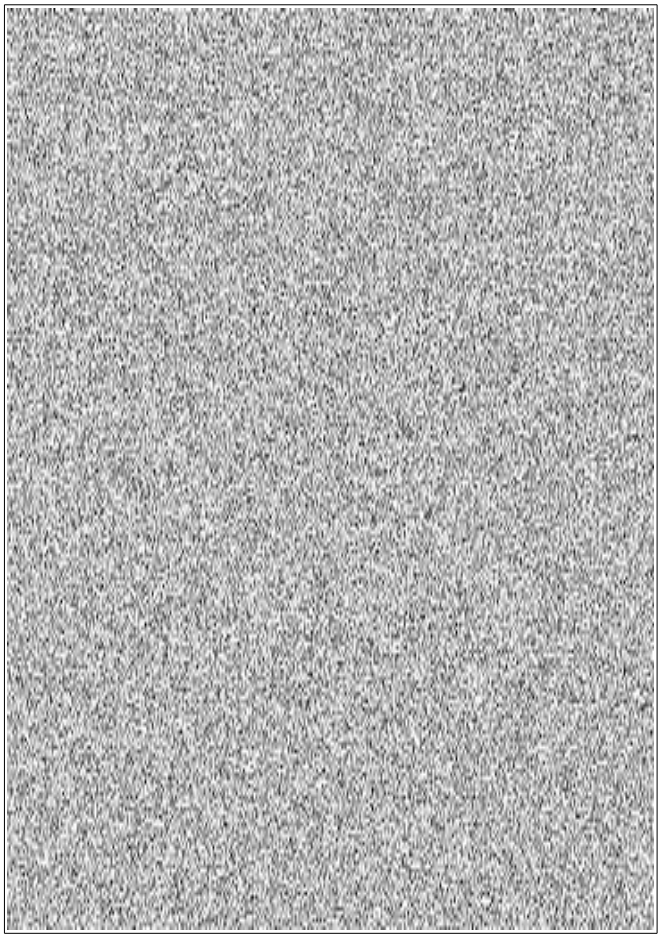
MM6D Remote controlled switching device

Technical manual



Hardware version: v200612
Software version: v0.1
Technical manual version: v1.0
Issue date: 2020.06.12.
Draw number: 59/11/1

Content

I. Hardware

1. Technical data

Supply voltage:	230V AC	Mass of cover:	termoplast (ABS)
Auxiliary voltage:	12V DC	Communication:	Wireless LAN,
Supply current:	max. ?A		TTL 3.3V serial port
Isolation class:	Class I	Get/set data:	via HTTP
Mechanical size:	71 x 71 x 27 mm	Administration:	via serial connection
IP protection:	IP 20		

2. General description

The device has four 12V DC inputs separated by an optocoupler and four relay outputs. These have a predefined function. Their status can be queried or set via HTTP. The power outputs can also be switched manually. The continuous operation of the microcontroller is ensured by a 3.7V 500mAh LiPoly battery, the alarm sensor is provided by a non-rechargeable 6F22 9V battery.

Load capacity of outputs:

Function	Voltage	Maximal current	Overcurrent protection	Watched?
Status lamp outputs	12V DC	0.5A	fuse	no
Lamp output	230V AC	2 A	overcurrent breaker	yes
Ventilator output	230V AC	2 A		yes
Heater output	230V AC	10 A		yes

3. Schematic and PCB draws

The wiring diagrams of the device is shown in Annex 1, PCB draws are in Annex 2-4. You can download it as part of the complete documentation or in separate PDF, SVG and KiCAD formats from the developer/manufacturer's website. The Gerber files needed for production are included in the package.

4. Other draws and documents

Documentation package contents drilling draws in PDF and DXF format.

5. Terms of use

6. Look of device

a) Manuals and connectors

1. Mains voltage signal light (white LED)
2. Auxiliary voltage signal light (white LED)
3. Activity signal light (blue LED)
4. Manual mode signal light (yellow LED)
5. General error signal light (red LED)
6. Protection error signal light (red LED)
7. Lamp on signal light (green LED)
8. Ventilator on signal light (green LED)
9. Heater on signal light (green LED)
10. Mains connectors (P1-3)
11. Console connector (P4)
12. Alarm sensor connectors (P5-6)
13. Status lamp connectors (P7-9)
14. Lamp connectors (P10-12)
15. Ventilator connectors (P13-15)
16. Heater connectors (P16-18)
17. Lamp manual mode switch (SW1)
18. Ventilator manual mode switch (SW2)
19. Heater manual mode switch (SW3)
20. Operation mode switch (SW4)

