
Translation of the original instructions

Multi-channel controller

TOPAX MC

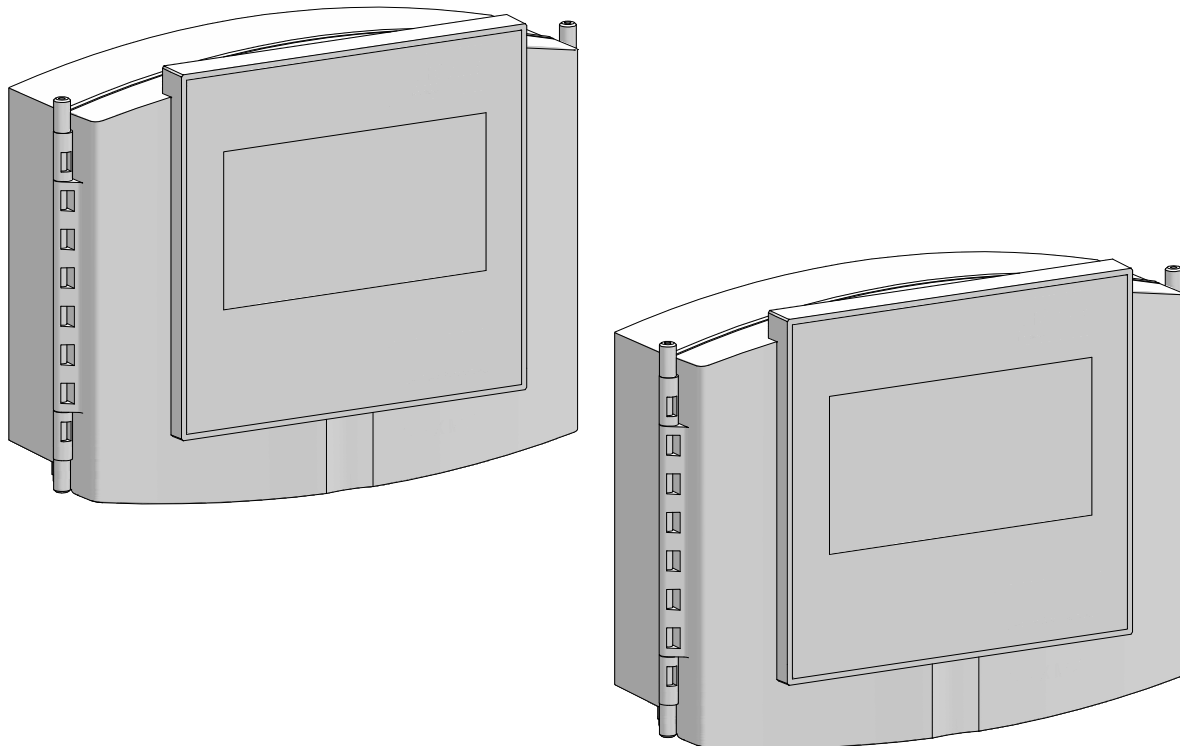


Table of contents

1 About these operating instructions	5	7.6 Connection of actuators	18
1.1 Target groups	5	7.6.1 Alarm relay	19
1.2 General non-discrimination	5	7.6.2 Output circuit board with relay	19
1.3 Warnings	5	7.6.3 Output circuit board (optocoupler)	19
1.4 Action steps	6	7.6.4 Servomotor relay output circuit board	19
1.5 Cross-references	6	7.6.5 Output circuit board with servomotor 20 mA	19
1.6 Latest version	6	7.6.6 Output circuit board with relay high current	20
1.7 Copyright	6	7.6.7 Digital universal output module	20
2 Safety	7	7.6.8 Connection examples for actuators	21
2.1 General warnings	7	7.6.9 Testing the outputs	21
2.2 Hazards due to non-compliance with the safety instructions	7	7.7 Analogue inputs and outputs	22
2.3 Working in a safety-conscious manner	7	7.8 Digital inputs	22
2.4 Personnel qualification	7	7.9 Connecting RC protection for relays	22
2.4.1 Personnel tasks	8	7.10 Ethernet connection	23
3 Intended use	9	7.11 RS485 interface	23
3.1 Notes on product warranty	9	7.11.1 Connecting the device to a network	23
3.2 Intended purpose	9	8 Commissioning	24
3.3 Foreseeable misuse	9	8.1 Configuration assistant	24
4 Product description	10	8.2 Password protection	24
4.1 Scope of delivery	10	8.3 Network settings	25
4.2 Rating plate	10	8.4 Menu structure	26
4.3 Main view	10	9 Operation	27
5 Technical data	11	9.1 Inputs	27
5.1 Measuring inputs	11	9.1.1 Configuring the sensors	27
5.2 Input modules	12	9.1.2 Configuring temperature sensors	27
5.3 Output modules	13	9.1.3 Configuring the compensation of cross-sensitivities	27
6 Dimensions	14	9.1.4 Virtual inputs	27
6.1 Outer dimensions	14	9.1.5 Configuring digital inputs	28
6.2 Drillhole dimensions	14	9.2 Controller	30
7 Installation	15	9.2.1 P controller	32
7.1 Principles	15	9.2.2 PI and PID controllers	32
7.2 Mounting the device on the wall	15	9.2.3 Definitions	33
7.3 Connecting the device to the power supply	15	9.2.4 Explanation of the controllers	33
7.4 Terminal assignment	16	9.2.5 Functional diagram of a controller	35
7.5 Connecting sensors	17	9.2.6 Configuring the controller parameters	36
7.5.1 pH Redox module input circuit board	17	9.2.7 Disturbance variable	36
7.5.2 Input circuit board potentiostat module and high-resolution potentiostat module	17	9.2.8 Configuring alarm behaviour	36
7.5.3 Current module input circuit board	17	9.2.9 Starting auto-adaptation	36
7.5.4 Conductive input circuit board to the conductivity module	18	9.3 Outputs	36
7.5.5 Connection examples of the sensors	18	9.3.1 Configuring the controller outputs	37
		9.3.2 Configuring actuation using a timer	37
		9.3.3 Digital output signals	37
		9.3.4 Configuring analogue output signals	38
		9.3.5 Configuring LED control for water sampling stations	38
		9.4 Calibration	38
		9.4.1 pH single-rod measuring cell	39
		9.4.2 Redox value	40
		9.4.3 3 electrode potentiostat	40
		9.4.4 Excess chlorine measuring cell CS120	41
		9.4.5 Conductivity (conductive)	41
		9.4.6 Temperature	42

9.4.7	Servomotor relay	42	12.2.2	Measurement active	62
9.4.8	Servomotor 20 mA	43	12.2.3	Virtual inputs	62
9.4.9	Calibration error	43			
9.5	Setpoints and setpoint sets	43	13	EU declaration of conformity	64
9.5.1	Configuring setpoints	43	14	Warranty claim	65
9.5.2	Loading setpoint sets	44			
9.5.3	Switching between setpoints	44			
9.5.4	Carrying out shock chlorination	45			
9.5.5	Configuring medium dosing	45			
9.6	Trend	45			
9.6.1	Configuring the trend display	45			
9.7	Messages	45			
9.7.1	Confirming messages	45			
9.8	Logbook	46			
9.8.1	Viewing and opening files	46			
9.8.2	Opening files externally	46			
9.9	Setup	46			
9.9.1	Changing the language	46			
9.9.2	Saving the configuration	46			
9.9.3	Main view	47			
9.9.4	Changing the colour of alarm messages	47			
9.10	Information	47			
9.11	Manual mode	47			
9.12	Service	47			
9.12.1	Network access	47			
9.12.2	Configuring network settings	48			
9.12.3	Resetting to factory settings	48			
10	Maintenance	49			
10.1	Maintenance intervals	49			
10.2	Keeping logfiles	49			
10.3	Updating software	49			
10.4	Battery/button cell	49			
10.4.1	Checking the charge	49			
10.4.2	Replacing the battery	49			
10.5	Replacing the fuse	50			
10.6	Resetting to factory settings	50			
10.7	Finishing maintenance	50			
11	Troubleshooting	51			
11.1	Alarms and messages	51			
11.2	Slope errors and sensor errors	54			
12	Modbus addresses	55			
12.1	Modbus addresses (cross-channel)	55			
12.1.1	Basic data:	55			
12.1.2	High chlorination	55			
12.1.3	Admixture and temperature control	55			
12.1.4	Programmable logic controller / inputs	55			
12.1.5	Analogue outputs	56			
12.1.6	Alarm status	56			
12.1.7	Temperature inputs	59			
12.2	Modbus addresses (channel-specific)	59			
12.2.1	Inputs	60			

1 About these operating instructions

This document:

- Is part of the product.
- Describes the safe and correct use of the product in all operating phases.
- Must be read completely before the product is commissioned.
- Must be read and applied by every person tasked with working on the product.
- Must be kept for the duration of the service life of the product.
- Must be passed on to any subsequent owner of the product.

1.1 Target groups

Target group	Task
Operator	1. Keep these operating instructions available at the place of use of the product, including for later use. 2. Instruct employees to read and comply with these instructions, especially the safety instructions and warnings. 3. Comply with additional system-related specifications and regulations.
Qualified personnel Trained persons	► Read, observe and follow these operating instructions, in particular the safety instructions and warnings.

Table 1: Target groups and their tasks

1.2 General non-discrimination

For better readability, these operating instructions always use the masculine form when referring to persons. However, all genders are addressed equally.

1.3 Warnings

Warnings are intended to help you recognise risks and avoid negative consequences. They are structured as follows in these operating instructions:

Warning sign **SIGNAL WORD**

Type and source of danger

Consequences of non-compliance

- A safety precaution to be taken to eliminate the hazard.

Fig. 1: Design of warnings

Signal words

These operating instructions use the following signal words to emphasise the severity of possible injuries if the danger is ignored:



DANGER

Imminent danger

Non-compliance can result in death or serious injury.



WARNING

Possible danger

Non-compliance can lead to death or severe injuries.



CAUTION

Potentially hazardous situation

Non-compliance can result in minor injuries.



NOTE

Potentially hazardous situation

Non-compliance can result in damage to property or malfunctions.



INFORMATION

Information or recommendation

Simplifies handling or extends the service life of the product or system.

Warning signs used

These operating instructions use the following warning signs to indicate the type and source of danger:



General hazard



Danger to life from chlorine poisoning



Danger of electric shock



Risk of machine damage or malfunction

1.4 Action steps

Action steps are structured as follows:

- ✓ This prerequisite must be met before you can start with the action steps.

► Single step

Multiple steps in sequence are structured as follows:

1. First step

2. Second step

↳ Intermediate result of a step

📄 Overall result

1.5 Cross-references

Cross-references are marked with an arrow.

Example: (→ Fig. 5)

1.6 Latest version

Please find the latest version of these operating instructions at www.lutz-jesco.com.

1.7 Copyright

The content of these operating instructions and the images contained in them are subject to the copyright protection of Lutz-Jesco GmbH.

2 Safety

2.1 General warnings

The following warnings are intended to help you eliminate the dangers that can arise while handling the product. Risk prevention measures always apply regardless of any specific action.

Safety instructions that warn against risks arising from specific activities or situations can be found in the respective sub-sections.



DANGER

Mortal danger from electric shock!

Wrongly connected or located cables or damaged ones can injure you.

- ▶ Perform the electrical installation in accordance with the appropriate circuit diagram.
- ▶ Replace damaged cables without delay.
- ▶ Do not use extension cables.
- ▶ Do not bury cables.
- ▶ Secure cables to avoid being damaged by other equipment.



WARNING

Increased risk of accidents due to insufficient qualification of personnel!

Only sufficiently qualified personnel may install, operate and maintain the product and its accessories. Insufficient qualification will increase the risk of accidents.

- ▶ Ensure that all action is taken only by personnel with sufficient and corresponding qualifications.
- ▶ Prevent access to the system for unauthorised persons.



NOTE

Do not dispose of the device in the domestic waste!

Do not dispose of electric devices via the domestic waste.

- ▶ The device and its packaging must be disposed of in accordance with locally-valid laws and regulations.
- ▶ Dispose of different materials separately and ensure that they are recycled.

2.2 Hazards due to non-compliance with the safety instructions

Failure to follow the safety instructions may endanger not only persons, but also the environment and the equipment.

The specific consequences can be:

- Failure of important functions of the product and the associated system
- Failure of required maintenance and repair methods

- Risk to persons when working on the product
- Danger to the environment from overdosing

2.3 Working in a safety-conscious manner

Besides the safety instructions specified in these operating instructions, further safety rules may apply. Always comply with all safety-relevant regulations and guidelines that apply at the usage location of the product. Note in particular the following items:

- Safety regulations on handling electricity and live components
- Safety regulations on handling hazardous substances
- Accident prevention regulations
- Safety and operating provisions
- Environmental protection provisions
- Other applicable directives and laws

2.4 Personnel qualification

Any personnel who work on the product must have special knowledge and skills.

Anybody who works with the product must meet the conditions below:

- Attendance at all the training courses offered by the owner
- Personal suitability for the respective activity
- Sufficient qualification for the respective activity
- Training into the handling of the device
- Knowledge of safety equipment and the way this equipment functions
- Knowledge of these operating instructions, particularly the safety instructions and sections relevant for the activity
- Knowledge of fundamental regulations regarding health and safety and accident prevention

All persons must have one of the following minimum qualifications:

- Trained as a specialist to work independently with the product
- Sufficient training to work on the product under the supervision and guidance of a qualified specialist

These operating instructions differentiate between the following user groups:

Qualified personnel

Thanks to their professional training, knowledge, experience and knowledge of the relevant specifications, qualified personnel are able to perform the job allocated to them and recognise and/or eliminate any possible dangers by themselves.

Trained electricians

Due to their professional training, knowledge and experience as well as knowledge of specific standards and provisions, trained electricians are able to do the electrical work assigned to them and to recognise and avoid any potential dangers by themselves.

They are specially trained for their specific working environment and are familiar with relevant standards and provisions.

They must comply with the legally binding regulations on accident prevention.

Trained persons

Trained persons have received training from the operator about the tasks they are to perform and about the dangers stemming from improper behaviour.

Trained persons have attended all trainings offered by the operator.

2.4.1 Personnel tasks

Incorrect handling of the product can cause severe personal injury and damage to property. Therefore, ensure that all work is carried out by qualified personnel only.

The following table shows which qualifications are required for the corresponding activities.

Qualification	Activities
Specialist staff	• Transportation • Mechanical installation • Commissioning • Shut-down • Maintenance • Repairs • Disposal • Troubleshooting
Trained electricians	• Electrical installation
Trained persons	• Operation

Table 2: Personnel tasks

3 Intended use

3.1 Notes on product warranty

Any non-designated use of the product can compromise its function or intended protection. This leads to invalidation of any warranty claims!

Please note that liability is on the side of the user in the following cases:

- The product is operated in a manner that is not consistent with these operating instructions, particularly the safety information, action steps and the intended use.
- Information on usage and environment is not adhered to.
- People operate the product who are not adequately qualified to carry out their respective activities.
- Unauthorised changes are made to the product by the user.

3.2 Intended purpose

The controller monitors the current measured values during water treatment and controls the dosing systems connected for water treatment. In this way, the controller ensures constant water parameters in various applications and can be deployed universally. One of its main applications is maintaining the quality of water in swimming pools and industrial installations by evaluating the measurements of the chlorine value, the pH value, the Redox value, the total chlorine, the conductivity and the control of chlorinators, for example, among other things.

3.3 Foreseeable misuse

The following section provides information regarding the device applications that are classified as non-intended use. This section is intended to allow you to detect possible misuse in advance and to avoid it.

Foreseeable misuse is assigned to the individual stages of the product lifetime:

Incorrect assembly

- Connecting the mains voltage without a protective earth
- Non-fused or non-standard mains voltage
- Not possible to immediately or easily disconnect the power supply
- Wrong connecting cables for mains voltage
- Sensors and actors connected to the incorrect terminals or incorrectly configured
- Protective earth removed

Incorrect commissioning

- Commissioning with damaged or outdated sensors
- Commissioning without establishing all protective measures, fastenings and so on

Incorrect operation

- Protective equipment not functioning correctly or dismantled
- Unauthorised modification of the controller
- Ignoring of alarm or error messages
- Elimination of alarm or error messages by insufficiently-qualified personnel
- Bridging the external fuse
- Difficult operation due to insufficient lighting or poor access to the device
- Operation not possible due to dirty or illegible display

Incorrect maintenance

- Carrying out maintenance during ongoing operation
- No adequate or regular inspection of correct functioning
- No replacement of damaged parts or cables
- No securing against reactivation during maintenance work
- Using the wrong spare parts

4 Product description

4.1 Scope of delivery

Carefully check the delivery prior to installation and refer to the delivery note to ensure that the delivery is complete and to check for any transport damage. Contact the supplier and/or carrier regarding any questions concerning the delivery and/or transport damage. Do not operate defective products.

The scope of delivery includes:

- TOPAX® MC multi-channel controller
- Operating instructions
- Mounting set
- Sensors (optional)
- Cable connection from the device to the sensors (optional)

4.2 Rating plate

The rating plate clearly identifies the product and provides important information such as the manufacturer, product designation, year of manufacture and technical and safety-relevant data. The rating plate must be kept legible for the duration of the service life of the product.

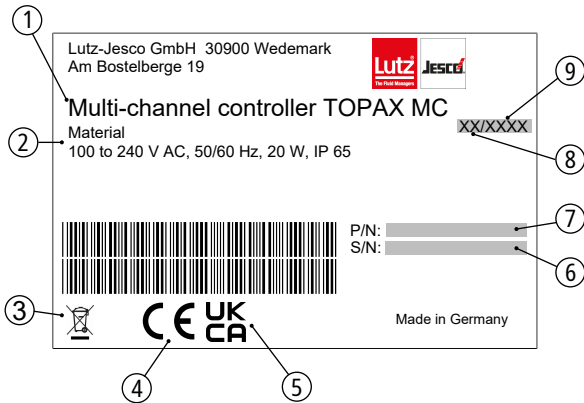


Fig. 2: TOPAX MC rating plate

1 Product name	2 Materials
3 WEEE label	4 Label showing conformity with applicable European directives
5 Label showing conformity with applicable UK directives	6 Serial number
7 Part number	8 Month of manufacture
9 Year of manufacture	

4.3 Main view

The main menu view will appear upon the start of the device or 5 minutes after the last input. The main view shows the current values from up to four sensors and further information.

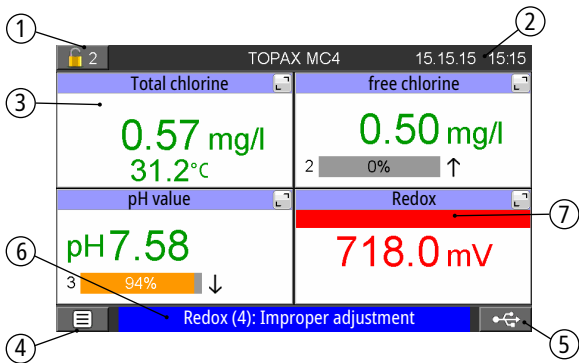


Fig. 3: Main view with four sensors

1 Login / password settings	2 Date/time
3 Measured values	4 Main menu
5 File browser	6 Status row for messages
7 Alarm flashes	

5 Technical data

TOPAX® MC			
Dimensions	Housing (W x H x D)	mm	302 x 240 x 107
	Screen diagonal		5" or 7" depending on model
Power supply			100 – 240 V AC, 50/60 Hz
Power consumption	W		max. 20
Analogue outputs for remote transmission			4 x 0/4 – 20 mA, working resistance max. 500 Ω
Disturbance variable input	mA		0/4 – 20
Alarm relay (two-way contact)			250 V AC, 10 A (ohmic resistive load)
Interfaces			Ethernet TCP/IP or RS485 Modbus RTU (optional)
Protection class			IP65
Ambient temperature	°C		-5 to +45, no exposure to direct sunlight
Control characteristic			P, PI, PID or PD behaviour, control direction selectable with disturbance variable feed forward, 2-side control selectable

Table 3: Technical data

5.1 Measuring inputs

All measuring inputs consist of an input for temperature measurement via Pt100 and a second input for the measurement of a further water parameter. On some measuring inputs, this input will measure a number of different parameters.

Measuring inputs (depending on version)			
Bromine	Membrane-covered measuring cell	mg/l	0 – 5 (dependant on the measuring cell)
Free chlorine	Amperometric 3-electrode measuring cell with potentiostat (DMZ3.1)	mg/l	0 – 2 or 0 – 15 (dependant on the input module and the measuring cell transconductance)
	CS120 excess chlorine measuring cell	mg/l	0 – 10 (dependant on the measuring cell transconductance)
	Membrane-covered measuring cell	mg/l	0 – 20 (dependant on the measuring cell)
Chlorine dioxide	Amperometric 3-electrode measuring cell with potentiostat (DMZ3.1)	mg/l	0 – 2 or 0 – 15 (dependant on the input module and the measuring cell transconductance)
	CS120 excess chlorine measuring cell	mg/l	0 – 10 (dependant on the measuring cell transconductance)
	Membrane-covered measuring cell	mg/l	0 – 20 (dependant on the measuring cell)
Total chlorine	Membrane-covered measuring cell	mg/l	0 – 10 (dependant on the measuring cell)
Ozone	Membrane-covered measuring cell	mg/l	0 – 2 (dependant on the measuring cell)
pH value	pH single-rod measuring cell	pH	0 – 14 (dependant on the single-rod measuring chain)
Redox value	Redox single-rod measuring cell	mV	-1000 to +1000 (dependant on the single-rod measuring chain)
Chlorite	Membrane-covered measuring cell	mg/l	0 – 2 (dependant on the measuring cell)
Hydrogen peroxide	Membrane-covered measuring cell	mg/l	0 – 200 (dependant on the measuring cell)
Conductivity	Conductive conductivity measuring cell inc. temperature sensor Pt100 (c = 1)	mS/cm	0 – 2, 0 – 20, 0 – 100 (depending on the configuration, corresponds to approx. 0 – 1% or 0 – 5 % salt content)
Dissolved oxygen	Optical measuring cell	mg/l	0.00 – 20.00 (ppm)
Turbidity	Optical measuring cell	NTU	0.00 – 10.00 oder 0.0 – 100.0
Peracetic acid	Membrane-covered measuring cell	mg/l	0 – 2000
Neutral		%	1 – 100
Current		mA	0 – 20
Temperature	Pt100	°C	-10 to +90

Table 4: Measuring inputs

5.2 Input modules

Module type	Measurement	Sensor type	Measuring range	Measuring accuracy
All input cards*	Temperature	PT100	-9.9 °C to +90 °C - 14.2 °F to 194 °F	< 1 °C < 1 °F
pH / Redox module (0x33)	pH value	pH single-rod measuring cell	0 – 14 pH	0.01 pH
	Redox voltage	Redox single-rod measuring cell	-1000 mV to +1000 mV	0.5 mV
Potentiostat module (0x32)	Free chlorine	Amperometric 3-electrode measuring cell (DMZ3)	Slope-dependent	Slope-dependent
	Chlorine dioxide	CS120 excess chlorine measuring cell	0 – 10, 0 – 15, 0 – 20 mg/l Cl ₂	> 0.01 mg/l Cl ₂ bis < 0.1 mg/l Cl ₂
Potentiostat module HD (high resolution) (0x38)	Free chlorine	Amperometric 3-electrode measuring cell (DMZ3)	Slope-dependent	Slope-dependent
	Chlorine dioxide	CS120 excess chlorine measuring cell	0 – 1, 0 – 2 mg/l Cl ₂	0.01 mg/l Cl ₂
Current module (0x31)	Free chlorine	CS120 excess chlorine measuring cell	Slope-dependent	Slope-dependent
	Chlorine dioxide		0 – 7 mg/l to 0 – 200.0 mg/l	> 0.005 mg/l bis < 0.17 mg/l
	Current	Membrane-covered measuring cells, other sensors with 0/4 – 20 mA signal	Depending on the sensor used	Depending on the sensor used, mA input < 0.01 mA
	Free chlorine			
	Chlorine dioxide			
	Total chlorine			
	Chlorite			
	Hydrogen peroxide			
	Neutral (%)			
	Salt content			
	Conductivity			
	Ozone			
	Bromine			
	Peracetic acid			
	Dissolved oxygen			
	Turbidity			
HD current module (high resolution) (0x3B)	Free chlorine Chlorine dioxide	CS120 excess chlorine measuring cell	Slope-dependent 0 – 4.9 mg/l to 0 – 160.0 mg/l	Slope-dependent > 0.002 mg/l bis < 0.05 mg/l
Conductivity module (0x36)	Conductivity	Conductive conductivity measuring cell	10 – 2000 µS/cm, 0 – 20.0 to 100 mS/cm	< 5 µS/cm, < 0.15 mS/cm
	Salt content		0 – 1, 0 – 5%	< 0.01 %

Table 5: Input modules

5.3 Output modules

Output modules (depending on model)	Technical data
Servomotor relay	2 x 230 V AC, 5 A (ohmic load) Potentiometer feedback: 1 – 10 kΩ
Servomotor 20 mA	Constant 0/4 – 20 mA output with 20 mA feedback
Relays	2 x 230 V AC, 5 A (ohmic load)
Relay high current	2 x 230 V AC, 8 A (ohmic load)
Optocoupler	2 x 80 V DC, 5 mA
Digital universal	Selectable: 2 x 230 V AC, 5 A (ohmic load) relays or 2 x 80 V DC, 5 mA optocouplers
Voltage output module	0 – 10 V output with feedback

Table 6: Output modules

6 Dimensions

All dimensions in millimetres (mm).

