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

Titles:	MM6D Remote controlled switching device	Rev.:	200612	Pages:	1/28
	Technical manual				
Name:	Pozsár Zsolt			Date:	2020.06.12.

Content

I. Hardware

1. Technical data

Supply voltage:	230V AC	IP protection:	IP 55
Auxiliary voltage:	12V DC	Mass of cover:	termoplast (ABS)
Supply current:	max. 15 A	Communication:	Wireless LAN,
Isolation class:	Class I		TTL 3.3V serial port
Mechanical size:	300 x 220 x 120 mm	Get/set data:	via HTTP
		Administration:	via serial connection

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 load	Overcurrent protection	Watched?
Status lamp outputs	12V DC	6W	fuse	no
Lamp output	230V AC	460W	overcurrent breaker	yes
Ventilator output	230V AC	460W		yes
Heater output	230V AC	2.3 kW		yes

3. Schematic and PCB draws

The wiring diagrams of the device is shown in Annex 2, schematic and PCB draws are in Annex 3-7. 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 of boards are included in the package.

4. Other draws and documents

Documentation package contents draw of frontpage in ODG and PDF and drilling draw in DXF and PDF format.

5. Terms of use

6. Look of device

a) Manuals

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. Alarm/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. Lamp manual mode switch (SW1)
11. Ventilator manual mode switch (SW2)
12. Heater manual mode switch (SW3)
13. Operation mode switch (SW4)