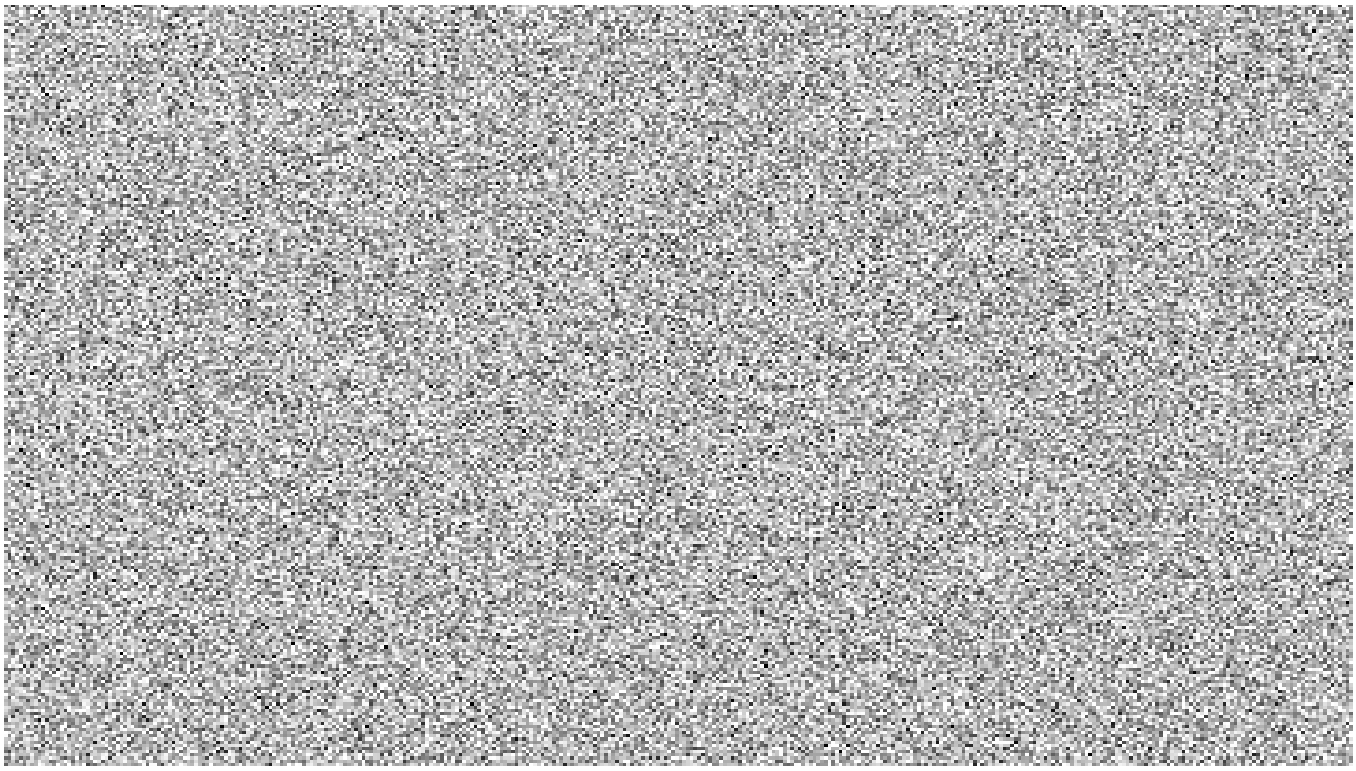


Figure 1: Manuals and connectors

b) Internal construction

1. Board of microcontroller
2. Battery of microcontroller (BT1)
3. Battery of alarm input (BT2)
4. Auxiliary power supply
5. Board power supply
6. Fuse of alarm sensor (F2)
7. Fuse of transformer's primer coil (F1)
8. Fuse of auxiliary voltage (F3)
9. Fuse of external status lamps (F4)
10. Fuse of board power supply (F5)
11. Relay of external status lamp (K1)
12. Relay of lamp output (K2)
13. Relay of ventilator output (K3)
14. Relay of heater output (K4)
15. Breaker of lamp output (F6)
16. Breaker of ventilator output (F7)
17. Breaker of heater output (F8)
18. Mains connectors (P1-3)
19. Console connector (P4)
20. Alarm sensor connectors (P5-6)
21. Status lamp connectors (P7-9)
22. Lamp connectors (P10-12)
23. Ventilator connectors (P13-15)
24. Heater connectors (P16-18)
25. Mounting holes

