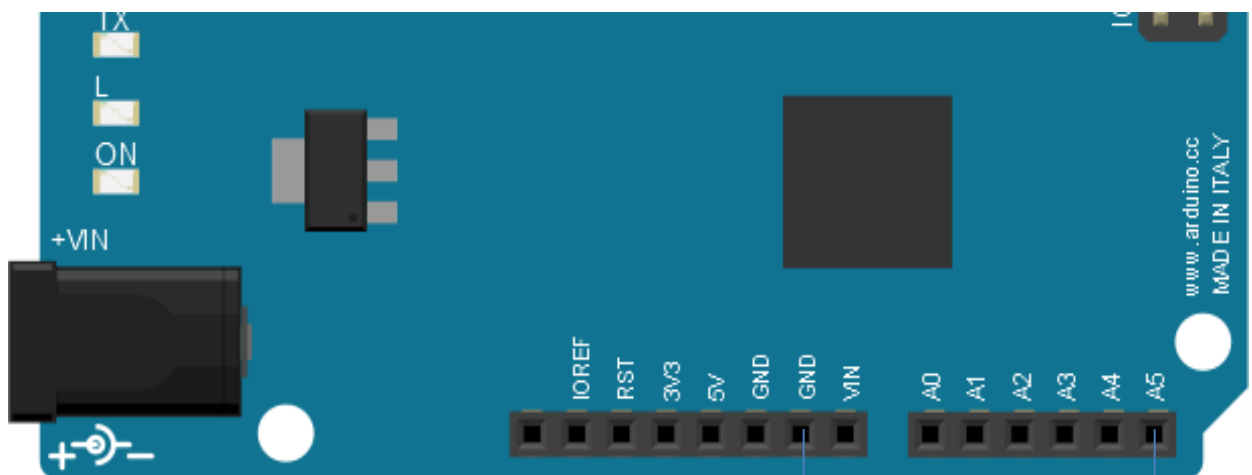
*boolean = true ON, OFF = false;*



### RTC module

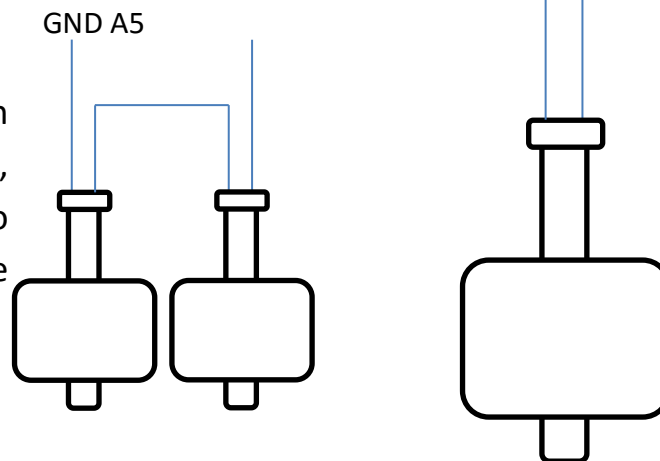


### Sensor automatic refills



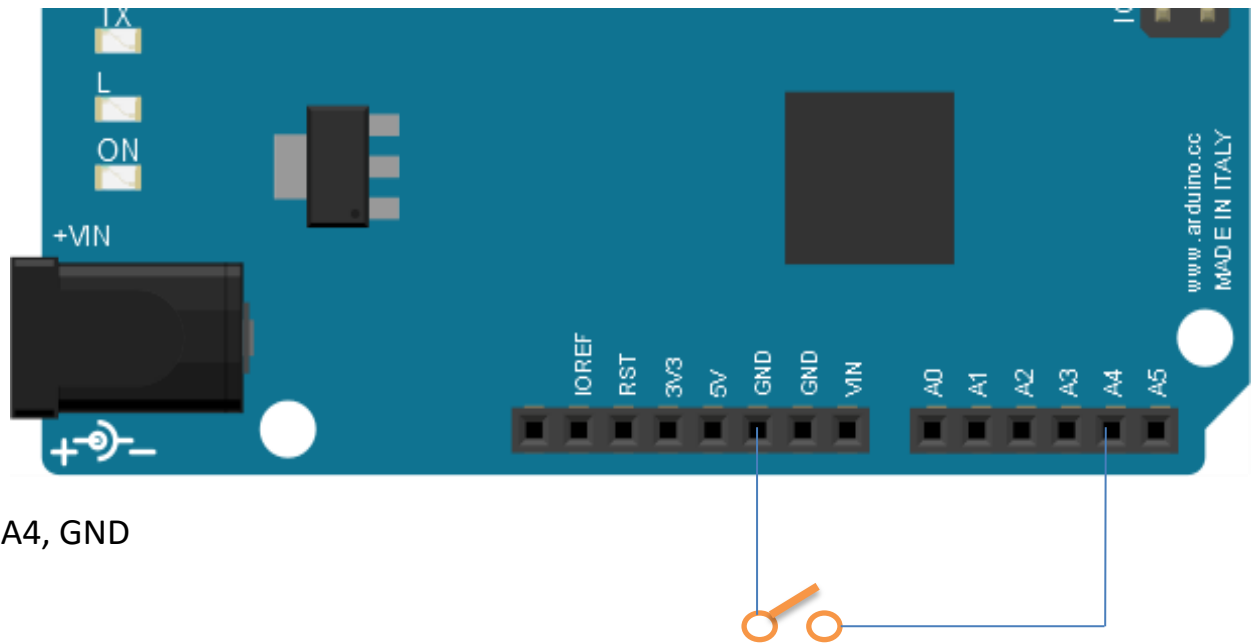
A5, GND

For security, you can use two sensors, then you need to combine them in the following manner:

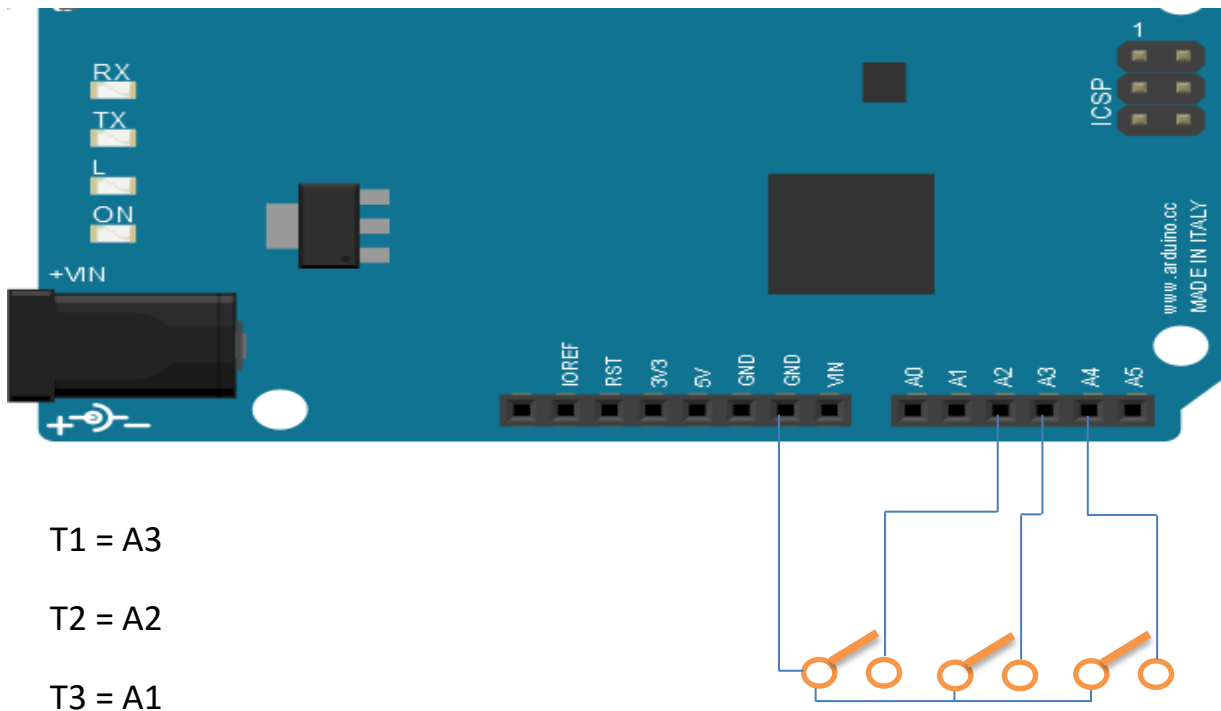




### Off circulation to feeding time



### Keyboard



### Buzzer and LED

Buzzer to be connected to the A0 pin and ground, and led by a resistor to pin 13 and ground.

## 6. first start

After placing the system, install the Arduino IDE version not lower than 1.6.1 (!) It is very important, otherwise the code will not fit :) so it Nabil <http://arduino.cc/en/main/software>

With the IDE will install the drivers for the USB. For the principle of the best short code load file / Examples / 01.Basics / Blink. If you succeed, through the IDE (Sketch / Import Library ... / Add library) to import libraries needed to act AQmy, Time, OneWire and DS1307RTC available at <http://playground.arduino.cc/code/time>

The ones that I used here are:

[http://magu.pl/aqma\\_files/time.zip](http://magu.pl/aqma_files/time.zip)

[http://magu.pl/aqma\\_files/DS1307RTC.zip](http://magu.pl/aqma_files/DS1307RTC.zip)

[http://magu.pl/aqma\\_files/OneWire.zip](http://magu.pl/aqma_files/OneWire.zip)

It's time for code AQmy. First fitting to disconnect power from the relay module (without configuration may behave strangely). Inputs from <http://magu.pl/aqma> open in the IDE and loaded into the Arduino.

