Assembly and operating instructions

Multi-channel measuring and control system DULCOMARIN® 3, single and multi-pool system

EN

Please carefully read these operating instructions before use. · Do not discard.
The operator shall be liable for any damage caused by installation or operating errors.
The latest version of the operating instructions are available on our homepage.

Part number: 982801

Target group: Trained user.

Version: BA DC 092 08/19 EN

General non-discriminatory approach

In order to make it easier to read, this document uses the male form in grammatical structures but with an implied neutral sense. It is aimed equally at both men and women. We kindly ask female readers for their understanding in this simplification of the text.

Supplementary information

→ Please read the supplementary information in its entirety.

Information

This provides important information relating to the correct operation of the unit or is intended to make your work easier.

Warning information

Warning information includes detailed descriptions of the hazardous situation, see ↳ *Chapter 1.2 'Labelling of Warning Information' on page 6*.

The following symbols are used to highlight instructions, links, lists, results and other elements in this document:

Tab. 1: More symbols

Symbol	Description
1. →	Action, step by step.
⇨	Outcome of an action.
↳	Links to elements or sections of these instructions or other applicable documents.
■	List without set order.
[Button]	Display element (e.g. indicators). Operating element (e.g. button, switch).
'Display /GUI'	Screen elements (e.g. buttons, assignment of function keys).
`CODE`	Presentation of software elements and/or texts.

Table of contents

1 Safety and responsibility

1.1 Introduction

Target group of document

General knowledge of measuring and control technology and swimming pool technology is required in order to understand the document. Furthermore, the planning and use of measuring and control technology and swimming pool technology require technical specialist knowledge, which is not communicated in this document. The minimum requirement of personnel is “trained user”, see *Chapter 1.5 ‘User qualification’ on page 10*, unless otherwise specified.

Assembly and operating instructions

The printed version of the assembly and operating instructions is naturally not updated. We would therefore ask you to regularly visit the manufacturer’s homepage www.prominent.com to find out about the new electronic versions of the assembly and operating instructions. These versions may contain, among other things, information about new fault remedies or spare parts.

1.2 Labelling of Warning Information

Introduction

These operating instructions provide information on the technical data and functions of the product. These operating instructions provide detailed warning information and are provided as clear step-by-step instructions.

The warning information and notes are categorised according to the following scheme. A number of different symbols are used to denote different situations. The symbols shown here serve only as examples.

DANGER!

Nature and source of the danger

Consequence: Fatal or very serious injuries.

Measure to be taken to avoid this danger.

Description of hazard

– Denotes an immediate threatening danger. If the situation is disregarded, it will result in fatal or very serious injuries.

WARNING!

Nature and source of the danger

Possible consequence: Fatal or very serious injuries.

Measure to be taken to avoid this danger.

– Denotes a possibly hazardous situation. If the situation is disregarded, it could result in fatal or very serious injuries.

CAUTION!

Nature and source of the danger

Possible consequence: Slight or minor injuries. Material damage.

Measure to be taken to avoid this danger.

– Denotes a possibly hazardous situation. If the situation is disregarded, it could result in slight or minor injuries. May also be used as a warning about material damage.

NOTICE!

Nature and source of the danger

Damage to the product or its surroundings.

Measure to be taken to avoid this danger.

– Denotes a possibly damaging situation. If the situation is disregarded, the product or an object in its vicinity could be damaged.

Type of information

Hints on use and additional information.

Source of the information. Additional measures.

– *Denotes hints on use and other useful information. It does not indicate a hazardous or damaging situation.*

1.3 General safety information

WARNING!

Live parts!

Possible consequence: Fatal or very serious injuries

– Measure: Before undertaking installation work on the open device, ensure that it is disconnected from the power supply.
– Regularly monitor the devices and de-energise damaged or defective devices, or devices that have been tampered with, from the power supply.
– The operator must install a suitable circuit breaker (e.g. IEC 60947-1 and IEC 60947-3) for this.
– When switching off the device, the operator must ensure that the entire process remains safe.
– The operator should fit a residual current device (RCD) or another suitable measure to protect personnel and equipment.

WARNING!

Danger from hazardous substances!

Possible consequence: Fatal or very serious injuries.

Please ensure when handling hazardous substances that you have read the latest safety data sheets provided by the manufacture of the hazardous substance. The actions required are described in the safety data sheet. Check the safety data sheet regularly and replace, if necessary, as the hazard potential of a substance can be re-evaluated at any time based on new findings.

The system operator is responsible for ensuring that these safety data sheets are available and that they are kept up to date, as well as for producing an associated hazard assessment for the workstations affected.

WARNING!

Unauthorised access!

Possible consequence: Fatal or very serious injuries.

– Measure: Ensure that there can be no unauthorised access to the device.

WARNING!

Operating faults!

Possible consequence: Fatal or very serious injuries.

– Ensure that the device is only operated by adequately qualified and technically expert personnel.
– Please also observe the operating instructions for sensors and fittings and any other units which may be fitted, such as sample water pumps etc.
– The operator is responsible for ensuring that personnel are qualified.

NOTICE!

Correct sensor operation

Damage to the product or its surroundings.

– Correct measurement and metering is only possible if the sensor is working perfectly.
– Check and calibrate the sensor regularly.

Protection of radio reception

This equipment is not intended to be used in residential areas and cannot guarantee appropriate protection of radio reception in these environments.

The control's limit values need to be permanently activated with swimming pool controllers.

1.4 Intended use

The unit is designed to measure and regulate water treatment in a swimming pool with one or more pools.

The unit's range of application extends to industry and residential.

Only use the unit in accordance with the technical details and specifications provided in these operating instructions and in the operating instructions for the individual components (such as sensors, fittings, calibration devices, metering pumps, etc.).

The controller can be used in processes, which have a time constant of > 30 seconds.

All other uses or modifications are prohibited.

Interference resistance

The device complies with the interference resistance provisions in accordance with EN 61326-1 and is intended for use in industrial electromagnetic environments and in residential areas.

WARNING!

Disturbance signal emissions class A or B / Protection for radio reception

The device complies with the disturbance signal emissions test requirements for residential areas as a Class B (Residential area), Group 1 unit.

With devices with communication interface

- B = Profibus,
- E = LAN,
- G = Profinet,

the unit only complies with the limit values for a class A device (other areas apart from residential), Group 1.

This device is then not intended to be used in residential areas and cannot guarantee appropriate protection of radio reception in these environments.

1.5 User qualification

WARNING!

Danger of injury with inadequately qualified personnel

The operator of the system / equipment is responsible for ensuring that the qualifications are fulfilled.

If inadequately qualified personnel work on the unit or loiter in the hazard zone of the unit, this could result in dangers that could cause serious injuries and material damage.

- All work on the unit should therefore only be conducted by qualified personnel.
- Unqualified personnel should be kept away from the hazard zone.

The pertinent accident prevention regulations, as well as all other generally acknowledged safety regulations, must be adhered to.

Training	Definition
Instructed personnel	An instructed person is deemed to be a person who has been instructed and, if required, trained in the tasks assigned to him and possible dangers that could result from improper behaviour, as well as having been instructed in the required protective equipment and protective measures.
Trained user	A trained user is a person who fulfils the requirements made of an instructed person and who has also received additional training specific to the system from the manufacturer or another authorised distribution partner.
Trained, qualified personnel	A trained, qualified employee is deemed to be a person who is able to assess the tasks assigned to him and recognize possible hazards based on his training, knowledge and experience, as well as knowledge of pertinent regulations. A trained, qualified employee must be able to perform the tasks assigned to him independently with the assistance of drawing documentation and parts lists. The assessment of a person's technical training can also be based on several years of work in the relevant field.
Electrical technician	An electrical technician is able to complete work on electrical systems and recognise and avoid possible dangers independently based on his technical training and experience as well as knowledge of pertinent standards and regulations. An electrical technician must be able to perform the tasks assigned to him independently with the assistance of drawing documentation, parts lists, terminal and circuit diagrams. The electrical technician must be specifically trained for the working environment in which the electrical technician is employed and be conversant with the relevant standards and regulations.
Service	The Service department refers to service technicians, who have received proven training and have been authorised by the manufacturer to work on the system.

1.6 Warranty

The general terms and conditions of business, contracts and national laws and regulations apply in the relevant order of priority.

1.7 Network security

The product is suitable for use in networks. Users are responsible for taking appropriate security measures for their own network and all components contained therein, in particular their computer systems and other systems. They must protect these adequately from unauthorised access by third parties, viruses, harmful software and any other forms of harmful elements. In particular, the user undertakes to set up an appropriate firewall and wherever possible to use automatically generated passwords of an adequate length, which should be regularly changed, or to take other appropriate measures to establish or maintain network security. Responsibility for network security lies with the operator of the system. ProMinent GmbH in particular is not liable for any consequences resulting from inadequate security measures and the potential misuse of the user's identification features.

2 Functional description

2.1 Function

The measuring and control system DULCOMARIN® 3 controls the entire range of swimming pools – from private pools to public adventure pools.

The measuring and control system DULCOMARIN® 3 is used to treat swimming pool water. Eco!Mode® adapts the circulation capacity for on-demand energy use.

The system is operated either via the 7” touchscreen with graphic user interface or using mobile smart devices by means of the integrated web server while maintaining full functionality. Explanatory videos guide the user step-by-step through operation.

Up to 16 pool circuits can be networked using industrial bus systems. Local operating devices can be added to each pool circuit.

Field of application

- Water parks,
- Public swimming pools,
- Private swimming pools.

2.2 Overview of the functions

Measurement and control of all relevant hygiene parameters.

- pH,
- ORP,
- chlorine, free / combined / total,
- bromine,
- chlorine dioxide,
- temperature,
- conductivity,
- turbidity.

Control of swimming pool technology:

- circulating pumps, on-demand thanks to Eco!Mode®,
- filter backflushing,
- lighting,
- covers,
- whirlpool functions,
- attractions, such as counterflow systems.

Evaluation and reporting functions:

- high-resolution screen recorders with zoom function,
- comprehensive data logger for evaluations on a PC,
- sending of configurable status messages by e-mail.

Communication options:

- LAN and Wi-Fi connection for operation using a PC, tablet or smartphone etc.

2.3 Open-source software licences

The DULCOMARIN® 3 controller may contain firmware with open-source software packages. You will find a list in table format of the possible software packages, the licensing conditions for these packages and the source code on the data carrier provided with the controller and on the product and download page for the DULCOMARIN® 3.

3 Operating concept

3.1 Operating elements

Operating elements

The device is operated by a touchscreen as a combined input and output interface between man and machine (HMI).

The capacitative touchscreen display provides an overview of all functions. It reacts like a smartphone.

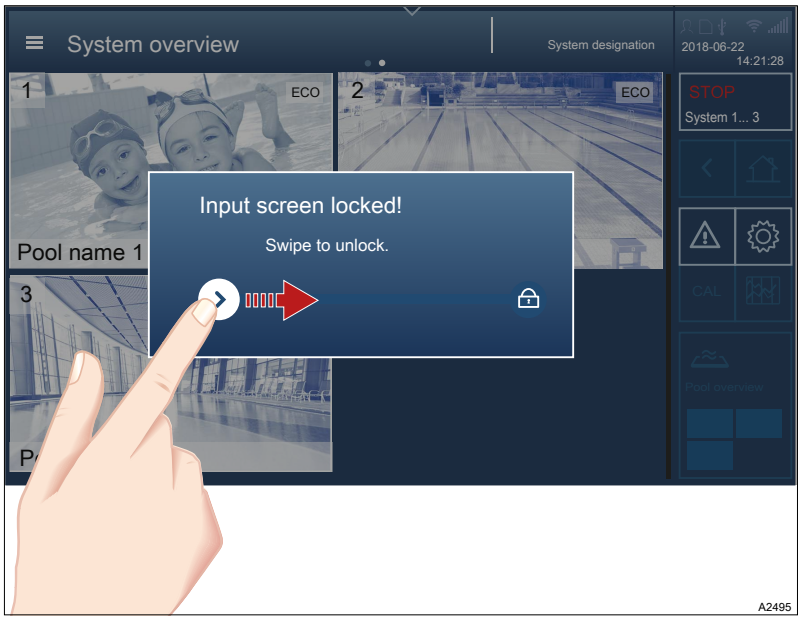


Fig. 1: Locked screen

→ To unlock: use the tip of your finger to move the left icon and swipe the icon to the right towards the lock. Move the icon until it covers the lock. Tap your finger briefly on the lock and the lock opens

⇨ The lock opens.

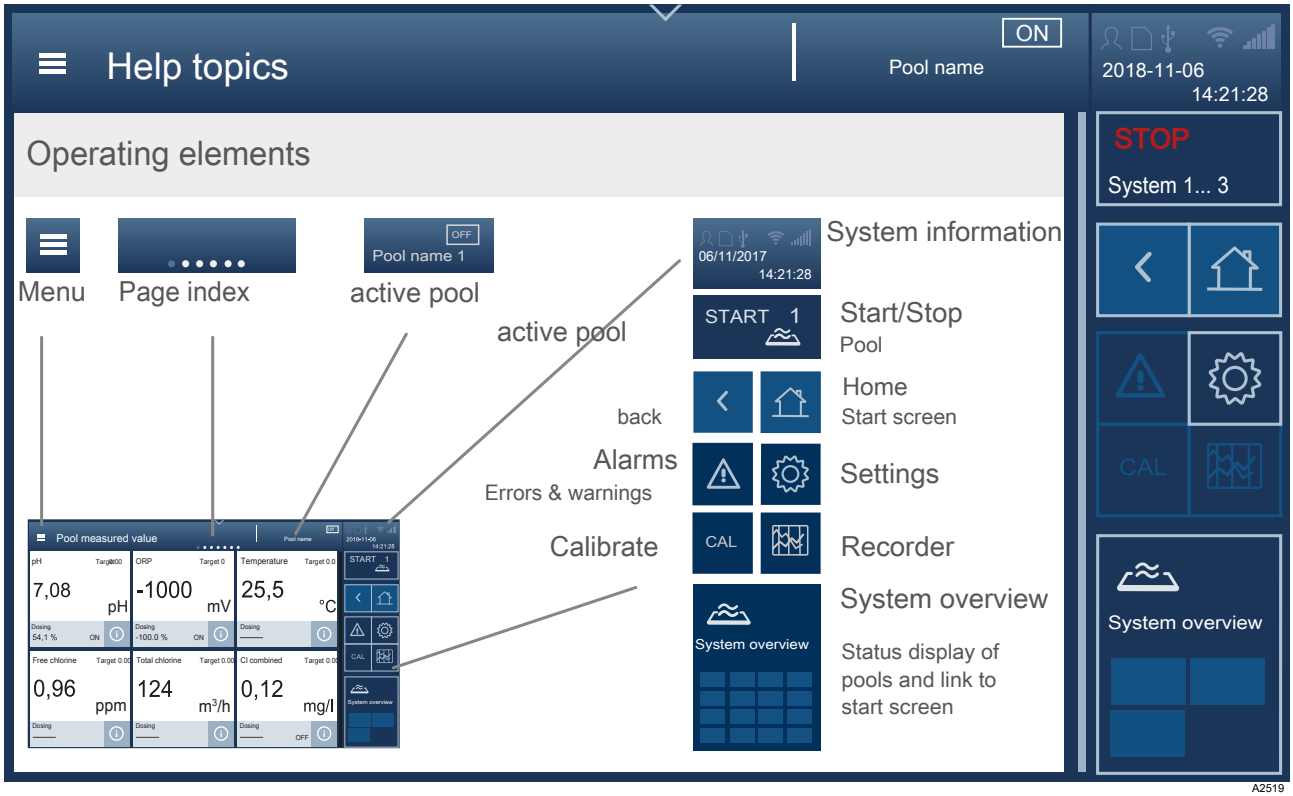


Fig. 2: The individual operating elements

Alternate *'ON/ OFF'* to *'START/STOP'* status:

- *'ON'* status ➡ *'STOP'* pool display (at pool level),
- *'OFF'* status ➡ *'START'* pool display (at pool level).

If the status display for a pool indicates *[ON]* status, then the *[STOP]* key can be used to stop the control and outputs of this pool.

If the status display for a pool indicates *[OFF]* status, then the *[START]* key can be used to start the control and outputs of this pool.

All pools can be stopped at system level using the *[STOP]* key *[system 1 ... n]*. Each pool can then only be started individually.

3.1.1 Pictograms used as operating elements

Tab. 2: Pictograms used as operating elements.

Picto.	Name	Meaning and function
Active pictograms are highlighted, while inactive pictograms remain dimmed. Only the active pictograms can be actuated.		
	System alarms	This key immediately opens the global list with all system alarms.
	Calibration menu	This key immediately opens the calibration menu. You then need to select the parameters to be calibrated.
	System settings	This key immediately opens the list with all system settings.
	Quick access menu	This key immediately opens the quick access menu (*'hamburger'* menu) . You can then select from the various sub-menus in the *'hamburger'* menu .
	*[Home]*	This key takes you straight back to the screen defined as *[Home]*.
	Locked lock	This icon indicates that the display is locked.
	Screen recorder	This key immediately opens the view with the recorder. The screen recorder logs all the device's activities and measured values.
	Pool status	Alternate *'ON/ OFF'* to *'START/STOP'* status ■ *'ON'* status➡ *'STOP'* display ■ *'OFF'* status ➡ *'START'* display
	General information	You will find all information about the date, time, device type and links between the various interfaces etc. displayed here.
	Back	This key takes you one level back in the menu.
	Page index	These points at the top of the display indicate that there are more pages. You can access these pages by swiping to the left or right. The dark point marks the position of the visible page in the entire system.

3.2 Navigation levels

Login

Fig. 3: Login interface

Select user

Fig. 4: User selection interface

Entering a PIN/PUK

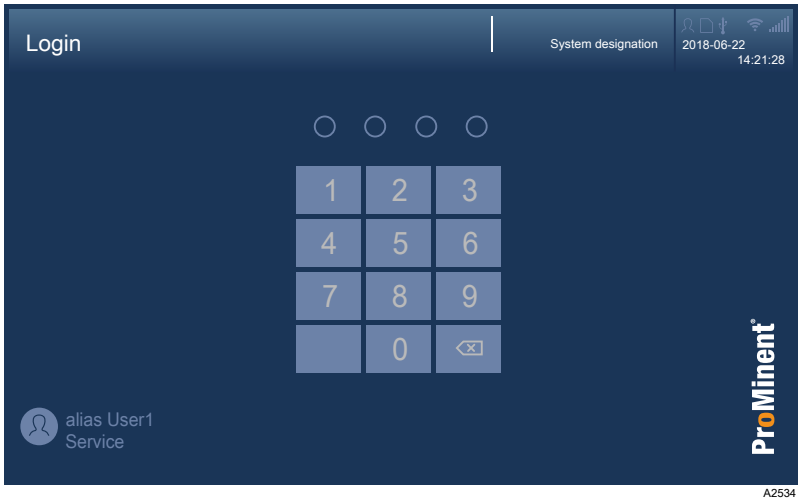


Fig. 5: PIN entry interface

You can enter the PIN you have assigned here. If you can't remember your PIN, you can enter the PUK. The PUK is supplied with the device and can be found in a sealed envelope. It is the responsibility of the operator to ensure that the PUK is kept safe and is available when needed.

3.2.1 Interactions

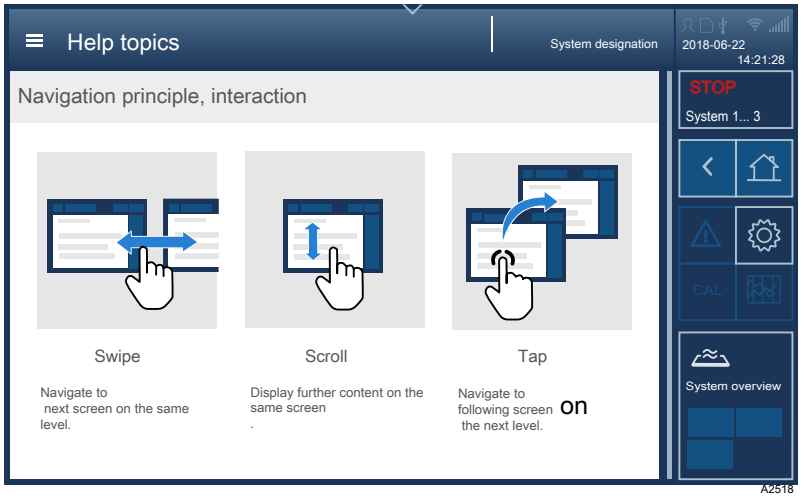


Fig. 6: Swiping, scrolling and tapping

3.2.2 Navigation levels

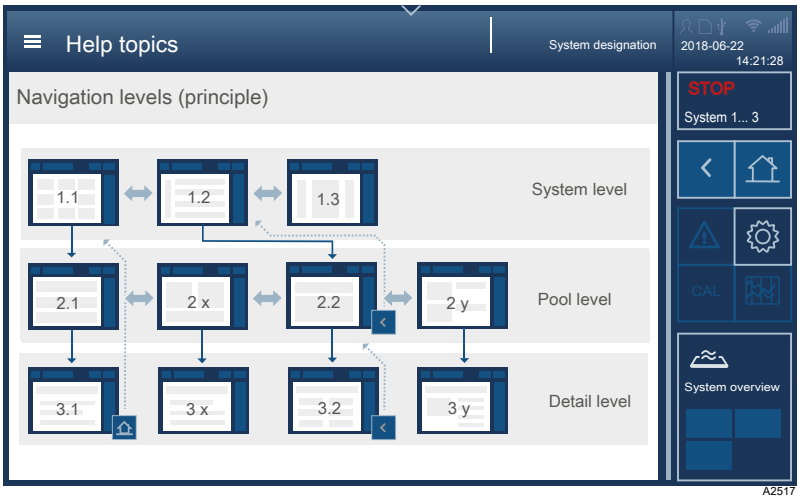


Fig. 7: Principle of navigation levels

Swipe between the pages of a level e.g. 1.1-1.3.

Tapping on a level takes you one level lower in the menu if this is possible.

Press ‹ to go back one level.

The Home key returns you to the *[Home]* screen.

3.2.2.1 System level

System overview

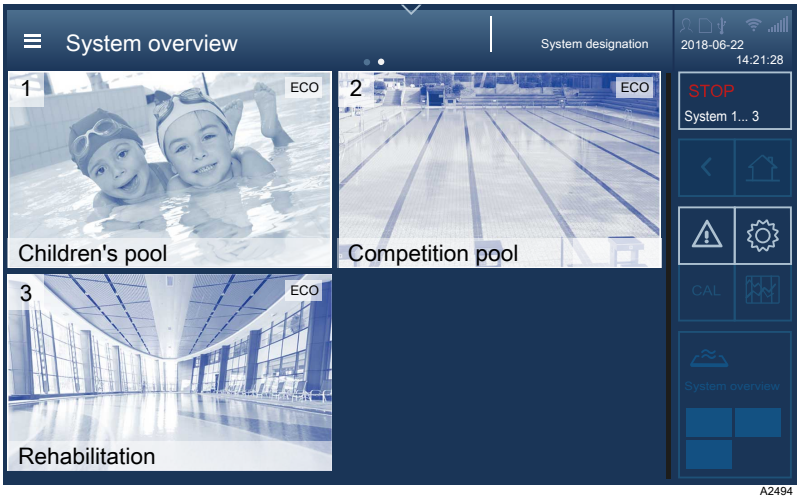


Fig. 8: [Home] screen, here with the individual system overview.

You can set the layout and assignment in the *[System settings]* menu. Tapping on the *[Home]* icon always takes you to the *[Home]* screen.

You now have two options:

- Swipe over the display to move to the next display, or
- tap on the respective pool to view the measured value display.

System measured values

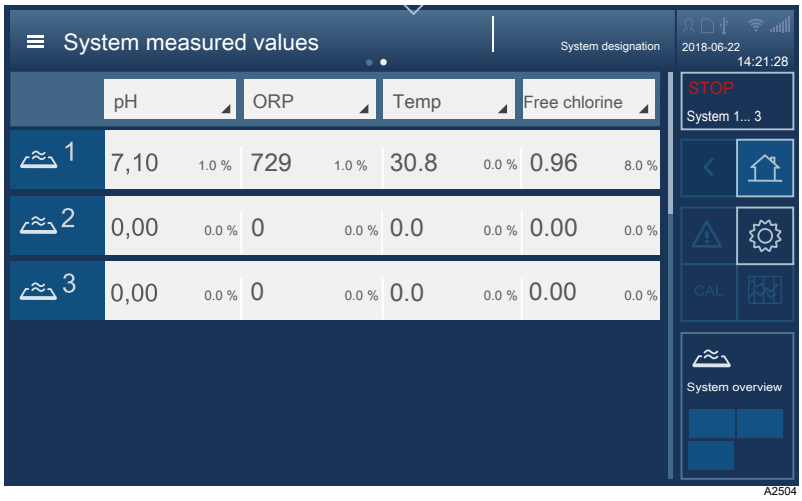


Fig. 9: Measured values interface.

You can view all the system's measured values for pools 1 to n.

→ Scrolling up or down over the display allows you to display all pools.

3.2.2.2 Pool level

Measured values of pools

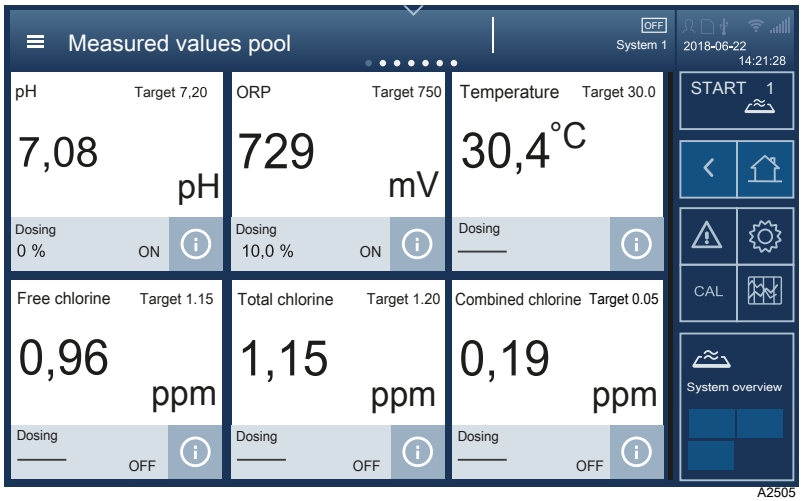


Fig. 10: Measured values interface for the selected pool.

Up to 12 measured values = tiles can be displayed. The 7 points in the centre at the top indicate that it is possible to swipe on this display.

Measured values of pools, details

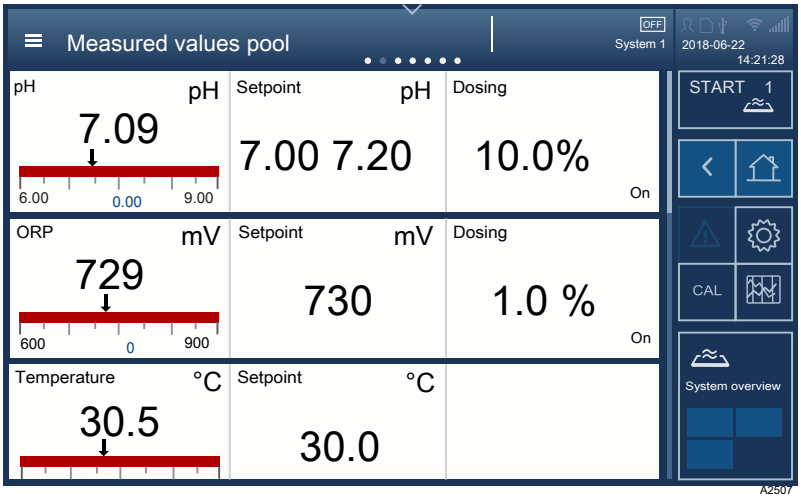


Fig. 11: Detailed pool display interface.

This display is more detailed, the set limit values are also displayed here. The measured value, setpoint and metering are displayed at a glance. The scroll bar indicates that there are more measured values below – you therefore need to scroll upwards.

Screen recorder

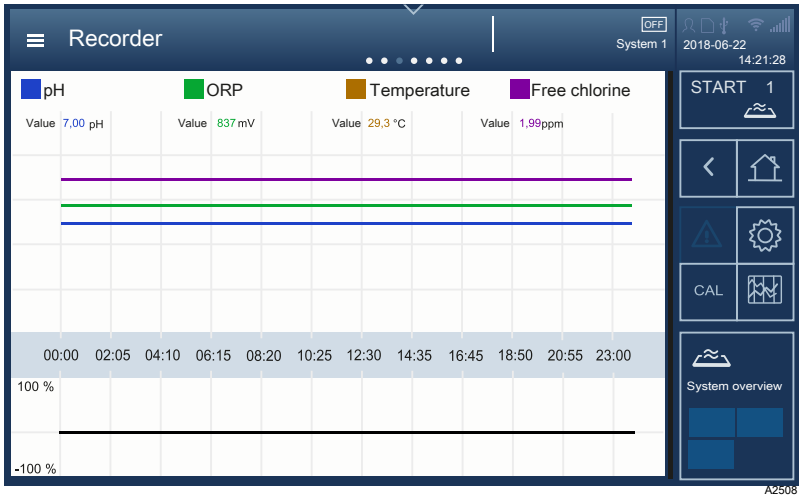


Fig. 12: Screen recorder mode interface.

This is the screen recorder : tapping on it takes you to the next page of the display. The screen recorder logs all the device's activities and measured values.

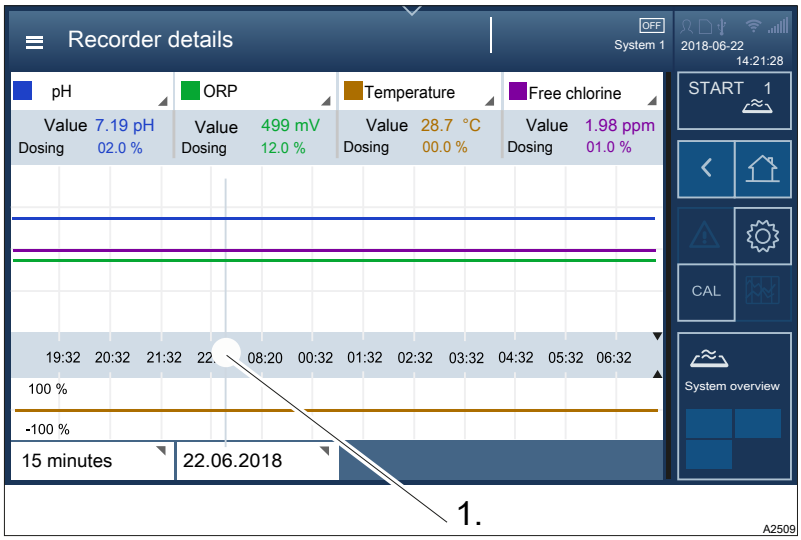


Fig. 13: Screen recorder interface with cursor (1.)

1 Cursor

The measured values at certain times can be displayed in this screen recorder view by moving the cursor (1). Tapping on and scrolling up/down the displays for measured variables, time and date lets you also select other values or units, deactivate individual measured variables and adapt the time interval displayed. Use or to go back.

Connectivity

You can monitor and configure all recognised CAN bus modules and call up and read all the parameters required here.