6.1 Outer dimensions

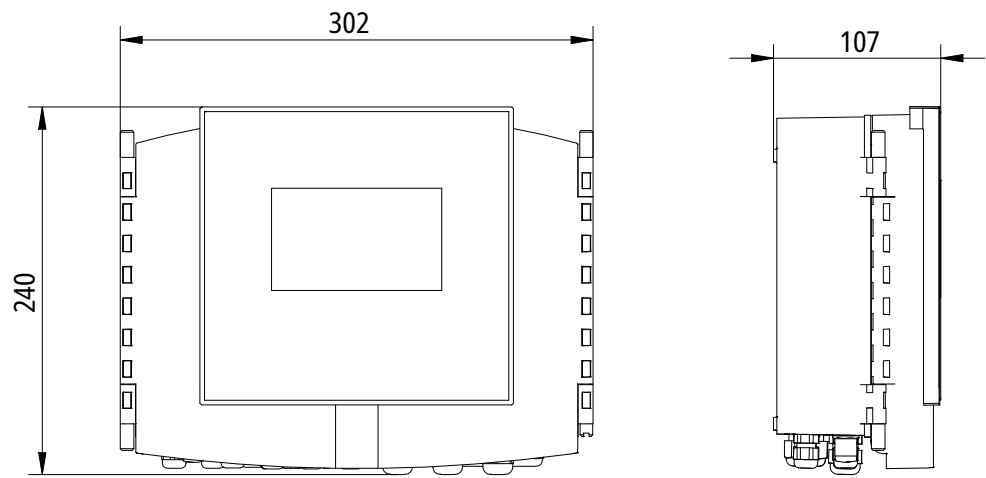


Fig. 4: Outer dimensions TOPAX® MC with 5" display

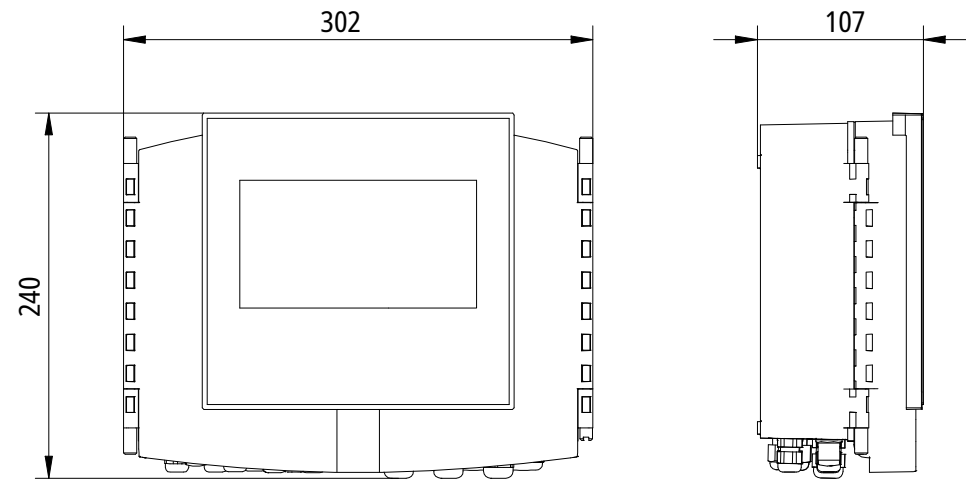


Fig. 5: Outer dimensions TOPAX® MC with 7" display

6.2 Drillhole dimensions

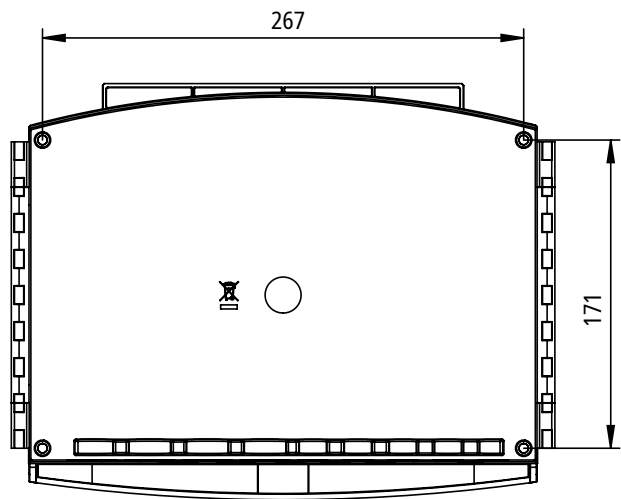


Fig. 6: Drillhole dimensions

7 Installation

7.1 Principles

Make sure that the installation location complies with the following requirements:

- The display is easily accessible and is visible.
- Leave enough space for installing cables underneath the device. You must be able to install the cables without kinking or damaging them.
- Various lines (e.g. voltage supply, data cable and sensitive lines for measuring purposes) must be installed separately. The different lines should only cross at an angle of 90° to prevent interference.
- Electrical, magnetic and electromagnetic fields affect signal transmission and can destroy electronic components.
- Compliance with the permissible ambient temperatures (→ Technical data [► 11]).

7.2 Mounting the device on the wall

- ✓ Required equipment  is to hand: Assembly set, drill and slotted screwdriver
1. Drill the four holes for mounting the device on the wall (for the exact dimensions → Dimensions [► 14]).
 2. Unscrew the screw on the right-hand side of the device and pull out the rod.
 3. You can now open the device.
 4. Open the device and use the screws for wall mounting. Ensure that the device is secured to the wall.
 5. Close the device again using the rod.

 Device mounted on the wall.

7.3 Connecting the device to the power supply

The voltage supply to your device can now be performed via a normal Schuko plug or a control cabinet. Perform the specifications of this section for devices without a pre-fitted Schuko plug.

- ✓ The device has been mounted (→ Mounting the device on the wall [► 15]).
- ✓ A voltage supply with 100 – 240 V AC (50/60 Hz) is available.
- ✓ The voltage supply has been disconnected and protected against re-connection.
- ✓ The housing is open.
- ✓ Required equipment  is to hand: Protective contact plug, wire end ferrules 0.75 – 2.5 mm²



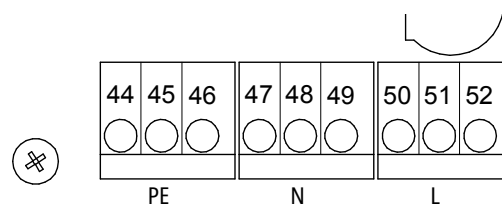
DANGER

Mortal danger from electric shock!

Improperly installed or damaged components in the electronics installation can cause injury.

- Ensure that all work on the electrical installation is performed by a qualified electrician.
- Ensure that all work on the electrical installation is performed in a de-energised state.
- Ensure that the power supply is secured with a fault current protective circuit.
- Replace damaged cables or components without delay.

1. Fit wire end sleeve to the cable ends if the supply cable does not have them.
2. Open the device housing.
3. Lead the supply cable through a cable screw connection to the underside of the device.
4. Turn the cable screw connection union nut until the line is fixed in the screw connection so that the screw connection performs strain relief. Ensure that the feed cable is installed loosely.
5. Connect the voltage supply to terminals 44 – 52. Make sure to observe which terminals are allocated for protective conductors (PE, green-yellow*), neutral conductors (N, blue*) and phase (L, brown*) on the circuit board.



*Applies to wire colours of cables from the manufacturer (no liability is assumed for cables from other manufacturers) and exclusively for European plugs.

Fig. 7: Connecting the voltage supply

 Device connected to the power supply.



INFORMATION

Only 3 of 9 terminals are required for connecting the voltage supply. You can use the free terminals to supply further devices with voltage. The contact load rating amounts to max. 4A.

7.4 Terminal assignment

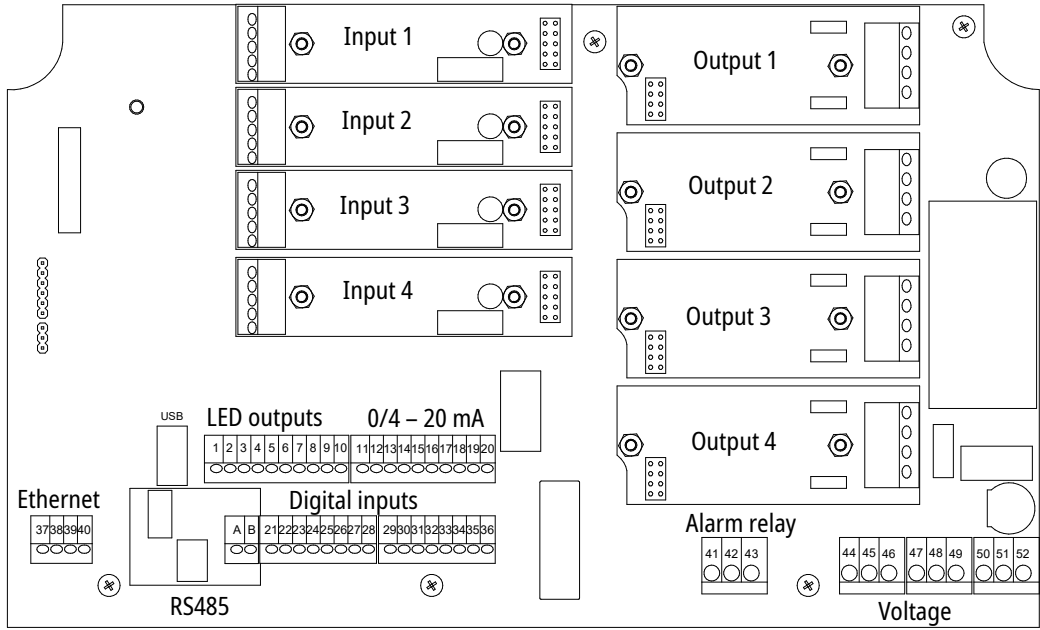


Fig. 8: Overview terminal connection

Terminal	Function		Description
1	LED output 1 (red)	+	5 V with 220 Ω series resistance for LEDs of the water sampling stations
2	LED-output 1 (green)	+	
3	LED output 2 (red)	+	
4	LED-output 2 (green)	+	
5	LED output 3 (red)	+	
6	LED-output 3 (green)	+	
7	LED output 4 (red)	+	
8	LED-output 4 (green)	+	
9 – 10	LED output GND	-	Ground for the LEDs
11	Disturbance variable input	+	0/4 – 20 mA
12		-	
13	Analogue output 1	+	0/4 – 20 mA, working resistance max. 500 Ω
14		-	
15	Analogue output 2	+	
16		-	
17	Analogue output 3	+	
18		-	
19	Analogue output 4	+	
20		-	
21 – 36	Digital inputs 1 – 8	+ (odd) - (even)	Function configurable
37 – 40	Ethernet connection		
41 – 43	Alarm relay		Terminals 41 + 42 (NO) Terminals 42 + 43 (NC)
44 – 46	Connection supply voltage		Protective earth (PE)
47 – 49			Neutral line (N)
50 – 52			Phase (L)

Table 7: Terminal assignment

7.5 Connecting sensors



DANGER

Mortal danger from electric shock!

Live parts can inflict fatal injuries.

- ▶ Disconnect from the external electricity supply before opening the controller.
- ▶ Secure the TOPAX® MC controller against being switched on again.

Up to four input modules can be connected to the device. A water parameter and the temperature can be measured with every module.

- ✓ The voltage supply has been disconnected and protected against re-connection.
 - ✓ The housing is open.
 - ✓ Required equipment ✂ is to hand: Sensors and connection cables
1. Lead the cable through one of the cable screw connections on the underside into the interior of the housing.
 2. Connect the wires onto the terminal block of the input modules. Comply with the terminal plans in the following sections.

🔌 Sensor connected.



NOTE

Electrical interference can impair the measurement results

Incorrect installation of the electrical cables can influence the measurement results. As a result, the control of connected devices can be faulty.

- ▶ Do not route the connecting cable parallel to the mains and control connections, and always with a clearance of at least 15 cm. Lay connection junctions at an angle of 90°.

7.5.1 pH Redox module input circuit board

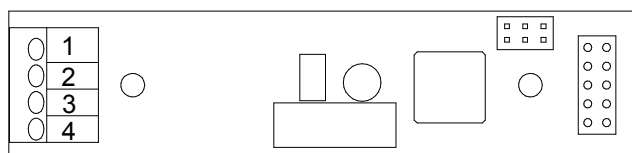


Fig. 9: pH Redox module input circuit board

Terminal	Function	Sensors
1	Temperature input	Resistance thermometer TE110/Pt100
2	Temperature input	
3	- (wire with Ø 1.5 mm)	pH single-rod measuring chain PE110/Redox single-rod measuring chain ME110
4	+ (wire with Ø 2 mm)	

Table 8: Terminal connection of the pH Redox module input circuit board

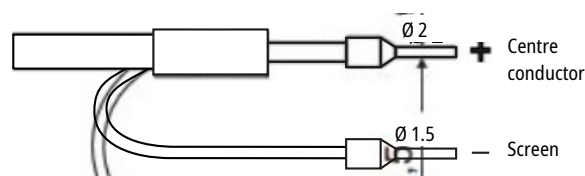


Fig. 10: Connect the cable from the pH or Redox single-rod measuring chain correctly

7.5.2 Input circuit board potentiostat module and high-resolution potentiostat module

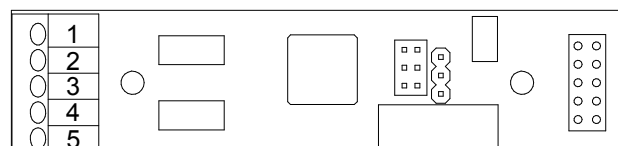


Fig. 11: Input circuit board potentiostat and HD potentiostat

Terminal	Function	Sensors
1	Temperature input	Resistance thermometer TE110/Pt100
2	Temperature input	
3	Measuring electrode	3 electrode potentiostat
4	Counter electrode	
5	Reference electrode	

Table 9: Terminal connection of the potentiostat module input circuit board

7.5.3 Current module input circuit board

A number of sensors require an operating voltage for their measurement. These sensors are connected to the current module and supplied with 24 V.

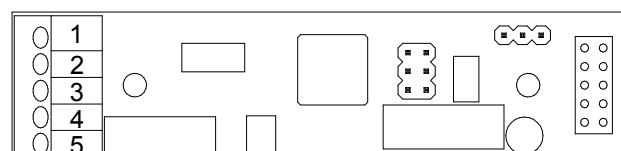


Fig. 12: Current module input circuit board

Terminal	Function	Sensors
1	Temperature input	Resistance thermometer TE110/Pt100
2	Temperature input	
3	-	CS120 excess chlorine measuring cell
4	+ for CS120**	Conductivity measuring cell
	- for 0/4 – 20 mA	Total chlorine measuring cell
5	+ 24 V DC output	Membrane-covered measuring cell CI 4.1
		Membrane-covered measuring cell CD 4 MA*

Table 10: Terminal connection of the current module input circuit board

* Requires 24 V supply module

**red: +; blue, purple: -

7.5.4 Conductive input circuit board to the conductivity module

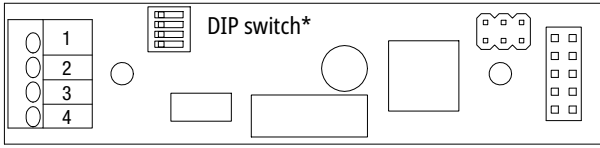


Fig. 13: Conductive input circuit board to the conductivity module

* The switch position on the DIP switch is marked with a small "ON".

Terminal	Function	Sensors	Wire colour M12 connection cable
1	Temperature input	Conductive conductivity measuring cell, k=1	Black (BK)
2	Temperature input		Blue (BU)
3	Conductivity measurement input		Brown (BN)
4	Conductivity measurement input		White (WH)

Table 11: Terminal connection of the conductive input circuit board to the conductivity module

DIP switch	0 – 2000 µS/cm	0 – 20 mS/cm	0 – 100 mS/cm
1	OFF	ON	ON
2	OFF	ON	ON
3	OFF	OFF	ON
4	OFF	OFF	ON

Table 12: Selecting the measuring range

7.5.5 Connection examples of the sensors

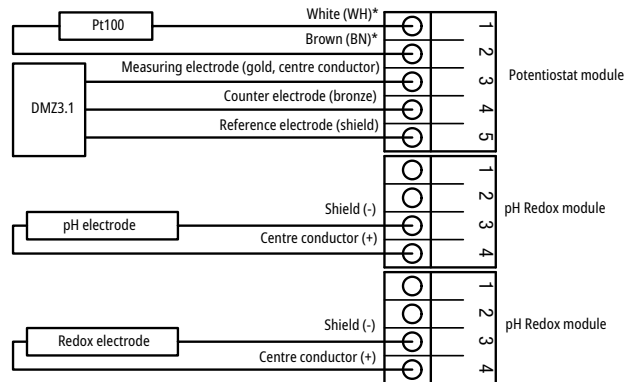


Fig. 14: Measurement of temperature, free chlorine with DMZ3.1, pH value and Redox value

* Applies to cables and sensors from Lutz-Jesco GmbH. No liability is accepted for cables from other manufacturers.

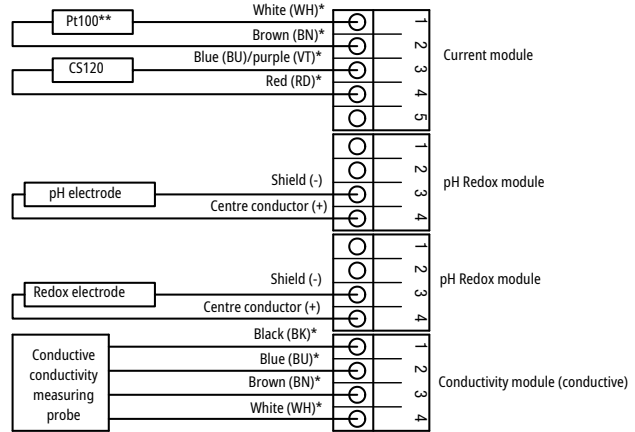


Fig. 15: Measurement of temperature, free chlorine with CS120, pH value, Redox value and conductive conductivity

* Applies to cables and sensors from Lutz-Jesco GmbH. No liability is accepted for cables from other manufacturers.

** Optional: this configuration also includes a temperature sensor in the conductivity electrode.

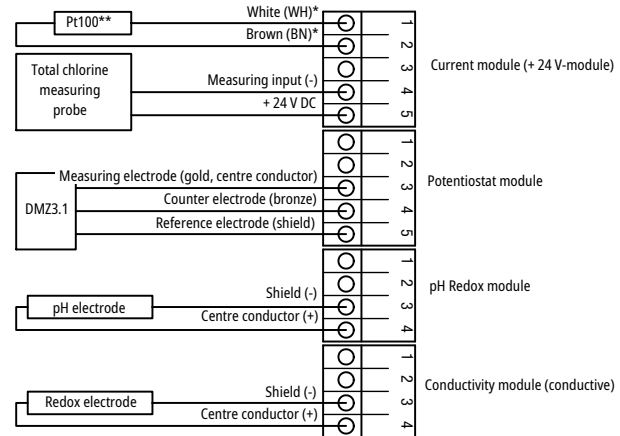


Fig. 16: Measurement of temperature, total chlorine, free chlorine with DMZ3.1, pH value and Redox value

* Applies to cables and sensors from Lutz-Jesco GmbH. No liability is accepted for cables from other manufacturers.

7.6 Connection of actuators

Depending on the device model, you have various options to control actors such as dosing pumps or regulation valves.



INFORMATION

The output circuit boards can be freely assigned to the slots.

7.6.1 Alarm relay

The alarm relay on the main board is used for routing alarms. The output is potential-free.



Fig. 17: Alarm relay

Terminal	Function	Description
41 + 42	Normally closed (NC)	The relay on these terminals is normally closed.
42 + 43	Normally open (NO)	The relay on these terminals is normally open.

Table 13: Terminal connection of the alarm relay

7.6.2 Output circuit board with relay

The output is potential-free.