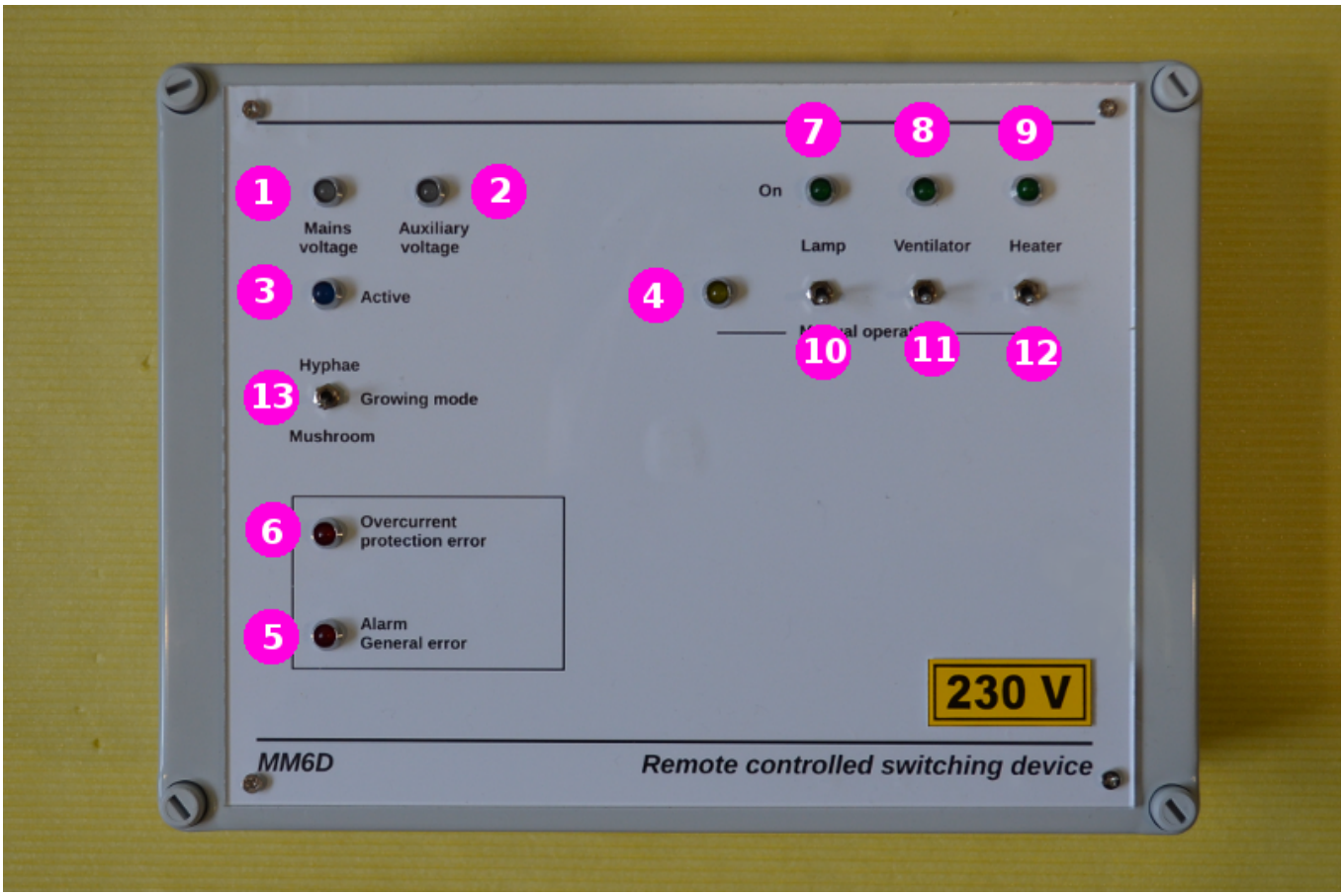


Figure 1: Manuals

b) Internal construction

1. Main board
2. Display board
3. Accumulator of microcontroller (BT101)
4. Battery of alarm input (BT201)
5. Transformers
6. Fuse of transformers (F4)
7. Fuse of auxiliary voltage (F6)
8. Fuse of external status lamps (F5)
9. Relay of external status lamp (K4)
10. Relay of lamp output (K1)
11. Relay of ventilator output (K2)
12. Relay of heater output (K3)
13. Breaker of lamp output (F1)
14. Breaker of ventilator output (F2)
15. Breaker of heater output (F3)
16. Mains connectors (P1-3)
17. Console connector (P18)
18. Alarm sensor connectors (P13-14)
19. Status lamp connectors (P15-17)
20. Lamp connectors (P4-6)
21. Ventilator connectors (P7-9)
22. Heater connectors (P10-12)
23. Mounting holes

