Domotica with ESP32 mesh network

8 digital inputs
8 digital outputs
clock synchronized with NTP server
fully operable via web page
outputs can be controlled via:
- day
- time
- input
- a combination of these 3
- manually

network is built automatically, modules can be added or removed
network rebuilds itself.
Check every minute whether all modules are still connected

Status of the various inputs and outputs clearly visible as well as the clock.
Each input or output has 4 options to be displayed,

* not active	not highlighted
* active not controlled (0)	green
* active controlled(1)	red
* active but no feedback of module with this number	yellow

these colors are identical for the web page

uitgangen

		dag	aan	uit	in	M
0	uitgang 0	8	24:00	24:00	0	☐
1	uitgang 1	8	24:00	24:00	1	☐
2	uitgang 2	8	24:00	24:00	0	☐
3	uitgang 3	8	24:00	24:00	1	☐
4	uitgang 4	8	12:30	14:40	0	☐
5	uitgang 5	8	24:00	24:00	x	☐
6	uitgang 6	8	24:00	24:00	x	☐
7	uitgang 7	8	24:00	24:00	x	☐

ingangen

0	ingang 0
1	ingang 1
2	ingang 2
3	ingang 3
4	ingang 4
5	ingang 5
6	ingang 6
7	ingang 7

klok instellen

thieu-b55 februari 2023

Some useful addresses

ESP32 and Arduino IDE :
https://randomnerdtutorials.com/installing-the-esp32-board-in-arduino-ide-windows-instructions/

ESP32 mesh / How to install painlessMesh Library :
https://randomnerdtutorials.com/esp-mesh-esp32-esp8266-painlessmesh/#more-100202

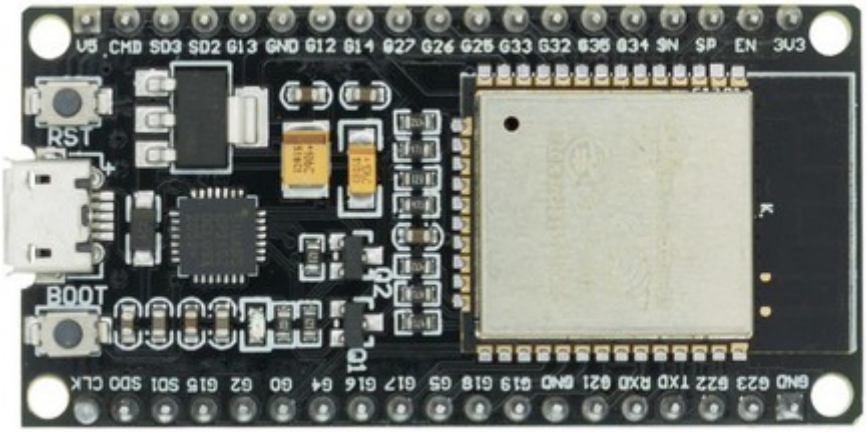
ESP32 mesh :
https://docs.espressif.com/projects/esp-idf/en/stable/esp32/api-guides/esp-wifi-mesh.html

this project on github :
https://github.com/thieu-b55/Easy-esp32-domotica-with-esp32-mesh