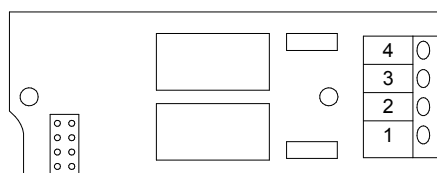


Fig. 18: Output circuit board with relay

Terminal	Function	Description
4	Relay X.1	First digital output
3		
2	Relay X.2	Second digital output
1		

Table 14: Terminal connections of the output circuit board with relay

Actors	Configuration
MAGDOS dosing pumps	On/Off
MEMDOS dosing pumps	On/Off
MEMDOS SMART dosing pumps	On/Off
Peristaltic pumps	Pulse length

Table 15: Actors and relay configuration

7.6.3 Output circuit board (optocoupler)



Fig. 19: Output circuit board with optocoupler

Terminal	Function	Description
4	-	Optocoupler x 1 First digital output
3	+	
2	-	Optocoupler x 2 Second digital output

Terminal	Function	Description
1	+	

Table 16: Terminal connections of the output circuit board with optocoupler

Actors	Configuration
MAGDOS dosing pumps	Pulse frequency
MEMDOS dosing pumps	
MEMDOS SMART dosing pumps	

Table 17: Actors and configuration optocoupler

7.6.4 Servomotor relay output circuit board

This output is suitable for connecting a servomotor with or without feedback via a potentiometer from 1 – 10 kΩ. The output is potential-free.

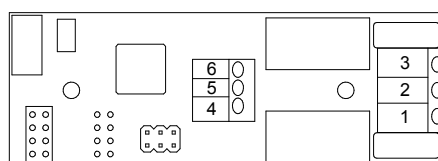


Fig. 20: Servomotor relay output circuit board

Terminal	Function	Description
6		Feedback via potentiometer
5		
4		
3	Closing the regulation valve	Relay output to the regulation valve
2	Voltage*	Relay input
1	Opening the regulation valve	Relay output to the regulation valve

Table 18: Terminal connections of the output circuit board with servomotor relay

* With a regulation valve with 230 V, L and N can be disconnected from the terminal strip of the voltage supply.

Actors	Configuration
Chlorine gas control valve C 7700	Servomotor with potentiometer/ servomotor without potentiometer

Table 19: Actors and configuration servomotor relay

7.6.5 Output circuit board with servomotor 20 mA

The output connects a servomotor with or without feedback.

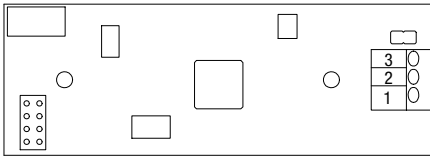


Fig. 21: Output circuit board with servomotor 20 mA

Terminal	Function	Description
3	Output	4 – 20 mA
2	Input (feedback)	4 – 20 mA
1	-	GND

Table 20: Terminal connections of the output circuit board with servomotor 20mA

Actors	Configuration
Chlorine gas control valve C 7700	Servomotor with 20 mA/continuous output (20 mA)
EASYZON chlorine dioxide system	Continuous output (20 mA)
MAGDOS dosing pumps	
MEMDOS dosing pumps	
MEMDOS SMART dosing pumps	

Table 21: Actors and configuration servomotor 20 mA

7.6.6 Output circuit board with relay high current

The output is potential-free.

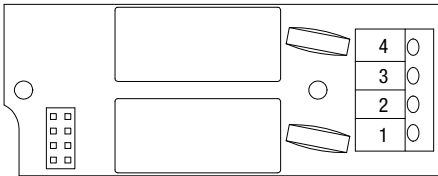


Fig. 22: Output circuit board with relay high current

Terminal	Function	Description
4	Relay X.1	First digital output max. 8 A (ohmic resistive load)
3		
2	Relay X.2	Second digital output max. 8 A (ohmic resistive load)
1		

Table 22: Terminal connections of the output circuit board with relay



NOTE

Damage to the device!

The mains supply terminals on the TOPAX® MC input (terminals 44 – 52) may be operated with a maximum permanent load of 6 A.

- With higher electrical loads, the relays on the output circuit board must be connected with a separate cable and provided with fuse protection!

Actors	Configuration
MAGDOS dosing pumps	On/Off
MEMDOS dosing pumps	On/Off

Actors	Configuration
MEMDOS SMART dosing pumps	On/Off
MINIDOS/MIDIDOS dosing pumps	On/Off
Peristaltic pumps	Pulse length

Table 23: Actuators and the configuration thereof with a high current relay circuit board

7.6.7 Digital universal output module

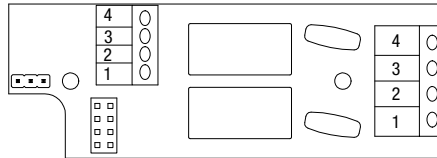


Fig. 23: Digital universal output module

The output module digital universal can be operated either as 2x optocoupler or as 2x relay. The selection is made via the jumper.

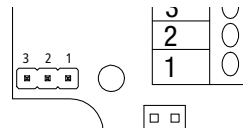


Fig. 24: Jumper

Jumper	Function	Clamps
3*	Optocoupler outputs	big
2	Relay outputs	small
1		

Table 24: Terminal connection

* Pin 3 is not available on all boards. If only pins 1 and 2 are present, the relay is active when the jumper is set to 1-2. The optocoupler outputs are always active.



INFORMATION

To ensure safety, the universal modules are always set to relay output on the factory side. If the optocouplers are required, the module must be adapted accordingly.

Optocoupler output function (jumper 2/3 or removed jumper)

Terminal	Function	Description
4 small, left	Optocoupler x 1	First digital output
3 small, left		
2 small, left	Optocoupler x 2	Second digital output
1 small, left		

Table 25: Optocoupler output function (jumper 2/3 or removed jumper)

Actors	Configuration
MAGDOS dosing pumps	Pulse frequency
MEMDOS dosing pumps	
MEMDOS SMART dosing pumps	

Table 26: Actors and configuration optocoupler output

Relay output function (jumper 1/2)

Terminal	Function	Description
4 big, right	Relay X.1	First digital output
3 big, right		
2 big, right	Relay X.2	Second digital output
1 big, right		

Table 27: Relay output function (jumper 1/2)

Actors	Configuration
MAGDOS dosing pumps	On/Off
MEMDOS dosing pumps	On/Off
MEMDOS SMART dosing pumps	On/Off
Peristaltic pumps	Pulse length

Table 28: Actors and configuration relay output

7.6.8 Connection examples for actuators

* Applies to cables from Lutz-Jesco GmbH. No liability is accepted for cables from other manufacturers.

MAGDOS LD/LK/LP, MEMDOS LP, MEMDOS SMART LD/LK/LP

- Output module Optocoupler
- Pulse frequency

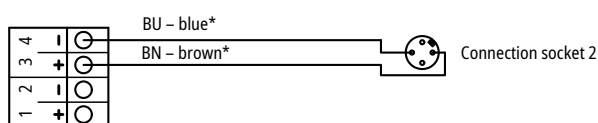


Fig. 25: Connection example (dosing pump)

MAGDOS LA/LP, MEMDOS LA/LP, MEMDOS SMART LP

- Output module Servomotor 20mA
- Continuous control output

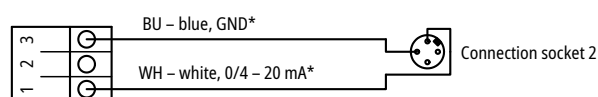


Fig. 26: Connection example (dosing pump)

Peristaltic pump 2.7 l/h

- Output module Relay/Relay high current
- Impulse length

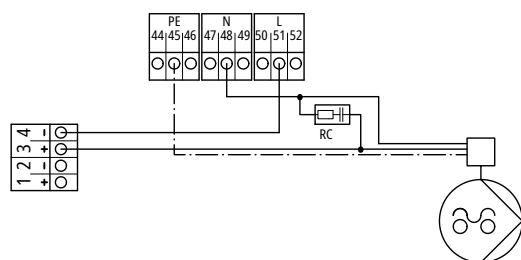


Fig. 27: Connection example (peristaltic pump)

Chlorine gas regulation valve C 7700, 4 – 20 mA (manufactured as of 05/2017)

- Output module; Servomotor 20 mA, with feedback

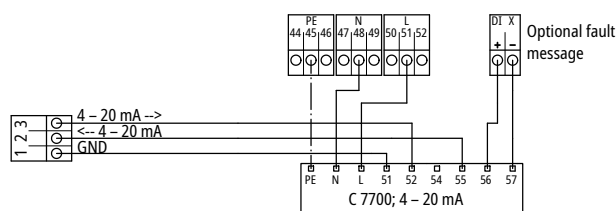


Fig. 28: Connection example (chlorine gas regulation valve)

Chlorine gas regulation valve C 7700, relay 3-P-S (manufactured as of 05/2017)

- Output module Servomotor relay, with feedback

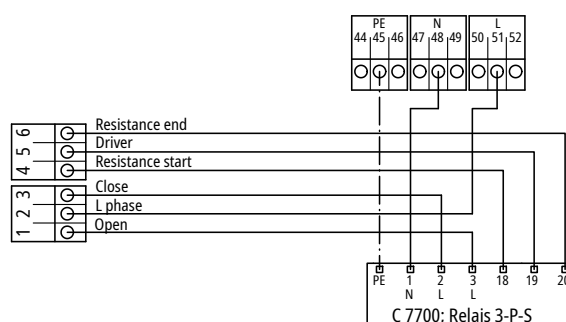


Fig. 29: Connection example (chlorine gas regulation valve)

7.6.9 Testing the outputs

You can use manual mode to test the correct connection of an actor.

Take the alarm chain into account before conducting the test and inform any connection points or interrupt the alarm chain for the period of the test.

Test the connected actors

- ✓ The actuators have been connected correctly (→ Connection of actuators [► 18]).
 - ✓ The device housing cover is closed.
 - ✓ The voltage supply has been established and the device has been switched on.
1. In **Menu 2**, navigate to **Manual mode** (→ Manual mode [► 47]).
 2. You will now see all the outputs.
 3. Select the output to which you have connected the actor and that you want to test.
 4. Now enter a value between 0 % and 100 % and select **On**.
 - ↳ The actor is tested.
 5. Check whether the actor reacts in the required way.
 6. Stop the actor test either by setting it back to **Off** or by setting a timer, so that the test is stopped automatically after the time has elapsed.
- ☑ Actor has been tested.

7.7 Analogue inputs and outputs

One analogue input and four analogue outputs are available.

AI1	A01	A02	A03	A04
11, 12	13, 14	15, 16	17, 18	19, 20
+	+	+	+	+
-	-	-	-	-
○	○	○	○	○

Fig. 30: Wiring diagram for analogue input 11/12 and analogue outputs 13 – 20

Connection example: analogue input

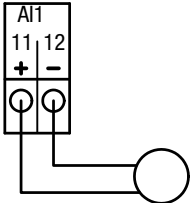


Fig. 31: Flow disturbance variable 4 – 20 mA

Connection examples: analogue outputs

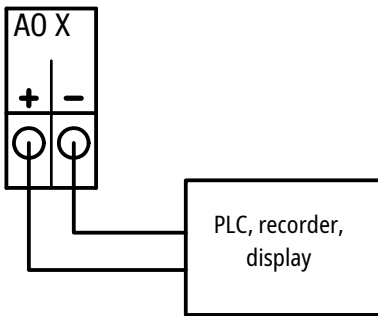


Fig. 32: Measurement outputs – measurement output/recorder outputs 4 – 20 mA, freely-configurable

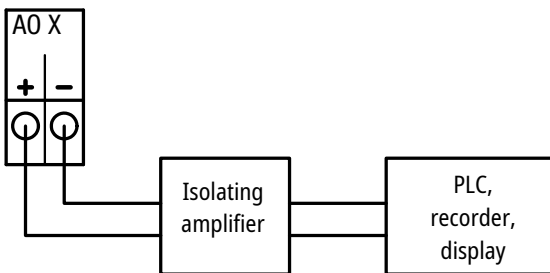


Fig. 33: Measurement outputs – isolating amplifier for analogue inputs and outputs

The 0/4 – 20 mA inputs and outputs on the mainboard are not galvanically isolated. Install an isolating amplifier for standard signals.

Testing the analogue outputs

You can also test the connection of terminals 13 to 20.

- ✓ The device housing cover is closed.
- ✓ The voltage supply has been established and the device has been switched on.

1. In **Menu 2**, navigate to **Outputs** → **Analogue**.

2. Press **Test signal**.

3. Set an mA value for each analogue output to be tested.

4. Press **Start**.

☞ Analogue outputs tested.

7.8 Digital inputs

DI 1	DI 2	DI 3	DI 4	DI 5	DI 6	DI 7	DI 8
21, 22	23, 24	25, 26	27, 28	29, 30	31, 32	33, 34	35, 36
+	+	+	+	+	+	+	+
-	-	-	-	-	-	-	-
○	○	○	○	○	○	○	○

Fig. 34: Wiring diagram digital inputs, freely-configurable

You can use up to 8 digital inputs to evaluate switching statuses, detect them as an alarm message and document them in the logbook.

Connection examples

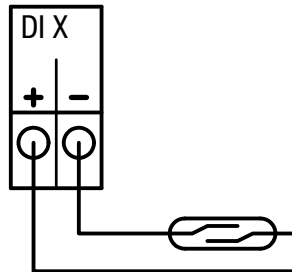


Fig. 35: Suction line, level control – 1 level, 1 cable

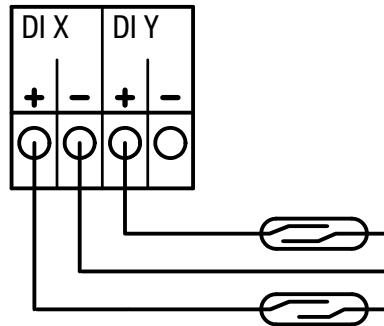


Fig. 36: Suction line, level control – 2 levels, 1 cable

See also

☞ Configuring digital inputs [► 28]

7.9 Connecting RC protection for relays

When connecting to the relays, note that inductive loads must be suppressed. If this is not possible, the relay contact on the device terminal must be protected by an RC protective circuit / interference suppression element.

If devices with inductive loads from a nominal current of 1 A are connected to a relay, the contacts in the relay may become bonded. Thus, the device will operate in an uncontrolled manner. To prevent bonding if the load circuit suffers a short-circuit, the relays must be protected separately on the maximum relay switching current.

- ✓ You want to connect an inductive load to the relay.

1. Switch off the device.

2. Clamp the interference suppression element parallel to the inductive load.
3. If you cannot perform step 2, clamp the interference suppression element parallel to the relay output.

✎ RC protection for relay connected.

7.10 Ethernet connection

You can use the Ethernet connection for the following actions:

- Reading/writing via Modbus TCP/IP protocol* (PLC or Computer)
- Access via web browser
- Access via TFTP server

The device is fitted with a network input in the form of a 4-pole and D-coded M12x1 socket. Lutz-Jesco GmbH offers different lengths of special twisted-pair network cables to make the typical Ethernet RJ-45 plug connection. If you use third-party cables, choose a category 5 cable with an impedance of 100 Ohm or above.

Pin	Assignments	Wire colours
1	TX-	yellow
2	TX+	orange
3	RX-	white
4	RX+	blue
-	Screen	-

Table 29: Ethernet connection socket

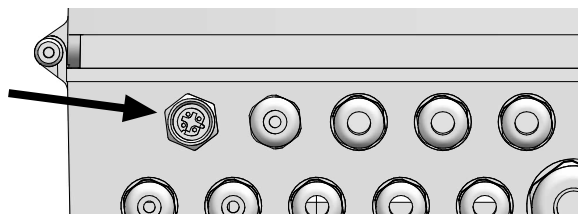


Fig. 37: Ethernet connection

Installing a wired network

Please note the following during installation:

- The Ethernet is cabled in a star topology. The maximum cable length is 100 m.
- Only use shielded cables and connectors.
- Only use CAT5 cables or better.

*For the list of Modbus commands → Modbus addresses [► 55]

7.11 RS485 interface

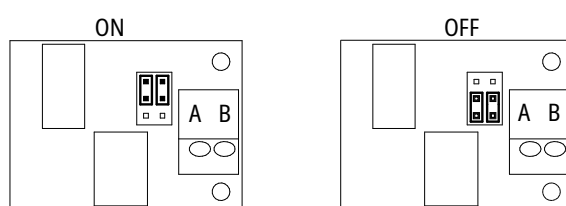


Fig. 38: Jumper position on RS485



INFORMATION

When using multiple devices on the same data line, you need to activate 120 Ω resistance on the last device. You can activate the resistance by setting the jumper to "ON" as shown above.

Your device can have an optional RS485 interface. Using a second data cable you can connect up to 14 devices with a PC or a PLC. Modbus RTU protocol serves as a protocol for data transfer. You can use the addresses 1 to 14. The addresses 0 and 15 are reserved for internal purposes and are not supported.

RS485 Modbus settings:

- Baud rate: 9600
- Word length: 8 Bit
- Stop bit: 1 Bit
- Parity: None
- You can read out a maximum of 40 addresses at once.

For the list of Modbus commands → Modbus addresses [► 55]

7.11.1 Connecting the device to a network

1. Open the device housing.
2. Connect a two-wire cable to terminals A and B of the RS485 module.
3. Connect the device to your network.

✎ Device connected to network.

8 Commissioning

When you put the device into operation for the first time, a **configuration assistant** guides you through the basic settings:

- Selecting the language
- Selecting measured values for the installed input modules
- Assigning inputs to the controllers
- Assigning a function to output modules

With the exception of the language, you can set the configured values only in the configuration assistant. You make the finer settings in the sub-menus.



NOTE

Impairment of measurement results

The measurement results of the high-impedance measuring inputs can be negatively influenced during the first 24 hours due to heat development inside the housing of the TOPAX® MC controller.

- ▶ Activate the **TOPAX® MC** controller 24 hours before start-up.
- ▶ Factor in the influence of heat development, and do not perform the calibration of the measurement results until 24 hours after activating the **TOPAX® MC** controller.

8.1 Configuration assistant

The configuration assistant appears automatically when you start up the device for the first time. You can also call up the configuration assistant manually in **Menu 2** under **Setup** → **Configuration** → **Configuration assistant**.

You can navigate forwards and backwards in the configuration assistant using the arrows.

Language

On this tab, you select the language. If necessary, you can later change the language under **Setup** (→ Changing the language [▶ 46]).

Inputs

On this tab, you select the desired measured value for the installed input modules. You can switch off the measurement by deselecting the **activated** checkbox.

Controller

On this tab, you can assign inputs to up to four controllers. As the input, you select a sensor or a virtual input (for more information → Controller [▶ 30]).

Note that controllers 1 to 4 have a fixed assignment to output modules 1 to 4.

Digital outputs

On this tab, you can assign a function to output modules. Only those output modules that are still free are displayed. Various control functions such as alarm output, timer and medium dosing are available. Please note that you are allowed to assign medium dosing only to the second digital outputs of an output module.

8.2 Password protection

The password protection of your device has been deactivated at the factory. You can provide your device with password protection against access to specific functions in three levels. The level that is currently set will be displayed in the top left-hand corner next to the lock icon.

Level	Released functions
1	Simple settings for daily operation
2	Input and output configuration and sensor adjustment This level is required for device configuration and should only be operated by experienced users.
3	Service menu This level is mainly required for maintenance work such as changing the sensor, performing software updates or network settings. Here, you can also activate the password protection for individual levels.

Table 30: Password protection: Levels



INFORMATION

The following passwords are factory-set:

1. Level: 0001
2. Level: 0002
3. Level: 0003

Configuring password protection

1. Press the lock icon in the left-hand upper corner to configure the password protection.
2. **Password active**: Select whether the password protection should be deactivated or activated and the levels to which the password protection applies. Deactivation of the password protection and activation of the password protection for individual levels is only possible if you have logged into level 3.



INFORMATION

Password protection must be activated to unlock the following steps.

3. Select one of the three password levels into which you wish to log on.
4. **Login**: Log in with the password for the password level previously selected.
5. **Change password**: You can edit the password of the level in which you are logged in.

📖 Password protection configured.



INFORMATION

The characters are displayed as asterisks during password entry. If the password is to be displayed when typing, navigate to **Setup** → **Display 2** and select the **Plain text password** checkbox.

8.3 Network settings

To use the device in a network, you may need to make certain settings.

See also

- 📖 Network access [▶ 47]
- 📖 Configuring network settings [▶ 48]

8.4 Menu structure

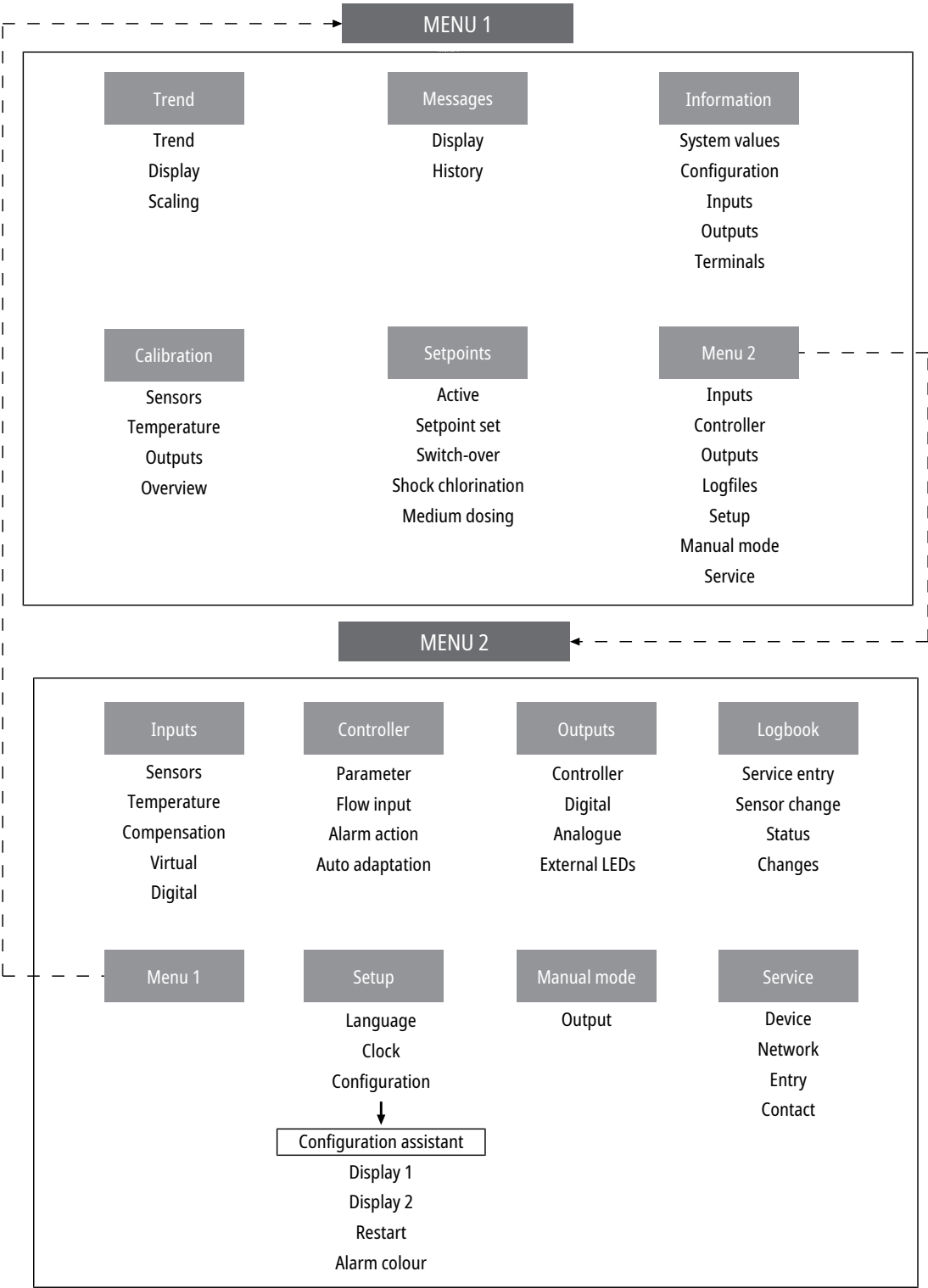


Fig. 39: Menu structure

Menu 1

- Trend [► 45]
- Messages [► 45]
- Information [► 47]
- Calibration [► 38]
- Setpoints and setpoint sets [► 43]

Menu 2

- Inputs [► 27]
- Controller [► 30]
- Outputs [► 36]
- Logbook [► 46]
- Setup [► 46]
- Manual mode [► 47]
- Service [► 47]

9 Operation

The device is set up variably and can be individually adapted to meet your requirements. As such, it is necessary to adjust the configuration of the inputs and outputs to the sensors and actors used.

