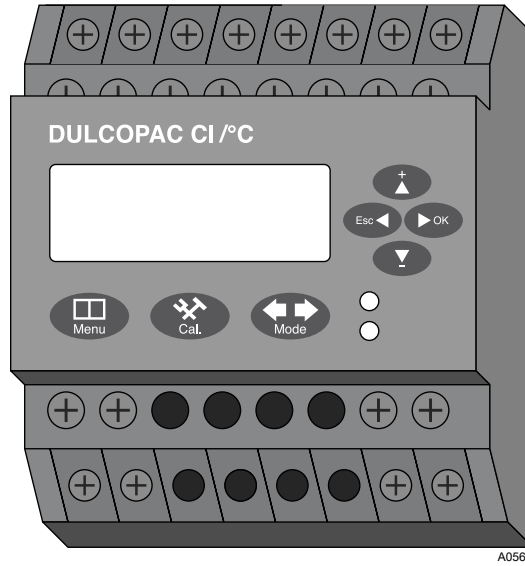
Assembly and operating instructions

DULCOMETER® DULCOPAC

Single Channel Measuring and Control Unit for Top Hat Rail Installation



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!
Technical changes reserved.

Part no. 985978

BA DM 185 04/11 EN

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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

Read the following supplementary information in its entirety!

The following are highlighted separately in the document:

- Enumerated lists

→ Instructions

⇨ Results of the instructions

Information

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

Safety information

Safety information are provided with detailed descriptions of the endangering situation, see ↳ *Chapter 1.1 "Explanation of the safety information" on page 7*

Table of contents

1 An initial overview for you

Data and functions

These operating instructions describe the technical data and functions of the single channel measuring and control unit DULCOMETER® DULCOPAC.

The single channel measuring and control unitDULCOMETER® DULCOPAC will simply be referred to as the DULCOPAC for the remainder of these instructions.

The DULCOPAC is designed to measure and control the variables pH, ORP, chlorine, bromine, peracetic acid, hydrogen peroxide and conductivity in aqueous solutions and has one sensor input for each measured variable.

Allocation of part numbers by measured variable

Part number	Measured variable
1036425	pH (mV)
1036426	pH (mA)
1036427	ORP (mV)
1036428	ORP (mA)
1036429	Chlorine
1036430	Conductivity (mA)
1036431	Conductivity (direct)
1036432	PAA (peracetic acid)
1036433	H_2O_2 (hydrogen peroxide)
1036434	Bromine

1.1 Explanation of the safety information

Introduction

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

The safety 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

Danger!

– Denotes an immediate threatening danger. If this 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

Warning!

– Denotes a possibly hazardous situation. If this 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

Caution!

– Denotes a possibly hazardous situation. If this 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

Note!

– Denotes a possibly damaging situation. If this 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

Information!

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

1.2 Users' qualifications

WARNING!

Danger of injury with inadequately qualified personnel!

The operator of the plant / device 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

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/her 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 ProMinent or another authorised distribution partner.
Trained qualified personnel	A 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/her training, knowledge and experience, as well as knowledge of pertinent regulations. The assessment of a person's technical training can also be based on several years of work in the relevant field.

Training	Definition
Electrician	Electricians are deemed to be people, who are able to complete work on electrical systems and recognize and avoid possible hazards independently based on his/her technical training and experience, as well as knowledge of pertinent standards and regulations. Electricians should be specifically trained for the working environment in which the are employed and know the relevant standards and regulations. Electricians must comply with the provisions of the applicable statutory directives on accident prevention.
Customer Service department	Customer Service department refers to service technicians, who have received proven training and have been authorised by ProMinent to work on the system.

Note for the system operator

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

2 Safety and responsibility

2.1 General safety information for the device

WARNING!

Live parts

Possible consequence: Fatal or very serious injuries

- Measure: Before working on the device or the electrical supply, disconnect it from the power supply.
- Isolate damaged, faulty or manipulated devices from the power supply and secure to prevent switching back on

WARNING!

Unauthorised access

Possible consequence: Fatal or very serious injuries.

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

WARNING!

Operating errors!

Possible consequence: Fatal or very serious injuries.

- The device should only be operated by adequately qualified and technically expert personnel
- Please also observe the operating instructions for controllers and fittings and any other component groups, such as sensors, sample water pumps ...
- The company operating the measuring/control station is responsible for the qualification of the personnel operating it.

⚠ CAUTION!

Electronic malfunctions

Possible consequence: Material damage right through to destruction of the unit

- The mains connection and data cables should not be laid together with cables that are prone to interference
- Measure: If sufficient separation of the cables cannot be ensured, take appropriate interference suppression measures.

! NOTICE!

Correct and proper use

Damage to the product or its surroundings

- The unit is not intended to measure or regulate gaseous or solid media
- The device may only be used in accordance with the technical data and specifications provided in these operating instructions and in the operating instructions for the individual components

! NOTICE!

Correct sensor operation / Run-in time

Damage to the product or its surroundings

- Correct measuring and metering is only possible if the sensor is working perfectly
- Observe the sensor run in periods without fail
- Calculate the run in periods when planning commissioning
- It may take a whole working day to run-in the sensor
- Observe the sensor operating instructions

! NOTICE!

Correct sensor operation

Damage to the product or its surroundings

- Correct measuring and metering is only possible if the sensor is working perfectly
- Regularly check and calibrate the sensor

! NOTICE!

Compensation for control deviations

Damage to the product or its surroundings

– Do not use the controller in control circuits which require fast compensation (< 30 s)

2.2 Correct and proper use

! NOTICE!

Compensation for control deviations

Damage to the product or its surroundings

– The controller can be used in processes, which require compensation of > 30 seconds

! NOTICE!

Correct and proper use

The unit is intended to measure and regulate liquid media. The marking of the measured variables is located on the controller and is absolutely binding.

The unit may only be used in accordance with the technical details and specifications provided in this operating manual and in the operating manuals for the individual components (such as, for example, sensors, fittings, calibration devices, metering pumps etc.).

Any other uses or modifications are prohibited.

3 Brief functional description

The DULCOPAC is equipped to measure the variables pH, ORP, chlorine, bromine, peracetic acid, hydrogen peroxide and conductivity in aqueous solutions and has one sensor input for each measured variable.

The DULCOPAC is suitable for water and waste water treatment applications in which measured values seldom have to be recorded or adjusted. The device is therefore designed to be installed on a top hat rail (TS 35 according to EN 50022) in a control cabinet. It is operated and configured using push buttons and the integrated LCD display.

Additional module

The following additional module is available for operation of the DULCOPAC:

- DULCOPAC power supply:
  Power supply unit for up to 10 DULCOPAC

Application example: Measurement of pH with connection to a PLC

Task and conditions of use.

The pH value is to be measured in the bypass of a process water pipe, temperature 35 °C, pressure 3 bar, no solid matter content. The DULCOPAC is located in a control cabinet and the converted measuring signal is transmitted to a PLC as an analog signal.

Components of the measuring/control station

Quantity	Description	Part no.
1	DULCOPAC pH (mV)	1036425
1	DULCOPAC power supply	1036436
2 m	Coaxial cable ⌀ 5 mm 10.0 m - S	305040
1	pH sensor PHEP 112 SE	150041
1	Sensor DGMA with sample water limit contact	DGMa310T000

Application example: Measurement of free chlorine with connection to a PLC

Task and conditions of use

The concentration of chlorine is to be measured in the bypass of a process water pipe. Chlorine concentration approx. 0.6 ppm, water temperature approx. 35 °C, total pressure approx. 1 bar, no solid matter The DULCOPAC is located in a control cabinet and the converted measuring signal is transmitted to a PLC as an analog signal.

Components of the measuring/control station

Quantity	Description	Part no.
1	DULCOPAC Chlorine	1036429
1	DULCOPAC power supply	1036436
2 m	Two-wire measuring line 2 x 0.25 mm^2, Ø 4 mm	725122
1	Chlorine sensor CLE 3-mA-2 ppm	792920
1	Sensor DGMA with sample water limit contact	DGMa301T000

Application example: Measurement of conductive conductivity with connection to a PLC

Task and conditions of use.

The electrolytic conductivity is to be measured in the bypass of a process water pipe. Conductivity approx. 7500 µS/cm, water temperature approx. 35 °C, total pressure approx. 1 bar, no solid matter. The DULCOPAC is located in a control cabinet and the converted measuring signal is transmitted to a PLC as an analog signal.

Components of the measuring/control station

Quantity	Description	Part no.
1	DULCOPAC Conductivity (direct)	1036431
1	DULCOPAC power supply	1036436
2 m	Measuring line type LKT for conductivity sensor Ø 6,2 mm	723712
1	Sensor conductivity LFT 1 DE	1001376
1	Sensor DGMA with sample water limit contact	DGMa310T000

3.1 Overview of the first level menu

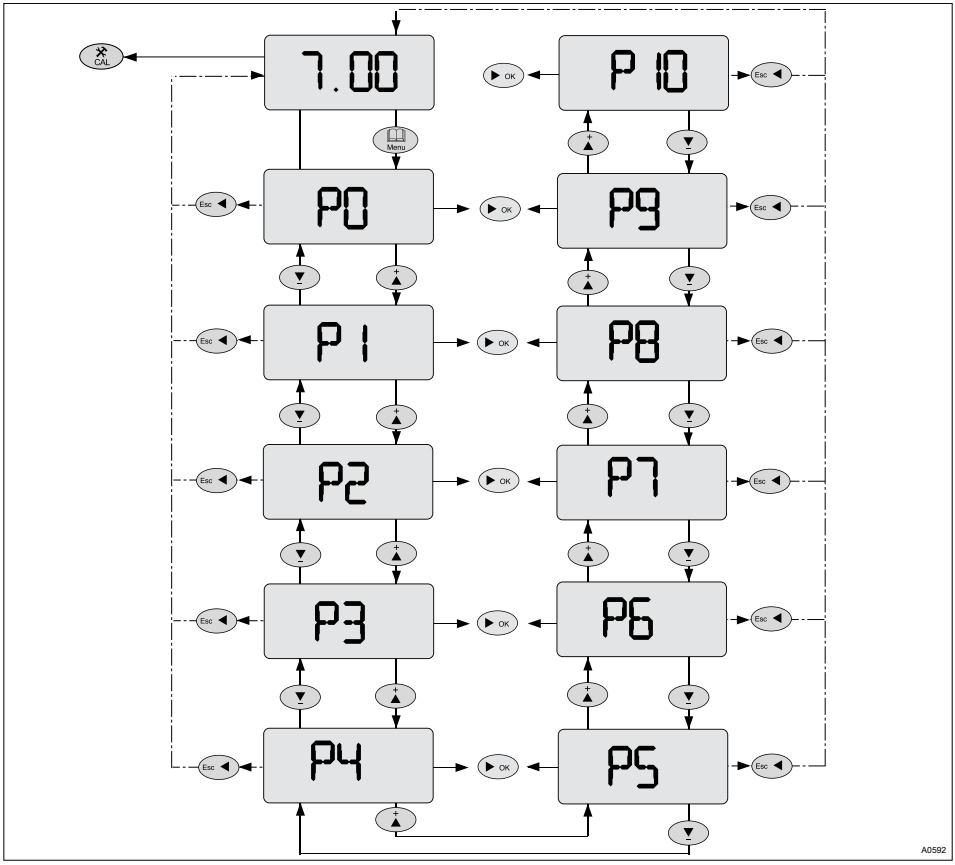

Fig. 1: First level menu; shown for pH

Using the key Menu you can jump from the continuous display to the first level of the adjustable parameters. There using keys + and − you can change between the adjustable parameter displays.

You can return to the central menu item by pressing the Esc key.

You can jump from the first level to the second level by pressing the OK key.

