MM8D Central controlling device

Technical manual

Hardware version: v210326 MM8D software version: v0.1 Technical manual version: v1.0 Issue date: 2021.03.26.

Draw number: 59/13/1

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	Technical manual				
Name:	Pozsár Zsolt			Date:	2021.03.26.

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I. Hardware

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1. Technical data

Supply voltage: 3.3/5 V DC SELV

Supply current: max. 1 A

Isolation class: Class 0

Mechanical size: $240 \times 60 \times 25 \text{ mm}$

IP protection: IP 00

Mass of cover: termoplast (PC), only top cover

2. General description

The device consists of two parts: the control computer and the adapter card. The card can also be connected to 3.3V and 5V TTL systems. The control program is designed for PC and Raspberry Pi, the interface PC is connected to the LPT port, in the second case to the GPIO port. The adapter card has four 12V, galvanically isolated, polarity-protected inputs. Of the eight outputs, four are morse-contact relay outputs and four are open collector outputs for lower load (e.g., LED). The load capacity of the relay output is 5A (max. 240V AC or 100V DC), the load capacity of the open collector outputs is 80 mA (max. 24V DC).

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 mechanical draw of top cover.

5. Terms of use

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6. Look of board

a) Manuals and connectors

- 1. LEDs of input #1-4
- 2. LEDs of relay output #1-4
- 3. LEDs of LED output #1-4
- 4. LEDs of power inputs
- 5. J1 connector inputs
- 6. J2 connector to computer
- 7. J3 connector from power supply
- 8. J4 connector from computer

- 9. J5 connector from computer
- 10. J6 connector contactors of relay output #1
- 11. J7 connector contactors of relay output #2
- 12. J8 connector contactors of relay output #3
- 13. J9 connector contactors of relay output #4
- 14. J10 connector LED outputs #1-4
- 15. Mounting holes
- 16. Jumpers

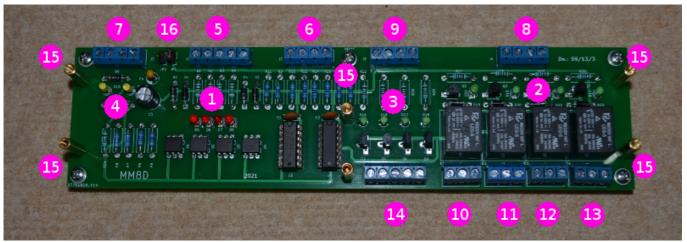


Figure 1: Manuals and connectors

b) Jumpers

sign	func	ction
sign	for PC (LPT port)	for Rasperrry Pi (GPIO port)
JP1	CLOSE	OPEN
JP2	OPEN	CLOSE

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c) Pinout of connectors

sign	pin	function	function		
	1	input #1	I1	+12 V	
	2	input #2	I2	+12 V	
J1	3	input #3	I3	+12 V	
	4	input #4	I4	+12 V	
	5	common	ICOM		
	1	input #1 to computer	I1C	+3.3/5 V	
10	2	input #2 to computer	I2C	+3.3/5 V	
J2	3	input #3 to computer	I3C	+3.3/5 V	
	4	input #4 to computer	I4C	+3.3/5 V	
	1	power voltage input	+5 V	+5 V	
10	2	GND	GND		
J3	3	GND	GND		
	4	power voltage input	+3.3 V	+3.3 V	
	1	relay output #1 from computer	RO1C	+3.3/5 V	
T.4	2	relay output #2 from computer	RO2C	+3.3/5 V	
J4	3	relay output #3 from computer	RO3C	+3.3/5 V	
	4	relay output #4 from computer	RO4C	+3.3/5 V	
	1	LED output #1 from computer	LO1C	+3.3/5 V	
TE	2	LED output #2 from computer	LO2C	+3.3/5 V	
J5	3	LED output #3 from computer	butput #1 from computer butput #2 from computer butput #3 from computer LO2C LO3C		
	4	LED output #4 from computer	LO4C	+3.3/5 V	
	1	relay contactor NO	RO?NO		
J6-9	2	relay contactor COM	RO?COM		
	3	relay contactor NC	RO?NC		
	1	LED output #1 (open collector)	LO1		
	2	LED output #2 (open collector)	LO2		
J10	3	LED output #3 (open collector)	LO3		
	4	LED output #4 (open collector)	LO4		
	5	GND	GND		