Pool settings

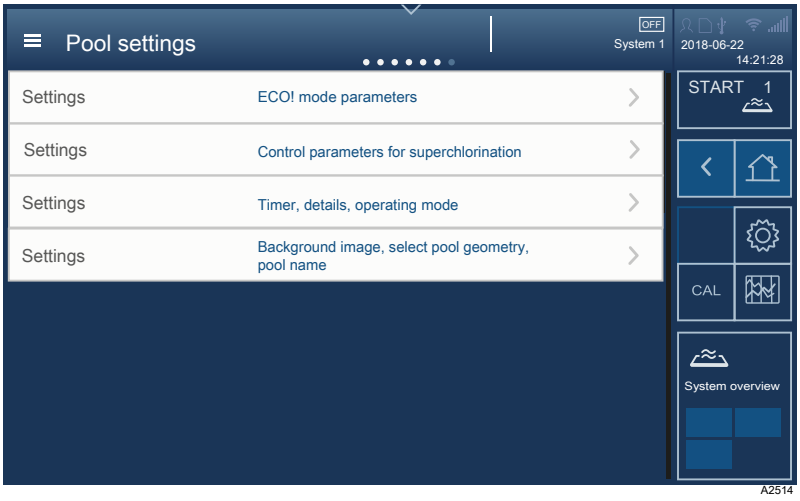


Fig. 14: Pool settings interface

You can set or select the parameters for Eco!Mode®, timer details, operating modes, superchlorination and background images here.

3.2.2.3 Detail level

Measured variables, details

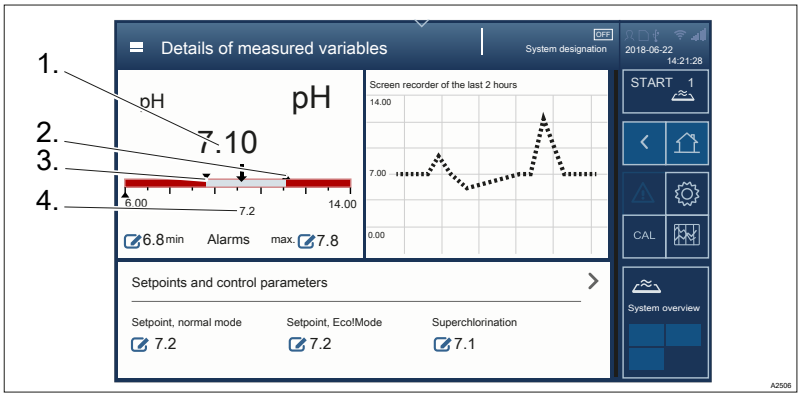


Fig. 15: Details of measured variables interface.

Tapping on the desired measured value of the measured variable takes you to the details of measured variables, the measured value screen recorder for the last 2 hours, the control parameters and setpoints for the operating modes: Normal, Eco!Mode® and superchlorination. Here you can select the normal, Eco!Mode® and superchlorination operating modes in order to set the parameters for them.

4 Access to the setting menus

You can use various means of access to access the controller's setting menus:

- Hamburger menu with access to the system.
- Hamburger menu with access to the selected pool.
- Cog wheel icon.
- Swiping and tapping on the display.

Please consult chapter *Chapter 3 'Operating concept' on page 14* for details of how to use all menus and interfaces.

4.1 Hamburger menu with access to the system

In the Hamburger menu with access to the system, you can undertake all settings, which affect the entire system and not certain pools. More menu items only become visible once you select a pool on the display, see *Chapter 4.2 'Hamburger menu with access to the selected pool' on page 25*.

Menu item	Destination of the menu item
Login	*Chapter 12.2.1 'Login/logout' on page 81*
Language settings	*Chapter 12.2.2 'Setting the language' on page 81*
Safely remove the storage medium	*Chapter 12.2.8 'Screen recorder' on page 85*
System settings	*Chapter 12.2 'System settings' on page 81*
Help topics	*Chapter 12.3 'Help topics' on page 86*
Info	*Chapter 12.4 'Information' on page 87*
Login.	*Chapter 12.2.1 'Login/logout' on page 81*

4.2 Hamburger menu with access to the selected pool

You can make all the adjustments that affect a certain pool in the hamburger menu with access to the selected pool. The pool in question is selected by tapping on the required pool before activating the hamburger menu.

Menu item	Destination of the menu item
Login	*Chapter 12.2.1 'Login/logout' on page 81*
Language settings	*Chapter 12.2.2 'Setting the language' on page 81*
Safely remove the storage medium	*Chapter 12.2.8 'Screen recorder' on page 85*
System settings	*Chapter 12.2 'System settings' on page 81*
Help topics	*Chapter 12.3 'Help topics' on page 86*
Information	*Chapter 12.4 'Information' on page 87*
Calibration	*Chapter 14 'Calibrating the measured variables' on page 91*
Screen recorder	*Chapter 12.6 'Screen recorder' on page 87*
Pool control	*Chapter 12.7 'Pool control (attractions)' on page 87*
Single pool	*Chapter 12.8 'Single pool > Measured values pool' on page 87*
Measured values pool	*Chapter 12.9 'Measured values pool' on page 87*
Connectivity	*Chapter 12.10 'Connectivity' on page 87*
Home	*Chapter 12.1 'Home' on page 81*
Login	*Chapter 12.2.1 'Login/logout' on page 81*

4.3 Cog wheel icon

The cog wheel icon takes you to the *'System settings'* *Chapter 12.2 'System settings' on page 81*menu item. The *'System settings'* menu item contains the following sub-menus:

Menu item	Sub-menu item for which parameters are to be set	Destination of the menu item
Login	free	*Chapter 12.2.1 'Login/logout' on page 81*
Language	Set the operating language	*Chapter 12.2.2 'Setting the language' on page 81*
Display	Display	*Chapter 12.2.3 'Display' on page 81*
	Colour scheme	*Chapter 12.2.3.4 'Colour scheme' on page 82*
	Screen lock	*Chapter 12.2.3.5 'Screen lock' on page 82*
	Maintenance interval	*Chapter 12.2.3.8 'Activating maintenance timer' on page 82*
	Date	*Chapter 12.2.3.1 'Date and time' on page 81*
	Time	*Chapter 12.2.3.2 'Setting units' on page 82*
System	Unit settings	*Chapter 12.2.4.1 'Unit settings' on page 83*
	Software update	*Chapter 21 'Software update' on page 115*
	Device restart	*Chapter 12.2.4 'System > System settings' on page 82*
Network	LAN	*Chapter 9 'LAN construction' on page 74*
	Wi-Fi	*Chapter 10.3 'Wi-Fi interface (optional)' on page 78*
	IP	
	DHCP client	
	DHCP server	
Web services	Intranet	*Chapter 12.2.6.1 'Web server settings' on page 84*
	Web server	*Chapter 12.2.6.3 'Intranet' on page 84*
	FTP server	*Chapter 12.2.6 'Web services > NETWORK settings' on page 84*
	VNC server	*Chapter 12.2.6.2 'VNC server' on page 84*
User administration	Add/delete user	*Chapter 12.2.7 'User administration' on page 84*
	Change password	*Chapter 12.2.7 'User administration' on page 84*
Recorder	Recorder, settings	*Chapter 12.2.8 'Screen recorder' on page 85*
E-mail	E-mail alarms, settings	*Chapter 12.2.9 'E-mail' on page 85*
Bar graphs	Settings	*Chapter 12.2.10 'Bar graphs' on page 86*
cNet/CAN network	BUS details	*Chapter 12.2.11 'Network CAN' on page 86*

Menu item	Sub-menu item for which parameters are to be set	Destination of the menu item
Functional test	Log books, network configuration	*Chapter 12.2.13 'Functional test' on page 86*
Default settings	Complete system User settings Control parameters	*Chapter 12.2.14 'Default settings' on page 86*

4.4 Swiping and tapping on the display

Once you have selected a pool, you can select the following menu items by swiping and tapping on the display.

Menu item	Destination of the menu item
Measured values pool	*Chapter 12.9 'Measured values pool' on page 87*
Recorder	*Chapter 12.6 'Screen recorder' on page 87*
Connectivity	*Chapter 12.10 'Connectivity' on page 87*
Pool control	*Chapter 12.7 'Pool control (attractions)' on page 87*
Pool settings	*Chapter 12.11.1 'ECO mode parameters' on page 87*
	Chapter 12.11.2 'Timer details operating mode' on page 88
	Chapter 12.11.3 'Background image, pool geometry, pool name' on page 88
	Chapter 12.11.4 'Superchlorination' on page 88

5 Storage and transport

- **User qualifications, storage and transport:** trained personnel
  ↳ *Chapter 1.5 'User qualification' on page 10*

CAUTION!

Danger of material damage

The device can be damaged by incorrect or improper storage or transportation!

- The unit should only be stored or transported in a well packaged state - preferably in its original packaging.
- The packaged unit should also only be stored or transported in accordance with the stipulated storage conditions.
- The packaged unit should be protected from moisture and the ingress of chemicals.

Packaging material

If required, dispose of the packaging material in an environmentally responsible way. All packaging components carry the corresponding recycling code ♻.

Ambient conditions for storage and transport

Store and transport the system in its original packaging.

Also protect the packaged systems against damp, exposure to chemicals and mechanical effects.

Storage temperature: - 20 ... 70 °C.

Air humidity: < 95% relative humidity, non-condensing.

Humidity: None. Avoid rain and condensation.

Other: No dust, no direct sunlight.

Storage period

There is no limit to the storage period.

Transport weight

The transport weight depends on the device's equipment and lies between 4 ... 8 kg.

6 Assembly and installation

6.1 Installation site and ambient conditions

- **User qualification, mechanical installation:** trained and qualified personnel *Chapter 1.5 'User qualification' on page 10*
- **User qualification, electrical installation:** Electrical technician *Chapter 1.5 'User qualification' on page 10*

NOTICE!

Installation site and ambient conditions

- The controller meets the requirements for degree of protection IP 67 (housing, closed) or IP 20 (housing, open) and leak-tightness (based on NEMA 4X). These standards are only met if all seals and threaded connectors are correctly fitted.
- Only carry out the (electrical) installation after (mechanical) installation.
- Ensure that there is unimpeded access for operation.
- Ensure safe and low-vibration fixing.
- No direct sunlight.
- Permissible ambient temperature of the controller at the installation location: - 5 ... 50 °C at max. 95% relative air humidity (non-condensing).
- Requires a low-voltage cable with a temperature resistance of ≧ 70 °C.
- Take into consideration the permissible ambient temperature of the connected sensors and other components.
- The controller is only suitable for operation in closed rooms. If operating outdoors, use a suitable protective enclosure to protect the controller from the environment.

Mounting position

- *A wall-mounted controller is used as standard.*
- *Always install the controller so that the cable entries point downwards.*
- *Leave sufficient free space for the cables.*
- *Attach the controller in such a way that the upper part of the housing can be opened upwards with ease and does not hit anything or become obstructed.*
- *Attach the controller in such a way that the opened upper part of the housing does not present an obstacle or danger point.*

6.2 Scope of delivery

Tab. 3: The following components are included as standard:

Description	Quantity
Measuring/control system DULCOMARIN® 3 including wall bracket.	1
Assembly material, complete, 2P universal (set).	2

Description	Quantity
Threaded cable connector set, M20 DCPa.	1
Data DVD.	1
Operating instructions.	1
Access card with PUK.	1

6.3 Installation, mechanical

- **User qualification, mechanical installation:** trained and qualified personnel ↳ *Chapter 1.5 'User qualification' on page 10*

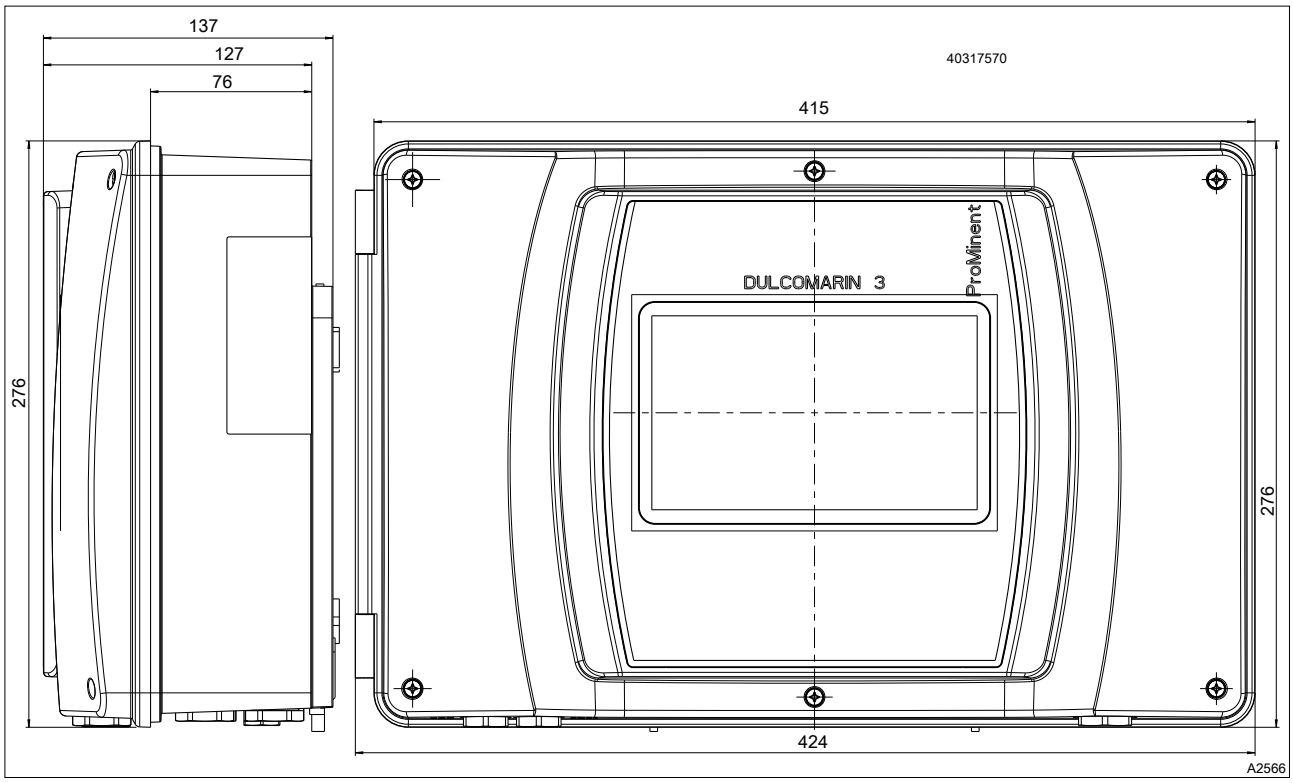


Fig. 16: Dimensional drawing, all dimensions in millimetres.

Install the device so that it is at eye level and is easily accessible to operating personnel. Leave enough free space on the left of the device for it to be folded open.

6.3.1 Wall mounting

Mounting materials (contained in the scope of delivery)

- 1 x wall bracket
- 4 x PT screws 5 x 35 mm
- 4 x washers 5.3
- 4 x rawl plug Ø 8 mm, plastic

Wall mounting

Take the wall bracket out of the housing

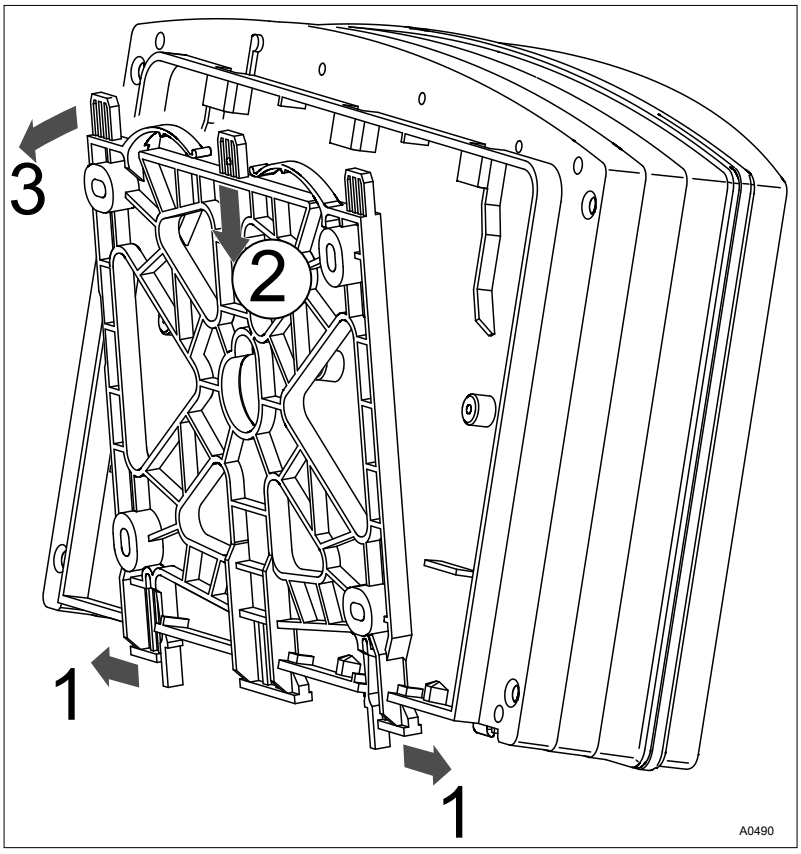


Fig. 17: Removing the wall bracket

1. Pull the two snap hooks (1) outwards
   ⇨ The wall brackets snaps slightly downwards.
2. Push the wall bracket downwards (2) from the housing and fold (3) it out
3. Use the wall bracket as a drilling template to mark the positions of four drill holes
4. Drill the holes: Ø 8 mm, d = 50 mm

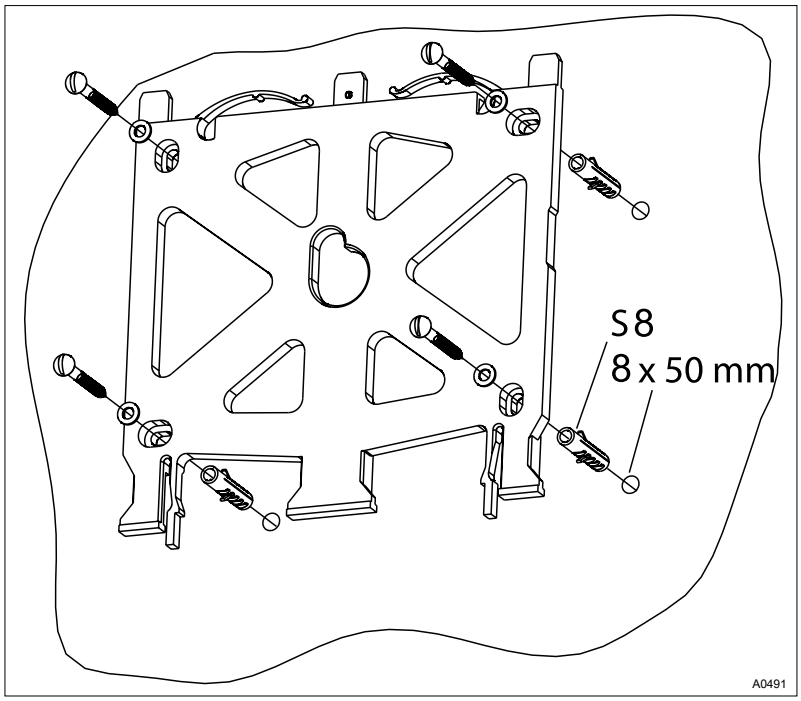


Fig. 18: Fitting the wall bracket

5. Screw the wall bracket into position using the washers, see Fig. 18

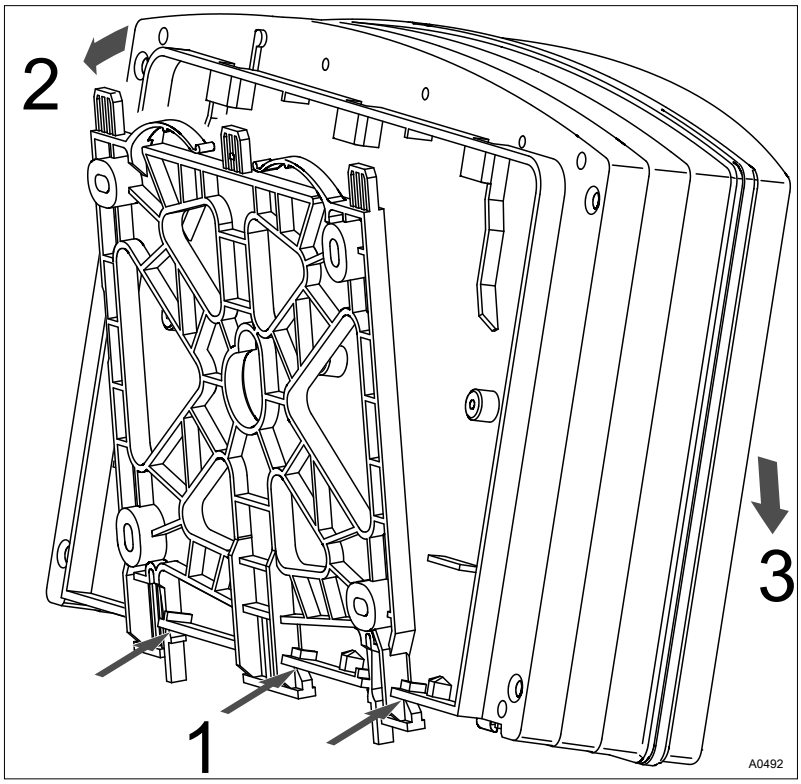


Fig. 19: Fitting the wall bracket

6. Hook the bottom of the housing (1) into the wall bracket
7. Lightly press the housing at the top (2) against the wall bracket
8. Then check that the housing is hooked in at the top and press down (3) until it audibly engages

6.4 Electrical installation

- **User qualification, electrical installation:** Electrical technician
  Chapter 1.5 'User qualification' on page 10

WARNING!

Mains connection via mains plug is not permissible.

The device must not be connected to the mains using a mains plug. If the socket is incorrectly wired, there is a risk of electrical safety not being provided due to faulty potentials.

Only connect the device via a terminal box.

Lightning and surge protection

We recommend fitting lightning and surge protection in the building. The lightning and surge protection should include protection from high, medium and low voltage power surges. The operator is responsible for ensuring that the lightning and surge protection required is implemented correctly.

The cabling system requires a low voltage cable with a temperature resistance of ≧ 70 °C.

Only use the threaded cable connector set supplied with installation to guarantee the degree of protection and UL® requirement. Make sure that the device has no unsealed openings after installation.

Procedure for fitting the threaded cable connector in a watertight manner

1. Manually tighten the threaded cable connector's union nuts. "Manually tighten" means ➡ tighten as far as possible without tools.

   Ensure that the rubber insert surrounds the cable or closure cap in a snug manner. There should be no gaps.

2. Then use an appropriate tool to tighten the union nuts by 90°.

6.4.1 Dimensioning/ arrangement of threaded connectors

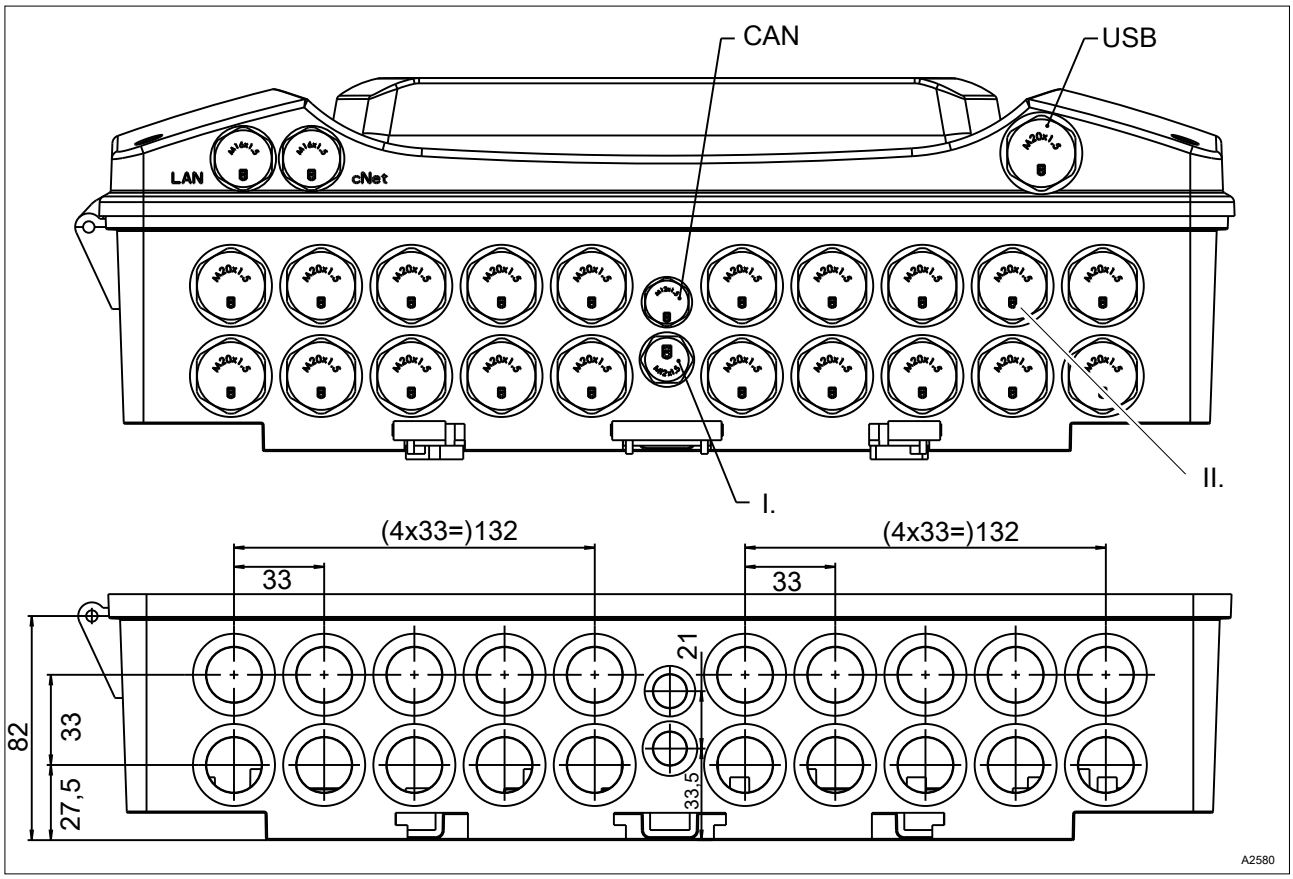


Fig. 20: Dimensioning/ arrangement of threaded connectors

I. Bleeding (must not be removed or sealed)
II. Blanking plug

→ Remove the blind plugs on the device and insert the appropriate threaded cable connectors. Use the appropriate sealing inserts depending on the cable used. The appropriate threaded cable connectors form part of the device's scope of delivery. The individual parts are specified in detail here ↳ *Tab. 4 'Individual parts of threaded cable connector set M20 DCPa. Part number: 1092176' on page 34*.

Tab. 4: Individual parts of threaded cable connector set M20 DCPa. Part number: 1092176

Name	Quantity in parts	Part number
Threaded cable connectors, M20x1.5, (5-13) 9005 V0	10	1092175
Sealing ring, M20/4x, Ø5	5	1045172
Sealing ring M20/2x, Ø4	5	1045173
Sealing ring M20/2x, Ø6	5	1045194
Sealing stopper, Ø4 mm, PA, red	4	1092174
Sealing stopper, Ø5 mm, PA, red	4	1092122
Sealing stopper, Ø6 mm, PA, red	4	1092123

6.4.2 Connection labels, base module

Tab. 5: DULCOMARIN® 3, connection labels, 100 ... 230 V AC

Description	Terminal identifier	Terminals	Pin	Signal	Function
Power supply 100 ... 230 V AC	*[Power IN]*	XP1	12 (L)	Phase	AC voltage supply to unit
			8 (N)	Neutral conductor	
			4 (PE)	Protective earth conductor	
External supply 100 ... 230 V AC	*[Power OUT]*		11 (L)	Phase	Supply voltage to output
			7 (N)	Neutral conductor	
			3 (PE)	Protective earth conductor	
External supply 100 ... 230 V AC			10 (L)	Phase	Supply voltage to output
			6 (N)	Neutral conductor	
			2 (PE)	Protective earth conductor	
External supply 100 ... 230 V AC			9 (L)	Phase	Supply voltage to output
			5 (N)	Neutral conductor	
			1 (PE)	Protective earth conductor	
Output relay 6 feeding NO	*[Powered relays Rel 6]*	XR5	12 (L*) switched	Phase switched	Output relay 100 ... 230 V AC
			8 (N)	Neutral conductor	
			4 (PE)	Protective earth conductor	
Output relay 6 feeding NC			11 (L*) switched	Phase switched	
			7 (N)	Neutral conductor	
			3 (PE)	Protective earth conductor	
Output relay 5 feeding NO	*[Powered relays Rel 5]*		10 (L*) switched	Phase switched	Output relay 100 ... 230 V AC
			6 (N)	Neutral conductor	
			2 (PE)	Protective earth conductor	
Output relay 5 feeding NC			9 (L*) switched	Phase switched	
			5 (N)	Neutral conductor	
			1 (PE)	Protective earth conductor	
Output relay 4 feeding NO	*[Powered relays Rel 4]*	XR4	12 (L*) switched	Phase switched	Output relay 100 ... 230 V AC
			11 (L*) switched	Phase switched	
			8 (N)	Neutral conductor	

Description	Terminal identifier	Terminals	Pin	Signal	Function
			7 (N)	Neutral conductor	
			4 (PE)	Protective earth conductor	
			3 (PE)	Protective earth conductor	
Output relay 4 feeding NC			10 (L*) switched	Phase switched	
			9 (L*) switched	Phase switched	
			6 (N)	Neutral conductor	
			5 (N)	Neutral conductor	
			2 (PE)	Protective earth conductor	
			1 (PE)	Protective earth conductor	
Potential-free output relay 3	*[Dry relays Rel 3]*	XR3	1 (COM)	Root	Potential-free output relay 100 ... 230 V AC or 24 V DC*
			2 (NO)	Normally Open	
			3 (NC)	Normally Closed	
Potential-free output relay 2	*[Dry relays Rel 2]*	XR2	1 (COM)	Root	Potential-free output relay 100 ... 230 V AC or 24 V DC*
			2 (NO)	Normally Open	
			3 (NC)	Normally Closed	
Potential-free output relay 1	*[Dry relays Rel 1]*	XR1	1 (COM)	Root	Potential-free output relay 100 ... 230 V AC or 24 V DC*
			2 (NO)	Normally Open	
			3 (NC)	Normally Closed	
* If XR1 to XR 3 is supplied with 24 V, then the leads of the respective cable must also be fixed with cable connectors (double insulation).					
Control output 4	*[Digital outputs]*	XA4	1 (A)	Contact output A	Pulse frequency output for the control of electronic metering pumps, e.g. Beta4b. Max. load: max. switching voltage (safety low voltage) 30 V_{SS} AC or DC Max. switching current 250 mA (wear-free OptoMos relay
			2 (B)	Contact output B	
Control output 3		XA3	1 (A)	Contact output A	Digital output, control, OptoMos relay
			2 (B)	Contact output B	
Control output 2		XA2	1 (A)	Contact output A	Digital output, control, OptoMos relay
			2 (B)	Contact output B	
Control output 1		XA1	1 (A)	Contact output A	Digital output, control, OptoMos relay

Description	Terminal identifier	Terminals	Pin	Signal	Function
			2 (B)	Contact output B	
Digital input 8	*[Digital inputs]*	XK8	1 (-)	Reference potential	Digital control input, depending on the configuration: sample water alarm or pause control. A potential-free contact is connected to terminal 1 and 2. Electronic contacts can be supplied with 15 V if required. Max. cable length 30 m (EMC standard 61326) Power supply
			2 (+)	Contact input	
			3 (+V)	+15 V/10 mA power supply	
Digital input 7		XK7	1 (-)	Reference potential	External contact input with 15 V/10 mA power supply
			2 (+)	Contact input	
			3 (+V)	+15 V/10 mA power supply	
Digital input 6		XK6	1 (-)	Reference potential	External contact input with 15 V/10 mA power supply
			2 (+)	Contact input	
			3 (+V)	+15 V/10 mA power supply	
Digital input 5		XK5	1 (-)	Reference potential	External contact input with 15 V/10 mA power supply
			2 (+)	Contact input	
			3 (+V)	+15 V/10 mA power supply	
Digital input 4		XK4	1 (-)	Reference potential	External contact input with 15 V/10 mA power supply
			2 (+)	Contact input	
			3 (+V)	+15 V/10 mA power supply	
Digital input 3		XK3	1 (-)	Reference potential	External contact input with 15 V/10 mA power supply
			2 (+)	Contact input	
			3 (+V)	+15 V/10 mA power supply	
Digital input 2		XK2	1 (-)	Reference potential	External contact input with 15 V/10 mA power supply
			2 (+)	Contact input	
			3 (+V)	+15 V/10 mA power supply	
Digital input 1		XK1	1 (-)	Reference potential	External contact input with 15 V/10 mA power supply
			2 (+)	Contact input	
			3 (+V)	+15 V/10 mA power supply	
CAN bus 1	*[CAN]*	XC1	1 (CAN-SCHIRM)	CAN shield with connection to PE	CAN 1 local CAN-BUS with external power supply 20 V / 0.4 A (power-