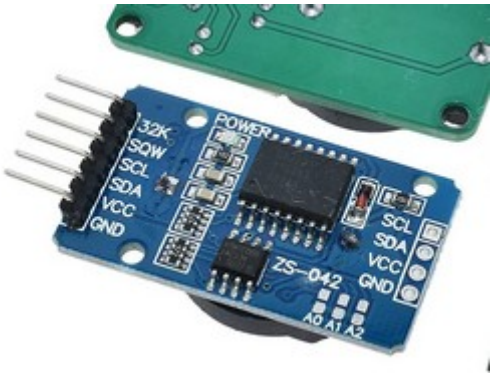
ESP32 domotica

Main module parts

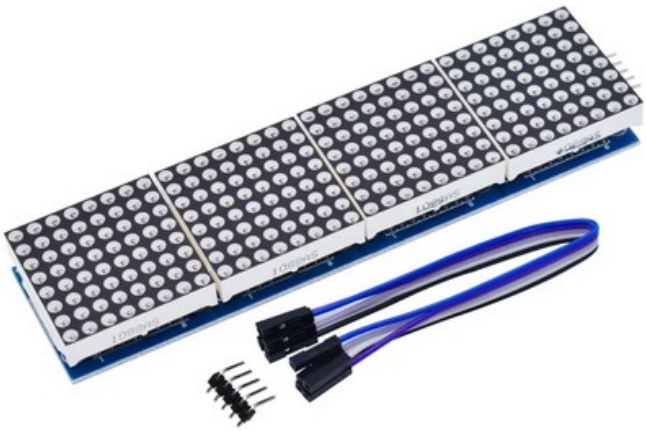
2 x ESP32 Devkit (ESP32 module cannot be part of a mesh network and web server at the same time).



1x DS3231 clockmodule **with SQW output**



1 x MAX7219 led display

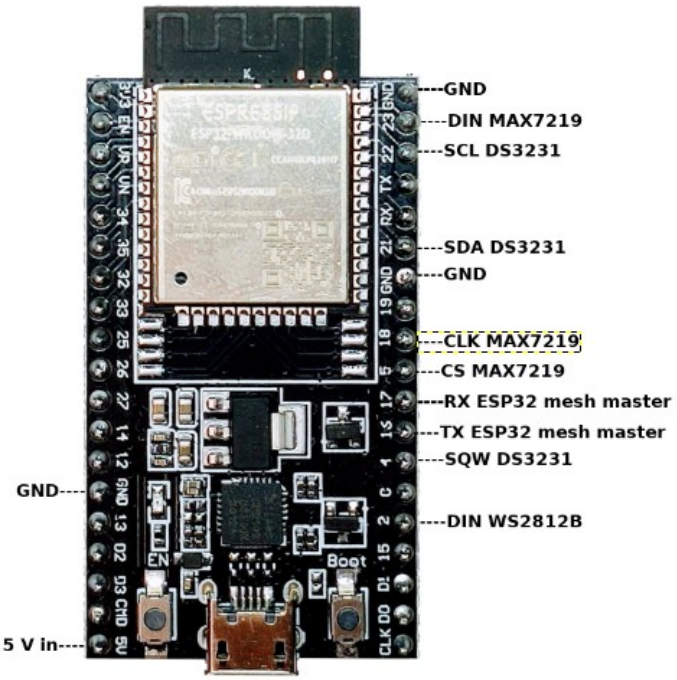


Ledstrip 16 leds WS2812B

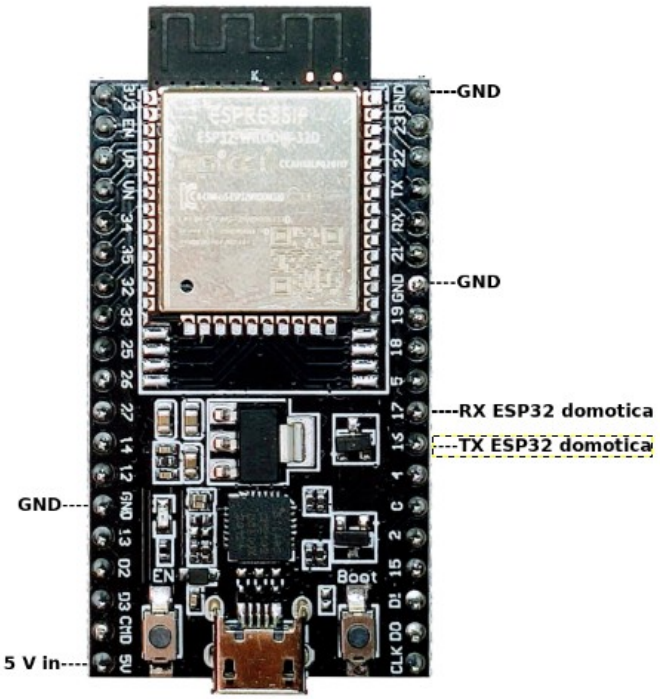
led 0 – 7	output	led 0 = output 0	led 7 = output 7
led 8 – 15	input	led 8 = input 0	led 15 = input 7

The ESP32 home automation module consists of 2 ESP32 devkit modules which are connected to each other via the serial port.
An ESP32 cannot be a web server and mesh node at the same time.