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d) Connect to computer

	MN	/18D	Raspberry Pi			PC			
sign	pin	function	sign	pin	function	sign	pin	function	
	1	I1C		3	GPIO02		15	-ERROR	
J2	2	I2C		5	GPIO03	LPT	13	SELECT	
	3	I3C		7	GPIO04	port	12	PE	
	4	I4C		11	GPIO17		10	-ACK	
	1	+5 V		2	+5 V	power		+5 V	
J3	2	GND		6	GND	supply		GND	
13	3	GND	GPIO	9	GND	-	25	GND	
	4	+3.3 V		17	+3.3 V		-	-	
	1	RO1C	port	12	GPIO18		2	DO	
J4	2	RO2C		16	GPIO23		3	D1	
J4	3	RO3C		18	GPIO24	LPT	4	D2	
	4	RO4C		22	GPIO25	port	5	D3	
	1	LO1C		32	GPIO12		6	D4	
15	2	LO2C		36	GPIO16		7	D5	
J5	3	LO3C		38	GPIO20		8	D6	
	4	LO4C		40	GPIO21		9	D7	

e) Connect to environment

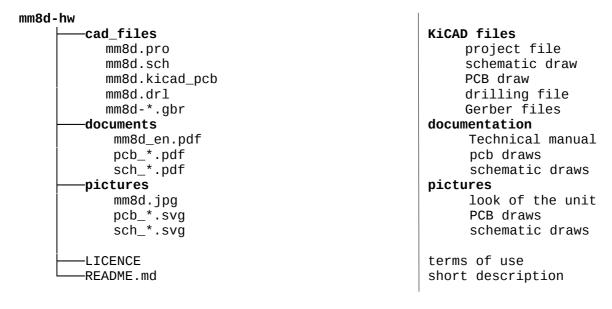
sign	pin	function	source/target			
	1	I1	mains voltage sensor			
	2	I2	mains overcurrent breaker #1			
J1	3	I3	mains overcurrent breaker #1			
4 I4 5 ICOM			mains overcurrent breaker #1			
			common			
J6	1-3	RO1	alarm output to alarm device			
J7	1-3	RO2	unused			
J8	1-3	RO3	unused			
J9	1-3	RO4	unused			
	1	LO1	ACTIVE light (blue)			
	2	LO2	WARNING light (yellow)			
J10	3	LO3	ERROR light (red)			
	4	LO4	unused			
	5	GND	GND			

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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: *mm8d-hw-210326-1.0.tar.gz*.

Content of package - only important files:



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II. Softwares

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II/a. MM8D

1. General description

The software consists of five main parts:

Operating daemon

The connected MM6D and MM7D electrical equipment is controlled by a Python program that runs as a service in the background. Utilities Bash shell programs, configuration files are in text (INI) format. The configuration program has a full screen character interface, its source code (FreePascal) is only included in the tar.gz package. This part of the software is included in the tar.gz and mm8d-sw Debian packages.

Environmental characteristics adjustment program

The setup program has a full screen character interface, its source code (FreePascal) is included in the tar.gz package only. This part of the software is included in the tar.gz package and the mm8d-eec Debian package.

Web interface

Data access is provided by CGI programs written in Perl, its Bash shell utility, and web content consists of static HTML files. This requires an Apache2 web server. This part of the software is included in the tar.gz package and the mm8d-web Debian package.

Hardware checker program

This Python program can be used to verify that the hardware is working properly. Before testing running service of the software must be stopped. This part of the software is included in the tar.gz package and the mm8d-sw Debian package.

2. Prepare installation

Before installing the program, you need to install Raspbian OS Lite on your Raspberry Pi and Debian GNU/Linux on PC. Remember to change the default password for user pi, set the device name (hostname) and access to the local network. For easy remote access, use a permanent IP address or set up an IP address assignment on your router.

