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Operating Instructions
Liquiline Control CDC90

Data transmission via Modbus TCP

Endress+Hauser
People for Process Automation

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1 About this document

Structure of information	Meaning
DANGER **Causes (/consequences)** If necessary, Consequences of non-compliance (if applicable) ▶ Corrective action	This symbol alerts you to a dangerous situation. Failure to avoid the dangerous situation **will** result in a fatal or serious injury.
WARNING **Causes (/consequences)** If necessary, Consequences of non-compliance (if applicable) ▶ Corrective action	This symbol alerts you to a dangerous situation. Failure to avoid the dangerous situation **can** result in a fatal or serious injury.
CAUTION **Causes (/consequences)** If necessary, Consequences of non-compliance (if applicable) ▶ Corrective action	This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or more serious injuries.
NOTICE **Cause/situation** If necessary, Consequences of non-compliance (if applicable) ▶ Action/note	This symbol alerts you to situations which may result in damage to property.

1.1 Symbols

- Additional information, tips
- Permitted or recommended
- Not permitted or not recommended
- Reference to device documentation
- Reference to page
- Reference to graphic
- Result of a step

1.1.1 Symbols on the device

- Reference to device documentation
- Do not dispose of products bearing this marking as unsorted municipal waste. Instead, return them to the manufacturer for disposal under the applicable conditions.

1.2 Documentation

This supplementary documentation must be used only in conjunction with a Liquiline Control CDC90 with Modbus TCP.

This supplementary documentation is an integral part of the Operating Instructions and provides additional information on the use of the device with Modbus TCP.

More information can be found in the following Operating Instructions:

Operating Instructions CDC90 BA01707C

It is assumed that the reader has basic knowledge in this area.

Further information on Modbus technology can be found, for example, on the website: www.modbus.org

1.3 List of abbreviations

n/a	Not applicable
NaN	Not a number (IEEE-754, 7Fh A0h 00h 00h)
ENP	Electronic name plate
I&M	Identification & Maintenance
AI	Analog Input (PA Profile function block)
DI	Discrete Input (PA Profile function block)
AO	Analog Output (PA Profile function block)
DO	Discrete Output (PA Profile function block)
DCS	Distributed control system

2 Basic safety instructions

2.1 Requirements for the personnel

- Installation, commissioning, operation and maintenance of the measuring system may be carried out only by specially trained technical personnel.
- The technical personnel must be authorized by the plant operator to carry out the specified activities.
- The electrical connection may be performed only by an electrical technician.
- The technical personnel must have read and understood these Operating Instructions and must follow the instructions contained therein.
- Faults at the measuring point may only be rectified by authorized and specially trained personnel.

Repairs not described in the Operating Instructions provided must be carried out only directly at the manufacturer's site or by the service organization.

2.2 Intended use

Liquiline Control CDC90 is a fully automatic measuring, cleaning and calibration system for Memosens sensors. The system is fully equipped with power supply cables and a hose system.

2.2.1 Non-intended use

Use of the device for any purpose other than that described, poses a threat to the safety of people and of the entire measuring system and is therefore not permitted.

The manufacturer is not liable for damage caused by improper or non-designated use.

2.3 Workplace safety

As the user, you are responsible for complying with the following safety conditions:
- Installation guidelines
- Local standards and regulations
- Regulations for explosion protection

Electromagnetic compatibility
- The product has been tested for electromagnetic compatibility in accordance with the applicable international standards for industrial applications.
- The electromagnetic compatibility indicated applies only to a product that has been connected in accordance with these Operating Instructions.

2.4 Operational safety

Before commissioning the entire measuring point:

1. Verify that all connections are correct.
2. Ensure that electrical cables and hose connections are undamaged.
3. Do not operate damaged products, and protect them against unintentional operation.
4. Label damaged products as defective.

During operation:

▶ If faults cannot be rectified:
products must be taken out of service and protected against unintentional operation.

⚠ CAUTION

Programs not switched off during maintenance activities.

