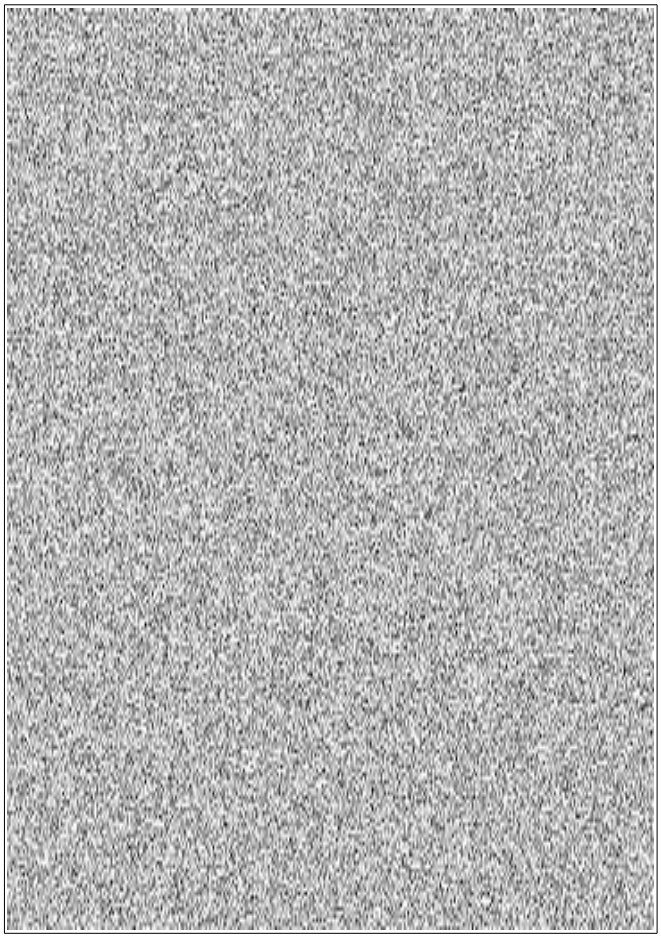
# MM6D Remote controlled switching device

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. 15 A | | TTL 3.3V serial port |
| Isolation class: | Class I | Get/set data: | via HTTP |
| Mechanical size: | 300 x 220 x 120 mm | Administration: | via serial connection |
| IP protection: | IP 55 | | |

## 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 draw 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 (P18)
12. Alarm sensor connectors (P13-14)
13. Status lamp connectors (P15-17)
14. Lamp connectors (P4-6)
15. Ventilator connectors (P7-9)
16. Heater connectors (P10-12)
17. Lamp manual mode switch (SW1)
18. Ventilator manual mode switch (SW2)
19. Heater manual mode switch (SW3)
20. Operation mode switch (SW4)