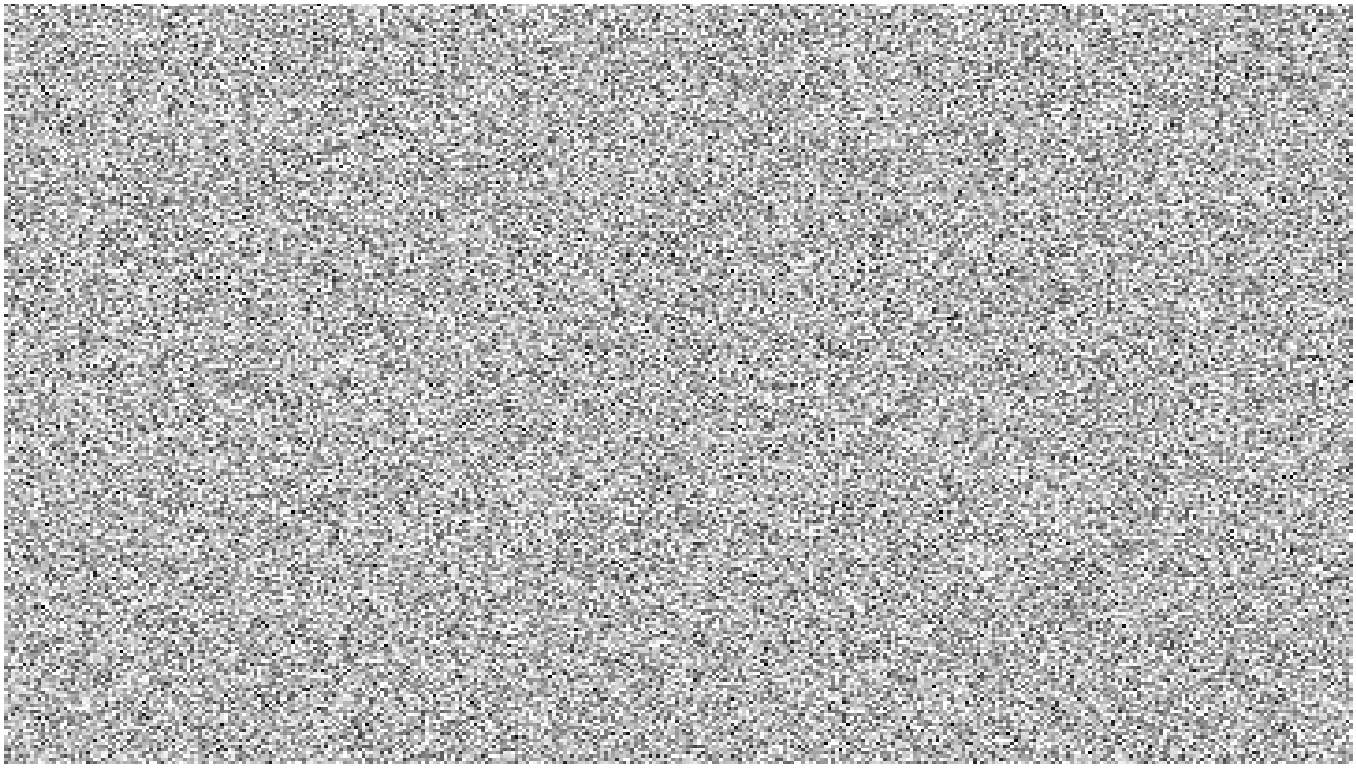


Figure 2: Internal construction

c) Pinout of connectors

sign	pin	function		voltage level
P1	1	Mains voltage input	L	230V AC
P2	1		N	
P3	1		PE	
P4	2	Serial console connector	RXD	+5V
	3		TXD	+3.3V
	5		GND	
P5	1	Contact of alarm sensor		+9/12V
P6	1			+9/12V
P7	1	External status lamps common	C	
P8	1	Red external status lamp	R	+12V
P9	1	Green external status lamp	G	+12V
P10	1	Lamp output	PE	
P11	1		N	
P12	1		L	230V AC
P13	1	Ventilator output	PE	
P14	1		N	
P15	1		L	230V AC
P16	1	Heater output	PE	
P17	1		N	
P18	1		L	230V AC

7. Downloadable documentation

The complete documentation of the hardware in the .tar.gz format compressed file can be downloaded from the manufacturer's website or Github. (Refer to Chapter III for references.) Name of package is: *mm6d-200612-0.1-1.0.tar.gz.*

Content of package - only important files:

```
mm6d
├──cad_files                        KiCAD and LibreCAD files
│     ├──drilling                   drilling draws
│     │     front.dxf                   front of box
│     │     mountingplate.dxf           mounting plate
│     ├──mm6d                       documentation of PCB
│     │     mm6d.pro                    project file
│     │     mm6d.sch                    schematic draw
│     │     mm6d.kicad_pcb              PCB draw
│     │     mm6d.drl                    drilling file
│     │     mm6d-*.gbr                  Gerber files
│     └──wiring                     internal wiring
│           wiring.pro                   project file
│           wiring.sch                   schematic draw
├──documents                        documentation
│     mm6d_en.pdf                        Technical manual
│     drl_*.pdf                          drilling draws
│     pcb_*.pdf                          pcb draws
│     sch_*.pdf                          schematic draws
├──frontpage                        frontpage
│     *                                  pictures of frontpage
├──pictures                         pictures
│     mm6d.jpg                           look of the unit
│     pcb_*.svg                          PCB draws
│     sch_*.svg                          schematic draws
├──software                         software
│     mm6d.ino                           source file
│
├──LICENCE                          terms of use
├──LICENCE-hw                       terms of use of hardware
├──LICENCE-sw                       terms of use of software
└──README                           short description
```

II. Software

1. General description

The device measures three characteristics of the air, which can be queried remotely and it has got three status LED, which can be set remotely.

The program displays initialization steps and error messages on the serial console.

When an HTTP request is received, the client's IP address and username / password arguments are checked. If appropriate, perform a measurement or turn the status LEDs on / off. After displays the result on the web interface. Incoming requests are indicated by the flashing of the blue activity LED.

2. Setup

You can found source file of software in *software* directory. Before installing the program, you need to set these values:

```
// settings
const char* wifi_ssid       = "";
const char* wifi_password   = "";
const String www_username   = "";
const String allowedaddress = "";
```

3. Installation

Use a serial cable and Arduino IDE software to install program to microcontroller. Before installation procedure unpack required libraries from *libraries* directory or clone from Github.com to *~/Arduino/libraries/*.

4. Using the device

The device operates automatically does not require any human intervention.

a) Data set and retrieval via HTTP

An example for how to use arguments:

http://192.168.1.12/set/greenled/off?username=bob

URL of information and data pages:

(On next page.)