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Prepare operation system:

```
user@localhost$ sudo apt-get update
user@localhost$ sudo apt-get upgrade
user@localhost$ sudo apt-get install git wget
user@localhost$ sudo echo "deb http://www.szerafingomba.hu/deb/ ./" >> /etc/apt/sources.list
user@localhost$ sudo wget -q -O - http://www.szerafingomba.hu/deb/KEY.gpg | apt-key add -
user@localhost$ sudo apt-get update
user@localhost$ mkdir $HOME/download
```

3. Download

Download program from homepage:

```
user@localhost$ cd $HOME/download
user@localhost$ wget http://www.szerafingomba.hu/softwares/mm8d/mm8d-sw-0.1-armhf.tar.gz
user@localhost$ tar -xzf mm8d-sw-0.1-armhf.tar.gz
```

(Note: on PC use 'i386' instead 'armhf'.)

Download latest version of program from Github:

```
user@localhost$ cd $HOME/download
user@localhost$ git clone http://github.com/pozsarzs/mm8d-sw.git
```

4. Installation

```
user@localhost$ cd mm8d-sw
user@localhost$ ./prepare
user@localhost$ ./install
```

Download and install with package manager:

```
user@localhost$ sudo apt-get install mm8d-sw mm8d-web mm8d-eec
```

5. Files of program

The program's installed and runtime created files, with explanations of important files for the user and the purpose of symbolic links:

```
-etc
     -cron.d
       mm8d-sw
       mm8d-web
     init.d
       mm8d.sh
     rc0.d
       K01mm8d.sh
                                              » /etc/init.d/mm8d.sh
     rc2.d
                                              » /etc/init.d/mm8d.sh
       S01mm8d.sh
      rc3.d
                                              » /etc/init.d/mm8d.sh
       S01mm8d.sh
     -rc4.d
```

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```
S01mm8d.sh
                                             » /etc/init.d/mm8d.sh
     rc5.d
       S01mm8d.sh
                                             » /etc/init.d/mm8d.sh
     rc6.d
       K01mm8d.sh
                                             » /etc/init.d/mm8d.sh
     -sudoers.d
       010_mm8d-nopasswd
     -systemd
          -system
           mm8d.service
     -motd
-home
     -pi
          -download
                                             downloaded files
-usr
     -lib
          -cgi
            getdata.cgi
                                             CGI programs
            getpage.cgi
     -local
          -bin
           mm8d.py
                                             daemon program
           mm8d-creatediagrams
                                             diagram creator
           mm8d-editenvirconf
                                             edit envir. characteristics
           mm8d-editenvirconf.bin
                                             settings editor
           mm8d-editmainconf
                                             edit program settings
           mm8d-editmainconf.bin
                                             settings editor
           mm8d-getsnapshots
                                             camera picture downloader
           mm8d-hwtest.py
                                             hardware checker
           mm8d-maintainlog
                                             maintain log
           mm8d-override
                                             override outputs
           mm8d-override.bin
                                             override program
           mm8d-startdaemon
                                             start daemons
           mm8d-stopdaemon
                                             stop daemons
           mm8d-updatestartpage
                                             update startpage
           mm8d-viewlog
                                             show logfile
          -etc
               -mm8d
                 envir-ch?.ini
                                             envir. characteristics settings
                 mm8d.ini
                                             program settings
          -share
                -doc
                    -mm8d
                                             author(s)
                     AUTHORS
                     COPYING
                                             terms of use (EN)
                     INSTALL
                                             installation instruction (EN)
                     README
                                             information (EN)
                     VERSION
                                             version
                -locale
                ____??
                     mm8d.msg
                                             message files
                man
                   -man1
                                             manual pages (EN)
                 mm8d.py.1.gz
                 mm8d-creatediagrams.1.gz
                 mm8d-editenvirconf.1.gz
                 mm8d-editmainconf.1.gz
                 mm8d-getsnapshots.1.gz
                 mm8d-hwtest.py.1.gz
                 mm8d-maintainlog.1.gz
                 mm8d-override.1.gz
                 mm8d-startdaemon.1.gz
```

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```
mm8d-stopdaemon.1.gz
                 mm8d-updatestartpage.1.gz
                 mm8d-viewlog.1.gz
                 footer_??.html
                 header_??.html
var
     -local
          -lib
               -mm8d
                    out1
                    out2
                    out3
                    out4
          -lock
           mm8d.lock
          -log
           mm8d-ch?.bak
                                             log files
           mm8d-ch?.log
                                             debug log
           debug-*.log
     -run
      mm8d.pid
     www
          -html
                diagrams
                    gasconcentrate-ch?.png
                    humidity-ch?.png
                    temperature-ch?.png
                pics
                ants.jpg
                gasconcentrate-empty.png
                humidity-empty.png
                szerafin.ico
                temperature-empty.png
                snapshots
                    camera-ch?.jpg
           styles.css
           index.html
```

When installing with package manager, the program is installed to /usr instead of /usr/local.

