

PROTECTOR DIGITAL

MANUAL

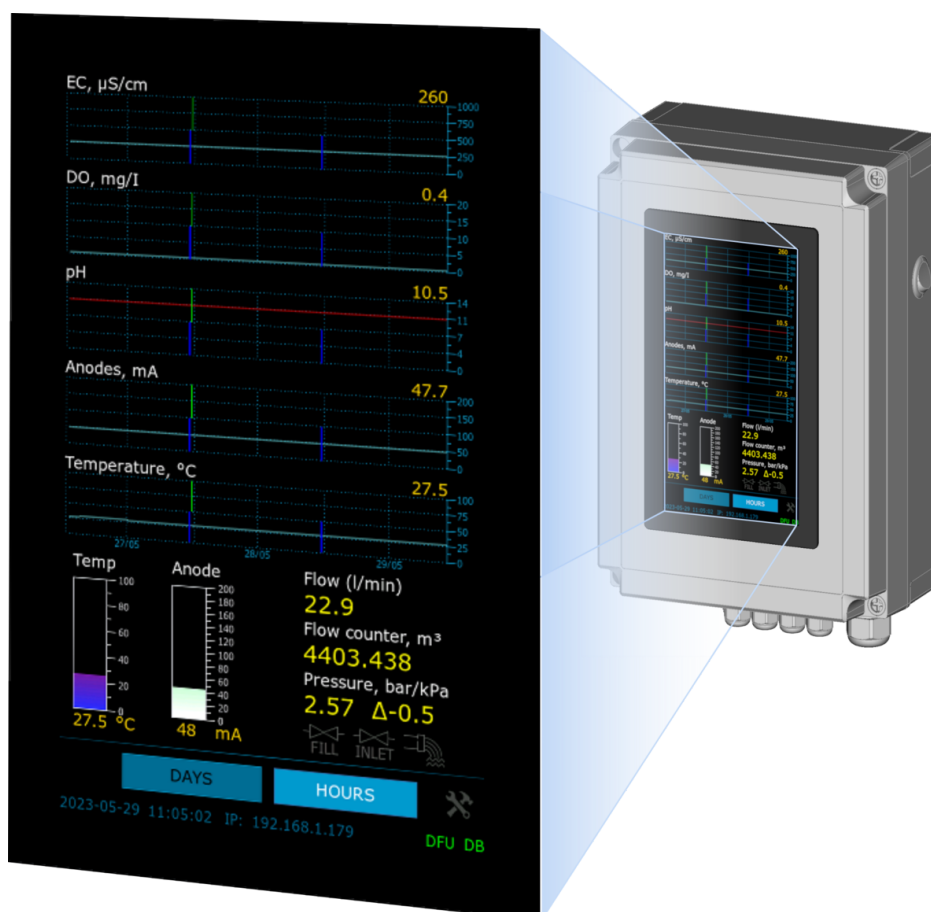


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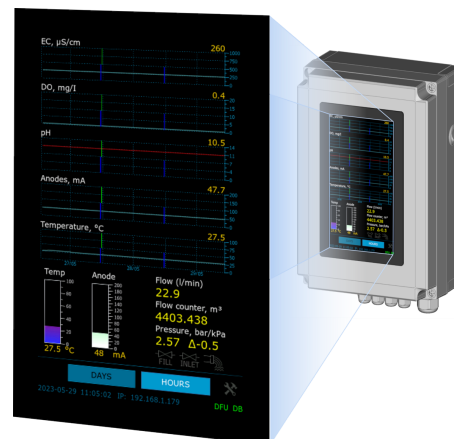
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WHAT IS PROTECTOR DIGITAL?

Protector Digital not only protects your water system but also continuously collects extensive data. This data can be analyzed to understand system behavior and perform preventive maintenance, saving both time and money.

Protector Digital can be connected to a Building Management System (BMS) using one of Protector's built-in protocols or directly to the Internet. In the latter case, it sends data to the IWT Database, where specialists can monitor and analyze it.

Protector is also equipped with a large touchscreen, allowing users to view data locally without requiring external connections.



SPECIFICATIONS

DIMENSIONS, WEIGHT AND CONDITIONS.

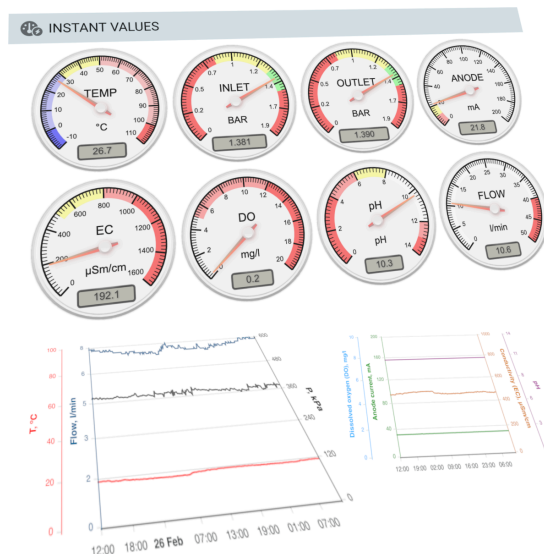
1	Dimensions	200x283x105 mm
2	weight	1,6 kg
3	Ambient temperature	+10..+60 °C
4	humidity	0–75%
5	Ingress Protection Code	IP44