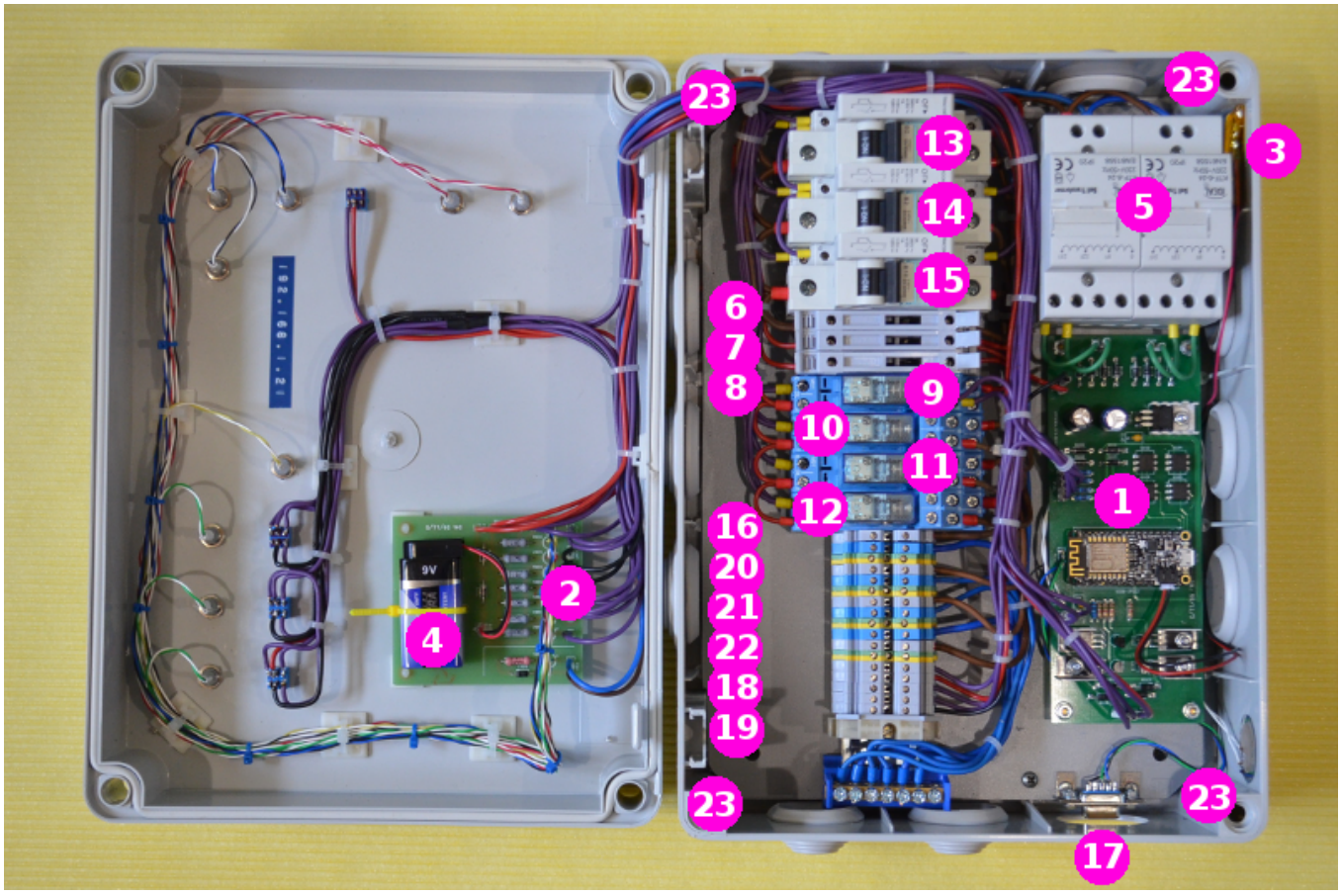


Figure 2: Internal construction

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

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-hw-200612-1.0.tar.gz.*

Content of package - only important files:

```
mm6d-hw
    ├──cad_files                                    KiCAD and LibreCAD files
    │       ├──display                              display board
    │       │       display.pro                         project file
    │       │       display.sch                         schematic draw
    │       │       display.kicad_pcb                   PCB draw
    │       │       display.drl                         drilling file
    │       │       display-*.gbr                      Gerber files
    │       ├──drilling                             drilling draws
    │       │       front.dxf                          front of box
    │       │       mountingplate.dxf                 mounting plate
    │       ├──mainboard                            main board