Risk of injury due to medium or cleaning agent!

- ▶ Quit any programs that are active.
- ▶ Switch to the Service Mode before you remove sensors from the assembly.
- ▶ If you need to test the cleaning function while cleaning is in progress, wear protective clothing, goggles and gloves or take other suitable measures to protect yourself.

2.5 Product safety

2.5.1 State-of-the-art technology

The product is designed to meet state-of-the-art safety requirements, has been tested, and left the factory in a condition in which it is safe to operate. The relevant regulations and international standards have been observed.

2.6 IT security

We only provide a warranty if the device is installed and used as described in the Operating Instructions. The device is equipped with security mechanisms to protect it against any inadvertent changes to the device settings.

IT security measures in line with operators' security standards and designed to provide additional protection for the device and device data transfer must be implemented by the operators themselves.

3 Electrical connection

3.1 Connecting the communication interfaces

Installation and wiring is described in the Operating Instructions of Liquiline Control CDC90.

4 System integration

4.1 Integrating Modbus TCP communication into the system

4.1.1 Settings

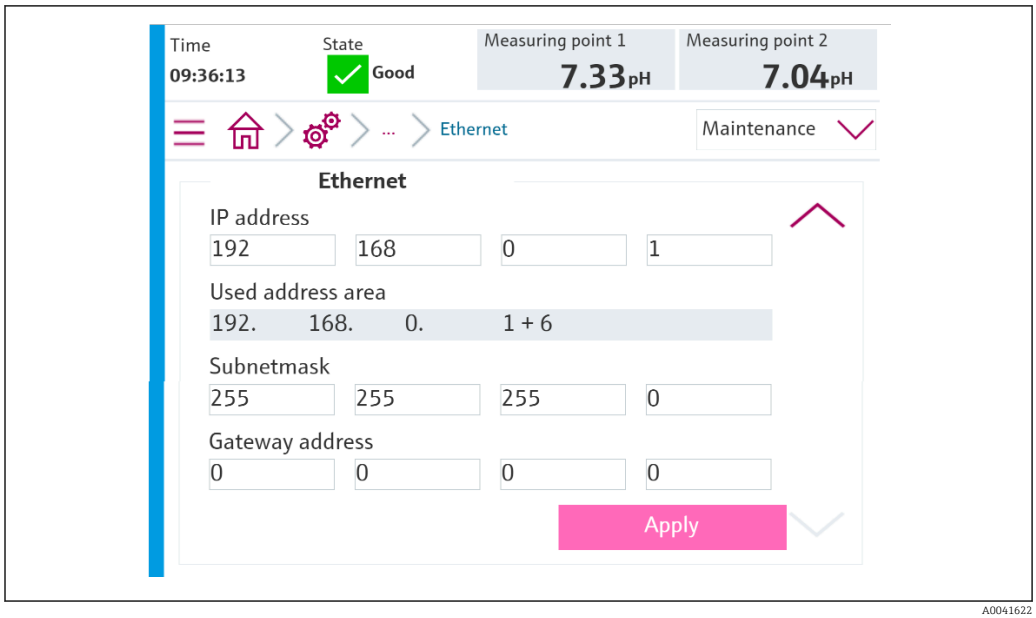
The network settings (IP address, subnet mask and gateway) of the device must first be configured before a connection to the Liquiline Control CDC90 can be established.

The settings depend on the network into which the device is being integrated.

Default setting

Setting	Factory setting
IP address	192.168.0.1 Valid IPv4 address of CDC90
Netmask	255.255.255.0 Valid subnet mask
TCP port (HTTP)	80
TCP port (Modbus TCP)	502

Setting the static IP address



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1. Under: Setup/General settings/Advanced settings/Ethernet/Settings, set the values as indicated in the graphic below.
2. Change the settings for the IP address and network mask. In addition to this IP address, the CDC90 uses the next six IP addresses for internal components. All seven IP addresses in the network must be free.
3. Save settings by pressing **Accept**.
4. Wait 20 seconds until the measured values are visible again.