MONITORED VALUES

#	Value	Range
1	Water flow	3..100 l/min
2	Flow counter	0..9999 m ³
3	Water temperature	0..110 °C
4	Electro conductivity (EC)	0..2000 µS/cm
5	Anode current	0..200 mA
6	Pressure	0..10 bar
7	Pressure difference	0..100kPa
8	PH	0..14
9	Dissolved oxygen (DO), optional	0..20 mg/l
10	Fill water amount	0..9999 m ³
11	Fill water electro conductivity (EC)	0..2000 µS/cm

FUNCTIONS

1. Automatic drain (sludge back flush) (requires drain/inlet valves).
2. Automatic pressure control (requires fill valve).
3. Connection to BMS (Modbus/RTU, Modbus/TCP, 4..20mA)
4. Internal web server (via LAN connection)
5. Cloud database data storage
6. Remote control
7. Remote firmware update
8. Leak detection
9. Alarms by e-mail



COMMUNICATION PORTS AND PROTOCOLS

Port	Protocol	Usage
Ethernet RJ-45	MQTTs to port 8883	The main IoT protocol for transmitting historical and real-time data to the cloud.
Ethernet RJ-45	HTTPS to port 443	A backup protocol for sending data to the cloud. It is used when the MQTT port is blocked.
Ethernet RJ-45	MODBUS/TCP	The most convenient way to connect Protector to a building control system. Many systems support Modbus-TCP, and Protector enables access to real-time values from all sensors using this protocol.
Ethernet RJ-45	BACNet/IP	Another commonly used method to connect Protector to a Building Management System (BMS).
Ethernet RJ-45	HTTP on local port 80	Built-in web-server. Built-in web server. By entering the IP address displayed on the screen, you can connect to Protector using any web browser. A user-friendly webpage will display all real-time and historical data in easy-to-read charts.
RS485 1	MODBUS RTU/Master	Used to communicate with RS485 sensors and Digital Filling Unit.
RS485 2	MODBUS/RTU Slave	Connect Protector to different gateways or building control systems using the RS485 interface. Real-time values from all sensors are provided via Modbus-RTU.
4..20mA input	-	Connect analog sensors (pH/DO/ORP/pressure).
4..20mA out	-	Connect to a Building Management System (BMS). Available only on request.

BACNET/IP

Hardware connections:

1. **BACnet/IP**: physical interface RJ-45 Cat 5E 100Mb. Port 47808 (0xBAC0).
 2. **BACnet/MSTP**: RS485. Default settings: 38400 8N1. Can be changed via the on-screen menu.
- Default object id: **102**. Can be changed via BACnet.

OBJECTS

ANALOG INPUT OBJECTS

Name	Units	Range
Anode current	mA	0..200
Flow counter	m ³	0..9999999
Flow	l/min	0..50
Conductivity	μS/cm	0..2000
Temperature	°C	0..110
Inlet pressure	kPa	0..1000
pH	-	0..14
Dissolved oxygen	mg/l	0..20
ORP redox	-	-2000..2000
Pressure difference	kPa	0..100
Outlet pressure	kPa	0..1000

BINARY OUTPUT OBJECTS

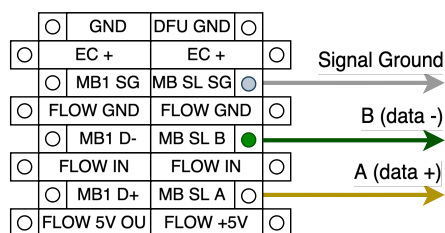
Name	Function
Drain	Open drain valve. The valve will close automatically after max drain duration time
Fill	Open fill valve. The valve will close automatically when reached max pressure or after 30 seconds

MODBUS

PROTOCOLS

RTU

Hardware connection:



SETTING SLAVE ADDRESS AND SPEED

1. Go to Tools→Settings→Connections
2. Set speed and address
3. Tap "Save".

Parity and stop bits are always 8N1 (8 bits, no parity, 1 stop bit).

TCP

Hardware connection: RJ-45 Cat 5E 100Mb

Address: same as for Modbus/RTU, default value: 1.