Description	Terminal identifier	Terminals	Pin	Signal	Function
			2 (CANV+)	CAN supply voltage +20 V/400 mA	restricted) with CAN shield to PE connector
			3 (CANGND)	CAN reference potential	
			4 (CANH)	CAN high	
			5 (CANL)	CAN low	
		XC3	1 (CAN-SCHIRM)	CAN shield	CAN 1 local CAN-BUS with external power supply 20 V / 0.4 A (power-restricted) without CAN shield to PE connector
			2 (CANV+)	CAN supply voltage +20 V/400 mA	
			3 (CANGND)	CAN reference potential	
			4 (CANH)	CAN high	
			5 (CANL)	CAN low	
Modules 1					Module slot 1 for 2-channel IO modules
Modules 2					Module slot 2 for 2-channel IO modules
Modules 3					Module slot 3 for 2-channel IO modules
Modules 4					Module slot 4 for 2-channel IO modules

Tab. 6: DULCOMARIN® 3, connector labels, 24 V DC

Description	Terminal identifier	Terminals	Pin	Signal	Function
24 VDC supply	*[Power IN]*	XP1	12 (+)	Phase	DC supply to unit 24 VDC, - 15% ... +20 %
			8 (-)	Neutral conductor	
			4 (PE)	Protective earth conductor	
External power supply 24 VDC	*[Power OUT]*		11 (+)	Phase	Supply voltage for output 24 VDC, -15% ... +20 %
			7 (-)	Neutral conductor	
			3 (PE)	Protective earth conductor	
External power supply 24 VDC			10 (+)	Phase	Supply voltage for output 24 VDC, -15% ... +20 %
			6 (-)	Neutral conductor	
			2 (PE)	Protective earth conductor	
External power supply 24 VDC			9 (+)	Phase	Supply voltage for output 24 VDC, -15% ... +20 %
			5 (-)	Neutral conductor	
			1 (PE)	Protective earth conductor	
Output relay 6 feeding NO	*[Powered relays Rel 6]*	XR5	12 (+) switched	Phase switched	Output relay 24 VDC, -15% ... +20 %
			8 (N)	Neutral conductor	
			4 (PE)	Protective earth conductor	
Output relay 6 feeding NC			11 (+) switched	Phase switched	
			7 (-)	Neutral conductor	
			3 (PE)	Protective earth conductor	
Output relay 5 feeding NO	*[Powered relays Rel 5]*		10 (+) switched	Phase switched	Output relay 24 VDC, -15% ... +20 %
			6 (-)	Neutral conductor	
			2 (PE)	Protective earth conductor	
Output relay 5 feeding NC			9 (+) switched	Phase switched	
			5 (-)	Neutral conductor	
			1 (PE)	Protective earth conductor	
Output relay 4 feeding NO	*[Powered relays Rel 4]*	XR4	12 (+) switched	Phase switched	Output relay 24 VDC, -15% ... +20 %
			11 (+) switched	Phase switched	
			8 (-)	Neutral conductor	
			7 (-)	Neutral conductor	

Description	Terminal identifier	Terminals	Pin	Signal	Function
			4 (PE)	Protective earth conductor	
			3 (PE)	Protective earth conductor	
Output relay 4 feeding NC			10 (+) switched	Phase switched	
			9 (+) switched	Phase switched	
			6 (-)	Neutral conductor	
			5 (-)	Neutral conductor	
			2 (PE)	Protective earth conductor	
			1 (PE)	Protective earth conductor	
Potential-free output relay 3	*[Dry relays Rel 3]*	XR3	1 (COM)	Root	Potential-free output relay 100 ... 230 V AC or 24 V DC
			2 (NO)	Normally Open	
			3 (NC)	Normally Closed	
Potential-free output relay 2	*[Dry relays Rel 2]*	XR2	1 (COM)	Root	Potential-free output relay 100 ... 230 V AC or 24 V DC
			2 (NO)	Normally Open	
			3 (NC)	Normally Closed	
Potential-free output relay 1	*[Dry relays Rel 1]*	XR1	1 (COM)	Root	Potential-free output relay 100 ... 230 V AC or 24 V DC
			2 (NO)	Normally Open	
			3 (NC)	Normally Closed	
Control output 4	*[Digital outputs]*	XA4	1 (A)	Contact output A	Pulse frequency output for the control of electronic metering pumps, e.g. Beta4b. Max. load: max. switching voltage (safety low voltage) 30 V_{SS} AC or DC Max. switching current 250 mA (wear-free OptoMos relay
			2 (B)	Contact output B	
Control output 3		XA3	1 (A)	Contact output A	Digital output, control, OptoMos relay
			2 (B)	Contact output B	
Control output 2		XA2	1 (A)	Contact output A	Digital output, control, OptoMos relay
			2 (B)	Contact output B	
Control output 1		XA1	1 (A)	Contact output A	Digital output, control, OptoMos relay
			2 (B)	Contact output B	

Description	Terminal identifier	Terminals	Pin	Signal	Function
Digital input 8	*[Digital inputs]*	XK8	1 (-)	Reference potential	External contact input with 15 V/10 mA power supply
			2 (+)	Contact input	
			3 (+V)	+15 V/10 mA power supply	
Digital input 7		XK7	1 (-)	Reference potential	Digital control input, depending on the configuration: sample water alarm or pause control. A potential-free contact is connected to terminal 1 and 2. Electronic contacts can be supplied with 15 V if required. Max. cable length 30 m (EMC standard 61326) Power supply
			2 (+)	Contact input	
			3 (+V)	+15 V/10 mA power supply	
Digital input 6		XK6	1 (-)	Reference potential	External contact input with 15 V/10 mA power supply
			2 (+)	Contact input	
			3 (+V)	15 V/10 mA power supply	
Digital input 5		XK5	1 (-)	Reference potential	External contact input with 15 V/10 mA power supply
			2 (+)	Contact input	
			3 (+V)	+15 V/10 mA power supply	
Digital input 4		XK4	1 (-)	Reference potential	External contact input with 15 V/10 mA power supply
			2 (+)	Contact input	
			3 (+V)	+15 V/10 mA power supply	
Digital input 3		XK3	1 (-)	Reference potential	External contact input with 15 V/10 mA power supply
			2 (+)	Contact input	
			3 (+V)	+15 V/10 mA power supply	
Digital input 2		XK2	1 (-)	Reference potential	External contact input with 15 V/10 mA power supply
			2 (+)	Contact input	
			3 (+V)	+15V/10mA power supply	
Digital input 1		XK1	1 (-)	Reference potential	External contact input with 15 V/10 mA power supply
			2 (+)	Contact input	
			3 (+V)	+15V/10mA power supply	

Description	Terminal identifier	Terminals	Pin	Signal	Function
CAN bus 1	*[CAN]*	XC1	1 (CAN-SCHIRM)	CAN shield with connection to PE	CAN 1 local CAN-BUS with external power supply 20 V / 0.4 A (power-restricted) with CAN shield to PE connector
			2 (CANV+)	CAN supply voltage +20 V/400 mA	
			3 (CANGND)	CAN reference potential	
			4 (CANH)	CAN high	
			5 (CANL)	CAN low	
		XC3	1 (CAN-SCHIRM)	CAN shield	CAN 1 local CAN-BUS with external power supply 20 V / 0.4 A (power-restricted) without CAN shield to PE connector
			2 (CANV+)	CAN supply voltage +20 V/400 mA	
			3 (CANGND)	CAN reference potential	
			4 (CANH)	CAN high	
			5 (CANL)	CAN low	
Modules 1					Module slot 1 for 2-channel IO modules
Modules 2					Module slot 2 for 2-channel IO modules
Modules 3					Module slot 3 for 2-channel IO modules
Modules 4					Module slot 4 for 2-channel IO modules

Tab. 7: DULCOMARIN® 3, upper part of housing

Description	Terminal identifier	Terminals	Pin	Signal	Function
Modbus RTU	*[RS485 IN]*	XB1	1 (A)	Cable A	Modbus-RTU input
			2 (B)	Cable B	
			3 (GND)	RS485 reference potential	
			4 (shield)	RS485 shield	
	[RS485 OUT]	XB2	1 (A)	Cable A	Modbus RTU output
			2 (B)	Cable B	
			3 (GND)	RS485 reference potential	
			4 (shield)	RS485 shield	
LAN					Customer LAN interface
cNet					Internal ProMinent system interface for distributed system
USB					USB interface for customer's USB stick
SD card					ProMinent internal SD card reader

Tab. 8: Connection label on the base module

Connection label	Function
Modules 1	Module slot 1 for 2-channel IO modules
Modules 2	Module slot 2 for 2-channel IO modules
Modules 3	Module slot 3 for 2-channel IO modules
Modules 4	Module slot 4 for 2-channel IO modules
XC1	Connector of CAN bus with CAN shield on PE
XC3	Connector of CAN bus without CAN shield on PE
XK1	Digital input for potential-free signals (e.g. sample water fault, pause etc.)
XK2	Digital input for potential-free signals (e.g. sample water fault, pause etc.)
XK3	Digital input for potential-free signals (e.g. sample water fault, pause etc.)
XK4	Digital input for potential-free signals (e.g. sample water fault, pause etc.)
XK5	Digital input for potential-free signals (e.g. sample water fault, pause etc.)
XK6	Digital input for potential-free signals (e.g. sample water fault, pause etc.)
XK7	Digital input for potential-free signals (e.g. sample water fault, pause etc.)
XK8	Digital input for potential-free signals (e.g. sample water fault, pause etc.)
XA1	Digital input for potential-free signals (e.g. sample water fault, pause etc.)
XA2	Digital input for potential-free signals (e.g. sample water fault, pause etc.)
XA3	Digital input for potential-free signals (e.g. sample water fault, pause etc.)
XA4	Digital input for potential-free signals (e.g. sample water fault, pause etc.)
Rel 1 XR1	Alternating relay, unpowered
Rel 2 XR2	Alternating relay, unpowered
Rel 3 XR3	Alternating relay, unpowered
Rel 4 XR4	Alternating relay, unpowered, fused, NO with RC circuit
Rel 5 XR5	Alternating relay, unpowered, fused, NO with RC circuit
Rel 6 XR5	Alternating relay, unpowered, fused, NO and NC with RC circuit
Power IN	Feed 100 … 240 V AC, L, N, PE
Power OUT	Outlet 100 …240 V AC, L, N, PE, max.10 A for feed Rel1, Rel2, Rel3

Tab. 9: Connection label on the upper part of the housing

Connection label	Function
USB	USB interface for customer’s USB stick.
cNet	Internal ProMinent system interface for distributed systems.
LAN	Customer LAN interface.
XB1	Modbus (RS485) interface, input.
XB2	Modbus (RS485) interface, output.

6.4.3 Terminal layout

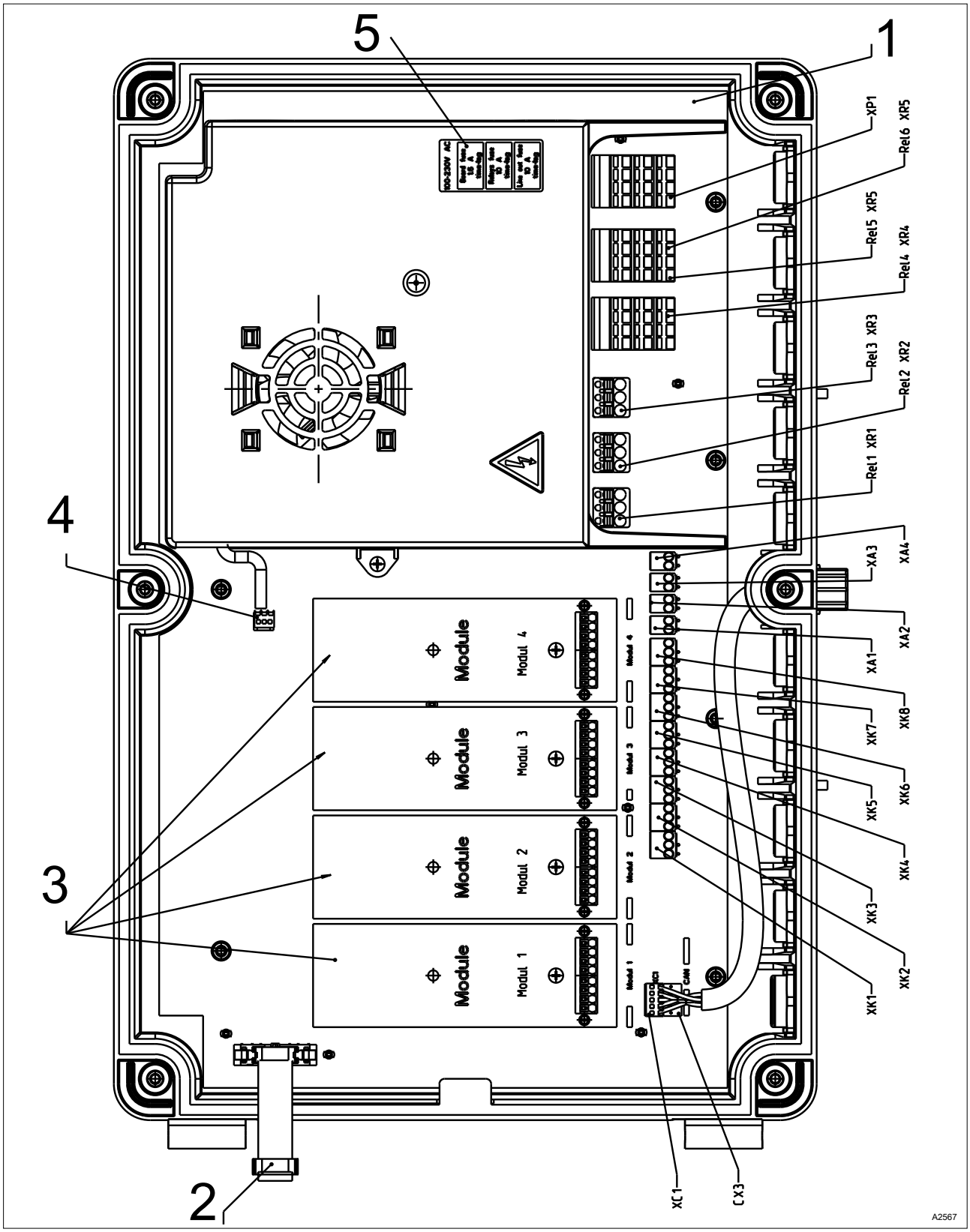


Fig. 21: Terminal layout

1 Base module
2 Internal connection to the HMI
3 Module plug-in contacts
4 Fan connector
5 Position of fuses under the cover

6.4.4 Terminal diagram

To preserve the relay's contacts, we recommend using a protective RC circuit (e.g. part number 710802). This should be connected in parallel to the load, also see *Chapter 6.4.6 'Switching of inductive loads' on page 54*.

Relays 4, 5 and 6 already have RC circuits, *Tab. 8 'Connection label on the base module' on page 44*.

6.4.4.1 Interfaces in the lower part of the housing - 1

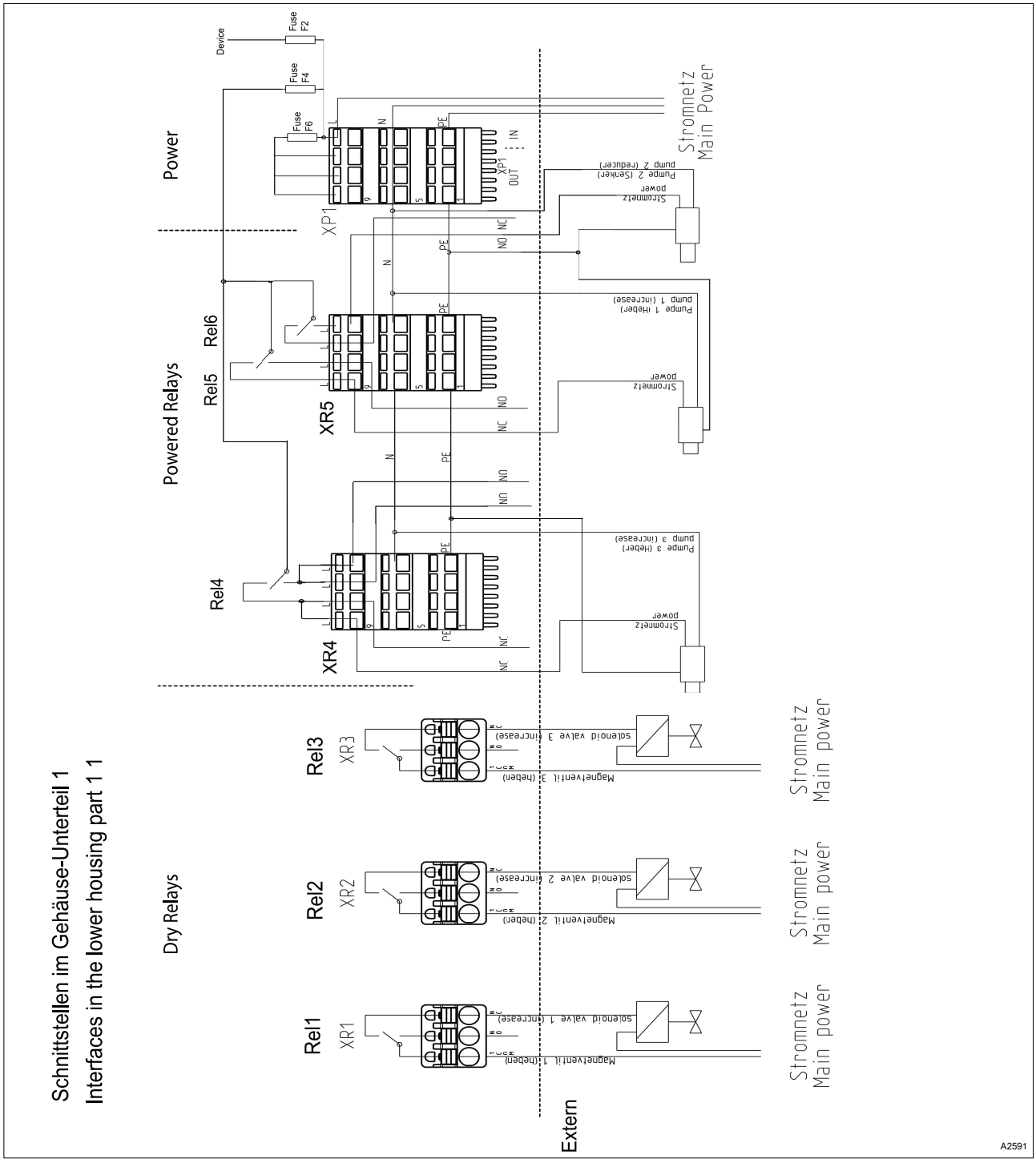


Fig. 22: Interfaces in the lower part of the housing - 1

6.4.4.2 Interfaces in the lower part of the housing - 2

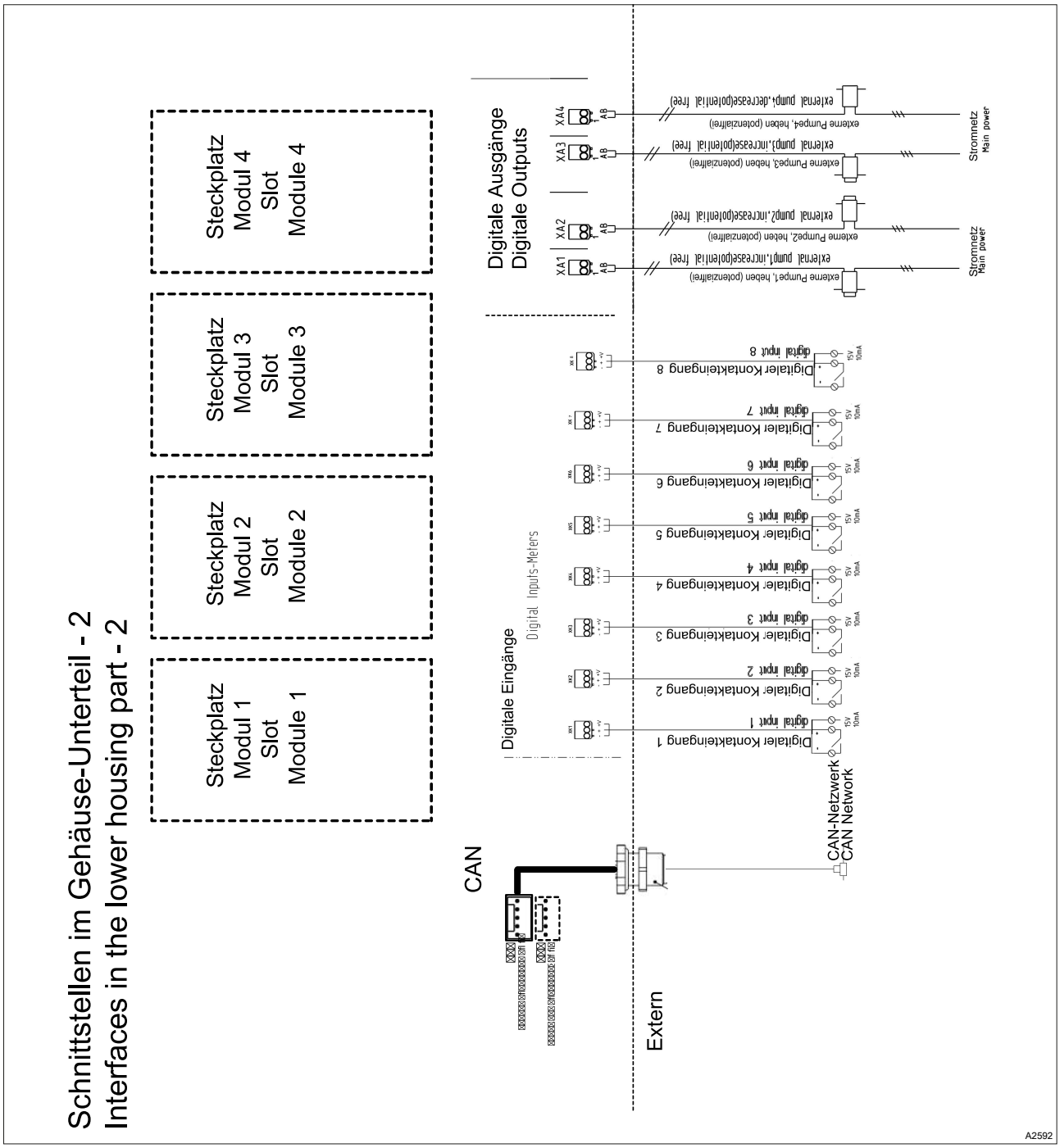


Fig. 23: Interfaces in the lower part of the housing - 2

6.4.4.3 Interfaces in the top part of the housing

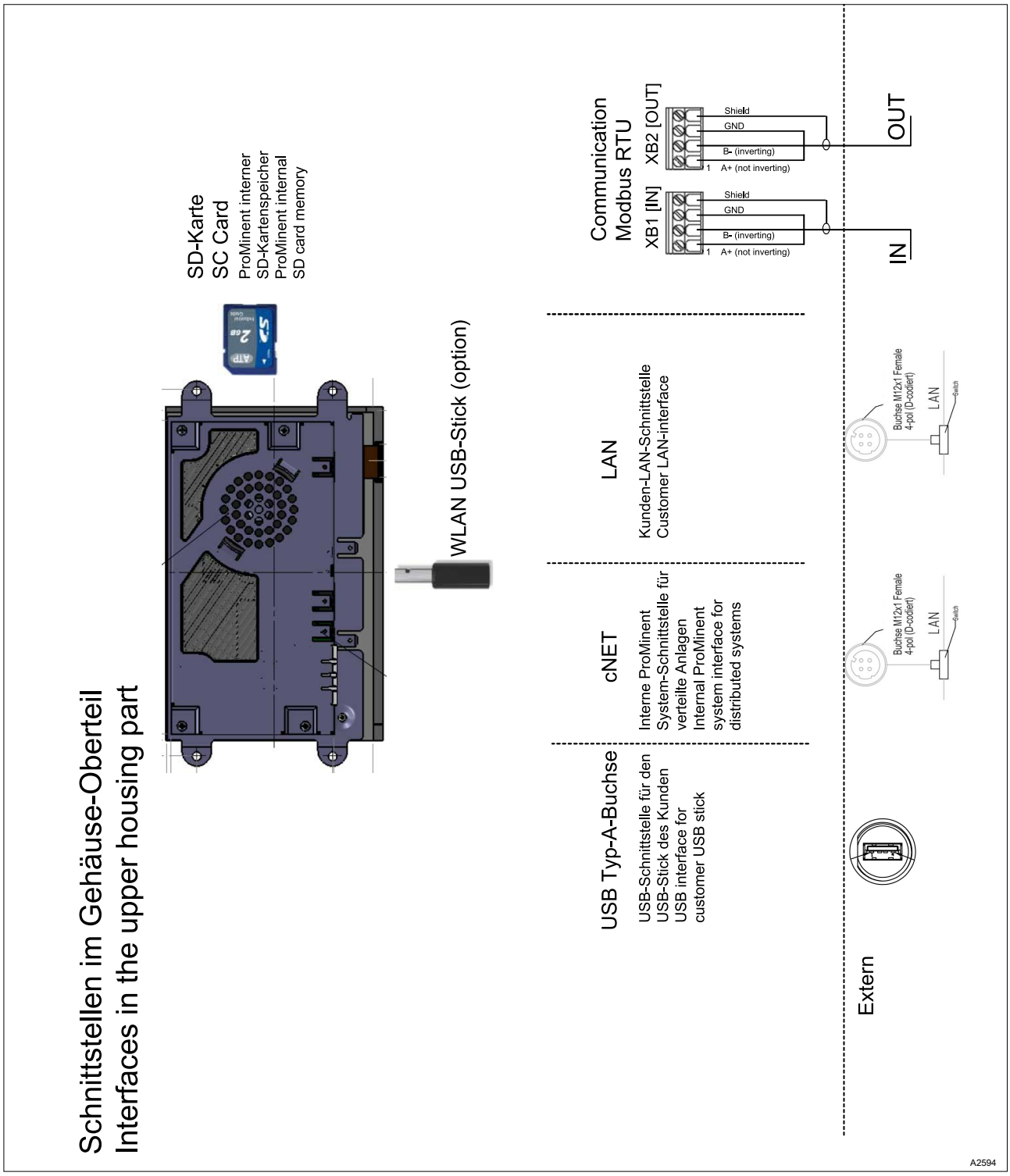


Fig. 24: Interfaces in the top part of the housing

6.4.4.4 Module interfaces

6.4.4.4.1 Module: mV temperature/mA input. Part number 734355

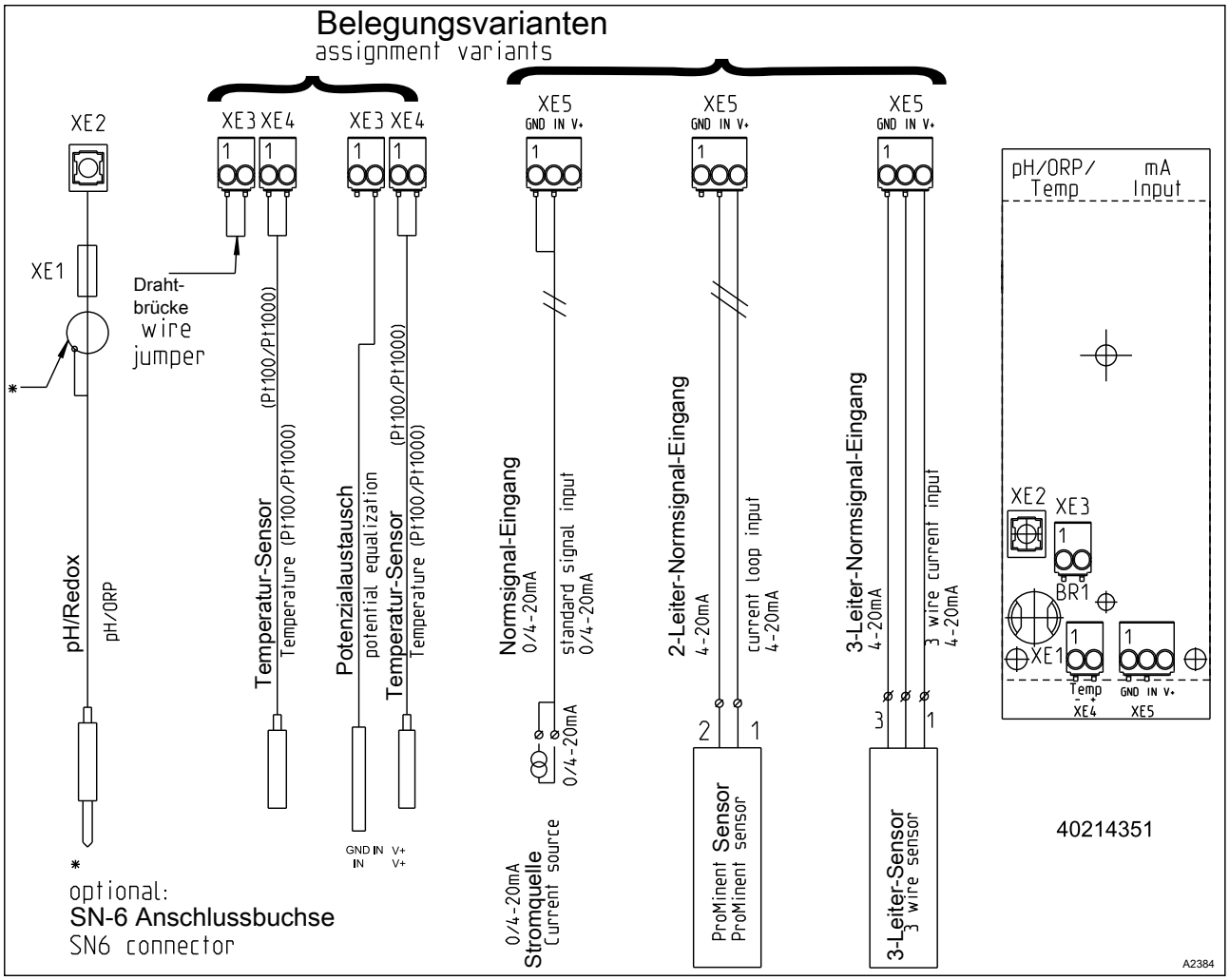


Fig. 25: Module: mV temperature/mA input. Part number 734355

A module for the direct measurement of a pH value or redox potential via a coaxial cable and a sensor signal from an mA 2-wire sensor, e.g. for chlorine, bromine or peracetic acid (PES).

mA interface:

- for use with ProMinent 2-wire transmitters and sensors with 2-wire mA interface.
- Processing of active mA signals, type of connector: current source.
- Driver voltage: 24 V DC.
- Max. current 50 mA.
- Input switches off at 70 mA.
- Protection against reverse polarity and overvoltage up to max. 30 V DC.
- Maximum cable length: 30 m, limited by the EMC specification.