Connections ESP32_domotica



Connections ESP32_domotica_mesh_master



1 ESP32 Devkit is required for each of the input or output modules

ESP32 domotica input

U

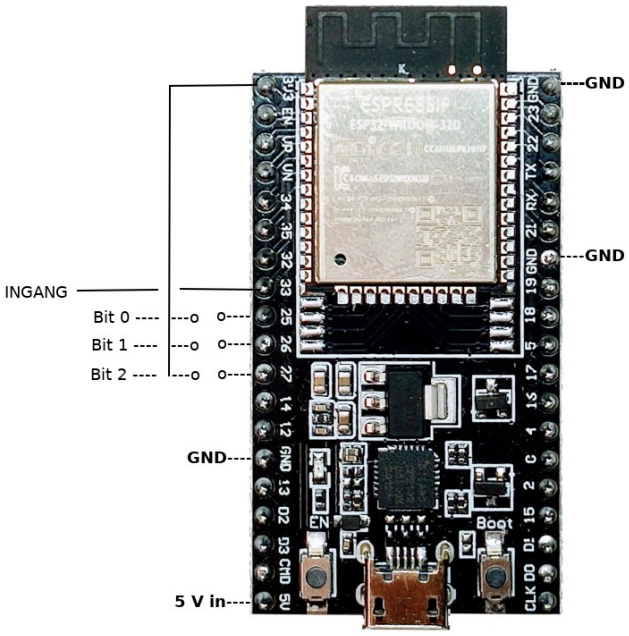
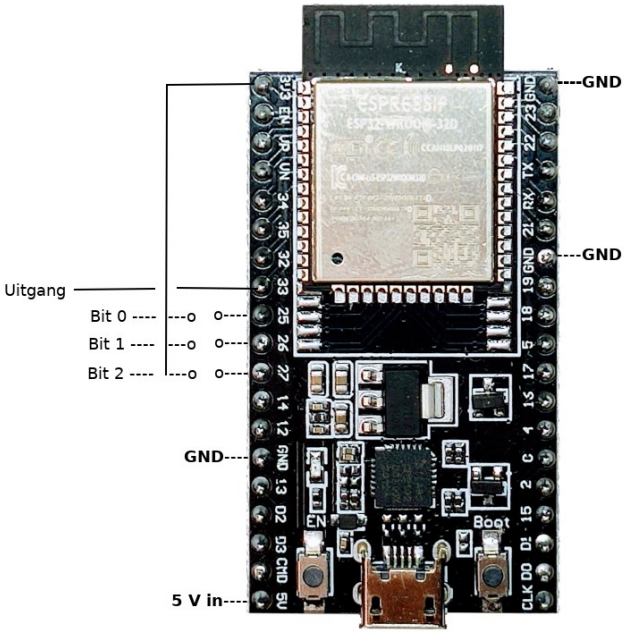


Foto ingang met optocoupler

ESP32 domotica output



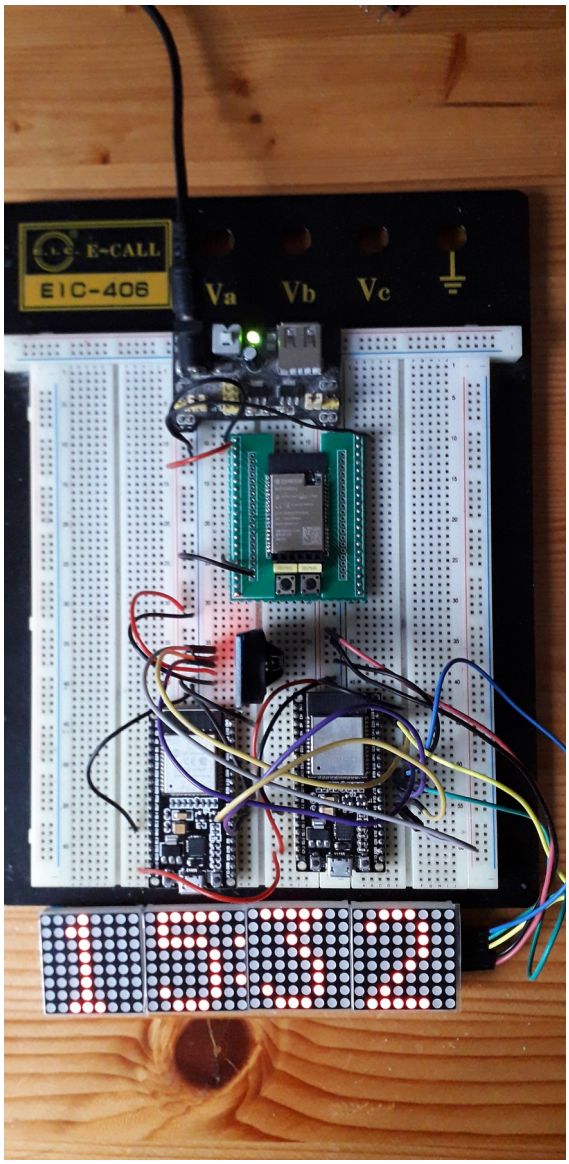
Addressing the modules is done by connecting Bit 0, Bit 1 and Bit 2 to the 3.3V or not