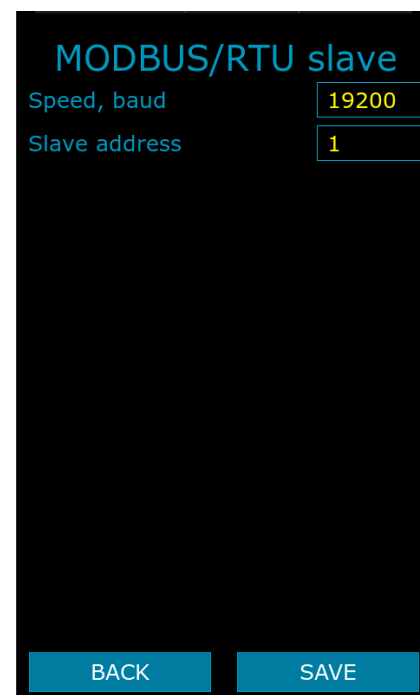


Figure 1: Modbus settings

HOLDING REGISTERS

reg #	RW	Type	Value	Units	Range
0	RW	UINT16	MB Address		
1	RW	UINT16	MB Address 0 - 300, 1 - 1200, 2 - 2400, 3 - 4800, 4 - 9600, 5 - 19200, 6 - 38400, 7 - 57600, 8 - 115200		
2	RO	UINT32	Timestamp	seconds	
4	RO	float dcba	Anode current	mA	0..200
6	RO	float dcba	Flow counter	m ³	0..9999999
8	RO	float dcba	Flow	l/min	0..50
10	RO	float dcba	Conductivity	μS/cm	0..2000
12	RO	float dcba	Temperature	°C	0..110
14	RO	float dcba	Inlet pressure	kPa	0..1000
16	RO	float dcba	Outlet pressure (raw, not calibrated)	kPa	0..1000
18	RO	float dcba	pH	-	0..14

reg #	RW	Type	Value	Units	Range
20	RO	float dcba	Dissolved oxygen	mg/l	0..20
22	RO	float dcba	ORP redox	mV	-2000..2000
28	RO	float dcba	Pressure difference(calibrated)	%	0..100
30	RO	float dcba	DFU flow counter	m ³	0..9999
32	RO	float dcba	DFU flow	l/min	0..100
34	RO	float dcba	DFU Conductivity	µS/cm	0..2000
36	RO	float dcba	DFU Temperature	°C	0..60
38	RO	float dcba	DFU Pressure	kPa	0..1000
40	RO	UINT16	Sensors connected, bit structure, see below		
41	RO	UINT16	Inlet valve	-	0/1
42	RW	UINT16	Drain valve. Writing 1 starts drain if pressure is above abs min. Stops automatically. Writing 0 stops drain.	-	0/1
43	RO	UINT16	Fill valve	-	0/1
44	RO	UINT16	EX2 Output	-	0/1

Sensors connected, bit structure:

Bit #	0	1	2	3	4	5	6	7	8	9	10
Sensor	Flow	T	EC	P in	P out	DO	Anode	pH	ORP	DFU EC	DFU flow

16-BIT HOLDING REGISTERS FOR BAS2 WITH INTEGER VALUE ONLY

reg #	RW	Type	Value	Units	Range
100	RO	UINT16	UNIX Timestamp LO	seconds	0..65535
101	RO	UINT16	UNIX Timestamp HI	seconds	0..65535
102	RO	UINT16	Anode current	mA	0..200
103	RO	UINT16	Flow counter	m ³	0..65535
104	RO	UINT16	Flow counter	l	0..999
105	RO	UINT16	Flow	l/min	0..50
106	RO	UINT16	Conductivity	µS/cm	0..2000
107	RO	UINT16	Temperature	°C	0..110
108	RO	UINT16	Inlet pressure	kPa	0..1000
109	RO	UINT16	Outlet pressure (raw, not calibrated)	kPa	0..1000

reg #	RW	Type	Value	Units	Range
110	RO	UINT16	pH	-	0..14
111	RO	UINT16	Dissolved oxygen	µg/l	0..20000
112	RO	UINT16	ORP redox	mV	-2000..2000
113	RO	UINT16	Pressure difference (calibrated)	kPa	0..100
114	RO	UINT16	DFU flow counter, m ³	m ³	0..9999
115	RO	UINT16	DFU flow counter, liters	l	0..999
116	RO	UINT16	DFU flow	l/min	0..100
117	RO	UINT16	DFU Conductivity	µS/cm	0..2000
118	RO	UINT16	DFU Temperature	°C	0..60
119	RO	UINT16	DFU Pressure	kPa	0..1000