6. Setup

Both configuration shell programs will stop the running service of MM8D, then open the editor and then start them after closing.

To set the program:

```
user@locahost$ mm8d-editmainconf

To set the environmental characteristics:

user@locahost$ mm8d-editenvirconf
```

7. Using the device

The device operates automatically after installation and setup and does not require any human

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intervention. The status of the growing site can be checked with a web browser, and settings can be made by logging via LAN with SSH client.

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9. 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 are: mm8d-sw-0.1-armhf.tar.gz and mm8d-sw-0.1-i386.tar.gz.

Content of package - only important files:



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10. Screenshots

```
MM8D-EditMainConf v0.1 * Page 4/10: IP address of controllers
  MM6D on channel #1:
                       192.168.1.11
  MM6D on channel #2:
                      192.168.1.12
  MM6D on channel #3:
                       192.168.1.13
  MM6D on channel #4:
                       192.168.1.14
  MM6D on channel #5:
                       192.168.1.15
  MM6D on channel #6: 192.168.1.16
  MM6D on channel #7: 192.168.1.17
  MM6D on channel #8: 192.168.1.18
  MM7D on channel #1: 192.168.1.21
  MM7D on channel #2:
                      192.168.1.22
  MM7D on channel #3:
                       192.168.1.23
  MM7D on channel #4: 192.168.1.24
  MM7D on channel #5: 192.168.1.25
  MM7D on channel #6: 192.168.1.26
  MM7D on channel #7: 192.168.1.27
  MM7D on channel #8: 192.168.1.28
Tab/Up/Down move Enter edit Home/PgUp/PgDn/End paging Esc exit
```

Figure 2: mm8d-editmainconf

```
MM8D-EditEnvirConf v0.1 * Page 6/9: Growing mushroom - heating
                                             7°C
  Minimal temperature:
                                            10 °C
  Heating switch-on temperature:
                                            15°C
  Heating switch-off temperature:
  Maximal temperature:
                                            25°C
  Disable heater (0/1):
   0.00...0.59 0
                     12.00..12.59 0
   1.00...1.59 0
                     13.00..13.59 0
   2.00...2.59 0
                     14.00..14.59 0
   3.00...3.59 0
                     15.00..15.59 0
   4.00...4.59 0
                     16.00..16.59 0
    5.00...5.59 0
                     17.00..17.59 0
   6.00...6.59 0
                     18.00..18.59 0
   7.00...7.59 0
                     19.00..19.59 0
   8.00...8.59 0
                     20.00..20.59 0
   9.00...9.59 0
                     21.00..21.59 0
  10.00..10.59 0
                     22.00..22.59 0
   11.00..11.59 0
                    23.00..23.59 0
Tab/Up/Down move Enter edit Home/PgUp/PgDn/End paging Esc exit
```

Figure 3: mm8d-editenvirconf

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```
MM8D-Override v0.1 * Override output status

Output #1 - lamp: neutral
Output #2 - ventilator: neutral
Output #3 - heater: neutral