URL	type	description	args.
http://*ipaddress*/	text/html	Start and information page	
http://*ipaddress*/version	text/plain	Get software name and version	
http://*ipaddress*/get/all		Get all data	username
http://*ipaddress*/get/humidity		Get relative humidity in %	
http://*ipaddress*/get/temperature		Get temperature in °C	
http://*ipaddress*/get/unwantedgaslevel		Get rel. level of unwanted gases in %	
http://*ipaddress*/set/all/off		Switch off all LEDs	
http://ipaddress/set/greenled/off		Switch off green LED	
http://ipaddress/set/greenled/on		Switch on green LED	
http://ipaddress/set/redled/off		Switch off red LED	
http://ipaddress/set/redled/on		Switch on red LED	
http://ipaddress/set/yellowled/off		Switch off yellow LED	
http://ipaddress/set/yellowled/on		Switch on yellow LED	

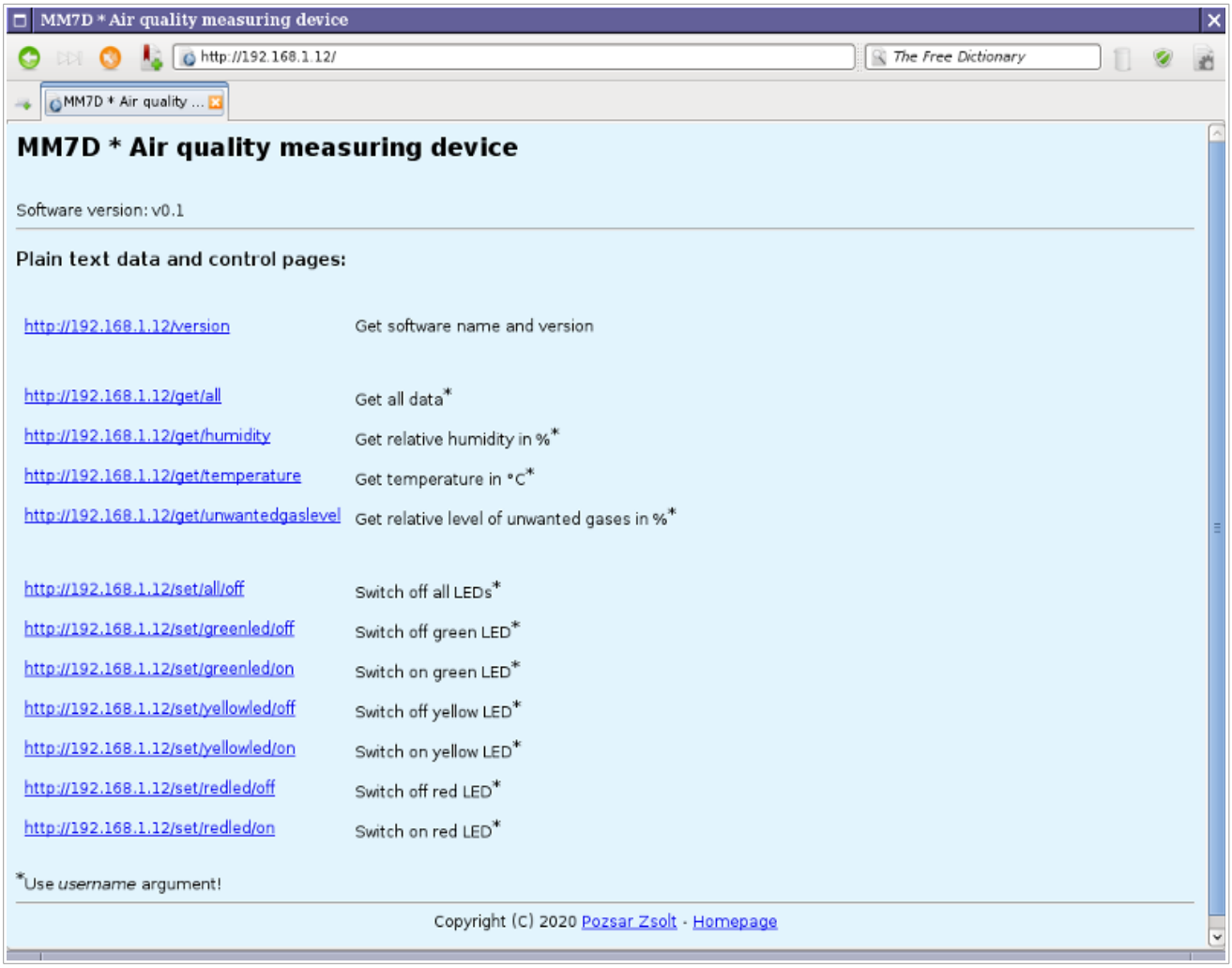


Figure 3: Start page

b) Connect to console via serial port

The console connector of the device and the RS-232 serial port of the computer must be connected by means of a level shifter adapter with a null modem cable. The level shifter adapter is required due to the different voltages of the logic levels (0 V / 3.3 V and -12 V / + 12 V).

The console connector of the device and the USB port of the computer must be connected using an Adafruit 954, FTDI TTL-232R-RPI or similar 3.3V serial / USB cable.

Connection parameters

speed (baudrate):	115 200 bps
data bits:	8
parity bit:	no
stop bit:	1
flow control:	no

Connect via linux terminal

Name of ports (device files):

RS-232 serial port:	/dev/ttyS0, /dev/ttyS1, ...
serial/USB converter:	/dev/ttyUSB0, /dev/ttyUSB1, ...