    │       │       mainboard.pro                     project file
    │       │       mainboard.sch                     schematic draw
    │       │       mainboard.kicad_pcb               PCB draw
    │       │       mainboard.drl                     drilling file
    │       │       mainboard-*.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	

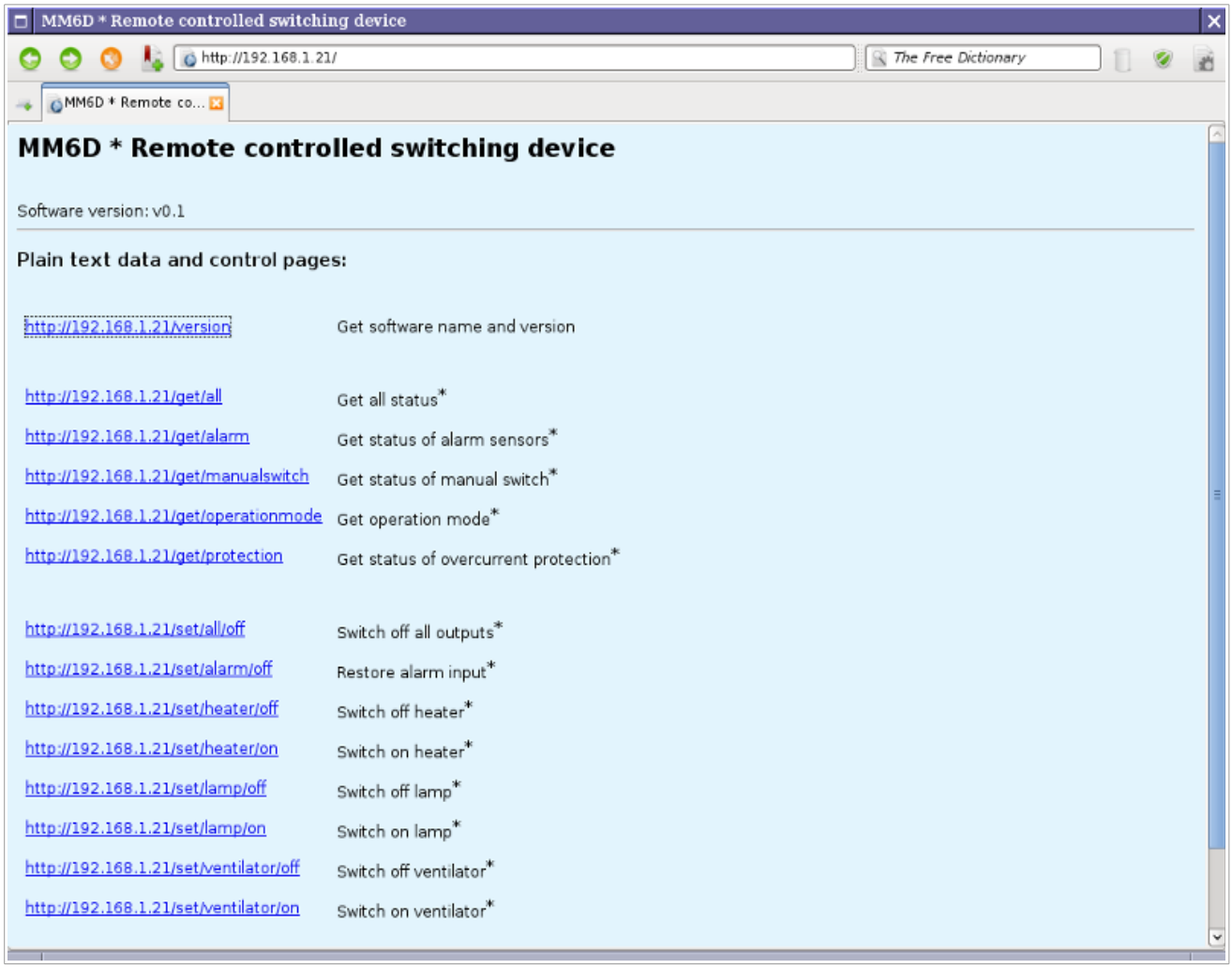


Figure 3: Start page

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

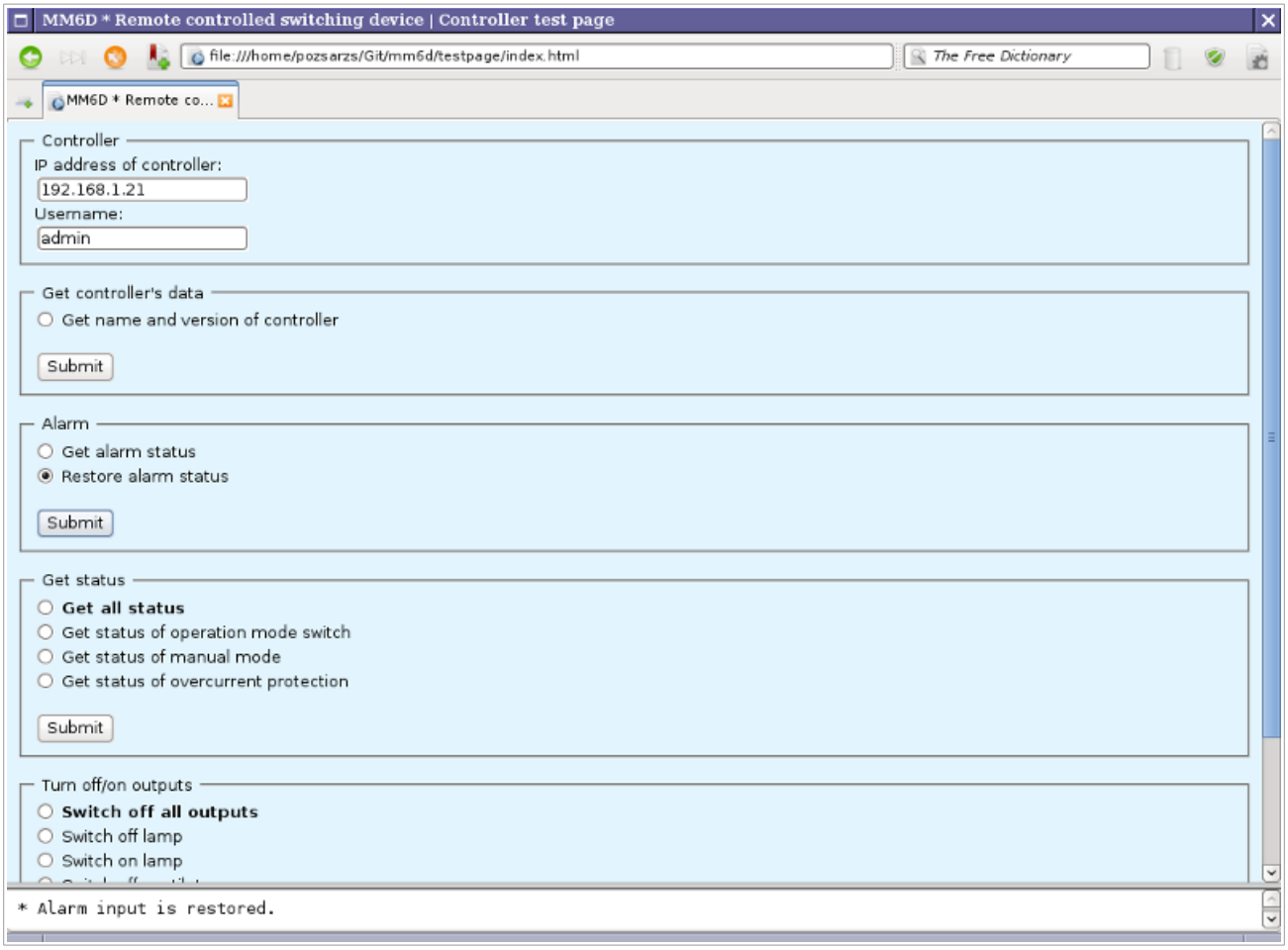


Figure 5: Test page

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
    ├──libraries                external libraries
    │       *.tar.gz                libraries in archive file
    │       clone                   clone script
    ├──testpage                 test page
    │       index.html              startpage
    ├──source                   source code
    │       mm6d.ino                source code
    │
    ├──LICENCE                  terms of use
    └──README.md                short description
```