You can jump to the calibration menu for the measured variable in question by pressing the Cal. key.

Display	Jump to the menu	Meaning
7.00		Continuous display
7.00		Calibration menu, see *Chapter 8.2 "Calibration of the measured variable pH" on page 59*
P0		Adjust setpoint, see *Chapter 7.2 "P0 - Adjusting the setpoint" on page 35*
P1		Adjust control, see *Chapter 7.3 "P1 - Adjusting the control" on page 36*
P2		Adjust relay, see *Chapter 7.4 "P2 - Adjusting the relay" on page 39*
P3		Adjust relay operating mode, see *Chapter 7.5 "P3 - Operating mode Adjusting the relay" on page 42*
P4		Adjust alarm thresholds, see *Chapter 7.6 "P4 - Adjusting the alarm thresholds" on page 44*
P5		Adjust analog outputs operating mode, see *Chapter 7.7 "P5 - Operating mode Adjusting the analog outputs" on page 46*
P6		Adjust analog outputs, see *Chapter 7.8 "P6 - Adjusting the analog outputs" on page 49*
P7		Adjust digital inputs, see *Chapter 7.9 "P7 - Adjusting the digital inputs" on page 50*
P8		Adjust communication, see *Chapter 7.10 "P8 - Adjusting the communication (RS 485)" on page 51*

Display	Jump to the menu	Meaning
P9	▶OK	Adjust measuring range, see *Chapter 7.11 “P2 - Adjusting the measuring range” on page 53*
P10	▶OK	Set measurement rate in minutes, see *Chapter 7.12 “P10 - Adjusting the measurement rate” on page 55*

4 Assembly and installation for trained qualified personnel

- **User qualification, mechanical mounting:** trained qualified personnel, see ↳ *Chapter 1.2 “Users' qualifications” on page 9*
- **User qualification, electrical installation:** Qualified electrician, see ↳ *Chapter 1.2 “Users' qualifications” on page 9*

! NOTICE!

Mounting position and conditions

– The installation (electrical) can only take place after mounting (mechanical)
– Ensure that there is unimpeded access for operation
– Secure, low-vibration fixing
– Avoid direct sunlight
– Permissible ambient temperature at fitting position: -10 ... 60°C at max. 95 % relative air humidity (non-condensing)
– The permissible ambient temperature of the connected sensors and other such components must be considered

Reading and operating position

– *Install the device in a favourable position for reading and operating (preferably at eye level)*

Mounting position

– *Leave sufficient free space for the cables*

Packaging material

Dispose of packaging material environmentally. All packaging components are provided with their corresponding recycling ♻.

4.1 Scope of supply

The following components are included as standard with a DULCOPAC.

Description	Quantity
DULCOMETER® DULCOPAC single-channel measuring and control unit	1
Instructions for assembly and use	1
General safety information	1

4.2 Mechanical assembly of the DULCOPAC

The DULCOPAC is intended for installation using top hat rails (TS 35 after EN 50022) in control cabinets. The DULCOPAC is inserted on the top hat rail and engages automatically. For removal, the device is unlocked on the bottom edge using a suitable tool and removed from the top hat rail.

4.3 Installation (electrical)

WARNING!

Live parts

Possible consequence: Fatal or very serious injuries

- Measure: Before working on the device or the electrical supply, disconnect it from the power supply.
- Isolate damaged, faulty or manipulated devices from the power supply and secure to prevent switching back on

4.3.1 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

4.3.2 Terminal diagram / wiring

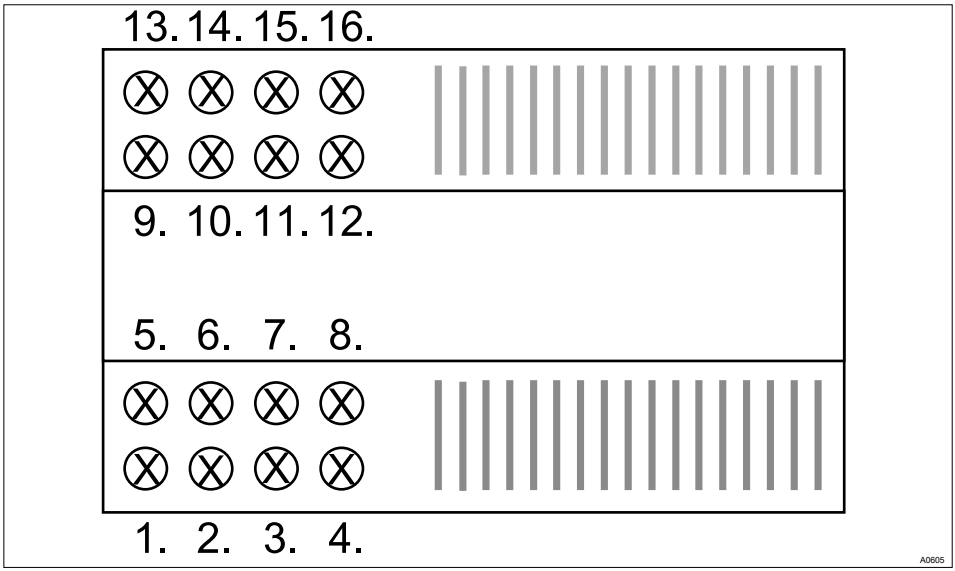

Fig. 2: Terminal allocation of the power supply module

1.	+ 24 V DC	9.	PE
2.	+ 24 V DC	10.	PE
3.	0 V	11.	N
4.	0 V	12.	L
5.	+ 24 V DC	13.	PE
6.	+ 24 V DC	14.	PE
7.	0 V	15.	N
8.	0 V	16.	L

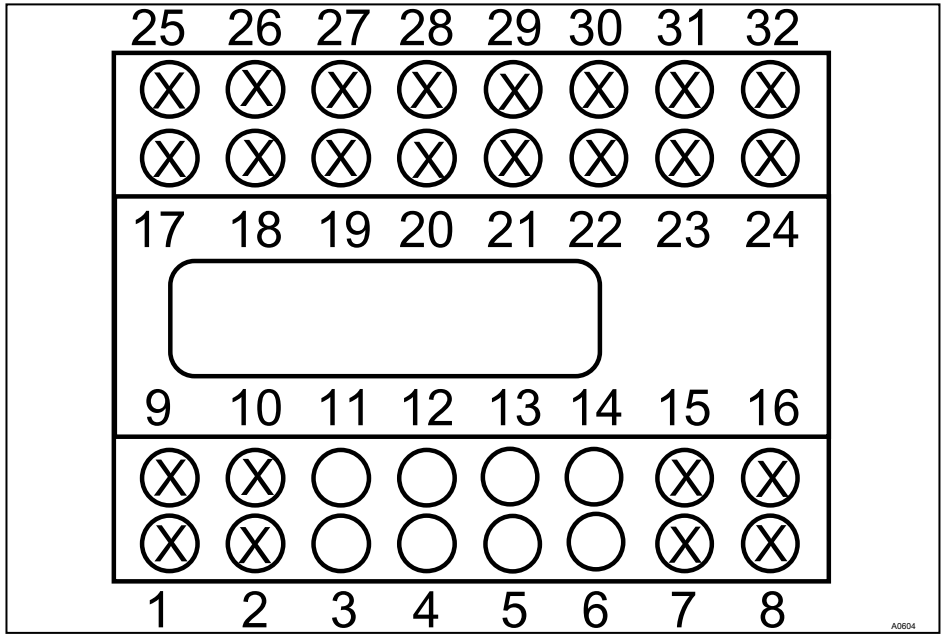

Fig. 3: Terminal allocation for the measuring module

1	Sensor	17	mA output 1 (+)
2	Sensor	18	mA output 1 (-)
3	free	19	Input RS485 (AA')
4	free	20	Input RS485 (BB')
5	free	21	free
6	free	22	Relay 2 (common)
7	+ 24 V DC	23	Relay 2 (NO)
8	0 V	24	Relay 2 (NC)
9	Pt 100	25	mA output 2 (+)
10	Pt 100	26	mA output 2 (-)
11	free	27	Pause input
12	free	28	Pause input
13	free	29	free
14	free	30	Relay 1 (common)
15	+ 24 V DC	31	Relay 1 (NO)
16	0 V	32	Relay 1 (NC)

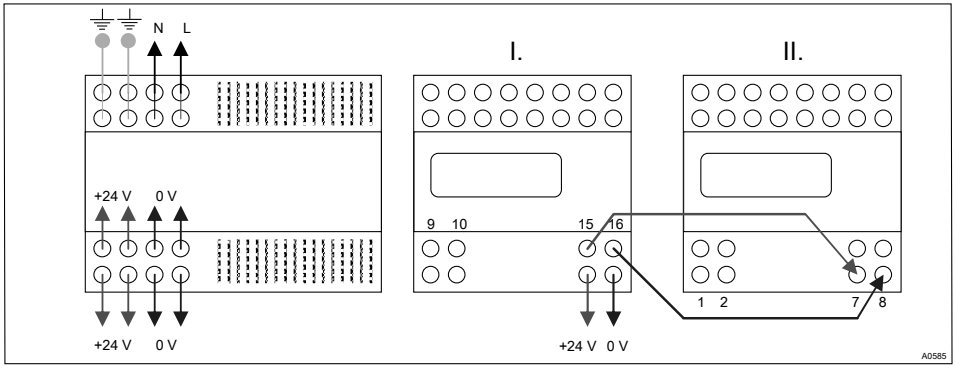

Fig. 4: Terminal diagram - DULCOPAC power supply

I. Module 1
II. Module 2

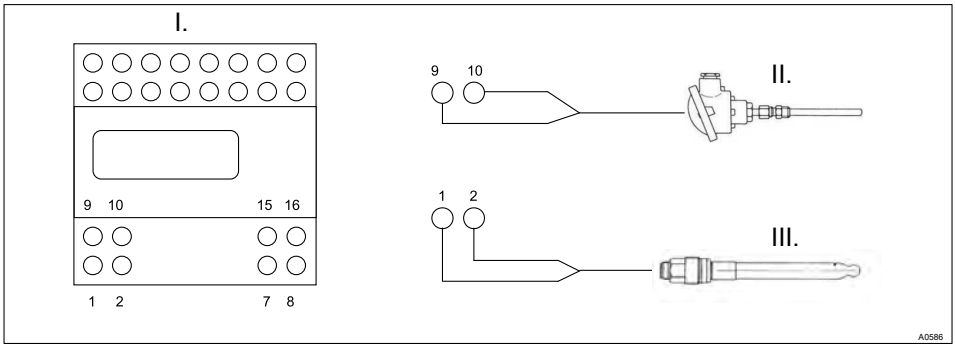

Fig. 5: pH sensor and temperature sensor (Pt 100)

I. DULCOPAC (pH / T°C)
II. Temperature sensor (Pt 100)
III. pH sensor

1. Inner conductor
2. Shielding

If the remote control is faulty (open circuit), both displays flash.

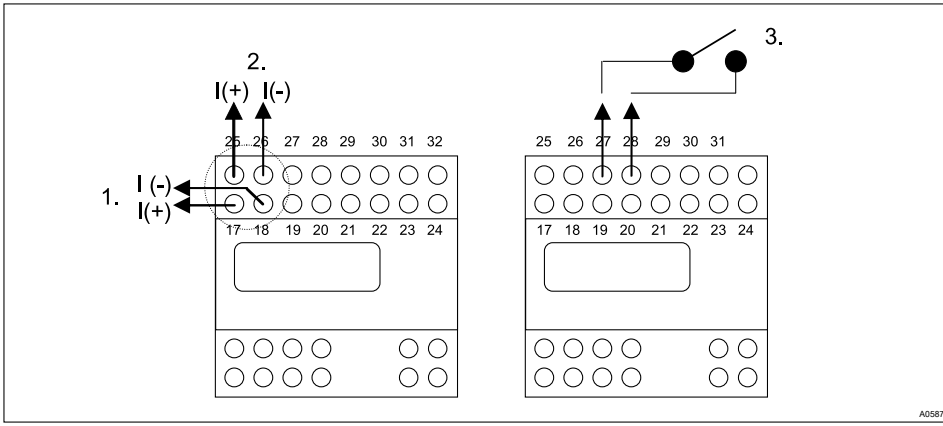

Fig. 6: 0/4 ... 20 mA output and remote control output

1. Output 1
2. Output 2
3. Relay external remote control

CAUTION!