Then you need to install and open the application AQma Configurator to configure it (or leave Defaultowe and send!) All possible parameters. Otherwise AQma click a button to throw a message that the data is incomplete or incorrect.

**FOR THE FIRST TIME necessity you need to be configured and sent CONFIGURATION OF EACH CIRCUIT !!!(T4, T5, T6 too!) Otherwise, it may happen that AQma will attempt to retrieve information from the EPROM, which dropped there earlier implemented the code. This may result in an attempt to turn on / off the circuit at 255: 255 :) Well, would be error for example. "Incorrect data".**

## Application AQma Configurator

Application for simple (I hope) configuration AQmy. It works under Windows, tested on Windows 7, Windows 8, Windows 8.1, Windows 10.

Because of the compiler used, the application will probably work on all desktop systems, Microsoft. AQma Configurator is available for the total buckshee, without source code. With the exact provisions of the license can be consulted on the menu AQma / License.

<http://magu.pl/aqma>

### buttons



Connect with AQma



Combined, disconnect the AQma



Download the configuration from the controller AQma. WARNING! Using this feature will overwrite any unsaved changes made by the user.



Send and save - sends the configuration of the field in which it is located, the records sent in the application memory.



Close the application

## Configuration description circuit

On the System tab, you can describe circuits. The names will appear on the following pages, it will be helpful for configuration and subsequent changes.

The changes must be confirmed by pressing the "Apply".

Descriptions of circuits are not stored in the controller memory AQma, they are only available from within the application.


## 7. The combination of AQma

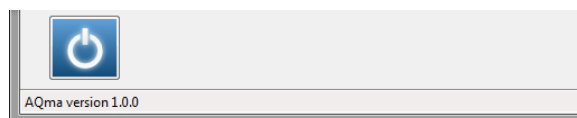
Configuration tasks can be performed offline, however, that the changes to take effect should be combined with AQma and then send or receive specific configuration data.

First, in the "COM Port", select the virtual port, which is plugged Leonardo. The drop-down box will display only available and active ports. A list of ports is refreshed with every development.

Then click



If the port is open and the Arduino is identified as AQma, the button changes to and in the low  left corner appears the name and version of the driver software AQma. From this moment you can send configuration of individual modules.



### Date and time

"Get a date with driver" - do not believe it, it gets a date with the controller (only date, nothing more).

To set the date, tick box, type:

day / month / year - hour: minute: second and slap "Send".

If the date setting is not tick, that each card is changed to the "System" to send the proposed current date and time with Windows. After tick date and time ceases to be by default the.

## 8. Feeding or delayed start

Configuration is handled with the time in minutes.

If it is pointed hatch "Feeding", given time will determine how long the circuit is to be switched off when you press feeding.

If dotted the "Delayed start" given time will determine how long after the power is turned on, the circuit is to remain off. This may be useful when the protein skimmer, HQI or other things which, by virtue of the third beer, do not come to mind.

In case if you need to quick-start circuit, despite the switched-on "Delay Start", turn the dot in the position of "feeding" or in the time field, enter "0" and send configuration.

## 9. Automatic refill

Configure it for your system. To set hysteresis remains. It works in two ways.

if refills sensor indicates a low water level and doing it for a specified number of seconds (configured in the hysteresis) is a refill turns on the circuit and it will keep it there until signaled the correct level of the water, then refill wait a second and turn off the circuit.

The second mechanism "silky smooth refill "is based on cycles. The sensor is tested refills every second. If the exact time of the test sensor will indicate the need for refills and such a state occurs specified number of times, at any time and for the last test of the sensor is compact, then refill it starts to pour until zaraportowania sensor proper water level (reset cycle counter). Such

a mechanism should work even with a properly calibrated Wavebox, because who forbid rich, mount it in the sump?

The minimum time for which the pump can turn it around. One second.

## 10. timers

Configuration available in the "Timers" allows you to set times on / off for the three Reserves T1, T2, T3. Circuits are working with a resolution of seconds. For a circuit is operated in accordance with the programmed schedule square "On / Off" must be tick. If the bird absence, the circuit will remain off regardless of the setting. Unless it has been turned on manually by pressing.