2-wire control line for the connection of mA sensors to terminals XE5.2 and XE5.3

Control line LiYY, 2 x 0.25 mm^2, Ø 4 mm, part number 725122

mV interface:

- For the direct connection of pH and ORP sensors
- Maximum cable length: 10 m

Tab. 10: Sensor connection cable, coaxial, for terminal XE1/XE2

Description	Part number
Cable combination, coaxial, Ø 5 mm 0.8 m - SN6 – pre-assembled.	1024105
Cable combination, coaxial, Ø 5 mm 2 m - SN6 – pre-assembled.	1024106
Cable combination, coaxial, Ø 5 mm 5 m - SN6 – pre-assembled.	1024107

6.4.4.4.2 Module: 2x mV inputs/temperature input. Part number 734131

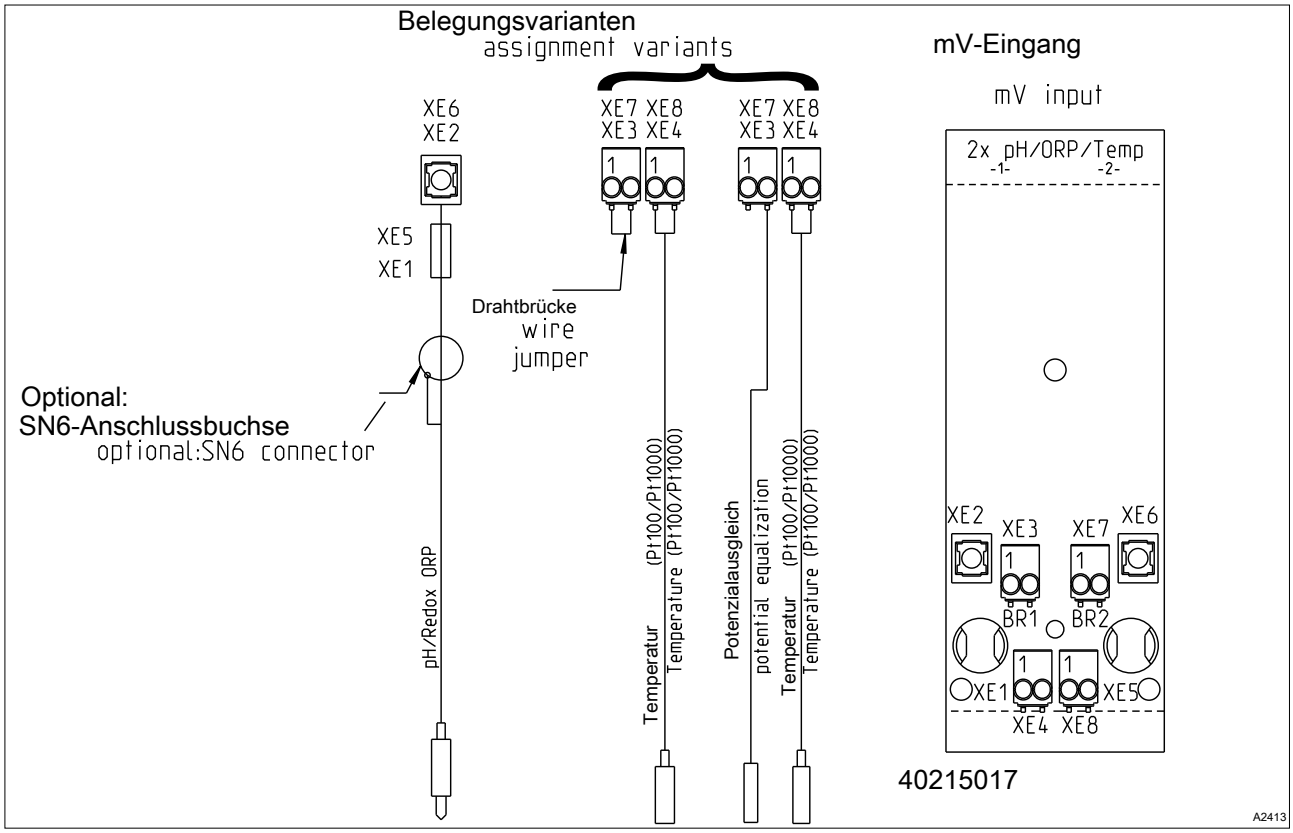


Fig. 26: Module: 2x mV inputs/temperature input. Part number 734131

A module for the direct measurement of two pH values or two redox potentials or pH value and redox potential via a coaxial cable.

- For the direct connection of pH and ORP sensors
- Maximum cable length: 10 m

Tab. 11: Sensor connection cable, coaxial, for terminal XE1/XE2 and X5/X6

Description	Part number
Cable combination, coaxial, Ø 5 mm 0.8 m - SN6 – pre-assembled.	1024105
Cable combination, coaxial, Ø 5 mm 2 m - SN6 – pre-assembled.	1024106
Cable combination, coaxial, Ø 5 mm 5 m - SN6 – pre-assembled.	1024107

6.4.4.4.3 Module: 2x conductive conductivity/temperature sensors. Part number 734223

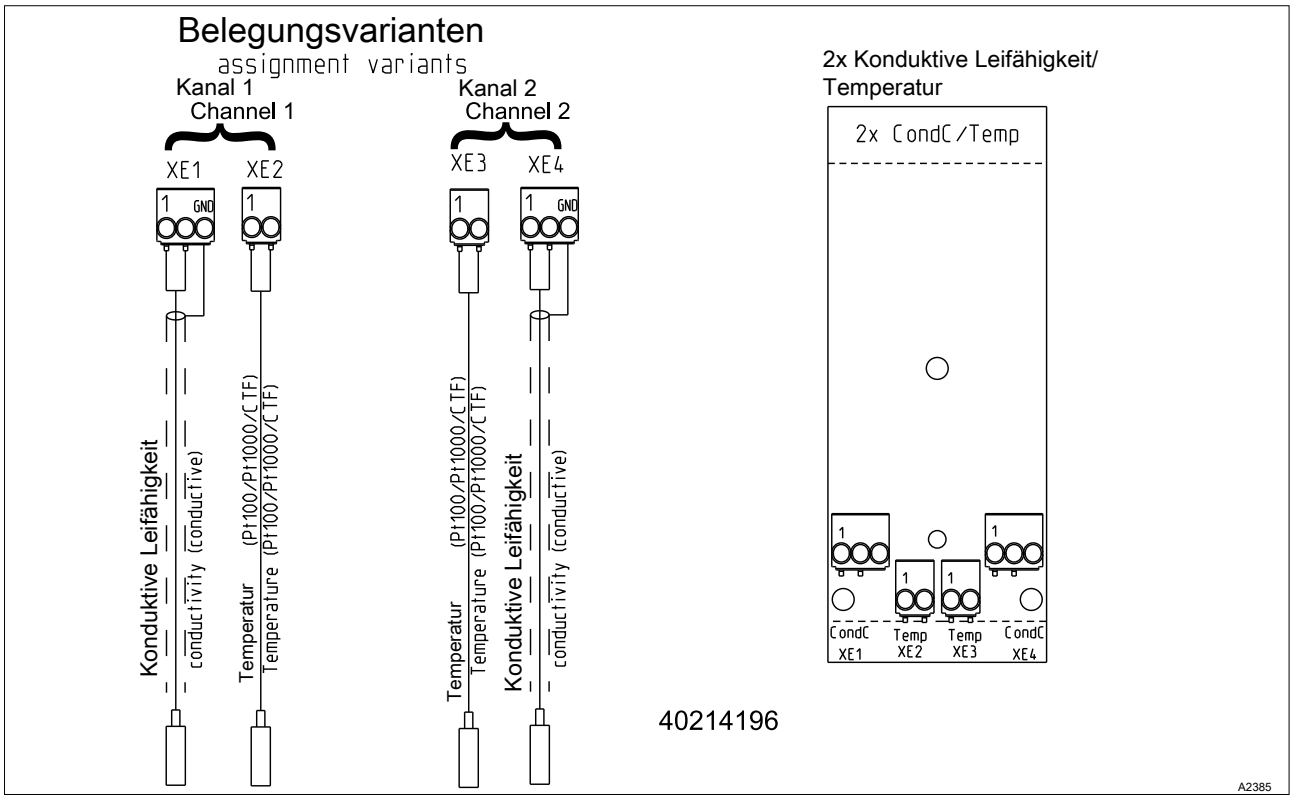


Fig. 27: Module: 2x conductive conductivity/temperature sensors. Part number 734223

A module for the direct measurement of the electrolytic conductivity based on the conductive principle. For the direct connection of 2 electrode conductivity sensors.

- Maximum cable length: 30 m, screened.

Electrical data

Parameter	Value
Cell constant:	0.005 1/cm ... 15 1/cm
Measuring ranges dependent on the sensor type:	
Specific conductivity:	0.001 µS/cm ... 200 mS/cm
Specific electrical resistance:	5 Ωcm ... 1000 MΩcm
TOS (total dissolved solids):	0 ... 9999 ppm (mg/l)
SAL (salinity):	0.0 ... 70.0 ‰ (g/kg)
Precision:	
Specific conductivity: 1 µS/cm ... 20mS/cm:	better 1% of the measured value ±1 µS/cm/±1 digit
Specific electrical resistance: 50 Ωcm ... 10 MΩcm:	better 1% of the measured value ±1 digit
Specific electrical resistance: 10 MΩcm ... 100 MΩcm:	better 10 MΩcm
Correction variable: Temperature via Pt100/Pt1000, semiconductor temperature sensor	
Measuring range: (Pt100/Pt1000: Sensor cable length up to 10 m)	-20 °C ... +180 °C
Measuring range: (Pt100/Pt1000: Sensor cable length up to 50 m)	-20 °C ... +120 °C
Measuring range: (Semiconductor temperature sensor)	-20 °C ... +125 °C
Precision of the temperature measurement: better 1% of the measured value (maximum 1 °C)	

6.4.4.4.4 Module: 2x mA input. Part number 734126

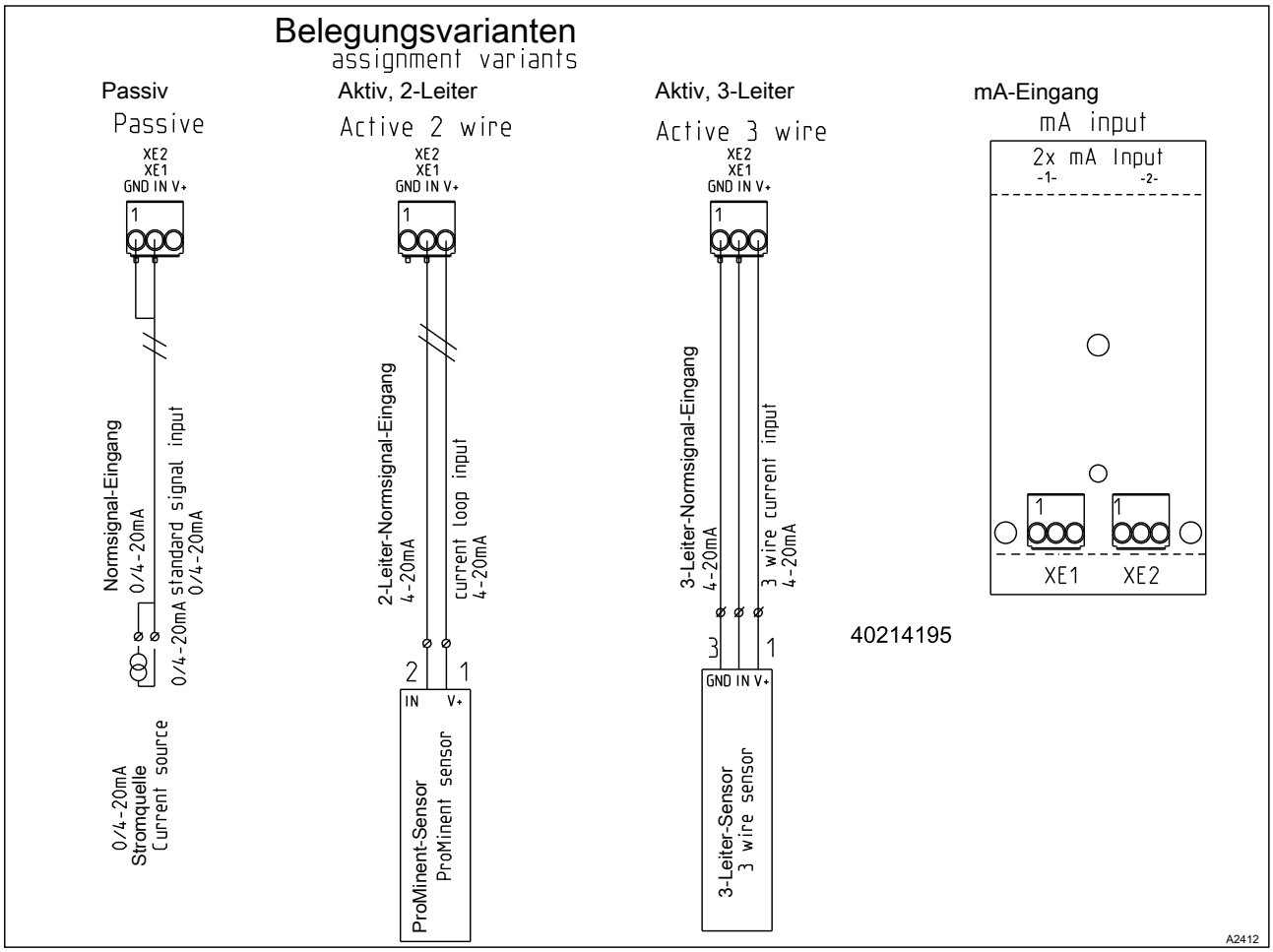


Fig. 28: Module: 2x mA input. Part number 734126

A module for the measurement of sensor signals from a 2-wire sensor, e.g. for chlorine, bromine or peracetic acid (PES), and pH and ORP via the pH transmitters, pHV1, part number 809126, and ORP, RHV1, part number 809127.

- For use with ProMinent 2-wire transmitters and sensors with 2-wire mA interface.
- Processing of active mA signals (type of connector: current source).
- Driver voltage: 24V DC.
- Max. current 50 mA.
- Input switches off at 70 mA.
- Protection against reverse polarity and overvoltage up to max. 30 V DC.
- Maximum cable length: 30 m, limited by the EMC specification.

Connect sensor 1 to terminal XE1 pin 2 and pin 3 with the control cable. Connect sensor 2 to terminal XE2 pin 2 and pin 3 with the control cable.

Control cable LiYY 2 x 0.25 mm^2, Ø 4 mm, part number 725122.

6.4.5 Cable Cross-Sections and Cable End Sleeves

	Minimum cross-section	Maximum cross-section	Stripped insulation length
Without cable end sleeve	0.25 mm^2	1.5 mm^2	
Cable end sleeve without insulation	0.20 mm^2	1.0 mm^2	8 - 9 mm
Cable end sleeve with insulation	0.20 mm^2	1.0 mm^2	10 - 11 mm

6.4.6 Switching of inductive loads

If you connect an inductive load, i.e. a consumer which uses a coil (e.g. an alpha motorised pump), then you must protect your controller with a protective circuit. If in doubt, consult an electrical technician for advice.

The RC member protective circuit is a simple, but nevertheless very effective, circuit. This circuit is also referred to as a snubber or Boucherot member. It is primarily used to protect switching contacts.

When switching off, the connection in series of a resistor and capacitor means that the current can be dissipated in a damped oscillation.

Also when switching on, the resistor acts as a current limiter for the capacitor charging process. The RC member protective circuit is highly suitable for AC voltage supplies.

The magnitude of the resistance R of the RC member is determined according to the following equation:

$R=U/I_L$

(Where U= Voltage across the load and I_L = current through the load)

The magnitude of the capacitor is determined using the following equation:

$C=k * I_L$

k=0,1...2 (dependent on the application).

Only use capacitors of class X2.

Units: R = Ohm; U = Volt; I_L = Ampere; C = µF

If consumers are connected which have a high starting current (e.g. plug-in, switched mains power supplies), then a means of limiting the starting current must be provided.

The switching-off process can be investigated and documented using an oscilloscope. The voltage peak at the switch contact depends on the selected RC combination.

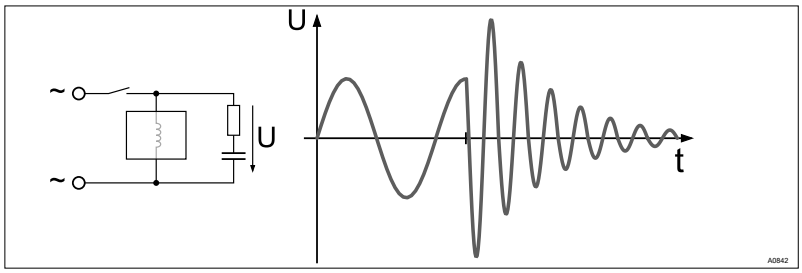


Fig. 29: Switching-off process shown on the oscillogram.

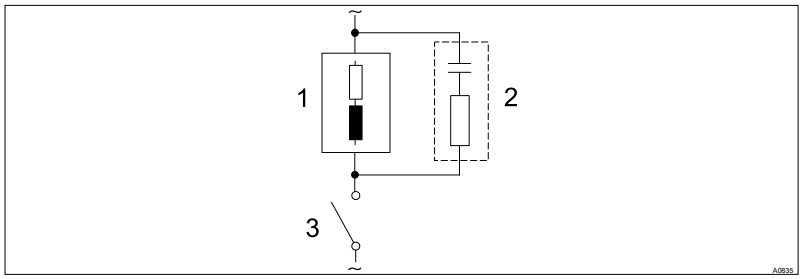


Fig. 30: RC protective circuit for the relay contacts

Typical AC current application with an inductive load:

- 1) Load (e.g. alpha motor-driven pump)
- 2) RC-protective circuit
  - Typical RC protective circuit at 230 V AC:
  - Capacitor *[0.22µF/X2]*
  - Resistance *[100 Ohm / 1 W]* (metal oxide (pulse resistant))
- 3) Relay contact (XR1, XR2, XR3)

6.4.7 Connect the sensors electrically to the controller

User qualification, electrical installation: electrical technician, see *Chapter 1.5 'User qualification' on page 10*

Pre-assembled coaxial cable

If possible, use only pre-assembled coaxial cables, which you can select from the product catalogue.

- *Coaxial cable 0.8 m, pre-assembled.*
- *Coaxial cable 2 m, SN6, pre-assembled.*
- *Coaxial cable 5 m, SN6, pre-assembled.*

6.4.7.1 Connection of pH or ORP sensors via a coaxial cable

NOTICE!

Possible incorrect measurement due to poor electrical contact

Only use this type of connector if you do not wish to use pre-assembled coaxial cables. Observe the following with this type of connection:

Remove the black plastic layer from the inner coaxial cable. There is a black plastic layer on all types of cable. When doing so, ensure that individual threads of the shielding do not come into contact with the inner conductor.

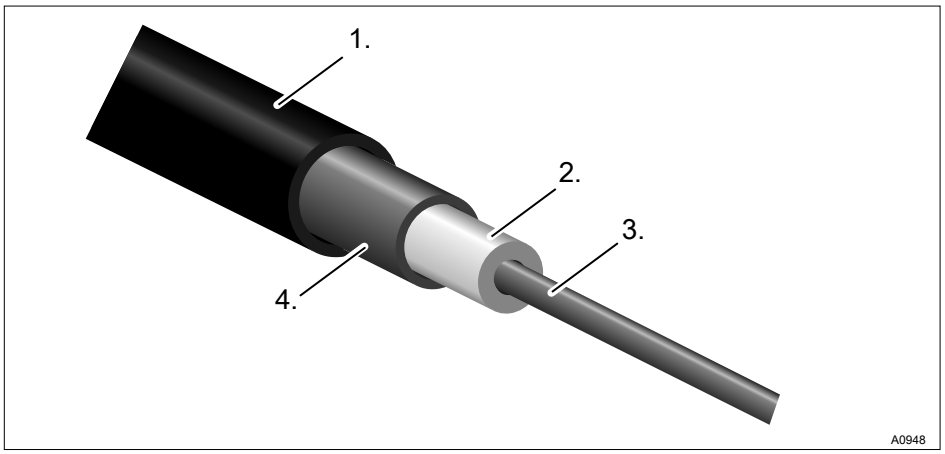


Fig. 31: Coaxial cable:

1. Protective sleeve
2. Insulation
3. Inner conductor
4. Outer conductor and shielding

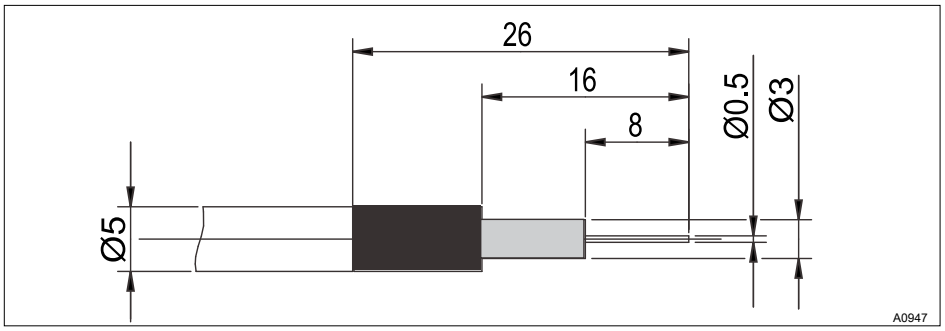


Fig. 32: Coaxial cable construction

The pH or ORP sensors are connected using a coaxial cable directly via the controller's electrical terminal. This relates to the pH/ORP via mV connection type.

There are two connection types:

There is a connection type without potential equalisation (unsymmetrical connection type) or a connection type with potential equalisation (symmetrical connection type).

When is potential equalisation used?

Use potential equalisation if the pH/ORP measurement is interfered with by interference potentials from the sample media. For example interference potentials may be produced by electric motors with incorrect interference suppression or due to insufficient galvanic insulation of electrical conductors etc. The potential equalisation does not cancel this interference potential, it does however reduce its effect on the measurement. Therefore, ideally the source of the interference potential should be eliminated.

Switching the controller to a measurement with potential equalisation

NOTICE!

Wire jumper with connected potential equalisation

A measurement with a wire jumper and connected potential equalisation produces incorrect measured values.

Please note the following differences:

The controller is factory-preset for measurements without potential equalisation (unsymmetrical measurement).

For a measurement with potential equalisation (symmetrical measurement), the setting in the [Measurement] menu must be changed accordingly.

With a symmetrical connection, the wire jumper needs to be removed and the cable for the potential equalisation conductor (PA) needs to be connected to the terminal previously occupied by the wire jumper.

1. In the *[Measurement]* channel 1 or 2 menu, change the entry under *[Potential equalisation]* to *[Yes]*.
2. Open the controller and remove the wire jumper.

Sensor connection without potential equalisation

The sensor is connected to the controller, as marked in the terminal diagram. Do not remove the wire jumper in the controller.

Sensor connection with potential equalisation

NOTICE!

Error sources when measuring with potential equalisation

A measurement without a wire jumper and unconnected potential equalisation produces incorrect measured values.

With a symmetrical connection, connect the cable for potential equalisation to the terminals of the controller. Beforehand, remove the respective wire jumper at these terminals.

The potential equalisation must always be in contact with the medium being measured. A special potential equalisation plug (order no. 791663) and a cable (order no. 818438) are necessary with the DGMa bypass fitting. The potential equalisation pin is always fitted with the DLG bypass fitting, only the cable (order no. 818438) is needed.

Features when calibrating with potential equalisation

When calibrating, immerse the potential equalisation in the respective buffer solution, or use the calibration receptacle which forms part of the scope of delivery of the DGMa valve. This calibration receptacle incorporates an integral potential equalisation pin to which you can connect the potential equalisation cable.

6.4.7.2 Connection of amperometric sensors

Connect the sensor, as described in the sensor operating instructions, to the corresponding terminals of the controller, see
Chapter 6.4.4 'Terminal diagram' on page 46

6.4.7.3 Connecting the conductive conductivity sensor

NOTICE!

The sensor must be dry

Do not allow the conductivity sensor to come into contact with liquid. Only allow the conductivity sensor to come into contact with liquid once the conductivity sensor has been connected, configured and calibrated. The sensor parameters (zero point) of a moist or wet conductivity sensor can no longer be properly calibrated.

If the conductivity sensor has come into contact with liquid prior to calibration, there is an option to dry the conductivity sensor. A dry conductivity sensor can be successfully recalibrated to the sensor parameters.

Shielded sensor cable

All conductivity sensors connected to the controller require a shielded sensor cable.

Connect the sensor in accordance with the wiring diagram.

Tab. 12: If you use a sensor without fixed cable or wish to extend the fixed cable, you must use the pre-assembled sensor cables:

Accessories	Part number
Measuring line LF 1 m:	1046024
Measuring line LF 3 m:	1046025
Measuring line LF 5 m:	1046026
Measuring line LF 10 m:	1046027

Selection of the connected sensor

All of the sensor-dependent settings are reset to the [DEFAULT] values when changing the connected sensor.

Sensor	Connector	Cell constant Cell constant (1/cm)	T-correction element	Max. temp. (°C)	Measuring range κ min (Unit)	Measuring range κ max (Unit)
LFTK1FE3m	Fixed cable 0.25 mm², 3 m, shielded	1.00	Pt1000	80	0.01 mS/cm	20 mS/cm
LFTK1FE5m	Fixed cable 0.25 mm², 5 m, shielded	1.00	Pt1000	80	0.01 mS/cm	20 mS/cm
LFTK1-DE	DIN 4-pin	1.00	Pt1000	80	0.01 mS/cm	20 mS/cm
LFTK1-1/2	DIN 4-pin	1.00	Pt1000	80	0.01 mS/cm	20 mS/cm
LF1-DE	DIN 4-pin	1.00	-	80	0.01 mS/cm	20 mS/cm
LFT1-DE	DIN 4-pin	1.00	Pt100	80	0.01 mS/cm	20 mS/cm
LFT1-1/2	DIN 4-pin	1.00	Pt100	80	0.01 mS/cm	20 mS/cm
LMP01	DIN 4-pin	0.10	Pt100	70	0.1 uS/cm	500 uS/cm
LMP01-HT	DIN 4-pin	0.10	Pt100	120	0.1 uS/cm	500 uS/cm
LMP01-TA	Fixed cable 0.34mm², 5 m, shielded	0.10	Pt100	70	0.1 uS/cm	500 uS/cm
LMP001	DIN 4-pin	0.01	Pt100	70	0.01 uS/cm	50 uS/cm
LMP001-HT	DIN 4-pin	0.01	Pt100	120	0.01 uS/cm	50 uS/cm
LM1	DIN 4-pin	1.00	-	70	0.1 mS/cm	20 mS/cm
LM1-TA	Fixed cable 0.34 mm², 5 m, shielded	1.00	-	70	0.1 mS/cm	20 mS/cm
LMP1	DIN 4-pin	1.00	Pt100	70	0.1 mS/cm	20 mS/cm
LMP1-HT	DIN 4-pin	1.00	Pt100	120	0.1 mS/cm	20 mS/cm
LMP1-TA	Fixed cable 0.34 mm², 5 m, shielded	1.00	Pt100	70	0.1 mS/cm	20 mS/cm

Sensor	Connector	Cell constant Cell constant (1/cm)	T-correction element	Max. temp. (°C)	Measuring range κ min (Unit)	Measuring range κ max (Unit)
CK1	DIN 4-pin	1.00	-	150	0.01 mS/cm	20 mS/cm
CKPt1	DIN 4-pin	1.00	Pt100	150	0.01 mS/cm	20 mS/cm

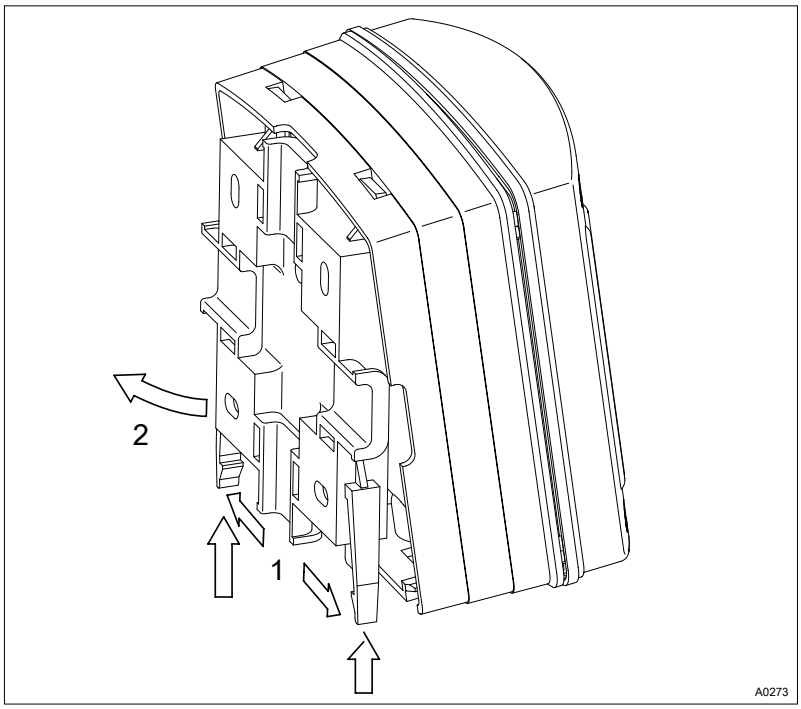
6.5 Procedure with DXM housing (small)

6.5.1 Mounting (mechanical)

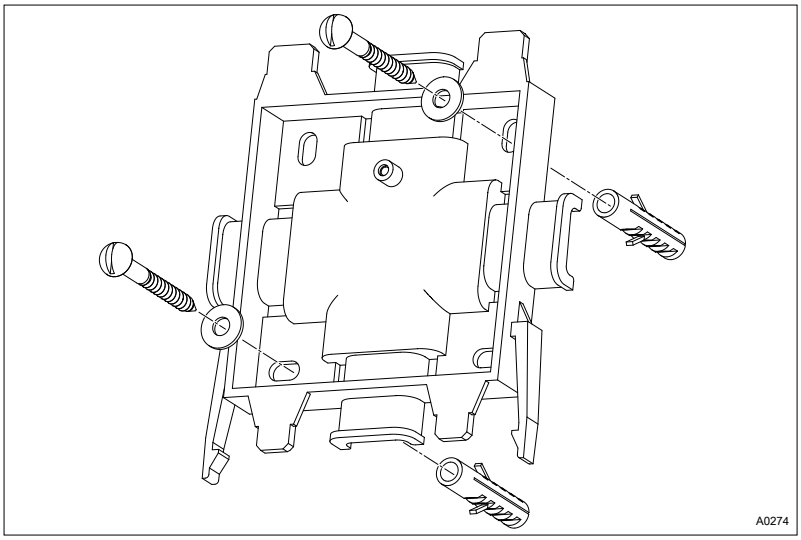
For wall mounting, please observe the following steps:

Mounting materials (contained in the scope of delivery):

- 1 x wall/pipe bracket
- 2 x half-round head screws 5x45 mm
- 2 x washers 5.3
- 2 x rawl plug Ø 8 mm, plastic
- 1 x sealing cap
- 1 x safety screw (PT)



1. Remove the wall/pipe bracket from the DXM
2. Pull the two snap hooks outwards and push them upwards (1)
3. Fold the wall/pipe bracket away and pull it out (2) in a downwards direction
4. Mark two drill holes diagonal to each other by using the wall/pipe bracket as a drilling template
5. Drill the holes: Ø 8 mm, d = 50 mm



6. Tighten the wall/pipe bracket
7. Hook in the housing at the top in the wall/pipe bracket and push it using light pressure at the bottom against the wall/ pipe bracket. Then press the housing upwards, until it audibly engages

6.5.2 Installation (electrical)

For wall mounting

1. Undo the four housing screws.
2. **NOTICE!**
   The hinge between the front and rear part of the housing cannot absorb high levels of mechanical loading. When working on the front part of the housing you must support it.

   Raise the front part slightly forwards and then fold out to the left.