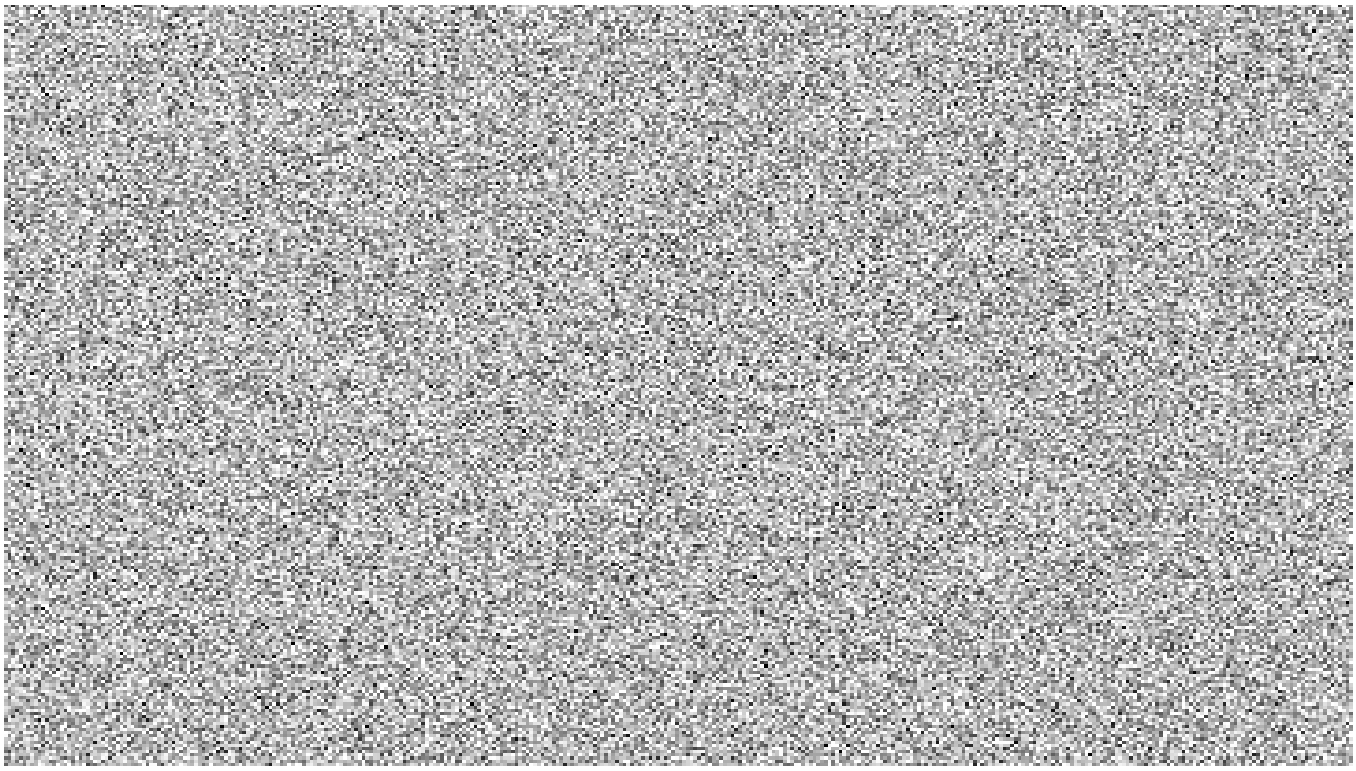


*Figure 1: Manuals and connectors*

### b) Internal construction

1. Board of microcontroller
2. Battery of microcontroller (BT1)
3. Battery of alarm input (BT2)
4. 12V DC power supply
5. Fuse of power supply (F4)
6. Fuse of auxiliary voltage (F5)
7. Fuse of external status lamps (F6)
8. Relay of external status lamp (K1)
9. Relay of lamp output (K2)
10. Relay of ventilator output (K3)
11. Relay of heater output (K4)
12. Breaker of lamp output (F1)
13. Breaker of ventilator output (F2)
14. Breaker of heater output (F3)
15. Mains connectors (P1-3)
16. Console connector (P18)
17. Alarm sensor connectors (P13-14)
18. Status lamp connectors (P15-17)
19. Lamp connectors (P4-6)
20. Ventilator connectors (P7-9)
21. Heater connectors (P10-12)
22. Mounting holes