Maximum load capacity of the outputs

Possibility of damage due to overloading of the outputs.

The relay outputs no longer supply an output of 1 amp at maximum 48 volts (AC or DC)

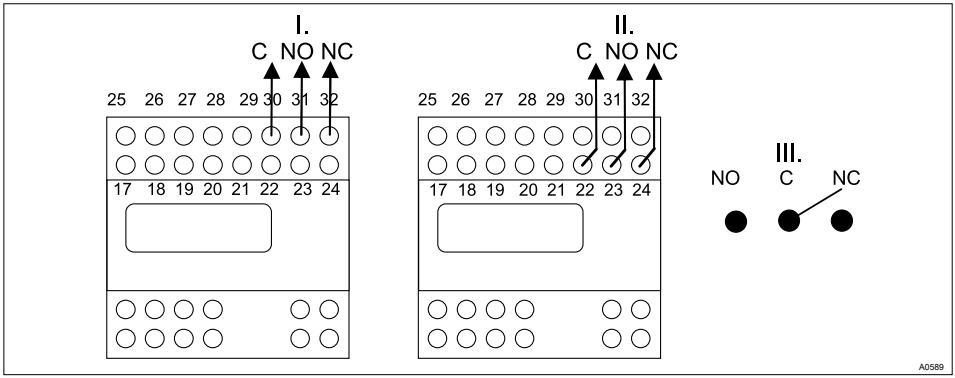

Fig. 7: Connection of the Relay Outputs

I. Relay output 1
II. Relay output 2
III. Relay outputs

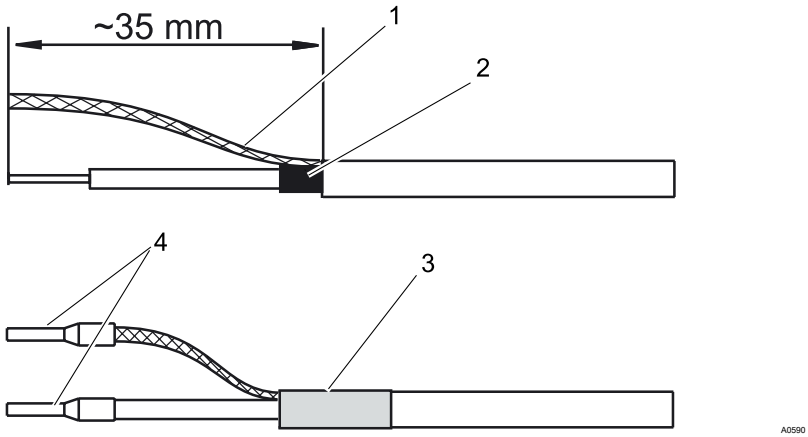

Fig. 8: Preparation of the coaxial cable

- Strip the coaxial cable insulation During this operation, remove the black, semiconducting layer (2) as shown from the insulation of the inner conductor
- Twist the shielding (1) together and insulate the black, semiconducting layer with heat shrink (3)
- Provide the conductor ends with cable end sleeves (4)

4.3.3 Installation (electrical)

WARNING!

Overcurrent protection device

You must carry out the entire installation only if using a circuit breaker or a safety fuse, which is dimensioned according to the applicable regulations for the entire installation. Observe the regulations of *"VDE 0100 Conditions for setting up high current plant with nominal voltages below 1000 V"*, or the relevant national regulations, when selecting the conductive material, during installation, when dimensioning fuses and for the electrical connection of the device.

Electrical data of the DULCOPAC

- 24 Volt DC
- 3 Watt

Electrical data of the DULCOPAC power supply

- 230 Volt AC
- 30 Watt

Connect the DULCOPAC in accordance with *Chapter 4.3.1 "Cable Cross-Sections and Cable End Sleeves" on page 23* and *Chapter 4.3.2 "Terminal diagram / wiring" on page 24* to the power supply module and other selected peripherals.

5 Commissioning

- **User qualification:** trained user, see *Chapter 1.2 “Users' qualifications” on page 9*

WARNING!

Sensor run in periods

This can result in hazardous incorrect metering

– Correct measuring and metering is only possible if the sensor is working perfectly
– Observe the sensor operating instructions
– Calibrate the sensor after commissioning

Following completion of mechanical and electrical assembly, the DULCOPAC should be integrated into the measuring point.

5.1 Initial commissioning

Upon first switching on of the DULCOPAC the DULCOPAC is in a STOP condition.

Next you must adjust the control and set the various parameters which depend on the process to be measured, see *Chapter 7 “Operating menus and adjustment range for all measured variables” on page 33*.

Operation and configuration of the DULCOPAC takes place using keys and the integral LCD display.

6 Operating diagram and operating elements

6.1 Overview of device /Control elements

- **User qualification:** trained user, see *Chapter 1.2 "Users' qualifications" on page 9*

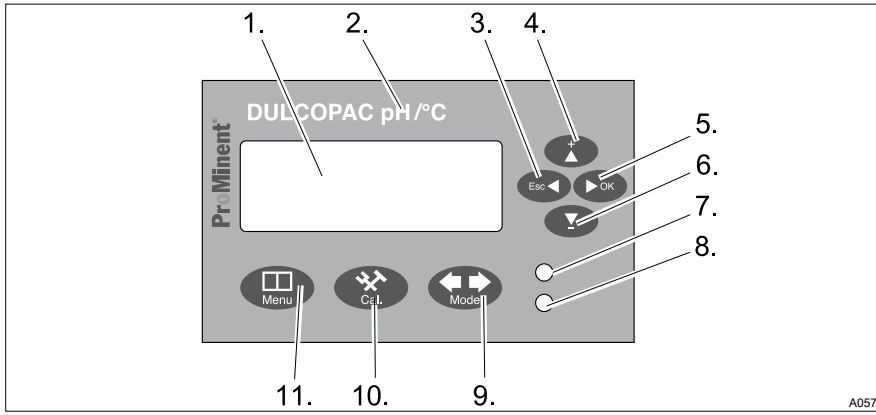

Fig. 9: Overview of device /Control elements

#	Function	Description
1.	LCD display	
2.	Measured variable	The measured variables which the device measures and process.
3.	Esc-Key	Jumps a level back in the operating menu, without storage or changing entries or values
4.	+-Key	Too increase a displayed number value and to jump upwards in the operating menu
5.	OK-Key	To apply, confirm or save a displayed value or status or to acknowledge an alarm

#	Function	Description
6.	-Key	Too decrease a displayed number value and to jump down in the operating menu
7.	LED	
8.	LED	
9.	Mode-Key	To scroll within the calibration menu
10.	Cal.-Key	For navigation within the calibration menu
11.	Menu-Key	Accesses the controller operating menu

6.2 Continuous display

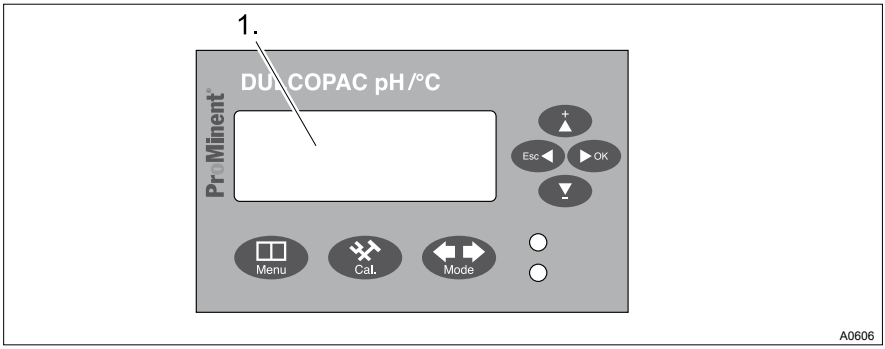

Fig. 10: Continuous display

In the continuous display of the LCD display (1), the respective measured value of the measured variable is displayed. If an error occurs, the corresponding error code is displayed here, see *"Table of displayed error codes" Table on page 56*

7 Operating menus and adjustment range for all measured variables

7.1 Overview of the first level menu

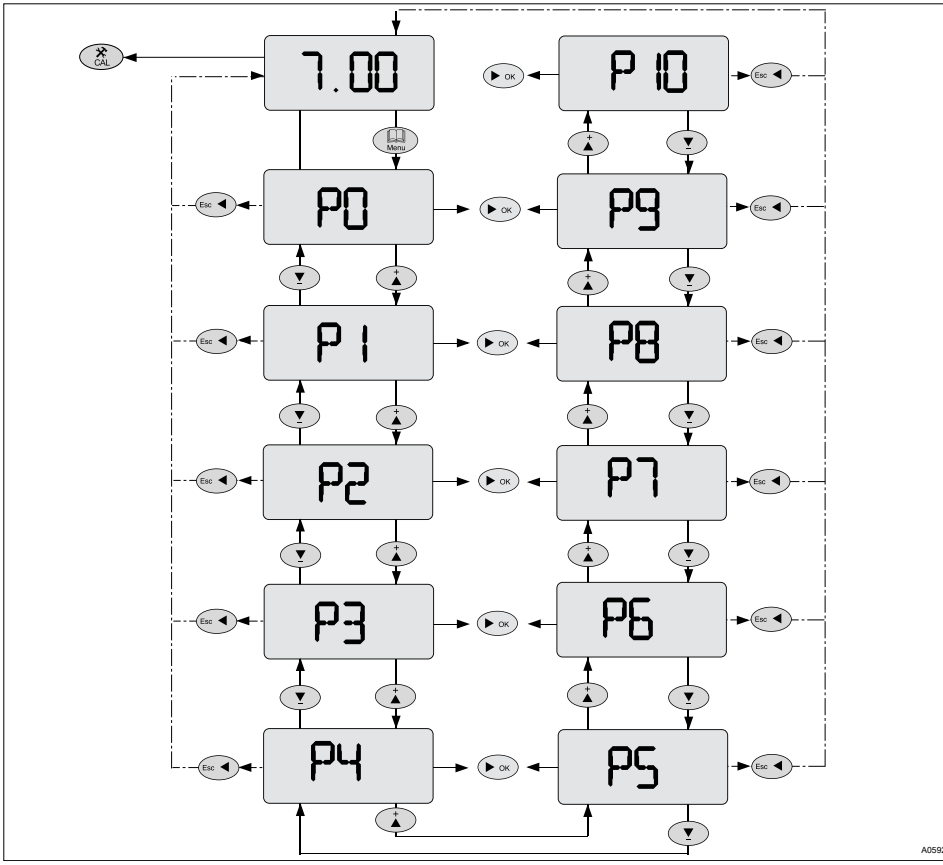

Fig. 11: First level menu; shown for pH

Using the key Menu you can jump from the continuous display to the first level of the adjustable parameters. There using keys + and − you can change between the adjustable parameter displays.

You can return to the central menu item by pressing the Esc key.

You can jump from the first level to the second level by pressing the ▶OK key.

You can jump to the calibration menu for the measured variable in question by pressing the Cal. key.