Make sure you are a member of the dialout group:

```
username@localhost$ id
```

If not, set up your group membership:

```
username@localhost$ sudo usermod -a -G dialout username
```

Connect with GNU Screen program:

```
username@localhost$ screen port_name 115200
```

Connect with Minicom program:

```
username@localhost$ minicom -b 115200 -o -D port_name
```

Connect with Windows terminal (Putty)

Name of ports:

RS-232 serial port:	COM1, COM2, ...
serial port/USB converter:	variable, see the device manager

Select the serial connection mode and communication port, set the speed and start the connection.

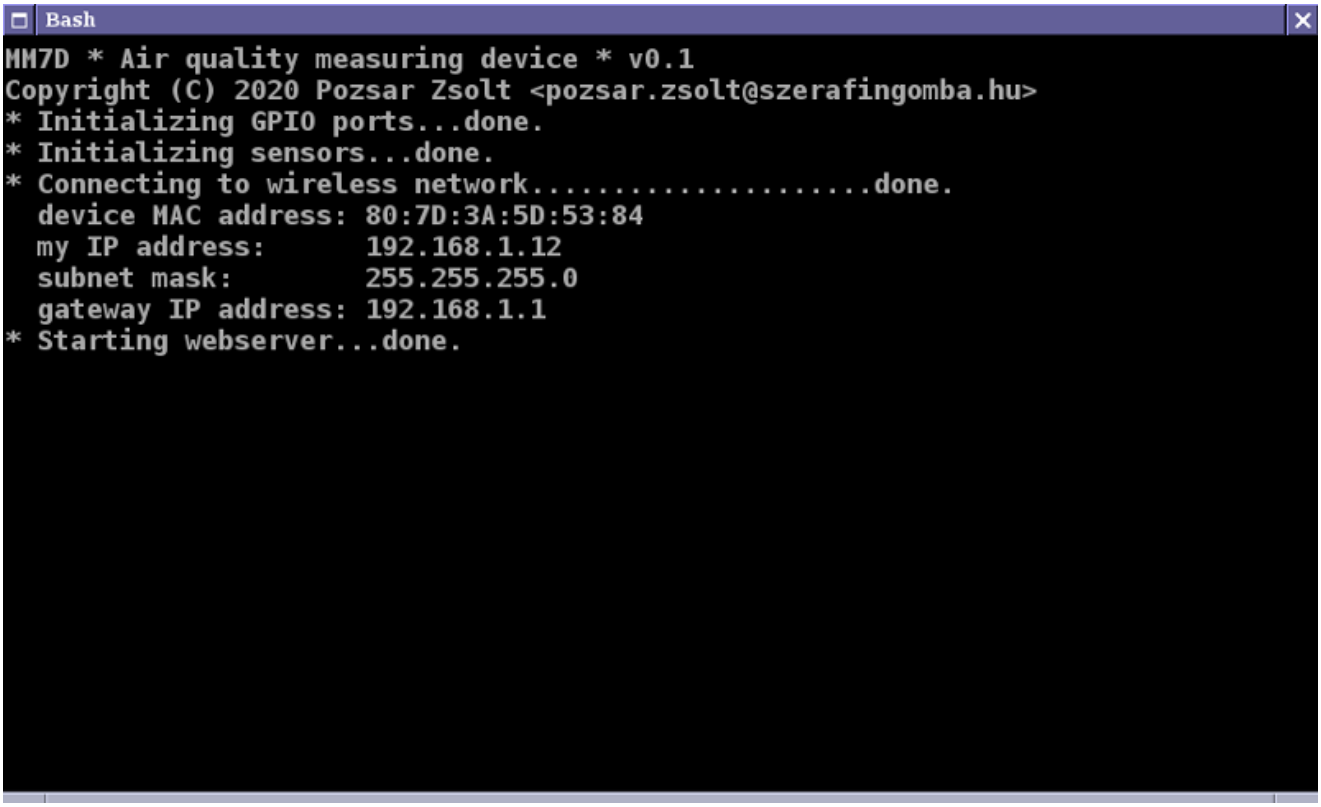


Figure 4: Serial console with messages

5. Check operation

You can check operation of controller with a web brower, use index.html in *testpage* folder or open http://szerafingomba.hu/equipments/mm6d/testpage/ URL. It doesn't store any data on server.

6. Terms of use

This program is free software: you can redistribute it and/or modify it under the terms of the European Union Public License 1.1 version.

This program is distributed in the hope that it will be useful, but WITHOUT ANY WARRANTY; without even the implied warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.

You can read the full text of the license online. (Refer to Chapter III for references.)