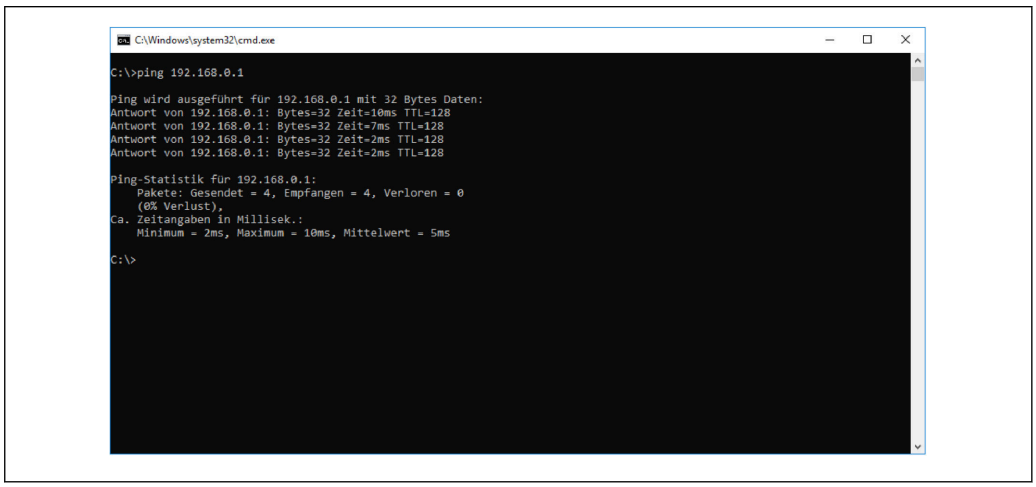
4.1.2 Checking the connection

NOTICE

The device uses an EtherCat connection for internal communication. Depending on the load on the network, EtherCat can cause failures in the CDC90 IPCs if several CDC90 devices are integrated in the same network.

- To reduce the network load in the event of a Modbus TCP connection, the networks must be separated. A physical separation with a VLAN-capable switch, e.g. Layer 2 Managed Switch (VLAN Capable), or a software-based separation are possible.

The Liquiline Control CDC90 implements the ICMP protocol. The “ping” command can be used to check whether the Liquiline Control CDC90 can be reached via the network.



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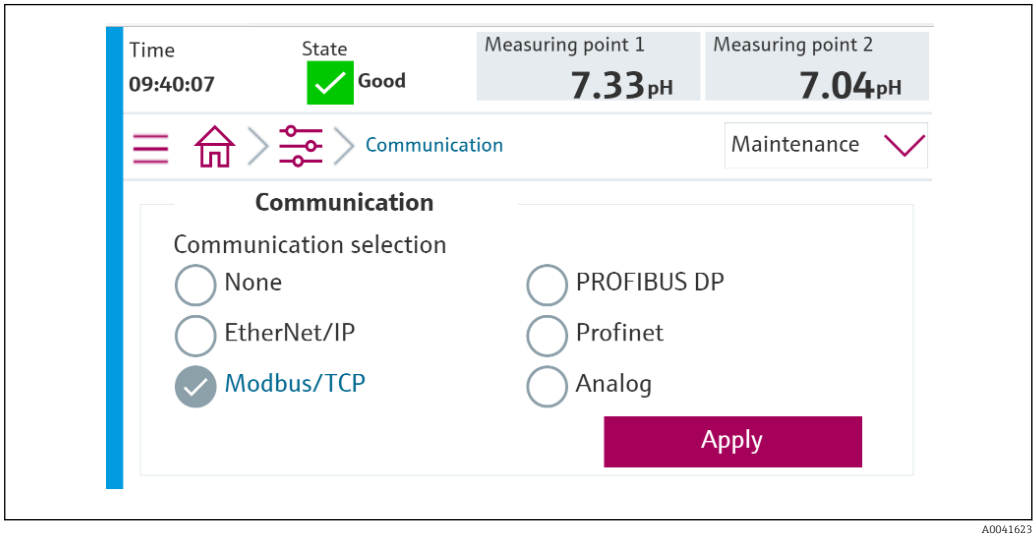
4.1.3 Selecting Modbus TCP

To specify which fieldbus communication method is used to send commands, go to:

1. Select the Modbus TCP protocol.
2. Press **Accept** to confirm.

The values cannot be read until this setting has been made.