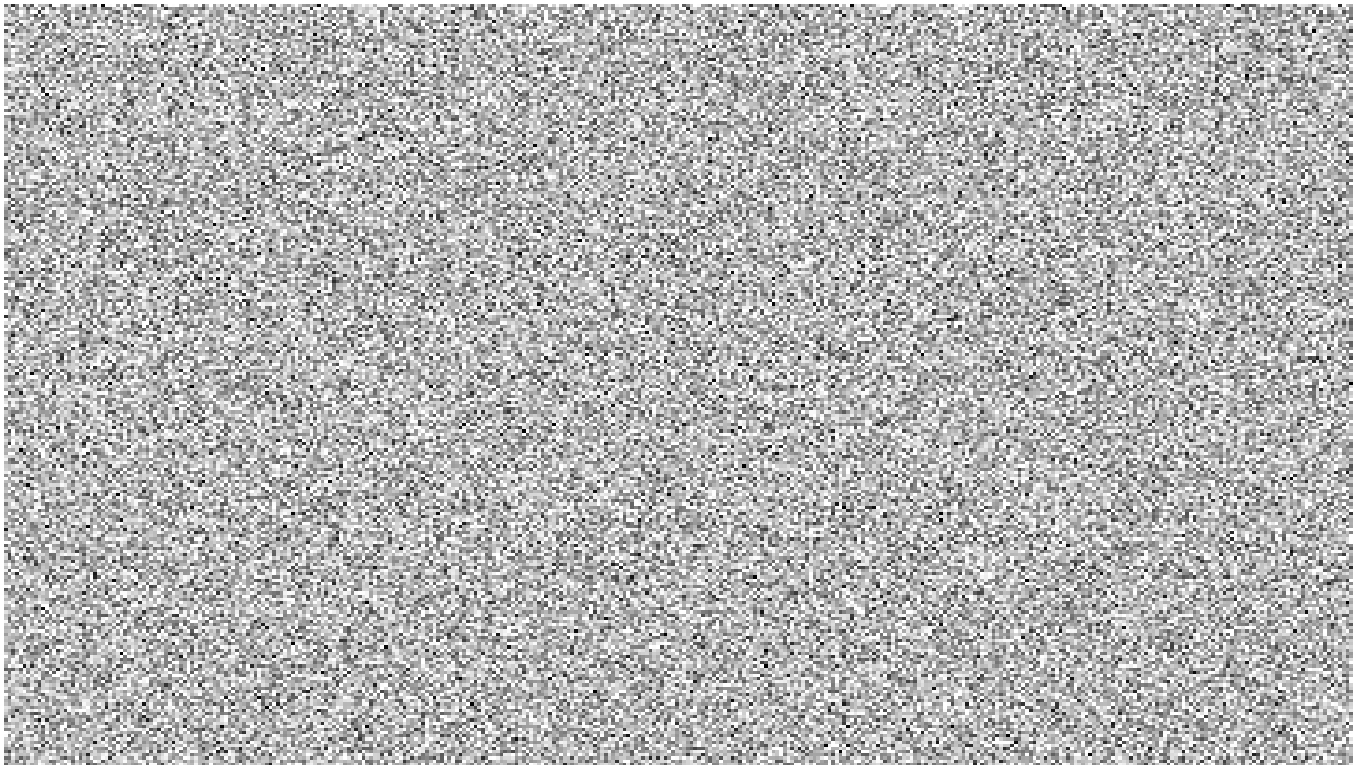


*Figure 2: Internal construction*

## c) Pinout of connectors

| sign | pin | function | | voltage level |
|---|---|---|---|---|
| P1 | 1 | Mains voltage input | L | 230V AC |
| P2 | 1 | | N | |
| P3 | 1 | | PE | |
| P4 | 1 | Lamp output | L | 230V AC |
| P5 | 1 | | N | |
| P6 | 1 | | PE | |
| P7 | 1 | Ventilator output | L | 230V AC |
| P8 | 1 | | N | |
| P9 | 1 | | PE | |
| P10 | 1 | Heater output | L | 230V AC |
| P11 | 1 | | N | |
| P12 | 1 | | PE | |
| P13 | 1 | Contact of alarm sensor | | |
| P14 | 1 | | | +9/12V |
| P15 | 1 | Green external status lamp | G | +12V |
| P16 | 1 | Red external status lamp | R | +12V |
| P17 | 1 | External status lamps common | C | |
| P18 | 2 | Serial console connector | RXD | +5V |
| | 3 | | TXD | +3.3V |
| | 5 | | GND | GND |
| P19 | 1 | Internal power supply module | L | 230V AC |
| | 2 | | N | |
| | 3 | | PE | |
| | 4 | | -V | GND |
| | 5 | | +V | +12V |
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## 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-200612-1.0.tar.gz.*

Content of package - only important files:

```
mm6d-hw
    ├──cad_files                          KiCAD and LibreCAD files
    │      ├──drilling                    drilling draws
    │      │      front.dxf                    front of box
    │      ├──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
    │
    ├──LICENCE                            terms of use
    └──README.md                          short description
```

# II. Software

## 1. General description

The task of the program is to operate the hardware and communicate with the central controller.

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 argument are checked. If appropriate, read inputs or or turn outputs 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 *source* 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 micro USB cable and Arduino IDE software to install program to microcontroller.