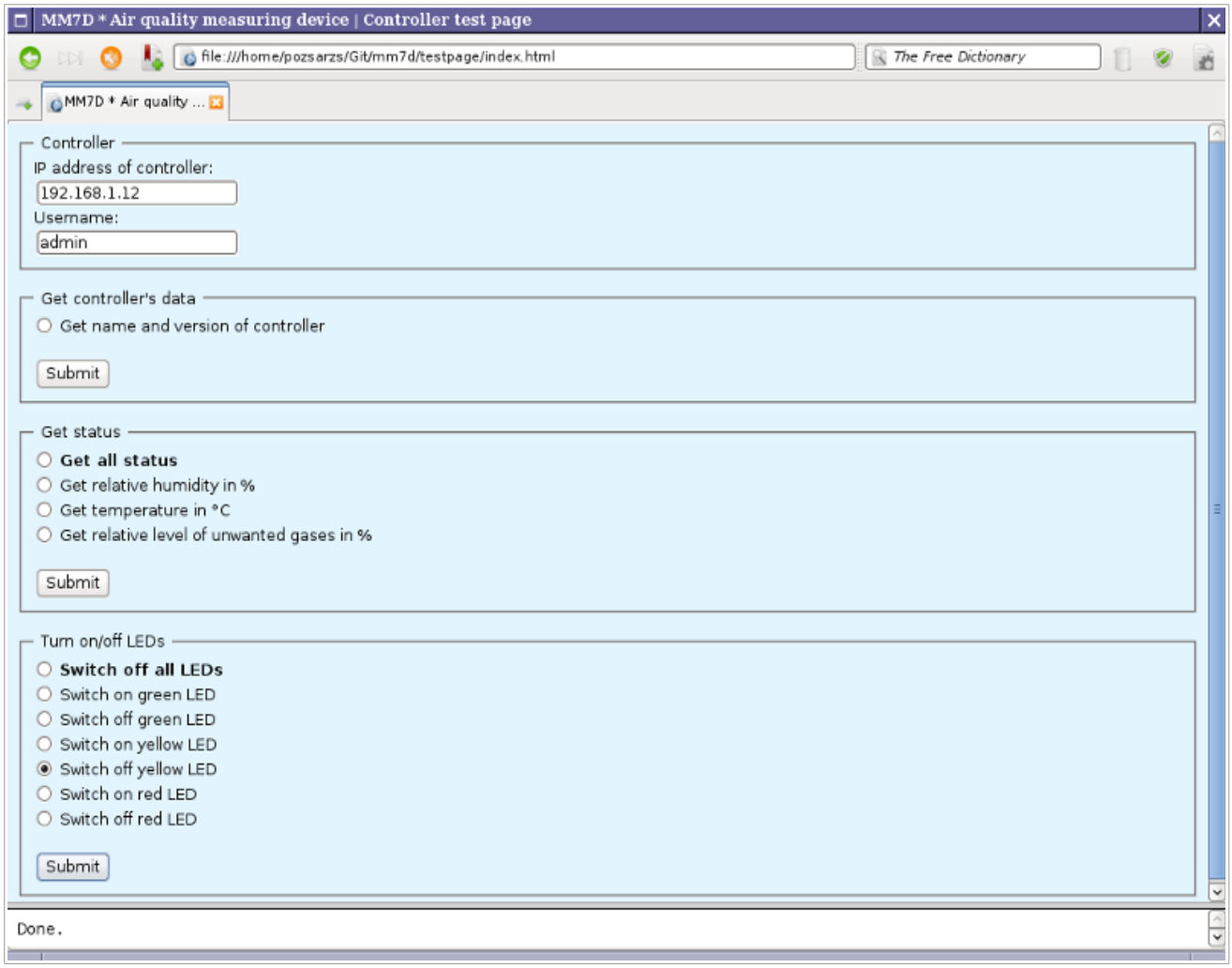


Figure 5: Test page

III. Related links

1. Hardware and software

Full package	http://www.szerafingomba.hu/equipments/mm7d/mm7d-200620-0.1-1.0.tar.gz
Download from Github	http://github.com/pozsarzs/mm7d.git
Technical manual	http://www.szerafingomba.hu/equipments/mm7d/technical-manual-200620-0.1-1.0-en.pdf
Test page	http://szerafingomba.hu/equipments/mm7d/testpage/

Schematic and PCB draws (PDF):

Schematics	http://www.szerafingomba.hu/equipments/mm7d/sch_mm7d-1.pdf
	http://www.szerafingomba.hu/equipments/mm7d/sch_mm7d-2.pdf
PCB solder side	http://www.szerafingomba.hu/equipments/mm7d/pcb_mm7d-sold.pdf
PCB component side	http://www.szerafingomba.hu/equipments/mm7d/pcb_mm7d-comp.pdf
PCB silkscreen	http://www.szerafingomba.hu/equipments/mm7d/pcb_mm7d-silk.pdf

2. Terms of use

CC-BY-NC-4.0	https://creativecommons.org/licenses/by-nc/4.0/legalcode
CC-BY-NC-4.0	https://creativecommons.org/licenses/by-nc/4.0/
EUPL v1.2	https://eupl.eu/1.2/en/