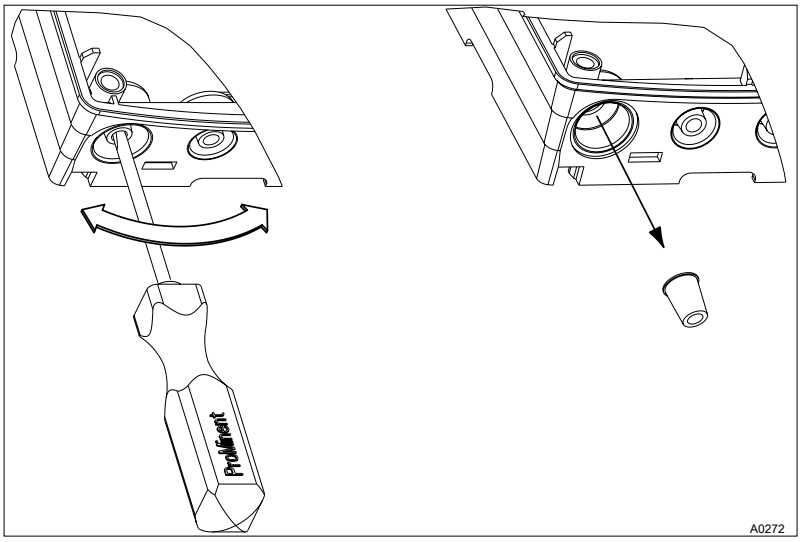


Fig. 33: The large threaded cable connector (M20 x 1.5) is only for use with the coaxial cable.

3. Punch out as many threaded holes on the bottom of the rear part as required.

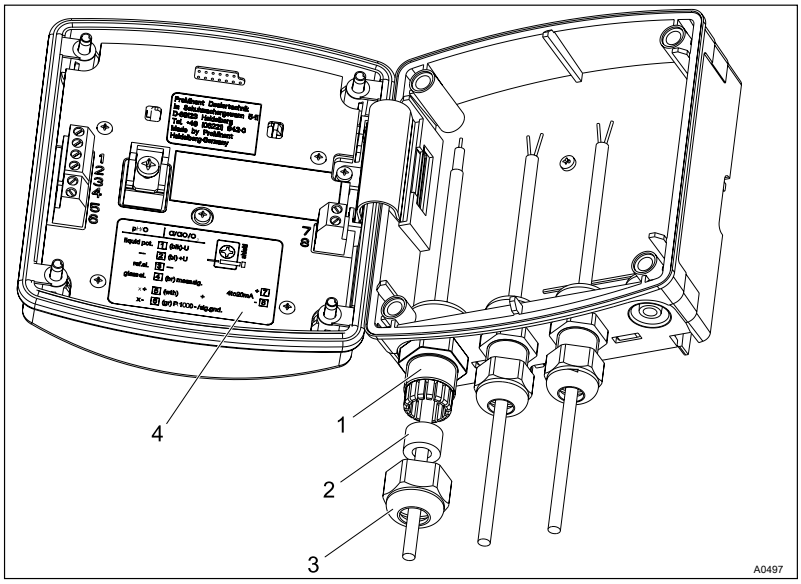


Fig. 34: Threaded connectors

1. Threaded connector
2. Reducing insert
3. Clamping nut
4. Terminal diagram

4. Screw in the corresponding threaded connectors (1) and tighten.
5. Insert the reducing inserts (2) into the threaded connectors depending on the cable cross-section used.
6. Guide the cables into the threaded connectors.
7. Connect the cables, as shown on the wiring diagram for the respective device (e.g. an actuator) and the module.
8. Tighten the union nuts (3) of the threaded connectors until they are properly sealed.
9. Replace the front part onto the rear part.
10.

NOTICE!

Degree of protection IP 65

Once again check that the seal is seated properly. Degree of protection IP 65 can only be achieved if it is correctly fitted.

As necessary, pull the front part slightly forwards to relieve the strain on the seal.

Manually tighten the housing screws.

For control panel mounting (internal module)

NOTICE!

Cable strain relief

With control panel installation, make sure that the cables are routed in a cable duct to ensure strain relief.

Connect the cables, as shown on the wiring diagram for the respective device (e.g. an actuator) and the module.

7 CAN bus

- **User qualification, mechanical installation:** trained and qualified personnel *Chapter 1.5 'User qualification' on page 10*
- **User qualification, electrical installation:** Electrical technician *Chapter 1.5 'User qualification' on page 10*

7.1 CAN components

7.1.1 T-connectors

Do not connect T-connectors directly

T-connectors must not be connected directly with an end device. There must always be a CAN connecting cable between a T-connector and end device.

T-connectors are used to connect individual end devices to the CAN backbone. The T-connectors are inserted in the backbone and the end device is connected using a CAN cable with a length of no more than 2 m. T-connectors cannot be strung together. However, the number of T-connectors directly connected to one another should not exceed 5 for reasons of mechanical stability. If T-connectors are strung together, ensure that they have sufficient mechanical strength.

7.1.2 Terminal resistances

The CAN bus is a differential fieldbus. A CAN terminal resistance must be fitted at both ends of the CAN backbone. Terminal resistances come in a male and female version. Generally speaking, a male terminal resistance is needed at one end of the backbone and a female one at the other end. You should avoid using more than two terminal resistances in a CAN network. Terminal resistances are fitted either directly at the end of a cable or on a T-connector.

Summary

Summary:

- Maximum elongation of the CAN backbone: 400 m.
- Only tighten threaded connectors by hand and ensure that the threaded connector is complete and watertight.
- Never connect T-connectors directly to an end device.
- Branching cables to the end devices should be as short as possible, maximum 2 m.
- If producing islands, a maximum of four end devices should be connected to the backbone via a branching cable.
- If using M12 plug connectors provided by the customer, ensure the correct pin coding. The end devices may be damaged if the polarity is reversed.
- It is essential that the braid is connected electrically to the plug to ensure the function.
- If using M12 plug connectors provided by the customer, it is essential that suitable cable end sleeves are used and that the braid is connected in the plugs with protection against short circuits.
- Sections of more than 50 m should be produced using rolled goods (Li02YSCY).

- If routing bus cables along with live cables, note the rules relating to the accumulation of cables (DIN VDE 0298 Part 4).
- If routing bus cables along with live cables, rolled goods (Li02YSCY) should be used.

7.2 CAN construction

- **User qualification, electrical installation:** Electrical technician
  ↳ *Chapter 1.5 'User qualification' on page 10*

The multi-channel measuring and control system DULCOMARIN® 3 is suitable for controlling a system, like a filtration circuit, pool etc., depending on the version.

7.2.1 General knowledge of the CAN bus

General knowledge of CAN bus (Controller Area Network) is required to understand the construction. Furthermore, the planning and use of measuring and control technology and the CAN bus (Controller Area Network) requires technical specialist knowledge, which is not communicated in this document.

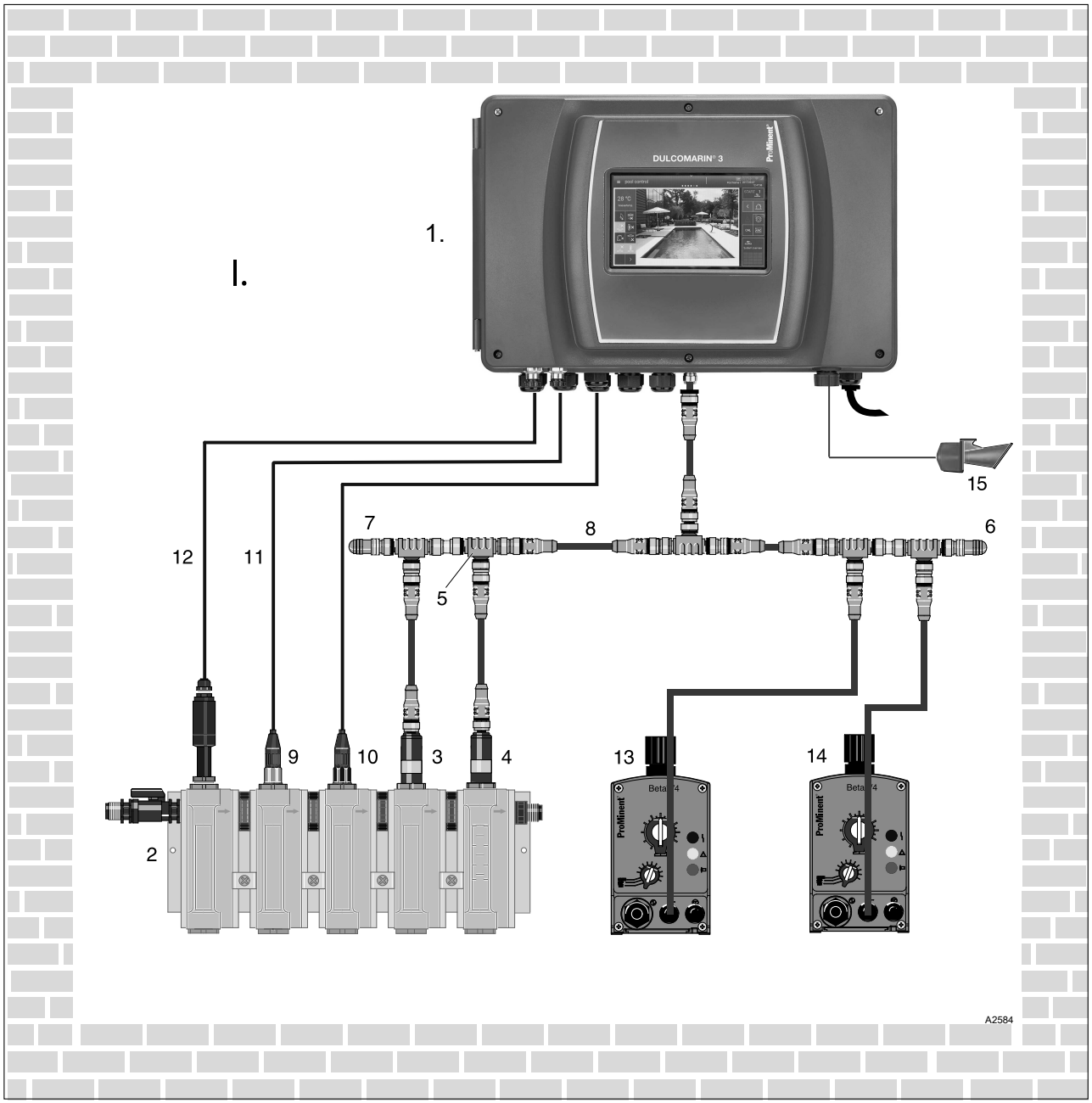


Fig. 35: Measuring and control system for a filter circuit

1. Multi-channel measuring and control system DULCOMARIN® 3
2. Bypass fitting DGMa
3. Chlorine sensor CLE
4. Chlorine sensor CTE
5. T-coupler
6. Terminal resistor, M12 coupling
7. Terminal resistor, M12 plug
8. CAN connecting cable
9. pH sensor
10. ORP sensor
11. Coaxial cable
12. Control cable
13. Metering pump 1 (e.g. Beta)
14. Metering pump 2 (e.g. Beta)
15. Alarm horn/alarm indicator

I. Plant room

7.2.2 Determine the requirement for cables and accessories

Fig. 36: Central unit connected to CAN bus

Tab. 13: Accessories, supplied

Pos.	Quantity	Name	Order no.
1	1	Connecting cable, CAN, M12, 5-pin, 0.5 m	1022137
2	1	T-coupler, M12, 5-pin. CAN	1022155
-	1	Terminal resistor, M12 coupling	1022154
-	1	Terminal resistor, M12 plug	1022592

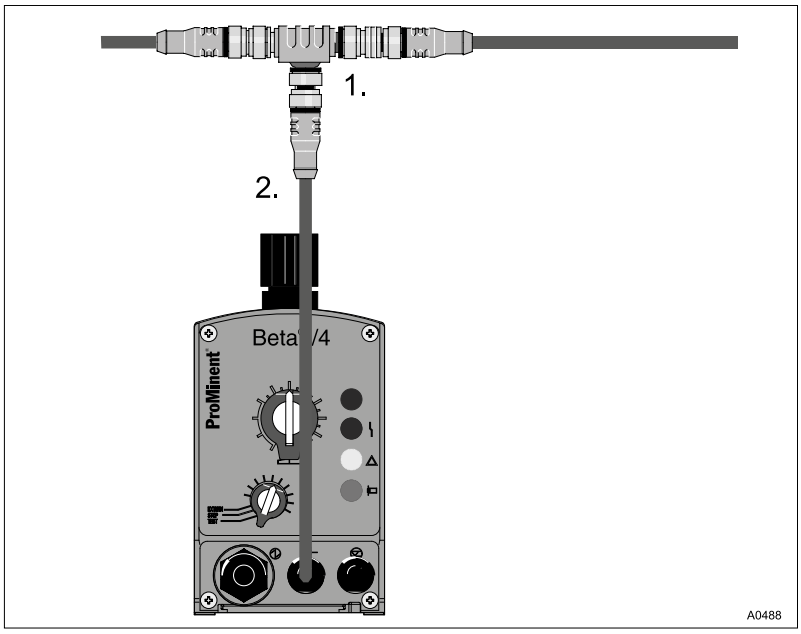


Fig. 37: Beta/4 CANopen

Tab. 14: Accessories, supplied

Pos.	Quantity	Name	Order no.
1	1	T-coupling, M12, 5-pin, CAN	1022155
2	1	Connecting cable, CAN, M12, 5-pin, 1 m	1022139

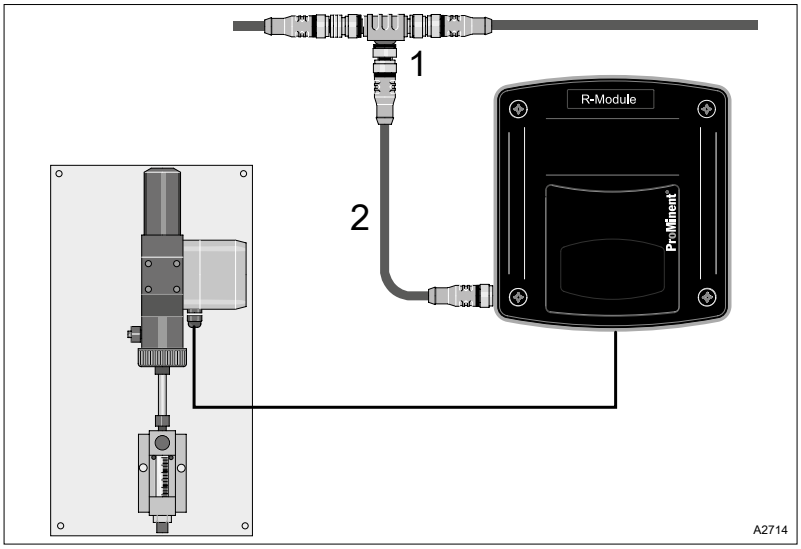


Fig. 38: R module with external actuator.

Tab. 15: Accessories, supplied

Pos.	Quantity	Name	Order no.
1	1	T-coupling, M12, 5-pin, CAN	1022155
2	1	Connecting cable, CAN, M12, 5-pin, 1 m	1022139

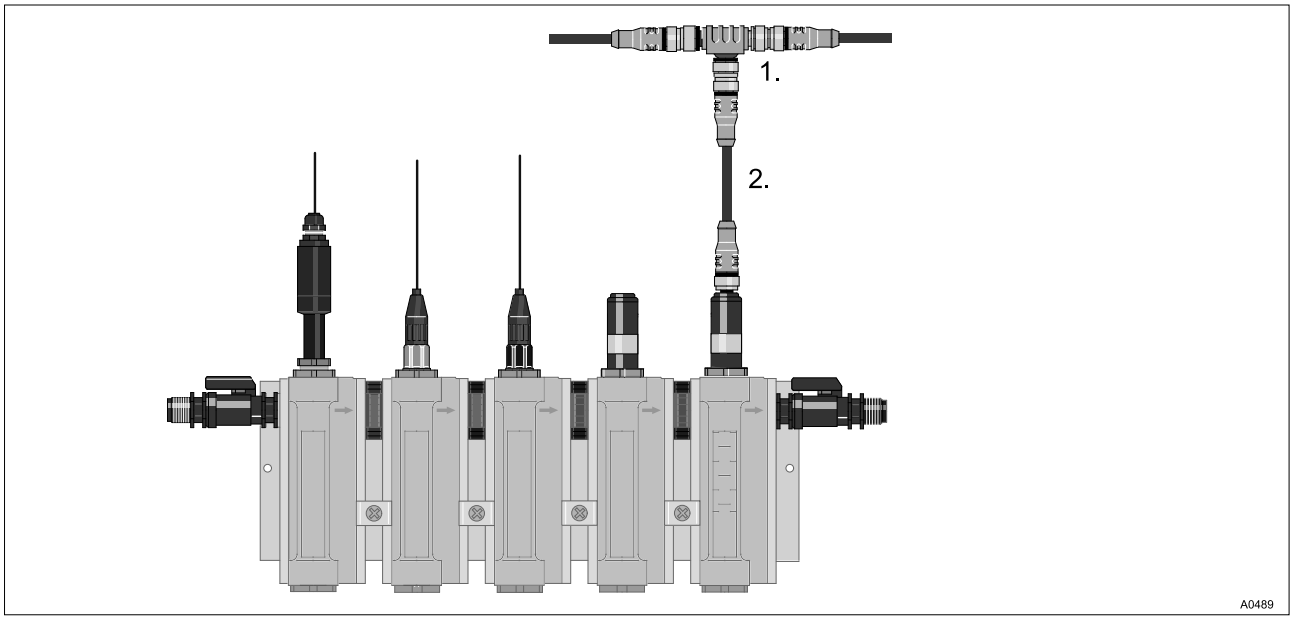


Fig. 39: Sensors

Tab. 16: Accessories, supplied

Pos.	Quantity	Name	Order no.
1	1	T-coupling, M12, 5-pin, CAN	1022155
2	1	Connecting cable, CAN, M12, 5-pin, 0.5 m	1022137

1. Determine the requirement for connection cables between the external modules.
2. Determine the requirement for holding clamps for the connection cables (ASV pipe clamp, 16 mm, order no. 359904.

7.2.3 Routing the CAN bus backbone

CAUTION!
Maximum backbone length
Possible consequence: Malfunctions.

– The maximum main bus length (without branching cables) must be less than 400 m.

CAUTION!
Branching cables
Possible consequence: Malfunctions.

It is essential that the T-pieces and connecting cables (branching cables) enclosed with the modules (M, A, G, N, R and I modules, CAN sensors and metering pumps with CAN bus) are used.

Branching cables are the connections branching from the CAN bus backbone to the modules.

The external modules can be placed in any sequence along the CAN bus backbone. The operating instructions show, for example, possible sequences of the external modules.

Each CAN cable has a plug or coupling at each end so that these cables can be coupled together in sequence to create longer cables.

Arrange the external modules in groups for each pool.

First assemble and install the external modules and their attachments. Only then connect the external modules to the CAN bus backbone along the shortest route.

Name	Order no.
Connecting cable - CAN, M12, 5-pin, 0.5 m	1022137
Connecting cable - CAN, M12, 5-pin, 1 m	1022139
Connecting cable - CAN, M12, 5-pin, 2 m	1022140
Connecting cable - CAN, M12, 5-pin, 5 m	1022141
Connecting cable - CAN, M12, 5-pin, 10 m	1046383
Connecting cable - CAN, M12, 5-pin, 25 m	1055588

Name	Order no.
Connecting cable - CAN, M12, 5-pin, 50 m	1055589
Connecting cable - CAN, sold by the metre	1022160
Connection kit for connecting cables - CAN, sold by the metre	1026589

7.3 CAN connectivity

7.3.1 Principles

The CAN bus is an industrial fieldbus designed for stringent safety requirements. The CAN bus is produced in line topology. Line topology means that there are only very short connection cables leading to the end devices from one backbone, which is up to 400 m in length. You must avoid using a star topology or creating islands with more than four end devices. All M12 round plug connectors are water- and dust-proof to IP67 when fully screw-connected. When installing, you must only tighten the M12 round plug connectors by hand. If using a tool, you must take care to ensure that the threaded connectors are not damaged. In environments with aggressive chemicals, the cables and plug connectors may be discoloured. This has no impact on functionality assuming that the components are correctly screw-connected. The discolouration is simply optical in nature.

Various components are available for installing the CAN system bus:

- pre-assembled M12 cables of various lengths
- installation cables without plugs, sold by the metre (Li02YSCY)
- M12 T-connectors
- M12 terminating resistances (plug & coupling)

7.3.2 Local Unit/compact system, arrangement of components, CAN connectivity

General knowledge of CANbus (Controller Area Network) is required in order to understand the document. Furthermore, the planning and use of measuring and control technology and the CANbus (Controller Area Network) requires technical specialist knowledge, which is not communicated in this document.

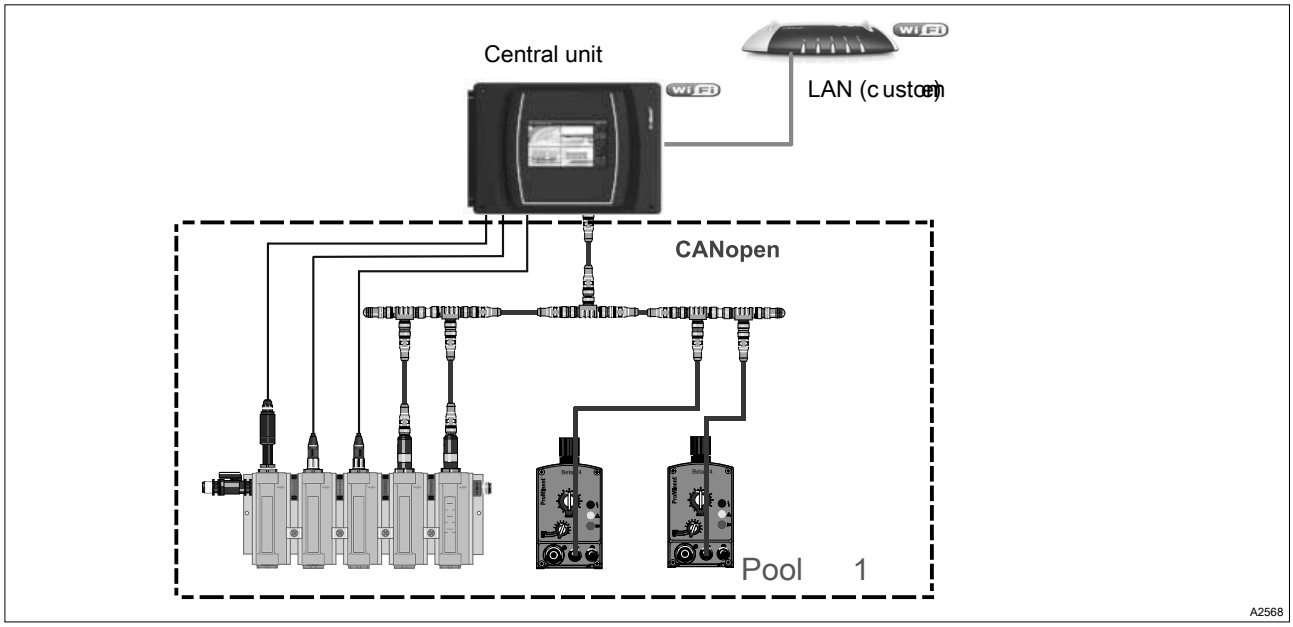


Fig. 40: Compact system, arrangement of components, CAN connectivity

- The system is operated centrally on the Dulcomarin® 3,
- Connection of sensors and actuators via CANbus,
- Central unit with Wi-Fi connectivity,
- Web server (read-only), VNC full access,
- LAN only with the compact system.

7.3.3 Local Unit/compact system with R module, arrangement of components, CAN connectivity

General knowledge of CANbus (Controller Area Network) is required in order to understand the document. Furthermore, the planning and use of measuring and control technology and the CANbus (Controller Area Network) requires technical specialist knowledge, which is not communicated in this document.

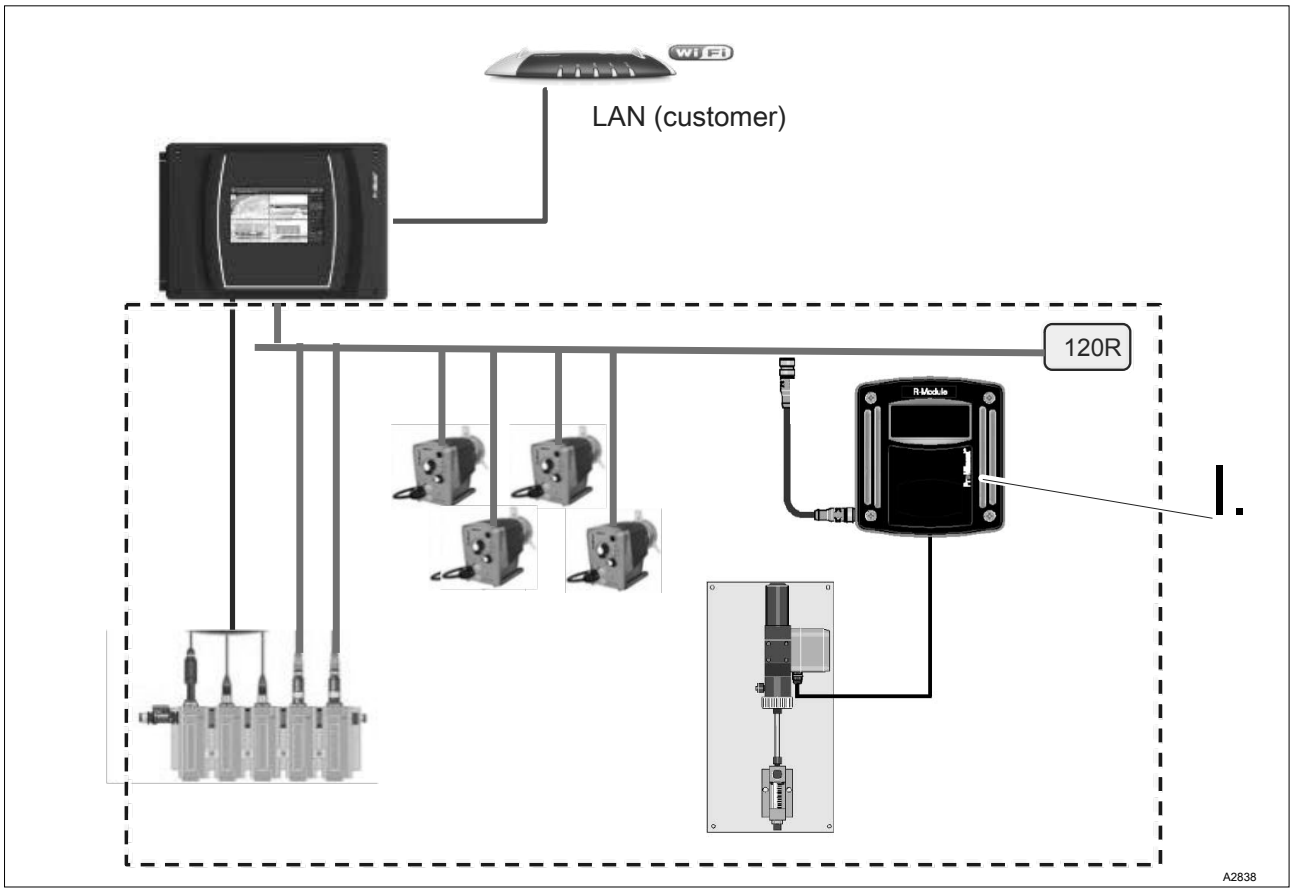


Fig. 41: Compact system with R module

I R module for a chlorine gas metering device with response signal

7.3.4 Multi-pool unit (Global Unit), arrangement of components, CAN connectivity

General knowledge of CANbus (Controller Area Network) is required in order to understand the document. Furthermore, the planning and use of measuring and control technology and the CANbus (Controller Area Network) requires technical specialist knowledge, which is not communicated in this document.

8 cNet configuration for up to 16 pools, by way of example

- **User qualification, mechanical installation:** trained and qualified personnel ↳ *Chapter 1.5 'User qualification' on page 10*
- **User qualification, electrical installation:** Electrical technician ↳ *Chapter 1.5 'User qualification' on page 10*

8.1 Multi-pool device (Global Unit) installed in the pool plant room

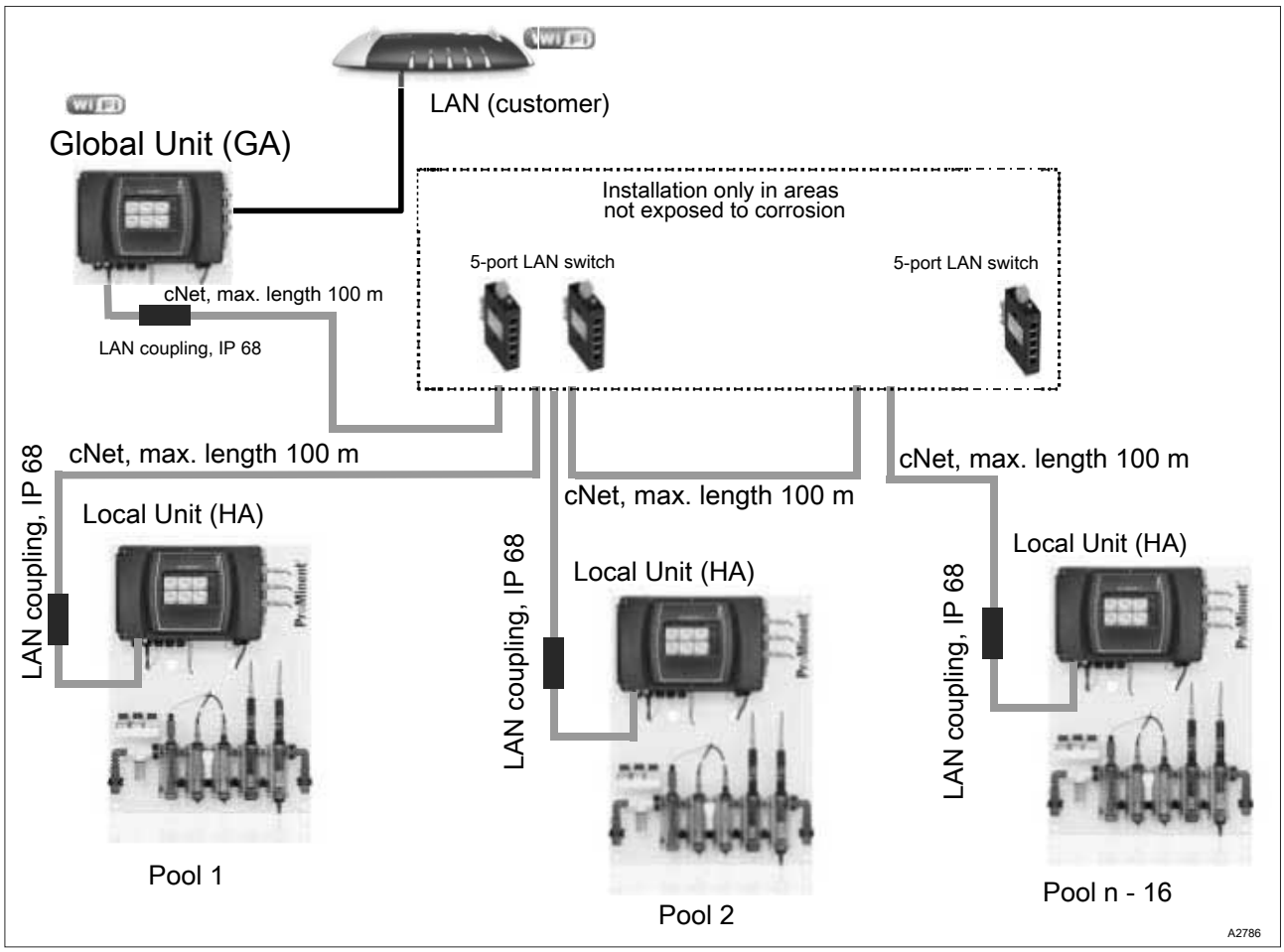


Fig. 42: Multi-pool device (Global Unit) installed in the pool plant room, metering pumps installed at the pool.

