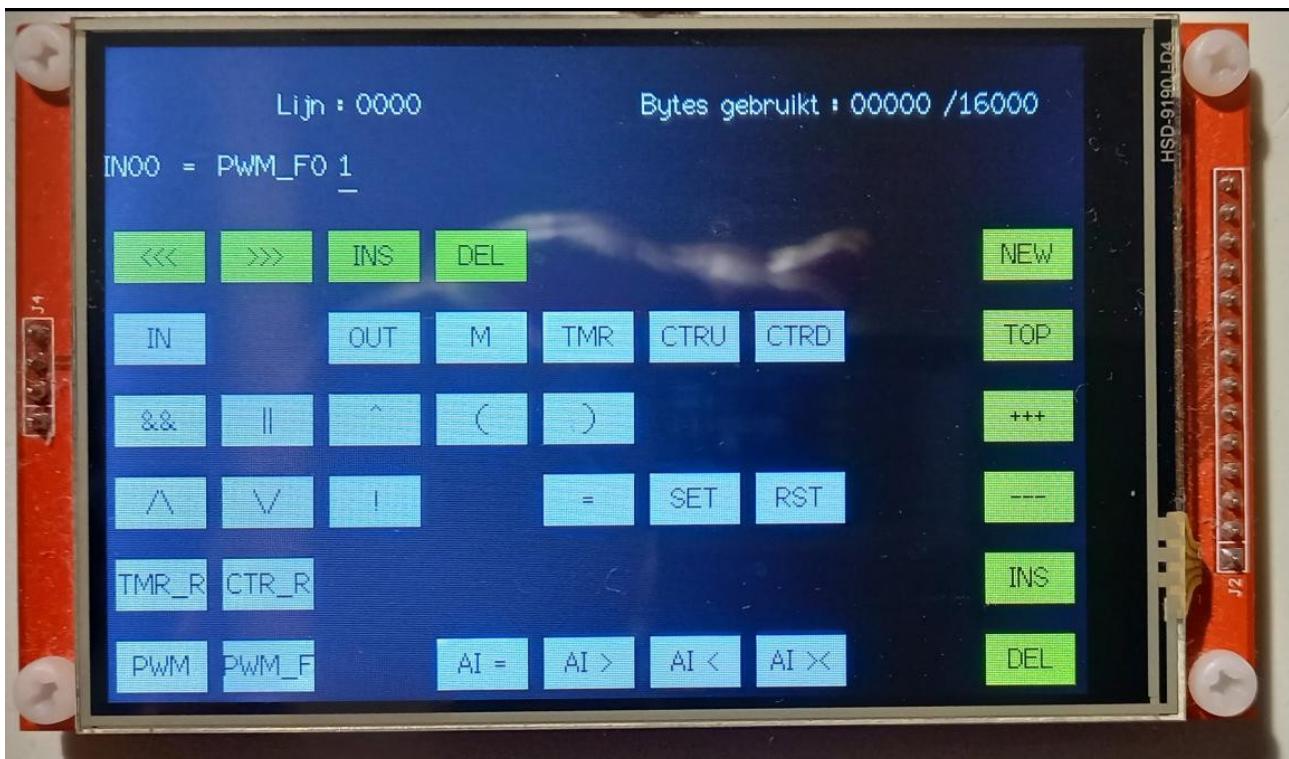
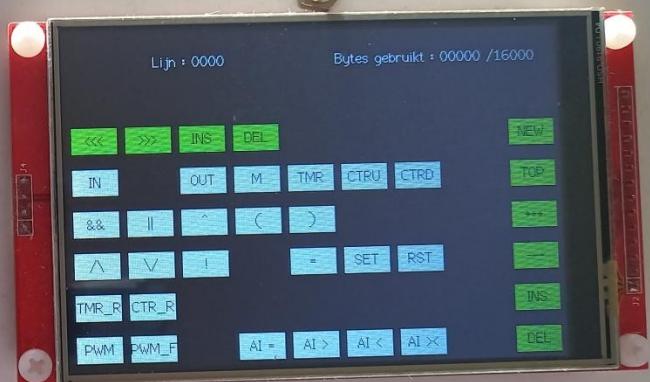
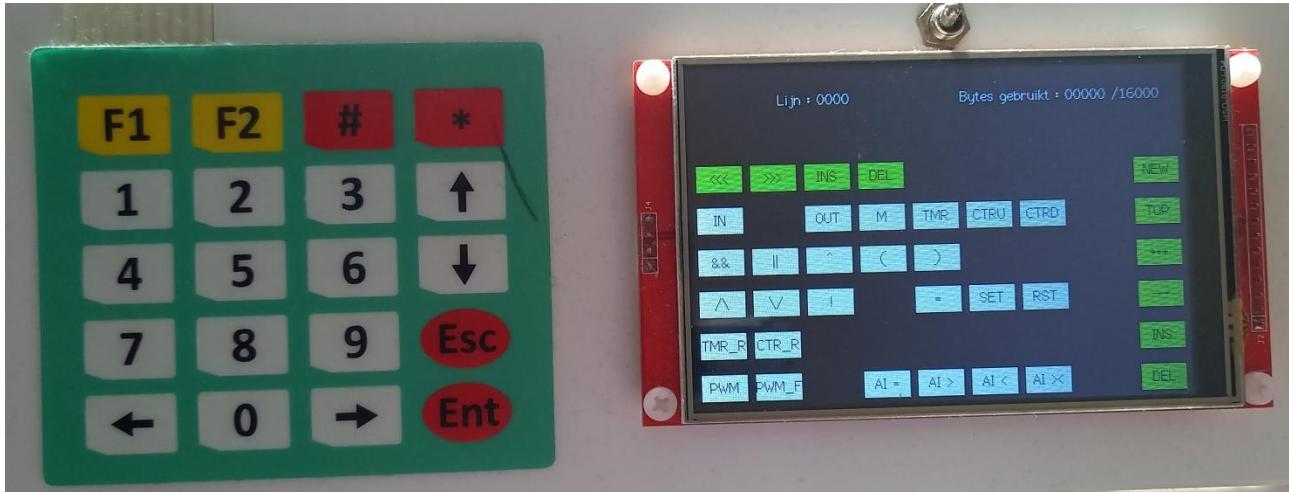


STM 32 mini PLC



Features :

STM32F407VGT6 Discovery board

Easy to program

Ideal for model building or other hobby automation applications

Cheap

16 digital inputs

16 digital outputs

can be expanded to:

64 digital inputs

64 digital outputs

4 analog inputs

possible comparisons

AI = equal to

AI > greater than

AI < less than

AI >< greater than and less than

4 PWM outputs (hardware PWMs do not take up processor time)

frequency can be set per PWM

PWM outputs can be controlled by an analog input, for example to control a speed control by a potentiometer.

Use the PWM_F command for this.

64 internal markers

64 internal counters

counter_up input

counter_down input

counter_reset input

counter_up output 1 if count value reached

counter_down output 1 if count value 0

64 internal timers

timer input

timer_reset input

timer_output 1 if set time reached

adjustable between 0.1 second and 99:59:59:90

TMR56 to TMR63 continuous timers

deliver square wave of the set time if input 1

Due to limited screen size, only programmable with Arduino notation

&&	AND
	OR
^	XOR
!	NOT
(
)	
\	RISING EDGE
/	FALLING EDGE
=	
SET	
RST	

Cycle time adjustable between 10 milliseconds and 100 milliseconds (hardware timer interrupt)

To keep the Timer seconds equal to real seconds set to:

10 milliseconds
20 milliseconds
25 milliseconds
50 milliseconds
100 milliseconds

Program can be stored in the FLASH memory of the STM32F407.

16000 bytes of free programmable memory

Maximum 1000 lines.

The number of lines and the cycle time is determined by the number of bytes per line.

Each program line can be maximum 20 bytes long (screen size and RAM storage capacity limitation)

with maximum use of bytes in each line the maximum number of lines is 800.

bytes per instruction

1 byte
&& || ^ != SET RST () \ /

2 bytes
INxx OUTxx Mxx TMRxx CTRUxx CTRDxx TMR_Rxx CTR_Rxx

3 bytes

AI = x %%%	AI nummer	instel percentage
AI > x %%%	AI nummer	instel percentage
AI < x %%%	AI nummer	instel percentage
PWM x %% %	PWM nummer	procent uitsturing
PWM_F x x	PWM_F nummer	nummer van analoge ingang die PWMx stuurt

4 bytes
AI >< x %%% %%% AI nummer instel percentage > instel percentage <

Cycle time required depends on the number of selected inputs/outputs and program length

Time required for 16 inputs/outputs without program
331 microseconds

Time required for 64 inputs/outputs without program
659 microseconds

Average time per instruction
1.5 microseconds

For full use of the program space with 64 inputs/outputs, 50 milliseconds should be more than enough.

659 microseconds + (16000 instructions * 1.5 microseconds) = 24659 microseconds.

Analog and digital inputs are read in at the beginning of the program

Digital outputs and PWMs are calculated during the program run but written to the outputs at the end of the program.

Program line processing without brackets is done from left to right.

Program line processing with brackets, first all logic within the brackets from left to right until all brackets are processed and then the entire line from left to right.

Automatic start of the program if saved in FLASH and prog/run switch on run when power is turned on.

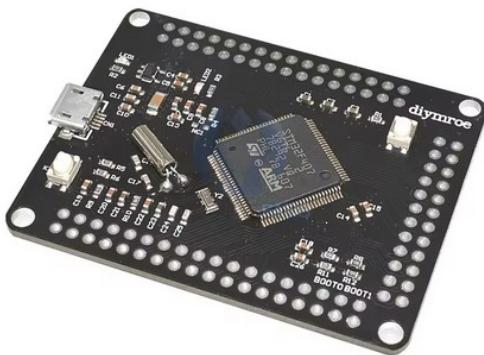
a program example

```
0000 IN 0 = OUT 0
0001 IN 0 = TMR 56
0002 TMR 56 = OUT 1
0003 IN 0 && ! TMR 56 = OUT 2
0004 TMR 56 = CTRU 0
0005 CTRU 0 && TMR 56 = CTRU 1
0006 CTRU 0 = OUT 3
0007 CTRU 1 = OUT 4
0008 ^ CTRU 1 = CTR_R 0
0009 ^ CTRU 0 = CTR_R 1
0010 AI >< 0 10 50 = OUT 5
0011 IN 0 = PWM_F 0 0
0012 AI > 0 25 = PWM 1 25
0013 ! OUT 6 = OUT 6
```

Parts

1 x STM32F407VGT6 Discoveryboard

https://nl.aliexpress.com/item/32757449543.html?pdp_npi=4%40dis%21EUR%21%E2%82%AC%2011%2C00%21%E2%82%AC%207%2C59%21%21%2111.07%217.64%21%40211b80e117391834555678607ed237%2161939415252%21sh%21BE%21924161374%21X&spm=a2g0o.store_pc_allItems_or_groupList.new_all_items_2007507701964.32757449543&gatewayAdapt=glo2nld



€7.59 €11.00 31% korting

Groothandel | Meer dan 3 stuks, 1% extra korting off
Prijs is inclusief btw

€0.99 off over €38.76 >

STM32F4 Discovery STM32F407VGT6 Arm Cortex-M4 32bit Mcu Core Development Board Spi I2C Iic Uart Isc Sdio Interface Module

★★★★★ 5.0 4 Recensies | 35 verkocht

Meer prijsinformatie ⓘ

1 x TFT 4.0" with touch

https://nl.aliexpress.com/item/33015586094.html?pdp_npi=4%40dis%21EUR%21%E2%82%AC%204%2C10%21%E2%82%AC%203%2C08%21%21%214.13%213.10%21%40211b80e117391832257753223ed237%2112000026583382486%21sh%21BE%21924161374%21X&spm=a2g0o.store_pc_allItems_or_groupList.new_all_items_2007585585678.33015586094&gatewayAdapt=glo2nld