III. Related links

1. Hardware

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

Schematic and PCB draws (PDF):

Schematics	http://www.szerafingomba.hu/equipments/mm6d/sch_mm6d-1.pdf
	http://www.szerafingomba.hu/equipments/mm6d/sch_mm6d-2.pdf
	http://www.szerafingomba.hu/equipments/mm6d/sch_mm6d-3.pdf
PCB main board	http://www.szerafingomba.hu/equipments/mm6d/pcb_mm6d-1-sold.pdf
	http://www.szerafingomba.hu/equipments/mm6d/pcb_mm6d-1-comp.pdf
	http://www.szerafingomba.hu/equipments/mm6d/pcb_mm6d-1-silk.pdf
PCB display board	http://www.szerafingomba.hu/equipments/mm6d/pcb_mm6d-2-sold.pdf
	http://www.szerafingomba.hu/equipments/mm6d/pcb_mm6d-2-silk.pdf

2. Software

Software package	http://www.szerafingomba.hu/softwares/mm6d/mm6d-sw-0.1.tar.gz
Download from Github	http://github.com/pozsarzs/mm6d-sw.git

3. 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/

4. Developer and manufacturer

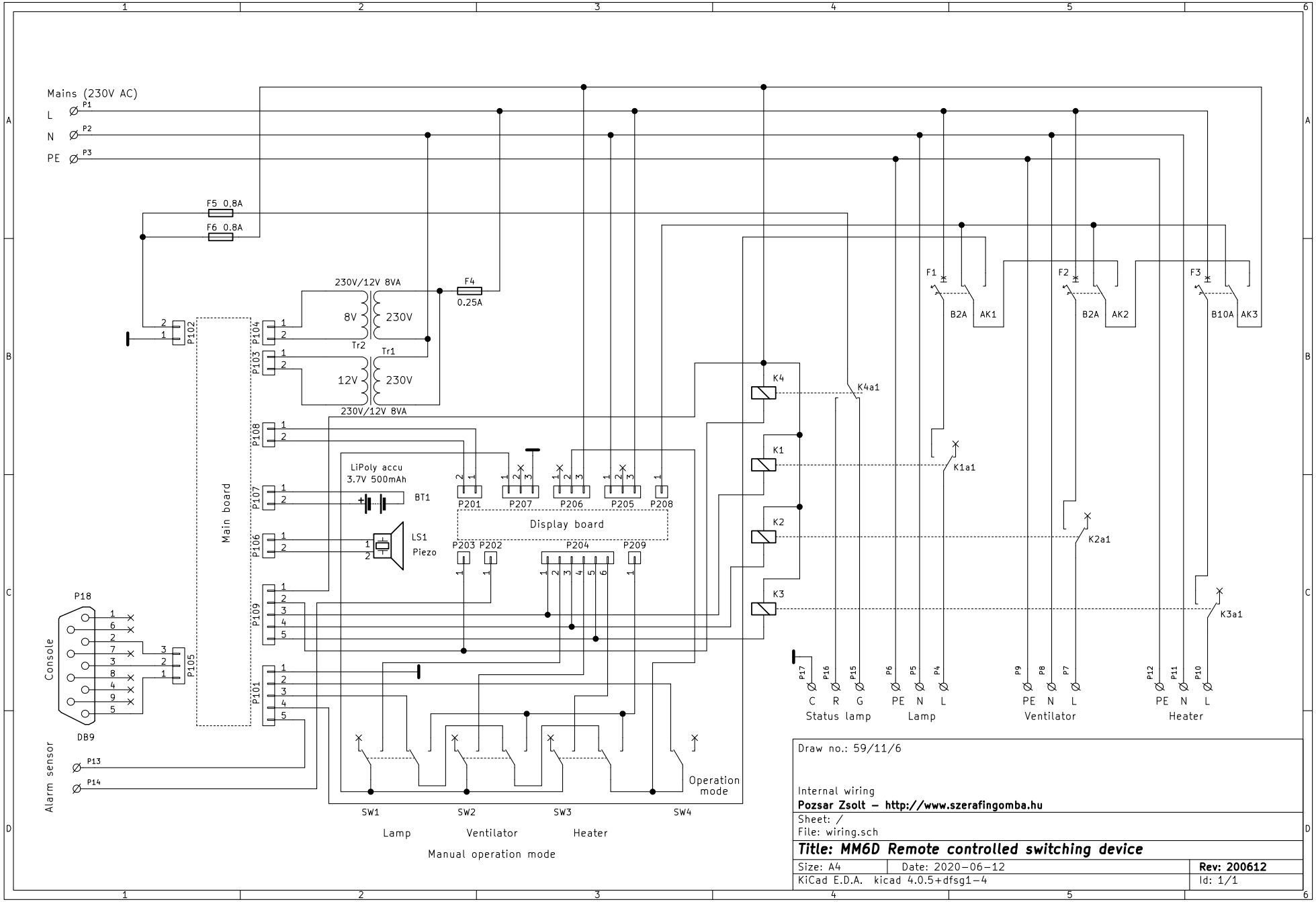
Homepage	https://www.szerafingomba.hu
E-mail	info@szerafingomba.hu