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Only one fieldbus communication is used to send commands to the Liquiline Control CDC90 or to read the values.

Once the protocol has been enabled, but the connection to the control station has not been detected or established, an Out of Spec message 1003 is reported: communication to the distributed control system is interrupted.

4.1.4 Parameter tables

Variables	R/W	Register
System control	w	00 ... 06
System Information	R	00 ... 09
Calibration report	R	10 ... 54
Name of device	R	60 ... 75
Information about measuring point 1	R	100 ... 153
Information about measuring point 2	R	200 ... 253
IO feedbacks	R	900 ... 961
Device information	R	1000 to 1087

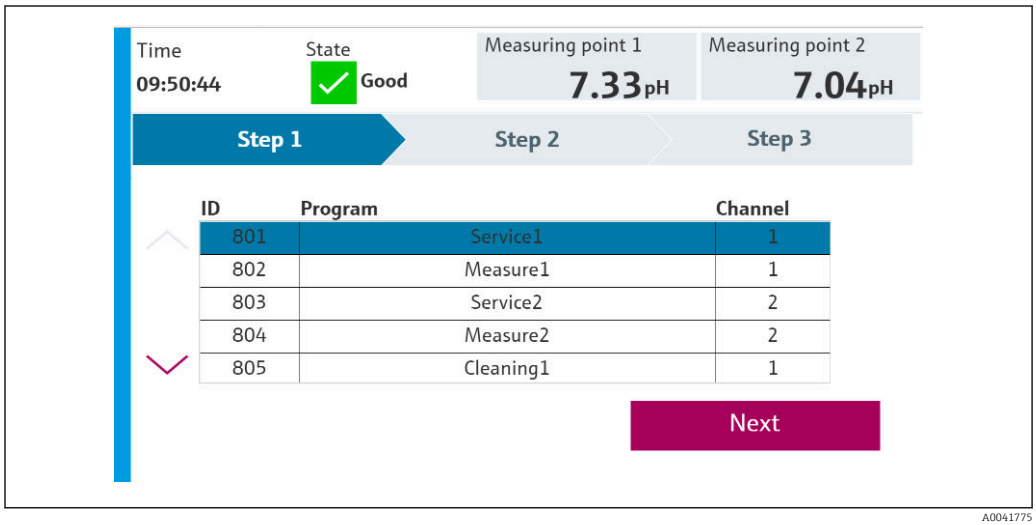
Output parameters

The output data modules are used as command parameters to start programs or change the operating mode.

The program IDs can be viewed in the "CDC90 program configuration tool" or found on the local display under the User Guidance / Programs menu.

System control

Register	Parameter	Description	Data type
0	OpMode-Control	2 = OpMode is automatic 3 = OpMode is remote	USINT
3	ProgramSelection	Select the program via the program ID	UINT
4	ProgramControl	0 = No program started 1 = Start selected program 2 = Pause active program (currently not supported) 3 = Quit active program	USINT



1 *Overview of the programs*

Programs

ID	Name	Sequence	Channel
801	Service1	1001	1
802	Measure1	1002	1
803	Service2	1001	2
804	Measure2	1002	2
805	Cleaner1	1009	1
806	Cleaner2	1009	2

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2 Programming in the configuration tool