The following section leads you through the device configuration.

9.1 Inputs

You can connect up to four sensors to the device (depending on the model) for various water parameters and for temperature. You can also use up to eight digital inputs.

9.1.1 Configuring the sensors

To enable precise and error-free measurement of the water parameters, you need to configure the sensors separately on the device:

1. In **Menu 2** under **Inputs**, navigate to the **Sensors** tab.
2. On the **Sensors** tab, configure every connected sensor and state the following information.
3. **Input**: Select the input module of the sensor that you want to configure.
4. **Signal**: Enter the type of the sensor signal. Depending on the input module, the signal type has been specified or you can select a signal type.
5. **Value**: Here, you can check which water parameters are measured. This setting can only be changed in the configuration assistant.
6. **Unit**: Select the appropriate unit.
7. **Sensor range**: If an input field is available, enter the measuring range of the sensor.
8. **Min-alarm**: Activate or deactivate the **Min-alarm** and state a value under which the alarm is to be triggered.
9. **Max-alarm**: Activate or deactivate the **Max-alarm** and state a value above which the alarm is to be triggered.
10. **Delay**: Set a time delay for the minimum and maximum alarm.

☞ Sensors configured.

9.1.2 Configuring temperature sensors

You can connect up to four temperature sensors to the device (depending on the model). This enables you to measure the temperatures at various positions.

1. In **Menu 2** under **Inputs**, navigate to the **Temperature** tab.
2. On the **Temperature** tab, configure every connected temperature sensor and state the following information.
3. **Measurement**: Choose between **On** and **Off**.
4. **Min-alarm**: Activate or deactivate the minimum alarm and state a temperature under which the alarm is to be triggered.
5. **Max-alarm**: Activate or deactivate the maximum alarm and state a temperature above which the alarm is to be triggered.

☞ Temperature sensors configured.

9.1.3 Configuring the compensation of cross-sensitivities

The water parameters that you measure with the sensors can be influenced by cross-sensitivity (e. g. with the temperature or the pH value) in accordance with their design. The device can compensate these interferences automatically.

1. In **Menu 2** under **Inputs**, navigate to the **Compensation** tab.
2. Working in the **Compensation** tab, configure every sensor connected for which the measured value is to be compensated and state the following information.
3. **Temperature**: If it is possible to compensate for the influence of the temperature, you can select a fixed reference value or one of the four temperature inputs.
4. **pH value**: The influence of the pH value on the measuring signal can be compensated. You can select a set reference value or a sensor input to do this.

☞ Compensation of cross-sensitivities configured.

9.1.4 Virtual inputs

You can calculate a new value from multiple measurements or reference values using a virtual input. You can assign the new virtual value to a controller in the configuration assistant.

In this way, you can calculate the bound chlorine as the difference between the total chlorine and the free chlorine, for example, and use it as the basis for controlling your actuators.

It is also possible to calculate and display the proportion of effective chlorine (hypochlorous acid) from the free chlorine value. The dissociation curve of chlorine is mathematically stored for this purpose.

9.1.4.1 Configuring the difference value

You can calculate the difference between two measured values or the difference between a measured value and a fixed reference value.

1. In **Menu 2** under **Inputs**, navigate to the **Virtual** tab.
2. State the following information.
3. **Calculation**: Select **Difference**.
4. Select a sensor.
5. Select a second sensor or a reference value. The second sensor must output the same measured value as the first. You will need to enter the reference value manually.
6. **Min-alarm**: Activate or deactivate the minimum alarm and state a difference value under which the alarm is to be triggered.
7. **Max-alarm**: Activate or deactivate the maximum alarm and state a difference value above which the alarm is to be triggered.
8. **Delay**: Set a time delay for the minimum and maximum alarm.

☞ Difference value configured.

9.1.4.2 Configuring the calculation of bound chlorine

Bound chlorine is calculated from the difference between the total chlorine and the free chlorine:

Bound chlorine = total chlorine – free chlorine

At least one total chlorine measurement is required to calculate bound chlorine. Ideally, total chlorine measuring cells and free chlorine measuring cells with the same quality are used, e.g. as membrane-covered measuring cells. The free chlorine value can also be entered manually as a one-off reference value measurement, or an appropriate sensor input can be selected.

1. In **Menu 2** under **Inputs**, navigate to the **Virtual** tab.
2. **Free chlorine**: Select the sensor which measures the free chlorine. If no sensor is present, you can enter a reference value measured once which can be used for the calculation.
3. **Min-alarm**: Activate or deactivate the minimum alarm and state a value under which the alarm is to be triggered.
4. **Max-alarm**: Activate or deactivate the maximum alarm and state a value above which the alarm is to be triggered.
5. **Delay**: Set a time delay for the minimum and maximum alarm.

☞ Calculation of bound chlorine configured.

9.1.4.3 Configuring the calculation of effective chlorine

The disinfectant effect of the free chlorine is dependant on the pH value of the process water. This connection is illustrated by the dissociation curve (→ Fig. 40: Dissociation curve of free chlorine [► 28]). Free chlorine is the sum total of Cl_2 , HClO and ClO^- . Effective chlorine is the proportion of free chlorine which is actually effectively available for disinfection after dissociation as hypochlorous acid (HClO) depending on the pH value and the temperature. The concentration of the effective chlorine can be calculated based on the measured free chlorine, pH value and temperature.

By displaying the effective chlorine, the TOPAX® MC helps you to evaluate the disinfection effectiveness and define the correct setpoint for the water to be treated. The lower the effective chlorine, the higher the setpoint for the free chlorine within the permissible chlorine range. When the pH value is being set, make sure that pH values < pH 3.5 are avoided, since otherwise chlorine gas can be released from the water. With pH values > pH 9, on the one hand it can be expected that disinfection will not be ensured, and on the other hand that the measuring signal of the free chlorine measurement will be too low.

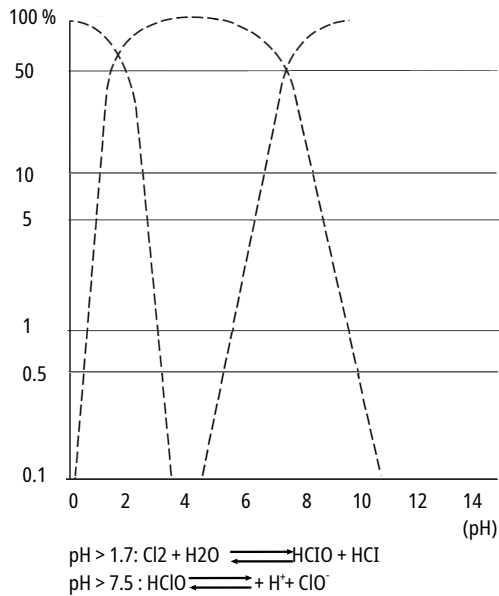


Fig. 40: Dissociation curve of free chlorine

1. In **Menu 2** under **Inputs**, navigate to the **Virtual** tab.
2. Working in the **Virtual** tab, configure the desired calculation of the effective chlorine and state the following information.
3. **Calculation**: Select **effective chlorine** to calculate the effective chlorine.
4. **Free chlorine**: Select the sensor which measures the free chlorine.
5. **pH value**: Select the sensor which measures the pH value. If no sensor is present, you can enter a reference value measured once which can be used for the calculation.
6. **Temperature**: A temperature value is required to calculate the effective chlorine. Select the temperature input which can be used for the calculation. If no temperature sensor is present, you can set a reference value measured once which can be used for the calculation.
7. **Min-alarm**: Activate or deactivate the minimum alarm and state a value under which the alarm is to be triggered.
8. **Max-alarm**: Activate or deactivate the maximum alarm and state a value above which the alarm is to be triggered.
9. **Delay**: Set a time delay for the minimum and maximum alarm.

☞ Calculation of effective chlorine configured.

9.1.5 Configuring digital inputs

You can use up to 8 digital inputs to evaluate switching statuses, detect them as an alarm message and document them in the logbook.

1. In **Menu 2** under **Inputs**, navigate to the **Digital** tab.
2. On the **Digital** tab, configure the inputs and state the following information.
3. **Action**: Choose between **OK = open** (N.O., working contact) or **OK = contact** (N.C., break contact).
4. **Function**: Depending on how you want the device to react to the input, select a function from the following table.

☞ Digital inputs configured.

Function	Reaction
Off	The switching of the contact has no influence on the measurement or control.
Setpoint changeover	You can use the contact to switch between setpoint sets.
Sample water missing	All controller outputs will be switched off.
External stop	All controller outputs will be switched off.
Filter rinsing	All controller outputs will be switched off whilst the filters are being flushed.
Pre-alarm 1 – 4	Only display as an alarm message. Nothing is switched off.*
Main alarm 1 – 4	The appendant controller output is switched off. The other outputs remain unaffected.**
Sample water missing 1 – 4	The corresponding controller is switched off.
External stop 1 – 4	The corresponding controller is switched off.
Filter rinsing 1 – 4	The corresponding controller is switched off.
Medium dosing	An additional medium will be dosed.
Others	You can assign an individual name to this digital input. The name is displayed in the alarm messages during switching the contacts.

Table 31: Functions of the digital inputs

* The configuration can be changed in **Menu 2** → **Controller** → **Alarm action**.

** Configuration to further outputs can be performed in **Menu 2** → **Controller** → **Alarm action**.

9.2 Controller

As soon as you have added a control function for the respective output (→ Configuration assistant [► 24]), you can change the parameters in the controller menu.

Functions of the controllers

Outputs						Controller functions	Behaviour
Relay high current	Relays	Opto-coupler	Digital universal	Servo-motor	Servo-motor 20 mA		
x	x		x			On/Off	- The output switches if a value is exceeded. - Hysteresis from 0.1 to 50% can be set
	x	x	x			Pulse frequency or 2-sides pulse frequency	- Relay: 10 – 100 pulses per minute - Optocoupler: 10 – 350 pulses per minute - The pulse frequency is dependant on the control deviation and the set control parameters. - With a control output power of $Y = 25\%$ and a maximum pulse frequency of 100 pulses/min., the controller would output 25 pulses/min.
x	x		x			Pulse length or 2 sides pulse length	0 – 3600 seconds cycle duration - Relay output (e. g. for solenoid valves) - Depending on the control deviation and the defined control parameters, the relay pulls in or drops out for the set cycle duration. If the cycle lasts 30 seconds and the controller output power is 40% the relay applies for example for 12 seconds, followed by 18 seconds of non-application.
				x		Servomotor with feedback potentiometer	- A feedback potentiometer (1 – 10 kΩ) can be connected for servomotors with position feedback. - Compensate the feedback potentiometer. During compensation, the servomotor is first started and then stopped automatically.
				x		Servomotor without a feedback potentiometer	- For servomotors without feedback. - Measure and set the runtime of the servomotor.
					x	Continuous output	Continuous control output from 0/4 – 20 mA for the actuation of constant actors.
					x	Servomotor with 20 mA feedback	Servomotors which are controlled via 4 – 20 mA and have a 4 – 20 mA position feedback.

Table 32: Functions of the individual controllers

Function of the pulse length

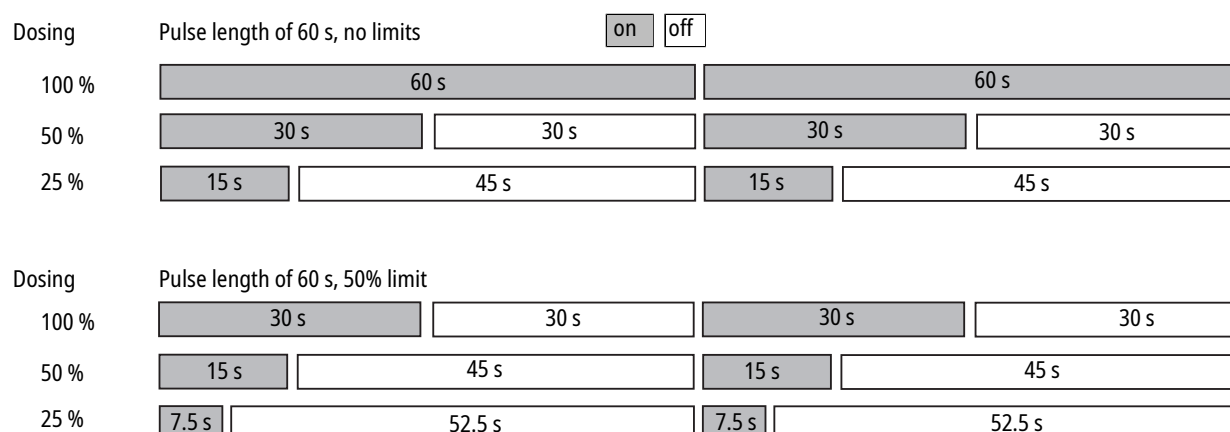


Fig. 41: Function of the pulse length e.g. for peristaltic pumps

Function of the pulse frequency

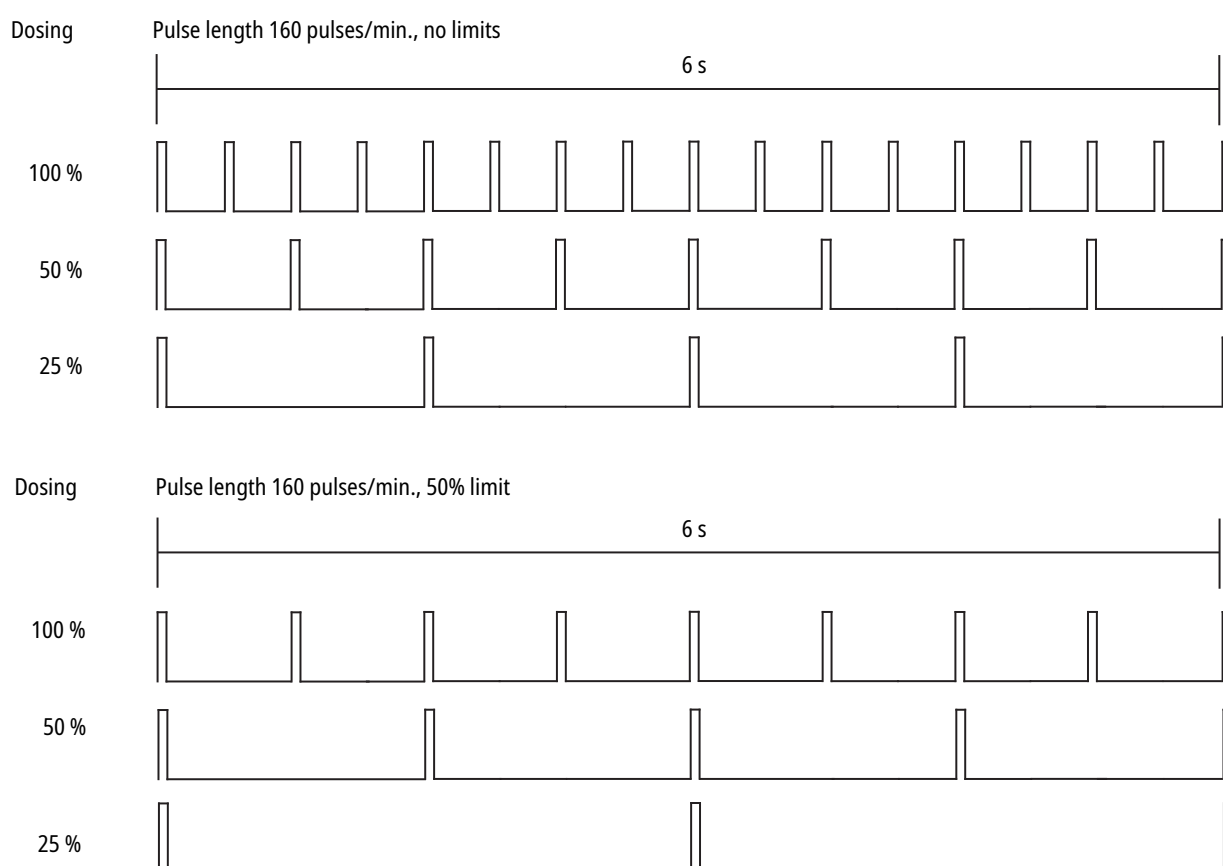


Fig. 42: Function of the pulse frequency e.g. for MAGDOS pumps

9.2.1 P controller

Proportional range Xp

(proportional effect or amplification of the controller)

The proportional range Xp (p-range) of a proportional controller indicates the amount by which the measurand X must deviate from the setpoint W, so that the control variable Y = 100%. If the control deviation is less, the control variable is reduced proportionally.

Control variable Y of a P-controller is affected proportionally only by the control deviation (X – W).

The TOPAX® MC specifies the P range, which was previously specified in %, in the relevant unit of the measurand directly, and is the deviation from the setpoint as of which the output is 100%.

In this way, the control deviation is specified directly, since the input electronics also have no fixed final value. Conversion is no longer necessary.

Example:

Setpoint = 0.8 mg/l

Xp value = 0.5 mg/l

Setpoint - Xp value = actual value at which control variable Y reaches 100%

0.8 mg/l - 0.5 mg/l = 0.3 mg/l

With an actual value of 0.3 mg/l, the control variable Y is 100%.

The following table shows the previous specification of the Xp value on the TOPAX® DX as % with the relevant measuring range and the relevant setting on the TOPAX® MC as a fixed value with the associated unit specification. The table is intended to make the old settings easier to convert in the event of a refit. Please note that only two decimal points are displayed in the TOPAX® MC controller.

Disinfection (free chlorine, chlorine dioxide etc.)						
Setpoint [mg/l]	Xp value in [%]	Xp value in [%]	Xp value in [mg/l]	Control variable Y 100 % with actual value in [mg/l]	Control variable Y 50 % with actual value in [mg/l]	Control variable Y 10 % with actual value in [mg/l]
	TOPAX® DX (1 mg/l)	TOPAX® DX (2 mg/l)	TOPAX® MC			
0.5	10.0	5.0	0.10	0.40	0.450	0.490
0.5	15.0	7.5	0.15	0.35	0.425	0.485
0.5	20.0	10.0	0.20	0.30	0.400	0.480
0.5	25.0	12.5	0.25	0.25	0.375	0.475
0.5	30.0	15.0	0.30	0.20	0.350	0.470
0.5	40.0	20.0	0.40	0.10	0.300	0.460
0.5	50.0	25.0	0.50	0.00	0.250	0.450

Table 33: Xp value disinfection

pH value						
Setpoint [pH]	Direction	Xp value in [%]	Xp value in [pH]	Control variable Y 100 % with actual value in [pH]	Control variable Y 50 % with actual value in [pH]	Control variable Y 10 % with actual value in [pH]
		TOPAX® DX (0 – 14 pH)	TOPAX® MC			
7.0	boosting	5.0	0.70	6.30	6.65	6.93
7.0	boosting	10.0	1.40	5.60	6.30	6.86
7.0	boosting	15.0	2.10	4.90	5.95	6.79
7.0	boosting	20.0	2.80	4.20	5.60	6.72
7.0	boosting	25.0	3.50	3.50	5.25	6.65
7.4	boosting	5.0	0.70	6.70	7.05	7.33
7.4	boosting	10.0	1.40	6.00	6.70	7.26
7.4	dropping	25.0	3.50	10.90	9.15	7.75

Table 34: Xp value pH value

9.2.2 PI and PID controllers

Reset time Tn

(integral effect of PI controller)

The integral time of a PI or PID controller is called the reset time Tn.

The integral time is the time required by the control variable Y with a constant nominal/actual deviation to achieve the same change in output signal as produced immediately by the P proportion immediately after the change in the nominal/actual deviation.

Example of proportional range and reset time

Xp = 1,0 mg/l (P-range)

$T_n = 3 \text{ min}$

(sudden change of the actual value by 0.10 mg/l)

After a sudden deviation of the actual value from the setpoint of around (X-W) 0.10 mg/l, the control variable Y immediately changes to 10%.

Due to the integral behaviour, the control variable continues to increase for as long as the deviation (X-W) remains, in order to achieve a control variable increase of a further 10% after $T_n = 3$ minutes (resulting in 20%).

This means that the value increases by an additional 10 % every 3 min. This increase takes place in a linear fashion for the entire period of time until Y = 100 % has been reached.

Control variable	Setpoint
X (actual value)	0.20 mg/l
Setpoint (W)	0.30 mg/l
X-W	0.10 mg/l
Xp (P-range)	1.0
T_n	3 minutes
Y (immediate power output of the controller)	10 % through Xp
Y (output power of the controller after 3 minutes)	20 % through T_n
Y (output power of the controller after 6 minutes)	30 % through T_n

Table 35: Example of proportional range and reset time

Derivative time T_v

(differential effect of PID controller)

With the differential function, a correction factor is entered in the controlled system when the control variable begins to differ from the setpoint. The control variable depends on the speed at which the setpoint/actual deviation takes place (i.e. not the actual deviation). The duration of the correction is determined by the derivative time T_v .

If the control variable does not change, i.e. the speed of change is "0", the correction factor and the time constants T_v caused by the differential proportion drop to "0" (even if the actual value consistently deviates from the setpoint). The fact that the control system brings the actual value to the setpoint is caused mainly by the integral proportion of the controller. The differential proportion often improves the controller result because it acts against the trend to deviate.

9.2.3 Definitions

Term	Definition
Actual value (X)	The actual value of X of the measurement for the respective sensor is constantly indicated.
Setpoint (W)	Setpoint W of a control system defines the level at which the controller should settle the process and keep it constant.

Term	Definition
Deviation (X-W)	Control deviation X-W occurs if the actual value X of the measurand differs from setpoint W. Control variable Y results from the control deviation and the control parameters set.
Control variable Y	The control variable Y of a control system is the value that the controller transmits to the actuator (between 0 % and 100 %) depending on the parameters set and control deviation (X-W).