Display	Jump to the menu	Meaning
7.00		Continuous display
7.00	Cal.	Calibration menu, see *Chapter 8.2 "Calibration of the measured variable pH" on page 59*
P0	▶OK	Adjust setpoint, see *Chapter 7.2 "P0 - Adjusting the setpoint" on page 35*
P1	▶OK	Adjust control, see *Chapter 7.3 "P1 - Adjusting the control" on page 36*
P2	▶OK	Adjust relay, see *Chapter 7.4 "P2 - Adjusting the relay" on page 39*
P3	▶OK	Adjust relay operating mode, see *Chapter 7.5 "P3 - Operating mode Adjusting the relay" on page 42*
P4	▶OK	Adjust alarm thresholds, see *Chapter 7.6 "P4 - Adjusting the alarm thresholds" on page 44*
P5	▶OK	Adjust analog outputs operating mode, see *Chapter 7.7 "P5 - Operating mode Adjusting the analog outputs" on page 46*
P6	▶OK	Adjust analog outputs, see *Chapter 7.8 "P6 - Adjusting the analog outputs" on page 49*
P7	▶OK	Adjust digital inputs, see *Chapter 7.9 "P7 - Adjusting the digital inputs" on page 50*

Display	Jump to the menu	Meaning
P8	▶OK	Adjust communication, see *Chapter 7.10 “P8 - Adjusting the communication (RS 485)” on page 51*
P9	▶OK	Adjust measuring range, see *Chapter 7.11 “P2 - Adjusting the measuring range” on page 53*
P10	▶OK	Set measurement rate in minutes, see *Chapter 7.12 “P10 - Adjusting the measurement rate” on page 55*

7.2 P0 - Adjusting the setpoint

Adjusting the setpoint

The setpoint is the value to which the process, which is being measured, should be adjusted towards. All other values which the DULCOPAC measures and controls are based on the adjustment of this value.

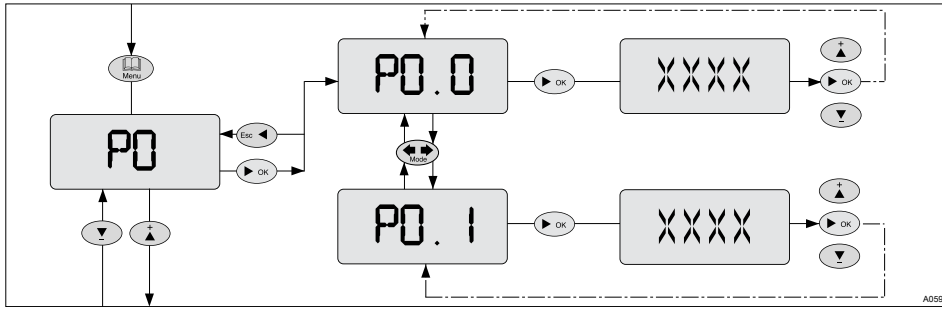

Fig. 12: P0 - Adjusting the setpoint

7.3 P1 - Adjusting the control

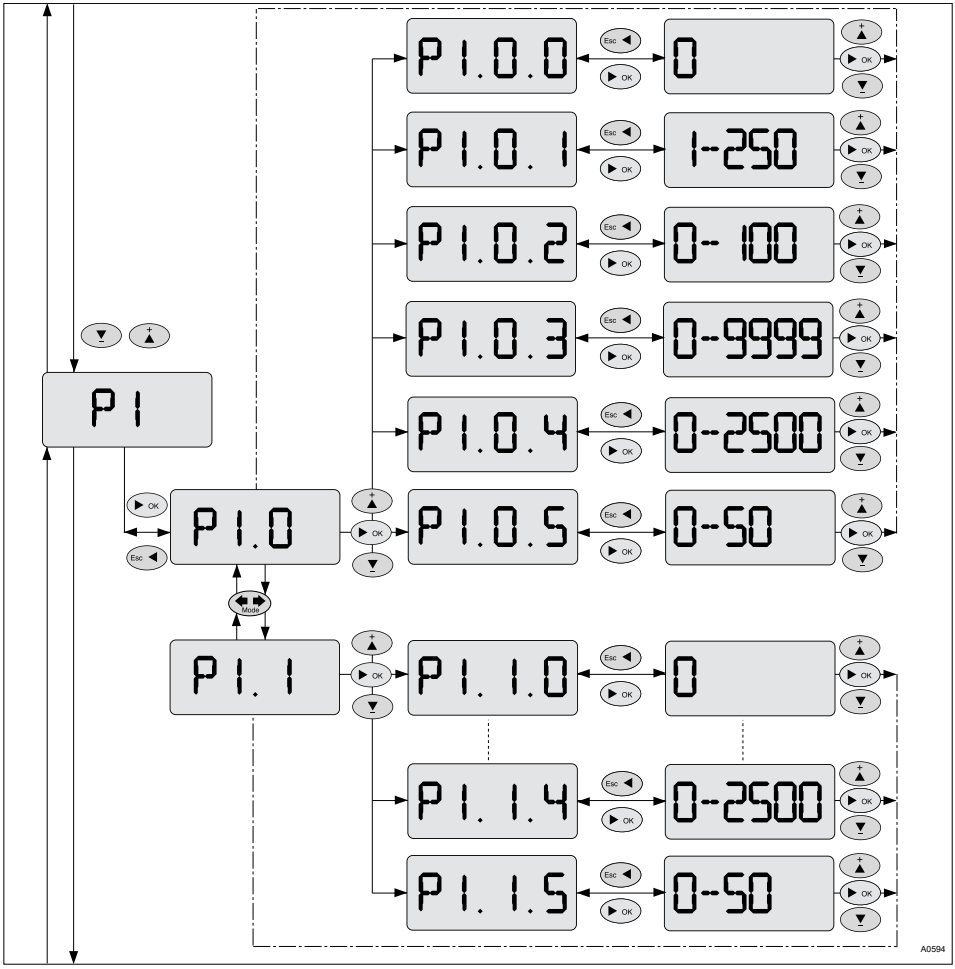

Fig. 13: P1 - Adjusting the control

Temperature measurement

The temperature measurement on channel 2 only has an influence on the control with the measured variable [conductivity] (direct/ not mA). For other measured variables, the temperature measurement is for information only, but has no effect on the control.

Parameter abbreviation	Parameter name
P1.0.0	Automatic control (attempts to find the optimum settings)
P1.0.1	Proportional coefficient xp / %
P1.0.2	Additive basic load
P1.0.3	Integral action time T_i
P1.0.4	Derivative action time T_d
P1.0.5	Dead zone
P1.1.0	Automatic control (attempts to find the optimum settings)
P1.1.1	Proportional coefficient xp/%
P1.1.2	Additive basic load
P1.1.3	Integral action time T_i
P1.1.4	Derivative action time T_d
P1.1.5	Dead zone

Setting		Possible values			
	Starting value	Incre-ment	Lower value	Upper value	Remarks
P1.0.0	0	1	0	1	0 = inactive; 1 = active
P1.0.1		1	1 %	250 %	xp
P1.0.2		1	0 %	100 %	Additive basic load
P1.0.3		1	0 s	9999 s	T_i
P1.0.4		1	0 s	2500 s	T_d
P1.0.5		1	0 %	50 %	Dead zone
P1.1.0	0	1	0	1	0 = inactive; 1 = active
P1.1.1		1	1 %	250 %	xp
P1.1.2		1	0 %	100 %	Additive basic load
P1.1.3		1	0 s	9999 s	T_i
P1.1.4		1	0 s	2500 s	T_d
P1.1.5		1	0 %	50 %	Dead zone

7.4 P2 - Adjusting the relay

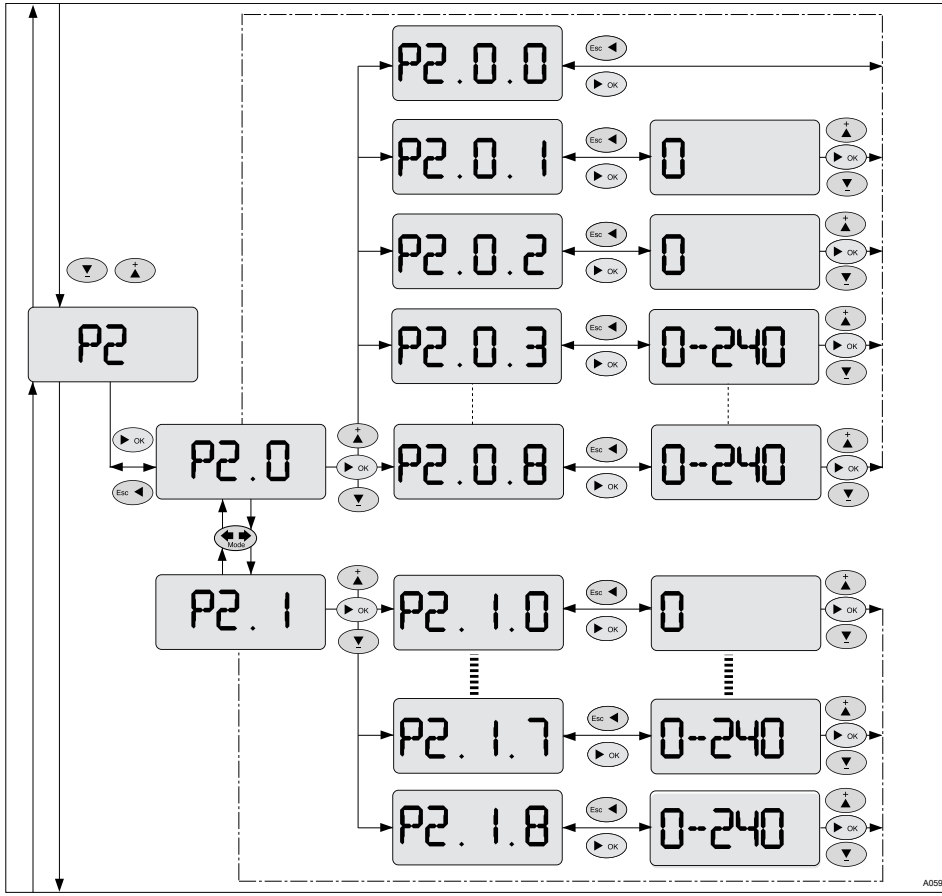

Fig. 14: P2 - Adjusting the relay

Relay combinations

The two relays can be configured independently of each other.