Input parameters

System Information

Register	Parameter	Description	Data type
0	OpMode-State	0 = OpMode is setup 1 = OpMode is manual 2 = OpMode is automatic 3 = OpMode is remote	USINT
1	Alarm-State	0 = CDC90 has no alarm 1 = CDC90 has an error alarm 2 = CDC90 has a function control alarm 3= CDC90 has a maintenance alarm 4= CDC90 has an out of specification alarm	USINT
2	Alarm-Number	Number of an alarm	UINT
3	ProgramSelection-State	Reflects the ProgramSelection, if valid.	UINT
4	ProgramControl-State	0 = No program running 1 = Selected program running 2 = Active program paused (currently not supported) 3 = Active program stopped 4 = Selected program canceled 5 = Selected program quit successfully	USINT
5	Current Step	Active program step	UINT
6	Program-Result	0 = No result 1 = Selected program completed successfully 2 = Selected program not completed successfully	USINT

Calibration results

Calibration results for measuring point 1 and for measuring point 2:

Sensor	Calibration result measured value 1	Calibration result measured value 2	Calibration result measured value 3	Calibration result measured value 4	Calibration result measured value 5
pH glass	Current raw value mV	Current measured value pH	Temperature °C	Slope mV/pH	Zero point pH
pH ISFET	Current raw value mV	Current measured value pH	Temperature °C	Slope mV/pH	Zero point pH
ORP	Current raw value mV	Current measured value pH (Raw value+Offset)	Temperature °C	Offset value mV	No data
pH/ORP	pH calibration				
	Current raw value mV	Current measured value pH	Temperature °C	Slope mV/pH	Zero point pH
	ORP calibration				
	Current raw value mV	Current measured value pH (Raw value+Offset)	Temperature °C	Offset value mV	No data

Register	Parameter	Description	Data type
10 - 11	CalibrationResult1-Value		REAL
12	CalibrationResult1-Unit	0 = No unit 7 = % 23 = nA 25 = mA 53 = pH 59 = hPa 65 = kΩ 66 = MΩ 89 = °C 90 = K 110 = mV 114 = mV/pH 127 = °F	USINT
13	CalibrationResult1-Valid	0 = OK 1 = Busy 2 = Local calibration active 3 = Sensor not configured 4 = Sensor not supported 5 = Invalid entry 6 = Calibration error	USINT
14	CalibrationResult1-Type	0 = No calibration type defined 1 = Raw value 2 = Measured value 3 = Temperature 4 = Offset 5 = Medium 1 6 = Measured value 1 7 = Medium 2 8 = Measured value 2 9 = Slope 10 = Zero point 11 = Delta slope 12 = Delta zero point	USINT

Register	Parameter	Description	Data type
20-21	CalibrationResult2-Value		REAL
22	CalibrationResult2-Unit	0 = No unit 7 = % 23 = nA 25 = mA 53 = pH 59 = hPa 65 = kΩ 66 = MΩ 89 = ℃ 90 = K 110 = mV 114 = mV/pH 127 = ℉	USINT
23	CalibrationResult2-Valid	0 = OK 1 = Busy 2 = Local calibration active 3 = Sensor not configured 4 = Sensor not supported 5 = Invalid entry 6 = Calibration error	USINT
24	CalibrationResult2-Type	0 = No calibration type defined 1 = Raw value 2 = Measured value 3 = Temperature 4 = Offset 5 = Medium 1 6 = Measured value 1 7 = Medium 2 8 = Measured value 2 9 = Slope 10 = Zero point 11 = Delta slope 12 = Delta zero point	USINT
30-31	CalibrationResult3-Value		REAL
32	CalibrationResult3-Unit	0 = No unit 7 = % 23 = nA 25 = mA 53 = pH 59 = hPa 65 = kΩ 66 = MΩ 89 = ℃ 90 = K 110 = mV 114 = mV/pH 127 = ℉	USINT
33	CalibrationResult3-Valid	0 = OK 1 = Busy 2 = Local calibration active 3 = Sensor not configured 4 = Sensor not supported 5 = Invalid entry 6 = Calibration error	USINT