## 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 argument:

http://192.168.1.21/set/lamp/off?uid=bob

URL of information and data pages:

| 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 status | username |
| http://*ipaddress*/get/alarm | | Get status of alarm sensors | |
| http://*ipaddress*/get/manualswitch | | Get status of manual switch | |
| http://*ipaddress*/get/operationmode | | Get operation mode | |
| http://*ipaddress*/get/protection | | Get status of overcurrent protection | |
| http://*ipaddress*/set/all/off | | Switch off all outputs | |

| URL | type | description | args. |
|---|---|---|---|
| http://*ipaddress*/set/alarm/off | text/plain | Restore alarm input | username |
| http://*ipaddress*/set/heater/off | | Switch off heater | |
| http://*ipaddress*/set/heater/on | | Switch on heater | |
| http://*ipaddress*/set/lamp/off | | Switch off lamp | |
| http://*ipaddress*/set/lamp/on | | Switch on lamp | |
| http://*ipaddress*/set/ventilator/off | | Switch off ventilator | |
| http://*ipaddress*/set/ventilator/off | | Switch on ventilator | |

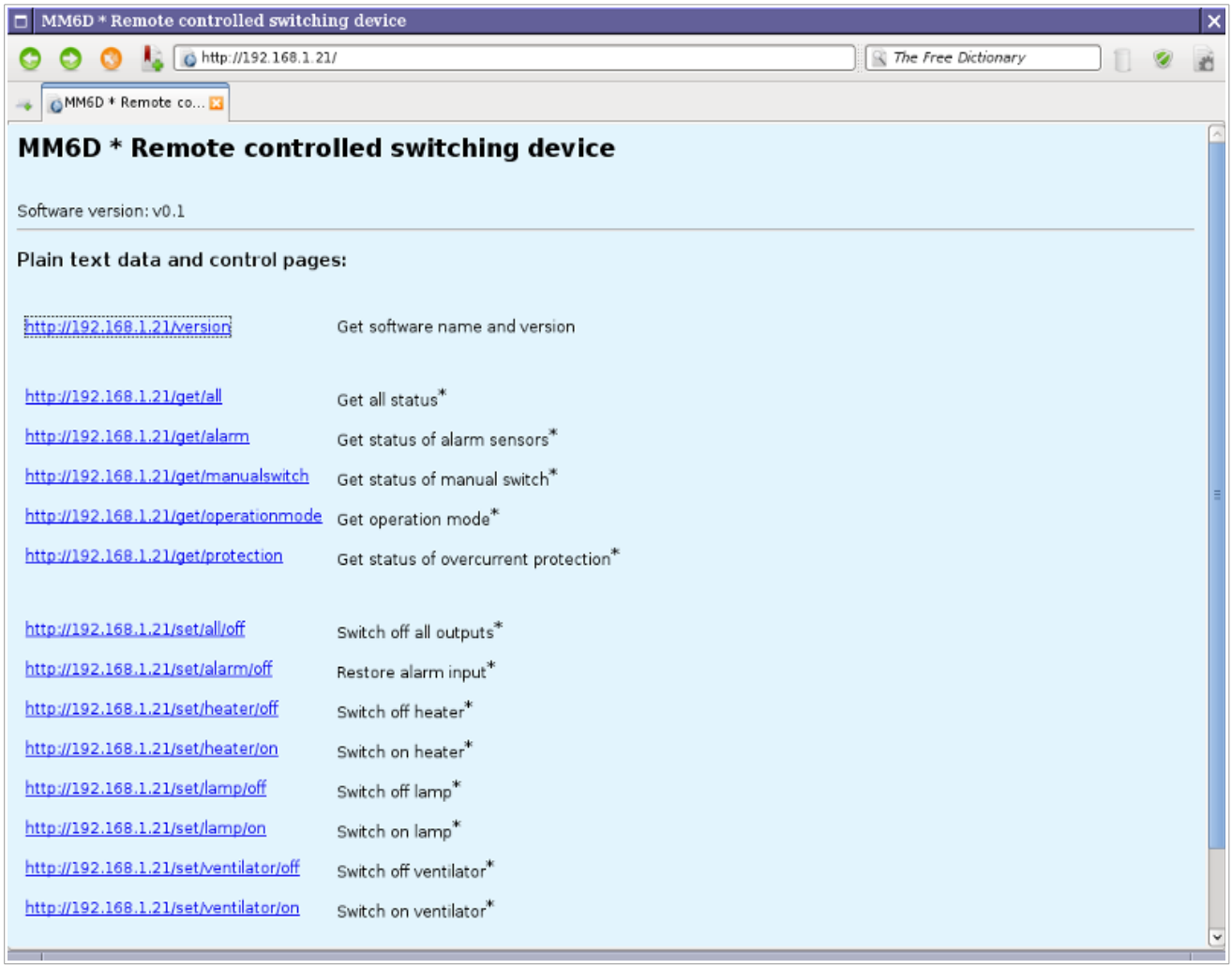


*Figure 3: Start page*

### 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.

## 5. Check operation

You can check operation of controller with a web brower, use index.html in *testpage* folder.


