USER GUIDE FOR LEVEL INDICATING CONTROLLER LFC128-2

LFC128-2-MN-EN-01	JUN-2020

This document is applied for the following products

SKU	LFC128-2	**HW Ver.**	1.0	**FW Ver.**	1.1
Item Code	LFC128-2	Level Indicating Controller, 4AI/DI, 4DI, 4xRelay, 1xPulse Output, 2 x RS485/ModbusRTU-Slave Communication			

1. Functions Change Log

HW Ver.	FW Ver.	Release Date	Functions Change
1.0	1.1	JUN-2020	

2. Introduction

LFC128-2 is an advanced level display controller. The product integrates Modbus RTU interface to help PLC / SCADA / BMS and any IoT port can connect to monitor. LFC128-2 has a simple yet powerful design with 4 AI / DI, 4 DI, 4 Relays, 1 Pulse pulse output, 2 RS485 Slave ModbusRTU allowing them to connect with multiple devices easily. With advanced technology that provides high stability and reliability, many functions, easy installation with touch screen and friendly interface helps visually monitor level.



LFC128-2-H1.PNG

3. Specification

Digital Inputs	04 x Ports, opto-coupler, 4.7 kohms input resisrtance, 5000V rms isolation, Logic 0 (0-1VDC), Logic 1 (5-24VDC), Functions: logic status 0/1 or Pulse counting (32 bit counter with max 4kHz pulse)
Analog Inputs	04 x Ports, select between 0-10VDC input or 0-20mA input, 12 bit Resolution, can be configured as Digital input by DIP switch (max 10VDC input) The AI1 port is a 0-10 VDC / 4-20 mA level sensor connection port
Relay Output	04 x Ports, electro-mechanical Relays, SPDT, contact rating 24VDC/2A or 250VAC/5A, LED indicators
Pulse Output	01 x Ports, open-collector, opto-isolation, max 10mA and 80VDC, On/off control, Pulser (max 2.5Khz, max 65535 Pulses) or PWM (max 2.5Khz)
Communication	02 x ModbusRTU-Slave, RS485, speed 9600 or 19200, LED indicator
Reset button	For resetting 02 x RS485 Slave port to default setting (9600, None parity, 8 bit)
Screen type	Touch screen
Power supply	9..36VDC
Consumption	200mA @ 24VDC supply
Mounting type	Panel mount
Terminal Block	pitch 5.0mm, rating 300VAC, wire size 12-24AWG
Working temperature/humidity	0..60 degC / 95%RH non-condensing
Dimension	H93xW138xD45
Net weight	390 grams

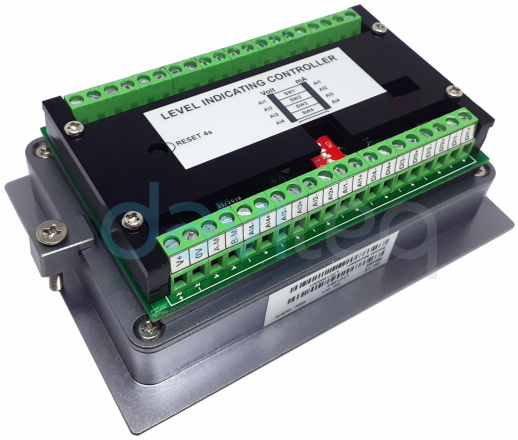
4. Product Pictures

LEVEL INDICATING CONTROLLER
LFC128-2

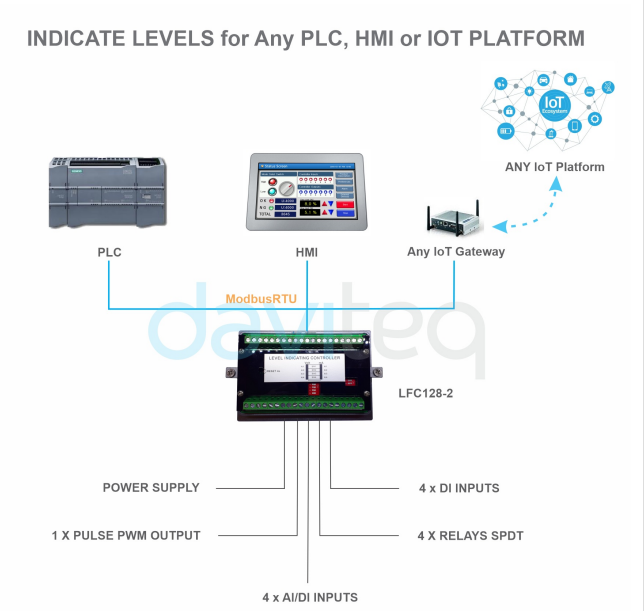


LFC128-2-H1.PNG

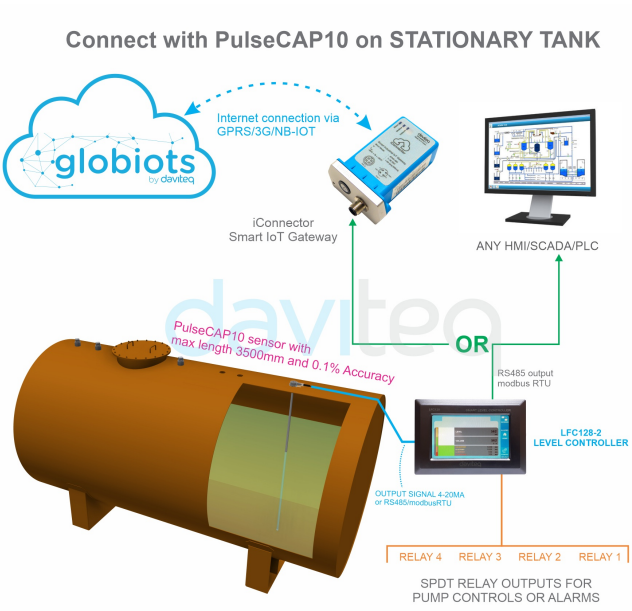
LEVEL INDICATING CONTROLLER
(backside)