SUPPORTED SENSORS

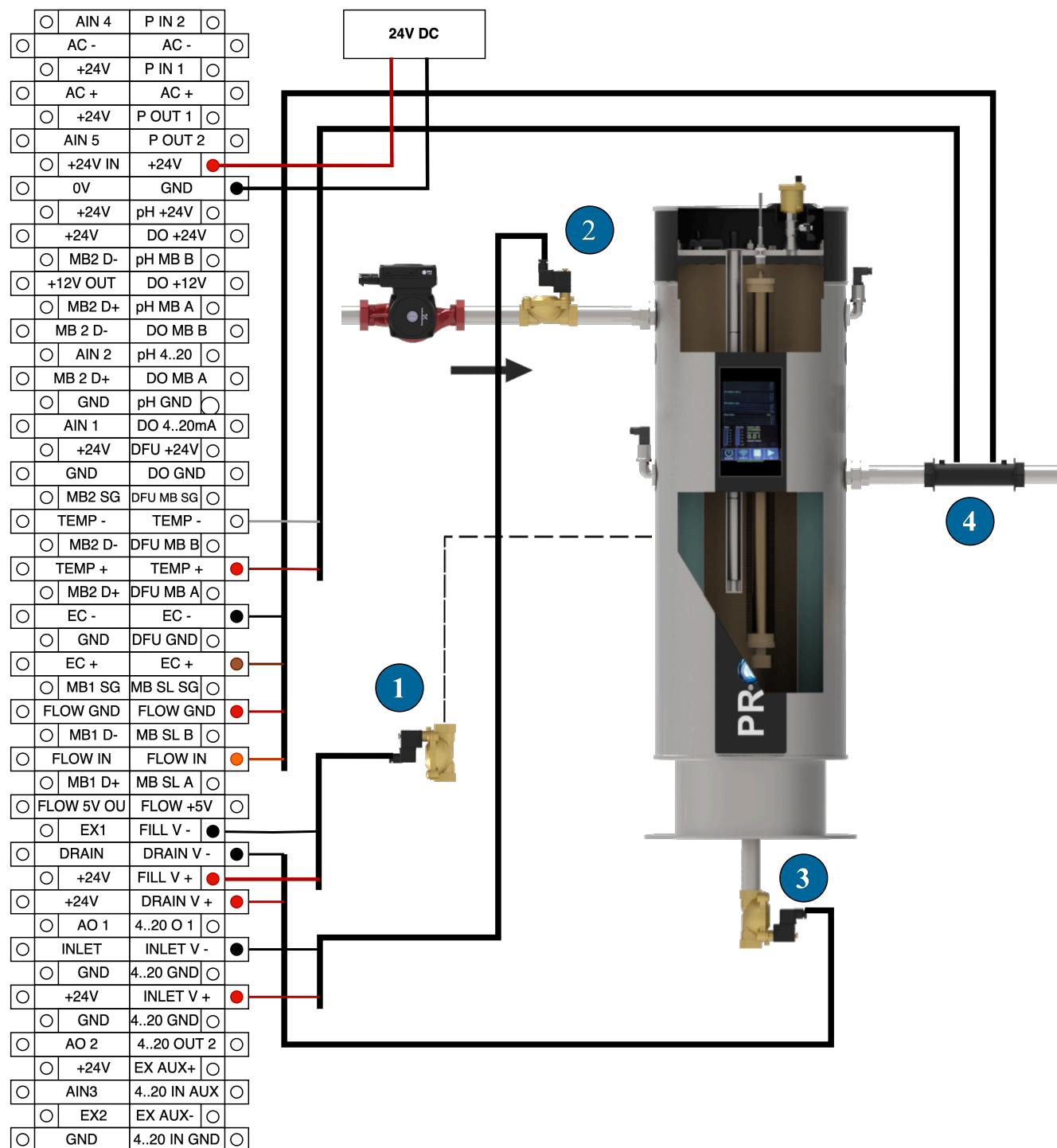
#	Value	Manufacturer	Output	Model	Comment
1	EC/T/Flow	IWTM	Raw	FS-8800	7 wires connected directly to terminals
1	Pressure	Any	4..20mA	Any	Range 0..1000kPa
2	pH/ORP	Sensorex	RS485	S272	
3	pH/ORP	Any	4..20 mA	Any	
4	DO	Sensorex	RS485	LUMIN-S	
5	DO	Hamilton	RS485	VisiFerm RS485 Arc	
6	DO	Any	4..20 mA	Any	0..20mg/l range
7	Flow	Any	Pulse	Any	Supports hall-effect (3-wire with 5V power) and mechanical (2-wire) turbine flow meters.
8	Anode current	n/a	current	n/a	Direct connection to terminals. Max current is 200.mA.

IMPORTANT NOTES

1. Never connect sensors with the device powered on.
2. MODBUS/RTU (RS485) sensors are detected within 15-20 seconds. If not detected, please turn Protector off, check connections and turn on.