Parameter abbreviation	Parameter name
P2.0.0 (relay 1)	Relay 1 configuration = inactive
P2.0.1	Relay 1 configuration channel 1 = control mode
P2.0.2	Relay 1 configuration channel 2 = control mode
P2.0.3	Min. alarm channel 1 relay 1
P2.0.4	Max.. Alarm channel 1 relay 1
P2.0.5	Min. and max. alarm channel 1 (range) relay 1
P2.0.6	Min. alarm channel 2 relay 1
P2.0.7	Max. alarm channel 2 relay 1
P2.0.8	Min. and max. alarm channel 2 (range) relay 1
P2.1.0 (relay 2)	Relay 2 configuration = inactive
P2.1.1	Relay 2 configuration channel 1 = control mode
P2.1.2	Relay 2 configuration channel 2 = control mode
P2.1.3	Min. alarm channel 1 relay 2
P2.1.4	Max.. Alarm channel 1 relay 2
P2.1.5	Min. and max. alarm channel 1 (range) relay 2
P2.1.6	Min. alarm channel 2 relay 2
P2.1.7	Max. alarm channel 2 relay 2
P2.1.8	Min. and max. alarm channel 2 (range) relay 2

Setting		Possible values			
	Starting value	Increment	Lower value	Upper value	Remarks
P2.0.0 (relay 1)					Relay 1 inactive
P2.0.1			0	1	Control direction: 0 = raise 1 = lower
P2.0.2			0	1	
P2.0.3		1	0 s	240 s	Switch on delay
P2.0.4		1	0 s	240 s	
P2.0.5		1	0 s	240 s	
P2.0.6		1	0 s	240 s	
P2.0.7		1	0 s	240 s	
P2.0.8		1	0 s	240 s	
P2.1.0 (relay 2)					Relay 2 inactive
P2.1.1			0	1	Control direction: 0 = raise 1 = lower
P2.1.2			0	1	
P2.1.3		1	0 s	240 s	Switch on delay
P2.1.4		1	0 s	240 s	
P2.1.5		1	0 s	240 s	
P2.1.6		1	0 s	240 s	

Setting		Possible values			
	Starting value	Incre-ment	Lower value	Upper value	Remarks
P2.1.7		1	0 s	240 s	
P2.1.8		1	0 s	240 s	

7.5 P3 - Operating mode Adjusting the relay

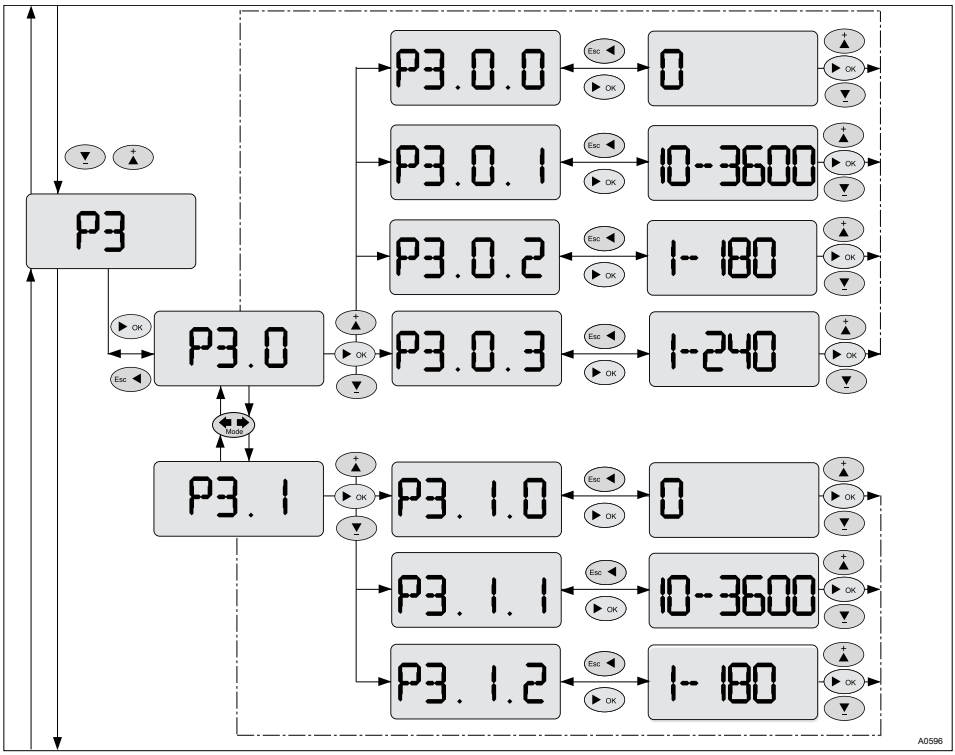

Fig. 15: P3 - Operating mode Adjusting the relay

Relay configuration takes place in control mode.

Parameter abbreviation	Parameter name
P3.0.0 (relay 1)	Control On / Off
P3.0.1	Solenoid valve control
P3.0.2	Pulse frequency control
P3.0.3	3-P step-by-step controller
P3.1.0 (relay 2)	Control On / Off
P3.1.1	Solenoid valve control
P3.1.2	Pulse frequency control

Setting		Possible values			
	Starting value	Increment	Lower value	Upper value	Remarks
P3.0.0	0 %	1	0 %	50 %	Hysteresis relative to the set-point
P3.0.1	120 s	1	10 s	3600 s	Cycle time
P3.0.2	120 / min	1	1	180	Pulse frequency
P3.0.3	90 s	1	1 s	240 s	Max. opening time
P3.1.0	0 %	1	0 %	50 %	Hysteresis relative to the set-point
P3.1.1	120 s	1	10 s	3600 s	Cycle time
P3.1.2	120 / min	1	1	180	Pulse frequency

7.6 P4 - Adjusting the alarm thresholds

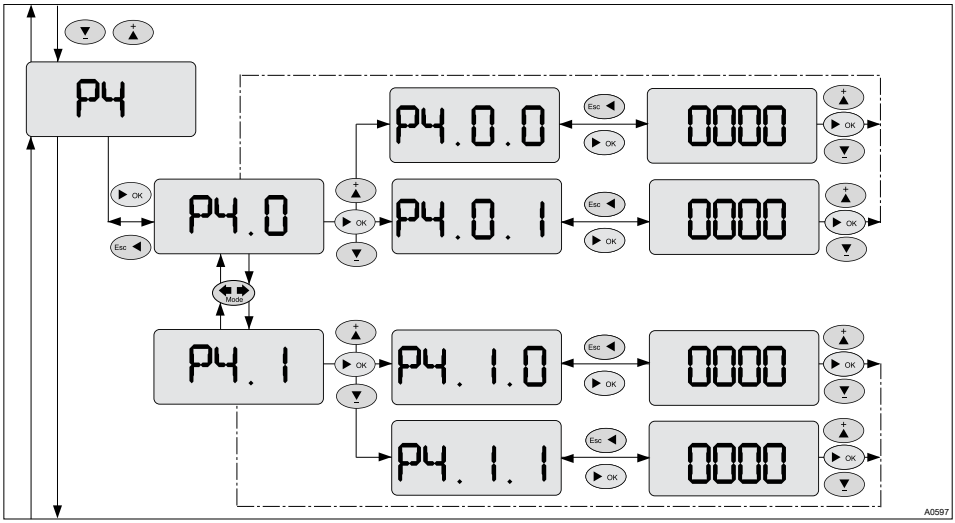

Fig. 16: P4 - Adjusting the alarm thresholds

Parameter abbreviation	Parameter name
P4.0.0	Min. alarm channel 1
P4.0.1	Max. alarm channel 1
P4.1.0	Min. alarm channel 2
P4.1.1	Max. alarm channel 2

Setting		Possible values			
	Starting value	Incre-ment	Lower value	Upper value	Remarks
P4.0.0	0	0.01	*	**	
P4.0.1	0	0.01	*	**	
P4.1.0	0	0.01	*	**	
P4.1.1	0	0.01	*	**	

0 ≃ Off

* = start point of the respective measuring range

** = end point of the respective measuring range

7.7 P5 - Operating mode Adjusting the analog outputs

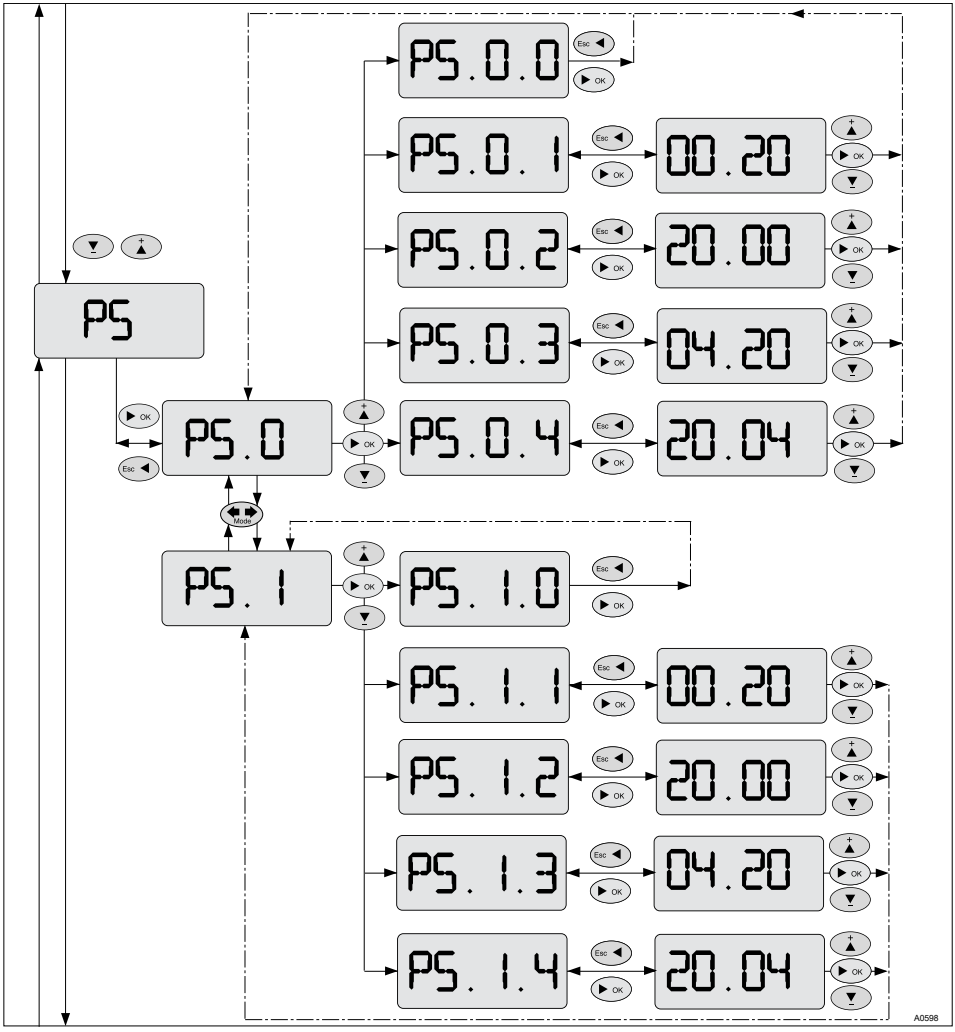

Fig. 17: P5 - Operating mode Adjusting the analog outputs

Parameter abbreviation	Parameter name
P5.0.0 (mA output 1)	mA output 1, inactive
P5.0.1	mA output 1, channel 1, control variable
P5.0.2	mA output 1, channel 2, control variable
P5.0.3	mA output 1, channel 1, measured value
P5.0.4	mA output 1, channel 2, measured value
P5.1.0 (mA output 2)	mA output 2, inactive
P5.1.1	mA output 2, channel 1, control variable
P5.1.2	mA output 2, channel 2, control variable
P5.1.3	mA output 2, channel 1, measured value
P5.1.4	mA output 2, channel 2, measured value

Setting		Possible values			
	Starting value	Increment	Lower value	Upper value	Remarks
P5.0.0 (mA output 1)					Inactive
P5.0.1	04 - 20 mA	00 - 20 mA			
P5.0.2	04 - 20 mA	04 - 20 mA			
P5.0.3	04 - 20 mA	20 - 00 mA			
Select raise / lower: 0=raise; 1=lower					

Setting		Possible values			
	Starting value	Incre-ment	Lower value	Upper value	Remarks
P5.0.4	04 - 20 mA	20 - 04 mA			
P5.1.0 (mA output 2)					Inactive
P5.1.1	04 - 20 mA	00 - 20 mA			
P5.1.2	04 - 20 mA	04 - 20 mA			
P5.1.3	04 - 20 mA	20 - 00 mA			
P5.1.4	04 - 20 mA	20 - 04 mA			
Select raise / lower: 0=raise; 1=lower					