*Figure 4: Serial console with messages*

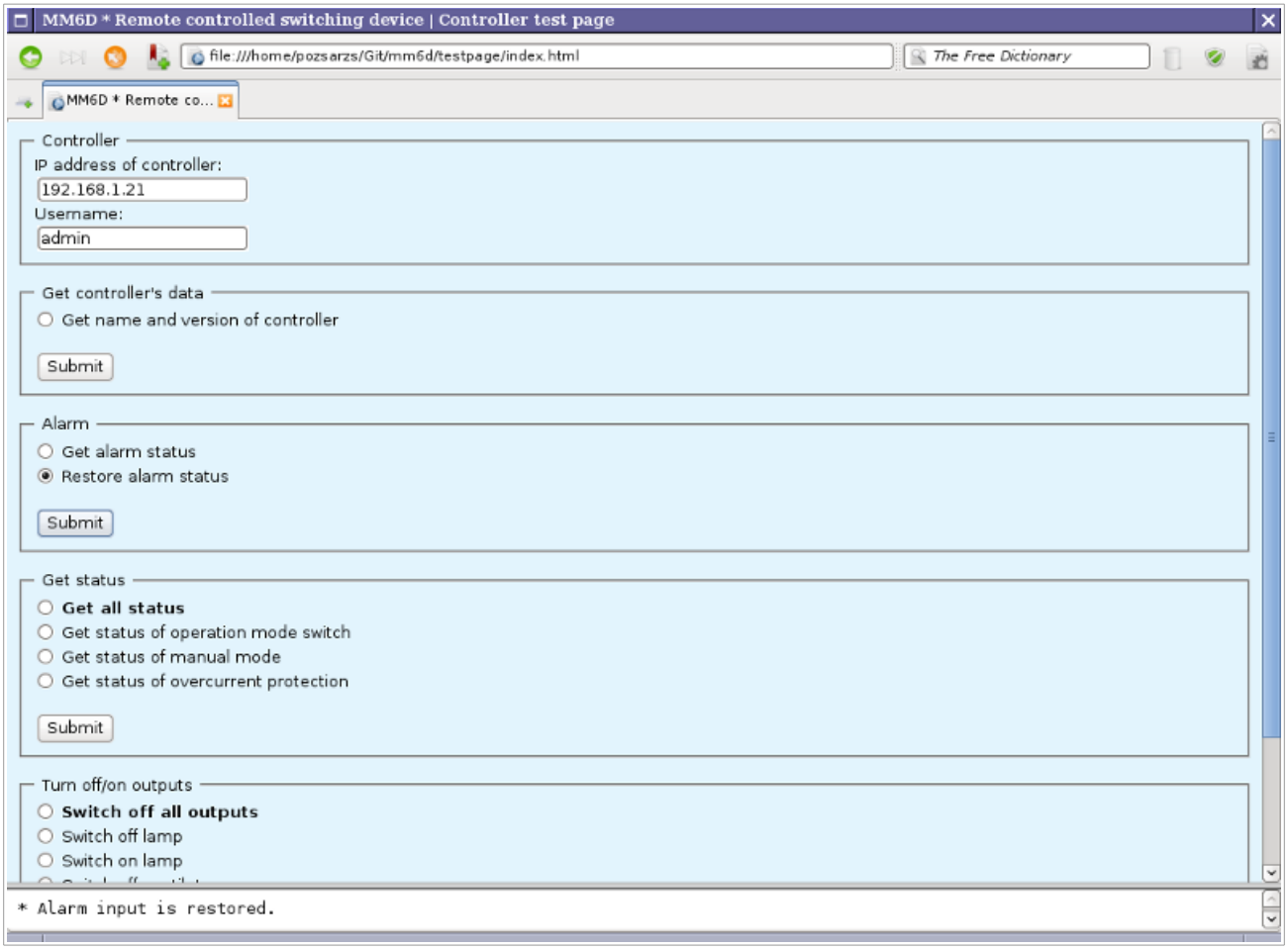


*Figure 5: Test page*

## 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.)

## 7. Downloadable software package

The software package in .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-sw-0.1.tar.gz.*

Content of package - only important files:

```
mm6d-sw
     ├──documents                  documentation
     │       *                          documentation
     ├──testpage                   test page
     │       index.html                 startpage
     ├──source                     source code
     │       mm7d.ino                   source code
     │
     ├──LICENCE                    terms of use
     └──README.md                  short description
```

# III. Related links

# 1. Hardware and software

| | |
|---|---|
| Full package | http://www.szerafingomba.hu/equipments/mm6d/mm6d-200612-0.1-1.0.tar.gz |
| Download from Github | http://github.com/pozsarzs/mm6d.git |
| Technical manual | http://www.szerafingomba.hu/equipments/mm6d/technical-manual-200612-0.1-1.0-en.pdf |
| Test page | http://szerafingomba.hu/equipments/mm6d/testpage/ |