Buying

€14.90 €19.87 25% korting

Prijs is inclusief btw

€0.99 off over €20.87 >

1.44 1.8 2.0 2.2 2.4 2.8 3.2 3.5 4.0 inch SPI TFT LCD-scherm Kleurrijke Touch Display Module ILI9341 ILI9488 480*320 240*320 Drive

★★★★★ 4.9 79 Recensies | 487 verkocht

Kleur: 4.0 inch with touch

1.44 inch no touch

1.8 inch no touch

2.2 inch no touch

2.4 inch no touch

2.4 inch with touch

2.8 inch no touch

2.8 inch with touch

3.2 inch no touch

3.2 inch wth touch

3.5 inch no touch

4.0 inch with touch

4.0 inch no touch

1 x keyboard

https://nl.aliexpress.com/item/1005006003827538.html?spm=a2g0o.productlist.main.19.186e6507ePonWY&algo_pvid=17155b4b-7689-462b-8714-781293fa734f&algo_exp_id=17155b4b-7689-462b-8714-781293fa734f-9&pdp_ext_f=%7B%22order%22%3A%22163%22%2C%22eval%22%3A%221%22%7D&pdp_npi=4%40dis%21EUR%214.55%211.49%21%213.49%211.02%21%40211b612517391839046883591ebb9c%2112000035271891695%21sea%21BE%21924161374%21X&curPageLogUid=CuBLZAXDJYbI&utparam-url=scene%3Asearch%7Cquery_from%3A



€1.95 €5.91 67% korting

Prijs is inclusief btw Extra 2% korting

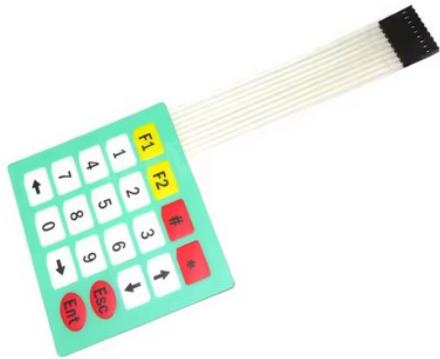
4 12 16 20 Sleutel 1*4*4*3 4*4 4*5 Membraan Schakelaar Toetsenbord 1X4 3X4 4X4 4X5 Matrix Matrix Toetsenbord Voor Arduino Slimme Auto

★★★★★ 4.8 18 Recensies | 163 verkocht

Kleur: 4x5



Meer prijsinformatie ⓘ



Good quality, Best service

1 x power supply 3.3V 1A

https://nl.aliexpress.com/item/4000010690717.html?pdp_npi=4%40dis%21EUR%21%E2%82%AC%203%2C17%21%E2%82%AC%203%2C17%21%21%213.19%213.19%21%40211b80e117391842098213682ed237%2110000000029017724%21sh%21BE%21924161374%21X&spm=a2g0o.store_pc_allItems_or_groupList.new_all_items_2007550430618.4000010690717&gatewayAdapt=glo2nld



€3.17

Elk €2.77, ≥ 10 stuks

Prijs is inclusief btw Extra 3% korting

€0.99 off over €23.85

HLK-PM01 HLK-PM03 HLK-PM12 AC-DC 220V naar 5 V/3.3 V/12 V mini voeding module, intelligente huishoudelijke schakelaar voeding module

★★★★★ 5.0 2 Recensies | 11 verkocht

Kleur: HLK-PM03



1 x fuse holder with fuse

https://nl.aliexpress.com/item/4000648795427.html?pdp_npi=4%40dis%21EUR%21%E2%82%AC%202%2C34%21%E2%82%AC%202%2C34%21%21%212.35%212.35%21%40211b80e117391840608967475ed237%2112000035593556380%21sh%21BE%21924161374%21X&spm=a2g0o.store_pc_allItems_or_groupList.new_all_items_2007586169297.4000648795427&gatewayAdapt=glo2nld



€2.46 / partij

Elk €1.40, ≥ 10 stuks

10stukken | Prijs is inclusief btw Extra 2% korting

€0.99 off over €19.88

>

10 Stuks BLX-A 5*20Mm Zwart Glas Zekering Houder 5*20 Verzekering Buis Fuseholder Voor 5X20Mm 5X20Mm 5X20 Zekering Printplaat

★★★★★ 4.9 82 Recensies | 900+ verkocht

Temperatuur: 1A

0.2A	0.25A	0.5A	1A	1.25A	1.5A	1.6A	2A
2.5A	3A	3.15A	4A	5A	6A	7A	8A
10A	15A	20A	25A	30A	No Fuse		

LED's (depending on number of inputs and outputs)

https://nl.aliexpress.com/item/1005003320296052.html?pdp_npi=4%40dis%21EUR%21%E2%82%AC%203%2C48%21%E2%82%AC%203%2C48%21%21%213.50%213.50%21%40211b80e117391836852806373ed237%2112000025195180423%21sh%21BE%21924161374%21X&spm=a2g0o.store_pc_allItems_or_groupList.new_all_items_2007601408665.1005003320296052&gatewayAdapt=glo2nld

€3.48

Elk €2.56, ≥ 10 stuks

Prijs is inclusief btw

100 stks 3mm LED Diode Ultra Helder Warm Wit Rood Groen Blauw UV Paars Geel Oranje Roze 2 V 3 V Veelkleurig Emitting Assortiment

★★★★★ 4.9 222 Recensies | 1.000+ verkocht

Kleur: 100pcs Green



Meer prijsinformatie ⓘ

Resistors (depending on the number of inputs and outputs)

[https://nl.aliexpress.com/item/1005003342360099.html?pdp_npi=4%40dis%21EUR%21%E2%82%AC%202%2C27%21%21%2116.71%2116.71%21%40211b80e117391837652238084ed237%2112000_025311533853%21sh%21BE%21924161374%21X&spm=a2g0o.store_pc_allItems_or_groupList.new_all_items_200758700997_1.1005003342360099&gatewayAdapt=glo2nld](https://nl.aliexpress.com/item/1005003342360099.html?pdp_npi=4%40dis%21EUR%21%E2%82%AC%202%2C27%21%E2%82%AC%202%2C27%21%21%2116.71%2116.71%21%40211b80e117391837652238084ed237%2112000_025311533853%21sh%21BE%21924161374%21X&spm=a2g0o.store_pc_allItems_or_groupList.new_all_items_200758700997_1.1005003342360099&gatewayAdapt=glo2nld)



€2.35 / partij

Elk €1.30, ≥ 10 stuks
100stukken | Prijs is inclusief btw Extra 1% korting

100 stks 1/8 W 1% Metaalfilmweerstand 0.125 W 1R-4.7 M 10R 22R 47R 100R 220R 470R 680R 1 K 3.3 K 4.7 K 10 K 22 K 47 K 220 K 680 K 1 M ohm

★★★★★ 4.7 339 Recensies | 500+ verkocht

Weerstand: 4.7K

1R	1.2R	1.5R	1.8R	2R	2.2R	2.4R	2.7R
3R	3.3R	3.6R	3.9R	4.3R	4.7R	5.1R	5.6R
6.2R	6.8R	7.5R	8.2R	9.1R	10R	12R	15R
18R	20R	22R	24R	27R	30R	33R	36R

1 x capacitor 2200uF / 16V

3.3V power supply

1 x resistor 1K

Backlight TFT

4 x resistor 10K

Analog input

1 x switch

https://nl.aliexpress.com/item/1005002470127465.html?spm=a2g0o.productlist.main.5.36b80rSi0rSiMt&algo_pvid=1018b843-9e58-4360-9bf5-48682d8a6ecb&algo_exp_id=1018b843-9e58-4360-9bf5-48682d8a6ecb-2&pdp_ext_f=%7B%22order%22%3A%221254%22%2C%22eval%22%3A%221%22%7D&pdp_npi=4%40dis%21EUR%211.56%210.98%21%21%211.57%210.99%21%40211b876717392161390216040ea283%211200020770603814%21sea%21BE%210%21ABX&curPageLogUid=MAmS7ToImaEZ&utparam-url=scene%3Asearch%7Cquery_from%3A

ON-OFF

€0.98 / partij €1.89 48% korting

2stukken | Prijs is inclusief btw

2 Stuks 6Mm Schakelaars Miniatura Tuimelschakelaar Enkelpolige Dubbele Worp Mini Waterdichte Cap Micro Elektronische Gadgets Aan-Uit-Op 6a

★★★★★ 4.8 267 Recensies | 1.000+ verkocht

Kleur: ON-OFF 2pin

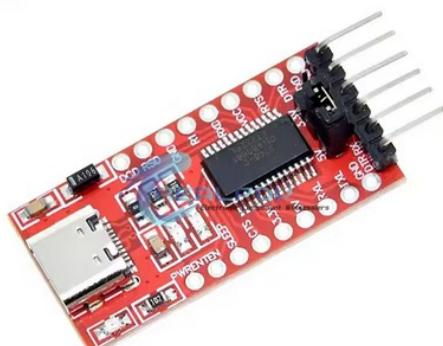


Meer prijsinformatie ⓘ

1 x FTDI INSTELLEN OP 3.3 V

https://nl.aliexpress.com/item/1005006445462581.html?spm=a2g0o.productlist.main.1.23bb270eNeShoT&algo_pvid=7d16b5fb-5c56-42a1-b1ad-d55cd02014f&algo_exp_id=7d16b5fb-5c56-42a1-b1ad-d55cd02014f-0&pdp_ext_f=%7B%22order%22%3A%223621%22%2C%22eval%22%3A%221%22%7D&pdp_npi=4%40dis%21EUR%212.00%212.00%21%21%2114.68%2114.68%21%402103956b17391844391625279ecd59%211200037194056997%21sea%21BE%21924161374%21X&curPageLogUid=KZWRiDkoOkdD&utparam-url=scene%3Asearch%7Cquery_from%3A

 **REALPOU**
Electronic Component Wholesalers



€2.02

Elk €1.58, ≥ 10 stuks

Prijs is inclusief btw

FT232RL FT232 FTDI USB 3,3 V 5,5 V naar TTL seriële adaptermodule voor Arduino FT232 Pro minipoort USB NAAR TTL 232 Mini / Type-C USB

★★★★★ 4.8 340 Recensies | 3.000+ verkocht

Kleur: Type-C USB



Meer prijsinformatie ⓘ

1 x ST link

https://nl.aliexpress.com/item/1005005273159580.html?spm=a2g0o.productlist.main.3.5e44599bstE04R&algo_pvid=b82bd88e-6271-45d0-8932-17657c055b53&algo_exp_id=b82bd88e-6271-45d0-8932-17657c055b53-1&pdp_ext_f=%7B%22order%22%3A%221642%22%2C%22eval%22%3A%221%22%7D&pdp_npi=4%40dis%21EUR%212.99%212.99%21%21%213.01%213.01%21%402103956b17391845385348306ecd59%211200032440955298%21sea%21BE%21924161374%21X&curPageLogUid=oAPZI20FNiVm&utparam-url=scene%3Asearch%7Cquery_from%3A



€2.99

Elk €2.48, ≥ 10 stuks

Prijs is inclusief btw Extra 2% korting

ST-Link V2 stlink mini STM8 STM32 ST LINK Simulator Downloadprogrammering met deksel