IV. Annexes

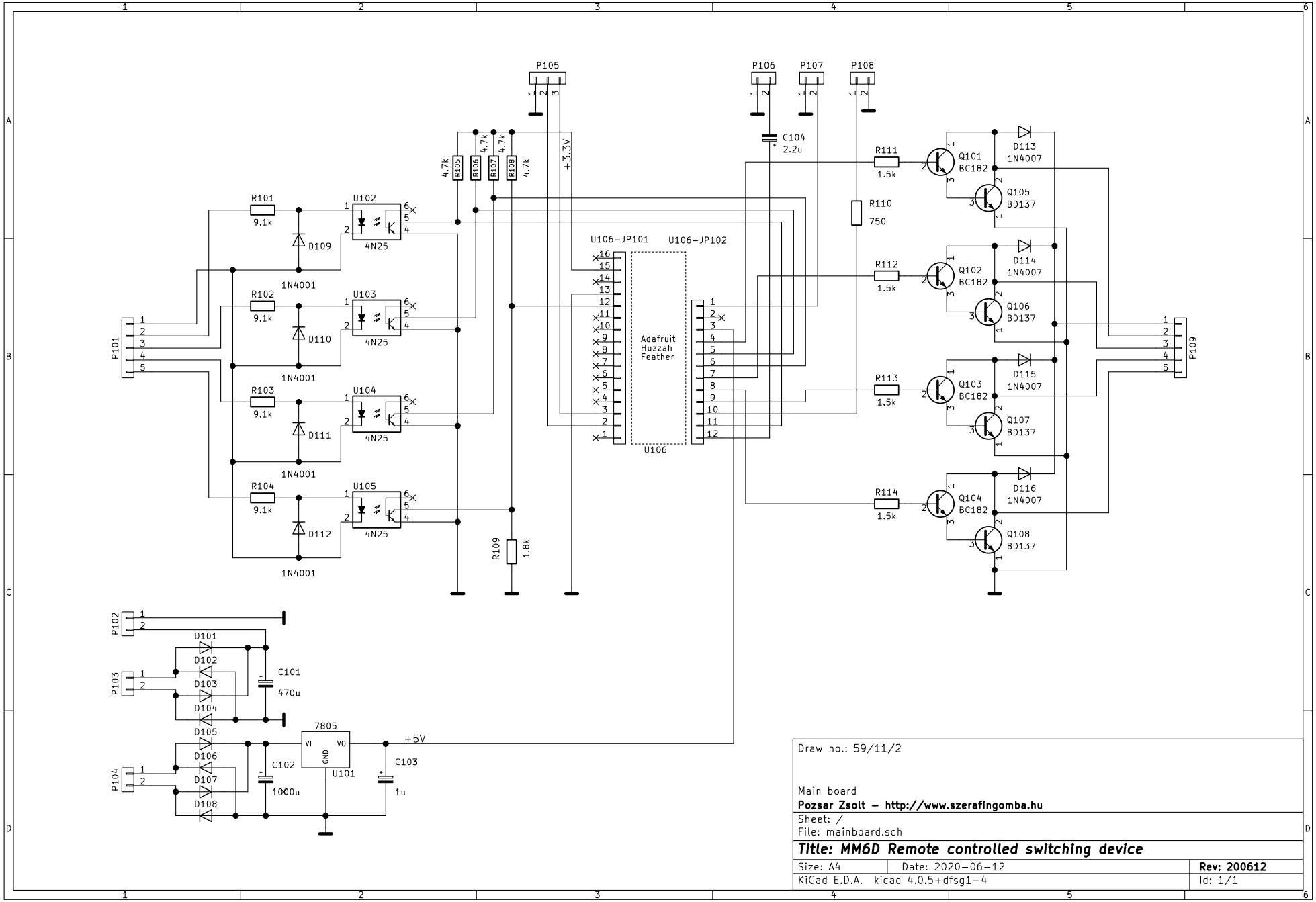
Content

sign	message	web	console	blue LED	red LED	sound
E01	Control timeout error!	no	yes	yes	yes	no
E02	Overcurrent protection error!	no	yes	no	yes	beep
E03	Authentication error!	yes	yes	no	no	2x beep
E04	Not allowed client IP address!	yes	yes	no	no	3 x beep
E05	Page not found!	yes	yes	no	no	no