Up/Down move Enter edit Esc exit
```

Figure 4: mm8d-override

```
MM8D hardware test utility * (C)2020-2021 Pozsar Zsolt
 * load configuration: /usr/local/etc/mm8d/mm8d.ini...
 * setting ports...
 * What do you like?
    1: Check I1-4 inputs
    2: Check R01-4 relay contact outputs 3: Check L01-4 open collector outputs
    q: Quit
 * Check R01-4 relay contact outputs
   used lines of LPT port:
     LPT #1
     R01: D0
     R02: D1
     R03: D2
     R04: D3
   Press ^C to stop!
°C
 * What do you like?
    1: Check I1-4 inputs
    2: Check R01-4 relay contact outputs
    3: Check LO1-4 open collector outputs
    q: Quit
```

Figure 5: mm8d-hwtest.py

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II/b. MM8DTiny

1. General description

A minimalist version of the driver that does not run as a service in the background. It does not have a web interface (remote monitoring capability), logging, configuration and environment parameter editor, hardware testing program, and other extra features. Use only as a backup program or to check the operation of the system.

2. Installation

The program does not require installation other than unpacking the package.

3. Setup

Before use, edit the mm8dty.ini main configuration file and the ini files in the channels directory (environment parameters). If you are using it on DOS, edit the wattcp.cfg configuration file that is required for a network connection.

4. Using the device

The device operates automatically does not require any human intervention.

5. Check operation

Its operation can be tracked on the console.

6. Terms of use

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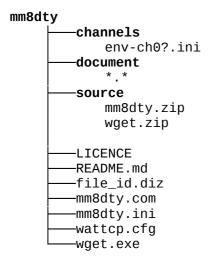
7. Downloadable software packages

The software package in .tar.gz and .zip format compressed files can be downloaded from the manufacturer's website or Github. (Refer to Chapter III for references.)

DOS version:

Name of package is *mm8dty0.1.zip*.

Content of package - only important files:



environmental parameters
configuration files
documentation
documentation
source code
source code
source code of wget.exe

terms of use
short description
shorter description
program file
main configuration files
Waterloo TCP/IP settings
GNU Wget program

Linux version:

Name of package is *mm8dtiny-0.1-i386.tar.qz*.

Content of package - only important files:

```
mm8dtiny

channels
env-ch0?.ini
document
*.*
-source
mm8dty.zip
wget.zip

LICENCE
-README.md
-mm8dty
-mm8dty
-mm8dty
-mm8dty
-mm8dty
-mm8dty
-mm8dty
-mm8dty.ini
-start
-wget
```

environmental parameters
configuration files
documentation
documentation
source code
source code of wget

terms of use
short description
program file
main configuration files
"start with sudo" script
GNU Wget program

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8. Screenshots

```
MM8DTiny v0.1 * Central remote controlling device
Copyright (C) 2021 Pozsar Zsolt <pozsar.zsolt@szerafingomba.hu>
Web: http://www.szerafingomba.hu/equipments/
INITIALIZING CONTROLLER PROGRAM...
Load main settings...completed.
  Interface port: LPT1
 Enabled channel(s): #1 #2
 IP address of MM6D device on CH #1: 192.168.1.11
 IP address of MM7D device on CH #1: 192.168.1.11
 IP address of MM6D device on CH #2: 192.168.1.12
 IP address of MM7D device on CH #2: 192.168.1.12
 Checking remote devices...
  Version of MM6D device on CH # 1: v0.3
 Version of MM6D device on CH # 2: v0.3
 Version of MM7D device on CH # 1: v0.3
 Version of MM7D device on CH # 2: v0.3
 Load environment parameters...completed.
 Reset local ports...completed.
Set MM7D to auto mode on CH #1...completed.
* Set MM7D to auto mode on CH #2...completed.
STARTING PROCESSING LOOP...
* * * Begin of processing loop * * *
 Read data from local port...completed.
* Analise data...
```

Figure 6: mm8dty.exe