Register	Parameter	Description	Data type
34	CalibrationResult3-Type	0 = No calibration type defined 1 = Raw value 2 = Measured value 3 = Temperature 4 = Offset 5 = Medium 1 6 = Measured value 1 7 = Medium 2 8 = Measured value 2 9 = Slope 10 = Zero point 11 = Delta slope 12 = Delta zero point	USINT
40-41	CalibrationResult4-Value		REAL
42	CalibrationResult4-Unit	0 = No unit 7 = % 23 = nA 25 = mA 53 = pH 59 = hPa 65 = kΩ 66 = MΩ 89 = °C 90 = K 110 = mV 114 = mV/pH 127 = °F	USINT
43	CalibrationResult4-Valid	0 = OK 1 = Busy 2 = Local calibration active 3 = Sensor not configured 4 = Sensor not supported 5 = Invalid entry 6 = Calibration error	USINT
44	CalibrationResult4-Type	0 = No calibration type defined 1 = Raw value 2 = Measured value 3 = Temperature 4 = Offset 5 = Medium 1 6 = Measured value 1 7 = Medium 2 8 = Measured value 2 9 = Slope 10 = Zero point 11 = Delta slope 12 = Delta zero point	USINT
50-51	CalibrationResult5-Value		REAL
52	CalibrationResult5-Unit	0 = No unit 7 = % 23 = nA 25 = mA 53 = pH 59 = hPa 65 = kΩ 66 = MΩ 89 = °C 90 = K 110 = mV 114 = mV/pH 127 = °F	USINT

Register	Parameter	Description	Data type
53	CalibrationResult5-Valid	0 = OK 1 = Busy 2 = Local calibration active 3 = Sensor not configured 4 = Sensor not supported 5 = Invalid entry 6 = Calibration error	USINT
54	CalibrationResult5-Type	0 = No calibration type defined 1 = Raw value 2 = Measured value 3 = Temperature 4 = Offset 5 = Medium 1 6 = Measured value 1 7 = Medium 2 8 = Measured value 2 9 = Slope 10 = Zero point 11 = Delta slope 12 = Delta zero point	USINT

Measured value units of the sensors

Information about measuring point 1 and measuring point 2

Sensor	Measured value 1	Measured value 2	Measured value 3	Measured value 4	Measured value 5
pH glass	Current measured value pH	Raw value mV	Glass impedance MΩ	Temperature °C	----
pH ISFET	Current measured value pH	Raw value mV	Leak current nA	Temperature °C	----
ORP	ORP mV	ORP %	----	Temperature °C	----
pH/ORP	Current measured value pH	ORP mV	Raw value mV	Temperature °C	Reference impedance kΩ

Information about measuring point 1

Register	Parameter	Description	Data type
100	Channel1-Activation	0 = Active 1 = Not active (only read in at restart)	UINT
101	Channel1-Position	0 = Assembly in service position 1 = Assembly in measure position	UINT
102	Channel1-Hold	0 = Not active 1 = Active	UINT
103	Channel1-ConnectedSensorType	0 = None 3 = pH glass 5 = pH ISFET 8 = ORP 18 = pH/ORP	UINT
110 - 111	Channel1-Value1		REAL

Register	Parameter	Description	Data type
112	Channel1-Value1-Unit	0 = No unit 7 = % 23 = nA 25 = mA 53 = pH 59 = hPa 65 = kΩ 66 = MΩ 89 = °C 90 = K 110 = mV 114 = mV/pH 127 = °F	UINT
113	Channel1-Value1-Valid	0 = Good 1 = Uncertain 2 = Bad 3 = Not assigned	UINT
120 - 121	Channel1-Value2		REAL
122	Channel1-Value2-Unit	0 = No unit 7 = % 23 = nA 25 = mA 53 = pH 59 = hPa 65 = kΩ 66 = MΩ 89 = °C 90 = K 110 = mV 114 = mV/pH 127 = °F	UINT
123	Channel1-Value2-Valid	0 = Good 1 = Uncertain 2 = Bad 3 = Not assigned	UINT
130 - 131	Channel1-Value3		REAL
132	Channel1-Value3-Unit	0 = No unit 7 = % 23 = nA 25 = mA 53 = pH 59 = hPa 65 = kΩ 66 = MΩ 89 = °C 90 = K 110 = mV 114 = mV/pH 127 = °F	UINT
133	Channel1-Value3-Valid	0 = Good 1 = Uncertain 2 = Bad 3 = Not assigned	UINT
140 - 141	Channel1-Value4		REAL