Address	Bit 2	Bit 1	Bit 0
0	0	0	0
1	0	0	1
2	0	1	0
3	0	1	1
4	1	0	0
5	1	0	1
6	1	1	0
7	1	1	1

Each input module must have a unique address 0-7
Each output module must have a unique address 0-7

Foto’s relais FET Triac

ESP32 domotica
ESP32 domotica mesh master
DS3231
MAX7219
together on a breadboard (only the bottom 2 modules)



Built together in one housing

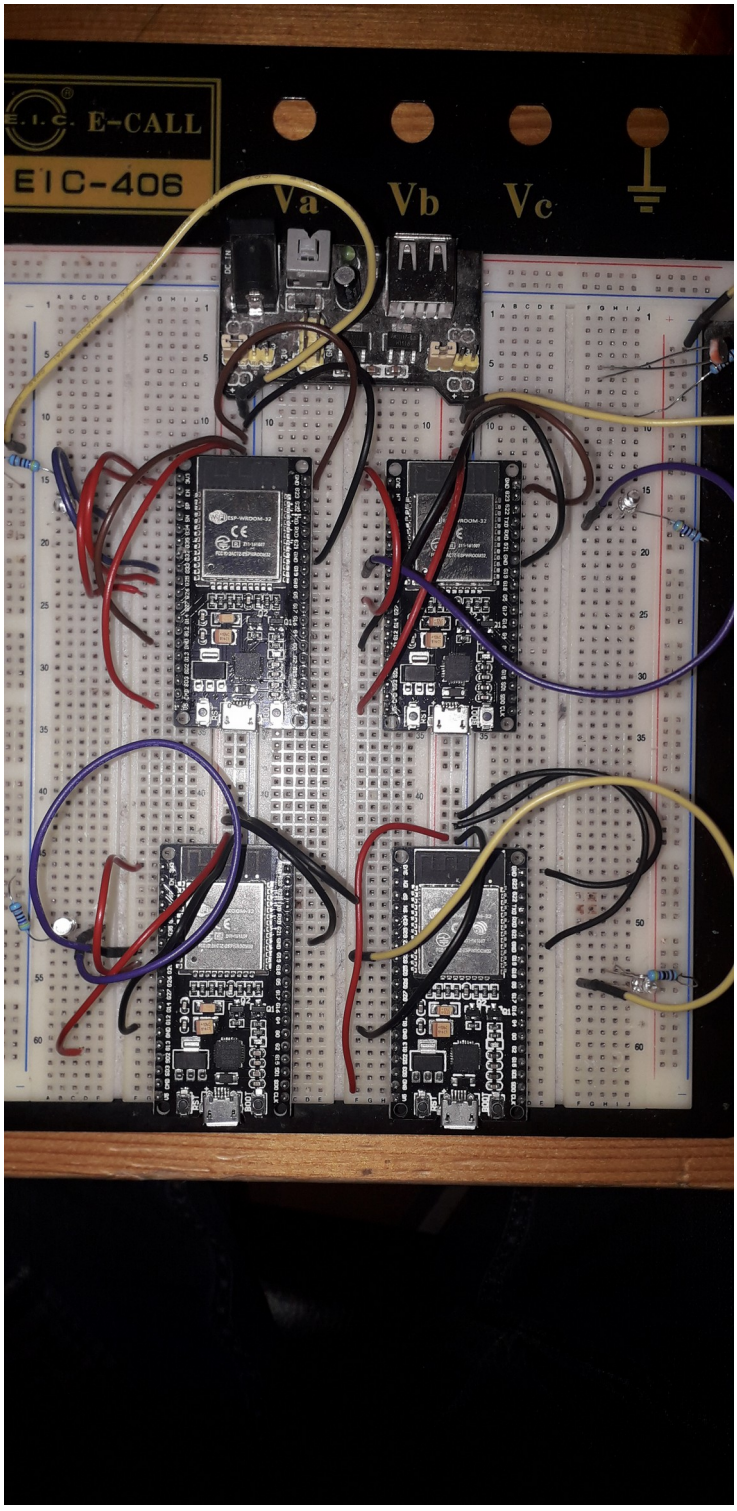
Top 8 LEDs show the status of the input modules
Bottom 8 LEDs show the status of the output modules