★★★★★ 4.9 212 Recensies | 1.000+ verkocht

Meer prijsinformatie ⓘ

Some useful addresses

Software STMicroelectronics

Integrated Development Environment for STM32

<https://www.st.com/en/development-tools/stm32cubeide.html>

STM32CubeProgrammer software for all STM32

<https://www.st.com/en/development-tools/stm32cubeprog.html>

Voor het laden van een .bin file in de STM32

PlatformIO

<https://dronebotworkshop.com/platformio/>

This project on Github

<https://github.com/thieu-b55/STM32-mini-PLC>

Connections

TFT 4.0" SPI touch

VCC 3.3 V Power Supply
GND GND Power Supply
LED -----R 1K----- 3.3V

TFT CS PB12
TFT RESET PB10
TFT DC PB11
TFT SDI(MOSI) PB15
TFT SCK PB13
TFT SDO(MISO) PB14

T_CLK PB3
T_CS PA4
T_DIN(MOSI) PB5
T_DO(MISO) PB4
T_IRQ PA5

Component side connect J1 (voltage regulator bypass)

Keyboard

Top View Connector									
Column				Row					
1	2	3	4	1	2	3	4	5	
PE4	PE5	PE6	PE7	PC12	PC11	PC10	PC9	PC8	

Switch

+ 3.3V ---- N.O. ---- PA7 (0 program / 1 run)

FTDI INSTELLEN OP 3.3 V
GND GND
RX PA9
TX PA10

ST link

GND GND
SWDIO PA13
SWCLK PA14

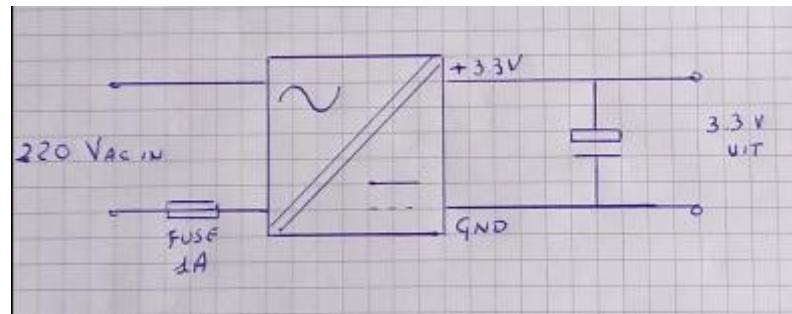
Power Supply

3.3V

3 x 3.3V STM32F407VGT6 discovery board
VCC TFT

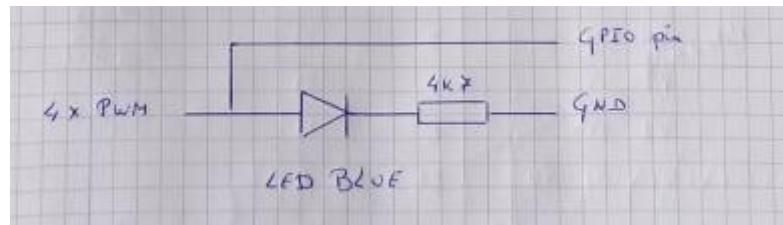
GND

5 x GND STM32F407VGT6 discovery board
GND TFT



PWM outputs (also used as PWM_F outputs)

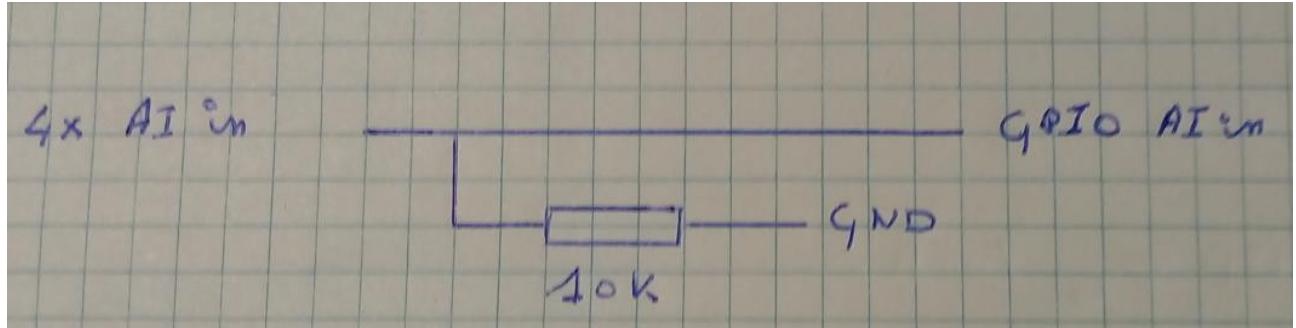
PWM0	PA8
PWM1	PA15
PWM2	PA6
PWM3	PB6



Connect LEDs according to drawing

Analog inputs

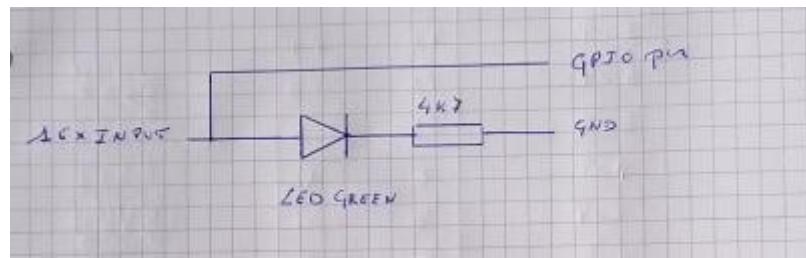
AI 0	PA0
AI 1	PA1
AI 2	PA2
AI 3	PA3



Connect resistors according to drawing

16 digitale inputs

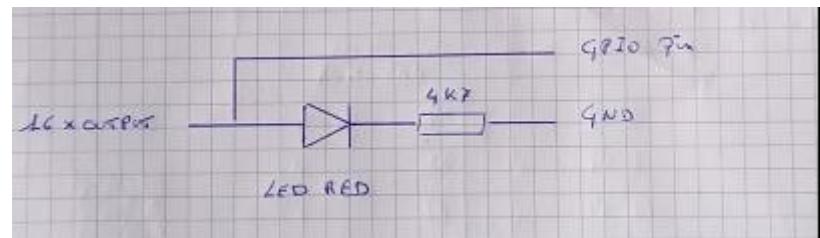
IN0	PC0
IN1	PC1
IN2	PC2
IN3	PC3
IN4	PC4
IN5	PC5
IN6	PC6
IN7	PC7
IN8	PE8
IN9	PE9
IN10	PE10
IN11	PE11
IN12	PE12
IN13	PE13
IN14	PE14
IN15	PE15



Connect LEDs to each input as shown in the drawing.

16 digitale outputs

OUT0	PD0
OUT1	PD1
OUT2	PD2
OUT3	PD3
OUT4	PD4
OUT5	PD5
OUT6	PD6
OUT7	PD7
OUT8	PD8
OUT9	PD9
OUT10	PD10
OUT11	PD11
OUT12	PD12
OUT13	PD13
OUT14	PD14
OUT15	PD15



Connect LEDs to each output as shown in the drawing.

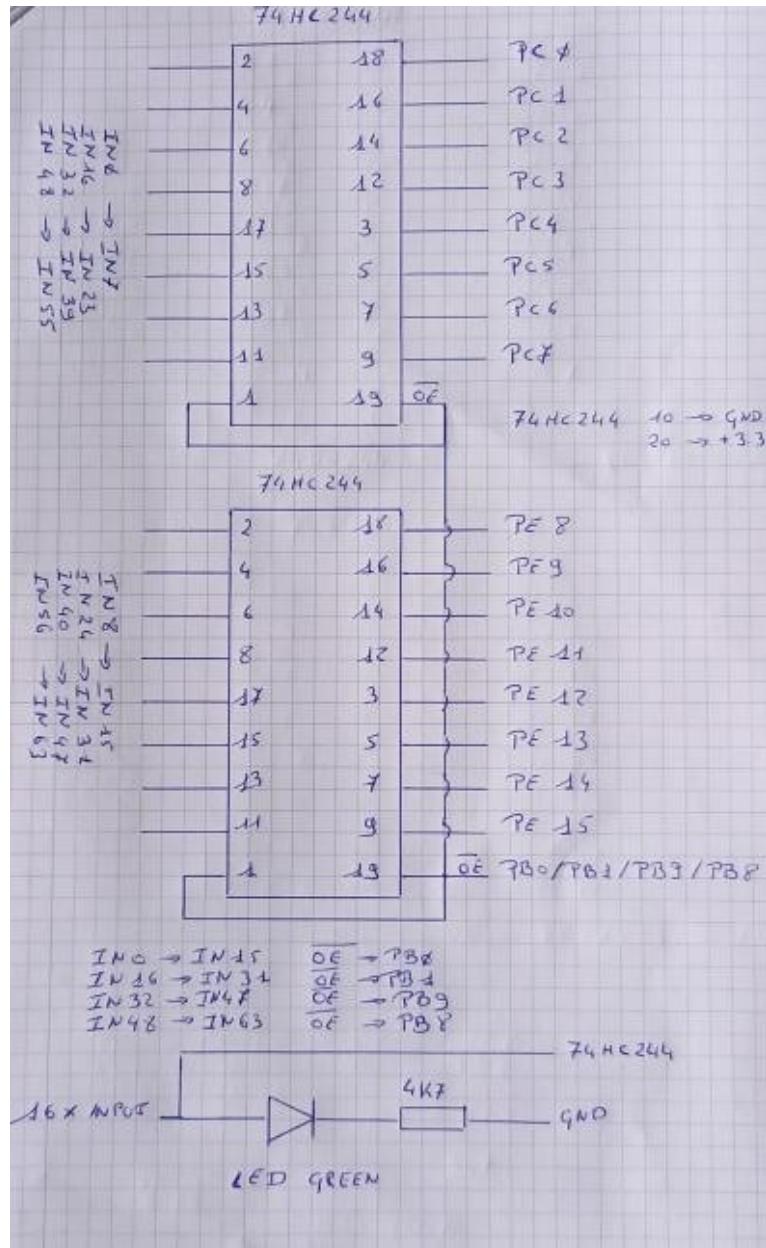
NUMBER OF INPUTS AND/OR OUTPUTS > 16

When using more than 16 inputs or outputs, the GPIO pins can no longer be used directly as inputs or outputs.

For the inputs, these are read in via 2 x 74HC244 per 16 inputs.

For the outputs, these are controlled via 2 x 74HC273 per 16 outputs.