CONNECTION DIAGRAMS

BASIC CONNECTION DIAGRAM WITH COMBINED CONDUCTIVITY/FLOW

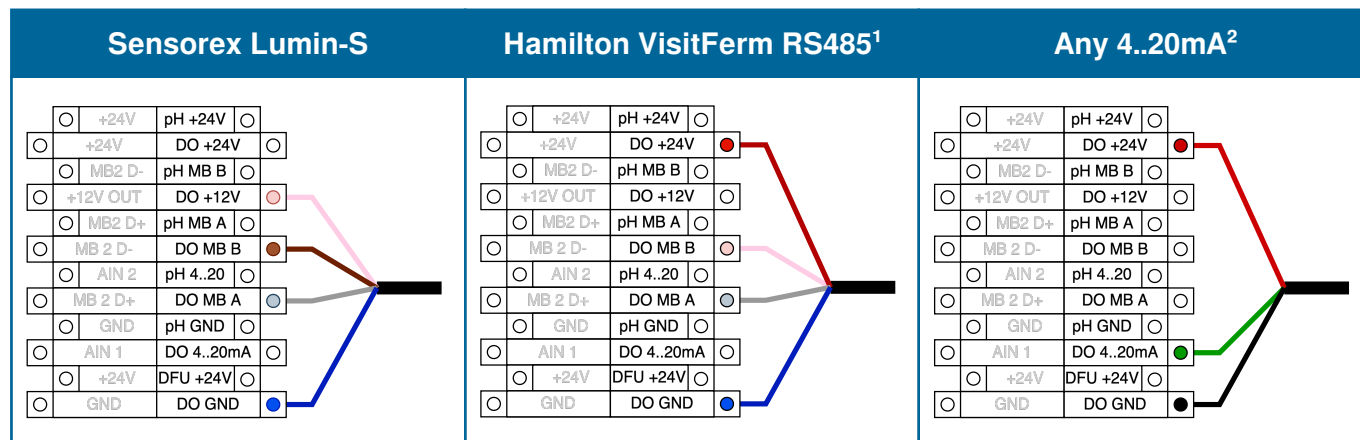


- 1 Fill valve
- 2 Inlet valve
- 3 Drain valve

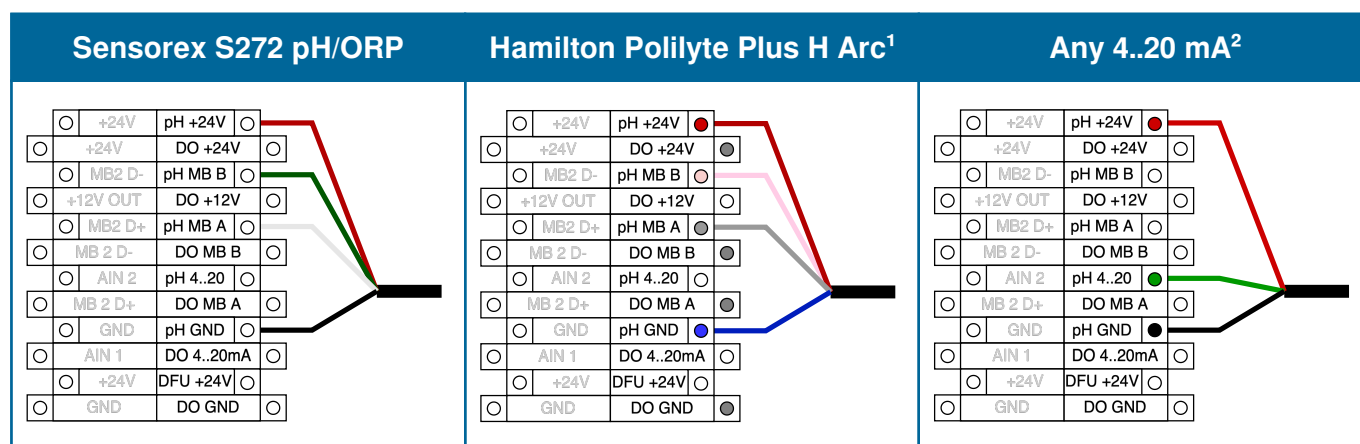
Combined conductivity/flow sensor

SENSORS

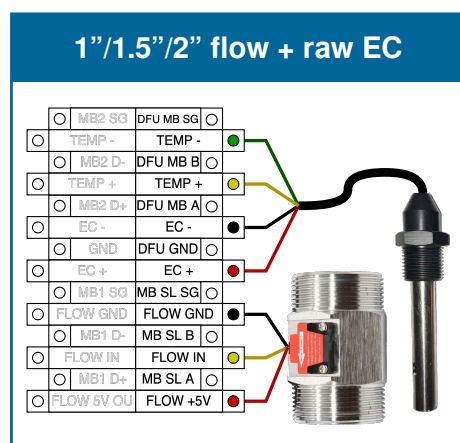
DISSOLVED OXYGEN (DO)



PH/ORP



FLOW AND RAW CONDUCTIVITY



HAMILTON SENSOR SETUP

WARNING! Hamilton DO, pH and EC modbus sensors are shipped with the same address – 1. Never connect non-configured Hamilton sensors. There are 2 options to configure them:

1. Use Hamilton configuration tools. Refer to the sensor manual for the procedure. Set the following addresses:

DO	pH/ORP	EC
21	22	23

2. Use Protector Digital to configure them by the following procedure:
 1. Connect a single Hamilton sensor, power up and wait until the sensor is detected.
 2. Turn power off.
 3. Repeat steps 1 and 2 with the second and third sensor

¹ Hamilton sensors may be shipped with two types of cables: 4-wire and 8-wire. Select the appropriate wire colors according to the

diagram.