There are 4 options for both inputs and outputs

no light	input or output not active
yellow	Input or output is active but no feedback from a module with this adress
green	module active and input / output 0
red	module active and input / output 1

more explanation on active not active later in this manual.

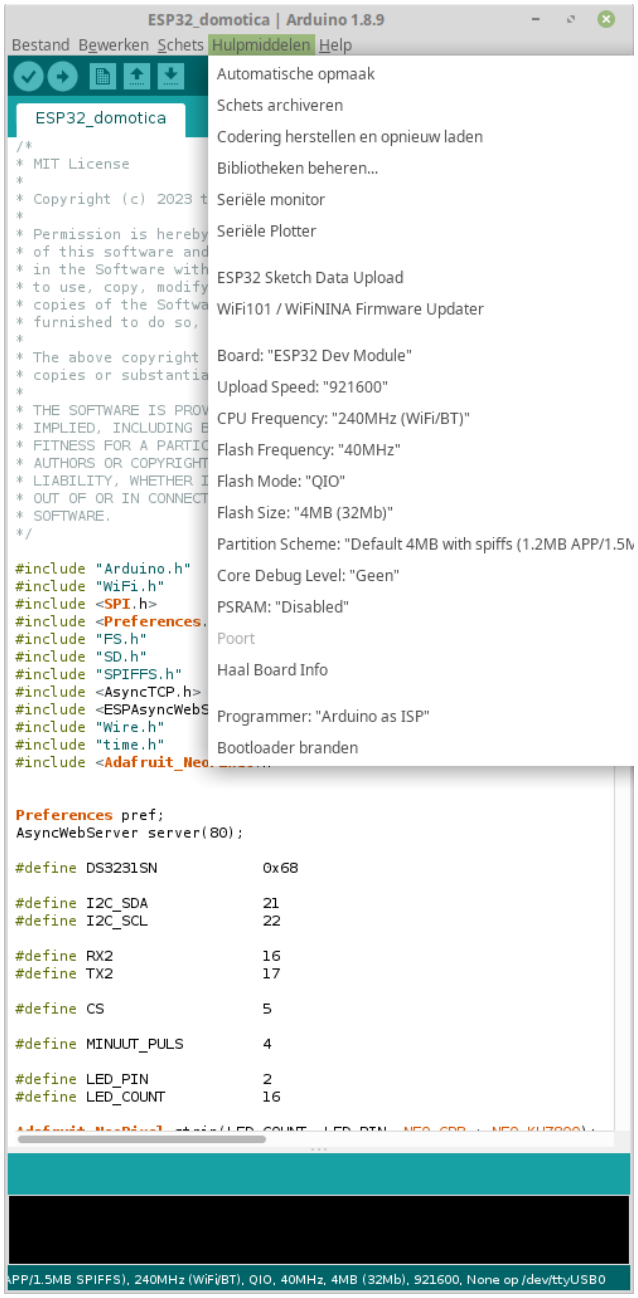
3 output modules
1 input module
on breadboard



After building, programming

This project on github :
https://github.com/thieu-b55/Easy-esp32-domotica-with-esp32-mesh

Open the program ESP32_domotica.ino with the Arduino IDE and use the following settings