Register	Parameter	Description	Data type
142	Channel1-Value4-Unit	0 = No unit 7 = % 23 = nA 25 = mA 53 = pH 59 = hPa 65 = kΩ 66 = MΩ 89 = ℃ 90 = K 110 = mV 114 = mV/pH 127 = ℉	UINT
143	Channel1-Value4-Valid	0 = Good 1 = Uncertain 2 = Bad 3 = Not assigned	UINT
150 - 151	Channel1-Value5		REAL
152	Channel1-Value5-Unit	0 = No unit 7 = % 23 = nA 25 = mA 53 = pH 59 = hPa 65 = kΩ 66 = MΩ 89 = ℃ 90 = K 110 = mV 114 = mV/pH 127 = ℉	UINT
153	Channel1-Value5-Valid	0 = Good 1 = Uncertain 2 = Bad 3 = Not assigned	UINT

Information about measuring point 2

Register	Parameter	Description	Data type
200	Channel2-Activation	0 = Active 1 = Not active (only read in at restart)	UINT
201	Channel2-Position	0 = Assembly in service position 1 = Assembly in measure position	UINT
202	Channel2-Hold	0 = Not active 1 = Active	UINT
203	Channel2-ConnectedSensorType	0 = None 3 = pH glass 5 = pH ISFET 8 = ORP 18 = pH/ORP	UINT
210 - 211	Channel2-Value1		REAL

Register	Parameter	Description	Data type
212	Channel2-Value1-Unit	0 = No unit 7 = % 23 = nA 25 = mA 53 = pH 59 = hPa 65 = kΩ 66 = MΩ 89 = °C 90 = K 110 = mV 114 = mV/pH 127 = °F	UINT
213	Channel2-Value1-Valid	0 = Good 1 = Uncertain 2 = Bad 3 = Not assigned	UINT
220 - 221	Channel2-Value2		REAL
222	Channel2-Value2-Unit	0 = No unit 7 = % 23 = nA 25 = mA 53 = pH 59 = hPa 65 = kΩ 66 = MΩ 89 = °C 90 = K 110 = mV 114 = mV/pH 127 = °F	UINT
223	Channel2-Value2-Valid	0 = Good 1 = Uncertain 2 = Bad 3 = Not assigned	UINT
230 - 231	Channel2-Value3		REAL
232	Channel2-Value3-Unit	0 = No unit 7 = % 23 = nA 25 = mA 53 = pH 59 = hPa 65 = kΩ 66 = MΩ 89 = °C 90 = K 110 = mV 114 = mV/pH 127 = °F	UINT
233	Channel2-Value3-Valid	0 = Good 1 = Uncertain 2 = Bad 3 = Not assigned	UINT
240 - 241	Channel2-Value4		REAL

Register	Parameter	Description	Data type
242	Channel2-Value4-Unit	0 = No unit 7 = % 23 = nA 25 = mA 53 = pH 59 = hPa 65 = kΩ 66 = MΩ 89 = ℃ 90 = K 110 = mV 114 = mV/pH 127 = ℉	UINT
243	Channel2-Value4-Valid	0 = Good 1 = Uncertain 2 = Bad 3 = Not assigned	UINT
250 - 251	Channel2-Value5		REAL
252	Channel2-Value5-Unit	0 = No unit 7 = % 23 = nA 25 = mA 53 = pH 59 = hPa 65 = kΩ 66 = MΩ 89 = ℃ 90 = K 110 = mV 114 = mV/pH 127 = ℉	UINT
253	Channel2-Value5-Valid	0 = Good 1 = Uncertain 2 = Bad 3 = Not assigned	UINT