² Check the sensor voltage. 12V sensors should be connected to 12V terminal.

POWER SUPPLY

REQUIREMENTS:

Options	No valves	Up to 2 Valves	Up to 3 Valves
Voltage	24v	24v	24v
Output current	1A	2A	2.5A
Power	24w	48w	60w

RECOMMENDED POWER SUPPLIES:

#	Image	Manufacturer	Model	Comment
1		IWTM	PD-PWR-60	Up to 3 Valves
2		MEAN WELL	HR-60-24	Up to 3 Valves
3		MEAN WELL	MDR-60-24	Up to 3 Valves

#	Image	Manufacturer	Model	Comment
4		MEAN WELL	MDR-20-24	No valves

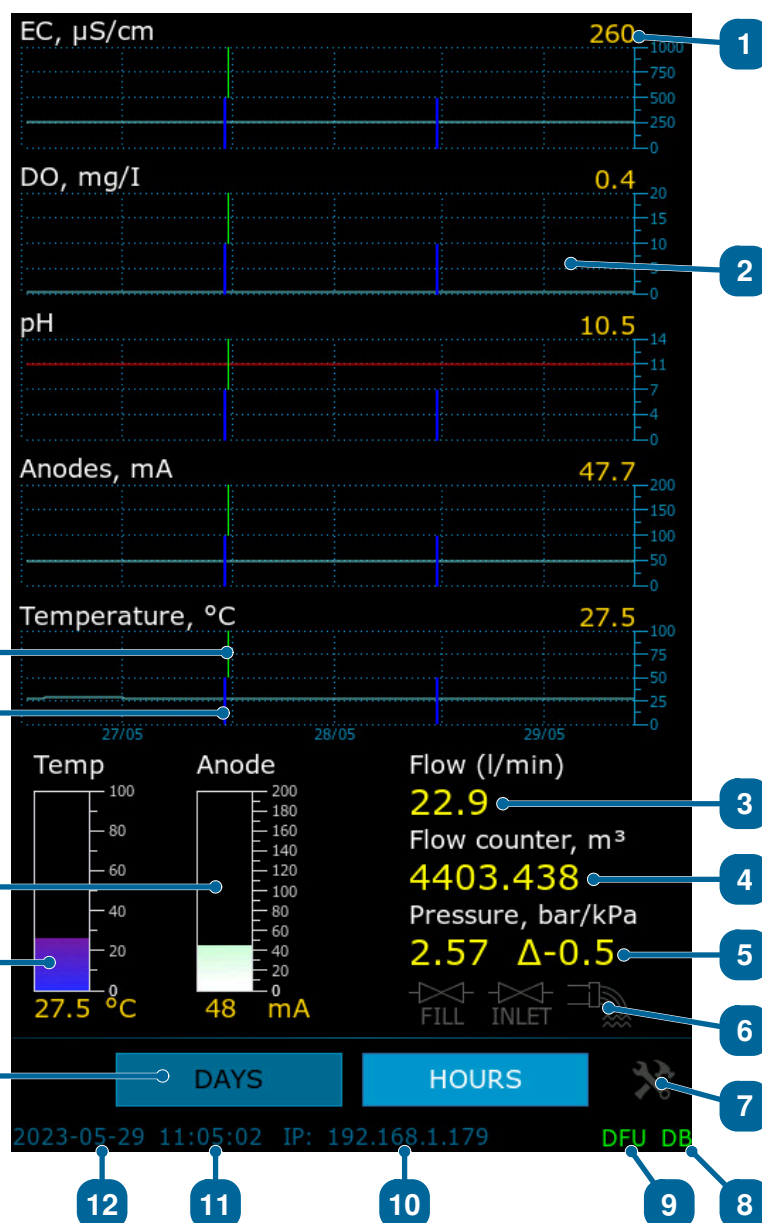
ON-SCREEN DATA AND CONTROLS

SETUP WIZARD

On a first start Protector will run a Setup Wizard which guides through all settings required.