Program the ESP32_domotica ESP32

Open the program ESP32_domotica_mesh_master.ino in the Arduino IDE

```
#define   MESH_PREFIX     "ESP32"
#define   MESH_PASSWORD   "ESP32_pswd"
#define   MESH_PORT       6666
```

The above data can be changed, but all modules of this network must have the same data

Use the following settings

Program the ESP32_domotica_mesh_master ESP32

Open the program ESP32_domotica_ingang.ino in the Arduino IDE

```
#define   MESH_PREFIX     "ESP32"
#define   MESH_PASSWORD   "ESP32_pswd"
#define   MESH_PORT       6666
```

The above data can be changed, but all modules of this network must have the same data

Use the following settings

Choose the desired address using GPIO25; GPIO26 and GPIO27, address is only read during startup.

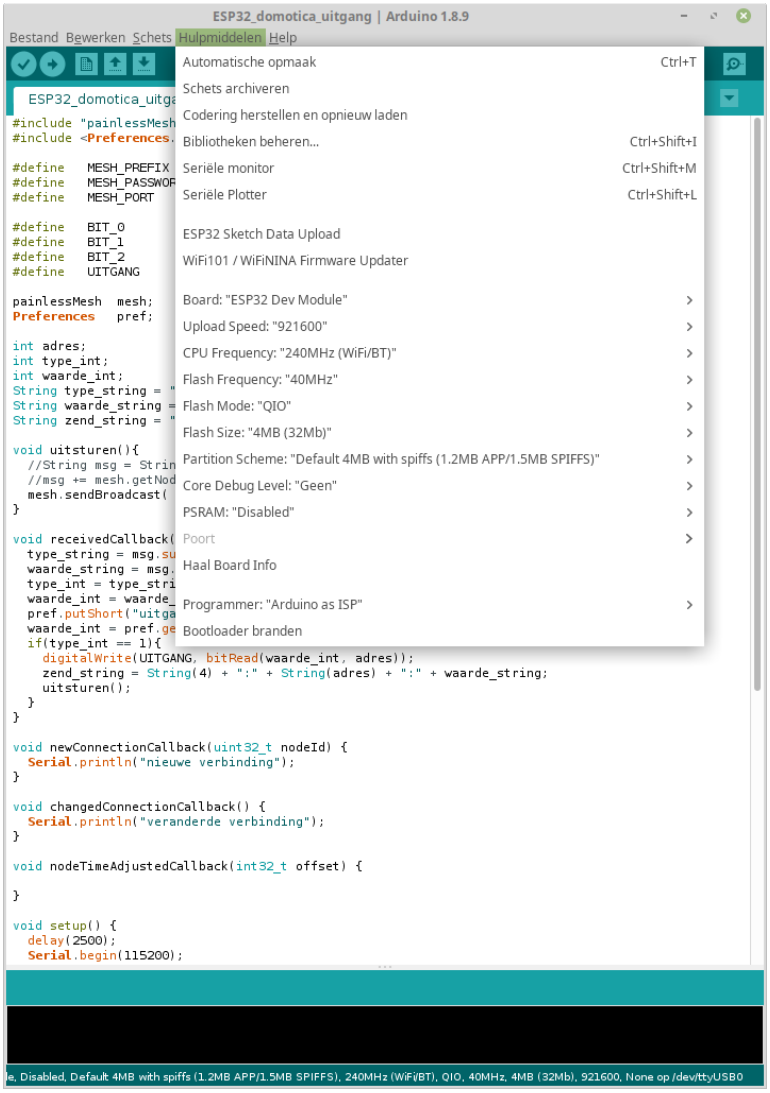
Program the ESP32_home automation_input ESP32

Open the program ESP32_domotica_output.ino in the Arduino IDE

```
#define   MESH_PREFIX     "ESP32"
#define   MESH_PASSWORD   "ESP32_pswd"
#define   MESH_PORT       6666
```

The above data can be changed, but all modules of this network must have the same data

Use the following settings



Choose the desired address using GPIO25, GPIO26 and GPIO27, address is only read during startup.