Table 36: Definitions

9.2.4 Explanation of the controllers

9.2.4.1 Calculation of settable values

In order for the controller to keep actual values of free chlorine and Ph close to the setpoints within tight limits, e.g. for bathing, the controller must be adjusted to the controlled system. This is achieved using control parameters Xp for the proportional range (P), T_n for the reset time of the integral range (I) and the derivative time T_v for the differential range (D).

These settings can be determined by recording the step response of the controlled system. To do this the actuator must be changed suddenly by hand from "CLOSED" (0 %) to "OPEN" (100 %) or for example from 30% to 50%.

The following formula can be used for calculating reference values:

$$X_p \sim 0.83 \cdot \Delta X / \Delta t \cdot T_u$$

$$T_n \sim 3.3 \cdot T_u$$

Variable	Description
Yh	Setting range (e.g. valve fully open or 100% dosing pump capacity)
Xmax	Maximum value of the controller variable at 100 % dosing rate
$\Delta X / \Delta t$	Gradient of the measured curve ($\rightarrow$ Fig. 44: Step response of a controller to a change in control variable Y. (X = actual value; e.g. disinfection or pH value) [► 34])
T_0	Time of control variable Y change
T_u	Lag time (s)

Table 37: Calculation of settable values

In order to meter chlorine gas, you need accounting for the speed of the chlorine gas valve. The value of Xp is computed for a drive speed from 0 % through 100 % in 60 seconds. A slower operation would show the same trend as a bigger proportional range Xp. In order to adjust this, the Xp value must be first reduced at slower operation and vice versa.

The following formula can be used:

$$X_{p \text{ new}} = X_p \cdot 60 \text{ s} / T_y$$

T_y = Motor regulation time

As these are approximate values, changing the X_p value may after a certain time improve the control variable. If the control responds too slowly or too fast, a smaller X_p and a smaller T_n would result in a faster control behaviour and a larger X_p and/or T_n would result in slower behaviour.

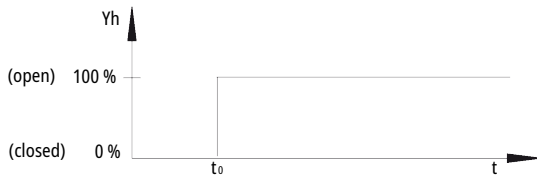


Fig. 43: State of the control variable, e.g. opening of a valve or dosing rate of a pump.

Here below, a diagram shows for the controlled variable X over the time t :

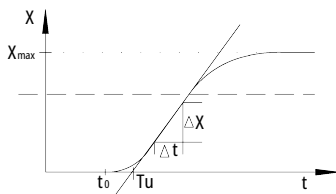


Fig. 44: Step response of a controller to a change in control variable Y . (X = actual value; e.g. disinfection or pH value)

The control parameters can be automatically calculated to the respective state in the TOPAX® MC.

The settings are optimized better during operation, in order to take a representative load into consideration for the control. Dimensioning by means of trial and error (empirical setting) has proven itself when doing this.

This is a practical method that requires little calculation and auxiliary equipment, performed in accordance with the most well-known setting rules from Ziegler/Nichols, the empirical formula procedure.

Adjusting using the oscillation method:

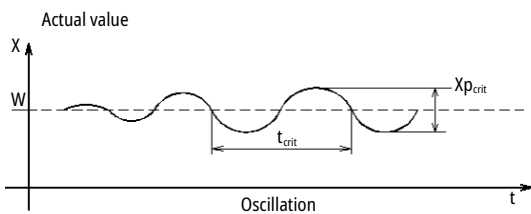


Fig. 45: Adjusting using the oscillation method:

The procedure is very good for systems that can be made to oscillate.

Adjustment through trial and error:

Start with a non-critical setting (large X_p , $T_n = 0$, $T_v = 0$) and slowly reduce the proportionality factor X_p . Then gradually add the integral proportion, increase it in stages and keep trying until the result approximately corresponds to control with little oscillation.

9.2.4.2 Controller parameters

For disinfection, pH value, combined chlorine and conductivity inputs, the following settings can be configured:

Controller	X_p value	T_n value	pH value
P	0.01 – 99999	-	
PI	0.01 – 99999	1 – 200 min	
PD	0.01 – 99999		1 – 1200 s
PID	0.01 – 99999	1 – 200 min	1 – 1200 s

Table 38: Controller parameters



INFORMATION

All control parameters which are pre-set in the as-delivered state must be checked and adapted on-site.

9.2.4.3 Control direction

You can define the control direction for each controller. Possible options:

- Value boost: Display "up" arrow
- Lower pH value: Display "down" arrow
- 2-side regulation: only pH value

Terminal assignment

Ter- minal	Function	1-side controller	2-side controller
4	Relay X.1	Increase or reduce	Raise
3			
2	Relay X.2	Freely adjustable digital output	Lower
1			

Table 39: Terminal assignment

NOTE! With 2-sided control, you need to enter two setpoints. These should preferably differ only very slightly.

For example:

1. Setpoint (pH), lift = 7
2. Setpoint (pH), lower = 7.05

9.2.4.4 Basic load dosing

Basic load dosing can be configured outside of the control range. This dosing takes place even if the PID automatic controller output is 0%. If a basic load is configured, this value is shown in blue on the display screen in the Y display. The Y display for automatic control is shown in green. In the status display, this condition is indicated by a "+" after the Y display. Note that this basic load is always effective and that a certain percentage of the actuator is always open irrespective of the control even though the controller does not require dosing. The basic load can be adjusted separately for each output up to a maximum of 20% of the control range.

9.2.5 Functional diagram of a controller

The following example illustrates how a dual-channel controller works (TOPAX MC 2). It measures the water parameters with the help of sensors. Through the control of actuators, such as dosing pumps, the water parameters are kept at the required setpoints.

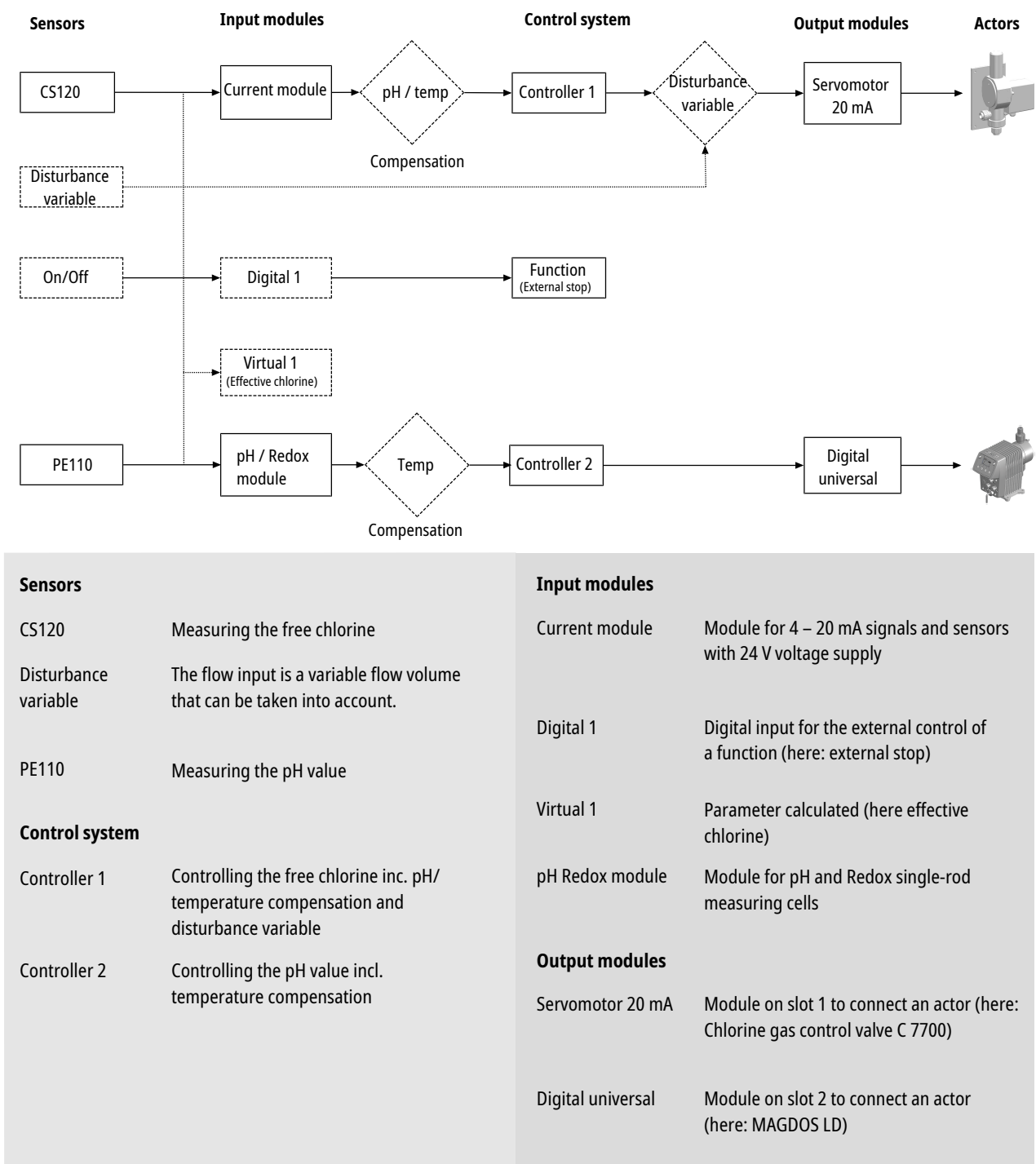


Fig. 46: Functional diagram of a dual-channel controller

9.2.6 Configuring the controller parameters

Before making the following settings, please read the basic information on the controllers (→ Controller [► 30]). You can configure the behaviour of the individual controller channels.

1. In **Menu 2** under **Controller**, navigate to the **Parameter** tab.
2. Working in the **Parameter** tab, configure every control channel and state the following information.
3. **Control direction**: Configure the direction of control. If a switch is to be made between a 1- and a 2-side control, this must be set in the configuration assistant.
4. **Function**: Set the desired controller function. Possible: P-, PI-, PD- and PID-controller.
5. **P, I and D**: Depending on which control function has been set, you can configure these parameters (for more information about the calculation → Controller [► 30]).
6. **Disturbance variable** and **Factor disturbance variable**: If you have activated a disturbance variable (→ Disturbance variable [► 36]), you can configure the influence of this disturbance variable on the selected controller channel. You can switch the influence on or off and set a factor between 0.1 and 20.

☞ Controller parameters configured.

9.2.7 Disturbance variable

You can add a disturbance variable for the controllers. This additional measurement can be connected via the 4–20mA input on the mainboard. The disturbance variable can then be taken into account with a factor (0.1 to 10) during the calculation of the control variable Y. The control variable Y will be multiplied with the disturbance variable during the calculation.

Example: If the factor = 2 and the disturbance variable amounts to 42%, the controller can be set to a maximum of the control variable Y = 84 %. If the factor = 0.5 and the disturbance variable amounts to 42%, the controller can be set to a maximum of the control variable Y = 21%.

9.2.7.1 Adding a disturbance variable

1. In **Menu 2** under **Controller**, navigate to the **Flow input** tab and enter the following information.
2. **Flow input**: Select the appropriate input for the disturbance variable signal here. You can use the fixed disturbance variable input on the mainboard (0-20 /4-20 mA), one of the input modules for flow measurement or specify the disturbance variable via Modbus. Please note the timeout of 15s!
3. **Unit**: As a rule, the disturbance variable is the measurement of a flow. Select the desired unit.
4. **Sensor range**: Enter the measuring range.

☞ Disturbance variable added.

9.2.8 Configuring alarm behaviour

Select the conditions here to define when the controller output is to switch off in the event of an alarm.

Note that as soon as the **Sample water missing**, **External stop** and **Filter rinsing** alarms are configured (→ Configuring digital inputs [► 28]), all controller outputs switch off. You can differentiate depending on the sample water circuit, for example, by activating sample water missing 1 – 4. If you have two sample water circuits, for example, you can set the first controller to sample water missing level 1 and the second controller to sample water missing level 2.

In **Menu 2** under **Controller**, navigate to the **Alarm action** tab.

1. **Controller**: Under **Controller**, select the controller to be configured.
2. **Input**: The input assigned to the controller is displayed
3. **Controller stops at**: Select the error messages for the controller is to be stopped by pressing on **Controller stops at** and setting the required checkmark.

☞ Alarm behaviour configured.

9.2.9 Starting auto-adaptation

Auto adaptation is an auxiliary function with which control parameters (Xp (P), and Tn (I)) can be determined automatically. From a starting value of 0.3 mg/l, the controller will run a program which automatically reduces and increases the chlorine value, measuring the times until the measurement answer is received and determining the step response. If the auto adaptation, which lasts up to three hours, is completed successfully the decision will be taken as to whether to accept the new parameters. When doing this, it is important for the conditions during the auto adaptation to correspond to the realistic conditions during operation. The auto adaptation may need to be repeated, or optimisation carried out manually by the operating personnel.

1. In **Menu 2** under **Controller**, navigate to the **Auto adaptation** tab.
2. Under **Disinfection**, select the controller to be configured.
3. Under **pH**, select the controller to be configured.
4. Press **Start**.

☞ Auto adaptation started.

Once the controller has completed auto adaptation, a table shows the measured values and the values that are currently set. You can now decide whether you wish to accept the new values.

9.3 Outputs

Depending on the equipment, you can connect a range of actors to the device and actuate them. Make sure that you actuate the actor with the correct signal type and select an appropriate output module with the configuration. An alarm relay, four analogue outputs and external LEDs (e.g. for water sampling stations) are always available.

9.3.1 Configuring the controller outputs

You can configure and use up to four controllers.

- ✓ You have used the configuration assistant to assign an input and a control function to a controller (→ Configuration assistant [► 24]).
- 1. In **Menu 2** under **Outputs**, navigate to the **Controller** tab.
- 2. Working on the **Controller** tab, configure the controller output and state the following information.
- 3. **Y-alarm**: Activate the Y alarm. The Y alarm is a safety cut-out. If the controller output power amounts to more than 95 % (e.g. through a malfunction) over the set time, the Y alarm will be triggered and the corresponding controller output will be set to 0 %. You can set a time between 0 and 200 minutes.
- 4. **Pulse frequency/pulse length/hysteresis**: Depending on the controller function, you can set the maximum pulse frequency that your pump (or actuator) can process. In the case of pulse length, the duration can be set here to 100% of the pulse. In the case of the **On/Off** controller function, you need to enter a hysteresis between activation and shutdown based on the measured value. A larger hysteresis protects the actuators, but the control then also works less accurately.
- 5. **Base load**: Depending on the controller function, you can set a base load that is always active irrespective of the control variable. With a base load of 10 %, the actor is always actuated with a minimum of 10 %.
- 6. **Limit**: Depending on the controller function, you can set a limit of between 5 – 100%. State the value at which the actor should be actuated as maximum.
- 7. Additional settings are possible, depending on the controller's function (→ Controller [► 30]).

🔧 Controller outputs configured.

9.3.2 Configuring actuation using a timer

The output can be used for direct actuation via a timer. This is required e.g. to run the flocculant pump or the peristaltic pumps over a certain time.

- ✓ You have assigned the **Timer switch** input to a controller using the configuration assistant (→ Commissioning [► 24]).
- 1. Configure the output in **Menu 2** → **OutputsAusgänge** (→ Outputs [► 36]).
- 2. Navigate to **Menu 1** → **Setpoints**. Here, you can set the desired set control output directly from 0 to 100%.
- 3. **Setpoint set**: Here, you can set various control outputs and using the timers on the **Switch-over** tab, you can specify when the control output is to be changed. The **Switch setpoints automatically** checkbox must be selected (for more information about switching → Setpoints and setpoint sets [► 43]).

🔧 Actuation configured via a timer.

9.3.3 Digital output signals

You can use digital output signals via the outputs of the alarm relay, an optocoupler circuit board or a relay circuit board. The following sections describe the configurations that you can perform.

9.3.3.1 Using an alarm relay as an alarm output

You can use the alarm relay (terminals 41 – 43) on the main board as an output for alarm messages.

1. In **Menu 2** under **Outputs**, navigate to the **Digital** tab.
2. Working under **Digital output**, select the **alarm relay** output.
3. Configure the alarm relay by entering the following data.
4. **On alarm: Relay on** = The alarm relay is activated in the event of an alarm. **Relay off** = The alarm relay is generally active. If there is an alarm, the relay is switched off.
5. **Latching: On** = The alarm output is active until all alarms have been manually confirmed. **Off** = The output is deactivated automatically if the alarms are no longer active.
6. **Output triggers at**: Select which alarms should trigger the alarm relay. The relay switches as soon as one of the selected alarms is active.
7. **Alarm delay**: Define the earliest point (in seconds) at which the relay should switch after activation of the alarm.

🔧 Configuration of the alarm relay completed.

9.3.3.2 Configuring additional alarm outputs

In addition to the alarm relay, you can use the unused outputs of the optocoupler circuit board or relay circuit boards for further alarm messages.

- ✓ You have used the configuration assistant to assign the **alarm output** function to a free output (→ Configuration assistant [► 24]).
- 1. In **Menu 2** under **Outputs**, navigate to the **Digital** tab.
- 2. Working under **Digital output**, select the desired output. The free outputs are displayed that you have configured as an **alarm output** in the configuration assistant. Example: **Relay 1.2**. The first digit stands for the number of the output circuit board (1.X) and the second digit stands for the number of the output on the circuit board (X.2).
- 3. Under **Function**, check whether **Alarm output** is displayed.
- 4. Configure the alarm output by entering the following data.
- 5. **Latching: On** = The alarm output is active until all alarms have been manually confirmed. **Off** = The output is deactivated automatically if the alarms are no longer active.
- 6. **Output triggers at**: Select from the list of all possible alarms those which should trigger the output. The output switches as soon as one of the selected alarms is active.
- 7. **Alarm delay**: Specify the earliest number of seconds after activation of the alarm that the output should switch.

🔧 Configuration of the alarm output completed.

9.3.3.3 Configuring limit value control

You can use this function to control ECO or night mode in a swimming pool with reduced operation. If there are no or just a few swimmers in the swimming pool, energy and dosing media can be saved. The limit value control monitors the maintenance of the parameters. In Germany, the values of DIN 19643 apply. As such, "DIN contact" is a widespread name for this function.

You can use unused outputs from optocoupler circuit boards or relay circuit boards as a limit value control (including "DIN contact").

- ✓ You have used the configuration assistant to assign the **Limit value control** function to a free output (→ Configuration assistant [► 24]).

1. In **Menu 2** under **Outputs**, navigate to the **Digital** tab.
2. Working under **Digital output**, select the desired output. The free outputs are displayed that you have configured as **Limit value control** in the configuration assistant. Example: **Relay 1.2**. The first digit stands for the number of the output circuit board (X.1) and the second digit stands for the number of the output on the circuit board (X.2).
3. Under **Function**, check whether **Limit check** is displayed.
4. Configure the limit value control by entering the following data.
5. **Action**: Choose between **normal opened** (N.O., make contact) or **normal closed** (N.C., break contact).
6. **Delay**: The contact switches only if all water parameters are continually over the set lag time within the limits set. The lag time can be set between 0 and 10.
7. **Parameter**: Set the measured values in which the water parameters must be located so that the output switches. Press the minimum or maximum value that you wish to change.

🔧 Limit value control configured.

9.3.4 Configuring analogue output signals

The basic configuration of the device includes up to four analogue 4 – 20 mA outputs. You can use the outputs to transmit the measured values to a control room or a PLC (programmable logic controller). Some actuators such as dosing pumps can be controlled directly via this output.

1. In **Menu 2** under **Outputs**, navigate to the **Analogue** tab.
2. Working under **Analogue**, select the desired output.
3. Configure the analogue output by entering the following data.
4. **20 mA type**: You can choose between the following signal types: 4 – 20 mA, 0 – 20 mA, 20 – 4 mA or 20 – 0 mA.
5. **Test signal**: You can test the configuration of the analogue outputs. Check the actuation on the external device.
6. **Output**: Define what should be outputted on the selected output. You can choose between the measurement and temperature values or outputs (controller outputs).
7. **Minimum**: Set a minimum value. The minimum value indicates for which measured value the signal is the weakest.
8. **Maximum**: Specify a maximum value. The maximum value indicates for which measured value the signal is the weakest.



INFORMATION

The values for **Minimum** and **Maximum** are used to scale the analogue output signal. Example: Sensor 1 has a measuring range of 0 – 10 mg/l. 4 – 20 mA was selected as the 20 mA type. If the complete sensor measuring range is to be covered by the analogue signal, 0 mg/l should be selected for minimum and 10 mg/l for maximum. At 0 mg/l, a 4 mA signal will be issued; at 10 mg/l a 20 mA signal will be issued.

🔧 Configuration of the analogue outputs completed.

9.3.5 Configuring LED control for water sampling stations

Some water sampling stations have multiple light-emitting diodes (LEDs) that display whether a water parameter is in the desired range. You can configure the actuation of the LEDs.

1. In **Menu 2** under **Outputs**, navigate to the **External LED** tab.
2. Under **LED**, select the desired LED.
3. Configure the LED by entering the following data.
4. **Function**: Select the reaction criteria for the LED. Selection of **Sample water missing** results in a green LED as standard. If the digital contact **Sample water missing** is active, it illuminates red. Further options are the measured values of the sensor inputs 1 - 4.
5. **Minimum** and **Maximum**: If you have decided to use a measured value, you need to define a minimum and a maximum value. The LED illuminates red if the minimum value is undercut or the maximum value is exceeded. If the measured value lies between the values, the LED illuminates green. If sample water is missing at the same time, the LEDs illuminate orange.
6. **Test signal**: You can test the configuration of the LEDs.

🔧 Configuration of the external LED outputs completed.

9.4 Calibration



INFORMATION

New electrodes or initial start-up requires the renewed calibration of all measuring cells after 1 – 2 days initial running time.

Before new sensors can detect measured values correctly, you need to adjust them. All calibration processes in the device are monitored for plausibility (zero point and slope) and the measured values documented. Measured values resulting from an uncalibrated sensor are marked in the main overview. In this case, the measured values are displayed in red. If the measurement input is displayed individually in the main view, the information **Improper adjustment** is also displayed. The current calibration and slope can be found in the **Calibration** menu on the **Overview** tab.

9.4.1 pH single-rod measuring cell

Calibration of the pH single-rod measuring cell can be performed as a 2-point calibration with 2 buffer solutions or a single point calibration with subsequent input of the slope of the sensor. The actual voltage of the single-rod measuring cell and the ideal value of the set buffer solution is displayed during calibration. The response time for a new single-rod measuring chain is a few seconds and is set when the physical reading becomes stable. Older single-rod measuring cells can have a longer reaction time.



INFORMATION

To perform the calibration performed here, you will require a buffer solution with a known pH value. Buffer solutions have a restricted storage life and their pH value changes depending on their duration of storage and the storage conditions.