**Schematic and PCB draws (PDF):**

| | |
|---|---|
| Schematics | http://www.szerafingomba.hu/equipments/mm6d/sch_mm6d-1.pdf<br>http://www.szerafingomba.hu/equipments/mm6d/sch_mm6d-2.pdf |
| PCB solder side | http://www.szerafingomba.hu/equipments/mm6d/pcb_mm6d-sold.pdf |
| PCB component side | http://www.szerafingomba.hu/equipments/mm6d/pcb_mm6d-comp.pdf |
| PCB silkscreen | http://www.szerafingomba.hu/equipments/mm6d/pcb_mm6d-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 | Control timeout error! | no | yes | yes+ BLUE | no |
| E02 | Overcurrent protection error! | no | yes | yes | beep |
| E03 | Authentication error! | yes | yes | no | 2x beep |
| E04 | Not allowed client IP address! | yes | yes | no | 3 x beep |
| E05 | Page not found! | yes | yes | no | no |
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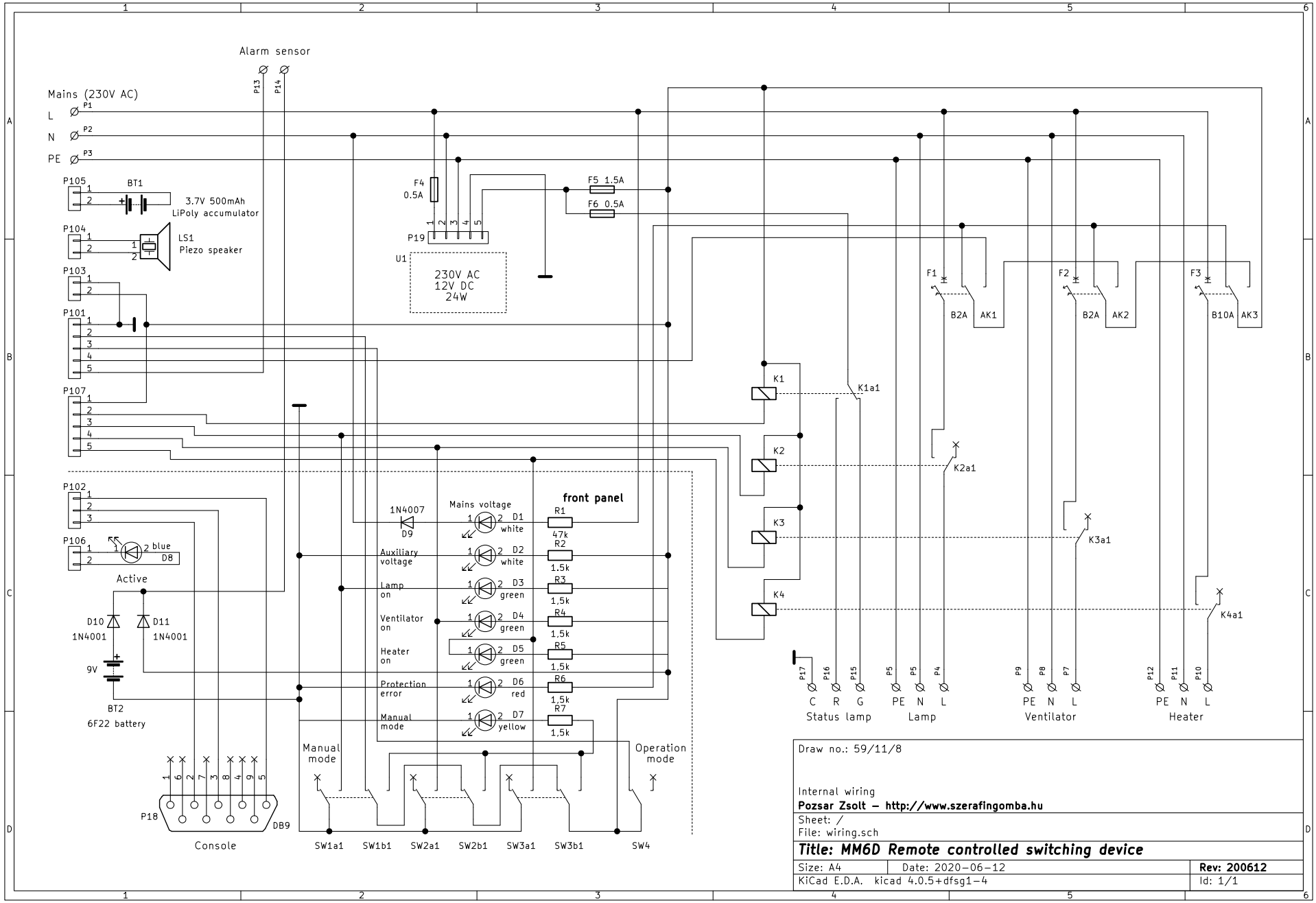
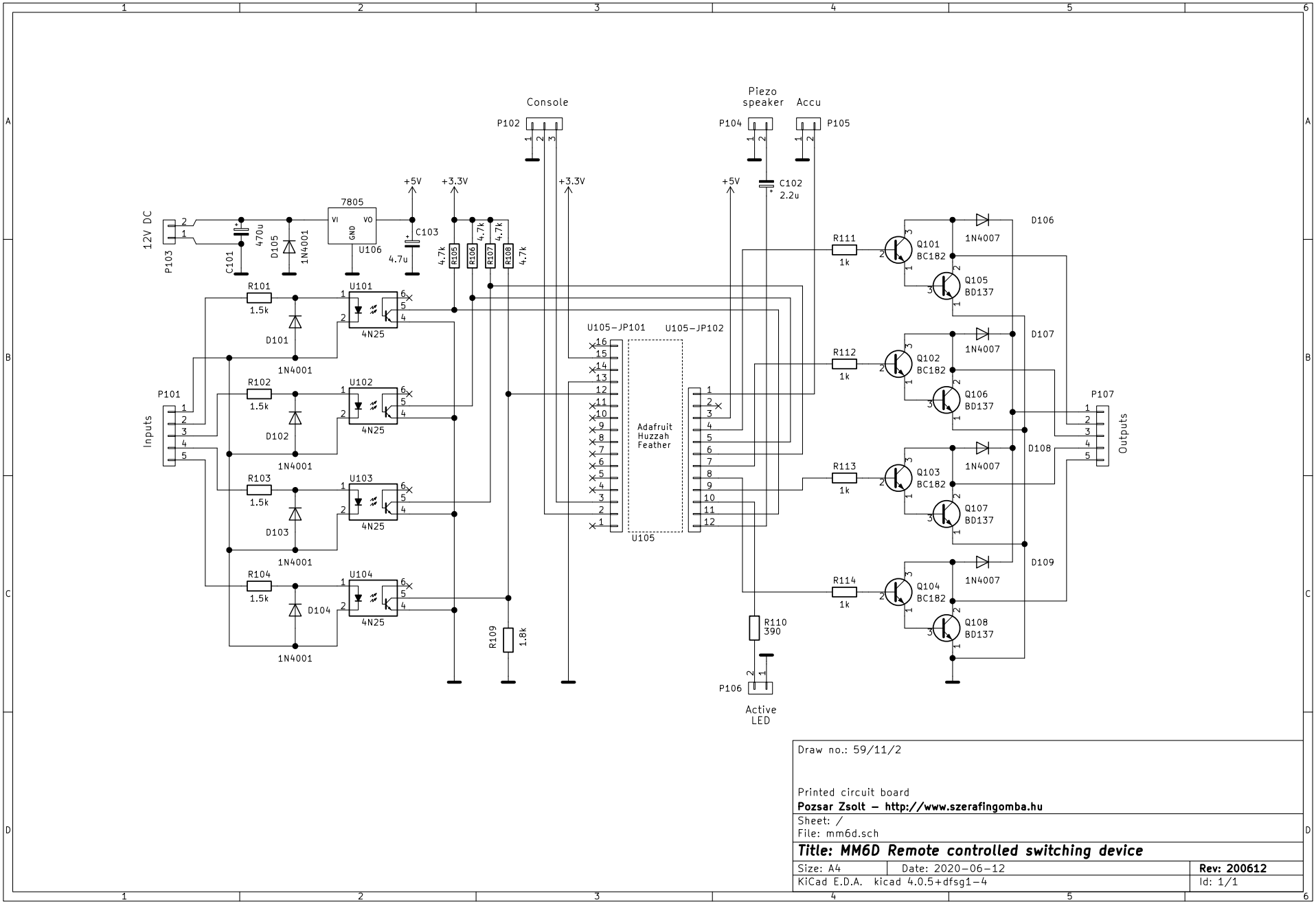
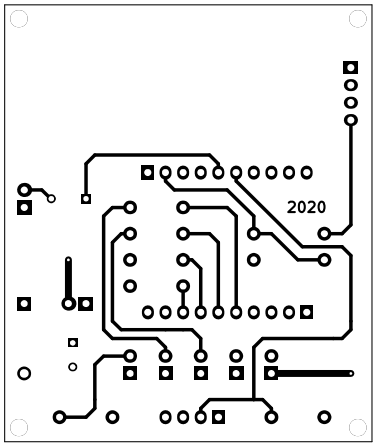
*Annex 1: Error messages and signs*