Program the ESP32_domotica_output ESP32

When using for the first time, the network data must first be entered.
Connect to

Network: **ESP32rc**
Password: **ESP32pswd**

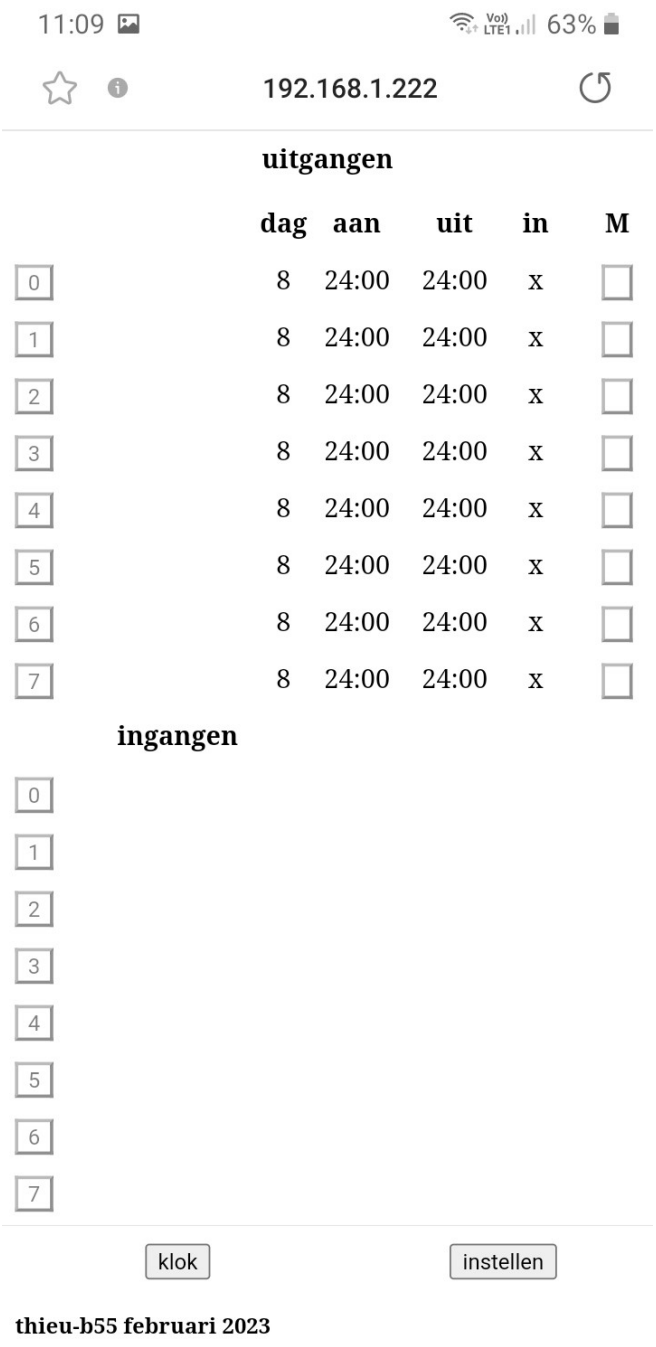
Open the web page at 192.168.4.1

Enter the details of the WiFi network, if desired the IP address can also be changed, is set to 192.168.1.122