IO feedbacks

Register Bytes	Parameter	Description	Data type
900	LED	0 = Off 8 = Green 18 = Red	USINT
901	Current Response	(currently not supported)	USINT
902	Local Softkey	0 = No softkey is pressed 6 = Soft key 1 is pressed 10 = Soft key 2 is pressed 14 = Soft key 3 is pressed 18 = Soft key 4 is pressed	USINT
903	Current Command	(currently not supported)	USINT
904	Canister1	0 = Empty 1 = Full, not empty	BYTE
905	PressureSwitch	0 = Not active 1 = Active	BYTE
906	Canister3	0 = Empty 1 = Full, not empty	BYTE
907	Canister2	0 = Empty 1 = Full, not empty	BYTE
910	Assembly1 Measure	0 = Off 1 = On	BYTE

Register Bytes	Parameter	Description	Data type
911	Assembly1 Service	0 = Off 1 = On	BYTE
912	WaterValve	0 = Off 1 = On	BYTE
913	AirValve	0 = Off 1 = On	BYTE
914	Pump1	0 = Off 1 = On	BYTE
915	Pump2		
916	Pump3		
917	CustomValve1	0 = Off 1 = On	BYTE
918	ChannelSwitch1	0 = Off 1 = On	BYTE
919	ChannelSwitch2		
920	Assembly2 Measure	0 = Off 1 = On 0 = Off 1 = On	BYTE
921	Assembly2 Service		
922	CustomValve2	0 = Off 1 = On	BYTE
923	CustomValve3		
924	CustomValve4		
925	CustomValve5		
930	CustomDo1	0 = Off 1 = On	BYTE
931	CustomDo2		
932	CustomDo3		
933	CustomDo4		
934	CustomDo5		
935	CustomDo6		
936	CustomDo7		
937	CustomDo8		
938	CustomDo9		
939	CustomDo10		
940	CustomDo11	Operating mode: Setting, if DO11 = 0 and DO12 = 0 Manual, if DO11 = 0 and DO12 = 1 Automatic, if DO11 = 1 and DO12 = 0 Remote access, if DO11 = 1 and DO12 = 1	
941	CustomDo12		
942	Assembly1 Position	0 = Service 1 = Measure	BYTE
943	Assembly2 Position		
944	Program active	0 = No program 1 = Program active	BYTE
945	Alarm active	0 = alarm 1 = no alarm	BYTE
946 169	Assembly1 Position switch 1 (DI1)	0 = Off 1 = On	BYTE
947	Assembly1 Position switch 2 (DI2)	0 = Off 1 = On	BYTE
948	Assembly2 Position switch 1 (DI3)	0 = Off 1 = On	BYTE

Register Bytes	Parameter	Description	Data type
949	Assembly2 Position switch 2 (DI4)	0 = Off 1 = On	BYTE
950	CustomDI1	0 = Off 1 = On	BYTE
951	CustomDI2		
952	CustomDI3		
953	CustomDI4		
954	CustomDI5		
955	CustomDI6		
956	CustomDI7		
957	CustomDI8		
958	Remote Softkey1 (DI13)	0 = Off 1 = On	BYTE
959	Remote Softkey2 (DI14)		
960	Remote Softkey3 (DI15)		
961	Remote Softkey4 (DI16)		

Name of the device

Parameter	Description	Data type	Register
Device-Tag	Device description/TAG	STRING(32)	60-75

Device information

Parameter	Description	Data type	Bytes
Firmware	Firmware version	STRING(8)	1000 - 1003
ShortOrdercode	Short order code	STRING(16)	1004 - 1011
SerialNumber	Serial number	STRING(16)	1012 - 1019
ManufactoringDate	Date of manufacture	DATETIME	1020 - 1023
OrginalOrdercodeExt	Extended (original) manufacturing order code	STRING(64)	1024 - 1055
CurrentOrdercodeExt	Extended order code from last upgrade	STRING(64)	1056 - 1087

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