INPUTS > 16

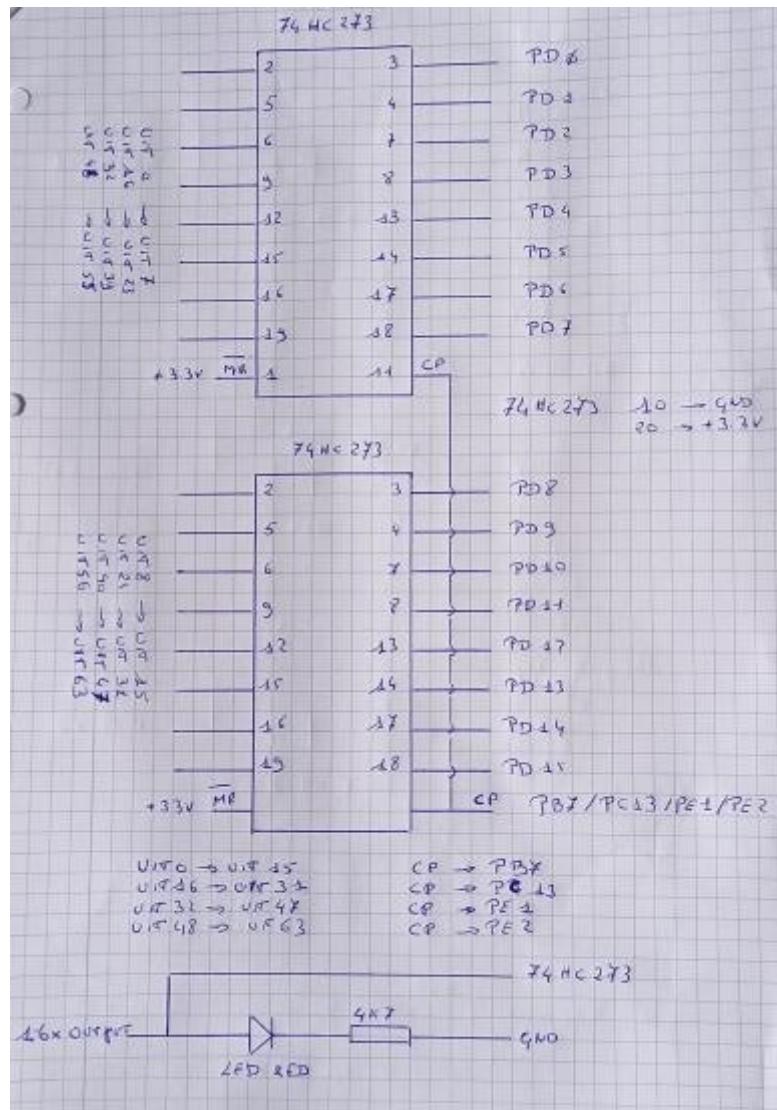


inputs	0 → 15	/OE	>>	PB0
inputs	16 → 31	/OE	>>	PB1
inputs	32 → 47	/OE	>>	PB9
inputs	48 → 63	/OE	>>	PB8

Connect LED to each input as shown in drawing

74HC244 has no PUSH_UP / PULL_DOWN resistor at the input, if no LEDs connect input to resistor 4K7 with GND

OUTPUTS > 16



outputs	0 → 15	CP	>>	PB7
outputs	16 → 31	CP	>>	PC13
outputs	32 → 47	CP	>>	PE1
outputs	48 → 63	CP	>>	PE2

Connect LED to each output as shown in drawing

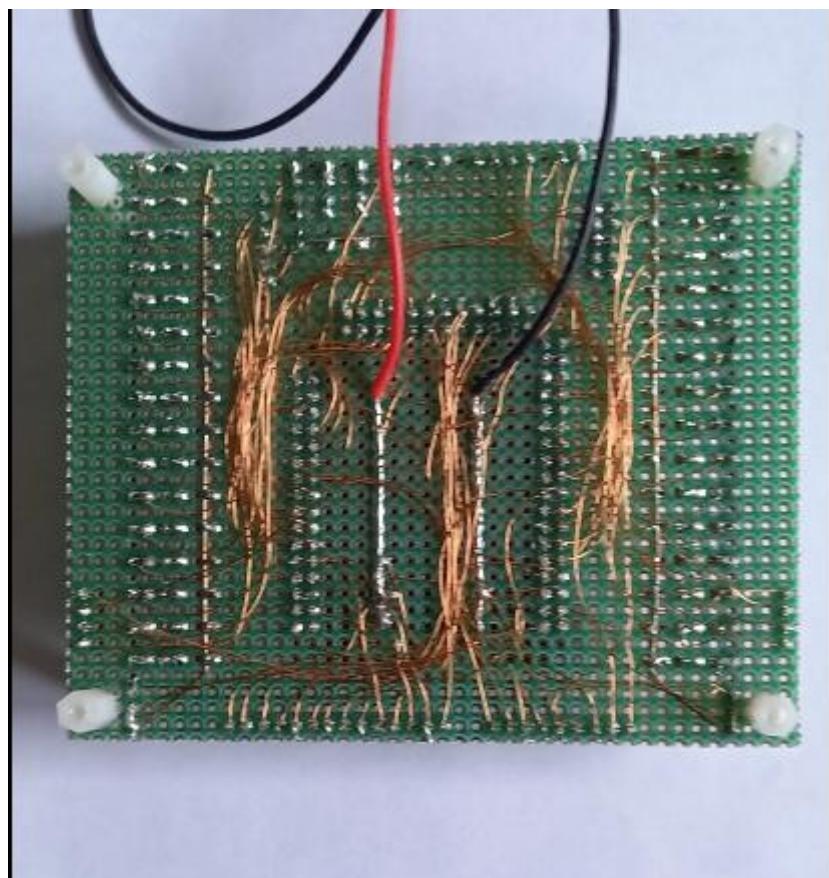
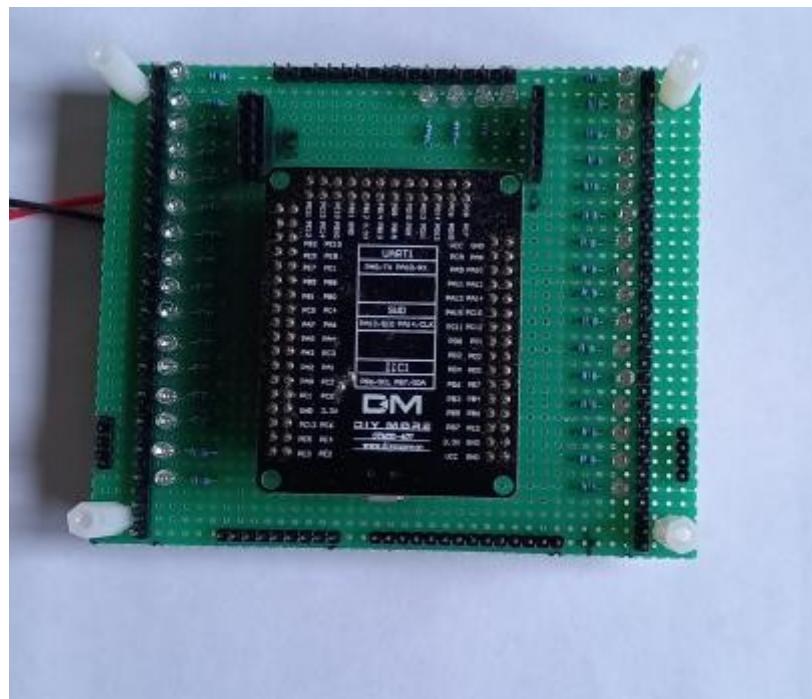
STM32F407VGT6 Discovery board

PA0	Analoge ingang 0
PA1	Analoge ingang 1
PA2	Analoge ingang 2
PA3	Analoge ingang 3
PA4	TFT_TOUCH_CS
PA5	TFT_TOUCH_INT
PA6	PWM_2 UIT
PA7	0/1 PROG/RUN
PA8	PWM_0 UIT
PA9	RX FTDI
PA10	TX FTDI
PA11	
PA12	
PA13	ST link SWDIO
PA14	ST link SW CLK
PA15	PWM_1 UIT
PB0	INPUT_M0
PB1	INPUT_M1
PB2	
PB3	TFT_TOUCH_SCLK
PB4	TFT_TOUCH_MISO
PB5	TFT_TOUCH莫斯I
PB6	PWM_3 UIT
PB7	OUTPUT_M0
PB8	INPUT_M3
PB9	INPUT_M2
PB10	TFT_RST
PB11	TFT_DC
PB12	TFT_CS
PB13	TFT_SCLK
PB14	TFT_MISO
PB15	TFT莫斯I
PC0	IN_0
PC1	IN_1
PC2	IN_2
PC3	IN_3
PC4	IN_4
PC5	IN_5
PC6	IN_6
PC7	IN_7
PC8	KEYBOARD_R_0 (IN)
PC9	KEYBOARD_R_1 (IN)
PC10	KEYBOARD_R_2 (IN)
PC11	KEYBOARD_R_3 (IN)
PC12	KEYBOARD_R_4 (IN)
PC13	OUTPUT_M1
PC14	
PC15	
PD0	UIT_0
PD1	UIT_1

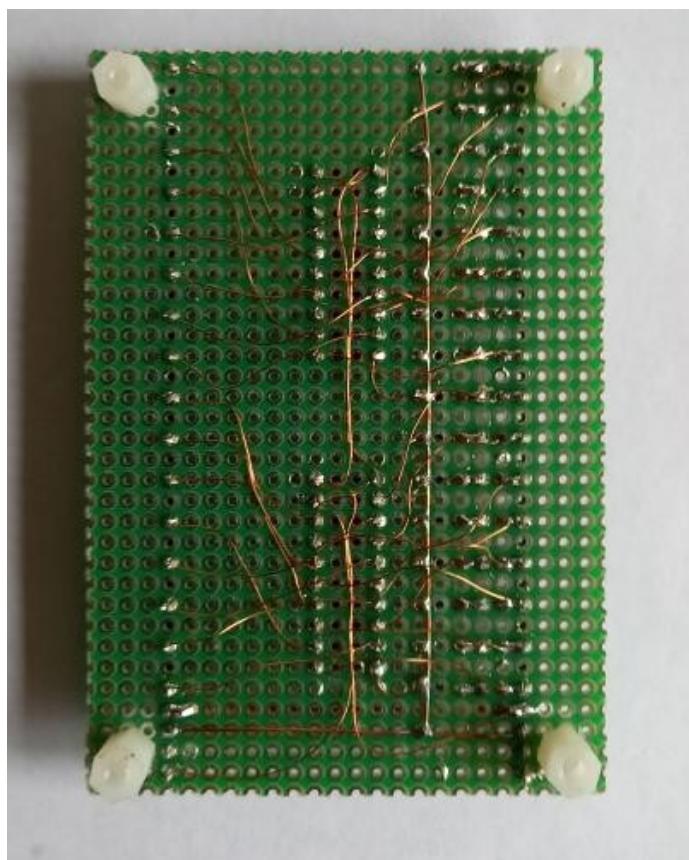
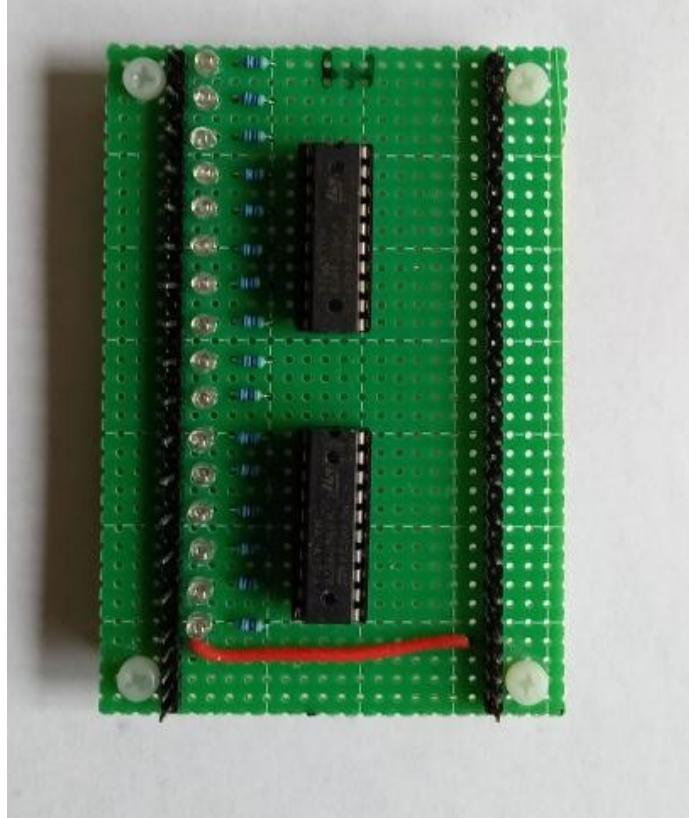
PD2	UIT_2
PD3	UIT_3
PD4	UIT_4
PD5	UIT_5
PD6	UIT_6
PD7	UIT_7
PD8	UIT_8
PD9	UIT_9
PD10	UIT_10
PD11	UIT_11
PD12	UIT_12
PD13	UIT_13
PD14	UIT_14
PD15	UIT_15
PE0	ONBOARD LED plc cyclus start
PE1	OUTPUT_M2
PE2	OUTPUT_M3
PE3	
PE4	KEYBOARD_C_0 (UIT)
PE5	KEYBOARD_C_1 (UIT)
PE6	KEYBOARD_C_2 (UIT)
PE7	KEYBOARD_C_3 (UIT)
PE8	IN_8
PE9	IN_9
PE10	IN_10
PE11	IN_11
PE12	IN_12
PE13	IN_13
PE14	IN_14
PE15	IN_15
BOOT0	GND
3.3V	3.3V Power Supply
3.3V	3.3V Power Supply
3.3V	3.3V Power Supply
GND	GND Power Supply
GND	GND Power Supply
GND	GND Power Supply
GND	GND Power Supply
GND	GND Power Supply