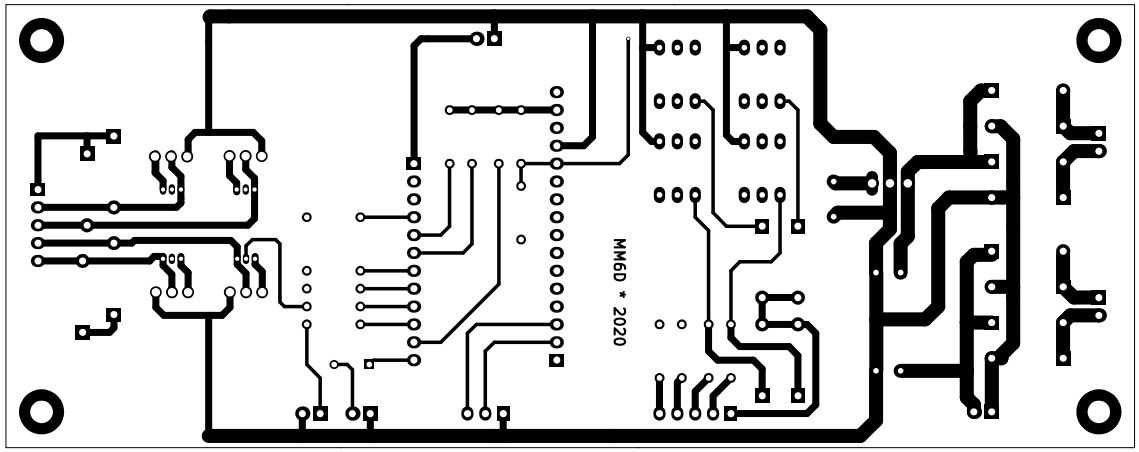
Annex 1: Error messages and signs



Annex 2: Internal wiring

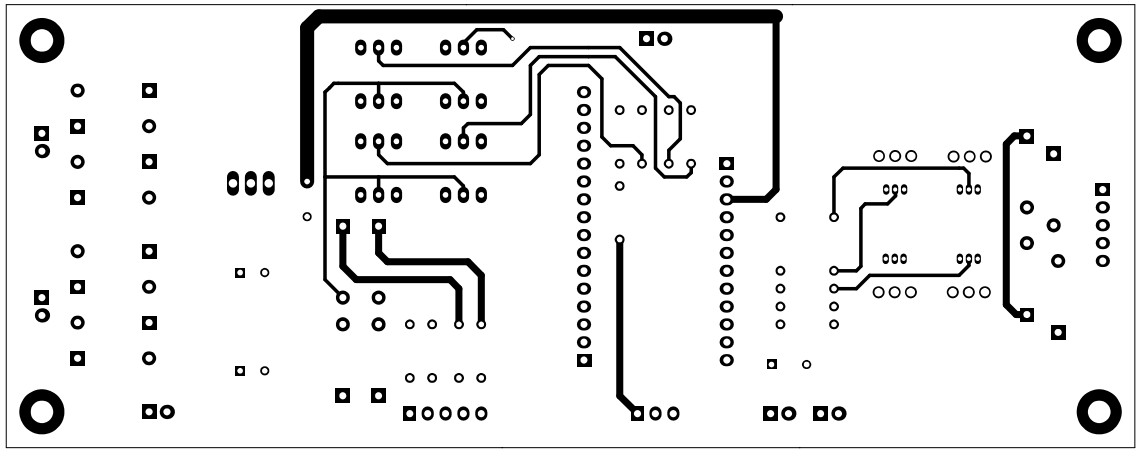


Annex 3: Schematic of main board



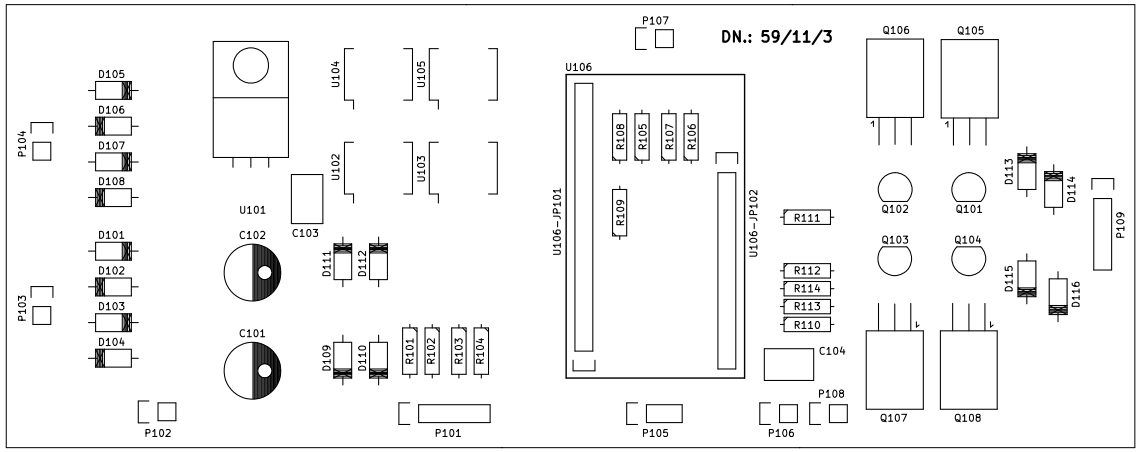
Draw no.: 59/11/3		
Main board **Pozsar Zsolt – http://www.szerafingomba.hu**		
Sheet: File: mainboard.kicad_pcb		
Title: MM6D Remote controlled switching device		
Size: A4	Date: 2020-06-12	**Rev: 200612**
KiCad E.D.A. kicad 4.0.5+dfsg1-4		Id: 1/1

Annex 4: PCB solder side of main board



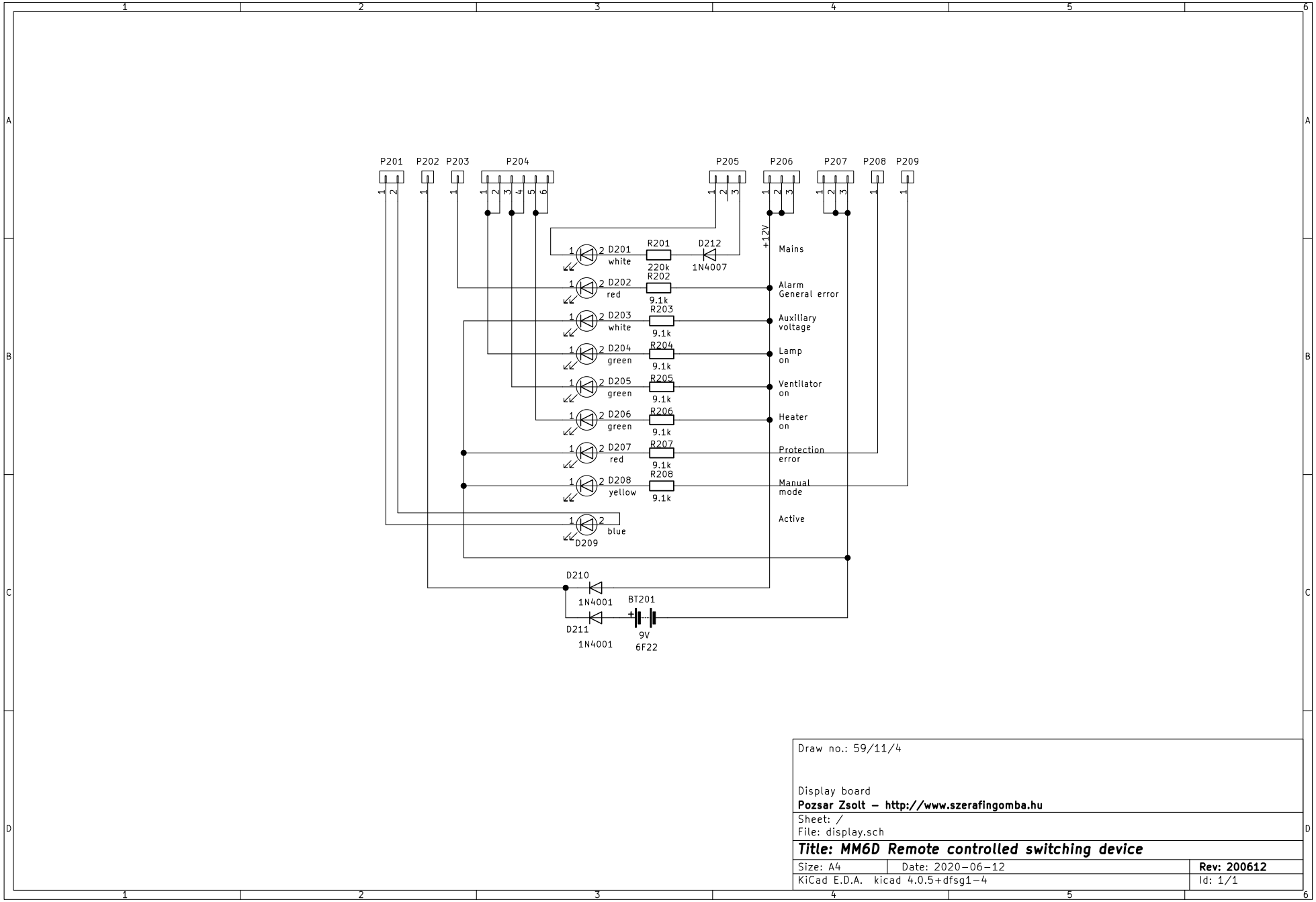
Draw no.: 59/11/3		
Main board **Pozsar Zsolt – http://www.szerafingomba.hu**		
Sheet: File: mainboard.kicad_pcb		
Title: MM6D Remote controlled switching device		
Size: A4	Date: 2020-06-12	**Rev: 200612**
KiCad E.D.A. kicad 4.0.5+dfsg1-4		Id: 1/1