```
Get parameters of air from MM7D on CH #2...completed.
Analise data...
CH #1:
                               19 °C
  temperature:
  relative humidity:
                               68
  relative gas concentrate:
  operation mode:
                               growing mushroom
Relative humidity is too low!
  heaters:
                               OFF
                               ON
  lamps:
  ventilators:
                               0FF
CH #2:
  temperature:
                               18°C
  relative humidity:
                               58
  relative gas concentrate:
                               1
  operation mode:
                               growing mushroom
Relative humidity is too low!
  heaters:
  lamps:
                               ON
  ventilators:
                               0FF
* * End of processing loop * * *
```

Figure 7: mm8dty.exe

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III. Related links

Titles:	MM8D Central controlling device	Rev.:	210326	Pages:	21/28
	Technical manual				
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1. Hardware

Full package http://www.szerafingomba.hu/equipments/mm8d/mm8d-hw-210326-1.0.tar.gz

Download from Github http://github.com/pozsarzs/mm8d-hw.git

Technical manual http://www.szerafingomba.hu/equipments/mm8d/technical-manual-210326-0.1-1.0-en.pdf

Schematic and PCB draws (PDF):

Schematics http://www.szerafingomba.hu/equipments/mm8d/sch_mm8d.pdf

PCB solder side http://www.szerafingomba.hu/equipments/mm8d/pcb_mm8d-sold.pdf
PCB component side http://www.szerafingomba.hu/equipments/mm8d/pcb_mm8d-comp.pdf

PCB silkscreen http://www.szerafingomba.hu/equipments/mm8d/pcb_mm8d-silk.pdf

2. Software

Normal version:

for Raspberry Pi http://www.szerafingomba.hu/softwares/mm8d/mm8d-sw-0.1-armhf.tar.gz

for PC http://www.szerafingomba.hu/softwares/mm8d/mm8d-sw-0.1-i386.tar.gz

Download from Github http://github.com/pozsarzs/mm8d-sw.git

Tiny version:

for DOS http://www.szerafingomba.hu/softwares/mm8d/mm8dty01.zip

for Linux http://www.szerafingomba.hu/softwares/mm8d/mm8dtiny-0.1-i386.tar.gz

Download from Github http://github.com/pozsarzs/mm8dtiny.git

3. Terms of use

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EUPL v1.2 https://eupl.eu/1.2/en/

GNU GPL v3.0 https://www.gnu.org/licenses/gpl-3.0.html

4. Developer and manufacturer

Homepage https://www.szerafingomba.hu

E-mail <u>info@szerafingomba.hu</u>

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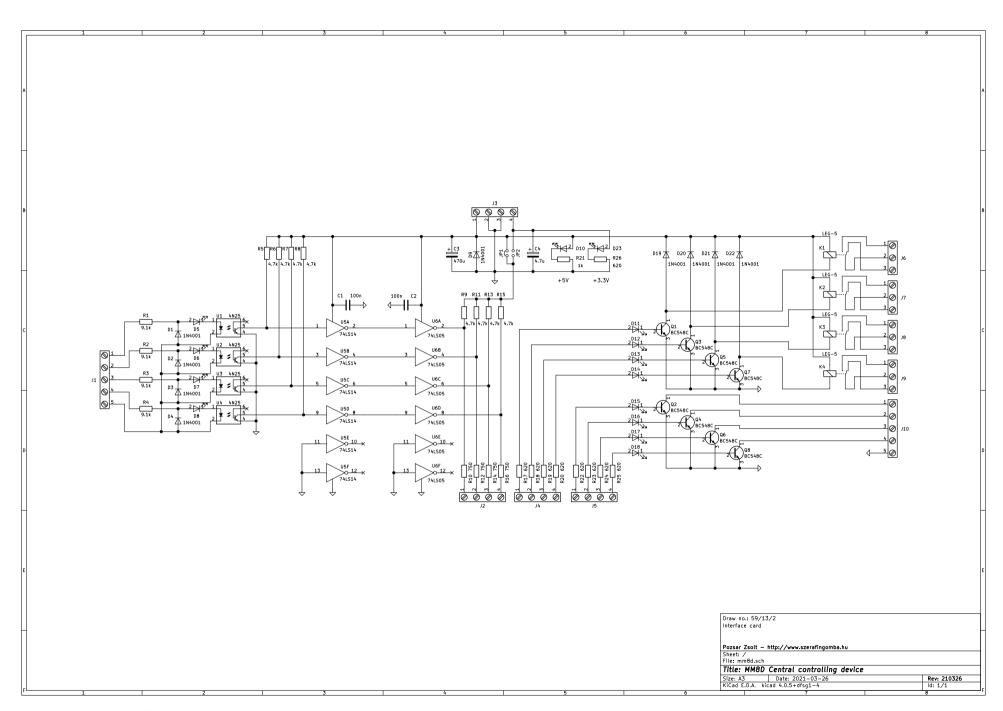
IV. Annexes

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Content

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- 2. PCB solder side
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Annex 1: Schematic of printed circuit board