Result after a few hours of soldering fun

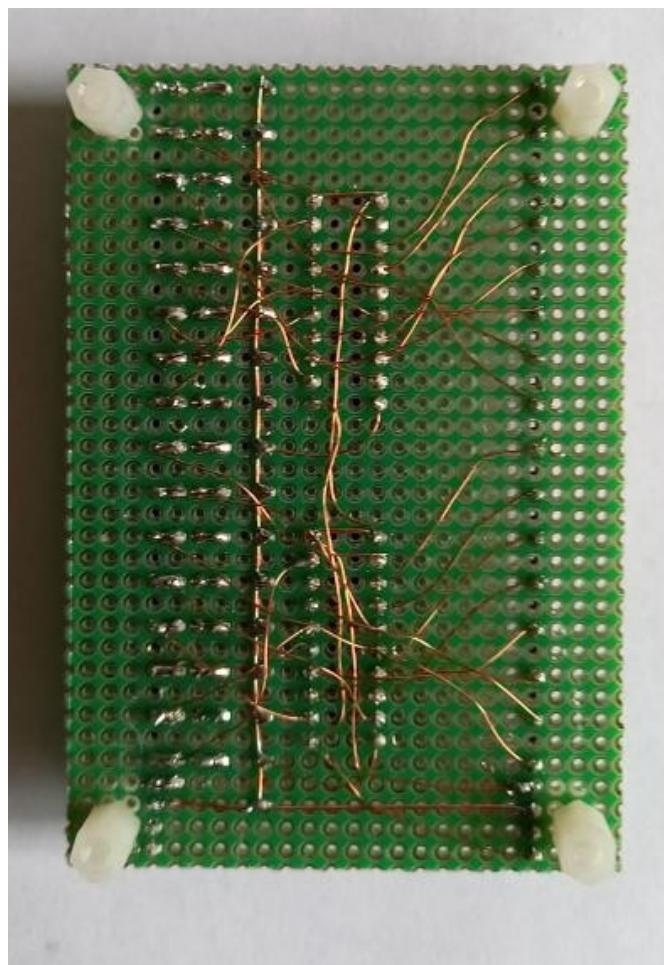
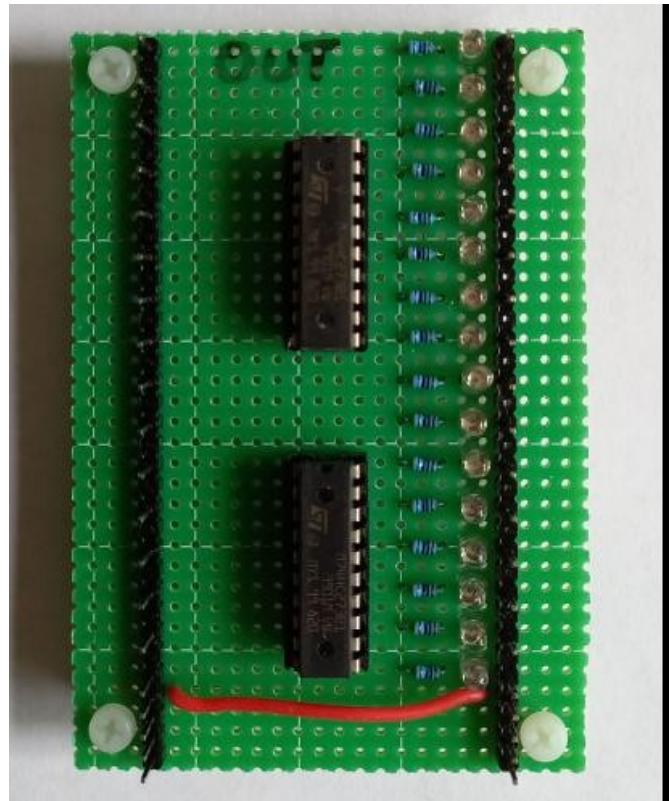
STM32F407 board



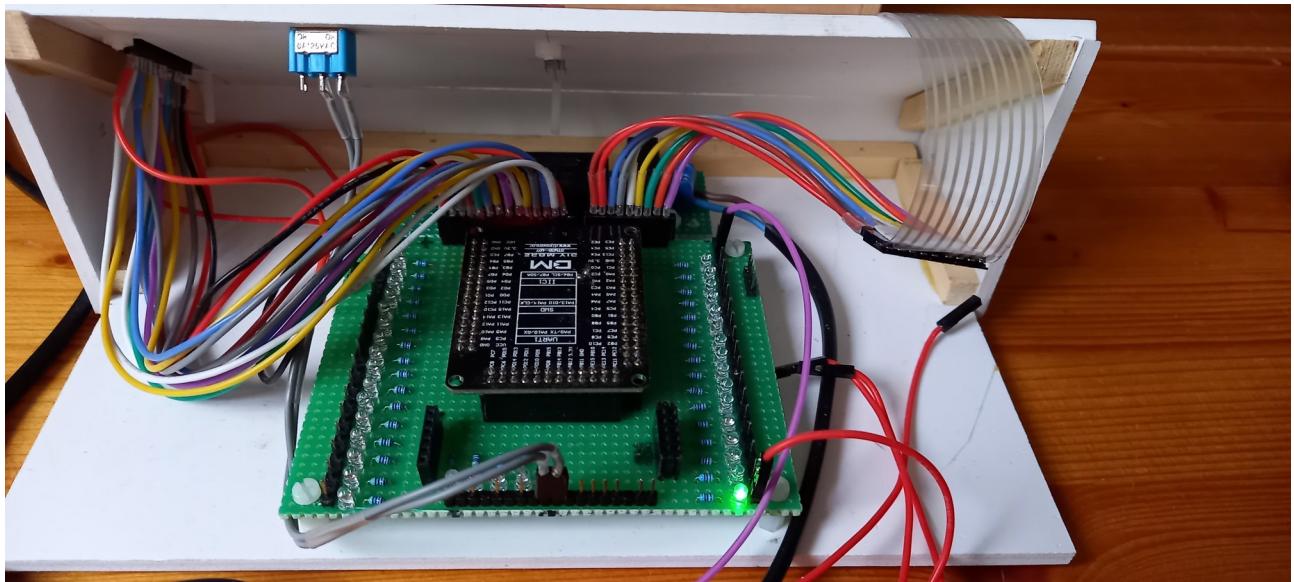
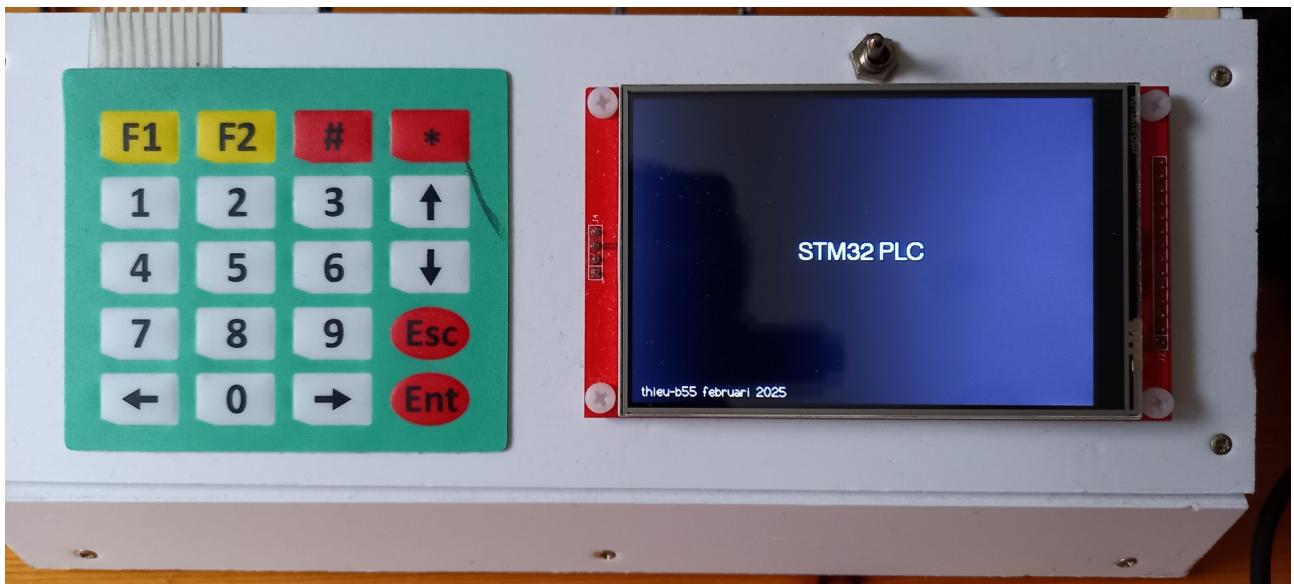
Input module



Output module



In housing



The libraries used, the .ino file and the .bin file can be found on Github:

<https://github.com/thieu-b55/STM32-mini-PLC>

Don't forget to connect BOOT0 of the STM32 to GND, these are 2 adjacent pins on the header.

Load the STM32_Plc.ino program into the Arduino IDE and use the following settings



This program was written using Platformio and can therefore be loaded into the STM32F407 that way.

The firmware.bin file can be loaded into the STM32F407 using the STM32CubeProgrammer. If everything went well, the STM32 mini PLC is ready for use.

When using Arduino IDE 1.8.19, uploading the program to the STM32F409VGT6 is not possible.

For further explanation

<https://forum.arduino.cc/t/ide1-8-19-st-link-stm32f103cbt6-cant-upload/1308454>

In Linux Mint you can find the STM32Plc.ino.bin file in the folder tmp/arduino_build_xxxxxx
You can upload this file to the STM32 using the STM32CubeProgrammer.