Global Unit, function G (=cNet Master), with module I/O board.

- On the 7" display and VNC server (WLAN/WiFi) of the Global Unit: full operability of the controllers for all pools

cNet-networked Local Units, function H (cNet slaves) as Local Units:

- They can be DSPa panels or DCPa controllers,
- Operation on the local 7" display: view and change the data for the assigned pool,
- The metering pumps with CANbus or pulse frequency control are located close to the controllers,
- No WLAN/Wi-Fi in the local units.

The following is important when combining the components:

- LAN connector: for connecting to customer's PCs and network components.
- cNet connector: for connection of Dulcomarin® 3 components
  - A separate network is needed for a DULCOMARIN® 3 system. A DULCOMARIN® 3 system cannot be integrated into an existing network.
- The customer's LAN may not be connected to the cNet connector. The DULCOMARIN® 3 would assign automatic IP addresses to the customer's LAN components and disrupt the network.

8.2 Global Unit with Local Unit functionality in the plant room

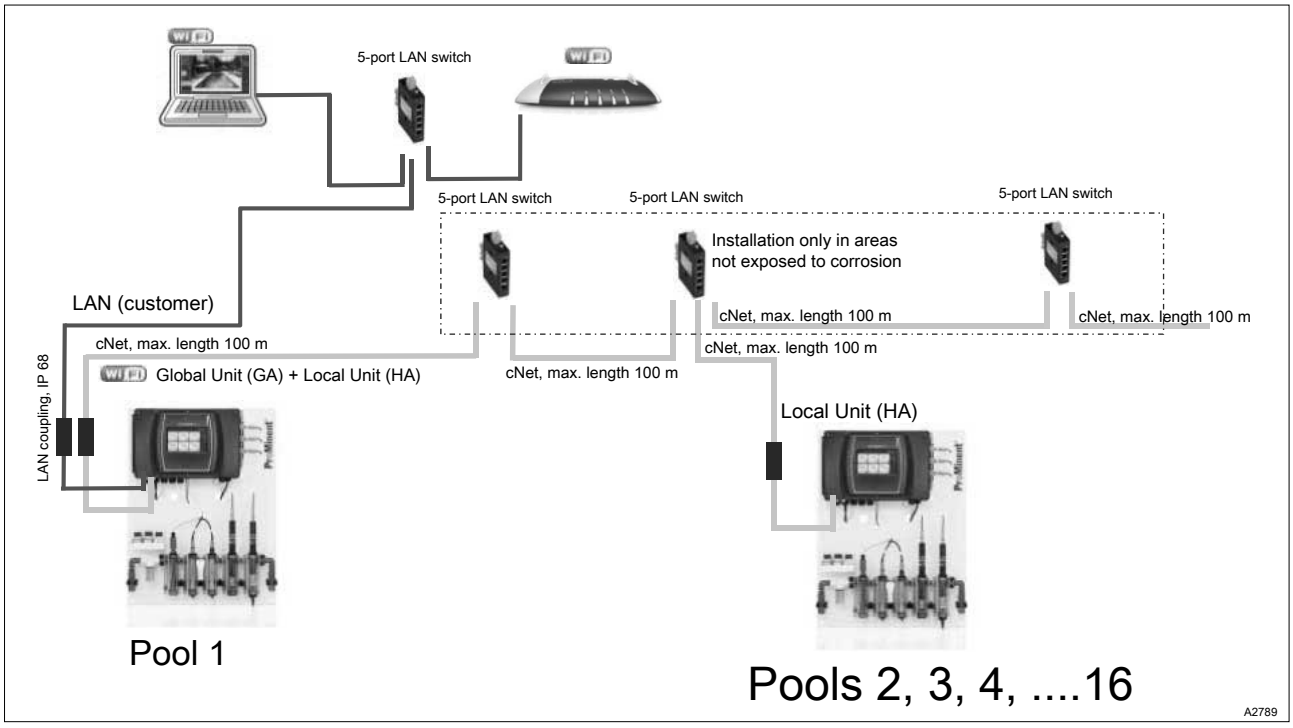


Fig. 43: Global Unit with Local Unit functionality in the plant room, metering pumps at the pool, visualisation in the plant room with VNC server on the PC.

- Visualisation on a PC in the plant room.
  - The PC is connected by LAN to the Global Unit.
- Global Unit, function G (=cNet Master), with the module I/O board.
  - The controller in the plant room controls 1 pool.
  - On the 7" display and VNC server (WLAN/WiFi) of the Global Unit: full operability of the controllers for all pools.
- cNet-networked Global Units, function H (cNet slaves) as Local Units.
  - They can be DSPa panels or DCPa controllers
  - Operation on the local 7" display: view and change the data for the assigned pool.
  - The metering pumps with CANbus or pulse frequency control are located close to the controllers.
  - No WLAN/Wi-Fi in the local units.

9 LAN construction

- **User qualification, mechanical installation:** trained and qualified personnel ↳ *Chapter 1.5 'User qualification' on page 10*
- **User qualification, electrical installation:** Electrical technician ↳ *Chapter 1.5 'User qualification' on page 10*

The LAN required to integrate the Global Unit into the customer's network is provided and configured by the customer.

The device's LAN interface is used to connect to a customer network for the purposes of control and data exchange. An IP67 sealed M12 plug connection with D coding is used for the connection. ProMinent® connecting cables of various lengths can be used to connect to RJ45 network sockets in the building. CAT6 installation cables are recommended for connections in the building. The RJ45 sockets must be fitted in a protected location if installing the device in damp rooms or if aggressive aerosols are present. Patch cables may not be used to install RJ45 sockets.

In-depth knowledge of electrical installations is needed for installation of the network cabling in the building.

Functionality:

- Web server (password-protected).
  - Remote control using a web browser (PC, tablet, smartphone).
- VNC (Virtual Network Computing) server (password-protected).
  - Transferring screen content to a remote PC to control the device.
- FTP (File Transfer Protocol in) server (password-protected).
  - Access to the device's SD card from a remote PC for the purpose of data transfer (reading and writing).

Technical data:

- Speed of 10 and 100 Mbit (fast Ethernet),
- IPv4 network protocol,
- D-coded M12 socket,
- DHCP client and server functionality for the automatic configuration of the network interface. Note: When the client is enabled, the device attempts to contact a DHCP server for a period of up to 2 minutes before the start. The device only starts once contact has been made.
- Manual assignment of network parameters (IP address, subnet mask, gateway).

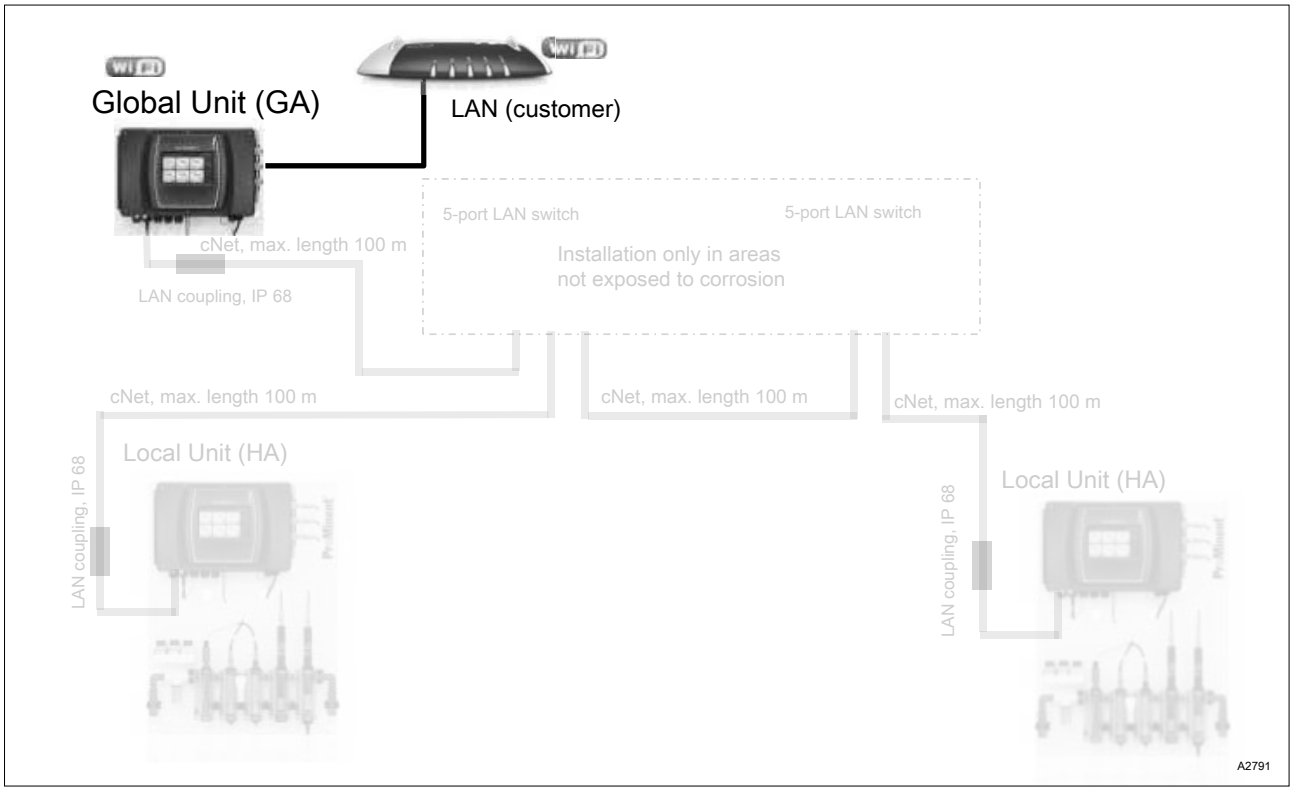


Fig. 44: Multi-pool device (Global Unit) installed in the pool plant room, metering pumps installed at the pool.

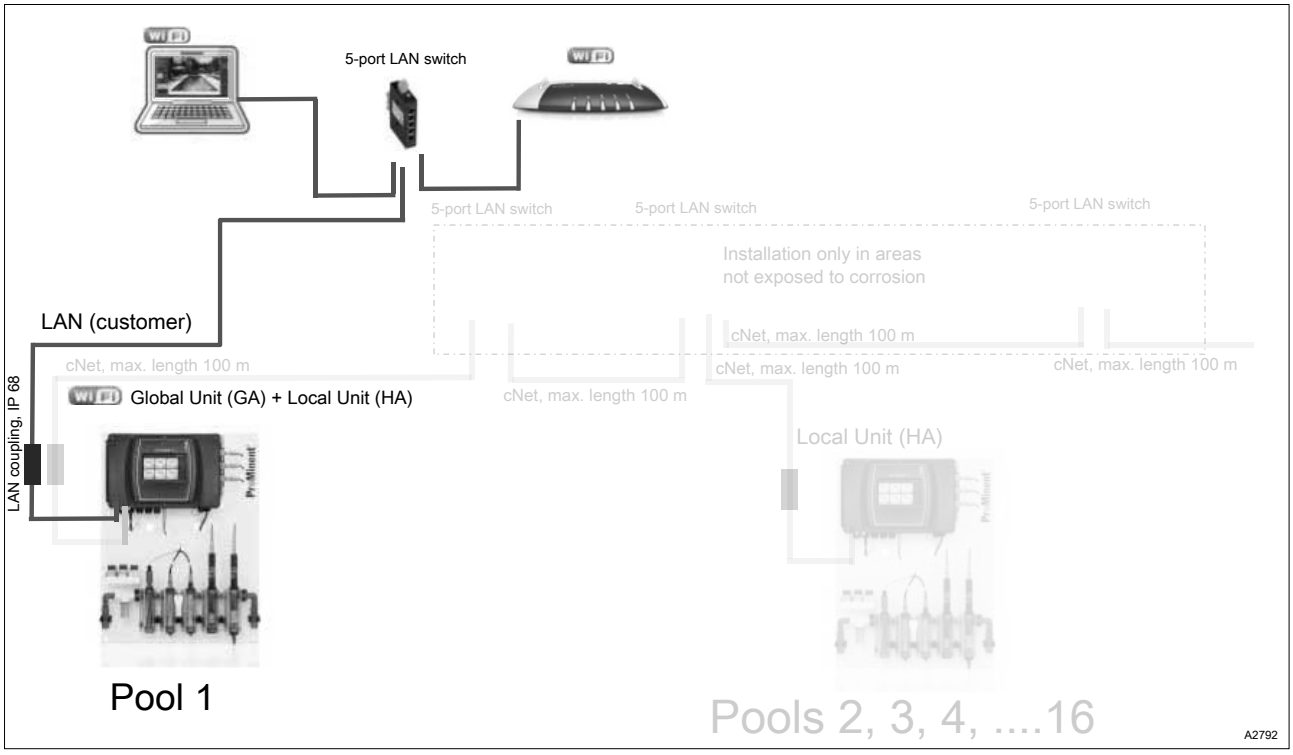


Fig. 45: Global Unit with Local Unit functionality in the plant room, metering pumps at the pool, visualisation in the plant room with VNC server on the PC.

9.1 Digital certificate

When using a digital certificate, should an error message appear in your browser, acknowledge the message so that you can continue working.

10 Interfaces

10.1 SD card

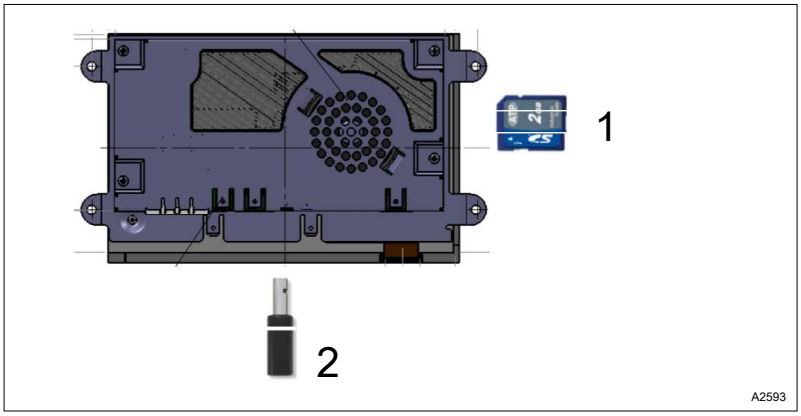


Fig. 46: SD card slot in the top part of the housing

1 SD card (industrial version)
2 Wi-Fi USB stick (optional)

Data backup / limited service life

There is a possibility of loss of data with all types of data storage. Data loss can be caused by damage to hardware, software, or unauthorised access etc. The operator of the device is responsible for backing up data recorded by the data logger. This should be done in accordance with the national and international requirements, regulations and standards applicable to the operator of the device. Define and document this data backup in a backup or recovery plan.

The manufacturer of the device is not responsible for backup or recovery of data.

SD cards only have a limited service life. This service life is based, for example, on the general ageing of the SD card and depends on the memory technology (flash memory) of the fundamentally limited number of write processes. Bear this in mind with your data backup strategy and ensure that you regularly replace your SD card.

An industrial SD card is currently supplied. Unlike *'consumer'* cards, industrial SD cards have an operating temperature of up to 85°C.

The device is supplied with an SD card. Log book and screen recorder data are stored on the SD card.

Technical data:

- SDHC (SD 2.0)
- Industrial version with extended temperature range and good reliability. The use of SD cards from the PC sector is not permitted.
- Standard SD form factor
- FAT or FAT32 file system. FAT or FAT32 must be used when formatting on a PC

10.2 USB port

Ensure IP66/IP67 degree of protection

When you don't need the USB port, seal it with the screw cap. IP66/IP67 degree of protection is only ensured when the screw cap is screwed on.

Functionality:

- Importing firmware updates
- Loading log book data (tabulator with separate CVS format)
- Loading recorder book data (tabulator with separate CVS format)
- Loading and saving system configurations (depending on system)

Technical data:

- USB socket: Type A
- Specification: USB 2.0
- Supported types of formatting: FAT16, FAT32

10.3 Wi-Fi interface (optional)

Range within buildings

Due to the fact that data transfer is based on the wireless setup, the range within buildings may vary greatly. Walls and ceilings, especially those made from reinforced concrete, may severely suppress the wireless signal. The presence of electrical systems, in particular other wireless stations (Wi-Fi, DECT, GSM) in the direct vicinity, may also have a major impact on wireless transmissions. Preference should always be given to use of (LAN) cables when connecting to the customer's network infrastructure.

The device's Wi-Fi interface is used to connect to a customer network or to connect up smart devices (tablet, smartphone etc.) without the use of cables for the purposes of control and data exchange. The Wi-Fi interface can be used at the same time as the LAN interface

In-depth knowledge of electrical installations is needed for installing the network cabling in the building.

Functionality:

- Web server (password-protected).
  - Remote control using a web browser (PC, tablet, smartphone).
- VNC (Virtual Network Computing) server (password-protected).
  - Transferring screen content to a PC to control the device.
- FTP (File Transfer Protocol in) server (password-protected).
  - Access to the device's SD card from a PC for the purpose of data transfer (reading and writing).

Technical data:

- IEEE 802.11a/b/g standard up to 54 Mbit.
- 2.4 GHz ISM frequency band.
- Max. 100 mW transmission power (20 dBm).

- Range in buildings of up to 35 m with an unobstructed line of sight (IEEE 802.11g).
- WPA2 encryption.
- Client mode for connecting with a router (home network).
- Access point mode for connecting with smart devices (tablet, smartphone etc.), not at the same time as client mode.
- DHCP client and server functionality for the automatic configuration of the network interface. Note: When the client is enabled, the device attempts to contact a DHCP server for a period of up to 2 minutes before the start. The device only starts once contact has been made.
- Manual assignment of network parameters (IP address, subnet mask, gateway).

[Wireless mode AP (Access Point)]

In *[wireless mode AP (Access Point)]*, the device provides Wi-Fi and enables other smart devices (tablet, smartphone etc.) to connect to and communicate with the device.

[WLAN mode client (station mode)]

In *[WLAN mode client (station mode)]*, the device accesses an existing Wi-Fi. The device then communicates with a Wi-Fi router and via this router with other compatible devices.

11 Data logger

The device has the function of a data logger. The data logger function brings together all data from the screen recorder and the various log books, such as error log book, user input log book, calibration log book etc. on the device's SD card. In all cases, leave the SD card in the controller and use the copying function to copy the data logger data onto a USB stick. *Chapter 12.2.8 'Screen recorder' on page 85*

12 Operating the device

12.1 Home

Jump back to the screen defined as “Home”.

12.2 System settings

You can adjust the following sub-items in this menu item:

12.2.1 Login/logout

Here you can *‘login’* or *‘log out’* as a user. Your system administrator will provide the access data you need for this.

12.2.2 Setting the language

1. Tap on the icon with the cog wheel .

Fig. 47: Setting the user interface language

⇨ The *[System settings]* menu appears.

2. Tap on the *[Language]* menu item, indicated by a national flag.

⇨ The *[Language settings]* menu opens.

3. Select the language required and tap on .

⇨ The controller works with the national language you have selected.

12.2.3 Display

12.2.3.1 Date and time

Here you can set the date and time and also adjust the display format.

12.2.3.2 Setting units

Here you can set which units are to be used.

The following units are available:

- Temperature in °C or °F
- ppm or mg/l

12.2.3.3 Reduce brightness after:

Here you can set how long after a period without user intervention the display brightness is reduced. Adjust the value in minutes to your requirements.

12.2.3.4 Colour scheme

Here you can set a different colour scheme, e.g. to suit your interior.

12.2.3.5 Screen lock

Here you can set when the screen lock is to be enabled. Adjust the value in seconds to your requirements.

12.2.3.6 New "Home" display

Here you can set which display appears when you press the Home button.

12.2.3.7 Activate return to the menu

If the *'Activate return to the menu'* menu item is disabled, use the small arrow ‹ (one level higher) to go back to the previous menu level.

If you have opened the sidebar (Home, Log out, Menu etc.), you cannot use ‹ (one level higher) to go back to the sidebar menu.

If the *'Activate return to the menu'* menu item is enabled, use the small arrow ‹ (one level higher) to go back to the sidebar.

12.2.3.8 Activating maintenance timer

Here you can set when a display should appear indicating who needs to maintain your system. Here you can save the contact details of your service partner.

12.2.4 System > System settings

In this menu item, you can adjust or run the following sub-menus. When doing so, note that the menu item required only becomes visible once you scroll down or up in the menu navigation. Providing an OK button is not displayed, the set values are saved as soon as the menu is exited.

12.2.4.1 Unit settings

Selected number of pools

You can set the number of pools which your device is to control here. Up to 16 pools are possible.

12.2.4.2 System names

Here you can enter the names of your system, *'such as'* "Swimming pool in hotel" or "Town swimming pool".

12.2.4.3 Defining pool name

Here you can define the names of your pools, such as children's pool, therapy pool, competition pool etc.

12.2.4.4 System functions

Restart

Here you can restart the system, all set values and functions are retained. This has the same function as restarting the operating system on a PC.

Start update

↳ *Chapter 21 'Software update' on page 115*

Restarting application

Here you can restart the respective application. This has the same function as restarting an application program (e.g. Word) on a PC.

12.2.5 Network

You can adjust or run the following sub-items in this menu item:

12.2.5.1 LAN

You can enter the parameters of the local network here. Use *[OK]* to confirm or *[Cancel]* to abort.

12.2.5.2 DHCP client or DHCP server

The Dynamic Host Configuration Protocol (DHCP) is a communication protocol used in computer technology. It allows the network configuration to be assigned to clients by a server.

DHCP enables connected clients to integrate into an existing network without the network interface having to be configured manually. The information needed, such as IP address, network mask, gateway, name server (DNS) and other settings, are assigned automatically provided the client's operating system supports this.

You can enter here whether the DHCP is to be enabled and so, whether it is enabled as client or server.

12.2.5.3 Wi-Fi

You can enter the Wi-Fi parameters here. Use *[OK]* to confirm or *[Cancel]* to abort.

↳ *Chapter 10.3 'Wi-Fi interface (optional)' on page 78*

12.2.6 Web services > NETWORK settings

You can adjust or run the following sub-items in this menu item:

12.2.6.1 Web server settings

Web server: Here you can set whether you want to permit access by remote maintenance software if needed.

12.2.6.2 VNC server

Virtual Network Computing, or VNC for short, is software, which displays the screen content of a PC (server) on a local PC (client) and in return sends the local PC's keyboard and mouse movements to the PC. This allows you to work on a PC as if you were standing directly in front of the DULCOMARIN® 3. VNC implements the Remote Framebuffer Protocol and can therefore be used on any platform, unlike other remote maintenance software.

You have to enable the VNC function in the DULCOMARIN® 3 and set the corresponding IP and gateway addresses.

Web server: Here you can set the password for your VNC server.

You can find VNC programs for iOS in the Apple App Store, for Android in the Google Play Store and VNC Viewer for Windows for PCs online.

12.2.6.3 Intranet

Here you can set whether all your device's web services are enabled on the Intranet (not public) or on the Internet (public).

12.2.7 User administration

User administration of the DULCOMARIN® 3 is divided into 4 authorisation levels for personnel with assignment of the corresponding access codes. The 5 qualification levels are defined in the operating instructions. These access code levels are assigned as roles to personnel as follows:

Authorisation level/ role	Authorisation	Recommended user qualification
User	■ Read in all areas. ■ Calibrate the measured variables.	■ Instructed person.
Installation	As user, but also: ■ Log modules on/off. ■ Change control parameters. ■ Carry out software updates	■ Trained, qualified personnel. ■ Electrical technician.
Service (manufacturer)	As installation, but also: ■ Run function tests	■ Service.
Administration	As service, but also: ■ Create users. ■ Administer roles. ■ Delete user.	■ Trained user. ■ Service.
Define user qualification: ↳ *Chapter 1.5 'User qualification' on page 10*		

As a user, you can change your password.

As an administrator, you can create, manage and delete users as well as changing the administrator password.

12.2.8 Screen recorder

Launching PDF Viewer
When you launch the PDF Viewer, it may take up to 30 seconds for the PDF to be created. Creation of the PDF depends on the amount of data that has to be processed and may vary greatly.

Here you can set the following parameters and configure or apply them specifically for your application:

- screen recorder settings,
- set min/max values for the respective measured variables,
- set PDF viewer date,
- transfer recorder files (copy to USB stick),
- remove storage media,
- safely remove SD card,
- safely remove USB stick.

12.2.9 E-mail

Here you can set the following parameters and configure or apply them specifically for your application:

- enable alarm for the entire system,
- enter e-mail addresses 1-4,
- send measured values daily,
- enable alarm 1 “Storage tank for metering pump 1 empty”,
- enable alarm 2 “Storage tank for metering pump 2 empty”,
- enable alarm 3 “Storage tank for metering pump 3 empty”,
- send test mail.

12.2.10 Bar graphs

Here you can set the following parameters and configure or apply them specifically for your application:

- set min/max values for the respective measured variables,
- reset all current bar graphs.

12.2.11 Network CAN

Here you can configure, add or remove the CAN components for all pools (1 ... 16). The device has help texts to assist you.

12.2.12 cNet network

You can configure, add or remove the cNet components here, if there are any. The device has help texts to assist you.

12.2.13 Functional test

This function is only available to the ProMinent Service.

12.2.14 Default settings

Here you can reset various settings / values to the factory settings:

- All default values
- Reset users
- Default values for all controller parameters pool 1 to 16
- Sent test e-mail
- Delete protocol recorder
- Deletes the list of modules which have been assigned, but no longer exist in the bus.
- Deletes the list of modules which are assigned in the bus. A new assignment is needed.

You will find the values available for replacing the factory setting here: *Chapter 17 'Factory settings of device' on page 102*

12.3 Help topics

User interface, general

Here you will find explanations of the functions and concepts of the various operating elements, also refer to chapter *Chapter 3 'Operating concept' on page 14*

Assembly / operating manuals (PDF)

PDFs of the operating instructions of the components installed, such as pumps, sensors, terminal diagrams etc., are stored here. You can display the PDFs by tapping on the icon.

Media library

Videos are stored here. These videos explain how to calibrate the sensors of various measured variables.

12.4 Information

Here you can display various information about your device, such as software version, date, system information, identity code, serial number etc.

12.5 Calibrating

For explanations of calibration procedures, see ↳ *Chapter 14 'Calibrating the measured variables' on page 91*

12.6 Screen recorder

Here you can display the screen recorder of the pool you have selected. You can read the chronological order of the various measured values on this screen recorder.

12.7 Pool control (attractions)

You can display the various pool attractions in this menu. You can enable or disable these attractions. You can set timers for the attractions in the submenu, which you reach using the arrow key.

12.8 Single pool > Measured values pool

The *'Single pool'* entry takes you to *'Measured values pool'* (depiction of all measured variables for the selected pool). Here you can then read all parameters or configure all parameters according to your user rights.

12.9 Measured values pool

The *'Measured values pool'* entry takes you to *'Measured values pool'* (depiction of all measured variables for the selected pool). Here you can then read all parameters or configure all parameters according to your user rights.

12.10 Connectivity

You can view, assign, configure and set parameters for all installed and networked CAN components. You are guided by your device through the various settings in a manner sensitive to your context.

12.11 Pool settings

12.11.1 ECO mode parameters

Here you can set the parameters for your Eco!Mode. Eco!Mode operating mode reduces the energy consumption of the filter pumps. In this respect, note the applicable national regulations, laws and standards.

To discover how to set Eco!Mode, go to ↳ *Chapter 3.2.2.3 'Detail level' on page 23*

12.11.2 Timer details operating mode

Here you can set the *'timer'* parameters for your *'Eco!Mode'* and *'superchlorination'* operating modes.

In this respect, note the applicable national regulations, laws and standards.

To discover how to set Eco!Mode and superchlorination, go to ↳ *Chapter 3.2.2.3 'Detail level' on page 23*

12.11.3 Background image, pool geometry, pool name

You can set the following parameters here:

- Background image
- Pool geometry
- Pool name

The pool geometry is included in the controller's calculations as a parameter.

12.11.4 Superchlorination

Superchlorination is needed at the start of the bathing season, after refilling the swimming pool or if the pool has temporarily been affected by harmful microorganisms. But the balance can also be upset in the summer or if water temperatures are high and there is increased growth of organic substances.

In this menu, you can set whether superchlorination is to be possible and whether this superchlorination is to take place using a timer and/or contact.

In this respect, note the applicable national regulations, laws and standards.

To discover how to set superchlorination, go to ↳ *Chapter 3.2.2.3 'Detail level' on page 23*

13 Application-specific settings

- **User qualification:** trained user, *Chapter 1.5 'User qualification' on page 10*

Application-specific settings include

- Configuring pools
- Setting the measured variables
- Setting the control
- Set the pumps
- Setting the relays, digital inputs and digital outputs
- Setting Eco!Mode and superchlorination

1. You can access the application-specific settings via the *[Measured value pool]* menu, Fig. 48 or Fig. 49.

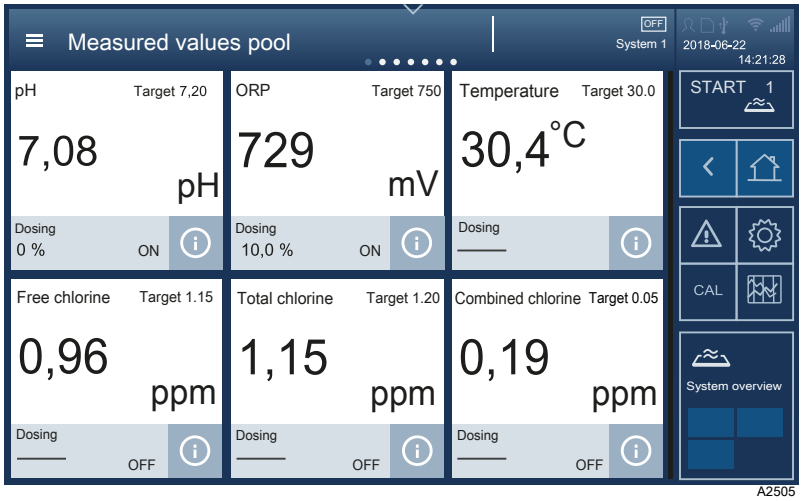


Fig. 48: Measured values interface for the selected pool.

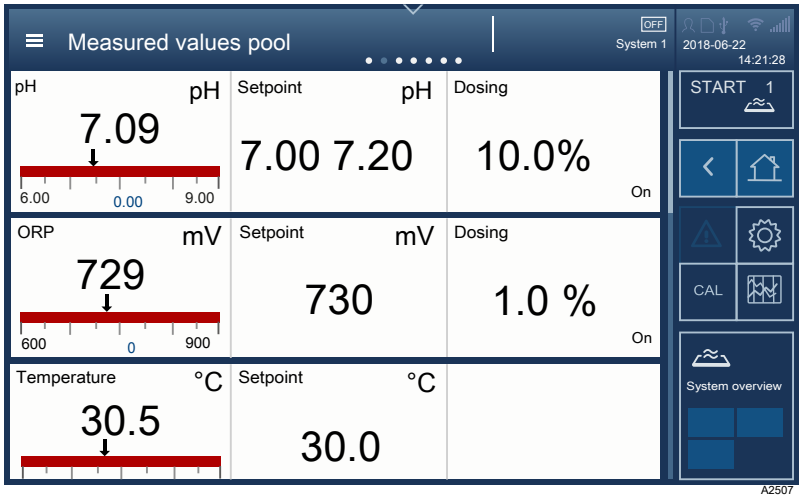


Fig. 49: Measured values interface for the selected pool with detailed information.

2. In the *[Measured value pool]* menu tap on the measured variable, setpoint or dosing which is to be set.
3. You are then taken to the *[Details of measured variables]* menu, Fig. 50.

