title : Electronic diagram `TWT jetting grid`
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url : https://github.com/Dennis-van-Gils/project-TWT-jetting-grid
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Purpose: Control 112 solenoid valves @ 24 V by a single Arduino. We will use two Centipede boards (only one shown), each providing 64 digital outputs controlled over I2C. Each Centipede board will have 4 Sanwo MOSFET boards connected to them, each providing 16 channels. Hence, there is a total of 8 Sanwo MOSFET boards to control in total 112 (max 128) solenoid valves. We will work in groups of 14, because 8x14=112. Also, each of the 4 sides of the tunnel will house 2x14=28 valves. Cable management is easier this way. Hence, instead of populating all 16 channels per MOSFET board, we occupy only the first 14.

Rittal cabinet

Rittal cabinet | lab environment

Windows 11 & Python

USB cable
Bulgin px0840-b-5m00

USB panel mount
Bulgin PX0844/B/0M50/B

USB isolator
Olimex USB-ISO

USB-RS485 opt. isolated
Titan USB-COMI-SI-M

near PC, use long RS485 cable

RS485 (D+, D-, GND)

perfboard

Close the jumper to power the Feather externally. WARNING: Do not connect to USB in that case to prevent back-powering the USB port at the PC side.

JUMPER ENA EXT. POWER

SAFETY PULSES

Adafruit Feather M4 Express
"Main MCU"
Adafruit #3857

I2C I/O expander, 64 ch. Macetech Centipede V2 1 of 2

Arduino pass-through (not connected)

LM78xx OUT

ADDRESS jumper

max 125 mA over 16 ch.

MCP23017

CENTIPEDE #1

PWR jumper

ribbon cable 20 ways
Amphenol FC20600-0

repeat for 14 channels

draws 3.7 A over 14 solenoids

draws 62 mA over 14 ch.

Sanwo 16 ch. MOSFET board modified for 3.3V
1 of 8

Sanwo 16 ch. MOSFET board modified for 3.3V
2 of 8

fuse

GND
24 VDC

etc.

74AHCT125

LED data (5V)
LED data (3.3V)

220 uF, 16 V
1 uF, 50 V
1000 µF

POWER IN
max 6 A per screw term.

LEDS OUT

4-20mA R click
MIKROE-1387
1 of 4
active receiver (provides 16 VDC)

read pressure 1 (4-20mA)

bulkhead connector
Harting 19 41 024 0301
& 7x insert 09 14 005 2701

cable connector
Harting 19 41 124 0523
& 7x insert 09 14 005 2601

1 of 4 | 1 of 4

35 x 0.5 mm², OD 14.5 mm
ÖLFLEX CLASSIC 110, 1119035

pressure manifold #1

water pressure from jetting pump

solenoid valve
RPE 5105NC-24VDC
24 V, 265 mA
1 of 28

jetting nozzle

valve #1

28x

pressure snubber
Omega PS-4E-MG

4-20 mA

pressure sensor #1
Omega PXM309-007GI

connector 2 of 4

connector 3 of 4

connector 4 of 4

pressure manifold #2
(valves 29 to 56 & pressure sensor #2)

pressure manifold #3
(valves 57 to 84 & pressure sensor #3)

pressure manifold #2
(valves 85 to 112 & pressure sensor #4)

power switch
Arcolectric c1353algnf

fuse

wall power 230 VAC

draws ~ 4 A

cable connector
Harting 19200031440
& insert 09200032711

bulkhead connector
Harting 09200030301
& insert 09200032611

wall GND

chassis

24 VDC PSU
31 A, 750 W
TRACOPOWER
TXLN 750-124

3.3 VDC PSU
2.6 A, 8.6W
CUI
PSK-10D-3-DIN

5 VDC PSU
6 A, 30 W
XP POWER
DNR30US05

Safety circuit to enable the jetting pump

"Pump safety MCU"
Adafruit Feather M0 Basic
Adafruit #2772

Non-Latching Relay Featherwing
Adafruit #2895
(circuit not fully drawn)

panel mount
Phoenix 1424137 & 1440164

plug & cable
Phoenix 1424107

shielded cable
10m

socket
Phoenix 1404642

panel mount
Phoenix 1424139 & 1440164

RGB LED matrix NeoPixel 16x16
Adafruit #2547

TODO: RS485 cable needs shield connected to PE via inverter

L1, L2, L3, PE

MODBUS RS485 (D+, D-, GND)

freq. inverter
3ph 400 VAC, I_{max} = 17 A
Xylem Hydrovar 4.075

MS

motor
3ph 400 VAC, 10.5 A, 7.5 kW
Lowara PLM 132 B5 7.5 kW

jetting pump
6.8 kW, 2900 rpm, 60 m³/h
Xylem Lowara 46SVH2N075T/4

water pressure from jetting pump

Xylem Hydrovar, X1 terminal

26	GX	13	GX
25	RS485.2P	12	RS485.1P
24	RS485.2N	11	RS485.1N
23	GND	10	GND
22	FAN.CTRL	9	10V
21	GND	8	GND
20	SOLO.RUN	7	PTC
19	GND	6	GND
18	ON_OFF	5	AI2
17	GND	4	24 V
16	LOW_WATER	3	GND
15	GND	2	AI1
14	DI1	1	24 V

Color code cables

Harting bulkhead connector

pin#	cable#	color	signal	valve#
1	A	OR	mosfet 1-Y0	1
2	A	OR/WH	mosfet 1-Y1	2
3	A	GN	mosfet 1-Y2	3
4	A	GN/WH	mosfet 1-Y3	4
5	A	BL	mosfet 1-Y4	5
6	A	BL/WH	mosfet 1-Y5	6
7	A	GY	mosfet 1-Y6	7
8	A	GY/WH	mosfet 1-Y7	8
9	B	OR	mosfet 1-Y10	9
10	B	OR/WH	mosfet 1-Y11	10
11	B	GN	mosfet 1-Y12	11
12	B	GN/WH	mosfet 1-Y13	12
13	B	BL	mosfet 1-Y14	13
14	B	BL/WH	mosfet 1-Y15	14
15	C	OR	mosfet 2-Y0	15
16	C	OR/WH	mosfet 2-Y1	16
17	C	GN	mosfet 2-Y2	17
18	C	GN/WH	mosfet 2-Y3	18
19	C	BL	mosfet 2-Y4	19
20	C	BL/WH	mosfet 2-Y5	20
21	C	GY	mosfet 2-Y6	21
22	C	GY/WH	mosfet 2-Y7	22
23	D	OR	mosfet 2-Y10	23
24	D	OR/WH	mosfet 2-Y11	24
25	D	GN	mosfet 2-Y12	25
26	D	GN/WH	mosfet 2-Y13	26
27	D	BL	mosfet 2-Y14	27
28	D	BL/WH	mosfet 2-Y15	28
29	pressure	OR	4-20 mA (+)	-
30	pressure	OR/WH	4-20 mA (-)	-
31	ground	BK		-
32	ground	BK		-
33	ground	BK		-
34	ground	BK		-
35	ground	BK		-

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