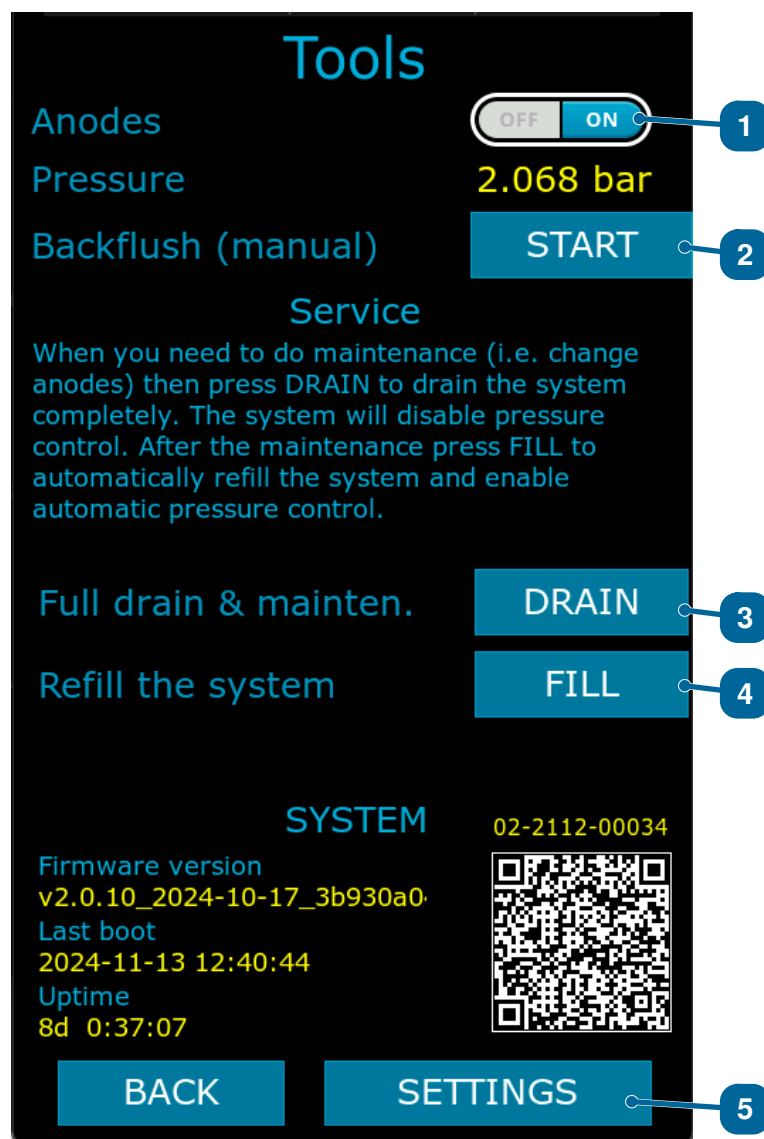
MAIN SCREEN

- 1 Instant value
Instant sensor value, updated every second.
- 2 Trend
Shows how the value changes with time. Updated every 10 minutes.
- 3 Water flow
- 4 Flowcounter
- 5 Pressure
Pressure in the system and pressure difference between Protector inlet and outlet. High difference indicates the need for drain.
- 6 Valve indicators
- 7 Tools button
- 8 Cloud connection status
HT: connected by https,
MT: connected by MQTT
- 9 DFU is connected
- 10 Network status/IP address
- 11 Time
- 12 Date
- 13 Trend scale (days/hours)
HOURS: 1 point/10min
DAYS: 1 point/day.
- 14 Temperature gauge
- 15 Anode gauge
- 16 Drain (blue line)
- 17 Fill (green line)



TOOLS MENU

Tap "Tools" button.



1. **Anodes switch.** Manually switch off the anodes.
2. **Manual back flushing.** Tap and hold to drain the system manually.
3. **Full drain.** Tap this button to empty the tank and put the system into maintenance mode before doing service to the Protector.
4. **Refill.** Tap this to refill the system after maintenance and return to normal mode.
5. **Settings.** Open settings menu. A PIN-code required.

NETWORK SETTINGS

Tools→Settings→PIN-code→NETWORK.