*Annex 2: Internal wiring*




*Annex 3: Schematic of printed circuit board*




Draw no.: 59/12/3

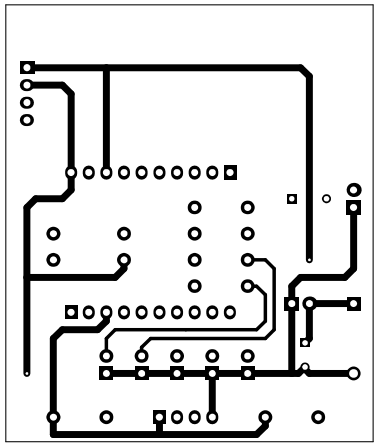
**Pozsar Zsolt – http://www.szerafingomba.hu**

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

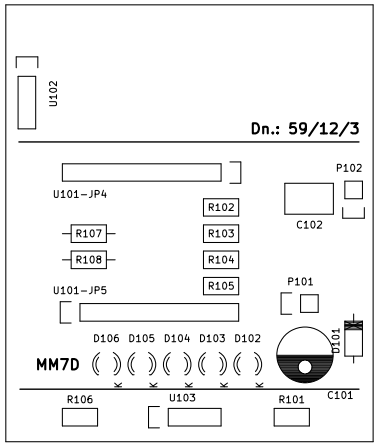
**Pozsar Zsolt – http://www.szerafingomba.hu**

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:<br>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 6: PCB silkscreen*