Timers can "pass" by 00:00

### Switching manual

It is possible to manually toggle the state of T1 circuits, T2, T3 (if the investment was made in the microswitch). Pressing the button will toggle the state of the circuit (if it was turned on, turn off, and if he was off it will turn on, or vice versa ...). Each input circuit in a state of manual LED starts blinking on the housing.

To return to the settings configured by AQma Configurator must hold the button for a few seconds until you hear the acoustic signal "biiiiipp" (if you made an investment in buzzer).

## 11. dosing pumps

On the "Metering pumps" can be set dosage for three circuits. For each circuit is provided for up to four inclusion.

Bird at the "On / Off" is set as a circuit switched, no bird off the circuit.

In the "Flow rate:" enter, again, do not believe ... Pump capacity (in milliliters per minute). You can rewrite the manufacturer, or better to measure yourself. So turn on the pump until the entering into. Then, in the box you type

pump capacity 60.0 ml / min, start at some near future and the amount of fluid dispensed for 60ml. In this way the circuit will turn on the exact minute. Of course, you need to catch the liquid into a container with scale and what is on the dipstick will see a rewrite to "pump capacity"

You can be dispensed only on certain days of the week, putting the birds in the right places.

The pumps can dispense by 0:00, but you'll have to remember that changes day and after the zero hour must also be included in the schedule.

### Additional timers instead of peristaltic pumps

In the case when the functionality of peristaltic pumps is not used, the circuit D1, D2, D3 can work as an ordinary timer. In this case, on the "Metering pumps" should be zakropkować "Timer". You can then configure the on and off times (hours: minutes) for the three circuits T4, T5, T6 physically the same as D1, D2, D3. "On / Off" works the same way as in the case of timers.

### Mixed mode peristaltic pumps and timers

In a situation when you are using is less than three peristaltic pumps, other circuits can be configured mode timers. Configuring mixed mode is as follows:

- on the "Metering pumps" must zakropkować the "Timer"
- set up timers and send configuration to AQmy. All labels "On / Off" circuits T4, T5, T6 do green.
- then you should zakropkować the "peristaltic pumps"
- configure the pump / pumps to be used in and send configuration ONLY used circuits to AQmy
- color labels "On / Off" timers T4, T5, T6 will change depending on the configuration. Timer acting is green, the timer will be replaced by a dosing pump is black.

## 12. Control of filling signal (PWM)

AQma is equipped with a control algorithm PWM signal for three channels. The first channel operates at a resolution of 980Hz, second and third channel with a resolution of 490Hz.

Configuration is available on the PWM and comes down to tick "On / Off" setting time on "Enable" (hour: minute, second) and time off.

You can set the length of the sunrise and sunset times (in minutes), as well as minimum and maximum power that will be controlled lamp. tick square "Lighting Night" (Oświetlenie nocne) will, that at the time when the lamp should be off, will be maintained minimum value (PWM is the minimum field expressed in%). If the bird is not, PWM will be set to zero.

On / off time can pass by 0:00, the time of sunrise can pass through 0:00, the time the West may also pass through 0:00. PWM is "resistant" to the power shortages and the return of power rises with the settings adequate to the current time.

On the PWM mode is a test. You can turn it on by putting the bird in the "Test", but only if you are connected to AQma.

This mode allows you to test the settings for PWM lamp. After starting the test mode, the active becomes a box with a zipper. You can also set the desired lamp power. The current value of the PWM maps the color bar above the slider. Data for AQmy are sent immediately after the slider (when you release the mouse button). It is possible to set the exact percentages (1%) using the arrow keys on the keyboard, then the data will be sent after pat enter.

Since version 1.1.2 AQma has additional functionality:

- after a power failure all PWM channels seamlessly to "brighten" up to the set value. The whole process takes 30 seconds. This value can be changed in the variable `pwmSilkySmootTimeSec` (from 1 to 255 seconds).
- it is possible to control the inverter with "pseudopwm" that works vice versa. How to get the maximum fill level is not lit and the filling with zero pound full power (a lot lately such converters on the



market). If you went to the inverter, you must modify the "Settings" `pwmXInvert` variable from false to true (where X is the channel number). Total for the first channel should look like this:

*`pwm1Invert boolean = true;`*

- after setting the 1% fill for night lighting, it is set to the smallest possible value of PWM. Theoretically lamp 100W will work with power 0,39W (only night lighting and test mode). Subsequent values are calculated "normal".
- a nod to the population in need of the display to light. The `pwm ()` returns a value by itself fill the channel. So easy it can be displayed.

You've made it to the end 😊 Congratulations!

*Marcin Grunt*  
[maqu@maqu.pl](mailto:maqu@maqu.pl)