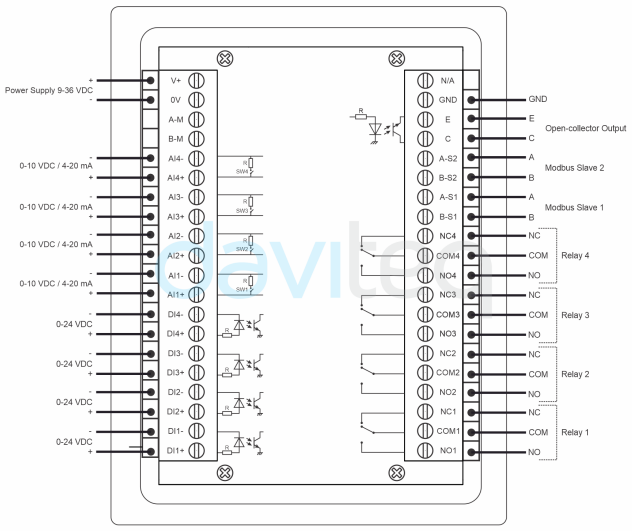
LFC128-2-H2.PNG



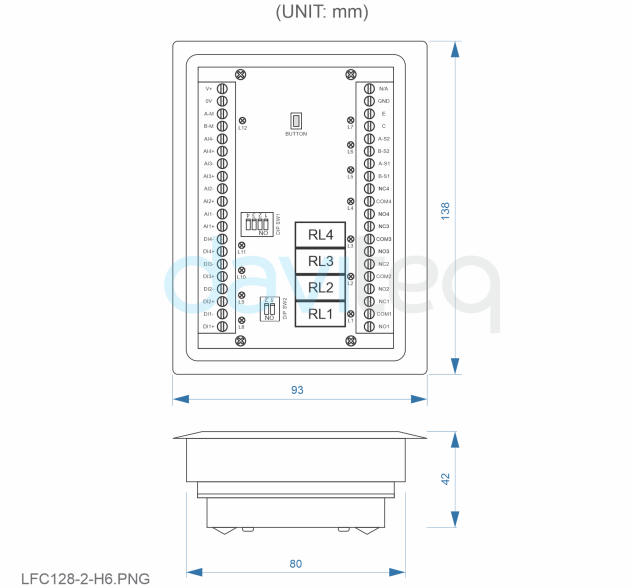
LFC128-2-H3.PNG



LFC128-2-H4.PNG

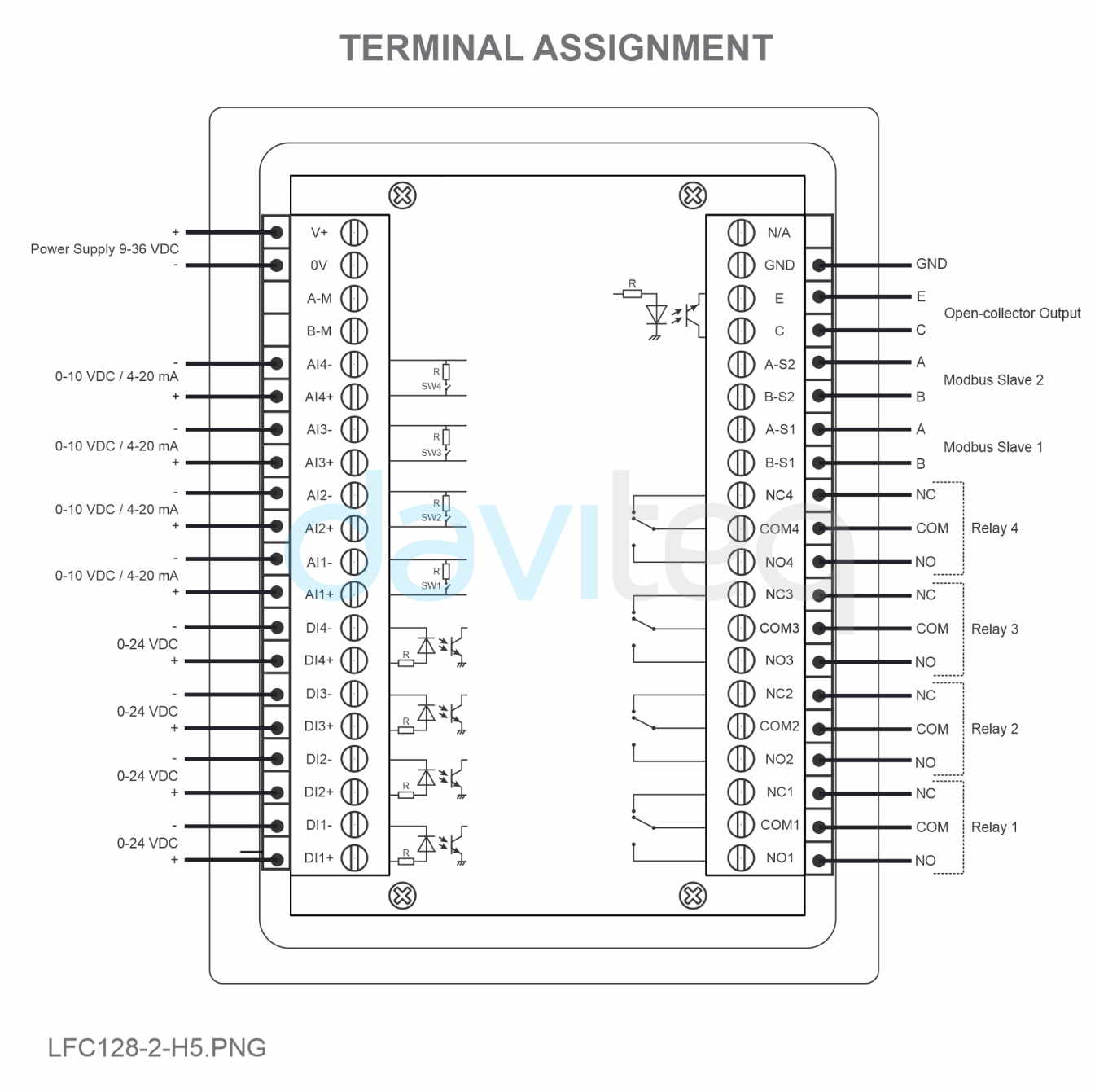


LFC128-2-H5.PNG

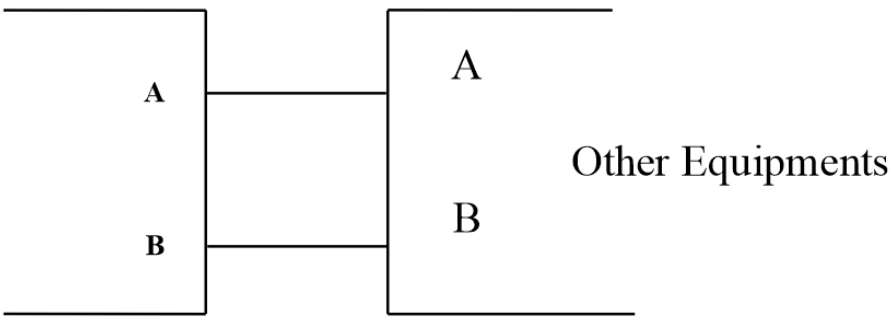


LFC128-2-H6.PNG

5. Operation Principle



5.1 Modbus communication



02 x RS485/ModbusRTU-Slave

Protocol: Modbus RTU

Address: 1 - 247, 0 is the Broadcast address

Baud rate: 9600 , 19200

Parity: none, odd, even

Status indicator LED:

- Led on: modbus communication OK
- Led blinking: received data but modbus communication incorrect, due to wrong Modbus configuration: address, baudrate
- Led off: LFC128-2 received no data, check the connection

Memmap resgisters

READ uses command 03, WRITE uses command 16

Default configuration:

- Address: 1
- Baudrate slave 1: 9600
- Parity slave 1: none
- Baudrate slave 2: 9600
- Parity slave 2: none

Modbus Register	Hex adr	# of registers	Description	Range	Default	Format	Property	Comment
0	0	2	device info		LFC1	string	Read	
8	8	1	DI1___DI2: digital status	0-1		uint8	Read	H_byte: DI1 L_byte: DI2
9	9	1	DI3___DI4: digital status	0-1		uint8	Read	H_byte: DI3 L_byte: DI4
10	A	1	AI1___AI2: digital status	0-1		uint8	Read	H_byte: AI1 L_byte: AI2
11	B	1	AI3___AI4: digital status	0-1		uint8	Read	H_byte: AI3 L_byte: AI4
12	C	1	AI1: analog value			uint16	Read	
13	D	1	AI2: analog value			uint16	Read	
14	E	1	AI3: analog value			uint16	Read	
15	F	1	AI4: analog value			uint16	Read	
16	10	2	AI1: scaled value			float	Read	
18	12	2	AI2: scaled value			float	Read	
20	14	2	AI3: scaled value			float	Read	
22	16	2	AI4: scaled value			float	Read	
24	18	1	relay 1	0-1		uint16	Read	
25	19	1	relay 2	0-1		uint16	Read	
26	1A	1	relay 3	0-1		uint16	Read	
27	1B	1	relay 4	0-1		uint16	Read	
28	1C	1	open collector ctrl		0-3	uint16	Read/Write	0: off 1: on 2: pwm, pulse continuously 3: pulse, when enough pulse number, ctrl = 0
30	1E	2	counter DI1			uint32	Read/Write	counter writable, erasable
32	20	2	counter DI2			uint32	Read/Write	counter writable, erasable
34	22	2	counter DI3			uint32	Read/Write	counter writable, erasable

36	24	2	counter DI4			uint32	Read/Write	counter writable, erasable
38	26	2	counter AI1			uint32	Read/Write	counter writable, erasable, max frequency 10Hz
40	28	2	counter AI2			uint32	Read/Write	counter writable, erasable, max frequency 10Hz
42	2A	2	counter AI3			uint32	Read/Write	counter writable, erasable, max frequency 10Hz
44	2C	2	counter AI4			uint32	Read/Write	counter writable, erasable, max frequency 10Hz
46	2E	2	DI1: time on			uint32	Read/Write	sec
48	30	2	DI2: time on			uint32	Read/Write	sec
50	32	2	DI3: time on			uint32	Read/Write	sec
52	34	2	DI4: time on			uint32	Read/Write	sec
54	36	2	AI1: time on			uint32	Read/Write	sec
56	38	2	AI2: time on			uint32	Read/Write	sec
58	3A	2	AI3: time on			uint32	Read/Write	sec
60	3C	2	AI4: time on			uint32	Read/Write	sec
62	3E	2	DI1: time off			uint32	Read/Write	sec
64	40	2	DI2: time off			uint32	Read/Write	sec
66	42	2	DI3: time off			uint32	Read/Write	sec
68	44	2	DI4: time off			uint32	Read/Write	sec
70	46	2	AI1: time off			uint32	Read/Write	sec
72	48	2	AI2: time off			uint32	Read/Write	sec
74	4A	2	AI3: time off			uint32	Read/Write	sec
76	4C	2	AI4: time off			uint32	Read/Write	sec
128	80	2	counter DI1			uint32	Read	counter cannot write, erase
130	82	2	counter DI2			uint32	Read	counter cannot write, erase
132	84	2	counter DI3			uint32	Read	counter cannot write, erase
134	86	2	counter DI4			uint32	Read	counter cannot write, erase
136	88	2	counter AI1			uint32	Read	counter cannot write, erase; max frequency 10Hz
138	8A	2	counter AI2			uint32	Read	counter cannot write, erase; max frequency 10Hz
140	8C	2	counter AI3			uint32	Read	counter cannot write, erase; max frequency 10Hz

142	8E	2	counter AI4			uint32	Read	counter cannot write, erase; max frequency 10Hz
256	100	1	modbus address slave	1-247	1	uint16	Read/Write	
257	101	1	modbus baudrate slave 1	0-1	0	uint16	Read/Write	0: 9600, 1: 19200
258	102	1	modbus parity slave 1	0-2	0	uint16	Read/Write	0: none, 1: odd, 2: even

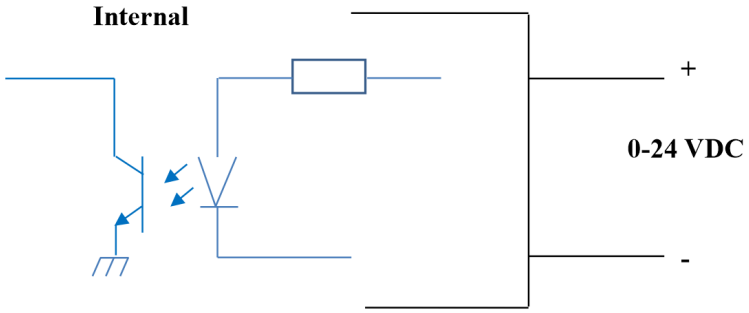
5.2 Reset Button

When holding the reset button for 4 seconds, LFC 128-2 will reset the default configuration to 02 x RS485 / Modbus RTU-Slave.

Default Modbus RTU Configuration:

- Address: 1
- Baud Rate: 9600
- Parity: none

5.3 Digital Input



Specification:

- 04 channels DI, isolated
- Input Resistance: 4.7 kΩ
- Isolation Voltage: 5000Vrms
- Logic level 0: 0-1V
- Logic level 1: 5-24V
- Function:
  - Read logic 0/1
  - Pulse Counter

5.3.1 Read the logical state 0/1

Logic value in Modbus Memory Map: 0-1

Registers to store logic values in the Modbus Memory Map:

- DI1__DI2: digital status: stores the logical state of channel 1 and channel 2.
  - H_byte: DI1
  - L_byte: DI2
- DI3__DI4: digital status: store the logical state of channel 3 and channel 4.
  - H_byte: DI3
  - L_byte: DI4

5.3.2 Pulse Counter

Counter value in Modbus Memory Map, when adding the number exceeds the threshold, it will automatically return: 0 - 4294967295 (32bits)

The register that stores Counter value in the Modbus Memory Map cannot be erased:

- Counter DI1: stores the logic state of channel 1
- Counter DI2: stores the logic state of channel 2
- Counter DI3: store the logic state of channel 3
- Counter DI4: stores the logic state of channel 4

The register that stores Counter value in the Modbus Memory Map cannot be erased:

- None reset counter DI1: stores the logic state of channel 1
- None reset counter DI2: stores the logic state of channel 2
- None reset counter DI3: stores the logic state of channel 3
- None reset counter DI4: stores the logic state of channel 4

Pulse Counter Mode:

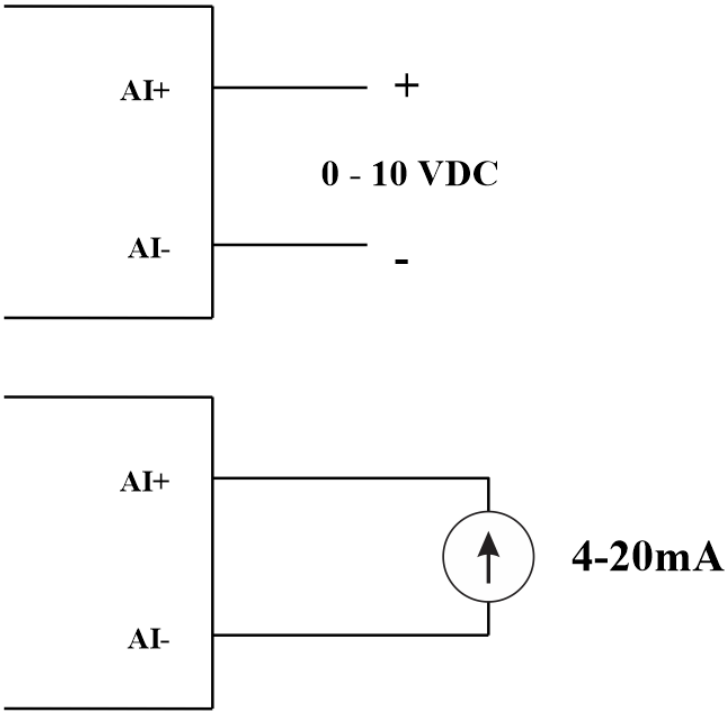
Low-speed pulse count less than 10Hz with filter, anti-jamming:

- Set register "counter DI1: filter time" = 500-2000: Channel 1 counts pulses less than 10Hz
- Set register "counter DI2: filter time" = 500-2000: Channel 2 counts pulses less than 10Hz
- Set register "counter DI3: filter time" = 500-2000: Channel 3 counts pulses less than 10Hz
- Set register "counter DI4: filter time" = 500-2000: Channel 4 counts pulses less than 10Hz

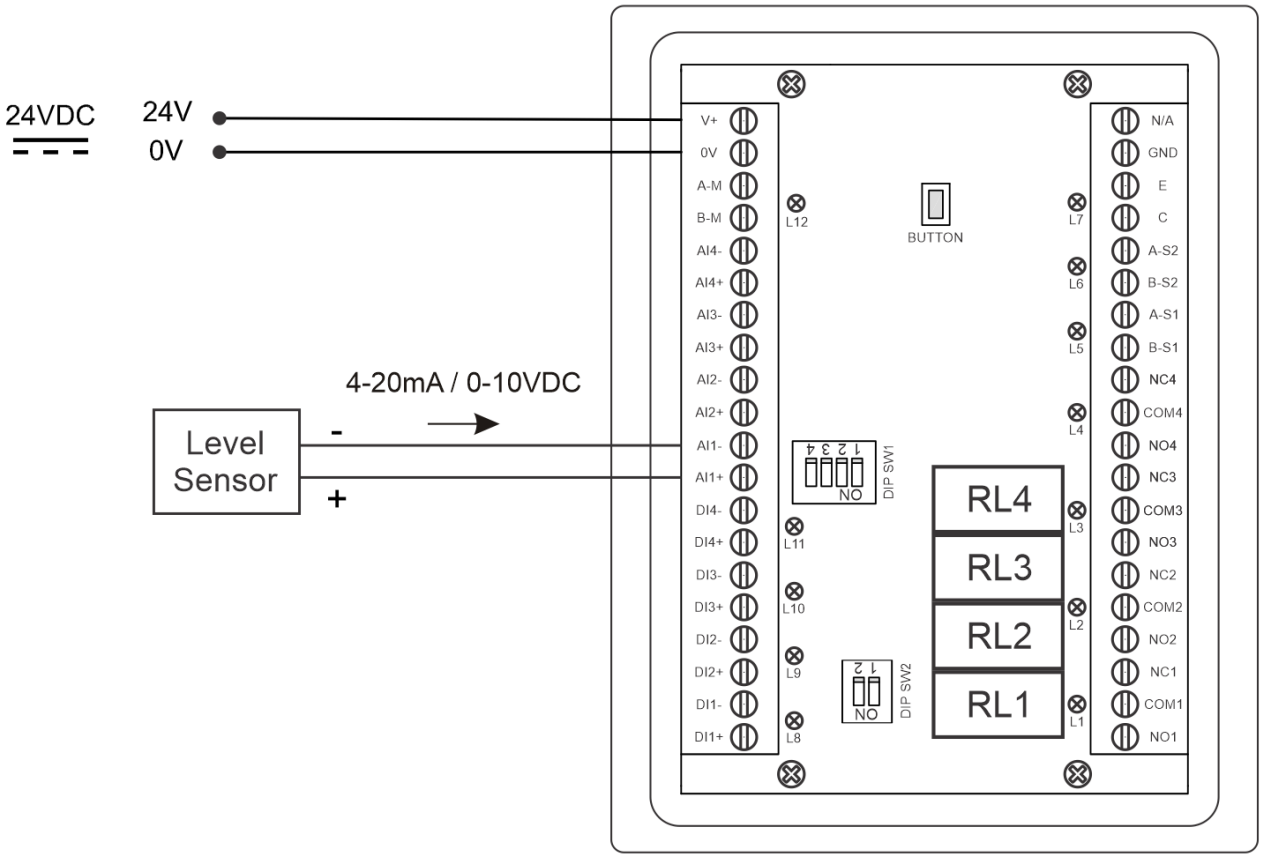
High-speed pulse count with max 2KHz frequency without filter:

- Set register "counter DI1: filter time" = 1: channel 1 counts pulses with Fmax = 2kHz
- Set register "counter DI2: filter time" = 1: channel 2 counts pulses with Fmax = 2kHz
- Set register "counter DI3: filter time" = 1: channel 3 counts pulses with Fmax = 2kHz
- Set register "counter DI4: filter time" = 1: channel 4 counts pulses with Fmax = 2kHz

5.4 Analog Input



04 AI channels, no isolation (**AI1 is a 4-20mA / 0-5 VDC / 0-10 VDC level sensor input**)



Use DIP SW to configure Analog input: 0-10V, 0-20mA



Value	Type of AI
0	0-10 V
1	0-20 mA

Input type:

- Measure voltage: 0-10V
- Measure current: 0-20mA
- The configuration for **AI** reads the same logical state as **DI**, but it is not isolated with a pulse range of **0-24V**

Input impedance:

- Measure voltage: 320 kΩ
- Measure the current: 499 Ω

5.4.1 Read the Analog value

Resolution 12 bits

Non-Linearity: 0.1%

Analog value in Modbus Memory Map: 0-3900

Analog value register in the Modbus Memory Map:

- AI1 analog value: store the Analog value of channel 1
- AI2 analog value: stores the Analog value of channel 2
- AI3 analog value: store the Analog value of channel 3
- AI4 analog value: store the Analog value of channel 4

5.4.2 AI configuration works as DI

No isolation

AI Configure AI to read the same logic state as DI with pulse amplitude from 0-24V

There are 2 counter threshold AIx: logic threshold 0 and counter AIx: threshold logic 1 in the modbus table: 0-4095

- Analog Analog value of AI <counter AIx: threshold logic 0: is considered Logic 0 status of AI
- Analog Analog value of AI> counter AIx: threshold logic 1: is considered to be Logic 1 state of AI
- Counter AIx: threshold logic 0 = <Analog value of AI <= counter AIx: threshold logic 1: is considered to be the constant logic state

Logic Logical status value of AI in Modbus Memory Map table: 0-1

The register stores logical values in Modbus Memory Map:

- AI1___AI2: digital status: stores the logical state of channel 1 and channel 2.
  - H_byte: AI1
  - L_byte: AI2
- AI3___AI4: digital status: stores the logical state of channel 1 and channel 2.
  - H_byte: AI3
  - L_byte: AI4

5.4.3 Pulse Counter AI max 10Hz

Counter value in Modbus Memory Map, when adding the number beyond the threshold, it will automatically return: 0 - 4294967295 (32bits)

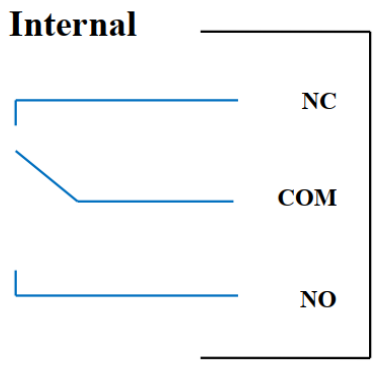
The register that stores Counter value in the Modbus Memory Map cannot be erased:

- Counter AI1: stores the logic state of channel 1
- Counter AI2: save logic state of channel 2
- Counter AI3: save logic state of channel 3
- Counter AI4: save logic state of channel 4

The register that stores Counter value in the Modbus Memory Map cannot be erased:

- None reset counter AI1: stores the logic state of channel 1
- None reset counter AI2: stores the logic state of channel 2
- None reset counter AI3: stores the logic state of channel 3
- None reset counter AI4: save logic state of channel 4

5.5 Relay



04 channel Relay SPDT NO / NC

Contact rating: 2A / 24VDC, 0.5A / 220VAC

There are status LEDs:

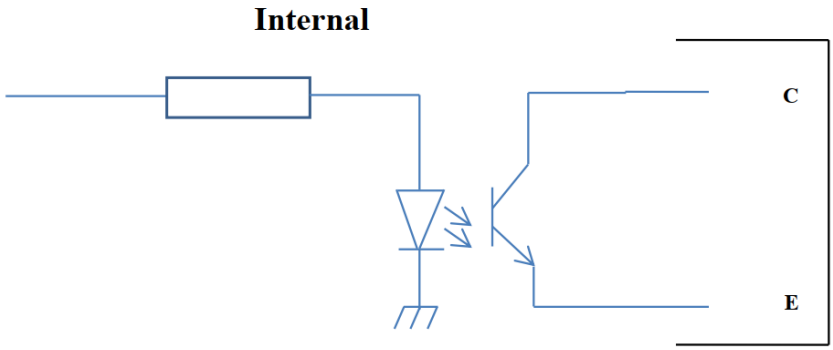
- Led on: Close Contact
- Led off: Open Contact

Default Relay Register	Status of relays when resetting power supplies
3	Operate according to the Alarm configuration

Alarm Configuration:

- **HIHI** : Relay 4 On
- **HI** : Relay 3 On
- **LO** : Relay 2 On
- **LOLO**: Relay 1 On

5.6 Pulse Output



01 isolated open-collector channel

Opto-coupler: Source current Imax = 10mA, Vceo = 80V

Functions: On / Off, pulse generator, PWM

5.6.1 On/Off Function

Set the Open-collector register in the Modbus Memory Map table:

- Set Open-collector register: 1 => Pulse Output**ON**
- Set Open-collector register: 0 => Pulse Output**OFF**

5.6.2 Pulse generator

Pulse output transmits a maximum of 65535 pulses, with Fmax 2.5kHz

Configure the following registers in the Modbus Memory Map table:

- Set register "open collector: pulse number": 0-65535 => Pulse Number = 65535: broadcast 65535 pulses
- Set register "open collector: time cycle": (0-65535) x0.1ms => Time Cycle = 4: Fmax 2.5kHz
- Set register "open collector: time on": (0-65535) x0.1ms => Time On: is the logic time 1 of the pulse
- Set the register "open collector ctrl" = 3 => configure the Pulse Output to generate a pulse and start to pulse, generate a sufficient number of pulses in the "open collector: pulse number" register => stop pulse generator and register " open collector ctrl ”= 0

5.6.3 PWM

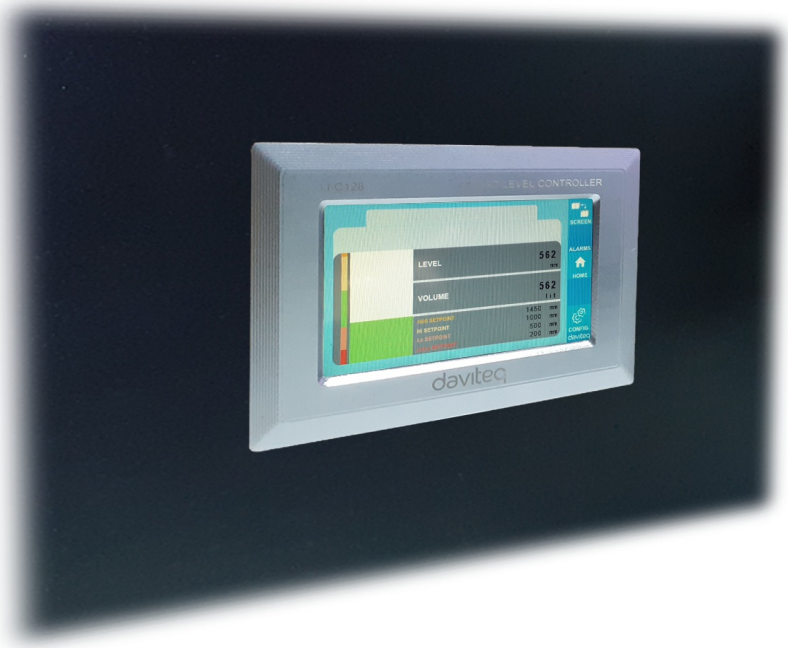
Max frequency 2.5kHz

Configure the following registers in the Modbus Memory Map table:

- Set the register "open collector ctrl" = 2 => configure Pulse Output PWM function
- Set register "open collector: time cycle": (0-65535) x0.1ms => Time Cycle = 4: Fmax 2.5kHz
- Set register "open collector: time on": (0-65535) x0.1ms => Time On: is the logic time 1 of the pulse

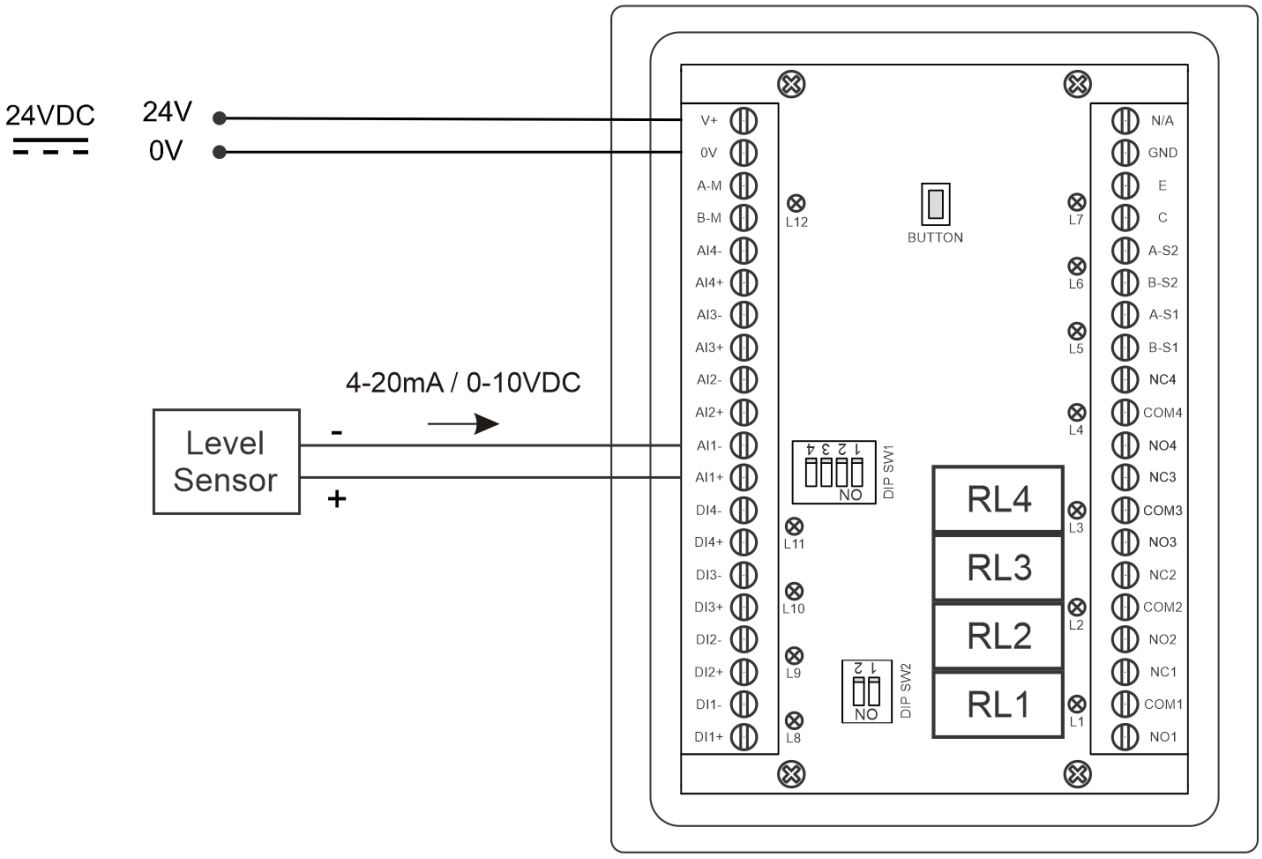
6. Installation

6.1 Installation method



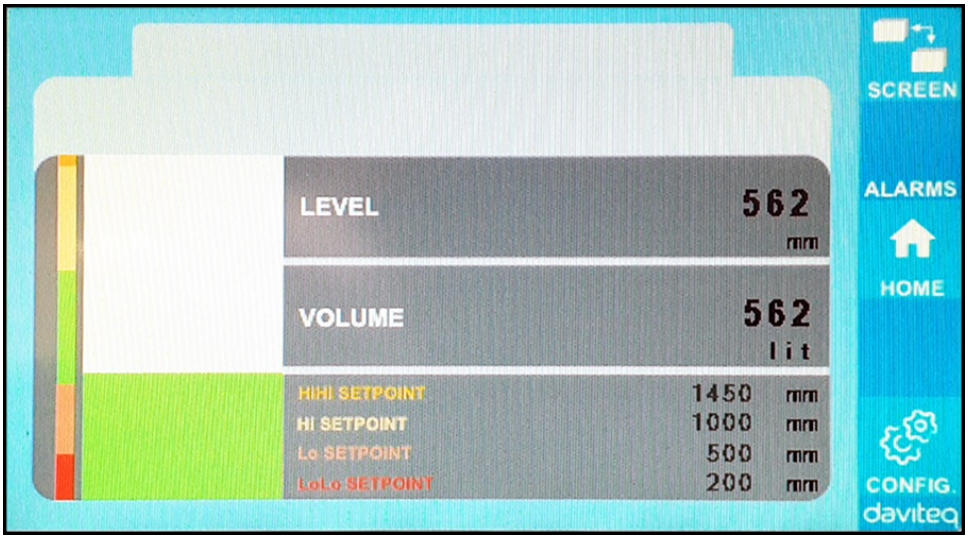
Panel mount

6.2 Wiring with Level Sensor



7. Configuration

7.1 Home Screen



SCREEN: Switch to 2nd screen with more detailed information

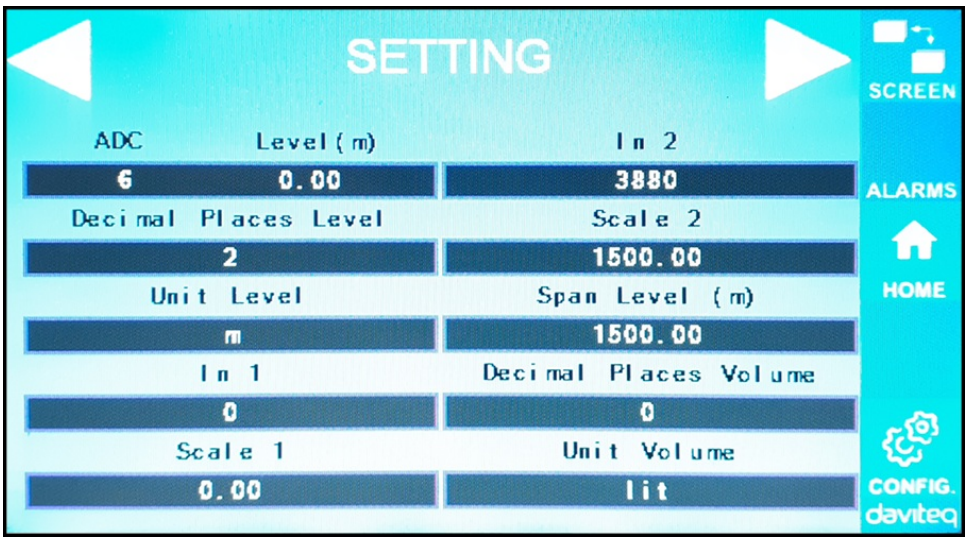
ALARMS: Show Level Alert

HOME: Return to Home Screen

CONFIG. (Default Password: a): Go to Setting Screen

7.2 Setting screen (Default Password: a)

7.2.1 Screen 1



ADC: Raw signal value of channel AI1

Level (Unit): The level corresponds to the ADC signal after configuration

Decimal Places Level: Decimal number of digits after the dot of Level 0-3 (00000, 1111.1, 222.22, 33.333)