Comply with the manufacturer's instructions pertaining to the correct storage; use buffer solutions only within the scope of their life period and never submerge a sensor in a buffer solution immediately after removing it from a different buffer solution.

Only electrometric pH value measuring devices using electrodes may be used to perform the control measurement of the automatic pH value measurements. Other pH value measuring procedures such as photometric measurement using Phenol red reagents or test strips (litmus paper) usually display a bigger measured value deviation. This measured value deviation can be taken into account during the calibration of the automatic pH value measurement by selecting the control measurement procedure, so that different display values between manual measurement and automatic measurement can be compared. However, electrometric measurement using electrodes is the more exact measurement.

9.4.1.1 Adjusting the pH value with 2 points

- ✓ Two buffer solutions with a difference of min. 2 pH are available.



INFORMATION

It is best to select your buffer solutions to include the subsequent set-point. Standard buffer solutions with pH 6.8 and pH 9.27 are included in the scope of delivery for the sampling stations to perform initial adjustment during commissioning.

- ✓ The sensor is ready to operate.
1. In **Menu 1** under **Calibration**, navigate to the **Sensors** tab.
 2. Select the input that measures the pH value and that you want to calibrate.
 3. Press the **2 points** button.
 - ↳ 2-point calibration begins.
 4. Shut off the sample water.
 5. Unscrew the pH single-rod measuring cell from the water sampling station.

6. Rinse the pH single-rod measuring cell with water and dab it dry. Rubbing can cause electrical discharge on the glass membrane, which results in a delayed display.
 7. Hold the dry pH single-rod measuring cell in the first buffer solution. It is not important, which of the two buffer solutions you start with.
 8. Enter the pH value of the first buffer solution. This pH value serves as a reference value for the device. The ideal voltage value and the current voltage value are displayed in mV. If these values deviate too greatly from one another, the best value is displayed in red. Too great a level of deviation is an indication that the pH single-rod measuring cell needs to be replaced.
 9. Wait until the value has stabilised.
 10. Confirm the entry with the green checkmark.
 11. Repeat points 6 to 10 for the second buffer solution.
 - ↳ A window with the actual slope of the sensor will open.
- ☑ 2-point adjustment of the pH value completed.

9.4.1.2 Adjusting the pH value with 1 point

- ✓ A buffer solution is at hand for calibration.
 - ✓ The slope of the pH single-rod measuring cell was measured in a laboratory beforehand.
1. In **Menu 1** under **Calibration**, navigate to the **Sensors** tab.
 2. Select the input that measures the pH value and that you want to calibrate.
 3. Press the **1 point** button.
 - ↳ 1-point calibration begins.
 4. Shut off the sample water.
 5. Unscrew the pH single-rod measuring cell from the water sampling station.
 6. Rinse the pH single-rod measuring cell with water and dab it dry. Rubbing can cause electrical discharge on the glass membrane, which results in a delayed display.
 7. Hold the pH single-rod measuring cell in the buffer solution and move back and forth for a short time.
 8. Enter the pH value of the buffer solution. This pH value serves as a reference value for the device. The ideal voltage value and the current voltage value is displayed in mV. If these values deviate too greatly from one another, the best value is displayed red. Too great a level of deviation is an indication that the pH single-rod measuring cell needs to be replaced.
 9. Wait until the value has stabilised.
 10. Confirm the entry with the green checkmark.
 11. You will be requested to set the slope. Enter the slope.
 12. Confirm the entry with the green checkmark.
- ☑ 1-point adjustment of the pH value completed.

9.4.2 Redox value

The Redox value is measured using the Redox single-rod measuring cell. The Redox single-rod measuring chain measures the voltage which is present in the water due to oxidizing and reducing substances. You must calibrate the Redox single-rod measuring cell during commissioning.

9.4.2.1 Adjusting the Redox value with 1 point

✓ A buffer solution is at hand for calibration.

1. In **Menu 1** under **Calibration**, navigate to the **Sensors** tab.
2. Select the input that measures the Redox value and that you want to calibrate.
3. Press the **1 point** button.
↳ 1-point calibration begins.
4. Shut off the sample water.
5. Unscrew the Redox single-rod measuring cell from the water sampling station.
6. Rinse the Redox single-rod measuring cell with water and dab it dry. Abrasion can generate electrical charges.
7. Hold the Redox single-rod measuring cell in the buffer solution and move back and forth for a short time.
8. Enter the voltage value in mV which is recorded on the buffer solution. The voltage value entered and the current measured voltage value are displayed in mV. If these values deviate too greatly from one another, the best value is displayed red. Too great a level of deviation is an indication that the Redox single-rod measuring cell needs to be replaced.
9. Wait until the value has stabilised.
10. Confirm the entry with the green checkmark.

🔑 1-point adjustment of the Redox value completed.



INFORMATION

With older sensors, the reaction time can increase or the measured value can differ considerably from the buffer solution value. This indicates that the Redox single-rod measuring cell must be checked and replaced if necessary.

9.4.3 3 electrode potentiostat

You should calibrate a 3-electrode potentiostat or the potentiostatic measuring cells (chlorine sensors) as single-point calibration as a matter of course. You will require a photometrically measured value in accordance with the DPD method as a reference value.



INFORMATION

With operation in a hot water system, electrochemical processes on the measuring electrode can result in a displacement of the zero point. In this case, 2-point calibration is necessary in which you calibrate the zero point using chlorine-free hot water. The second point is determined using the DPD method with chlorinated water as usual.

9.4.3.1 Adjusting the 3-electrode potentiostat with 1 point

To calibrate chlorine sensors, you will require a photometer with which to measure the reference value using the DPD method.

- ✓ A measurement device for determining the DPD value is already present.
 - ✓ The sensor is operated with sample water.
1. In **Menu 1** under **Calibration**, navigate to the **Sensors** tab.
 2. Select the input that you want to calibrate.
 3. Press the **1 point** button.
↳ 1-point calibration begins.
 4. Take sample water in immediate proximity to the measuring cell and confirm with **OK**.
 5. Determine the concentration in the sample water using the DPD method.
 6. Enter the measured concentration. This serves the device as a reference value with which to permit correct measurement.
 7. Confirm the entry with the green checkmark.
- 🔑 1-point adjustment of a 3-electrode potentiostat completed.

9.4.3.2 Adjusting the 3-electrode potentiostat with 2 points

- ✓ A measurement device for determining the DPD value is already present.
 - ✓ The sensor is operated with sample water.
1. In **Menu 1** under **Calibration**, navigate to the **Sensors** tab.
 2. Select the input that you want to calibrate.
 3. Press the **2 points** button.
↳ 2-point calibration begins.
 4. You will be asked to set the first reference value; this is the zero point. If the zero point was mal-set by accident, set it by pinching off the measuring electrode and entering a value of zero. Should real 2-point calibration be performed, e.g. due to hot water, you must first perform calibration with chlorine-free and then with chlorinated water. Enter a value for the zero point.
 5. Confirm the entry with the green checkmark.
 6. Take sample water in immediate proximity to the measuring cell and confirm with **OK**. This means that the current signal at the time of the sample water extraction is saved to rule out signal fluctuation as a measurement error during the DPD ascertainment.

7. Determine the concentration in the sample water using the DPD method.
8. First enter the determined DPD value.
9. Confirm the entry with the green checkmark.
- 🔧 2-point adjustment of a 3-electrode potentiostat completed.

9.4.4 Excess chlorine measuring cell CS120



NOTE

Incorrect calibration

Failure to perform the calibration in the sequence specified here means that it may be erroneous and result in measurement errors.

- ▶ It is imperative to adhere to the sequence of the work steps.

9.4.4.1 Adjusting an excess chlorine measuring cell CS120 (2-electrode measuring cell) with 2 points

- ✓ A measurement device for determining the DPD value is already present.
 - ✓ The sensor is operated with sample water.
1. In **Menu 1** under **Calibration**, navigate to the **Sensors** tab.
 2. Select the input that you want to calibrate.
 3. Press the **2 points** button.
 - ↳ 2-point calibration begins.
 4. You will be asked to set the first reference value; this is the zero point. If the zero point has been set incorrectly by mistake, it must be re-set. To this end, supply the measuring cell with chlorine-free water. Alternatively, the sample water can be switched off until the potential in the measuring cell has been equalised. This value can be used as a zero point.
 5. Confirm the entry with the green checkmark.
 6. Re-connect the measuring cell or turn the sample water back on. Wait until the μA value has increased again.
 7. Take sample water in immediate proximity to the measuring cell and confirm with **OK**. This means that the current signal at the time of the sample water extraction is saved to rule out signal fluctuation as a measurement error during the DPD ascertainment.
 8. Determine the concentration in the sample water using the DPD method.
 9. First enter the determined DPD value.
 10. Confirm the entry with the green checkmark.
- 🔧 The 2-point calibration of the CS120 is complete.

9.4.5 Conductivity (conductive)

When you calibrate the conductivity measurement, the slope of the conductive measuring electrode is determined in combination with the input amplifier of the TOPAX[®] MC. The value (mA) measured with the conductive conductivity measuring cell is assigned to the con-

ductivity (mS/cm or $\mu\text{S/cm}$), which is then displayed in the main menu. This is done via two points. The first point at 0 mA corresponds to 0 mS/cm and is electrically predetermined. This therefore requires no action, so the usual procedure is a 1-point adjustment, as close to the setpoint as possible.



INFORMATION

The unit is always mS/cm or $\mu\text{S/cm}$. Due to limited space, the TOPAX[®] MC may display only mS or μS ; % salt content is a further possibility. Depending on the composition of the sample water, e.g. NaCl and KCl, the display of % salt content may deviate (the relationship is also not linear). The % salt content display is intended for swimming pools with inline electrolysis. Generally speaking, it can be assumed that 20mS/cm corresponds to about ~1% salt content NaCl.



INFORMATION

Given correct calibration, measurements in the medium and upper measuring range have a deviation of $\pm 1\%$ of the measuring range final value. The electronic design means that measurements against the zero point have a greater tolerance. This means that the conductivity measurement is suitable for tap water applications but not for ultra pure water applications (e.g. reverse osmosis units).

9.4.5.1 Adjusting conductivity with 1 point

For calibration purposes, use only KCl buffer solutions (potassium chloride) for the various measuring ranges in accordance with the following scheme:

Measuring range	buffer solution
0 – 2000 $\mu\text{S/cm}$	1000 $\mu\text{S/cm}$ = 1 mS/cm
0 – 20 mS/cm	12,88 mS/cm
0 – 100 mS/cm	80 or 100 mS/cm

Table 40: 1-point adjustment for the conductivity measurement

- ✓ A buffer solution corresponding to the measuring range is on hand and has the printed temperature.
 - ✓ Required equipment ✂ is to hand: a clean cloth
1. In **Menu 1** under **Calibration**, navigate to the **Sensors** tab.
 2. Select the input that measures the conductivity and that you want to calibrate.
 3. Press the **1 point** button.
 - ↳ 1-point calibration begins.
 4. Shut off the sample water.
 5. Unscrew the conductivity measuring cell from the corresponding measuring cell housing.
 6. Dry the electrode with the cloth to prevent dilution of the buffer solution.
 7. Hold the conductivity measuring cell in the buffer solution and move back and forth for a short time.

8. Enter the value which is recorded on the buffer solution. The measured current value and the entered value are both displayed.
 9. Wait until the value has stabilised.
 10. Confirm the entry with the green checkmark.
- ☞ 1-point adjustment of the conductivity measurement completed.

9.4.5.2 Adjusting conductivity at the setpoint/working point

When you are controlling the conductivity with your TOPAX® MC, you can calibrate the conductivity close to the setpoint/working point ($\pm 10\%$) using a reference measurement.

- ✓ The salt content of the sample water is close to the setpoint / working point; the sampling station is in operation.
 - ✓ Required equipment ✂ is to hand: Hand-held measuring device
1. In **Menu 1** under **Calibration**, navigate to the **Sensors** tab.
 2. Select the input that measures the conductivity and that you want to calibrate.
 3. Press the **1 point** button.
 - ↳ The calibration starts.
 4. Remove the sample water from the measuring point.
 5. Determine the conductivity with the portable meter.
 6. Enter the value ascertained using the measuring device.
 7. Confirm the entry with the green checkmark.
- ☞ The calibration of the conductivity in the setpoint has been completed.

9.4.6 Temperature

You can connect a temperature sensor to every input module. You can adjust the temperature sensor by setting a reference value. When setting the reference value, the device will automatically correct the measurement of the temperature sensor by the difference.

9.4.6.1 Adjusting the temperature sensor

- ✓ A thermometer is available.
 - ✓ You have activated the measurement of the temperature (→ Configuring temperature sensors [► 27]).
1. In **Menu 1** under **Calibration**, navigate to the **Temperature** tab.
 2. Under **Input**, select the input module for which you want to set a reference value.
 3. Measure the reference temperature with the thermometer provided.
 4. Press the **Reference value** button.
 5. Enter the reference temperature measured beforehand.
 6. Confirm with the green checkmark.
- ☞ Adjustment of a temperature sensor completed.

9.4.7 Servomotor relay

9.4.7.1 Servomotor with position feedback

You can connect servomotors with a position feedback to your device and control them via an output. Before you can control the servomotor exactly, you must first compensate the control via your device and the position of the servomotor.

During compensation, the servomotor is first driven to the end position and then back.

This section only applies to servomotors with a feedback potentiometer.

9.4.7.2 Calibrating a servomotor with position feedback

- ✓ The servomotor is switched on and has been connected properly.
 - ✓ The output has been configured correctly (→ Controller [► 30]).
1. In **Menu 1** under **Calibration**, navigate to the **Outputs** tab.
 2. Under **Output**, select the output that is to be adjusted.
 3. Press the **Compensation** button.
 - ↳ A further window with a progress bar opens; this indicates the position feedback.
 4. Press the **Start** button to start the calibration.
 5. The motor starts and runs to top speed, then stops. This can take a number of minutes.
 6. Completion of the compensation is signalled with **Compensation OK**.
- ☞ Calibration of an servomotor with position feedback completed.

9.4.7.3 Actuating a servomotor without position feedback

You can actuate servomotors without a position feedback. To this end, you need to measure how quickly the motor starts and then set the controller accordingly.

- ✓ The servomotor is switched on and has been connected properly.
 - ✓ The output has been configured correctly (→ Controller [► 30]).
 - ✓ Required equipment ✂ is to hand: Timer.
1. In **Menu 2**, navigate to the **Manual mode** menu item.
 2. Activate the manual mode of the output with **On** and set the control output as 0%.
 - ↳ The servomotor now stops completely.
 3. Observe the drive and wait until it has stopped completely.
 4. Set the output to 100 % and at the same time, start to measure the time for the complete opening of the drive.
 - ↳ The servomotor now starts and runs to top speed.
 5. Observe the drive and wait until it has stopped completely.
 6. Deactivate manual mode with **Off**.
 7. In **Menu 2** under **Outputs**, navigate to the **Controller** tab.

8. Under **Output**, select the output of the runtime that you have just measured.
 9. Under **Runtime**, enter the time that you have just measured.
- ☞ Runtime set!

9.4.8 Servomotor 20 mA

You can connect servomotors with a 20 mA actuation and a 20 mA feedback to the device. The servomotors must be calibrated with the actuation before commissioning. You can calibrate the 20 mA output signal with ± 1 mA.

9.4.8.1 Calibrating an actuator 20 mA

- ✓ The servomotor is switched on and has been connected properly.
 - ✓ The output has been configured correctly (→ Controller [► 30]).
1. In **Menu 1** under **Calibration**, navigate to the **Outputs** tab.
 2. Under **Output**, select the output that is to be adjusted.
 3. Press the **Compensation** button.
 - ↳ A further window with a progress bar opens; this indicates the position feedback.
 4. Press the **Start** button to start the calibration.
 - ↳ The motor starts and runs to top speed, then stops. This can take a number of minutes. Completion of the compensation is signalled with **Compensation OK**.
- ☞ Calibration of an servomotor 20 mA completed.

9.4.8.2 Adjusting a 20 mA output

If, whilst performing the previous compensation, you have determined that the output signal does not completely conform with the motor position, you can adjust the output signal. You can adjust both the lower signal range (0/4 mA) and the upper signal range (20 mA) to the motor position.

1. In **Menu 1** under **Calibration**, navigate to the **Outputs** tab.
 2. Under **Outputs**, select the output that you want to adjust.
 3. Press the **1 point** button to calibrate just the upper area or the **2 points** button for the upper and lower areas.
 4. A further window will open in which you can set a tolerance. You can change this by a maximum of -50 to +50 depending on whether you want to calibrate the upper or lower range. The maximum change corresponds c. to a current of 1 mA.
 5. Check the output signal using a multimeter or a servomotor and make sure that the motor is now under exact control.
 6. Save the current offset by pressing the **Save** button.
- ☞ Calibration of the 20 mA output completed.

9.4.9 Calibration error

→ Slope errors and sensor errors [► 54]

9.5 Setpoints and setpoint sets

The setpoint 'W' of a control is the required value, whereas the actual value 'X' is the continually measured value of a sensor. You can specify various setpoints that should actuate the device. You have four different sets of setpoints; the controller can switch between them automatically. The setpoint sets can be used to vary the control at different times of the day or in different operating conditions.

The following section describes the possibilities of controlling using setpoints and their configuration.

9.5.1 Configuring setpoints

You can configure and save the setpoints via the menu item **Setpoints**.

1. In **Menu 1** under **Setpoints**, navigate to the **Active** tab.
2. **Active**: You can view the setpoint set currently active on the **Active** tab.
 - ↳ The individual setpoints are displayed. If you change one of the values, it is immediately activated as a new setpoint.
3. **Save**: You can save the active setpoints as a setpoint set. Select a setpoint set for this and press **Save**.
4. **Setpoints 1 – 4**: The possible setpoints for the controller follow in sequence. The following information is displayed from left to right:

- **S1 – S4** and **V1 – V4** indicates the sensor input or virtual input.

- **O1 – O4** indicates the output to the output.

- **Timer switch** indicates that the output is controlled directly.

- This is followed by the measured value of this input, e.g. free chlorine, pH or the text **No output** if this controller is inactive. An upwards or downwards arrow indicates the control direction (raise or lower).

- This is followed by the setpoint. Darauf folgt der Sollwert. Pressing on the setpoint enables you to change it immediately. If it is a 2-side control, two setpoints must be entered. Both for the control direction "Raise" or "Lower". Changing these setpoints does not have an impact on the savable setpoint sets. To do so, you must perform step 3.

- **T1 – T4** displays the temperature control if it has been configured with an appropriate hysteresis under digital outputs in the configuration assistant.

5. **Flow rate**: You can activate or deactivate the flow. This enables you to reduce the flow by between 0 % and 100 %. The value of the flow is multiplied with the output Y. If the output is e.g. 80 % but the flow is only 50 %, this produces an output capacity of: Control variable Y = 80 % · 50 % = 40 %.

☞ Setpoints configured.

9.5.2 Loading setpoint sets

You can load a setpoint set.

1. In **Menu 1** under **Setpoints**, navigate to the **Setpoint set** tab.
2. Select the desired setpoint set.
3. Press **Load**.

↳ The desired setpoint set is active immediately.

🔊 Setpoint set loaded.

9.5.3 Switching between setpoints

You can manually or automatically switch between the setpoint sets configured in the previous section. You have two possibilities to activate automatic switching.

1. In the **Setpoints** menu, navigate to the **Switch-over** tab and select the **Switch setpoints automatically** checkbox.
2. In the **Manual mode** menu, select the **Switch setpoints automatically** checkbox.

You can use a digital input (→ Switching via digital inputs [► 44]) and multiple internal timers (→ Switching via timer [► 44]) for automatic switching. The switching has priority over a digital input. Switching via a timer only occurs if no switching is active via a digital input.

9.5.3.1 Switching via digital inputs

Before you can use a digital input for switching to a particular setpoint set, you need to configure the digital input (→ Configuring digital inputs [► 28]).

Switching can be performed in three different forms: externally-controlled switching; switching via an internal timer and the **ECO control** function, which includes the limit value control.

Configure external switchover

In the case of external actuation, switching to the desired setpoint set is performed as long as the digital input has been activated.

If the digital input is deactivated, the device switches back to the previous setpoint set.

1. To configure this, choose the **Switch-over** tab in the **Setpoints** menu item.
2. Configure the switching and state the following information.
3. **Switch setpoints automatically**: Set a checkmark here.
4. **Switch-over**: Select **Digital input**.
5. **Function**: Select the point **External switching**.
6. **Setpoint set**: Select the setpoint set to which is to be switched.
7. **Digital input**: The digital input in use is indicated here.

🔊 External switching configured.

Configuring timer-based switching

During switching via a timer, the desired setpoint set is active until the set period has been completed. The previous setpoint set is re-activated after the time has elapsed.

You can also start the timer manually, thereby e.g. triggering shock chlorination.

1. To configure this, choose the **Switch-over** tab in the **Setpoints** menu item.
2. Configure the switching and state the following information.
3. **Switch setpoints automatically**: Set a checkmark here.
4. **Switch-over**: Select **Digital input**.
5. **Function**: Go to **Timer**.
6. **Setpoint set**: Select the setpoint set to which is to be switched.
7. **Digital input**: The digital input in use is indicated here.
8. **Time**: Configure the timer to the desired duration.
9. **Off** or **Active**: It will be displayed here whether the timer is currently active. If this is the case, the display will show how long it is still active.
10. **Start** and **Stop** button: The timer can be started or stopped manually, e. g. for a shock chlorination.

🔊 Switching via a timer configured.

Configure switching via ECO control

A limit value control is defined for the "Economy mode". The limit value control is generally used to reduce the circulation capacity (partial operation).

If all of the measured values are located within the limit values that have been set, the output is closed. If the digital input is also switched for switching to another setpoint set, "Economy mode" is active and the switch will be made to the desired setpoint set.

- ✓ The limit value control is configured (→ Configuring limit value control [► 38]).

1. To configure this, choose the **Switch-over** tab in the **Setpoints** menu item.
2. **Switch setpoints automatically**: Set a checkmark here.
3. **Switch-over**: Select **Digital input**.
4. **Function**: Select **ECO control**.
5. **Setpoint set**: Select the setpoint set to which is to be switched.
6. **Digital input**: The digital input in use is indicated here.

🔊 Switching via ECO control configured.

9.5.3.2 Switching via timer

Up to ten timers can be configured parallel to the switching via a digital switching input (→ Switching via digital inputs [► 44]). Times are defined for the point at which the timers should switch to a certain setpoint set.

Switching via timer configured.

1. To configure this, choose the **Switch-over** tab in the **Setpoints** menu item.
2. **Switch setpoints automatically**: Set a checkmark here.
3. **Switch-over**: Configure up to ten timer switches and state the following information.
4. **Off/Active**: Switch on the timer.
5. **Time**: Configure a time at which the switch-over is to be made. State the hour and minutes.
6. **Monday – Sunday**: Set a checkmark against every weekday on which the timer should be active.
7. **Setpoint set**: Select the setpoint set to which is to be switched.