In other operating systems look for the file STM32_Plc.ino.bin

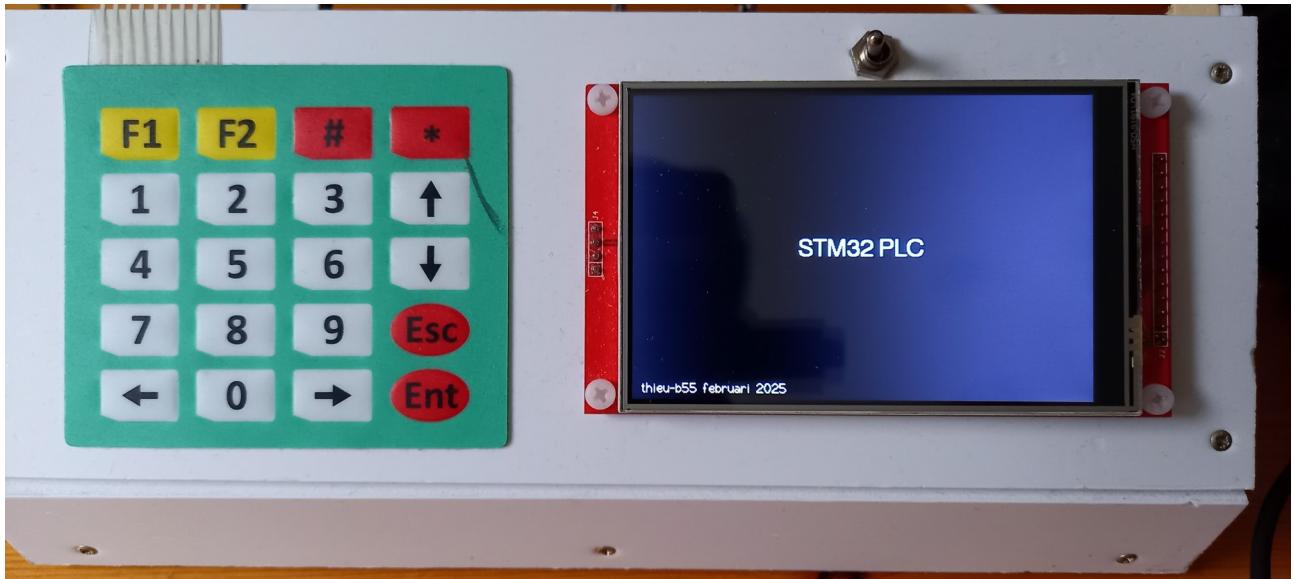
Touch calibratie



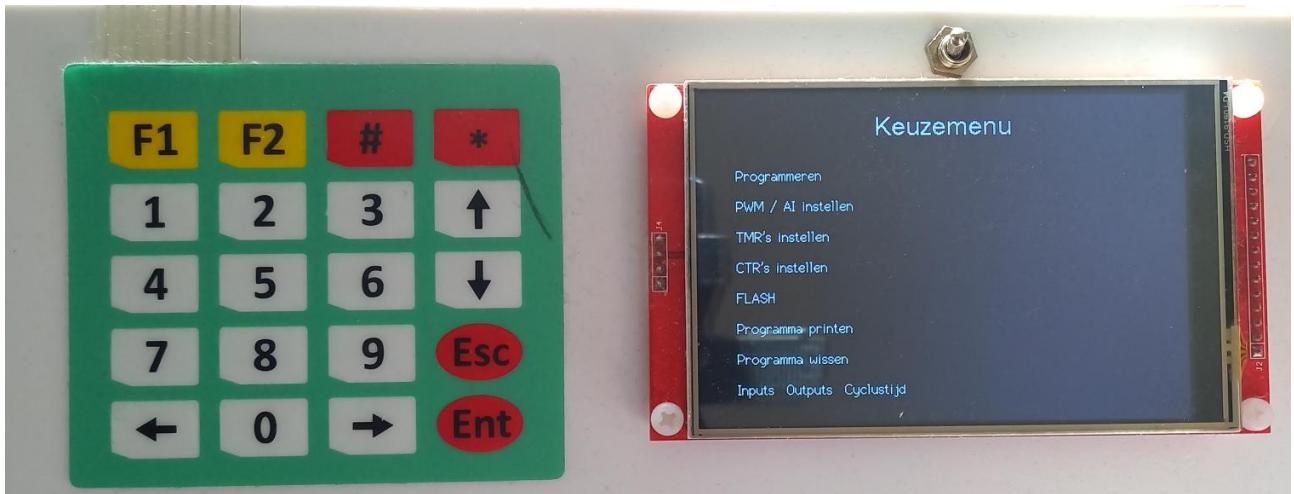
Press in the indicated corners

Startup screen

The switch above the TFT screen is the programming / run switch



Selection menu

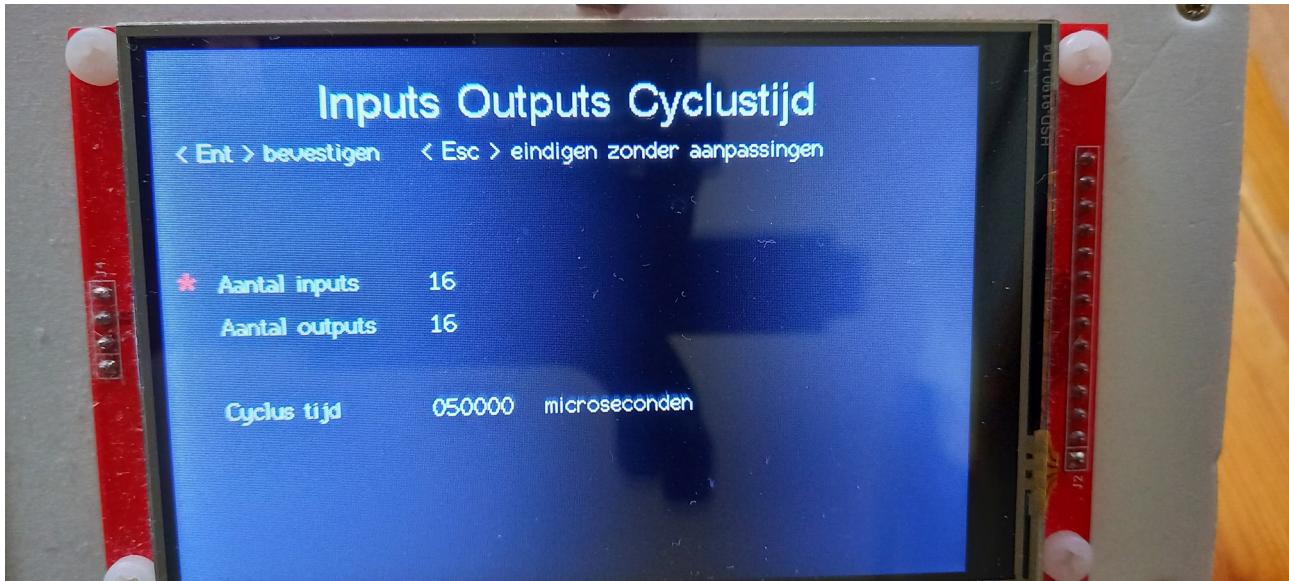


Choice between the different options

Touchscreen works best with supplied pen

It is best to first set the number of inputs and outputs.

Inputs Outputs Cyclus tijd



Use the <UP> and <DOWN> arrows on your keyboard to select what you want to adjust.

Only 16, 32, 48, and 64 are correct choices.

For the cycle time, any time ≥ 10000 microseconds and ≤ 100000 microseconds is possible.

To make the Timer seconds run in line with real seconds, choose

10000 microseconden

20000 microseconden

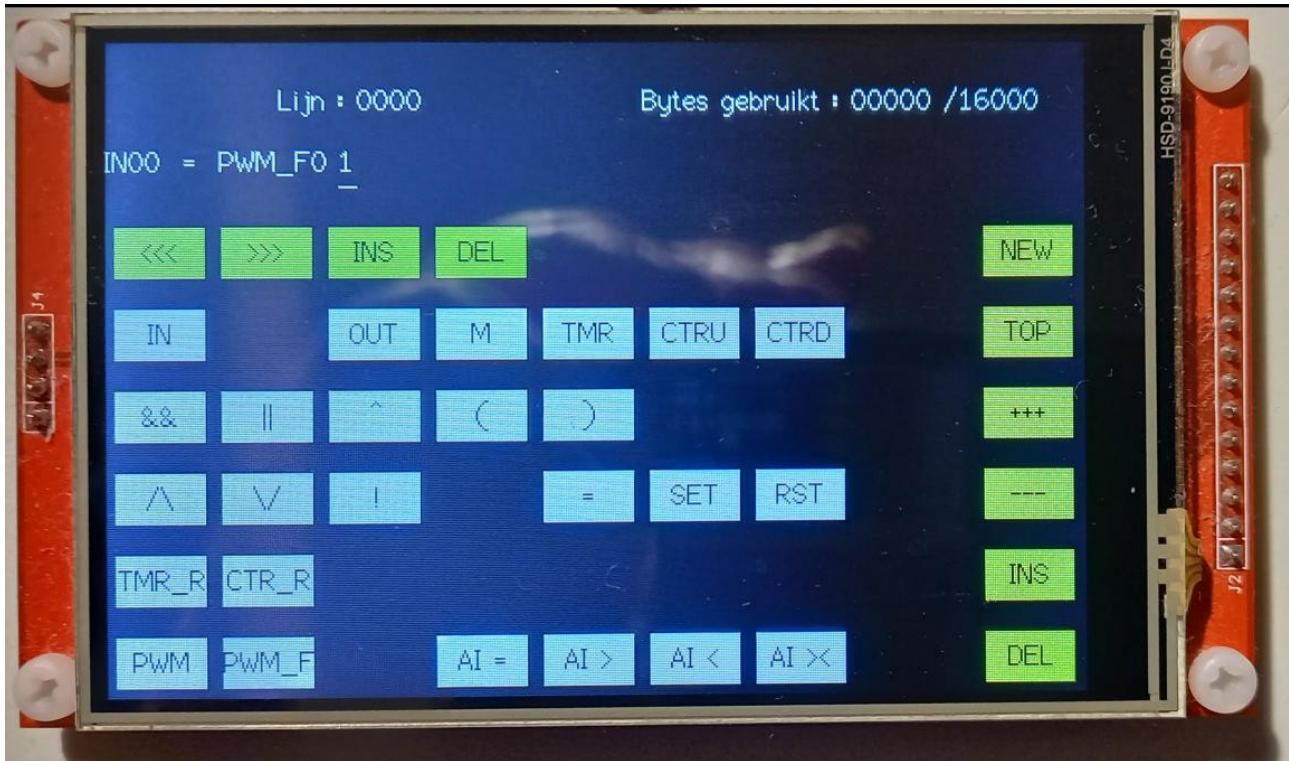
25000 microseconden

50000 microseconden

100000 microseconden

After setting press <OK> on the keyboard <ESC> to exit without adjustment

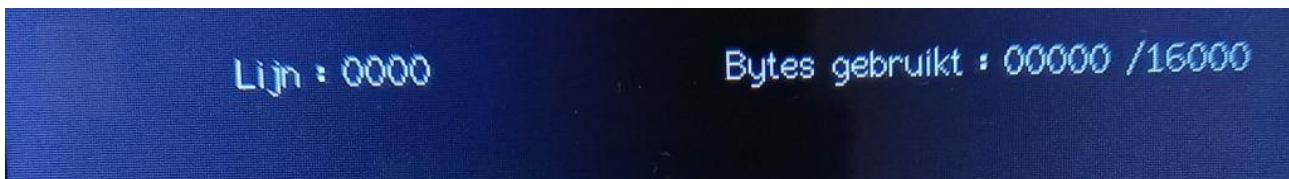
Programming



Exit programming with <Esc> on the keyboard

The programming screen is made up of several parts

Info



Line number of the current line

Number of bytes used out of 16000 available

In-lijn edit



<<< and >>> move the cursor left or right

<INS> insert an instruction

use <<< or >>> to go to the instruction you want to insert something for
press <INS>

text INS appears before the current instruction

go to INS with <<< or >>> and press the desired instruction

go to the instruction you want to delete with <<< or >>>

press to delete

Line edit



<NEW>

Save the line you just entered.

Any errors will be shown in red, but checking it yourself is not a bad idea.

If everything is OK, the editor will jump to the next empty line after saving <NEW> after in-line edit

1 x <NEW> saves and checks the line

2 x <NEW> jumps to the next empty line.