Unit level: level units, 0-3 (0: mm, 1: cm, 2: m, 3: inch)

In 1: Enter the ADC value after putting 4 mA / 0 VDC into AI1 for calibration at 0 level

Scale 1: The level value displayed corresponds to the value entered in In 1 (usually 0)

In 2: Enter the ADC value after putting 20 mA / 10 VDC into AI1 for calibration at Full level

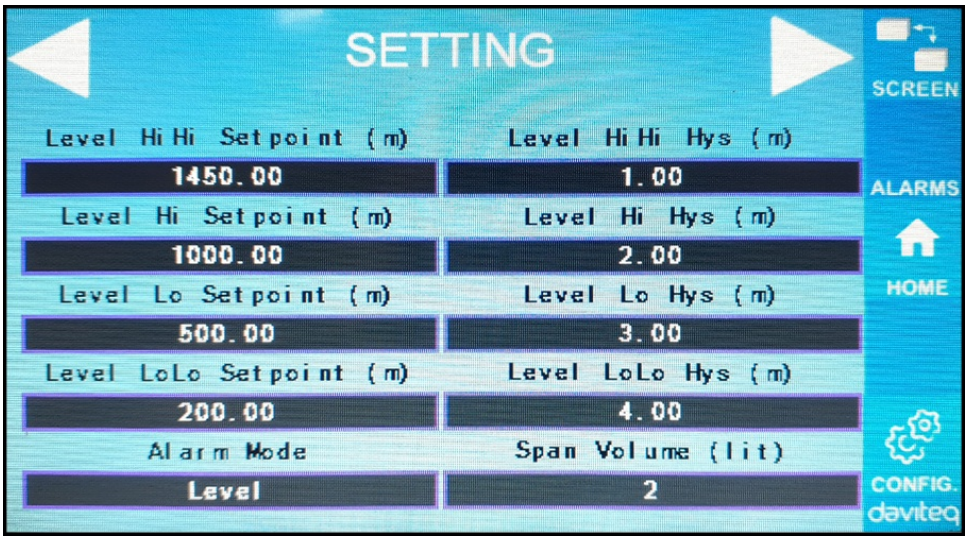
Scale 2: The level value displayed corresponds to the value entered in In 2

Span Level: Maximum value of Level (Span Level ≥ Scale 2)

Decimal Places Volume: Decimal number of digits after the dot of Volume 0-3 (00000, 1111.1, 222.22, 33.333)

Unit Volume: units of volume 0-3 (0: lit, 1: cm, 2: m3, 3:%)

7.2.2 Screen 2



Level Hi Hi Set point (Unit): High High level of Alarm Level

Level Hi Hi Hys (Unit): High High level hysteresis of Alarm Level

Level Hi Set point (Unit): High level of Alarm Level

Level Hi Hys (Unit): High level hysteresis of Alarm Level

Level Lo Set point (Unit): Low level of Alarm Level

Level Lo Hys (Unit): Low level hysteresis of Alarm Level

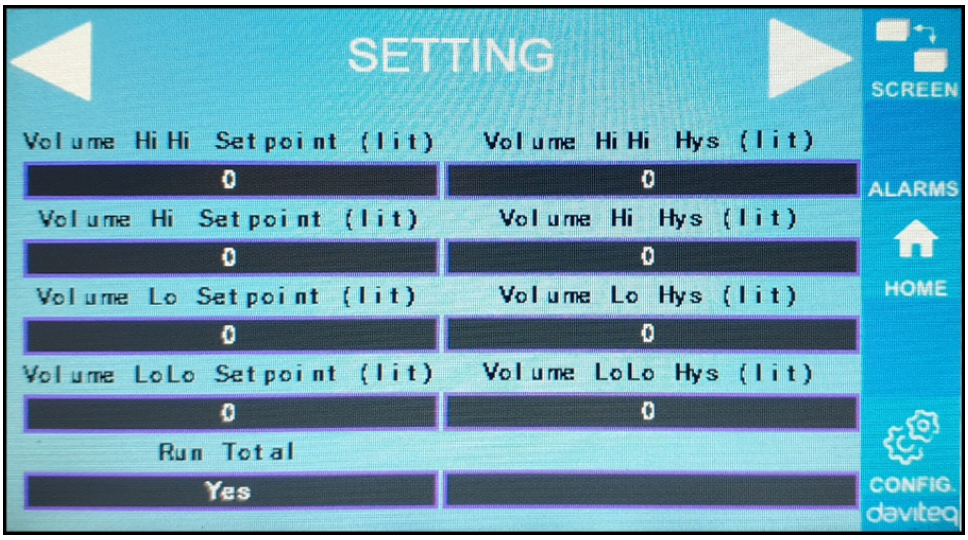
Level Lo Lo Set point (Unit): Low Low level of Alarm Level