☞ Switching via a timer configured.

9.5.4 Carrying out shock chlorination

If higher chlorine values are required for hygiene reasons, you can carry out shock chlorination in addition to the normal disinfection measures using a timer. The alarms are switched off during shock chlorination.

1. In **Menu 1** under **Setpoints**, navigate to the **Shock chlorination** tab.
2. **Controller**: Select the required controller.
3. **Setpoint**: Set a setpoint.
4. **Hold time**: Set the holding time (hours : minutes).
5. **Alarm suppression**: Set the time during which the alarms are to remain switched off.
6. Press **Start**.

☞ The shock chlorination begins. The shock chlorination has been completed once the current value has fallen to the normal setpoint after the holding time or if the time for alarm suppression has elapsed.

☞ Shock chlorination has been performed.

9.5.5 Configuring medium dosing

You can dose additional media using the medium dosing function. The following options are available to you for controlling:

- On/Off
 - Timer switch
 - Digital input
 - Flow rate
- ✓ A free output has been selected in **Menu 2** under **Setup/Configuration assistant**. Only the second digital output of an output module can be used for this purpose.
1. In **Menu 1** under **Setpoints**, navigate to the **Medium dosing** tab.
 2. Select the actuation required for your purposes under **Control**.
 3. **On/Off**: Configure the **Active** and **Not active** parameters in percent and press **Start**.

4. **Timer switch**: Select a timer and set a checkmark against every day of the week on which the timer should be active. Configure the **Active** and **Not active** parameters in percent as well as the starting, running and residual time.
5. **Digital input**: Select the input for which the medium dosing is intended (→ Digital inputs [► 22]) and configure the **Active** and **Not active** parameters in percent.
6. **Flow rate**: Configure the **Maximum** and **Minimum** in %, enter the flow rate in l/min for the maximum value and configure a setpoint (Y).

☞ Medium dosing configured.

9.6 Trend

The trend display in menu 1 graphically shows how the measured values have changed in the last 24 hours. You can display up to four measured values. You can use the zoom buttons to increase or decrease the time span.

9.6.1 Configuring the trend display

1. In **Menu 1**, press **Trend**.
 - ☞ The device shows the trend.
2. Choose the **Display** tab.
3. Activate up to four measured values to be displayed in the trend.
4. Choose the **Scaling** tab.
 - ☞ You can set the scaling of the individual trend display for every value individually.
5. Select a sensor and define **Minimum** and **Maximum**.

☞ Trend display configured.

9.7 Messages

The device displays up to 5 alarm, error or service messages in the status bar. The status row flashes in the colour set for the message type. Inactive messages are displayed in white.

In the **Messages** menu, you will find all current messages on the **Active** tab.

9.7.1 Confirming messages

You need to confirm these messages so that **inactive** messages no longer appear in the status bar.



NOTE

The device will continue to show you **active** messages in the status bar, even if you have confirmed them.

1. When a message is displayed, press on the status row or go to the **Messages** menu.
 - ☞ The **Active** tab lists all active messages.
2. Select the message and press **Confirm**. You can also confirm all messages in one step by pressing the **Confirm all** button.

↪ The confirmed message is marked with a green tick.

📁 Message confirmed.

History

You can view the history of the messages on the **History** tab. You can see when a message was started, stopped and confirmed.



INFORMATION

The latest messages are displayed in the history. A complete list can be found in the files in the **REPORTS** folder on the USB stick (→ Viewing and opening files [▶ 46]).

9.8 Logbook

The messages and service entries are saved in the device on a USB flash drive. You can display the files on the device or connect the USB flash drive to an external device.

The USB flash drive in the device contains the following logbook files:

Log	Format	Description
REPORTS	CSV	Messages
TREND	DAT	Trend data
SERVICE	CSV	Service entries
CHANGES	CSV	Changes to the configuration
SETUP	SET	Configuration
ADJUSTMENT	CSV	Calibration
LANG	LAA	Language files
System Volume Information	DAT	Setup

Table 41: Logbook



INFORMATION

You can open and analyse CSV files with a suitable programme (e. g. MS Excel). You can also view all CSV files on the device.



INFORMATION

All trend data from the USB stick can be displayed on a Windows PC using the TopReader II software.

9.8.1 Viewing and opening files

You can display the logbook files on the device.

- Press the USB icon in the status row (below right).
 - ↪ The files saved on the USB flash drive will be displayed in a file browser.
- Open one of the file folders.
- Select the desired file and press **Open file**.

📁 File opened.

9.8.2 Opening files externally

You can open the logbook files on an external device once you have removed the USB flash drive.



DANGER

Mortal danger from electric shock!

An the housing of the device is open, you are risk of getting an electric shock from contact with live parts.

- ▶ Ensure that the machine has been disconnected from the voltage supply and is not live when conducting work with an open housing.
- ▶ Secure the voltage supply against reactivation.

✓ The voltage supply is deactivated before the start and secured against reactivation.

- Open the housing.
- Remove the USB flash drive.
- Connect the USB flash drive with an external device and open it.

↪ You can now access the logbook files.

📁 Files opened externally.

9.9 Setup

9.9.1 Changing the language



INFORMATION

The factory settings provide the following languages: German, English, French, Spanish and Portuguese. If you require additional language files, please contact the manufacturer.

The language files are stored in the **Logbook** in the **LANG** directory. You can use these language files to switch between languages. The device monitors whether the language files used are currently valid.

- In **Menu 2** under **Setup**, navigate to the **Language** tab.
- Choose the desired language.
- Press **Save**.

📁 Language changed.

9.9.2 Saving the configuration

You can save your individual configuration and load it later to rectify problems quickly.



INFORMATION

Recommendation

Leave the factory-set configuration file unchanged and save your personal configuration in a new file. Given problems with the configuration, this enables you to return to a functioning configuration quickly.

1. In **Menu 2** under **Setup**, navigate to the **Configuration** tab.
2. Press **Save** and enter an existing file name to overwrite the file or a new name to generate a new configuration file.
3. Press on the green checkmark to confirm the entry.
4. Press **Save**.

☑ Configuration saved.

9.9.3 Main view

In the main view, the device displays various items of information pertaining to the installed input modules. In **Menu 2** under **Setup**, you can individually specify on the **Display 2** tab which information is to be displayed. You can choose from the following information:

- Deviation display
- Alarm flashes
- Sample water missing 1 – 4
- External stop 1 – 4
- Filter rinsing 1 – 4
- Clear text password
- Adjustment due

9.9.3.1 Activating and configuring the second overview

You also have the option of activating and configuring a second overview.

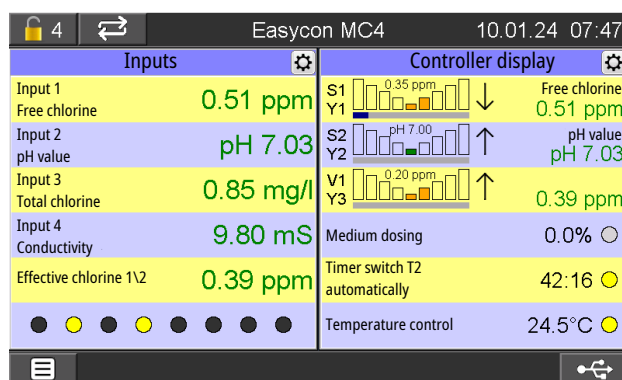


Fig. 47: Individual second overview

1. In **Menu 2** under **Setup**, navigate to the **Display 1** tab.
2. Activate the **2nd overview**.
3. **Number windows**: Choose between one or two windows (one window has up to six freely configurable displays).
 ↳ Second overview activated. The  button now appears on the left in the upper status bar. You can use this button to switch between the main view and second overview.
4. Switch to the **2nd overview**.
5. Press the cogwheel icon in the top-right corner to configure the selected window.
6. **Name**: Give each window an individual name.

7. **Display 1 – 6**: The previously configured functions of the inputs, controllers and outputs are available for selection. You can assign six displays per window.
8. **Colour scheme**: You can choose between two colour schemes for the background of the 2nd overview.

☑ Configuration of the second overview completed.

9.9.4 Changing the colour of alarm messages

You can change the colours of the different alarm messages.

NOTE! Some alarms cannot be modified. These are not listed in the table.

1. In **Menu 2** under **Setup**, navigate to the **Alarm colour** tab.
2. Under **Alarms**, search for the message for which you want to change the alarm colour.
3. Press on the row of the alarm and then on **Edit**.
4. Select the desired colour.
5. Confirm your selection with **OK**.

☑ Alarm colour edited.

9.10 Information

General information about the multi-channel controller or the water sampling station can be found in **Menu 1** under **Information**. The information is divided into the following tabs:

- System values
- Configuration
- Inputs
- Outputs
- Terminals

9.11 Manual mode

You can manually control a controller output in the menu item **Manual mode** and set an output capacity between 0 and 100%. If a controller is in manual mode, this is indicated by a blue Y display in the main view and by a hand icon. In the menu item **Manual mode**, you can also activate or deactivate the automatic switching of setpoints (→ Setpoints and setpoint sets [► 43]).

9.12 Service

9.12.1 Network access

To be able to access the device through a network, you need to connect the device to an existing Ethernet or RS485 network.

More information about connecting to an existing network (→ Ethernet connection [► 23], RS485 interface [► 23] and Configuring network settings [► 48]).

Modbus

You can access certain data on the device via the Modbus protocol using both Ethernet and the RS485. You need the Modbus protocol, for example, to connect to a control panel or a PLC. Modbus TCP/IP is supported for Ethernet and Modbus RTU is supported for the RS485 interface.

→ Modbus addresses ► 55]

Web browser (only Ethernet)

You can access the device data using all network devices which are fitted with a web browser. You will require the IP address, subnet-mask and possibly the MAC address of the device.

The network settings of your device can be found under **Menu 2** → **Service** → **Network**.

Open the web browser of your end device and enter the IP address of the device in the address row. The page of the device will open and provide a range of information.

TFTP protocol (only Ethernet)

You can access the device memory via a TFTP client software as long as TFTP is activated in the network settings. You need the device IP address for access.

The network settings of your device can be found under **Menu 2** → **Service** → **Network**.

9.12.2 Configuring network settings

To use the device in a network, you need to make the following settings.

1. In **Menu 2** under **Service**, navigate to the **Network** tab.
2. Working in the **Network** tab, configure the interface and state the following information.
3. **IP address**: Give the device a unique IP address through which it can be reached in the network. If this IP address is already being used by another device, errors can result.
4. **Subnetmask**: Enter the subnetmask.
5. **Gateway**: Enter the gateway.
6. **DNS server**: Enter the DNS server.
7. **TFTP server**: **On** = Access via TFTP protocol activated on the device memory. **Off** = Access via TFTP protocol de-activated on the device memory.
8. **Modbus RTU address**: Enter a number between 1 and 14 in the device if your device is fitted with a RS485 network connection.

🔑 Network settings configured.

9.12.3 Resetting to factory settings



INFORMATION

These operating instructions differentiate between the internal factory settings and the device configuration. The factory settings contain the basic configuration of the device hardware and cannot be changed. The configuration file (*.SET) contains the individual device configuration. You can change, save and load the individual settings.

Resetting to the factory settings

You can now reset the device to its factory settings. This deletes the configuration. You must then either load a configuration file or perform the configuration manually.

1. In **Menu 2**, navigate to **Service** → **Device**.
2. Press **Factory settings**.
3. Confirm with **Yes**.

↳ The configuration will be deleted. You must proceed with the following section.

🔑 Device reset to the factory settings.

Resetting the configuration

The device configuration will be saved in *.SET files. A factory-set configuration file with standard settings is already present. You can change these or save your personal configuration in new files.

Recommendation: Leave the factory-set configuration file unchanged and save your personal configuration in a new file. Given problems with the configuration, this enables you to return to a functioning configuration quickly.

1. In **Menu 2**, navigate to **Setup** → **Configuration**.
2. Select an existing configuration file.
3. Click **Load** to confirm.

↳ The device configuration returns to the saved state.

🔑 Load the old configuration.

10 Maintenance

Products from Lutz-Jesco GmbH are manufactured to the highest quality standards and have a long service life. However, some parts are subject to operational wear.

This means that regular inspections are necessary to ensure a long operating life of the product. Regular maintenance protects the product against operational disruptions.



DANGER

Mortal danger from electric shock!

Live parts can inflict fatal injuries.

- ▶ Before carrying out any maintenance work, always disconnect the device from the power supply.
- ▶ Secure the system to prevent it from being switched on by accident.



WARNING

Increased risk of accidents due to insufficient qualification of personnel!

Only sufficiently qualified personnel may install, operate and maintain the product and its accessories. Insufficient qualification will increase the risk of accidents.

- ▶ Ensure that all action is taken only by personnel with sufficient and corresponding qualifications.

10.1 Maintenance intervals

This table gives you an overview of the recommended maintenance work and the intervals at which it must be carried out. The next few sections contain instructions for carrying out this work.

Interval	Maintenance
Monthly	• Visual check • Touchscreen function test • Calibrating the measured values
Annually	• Checking the button cell

Table 42: Maintenance intervals

10.2 Keeping logfiles

If you make an entry in the logfiles, the device will issue a reminder when a sensor needs to be replaced.

1. In **Menu 2**, navigate to **Service** → **Service entry** and select the required sensor under **Service entry**.
2. Enter the serial number in the tab and the manufacturing company of the sensor.
3. Activate the reminder function and enter a date for the next sensor change.

📁 Logfiles maintained.

10.3 Updating software

You can update the device software to a newer version.

You can find the current firmware version on our homepage at www.lutz-jesco.com. Copy this *.BIN file onto the device USB flash drive. The file must be saved in the root directory of the USB flash-drive and may not be stored in a sub-folder.



INFORMATION

Since settings can become lost during a software update, we recommend saving the current configuration before performing an update (→ Saving the configuration [▶ 46]). If an error occurs, you should reload the saved configuration.

- ✓ You have saved the current configuration.

1. In **Menu 2**, navigate to **Service** → **Device**.
2. Press **Software update**.
3. Select the *.BIN file with the newer version and press **Load**.

↳ The software is installed. The device will restart automatically during this procedure.

📁 Update performed

10.4 Battery/button cell

The device is fitted with a button cell. Check the button cell within the scope of the annual maintenance. The lifetime of the button cell is determined by the device usage and can vary considerably.

You will need to replace the battery more often with devices which are switched off often or over a long period (e.g. over winter).

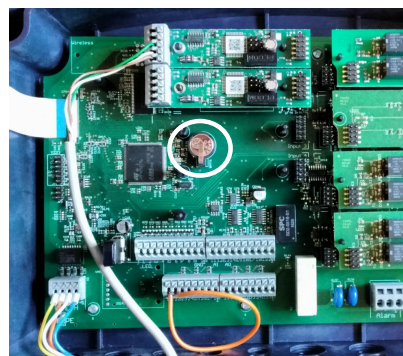


Fig. 48: CR1220 button cell

10.4.1 Checking the charge

You can check the battery charge easily using the device. Replace the battery if the charge amounts to less than 2.9 V.

- ▶ In **Menu 1**, navigate to **Information** → **System values** and read the current charging state of the battery.

10.4.2 Replacing the battery

To be able to replace the CR1220 button cell (→ Fig. 48: CR1220 button cell [▶ 49]) you need to remove the two input circuit boards.

**NOTE****Data loss!**

You need to save the current configuration of the device before replacing the battery. Otherwise all settings will be lost.

- ✓ You have saved the current configuration (→ Saving the configuration [► 46]).
 - ✓ The voltage supply has been disconnected and protected against re-connection.
 - ✓ The housing is open.
 - ✓ Required equipment ✂ is to hand: Socket spanner 5.5 mm (M3), new battery: CR1220, Ø12,5 mm, 3 V, 35 mAh
1. Pull all cable connections from the input circuit boards which you need to dismantle.
 2. Using the socket wrench, unscrew the retaining nuts from the white protective plate and remove the plate.
 3. Using the socket wrench, unscrew the two nuts from the input circuit boards which you need to remove.
 4. Working carefully, slide the input circuit boards from their brackets.
 - ↳ The battery is now easily accessible.
 5. Lever the battery out of its holder without damaging the contact bow.
 6. Slide a new battery in the holder.
- 🔊 The battery has been changed.

10.5 Replacing the fuse

Your device is fitted with an electrical fuse to protect against short circuits or over-voltage. You can change the fuse if it is defective.

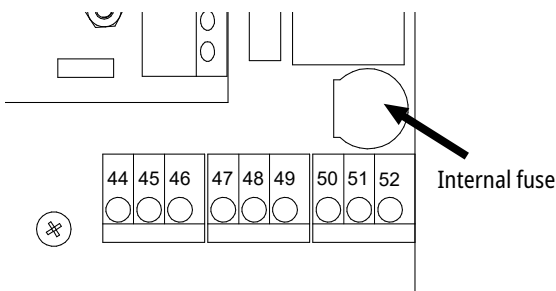


Fig. 49: Position of the fuse

- ✓ The voltage supply has been disconnected and protected against re-connection.
 - ✓ The housing is open.
 - ✓ Required equipment ✂ is to hand: Slotted screwdriver, new fuse: 5 x 20 mm, 3.15 A, 250 V (delay)
1. The fuse holder in the form of a bayonet catch is located at the bottom right-hand side, above the clamps for PE, N and L with the marking "Fuse". Use the slotted screwdriver to press the catch downwards and then turn it leftwards.

2. Remove the fuse.
 3. Replace the fuse and fix it in place by turning the catch clockwise.
- 🔊 Fuse has been replaced.

10.6 Resetting to factory settings

→ Resetting to factory settings [► 48]

10.7 Finishing maintenance

1. Make a note of the date and scope of the maintenance performed.
 2. In the **Service** menu, navigate to the **Service entry** tab.
 3. Enter your company name and notes about the maintenance. Activate the reminder function and enter a date for the next service. Confirm with the **Save** button.
 - ↳ Your service action has been saved in the logfiles.
 4. To put the device back into operation → Commissioning [► 24].
- 🔊 Maintenance completed.

11 Troubleshooting

See below for information about how to rectify faults on the device or the system. If you cannot eliminate the fault, please consult with the manufacturer on further measures or return the device for repair.

Fault	Possible Cause	Corrective actions
The device loses all settings after it has been disconnected from the network and then re-connected.	The battery is empty.	Check that the battery is really empty. To do so, navigate to menu 1 > Information > System values. You can view the battery voltage under "Battery". If the voltage is under 2.9 V, change the battery. Replace the battery (→ Battery/button cell [► 49]).
The device is off.	The power supply has been interrupted.	Restore the power supply.
	The device fuse is defective.	Replace the fuse (→ Replacing the fuse [► 50]).

Table 43: Troubleshooting

11.1 Alarms and messages

Alarm/message	Possible causes	Measures for resolution
Sample water missing	Reed switch in the flow control defective	Replace the reed switch.
	Inlet and/or outflow tap closed	Open the inlet and/or outflow tap.
	The sample water inflow is soiled.	Check the visible parts and filter for soiling and clean if necessary.
Sensor error	Sensor not connected correctly	Make sure that the sensor has been connected correctly (→ Connecting sensors [► 17]).
	Cable break in the sensor signal cable	Replace the signal cable.
Max-alarms sensor	Max alarm set incorrectly	Check settings and correct.
	Overdosing due to incorrect setup	Check the control parameters using the trend course. Increasing the Xp value can remedy this. Reducing the output can also be effective in this regard.
	Overdosing due to incorrect control direction	Check the control parameters for their correctness of lifting and lowering.
	Overdosing due to incorrect measurement	- Check the measuring cell for single-rod measuring chains with regard to electrolyte supply and cleanliness of the diaphragm. - Check the disinfection measuring cells with cleaning balls with regard to the cleanliness of the electrodes - Check the constancy and quantity of the sample water flow
	Overdosing after high chlorination	The time until the alarms are active again will increase.
	Fault of sensor 1 – 4	Check the sensor at the corresponding measuring input 1–4. Remedy the fault and replace the sensor if necessary.
	The connection line is defective	Replace the sensor connecting cable.
	Faulty signal on the input electronics	Check the cable routing and sensor for their correct function. Replace the defective parts if necessary.
	Measurement value input defective	Replace the TOPAX® MC input card.
	No dosing/incorrect dosing	Check the actuators for their correct function.
Min-alarm sensor	Min-alarm set incorrectly	Check settings and correct.
	Overdosing due to incorrect setup	Check the control parameters using the trend course. Increasing the Xp value can remedy this. Reducing the output can also be effective in this regard.
Min-alarm sensor	Overdosing due to incorrect control direction	Check the control parameters for their correctness of lifting and lowering.

Alarm/message	Possible causes	Measures for resolution
	Overdosing due to incorrect measurement	- Check the measuring cell for single-rod measuring chains with regard to electrolyte supply and cleanliness of the diaphragm. - Check the disinfection measuring cells with cleaning balls with regard to the cleanliness of the electrodes - Check the constancy and quantity of the sample water flow
	Overdosing after high chlorination	Increase the time until the alarms are active again.
	Fault of sensor 1 – 4	Check the sensor at the corresponding measuring input 1–4. Remedy the fault and replace the sensor if necessary.
	The power cable is defective.	Replace the sensor connecting cable.
	Faulty signal on the input electronics	Check the cable routing and sensor for their correct function. Replace defective parts if necessary.
	Measurement value input defective	Replace the TOPAX® MC input card.
	No dosing/incorrect dosing	Check the actuators for their correct function.
Min/max-alarm virtual inputs	see "Min/max-alarms sensors"	
	Max-alarm bound chlorine in the swimming pool	Increase the quantity of the fresh water inflow. Check the filter in the circuit and increase the amount of flocculant/the mixing/the reaction distance if necessary. If the values are exceeded to an extreme extent, check the sensor system for correct functionality and replace large amounts of the pool water if necessary.
Y alarm sensors	Time insufficient to reach setpoint	Increase the time of the Y alarm.
	Dosing capacity too low to reach the setpoint in time	Increase the dosing capacity.
	Dosing defective	Repair the dosing to ensure the setpoints are reached again.
	Defective hoses and actuator lines	Repair the hoses, lines and any leaks.
Min/max-alarm temperature	(Measuring) water temperature too warm or cold	Adjust the heater and bring the temperature into the correspondingly configured temperature band.
	Heater/cooling defective	Repair the heater/cooling.
	The temperature control does not function correctly.	Adjust the hysteresis of the digital output in the configuration assistant.
	The performance of the heater/cooling does not match the process	Adjust the heater/cooling.
External stop	System stopped externally	Clear the system again.
	Incorrect message	Check the setting and if necessary, re-configure in the menu Inputs → Digital . Comply with the switch direction.
Filter rinsing	System stopped by filter rinsing	End the filter rinsing.
	Incorrect message	Check the setting and if necessary, re-configure in the menu Inputs → Digital . Comply with the switch direction.
Pre-alarms	Packaging is almost empty*	Provide new packaging and prepare for change.
	Incorrect message	Check the setting and if necessary, re-configure in the menu Inputs → Digital . Comply with the switch direction.
	Suction line defective	Replace the suction line.
Main alarms	Packaging empty*	Replace the packaging.
	Incorrect message	Check the setting and if necessary, re-configure in the menu Inputs → Digital . Comply with the switch direction.
	Suction line defective	Replace the suction line.
Digital inputs (others)	Digital (user-configured) input was switched	Remedy any fault.
	Switch direction configured incorrectly	Re-configure switch direction in the menu Inputs → Digital .