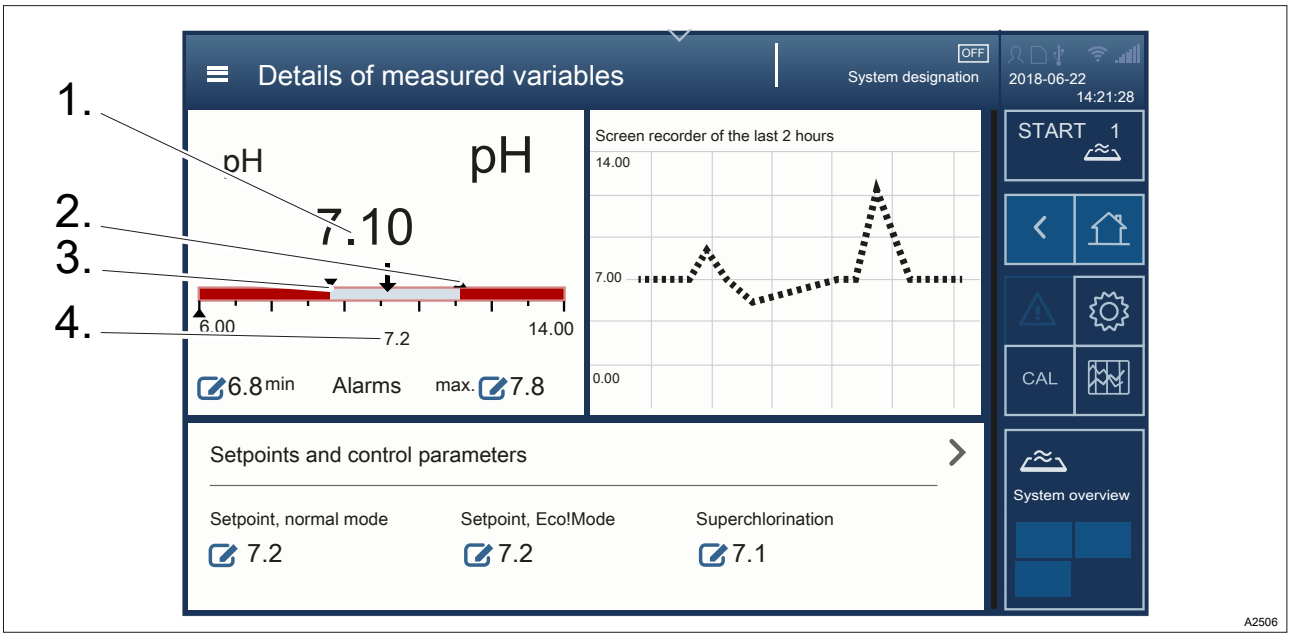


Fig. 50: [Details of measured variables] interface.

1. Actual value
2. Upper limit value
3. Lower limit value
4. Setpoint

4. You can now scroll in the *[Details of measured variables]* menu and then tap on the relevant parameter, which is to be set.
5. You can then change the setpoints at the location of the icon or set parameters, such as alarms, measurement, output etc. by tapping on the relevant point in the menu.

14 Calibrating the measured variables

14.1 General information on calibration

- **User qualification:** trained user, *Chapter 1.5 'User qualification' on page 10*

Every measured variable, active in a control circuit, can and must be calibrated. Every calibration process is logged by the device.

You are guided by the device, context-sensitively through the menu, to calibrate the respective measured variable. The device assists you in this process by providing text and video information. The following fundamental parameters always have to be considered during calibration:

The operator is responsible for the correct condition of all devices, parameters etc. needed for calibration. This means for example:

- Always use the calibration process prescribed by law or standard for your system.
- Make sure that the sensors are in a usable state, referring in this context to the operating instructions for the respective sensor.
- The buffer used for pH or ORP calibration may not be stored beyond their best-before date and do not use cooled buffers for calibration.
- Make sure that the respective reference measuring device has sufficient measuring accuracy and that maintenance carried out on it is logged.
- Do not store the tablets or reagents needed for the DPD method beyond their best-before date.
- There should be a sufficient volume (l/h) of sample water flowing through the bypass fitting.
- There should be no gas bubbles on the respective sensor.
- The temperature of the sample water should be within the sensor's permitted temperature range, referring in this context to the operating instructions for the respective sensor.
- The pH-range of the sample water must be within the sensor's permitted pH-range, referring in this context to the operating instructions for the respective sensor.
- The controller should be operating in normal mode, not in superchlorination or Eco!Mode®.
- If water samples are taken for calibration, these water samples need to be processed immediately. A delay will distort the values.
- Repeat the process if calibration is unsuccessful.
- If calibration is repeatedly unsuccessful, check all components of the control circuit using the respective component operating instructions. Contact Service should you still be unable to isolate the error and calibration still fails. The system then continues to operate with the last calibration recognised as valid.

14.2 Calibrate: measured variable, pH

Please note the following general rules:

- With a 2-point calibration, the difference between the buffers should be at least 2 pH values.
- Never calibrate the sensor in the storage bottle, instead always take out the amount of buffer needed and dispose of the removed buffer after the calibration.
- Never pour the buffer back into the storage bottle, but dispose of it.

Tab. 17: The following calibration buffers can be used, for example:

Manufacturer	pH value
ProMinent®	4 7 9 10
NBS® DIN 19266	1 4 7 9
DIN 19267	1 4 7 9 13
Merck+Riedel®	2 4 7 9 12

The device can only work properly if the buffer solution used matches the selected, activated buffer solution. Other buffer solutions, even those with the same nominal values, may react differently to temperature. These reactions may result in measuring errors.

Please also observe the important notes relating to pH calibration in .

1. Tap on *[CAL]*

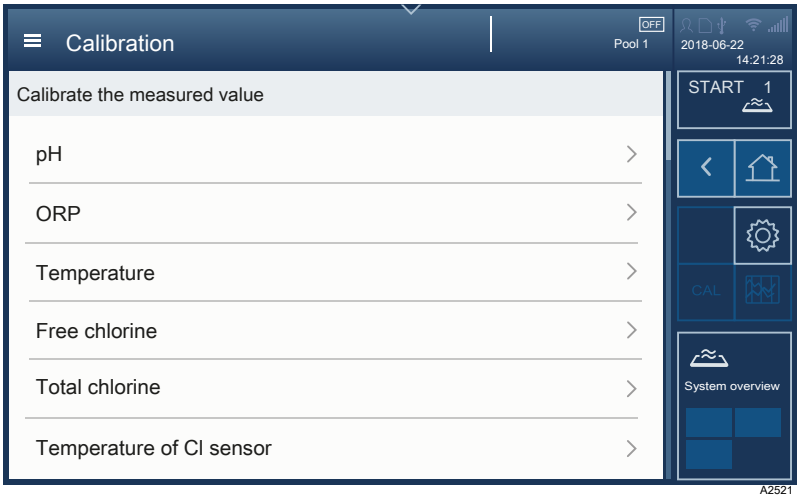


Fig. 51: Calibration interface.

2. Select the measured variable to be calibrated by tapping and scrolling on the display. In this case pH.
3. Under CAL setup, set calibration parameters expedient for your measurement. This includes:
   - Buffer detection
   - Buffer manufacturer
   - Buffer value 1
   - Buffer value 2
   - Buffer temperature
4. Select the calibration process expedient for your purpose.
5. Follow the instructions on the display.

14.3 Calibrate: measured variable, ORP

Once the packaging has been opened, the ORP buffers often veer towards higher mV values due to the addition of oxygen. Therefore use as small a vessel as possible and use up the ORP buffer quickly.

Please note the following general rules:

- Never calibrate the sensor in the storage bottle, instead always take out the amount of buffer needed and dispose of the removed buffer after the calibration.
- Never pour the buffer back into the storage bottle, but dispose of it.

1. Tap on *[CAL]*

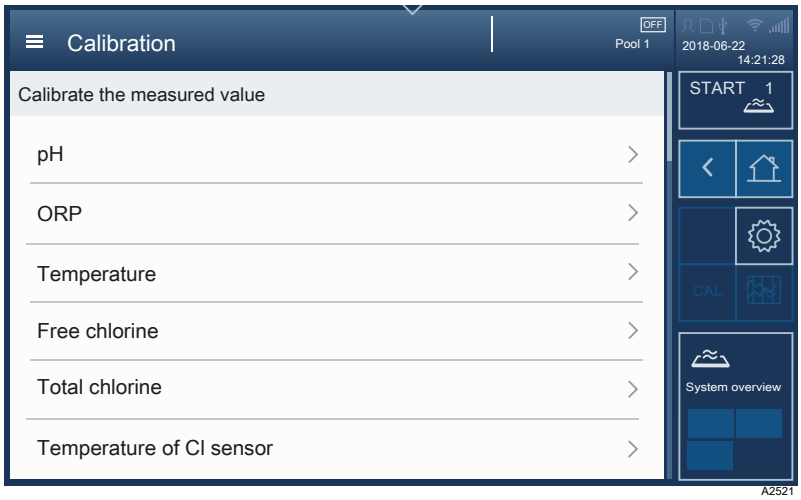


Fig. 52: Calibration interface.

2. Select the measured variable to be calibrated by tapping and scrolling on the display.
3. Follow the instructions on the display.

14.4 Calibrate: measured variable, free chlorine

Measured variable	Sensor	DPD tablet
Free chlorine	CLE 3-CAN-P	DPD 1
	CLE 3.1-CAN-P	DPD 1
	CBR 1-CAN-P	DPD 1
	CLO 1-CAN-P	DPD 1

1. Tap on *[CAL]*

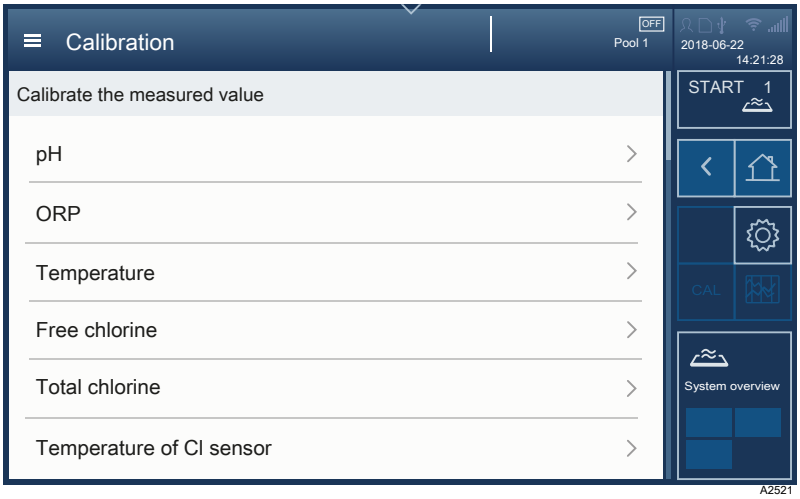


Fig. 53: Calibration interface.

2. Select the measured variable to be calibrated by tapping and scrolling on the display.
3. Follow the instructions on the display.

14.5 Calibrate: measured variable, total available chlorine

Measured variable	Sensor	DPD tablet
Total available chlorine	CGE 3-CAN-P	DPD 1

1. Tap on *[CAL]*

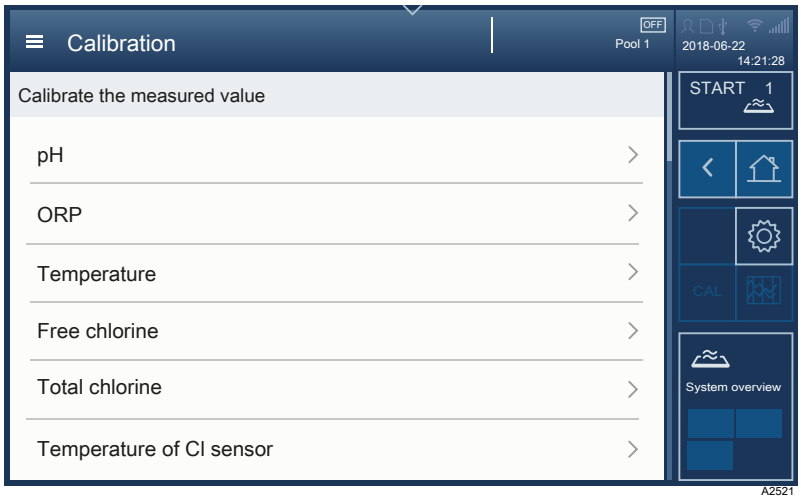


Fig. 54: Calibration interface.

2. Select the measured variable to be calibrated by tapping and scrolling on the display.
3. Follow the instructions on the display.

14.6 Calibrate: measured variable, total chlorine

Measured variable	Sensor	DPD tablet
Total chlorine	CTE 1-CAN-P	One DPD 4 tablet or one DPD 1 tablet + one DPD 3 tablet

1. Tap on *[CAL]*

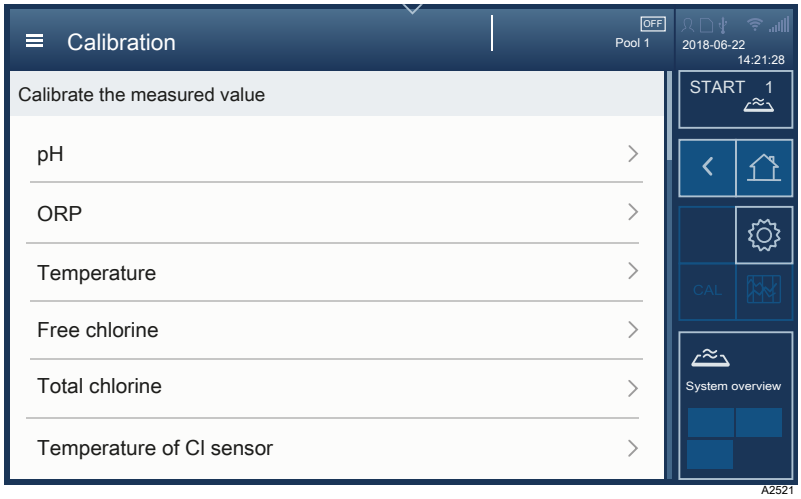


Fig. 55: Calibration interface.

2. Select the measured variable to be calibrated by tapping and scrolling on the display.
3. Follow the instructions on the display.

14.7 Calibrate: measured variable, total available bromine

Measured variable	Sensor	DPD tablet
Total available bromine	BRE 3-CAN-P	For DBDMH, free bromine: DPD1. For BCDMH: one DPD 4 tablet or one DPD 1 tablet + one DPD 3 tablet

1. Tap on *[CAL]*

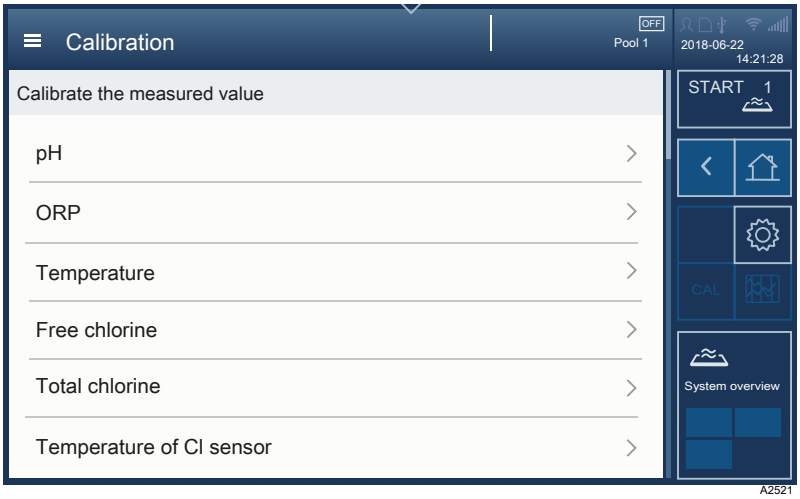


Fig. 56: Calibration interface.

2. Select the measured variable to be calibrated by tapping and scrolling on the display.
3. Follow the instructions on the display.

14.8 Calibrate: measured variable, total bromine

Measured variable	Sensor	DPD tablet
Total bromine	CBR 1-CAN-P	DPD 1

1. Tap on *[CAL]*

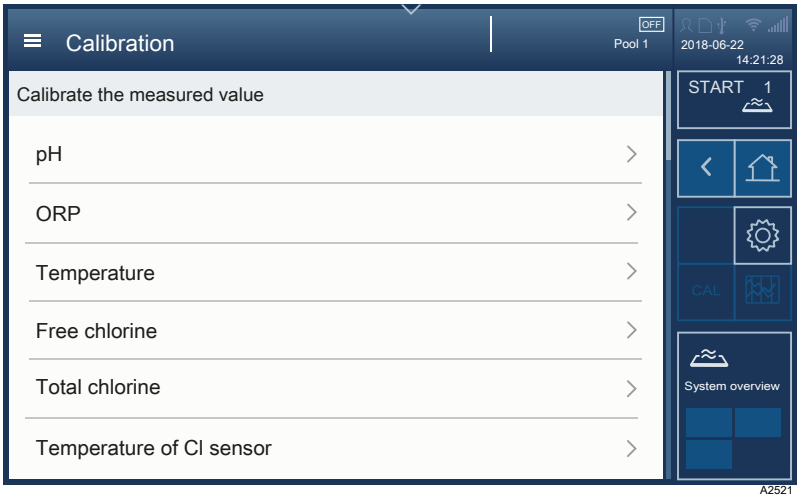


Fig. 57: Calibration interface.

2. Select the measured variable to be calibrated by tapping and scrolling on the display.
3. Follow the instructions on the display.

14.9 Calibrate: measured variable, chlorine dioxide

Measured variable	Sensor	DPD tablet
Chlorine dioxide	CDR 1-CAN	DPD 1

1. Tap on *[CAL]*

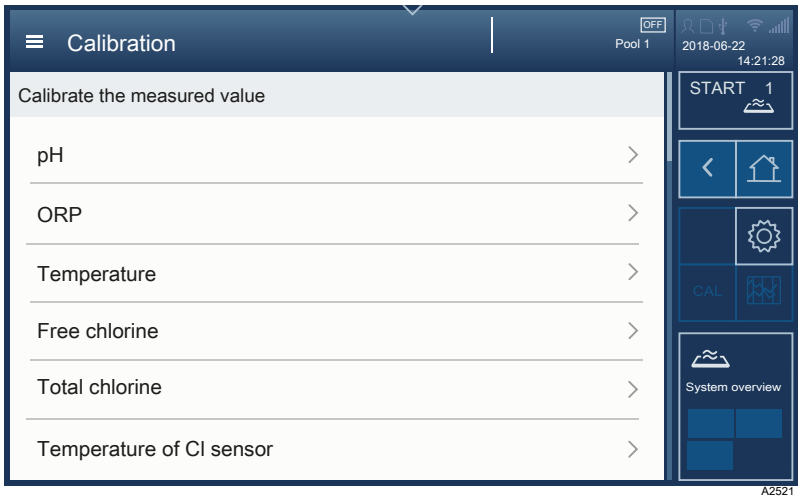


Fig. 58: Calibration interface.

2. Select the measured variable to be calibrated by tapping and scrolling on the display.
3. Follow the instructions on the display.

14.10 Calibrate: measured variable, chlorite

Measured variable	Sensor	DPD tablet
Chlorite	CLT 1-CAN	DPD method, chlorite in addition to chlorine dioxide

1. Tap on *[CAL]*

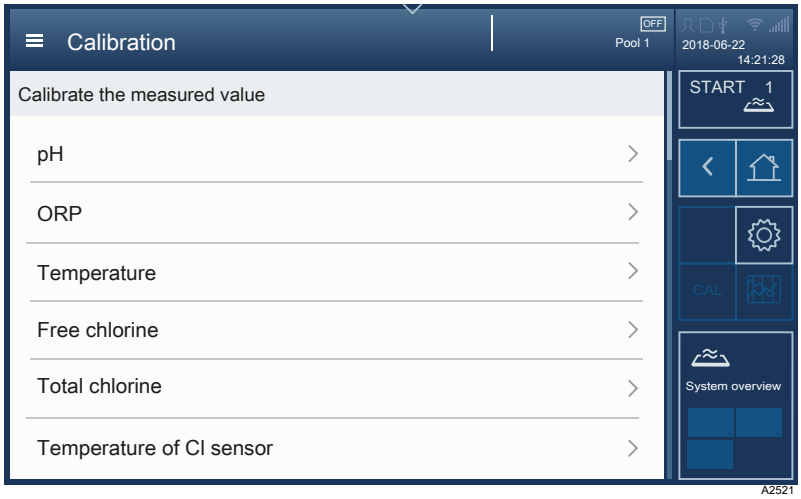


Fig. 59: Calibration interface.

2. Select the measured variable to be calibrated by tapping and scrolling on the display.
3. Follow the instructions on the display.

14.11 Calibrate: Temperature measured variable

1. Tap on *[CAL]*

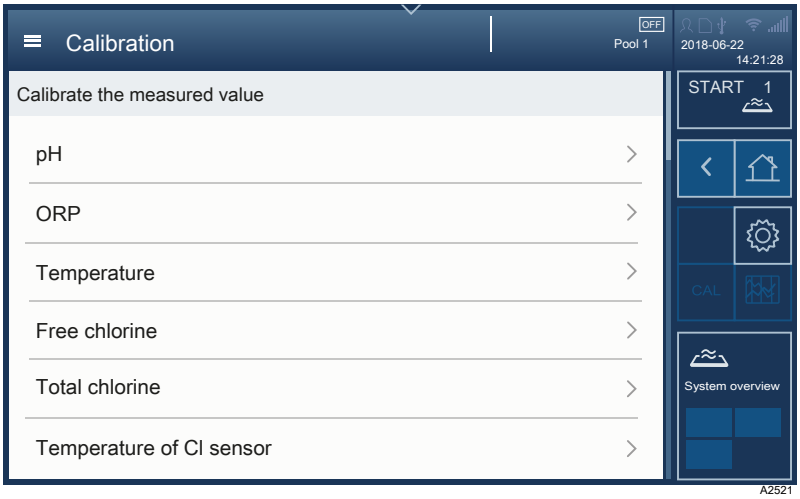


Fig. 60: Calibration interface.

2. Select the measured variable to be calibrated by tapping and scrolling on the display.
3. Follow the instructions on the display.

15 Calibrating the actuators

- **User qualification:** trained user, *Chapter 1.5 'User qualification' on page 10*

15.1 Calibrating the servomotor of the chlorine gas control

Prerequisite: The servomotor of the chlorine gas control is connected to the R module. The R module is assigned to the respective system, e.g. a swimming pool, in the *[Connectivity]* menu item using the *[Assignment modules]* button.

1. Tap on the R module in the *[Connectivity]* menu item.
   ⇨ The *[BUS details]* menu opens.
2. In the *[BUS details]* menu, scroll to *[R module calibration]*.
   ⇨ The *[calibrate R modules]* menu item opens.
3. Tap on *[Start]*.
   ⇨ The calibration process starts. The calibration process can take several minutes. There can also be occasional pauses.

   The device displays *[Calibration successful]* at the end of the calibration process.

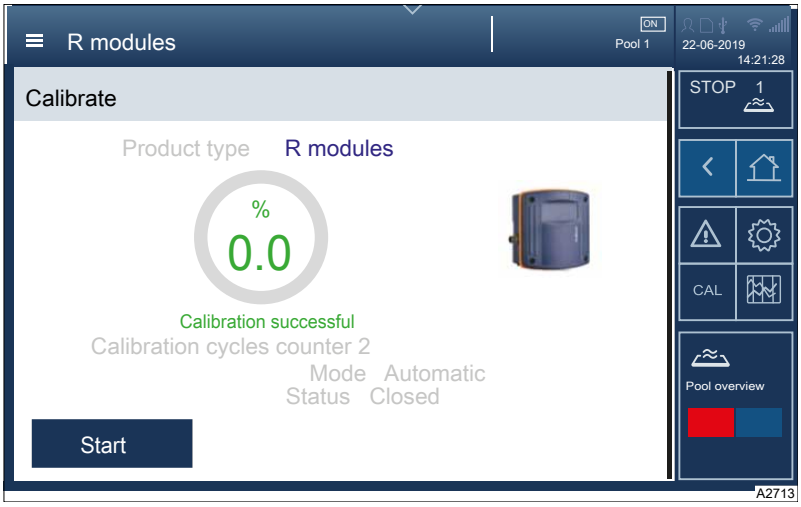


Fig. 61: [Calibration successful]

16 Flocculant treatment

A flocculant (ml/h) is metered into the volumetric flow circulated (m^3/h) upstream of the filter. The quantity to be added is noted on the flocculant packaging, e.g. 0.5 ... 1.5 ml per m^3/h circulation capacity.

Assumption: If the circulation capacity of pool X is 100 m^3/h and the amount of flocculant to be added is 1.0 ml per m^3/h of circulation capacity, the flocculant pump must meter 100ml/h of flocculant. If the circulation volume is reduced in partial load to e.g. 70 m^3/h, the amount of flocculant added must be automatically reduced to 70 ml/h.

The following are entered as variables:

- Circulation capacity in m^3/h
- Addition of flocculant in ml/h

The metering rate of the flocculant pump is calculated from these two parameters. The flocculant pump is controlled directly via the CAN bus. It can also be controlled via mA or frequency.

Because small volumes should be metered as continuously as possible, the DF4 peristaltic pump is very well suited to this task.

17 Factory settings of device

17.1 Factory settings for free chlorine measured variable

Measured variable: Free chlorine					
	Name		**Normal mode**	**Eco!Mode®**	**Superchlorination**
Controller settings	Control parameter		active	inactive	inactive
	Control type		PID	PID	PID
	Control direction		Increase value, monodirectional	Increase value, monodirectional	Increase value, monodirectional
	Setpoint		0.5 ppm	0.5 ppm	10 ppm
		Xp	0.2 ppm	2 ppm	0.5 ppm
		Ti	0 s (P) 3000 s (PI/PID)	0 s (P) 3000 s (PI/PID)	0 s (P) 3000 s (PI/PID)
		Td	0 s (P/PI/PID)	0 s (P/PI/PID)	0 s (P/PI/PID)
	Display range (bar graph)	min.	0	0	0
		max.	1	1	8
	Limit values (advance warning)	min.	0.3	0.3	0.3
	Limit values (advance warning)	max.	0.7	0.7	4.2
	Alarms (alarm relay switches)	min.	0.3	0.3	0.3
	Alarms (alarm relay switches and control stops)	max.	0.8	0.8	10.5
	Time for which limit value is exceeded, range 1 ... 1800 s		300 s	300 s	
	Recorder 2 h	min.	dynamic	dynamic	dynamic
		max.	dynamic	dynamic	dynamic
	Recorder	min.	0	0	0
		max.	2	2	10
					*
	* After superchlorination the alarms must be suppressed until normal mode is re-established. Superchlorination can possibly last up to 8 hours.				

17.2 Factory settings for combined chlorine measured variable

Measured variable: Combined chlorine				
	Name		Normal mode	Eco!Mode®
Controller settings	Control parameter		inactive	inactive
	Control type		2-point	2-point
	Control direction		Lower value, monodirectional	Lower value, monodirectional
	Setpoint			
		on	0.2	0.2
		off	0.15	0.15
	Display range (bar graph)	min.	0	0
		max.	0.5	0.5
	Limit values (advance warning)	min.	No alarm	No alarm
	Limit values (advance warning)	max.	0.2	0.2
	Alarms (alarm relay switches)	min.	0	0
	Alarms (alarm relay switches)	max.	0.2	0.2
	Time for which limit value is exceeded, range 1 ... 1800 s		300 s	300 s
	Recorder 2 h	min.	dynamic	dynamic
		max.	dynamic	dynamic
	Recorder	min.	0	0
		max.	1	1

17.3 Factory settings for pH measured variable

Measured variable: pH					
	Name		**Normal mode**	**Eco!Mode®**	**Superchlorination**
Controller settings	Control parameter		active	active	active
	Control type		PID	PID	PID
	Control direction		monodirectional; lower value	monodirectional; lower value	monodirectional; lower value
	Setpoint		7.2	7.2	7.2
		Xp	1.4	1.4	1
		Ti	0 s (P) 3000 s (PI/PID)	0 s (P) 3000 s (PI/PID)	0 s (P) 3000 s (PI/PID)
		Td	0 s (P/PI/PID)	0 s (P/PI/PID)	0 s (P/PI/PID)
	Display range (bar graph)	min.	6	6	6
		max.	8	8	8
	Limit values (advance warning)	min.	6.5	6.5	6.5
	Limit values (advance warning)	max.	7.4	7.4	7.4
	Alarms (alarm relay switches)	min.	6.5	6.5	6.5
	Alarms (alarm relay switches)	max.	8	8	8
	Time for which limit value is exceeded, range 1 ... 1800 s		300 s	300 s	300 s
	Recorder 2 h	min.	dynamic	dynamic	dynamic
		max.	dynamic	dynamic	dynamic
	Recorder overview	min.	6	6	6
		max.	8	8	8

17.4 Factory settings for ORP measured variable

ORP measured variable					
	Name		**Normal mode**	**Eco!Mode®**	**Superchlori-nation**
					prohibited!
Controller set-tings	Control param-eter		inactive	inactive	
	Control type		PID	PID	
	Control direc-tion		monodirectional; increase value	monodirectional; increase value	
	Setpoint		770	750	
		Xp	50	50	
		Ti	0 s (P) 3000 s (PI/PID)	0 s (P) 3000 s (PI/PID)	
		Td	0 s (P/PI/PID)	0 s (P/PI/PID)	
	Display range (bar graph)	min.	600	600	
		max.	1000	1000	
	Limit values (advance warning)	min.	750	740	
	Limit values (advance warning)	max.	850	790	
	Alarms (alarm relay switches)	min.	750	730	
	Alarms (alarm relay switches and control stops) *	max.	820	800	
	Time for which limit value is exceeded, range 1 ... 1800 s		300 s	300 s	
	Recorder 2 h	min.	dynamic	dynamic	
		max.	dynamic	dynamic	
	Recorder over-view	min.	600	600	
		max.	900	900	

* The control stops when controlling using the ORP value. The control does not stop if controlling via a chlorine sensor.

17.5 Factory settings for temperature measured variable

Measured variable: Temperature					
	Name		Normal mode	Eco!Mode®	Superchlorination
Controller settings	Control parameter		inactive	inactive	inactive
	Control type		2 points	2 points	2 points
	Control direction		Raise	Raise	Raise
	Setpoint				
		on	27	27	30
		off	29	29	32
	Display range (bar graph)	min.	15	15	15
		max.	40	40	40
	Limit values (advance warning)	min.	26	25	25
	Limit values (advance warning)	max.	30	30	30
	Alarms (alarm relay switches)	min.	25	25	25
	Alarms (alarm relay switches and control stops)	max.	31	30	30
	Time for which limit value is exceeded		300 s	300 s	300 s
	Recorder 2 h	min.	dynamic	dynamic	dynamic
		max.	dynamic	dynamic	dynamic
	Recorder overview	min.	10	10	0
		max.	35	35	35

18 Configuring the Local Unit and Global Unit

User qualification: trained user ↳ *Chapter 1.5 'User qualification' on page 10*

18.1 Local Unit/compact system

The entire system does not need to be cabled for configuration. You can start up and configure each individual pool separately providing assembly and installation of the relevant pool has been completed.

The Local Unit is configured as described in chapter ↳ *Chapter 13 'Application-specific settings' on page 89*.

You need to assign the CANbus-based pumps and/or devices.

All the devices available and assigned in the CANbus are displayed in the hamburger menu ▪ under *'Connectivity'*.

1. Tap on the *'BUS details'* overview.
   ⇨ You now find yourself in the BUS details pool menu where you can change selection of the existing assignment or assign new BUS devices by tapping on *'Change'*.
2. Now assign the respective CAN components (sensor, pump etc.) to your device. Assign the CAN components using the serial number of the CAN components. You will find the serial number for your CAN components on the nameplate of the CAN components.
3. Confirm the assignment with OK.
   ⇨ The user interface for the BUS details pool menu is displayed, with the previously assigned modules appearing as a green box.
4. Use the Back button ‹ to move to the *'BUS details'* overview in the Navigation menu.
   ⇨ The modules you have previously assigned are displayed here
5. Define the function of the respective pump, e.g. Lower pH value.