3. Developer and manufacturer

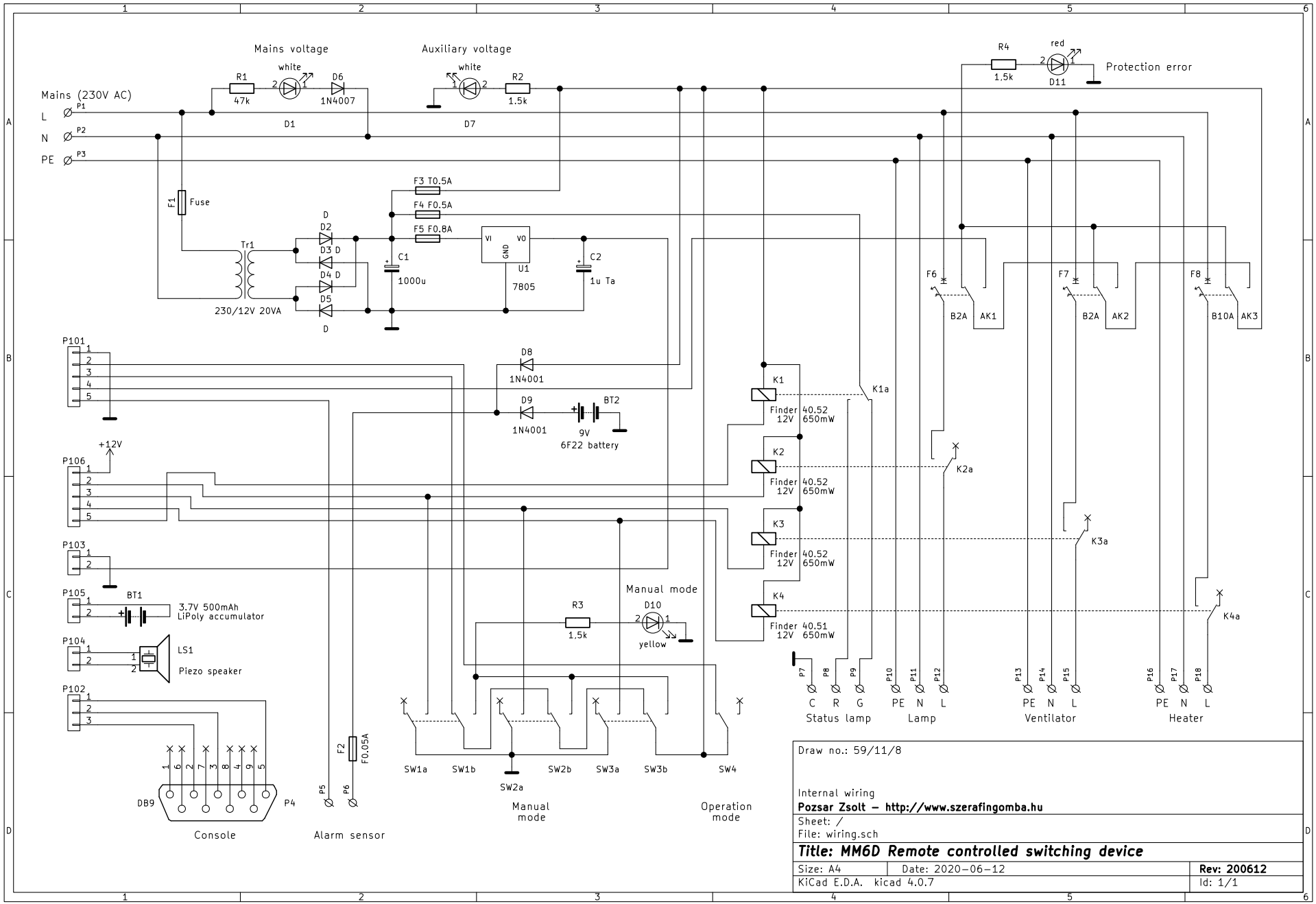
Homepage	https://www.szerafingomba.hu
E-mail	info@szerafingomba.hu