Level Lo Lo Hys (Unit): Low Low level hysteresis of Alarm Level

Alarm Mode: 0: Level, 1: Volume

Span Volume(Unit): Maximum value of the volume

7.2.3 Screen 3



Volume Hi Hi Set point (Unit): High High volume of Alarm Volume

Volume Hi Hi Hys (Unit): High High volume hysteresis of Alarm Volume

Volume Hi Set point (Unit): High volume of Alarm Volume

Volume Hi Hys (Unit): High volume hysteresis of Alarm Volume

Volume Lo Set point (Unit): Low volume of Alarm Volume

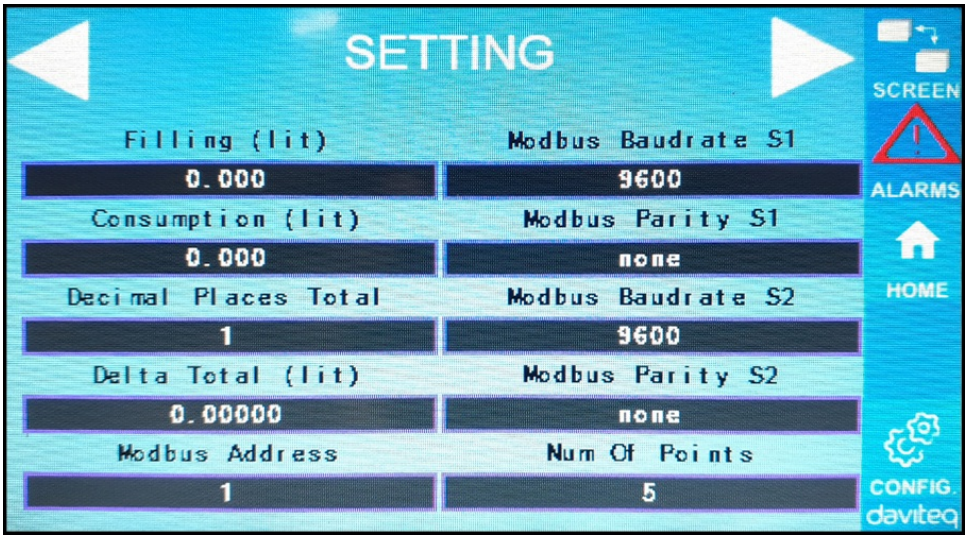
Volume Lo Hys (Unit): Low volume hysteresis of Alarm Volume

Volume Lo Lo Set point (Unit): Low Low volume of Alarm Volume

Volume Lo Lo Hys (Unit): Low Low volume hysteresis of Alarm Volume

Run Total: Run the total function. 0-1 (0: No 1: Yes)

7.2.4 Screen 4



Filling (Unit): Total function: total put into tank

Consumption (Unit): Total function: total consumption of the tank

Decimal Places Total: Decimal number of parameters Filling, Consumption, NRT Filling, NRT Consumption on display page (not the setting page)

Delta Total (Unit): Hysteresis level of the total function

Modbus Address: Modbus address of LFC128-2, 1-247

Modbus Baurate S1: 0-1 (0 : 9600 , 1 : 19200)

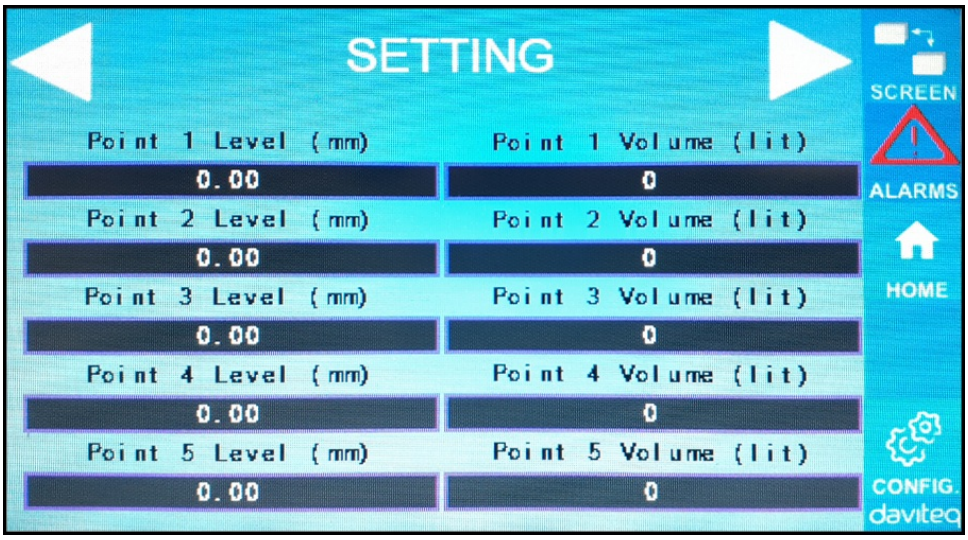
Modbus Parity S1: 0-2 (0: none, 1: odd, 2: even)

Modbus Baurate S2: 0-1 (0 : 9600 , 1 : 19200)

Modbus Parity S2: 0-2 (0: none, 1: odd, 2: even)

Num of Points: Number of points in the table to convert from level to volume, 1-166

7.2.5 Screen 5



Point 1 Level (Level Unit): Level at Point 1

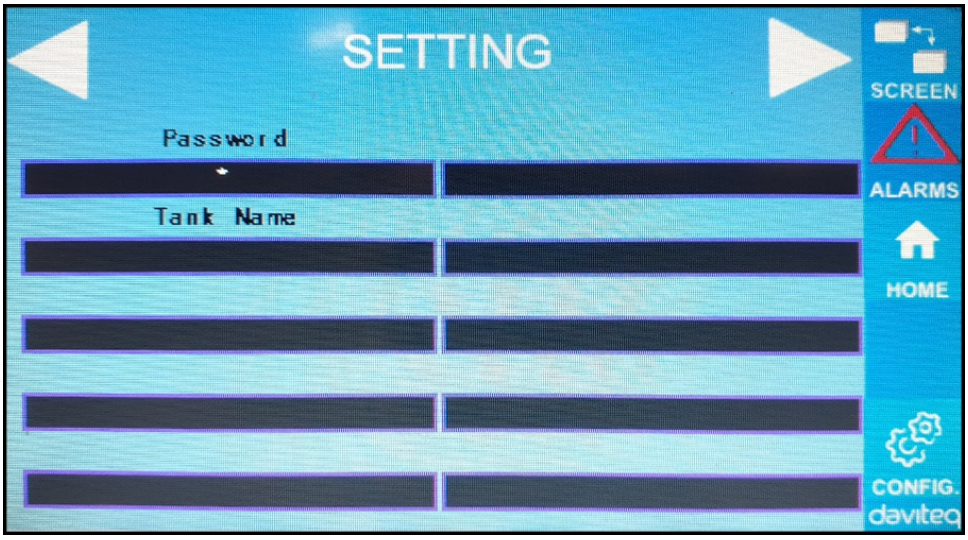
Point 1 Volume (Volume Unit): The corresponding volume at Point 1

-
-
-

Point 166 Level (Level Unit): Fuel level at Point 166

Point 166 Volume (Volume Unit): The corresponding volume at Point 166

7.2.6 Screen 6



Password: Password to enter the Setting page, 8 ASCII characters

Tank Name: Tank name displayed on the main screen

8. Troubleshooting

No.	Phenomena	Reason	Solutions
1	Modbus failed to communicate	Modbus LED Status: • LED is off: received no data • LED is blinking: the Modbus configuration is not the correct	• Check the connection • Check the Modbus configuration: Address, Baud Rate, Parity

2	Timeout Modbus	Noise appears on the line	Configure Baudrate 9600 and use a twisted pair cable with anti-jamming protection
3	Sensor Disconnected	Sensor and LFC128 lost connection	• Checking connection • Check sensor type (LFC128-2 only connects to 0-10VDC / 4-20mA analog sensor type) • Check the switch to see if it is turned on correctly • Check that the sensor connector is correct AI1
4	Linearization table error	Error of conversion table from level to volume	Check the configuration of the conversion table from level to volume

9. Support contacts

Manufacturer

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