   You can verify the identification of the pump by means of a stroke length adjustment on the selected pump. Turning the knob of the pump should change the value in the display – if not, then you have selected the wrong pump.
   ⇨ All CAN modules have not been assigned to the Local Unit.

18.2 Global Unit

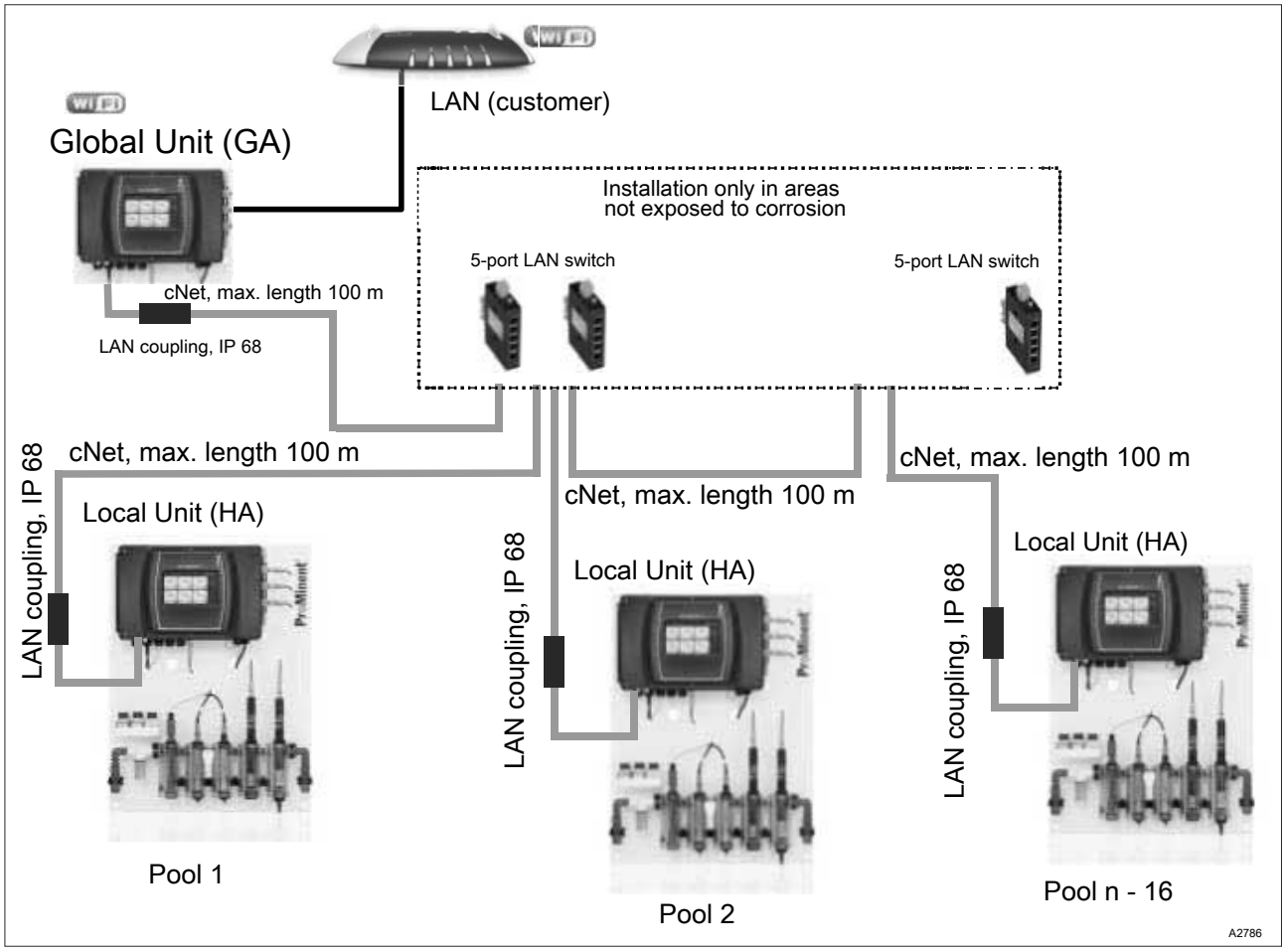


Fig. 62: Option 1: Multi-pool device (Global Unit) installed in the pool plant room, metering pumps installed at the pool.

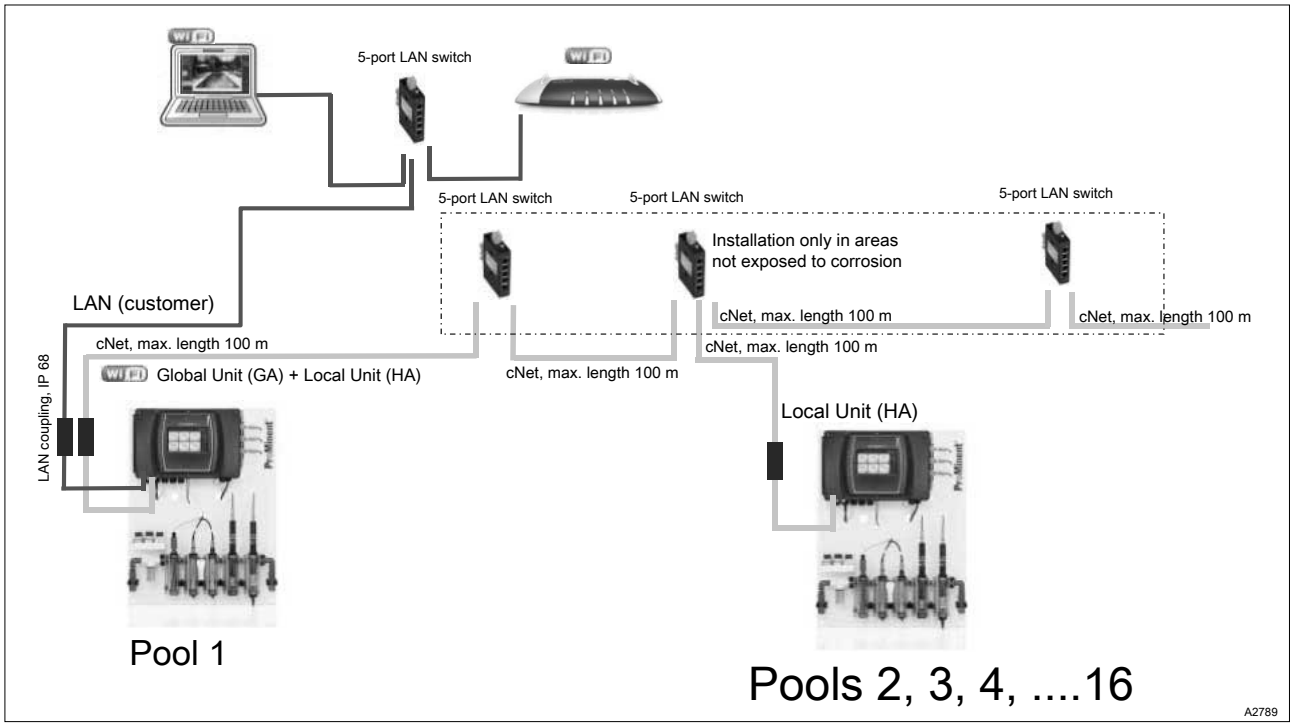


Fig. 63: Option 2: Global Unit with Local Unit functionality installed in the plant room, visualisation in the plant room with VNC server on the PC.

You can then configure the Global Unit following successful configuration of the Local Unit. The Global Unit can also be operated as a Local Unit in addition to its role as a Global Unit, but always needs to be assigned to pool 1. You need to note and implement the measured outlined in *Chapter 18.1 'Local Unit/compact system' on page 107* when operating as a Local Unit. The individual Local Units then need to be assigned to the Global Unit.

1. If necessary: Install the Global Unit as a Local Unit for pool 1.
2. Align the configuration of all Local Units.
3. Connect all Local Units to the Global Unit by cNet, see Fig. 63.
4. Input the number of pools on your Global Unit. To enter, tap on *'System settings'* > *'System'* in the hamburger menu ☰.

Fig. 64: Tap on [System].

5. Tap on *[System]*.
   ⇨ The *[System settings]* > *[Device settings]* > *[Selected number of pools]* menu opens.
6. Use the arrow key to exit the menu so that the system detects and carries over the number of pools entered.

Fig. 65: Tap on [System].

7. Tap on *[System]*.
   ⇨ The *[System settings]* > *[Device settings]* > *[Define pool name]* menu opens.

8. Enter the name of the respective pool here. Note that the Global Unit used as a Local Unit is always pool 1.

cNet: Assigning Local Units to the Global Unit via cNet

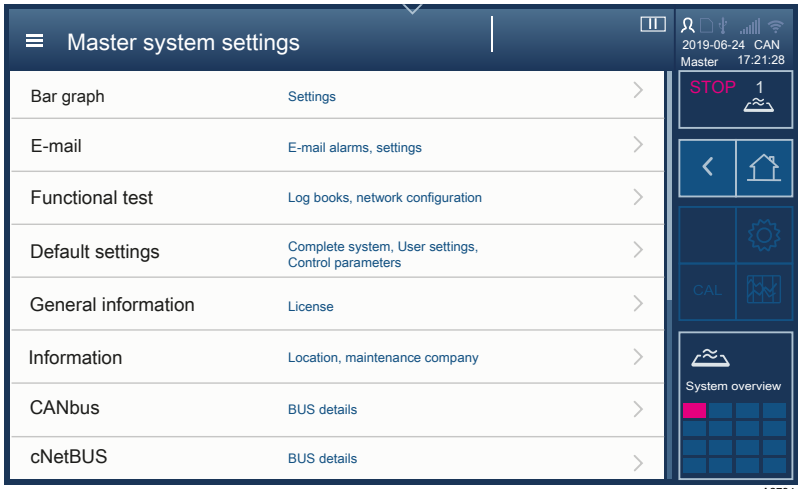


Fig. 66: Assigning Local Units to the Global Unit via cNet

1. Assign the Local Units to the Global Unit via cNet. To enter, tap on *'Master system settings'* > *' cNet-BUS '* in the hamburger menu ≡.

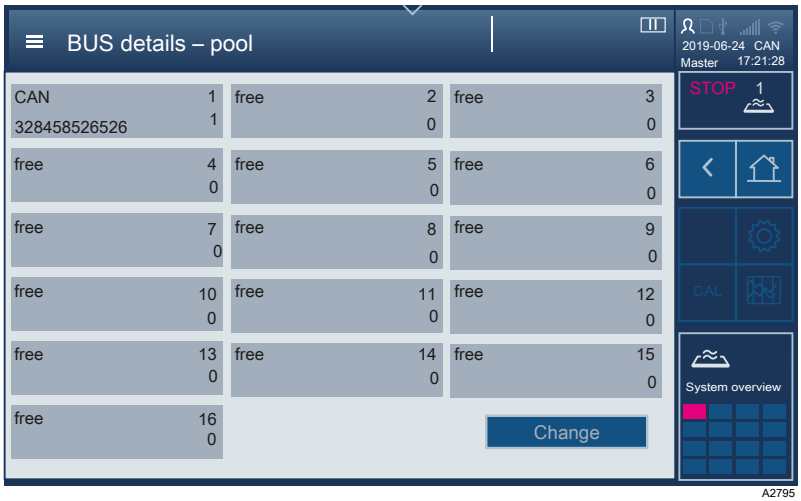


Fig. 67: Assigning Local Units to the Global Unit via cNet

2. Tap on the number of the Local Unit which you wish to assign and following the instructions on the device.

If necessary, print off this page and manually write down the serial numbers of the Local Units and the names of the associated pools. This will make it easier for you to assign the Local Units to the Global Unit.

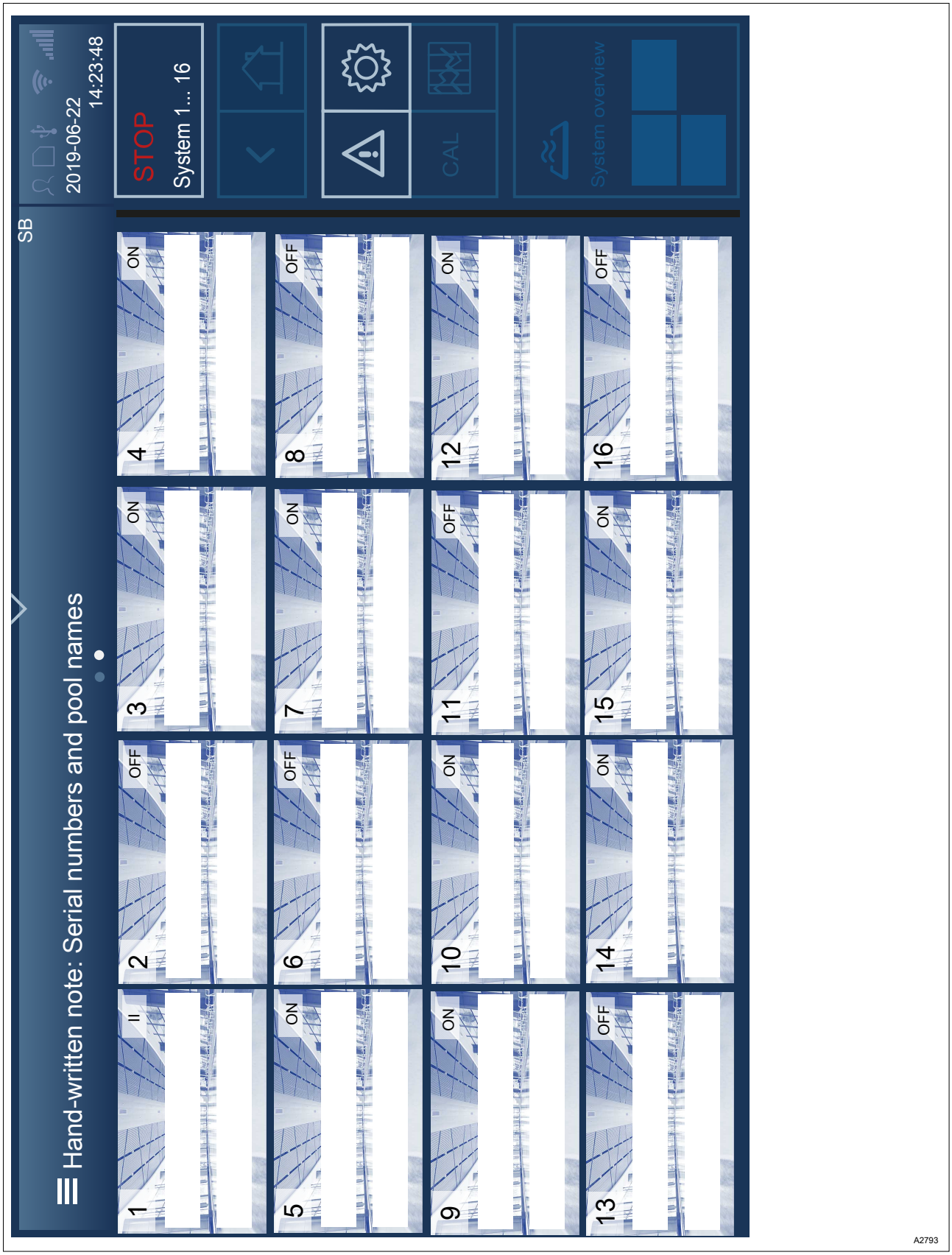


Fig. 68: Hand-written note: Serial number of the Local Units and names of the associated pools.

19 Commissioning

- **User qualification:** trained user, ↳ *Chapter 1.5 'User qualification' on page 10*

The following tasks should be undertaken for commissioning provided they have not already been carried out. Once the sensors have been calibrated, the system controlled by the DULCOMARIN® 3 is essentially ready for use.

Factor in the run-in periods of the sensors during commissioning. The run-in period can take up to 24 hours and the DULCOMARIN® 3 is only really ready for use once the sensors have fully run in.

The operator of the system is responsible for ensuring that everyone appointed to operate and maintain the device etc. has read the operating instructions and been trained in how to operate the device ↳ *Chapter 12 'Operating the device' on page 81*

Task	Chapter
Mechanical assembly carried out?	↳ *Chapter 6.3 'Installation, mechanical' on page 30*
Electrical installation carried out?	↳ *Chapter 6.4 'Electrical installation' on page 33*
CAN connectivity carried out?	↳ *Chapter 7.3 'CAN connectivity' on page 69*
LAN connectivity carried out?	↳ *Chapter 9 'LAN construction' on page 74*
cNet configuration carried out?	↳ *Chapter 8 'cNet configuration for up to 16 pools, by way of example' on page 72*
Compact unit configured?	↳ *Chapter 18.1 'Local Unit/compact system' on page 107*
Local Unit configured?	↳ *Chapter 18.1 'Local Unit/compact system' on page 107*
Global Unit configured?	↳ *Chapter 18.2 'Global Unit' on page 108*
Communication interfaces configured?	↳ *Chapter 10 'Interfaces' on page 77*
Data logger configured?	↳ *Chapter 11 'Data logger' on page 80*
Application-specific settings configured?	↳ *Chapter 13 'Application-specific settings' on page 89*
Sensors calibrated?	↳ *Chapter 14 'Calibrating the measured variables' on page 91*
Flocculant treatment configured?	↳ *Chapter 16 'Flocculant treatment' on page 101*

19.1 Initial commissioning procedure

Description of procedure for starting up a swimming pool for the first time (single pool)

The following requirements must be met:

- mechanical assembly carried out,
- hydraulic installation carried out,
- circulating pump running,
- electrical installation carried out,
- CAN connectivity carried out,
- communication interfaces configured.

Tab. 18: Description of procedure for starting up a swimming pool for the first time (single pool)

Step	Process	Details	Who	Duration
1	Switch on device	Switch on supply voltage.	Service	
2	Configuration of the DM3	Set language.	Service	
3	Configuration of the DM3	Set date and time.	Service	
4	Configuration of the DM3	Enter system data (pool name).	Service	
5	Configuration of the DM3	■ Pool settings ■ Pool geometry ■ Pool volume	Service	
6	Configuration of the DM3	Enter circulation capacity.	Service	
7	Configuration of the DM3	Assign sensors to pool.	Service	
8	Configuration of the DM3	Assign pump to pool.	Service	
9	Configuration of the DM3	Assign a function (raise value/lower value) to the pumps.	Service	
10	Start basic chlorination	Check control parameters and adapt as necessary. Perform basic chlorination, using a theoretically calculated value.	Service	approx. 2 min (whirlpool) to approx. 30 min (sports pool)
11	Chlorine measurement	Sensors must run in.	Service	up to 24 hours
12	Calibrate	Calibrate sensors	Service	Repeat calibration after 24 h after run-in when the measured value no longer changes
13	Start control	Start control on the DM3.	Service	
14	Closed-loop control	The system runs fully automatically.	Service	min. 2 h to 1 day
15	Maintenance	Check control parameters, if necessary perform fine adjustment and recalibrate the system.	Service	
16	Final log	Documentation of all control parameters including assignment of components with serial numbers in the respective pools.	Service	

20 Diagnostics, error and warning messages

- **User qualification:** trained user, ↳ *Chapter 1.5 'User qualification' on page 10*

The unit guides you and notifies you with complete help, warning and error texts that appear on the display when required. These texts enable a trained user to deal with the error etc. independently. When the unit indicates that it is no longer working, first check the power supply and then the internal and external fuse. Notify Service should this not lead to success.

21 Software update

- **User qualification:** trained user, *Chapter 1.5 'User qualification' on page 10*

Software update

Only the latest software is installed, all the application settings are retained.

1. Download the latest software version from the manufacturer's homepage www.prominent.com.
2. Copy this software onto a commercially available USB storage device.
3. Unscrew the protective cap from the USB port on the bottom right of the upper part of the housing and insert the USB storage device into the USB port.

NOTICE!

This process cannot be cancelled

Once started, an update process can no longer be terminated. The measuring and control unit can no longer be reset. Only perform the update process when you can be sure that the USB storage device is working and the USB storage device has the latest software installed.

4. Tap on the *[hamburger]* menu, then on *[System settings]*, tap on *[System]* and scroll to *[System functions]* and tap on *[Start update]*.

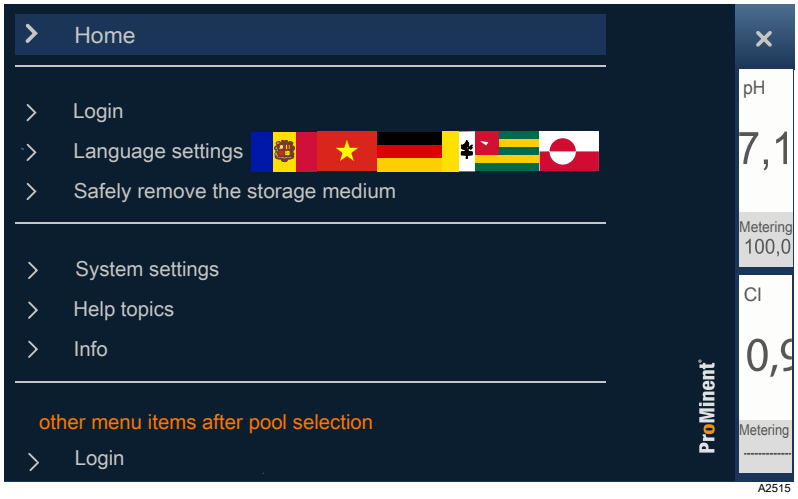


Fig. 69: Tap on the [hamburger] menu

⇨ The measuring and control unit requests a password and checks the software status on the USB storage device. The automatic update process starts automatically. Once the update process has ended, the *'Home'* screen appears on the measuring and control unit.

22 Maintenance

- **User qualification:** instructed user, *Chapter 1.5 'User qualification' on page 10*

The device requires no maintenance.

1. Use a soft cloth and commercially available window cleaner to clean the surfaces.
2. Regularly check the device for damage, e.g. each time the device is used.

   ⇨ Repair damaged devices immediately. If necessary, take damaged devices out of service and make the entire process safe.
3. All other maintenance work on the linked components is based on the details provided in the technical documentation for these components.

   ⇨ The operator of the device must produce a maintenance and servicing plan for the entire system.

23 Technical data

23.1 General information

Parameter	Value
Ambient temperature:	-5 ... 50 °C (for use indoors or with a protective enclosure). Requires a low voltage cable with a temperature resistance of ≧ 70 °C.
Storage temperature:	-20 ... 70 °C
Electrical connection:	90 ... 253 V AC, 50/60 Hz, 42 W
Degree of protection:	Wall-mounted: IP66/IP67 (closed) // IP20 (open)
Degree of contamination:	3 (standard IEC 61010)
Overvoltage category:	2 (DIN VDE 010/IEC publication 664)
Weight:	approx. 7.5 kg with packaging and accessories. approx. 4.67 kg without packaging and accessories.

23.2 Electrical data

The electrical data for the individual modules can be found at
↳ *Chapter 6.4.4 'Terminal diagram' on page 46*.

Fuses

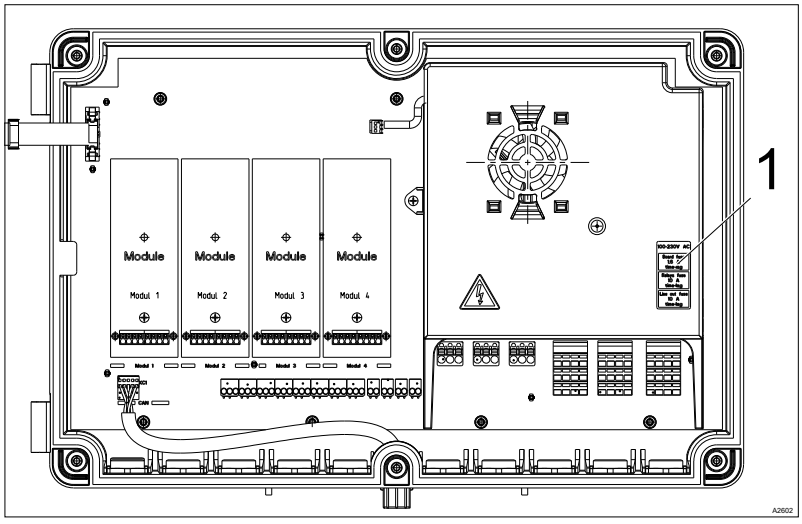


Fig. 70: Fuses (1)

Component	Part number
Mains fuse: 1.6 AT 250 VAC, 5 x 20 mm, H = high-performance fuses (high switch-off capacity)	732411
Output terminal XP1 fuse: 10 AT, 250 VAC, 5 x 20 mm; H = high-performance fuses (high switch-off capacity). Maximum load: 8 A (due to ambient temperature of up to 50 °C)	733855
Output relay XR4 fuse (relay 4), XR5 (relay 5, relay 6): 10 AT, 250 VAC, 5 x 20 mm, H = high-performance fuses (high switch-off capacity). Maximum load: 8 A (due to ambient temperature of up to 50 °C)	733855

Output relay, feeding

Relay	Function	Protective circuit	Switching power	Load type
XR4 relay 4	Output relay 100 ... 230 VAC, feeding	Varistor on NO and NC terminal and additionally RC circuit on the NO and NC terminal	Max. 1100 VA (≤ 5A) Starting current max. 30 A for 0.5 seconds	Ohmic and inductive on NO terminal (up to cos phi = 0.4)
XR5 relay 5	Output relay 100 ... 230 VAC, feeding	Varistor on NO and NC terminal and additionally RC circuit on the NO and NC terminal	Max. 1100 VA (≤ 5A) Starting current max. 30 A for 0.5 seconds	Ohmic and inductive on NO terminal (up to cos phi = 0.4)
XR5 relay 6	Output relay 100 ... 230 VAC, feeding	Varistor on NO and NC terminal and additionally RC circuit on the NO and NC terminal	Max. 1100 VA (≤ 5A) Starting current max. 30 A for 0.5 seconds	Ohmic and inductive (up to cos phi = 0.4)

Tab. 19: Output relay, potential-free

Relay	Function	Protective circuit	Switching power	Load type
XR1 relay 1	Output relay, potential-free (24 VDC or 100 ... 230 VAC)	Varistor on the NO and NC terminal	Max. 1100 VA (≤ 5A) Starting current max. 30 A for 0.5 seconds	Ohmic
XR2 relay 2	Output relay, potential-free (24 VDC or 100 ... 230 VAC)	Varistor on the NO and NC terminal	Max. 1100 VA (≤ 5A) Starting current max. 30 A for 0.5 seconds	Ohmic
XR3 relay 3	Output relay, potential-free (24 VDC or 100 ... 230 VAC)	Varistor on the NO and NC terminal	Max. 1100 VA (≤ 5A) Starting current max. 30 A for 0.5 seconds	Ohmic

Switching digital output 250 mA (XA1 ..., XA4)

Tab. 20: Switching; load type: ohmic max. 250 mA; max. 100 Hz

Insulation voltage	500 V pp max.
Switching voltage (safety low voltage):	30 V AC pp or DC max.
Switching current:	Max. 250 mA
Residual current (open):	Max. 10 µA
Switching frequency:	Max. 100 Hz
Max. cable length:	30 m (EMC standard 61326)
Relay type:	Optomos relay

Digital input with power supply (XK1 ..., XK8)

Tab. 21: Static/dynamic signal (frequency ≤ 10 kHz)

Insulation voltage	500 V pp max.
Output voltage of digital input:	max. 18 V (electrical strength of the switch)
Short circuit current, digital input (also capacitive discharge current):	max. 10 mA
Max. switching frequency (hardware):	10 kHz
Max. frequency:	Software filter sets the maximum frequency
Max. cable length:	30 m (EMC standard 61326)
Output voltage of supply to digital input:	12 ... 16 VDC / max. 10 mA
Contact resistance, open:	>100 kΩ
Contact resistance, closed:	<100 Ω
Switch:	mechanical contact or *[open collector]* (potential-free)

Tab. 22: CAN bus (XC1, XC3):

XC1:	CAN 1 local CAN BUS with external power supply 20 V / 0.4 A (power-restricted) with CAN shield to PE connector
XC3:	CAN 1 local CAN BUS with external power supply 20 V / 0.4 A (power-restricted) without CAN shield to PE connector

24 Spare parts and accessories

Ordering address for spare parts and accessories: The current address for ordering spare parts and accessories can be found on the manufacturer's homepage ProMinent GmbH.

24.1 Spare parts

Fuses

Component	Part number
Mains fuse: 2.5 AT 250 VAC, 5 x 20 mm, *[H]* = high switching capacity.	732413
Output terminal XP1 fuse: 10 AT, 250 VAC, 5 x 20 mm. Maximum load: 8 A (due to ambient temperature of up to 50 °C).	712073
Output relay XR4 fuse (relay 4), XR5 (relay 5, relay 6): 10 AT, 250 VAC, 5 x 20 mm. Maximum load: 8 A (due to ambient temperature of up to 50 °C).	712073

Assembly components

Component	Part number
Assembly material, complete, 2P Universal	1092176
Cable threaded connectors	1029464
CD with content	1092571
T-distributor, CAN	1022155
Connecting cable, CAN, 1 metre	1022139
Terminal resistance, M12 coupling	1022154
Terminal resistance, M12 plug	1022592

24.2 Accessories

Component	Part number
SD card, industrial, 2 GB	1076613
RC member RC-B30, 110 ... 230 V	710802

24.2.1 Additional measuring modules

The measuring modules available as accessories can be fitted to the base modules shown in chapter *Chapter 6.4.3 'Terminal layout' on page 45*. For terminal diagrams see *Chapter 6.4.4 'Terminal diagram' on page 46*. The measuring modules can replace or supplement the existing measuring modules. The modules are attached, fixed and detected by restarting the controller. Cabling and commissioning is all as per the measuring modules available ex-works.

Component	Part number
Measuring module *'2x pH/ORP/Temp'*, with fittings and terminal adhesive label.	1081807
Measuring module *'2x mA output'*, with fittings and terminal adhesive label.	1092565

25 Formal information and standards

25.1 Disposal of used parts

- **User qualification:** instructed user, see *Chapter 1.5 'User qualification' on page 10*

NOTICE!

Regulations governing the disposal of used parts

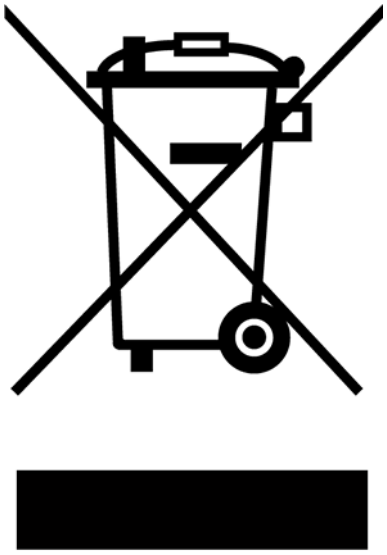
– Note the national regulations and legal standards that currently apply in your country

The manufacturer will take back decontaminated used devices providing they are covered by adequate postage.

Decontaminate the device before returning it for repair. To do so, remove all traces of hazardous substances. Refer to the Material Safety Data Sheet for your feed chemical.

A current Declaration of Decontamination is available to download on the ProMinent website.

Sign indicating EU collection system



In accordance with the European Directive 2012/19/EU on waste electrical and electronic equipment, this device features the symbol showing a waste bin with a line through it. The device must not be disposed of along with domestic waste. To return the device, use the return and collection systems available and observe the local legal requirements.

25.2 Standards complied with and Declaration of Conformity

The Declaration of Conformity for the controller is available to download on our homepage.

EN 61010-1 Safety requirements for electrical equipment for measurement, control and laboratory use – Part 1: General requirements

EN 61326-1 Electrical equipment for measuring, control and laboratory use – EMC requirements (for class A and B devices)

DIN EN 50581 - Technical documentation for the assessment of electrical and electronic products with regard to the restriction of hazardous substances

EN 60529 - Degrees of protection provided by enclosures (IP code)

26 Index

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S

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