<NEW> can also be used to go to the end of the program

<TOP>

go to the beginning of the program

<++>

next line

<-->

previous line

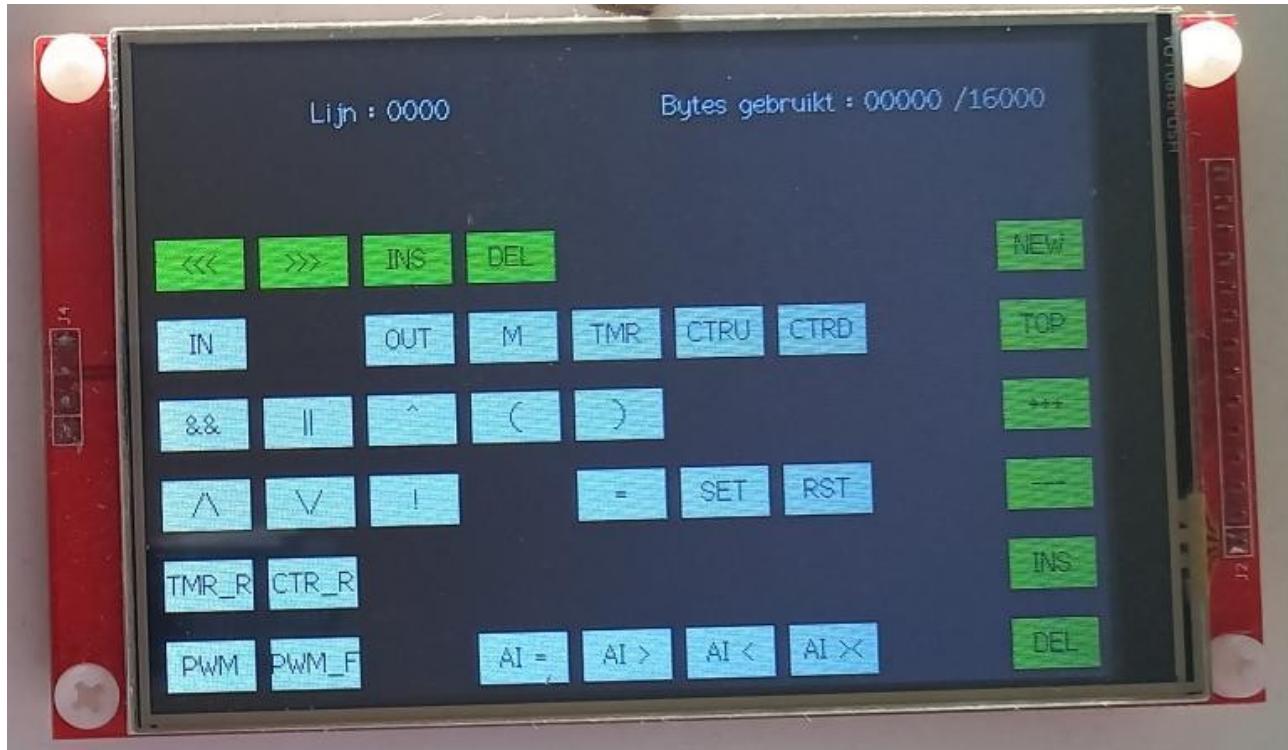
<INS>

insert blank line

CAUTION A BLANK LINE IN THE PROGRAM IS CONSIDERED THE END OF THE
PROGRAM

delete line

Programming



Build a program line here by choosing the instructions.

Instructie	Betekenis	nummer
IN	INPUT	0 tot aantal ingestelde inputs
OUT	OUTPUT	0 tot aantal ingestelde outputs
M	MERKER	0 → 63
TMR	TIMER	0 → 63
CTRU	CTR UP	0 → 63
CTRD	CTR DOWN	0 → 63
TMR_R	TIMER RESET	0 → 63
CTR_R	COUNTER RESET	0 → 63
PWM	PWM OUTPUT	0 → 3 0 → 100%
PWM_Fx y	PWM OUTPUT volgt AI	x pwm nummer y AI nummer
&&	AND	
	OR	
^	XOR	
(
)		
\	RISING EDGE	
/	FALLING EDGE	
!	NOT	
=	EQUALS	
SET	SET	
RST	RESET	

When entering, 99 appears behind the instruction
such as IN99 replace the 99 with a correct number

When entering a program line to change position for entering % or number use the arrows on the keyboard.

When editing a program line use the <<< or >>> symbols on the screen
AI resolution can be adjusted in the program

line 49 #define RESOLUTION 9 >> If necessary, enter another value here

since the comparison is done on a % basis, a higher resolution is probably of little use

AI = x %%%	Ingang x gelijk aan %
AI > x %%%	Ingang x groter als %
AI < x %%%	Ingang x kleiner dan %
AI >< x %%%	Ingang x groter dan en kleiner als %

Due to the byte structure of the PLC program, the comparison can only be entered in %.



By entering the minimum and maximum values in the <PWM/AI setting screen> the desired value will be displayed while programming the percentage.



AI 2 is set to minimum 25 and maximum 75 see top photo
50% of range is 50 see bottom photo

TMR56 to TMR63 are continuous timers and deliver a square wave at input = 1 with an on and off time determined by the timer settings

A program example

```
0000 IN 0 = OUT 0
0001 IN 0 = TMR 56
0002 TMR 56 = OUT 1
0003 IN 0 && ! TMR 56 = OUT 2
0004 TMR 56 = CTRU 0
0005 CTRU 0 && TMR 56 = CTRU 1
0006 CTRU 0 = OUT 3
0007 CTRU 1 = OUT 4
0008 ^ CTRU 1 = CTR_R 0
0009 ^ CTRU 0 = CTR_R 1
0010 AI >< 0 10 50 = OUT 5
0011 IN 0 = PWM_F 0 0
0012 AI > 0 25 = PWM 1 25
0013 ! OUT 6 = OUT 6
```

Setting up PWMs



In the PWM section, set the desired PWM frequency. Between 1 and 99999 Hz

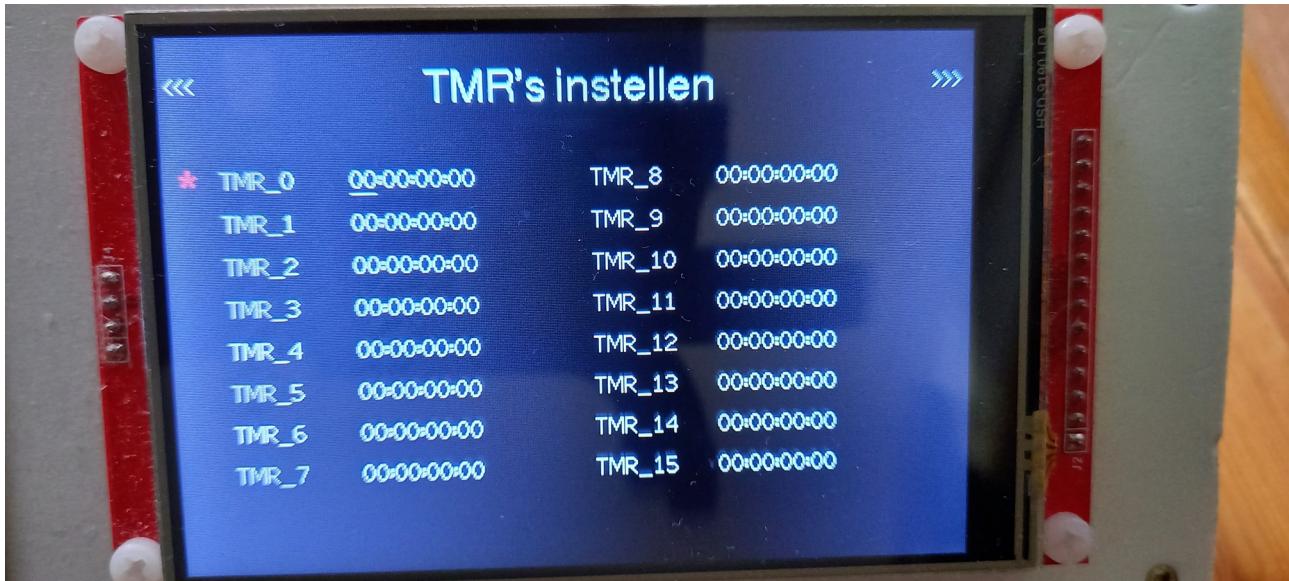


PWM0 with the percentage output if IN00 == 1



PWM_F0 1 PWM0 follows AI1 if IN00 == 1

Setting TMRs



16 timers per page

go to the previous or next page with <<< and >>>

go to the previous or next timer with the <UP> and <DOWN> arrow on the keyboard

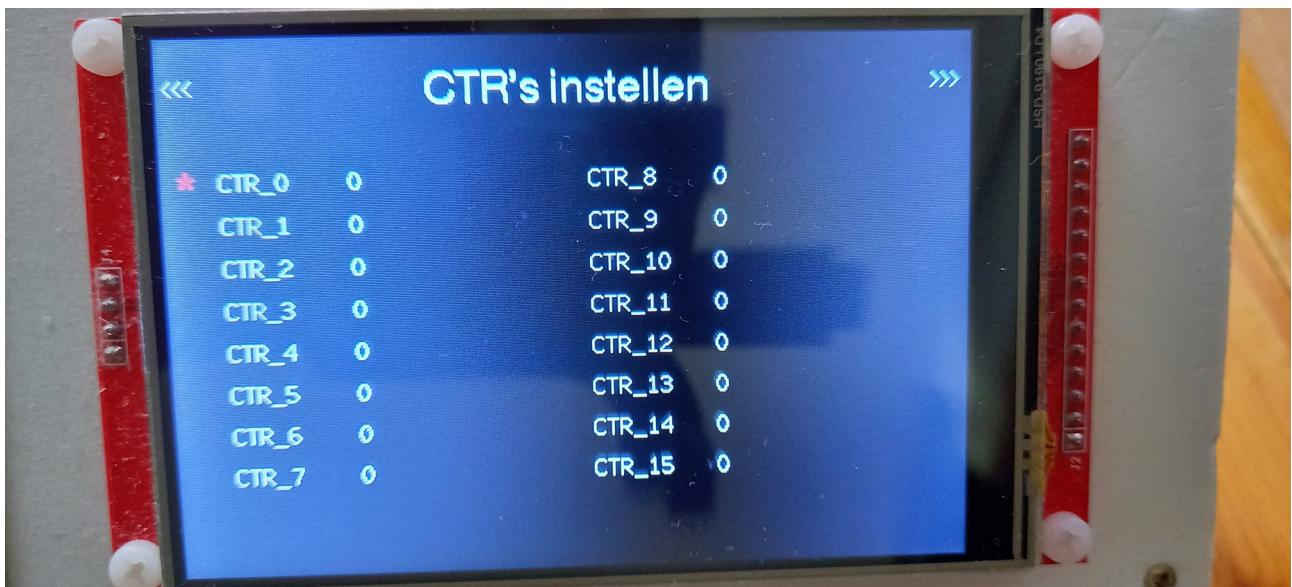
go to what you want to set on the timer with the <LEFT> and <RIGHT> arrow:

hours minutes seconds 10ths of seconds

Set between 00:00:00:10 and 99:59:59:90

!!! confirm with <ENT> !!!