7.8 P6 - Adjusting the analog outputs

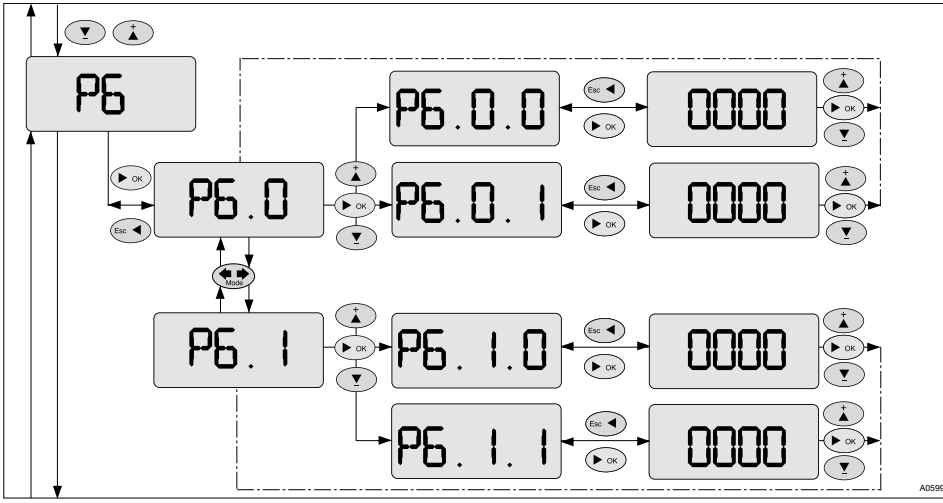

Fig. 18: P6 - Adjusting the analog outputs

Parameter abbreviation	Parameter name
P6.0.0	Lower value, mA output 1
P6.0.1	Upper value, mA output 1
P6.1.0	Lower value, mA output 2
P6.1.1	Upper value, mA output 2

7.9 P7 - Adjusting the digital inputs

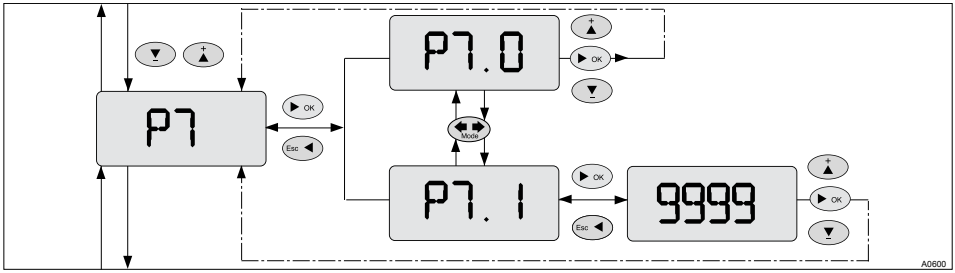

Fig. 19: P7 - Adjusting the digital inputs

Parameter abbreviation	Parameter name
P7.0	Pause input, Stop control (factory settings)
P7.1	Multiplicative feed forward control frequency

Setting		Possible values			
	Starting value	Increment	Lower value	Upper value	Remarks
P7.0					
P7.1	1	1	1	9999	Frequency 1/min

7.10 P8 - Adjusting the communication (RS 485)

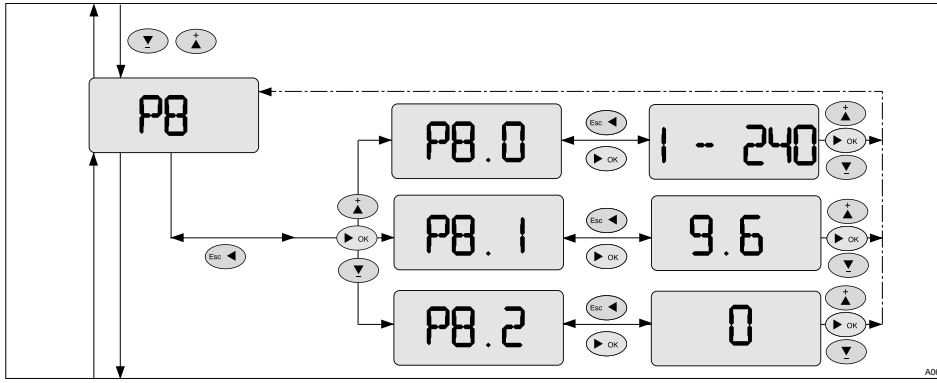

Fig. 20: P8 - Adjusting the digital inputs

Parameter abbreviation	Parameter name
P8.0	ID Device
P8.1	Bus Speed
P8.2	Parity

Setting		Possible values			
	Starting value	Increment	Lower value	Upper value	Remarks
P8.0		1	1	240	"-" = No communication
P8.1	19.2	9.6 = 9600 baud 19.2 = 19200 baud 38.4 = 38400 baud			
P8.2	0	0 = None 1 = Even 2 = Odd			

7.11 P2 - Adjusting the measuring range

WARNING!

Incorrect metering due to incorrect metering range

Possible consequence: Death or serious injuries may result from incorrect measurement and dosing

- If the assignment of the measuring range is modified, the settings must be checked in all menus
- If the assignment of the measuring range is changed, the sensor or the DULCOPAC must be recalibrated
- The measuring range of the sensor is essential for the measuring range

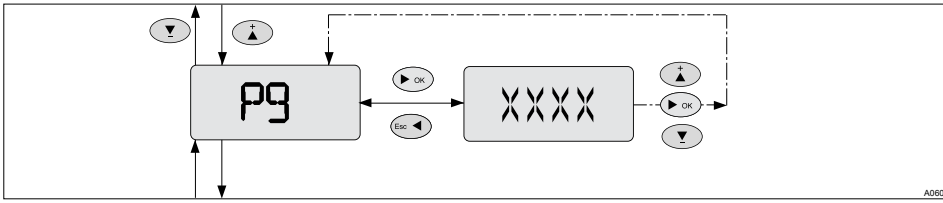

Fig. 21: P9 - Adjusting the measuring range - all measured variables except conductive conductivity measurement

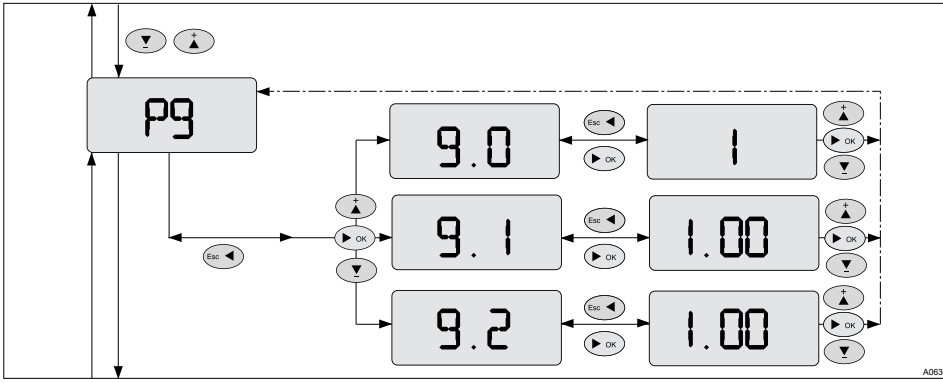

Fig. 22: P9 - Adjusting the cell constant - only conductive conductivity measurement

Measured variable	Possible measuring range
pH	
ORP	
Chlorine	
Bromine	
H2O2	
Peracetic acid	
Conductivity	
Conductivity, conductive	Menu 9.0: 0,1; 0,5; 1; 5; 10 [1/cm], cell constant or Menu 9.1: 0.1 ... 50 in 0.01 steps [1/cm], cell constant Menu 9.2: 0.1 ... 50 in 0.01 steps [K/cm], temperature coefficient α

7.12 P10 - Adjusting the measurement rate

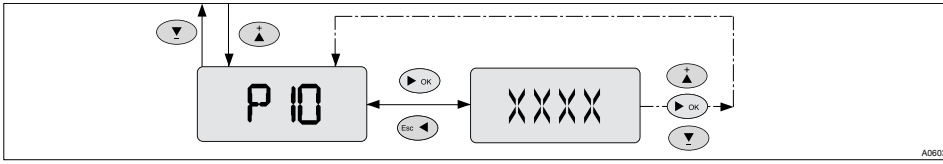

Fig. 23: P10 - Adjusting the measurement rate

Parameter abbreviation	Parameter name
P10	Adjusting the measurement rate

Setting		Possible values			
	Starting value	Increment	Lower value	Upper value	Remarks
P10	0 minutes.	1 min	0 min	240 min	0 = no measurement

8 Calibration menus for all measured variables of the DULCOPAC

Steady sensor signal

The sensor in question must emit a steady sensor signal, before the calibration can be started by pressing Cal.. Pressing key Cal. causes the currently displayed value to be imported directly into the control.

You can jump to the calibration menu for the measured variable in question by pressing the Cal. key.

Table of displayed error codes

Error code	Meaning
E01	No displayed value
E02	Error during the *"Slope"* calibration of K1
E03	Error during the *"Zero point"* calibration of K1
E04	Error during the *"Slope"* calibration of K2
E05	Error during the *"Zero point"* calibration of K2
E06	Input open or a non-displayable value

8.1 Calibration of the measured variable temperature

Calibration of the measured variable temperature

1. Remove the Pt 100 sensor, according to the operating instructions for the sensors and in-line probe housing
2. Press the key Mode, to output the temperature display

3. Press the key Cal.
   ⇨ The display *[HI]* appears
4. Using the key Mode you can select between *[HI]* and *[LI]*
   ⇨ First select the range *[LI]*.
5. Disconnect the sensor cable from the Pt 100 sensor
6. Short-circuit the sensor cable with a suitable jumper
   ⇨ The DULCOPAC recognizes this state as 0 °C.
7. Now press the key OK
   ⇨ The range *[LI]* is now calibrated
8. Remove the jumper and reconnect the sensor cable to the Pt 100 sensor

Prerequisite for the calibration range [HI]

For calibration in the range [HI] you need a container with, for example, water whose temperature is known (e.g. 80 °C). Insert the Pt 100 sensor into this container and wait until the displayed value has stabilised in the DULCOPAC display. You can now start the calibration.

9. Press the key Mode, to output the temperature display
10. Press the key Cal.
    ⇨ The display *[HI]* appears
11. Using the key Mode you can select between *[HI]* and *[LI]*
    ⇨ Select the range *[HI]*.
12. Then using keys + and − set the displayed value equal to the value of the test liquid.
13. Press the key OK
    ⇨ The range *[HI]* is now calibrated

14. Assemble the Pt 100 sensor, according to the operating instructions for the sensors and in-line probe housing

Delete the calibrated values

> ***Reset the DULCOPAC in the temperature measurement range to the factory settings***
>
> *By deleting the calibrated values, the DULCOPAC is reset to the factory settings for the temperature measuring range. This should be carried out to delete a possibly erroneous calibration. However, this should only be used as a temporary solution until the DULCOPAC can again be calibrated without problems. Calibrate the DULCOPAC just before it is to be used for measurements.*

1. Press the key Mode, to output the temperature display
2. Press the key Cal.
   ⇨ The display *[HI]* appears
3. Using the key Mode you can select between *[HI]* and *[LI]*
   ⇨ First select the range which is to be reset.
4. Press and hold the key Cal., while simultaneously pressing the key Mode
   ⇨ The following indication appears in the display *[----]*. The calibration is now deleted.
5. Carry out the same steps one more time to delete the remaining calibration

8.2 Calibration of the measured variable pH

Calibration of the measured variable pH for the DULCOPAC

The calibration limits of the DULCOPAC are:

- Zero point at pH 7: -59 mV < 0 < 56 mV
- Slope: 36 mV/pH ... 88 mV/pH

Correct sensor operation

– *Correct measuring and metering is only possible if the sensor is working perfectly*
– *Observe the sensor operating instructions*

Used buffer

Dispose of the used buffer solution. For more information: see buffer solution safety data sheet.

Remove the sensor

Remove the sensor, according to the operating instructions for the sensor and in-line probe housing.