Alarm/message	Possible causes	Measures for resolution
Service due	Service due	Perform a service on your product and confirm the message. If necessary, enter a new service appointment with a reminder in the Service menu.
	Incorrectly set message	Acknowledge the message and renew the entry in the Service menu.
Alarm sensor change due	Sensor change due	Replace the corresponding sensor, acknowledge the message and, if necessary, set a new message in the Service menu.
	Incorrectly set message	Acknowledge the message and renew the entry in the Service menu.
Alarm sensor improper adjustment	Calibration of the sensor not o.k.	Check all ambient conditions. Re-adjust the sensor (→ Calibration [► 38]). If the sensor cannot be adjusted, replace the sensor.
	Input electronics defective	Replace the input electronics.
Alarm temperature improper adjustment	Calibration of the temperature sensor defective	Adjust the temperature in the menu Calibration → Temperature .
	Sensor defective	Replace the temperature sensor.
	No temperature sensor connected	Deactivate temperature measurement in the menu Inputs → Temperature .
Alarm output improper adjustment	An output is not adjusted	Adjust the output in the menu Calibration → Outputs .
	Incorrectly-set control function	Working in the configuration assistant, set the output function, e.g. of the servomotor 20 mA to continuous output 20 mA.
	Actuator defective	Repair or replace the connected actuators.
Report sensor change.	Sensor must be changed/repared	Change the sensor. If necessary, enter a new appointment with a reminder in the service menu.
	Incorrectly set message	Acknowledge the message and renew the entry in the Service menu.
Allocation of sample water missing	Incorrect allocation of the digital inputs	The controller expects at least the configuration of an input for sample water missing. This must be re-used for each set controller in the menu Controller → Alarm action .
Allocation external stop	Incorrect allocation of the digital inputs	The controller expects at least the configuration of one external stop input. This must be re-used for each set controller in the menu Controller → Alarm action .
Allocation low level alert	Incorrect allocation of the digital inputs	The digital inputs for the low level alert do not match the messages checked in the menu Controller → Alarm action . Correct the allocation.
Allocation main alarm	Incorrect allocation of the digital inputs	The digital inputs for the main alarm do not match the checked messages in the menu Controller → Alarm action . Correct the allocation.
Setpoint changeover	The setpoints are switched via a digital input.	-

Table 44: Troubleshooting EASYPRO

* * Depending on the setting in the menu **Controller** → **Alarm action**, dosing and control can be interrupted or continue until the end has been reached.

11.2 Slope errors and sensor errors

Module type	Measurement	Sensor type	Slope error Improper adjustment	Display sensor error
pH / Redox module	pH value	pH single-rod measuring cell	< -40.0 mV/pH > -61.0 mV/pH	< pH 0.00 > pH 1400
	Redox voltage	Redox single-rod measuring cell	< 0.8 mV/mV > 1.2 mV/mV	< -1000 mV > 1000 mV
Potentiostat module	Free chlorine	Amperometric 3-electrode measuring cell (DMZ3)	< 3.0 µA/(mg/l)	< -0.2 mg/l
	Chlorine dioxide	CS120 excess chlorine measuring cell	> 100 µA/(mg/l)	> 530 µA
Potentiostat module HD (high resolution)	Free chlorine	Amperometric 3-electrode measuring cell (DMZ3)	< 3.0 µA/(mg/l)	< -0.2 mg/l
	Chlorine dioxide	CS120 excess chlorine measuring cell	> 100 µA/(mg/l)	> 530 µA
Current module	Free chlorine	CS120 excess chlorine measuring cell	< 3.0 µA/(mg/l)	> 680 µA
	Chlorine dioxide		> 100 µA/(mg/l)	
	Current	Membrane-covered measuring cells, other sensors with 0/4 – 20 mA signal	< 0.01 mA/(X) > 50 mA/(X)	< 3.65 mA > 21 mA
	Free chlorine			
	Chlorine dioxide			
	Total chlorine			
	Chlorite			
	Hydrogen peroxide			
	Neutral (%)			
	Salt content			
	Conductivity			
	Ozone			
	Bromine			
	Peracetic acid			
	Dissolved oxygen			
	Turbidity			
HD current module (high resolution)	Free chlorine	CS120 excess chlorine measuring cell	< 3.0 µA/(mg/l)	> 490 µA
	Chlorine dioxide		> 100 µA/(mg/l)	
Conductivity module	Conductivity	Conductive conductivity measuring cell	< 20.0 µA/(mS/cm)	
	Salt content		> 700 µA/(mS/cm)	

Table 45: Slope errors and sensor errors

12 Modbus addresses

12.1 Modbus addresses (cross-channel)

Here you will find an overview of the cross-channel Modbus data.

NOTE! With a DOUBLE-WORD, the HIGH-WORD is transferred first! Hexadecimal display is shown by a leading "0x".

12.1.1 Basic data:

Address	Read	Write	Description	Meaning
4	x		Device type + version	0x0500 + (number of channels -1) A single-channel controller accordingly has the identification: 0x0500.
6 – 8	x		Software Version:	Transfer: ASCII sign e.g. 102 is the software version V1.02
10 – 11	x		Operating hours	
13	x		Hardware version	

12.1.2 High chlorination

Address	Read	Write	Description	Meaning
1450	x	x	Status high chlorination	0 = Not running 1 = Running
1451	x		Setpoint high chlorination active	0 = Normal setpoint 1 = High chlorination setpoint
1452	x	x	Setpoint high chlorination	2 decimal points
1453	x	x	Holding time	HIBYTE = Hours LOBYTE = Minutes
1454	x	x	Alarm suppression	HIBYTE = Hours LOBYTE = Minutes
1455	x		Runtime of the holding time	Seconds
1456	x		Runtime of the high chlorination	Seconds

12.1.3 Admixture and temperature control

Address	Read	Write	Description	Meaning
1490	x	x	Status admixture	0 = Stop 1 = Running
1491	x		Output admixture	500 = 50.0 %
1502	x	x	Setpoint temperature control	500 = 50.0 °C

12.1.4 Programmable logic controller / inputs

Address	Read	Write	Description	Meaning
2000 – 2002	x		Serial number	The information consists of a ASCII sign in HIGH-BYTE and one in LOW-BYTE. Serial number: 123456 therefore becomes address 2000: 0x3132 Address 2001: 0x3334 Address 2002: Transmit 0x3536

Address	Read	Write	Description	Meaning
2003	x		Status of digital inputs	Displays the terminal logic (not the configured software function). The individual bits are assigned directly to the input clamps. Example: 0x01 means that the first digital input (terminals 21 + 22) are not actuated.
2004	x		Status of digital outputs	The individual bits of the output modules. Example: 0x03 means that the upper relay or the upper optocoupler of the second output module (from the top) is not active.
2007	x		Disturbance variable	in % of measuring range
2008 – 2017	x	x	Name of the device	Observe maximum of 20 characters! The evaluation must stop at the first zero (string end). The individual letters are located in the HIGH-BYTE and LOW-BYTE of every address. "GW" thus produces: Address 2008 = 0x4757 Address 2009 = 0x00?? The question marks are undefined. In this case, all other addresses send undefined values.

12.1.5 Analogue outputs

Address	Read	Write	Description	Meaning
2220 – 2223	x		Analogue outputs 1 – 4	421 = 4.21 mA (2 byte signed int)

12.1.6 Alarm status

Address	Read	Write	Description	Meaning	
2225	x		Alarm status 1 If the bit is set, the associated alarm or message is active.	Message or alarm	Bit
				Sensor error 1	0
				Sensor error 2	1
				Sensor error 3	2
				Sensor error 4	3
				Sensor 1 maximum alarm	4
				Sensor 2 maximum alarm	5
				Sensor 3 maximum alarm	6
				Sensor 4 maximum alarm	7
				Virtual 1 maximum alarm	8
				Virtual 2 maximum alarm	9
				Virtual 3 maximum alarm	10
				Virtual 4 maximum alarm	11
				Sensor 1 minimum alarm	12
				Sensor 2 minimum alarm	13
				Sensor 3 minimum alarm	14
				Sensor 4 minimum alarm	15

Address	Read	Write	Description	Meaning	
				Message or alarm	Bit
				Virtual 1 minimum alarm	0
				Virtual 2 minimum alarm	1
				Virtual 3 minimum alarm	2

Address	Read	Write	Description	Meaning	
2226	x		Alarm status 2 If the bit is set, the associated alarm or message is active.	Virtual 4 minimum alarm	3
				Controller 1 Y alarm	4
				Controller 2 Y alarm	5
				Controller 3 Y alarm	6
				Controller 4 Y alarm	7
				Temperature 1 maximum alarm	8
				Temperature 2 maximum alarm	9
				Temperature 3 maximum alarm	10
				Temperature 4 maximum alarm	11
				Temperature 1 minimum alarm	12
				Temperature 2 minimum alarm	13
				Temperature 3 minimum alarm	14
				Temperature 4 minimum alarm	15
				Message or alarm	Bit
2227	x		Alarm status 3 If the bit is set, the associated alarm or message is active.	Setpoint changeover	0
				Sample water missing	1
				External stop	2
				Filter rinsing	3
				Low level alert 1	4
				Low level alert 2	5
				Low level alert 3	6
				Low level alert 4	7
				Main alarm 1	8
				Main alarm 2	9
				Main alarm 3	10
				Main alarm 4	11
				Digital input 1	12
				Digital input 2	13
				Digital input 3	14
				Digital input 4	15
				Digital input 5	16
Address	Read	Write	Description	Meaning	
2228	x		Alarm status 4 If the bit is set, the associated alarm or message is active.	Message or alarm	Bit
				Digital input 5	0
				Digital input 6	1
				Digital input 7	2
				Digital input 8	3
				Sensor 1 improper calibration	4
				Sensor 2 improper calibration	5
				Sensor 3 improper calibration	6
				Sensor 4 improper calibration	7
				Temperature 1 improper calibration	8
				Temperature 2 improper calibration	9

BA-46020-02 / 1 / 07/08/2024

Address	Read	Write	Description	Meaning	
				Temperature 3 improper calibration	10
				Temperature 4 improper calibration	11
				Output 1 improper calibration	12
				Output 2 improper calibration	13
				Output 3 improper calibration	14
				Output 4 improper calibration	15
2229	x		Alarm status 5 If the bit is set, the associated alarm or message is active.	Message or alarm	Bit
				Next service due	0
				Sensor change sensor 1 due	1
				Sensor change sensor 2 due	2
				Sensor change sensor 3 due	3
				Sensor change sensor 4 due	4
				Sample water missing 1 – 4	5
				Sample water missing 2 – 4	6
				Sample water missing 3 – 4	7
				Sample water missing 4 – 4	8
				External stop 1 – 4	9
				External stop 2 – 4	10
				External stop 3 – 4	11
				External stop 4 – 4	12
				Filter rinsing 1 – 4	13
				Filter rinsing 2 – 4	14
				Filter rinsing 3 – 4	15
2230	x		Alarm status 6	Message or alarm	Bit
				Filter rinsing 4 – 4	0
				Configuration of low sample water	1
				Configuration of ext. stop	2
				Configuration DI pre-alarm	3
				Configuration DI main alarm	4
				IP connection error	5
				IP output status 1	6
2230	x		Alarm status 6	IP output status 2	7
				IP output status 3	8
				IP output status 4	
				x	9
				x	
				x	
				x	
				x	
				Message or alarm	Bit
				Battery	0
				Modbus input 1 maximum alarm	1
				Modbus input 2 maximum alarm	2
				Modbus input 3 maximum alarm	3

Address	Read	Write	Description	Meaning	
2231	x		Alarm status II 1	Modbus input 4 maximum alarm	4
				Modbus input 1 minimum alarm	5
				Modbus input 2 minimum alarm	6
				Modbus input 3 minimum alarm	7
				Modbus input 4 minimum alarm	8
				Modbus temperature 1 maximum alarm	9
				Modbus temperature 2 maximum alarm	10
				Modbus temperature 3 maximum alarm	11
				Modbus temperature 4 maximum alarm	12
				Modbus temperature 1 minimum alarm	13
				Modbus temperature 2 minimum alarm	14
				Modbus temperature 3 minimum alarm	15
				Message or alarm	Bit
				Modbus temperature 4 minimum alarm	
2232	x		Alarm status II 2	Timeout - ATE 1	0
				Timeout - ATE 2	1
				Timeout - ATE 3	2
				Timeout - ATE 4	3
				Adjustment of sensor 1 due	4
				Adjustment of sensor 2 due	5
				Adjustment of sensor 3 due	6
				Adjustment of sensor 4 due	7
				Adjustment of Modbus sensor 1 due	8
				Adjustment of Modbus sensor 2 due	9
				Adjustment of Modbus sensor 3 due	10
				Adjustment of Modbus sensor 4 due	11
				x	12
				x	
				x	
Address	Read	Write	Description	Meaning	
2233	x		Alarm status II 3	°C = 0, °F = 1	

12.1.7 Temperature inputs

Address	Read	Write	Description	Meaning	
2235	x		Temperature input 1	235 = 23.5 °C With an inactive temperature, the return is -10000 (2 Byte signed int)	
2236	x		Temperature input 2		
2237	x		Temperature input 3		
2238	x		Temperature input 4		

12.2 Modbus addresses (channel-specific)

Here you will find an overview of the Modbus data that is channel specific.

NOTE! With a DOUBLE-WORD, the HIGH-WORD is transferred first! Hexadecimal display is shown by a leading "0x".

BA-46020-02 / 1 / 07/08/2024

12.2.1 Inputs

20 addresses will be held available for each of the 1 to 4 inputs. The address space for the inputs begins at 2020, 2040, 2060 and 2080.

Address	Read	Write	Description	Meaning		
2020	x		Medium	1 = pH		
				2 = Redox		
				3 = Free chlorine		
				4 = Total chlorine		
				5 = Chlorine dioxide		
				6 = Bromine		
				7 = Chlorite		
				8 = Hydrogen peroxide		
				9 = Ozone		
				10 = Bromite		
				11 = Fluoride		
				12 = Salt content		
				13 = Conductivity		
				14 = Current		
				15 = Temperature		
				16 = Neutral (0 – 100%)		
				17 = Voltage		
				18 = Flow rate		
				19 = Hydrogen		
				20 = Frequency		
				21 = Peracetic acid		
				22 = Air flow		
				23 = Dissolved oxygen		
				24 = Turbidity		
				254 = Free entry		
				255 = No type		
2021 – 2022	x		Measurement	Number of positions after the decimal point, see unit (4 bytes signed int.).		
2023	x		Unit	Number	Unit	decimal places
				0	mA	2
				1	µA	1
				2	ppm	2
				3	mg/l	2
				4	µS/cm	2
				5	mS/cm	2
				6	%	2
				7	mV	2
				8	pH	2
				9	min	0
				10	s	0
				11	mV/pH	1
				12	Pulses/min.	0

BA-46020-02 / 1 / 07/08/2024

Address	Read	Write	Description	Meaning		
2023	x		Unit	13	Travelling unit	1
				14	Celsius	1
				15	nA	0
				16	Hertz	2
				17	Litres / hour	0
				18	V	2
				19	A	1
				20	m³/h	2
				21	m²/min	2
				22	%Vol	2
				23	%Sat	2
				24	kΩ	2
				25	MΩ	2
				26	NTU	2
2024	x		Assigned controller	Number of the assigned controller If no controller is assigned, 0xff is transmitted.		
2025	x		Control output Y (active control)	500 = 50,0 % (2 Byte signed int)		
	x	x	Control output Y (only manual mode)			
2026	x		Control output 2 Y2 (active control)	500 = 50,0 % (2 Byte signed int) Second side if 2-side control is active.		
	x	x	Control output 2 Y2 (only manual mode)			
2027 – 2028	x	x	Setpoint 1	Number of positions after the decimal point, see unit (4 bytes signed int.).		
2029 – 2030	x	x	Setpoint 2	If 2-side control is active (4 byte signed int).		
2031	x	x	Xp	Number of positions after the decimal point, see unit (2 bytes unsigned int.).		
2032	x	x	Tv	Derivative time in s (2 byte unsigned int).		
2033	x	x	Tn	Reset time in s (2 byte unsigned int).		
2034	x	x	Minimum and maximum alarm	Write: 0 = clear alarm	Read: Bit 0 = Minimum alarm is on Bit 1 = Maximum alarm is on	
2035	x	x	Y alarm	Write: 0 = clear alarm	Read: Bit 0 = Y-alarm is not present Bit 1 = Y-alarm is present	
2036	x	x	Manual mode	Bit 0: Manual mode on Bit 1: Lower (with 2-side control)		

12.2.2 Measurement active

It is possible to switch off the measurement only for the display and the assigned controller. The sensors are not deactivated and the trends continue to be recorded.

Address	Read	Write	Description	Meaning
2255–2258	x	x	Inputs 1–4: Measurement active	0 = not active 1 = active

12.2.3 Virtual inputs

20 addresses will be held available for each of the 1 to 4 inputs. The address space for the virtual inputs begins at 2100, 2120, 2140 and 2160.

Address	Read	Write	Description	Meaning
2100	x		Calculation	0 = off, no calculation 1 = difference value measurement 2 = bound chlorine 3 = effective chlorine
2101 – 2102	x		Measurement	Number of positions after the decimal point, see unit (4 bytes signed int.).
2103	x		Unit	Number
				Unit
				0
				1
				2
				3
				4
				5
				6
				7
				8
				9
				10
				11
				12
				13
				14
2104	x		Assigned controller	Number of the assigned controller If no controller is assigned, 0xff is transmitted.
2105	x		Control output Y (active control)	500 = 50,0 % (2 Byte signed int)
	x	x	Control output Y (only manual mode)	
2106	x		Control output 2 Y2 (active control)	500 = 50,0 % (2 Byte signed int)
	x	x	Control output 2 Y2 (only manual mode)	Second side if 2-side control is active.
2107 – 2108	x	x	Setpoint 1	Number of positions after the decimal point, see unit (4 bytes signed int.)
2109 – 2110	x	x	Setpoint 2	If 2-side control is active (4 byte signed int)

Address	Read	Write	Description	Meaning	
2111	x	x	Xp	Number of positions after the decimal point, see unit (2 bytes unsigned int.)	
2112	x	x	Tv	Derivative time in s (2 byte unsigned int)	
2113	x	x	Tn	Reset time in s (2 byte unsigned int)	
2114	x	x	Minimum and maximum alarm	Write: 0 = clear alarm	Read: Bit 0 = Minimum alarm is on Bit 1 = Maximum alarm is on
2115	x	x	Y alarm	Write: 0 = clear alarm	Read: Bit 0 = Y-alarm is not present Bit 1 = Y-alarm is present
2116	x	x	Manual mode	Bit 0: Manual mode on Bit 1: Lower (with 2-side control)	

13 EU declaration of conformity



(DE) EG-Konformitätserklärung

Hiermit erklären wir, dass das nachfolgend bezeichnete Gerät aufgrund seiner Konzipierung und Bauart sowie in der von uns in Verkehr gebrachten Ausführung den einschlägigen grundlegenden Sicherheits- und Gesundheitsanforderungen der aufgeführten EG-Richtlinien entspricht. Bei einer nicht mit uns abgestimmten Änderung am Gerät verliert diese Erklärung ihre Gültigkeit.

(EN) EC Declaration of Conformity

We hereby certify that the device described in the following complies with the relevant fundamental safety and sanitary requirements and the listed EC regulations due to the concept and design of the version sold by us.

If the device is modified without our consent, this declaration loses its validity.

(FR) Déclaration de conformité CE

Nous déclarons sous notre propre responsabilité que le produit ci-dessous mentionné répond aux exigences essentielles de sécurité et de santé des directives CE énumérées aussi bien sur le plan de sa conception et de son type de construction que du modèle que nous avons mis en circulation.

Cette déclaration perdra sa validité en cas d'une modification effectuée sur le produit sans notre accord explicite.

(ES) Declaración de conformidad CE

Por la presente declaramos que, dados la concepción y los aspectos constructivos del modelo puesto por nosotros en circulación, el aparato mencionado a continuación cumple con los requisitos sanitarios y de seguridad vigentes de las directivas de la U.E. citadas a continuación.

Esta declaración será invalida por cambios en el aparato realizados sin nuestro consentimiento.

(PT) Declaração de conformidade CE

Declaramos pelo presente documento que o equipamento a seguir descrito, devido à sua concepção e ao tipo de construção daí resultante, bem como a versão por nós lançada no mercado, cumpre as exigências básicas aplicáveis de segurança e de saúde das directivas CE indicadas.

A presente declaração perde a sua validade em caso de alteração ao equipamento não autorizada por nós.

Bezeichnung des Gerätes:

Mehrkanalregler

Description of the unit:

Multi-Channel Controlle

Désignation du matériel:

Régulateur multi-canaux

Descripción de la mercancía:

Controlador multi canal

Designação do aparelho:

Controlador multi-canalr

Typ:

TOPAX MC

Type:

EG-Richtlinien:

EC directives:

2014/30/EU

2014/35/EU

2011/65/EU

Die Schutzziele der Niederspannungsrichtlinie 2014/35/EU wurden gemäß Anhang I, Nr. 1.5.1 der Maschinenrichtlinie 2006/42/EG eingehalten.

The protective aims of the Low Voltage Directive 2014/35/EU were adhered to in accordance with Annex I, No. 1.5.1 of the Machinery Directive 2006/42/EC.

Harmonisierte Normen:

Harmonized standards:

DIN EN ISO 12100:2011-03

DIN EN 61000-4-2:2009-12

DIN EN 61000-4-3:2006 + A1:2008 + A2:2010

DIN EN 61000-4-4:2012

DIN EN 61000-4-5:2014

DIN EN 61000-4-6:2014-08

DIN EN 61000-4-11:2005-02

DIN EN 61000-6-2:2016-05

DIN EN 61000-6-3:2011-09

DIN EN 55016-2-3:2010 + A1:2010

Dokumentationsbevollmächtigter:

Authorised person for documentation:

Lutz-Jesco GmbH

Heinz Lutz

Geschäftsführer / Chief Executive Officer

Lutz-Jesco GmbH

Wedemark, 01.03.2019

Lutz-Jesco GmbH

Am Bostelberge 19

30900 Wedemark

Germany

BA-46020-02 / 1 / 07/08/2024

[illegible]



Lutz-Jesco GmbH

Am Bostelberge 19
30900 Wedemark
Germany
Tel.: (+49 51 30) 58 02-0
E-Mail: info@lutz-jesco.com
www.lutz-jesco.com