Set CTRs



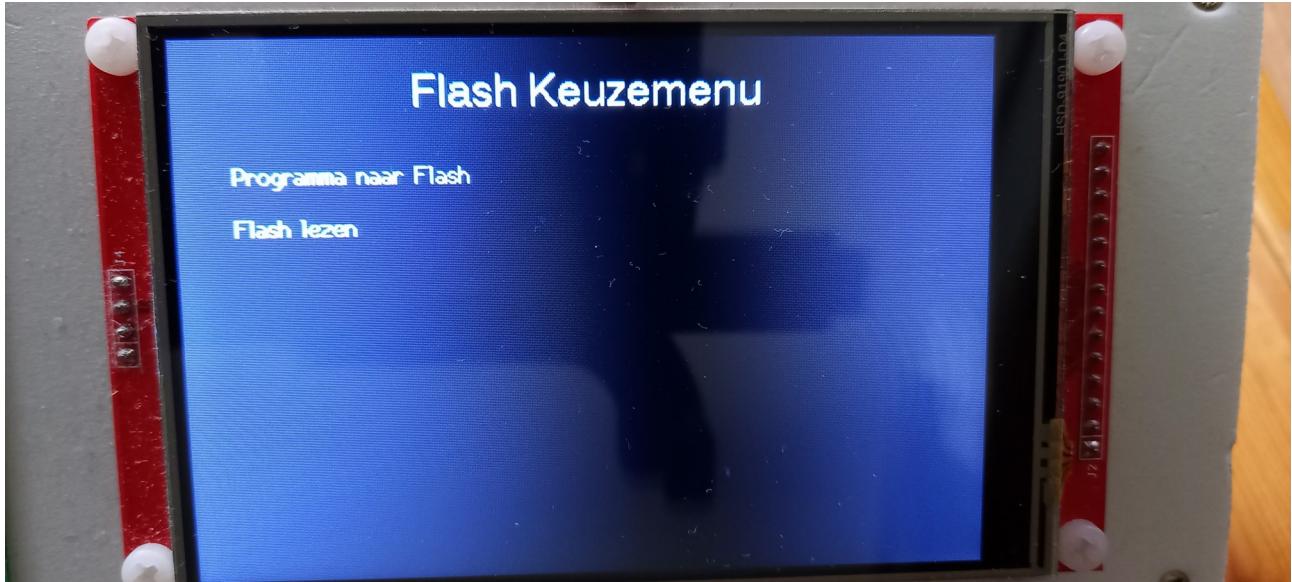
16 counters per page

go to the previous or next page with <<< and >>>

go to the previous or next counter with the <UP> and <DOWN> arrows on the keyboard

Set between 0 and 9999

FLASH



Program to Flash

Saves current program to Flash

Read Flash

Erases current program in PROGRAM FLASH and reads program from EEPROM FLASH to PROGRAM FLASH

Print program



Sends the program via the FTDI to a terminal

Example of a program print

Programma gebruikt: 100 bytes van de 16000 beschikbare bytes

```
0000 IN 0 = OUT 0
0001 IN 0 = TMR 56
0002 TMR 56 = OUT 1
0003 IN 0 && !TMR 56 = OUT 2
0004 TMR 56 = CTRU 0
0005 CTRU 0 && TMR 56 = CTRU 1
0006 CTRU 0 = OUT 3
0007 CTRU 1 = OUT 4
0008 ^ CTRU 1 = CTR_R 0
0009 ^ CTRU 0 = CTR_R 1
0010 AI >< 0 10 50 = OUT 5
0011 IN 0 = PWM_F 0 0
0012 AI > 0 25 = PWM 1 25
0013 ! OUT 6 = OUT 6
```

Aantal inputs: 16

Aantal outputs: 16

Cyclustijd: 100000 microseonden

PWM0 4 Hz

PWM1 5 Hz

PWM2 1 Hz

PWM3 1 Hz

AI0 0 100

AI1 0 0

AI2 0 0

AI3 0 0

TMR0 00:00:00:00

TMR1 00:00:00:00

TMR2 00:00:00:00

TMR3 00:00:00:00

TMR4 00:00:00:00

TMR5 00:00:00:00

TMR6 00:00:00:00

TMR7 00:00:00:00

TMR8 00:00:00:00

TMR9 00:00:00:00

TMR10 00:00:00:00

TMR11 00:00:00:00

TMR12 00:00:00:00

TMR13 00:00:00:00

TMR14 00:00:00:00

TMR15 00:00:00:00

TMR16 00:00:00:00

TMR17 00:00:00:00

TMR18 00:00:00:00

TMR19 00:00:00:00

TMR20 00:00:00:00

TMR21 00:00:00:00

TMR22 00:00:00:00

TMR23 00:00:00:00

TMR24 00:00:00:00

TMR25 00:00:00:00

TMR26 00:00:00:00

TMR27 00:00:00:00

TMR28 00:00:00:00

TMR29 00:00:00:00

TMR30 00:00:00:00

TMR31 00:00:00:00

TMR32 00:00:00:00

TMR33 00:00:00:00

TMR34 00:00:00:00

TMR35 00:00:00:00

TMR36 00:00:00:00

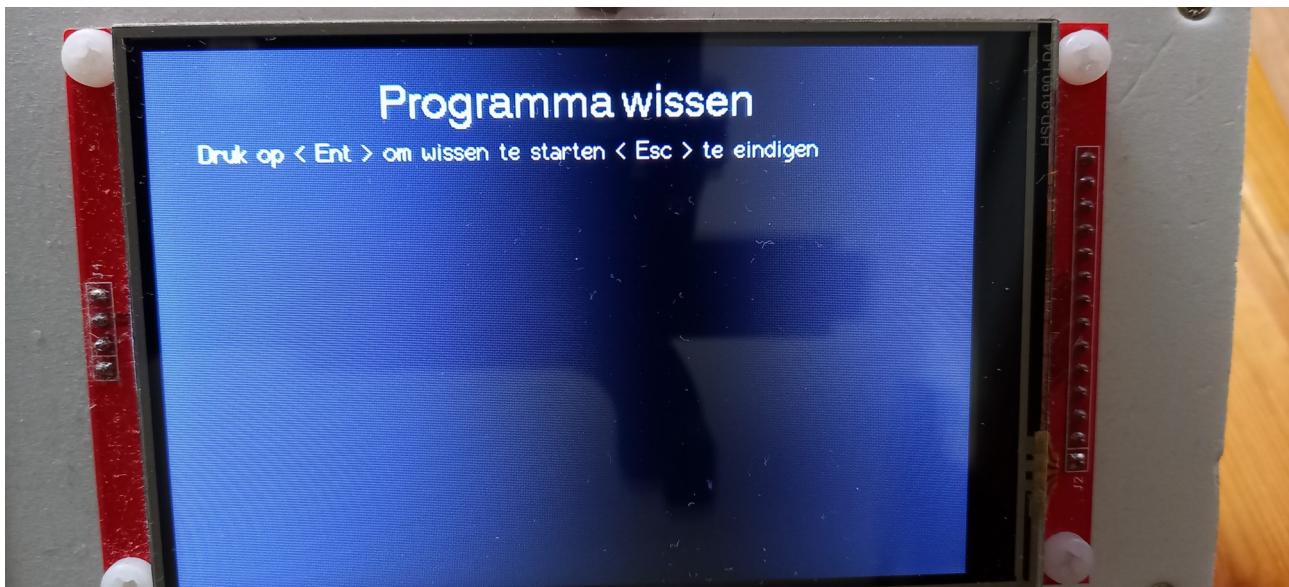
TMR37 00:00:00:00

TMR38 00:00:00:00
TMR39 00:00:00:00
TMR40 00:00:00:00
TMR41 00:00:00:00
TMR42 00:00:00:00
TMR43 00:00:00:00
TMR44 00:00:00:00
TMR45 00:00:00:00
TMR46 00:00:00:00
TMR47 00:00:00:00
TMR48 00:00:00:00
TMR49 00:00:00:00
TMR50 00:00:00:00
TMR51 00:00:00:00
TMR52 00:00:00:00
TMR53 00:00:00:00
TMR54 00:00:00:00
TMR55 00:00:00:00
TMR56 00:00:00:20
TMR57 00:00:00:00
TMR58 00:00:00:00
TMR59 00:00:00:00
TMR60 00:00:00:00
TMR61 00:00:00:00
TMR62 00:00:00:00
TMR63 00:00:00:00

CTR0 5
CTR1 5
CTR2 0
CTR3 0
CTR4 0
CTR5 0
CTR6 0
CTR7 0
CTR8 0
CTR9 0
CTR10 0
CTR11 0
CTR12 0
CTR13 0
CTR14 0
CTR15 0
CTR16 0
CTR17 0
CTR18 0
CTR19 0
CTR20 0

CTR21 0
CTR22 0
CTR23 0
CTR24 0
CTR25 0
CTR26 0
CTR27 0
CTR28 0
CTR29 0
CTR30 0
CTR31 0
CTR32 0
CTR33 0
CTR34 0
CTR35 0
CTR36 0
CTR37 0
CTR38 0
CTR39 0
CTR40 0
CTR41 0
CTR42 0
CTR43 0
CTR44 0
CTR45 0
CTR46 0
CTR47 0
CTR48 0
CTR49 0
CTR50 0
CTR51 0
CTR52 0
CTR53 0
CTR54 0
CTR55 0
CTR56 0
CTR57 0
CTR58 0
CTR59 0
CTR60 0
CTR61 0
CTR62 0
CTR63 0

Delete program



does what the title says.

Program, PWM settings, Timer settings and Counter settings are erased

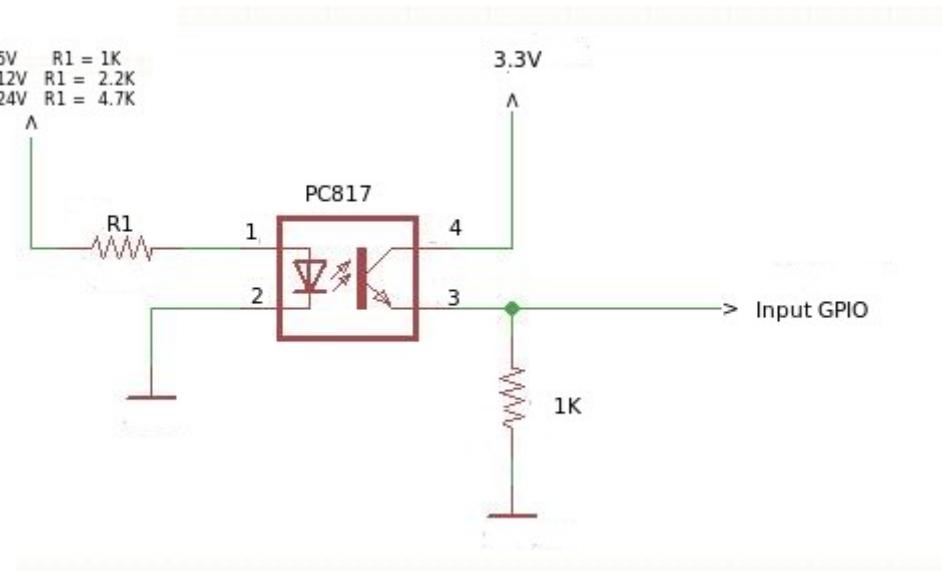
That was about it, just to mention that all GPIO's are 3.3V. Higher voltages can and will damage the STM32F407VGT6.

May the force be with you

greetings,
thieu-b55

Input higher than 3.3 V

PC817 optocoupler



Output higher than 3.3V

IRF520 module

https://nl.aliexpress.com/item/1005006157177189.html?spm=a2g0o.productlist.main.1.1900O7dKO7dKOg&algo_pvid=c5e6c073-2384-417f-9968-9cb927321b1a&algo_exp_id=c5e6c073-2384-417f-9968-9cb927321b1a-0&pdp_ext_f=%7B%22order%22%3A%22531%22%2C%22eval%22%3A%221%22%7D&pdp_npi=4%40dis%21EUR%213.61%211.63%21%213.65%211.65%21%40211b816617393907047688993ec539%211200036028414526%21sea%21BE%210%21ABX&curPageLogUid=GH7MeJvjNbDq&utparam-url=scene%3Asearch%7Cquery_from%3A#nav-specification