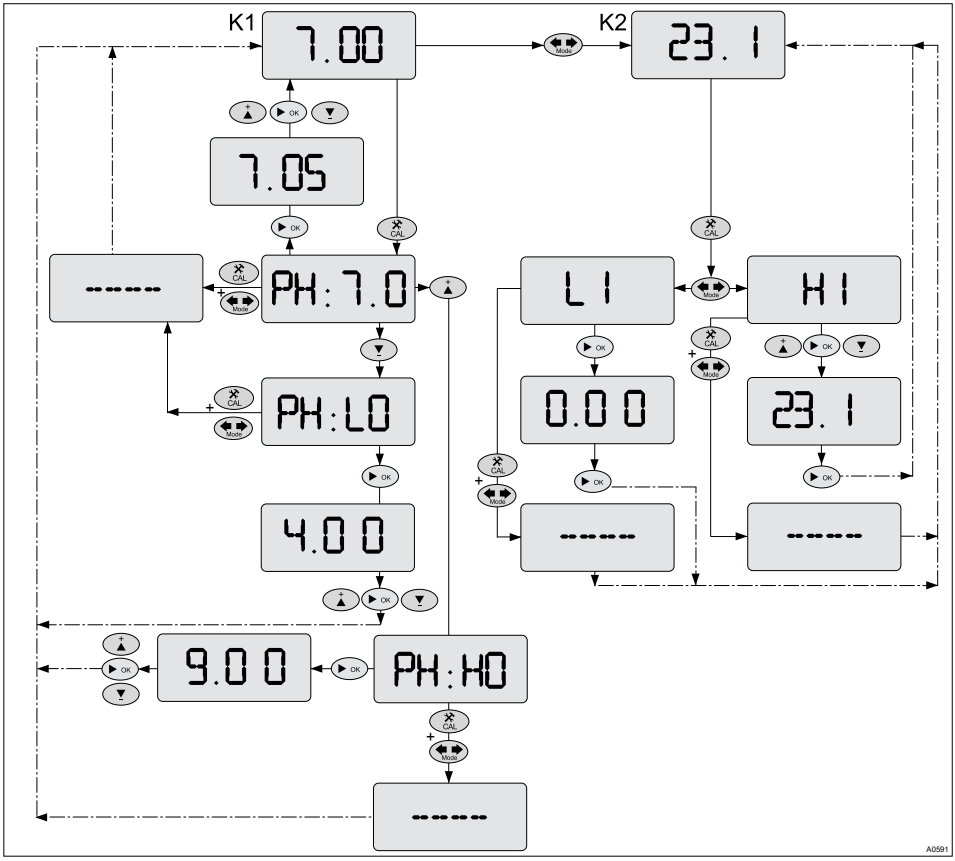

Fig. 24: Calibration of the measured variable pH and temperature

1. Remove the sensor and rinse it thoroughly in water before drying with a cloth (pad dry, don't rub)
2. Immerse the sensor in the pH 7 buffer solution held in the test container. In so doing, slightly move the sensor
3. Press the key Cal

   ⇨ *[PH:7.0]* is indicated on the display.

4. If the indication differs from pH 7.00, use the keys and to set the pH value to 7.00

5. Press the key OK

   ⇨ The zero point calibration has been successfully completed.

6. You can now refit the sensor and have thus carried out a 1-point calibration, or you can leave the sensor removed and next calibrate the slope. This would constitute a 2-point calibration

Slope calibration with pH 4 or pH 9

If your process is operating in the acidic range, then calibrate using a pH 4 buffer solution; if you process works in the alkaline range, then calibrate using a pH 9 buffer solution.

Slope calibration at pH 4

Prerequisite for calibration at pH 4

Prerequisite for the pH 4 calibration is that you have just completed the zero point calibration and that the sensor is still removed.

1. Rinse the sensor thoroughly with water before drying with a cloth (pad dry, don't rub)
2. Immerse the sensor in the pH 4 buffer solution held in the test container. In so doing, slightly move the sensor
3. Press the key Cal.
   ⇨ *[PH:7.0]* is indicated on the display.
4. Press the key
   ⇨ *[PH:LO]* is displayed.
5. Press the key OK
   ⇨ a value is displayed
6. If the indication differs from pH 4.00, use the keys and to set the pH value to 4.00
7. Press the key OK
   ⇨ The slope calibration has been successfully completed.

Slope calibration at pH 9

> ***Prerequisite for calibration at pH 9***
>
> *Prerequisite for the pH 9 calibration is that you have just completed the zero point calibration and that the sensor is still removed.*

1. Rinse the sensor thoroughly with water before drying with a cloth (pad dry, don't rub)
2. Immerse the sensor in the pH 9 buffer solution held in the test container. In so doing, slightly move the sensor
3. Press the key Cal
   ⇨ *[PH:7.0]* is indicated on the display.
4. Press the key ▲
   ⇨ *[PH:HO]* is displayed.
5. Press the key ▶OK
   ⇨ a value is displayed
6. If the indication differs from pH 9.00, use the keys ▼ and ▲ to set the pH value to 9.00
7. Press the key ▶OK
   ⇨ The slope calibration has been successfully completed.

> ***Fitting the sensor***
>
> *Fit the sensor, according to the operating instructions for the sensor and in-line probe housing.*

How to delete the slope calibration

*If you simultaneously press the keys Cal. and Mode in the PH:LO or PH:HO display, then the indication **[----]** appears briefly. The continuous display automatically reappears, the calibration value is deleted and the DULCOPAC continues to operate using the factory settings.*

Then carry out another correct 2 point calibration.

To calibrate the measured variable temperature see: *Chapter 8.1 “Calibration of the measured variable temperature” on page 56*

8.3 ORP sensor calibration

Calibration of the measured variable ORP for the DULCOPAC

The calibration limits of the DULCOPAC are:

- Offset: -50 mV < Buffer value < +50 mV

Correct sensor operation

– *Correct measuring and metering is only possible if the sensor is working perfectly*
– *Observe the sensor operating instructions*

Used buffer

Dispose of the used buffer solution. For more information: see buffer solution safety data sheet.

Remove the sensor

Remove the sensor, according to the operating instructions for the sensor and in-line probe housing.

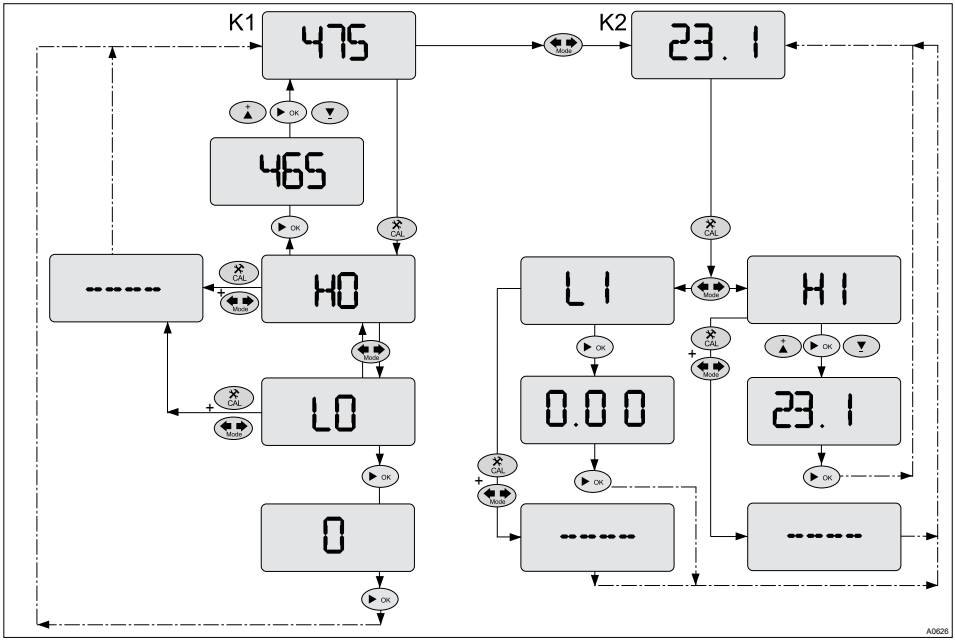

Fig. 25: ORP sensor calibration

A container with a ORP buffer solution (e.g. 465 mV) is needed for testing.

1. Remove the sensor and rinse it thoroughly in water before drying with a cloth (pad dry, don't rub)
2. Immerse the sensor in the buffer solution of value *"465 mV"*. In so doing, slightly move the sensor
3. Press the key CAL
   ⇨ *[HO]* is indicated on the display.
4. If the indication differs from *"465 mV"* use the keys ▼ and ▲ to set the value to *"465 mV"*
5. Press the key ▶OK
   ⇨ The zero point calibration has been successfully completed.

6. You can now refit the sensor and have thus carried out a 1-point calibration, or you can leave the sensor removed and next carry out a slope calibration. This would constitute a 2-point calibration

Slope calibration

Prerequisite for slope calibration

Prerequisite for calibration at "0 mV" is that you have just completed the zero point calibration and that the sensor is still removed.

1. Remove the ORP sensor from the measuring line
2. On the open side of the measuring line use a suitable bridge or jumper to bride the inner conductor to the coaxial cable
   ⇨ A value close to *"0"* appears in the display. Wait until this value stabilises.
3. Press the key Cal
   ⇨ *[HO]* is indicated on the display.
4. Press the key Mode
   ⇨ *[LO]* is displayed.
5. Press the key ▶OK
   ⇨ A *"0"* value is displayed. The slope calibration has been successfully completed.
6. Fit the ORP sensor on the measuring line
   ⇨ The slope calibration has been successfully completed.

Fitting the sensor

Fit the sensor, according to the operating instructions for the sensor and in-line probe housing.

How to delete the calibration

*If in the [LO] or [HO] display you simultaneously press the keys Cal. and Mode; the indication **[----]** is briefly displayed. The continuous display automatically reappears, the calibration value is deleted and the DULCOPAC continues to operate using the factory settings.*

Then carry out another correct 2 point calibration.

To calibrate the measured variable temperature see: ↳ *Chapter 8.1 "Calibration of the measured variable temperature" on page 56*

8.4 Calibration of the measured variable chlorine, bromine, H_2O_2 or peracetic acid

Sensor slope calibration

The calibration limits of the DULCOPAC are:

- Zero point: 2.5 % of the measurement range limit value < value < +2.5 % of the measurement range limit value
- Slope: 20 % < rated slope < 500 %

WARNING!

Danger of incorrect metering

This can result in hazardous incorrect metering

During initial commissioning, you must set the sensor measuring range in the DULCOPAC prior to calibration Refer to *Chapter 7.11 "P2 - Adjusting the measuring range" on page 53*

CAUTION!

Correct sensor operation / Run-in time

Damage to the product or its surroundings due to incorrect calibration.

– Correct measuring and metering is only possible if the sensor is working perfectly
– Observe the sensor operating instructions
– Please also read the operating manuals for the fittings and other components used
– Observe the sensor run in periods without fail
– Calculate the run in periods when planning commissioning
  – It may take a whole working day to run-in the sensor

! NOTICE!