Annex 5: PCB component side of main board

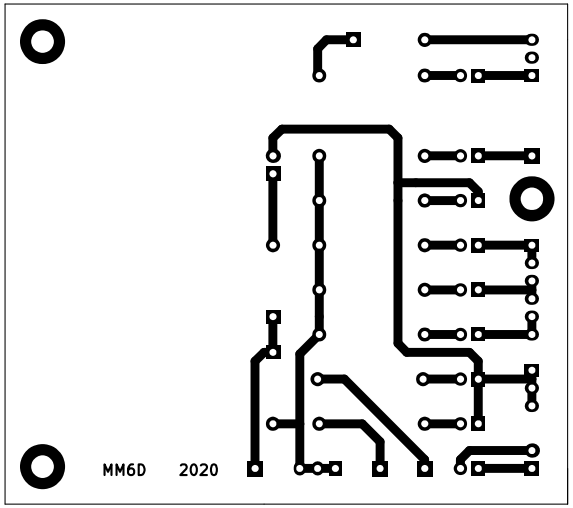


Draw no.: 59/11/3		
Main board **Pozsar Zsolt – http://www.szerafingomba.hu**		
Sheet: File: mainboard.kicad_pcb		
Title: MM6D Remote controlled switching device		
Size: A4	Date: 2020-06-12	**Rev: 200612**
KiCad E.D.A. kicad 4.0.5+dfsg1-4		Id: 1/1

Annex 6: PCB silkscreen of main board

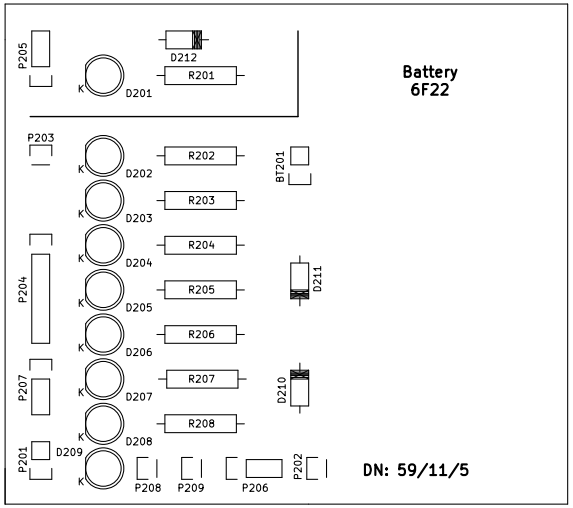


Annex 7: Schematic of display board



Draw no.: 59/11/5		
Display board **Pozsar Zsolt – http://www.szerafingomba.hu**		
Sheet: File: display.kicad_pcb		
Title: MM6D Remote controlled switching device		
Size: A4	Date: 2020-10-26	**Rev: 200612**
KiCad E.D.A. kicad 4.0.5+dfsg1-4		Id: 1/1

Annex 8: PCB solder side of display board



Draw no.: 59/11/5		
Display board **Pozsar Zsolt – http://www.szerafingomba.hu**		
Sheet: File: display.kicad_pcb		
Title: MM6D Remote controlled switching device		
Size: A4	Date: 2020-10-26	**Rev: 200612**
KiCad E.D.A. kicad 4.0.5+dfsg1-4		Id: 1/1

Annex 9: PCB silkscreen of display board