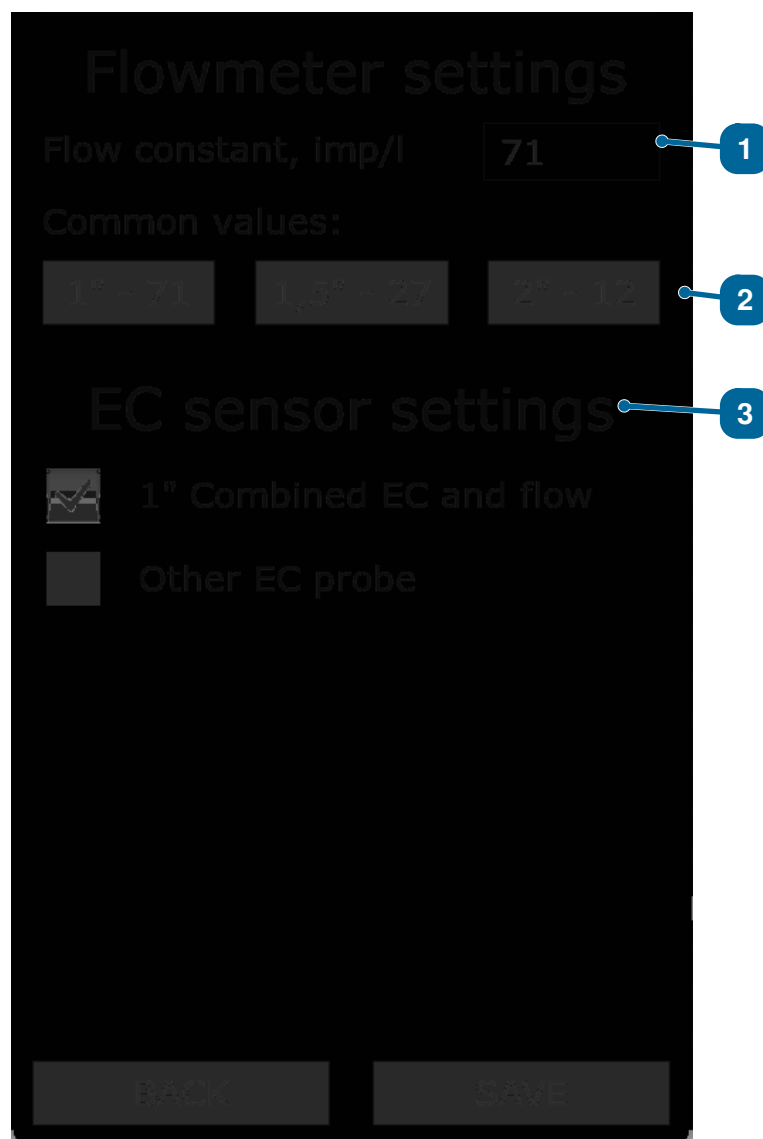
The screenshot shows the 'Network settings' interface. At the top, the title 'Network settings' is in blue. Below it, the 'DHCP client' is a toggle switch currently set to 'OFF' (labeled 1). The 'IP address' field contains '192.168.127.100' (labeled 2). The 'Network mask' field contains '255.255.255.0'. The 'Gateway' field contains '192.168.127.1'. The 'DNS' field contains '8.8.8.8'. The 'Link:' status is 'connected' in green, and the 'DB' status is 'DB' in green (labeled 3). Below these, a summary table shows: IP 192.168.1.166, NM 255.255.255.0, GW 192.168.1.3, and DNS 192.168.1.3 (labeled 4). At the bottom are 'BACK' and 'SAVE' buttons.

Field	Value
DHCP client	OFF
IP address	192.168.127.100
Network mask	255.255.255.0
Gateway	192.168.127.1
DNS	8.8.8.8
Link:	connected
DB	DB
IP	192.168.1.166
NM	255.255.255.0
GW	192.168.1.3
DNS	192.168.1.3

1. **Dynamic IP-address.** Enable DHCP client to obtain IP-address automatically.
2. **Static IP-address**
 1. Disable DHCP client
 2. Enter static IP, network mask, gateway and DNS. If you have no DNS address, enter 8.8.8.8 or 1.1.1.1.
 3. Tap "Save".
3. **Link and Database connection status**
4. **Current IP parameters**

FLOWMETER SETTINGS

Tools→Settings→PIN-code→FLOWMETER & EC



1. **Flow constant.** Select one of the presets or enter the constant manually. Flow constant is number of pulses per litre.

2. **Flow constant presets.**

3. **EC sensor settings.** Select '1" combined EC and flow' for the FS-8800 combined sensor. If you have any other conductivity sensor, select "Other EC probe".

PRESSURE CONTROL

Tools→Settings→PIN-code→PRESSURE CONTROL.

PRESSURE CONTROL

Auto pressure control ☐ OFF ☐ ON

Security valve, bar 4.00

Normal pressure range

Max, bar 3.00

Min, bar 2.00

Abs min pressure, bar 1.00

BACK SAVE

1. **Auto pressure control.** When turned on, Protector will keep the pressure between Min and Max values by refilling system. Fill valve needs to be connected for pressure control.
2. **Security valve.** Enter your system security valve pressure.
3. **Max.** Maximum pressure in the system. Protector will fill up to this level.
4. **Min.** Minimum pressure in the system. When below, Protector will start refilling.
5. **Abs min pressure.** Absolute minimum pressure. Protector will never drain the system below this pressure level.

BACK FLUSHING

Tools→Settings→PIN-code→BACK FLUSHING.

BACKFLUSH

Automatic backflush OFF ON

Difference to drain, %

- 10 +

Drain interval, days

- 7 +

Max drain duration, s

- 15 +

Pressure difference calibration

Inlet, bar

1.794

Outlet, bar

1.705

Difference (comp), kPa

9.0

Calibration requires no flow through the Protector. If you don't have an automatic inlet valve, please stop the flow manually. Press "CALIBRATE" when ready. Difference should be nearly zero when properly calibrated.

CALIBRATE

BACK

SAVE

1. **Automatic back flushing.** If enabled, Protector will from time to time drain the system according to the settings. Drain valve needs to be installed in the system.
2. **Difference to drain.** Pressure difference higher than this setting indicates that the filter is slugged and needs to be drained immediately.
3. **Drain interval in days.** The system will be drained after this number of days regardless of the pressure difference.
4. **Max drain duration.** Number of seconds the drain valve will stay open.
5. **Pressure difference calibration.** In order to detect pressure difference and slugged state of the tank Protector needs the pressure sensors to be calibrated. Follow instructions on the screen to calibrate.

CONTACTS

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