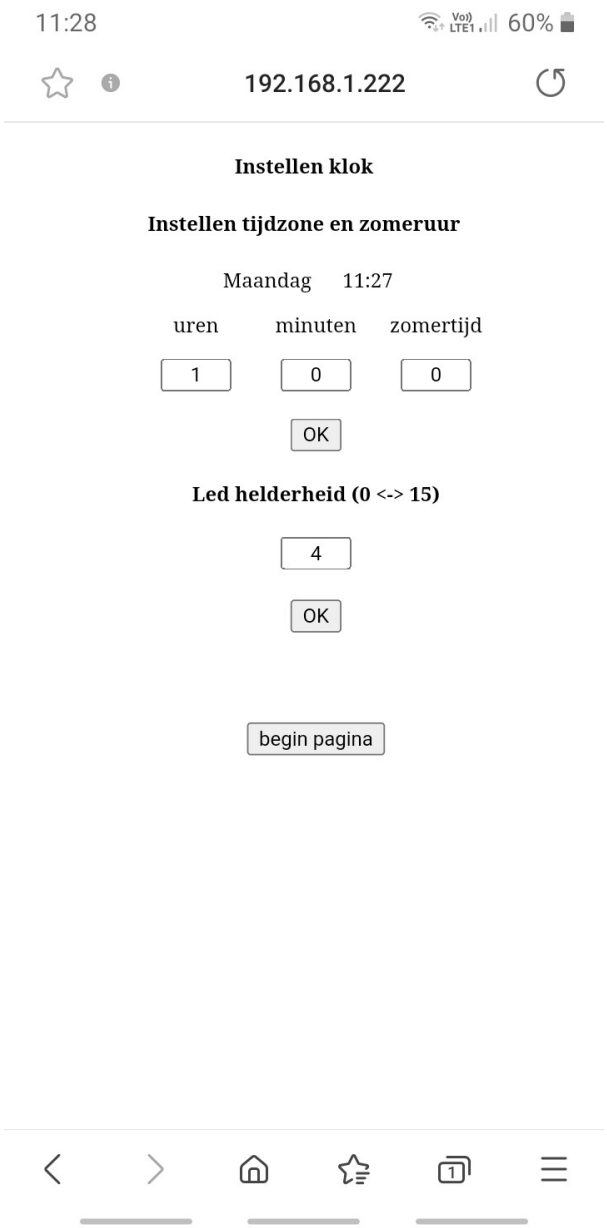
Press <Bevestig> ESP32 restarts after 5 seconds.

Network ESP32rc no longer available, go to the WiFi network and go to 192.168.1.122 or to the IP address of your choice

Startup screen



Press <klok>



uren : time difference in hours between local time and UTC time (+ / –)
minuten : time difference in minutes (30 or 0) between local time and UTC (no negative)
zomertijd : 1 if now summer time otherwise 0

Press <OK> to adjust time.

Led helderheid :0 – 15 brightness of the MAX7219
Press <OK> to adjust

Press <begin pagina>

Press <instellen>


11:17
63%
192.168.1.222
Instellen domotica
Instellen uitgangen
-
1
+
Label
Dag
Aan
Uit
In
uitgang 1
8
24:00
24:00
x
Dagelijks
Bevestig
Instellen ingangen
-
0
+
Label
ingang 0
Bevestig
begin pagina

Set outputs
select the desired output with < – > and < + >

Label : if desired name for the output (max 10 characters)

When should an output switch:

Dag : 1 Monday
2 Tuesday
3 Wednesday
4 Thursday
5 Friday
6 Saturday
7 Sunday
8 daily
9 weekdays
10 weekend

Aan : time to switch output to <1>
24:00 time switch off service

Uit : time to switch output to <0>
if Aan = 24:00 off duty

In : desired input that must be <1> before output can be <1>
x no check on input

Press <Bevestig>

Do this for all desired outputs

Same for the inputs
select the desired input with < – > and < + >
Label : if desired name for the input (max 10 characters)

Press <Bevestig>

When everything is filled in press <begin pagina>

The software checks every minute for the available inputs and outputs, at startup or when changing the configuration it can take a few minutes before all modules are found.

Colors and their meaning are identical for the LED strip and the web page

Example of the home page with a configuration with 5 active inputs and 1 active input

active >> **output** can be controlled
input the state of the input is taken into account

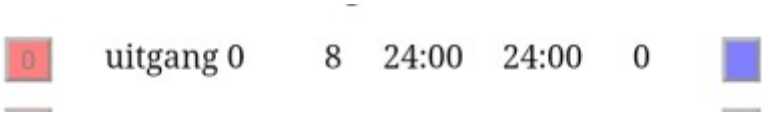
not active >> **output** cannot be sent
input a <1> of the input is not taken into account

An output / input is switched active or inactive by pressing the desired number of the output / input

an inactive output / input has the background color for the LED strip <off>

active	yellow	output / input is active but no feedback from a module with this address (yet).
	green	module has reported and the output / input is <0>
	red	module has reported and the output / input is <1>

When does an output switch



Here output 0 <1>
output is active
and is switched manually
manually pressing the last box

blue >> output manually on <1> (if active)

Here output 1 <1>

output	active
day = 8	daily
on = 24:00	time off
in = x	no input specified

output 3 <1>
active
day = 8
time = 24:00
in = input 1
input 1 <1> red

output = 1 if :
active **and** day **and** aan **and not** uit **and** in
or
active **and** manual