IV. Annexes

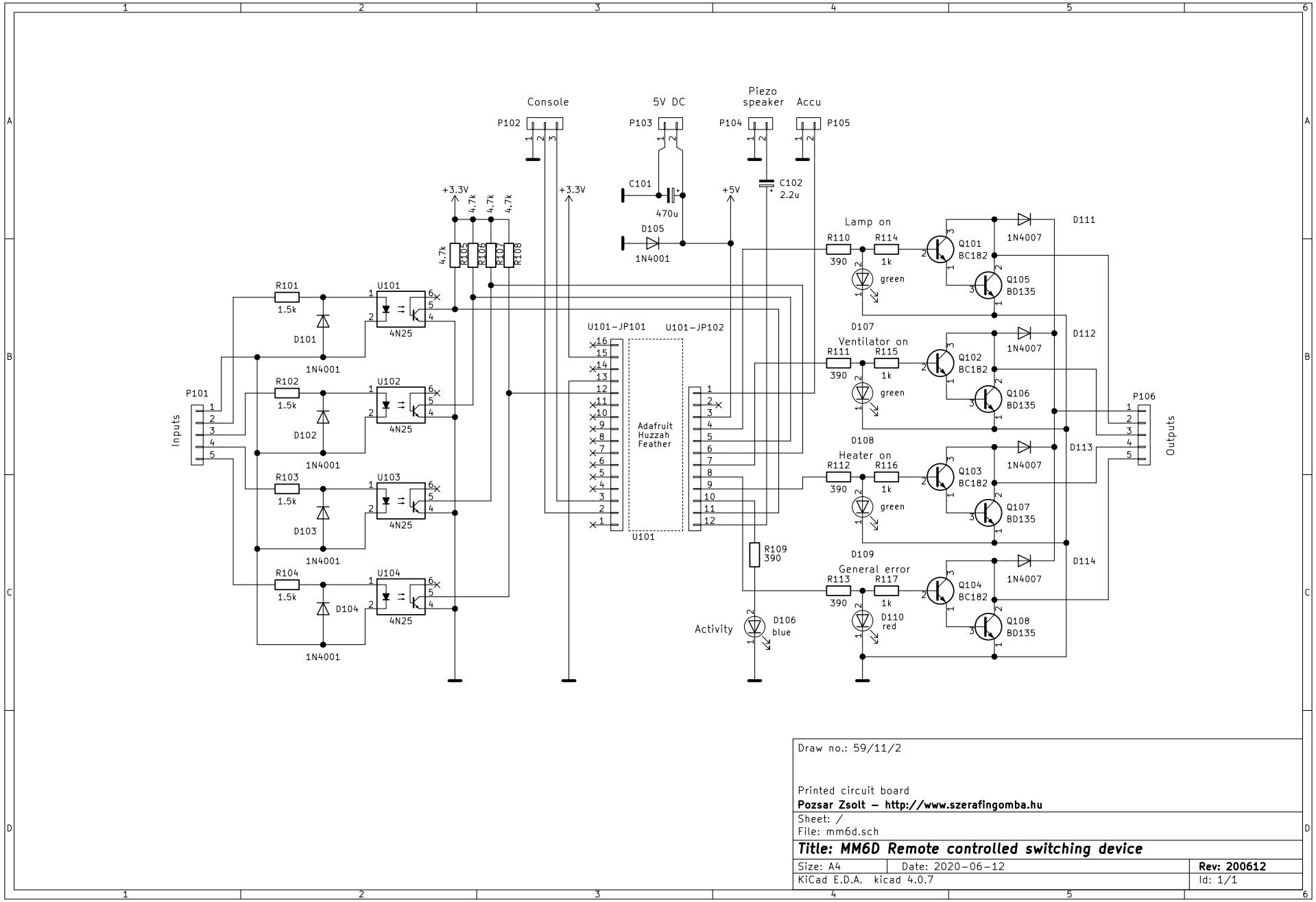
Content

Sign	Message	Web	Console	RED light	Sound
E01	Failed to read CO_2 sensor!	value: 999	yes	no	beep
E02	Failed to read T/RH sensor!	value: 999	yes	no	beep
E03	Authentication error!	yes	yes	no	2x beep
E04	Not allowed client IP address!	yes	yes	no	3 x beep

Annex 1: Error messages and signs

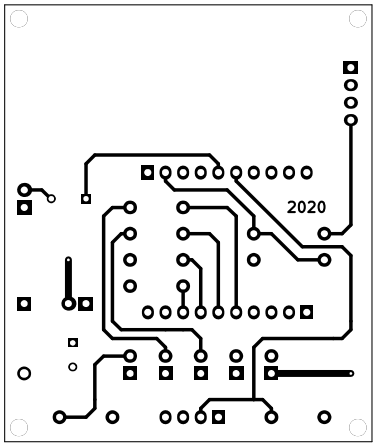


Annex 2: Internal wiring



Draw no.: 59/11/2		
Printed circuit board **Pozsar Zsolt – http://www.szerafingomba.hu**		
Sheet: / File: mm6d.sch		
Title: MM6D Remote controlled switching device		
Size: A4	Date: 2020-06-12	**Rev: 200612**
KiCad E.D.A. kicad 4.0.7		Id: 1/1

Annex 3: Schematic of printed circuit board



Draw no.: 59/12/3

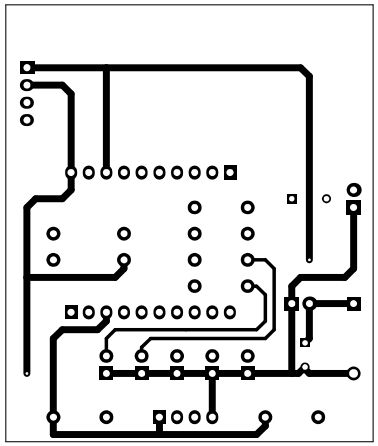
Pozsar Zsolt – http://www.szerafingomba.hu

Sheet:
File: mm7d.kicad_pcb

Title: MM7D Air quality measuring device

Size: A4	Date: 2020-06-20	**Rev: 200620**
KiCad E.D.A. kicad 4.0.5+dfsg1-4		Id: 1/1

Annex 4: PCB solder side



Draw no.: 59/12/3

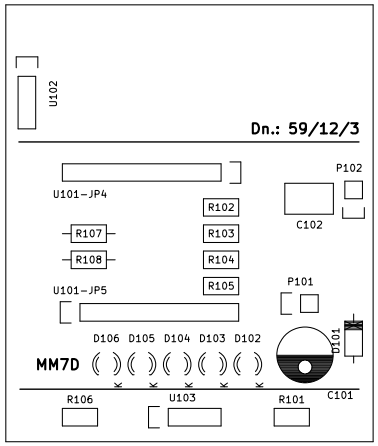
Pozsar Zsolt – http://www.szerafingomba.hu

Sheet:
File: mm7d.kicad_pcb

Title: MM7D Air quality measuring device

Size: A4	Date: 2020-06-20	**Rev: 200620**
KiCad E.D.A. kicad 4.0.5+dfsg1-4		Id: 1/1

Annex 5: PCB component side



Draw no.: 59/12/3		
Pozsar Zsolt – http://www.szerafingomba.hu		
Sheet: File: mm7d.kicad_pcb		
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Size: A4	Date: 2020-06-20	**Rev: 200620**
KiCad E.D.A. kicad 4.0.5+dfsg1-4		Id: 1/1

Annex 6: PCB silkscreen