Prerequisites for correct calibration of the sensor gradient

- You are using the DPD method required by the currently used feed chemical
- You have adhered to the sensor run in period
- There is permitted and constant flow at the in-line probe housing
- There is temperature equalisation between the sensor and the sample water
- There is a constant pH value in the permitted range

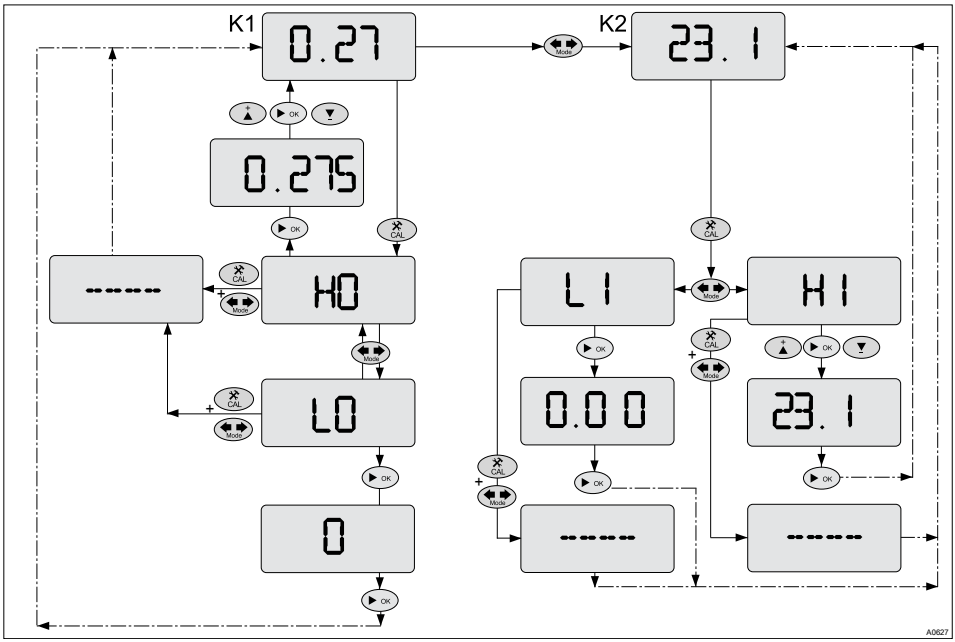

Fig. 26: Sensor slope calibration

The sensor is fitted, flushed with sample water and connected electrically to the DULCOPAC and run-in.

There has to be adequate feed chemical in the sample water for calibration (> 2% of the measuring range of the sensor).

Remove sample water directly at the measuring point and determine the content of feed chemical in the sample water in *"ppm"* using an appropriate reference method (e.g. DPD, titration etc.). Enter this value as follows at the DULCOPAC:

1. Press the key Cal.
   ⇨ The display *[HO]* appears.
2. Press the key OK
   ⇨ The actual measured value appears.
3. Using the keys ▲ and ▼ enter the value you determined using the reference method (e.g. DPD, titration etc.)
4. Confirm this entry with the key OK
   ⇨ The DULCOPAC is now returned to the continuous display and the sensor slope is calibrated.

How to delete the calibration

*If in the [HO] or [LO] display you simultaneously press the keys Cal. and Mode; the indication **[----]** is briefly displayed. The continuous display automatically reappears, the calibration value is deleted and the DULCOPAC continues to operate using the factory settings.*

Then carry out another correct calibration.

Calibration of zero point

> ***Necessity of calibrating the zero point***
>
> *Calibration of the zero point is not generally necessary. Calibration of the zero point is only necessary if the sensor is operated at the lower limit of the measuring range or if the 0.5 ppm sensor version is used.*

A container with water, free of additives that could falsify the measured result, is required for calibration. Immerse the removed, but still electrically connected to the DULCOPAC, sensor in this water. Stir for approx. 5 minutes using the sensor in the water until the measured value displayed at the DULCOPAC is steady and close to *"0"*.

1. Press the key Cal.
   ⇨ The display *[HO]* appears.
2. Press the key Mode
   ⇨ The display *[LO]* appears.
3. Press the key ▶OK
   ⇨ The DULCOPAC now sets the zero point and displays the continuous display again.
4. Fit the sensor into the in-line probe housing. This is described in the operating instructions of your in-line probe housing

Calibration of the measured variable temperature

To calibrate the measured variable temperature see: ↳ *Chapter 8.1 "Calibration of the measured variable temperature" on page 56*

8.5 Calibration of the measured variable conductivity

The calibration limits of the DULCOPAC are:

- Zero point: -50µS < Measuring range < +-50µS
- Slope: 20 % < Cell constant < 500 %

Operating instructions for the relevant sensor

You can determine the necessary sensor conditions for conductivity calibration by reading the relevant sensor operating instructions.

Before calibrating the conductivity sensor, you must check the sensor cell constant (k) in menu P9, see Chapter 7.11 “P2 - Adjusting the measuring range” on page 53, and adjust as necessary.

Temperature calibration

Before calibrating the conductivity, calibration of the temperature measured variable is recommended, as the conductivity measured variable is temperature-compensated. Refer to Chapter 8.1 “Calibration of the measured variable temperature” on page 56

Correct sensor operation

– *Correct measuring and metering is only possible if the sensor is working perfectly*
– *Observe the sensor operating instructions*

Used buffer

Dispose of the used buffer solution. For more information: see buffer solution safety data sheet.

Remove the sensor

Remove the sensor, according to the operating instructions for the sensor and in-line probe housing.

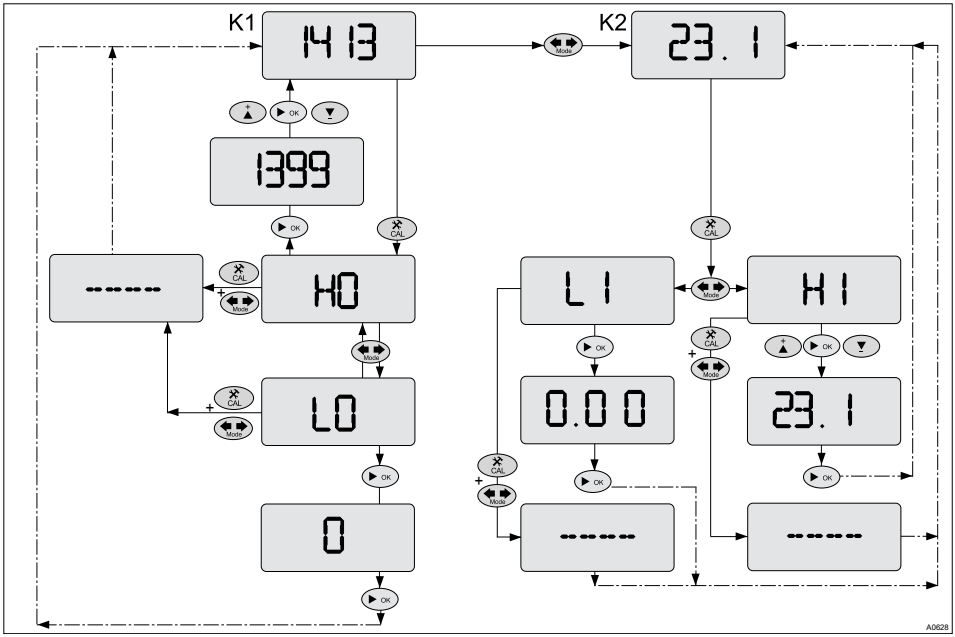

Fig. 27: Calibration of the measured variable conductivity

A container with a buffer solution (e.g. 1413 µS/cm) is needed for testing.

1. Immerse the sensor in the buffer solution *"1413 µS/cm"* in the test container. In so doing, slightly move the sensor

   ⇨ Wait until the measured value shown in the display has stabilised.

2. Press the key Cal.

   ⇨ *[HO]* is indicated on the display.

3. If the indication differs from *"1413 µS/cm"* use the keys ▼ and ▲ to set the value to *"1413 µS/cm"*

4. Press the key ▶OK

   ⇨ The zero point calibration has been successfully completed.

5. You can now refit the sensor and have thus carried out a 1-point calibration.

9 Maintenance, repair and error messages

- **User qualification:** trained user, see *Chapter 1.2 "Users' qualifications" on page 9*

The DULCOPAC is maintenance free.

The interval between possible calibrations, see *Chapter 8 "Calibration menus for all measured variables of the DULCOPAC" on page 56*, is based on the requirements of the process in question and the sensors used. In this respect please also observe the operating instructions for the sensors fitted.

In the event of an error message, please check the cabling of the DULCOPAC and the function or calibration of the other components of the measuring point.

Should a repair be necessary, please contact your ProMinent service.

Table of displayed error codes

Error code	Meaning
E01	No displayed value
E02	Error during the *"Slope"* calibration of K1
E03	Error during the *"Zero point"* calibration of K1
E04	Error during the *"Slope"* calibration of K2
E05	Error during the *"Zero point"* calibration of K2
E06	Input open or a non-displayable value

10 DULCOPAC technical data

10.1 Permissible ambient conditions

Permissible ambient operating conditions

Temperature	-10 °C ... 60 °C
Air humidity	10 % ... 95% relative air humidity (non-condensing)

Permissible ambient storage conditions

Temperature	-20 °C ... 70 °C
Air humidity	< 95% relative air humidity (non-condensing)

10.2 Sound Pressure Level

No noise generation measurable

10.3 Material specifications

Part	Material
Housing:	PS (polystyrene)

10.4 Chemical Resistance

The device is resistant to normal atmospheres in plant rooms

10.5 Dimensions and weights

Complete device:	Width x height x depth = 70 x 90 x 60 mm
Weight of device without packaging:	0.25 kg

11 Electrical data

Mains connection	
Nominal voltage range	24 Volt DC
Frequency	-
Current consumption	0,13 A

Power relay (P-relay)	
Loading of switching contacts	5 A; no inductive loads

Outputs galvanically isolated from other switching parts by reinforced insulation.

Digital input	
Open circuit voltage	15 V DC max.
Short circuit current	approx. 6 mA
Max.switching frequency	Static. For switching processes such as *“PAUSE”*, *“HOLD”*, etc.

! NOTICE!

Do not supply with voltage

For the connection of an external semi-conductor or mechanical switch.

mA output	0 - 20 mA	4 - 20 mA	manual
Current range	0 – 20.5 mA	3.8 – 20.5 mA	0 - 25 mA
In the event of a fault	0 or 23 mA	3.6 or 23 mA	
Max. load	480 Ω at 20.5 mA		
Max. output voltage	19 V DC		
Overvoltage-resistant up to:	±30 V		
Output accuracy	0.2 mA		

Galvanically isolated from all other connections (500 V)

mV input	
Measuring range	-1 V ... + 1 V 0 pH ... 14 pH
Measurement accuracy	±0.25 % of the range
Sensor monitoring of the input (low resistance threshold) (can be switched off)	< 500 kΩ ... 1 MΩ (short circuit)
Sensor monitoring of the input (high resistance threshold) (can be switched off)	no pH sensor connected

mV input	
Display glass sensor resistance of ProMinent pH sensor	0 ... 5000 MΩ
Overvoltage-resistant up to:	±5 V

Pump control (f-relay)	
Max. switching voltage:	50 V (protective low voltage)
Max. switching current:	50 mA
Max. residual current (open):	10 µA
Max. resistance (closed):	60 Ω
Max. switching frequency (HW) at 50% filling factor	100 Hz

Digital output galvanically isolated from all other connections via OptoMos relay.

Temperature input	
Temperature measuring range:	0...120 °C
Measuring flow:	approx. 1.3 mA
Measuring accuracy:	±0.8 % of the measuring range
Overvoltage-resistant up to:	±5 V
Short circuit-resistant	Yes

For connection of a Pt1000 temperature sensor using a 2-wire system. Not galvanically isolated from the mV input

12 Standards complied with

EN 60529 Specification for degrees of protection provided by enclosures (IP-Code)

EN 60746-1 Expression of performance of electrochemical analyzers - Part 1: General

EN 61000 Electromagnetic compatibility (EMC)

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

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

13 Disposal of used parts

- **Users' qualification:** instructed persons, see *Chapter 1.2 “Users' qualifications” on page 9*

! NOTICE!

Regulations governing disposal of used parts

– Note the current national regulations and legal standards which apply in your country

ProMinent Dosiertechnik GmbH, Heidelberg will take back decontaminated used devices providing that they are covered by adequate postage.

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